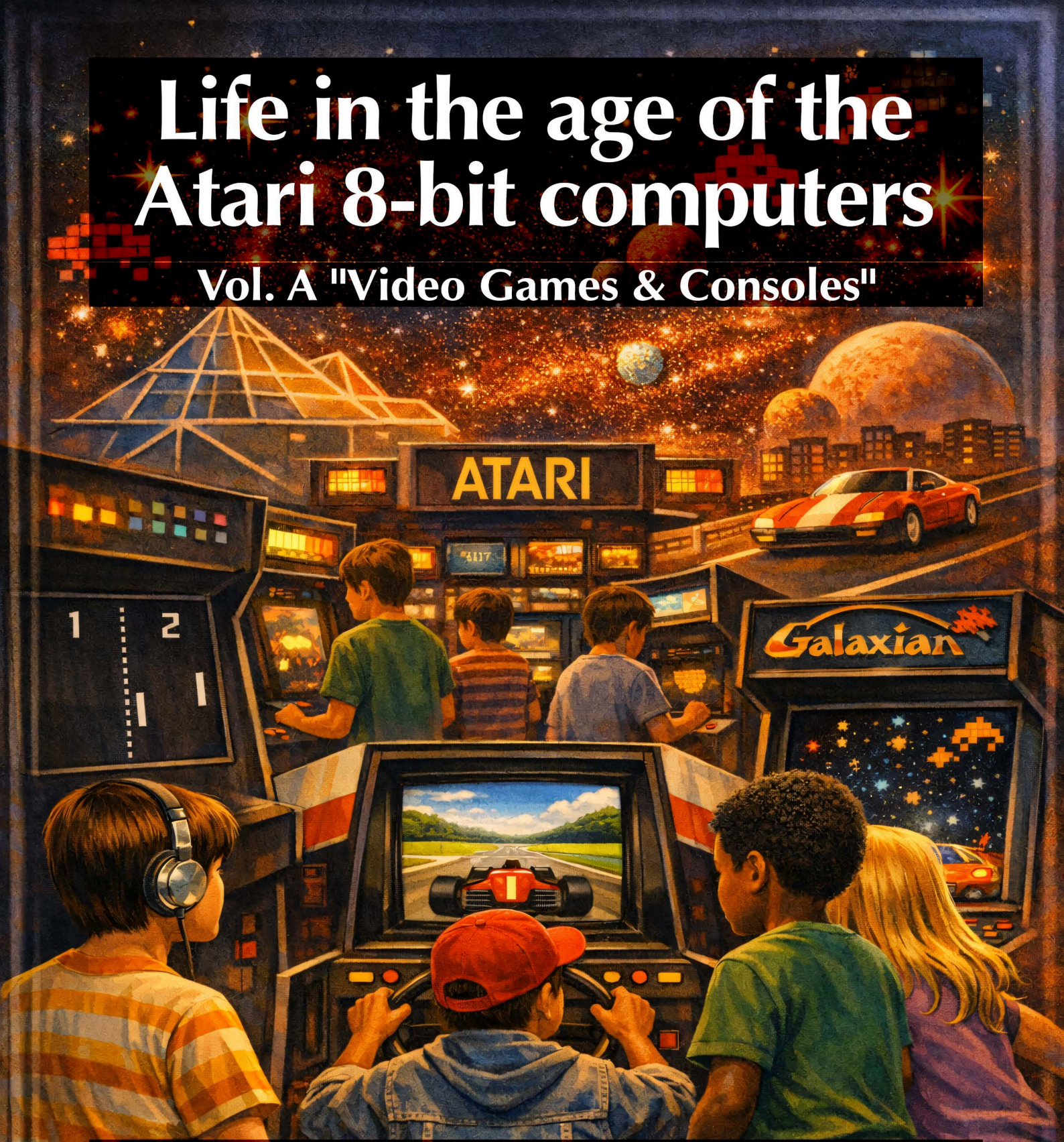
Life in the age of the Atari 8-bit computers

Vol. A "Video Games & Consoles"



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History of Video Game Consoles

Wikipedia articles curated by Laurent Delsarte
Downloaded from https://www.atari800xl.eu

Foreword

Talking with some very young colleagues at the office made me fully realise just how difficult it is to describe what the world of video games and personal computers was like in the early 1980s.

Their impression of it is distorted by series such as "Stranger Things" and other recent films set in the 80s. It simply doesn't match what I experienced as a child born in 1971, a teenager in France during the 80s.

How can I explain to them that, at the time, all of this was so new, so exciting? Of course, everyone – parents included – quickly understood what video game consoles were for. But trying to explain that you wanted a computer – that we called a "microcomputer" – which was far more expensive than a video game console, was quite another matter. Why? What for?

First of all, to play video games – that was the obvious honest answer, and there was no point denying it, even for those who swore otherwise. But you could do so much more with it, especially learning to program the machine, which seemed incredibly promising for the future. The name "Atari" was practically synonymous with "video game" back then. So, if you wanted to ask for an Atari computer, you needed solid arguments to justify it. And why an Atari rather than something else? There were so many options!

We didn't have access to many sources of information back then. Apart from a few magazines, there wasn't much at all. Spending time in a computer or video game shop was genuinely entertaining, even if you didn't buy anything. And an hour or so in an arcade was like stepping into a whole new world – with no direct view of the outside, constantly stimulated by those flashy colours and sounds coming from all around. The games were absolutely stunning – especially visually. They were far superior to their microcomputer versions, which were released only months, or even years, later.

Today's generation can feel anxious when they're disconnected, without a network, cut off from their tribe. But that was completely normal in the 80s. The Internet did exist, but it wasn't available to the general public – only to the military and universities. In fact, ordinary people had never even heard of the Internet, and websites hadn't been invented yet. We were only just beginning to imagine connecting via a modem – painfully slow – to a local BBS (Bulletin Board System). In the US, other services like CompuServe, PLATO, The Source and so on were available, but not in France. That said, at the same time, we did have the Minitel.

To try to begin sketching out as accurately as possible the contours of these technological revolutions of the 1970s and 1980s, I've selected a collection of Wikipedia articles, grouped by theme. Of course, this isn't exhaustive. Of course, this selection reflects a certain perspective on certain topics, and some choices had to be made. But the approach is entirely honest. You won't be fascinated by every single article, but I'm certain that, like me, you'll make some wonderful discoveries. I plan to compile these articles into about twenty themed books. Happy reading, happy exploring.

Video game console

A **video game console** is an electronic device that outputs a video signal or image to display a video game that can typically be played with a game controller. These may be home consoles, which are generally placed in a permanent location connected to a television or other display devices and controlled with a separate game controller, or handheld consoles, which include their own display unit and controller functions built into the unit and which can be played anywhere. Hybrid consoles combine elements of both home and handheld consoles.

A collection of various classic video game consoles at a game show in 2010

Video game consoles are a specialized form of home computer geared towards video game playing, designed with affordability and accessibility to the general public in mind, but lacking in raw computing power and customization. Simplicity is achieved in part through the use of game cartridges or other simplified methods of distribution, easing the effort of launching a game. However, this leads to ubiquitous proprietary formats that create competition for market share.[1] More recent consoles have shown further confluence with home computers, making it easy for developers to release games on multiple platforms. Further, modern consoles can serve as replacements for media players with capabilities to play films and music from optical media or streaming media services.

Video game consoles are usually sold on a five–seven-year cycle called a generation, with consoles made with similar technical capabilities or made around the same time period grouped into one generation. The industry has developed a razor and blades model: manufacturers often sell consoles at low prices, sometimes at a loss, while primarily making a profit from the licensing fees for each game sold. Planned obsolescence then draws consumers into buying the next console generation. While numerous manufacturers have come and gone in the history of the console market, there have always been two or three dominant leaders in the market, with the current market led by Sony (with their PlayStation brand), Microsoft (with their Xbox brand), and Nintendo (currently producing the Switch 2 and Switch consoles). Previous console developers include Sega, Atari, Coleco, Mattel, NEC, SNK, Magnavox, Philips and Panasonic.

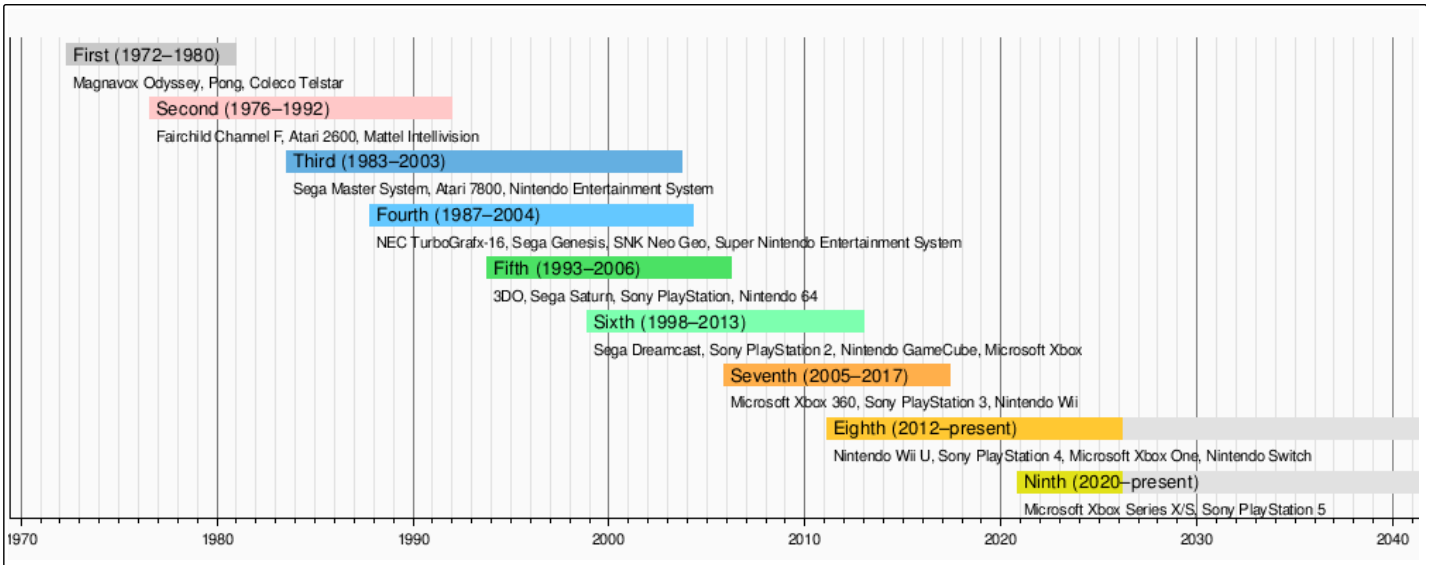
History

The first video game consoles were produced in the early 1970s. Ralph H. Baer devised the concept of playing simple, spot-based games on a television screen in 1966, which later became the basis of the Magnavox Odyssey in 1972. Inspired by the table tennis game on the Odyssey, Nolan Bushnell, Ted Dabney, and Allan Alcorn at Atari, Inc. developed the first successful arcade game, *Pong*, and looked to develop that into a home version, which was released in 1975. The first consoles were capable of playing only a very limited number of games built into the hardware. Programmable consoles using swappable ROM cartridges were introduced with the Fairchild Channel F in 1976, though popularized with the Atari 2600 released in 1977.

Handheld consoles emerged from technology improvements in handheld electronic games as these shifted from mechanical to electronic/digital logic, and away from light-emitting diode (LED) indicators to liquid-crystal displays (LCD) that resembled video screens more closely. Early examples include the Microvision in 1979 and Game & Watch in 1980, and the concept was fully realized by the Game Boy in 1989.

Both home and handheld consoles have become more advanced following global changes in technology; These technological shifts include improved electronic and computer chip manufacturing to increase computational power at lower costs and size, the introduction of 3D graphics and hardware-based graphic processors for real-time rendering, digital communications such as the Internet, wireless networking and Bluetooth, and larger and denser media formats as well as digital distribution.

Following the same type of Moore's law progression, home consoles are grouped into generations; each lasting approximately five years; Consoles within each generation share similar specifications and features, such as processor word size. While no one grouping of consoles by generation is universally accepted,[2] a breakdown of generations, showing representative consoles of each, is shown below.



Overview of the console generations, including generation overlaps. Major consoles of each generation are given for each.

Form factor


An example of a home console, the Microsoft Xbox 360

An example of a handheld console, the Sony PlayStation Portable (PSP)

The Nintendo Switch is a hybrid console with the ability to detach its Joy-Cons (left), and plug into its dock (right) for at home use.

Home video game console

Home video game consoles are meant to be connected to a television or other type of monitor, with power supplied through an outlet. This requires the unit to be used in a fixed location, typically at home in one's living room. Separate game controllers, connected through wired or wireless connections, are used to provide input to the game. Early examples include the Atari 2600, the Nintendo Entertainment System, and the Sega Genesis; newer examples include the Wii U, the PlayStation 5, and the Xbox Series X.

Microconsole

A microconsole is a home video game console that is typically powered by low-cost computing hardware, making the console lower-priced compared to other home consoles on the market. The majority of microconsoles, with a few exceptions such as the PlayStation TV and OnLive Game System, are Android-based digital media players that are bundled with gamepads and marketed as gaming devices. Such microconsoles can be connected to the television to play video games downloaded from an application store such as Google Play.[3]

Handheld game console

Handheld game consoles are devices that typically include a built-in screen and game controller in their case, and contain a rechargeable battery or battery compartment. This allows the unit to be carried around and played anywhere, in contrast to a home game console. Examples include the Game Boy, the PlayStation Portable, and the Nintendo 3DS.

Hybrid video game console

Hybrid video game consoles are devices that combine the use as either a handheld or a home console. In addition to handheld consoles; They generally also have either a wired connection or docking station that connects the console unit to a television screen. The consoles can be used as separate controllers only and be played during wired battery charging. Handhelds include the Sega Nomad, PlayStation Portable, and Nvidia's Shield Portable and Shield Tablet, or home consoles such as the Wii U have hybrid features.[4] With the Nintendo Switch, a console with detachable controllers called Joy-Con Set, the hybrid term became popular and is considered by some to be the first truly hybrid console.[5][6]

Functionality

Most consoles are considered programmable consoles and have the means for the player to switch between different games. Traditionally, this has been done by switching a physical game cartridge or game card or by using optical media. It is now common to download games through digital distribution and store them on internal or external digital storage devices.

Dedicated console

Some consoles are considered dedicated consoles, in which games available for the console are "baked" onto the hardware, either by being programmed via the circuitry or set in the read-only flash memory of the console. Thus, the console's game library cannot be added to or changed directly by the user. The user can typically switch between games on dedicated consoles using hardware switches on the console, or through in-game menus. Dedicated consoles were common in the first generation of home consoles, such as the Magnavox Odyssey and the home console version of *Pong*, and more recently have been used for retro style consoles such as the NES Classic Edition and Sega Genesis Mini.

The Sega Genesis (Mega Drive) Mini dedicated console

Dedicated consoles were very popular in the first generation until they were gradually replaced by second generation that use ROM cartridges. The fourth generation gradually merged with optical media.

Retro style console

During the later part of video game history, there have been specialized consoles using computing components to offer multiple games to players. Most of these plug directly into one's television, and thus are often called plug-and-play consoles. Most of them are also considered dedicated consoles since it is generally impossible to access the computing components by an average consumer, though tech-savvy consumers often have found ways to hack the console to install additional functionality, voiding the manufacturer's warranty. Plug-and-play consoles usually come with the console unit itself, one or more controllers, and the required components for power and video hookup. Many recent plug-and-play releases have been for distributing a number of retro games for a specific console platform. Examples of these include the Atari Flashback series, the NES Classic Edition, Sega Genesis Mini[7] and also handheld retro consoles such as the Nintendo Game & Watch color screen series.

Components

Console unit

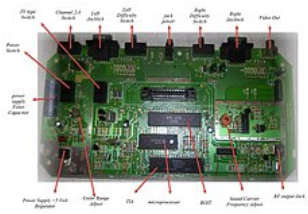
Early console hardware was designed as customized printed circuit boards (PCB)s, selecting existing integrated circuit chips that performed known functions, or programmable chips like erasable programmable read-only memory (EPROM) chips that could perform certain functions. Persistent computer memory was expensive, so dedicated consoles were generally limited to the use of processor registers for storage of the state of a game, thus limiting the complexities of such titles. *Pong* in both its arcade and home format, had a handful of logic and calculation chips that used the current input of the players' paddles and registers storing the ball's position to update the game's state and send it to the display device.[8] Even with more advanced integrated circuits (IC)s of the time, designers were limited to what could be done through the electrical process rather than through programming as normally associated with video game development.

Improvements in console hardware followed with improvements in microprocessor technology and semiconductor device fabrication.[9] Manufacturing processes have been able to reduce the feature size on chips (typically measured in nanometers), allowing more transistors and other components to fit on a chip, and at the same time increasing the circuit speeds and the potential frequency the chip can run at, as well as reducing thermal dissipation. Chips were able to be made on larger dies, further increasing the number of features and effective processing power. Random-access memory became more practical with the higher density of transistors per chip, but to address the correct blocks of memory, processors needed to be updated to use larger word sizes and allot for larger bandwidth in chip communications.[9] All these improvements did increase the cost of manufacturing, but at a rate far less than the gains in overall processing power, which helped to make home computers and consoles inexpensive for the consumer, all related to Moore's law of technological improvements.[9]

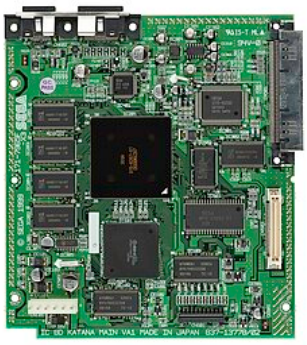
For the consoles of the 1980s to 1990s, these improvements were evident in the marketing in the late 1980s to 1990s during the "bit wars", where console manufacturers had focused on their console's processor's word size as a selling point.[10] Consoles since the 2000s are more similar to personal computers, building in memory, storage features, and networking capabilities to avoid the limitations of the past.[11] The confluence with personal computers eased software development for both computer and console games, allowing developers to target both platforms. However, consoles differ from computers as most of the hardware components are preselected and customized between the console manufacturer and hardware component provider to assure a consistent performance target for developers. Whereas personal computer motherboards are designed with the needs for allowing consumers to add their desired selection of hardware components, the fixed set of hardware for consoles enables console manufacturers to optimize the size and design of the motherboard and hardware, often integrating key hardware components into the motherboard circuitry itself. Often, multiple components, such as the central processing unit and graphics processing unit, can be combined into a single chip, otherwise known as a system on a chip (SoC), which is a further reduction in size and cost.[12] In addition, consoles tend to focus on components that give the unit high game performance, such as the CPU and GPU, and as a tradeoff to keep their prices in expected ranges, use less memory and storage space compared to typical personal computers.[13]

In comparison to the early years of the industry, where most consoles were made directly by the company selling the console, many consoles of today are generally constructed through a value chain that includes component suppliers, such as AMD and NVidia for CPU and GPU functions, and contract manufacturers including electronics manufacturing services, factories which assemble those components into the final consoles such as Foxconn and Flextronics. Completed consoles are then usually tested, distributed, and repaired by the company itself.[14] Microsoft and Nintendo both use this approach to their consoles, while Sony maintains all production in-house with the exception of their component suppliers.

Some of the commons elements that can be found within console hardware include:



The Atari 2600 motherboard, with basic IC chips identified



The Sega Dreamcast motherboard, incorporating more complex IC circuitry

An opened first-generation Xbox console with the hard disc drive and optical drive removed, showing components like the power supply (far right), cooling fins, cooling fan, and case features

Motherboard
The primary PCB that all of the main chips, including the CPU, are mounted on.

Daughterboard
A secondary PCB that connects to the motherboard that would be used for additional functions. These may include components that can be easily replaced later without having to replace the full motherboard.

Central processing unit (CPU)
The main processing chip on the console that performs most of the computational workload. The consoles' CPU is generally defined by its word size (such as 8-bit or 64-bit), and its clock speed or frequency in hertz. For some CPUs, the clock speed can be variable in response to software needs. In general, larger word sizes and faster clock sizes indicate better performance, but other factors will impact the actual speed.
Another distinguishing feature for a console's CPU is the instruction set architecture. The instruction set defines low-level machine code to be sent to the CPU to achieve specific results on the chip. Differences in the instruction set architecture of CPU of consoles of a given generation can make for difficulty in software portability. This had been used by manufacturers to keep software titles exclusive to their platform as one means to compete with others.[15]
Consoles prior to the sixth generation typically used chips that the hardware and software developers were most familiar with, but as personal computers stabilized on the x86 architecture, console manufacturers followed suit as to help easily port games between computer and console.[16]
Newer CPUs may also feature multiple processing cores, which are also identified in their specification. Multi-core CPUs allow for multithreading and parallel computing in modern games, such as one thread for managing the game's rendering engine, one for the game's physics engine, and another for evaluating the player's input.

Graphical processing unit (GPU)
The processing unit that performs rendering of data from the CPU to the video output of the console.
In the earlier console generations, this was generally limited to simple graphic processing routines, such as bitmapped graphics and manipulation of sprites, all otherwise involving integer mathematics while minimizing the amount of required memory needed to complete these routines, as memo. For example, the Atari 2600 used its own Television Interface Adaptor that handled video and audio, while the Nintendo Entertainment System used the Picture Processing Unit. For consoles, these GPUs were also designed to send the signal in the proper analog formation to a cathode ray television, NTSC (used in Japan and North America) or PAL (mostly used in Europe). These two formats differed by their refresh rates, 60 versus 50 Hertz, and consoles and games that were manufactured for PAL markets used the CPU and GPU at lower frequencies.[17]
The introduction of real-time polygonal 3D graphics rendering in the early 1990s—not just an innovation in video games for consoles but in arcade and personal computer games—led to the development of GPUs that were capable of performing the floating-point calculations needed for real-time 3D rendering. In contrast to the CPU, modern GPUs for consoles and computers, principally made by AMD and NVidia, are highly parallel computing devices with a number of compute units/streaming multiprocessors (depending on vendor, respectively) within a single chip. Each compute unit/microprocessor contains a scheduler, a number of subprocessing units, memory caches and buffers, and dispatching and collecting units which also may be highly parallel in nature. Modern console GPUs can be run at a different frequency from the CPU, even at variable frequencies to increases its processing power at the cost of higher energy draw.[18] The performance of GPUs in consoles can be estimated through floating-point operations per second (FLOPS) and more commonly as in teraflops (TFLOPS = 10^{12} FLOPS). However, particularly for consoles, this is considered a rough number as several other factors such as the CPU, memory bandwidth, and console architecture can impact the GPU's true performance.[19]

Coprocessors
Additional processors used to handle other dedicated functions on the console. Many early consoles feature an audio coprocessor for example.

Northbridge
The processor unit that, outside of the CPU and GPU, typically manages the fastest processing elements on the computer. Typically this involves communication of data between the CPU, the GPU, and the on-board RAM, and subsequently sending and receiving information with the southbridge.

Southbridge
The counterpart of the northbridge, the southbridge is the processing unit that handles slower processing components of the console, typically those of input/output (I/O) with some internal storage and other connected devices like controllers.

BIOS
The console's BIOS (Basic Input/Output System) is the fundamental instruction set baked into a firmware chip on the console circuit board that the console uses when it is first turned on to direct operations. In older consoles, prior to the introduction of onboard storage, the BIOS effectively served as the console's operating system, while in modern consoles, the BIOS is used to direct loading of the console's operating system off internal memory.

Random-access memory (RAM)
: Memory storage that is designed for fast reading and writing, often used in consoles to store large amounts of data about a game while it is being played to avoid reading from the slower game media. RAM memory typically does not sustain itself after the console is powered off. Besides the amount of RAM available, a key measurement of performance for consoles is the RAM's bandwidth, how fast in terms of bytes per second that the RAM can be written and read from. This is data that must be transferred to and from the CPU and GPU quickly as needed without requiring these chips to need high memory caches themselves.

Internal storage
: Newer consoles have included internal storage devices, such as flash memory, hard disk drives (HDD) and solid-state drives (SSD), to save data persistently. Early application of internal storage was for saving game states, and more recently can be used to store the console's operating system, game patches and updates, games downloaded through the Internet, additional content for those games, and additional media such as purchased movies and music. Most consoles provide the means to manage the data on this storage while respecting the copyrights on the system. Newer consoles, such as the PlayStation 5 and Xbox Series X, use high-speed SSD's not only for storage but to augment the console's RAM, as the combination of their I/O speeds and the use of decompression routines build into the system software give overall read speeds that approach that of the onboard RAM.[20]

Power supply
: Besides converting AC power from a wall socket to the DC power needed by the console electronics, the power supply also helps to regulate that power in cases of power surges. Some consoles power supplies are built into the unit, so that the consumer plugs the unit directly to a wall socket, but more often, the console ships with an AC adapter, colloquially known as a "power brick", that converts the power outside of the unit. On handheld units the power supply will either be from a battery compartment, or optionally from a direct power connection from an AC adapter, or from a rechargeable battery pack built into the unit.

Cooling systems
: More advanced computing systems generate heat, and require active cooling systems to keep the hardware at safe operating temperatures. Many newer consoles are designed with cooling fans, engineered cooling fins, internal layouts, and strategically-placed vents on the casing to assure good convective heat transfer for keeping the internal components cool.

Media reader
: Since the introduction of game cartridges, nearly all consoles have a cartridge port/reader or an optical drive for game media. In the latter console generations, some console revisions have offered options without a media reader as a means to reduce the console's cost and letting the consumer rely on digital distribution for game acquisition, such as with the Xbox One S All-Digital Edition or the PlayStation 5 Digital Edition.

Case
: All consoles are enclosed in a case to protect the electronics from damage and to constrain the air flow for cooling.

Input/output ports
: Ports for connecting power, controllers, televisions or video monitors, external storage devices, Internet connectivity, and other features are placed in strategic locations on the console. Controller connections are typically offered on the front of the console, while power and most other connections are usually found on the back to keep cables out of the way.

Controllers

All game consoles require player input through a game controller to provide a method to move the player character in a specific direction and a variation of buttons to perform other in-game actions such as jumping or interacting with the game world.[21] Though controllers have become more featured over the years, they still provide less control over a game compared to personal computers or mobile gaming.[22] The type of controller available to a game can fundamentally change the style of how a console game will or can be played.[23][24][25] However, this has also inspired changes in game design to create games that accommodate for the comparatively limited controls available on consoles.[26]

Controllers have come in a variety of styles over the history of consoles. Some common types include:

Paddle
: A unit with a single knob or dial and usually one or two buttons. Turning the knob typically allows one to move an on-screen object along one axis (such as the paddle in a table tennis game), while the buttons can have additional features.

Joystick
: A unit that has a long handle that can pivot freely along multiple directions along with one or more buttons. The unit senses the direction that the joystick is pushed, allowing for simultaneous movement in two directions within a game.

Gamepad
: A unit that contains a variety of buttons, triggers, and directional controls – either D-pads or analog sticks or both. These have become the most common type of controller since the third generation of console hardware, with designs becoming more detailed to provide a larger array of buttons and directional controls for players while maintaining ergonomic features.

Numerous other controller types exist, including those that support motion controls, touchscreen support on handhelds and some consoles, and specialized controllers for specific types of games, such as racing wheels for racing games, light guns for shooting games, and musical instrument controllers for rhythm games. Some newer consoles also include optional support for a mouse and keyboard devices. Some older consoles such as 1988 Sega Genesis aka Mega Drive and 1993 3DO Interactive Multiplayer, supported optional mice, both with special mice made for them, but the 3DO mouse like that console was a flop, and the mouse for the Sega had very limited game support. The Sega also supported the optional Menacer, a wireless infrared light gun, and such were at one point popular for games. It also support BatterUP, a baseball bat-shaped controller.

A controller may be attached through a wired connection onto the console itself, or in some unique cases like the Famicom hardwired to the console, or with a wireless connection. Controllers require power, either provided by the console via the wired connection, or from batteries or a rechargeable battery pack for wireless connections. Controllers are nominally built into a handheld unit, though some newer ones allow for separate wireless controllers to also be used.

The Magnavox Odyssey dual-paddle controller

The Atari CX40 joystick

The Nintendo Entertainment System gamepad with a single D-pad and four buttons

A modern controller, the DualSense for the Sony PlayStation 5, with multiple directional controls and buttons

Game media

While the first game consoles were dedicated game systems, with the games programmed into the console's hardware, the Fairchild Channel F introduced the ability to store games in a form separate from the console's internal circuitry, thus allowing the consumer to purchase new games to play on the system. Since the Channel F, nearly all game consoles have featured the ability to purchase and swap games through some form, though those forms have changed with improvements in technology.

ROM cartridge or game cartridge

The read-only memory (ROM) cartridge was introduced with the Fairchild Channel F. A ROM cartridge consist of a printed circuit board (PCB) housed inside of a plastic casing, with a connector allowing the device to interface with the console. The circuit board can contain a wide variety of components, at the minimum, the read-only memory with the software written on it. Later cartridges were able to introduce additional components onto the circuit board like coprocessors, such as Nintendo's SuperFX chip, to enhance the performance of the console.[27] Some consoles such as the Turbografx-16 used a smart card-like technology to flatten the cartridge to a credit-card-sized system, which helped to reduce production costs, but limited additional features that could be included onto the circuitry.[28] PCB-based cartridges waned with the introduction of optical media during the fifth generation of consoles. More recently, ROM cartridges have been based on high memory density, low cost flash memory, which allows for easier mass production of games. Sony used this approach for the PlayStation Vita,[29] and Nintendo continues to use ROM cartridges for its 3DS and Switch products.

Optical media

Optical media, such as CD-ROM, DVD, and Blu-ray, became the primary format for retail distribution with the fifth generation. The CD-ROM format had gained popularity in the 1990s, in the midst of the fourth generation, and as a game media, CD-ROMs were cheaper and faster to produce, offered much more storage space and allowed for the potential of full-motion video.[30] Several console manufacturers attempted to offer CD-ROM add-ons to fourth generation consoles, but these were nearly as expensive as the consoles themselves and did not fare well. Instead, the CD-ROM format became integrated into consoles of the fifth generation, with the DVD format present across most by the seventh generation and Blu-ray by the eighth. Console manufacturers have also used proprietary disc formats for copy protection as well, such as the Nintendo optical disc used on the GameCube, and Sony's Universal Media Disc on the PlayStation Portable.

Digital distribution

Since the seventh generation of consoles, most consoles include integrated connectivity to the Internet and both internal and external storage for the console, allowing for players to acquire new games without game media. All three of Nintendo, Sony, and Microsoft offer an integrated storefront for consumers to purchase new games and download them to their console, retaining the consumers' purchases across different consoles, and offering sales and incentives at times.

Cloud gaming

As Internet access speeds improved throughout the eighth generation of consoles, cloud gaming had gained further attention as a media format. Instead of downloading games, the consumer plays them directly from a cloud gaming service with inputs performed on the local console sent through the Internet to the server with the rendered graphics and audio sent back. Latency in network transmission remains a core limitation for cloud gaming at the present time.

While magnetic storage, such as tape drives and floppy disks, had been popular for software distribution with early personal computers in the 1980s and 1990s, this format did not see much use in console systems. There were some attempts, such as the Bally Astrocade and APF-M1000 using tape drives, as well as the Disk System for the Nintendo Famicom,[31] and the Nintendo 64DD for the Nintendo 64, but these had limited applications, as magnetic media was more fragile and volatile than game cartridges.[32]

A Fairchild Channel F cartridge, exposing the circuit contacts on the PCB

A Nintendo Wii optical disc

Mobile device running cloud game on Stadia with official controller

External storage

In addition to built-in internal storage, newer consoles often give the consumer the ability to use external storage media to save game data, downloaded games, or other media files from the console. Early iterations of external storage were achieved through the use of flash-based memory cards, first used by the Neo Geo but popularized with the PlayStation. Nintendo continues to support this approach with extending the storage capabilities of the 3DS and Switch, standardizing on the current SD card format. As consoles began incorporating the use of USB ports, support for USB external hard drives was also added, such as with the Xbox 360.

A PlayStation memory card

Online services

With Internet-enabled consoles, console manufacturers offer both free and paid-subscription services that provide value-added services atop the basic functions of the console. Free services generally offer user identity services and access to a digital storefront, while paid services allow players to play online games, interact with other uses through social networking, use cloud saves for supported games, and gain access to free titles on a rotating basis. Examples of such services include the Xbox network, PlayStation Network, and Nintendo Switch Online.

Console add-ons

Certain consoles saw various add-ons or accessories that were designed to attach to the existing console to extend its functionality. The best example of this was through the various CD-ROM add-ons for consoles of the fourth generation such as the TurboGrafx CD, Atari Jaguar CD, and the Sega CD. Other examples of add-ons include the 32X for the Sega Genesis intended to allow owners of the aging console to play newer games but has several technical faults, and the Game Boy Player for the GameCube to allow it to play Game Boy games.

Accessories

Consumers can often purchase a range of accessories for consoles outside of the above categories. These can include:

Video camera
: While these can be used with Internet-connected consoles like webcams for communication with other friends as they would be used on personal computers, video camera applications on consoles are more commonly used in augmented reality/mixed reality and motion sensing games. Devices like the EyeToy for PlayStation consoles and the Kinect for Xbox consoles were center-points for a range of games to support these devices on their respective systems.

Standard Headsets
: Headsets provide a combination of headphones and a microphone for chatting with other players without disturbing others nearby in the same room.

Virtual reality headsets
: Some virtual reality (VR) headsets can operate independently of consoles or use personal computers for their main processing system. As of 2020, the only direct VR support on consoles is the PlayStation VR, though support for VR on other consoles is planned by the other manufacturers.

Docking station
: For handheld systems as well as hybrids such as the Nintendo Switch, the docking station makes it easy to insert a handheld to recharge its battery, and if supported, for connecting the handheld to a television screen.


Kinect for Xbox One


Virtual reality headset PlayStation VR

Docking station for Nintendo Switch

Game development

The core development process for a console game is very similar to its counterparts and primarily differs in the high level concept due to demographics[33] and the technical back-end.[34] Consoles developers will usually make a development kit available to game developers which they can use to test their games on with more ease than a consumer model.

Early console games were commonly created by a single person and could be changed in a short amount of time due to the simplicity of the games at the time.[35] As technology has improved, the development time, complexity and cost of console games has increased dramatically,[36] to where the size of a team for an eighth generation game can number in the hundreds.[37] Similarly, the programming languages used in video game development has changed over time with early games being developed primarily in assembly. As time went on developers had more choice on what they could use based on the availability on the console but some languages became more popular than others.[36]

In comparison to PC and mobile games, console game developers must consider the limitations of the hardware their game is being developed for, as it is unlikely to have any major changes between the development phase and release. PC and mobile technology progresses quickly and there are many different configurations of their hardware and software. This is beneficial at the start of a console's life cycle, as

the technology will be cutting edge, but as the console ages, developers are forced to work with ageing hardware until the next generation of consoles is released. Earlier consoles games could be developed to take advantage of the fixed limitations of the consoles they were developed for, such as the MegaDrive's capability of fast scrolling influencing design decisions made for *Sonic the Hedgehog*.[38]

Console development kits

Console or game development kits are specialized hardware units that typically include the same components as the console and additional chips and components to allow the unit to be connected to a computer or other monitoring device for debugging purposes. A console manufacturer will make the console's dev kit available to registered developers months ahead of the console's planned launch to give developers time to prepare their games for the new system. These initial kits will usually be offered under special confidentiality clauses to protect trade secrets of the console's design, and will be sold at a high cost to the developer as part of keeping this confidentiality.[13] Newer consoles that share features in common with personal computers may no longer use specialized dev kits, though developers are still expected to register and purchase access to software development kits from the manufacturer. For example, any consumer Xbox One can be used for game development after paying a fee to Microsoft to register one intent to do so.[39]

Licensing

Since the release of the Nintendo Famicom / Nintendo Entertainment System, most video game console manufacturers employ a strict licensing scheme that limit what games can be developed for it. Developers and their publishers must pay a fee, typically based on royalty per unit sold, back to the manufacturer. The cost varies by manufacturer but was estimated to be about US$3–10 per unit in 2012. With additional fees, such as branding rights, this has generally worked out to be an industry-wide 30% royalty rate paid to the console manufacturer for every game sold.[40][41] This is in addition to the cost of acquiring the dev kit to develop for the system.

The licensing fee may be collected in a few different ways. In the case of Nintendo, the company generally has controlled the production of game cartridges with its lockout chips and optical media for its systems, and thus charges the developer or publisher for each copy it makes as an upfront fee. This also allows Nintendo to review the game's content prior to release and veto games it does not believe appropriate to include on its system. This had led to over 700 unlicensed games for the NES,[42] and numerous others on other Nintendo cartridge-based systems that had found ways to bypass the hardware lockout chips and sell without paying any royalties to Nintendo, such as by Atari in its subsidiary company Tengen.[43] This licensing approach was similarly used by most other cartridge-based console manufacturers using lockout chip technology.[44]

With optical media, where the console manufacturer may not have direct control on the production of the media, the developer or publisher typically must establish a licensing agreement to gain access to the console's proprietary storage format for the media as well as to use the console and manufacturer's logos and branding for the game's packaging, paid back through royalties on sales.[40] In the transition to digital distribution, where now the console manufacturer runs digital storefronts for games, license fees apply to registering a game for distribution on the storefront – again gaining access to the console's branding and logo – with the manufacturer taking its cut of each sale as its royalty.[40] In both cases, this still gives console manufacturers the ability to review and reject games it believes unsuitable for the system and deny licensing rights.

With the rise of indie game development, the major console manufacturers have all developed entry level routes for these smaller developers to be able to publish onto consoles at far lower costs and reduced royalty rates. Programs like Microsoft's ID@Xbox give developers most of the needed tools for free after validating the small development size and needs of the team.[45]

Similar licensing concepts apply for third-party accessory manufacturers.[40]

Emulation and backward compatibility

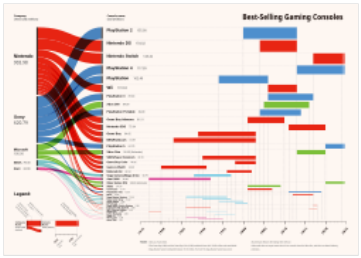
Consoles, like most consumer electronic devices, have limited lifespans. There is great interest in preservation of older console hardware for archival and historical purposes, as games from older consoles, as well as arcade and personal computers, remain of interest. Computer programmers and hackers have developed emulators that can be run on personal computers or other consoles that simulate the hardware of older consoles that allow games from that console to be run. The development of software emulators of console hardware is established to be legal, but there are unanswered legal questions surrounding copyrights, including acquiring a console's firmware and copies of a game's ROM image, which laws such as the United States' Digital Millennium Copyright Act make illegal save for certain archival purposes.[46] Even though emulation itself is legal, Nintendo is recognized to be highly protective of any attempts to emulate its systems and has taken early legal actions to shut down such projects.[47]

To help support older games and console transitions, manufacturers started to support backward compatibility on consoles in the same family. Sony was the first to do this on a home console with the PlayStation 2 which was able to play original PlayStation content, and subsequently became a sought-after feature across many consoles that followed.[48] Backward compatibility functionality has included direct support for previous console games on the newer consoles such as within the Xbox console family,[49] the distribution of emulated games such as Nintendo's Virtual Console, or using cloud gaming services for these older games as with the PlayStation Now service.

Market

Distribution

Consoles may be shipped in a variety of configurations, but typically will include one base configuration that include the console, one controller, and sometimes a pack-in game. Manufacturers may offer alternate stock keeping unit (SKUs) options that include additional controllers and accessories or different pack-in games. Special console editions may feature unique cases or faceplates with art dedicated to a specific video game or series and are bundled with that game as a special incentive for its fans. Pack-in games are typically first-party games, often featuring the console's primary mascot characters.[50]



Visualization of the Best-Selling game consoles from 1977 to 2024

The more recent console generations have also seen multiple versions of the same base console system either offered at launch or presented as a mid-generation refresh. In some cases, these simply replace some parts of the hardware with cheaper or more efficient parts, or otherwise streamline the console's design for production going forward; the PlayStation 3 underwent several such hardware refreshes during its lifetime due to technological improvements such as significant reduction of the process node size for the CPU and GPU.[51] In these cases, the hardware revision model will be marked on packaging so that consumers can verify which version they are acquiring.[52]

In other cases, the hardware changes create multiple lines within the same console family. The base console unit in all revisions share fundamental hardware, but options like internal storage space and RAM size may be different. Those systems with more storage and RAM would be marked as a higher performance variant available at a higher cost, while the original unit would remain as a budget option. For example, within the Xbox One family, Microsoft released the mid-generation Xbox One X as a higher performance console, the Xbox One S as the lower-cost base console, and a special Xbox One S All-Digital Edition revision that removed the optical drive on the basis that users could download all games digitally, offered at even a lower cost than the Xbox One S. In these cases, developers can often optimize games to work better on the higher-performance console with patches to the retail version of the game.[53] In the case of the Nintendo 3DS, the New Nintendo 3DS, featured upgraded memory and processors, with new games that could only be run on the upgraded units and cannot be run on an older base unit.[54] There have also been a number of "slimmed-down" console options with significantly reduced hardware components that significantly reduced the price they could sell the console to the consumer, but either leaving certain features off the console, such as the Wii Mini that lacked any online components compared to the Wii, or that required the consumer to purchase additional accessories and wiring if they did not already own it, such as the New-Style NES that was not bundled with the required RF hardware to connect to a television.[55]

Pricing

Consoles when originally launched in the 1970s and 1980s were about US$200–300,[56] and with the introduction of the ROM cartridge, each game averaged about US$30–40.[63] Over time the launch price of base consoles units has generally risen to about US$400–500,[56] with the average game costing US$60.[63] Exceptionally, the period of transition from ROM cartridges to optical media in the early 1990s saw several consoles with high price points exceeding US$400 and going as high as US$700. Resultingly, sales of these first optical media consoles were generally poor.[56]

When adjusted for inflation, the price of consoles has generally followed a downward trend, from US$800–1,000 from the early generations down to US$500–600 for current consoles. This is typical for any computer technology, with the improvements in computing performance and capabilities outpacing the additional costs to achieve those gains.[56] Further, within the United States, the price of consoles has generally remained consistent, being within 0.8% to 1% of the median household income, based on the United States Census data for the console's launch year.[56]

Since the Nintendo Entertainment System, console pricing has stabilized on the razorblade model, where the consoles are sold at little to no profit for the manufacturer, but they gain revenue from each game sold due to console licensing fees and other value-added services around the console (such as Xbox Live).[47][64][65] Console manufacturers have even been known to take losses on the sale of consoles at the start of a console's launch with expectation to recover with revenue sharing and later price recovery on the console as they switch to less expensive components and manufacturing processes without changing the retail price.[66] Consoles have been generally designed to have a five-year product lifetime, though manufacturers have considered their entries in the more recent generations to have longer lifetimes of seven to potentially ten years.[67]

Competition

The competition within the video game console market as subset of the video game industry is an area of interest to economics with its relatively modern history, its rapid growth to rival that of the film industry, and frequent changes compared to other sectors.[57][11]

Effects of unregulated competition on the market were twice seen early in the industry. The industry had its first crash in 1977 following the release of the Magnavox Odyssey, Atari's home versions of *Pong* and the Coleco Telstar, which led other third-party manufacturers, using inexpensive General Instruments processor chips, to make their own home consoles which flooded the market by 1977.[68]:81–89 The video game crash of 1983 was fueled by multiple factors including competition from lower-cost personal computers, but unregulated competition was also a factor, as numerous third-party game developers, attempting to follow on the success of Activision in developing third-party games for the Atari 2600 and Intellivision, flooded the market with poor quality games, and made it difficult for even quality games to sell.[69] Nintendo implemented a lockout chip, the Checking Integrated Circuit, on releasing the Nintendo Entertainment System in Western

territories, as a means to control which games were published for the console. As part of their licensing agreements, Nintendo further prevented developers from releasing the same game on a different console for a period of two years. This served as one of the first means of securing console exclusivity for games that existed beyond technical limitation of console development.[70]

The Nintendo Entertainment System also brought the concept of a video game mascot as the representation of a console system as a means to sell and promote the unit, and for the NES was Mario. The use of mascots in businesses had been a tradition in Japan, and this had already proven successful in arcade games like *Pac-Man*. Mario was used to serve as an identity for the NES as a humor-filled, playful console.[50][71] Mario caught on quickly when the NES released in the West, and when the next generation of consoles arrived, other manufacturers pushed their own mascots to the forefront of their marketing, most notably Sega with the use of Sonic the Hedgehog.[72] The Nintendo and Sega rivalry that involved their mascot's flagship games served as part of the fourth console generation's "console wars". Since then, manufacturers have typically positioned their mascot and other first-party games as key titles in console bundles used to drive sales of consoles at launch or at key sales periods such as near Christmas.[50]

Another type of competitive edge used by console manufacturers around the same time was the notion of "bits" or the size of the word used by the main CPU. The TurboGrafx-16 was the first console to push on its bit-size, advertising itself as a "16-bit" console, though this only referred to part of its architecture while its CPU was still an 8-bit unit. Despite this, manufacturers found consumers became fixated on the notion of bits as a console selling point, and over the fourth, fifth and sixth generation, these "bit wars" played heavily into console advertising.[10] The use of bits waned as CPU architectures no longer needed to increase their word size and instead had other means to improve performance such as through multicore CPUs.[10]

Generally, increased console numbers gives rise to more consumer options and better competition, but the exclusivity of titles made the choice of console for consumers an "all-or-nothing" decision for most.[11]

Console release prices (in U.S. Dollars) and total sales[56][57]

Console	Release year (U.S.)	Introductory price (U.S.)		Global Sales (Units)
		Originally[note 1]	2020 inflation[note 2]	
First generation				
Magnavox Odyssey	1972	$100	$553	350,000[58]
Second generation				
Atari 2600	1977	$200	$882	30,000,000
Intellivision	1979	$300	$996	3,000,000
Atari 5200	1982	$270	$740	1,400,000
Colecovision	1982	$175	$480	2,000,000
Third generation				
NES	1985	$200	$490	61,900,000
Atari 7800	1986	$150	$380	3,770,000
Master System	1986	$200	$470	13,000,000
Fourth generation				
Game Boy	1989	$110	$234	64,400,000
TurboGrafx-16	1989	$200	$426	5,800,000
Genesis	1989	$190	$405	30,750,000
SNES	1991	$200	$384	49,100,000
CD-I	1991	$400	$768	1,000,000
Neo Geo	1991	$650	$1248	980,000
Sega CD	1992	$300	$561	2,240,000
Fifth generation				
Atari Jaguar	1993	$250	$453	250,000
3DO	1993	$700	$1267	2,000,000
32X	1994	$160	$282	665,000
PlayStation	1995	$300	$516	102,490,000
Sega Saturn	1995	$400	$688	9,260,000
Nintendo 64	1996	$200	$334	32,390,000
Game Boy Color	1998			49,300,000
Sixth generation				
Dreamcast	1999	$200	$314	9,130,000
PlayStation 2	2000	$300	$459	155,000,000
GameCube	2001	$200	$294	21,740,000
Xbox	2001	$300	$441	24,000,000
Game Boy Advance	2001	$100	$147	118,690,000
N-Gage	2003	$300	$416	3,000,000
Seventh generation				
Nintendo DS	2004	$200	$278	154,020,000
PlayStation Portable	2004	$250	$348	82,000,000
Xbox 360	2005	$400	$540	84,700,000
PlayStation 3	2006	$500	$680	87,400,000
Wii	2006	$250	$326	101,630,000
Eighth generation				
Wii U	2012	$350	$399	13,560,000
Nintendo 3DS	2011	$250	$293	75,280,000
PlayStation Vita	2012	$250	$293	15,900,000
PlayStation 4	2013	$400	$448	117,200,000[note 3]
Xbox One	2013	$500	$560	51,000,000 (Estimate)
Nintendo Switch	2017	$300	$318	154,010,000[59]
Current				
PlayStation 5	2020	$400 / $500	$400 / $500	50,000,000[note 3][60]
Xbox Series X/S	2020	$300 / $500	$300 / $500	18,000,000 (Estimate)[note 3][note 4]
Nintendo Switch 2	2025	$499 / $600	$499/ $600	10,360,000[59]

Handheld units are shown in blue.

1. Based on pricing of base model at launch within the United States
2. Based on the Bureau of Labor Statistics Consumer Price Index
3. Still in production
4. Microsoft does not report exact sales for its consoles since the Xbox One, and sales are based industry estimates.[61][62]

Further, with the number of available consoles growing with the fifth and sixth generations, game developers became pressured to which systems to focus on, and ultimately narrowed their target choice of platforms to those that were the best-selling. This cased a contraction in the market, with major players like Sega leaving the hardware business after the Dreamcast but continuing in the software area.[57] Effectively, each console generation was shown to have two or three dominant players.[11]

Retail demo kiosk for a Dreamcast, the last console from Sega, at the Finnish Museum of Games in Tampere, Finland in 2017

Competition in the console market in the 2010s and 2020s is considered an oligopoly between three main manufacturers: Nintendo, Sony, and Microsoft. The three use a combination of first-party games exclusive to their console and negotiate exclusive agreements with third-party developers to have their games be exclusive for at least an initial period of time to drive consumers to their console. They also worked with CPU and GPU manufacturers to tune and customize hardware for computers to make it more amenable and effective for video games, leading to lower-cost hardware needed for video game consoles. Finally, console manufacturers also work with retailers to help with promotion of consoles, games, and accessories. While there is little difference in pricing on the console hardware from the manufacturer's suggested retail price for the retailer to profit from, these details with the manufacturers can secure better profits on sales of game and accessory bundles for premier product placement.[57] These all form network effects, with each manufacturer seeking to maximize the size of their network of partners to increase their overall position in the competition.[11]

Of the three, Microsoft and Sony, both with their own hardware manufacturing capabilities, remain at a leading edge approach, attempting to gain a first-mover advantage over the other with adaption of new console technology.[57] Nintendo is more reliant on its suppliers and thus instead of trying to compete feature for feature with Microsoft and Sony, had instead taken a "blue ocean" strategy since the Nintendo DS and Wii.[73]

See also

- Game consoles sales
- Unlockable game
- Video game clone

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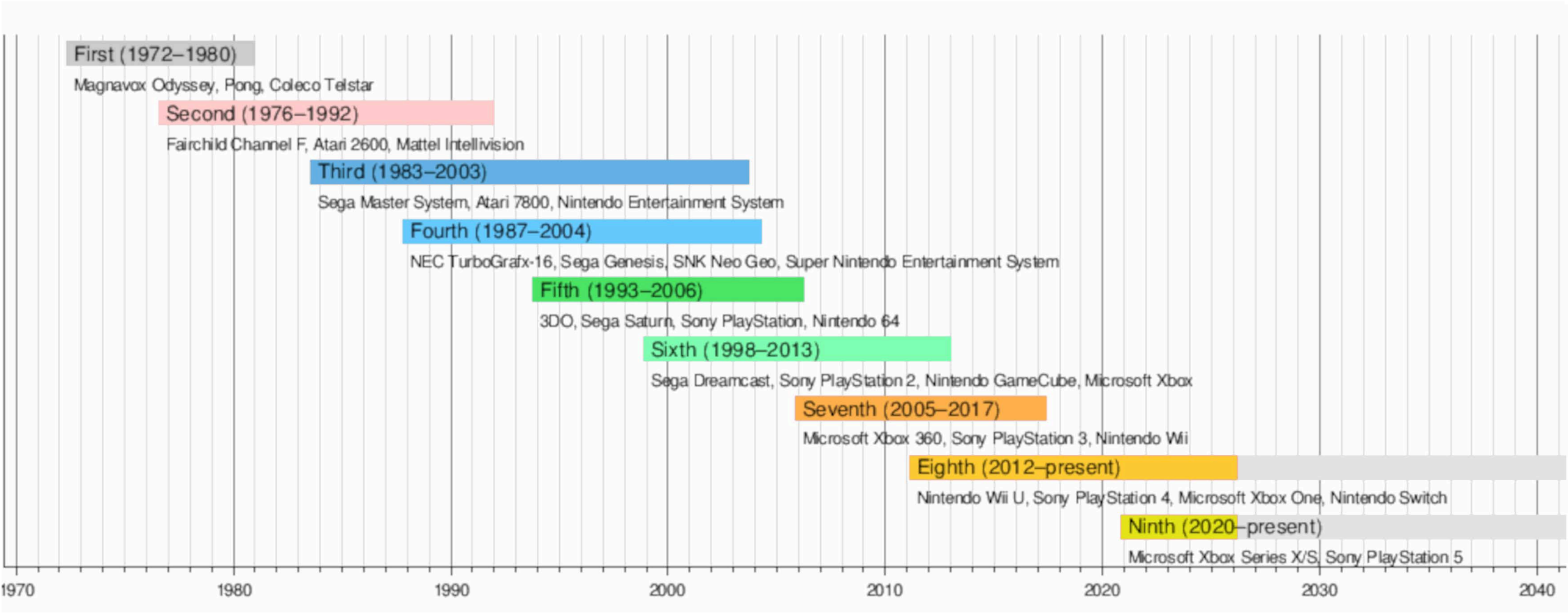
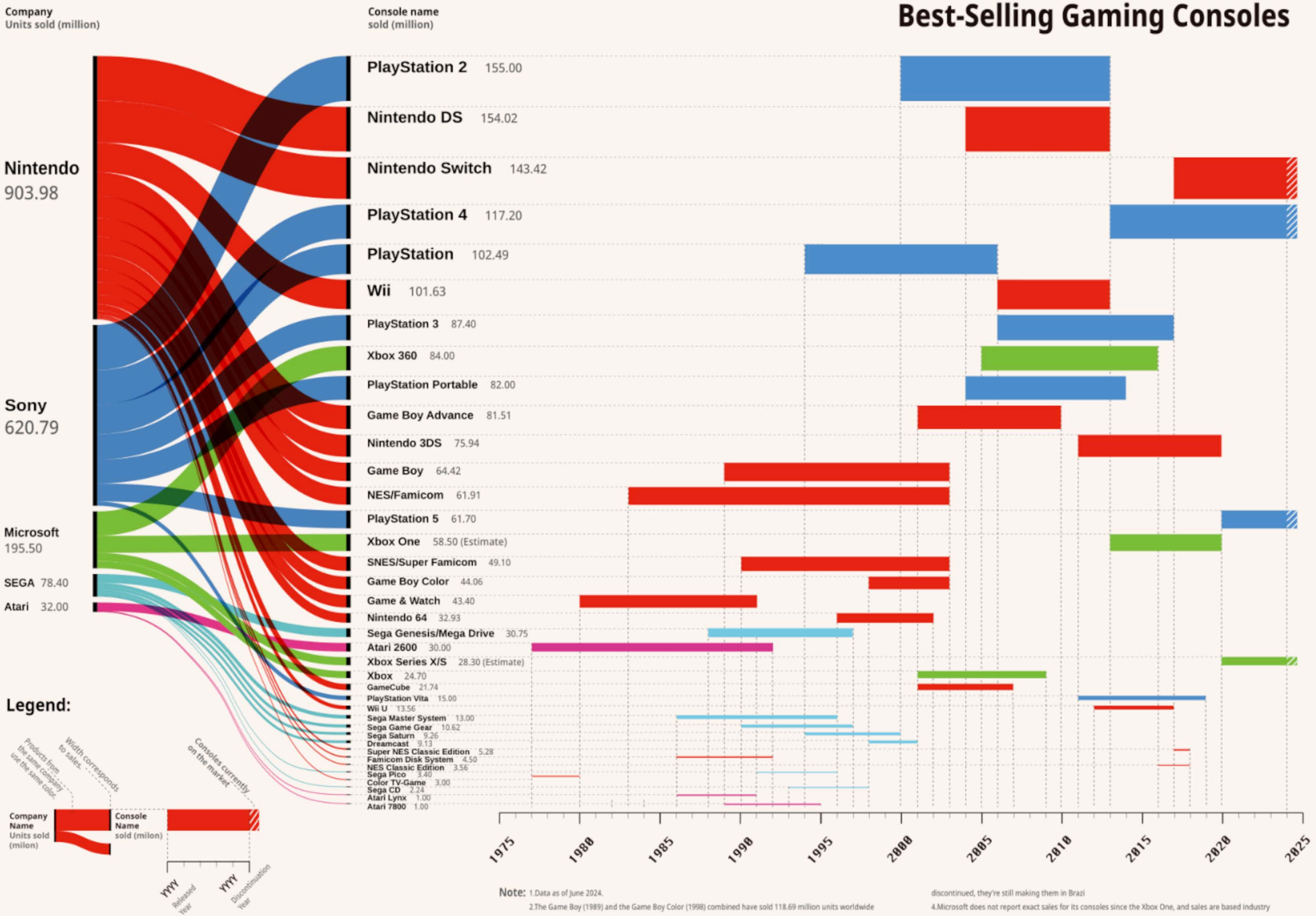
External links


First (1972–1980)
Magnavox Odyssey, Pong, Coleco Telstar
Second (1976–1992)
Fairchild Channel F, Atari 2600, Mattel Intellivision
Third (1983–2003)
Sega Master System, Atari 7800, Nintendo Entertainment System
Fourth (1987–2004)
NEC TurboGrafx-16, Sega Genesis, SNK Neo Geo, Super Nintendo Entertainment System
Fifth (1993–2006)
3DO, Sega Saturn, Sony PlayStation, Nintendo 64
Sixth (1998–2013)
Sega Dreamcast, Sony PlayStation 2, Nintendo GameCube, Microsoft Xbox
Seventh (2005–2017)
Microsoft Xbox 360, Sony PlayStation 3, Nintendo Wii
Eighth (2012–present)
Nintendo Wii U, Sony PlayStation 4, Microsoft Xbox One, Nintendo Switch
Ninth (2020–present)
Microsoft Xbox Series X/S, Sony PlayStation 5
1970
1980
1990
2000
2010
2020
2030
2040

Best-Selling Gaming Consoles



Note: 1.Data as of June 2024.

2.The Game Boy (1989) and the Game Boy Color (1998) combined have sold 118.69 million units worldwide

3.Sega Master System estimated between 10-13 million. Fun Fact The Sega Master System was never discontinued, they're still making them in Brazi

4.Microsoft does not report exact sales for its consoles since the Xbox One, and sales are based industry estimates.

History of video game consoles

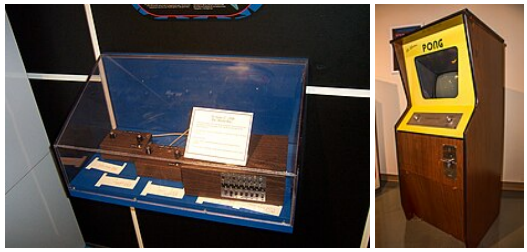
The **history of video game consoles**, both home and handheld, began in the 1970s. The first console that played games on a television set was the 1972 Magnavox Odyssey, first conceived by Ralph H. Baer in 1966. Handheld consoles originated from electro-mechanical games that used mechanical controls and light-emitting diodes (LED) as visual indicators. Handheld electronic games had replaced the mechanical controls with electronic and digital components, and with the introduction of Liquid-crystal display (LCD) to create video-like screens with programmable pixels, systems like the Microvision and the Game & Watch became the first handheld video game consoles.

Since then, home game consoles have progressed through technology cycles typically referred to as generations. Each generation has lasted approximately five years, during which the major console manufacturers have released console with broadly similar specifications. Handheld consoles have seen similar advances, and are usually grouped into the same generations as home consoles.

While early generations were led by manufacturers like Atari and Sega, the modern home console industry is dominated by three companies: Nintendo, Sony, and Microsoft. The handheld market has waned since the introduction of mobile gaming in the late 2000s, and today, the only major manufacturer in handheld gaming is Nintendo.

Origins

Home consoles



Left: Ralph H. Baer's "Brown Box", a prototype of the Magnavox Odyssey, the first home video game console. Right: A *Pong* arcade cabinet, signed by Allan Alcorn, *Pong*'s developer

The first video games were created on mainframe computers in the 1950s, typically with text-only displays or computer printouts, and limited to simple games like Tic Tac Toe or Nim.[1] Eventually displays with rudimentary vector displays for graphics were available, leading to titles like *Spacewar!* in 1962.[2] *Spacewar!* directly influenced Nolan Bushnell and Ted Dabney to create *Computer Space* in 1971, the first arcade video game.[3]

Separately, while at Sanders Associates in 1966, Ralph H. Baer conceived of the idea of an electronic device that could be connected to a standard television to play games. With Sanders' permission, he created the prototype "Brown Box" which was able to play a limited number of games, including a version of table tennis and a simple light gun game. Sanders patented the unit and licensed the patents to Magnavox, where it was manufactured as the first home video game console, the Magnavox Odyssey, in 1972.[4] Bushnell, after seeing the Odyssey and its table tennis game, believed he could make something better. He and Dabney formed Atari, Inc., and with Allan Alcorn, created their second arcade game, *Pong*. *Pong* first released in 1972 and was more successful than *Computer Space*.[5] Atari released a *Pong* home console through Sears in 1975.[6]

Handheld consoles

The origins of handheld game consoles are found in handheld and tabletop electronic game devices of the 1970s and early 1980s. These electronic devices can only play built-in games,[7] they fit in the palm of the hand or on a tabletop, and they may make use of a variety of video display technologies such as LED, VFD, or LCD.[8] These games derived from the emerging optoelectronic-display-driven calculator market of the early 1970s.[9][10]

The first such handheld electronic game was released by Mattel in 1977, where Michael Katz, Mattel's new product category marketing director, told the engineers in the electronics group to design a game the size of a calculator, using LED technology."[11] This effort led to the 1977 games *Auto Race* and *Football*.[12][13] The two games were so successful that according to Katz, "these simple electronic handheld games turned into a '$400 million category.'"[8] Another Ralph Baer invention, *Simon*, published by Milton Bradley in 1978, followed, which further popularized such electronic games and remained an enduring property by Milton Bradley (later Hasbro) that brought a number of copycats to the market.[14][15] Soon, other manufacturers including Coleco, Parker Brothers, Entex, and Bandai began following up with their own tabletop and handheld electronic games.[16]

The transition from handheld "electronic" games to handheld "video" games came with the introduction of LCD screens. These screens gave handheld games the flexibility to play a wide range of games. Milton Bradley's Microvision, released in 1979, used a 16x16 pixel LCD screen and was the first handheld to use interchangeable game cartridges.[17][18]

Nintendo's line of *Game & Watch* titles, first introduced in 1980, was designed by Gunpei Yokoi, who was inspired when he saw a man passing time on a train by playing with an LCD calculator.[19][20] Taking advantage of the technology used in the credit-card-sized calculators that had appeared on the market, Yokoi designed the series of LCD-based games to include a digital time display in the corner of the screen, so that they could double as a watch.[21] While the *Game & Watch* series were considered handheld electronic games rather than handheld video game consoles, their success led Nintendo, through Yokoi's design lead, to produce the Game Boy in 1989.[22]

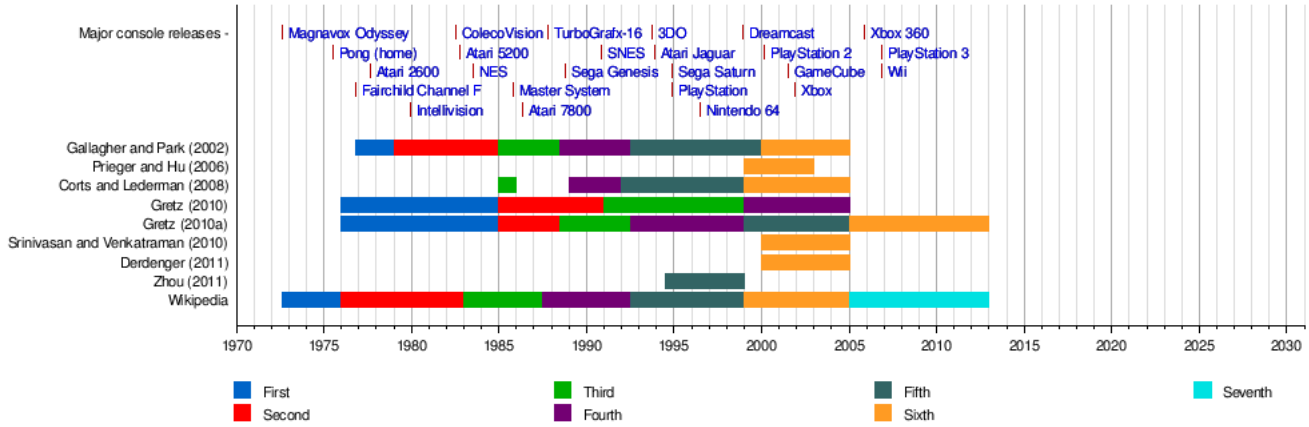
Console generations

Like most consumer electronics, home video game consoles are developed based on improving the features offered by an earlier product with advances made by newer technology. For video game consoles, these improvements typically occur every five years, following a Moore's law progression where a rough aggregate measure of processing power doubles every 18 months or increases ten-fold after five years.[23][24][25] This cyclic market has resulted in an industry-wide adoption of the razorblade model in selling consoles at minimal profit margin while making revenue from the sale of games produced for that console, and then transitioning users to the next console model at the fifth year as the successor console enters the market. This approach incorporates planned obsolescence into the products to continue to bring consumers towards purchasing the newer models.[26]

The Microvision, considered the first handheld video game, included interchangeable faceplates (the lighter piece) to play different games, also a first for handhelds.

Because of the industry dynamics, many console manufacturers release their new consoles in roughly the same time period, with their consoles typically offering similar processing power and capabilities as their competitors. This systematic market has created the nature of console generations, categorizing the primary consoles into these segmented time periods that represent consoles with similar capabilities and which shared the same competitive space. Like consoles, these generations typically start five years after its prior one, though may have long tails as popular consoles remain viable well beyond five years.[27][28]

The use of the generation label came after the start of the 21st century as console technology started to mature, with the terminology applied retroactively to earlier consoles. However, no exact definition and delineation of console generations was consistently developed in the industry or academic literature since that point. Some schemes have been based on direct market data (including a seminal work published in an IEEE journal in 2002),[29] while others are based on technology shifts. The online encyclopedia Wikipedia has been noted for creating its own version of console generation definitions that differ from some academic sources; the definitions from Wikipedia have been adopted by other sources but without having any true rationale behind them.[27] The discrepancies between how consoles are grouped into generations and how these generations are named have caused confusion when trying to compare shifts in the video game marketplace compared to other consumer markets.[27] Kemerer *et al.* (2017)[27] provide a comparative analysis of these different generations through systems released up to 2010 as shown below.



Comparative timeline of organization of video game console generations from various sources, based on year of console introduction, adapted from Kemerer *et al.* (2017).[27] Dates given for console introductions are based on first release in any market (typically either Japan or North America). Cited references from Kemerer *et al.* are as follows: Gallagher and Park (2002);[29] Hu and Prieger (2006);[30] Corts and Lederman (2008);[31] Gretz (2010);[32] Gretz (2010a);[33] Srinivasan and Venkatraman (2010);[34] Derdenger (2011);[35] Zhou (2011)[36]

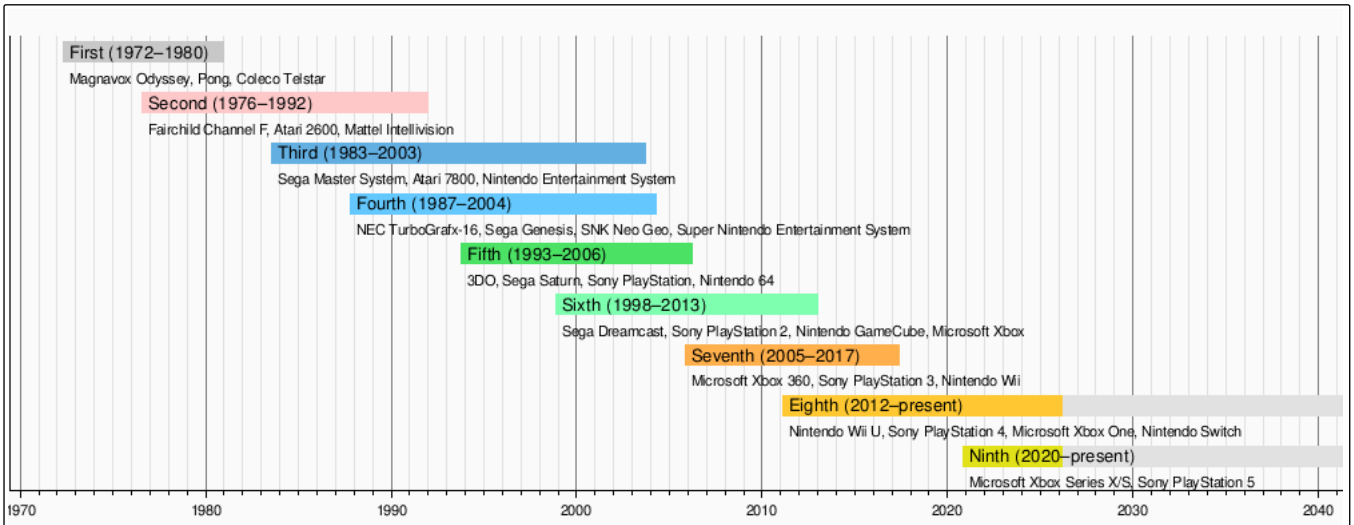
Timeline

For purposes of organization, the generations described here and subsequent pages maintain the Wikipedia breakdown of generation, generally breaking consoles apart by technology features whenever possible and with other consoles released in that same period incorporated within that same generation, and starting with the Odyssey and *Pong*-style home consoles as the first generation, an approach that has generally been adopted and extended by video game journalism.[37][38] In this approach the generation "starts" with the release of the first console considered to have those features, and considered to end with the known last discontinuation of a console in that generation. For example, the third generation is considered to end in 2003 with the formal discontinuation of the Nintendo Entertainment System that year. This can create years with overlaps between multiple generations, as shown.

This approach uses the concepts of "bits", or the size of individual word length handled by the processors on the console, for the earlier console generations. Longer word lengths generally led to improved gameplay concepts, graphics, and audio capabilities than shorter ones.[39] The use of bits to market consoles to consumers started with the TurboGrafx 16, a console that used an 8-bit central processing unit similar to the Nintendo Entertainment System (NES), but included a 16-bit graphical processing unit. NEC, the console's manufacturer, took to market the console as a "16-bit" system over the NES' "8-bit" to establish it as a superior system. Other advertisers followed suit, creating a period known as the "bit wars" that lasted through the fifth generation, where console manufactures tried to outsell each other simply on the bit-count of their system.[40] Aside from some "128 Bit" advertising slogans at the beginning of the sixth generation, marketing with bits largely stopped after the fifth generation. Though the

bit terminology was no longer used in newer generations, the use of bit-count helped to establish the idea of console generations, and the earlier generations gained alternate names based on the dominant bit-count of the major systems of that era, such as the third generation being the 8-bit era or generation.[40]

Later console generations are based on groupings of release dates rather than common hardware as base hardware configurations between consoles have greatly diverged, generally following trends in generation definition given by video game and mainstream journalism. Handheld consoles and other gaming systems and innovations are frequently grouped within the release years associated with the home console generations; for example the growth of digital distribution is associated with the seventh generation.[28][41]



Overview of the console generations, including generation overlaps. Major consoles of each generation are given for each.

Home console history timeline by generation

The development of video game consoles primarily follows the history of video gaming in the North American and Japanese markets. Few other markets saw any significant console development on their own, such as in Europe where personal computers tended to be favored alongside imports of video game consoles. The video game clone in less-developed markets like China and Russia were not considered here.

The following table provides an overview of the major hardware technical specifications of the consoles of each major generations by central processor unit (CPU), graphics processor unit (GPU), memory, game media, and other features.[29]

Generation	Time period	Primary consoles	CPU	GPU	Memory	Game media	Other common features
First	1972–1983	Odyssey Atari Pong Coleco Telstar series	Discrete diode–transistor logic transistor–transistor logic	—	—	custom printed circuit boards	
Second	1976–1992	Channel F Atari 2600 Odyssey 2 Intellivision ColecoVision	8-bit, 1–2 MHz, (Intellivision 16-bit)	—	2–16 KB	Game cartridges	
Third ("8-bit generation")	1983–2003	Nintendo Entertainment System Master System Atari 7800	8-bit, 2–4 MHz	—	3–24 KB		
Fourth ("16-bit generation")	1987–2004	TurboGrafx-16 Genesis Neo Geo Super NES	8-bit and 16-bit, 4–8 MHz	—	8–128 KB		CD-ROM add-ons
Fifth ("32-bit generation")	1993–2006	3DO Jaguar Saturn PlayStation Nintendo 64	32 and 64-bit, 12–100 MHz	—	2–4.5 MB	Game cartridges, Optical media	
Sixth	1998–2013	Dreamcast PlayStation 2 GameCube Xbox	32 and 64-bit, 200–733 MHz	100–233 MHz	16–64 MB	Optical media	Online connectivity, Confluence with common personal computer hardware, Parallel processing such as 128-bit SIMD capabilities.
Seventh	2005–2017	Xbox 360 PlayStation 3 Wii	32 and 64-bit, 729 MHz–3.3 GHz	243–550 MHz	88–512 MB	Optical media, digital distribution	Internet services, wireless controllers, motion controls, HD resolutions
Eighth	2012–present	Wii U PlayStation 4 Xbox One Nintendo Switch	32 and 64-bit, 1.0–2.3 GHz	307–1172 MHz	2–12 GB	Game cartridges, Optical media, digital distribution	Internet services, 4K resolution
Ninth	2020–present	Xbox Series X/S PlayStation 5	64-bit, 3.5–3.8 GHz	1565–2233 MHz	10–16 GB		Internet services, motion controls, 4K resolution, SSD internal memory caching

While there is no similar distinction of generations for handheld consoles, they are included in the sections below based on which home console generation they were released.

First generation (1972–1983)

The first generation of home consoles were generally limited to dedicated consoles with just one or two games pre-built into the console hardware, with a limited means to alter gameplay factors. In the case of the Odyssey, while it did ship with "game cards", these did not have any programmed games on them but instead acted as jumpers to alter the existing circuitry pathway, and did not extend the capabilities of the console.[42] Unlike most other future console generations, the first generation of consoles were typically built in limited runs rather than as an ongoing product line.

The Magnavox Odyssey was the first video game console, released in 1972.

The first home console was the Magnavox Odyssey in September 1972, which was based on Baer's "Brown Box" design.[43] Originally built from discrete transistors, Magnavox transitioned to integrated circuit chips that were inexpensive, and developed a new line of consoles in the Odyssey series from 1975 to 1977. At the same time, Atari had successfully launched *Pong* as an arcade game in 1972, and began work to make a home console version in late 1974, which they eventually partnered with Sears to the new home *Pong* console by the 1975 Christmas season. *Pong* had several technology advantages over the Odyssey, including an internal sound chip and the ability to track score. Coleco developed the first Telstar console in 1976.[44]:53–59 With Magnavox, Atari and Coleco all vying in the console space by 1976 and further cost reductions in key processing chips from General Instruments, numerous third-party manufacturers entered the console market by 1977 with ball-and-paddle games.[45]:147[6][46] This led to market saturation by 1977,[47] and the industry's first market crash.[44]:81–89 Atari and Coleco attempted to make dedicated consoles with wholly new games to remain competitive, including Atari's Video Pinball series and Coleco's Telstar Arcade, but by this point, the first steps of the market's transition to the second generation of consoles had begun, making these units obsolete near release.[44]:53–59

The Japanese market for gaming consoles followed a similar path at this point. Nintendo had already been a business partner with Magnavox by 1971 and helped to design the early light guns for the console. Dedicated home game consoles in Japan appeared in 1975 with Epoch Co.'s TV Tennis Electrotennis. As in the United States, numerous rival products of these dedicated consoles began to appear, most made by the large television manufacturers like Toshiba and Sharp, and these games would be called *TV geemu* or *terebi geemu* (TV game) as the designation for "video games" in Japan.[48] Nintendo became a major player when Mitsubishi, having lost their manufacturer Systek due to bankruptcy, turned to the company to help continue to build their Color TV-Game line, which went on to sell about 3 million units across four different units between 1977 and 1983.[48][49][50]

Console[note 1]	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Magnavox Odyssey	—	1972	1974	1975	350,000[51]
Home Pong series	—	1975	—	1977	200,000[52]
TV Tennis Electrotennis	1975	—	—		20,000[53]
Coleco Telstar	—	1976	—	1978	1,000,000
Color TV-Game	1977	—	—	1983	3,000,000[note 2]

1. Only well-documented consoles of this generation are listed
2. Collective sales across four models

Second generation (1976–1992)

The second generation of home consoles was distinguished by the introduction of the game cartridge, where the game's code is stored in read-only memory (ROM) within the cartridge. When the cartridge is slotted into the console, the electrical connections allow the main console's processors to read the game's code from the ROM. While ROM cartridges had been used in other computer applications prior, the ROM game cartridge was first implemented in the Fairchild Video Entertainment System (VES) in November 1976.[54][55] Additional consoles during this generation, all which used cartridge-based systems, included the Atari 2600 (known as the Atari Video Computer System (VCS) at launch), the Magnavox Odyssey 2, Mattel Electronics' Intellivision, and the ColecoVision. In addition to consoles, newer processor technology allowed games to support up to 8 colors and up to 3-channel audio effects.[56]

The Atari 2600 became the most popular game console of the second generation.

With the introduction of cartridge-based consoles came the need to develop a wide array of games for them. Atari was one of the forefronts in development for its Atari 2600. Atari marketed the console across multiple regions including into Japan,[48] and retained control of all development aspects of the games. Game developments coincided with the Golden age of arcade video games that started in 1978–1979 with the releases of *Space Invaders* and *Asteroids*, and home versions of these arcade games were ideal targets. The Atari 2600 version of *Space Invaders*, released in 1980, was considered the killer app for home video game consoles, helping to quadruple the console's sales that year.[57] Similarly, Coleco had beaten Atari to a key licensing deal with Nintendo to bring *Donkey Kong* as a pack-in game for the Colecovision, helping to drive its sales.[29]

Dug-up copies of *E.T.* and *Centipede* for the Atari 2600 from the Atari video game burial in New Mexico photographed in 2014. The Atari burial to dispose of unsold stock was created in September 1983 and seen as an iconic element of the 1983 video game crash.

At the same time, Atari has been acquired by Warner Communications, and internal policies led to the departure of four key programmers David Crane, Larry Kaplan, Alan Miller, and Bob Whitehead, who went and formed Activision. Activision proceeded to develop their own Atari 2600 games as well as games for other systems. Atari attempted legal action to stop this practice but ended up settling out of court, with Activision agreeing to pay royalties but otherwise able to continue game development, making Activision the first third-party game developer.[58] Activision quickly found success and were able to generate US$50 million in revenue from about US$1 million in startup funds within 18 months.[29] Numerous other companies saw Activision's success and jumped into game development to try to make fast money on the rapidly expanding North America video game market. This led to a loss of publishing control and dilution of the game market by the early 1980s.[59] Additionally, in following on the success of *Space Invaders*, Atari and other companies had remained eager for licensed video game possibilities. Atari had banked heavily on commercial sales of *E.T. the Extra-Terrestrial* in 1982, but it was rushed to market and poorly-received, and failed to make Atari's sales estimates. Along with competition from inexpensive home computers, the North American home console market crashed in 1983.[29][60]

For the most part, the 1983 crash signaled the end of this generation as Nintendo's introduction of the Famicom the same year brought the start of the third generation. When Nintendo brought the Famicom to North America under the name "Nintendo Entertainment System", it helped to revitalize the industry, and Atari, now owned by Jack Tramiel, pushed on sales of the previously successful Atari 2600 under new branding to keep the company afloat for many more years while he transitioned the company more towards the personal computer market.[61] The Atari 2600 stayed in production until 1992, marking the end of the second generation.[62]

Console	Introduced			Discontinued	Units Sold
	Japan	North America	Europe		
Fairchild Channel F	1977	1976	—	1983	250,000
Atari 2600	1983	1977	1978	1992	30,000,000
Magnavox Odyssey²	1982	1978		1984	2,000,000
Intellivision		1980	1982	1990	3,000,000
ColecoVision	—	1982	1983	1985	2,000,000
Atari 5200	—		—	1984	1,400,000

Handhelds of the second generation

Handheld electronic games had already been introduced on the market, such as *Mattel Auto Race* in 1977 and *Simon* in 1978. While not considered video games as lacking the typical video screen element, instead using LED lights as game indicators, they still established a market for portable video games.

The first handheld game console emerged during the second home console generation, using simple LC displays. Early attempts at cartridge-based handheld systems included the Microvision by Milton-Bradley and the Epoch Game Pocket Computer, but neither gained significant traction. Nintendo, on the other hand, introduced its line of *Game & Watch* portable games, each with a single dedicated game, as its first venture into the video game market. First introduced in 1980, the *Game & Watch* series ran for over a decade and sold more than 40 million units.[63]

Third generation (1983–2003)

The Nintendo Entertainment System made home console video games popular again in America after the 1983 crash.

Frequently called the "8-bit generation", the third generation's consoles used 8-bit processors, five audio channels, and more advanced graphics capability including sprites and tiles instead of block-based graphics of the second generation. Further, the third console saw the market dominance shift from the United States to Japan as a result of the 1983 crash.[64]

Both the Sega SG-1000 and the Nintendo Famicom launched near simultaneously in Japan in 1983.[65] The Famicom, after some initial technical recalls, soon gained traction and became the best selling console in Japan by the end of 1984.[66] By that point Nintendo wanted to bring the console to North America but recognized the faults that the video game crash had caused. It took several steps to redesign the console to make it look less like a game console and rebranded it as the "Nintendo Entertainment System" (NES) for North America to avoid the "video game" label stigma.[67][68] The company also wanted to avoid the loss of publishing control that had occurred both in North America as well as in Asia after the Famicom's release, and created a lockout system that required all game cartridges to be manufactured by Nintendo to include a special chip. If this chip was not present, the console would fail to play the game. This further gave Nintendo direct control on the titles published for the system, rejecting those it felt were too mature.[69][70] The NES launched in North America in 1985, and helped to revitalize the video game market there.[71]

Sega attempted to compete with the NES with its own Master System, released later in 1986 in both the US and Japan, but did not gain traction to compete. Similarly, Atari's attempts to compete with the NES via the Atari 7800 in 1987 failed to knock the NES from its dominant position.[72] The NES remained in production until 2003, when it was discontinued along with its successor, the Super Nintendo Entertainment System.[73]

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Famicom/NES	1983	1985	1986	2003	61,910,000
Mark III/Master System	1985	1986	1987	1996	13,000,000
Atari 7800	—			1992	3,770,000
Atari XEGS	—	1987			100,000
Famicom Disk System	1986	—	—		4,400,000

Fourth generation (1987–2004)

Sega saw their greatest success in the video game console market with the Genesis, their fourth generation console; however, it was ultimately outsold by the Super Nintendo Entertainment System.

The fourth generation of consoles, also known as the "16-bit generation", further advanced core console technology with 16-bit processors, improving the available graphics and audio capabilities of games.[74]

NEC's TurboGrafx-16 (or PC Engine as released in Japan), first released in 1987,[75] is considered the first fourth generation console even though it still had an 8-bit CPU. The console's 16-bit graphics processor gave it capabilities comparable to the other fourth generation systems, and NEC's marketing had pushed the console being an advancement over the NES as a "16-bit" system.[40][76] Both Sega and Nintendo entered the fourth generation with true 16-bit systems in the 1988 Sega Genesis (Mega Drive in Japan) and the 1990 Super Nintendo Entertainment System (SNES, Super Famicom in Japan). SNK also entered the competition with a modified version of their Neo Geo MVS arcade system into the Neo Geo, released in 1990, which attempted to bridge the gap between arcade and home console systems with the shared use of common game cartridges and memory cards.[77] This generation was notable for the so-called "console wars" between Nintendo and Sega primarily in North America. Sega, to try to challenge Nintendo's dominant position, created the mascot character Sonic the Hedgehog, who exhibited cool personality to appeal to the Western youth in contrast to Nintendo's Mario, and bundled the Genesis with the game of the same name. The strategy succeeded with Sega becoming the dominant player in North America until the mid-1990s.[78]

The Sega CD add-on, mounted below the Sega Genesis

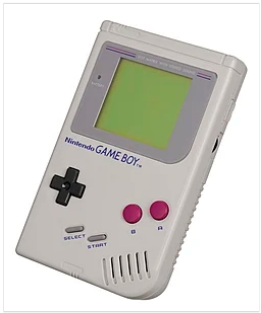
During this generation, the technology costs of using optical discs in the form of CD-ROMs has dropped sufficiently to make them desirable to be used for shipping computer software, including for video games for personal computers. CD-ROMs offered more storage space than game cartridges and could allow for full-motion video and other detailed audio-video works to be used in games.[29] Console manufacturers adapted by creating hardware add-ons to their consoles that could read and play CD-ROMs, including NEC's TurboGrafx-CD add-on (as well as the integrated TurboDuo system) in 1988, and the Sega CD add-on for the Genesis in 1991, and the Neo Geo CD in 1994. Costs of these add-ons were generally high, nearing the same price as the console itself, and with the introduction of disc-based consoles in the fifth generation starting in 1993, these fell by the wayside.[29] Nintendo had initially worked with Sony to develop a similar add-on for the SNES, the Super NES CD-ROM, but just before its introduction, business relationships between Nintendo and Sony broke down, and Sony would take its idea on to develop the fifth generation PlayStation.[79] Additionally, Philips attempted to enter the market with a dedicated CD-ROM format, the CD-i, also released in 1990, that included other uses for the CD-ROM media beyond video games but the console never gained traction.[80]

The fourth generation had a long tail that overlapped with the fifth generation, with the SNES's discontinuation in 2003 marking the end of the generation.[73] To keep their console competitive with the new fifth generation ones, Nintendo took to the use of coprocessors manufactured into the game cartridges to enhance the capabilities of the SNES. This included the Super FX chip, which was first used in the game *Star Fox* in 1993, generally considered one of the first games to use real-time polygon-based 3D rendering on consoles.[74]

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
PC Engine/TurboGrafx-16	1987	1989	1989	1994	5,800,000
CD-ROM²/TurboGrafx-CD	1988	1989	—	1995	1,900,000
Mega Drive/Genesis			1990	1997	30,750,000
Neo Geo	1990	1991	1994		980,000
Super Famicom/Super NES			1992	2003	49,100,000
Sega CD/Mega-CD	1991	1992	1993	1996	2,240,000
CD-i	1992	1991	1992	1998	1,000,000
Neo Geo CD	1994	1996	1994	1997	570,000

Handhelds of the fourth generation

Nintendo brought its experience from the *Game & Watch* series to develop the Game Boy system in 1989, with subsequent iterations through the years. The unit included a LCD screen that supported a 4-shade monochrome pixel display, the use of a cartridge-based system, and the means to link up two units to play head-to-head games. One of the early packages included *Tetris* bundled with the unit, which became the Game Boy's best-selling game and led the unit to dominate handheld sales at the time.[81] The Game Boy also introduced the Kirby franchise worldwide, which became a staple of Nintendo's handheld consoles.



The original Game Boy model

The Atari Lynx was also introduced in 1989 and included a color-LED screen, but its small game library and low battery life failed to make it competitive with the Game Boy.[82][83][84] Both Sega and NEC also attempted to compete with the Game Boy with the Game Gear and the TurboExpress, respectively, both released in 1990. Each were attempts to bring the respective home console games to handheld systems, but struggled against the staying power of the Game Boy.[84][85]

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Game Boy	1989	1989	1990	2003	118,690,000[note 1]
Atari Lynx	1990			1995	3,000,000
Game Gear		1991	1991	1997	10,620,000
TurboExpress			—	1994	1,500,000

1. Game Boy sales include those of the Game Boy Pocket, Light, and Color

Fifth generation (1993–2006)

During this time home computers gained greater prominence as a way of playing video games. The video game console industry nonetheless continued to thrive alongside home computers, due to the advantages of much lower prices, easier portability, circuitry specifically dedicated towards video games, the ability to be played on a television set (which PCs of the time could not do in most cases), and intensive first party software support from manufacturers who were essentially banking their entire future on their consoles.[86]


The Sony PlayStation became the most popular system of the fifth generation consoles, eventually selling over 100 million systems.

Besides the shift to 32-bit processors, the fifth generation of consoles also saw most companies excluding Nintendo shift to dedicated optical media formats instead of game cartridges, given their lower cost of production and higher storage capacity.[87] Initial consoles of the fifth generation attempted to capitalize on the potential power of CD-ROMs, which included the 3DO and the Atari Jaguar in 1993.[88] However, early in the cycle, these systems were far more expensive than existing fourth-generation models and has much smaller game libraries.[29] Further, Nintendo's use of co-processors in late SNES games further kept the SNES as one of the best selling systems over new fifth generation ones.[29]

Two of the key consoles of the fifth generation were introduced in 1995: the Sega Saturn, and the Sony PlayStation, both which challenged the SNES' ongoing dominance. The PlayStation, in addition to using optical media, also introduced the use of memory cards as to save the state of a game. Though memory cards had been used by Neo Geo to allow players to transfer game information between home and arcade systems, the PlayStation's approach allowed games to have much longer gameplay and narrative elements, leading to highly-successful role-playing games like *Final Fantasy VII*.[29] By 1996, the PlayStation became the best-selling console over the GBA.[29]

Nintendo released their next console, the Nintendo 64, in late 1996. Unlike other fifth generation units it still used game cartridges, as Nintendo believed the load-time advantages of cartridges over CD-ROMs was still essential, as well as their ability to continue to use lockout mechanisms to protect copyrights.[89][90] The system included support for memory cards as well, and Nintendo developed a strong library of first-party titles for the game, including *Wave Race 64* and *The Legend of Zelda: Ocarina of Time* that helped to drive its sales. While the Nintendo 64 did not match the PlayStation's sales, it kept Nintendo a key competitor in the home console market alongside Sony and Sega.[29]

As with the transition from the fourth to fifth generation, the fifth generation has a long overlap with the sixth console generation, with the PlayStation remaining in production until 2006.[91]

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
FM Towns Marty	1993	—	—	1995	45,000
Amiga CD32	—	1994	1993	1994	100,000
Atari Jaguar	1994	1993	1994	1996	250,000
3DO					2,000,000
PC-FX		—	—	1998	400,000
Sega 32X		1994	1995	1996	665,000
Sega Saturn		1995		2000	9,260,000
PlayStation				2006	102,490,000
Nintendo 64	1996	1996	1997	2002	32,930,000
Apple Pippin			—	1997	42,000

Handhelds of the fifth generation

Nintendo released the Virtual Boy, an early attempt at virtual reality, in 1995. The unit required the player to play a game through a stereoscopic viewerfinder, which was awkward and difficult, and did not lend well to portable gaming.[92][93][94] Nintendo instead returned to focus on incremental improvements to the Game Boy, including the Game Boy Pocket[95][96] and the Game Boy Color.[97]

The Virtual Boy headset and controller

Sega also released the Genesis Nomad, a handheld unit that played Sega Genesis games, in 1995 in North America only.[98][99] The unit had been developed through Sega of America with little oversight from Sega's main headquarters, and as Sega moved forward, the company as a whole decided to put more focus on the Sega Saturn to stay competitive and drop support for all other ongoing systems, including the Nomad.[100][101][102]

Despite Nintendo's domination of handheld console market, some competing consoles such as Neo Geo Pocket, WonderSwan, Neo Geo Pocket Color, and WonderSwan Color appeared in the late 1990s.

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Virtual Boy	1995	1994	1993	1996	770,000
Genesis Nomad	—	1995	—	1999	Unknown
Game Boy Pocket	1996			Unknown[*data missing*]	Unknown[note 1]
Game.com	—	1997		2000	>300,000
Game Boy Color	1998			2003	49,300,000[note 1]
Neo Geo Pocket	1998	—	—	1999	Unknown
WonderSwan	1999	—	—	2000	1,550,000
Neo Geo Pocket Color	1999			2001	Unknown

1. Sales of the Game Boy Pocket, Light and Color were grouped with the main Game Boy sales

Sixth generation (1998–2013)

By the sixth generation, console technology began to catch up to performance of personal computers of the time, and the use of bits as their selling point fell by the wayside. The console manufacturers focused on the individual strengths of their game libraries as marketing instead. The consoles of the sixth generation saw further adoption of optical media, expanding into the DVD format for even greater data storage capacity, additional internal storage solutions to function as memory cards, as well as adding support either directly or through add-ons to connect to the Internet for online gameplay.[103] Consoles began to move towards a convergence of features of other electronic living room devices and moving away from single-feature systems.[104]

With more than 160 million units sold, the Sony PlayStation 2 is the best selling video game console in history.

By this point, there were only three major players in the market: Sega, Sony, and Nintendo. Sega got an early lead with the Dreamcast first released in Japan in 1998.[105] It was the first home console to include a modem to allow players to connect to the Sega network and play online games.[29] However, Sega found several technical issues that had to be resolved before its Western launch in 1999.[106][107][108] Though its Western release was more successful than in Japan,[109] the console was soon outperformed by Sony's PlayStation 2 released in 2000. The PlayStation 2 was the first console to add support for DVD playback in addition to CD-ROM, as well as maintaining backward compatibility with games from the PlayStation library, which helped to draw consumers that remained on the long-tail of the PlayStation.[29] While other consoles of the sixth generation had not anticipated this step, the PlayStation 2's introduction of backwards compatibility became a major design consideration of future generations.[110] Along with a strong game library, the PlayStation 2 went on to sell 160 million units before it was discontinued in 2013,[111] and as of 2025, remains the best selling home console of all time.[112][113] Unable to compete with Sony, Sega discontinued the Dreamcast in 2001 and left the hardware market, instead focusing on its software properties.[29] Nintendo's entry in the sixth generation was the GameCube in 2001, its first system to use optical discs based on the miniDVD format.

At this point Microsoft also entered the console market with its first Xbox system, released in 2001. Microsoft considered the PlayStation 2's success as a threat to the personal computer in the living room space, and had developed the Xbox to compete. As such, the Xbox was designed based more on Microsoft's experience from personal computers, using an operating system built out from its Microsoft Windows and DirectX features, utilizing a hard disk for save game store, built-in Ethernet functionality, and created the first console online service, Xbox Live to support multiplayer games. While the original Xbox had modest sales compared to the PlayStation 2 and was not profitable for the company, Microsoft considered the Xbox to have successfully demonstrated their abilities to participate in the console market.[114]

The Dreamcast was the last system released by Sega, who became a third-party software publisher.

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Dreamcast	1998	1999	1999	2001	9,130,000
PlayStation 2	2000			2013	160,000,000
GameCube	2001	2001	2002	2007	21,740,000
Xbox	2002			2006	24,000,000

Handhelds of the sixth generation

Nintendo continued to refine its Game Boy design with the Game Boy Advance in 2001, including its Game Boy Advance SP in 2003 and Game Boy Micro in 2005, all with the ability to link to the GameCube to extend the functionality of certain games. Also introduced were the Neo Geo Pocket Color in 1999 and Bandai's WonderSwan Color, launched in Japan in 2000. South Korean company Game Park introduced its GP32 handheld in 2001, and with it came the dawn of open source handheld consoles.[115]

The N-Gage was an early attempt to merge game functionality and cellular phone features.

During the sixth generation, a new type of market for gaming came from the growing mobile phone arena, where advanced smart phones and other portable devices could be loaded with games. Nokia's N-Gage was one of the first devices marketed as a mobile phone and game system, first released in 2003 and later redesigned as the N-Gage QD.

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
WonderSwan Color	2000	—	—	2003	1,950,000
Game Boy Advance	2001			2010	81,510,000
N-Gage	—	2003		2005	3,000,000

Seventh generation (2005–2017)

By the seventh generation, Sony, Microsoft, and Nintendo had all developed consoles designed to interface with the Internet, adding networking support for either wired and wireless connections, online services to support multiplayer games, digital storefronts for digital purchases of games, and both internal storage and support for external storage on the console for these games. With the start and transition to the HD era, these consoles also added support for digital television resolutions through HDMI interfaces, but as the generation occurred in the midst of the High-definition optical disc format war between Blu-ray and HD-DVD, a standard for high-definition playback was yet to be fixed. A further innovation came by the use of motion controllers, either built into the console or offered as an add-on afterwards. Consoles in this generation started using custom CPUs based on the PowerPC instruction set, and were increasingly sharing similarities with the personal computer in game development, although with challenges due to the more complex nature of porting between the differences in architectures.

With more than 101 million units sold, the Nintendo Wii is the best-selling home video game console in the seventh generation.

Microsoft entered the seventh generation first with the Xbox 360 in 2005.[116] The Xbox 360 saw several hardware revisions over its lifetime which became a standard practice for Microsoft going forward; these revisions offered different features such as a larger internal hard drive or a fast processor at a higher price point. As shipped, the Xbox 360 supported DVD discs and Microsoft had opted to support the HD-DVD format with an add-on for playback of HD-DVD films. However, this format ended up as deprecated compared to Blu-ray. The Xbox 360 was backward compatible with about half of the original Xbox library. Through its lifetime, the Xbox 360 was troubled by a consistent hardware fault known as "the Red Ring of Death" (RROD), and Microsoft spent over $1 billion correcting the problem.[117]

Sony's PlayStation 3 was released in 2006. The PlayStation 3 represented a shift of the internal hardware from Sony's custom Emotion Engine to a PowerPC-based system. Initial PlayStation 3 units shipped with a special Emotion Engine daughterboard that allowed for backwards compatibility of PlayStation 2 games, but later revisions of the unit removed this, leaving only software-based emulation for PlayStation games available. Sony banked on the Blu-ray format, which was included from the start, and partially helped spur the adoption of Blu-Ray as the favoured format for high-definition optical media.[118] With the PlayStation 3, Sony introduced the PlayStation Network for its online services and storefront. While the system would initially have a slow start in the market in part, due to its high price, complex game development environment and initial lack of quality games, the PlayStation 3 eventually became more well received over time following gradual price cuts, improved marketing campaigns, new hardware revisions particularly the Slim models, and key critically acclaimed exclusives.

Nintendo introduced the Wii in 2006 around the same time as the PlayStation 3. Nintendo diverged on a feature-for-feature approach and instead developed the Wii around the novel use of motion controls in the Wii Remote. This "blue ocean strategy", releasing a product where there was no competition, was considered part of the unit's success,[119] and which drove Microsoft and Sony to develop their own motion control accessors to

compete. Nintendo provided various online services that the Wii could connect to, including the Virtual Console where players could purchase emulated games from Nintendo's past consoles as well as games for the Wii. The Wii used regular sized DVDs for its game medium but also directly supported GameCube discs. The Wii was generally considered a surprising success that many developers had initially overlooked.[120][121][122]

The seventh generation concluded with the discontinuation of the PlayStation 3 in 2017.[123]

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Xbox 360	2005			2016	84,700,000
PlayStation 3	2006		2007	2017	87,400,000
Wii	2006				101,630,000

The release of the Xbox 360 began the seventh generation.

Handhelds of the seventh generation

Nintendo introduced the new Nintendo DS system in 2004, a game cartridge-based unit that support two screens including one being touch-sensitive. The DS also included built-in wireless connectivity to the Internet to purchase new DS games or Virtual Console titles, as well as the ability to connect to each other or to a Wii system in an ad hoc manner for certain multiplayer titles.[124] Sony entered the handheld market in 2004 with the PlayStation Portable (PSP), with a reduced design based on the PlayStation 3. Like the DS, the PSP also supported wireless connectivity to the Internet to download new games, and ad hoc connectivity to other PSP or to a PlayStation 3. The PSP used a new format called Universal Media Disc (UMD) for game and other media.[125][126][127]

Nokia revived its N-Gage platform in the form of a service for selected S60 devices. This new service launched on April 3, 2008.[128] Other less-popular handheld systems released during this generation include the Gizmondo (launched on March 19, 2005, and discontinued in February 2006) and the GP2X (launched on November 10, 2005, and discontinued in August 2008). The GP2X Wiz, Pandora, and Gizmondo 2 were scheduled for release in 2009.

Another aspect of the seventh generation was the beginning of direct competition between dedicated handheld video game devices, and increasingly powerful PDA/cell phone devices such as the iPhone and iPod Touch, and the latter being aggressively marketed for gaming purposes. Simple games such as *Tetris* and *Solitaire* had existed for PDA devices since their introduction, but by 2009 PDAs and phones had grown sufficiently powerful to where complex graphical games could be implemented, with the advantage of distribution over wireless broadband. Apple had launched its App Store in 2008 that allowed developers to publish and sell games for iPhones and similar devices, beginning the rise of mobile gaming.

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Nintendo DS	2004		2005	2013	154,020,000
PlayStation Portable	2004			2014	82,000,000

Other seventh generation hardware

Based on the success of the Wii Remote controller, both Microsoft and Sony released similar motion detection controllers for their consoles. Microsoft introduced the Kinect motion controller device for the Xbox 360, which served as both a camera, microphone, and motion sensor for numerous games. Sony released the PlayStation Move, a system consisting of a camera and lit handheld controllers, which worked with its PlayStation 3.

Eighth generation (2012–present)

- Aside from the usual hardware enhancements, consoles of the eighth generation focus on further integration with other media and increased connectivity.[131] Consoles at this point had also standardized on CPUs using the x86 instruction set, the same as in personal computers, and there was a convergence of the individual hardware components between consoles and personal computers, making the porting of games between these systems much easier. Later hardware improvements pushed for higher frame rates at up to 4K resolutions.[132] Digital distribution increased in popularity, while the addition and improvements to remote play capabilities became standard, and second screen experiences via companion apps added more interactivity to games.[133]
- The Wii U, introduced in 2012, was considered by Nintendo to be a successor to the Wii but geared to more serious players. The console supported backward compatibility with the Wii, including its motion controls, and introduced the Wii U GamePad, a tablet/controller hybrid that acted as a second screen. Nintendo further refined its network offerings to develop the Nintendo Network service to combine storefront and online connectivity services. The Wii U did not sell as well as Nintendo had planned, as they found people mistook the GamePad to be a tablet they could take with them away from the console, and the console struggled to draw the third-party developers as the Wii had.[134]
- Both the PlayStation 4 and Xbox One came out in 2013. Both were similar improvements over the previous generation's respective consoles, providing more computational power to support up to 60 frames per second at 1080p resolutions for some games. Each unit also saw a similar set of revisions and repackaging to develop high- and low-end cost versions. In the case of the Xbox One, the console's initial launch had included the Kinect device but this became highly controversial in terms of potential privacy violations and lack of developer support, and by its mid-generation refresh, the Kinect had been dropped and discontinued as a game device.[135] Both consoles eventually released upgraded hardware during their mid-cycle refresh, with Sony releasing the PlayStation 4 Pro and Microsoft releasing the Xbox One X, which allowed for higher frame rates and up to 4K resolution,[136][137] in addition to Slim models, marking a departure from previous generations, while adding considerable longevity to this generation cycle.
- Later in the eighth generation, Nintendo released the Nintendo Switch in 2017. The Switch is considered the first hybrid game console. It uses a special CPU/GPU combination that can run at different clock frequencies depending on how it is used. It can be placed into a special docking unit that is hooked to a television and a permanent power supply, allowing faster clock frequencies to be used to be played at higher resolutions and frame rates, and thus more comparable to a home console. Alternatively, it can be removed and used either with the attached Joy-Con controllers as a handheld unit, or can be even played as a tablet-like system via its touchscreen. In these modes, the CPU/GPU run at lower clock speeds to

The Wii U was Nintendo's worst selling home console, selling around 13.56 million units before being discontinued, but some of Nintendo's first party games for the system have sold around half the install base of the system, telling that Nintendo has a very dedicated fanbase.[129][130]

conserve battery power, and the graphics are not as robust as in the docked version. A larger suite of online services was removed through the Nintendo Switch Online subscription, including several free NES and SNES titles, replacing the past Virtual Console system. The Switch was designed to address many of the hardware and marketing faults around the Wii U's launch, and has become one of the company's fastest-selling consoles after the Wii.[138]

- Game systems in the eighth generation also faced increasing competition from mobile device platforms such as Apple's iOS and Google's Android operating systems. Smartphone ownership was estimated to reach roughly a quarter of the world's population by the end of 2014.[139] The proliferation of low-cost games for these devices, such as *Angry Birds* with over 2 billion downloads worldwide,[140] presents a new challenge to classic video game systems. Microconsoles, cheaper stand-alone devices designed to play games from previously established platforms, also increased options for consumers. Many of these projects were spurred on by the use of new crowdfunding techniques through sites such as Kickstarter. Notable competitors include the GamePop, OUYA, GameStick Android-based systems, the PlayStation TV, the Nvidia Shield, the Apple TV and Steam Machines.[141]

The original Xbox One, Microsoft's eighth generation console, which has since been superseded by two upgraded models, the Xbox One S and the Xbox One X.

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Wii U	2012			2017	13,560,000
PlayStation 4	2014	2013		Active	117,200,000
Xbox One				2020[142]	51,000,000[note 1]
Nintendo Switch	2017			Active	153,100,000[note 2]

1. Microsoft has not reported Xbox sales figures since the Xbox 360, this value is an industry estimate
2. Combined sales of Switch, Switch Lite and Switch OLED

Handhelds of the eighth generation

- The Nintendo 3DS released in 2011 expanded on the Nintendo DS design and added support for an autostereoscopic screen to project stereoscopic 3D effects without the use of 3D glasses. The console otherwise remained backwards compatible with all of the DS titles.[143][144][145][146] Sony introduced its PlayStation Vita in 2011, a revised version of the PSP but eliminating the use of optical media and focusing on digital acquisition of games, as well as incorporating a touchscreen.[147][148][149][150][151] and was released in Europe and North America on February 22, 2012.[152][153]
- As noted above, the Nintendo Switch is a hybrid console, capable of both being used as a home console in its docked mode and as a handheld. The Nintendo Switch Lite revision was released in 2019, which reduced some of the features of the system and its size, including eliminating the ability to dock the unit, making the Switch Lite primarily a handheld system, but otherwise compatible with most of the Switch's library of games.[154][155]

Console	Introduced			Discontinued	Units sold
	Japan	North America	Europe		
Nintendo 3DS	2011			2020[156]	75,940,000
PlayStation Vita	2011	2012		2019	16,000,000
Nintendo Switch Lite	2019			Active	13,530,000

Other eighth generation hardware

Virtual reality systems appeared during the eighth generation, with three main systems: the PlayStation VR headset that worked with PlayStation 4 hardware, the Oculus Rift and the HTC Vive which ran off a personal computer.

Ninth generation (2020–present)

- Both Microsoft and Sony released successors to their home consoles in November 2020. Consoles in this generation also launched with lower-cost models lacking optical disc drives, targeting those who would prefer to purchase games exclusively through digital downloads. Both console families target 4K and 8K resolution televisions at high frame rates, support for real-time ray tracing rendering, 3D spatial audio, variable refresh rates, the use of high-performance solid-state drives (SSD) as internal high-speed memory to make delivering game content much faster than reading from optical disc or standard hard drives, which can eliminate loading times and support in-game streaming. With features that were commonly standard in PCs, and the move to higher performance APUs, consoles in the ninth generation now have capabilities comparable to high-end personal computers, often making cross-platform development easier and more widely available than previously, further converging and blurring the line between video game consoles and personal computers. However, consoles of this generation also represent what is anticipated to be the flattening of Moore's law, where further improvements to the performance of computer chips due to reaching theoretical limits on semiconductor manufacturing.[157]
- Microsoft released the fourth generation of Xbox with the Xbox Series X and Series S on November 10, 2020. The Series X has a base performance target of 60 frames per second at 4K resolution to be four times as powerful as the Xbox One X. One of Microsoft's goals with both units was to assure backward compatibility with all games supported by the Xbox One, including those original Xbox and Xbox 360 titles that are backward compatible with the Xbox One, allowing the Xbox Series X and Series S to support four generations of games.[158][159]
- Sony's PlayStation 5 was released on November 12, 2020, and also is a similar performance boost over the PlayStation 4. The PlayStation 5 uses a custom SSD solution with much higher input/output rates that are almost comparable to RAM chip speeds, significantly improving rendering and data streaming speeds. The chip architecture is comparable to the PlayStation 4, allowing backwards compatibility with most of the PlayStation 4 library while select games will need chip timing tweaking to make them compatible.[160][161]
- The Nintendo Switch is considered a cross-generational console due to being released late in the eighth generation cycle while still competitive with those in the ninth generation.[162] The console's successor, the Nintendo Switch 2, was released in June 2025, has yet to be cataloged into any console generation, as its computational power is lower than that of the PlayStation 5 or Xbox Series X/S, and was released several years after these consoles.
- In terms of handhelds, Sony has announced no further plans for handhelds after discontinuing the Vita, while Nintendo continues to offer the Nintendo Switch, Switch 2, and Switch Lite. The market here still continues to compete with the growing mobile gaming market, but developers

have taken advantage of new opportunities in cross-platform play support, in part due to the popularity of *Fortnite* in 2018, to make games that are compatible on consoles, computers, and mobile devices. Cross platform is now used widely in various games.[163][164] Cloud gaming also is seen as a potential replacement of handheld gaming. While earlier cloud gaming platforms have gone by the wayside, newer approaches including PlayStation Now, Xbox Cloud Gaming, Google's Stadia (discontinued in 2023) and Amazon Luna can deliver computer and console-quality gameplay to nearly any platform including mobile devices, limited by bandwidth quality.[165]

Console sales

Below is a timeline of each generation with the top three home video consoles of each generation based on worldwide sales.

Table key

#	Current	A current generation console being manufactured and sold on the market.
†	First place	Home console with the highest sales of its generation.
‡	Second place	Home console with the second highest sales of its generation.
◁	Third place	Home console with the third highest sales of its generation.
	Remaining places	Manufacturer released a home console but it was not one of the top three best selling home consoles of its generation.
	No entry	Manufacturer did not release a home console.

Manufacturer	Generation									
	First (1972–1983)	**Second** (1976–1992)	**Third** (1983–2003)	**Fourth** (1987–2004)	**Fifth** (1993–2006)	**Sixth** (1998–2013)	**Seventh** (2004–2017)	**Eighth** (2011–present)		(2
Atari	Home Pong (150,000)	Atari 2600 † (30 million)[note 1]	Atari 7800 ◁ (1 million)[note 2]		Atari Jaguar (250,000)			Atari VCS # (10,000+)		
Coleco	Telstar ‡ (1 million)	ColecoVision ◁ (2+ million)								
Nintendo	Color TV-Game series † (3 million)		NES † (61.91 million)	Super NES † (49.1 million)	Nintendo 64 ‡ (32.93 million)	GameCube ◁ (21.74 million)	Wii † (101.63 million)	Wii U (13.56 million)	Nintendo Switch †# (153.1 million)	
Magnavox/ Philips	Odyssey ◁ (330,000)	Odyssey² (2 million)	Videopac + G7400 (N/A)	CD-i (570,000)						
Mattel		Intellivision ‡ (3 million)					HyperScan (N/A)			
Sega			Master System ‡ (10–13 million)[note 8]	Sega Genesis ‡ (33.75 million)	Sega Saturn ◁ (9.26 million)	Dreamcast (9.13 million)				
NEC				TurboGrafx-16 ◁ (10 million)	PC-FX (100,000)					
SNK				Neo Geo AES (1.18 million)[cn 1]	Neo Geo CD (570,000)			Neo Geo X (N/A)		
3DO					3DO (2 million)					
Sony					PlayStation † (102.49 million)	PlayStation 2 † (≥160 million)	PlayStation 3 ‡ (≥87.4 million)	PlayStation 4‡ # (117.2 million)[202]		P (8
Microsoft						Xbox ‡ (≥24 million)	Xbox 360 ◁ (≥84 million)	Xbox One ◁ (est. 58.6 million)[202]		S (2

>Final sales are greater than the reported figure. See notes.

Notes

1. The **Atari 2600** sold 30 million units during its life-cycle. Atari also released a second home console during the second generation known as the **Atari 5200** which sold 1 million units.
2. The **Atari 7800** sold 1 million units. Atari also released the **Atari XEGS** during the third generation which sold 100,000 units.
3. **Home Pong** sold 150,000 units.[166][167] **Atari 2600** sold 30 million,[168] **Atari 5200** and **Atari 7800** sold 1 million units each[169][170] **Atari XEGS** sold 100,000 units,[171] the **Atari Jaguar** sold 250,000 units.[172] The VCS sold over 10,000+[173]
4. - **Telestar**: Coleco launched Telstar in 1976 and sold a million. Production and delivery issues, and dedicated consoles being replaced by electronic handheld games dramatically reduced sales in 1977. Over a million Telstars were scrapped in 1978, and it cost Coleco $22.3 million that year[174]—almost bankrupting the company.[175]
   - **ColecoVision**: The ColecoVision reached 2 million units sold by the spring of 1984. Console quarterly sales dramatically decreased at this time, but it continued to sell modestly[176][174] with most inventory gone by October 1985.[177]
5. **Color TV-Game series** sold 3 million units.[49] **NES**, **Super NES**, **Nintendo 64**, **GameCube** and **Wii** sales figures.[178] **Wii U** and **Switch** sales figures as of June 30, 2025.[179]
6. **Magnavox Odyssey**,[180] **Magnavox Odyssey²**[181] **Philips CD-i**[98] sales figures.
7. **Intellivision** sold 3 million units.[182]
8. The **Master System** sold 10–13 million units. Sega also released the **SG-1000** during the third generation which sold 160,000 units.

9. - **Master System**: 10–13 million, not including recent Brazil sales figures.[183][184] Screen Digest wrote in a 1995 publication that the Master System's active installed user base in Western Europe peaked at 6.25 million in 1993. Those countries that peaked are France at 1.6 million, Germany at 700 thousand, the Netherlands at 200 thousand, Spain at 550 thousand, the United Kingdom at 1.35 million, and other Western European countries at 1.4 million. However, Belgium peaked in 1991 with 600 thousand, and Italy in 1992 with 400 thousand. Thus it is estimated approximately 6.8 million units were purchased in this part of Europe.[185] 1 million were sold in Japan as of 1986.[186] 2 million were sold in the United States.[187] 8 million were sold by Tectoy in Brazil as of 2016.[188]
   - **Sega Genesis**: 30.75 million sold by Sega worldwide as of March 1996,[189][190] not including third-party sales. In addition, Tec Toy sold 3 million in Brazil,[191][192] and Majesco Entertainment projected it would sell 1.5 million in the United States.[193]
   - **Sega Saturn**: 9.26 million units sold.[190]
   - **Dreamcast**: 9.13 million units sold.[190][194][195][196]
10. The **TurboGrafx-16** was designed by Hudson and manufactured and marketed by NEC.[197] It managed to sell 10 million units.[198] The **PC-FX** sold less than 100,000 after a year on sale.[199]
11. The **Neo Geo AES** sold 1 million in Japan[200] and 180,000 overseas.[201] The **Neo Geo CD** was released in the same generation as the AES and sold over 570,000.[201] The **Neo Geo X** was made in a partnership with SNK Playmore & Tommo; currently it is unknown how many units were sold.
12. **PlayStation**: Sony corporate data reports 102.49 million units sold as of March 31, 2007.[203] Sony stopped divulging individual platform sales starting with 2012 fiscal reports,[204][205] and continues to sporadically.[206] **PlayStation 2**: 160 million units sold as of March 31, 2012.[113] It was discontinued worldwide on January 4, 2013.[207] **PlayStation 3**: Sony corporate data reports 87.4 million sold as of March 31, 2017.[113] PS3 shipments to Japanese retailers, the last country Sony was selling units to, ceased by May.[208] **PlayStation 4**: Sony corporate data reports 117 million units sold as of June 30, 2022.[113] **PlayStation 5**: Sony corporate data reports 80.2 million units sold as of June 30, 2025.[113]
13. **Xbox**: More than 24 million units sold as of May 10, 2006.[209] **Xbox 360**: Sold 84 million as of June 2014.[210] Production ended in 2016.[211] **Xbox One**: Microsoft CEO Satya Nadella unveiled at a December 3, 2014 shareholder presentation that 10 million units were sold.[212] Microsoft announced in October 2015 that individual platform sales in their fiscal reports will no longer be disclosed. The company shifted focus to the amount of active users on Xbox Live as its "primary metric of success".[213] International Data Corporation estimated 46.9 million sold worldwide through the second quarter of 2019.[214]

1. 1 million in Japan.[200] 180,000 overseas.[201]

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First generation of video game consoles

In the history of video games, the **first generation** era includes the video games, video game consoles, and handheld video game consoles available from 1972 to 1983. Notable consoles of the first generation include the Odyssey series (excluding the Magnavox Odyssey 2), the Atari Home Pong,[1] the Coleco Telstar series and the Color TV-Game series. The generation ended with the Computer TV-Game in 1980 and its following discontinuation in 1983, but many manufacturers had left the market prior due to the market decline in the year of 1978 and the start of the second generation of video game consoles.

Most of the games developed during this generation were hard-wired into the consoles and unlike later generations, most were not contained on removable media that the user could switch between.[2] Consoles often came with accessories and cartridges that could alter the way the game played to enhance the gameplay experience[3] as graphical capabilities consisted of simple geometry such as dots, lines or blocks that would occupy only a single screen.[4] First generation consoles were not capable of displaying more than two colours until later in the generation, and audio capabilities were limited with some consoles having no sound at all.

In 1972, two major developments influenced the future of the home video game market. In June, Nolan Bushnell and Ted Dabney founded Atari, which would go on to be one of the most well-known video game companies and play a vital role in the early generations of consoles. In September, Magnavox, an established electronics company, released the Odyssey. Inspired by the Odyssey's ping-pong game, Atari would soon go on to market the game *Pong* in both arcade and home versions; Nintendo, a well-established Japanese company that made a number of different products including but not limited to playing cards and toys, entered the video game console market for the first time in 1977 with its Color TV-Game series.[5]

Overview

History

In 1951, Ralph Baer conceived the idea of an interactive television while designing a television set for Loral in the Bronx, New York.[6] Baer did not pursue the idea, but it returned to him in August 1966 when he was the Chief Engineer and manager of the Equipment Design Division at Sanders Associates. By December 1966, he and a technician created a prototype that allowed a player to move a line across the screen. After a demonstration to the company's director of research and development, some funding was allotted and the project was made official. Baer spent the next few months designing further prototypes, and in February 1967 assigned technician Bill Harrison to begin building the project.[7] Harrison spent the next few months in between other projects building out successive modifications to the prototype. Baer, meanwhile, collaborated with engineer Bill Rusch on the design of the console, including developing the basis of many games for the system. By May, the first game was developed and by June, multiple games were completed for what was then a second prototype box. This included a game where players controlled dots chasing each other and a light gun shooter game with a plastic rifle. By August 1967, Baer and Harrison had

completed a third prototype machine, but Baer felt that he was not proving successful at designing fun games for the system; to make up for this he added Bill Rusch, who had helped him come up with the initial games for the console, to the project.[7] He soon proved his value to the team by coming up with a way to display three dots on the screen at once rather than the previous two, and proposing the development of a ping pong game.[8]

As Sanders was a military contractor and not in the business of making and selling commercial electronics, the team approached several cable television industry companies to produce the console, but were unable to find a buyer. By January 1969 the team had produced the seventh prototype, nicknamed the "Brown Box".[9]:12 After a Sanders patent attorney recommended approaching television manufacturers, they found interest first at RCA and finally at Magnavox, who entered negotiations in July 1969 and signed an agreement in January 1971.[8][10] Magnavox designed the exterior of the machine, and re-engineered some of the internals with consultation from Baer and Harrison; they removed the ability to display color, reduced the number of controller types, and changed the system of selecting games from a dial to separate game cards that modified the console's circuitry when plugged into the console. Magnavox named the console the Magnavox Odyssey and announced the system's launch date for September 1972.[8][11]

The "Brown Box" prototype is the forerunner of the Magnavox Odyssey, the first commercial home video game console.

First cartridge of Magnavox Odyssey

In the late 1960s, Nolan Bushnell saw *Spacewar!* at Stanford University. *Spacewar!* is a 1962 mainframe game developed by a group of students and employees at the Massachusetts Institute of Technology. Bushnell had worked at an amusement park, and felt that an arcade game version of the game would be very popular.[12] The high price of computers capable of running the game, however, meant that any such arcade game would not be economically feasible. By 1970, however, minicomputers were beginning to come down in price.[8][13] He and his office mate, Ted Dabney, agreed to work together to try and design a prototype of the game.[14] By the end of November 1970, the pair had abandoned the project as untenable, as economically feasible computers were not powerful enough. Dabney soon thought of a way to manipulate the video signal on the screen without a computer controlling it, and from there Syzygy Engineering came up with the idea of removing the computer altogether and building specialized hardware to handle everything for the game instead.[8][13] *Computer Space*, the first commercial arcade video game, was released by the pair as Syzygy Engineering through Nutting Associates at the end of 1971 and after its release they incorporated as Atari in the following year and began designing more games. Bushnell saw a demonstration of the Odyssey console playing its *Table Tennis* game in early 1972 and assigned their first employee, Allan Alcorn, to produce an arcade table tennis game. The result, *Pong*, was the first major arcade video game success, and inspired a large number of arcade and dedicated console versions and clones, including Atari's Home Pong in 1975.[8]

Technology

The first generation of consoles did not contain a microprocessor and were based on custom codeless state machine computers consisting of discrete logic (TTL) circuits comprising each element of the game itself. Over the generation, technology steadily improved and later consoles of the generation moved the bulk of the circuitry to custom integrated circuits such as Atari's custom Pong chips and General Instruments' AY-3-8500 series.[15]:119

Graphical capabilities were limited throughout the generation, often supported with physical accessories and screen overlays, but saw some improvement towards the end of the generation. While the Odyssey could only display 3 square dots in black and white, as the generation progressed, consoles started being able to display color as well as more complex shapes and text.[16] Early consoles such as the Odyssey and TV Tennis Electrotennis required players to keep track of scores manually but later, many introduced score counters on the display to assist players in score tracking.[17][18]:252 Audio capabilities were slow to improve over the generation, starting with the Odyssey, which had no audio, and later moving on to consoles which had buzzers that could produce a small range of beeps and buzzes.[19][20][21]

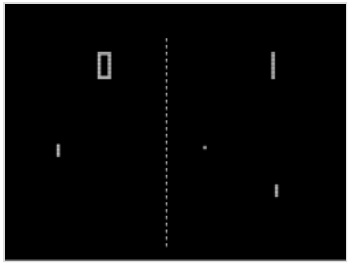
Market saturation and the end of the generation

In 1976, General Instrument produced a series of affordable integrated chips that allowed companies to simplify console production and lower costs.[22] Due to this, many companies had entered the home console market by the late 1970s.[23]:147 A significant number released consoles that were essentially clones of Atari's Home Pong and many were poorly made and rushed to market, causing the home console market to saturate.[24] The demand for the chip was so high that General Instruments could not supply enough to satisfy all the orders it was receiving, causing problems for some smaller companies.[22] Coleco received their order early on, allowing them to build up strong production capabilities and have success with their Telstar range.[25]

The start of the second generation and the next major advancement in home console technology began in 1976 with the release of the Fairchild Channel F.[26][27]:116 The technology behind the first generation quickly became obsolete as consumers had the ability to purchase new games for second generation consoles instead of having to purchase new systems when they wanted new content as with the dedicated consoles of the first generation.[28] As people transitioned to the newer systems, some companies were left with surplus stock and were selling at a loss. The combination of market saturation and the start of the second generation caused many companies to leave the market completely.[9]:22[22] Sales of second generation consoles were only modest for the next few years until the arrival of the killer app, the home port of *Space Invaders* for the Atari VCS in 1980.[29][30]

Home systems

There were hundreds of home video game consoles known to have existed in the first generation of video games.[31] This section lists the most notable.



Many consoles in the first generation were clones of or styled similarly to the arcade version of *Pong* (above).[31]

Odyssey series

In 1972 Magnavox released the world's first home video game console, the Magnavox Odyssey.[32] It came packaged with board game paraphernalia such as cards, paper money and dice to enhance the games.[32] It had features that became industry standard in subsequent generations such as detachable controllers, light gun accessories and interchangeable game media.[15]:xvii While no game data was stored on the circuit cards as they would be in future consoles, they could be used to select one of the twelve games built onto the hardware. Magnavox licensed its video game patents to other companies for a fee and prosecuted companies who released consoles without a licensing agreement.[33][34]

It was with the Odyssey that Nintendo first became involved in the home video game market. According to Martin Picard in the *International Journal of Computer Game Research*: "in 1971, Nintendo had – even before the marketing of the first home console in the United States – an alliance with the American pioneer Magnavox to develop and produce optoelectronic guns for the Odyssey, since it was similar to what Nintendo was able to offer in the Japanese toy market in [the] 1970s."[35]

In 1974 North American Philips purchased Magnavox and released a series of eight Odyssey consoles in North America from 1975 to 1977. All of them were dedicated consoles, and each subsequent release was an improvement over the previous, adding features such as additional game variations, on-screen displays, and player-controlled handicaps such as smaller paddle sizes and variable ball speed.[32][36] Three Odyssey series consoles were also released in Europe with similar features from 1976 to 1978.[37][38]

TV Tennis Electrotennis

On September 12, 1975, several months before the release of *Home Pong* in North America, Epoch released Japan's first home console, the TV Tennis Electrotennis. The technology was licensed from Magnavox and it contained a single ball and paddle style game that resembled Pong but without an onscreen score display.[39] The game controls were contained within the base unit and it connected to a television set through an ultra high frequency (UHF) antenna, as opposed to being directly connected, which was unique to the console at the time.[35] Compared to popular consoles of the generation, it performed poorly with an approximate 20,000 units sold.[39]

Atari Home Pong

In late 1975 Atari released a home version of their popular arcade game *Pong*.[40] It had been in development since 1974 under the lead of Allan Alcorn and Harold Lee.[9] By the end of 1975, Atari had become a major company in the home console market due to *Home Pong*.[41] Following Pong's success, Magnavox filed suit against Atari for infringement on its technology patents and ended up settling out of court with Atari becoming a licensee of Magnavox.[34]

Home video games achieved widespread popularity with the release of a home version of *Pong* and its success sparked hundreds of clones, including the Coleco Telstar, which went on to be a success in its own right with over a dozen models.

Coleco Telstar series

Starting in 1976, Coleco released a series of fourteen dedicated consoles up until 1978,[42] when they suffered a significant loss due to the combination of dock workers' strike, preventing it from shipping the final product in time for the holidays, and the start of the second generation.[15]:121[43][44] The series featured a number of different styles of ball games and external accessories to enhance gameplay such as the Telstar Arcade, which had a unique triangular design that came with a light gun and steering wheel attached to the casing.[18]:272 The series was marketed at a lower price than its competitors and sold well with over a million sales.[45]

Color TV-Game series

In the late 1970s, Nintendo released a series of five consoles for the Japanese market. The first of the series and the first console created by Nintendo,[46] the Color TV-Game 6, was released in 1977[35] and contained six ball-and-paddle games. The last, the Computer TV-Game, was a 1980[47] port of Nintendo's first arcade game, *Computer Othello*.[48] The third console in the series, the Color TV-Game Racing 112, was the first project of Shigeru Miyamoto, who would go on to become the creator of some of the most well-known video game franchises.[49][50]

Comparison

Comparison of first-generation video game home consoles

Name		Magnavox Odyssey	Odyssey series (11 consoles)[a]	TV Tennis Electrotennis
Manufacturer		Magnavox	Magnavox, Philips	Epoch Co.
Image				
Release date		NA: September 1972[60][61] UK: 1973[56][57][58][59] EU: 1974[56][57] JP: 1974[31]	NA: 1975–1977	JP: September 12, 1975[35]
Launch price	US$	US$99[62][60] (equivalent to $760 in 2025)	US$100–230 (equivalent to $600–1380 in 2025)	US$66 (equivalent to $390 in 2025)
	GBP	£79[63] (equivalent to £860 in 2025)		
	JP¥			JP¥19,500[64] (equivalent to ¥39,840 in 2024)
Media		Printed circuit board	Inbuilt chip	Inbuilt chip
Accessories (retail)		Light gun (sold separately)[65]	None	None
Sales		350,000[3]	Unknown	20,000[39]

Name		Home Pong series (9 models)	Coleco Telstar series (14 models)[b]	Color TV-Game series (5 consoles)[c]
Manufacturer		Atari, Sears Tele-Games	Coleco	Nintendo
Image				
Release date		NA: Late 1975 JP: Late 1975[64]	NA: 1976–1978	JP: 1977–1983[67][68]
Launch price	US$	US$98.95 (equivalent to $590 in 2025)[69]	US$50 (equivalent to $280 in 2025)	US$36–179 (equivalent to $210–700 in 2025)
	GBP			
	JP¥	JP¥24,800 (equivalent to ¥50,700 in 2024)[64]		JP¥9800–48,000 (equivalent to ¥16,940–71,130 in 2024)[48]
Media		Inbuilt chip	Inbuilt chip (most models) Cartridge (Telstar Arcade, 1977)[18]:15	Inbuilt chip
Accessories (retail)		None	Controller styles	None
Sales		150,000[70]:33–36[71]	1 million[45]	3 million[72]

Notes

a. Includes the Odyssey 100/200/300/400/500/2000/3000/4000 and Philips Odyssey 200/2001/2100[51][52][53][54]:309–310[55]

b. Includes the Coleco Telstar, Classic, Deluxe, Ranger, Alpha, Colormatic, Regent, Sportsman, Combat!, Colortron, Marksman, Galaxy, Gemini and Arcade[18]:272[27]:15–16[52][53]

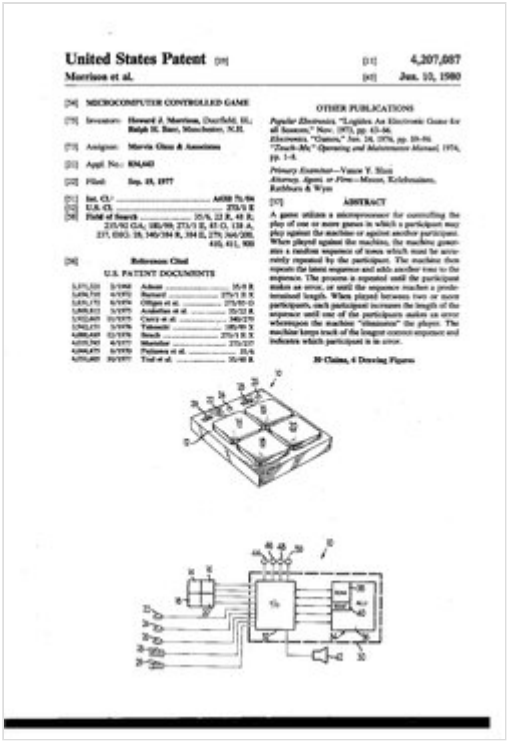
c. Includes the Color TV-Game 6, 15, Racing 112, Blockbreaker and Computer TV-Game[66]

Handheld systems

All of the handheld systems from the first generation are dedicated consoles and started late into the first generation. It was not until the second generation and the release of the Microvision that players could purchase games separately for the systems.[75]:46 The early dedicated handheld consoles were eventually eclipsed in popularity by programmable video games, which became popular in the fourth generation with the introduction of the Game Boy.[23]:316

One notable example is the Mattel handheld game series, which were released from 1976 to 1982. The first to be released were *Mattel Auto Race* and *Mattel Football,* while some of the latter models like the *Mattel Speed Freak* and the *Mattel Competition Football* handhelds are closer to the end of the first generation (1982)[76]. They were followed by other titles based on sports and some licensed properties such as *Battlestar Galactica*. Each game had basic controls, a simple LED interface and a buzzer for sound.[15]:70 The series was popular, sold well and, at times, was difficult to find due to high demand.[77]

In the same year, Coleco began to release handheld consoles after the end of the Telstar home console series.[15]:121 They released *Electronic Quarterback*, which expanded on the popular American football style games by adding new features.[78] Alongside *Mattel Football*, it became the other popular sports game of the period.[79]


United States Patent [19]
Morrison et al.
[11] 4,207,087
[45] Jun. 10, 1980
[54] MICROCOMPUTER CONTROLLED GAME
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ABSTRACT
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Ralph Baer and Howard Morrison invented and patented an electronic toy that was later licensed to Milton Bradley and sold as *Simon* in 1978.[73][74]

See also


1970s portal


Video games portal

- 1970s in video games
- Home computer
- History of computing hardware (1960s–present)

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Further reading

- How Video Games Invaded the Home TV Set (http://www.ralphbaer.com/how_video_games.htm) by Ralph Baer
- "A History of Home Video Game Consoles" (https://web.archive.org/web/20071226012027/http://www.informit.com/articles/article.aspx?p=378141). Archived from the original (http://www.informit.com/articles/article.aspx?p=378141) on December 26, 2007. by Michael Miller

External links

- The Dot Eaters: Bits From the Primordial Ooze (https://web.archive.org/web/20061120012048/http://www.thedoteaters.com/stage1.php)
- ClassicGaming Expo 2000: Baer Describes the Birth of Videogames (https://web.archive.org/web/20080306005508/http://classicgaming.gamespy.com/View.php?view=Articles.Listcgexpo2000%2Fbaerkeynote%2F)
- Video Games Turn 40 (1UP.com) (https://web.archive.org/web/20120204211456/http://www.1up.com/features/videogames-turn-40)

Second generation of video game consoles

In the history of video games, the **second-generation** era refers to computer and video games, video game consoles, and handheld video game consoles available from 1976 to 1992. Notable platforms of the second generation include the Fairchild Channel F, Atari 2600, Intellivision, Odyssey 2, and ColecoVision. The generation began in November 1976 with the release of the Fairchild Channel F.[1] This was followed by the Atari 2600 in 1977,[2] Magnavox Odyssey² in 1978,[3] Intellivision in 1979[4] and then the Emerson Arcadia 2001, ColecoVision, Atari 5200, and Vectrex,[5] all in 1982. By the end of the era, there were over 15 different consoles. It coincided with, and was partly fueled by, the golden age of arcade video games. The generation also included the entry of handheld consoles, chiefly led by Nintendo's foray into gaming led by the Blue Ocean philosophy of Gunpei Yokoi and the release of the Game & Watch in 1980. This peak era of popularity and innovation for the medium resulted in many games for second generation home consoles being ports of arcade games. *Space Invaders*, the first "killer app" arcade game to be ported, was released in 1980 for the Atari 2600, though earlier Atari-published arcade games were ported to the 2600 previously.[6] Coleco packaged Nintendo's *Donkey Kong* with the ColecoVision when it was released in August 1982.

Built-in games, like those from the first generation, saw limited use during this era. Though the first generation Magnavox Odyssey had put games on cartridge-like circuit cards, the games had limited functionality and required TV screen overlays and other accessories to be fully functional. More advanced cartridges, which contained the entire game experience, were developed for the Fairchild Channel F, and most video game systems adopted similar technology.[7] The first system of the generation and some others, such as the RCA Studio II, still came with built-in games[8] while also being able to use cartridges.[9] The popularity of game cartridges grew after the release of the Atari 2600. From the late 1970s to the mid-1990s, most home video game systems used cartridges until the technology was replaced by optical discs. The Fairchild Channel F was also the first console to use a microprocessor, which was the driving technology that allowed the consoles to use cartridges.[10] Other technology such as screen resolution, color graphics, audio, and AI simulation was also improved during this era. The generation also saw the first handheld game cartridge system, the Microvision, which was released by toy company Milton Bradley in 1979.

In 1979, Activision was created by former Atari programmers[11] and was the first third-party developer of video games.[12] A small company through the 1980s, it gradually grew into a 21st century gaming giant. In the early 1980s, many large corporations, spurred by the success of the home video game industry and especially the VCS, launched or bought subsidiaries to produce video game console software. By 1982, the shelf capacity of toy stores was overflowing with an overabundance of consoles, over-hyped game releases, and low-quality games from new third-party developers. An over-saturation of consoles and games,[13] coupled with poor knowledge of the market, saw the video game industry crash in 1983 and marked the start of the next generation. Beginning in December 1982 and stretching through all of 1984, the crash of 1983 caused major disruption to the North American market.[14][15] Some developers collapsed and the development of new console games slowed. By mid 1985, the amount of console games announced for release in the US was effectively zero.[16] The market did not fully recover until the third generation.[4] The second generation ended on January 1, 1992, with the discontinuation of the Atari 2600.[17]

Background

The primary driver of the second generation of consoles was the introduction of the low-cost microprocessor. Arcade games and the first generation of consoles used discrete electronic components including simple logic chips such as transistor-transistor logic (TTL)-based integrated circuits (ICs). Custom application-specific integrated circuits (ASICs) like the AY-3-8500 were produced to replicate these circuits within a single chip, but still presented only a single fixed logic program. Once a game was shipped, there were only minimal variations that could be made by adjusting the positions of jumpers (effectively the behavior of the "cartridges" that shipped with the Magnavox Odyssey). As Atari, Inc. recognized, spending from $100,000 to 250,000 and several months of development time on a hardware unit with a single dedicated game with only three-month shelf life before it was outdated by other competitors' offerings was not a practical business model, and instead some type of programmable console would be preferred.[18]

An opened Fairchild Channel F ROM cartridge, illustrating the ROM chips mounted to a circuit board within the casing. The cartridges were inserted into the console via the exposed contacts on the top of the board.

Intel introduced the first microprocessor, the 4004, in 1971, a special computer chip that could be sent a simple instruction and provide its result. This allowed the ability to create software programs around the microprocessor rather than fix the logic into circuits and ICs. Engineers at both Atari, Inc. (via its Cyan Engineering subsidiary) and at Alpex Computer Corporation saw the potential to apply this to home consoles as prices for microprocessors became more affordable. Alpex's work led to partnership with semiconductor manufacturer Fairchild Camera and Instrument and lead to the release of the first such programmable home console, the Fairchild Channel F released in 1976, based on the Fairchild F8 microprocessor. The Channel F also established the use of ROM cartridges to provide the software for the programmable console, consisting of a ROM chip mounted on a circuit board within a hard casing that can withstand the physical insertion into the console and potential static electricity buildup.[19] Atari's own programmable console, the Atari Video Computer System (Atari VCS or later known as the Atari 2600), was released in 1977 and based on the MOS Technology 6507 microprocessor, with a cartridge design influenced in part by the Channel F system.[19] Other console manufacturers soon followed suit with the production of their own programmable consoles.

At the start of the second generation, all games were developed and produced in-house. Four former Atari programmers, having left from conflicts in management style after Atari was purchased by Warner Communications in 1976, established Activision in 1979 to develop their own VCS games, which included *Dragster* initially and the hits *Kaboom!* and *Pitfall!* later. Atari sued Activision and its founders on the basis of theft of trade secrets and violation of their non-disclosure agreements, and for *Dragster* allegedly infringing on the *Drag Race* arcade game from Atari's arm Kee Games; the cases were thrown out of court and the two companies settled in 1982, with Activision agreeing to pay Atari for a "technology license". This established Activision as the first third-party developer for a console. It also established a working model for other third-party developers, and several such companies followed in Activision's wake, partially contributing to the video game crash of 1983 due to oversaturation.[20][21][22][23]

As the second generation of consoles coincided with the golden age of arcade video games, a common trend that emerged during the generation was licensing arcade video games for consoles. Many of them were increasingly licensed from Japanese video game companies by 1980, which led to Jonathan Greenberg of *Forbes* predicting in early 1981 that Japanese companies would eventually dominate the North American video game industry later in the decade.[24]

At this stage, both consoles and game cartridges were intended to be sold for profit by manufacturers. However, by segregating games from the console, this approach established the use of the razorblade business model in future console generations, where consoles would be sold at or below cost while licensing fees from third-party games would bring in profits.[25][26]

Fairchild Channel F

The Fairchild Channel F, also known early in its life as the Fairchild Video Entertainment System (VES), was released by Fairchild Semiconductor in November 1976 and was the first console of the second generation.[27] It was the world's first CPU-based video game console, introducing the cartridge-based game-code storage format.[28] The console featured a pause button that allowed players to freeze a game. This allowed them to take a break without the need to reset or turn off the console so they did not lose their current game progress.[29] Fairchild released twenty-six cartridges for the system, with up to four games being on each cartridge. The console came with two pre-installed games, *Hockey* and *Tennis*.[30]

Following the release of the Atari 2600, the Channel F's popularity waned quickly as the more action-driven games of the Atari 2600 drew more attention than the more educational and slow-paced games on the Channel F. By 1979, only an additional 100,000 units of the Channel F were sold for lifetime sales of 350,000.[31]

In 1978, Fairchild redesigned the system into a new model, the Channel F System II. The System II streamlined some of the initial Channel F to reduce cost and improve consumer usage compared to the Atari 2600, such as improved controller connections and using the television speakers for audio output, but by the time it was released, the Atari 2600 had too much market advantage for Fairchild to overcome. After releasing 21 games for the system, Fairchild sold the Channel F technology to Zircon International in 1979, who then discontinued the system by 1983.[31]

Atari 2600 and 5200

In 1977, Atari released its CPU-based console called the Video Computer System (VCS), later called the Atari 2600.[32] Nine games were designed and released for the holiday season. Atari held exclusive rights to most of the popular arcade game conversions of the day. They used this key segment to support their older hardware in the market. This game advantage and the difference in price between the machines meant that each year, Atari sold more units than Intellivision, lengthening its lead despite inferior graphics.[33] The Atari 2600 sold over 30 million units over its lifetime, considerably more than any other console of the second generation.[34] In 1982, Atari released the Atari 5200 in an attempt to compete with the Intellivision. While superior to the 2600, poor sales and lack of new games meant Atari only supported it for two years before it was discontinued.[35]


An Atari 2600 game joystick controller

Early Atari 2600 cartridges contained 2 kilobytes of read-only storage. This limit grew steadily from 1978 to 1983: up to 16 kilobytes for Atari 5200 cartridges. The Atari 2600 directly supports up to 4 kilobytes (4096 bytes) of cartridge ROM. *Bank switching*, a technique that allows two or more different parts of the program to use the same memory addresses, was required for the larger cartridges to work. The Atari 2600 cartridges got as large as 32 kilobytes through this technique.[36] The Atari 2600 has only 128 bytes of RAM available in the console. A few late game cartridges contain a combined RAM/ROM chip, or an additional separate RAM chip, thus adding another 256 bytes or more (up to 2 kilobytes)[37] of RAM inside the cartridge itself. The Atari 2600 standard joystick is a digital controller with a single button, released in 1977.[38] The Atari 2600 also supports 4 analog paddle controllers (or, in theory, 2 analog joysticks[39]).

Bally Astrocade

The Bally Astrocade was released in 1977 and was available only through mail order.[40] It was originally referred to as the Bally Home Library Computer.[40][41] Delays in the production meant that none of the units shipped until 1978. By this time, the machine had been renamed the Bally Professional Arcade.[41] In this form, it sold mostly at computer stores and had little retail exposure, unlike the Atari VCS. The rights to the console were sold to Astrovision in 1981. They re-released the unit with the BASIC cartridge included for free; this system was known as the Bally Computer System.[41] When Astrovision changed their name to Astrocade in 1982 they also changed the name of the console to the Astrocade to follow suit. It sold under this name until the video game crash of 1983 when it was discontinued.[42]

Magnavox Odyssey 2

In 1978, Magnavox released its microprocessor-based console, the Odyssey 2, in the United States and Canada.[43] It was distributed by Philips Electronics in the European market and was released as the Philips G7000.[44] A defining feature of the system was the speech synthesis unit add-on which enhanced music, sound effects and speech capabilities.[45] The Odyssey² was also known for its fusion of board and video games. Some titles came with a game board and pieces which players had to use in conjunction to play the game. Although the Odyssey² never became as popular as the Atari consoles, it sold 2 million units throughout its lifetime. This made it the third best selling console of the generation.[46] It was discontinued in 1984.[47]

Intellivision

The Intellivision was introduced by Mattel to test markets in 1979[48] and nationally in 1980. The Intellivision console contained a 16-bit processor with 16-bit registers and 16-bit system RAM. This was long before the "16-bit era".[49] Programs were however stored on 10-bit ROM. It also featured an advanced sound chip that could deliver output through three distinct sound channels.[49] The Intellivision was the first console with a thumb-pad directional controller and tile-based playfields with vertical and horizontal scrolling. The system's initial production run sold out shortly after its national launch in 1980.[49] Early cartridges were 4 kilobyte ROMs, which grew to 24 kilobytes for later games.

The Intellivision introduced several new features to the second generation. It was the first home console to use a 16-bit microprocessor and offer downloadable content through the PlayCable service.[50] It also provided real-time human voices during gameplay. It was the first console to pose a serious threat to Atari's dominance. A series of TV advertisements featuring George Plimpton were run. They used side-by-side game comparisons to show the improved graphics and sound compared with those of the Atari 2600.[49] It sold over 3 million units[51] before being discontinued in 1990.[52]

ColecoVision

The ColecoVision was introduced by toy manufacturer Coleco in August 1982. It was more powerful than previous consoles, providing an experience that was closer to Arcades than what the 2600 could provide.[53] The console launched with several arcade ports, including Sega's *Zaxxon*, and later saw third-party support from many developers such as Activision and even their competitor Atari. The ColecoVision is notable for its Atari 2600 expansion module, which enabled the console to play 2600 games, resulting in a lawsuit from Atari.[54] The ColecoVision was a victim of the video game crash, ultimately being discontinued in 1985.

Vectrex

The Vectrex was released in 1982. It was unique among home systems of the time in featuring vector graphics and its own self-contained display[55] (necessitated by the fact that a normal TV set cannot display vector graphics, since the TV is a raster display.) At the time, many of the most popular arcade games, such as *Asteroids*, used vector displays. Through a licensing deal with Cinematronics, GCE was able to produce high-quality versions of arcade games such as Space Wars and Armor Attack. Despite a strong library of games and good reviews, the Vectrex was ultimately a commercial failure.[56] It was on the market for less than two years.[57]

Comparison

Comparison of second-generation video game home consoles

Name		Fairchild Channel F	Atari 2600	Bally Astrocade	Magnavox Odyssey²	Intellivision
Manufacturer		Fairchild Semiconductor	Atari	Bally Technologies	Magnavox	Mattel
Image(s)						
Release date		USA: November 1976 JP: October 1977	USA: September 1977 EU: 1978 JP: May 1983	USA: 1978 [58]	EU: December 1978 USA: February 1979 JP: 1982 BR: 1983	USA: Test marketed in 1979. Official release in 1980 EU: 1982 JP: 1982
Launch price	US$	US$169.95 (equivalent to $960 in 2025)	US$199[59] (equivalent to $1,060 in 2025)	US$299[40] (equivalent to $1,590 in 2025)	US$200 (equivalent to $990 in 2025)	US$299[48][60] (equivalent to $1,170 in 2025)
	GBP	—	£199 (equivalent to £1,090 in 2025)	—	—	£199[61] (equivalent to £710 in 2025)
	JP¥	—	—	—	JP¥49,800 (equivalent to ¥82,600 in 2024)[62]	¥49,800 (equivalent to ¥68,480 in 2024)
Media	Type	Cartridge	Cartridge (and Cassette via special 3rd party attachment)	Cartridge and cassette/Floppy, available with ZGRASS unit	Cartridge	Cartridge
	Regional lockout	Unrestricted[63]	Unrestricted[63]	Unrestricted[63]	Unrestricted[63]	Unrestricted[63]
	Backward compatibility	—	—	—	—	Atari 2600 games through the System Changer module
Top-selling games		Videocart-17: Pinball Challenge	*Pac-Man*, 7 million (as of September 1, 2006)[64][65]	Unknown	Unknown	*Las Vegas Poker & Blackjack*, 1.939 million *Major League Baseball*, 1.085 million (as of June 1983)[66][67]
Accessories (retail)		▪ Jet-Stick for Channel F II	▪ Paddle controllers (bound pair) ▪ Driving controller ▪ Keypad ▪ Game Brain ▪ Starpath Supercharger ▪ GameLine	▪ ZGRASS unit	▪ The Voice ▪ Chess Module	▪ Keyboard Component (cancelled) ▪ PlayCable ▪ Intellivoice ▪ Entertainment Computer System ▪ Music Synthesizer keyboard ▪ System Changer (Play's Atari 2600 Games)
CPU		1.79 MHz (PAL 2.00 MHz) Fairchild F8	1.19 MHz MOS Technology 6507	1.789 MHz Zilog Z80	1.79 MHz Intel 8048 8-bit microcontroller	2 MHz General Instrument CP1610
Memory		64 bytes scratchpad in 3850 CPU Video RAM 2 kB (2×128×64 bits)	128 bytes RAM within MOS Technology RIOT chip (additional RAM may be included in game cartridges)	Main RAM 4 kB (up to 64 kB with external modules in the expansion port)	CPU-internal RAM: 64 bytes Audio/video RAM: 128 bytes	352 x 16-bit system RAM 240 x 8-bit scratchpad RAM 512 x 8-bit graphics pattern table RAM
Video	Resolution	circa 102×58 [68]	160×240+[69] (sprites) 40x240+ (playfield)	True: 160×102 Basic: 160×88 Expanded RAM: 320×204	160×200 (NTSC)	160x96 (20x12 tiles of 8x8 pixels)
	Palette	8 colors	128 colors (NTSC) 104 colors (PAL) 8 colors (SECAM)	32 colors (8 intensities)	16 colors (fixed); sprites use 8 colors	16 color
	Colors on Screen	8 simultaneous (maximum of 4 per pixel row)	128 simultaneous (2 sprite colors [1 color per sprite] and 2 background/ball colors per scanline)	True: 8 Basic: 2	Unknown	16 simultaneous

	Sprites	Only by software	per scanline: ▪ 2 8-pixel sprites, each with 1, 2, or 3 spaced copies and scaled by ×1, x2, or x4, in 8 predefined patterns ▪ 2 missiles (variable width) ▪ 1 ball (variable width)	Unlimited (software controlled)	▪ 4 8×8 single-color user-defined sprites ▪ 12 8×8 single-color characters; 64 shapes built into ROM BIOS; ▪ 4 quad characters; ▪ 9×8 background grid; dots, lines, or blocks	8 sprites, 8x16 half-pixels
	Other	—	—	—	—	Vertical and horizontal scrolling
Audio		Mono audio with: ▪ 500 Hz, 1 kHz, and 1.5 kHz tones (can be modulated quickly to produce different tones)	Mono audio with: ▪ two channel sound ▪ 5-bit frequency divider and 4-bit audio control register ▪ 4-bit volume control register per channel	Mono audio with: ▪ 3 voices ▪ noise/vibrato effect	Mono audio with: ▪ 24-bit shift register, clockable at 2 frequencies ▪ noise generator	Mono audio with: ▪ General Instrument AY-3-8914 ▪ three channel sound ▪ one noise generator

Name		Emerson Arcadia 2001	ColecoVision	Atari 5200	Vectrex
Manufacturer		Emerson Radio Corporation	Coleco	Atari	General Consumer Electric and Milton Bradley
Image(s)					
Release date		USA: May 1982 JP: 1983	USA: August 1982 EU: 1982	USA: November 1982	USA: November 1982 EU: May 1983 JP: June 1983
Launch price	US$	US$200 (equivalent to $670 in 2025)[70][71]	US$175[59] (equivalent to $580 in 2025)	US$270[59] (equivalent to $900 in 2025)	US$199[72] (equivalent to $660 in 2025)
	GBP	—	—	—	£149[73] (equivalent to £510 in 2025)
	JP¥	JP¥19,800 (equivalent to ¥26,700 in 2024)[71]	—	—	—
Media	Type	Cartridge[70]	Cartridge and Cassette, available with Expansion #3	Cartridge	Cartridge
	Regional lockout	Unrestricted[63]	Unrestricted[63]	Unrestricted[63]	Unrestricted[63]
	Backward compatibility	—	Compatible with Atari 2600 Via Expansion #1	Atari 2600 games through the 2600 cartridge adapter	—
Top-selling games		N/A	*Donkey Kong* (pack-in)	N/A	N/A
Accessories (retail)		N/A	▪ Expansion #1 ▪ Expansion #2 ▪ Expansion #3 ▪ Roller Controller ▪ Super Action Controller Set	▪ Trak-Ball Controller ▪ Atari 2600 adaptor	▪ 3-D Imager ▪ Light Pen
CPU		3.58 MHz Signetics 2650 CPU	3.58 MHz Zilog Z80A	1.79 MHz Custom MOS 6502C	1.5 MHz Motorola 68A09
Memory		512 bytes RAM	Main RAM 1 kB Video RAM 16 kB	Main RAM 16 kB DRAM	Main RAM 1 kB
Video	Resolution	128x208 / 128×104	256×192	80×192 (16 color) 160×192 (4 color) 320×192 (2 color)[74]	
	Palette	16 colors	15 colors, 1 transparent	256 colors	2 (black and white)
	Colors on Screen		16 simultaneous (1 color per sprite)	16 simultaneous,[74] Up to 256 (16 hues, 16 luma) on screen (16 per scanline) with display list interrupts	2 simultaneous (black and white)
	Sprites		32 sprites (4 per scanline), 8×8 or 8×16 pixels, integer zoom	8 single-color sprites, full height of display; 1/2/4x width scaling	
	Other		Tilemap playfield, 8×8 tiles	▪ 14 graphics modes (6 tilemap, 8 bitmap)[74] ▪ Fine and coarse scrolling (vertical and horizontal)[75]	Built in vector CRT
Audio		Mono audio with: ▪ Single Channel "Beeper" ▪ Single Channel "Noise"	Mono audio with: ▪ 3 tone generators ▪ 1 noise generator	Mono audio with: ▪ 4-channel sound	Mono audio (built-in speaker) ▪ 3 channel sound ▪ noise generator

Sales standings

The best-selling console of the second generation was the Atari 2600 at 30 million units.[76] As of 1990, the Intellivision had sold 3 million units.[77][48][52] This is around 1 million higher than the Odyssey² and ColecoVision sales[78][79] and eight times the number of purchases for the Fairchild Channel F, which was 350,000 units.[19]

Console	Units sold worldwide
Atari 2600	30 million (as of 2004)[76]
Intellivision	3 million (as of 2004)[51][48][80]
ColecoVision	2 million (as of 1983)[81]
Magnavox Odyssey²	2 million (as of 2005)[46]
Atari 5200	1 million (as of 1984)[82]
Fairchild Channel F	350,000 (as of 1979)[19]
Bally Astrocade	Unknown
Emerson Arcadia 2001	Unknown
Vectrex	Unknown

Other consoles

RCA Studio II (released in 1977)[83]

1292 Advanced Programmable Video System (released in 1978)[84]

VC 4000 (released in 1978)[85]

APF-MP1000 (released in 1978)[86]

Bandai Super Vision 8000 (released in 1979)[86]

Epoch Cassette Vision (released in 1981)[85]

VTech CreatiVision (released in 1981)[86]

Compact Vision TV Boy (released in 1983)[86]

Handheld systems

Nintendo Game & Watch

The Game & Watch was a series of 60 handheld consoles that contained a single game in each release. The first, titled "Ball" was released in 1980 and titles were released up until it was discontinued in 1991.[87] Unlike the other handheld consoles in the second generation, the Game & Watch had a segmented LCD screen similar to a digital watch which limited the display to the configuration of the segments. The series sold a combined 43.4 million units, making it the most popular handheld of the generation.

Microvision

The Microvision, manufactured and sold by Milton-Bradley. was released in 1979.[88] It was the first handheld game console that used cartridges that could be swapped out and that contained their own processor as the console itself had no on-board processor. It had a small game library which was prone to damage from static electricity and the LCD screen could also rot. These two factors contributed to its discontinuation two years after release.

Entex Select-A-Game and Adventure Vision

Entex released two handheld systems in the second generation, the Select-A-Game and the Adventure Vision. There were 6 games available for the Select-A-Game but it was only available for a year until focus shifted to the Adventure Vision which was released in the following year.

The Adventure Vision was released only in North America in 1982 by Entex and was the successor to the Select-A-Game.[87] It was unique among the consoles as it used a spinning mirror system for its built-in display and had to be used set down on a surface due to its size and shape.[89] It was discontinued one year later in 1983 after selling just over fifty thousand units.[87]

Palmtex Super Micro

Developed and manufactured by Palmtex, the Super Micro was released in 1984 and discontinued later that year. Due to financial problems between Palmtex and Home Computer Software, only three games were released for the system despite more being planned. It was criticized for its poor build quality and how easily it would break, and sold fewer than 37,000 units.

Epoch Game Pocket Computer

The Epoch Game Pocket Computer was released in Japan in 1984.[90] Due to poor sales, only five games were made for it and was not released outside of Japan.[91]

Comparison

Console	Microvision	Entex Select-A-Game	Adventure Vision
Manufacturer	Milton Bradley	Entex Industries	Entex Industries
Image			
Release date	November 1979[92]	1981[93]	1982
Launch price	US$49.99 (equivalent to $220 in 2025)[94]	US$59 (equivalent to $210 in 2025)[95]	US$79.99 (equivalent to $270 in 2025)
Units sold	*Unknown*	*Unknown*	50,757
Media	Cartridge	Cartridge	Cartridge
CPU	100 kHz TI TMS1100 or Intel 8021 within cartridge	Hitachi HD38800 within cartridge	733 kHz Intel 8048
Memory	64 B RAM		64 B RAM (on CPU) 1 KB (on main PCB)
Video	16 x 16 pixel LCD	7 x 16 pixel VFD 2 colors (red and blue)	150 x 40 pixel spinning mirror system Monochrome
Audio	Piezo Buzzer		National Semiconductor COP411L @ 52.6 kHz

Console	Super Micro	Epoch Game Pocket Computer	Game & Watch series
Manufacturer	Palmtex	Epoch	Nintendo
Image			
Release date	May 1984[96]	November 1984[97]	1980-1991
Launch price	US$39.95 (equivalent to $120 in 2025)	¥12,800 (equivalent to ¥16,890 in 2024)[97]	¥5,800 (equivalent to ¥7,650 in 2024)[98]
Units sold	Fewer than 37,200	*Unknown*	43.4 million[99]
Media	Cartridge	Cartridge	1 built in game per device
Top-selling games	Unknown	Unknown	*Donkey Kong* (8 million)[100]
CPU	None (CPU was contained within the cartridge)	6 MHz NEC D78c06	Sharp SM5xx series
Memory		2 KB RAM	260 B RAM
Video	32 x 16 pixel LCD 57.15 x 38.1mm	75 x 64 pixel LCD	Segmented LCD
Audio		Piezo Buzzer	

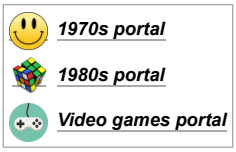
Software

Milestone titles

- *Advanced Dungeons and Dragons: Cloudy Mountain* (Intellivision) by Mattel Electronics won an award in the "1984 Best Adventure Videogame" category at the 5th Annual Arkie Awards.[101] It was the first Intellivision cartridge to have more than 4K of ROM.[102]
- *Adventure* (Atari 2600) by Atari, Inc. was the first action-adventure video game[103] and first console fantasy game.[104] It is considered to have played an important role in the advancement of home video games[105] and one of the best Atari 2600 titles.[106]
- *Asteroids* (arcade port) (Atari 2600) was the first game on the 2600 to utilize the bank-switching technique.[107]
- *Baseball* (Intellivision) by Mattel was the console's best selling title with over one million copies sold.[66]
- *Demon Attack* (Atari 2600) by Imagic was released in 1983. It won the 1983 Arcade Award for "Best Videogame of the Year".[108] It was the company's best selling game and is considered a classic of the Atari 2600.[109][110][111]

- *Donkey Kong* (arcade port) (ColecoVision) by Coleco was praised for being faithful to the original arcade game. Critics considered it the best version out of the ColecoVision, Atari and Intellivision ports.[45][112]
- *E.T. the Extra-Terrestrial* (Atari 2600), released in 1982,[113] is often credited as being one of the worst games of all time.[114] Some believe the game played a significant role in the video game crash of 1983.[115]
- *Microsurgeon* (Intellivision) by Imagic was praised for its originality.[45] It was included in "The Art of Video Games" exhibit at the Smithsonian Institution in 2012.[116]
- *Missile Command* (arcade port) (Atari 2600) by Atari, Inc. was released in 1981 and sold more than 2.5 million copies.[117] This made it the third best selling game on the console.[118]
- *Pitfall!* (Atari 2600) by Activision, released in 1982,[119] was one of the best selling games for the Atari 2600, selling over 4 million copies.[120] *Pitfall* popularized the side-scrolling platformer genre.[121]
- *Pitfall II: Lost Caverns* (Atari 2600) by Activision, released in 1984,[122] was one of the most technically impressive titles for the 2600.[123] It came with a specialized audio chip on the cartridge that allowed for advanced music capabilities where music could be changed dynamically.[124]
- *River Raid* (Atari 2600) by Activision was the first video game to be banned for minors in West Germany.[125] Despite this, it was still one of the most popular titles for the Atari 2600 and won an award for "1984 Best Action Videogame".[126]
- *Space Invaders* (arcade port) (Atari 2600) by Taito was the first official licensing of an arcade game and was the first "killer app" for video game consoles.[6][127] Its release saw sales of the Atari 2600 quadruple[127] and was the first title to sell 1 million copies.[128]
- *Star Wars: The Empire Strikes Back* (Atari 2600) by Parker Brothers was the first officially licensed video game of the Star Wars franchise.[129]
- *Utopia* (Intellivision) by Don Daglow is often credited with being the first real-time strategy that laid the foundation for many games within the genre.[130][131]
- *Zaxxon* (arcade port) (ColecoVision) by Sega was the first home console game to use isometric graphics.[132]

See also



- 1970s in video games
- 1980s in video games
- Home computer (List of home computers)
- History of computing hardware (1960s–present)

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Third generation of video game consoles

In the history of video games, the **3rd generation** of video game consoles, commonly referred to as the **8-bit era**, began on July 15, 1983, with the Japanese release of two systems: Nintendo's Family Computer (commonly abbreviated to Famicom) and Sega's SG-1000.[1] When the Famicom was released outside of Japan, it was remodeled and marketed as the Nintendo Entertainment System (NES). This generation marked the end of the North American video game crash of 1983, and a shift in the dominance of home video game manufacturers from the United States to Japan.[2] Handheld consoles were not a major part of this generation; the Game & Watch line from Nintendo (which started in 1980) and the Milton Bradley Microvision (which came out in 1979) that were sold at the time are both considered part of the previous generation due to hardware typical of the second generation.

Improvements in technology gave consoles of this generation improved graphical and sound capabilities, comparable to the golden age of arcade games. The number of simultaneous colors on screen and the palette size both increased which, along with larger resolutions, more sprites on screen, and more advanced scrolling and pseudo-3D effects, which allowed developers to create scenes with more detail and animation. Audio technology improved and gave consoles the ability to produce a greater variation and range of sound. A notable innovation of this generation was the inclusion of cartridges with on-board memory and batteries to allow users to save their progress in a game, with Nintendo's *The Legend of Zelda* introducing the technology to the worldwide market. This innovation allowed for much more expansive gaming worlds and in-depth storytelling, since users could now save their progress rather than having to start each gaming session at the beginning. By the next generation, the capability to save games became ubiquitous—at first saving on the game cartridge itself and, later, when the industry changed to read-only optical disks, on memory cards, hard disk drives, and eventually cloud storage.

The best-selling console of this generation was the NES/Famicom from Nintendo, followed by the Master System from Sega (the successor to the SG-1000), and the Atari 7800. Although the previous generation of consoles had also used 8-bit processors, it was at the end of the third generation that home consoles were first labeled and marketed by their "bits". This also came into fashion as fourth generation 16-bit systems like the Sega Genesis were marketed in order to differentiate between the generations. In Japan and North America, this generation was primarily dominated by the Famicom/NES, while the Master System dominated the Brazilian market, with the combined markets of Europe being more balanced in overall sales between the two main systems. The end of the third generation was marked by the emergence of 16-bit systems of the fourth generation and with the discontinuation of the Famicom on September 25, 2003. However, in some cases, the third generation still lives on as dedicated console units still use hardware from the Famicom specification, such as the VT02/VT03 and OneBus hardware.

Overview

1983–1984

The Japanese video game market was still a growing "wide open" market for video game consoles in 1983. Japan had a relatively small console market, where only 300,000 consoles had been sold up until 1983, compared to the millions that had been sold in the United States up until then. A number of Japanese manufacturers attempted to compete for the "wide open" Japanese console market with their own consoles.[3] The Epoch Cassette Vision, released in 1981, was the best-selling console in Japan at the time.[4] It was followed by the Bandai Arcadia (priced ¥19,800), a Japanese version of the Arcadia 2001 released in 1982, and the Atari 2800 (priced ¥24,800), a Japanese version of the Atari 2600 marketed in May 1983.[3]

The third generation of consoles began when two Japanese companies, Sega and Nintendo, decided to enter the console gaming market. On July 15, 1983, they both released new consoles in Japan, Sega's SG-1000 and Nintendo's Famicom.[5] Both companies previously had success as arcade game companies. Sega, one of Japan's largest arcade companies, was intending to compete in both the console and personal computer markets, with a home computer version called the SC-3000 released at the same time.[3] Meanwhile, Nintendo focused on making the Famicom more powerful than competing home systems so that it would be comparable to their *Donkey Kong* (1981) arcade video game hardware,[6] while at the same time selling it for cheaper than the Cassette Vision, selling the Famicom for ¥14,800 (about $150).[4] Nintendo unveiled the Famicom shortly before the Tokyo Toy Show in June 1983, becoming a sensation among toy show exhibitors, prior to Sega unveiling the SG-1000 at the Tokyo Toy Show.[7]

The Famicom went on to become very popular in Japan, where it quickly beat the Cassette Vision to become Japan's all-time best-selling console.[4] Sega would become Nintendo's main competitor for console sales during the era.[8] Sega's SG-1000, which preceded Sega's more commercially successful Master System, initially had little to distinguish itself from earlier consoles such as the ColecoVision and contemporary computers such as the MSX, although it was able to achieve advanced visual effects, including parallax scrolling in *Orguss* and sprite-scaling in *Zoom 909*.[9]

To enter the worldwide market, Nintendo approached the American company Atari, which had the majority share of the home video game market in North America, with a proposal for Atari to license the Famicom and distribute it.[10] An agreement was concluded, which was to be signed at the Consumer Electronics Show in July 1983.[11] At the same CES, however, Coleco exhibited its Coleco Adam home computer, which featured a version of Nintendo's *Donkey Kong*. At that time, Atari had exclusive rights to distribute Nintendo games on home computers, and Coleco had exclusive rights to distribute the game on consoles.[12] However, since Atari understood that Adam was a home computer, they postponed signing the agreement with Nintendo and asked the company to resolve the issue with rights.[13] The problem was resolved, but during this time, the video game crash of 1983 had occurred and Atari began to lose influence in the market. With this, Nintendo had no competitor left and the company eventually decided to enter the market on its own.[14]

1984–1986

Nintendo were initially discouraged after the crash, with Nintendo of America's market research being met with warnings to stay away from home consoles and US retailers refusing to stock game consoles. As a result, Nintendo instead introduced the Famicom to North America in the form of an arcade hardware, the Nintendo VS. System, in 1984. It became a major success in North American arcades, giving Nintendo the confidence to release the Famicom in North America as a video game console, for which there was growing interest due to Nintendo's positive reputation in the arcades.[4]

The company introduced a version of the Famicom in January 1985 at the Winter CES as the Nintendo Advanced Video System, abbreviated as the NAVS. The gamepads were wireless and worked with it using an infrared port, and the bundle would also include a light gun. It was planned that the NAVS would be available in the spring of 1985.[15] However, this did not happen and the console was shown again at the summer CES in June of that year, as an updated version called the Nintendo Entertainment System.[16] The system was released in October 1985 as an experiment within New York City bounds with *Super Mario Bros.* game bundled. The experiment was successful and showed that people still wanted to play games despite the 1983 crisis. After that the system was released in all North America in February 1986 at a price of US$159.[17]

In 1985, Sega succeeded the SG-1000 with the Master System, which incorporated hardware scrolling, alongside an increased color palette, greater memory, pseudo-3D effects, and stereoscopic 3-D, gaining a clear hardware advantage over the NES. However, the NES continued to dominate the North American and Japanese markets, while the Master System had more success in the European and South American markets.[18]

The Family Computer (commonly abbreviated the Famicom) became popular in Japan during this era, crowding out the other consoles in this generation. The Famicom's Western counterpart, the Nintendo Entertainment System, dominated the gaming market in North America, thanks in part to its restrictive licensing agreements with developers. This marked a shift in the dominance of home video games from the United States to Japan, to the point that *Computer Gaming World* described the "Nintendo craze" as a "non-event" for American video game designers as "virtually all the work to date has been done in Japan."[2] The company had an estimated 65% of 1987 hardware sales in the console market; Atari Corporation had 24% (including the Atari 7800, 2600 Jr. and XEGS), Sega had 8%, and other companies had 3%.[8]

1986–2007

The popularity of the Japanese consoles grew so quickly that in 1988 Epyx stated that, in contrast to a video game-hardware industry in 1984 that the company had described as "dead", the market for Nintendo cartridges was larger than for all home-computer software.[19] Nintendo sold seven million NES systems in 1988, almost as many as the number of units the Commodore 64 sold in its first five years.[20] In 1988, *The Los Angeles Times* reported that the rise of video game consoles had a positive impact on computer games, sales of which grew 37% during the first quarter of 1988.[21] In 1989, however, *Compute!* reported that Nintendo's popularity caused most computer-game companies to have poor sales during Christmas that year, resulting in serious financial problems for some,[22] and after more than a decade making computer games, in 1989 Epyx converted completely to console cartridges.[23] By 1990 30% of American households owned the NES, compared to 23% for all personal computers,[24] and peer pressure to have a console was so great that even the children of computer-game developers demanded them despite parents' refusal and the presence of state-of-the-art computers and software at home. As *Computer Gaming World* reported in 1992, "The kids who don't have access to videogames are as culturally isolated as the kids in our own generation whose parents refused to buy a TV".[25]

This era contributed many influential aspects to the history of the development of video games. The third generation saw the release of many of the first console role-playing video games (RPGs). Editing and censorship of video games was often used in localizing Japanese games to North America.[26] It was during this time that many successful video game franchises began, which went onto to becoming mainstays of the video game industry. Some examples are *Super Mario Bros.*, *Final Fantasy*, *The Legend of Zelda*, *Dragon Quest*, *Metroid*, *Mega Man*, *Metal Gear*, *Castlevania*, *Phantasy Star*, *Megami Tensei*, *Ninja Gaiden*, and *Bomberman*.

In Europe during the late 1980s, the Master System had a stronger start than the Nintendo Entertainment System in some areas, with NES sales lagging behind the Master System in the United Kingdom.[27] By 1990, the Master System was the biggest-selling console in Europe, though the NES was beginning to have a fast-growing user base in the United Kingdom and this position had reversed by the end of the run of both consoles.[28]

The third generation also saw the beginning of the children's educational console market. Due to their reduced capacities, these systems typically were not labeled by their "bits" and were not marketed in competition with traditional video game consoles.

In North America, the Atari 7800 and Master System were discontinued in 1992, while the NES continued to be produced until 1995. In Europe, the Master System was discontinued in the late 1990s. However it has continued to sell in Brazil through to the present day. In Japan, Nintendo continued to repair Famicom systems until October 31, 2007.[29][30]

Home systems

Family Computer/Nintendo Entertainment System

The Family Computer (Famicom), released on July 15, 1983, in Japan and in the United States on October 18, 1985, as the redesigned Nintendo Entertainment System (NES),[31]:449 is an 8-bit cartridge-based console developed and marketed by Nintendo. It became the most popular console of the generation, selling over 60 million units. It was the first home system to feature a controller with a directional pad (designed by Gunpei Yokoi), which became an industry standard. While the NES was discontinued in North America on August 14, 1995, it was not until September 25, 2003, that the Famicom was discontinued in Japan.

Sega Mark III/Master System

The Sega Mark III was released on October 20, 1985, for the Japanese market and was the third iteration of the SG-1000.[32] The name was changed to the Master System and the design altered for release outside of Japan. It was designed to be more powerful than the NES in an attempt to give it an edge over the competition but despite good sales, it did not match the success of the NES, making it the second best selling console of the generation. This was the case in all regions apart from Brazil, where it continued to sell for years after the end of the generation.

Atari 7800

The Atari 7800 was released in May 1986[33] and was the successor to the Atari 5200.[34] It was the first console to be backward compatible without additional hardware. It was originally due for launch on May 21, 1984,[35] but due to the sale of the company the launch did not happen until two years later and, coupled with a small library of games, the console did not sell as well as the Master System or NES.[31]:52

Comparison

Comparison of third-generation video game home consoles

Name		SG-1000	Sega Mark III/ Master System	Family Computer/ Nintendo Entertainment System	Atari 7800	Atari XEGS
Manufacturer		Sega		Nintendo	Atari Corporation	
Image(s)						
Release date		JP: July 15, 1983 AU: November 1983	JP: October 20, 1985 NA: October 1986 WW: June 1987 BR: September 4, 1989	JP: July 15, 1983 NA: October 18, 1985 BR: 1985 EU: September 1986 WW: 1987	NA: May 1986 WW: July 1987	NA: 1987
Launch prices	US$	—	US$199.99 (equivalent to $590 in 2025)	US$180 (equivalent to US$540 in 2025)[36][37]	US$140 (equivalent to $410 in 2025)	US$159 (equivalent to $470 in 2025)
	GBP	—	£99.95 (equivalent to £290 in 2025)[38]	—	—	—
	JP¥	JP¥15,000 (equivalent to ¥20,300 in 2024)[39]	JP¥15,000 (equivalent to ¥19,400 in 2024)[32]	JP¥14,800 (equivalent to ¥20,000 in 2024)[40]	—	—
Media	Type	▪ Cartridge ▪ Cassette (with keyboard attachment) ▪ Data card (Card Catcher required)	▪ Cartridge ▪ Data card (first model only)	▪ Cartridge ▪ 3″ floppy disk (*Famicom Disk System required, Japan and Hong Kong*)[41]	Cartridge	Cartridge
	Regional lockout	Unrestricted	Region locked	Region locked	Region locked	None
	Backward compatibility	—	SG-1000 (Japanese systems only)	—	Atari 2600	Atari 8-bit computers
Pack-in game		N/A	*Hang-On* and *Safari Hunt* (built-in) *Alex Kidd in Miracle World* *Sonic the Hedgehog*	*Super Mario Bros.* (approx. 40 million units)[42]	*Pole Position II*[43]	*Missile Command* (built-in)
Top-selling games		N/A	N/A	*Super Mario Bros. 3*, 18 million (as of May 21, 2003)[44] *Super Mario Bros. 2* (approx. 10 million units)[45]	N/A	N/A
Accessories (retail)		▪ Bike Handle Controller ▪ Card Catcher ▪ Sega Handle Controller ▪ Sega Rapid Fire Unit ▪ SK-1100	▪ Light Phaser ▪ SegaScope 3D Glasses ▪ Sega Control Stick ▪ Sega Handle Controller ▪ Sega Paddle Control[46] ▪ Sega Pro Action Replay ▪ Sega Remote Control System ▪ Sega Rapid Fire Unit ▪ Sega SG Commander ▪ Sega Sports Pad	▪ Famicom Disk System (*Japan and Hong Kong*) ▪ NES Advantage ▪ NES Four Score ▪ NES Max ▪ NES Satellite ▪ NES Zapper ▪ NES Power Pad ▪ NES R.O.B. ▪ Famicom 3D System (*Japan only*) ▪ More...	▪ Atari XG-1 Light Gun	▪ XEGS keyboard ▪ CX40 joystick ▪ Atari XG-1 Light Gun
CPU clock speed		NEC μPD780C (Z80-derived) (3.58 MHz (3.55 MHz PAL)[47]	Zilog Z80A (3.58 MHz NTSC, 3.55 MHz PAL[48])	Ricoh 2A03 (6502-derived) (1.79 MHz (1.66 MHz PAL))[49]:149	Custom 6502C (1.19 MHz or 1.79 MHz)	
GPU		▪ Texas Instruments TMS9918 ▪ Yamaha YM2217 VDP (Video Display Processor) (later models)	Yamaha YM2602 VDP (Video Display Processor)	Ricoh PPU (Picture Processing Unit)	▪ Atari MARIA ▪ Atari TIA (Television Interface Adaptor)	▪ ANTIC ▪ Graphic Television Interface Adaptor
Sound chip(s)		▪ Texas Instruments SN76489 ▪ Yamaha VDP PSG (later models)	▪ Yamaha VDP PSG (SN76496)[50] Japan only:	▪ NTSC: Ricoh 2A03[51]:147 ▪ PAL: Ricoh 2A07[51]:109	▪ Atari TIA Optional cartridge chip:	POKEY

			▪ Yamaha YM2413	Famicom Disk System: ▪ Nintendo 2C33[52]	▪ POKEY	
Memory		3 KB RAM[47] ▪ 1 KB main RAM ▪ 2 KB video RAM	24.031 KB (24,608 bytes) RAM ▪ 8 KB main XRAM ▪ 16 KB video XRAM[53] (256 bytes sprite attribute table) ▪ 32 bytes palette RAM[54]	4.277 KB (4380 bytes) RAM ▪ 2 KB main RAM)[49]:149 ▪ 2 KB video RAM[55] ▪ 256 bytes sprite attribute RAM ▪ 28 bytes palette RAM Upgrades: ▪ MMC chips: Up to 8 KB work RAM and 12 KB video RAM[56] ▪ Famicom Disk System: 32 KB work RAM, 8 KB video RAM[52]	4 KB RAM ▪ 4 KB main RAM (200 bytes line buffer)	64KB RAM
Video	**Resolution**	256×192[57]	256×192, 256×224, 256×240	256×240[58]	160×200 or 320×200	160x192
	Palette	21 colors[47]	64 colors	54 colors[49]:149	256 colors (16 hues, 16 luma)	256 colors
	Colors on screen	16 simultaneous (1 color per sprite)	32 simultaneous (16 colors per sprite)	25 simultaneous (4 colors per sprite)	25 simultaneous (1, 4 or 12 colors per sprite)	16 simultaneous (256 color palette)
	Sprites	▪ 32 on screen (4 per scanline) ▪ 8×8 or 16×16 pixels ▪ Integer sprite zooming up to 32×32 pixels	▪ 64 on screen (8 per scanline) ▪ 8×8 to 16×16 pixels ▪ Integer sprite zooming up to 32×32 pixels[59]	▪ 64 on screen (8 per scanline)[60] ▪ 8×8 or 8×16 pixels[60] ▪ Sprite flipping[61]:119	▪ Display list ▪ 100 sprites (30 per scanline without background)	8 on screen
	Background	Tilemap playfield, 8×8 tiles	Tilemap playfield, 8×8 tiles, tile flipping[54]	Tilemap playfield, 8×8 tiles	N/A	Tilemap playfield, 384×240 (overscan)
	Scrolling	N/A	Smooth hardware scrolling, vertical/horizontal/diagonal directions,[62] IRQ interrupt, line scrolling, split-screen scrolling[59]	Smooth hardware scrolling, vertical/horizontal directions MMC chips: IRQ interrupt, diagonal scrolling, line scrolling, split-screen scrolling	Coarse scrolling, vertical/horizontal directions	
Audio		Mono audio with:[63] ▪ Three square wave channels/voices ▪ One noise generator	Mono audio with: ▪ Three square wave channels ▪ One noise generator Japan only: ▪ Two operator FM synthesizer ▪ Nine FM synthesis channels	Mono audio with:[64] ▪ Two square wave channels ▪ One triangle wave channel ▪ One noise generator ▪ One DPCM channel, 6-bit audio, 4.2 to 33.5 kHz sampling rate Japan only upgrades: ▪ Optional cartridge chip ▪ One wavetable synthesizer (*Famicom Disk System*)	Mono audio with:[61]:121 ▪ Two square waves Optional cartridge chip: ▪ Four square wave channels ▪ One noise generator	Mono audio with: ▪ Four square wave channels ▪ One noise generator

Other consoles

Videopac+ G7400 (1983)

My Vision (1983)

PV-1000 (1983)

Tomy Tutor Pyūta Jr. was a console version released in 1983

Super Cassette Vision (1984)

BBC Bridge Companion (1985)

Family Computer Disk System (1986)

Action Max (1987)

View-Master Interactive Vision (1989)

VTech Socrates (1988)

GX4000 (1990)

Commodore 64 Games System (1990)

Revisions

Twin Famicom Manufactured by Sharp Corporation. Exclusively released in Japan on July 1, 1986

Famicom Titler (1989)

Master System II Cost-reduced variant released in 1990

New-Style NES (1993)

Clones

Dina (Telegames Personal Arcade) ColecoVision and SG-1000 combination released in 1986

Micro Genius IQ-201

Pegasus (1991)

Dendy (1992)

Unreleased

Nintendo Advanced Video System The original model for the NES planned to release worldwide (1983)

Sales comparison

The NES/Famicom sold by far the most units of any third generation console, particularly in Japan and North America. In North America in 1989, between Nintendo and Sega, there was a 94% to 6% split in market share between the NES and the Master System, in Nintendo's favor.[65] The NES sold 1.1 million units in North America during 1986, much more than the Master System (125,000) and Atari 7800 (100,000) combined.[66] By 1990, Nintendo had a 93% North American market share, followed by Sega with a 3.8% share, NEC with 1.3% and Atari with 1.1% share.[67] Nintendo maintained its North American lead through 1991, when it had a market-share of 80% that year, much more than Atari (12%) and Sega (8%) combined.[68] This was due to Nintendo's strong lineup of both first-party titles (such as *Super Mario Bros.*, *Metroid*, *Duck Hunt*, and *The Legend of Zelda*) and third-party titles along with Nintendo's strict licensing rules that required NES titles to be exclusive to the console for two years after release, putting a damper on third-party support for other consoles.[69]

In Europe, competition was much tougher for the NES, which was trailing behind the Master System up until 1990, despite the former's hegemony of the North American and Japanese markets.[28][27] NES sales began picking up from about 1990,[28] after which sales were more evenly split between the NES and Master System through 1994; the NES eventually overtook the Master System in Western Europe by a narrow margin, though the Master System maintained its lead in several markets such as the United Kingdom, Belgium and Spain.[70] In other regions, the Master System was the most successful console in Brazil,[71] South Korea,[72] and Australia,[73] while the Dendy (a Taiwanese Famiclone of the NES/Famicom) was the most successful in the former Soviet Union.[74]

Console	Firm	Units sold worldwide	Japan	Americas	Other regions
Nintendo Entertainment System (Family Computer / Famicom / NES)	Nintendo	61.91 million (2009)[75][76]	19.35 million (2009)[75]	34 million (2009)[75]	8.56 million (2009)[75]
Master System (including licensed Tectoy variants)	Sega	19.17 million (2016)	1 million (1986)[77]	United States: 2 million (1992)[78] Brazil: 8 million (2016)[71]	Western Europe: 6.8 million (1993)[70] South Korea: 720,000 (1994)[72] Australia: 650,000 (1994)[79]
Dendy (unlicenced Famiclone)	Micro Genius	6 million (1998)	—	—	Former USSR: 6 million (1998)[74]
Famicom Disk System	Nintendo	4.5 million (1992)	4.4 million (1990)[80]	—	Hong Kong: 10,000 (1992)
Atari 7800	Atari	1 million (1988)	Unknown	1 million (1988)[81]	Unknown
Sega SG-1000	Sega	400,000 (2007)	400,000 (2007)[82]	—	Unknown
Super Cassette Vision	Epoch Co.	300,000 (2007)	300,000 (2007)[82]	—	Unknown
Atari XEGS	Atari	130,000 (1989)	—	100,000 (1987)[83]	France: 30,000 (1989)[84]

Software

Milestone titles

- *Alex Kidd in Miracle World* (SMS) by Sega featured Sega's original mascot, Alex Kidd.[85]
- *Castlevania* (NES) by Konami is loosely based on Bram Stoker's *Dracula*, featuring Count Dracula as the main antagonist of the series. This game initiated the *Castlevania* series.
- *Dragon Ball: Dragon Daihikyō* (SCV) by Epoch was the first game based upon the now long-running manga and anime series, *Dragon Ball*.[86]
- *Dragon Quest* (NES) by Chunsoft and Enix introduced the *Dragon Quest* series in 1986.
- *Final Fantasy* (NES) by Square started the *Final Fantasy* series in 1987.
- *The Legend of Zelda* (NES) by Nintendo R&D4 and Nintendo initiated the *Legend of Zelda* series in 1986.
- *Mega Man 2* (NES) by Capcom was the breakthrough title in Capcom's *Mega Man* series. The series had a number of additional hits on the NES, and later spawned several successful spin-off series.
- *Metal Gear* (MSX2) by Konami initiated the *Metal Gear* series in 1987. It was released for the MSX2 computer and remade on the NES shortly after.
- *Metroid* (NES) by R&D1 and Nintendo initiated the *Metroid* series in 1986.
- *Ninja Gaiden* (NES) by Tecmo initiated the *Ninja Gaiden* series in 1988, and was acclaimed for its extreme difficulty, high quality music, and for having one of the earliest uses of cutscenes in video games.[87]
- *Phantasy Star* (SMS) by Sega Consumer Development Division 2 and Sega is considered one of the benchmark role-playing video games,[88] and is among the first to use a science fiction setting, and to feature a female protagonist.[89]
- *Super Mario Bros.* (NES) by Nintendo R&D4 and Nintendo was bundled with the NES and became the best-selling video game of all time, a title it held until 2009.[90] Countless imitations of the game appeared over the course of the console generation.
- *Super Mario Bros. 3* (NES) by Nintendo is widely considered the best sidescrolling platform game of the generation, as well as topping many "Best Game" lists for the NES.[91] Its jumping physics and world map segments, where players can choose their path, served as a formula for later 2D Mario games.

See also

- 1980s in video games

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Fourth generation of video game consoles

In the history of video games, the **fourth generation of video game consoles**, more commonly referred to as the **16-bit era**, began on October 30, 1987, with the Japanese release of NEC Home Electronics' PC Engine (known as the TurboGrafx-16 in North America). Though NEC released the first console of this era, sales were mostly dominated by the rivalry between Sega and Nintendo across most markets: the Mega Drive (known as the Genesis in North America) and the Super Nintendo Entertainment System (known as the *Super Famicom* in Japan). Cartridge-based handheld game consoles became prominent during this time, such as the Game Boy, Lynx, Game Gear, and TurboExpress.

Nintendo was able to capitalize on its success in the third generation, and managed to win the largest worldwide market share in the fourth generation as well. However, particularly in the lucrative North American market, there was a fierce console war in the early 1990s, which eventually saw Sega taking a market share lead over Nintendo in North America by 1993. Sega's success in this era stemmed largely from its launch of its popular *Sonic the Hedgehog* franchise to compete with Nintendo's *Super Mario* series, as well as a very stylized marketing campaign aimed at American teenagers. Several other companies released consoles in this generation, but none of them were widely successful. Nevertheless, there were other companies that started to take notice of the maturing video game industry and begin making plans to release consoles of their own in the future. As with prior generations, game media still continued to be distributed primarily on ROM cartridges, though the first optical disc systems, such as the Philips CD-i, were released to limited success. There was additionally competition with games on home computers such as the Amiga, Atari ST, Apple IIGS, and IBM PC compatibles, especially in markets like Europe. As games became more complex, concerns over violence in games like *Mortal Kombat* and *Night Trap* led to the creation of the Entertainment Software Rating Board.

The emergence of fifth generation video game consoles, beginning around 1994, did not initially significantly diminish the popularity of fourth generation consoles. In 1996, however, there was a major drop in sales of hardware from this generation and a dwindling number of software publishers supporting its systems,[1] which together led to a drop in software sales in subsequent years.

Differences from third generation consoles

Features that distinguish some fourth generation consoles from third generation consoles include:

- 16-bit microprocessors
- Multi-button game controllers with many buttons (3 to 8)
- Parallax scrolling of multi-layer tilemap backgrounds
- Large sprites (up to 64×64 or 16×512 pixels), 80–380 sprites on screen, 16–96 sprites per scan line
- Elaborate color, 64 to 4096 colors on screen, from palettes of 512 (9-bit) to 65,536 (16-bit) colors
- Stereo audio, with multiple channels and digital audio playback (PCM, ADPCM)
- Advanced music synthesis (FM, wavetable and/or sample-based synthesis)

Additionally, in specific cases, fourth generation hardware featured:

- Backgrounds with pseudo-3D scaling and rotation
- Sprites that can *individually* be scaled and rotated
- Flat-shaded 3D polygon graphics
- Surround sound support
- CD-ROM support via add-ons, allowing larger storage space, full motion video playback, and streaming CD-DA audio playback

Home systems

TurboGrafx-16

The PC Engine was the result of a collaboration between Hudson Soft and NEC and launched in Japan on October 30, 1987. It launched under the name TurboGrafx-16 in North America on August 29, 1989.

Initially, the PC Engine was quite successful in Japan, partly due to titles available on the then-new CD-ROM format. NEC released a CD add-on in 1990 and by 1992 had released a combination TurboGrafx and CD-ROM system known as the TurboDuo.


TurboGrafx-16

In the United States, NEC used Bonk, a head-banging caveman, as their mascot and featured him in most of the TurboGrafx advertising from 1990 to 1994. The platform was well received initially, especially in larger markets, but failed to make inroads into the smaller metropolitan areas where NEC did not have as many store representatives or as focused in-store promotion.

The TurboGrafx-16 failed to maintain its sales momentum or to make a strong impact in North America.[2] The TurboGrafx-16 and its CD combination system, the Turbo Duo, ceased manufacturing in North America by 1994, though a small amount of software continued to trickle out for the platform.

Mega Drive/Genesis

The Mega Drive was released in Japan on October 29, 1988.[3] The console was released in New York City and Los Angeles on August 14, 1989, under the name Sega Genesis, and in the rest of North America later that year.[4] It was launched in Europe and Australia on November 30, 1990, under its original name.


Second version of the Sega Genesis

Sega built its marketing campaign around its new mascot Sonic the Hedgehog,[5] pushing the Genesis as the "cooler" alternative to Nintendo's console[6] and inventing the term "Blast Processing" to suggest that the Genesis was capable of handling games with faster motion than the SNES.[7] Their advertising was often directly adversarial, leading to commercials such as "Genesis does what Nintendon't" and no scream at all.[8]

When the arcade game *Mortal Kombat* was ported for home release on the Genesis and Super Nintendo Entertainment System, Nintendo decided to censor the game's gore, but Sega kept the content in the game, via a code entered at the start screen. Sega's version of *Mortal Kombat* received generally more favorable reviews in the gaming press and outsold the SNES version three to one. This also led to Congressional hearings to investigate the marketing of violent video games to children, and to the creation of the Interactive Digital Software Association and the Entertainment Software Rating Board.[9] Sega concluded that the superior sales of their version of *Mortal Kombat* were outweighed by the resulting loss in consumer trust, and cancelled the game's release in Spain to avoid further controversy.[10] With the new ESRB rating system in place, Nintendo reconsidered its position for the release of *Mortal Kombat II*, and this time became the preferred version among reviewers.[11][12] The Toy Retail Sales Tracking Service reported that during the key shopping month of November 1994, 63% of all 16-bit video game consoles sold were Sega systems.[13]

The console was never popular in Japan (being regularly outsold by the PC Engine), but still managed to sell 30.75 million units worldwide. By late 1995, Sega was supporting five different consoles and two add-ons, and Sega Enterprises chose to discontinue the Mega Drive in Japan to concentrate on the new Sega Saturn.[14] While this made perfect sense for the Japanese market, it was disastrous in North America: the market for Genesis games was much larger than for the Saturn, but Sega was left without the inventory or software to meet demand.[15]

Super NES

Nintendo's fourth-generation console, the Super Famicom, was released in Japan on November 21, 1990; Nintendo's initial shipment of 300,000 units sold out within hours.[16] The machine reached North America as the Super Nintendo Entertainment System on August 23, 1991,[cn 1] and Europe and Australia in April 1992.


The Japanese & PAL version of the Super NES (first model)

Despite stiff competition from the Mega Drive/Genesis console, the Super NES eventually took the top selling position, selling 49.10 million units worldwide,[23] and would remain popular well into the fifth generation of consoles.[24] Nintendo's market position was defined by its machine's increased video and sound capabilities,[25] including exclusive first-party franchise titles such as *F-Zero*, *Super Mario World*, *Star Fox*, *Super Mario Kart*, *Donkey Kong Country*, *The Legend of Zelda: A Link to the Past* and *Super Metroid*.

Compact Disc Interactive (CD-i)

The CD-i format was announced in the late 1980s, with the first machines compatible with the format being released in 1991. The Philips CD-i's main selling point was that it was more than a game machine and could be used for multimedia needs. Due to an agreement between Nintendo and Philips about an abortive CD add-on for the SNES (which eventually evolved into Sony's PlayStation), Philips also had rights to use some of Nintendo's franchises. The CD-i was a commercial failure and was discontinued in 1998,[26] selling only 1 million units worldwide despite several partnerships and multiple versions of the device, some made by other manufacturers.

Philips CD-i

Neo Geo

Released by SNK in 1990, the Neo Geo was a home console version of the major arcade platform. Compared to its console competition, the Neo Geo had much better graphics and sound, however, the prohibitively expensive launch price of $649.99 and games often retailing at over $250 made the console only accessible to a niche market. A less expensive version, retailing for $399.99, did not include a memory card, pack-in game or extra joystick.

Neo-Geo

Add-ons

Nintendo, NEC and Sega also competed with hardware peripherals for their consoles in this generation. NEC was the first with the release of the TurboGrafx CD system in 1990. Retailing for $399.99 at release, the CD add-on was not a popular purchase, but was largely responsible for the platform's success in Japan.[27] The Sega CD was released with an unusually high price tag ($300 at its release) and a limited library of games. A unique add-on for the Sega console was Sega Channel, a subscription-based service (a form of online gaming delivery) hosted by local television providers. It required hardware that plugged into a cable line and the Genesis.

Nintendo also made two attempts with the Satellaview and the Super Game Boy. The Satellaview was a satellite service released only in Japan and the Super Game Boy was an adapter for the SNES that allowed Game Boy games to be displayed on a TV in color. Nintendo, working along with Sony, also had plans to create a CD-ROM drive for the SNES (plans that resulted in a prototype version of the Sony PlayStation), but eventually decided not to go through with that project, opting to team up with Philips in the development of the add-on instead (contrary to popular belief, the CD-i was largely unrelated to the project).

PC Engine CoreGrafx II with Super CD-ROM[2]

Second model Genesis and Sega CD

32X

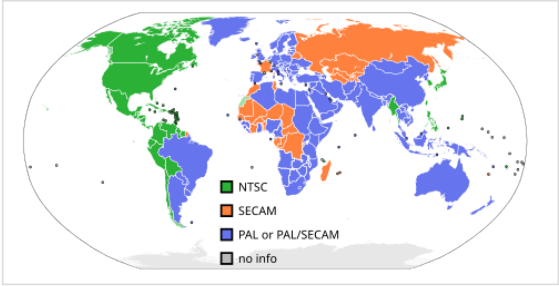
Satellaview

Super Game Boy

European importing

The fourth generation was also the era when the act of buying imported US games became more established in Europe, and regular stores began to carry them. The PAL region has a refresh rate of 50 Hz (compared with 60 Hz for NTSC) and a vertical resolution of 625 interlaced lines (576 effective), compared with 525/480 for NTSC. Because the simulation speed of contemporary game systems was directly linked to the output frame rate, which was in turn synchronized with the TV's refresh rate, this meant that the game would run more slowly on a PAL television. The smaller number of vertical lines in

the NTSC signal would also lead to black bars appearing on the top and bottom of a PAL television. Developers often had a hard time converting games designed for the American and Japanese NTSC standard to the European and Australian PAL standard. Companies such as Konami, with large budgets and a healthy following in Europe and Australia, readily optimized several games (such as the *International Superstar Soccer* series) for this audience, while most smaller developers did not.



NTSC
PAL, or switching to PAL
SECAM
No information

Also, few RPGs were released in Europe because the market for the genre was not as large as in Japan or North America, and the increasing amount of time and money required for translation as RPGs became more text-heavy, in addition to the usual need to convert the games to the PAL standard, often made localizing the games to Europe a high-cost venture with little potential payoff.[28][29] As a result, RPG releases in Europe were largely limited to games which had previously been localized for North America, thus reducing the amount of translation required.[29]

Popular US games imported at this time included *Final Fantasy IV* (known in the US as *Final Fantasy II*), *Final Fantasy VI* (known in the US as *Final Fantasy III*), *Secret of Mana*, *Street Fighter II*, *Chrono Trigger*, and *Super Mario RPG*. *Secret of Mana* and *Street Fighter II* would eventually receive official release in Europe, whilst *Final Fantasy IV*, *Final Fantasy VI*, *Chrono Trigger* and *Super Mario RPG* would be released in Europe years later on other consoles or formats outside of this generation.

Comparison

Comparison of fourth-generation video game home consoles

Name		PC-Engine/ TurboGrafx-16	Mega Drive/ Genesis	Super Famicom/ Super NES	Neo Geo
Manufacturer		NEC	Sega	Nintendo	SNK
Image(s)					
Release date		JP: October 30, 1987 NA: August 29, 1989 EU: 1990	JP: October 29, 1988 NA: August 14, 1989 EU: November 30, 1990	JP: November 21, 1990 NA: August 23, 1991[cn 1] EU: April 11, 1992	JP: June 18, 1991 NA: June 18, 1991 EU: 1991
Launch prices	US$	US$199.99 (equivalent to $520 in 2025)	US$189.99 (equivalent to $490 in 2025)	US$199.99 (equivalent to $470 in 2025)	US$649.99 (Gold version) (equivalent to $1,540 in 2025) US$399.99 (Silver version) (equivalent to $950 in 2025)
	GBP		£189.99[30][31] (equivalent to $470 in 2025)	£150[32] (equivalent to $330 in 2025)	
	JP¥	¥59,800 (equivalent to ¥65,970 in 2024)	¥21,000 (equivalent to ¥26,780 in 2024)	¥25,000 (equivalent to ¥30,260 in 2024)	
Media	Type	▪ HuCard (card-shaped cartridge) ▪ CD-ROM (Turbo CD add-on)	▪ Cartridge ▪ CD-ROM (Sega CD add-on) ▪ Data card (Power Base Converter add-on)	▪ Game Pak (Cartridge)	▪ Cartridge ▪ Data card (Japan/Europe)[33] ▪ CD-ROM (Neo Geo CD)
	Regional lockout	Partial[34]	Region locked	Region locked	Unrestricted
	Backward compatibility	—	Master System (using Power Base Converter)	Nintendo Entertainment System (unlicensed, using Super 8) Game Boy (using Super Game Boy)	—
Pack-in game		*Keith Courage in Alpha Zones*	*Sonic the Hedgehog* (15 million)[35]	*Super Mario World* (20.6 million)[36]	—
Best-selling games		*Bonk's Adventure*[37]	*Sonic the Hedgehog 2* (6 million)[38]	*Street Fighter II: The World Warrior* (6.3 million)[39]	*Samurai Shodown*
Accessories (retail)		▪ TurboGrafx-CD (1988) ▪ System Card (1988) ▪ Super System Card (1991) ▪ Arcade Card (1994) ▪ TurboTap (1987) ▪ TurboStick ▪ TurboBooster ▪ TurboBooster Plus	▪ Mega CD/Sega CD (1991) ▪ Sega CD Backup Ram carts (1992 JP) (1994 NA)[40] ▪ Sega 32X (1994) ▪ Mouse ▪ Menacer (1992) ▪ Power Base Converter ▪ Sega Activator (1993) ▪ Multitap	▪ Super Scope ▪ Super NES Mouse (1992) ▪ Super Multitap (1993) ▪ Super Game Boy (1994) ▪ Super Advantage ▪ Satellaview (1995)	▪ Neo Geo Controller Pro (1995) ▪ Neo Geo Memory Card (1990) ▪ Neo Geo MVS to AES Converter (1998)
CPU		Hudson Soft HuC6280A (based on 8-bit 65SC02) 1.79 MHz (0.77 MIPS) or 7.16 MHz (3.08 MIPS)[41]	▪ Motorola 68000 (16/32-bit CISC) 7.67 MHz (7.61 MHz PAL) (1.4 MIPS)	▪ Nintendo custom Ricoh 5A22 (based on 16-bit 65C816)	▪ Motorola 68000 (16/32-bit CISC) 12 MHz (2.1 MIPS)

		(12.5 MHz CD) (2.19 MIPS)[41] • Zilog Z80 (8/16-bit) 3.58 MHz (0.52 MIPS)[cn 2][41] 32X add-on: • 2× Hitachi SH-2 (32-bit RISC) @ 23 MHz (60 MIPS)[42]	3.58 MHz (3.55 MHz PAL) (1.5 MIPS) SA-1 enhancement chip: • Nintendo custom 65C816 10.74 MHz (4.5 MIPS)	• Zilog Z80 (8/16-bit) 4 MHz (0.58 MIPS)[41]
GPU	• Hudson Soft HuC6260 Video Color Encoder (16-bit) • Hudson Soft HuC6270A Video Display Controller (16-bit)	• Yamaha YM7101 VDP (Video Display Processor)[43] Upgrades: • SVP chip: Samsung SSP1601 DSP[44] @ 23 MHz (25 MIPS)[45] (1994) • CD add-on: Sega ASIC coprocessor[46] • 32X add-on: Sega 32x VDP (Sega Custom LSI) @ 23 MHz [47]	• Ricoh PPU1 (Picture Processing Unit 1) • Ricoh PPU2 (Picture Processing Unit 2)[48] Enhancement chips: • DSP: NEC μPD77C25 @ 8 MHz[49] (1990) • Super FX: 10.5 MHz[45] (10 MIPS) (1993) • Capcom Cx4 (Hitachi HG51B169 DSP)[50] (1994) • Super FX 2: 21.477 MHz (21 MIPS)[51] (1995)	• SNK LSPC2-A2 (line sprite generator & VRAM interface)[52] • SNK PRO-B0 (palette arbiter)[53][54]
Sound chip(s)	• Hudson Soft HuC6280A PSG • CD add-on: Oki MSM5205	• Yamaha YM2612 • Yamaha VDP PSG (SN76496)[55] Upgrades: • CD add-on: Ricoh RF5c164 • 32X add-on: Pulse-code modulation	Sony APU (Audio Processing Unit) • S-SMP (8-bit Sony SPC700) • S-DSP (16-bit DSP)	Yamaha YM2610
RAM	• 8 KB main RAM • 64 KB video RAM Upgrades: • Super System Card: 64 KB DRAM, 192 KB SRAM • Arcade Duo Card: 2048 KB FPM DRAM, 192 KB SRAM[56] • Arcade Pro Card: 2240 KB+192 kB	• 64 KB main PSRAM • 64 KB video DRAM[57] • 8 KB Z80/audio SRAM[58] Upgrades: • SVP chip: 128 KB DRAM, 2 KB cache, 1 KB DSP RAM[59] • CD add-on: 512 KB main, 256 KB Video, 64 KB Audio, 16 KB cache, 8 KB Internal Back-up[60] • CD BackUp Ram Carts: 8 KB to 512 KB [40] • 32X add-on: 256 KB main RAM, 256 KB video RAM	• 128 KB main DRAM • 64 KB video SRAM • 64 KB audio PSRAM Enhancement chips: • SA-1: 2 KB RAM • Super FX: 32 to 128 KB SRAM[51] • Super FX 2: 64 to 128 KB SRAM[51]	• 64 KB main SRAM • 74 KB video SRAM • 2 KB audio SRAM[52]
Video	• Resolution: 256×224 to 565×242 (progressive), 256×448 to 565×484 (interlaced) • Sprites: 64 on screen, 16 per scanline, 16×16 to 32×64 sizes, 16 colors per sprite, sprite flipping[61] • Tilemap: 1 scrolling background[61] with line scroll effect[62]	• Resolution: 320×224, 256×224 (NTSC), 320×240, 256×240 (PAL) (progressive),[64] 320×448 to 320×480 (interlaced) • Sprites: 80 on screen, 20 per scanline, 8×8 to 32×32 sizes, 16 colors per sprite,[65] integer sprite zoom,[66] sprite flipping[67]	• Resolution: 256×224 to 256×239 (progressive), 512×448 to 512×478 (interlaced) • Sprites: 128 on screen, 32 per scanline, 8×8 to 64×64 sizes, 16 colors per sprite, sprite flipping[48] • Tilemaps: 2–4 parallax scrolling planes (lo-res), or 1–2 scrolling planes (hi-res), or 1	• Resolution: 320×224 to 384×264[52] (progressive) • Sprites: 380 on screen, 96 per scanline, double line buffering, 16×16 to 16×512 sizes, 16 colors per sprite, sprite scaling, sprite flipping[52] • Tilemaps: 1 static plane, and optional 1–3 parallax scrolling

	▪ Colors on screen: 482 (241 for backgrounds, 241 for sprites) ▪ Color palette: 512 (9-bit color) ▪ CD add-on: Full motion video (FMV)[63]	▪ Tilemaps: 2 parallax scrolling planes with line & row scroll effects[68] and tile flipping[67] ▪ Colors on screen: 64[43] to 75[68] (standard), 192 (shadow/highlight),[43] 512 (160×224 resolution)[68] ▪ Color palette: 512 (standard), 1536 (shadow/highlight)[43] Upgrades: ▪ SVP enhancement chip: 3,000 texture mapping polygons/sec, 20,000 flat shading polygons/sec[69] ▪ CD add-on: Sprite/tilemap scaling & rotation,[46] FMV with 128–256 on-screen colors[70][71] ▪ 32X add-on: Color palette: 32,768 (15-bit high color), 256–32,768 colors on screen,[69] 40,000 Texture Gouraud Shading polygons/sec, 50,000 texture mapping polygons/sec, 100,000 Gouraud Shading polygons/sec, 160,000 flat shading polygons/sec [69]	scaling/rotating plane (Mode 7)[48] ▪ Colors on screen: 256 (1–3 lo-res planes), 128 (4 planes), 128 to 160 (hi-res)[48] ▪ Color palette: 32,768 (15-bit high color) Enhancement chips: ▪ Super FX: 2,000 flat shading polygons/sec, 1,000 texture mapping polygons/sec[72] ▪ Super FX 2: 4,000 flat shading polygons/sec, 2,000 texture mapping polygons/sec ▪ Capcom Cx4: Sprite rotation/Calculations for wireframe effects ▪ DSP-1: Advance Scaling and Rotation via Mode 7 ▪ DSP-2: Dynamic Scaling Capability and Transparency effects ▪ DSP-3: Bitstream decompression, and bitplane conversion of graphics ▪ DSP-4: Draw Distance	planes with scaling and line & column scroll effects[52][73] ▪ Colors on screen: 4096 ▪ Color palette: 65,536 (16-bit high color)
Audio	Stereo audio with: ▪ 6 programmable WS channels/voices ▪ Square, sine, sawtooth, triangle and other waveforms ▪ White noise generation on 2 channels ▪ LFO[74] or FM on 2 channels ▪ Optional streaming of samples through any channel CD add on: ▪ 1 ADPCM channel, 12-bit audio,[75] 32.088 kHz sampling rate[76] ▪ 1 streaming CD-DA channel, 16-bit CD audio, 44.1 kHz sampling rate	Stereo audio with: ▪ 6 FM synthesis channels/voices ▪ 3 square wave channels/voices ▪ Sine wave LFO ▪ 1 PCM channel, 8-bit samples, 8 to 22 kHz sampling rate[77] CD add on: ▪ 8 PCM channels (16-bit, 32 kHz)[46] ▪ 2-channel stereo streaming CD-DA (16-bit, 44.1 kHz) Upgrades: ▪ SVP chip: 2 PWM channels[45] ▪ 32X add-on: 10-bit PWM, surround sound	Stereo audio with: ▪ 8 ADPCM channels ▪ 16-bit audio, 32 kHz sampling rate ▪ Optional Dolby Surround support	Stereo audio with: ▪ 4 FM synthesis channels/voices ▪ 3 square wave channels/voices ▪ 1 white noise generator ▪ 6 ADPCM channels (12-bit) @ 18.5 kHz sampling rate[78] ▪ 1 ADPCM channel (16-bit) @ 1.8 to 55.5 kHz sampling rate[78]

Other consoles

Name		PC Engine SuperGrafx	PC Engine Duo/TurboDuo	CD-i	Wondermega/X'Eye
Manufacturer		NEC		Philips	Victor/JVC
Console					
Release date		JP: December 8, 1989	JP: September 21, 1991 NA: October 10, 1992	NA: December 3, 1991 JP: April 25, 1992 EU: July 10, 1992	JP: April 1, 1992 NA: September, 1994
Launch prices	US$		US$299.99 (equivalent to $690 in 2025)	US$799 (equivalent to $1,890 in 2025)	US$500 (equivalent to $1,090 in 2025)
	JP¥	¥59,800 (equivalent to ¥74,600 in 2024)			
Media	Type	HuCard	HuCard, CD-ROM	CD-ROM	Cartridge, CD-ROM
	Regional lockout	Region locked	Partial[34]	Unrestricted	Region locked
	Backward compatibility	PC Engine	PC Engine	No	Sega Genesis
GPU		▪ Hudson Soft HuC6260 Video Color Encoder (16-bit) ▪ Hudson Soft HuC6202 Video Priority Controller ▪ Hudson Soft HuC6270A Video Display Controller (16-bit)	▪ Hudson Soft HuC6260 Video Color Encoder (16-bit) ▪ Hudson Soft HuC6270A Video Display Controller (16-bit)	Philips SCC66470, MCD 212	Sega ASIC coprocessor[46]
Sound chip(s)		Hudson Soft HuC6280A PSG with 6 Wavetable channels @111.87 kHz	▪ Hudson Soft HuC6280A PSG ▪ Oki MSM5205	MCD 221	Ricoh RF5c164
RAM		▪ 32 KB main RAM ▪ 128 KB video RAM ▪ 64 KB main DRAM, 64 KB audio DRAM	▪ 256 KB SRAM ▪ 64 KB Video RAM ▪ 8 KB Work Ram	1 MB RAM	▪ 512 KB main ▪ 256 KB Video ▪ 64 KB Audio ▪ 16 KB cache ▪ 8 KB Internal Back-up[60] CD BackUp Ram Carts: ▪ 8 KB to 512 KB [40]
Video		▪ Resolution: 256×224 to 565×242 (progressive), 256×448 to 565×484 (interlaced) ▪ Sprites: 128 on screen, 32 per scanline, 16×16 to 32×64 sizes, 16 colors per sprite, sprite flipping[61] ▪ Tilemap: 2 parallax scrolling sprite layers			

	▪ Colors on screen: 512 (241 for backgrounds, 240 for sprites) ▪ Color palette: 512 (9-bit color)			
Audio	▪ 1 ADPCM channel, 12-bit audio,[75] 32.088 kHz sampling rate[76] ▪ 1 streaming CD-DA channel, 16-bit CD audio, 44.1 kHz sampling rate ▪ Optional Dolby Surround support	Stereo audio with: ▪ 6 programmable WS channels/voices ▪ Square, sine, sawtooth, triangle and other waveforms ▪ White noise generation on 2 channels ▪ LFO[74] or FM on 2 channels ▪ Optional streaming of samples through any channel ▪ 1 ADPCM channel, 12-bit audio,[79] 32.088 kHz sampling rate[76] ▪ 1 streaming CD-DA channel, 16-bit CD audio, 44.1 kHz sampling rate ▪ Optional Dolby Surround support	Stereo audio with: ▪ 8 ADPCM channels	Stereo audio with: ▪ 8 PCM channels (16-bit, 32 kHz)[46] ▪ 2-channel stereo streaming CD-DA (16-bit, 44.1 kHz)

Commodore CDTV
Released in 1991

Sega Pico
Released in 1993

LaserActive by Pioneer
Released in 1993

Super A'Can
Released in Taiwan on October 25, 1995

Worldwide sales standings

Console	Firm	Units sold
Super Nintendo Entertainment System	Nintendo	49.1 million[80]
Sega Mega Drive/Genesis	Sega	35.25 million[cn 3]
PC Engine/TurboGrafx-16	NEC	7.7 million
Sega CD	Sega	2.765 million[86]
PC Engine CD-ROM²	NEC	1.92 million[87]
Neo Geo AES	SNK	1.18 million[cn 4]
Philips CD-i	Philips	1 million[90]
Sega 32X	Sega	800,000[91]
Neo Geo CD	SNK	570,000[89]

Handheld systems

The first handheld game console released in the fourth generation was the Game Boy, on April 21, 1989. It went on to dominate handheld sales by an extremely large margin, despite featuring an 8-bit microprocessor and a low-contrast, unlit monochrome screen while all three of its leading competitors had color. Three major franchises made their debut on

the Game Boy: *Tetris*, the Game Boy's killer application; Pokémon; and Kirby. With some design (Game Boy Pocket, Game Boy Light) and hardware (Game Boy Color) changes, it continued in production in some form until 2008, enjoying a better than 18-year run.

The Atari Lynx included hardware-accelerated color graphics, a backlight, and the ability to link up to sixteen units together in an early example of network play when its competitors could only link 2 or 4 consoles (or none at all),[92] but its comparatively short battery life (approximately 4.5 hours on a set of alkaline cells, versus 35 hours for the Game Boy), and high price, resulted in the Lynx only selling 2 Million worldwide.[93]

The third major handheld of the fourth generation was the Game Gear. It featured graphics capabilities roughly comparable to the Master System (better colours, but lower resolution), a ready made games library by using the "Master-Gear" adaptor to play cartridges from the older console, and the opportunity to be converted into a portable TV using a cheap tuner adaptor, but it also suffered some of the same shortcomings as the Lynx. While it sold more than twenty times as many units as the Lynx, its bulky design – slightly larger than even the original Game Boy; relatively poor battery life – only a little better than the Lynx; and later arrival in the marketplace – competing for sales amongst the remaining buyers who did not already have a Game Boy – hampered its overall popularity despite being more closely competitive to the Nintendo in terms of price and breadth of software library.[94] Sega eventually retired the Game Gear in 1997, a year before Nintendo released the first examples of the Game Boy Color, to focus on the Nomad and non-portable console products.

Other handheld consoles released during the fourth generation included the TurboExpress, a handheld version of the TurboGrafx-16 released by NEC in 1990, and the Game Boy Pocket, an improved model of the Game Boy released about two years before the debut of the Game Boy Color. While the TurboExpress was another early pioneer of color handheld gaming technology and had the added benefit of using the same game cartridges or 'HuCards' as the TurboGrafx16, it had even worse battery life than the Lynx and Game Gear – about three hours on six contemporary AA batteries – selling only 1.5 million units.[95]

List of handheld consoles

Console		Game Boy Game Boy Pocket Game Boy Light	Atari Lynx	Game Gear	PC Engine GT TurboExpress PC Engine LT
Manufacturer		Nintendo	Atari	Sega	NEC
Image					
Release date		**Game Boy** JP: April 21, 1989 US: July 31, 1989 EU: September 28, 1990 **Game Boy Pocket** JP: July 21, 1996 US: September 3, 1996 **Game Boy Light** JP: April 14, 1998	US: October 11, 1989 EU: 1990 JP: 1990	JP: October 6, 1990 EU: April 26, 1991 US: April 26, 1991 AU: 1992	**PC Engine GT/TurboExpress** JP: December 1, 1990[96] US: 1991 **PC Engine LT** JP: December 13, 1991
Launch price	US$	US$89.95[97] (equivalent to $230 in 2025)	US$189.99 (equivalent to $490 in 2025)	US$149.99 (equivalent to $350 in 2025)	US$299.99[98] (equivalent to $710 in 2025)
	GBP	£69.99[99] (equivalent to £200 in 2025)			
	A$			A$155 (equivalent to $330 in 2022)	
	JP¥	¥12,500[100] (equivalent to ¥15,590 in 2024)		¥14,500 (equivalent to ¥17,550 in 2024)	
Units sold		118.69 million, including Game Boy Color[101][102]	500,000[95]	14 million[103][95]	1.5 million[95]
Media	Type	Cartridge	Cartridge	Cartridge	Datacard
	Regional lockout	Unrestricted	Unrestricted	Unrestricted	Region locked
	Backward compatibility	—	—	Master System (using adapter)	TurboGrafx-16 (HuCard only)
Best-selling games		*Pokémon Red*, *Blue*, and *Yellow*	*RoadBlasters*	*Sonic the Hedgehog 2*	*Bonk's Adventure*
CPU		Sharp SM83 @ 4.2 MHz	MOS 65SC02 @ 4 MHz	Zilog Z80 @ 3.5 MHz	HuC6280A @ 1.79 / 7.16 MHz
Memory		8 KB work RAM, 8 KB video RAM	64 KB RAM	8 KB work RAM, 16 KB video RAM	8 KB work RAM, 64 KB video RAM
Video		2.6 inch 160×144 4 shades of green/gray	3.5 inch 160×102 4,096-color palette, 16 colors per scanline	3.2 inch 160×144 4,096-color palette, 32 colors on-screen	2.6 inch 400×270 64 sprites, 16 per scanline 512-color palette, 482 colors on-screen
Audio		Stereo audio (using headphones), with: ▪ Two square wave channels ▪ One programmable waveform channel ▪ One white noise generator	Stereo audio with: ▪ Four square wave channels ▪ A built-in DAC for each channel	Stereo audio (using headphones), with: ▪ Three square wave channels ▪ One white noise generator	Stereo audio (using headphones), with: ▪ Six programmable waveform channels ▪ White noise generation ▪ Optional streaming of samples

Other handheld game consoles

Gamate
Released in 1991[104]

CD-i Intelligent Discman IVO
Released in 1991

Watara Supervision
Released in 1992

Mega Duck/Cougar Boy
Released in 1993

Milestone titles

- *Chrono Trigger* (SNES) by Square is frequently listed among the greatest video games of all time.[105][106][107][108][109][110][111][112]
- *Donkey Kong Country* (SNES) by Rare and Nintendo turned the tide of the console war in favor of Nintendo and became the best-selling game since *Super Mario Bros. 3*, largely due to its impressive graphics.[113]
- *FIFA International Soccer* (Genesis, SNES) by Extended Play Productions and EA Sports has been described as one of the most influential sports games ever made.[114]
- *Garou: Mark of the Wolves* (Arcade, Neo Geo AES) by SNK is considered one of the best fighting games, as well as the "swan song" of the generation. receiving praise for its hand-drawn graphics, and the game's tight and streamlined control scheme.[115]
- *Gunstar Heroes* (Genesis) by Treasure and Sega is considered one of the best action games of the generation.[116]
- *John Madden Football (1990)* (Genesis, SNES) by Park Place Productions and EA Sports played an important role in the early success of both the Genesis console and Electronic Arts.[117]
- *Super Mario World* (SNES) by Nintendo Entertainment Analysis & Development (Nintendo EAD) and Nintendo, a SNES launch title showcasing the console's capabilities with enhanced graphics and sound, as well as introducing new gameplay mechanics and expansive level design. It is often considered one of the best games in the series, it became the best-selling game of its generation and is cited as one of the greatest video games ever made.[118][119][120]
- *Super Metroid* (SNES) by Nintendo Research & Development 1 and Nintendo is still regarded by many gaming organizations as one of the "best games of all time."[121]
- *Mortal Kombat* (Arcade, Genesis, SNES) by Midway Games garnered heated controversy over its violent themes, with the uncensored Genesis version outselling the SNES version by nearly three-to-one, ultimately leading to a U.S. Congressional hearing and the creation of the Entertainment Software Rating Board.[122]
- *NHLPA Hockey '93* (Genesis, SNES) by Park Place Productions and EA Sports is considered one of the most outstanding sports games ever made.[123][124]
- *Phantasy Star II* (Genesis) by Sega Consumer Development Division 2 and Sega has been cited as one of the best and most influential console RPGs.[125][126][127]
- *Sonic the Hedgehog* (Genesis) by Sonic Team and Sega was Sega's bid to compete head-to head with Nintendo's *Mario* franchise, played a critical role in the success of the Genesis, and received widespread critical acclaim as one of the greatest games ever made, kickstarting a successful franchise.[128]
- *Street Fighter II* (Arcade, Genesis, SNES, TurboGrafx) by Capcom was the second game in the series to produce a lasting fanbase and set many of the trends seen in fighting games today, most notably its colorful selection of playable fighters from different countries across the globe.[129] As of 2008, it is Capcom's best-selling consumer game of all time.[130]
- *Streets of Rage 2* (Genesis) by Sega AM7 and Sega is considered the best beat 'em up of the generation.[131]
- *Super Monaco GP* (Arcade, Genesis) by Sega set a new standard for realism in console racing games.[132]
- *Super Mario World 2: Yoshi's Island* (SNES) by Nintendo Entertainment Analysis & Development (Nintendo EAD) and Nintendo is considered perhaps the finest 2D platformer.[133]
- *The Legend of Zelda: A Link to the Past* (SNES) by Nintendo EAD and Nintendo courted popularity that was larger than that of its predecessors on the NES.[134][135] It was one of the few action-adventures to be released early in the SNES's lifecycle. *Zelda II* on the NES had been mostly action-based and was side-scrolling, while *A Link to the Past* drew more inspiration from the original *Zelda* game with its top-down adventure format.[136][137][138][139]

See also

- 1980s in video games
- 1990s in video games

Notes

1. According to Stephen Kent's *The Ultimate History of Video Games*, the official launch date was September 9.[17] Newspaper and magazine articles from late 1991 report that the first shipments were in stores in some regions on August 23,[18][19] while it arrived in other regions at a later date.[20] Many modern online sources (circa 2005 and later) report August 13.[21][22]
2. Mega Drive games use the Z80 as a sound controller. The Power Base Converter effectively turns the Mega Drive into a Master System, giving control to the Z80 and leaving the 68000 dormant.
3. 30.75 million sold by Sega worldwide as of June 1996.[81][82] 1.5 million projected by Majesco Entertainment of the Genesis 3 in 1998.[83] 3 million sold by Tectoy in Brazil as of 2012.[84][85]
4. 1 million in Japan.[88] 180,000 overseas.[89]

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Fifth generation of video game consoles

The **fifth generation era** (also known as the **32-bit era**, the **64-bit era**, or the **3D era**) refers to computer and video games, video game consoles, and handheld gaming consoles dating from approximately October 4, 1993, to March 23, 2006.[note 1] The best-selling home console was the Sony PlayStation, followed by the Nintendo 64 and the Sega Saturn. The PlayStation also had a redesigned version, the PSone, which was launched on July 7, 2000.

Some features that distinguished fifth generation consoles from previous fourth generation consoles include:

- 3D polygon graphics with texture mapping
- 3D graphics capabilities – lighting, Gouraud shading, anti-aliasing and texture filtering
- Optical disc (CD-ROM) game storage, allowing much larger storage space (up to 650 MB) than ROM cartridges
- CD quality audio recordings (music and speech) – PCM audio with 16-bit depth and 44.1 kHz sampling rate
- Wide adoption of full motion video, displaying pre-rendered computer animation or live action footage
- Analog controllers
- Display resolutions from 480i to 576i
- Color depth up to 16,777,216 colors (24-bit true color)

This era is known for its pivotal role in the video game industry's leap from 2D to 3D computer graphics, as well as the shift in home console games from being stored on ROM cartridges to optical discs. This was also the first generation to feature internet connectivity: some systems had additional hardware which provided connectivity to an existing device, like the Sega Net Link for the Sega Saturn. The Apple Pippin, a commercial flop, was the first system to feature on-board internet capabilities.

For handhelds, this era was characterized by significant fragmentation, because the first handheld of the generation, the Sega Nomad, had a lifespan of just two years, and the Nintendo Virtual Boy had a lifespan of less than one. Both of them were discontinued before the other handhelds made their debut. The Neo Geo Pocket was released on October 28, 1998, but was dropped by SNK in favor of the fully backward compatible Neo Geo Pocket Color just a year later. Nintendo's Game Boy Color (1998) was the most successful handheld by a large margin. There were also two minor updates of the original Game Boy: the Game Boy Light (released in Japan only) and the Game Boy Pocket.

There was considerable time overlap between this generation and the next, the sixth generation of consoles, which began with the launch of the Dreamcast in Japan on November 27, 1998. The fifth generation ended with the discontinuation of the PlayStation (specifically its re-engineered form, the "PSOne") on March 23, 2006, a year after the launch of the seventh generation.

History

Transition to 3D

The 32-bit/64-bit era is most noted for the rise of fully 3D polygon games. While there were games prior that had used three-dimensional polygon environments, such as *Virtua Racing* and *Virtua Fighter* in the arcades and *Star Fox* on the Super NES, it was in this era that many game designers began to move traditionally 2D and pseudo-3D genres into 3D on video game consoles. Early efforts from then-industry leaders Sega and Nintendo saw the introduction of the 32X and Super FX, which provided rudimentary 3D capabilities to the 16-bit Genesis and Super NES. Starting in 1996, 3D video games began to take off with releases such as *Virtua Fighter 2* on the Saturn, *Tomb Raider* on the PlayStation and Saturn, *Tekken 2* and *Crash Bandicoot* on the PlayStation, and *Super Mario 64* on the Nintendo 64. Their 3D environments were widely marketed and they steered the industry's focus away from side-scrolling and rail-style titles, as well as opening doors to more complex games and genres. 3D became the main focus in this era as well as a slow decline of cartridges in favor of CDs, due to the ability to produce games less expensively and the media's high storage capabilities.

CD vs cartridge

After allowing Sony to develop a CD-based prototype console for them and a similar failed partnership with Philips,[3] Nintendo decided to make the Nintendo 64 a cartridge-based system like its predecessors. Publicly, Nintendo defended this decision on the grounds that it would give games shorter load times than a compact disc (and would decrease piracy due to a certain chip in the ROM cartridge).[4][5] However, it also had the dubious benefit of allowing Nintendo to charge higher

licensing fees, as cartridge production was considerably more expensive than CD production. Many third-party developers like EA Sports viewed this as an underhanded attempt to raise more money for Nintendo and many of them became more reluctant to release games on the N64.

Nintendo's decision to use a cartridge based system sparked a debate in the video game magazines as to which was better. The chief advantages of the CD-ROM format were (1) larger storage capacity, allowing for a much greater amount of game content;[6][7] (2) considerably lower manufacturing costs, making them much less risky for game publishers;[7][8] (3) lower retail prices due to the reduced need to compensate for manufacturing costs;[6][7][9] and (4) shorter production times, which greatly reduced the need for publishers to predict the demand for a game.[10][11] Its disadvantages compared to cartridge were (1) considerable load times;[6][8][10] (2) their inability to load data "on the fly", making them reliant on the console RAM;[6] and (3) the greater manufacturing costs of CD-ROM drives compared to cartridge slots, resulting in generally higher retail prices for CD-based consoles.[6][8] A Nintendo Power ad placed a Space Shuttle (representing cartridges) next to a snail (representing a CD), as an analogy for their respective speeds, stating that "the future doesn't belong to snails".[12]

Almost every other contemporary system used the new CD-ROM technology. Consequent to the storage and cost advantages of the CD-ROM format, many game developers shifted their support away from the Nintendo 64 to the PlayStation. One of the most influential game franchises to change consoles during this era was the *Final Fantasy* series, beginning with *Final Fantasy VII*, which was developed for the PlayStation instead of the N64 due to storage capacity issues;[13] prior *Final Fantasy* games had all been published on Nintendo consoles – either the NES or Super NES, with the only other entries being on the Wonderswan, or computers like the MSX.

Overview

The fifth generation was characterized by an unusually high number of console formats. More competing consoles comprised this generation than any other since the video game crash of 1983, leading video game magazines of the time to frequently predict a second crash.[14]

Major consoles

The 3DO Interactive Multiplayer was one of the earliest fifth generation consoles and was released in October 1993. Despite having massive third-party support and an unprecedented amount of hype for a first-time entrant into the industry, it had early difficulties due to software development delays and its high price. For its initial release, the 3DO had a $700 retail price tag and only a single available game ready for market. The 3DO would be discontinued only three years later. While generally regarded as a failed system, the 3DO was this generation's fourth best-selling console in a crowded field with sales of 2 million units.

The Sega Saturn was Sega's entry into the stand-alone 32-bit console market. It was released in Japan simultaneously with the 32X in November 1994, although it would not have a North American release until six months later.[3] It became Sega's most successful console in Japan. In America and Europe however, a disastrous launch and an MSRP of $399 compared to the PlayStation's $299 caused it to be a commercial failure,[15] selling far fewer units than the Master System and Mega Drive/Genesis before it.

The PlayStation, released in early December 1994, was the most successful console of this generation. With attention given by third-party developers and a more mature marketing campaign aimed at the 20–30 age group enabling it to achieve market dominance, it became the first home console to ship 100 million units worldwide.

The Nintendo 64, originally announced as the "Ultra 64", was released in 1996. The system's delays and use of the expensive cartridge format made it an unpopular platform among third-party developers. Several popular first-party titles allowed the Nintendo 64 to maintain strong sales in the United States, but it remained a distant second to the PlayStation.

Other consoles

The Amiga CD32 was released in September 1993 and sold in Europe, Australia, Canada and Brazil. It was never released in the United States due to Commodore's bankruptcy and court-ordered import restrictions.[16][17] Despite promising initial sales, the console was hampered by poor software quality with many titles being simply re-releases of older games.[18] Production of the Amiga CD32 was discontinued after only eight months.[17]

The Atari Jaguar was released in November 1993 and was marketed as the world's first 64-bit system. However, sales at launch were well below the incumbent fourth generation consoles, and a small games library rooted in a shortage of third-party support made it impossible for the Jaguar to catch up, selling below 250,000 units. The system's 64-bit nature was also questioned by many. Its only add-on, the Jaguar CD, was released in 1995 and was produced in limited quantities due to the low install base of the system. The 32-bit Atari Panther, set to be released in 1991, was canceled due to unexpectedly rapid progress in developing the Jaguar.[19]

The Sega 32X, an add-on console produced by Sega for the Genesis, was launched in November 1994. The Sega Neptune, a standalone version of the 32X, was announced but ultimately canceled. Sega failed to deliver a steady flow of games for the 32X platform. With customers anticipating the PlayStation on the horizon, and with Sega's more technically advanced Saturn already competing on the market in Japan, sales of the 32X were poor.[20]

NEC, creator of the TurboGrafx-16 of the previous generation, entered the market with the PC-FX in late December 1994. The system had a 32-bit processor, 16-bit stereo sound, and video capability. Despite its impressive specifications, it did not have a polygon processor and was marketed as a platform for 2D and full motion video games. The PC-FX game library was criticized for being low in quality, and having titles that relied more on animation than gameplay.[21][22] Due to low expected sales, it was never released outside of Japan.

In 1995, Nintendo released the Virtual Boy, a supposedly portable system capable of displaying true 3D graphics, albeit in monochromatic red and black. Despite being marketed as a portable system, it is not actually portable in practice due to the lack of a head strap.[23] Also, because of the nature of its display, the system reportedly caused headaches and eye strain.[23] It was discontinued within a year,[24] with fewer than 25 games being released for it.[23] Although it sold over 750,000 units, Nintendo felt that it was a failure compared to consoles such as the Super Nintendo, which sold over 20 million.[24]

Aftermath of the fifth generation

By the end of the 1995 Christmas shopping season, the fifth generation had come down to a struggle between the Sony PlayStation, Sega Saturn, 3DO Interactive Multiplayer, and the upcoming Nintendo 64. The Amiga CD32 had already been discontinued; the Jaguar, Genesis 32X, and Virtual Boy were still on the market but were considered a lost cause by industry analysts; the Neo Geo CD had proven to appeal only to a niche market; and industry analysts had already determined that the yet-to-launch Apple Bandai Pippin was too expensive to make any impact in the market.[25] Moreover, even the leading fifth generation consoles were still facing sluggish sales. Combined sales for the PlayStation, Saturn, and 3DO barely topped 1 million units for the Christmas shopping season, as compared to combined sales of 4 million for the Sega Genesis and Super NES.[26] Focus groups showed that most children under 12 years old were equally happy playing on fourth generation consoles as they were playing on fifth generation consoles, making the fourth generation consoles more appealing to adults buying gifts for children, since they were cheaper.[8] Industry analysts began putting forth the possibility that the fifth generation of consoles would never overtake the fourth generation in sales, and become superseded by a new generation of DVD player consoles before they could achieve mass acceptance.[27]

1996 saw the fifth generation consoles' fortunes finally turn around. With the Saturn, PlayStation, and Nintendo 64 all showing dramatic increases in sales over the previous year, they claimed a combined 40% of the retail market for hardware and software, putting them in position to finally overtake the fourth generation consoles in 1997.[28]

The Sega Saturn suffered from poor marketing and comparatively limited third-party support outside Japan.[3] Sega's decision to use dual processors was roundly criticized, as this made it difficult to efficiently develop for the console.[29] Sega was also hurt by the Saturn's surprise four-month-early U.S. launch; third-party developers, who had been planning for the originally scheduled launch, could not provide launch titles and were angered by the move. Retailers were caught unprepared, resulting in distribution problems; some retailers, such as the now defunct KB Toys, were so furious that they refused to stock the Saturn thereafter.[30]

Due to numerous delays, the Nintendo 64 was released one year later than its competitors. By the time it was finally launched in 1996, the PlayStation had already established its dominance, the Saturn was starting to struggle, and the 3DO and Jaguar had been discontinued. Its use of cartridge media rather than compact discs alienated some developers and publishers due to the space limits, the relatively high cost involved, and a considerably longer production time. In addition, the initially high suggested retail price of the console may have driven potential customers away, and some early adopters of the system who had paid the initial price may have been angered by Nintendo's decision to cut the price of the system by $50 six months after its release.[31] However, the Nintendo 64 turned out to be a commercial success, particularly in the United States, where it sold 20.63 million units, nearly two thirds of its worldwide sales of 32.93 million units. It was also home to highly successful games such as *Star Fox 64*, *Mario Kart 64*, *The Legend of Zelda: Ocarina of Time*, *The Legend of Zelda: Majora's Mask*, *Super Mario 64*, *GoldenEye 007*, *Banjo-Kazooie*, and *Super Smash Bros.* While Nintendo 64 sold far more units than the Sega Saturn, Atari Jaguar, and 3DO combined, it posed no challenge to the PlayStation's lead in the market.

By 1997, 40% to 60% of American homes played on video game consoles. 30% to 40% of these homes owned a console, while an additional 10% to 20% rented or shared a console.[32]

Changes in the industry

After the fifth generation console wars came to a stop, several companies saw their outlooks change drastically.

Atari

Atari Corporation, which was not able to recover its losses, ended up merging into JTS Corporation in 1996.[33][34] This caused the Atari name to virtually disappear from the gaming market until 1998, when Hasbro Interactive purchased the Atari assets from JTS for $5 million.[35]

On May 14, 1999, Hasbro Interactive announced that all rights to the Atari Jaguar were released into the public domain,[36] thus declaring the platform open; this allowed anyone to freely create and publish games for the Jaguar without endorsement or licensing from Hasbro Interactive. Since then, homebrew developers began to release uncompleted Jaguar games as well as several brand new titles to satisfy the system's cult following.[37]

Sega

Sega's loss of consumer confidence (coupled with its previous console failures), along with their financial difficulties, set the company up for a similar fate in the next round of console wars.

Home systems

Comparison

Comparison of fifth-generation video game home consoles

Name		3DO Interactive Multiplayer	Sega Saturn	PlayStation	Nintendo 64
Manufacturer		Panasonic, Sanyo, GoldStar, Creative	Sega	Sony	Nintendo
Developer		The 3DO Company		SCE	
Image(s)					
		Top: Panasonic FZ-1 R·E·A·L **Bottom:** GoldStar GDO-101M	**Top:** North American Saturn Model 1 and controller **Bottom:** Japanese Saturn Model 1 and updated controller	**Top:** Original PlayStation with DualShock controller **Bottom:** Revised PSOne with DualShock controller	**Top:** Nintendo 64 with controller and game cartridge **Bottom:** Nintendo 64 with 64DD peripheral attached
Release date		NA: October 4, 1993 JP: March 20, 1994 EU: June 11, 1994	JP: November 22, 1994 NA: May 11, 1995 EU/AU: July 8, 1995	JP: December 3, 1994 NA: September 9, 1995 EU: September 29, 1995 AU: November 15, 1995	JP: June 23, 1996 NA: September 29, 1996 EU: March 1, 1997 AU: March 1, 1997
Launch price	US$	US$699.99 (equivalent to $1,560 in 2025)	US$399.99 (equivalent to $850 in 2025)	US$299.99 (equivalent to $630 in 2025)[38]	US$199.99 (equivalent to $410 in 2025)
	GBP		£399.99[39] (equivalent to £820 in 2025)	£299[40](equivalent to £610 in 2025)	£249.99[41](equivalent to £490 in 2025
	A$				
	JP¥		¥44,800 (equivalent to ¥50,640 in 2024)	¥39,800 (equivalent to ¥44,990 in 2024)	
Media	Type	CD-ROM	CD-ROM Cartridge (limited, Japan and Europe only)	CD-ROM	Game Pak cartridge Proprietary magnetic disk (via 64DD)
	Regional lockout	Unrestricted	Region locked	Region locked	Region locked
Best-selling game		*Gex*, 1+ million[42][43]	*Virtua Fighter 2*, 1.7 million[44]	*Gran Turismo*, 10.85 million[45][46]	*Super Mario 64*, 11.62 million[47][48]
CPU		ARM60 (32-bit RISC) @ 12.5 MHz (8.75 MIPS[49])	▪ 2× Hitachi SH-2 7604 (32-bit RISC) @ 28.63 MHz) ▪ Hitachi SH-1 (32-bit RISC) @ 20 MHz (12.5 MIPS)[50] ▪ Motorola 68EC000 (16/32-bit CISC) @ 11.3 MHz[51] (1.9775 MIPS[52]) ▪ SCU (32-bit Saturn Control Unit)[53]	▪ LSI LR333x0 (labelled as the Sony CXD8530CQ on the package) (based on the MIPS R3051 core) @ 33.8688 MHz (30 MIPS[54]) ▪ System control coprocessor (inside CPU)	NEC VR4300 (64-bit RISC) @ 93.75 MHz (125 MIPS)[55][56] ▪ 32-bit data coprocessor (64DD)

GPU	▪ 2× accelerated video co-processors ▪ Math co-processor (inside CPU)	▪ Sega VDP1 (32-bit video display processor) @ 28.63 MHz (sprites, textures, polygons)[57] ▪ Sega VDP2 (32-bit video display processor) @ 28.63 MHz (backgrounds, scrolling)[58] ▪ SCU DSP (inside SCU (32-bit Saturn Control Unit))[53]	▪ Sony GPU[59] ▪ Vector math unit (in main CPU) @ 66 MIPS	Reality Co-Processor (64-bit MIPS R4000 based, 128-bit vector register processor) @ 62.5 MHz
Sound chip(s)	13 channel unnamed custom 20-bit DSP embedded in the CLIO chip[60]	▪ Yamaha YMF292 SCSP[61] ▪ Yamaha FH1 DSP (inside Yamaha YMF292 SCSP[61] 24-bit, 128-step,[53] 4 parallel instructions)	Sony SPU (sound processing unit)	Reality Signal Processor (DSP)
Memory	3 MB RAM ▪ 2 MB DRAM ▪ 1 MB VRAM	4.5 MB RAM ▪ 2 MB SDRAM ▪ 1.5 MB VRAM (512 KB sprite/texture cache, 512 KB frame buffers, 512 KB backgrounds) ▪ 1 MB DRAM (512 KB sound, 512 KB CD-ROM sub-system buffer data cache)	3587 KB RAM ▪ 2 MB DRAM ▪ 1026 KB VRAM (1 MB frame buffer, 2 KB texture cache, 64 bytes FIFO buffer) ▪ 512 KB sound RAM ▪ 1 KB non-associative SRAM data cache	4 MB RDRAM (8 MB with Expansion Pak)
Video	▪ Resolution: 320×240 to 384×288 (progressive), 320×480 to 768×576 (interlaced) ▪ Colors: 110,592 (384×288) on screen, out of 16,777,216 (24-bit) palette ▪ Polygons: 20,000/sec,[62] flat shading, Gouraud shading ▪ Sprites/textures: Scaling, rotation, texture mapping ▪ Background: 1 bitmap plane	▪ Resolution: 320×224 to 720×240 (progressive), 320×448 to 720×576 (interlaced)[63] ▪ Colors: 172,800 (720×240) on screen, out of 16,777,216 (24-bit) palette ▪ Polygons: 140,000/sec (textured, lighting, Gouraud shading)[64] to 500,000/sec (flat shading)[65] ▪ Sprites/textures: 16,384/frame (32 bytes each, 512 KB memory), scaling, rotation, distortion, texture mapping[57] ▪ Backgrounds: 7[63] (3–6 tilemap planes, 1–4 bitmap planes), parallax scrolling, scaling, rotation[58]	▪ Resolution: 256×224 to 640×240 (progressive), 256×448 to 640×480 (interlaced) ▪ Colors: 153,600 (640×240) on screen, out of 16,777,216 (24-bit) palette ▪ Polygons: 90,000/sec (textured, lighting, Gouraud shading)[66] to 360,000/sec[67] (flat shading) ▪ Sprites/textures: 4,000/frame[68] (bitmap objects[59]), scaling, rotation, texture mapping ▪ Background: 1 bitmap plane	▪ Resolution: 320×240 to 720×288 (progressive), 320×480 to 720×576 (interlaced) ▪ Colors: 207,360 (720×288) on screen, out of 16,777,216 (24-bit) palette ▪ Polygons: 150,000/sec (textured, lighting, Gouraud shading) to 600,000/sec (flat shading), anti-aliasing, Z-buffering ▪ Sprites/textures: Scaling, rotation, texture mapping, mipmapping, texture filtering, bilinear filtering, trilinear filtering[69] ▪ Background: 1 bitmap plane
Audio	Stereo audio, with: ▪ 16-bit sound ▪ Optional Dolby Surround support ▪ Streaming CD-DA audio (16-bit PCM, 44.1 kHz sampling rate)	Stereo audio, with:[61] ▪ 32 sound channels on SCSP ▪ FM synthesis on all 32 SCSP channels ▪ 16-bit PCM audio with 44.1 kHz sampling rate on all 32 SCSP channels ▪ 1 streaming CD-DA channel (16-bit PCM, 44.1 kHz)	Stereo audio, with: ▪ 24 ADPCM channels on SPU ▪ 16-bit audio and 44.1 kHz sampling rate on all 24 ADPCM channels ▪ 1 streaming CD-DA channel (16-bit PCM, 44.1 kHz) ▪ Optional Dolby Surround support	Stereo audio, with: ▪ Variable number of channels (up to 100 if all system resources are devoted to audio) ▪ Capable of playing back different types of audio (including PCM, MP3, MIDI and tracker music) ▪ 16-bit audio and 44.1 kHz sampling rate on all channels ▪ Optional Dolby Surround support
Accessories (retail)	▪ MPEG cards ▪ FZ-EM256 save memory backup unit ▪ Gamegun	▪ Arcade Stick ▪ Saturn digital gamepad ▪ 3D controller	▪ PlayStation Multitap (up to 8 players) ▪ Fishing reel controllers (*Bass Landing* and *Reel*	▪ Controller Pak ▪ Memory Expansion Pak ▪ Rumble Pak

	▪ Mouse	▪ Light guns ▪ Multitap (up to 12 players) ▪ Keyboard ▪ Sega NetLink (online modem and keyboard) ▪ Mouse ▪ 1.44 MB 3.5" floppy disk drive ▪ DirectLink (LAN) ▪ Memory card ▪ MPEG cards ▪ RAM expansion cartridges	*Fishing*) ▪ Dual Analog Controller ▪ DualShock ▪ GunCon ▪ Jogcon ▪ Konami Justifier ▪ NeGcon ▪ PocketStation (Japan only) ▪ PlayStation Mouse ▪ Analog Joystick ▪ Dance pad ▪ LCD screen (for PSone systems only) ▪ Memory card ▪ Link Cable	▪ Transfer Pak ▪ Nintendo 64DD (Japan only) ▪ Nintendo 64 Mouse (Japan only) ▪ Voice Recognition Unit
Online services	None	NA: NetLink 28.8k modem JP: SegaNet 14.4k modem	US: Lightspan Online Connection CD JP: i-mode Mobile Phone Connection Cable	US: SharkWire Online 14.4k modem (unofficial) JP: Randnet (64DD only)

Other consoles

These consoles are either less notable, never saw a worldwide release, and/or sold particularly poorly, and are therefore listed as 'Other'.

Name		Atari Jaguar	32X	PC-FX	Virtual Boy
Manufacturer		IBM	Sega	Hudson Soft	Nintendo
Developer		Atari		NEC	
Image(s)					
		Top: Atari Jaguar and controller **Bottom:** Atari Jaguar CD connected to the console and ProController	32X connected to a model 2 Genesis with Sega CD and controller	PC-FX and controller	Virtual Boy with controller
Release date		NA: November 23, 1993 EU: June 27, 1994 AU: August 1, 1994 JP: December 8, 1994	NA: November 21, 1994 EU: November 1994 JP: December 3, 1994	JP: December 23, 1994	JP: July 21, 1995 NA: August 14, 1995
Launch price	US$	US$249.99 (equivalent to $560 in 2025)	US$159.99 (equivalent to $350 in 2025)		US$179.95 (equivalent to $370 in 2025)
	GBP				
	A$		A$700 (equivalent to $1,460 in 2022)		
	JP¥		¥29.800 (equivalent to ¥30 in 2024)	¥49,800 (equivalent to ¥56,690 in 2024)	
Media	Type	ROM cartridge CD-ROM (via Jaguar CD add-on)	ROM cartridge CD-ROM (via Sega CD add-on)	CD-ROM	ROM cartridge
	Regional lockout	Unrestricted	Partial	None	Unrestricted
Best-selling game		*Alien vs Predator*, more than 50,000[70]	*Doom*	—	*Mario's Tennis* (US pack-in game)
CPU		▪ "Tom" (32-bit RISC) @ 26.59 MHz[71] ▪ "Jerry" (32-bit RISC) @ 26.59 MHz[71] ▪ Motorola 68000 (16/32-bit CISC) @ 13.3 MHz (2.3275 MIPS[52])	2× SH-2 32-bit RISC (23 MHz)	NEC V810 @ 21.475 MHz	NEC V810 @ 20 MHz
GPU		▪ Tom chip: GPU, object processor, blitter ▪ Jerry chip: DSP	▪ Sega 32x VDP (Sega Custom LSI) @ 23 MHz ▪ Yamaha YM7101 VDP (Video Display Processor) Sega CD Add-on: ▪ Sega ASIC coprocessor	▪ HuC6270 ▪ HuC6271	Video Image Processor
Sound chip(s)		"Jerry" chip: DSP, 2× DAC (converts digital data to analog signals)	▪ Pulse-code modulation ▪ Yamaha YM2612 ▪ Yamaha VDP PSG (SN76496) Sega CD Add-on: ▪ Ricoh RF5c164	Hudson Soft HuC6230 SoundBox	VSU (Virtual Sound Unit) chip

Memory	2 MB FPM DRAM (4× 512 KB chips)	256 KB RAM ▪ 256 KB VRAM ▪ 64 KB main PSRAM ▪ 64 KB video DRAM ▪ 8 KB audio SRAM Sega CD Add-on: ▪ 512 KB RAM ▪ 256 KB VRAM ▪ 64 KB ARAM ▪ 16 KB cache ▪ 8 KB Internal Back-up	2 MB	64 KB work PSRAM 128 KB graphics DRAM 128 KB VRAM
Video	▪ Resolution: 320×220 to 360×220 (progressive), 320×440 to 720×440 (interlaced)[71] ▪ Colors: 79,200 (360×220) on screen, out of 16,777,216 (24-bit) palette ▪ Polygons: 10,000/sec,[72] flat shading, Gouraud shading support ▪ Sprites/textures: 1,000/frame[73] (blitter objects),[71] scaling, rotation, texture mapping ▪ Background: 1 bitmap plane	▪ Resolution: 320×224 ▪ Colors: 32,768 (15-bit high color), 256–32,768 colors on screen, ▪ Polygons: 40,000 Texture Gouraud Shading polygons/sec, 50,000 texture mapping polygons/sec, 100,000 Gouraud Shading polygons/sec, 160,000 flat shading polygons/sec ▪ Sprites: 80 on screen, 20 per scanline, 8×8 to 32×32 sizes, 16 colors per sprite, integer sprite zoom, sprite flipping ▪ Tilemaps: 2 parallax scrolling planes with line & row scroll effects and tile flipping	▪ Resolution: 256x240 to 341x240 ▪ Colors: 16.77 on screen ▪ Sprites: 128 on screen, 32 per scanline, scaling, rotation, texture mapping, Motion JPEG compression @ 30fps ▪ Tilemaps: 9 parallax scrolling planes with texture mapping	▪ Stereoscopic LED display ▪ Resolution: 384×224 ▪ Sprites: 8×8
Audio	Stereo audio, with: ▪ Number of channels dependent on software ▪ Synthesis (wavetable synthesis, AM synthesis) ▪ 16-bit PCM sampling	Stereo audio with: ▪ 10-bit PWM, surround sound ▪ 6 FM synthesis channels/voices ▪ 3 square wave channels/voices ▪ Sine wave LFO ▪ 1 PCM channel, 8-bit samples, 8 to 22 kHz sampling rate Sega CD Add-on: ▪ 8 PCM channels (16-bit, 32 kHz) ▪ 1 streaming CD-DA channel (16-bit, 44.1 kHz)	16-Bit stereo audio with: ▪ two ADPCM Channels ▪ six 5-Bit sample Channels	Virtual Sound Unit with: ▪ Five wave channels ▪ One noise channel ▪ 32 PCM samples
Accessories (retail)	▪ Jaguar TeamTap ▪ Jaguar Pro Controller ▪ Jaguar MemoryTrack Cartridge ▪ Jaguar JagLink Interface	Megadrive peripherals supported	▪ FX BMP ▪ PC-FX Mouse ▪ PC-FX SCSI Adapter	▪ Virtual Boy AC Adapter ▪ Virtual Boy Stereo Headphones
Online services	Jaguar Voice/Data Communicator 19.2k modem (no mass production)	JP: Sega Meganet US: Sega Channel	None	None

FM Towns Marty, created by Fujitsu. Released on February 20, 1993.

Amiga CD32, created by Commodore. Released on September 17, 1993.

Playdia, created by Bandai. A console consisting of simple multiple choice games. Released in Japan on September 23, 1994.

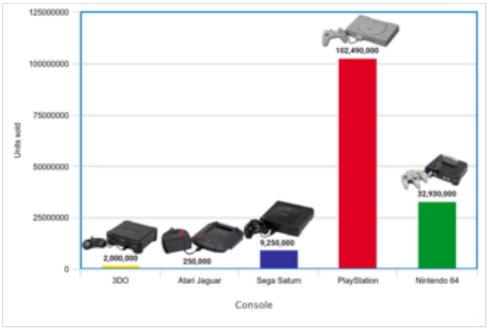
Casio Loopy, created by Casio. Released in October 1995 in Japan, targeted at female gamers.

Apple Bandai Pippin, created by Apple and Bandai. Released in 1996.

iQue Player, manufactured by iQue, a size-reduced Nintendo 64. Released in November 2003 only in China.

Worldwide sales standings

System	Units sold
PlayStation	102.49 million shipped (74.34 million PlayStation, 28.15 million PSone) (as of March 31, 2005)[74]
Nintendo 64	32.93 million (as of March 31, 2005)[75]
Sega Saturn	9.26 million[76][77]
3DO	2 million
32X	800,000[78]
Virtual Boy	770,000
PC-FX	400,000
Atari Jaguar	250,000 (as of May 15, 2007)[79]
Amiga CD32	100,000
FM Towns Marty	45,000 (as of December 31, 1993)[80]
Apple Bandai Pippin	42,000 (as of May 4, 2007)[81]



Bar chart showing the sales of the main 5th generation consoles

From 1996 to 1999 (when the PlayStation, N64 and Saturn were the major 5th-generation consoles still on the market) Sony managed a 47% market share of the worldwide market, followed by Nintendo with 28% (with a percentage of that figure from the 16-bit Super NES), while Sega was third with 23% (with a percentage of that from the Dreamcast).[82]

Production of the Sega Saturn was discontinued in 1998. Its demise was accelerated by rumors that work on its successor was underway; these rumors hurt the systems' sales in the west as early as 1997. The N64 was succeeded by the GameCube in 2001, but continued its production until 2004; however, PlayStation production was not ceased as it was redesigned as the PSone, further extending the life of the console around the release of the follow-up PlayStation 2. The PlayStation console production was discontinued in 2006, the same year that the PlayStation 3 was released in Japan and North America.

Handheld systems

Handheld comparison

Name		Genesis Nomad	Game Boy Color	Neo Geo Pocket	Neo Geo Pocket Color
Manufacturer		Sega	Nintendo	SNK	
Console					
Release dates		NA: October 1995	JP: October 21, 1998 NA: November 18, 1998 EU: November 23, 1998 AU: November 27, 1998	JP: October 28, 1998	JP: March 16, 1999 NA: August 6, 1999 EU: October 1, 1999
Launch price	US$	US$180 (equivalent to $380 in 2025)	US$79.95 (equivalent to $160 in 2025)		US$69.95 (equivalent to $140 in 2025)
	GBP			£59.99 (equivalent to £120 in 2025)	
	A$				
	JP¥			¥7,800 (equivalent to ¥8,600 in 2024)	
Discontinued		NA: 1999	WW: March 23, 2003	JP: 1999	NA: June 13, 2000 EU: June 13, 2000 JP: October 22, 2001
Media	Type	ROM cartridge	Game Boy Game Pak Game Boy Color Game Pak	ROM cartridge	
	Regional lockout	Region locked	Unrestricted	Unrestricted	Unrestricted
	Backward compatibility	Sega Genesis	Game Boy	—	Neo Geo Pocket
Best-selling game		*Sonic the Hedgehog*, 15 million[note 2]	*Pokémon Gold* and *Silver*, 23 million	Unknown	
CPU		Motorola 68000 @ 7.6 MHz	Sharp SM83 @ 4.2 / 8.4 MHz	Toshiba TLCS900H @ 6 MHz	
Memory		64 KB RAM 64 KB video RAM 8 KB audio RAM 20 KB ROM	32 KB RAM 16 KB video RAM 2 KB ROM 127 B High RAM	12 KB RAM 4 KB audio RAM 64 KB ROM	
Display	Type	3.25-inch backlit liquid-crystal display (LCD)	2.3-inch (diagonal) TFT LCD	2.6-inch (diagonal) LCD	2.6-inch TFT LCD
	Color	64 to 75 on screen, 512 color palette	32,768, up to 56 simultaneously	Monochromatic	4,096, up to 146 simultaneously
Audio		Yamaha YM2612 sound chip	Nintendo Audio Processing Unit generating: ▪ Two square wave channels ▪ One waveform channel ▪ One noise channel	Zilog Z80 @ 3 MHz controlling SN76489 sound chip generating: ▪ Three square wave channels ▪ One noise channel ▪ Dual 8-bit DACs	
Resolutions		384 × 224	160 × 144	160 × 152	
Battery life		4 hours	Up to 10 hours	40 hours	
Units sold		1 million	118.69 million (including Game Boy)		2 million

Other handhelds

PasoGo by Koei, a console with a library dedicated to the game of Go. Released in Japan in 1996.

Game.com. Released in 1997.

PocketStation. Released in 1999 in Japan only.

Milestone titles

- *Castlevania: Symphony of the Night* (PlayStation, Saturn) by Konami Computer Entertainment Tokyo and Konami is considered one of the best PlayStation games, and a strong argument for the relevance of 2D games in an increasingly 3D market. The game is also credited with starting the Metroidvania genre, along with *Super Metroid*.[83][84][85]
- *Crash Bandicoot* (PlayStation) by Naughty Dog and Sony Computer Entertainment (SCE) would go on to become Sony's *de facto* mascot along with Nintendo's Mario and Sega's Sonic the Hedgehog. The game featured a marsupial bandicoot named Crash and would prove to be one of the PlayStation's most successful titles.[86][87]
- *Dragon Warrior VII* (PlayStation) by Heartbeat, ArtePiazza, and Enix was the number one best-selling title on the PlayStation in Japan, released in 2000.[88] The game was the first main installment of Japan's national RPG series released in 5 years.
- *Final Fantasy VII* (PlayStation, PC) by Square Product Development Division 1 and Square is one of the PlayStation's most acclaimed and popular titles, selling around 10 million copies worldwide.[89] It was the first game in the *Final Fantasy* series to make use of full motion videos (FMVs) and is credited with allowing console role-playing games to gain mass-market appeal outside of Japan.[90] *Final Fantasy* became one of the biggest franchises in video gaming, with *Final Fantasy VII* in particular having several spin-offs known as *Compilation of Final Fantasy VII*.
- *GoldenEye 007* (Nintendo 64) by Rare and Nintendo is a critically acclaimed game that helped make the first-person shooter a potential popular genre on consoles. The game has subsequently become credited alongside Shiny Entertainment's *MDK* for pioneering and popularising the now-standard inclusion of scoped sniper rifles in video games.[91]
- *The Legend of Zelda: Ocarina of Time* (Nintendo 64) by Nintendo EAD and Nintendo is one of the most critically acclaimed games of all time and often listed as one of the greatest video games of all time.[85][92][93][94][95][96][97]
- *Nights into Dreams* (Saturn) by Sonic Team and Sega was bundled with the Saturn's analog controller, which was almost essential to the gameplay. With its innovative gameplay and graphics, *Nights*, an exclusive title, aided in the selling of a number of Saturns.[98]
- *Panzer Dragoon Saga* (Saturn) by Team Andromeda and Sega is the highest-rated Saturn title on Game Rankings with a score of 92.87%,[99] and has been cited as one of the greatest games ever made.[85][100][101]
- *Pokémon Red* and *Blue* (Game Boy) by Game Freak and Nintendo was a critical and financial success when the games debuted on the Game Boy and putting another Nintendo franchise on the map. By the end of this console generation, the games sold about 31 million units worldwide.[102][103][104][105]
- *Pokémon Gold* and *Silver* (Game Boy Color) also developed by Game Freak and Nintendo garnered critical acclaim from various gaming critics, are considered by many to be the best games in the Pokémon franchise.[106]
- *Quake* (PC, Saturn, Nintendo 64) by id Software built upon the technology and gameplay of its predecessor *Doom*,[107] and its engine offered full real-time 3D rendering and had early support for 3D acceleration through OpenGL, in addition to various multiplayer option compared to its predecessor. The game was critically acclaimed upon release and is considered one of the best video games of all time.[108][109][110]
- *Rayman* (Jaguar, PlayStation, Saturn, PC) by Ubisoft was highly praised for its animated 2D graphics, atmosphere, soundtrack, and high difficulty, and was the number one best-selling title on the PlayStation in the UK, released in 1995.[111] The game has since spawned over 45 additional entries in the series.
- *Resident Evil* (PlayStation, Saturn) by Capcom received critical acclaim and is credited for popularizing the survival horror genre.[112]
- *Sega Rally Championship* (Arcade, Saturn, PC) by Sega AM5 and Sega was the first rally racing game.[113] It broke new ground by incorporating different surfaces with different friction properties,[114][115] and has been cited as one of the greatest racing games ever made.[114][116]
- *Star Fox 64* (Nintendo 64) by Nintendo EAD and Nintendo is the first Nintendo 64 game to use the Nintendo 64 Rumble Pak, which was bundled with the game. It was a success and sold 3 million copies worldwide.[117]

- *Super Mario 64* (Nintendo 64) by Nintendo Entertainment Analysis & Development (Nintendo EAD) and Nintendo is considered to be one of the greatest games of all time, particularly for its use of a dynamic camera system, the implementation of its 360-degree analog control, and open world design.[118] *Super Mario 64* is one of the best selling home console games of the era, selling 11.62 million copies worldwide.[119]
- *Tekken 3* (arcade, PlayStation) by Namco is considered not only to be the greatest installment of the *Tekken* series, but remains as one of the greatest fighting games of all time according to PlayStation Magazine.[120] It has a Metacritic score of 96, and is the 12th highest rated game ever according to GameRankings.[121] Its predecessor achieved similar feats until its succession,[122] and the first game in the franchise was the first PlayStation game to sell over a million units.[123]
- *Tomb Raider* (PlayStation, Saturn, PC) by Core Design and Eidos Interactive popularized many elements seen in later video games and spawned several very successful sequels.[124][125] The main character, Lara Croft, was named the most recognizable female video game character by Guinness World Records.[126]
- *Tony Hawk's Pro Skater 2* (Nintendo 64, PlayStation, PC) by Neversoft and Activision garnered widespread critical acclaim and has been cited as one of the greatest games ever made.[85]
- *Virtua Cop* (Arcade, Saturn, PC) by Sega AM2 and Sega introduced the use of 3D polygons to the light-gun shooter genre,[127] paving the way for future light gun shooters like Namco's *Time Crisis* and Sega's *The House of the Dead*, and was a major influence on *GoldenEye 007*.[128]
- *Virtua Fighter* (Arcade, Saturn, PC) by Sega AM2 and Sega created the 3D fighting game genre.[129] The console port, which was nearly identical to the arcade game, sold at a nearly 1:1 ratio with the Saturn hardware at launch.[130] The original arcade version also had a major influence on the PlayStation becoming a 3D-focused console.[131]
- *Virtua Fighter 2* (Arcade, Saturn, PC) by Sega AM2 and Sega was heralded at the time as "the ultimate arcade translation" and "the best fighting game ever".[132] The title remains the highest selling Saturn game in Japan with 1.7 million copies.[133]
- *Wipeout* (PlayStation, PC, Saturn) by Psygnosis received critical and financial success for its futuristic setting, weapons designed to both stall and destroy opponents and its marketing campaign designed by Keith Hopwood and The Designers Republic, in addition to unique licensed music from established electronica acts for PAL versions. The game has been described as being synonymous with Sony's debut gaming hardware and as an early showcase for 3D graphics in console gaming.[134]

See also

- 1990s in video games

Notes

1. The fifth generation of video game consoles began when Panasonic released the 3DO Interactive Multiplayer on October 4, 1993, in the American market.[1] Then the fifth generation of video game console ended when the last console of the generation, the Sony PlayStation, was discontinued on March 23, 2006.[2]
2. Shared with Sega Genesis

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Sixth generation of video game consoles

In the history of video games, the **sixth generation era** (in rare occasions called the **128-bit era**; see "bits and system power" below) is the era of computer and video games, video game consoles, and handheld gaming devices available at the turn of the 21st century, starting on November 27, 1998. Platforms in the sixth generation include consoles from four companies: Sega's Dreamcast (DC), Sony's PlayStation 2 (PS2), the Nintendo GameCube (GC), and Microsoft's Xbox. This era began on November 27, 1998, with the Japanese release of the Dreamcast, which was joined by the PlayStation 2 on March 4, 2000, the GameCube on September 14, 2001, and the Xbox on November 15, 2001, respectively. The Dreamcast was among the first to be discontinued in 2001, followed by GameCube in 2007, Xbox in 2009, and PlayStation 2 in 2013. Meanwhile, the seventh generation of consoles started on November 22, 2005, with the launch of the Xbox 360.[1]

The major innovation of this generation was of full utilization of the internet to allow a fully online gaming experience. While the prior generation had some systems with internet connectivity, such as the Apple Pippin, these had little market penetration and thus had limited success in the area. Services such as Microsoft's Xbox Live became industry standard in this, and future, generations. Other innovations of the Xbox was its being the first system with an internal ethernet port and the first to utilize an internal hard disk drive to store game data. This led to many improvements to the gaming experience, including the ability to store program data (rather than just save game data) that allowed for faster load times, as well as the ability to download games directly from the internet rather than to purchase physical media such as a disk or cartridge. Soon after its release other systems, like the Sony PlayStation 2, produced peripheral storage devices to allow similar capabilities, and by the next generation internal storage became industry standard.

Bit ratings (i.e. "64-bit" or "32-bit" for the previous generation) for most consoles largely fell by the wayside during this era, with the notable exceptions being promotions for the Dreamcast[2] and PS2[3] that advertised "128-bit graphics" at the start of the generation. The number of "bits" cited in this way in console names refers to the CPU word size, and had been used by hardware marketing departments as a "show of power" for many years. However, there is little to be gained from increasing the word size much beyond 32 or 64 bits because, once this level is reached, performance depends on more varied factors, such as processor clock speed, bandwidth, and memory size.

The **sixth generation of handhelds** began with the release of Bandai's WonderSwan, launched in Japan in 1999. Nintendo maintained its dominant share of the handheld market with the release in 2001 of the Game Boy Advance, which featured many upgrades and new features over the Game Boy. The Game Boy Advance was discontinued in early 2010. The next generation of handheld consoles began in November 2004, with the North American introduction of the Nintendo DS.

The last official Dreamcast games were released in 2002 (North America and Europe) and 2007 (Japan). The last GameCube games were released in 2006 (Japan) and 2007 (North America and Europe). The last Xbox games were released in 2006 (Japan), 2007 (Europe) and 2008 (North America). The last PlayStation 2 games were released in 2013; The last game released in Japan was *Final Fantasy XI: Seekers of Adoulin* in March, the last game released in North America was *FIFA 14* in September, and last game released in Europe was *Pro Evolution Soccer 2014* in November, marking the end of this generation.[4][5]

Home systems

The PlayStation 2[6][7][8] achieved sales dominance in this generation, becoming the best-selling console in history,[9] with over 160 million units sold as of November 2024.[10] The Microsoft Xbox had sold over 24 million units as of May 2006,[11][12] and the GameCube had sold 22 million units as of September 2010.[13] The Dreamcast, which arrived prior to all of the others and was discontinued in 2001, came in fourth with 9.13 million sold.[14]

The PlayStation 2 was the best-selling system of the sixth generation, selling over 160 million units, also making it the best-selling console of all time.

The sixth generation began to end when the Xbox was succeeded by the Xbox 360 in late 2005. GameCube hardware was still being produced when the Wii was released in late 2006, but as of June 2008 had also been ceased. PlayStation 2 sales continued to be strong through to the end of 2010,[15] due to the system's large software library, continuing software support, and affordable price.[16]

In February 2008, the PlayStation 2 outsold both the PlayStation 3 and Xbox 360 in the United States.[17][18] Games were still being produced for the PlayStation 2, Xbox, and GameCube as of 2008, while Dreamcast games were officially discontinued in 2003. There were still a few games being produced for the Dreamcast in 2004, but they are essentially NAOMI arcade ports released only in Japan, with small print runs. The PlayStation 2 was still being produced after the launch of the Wii U in 2012, making the sixth generation the second longest generation of all time.

Dreamcast

Sega's Dreamcast was the first console of the generation[19] and had several features to show an advantage from the competition, including Internet gaming as an optional feature through its built-in modem, and a web browser.

The console is credited with restoring Sega's reputation,[20] which had been damaged by the earlier failures of the Sega Saturn, Sega 32X, Genesis Nomad and Sega CD.[21] Despite this, the Dreamcast was discontinued prematurely due to numerous factors. The impending and much-hyped PlayStation 2 slowed Dreamcast sales, mostly due to the fact that the PlayStation 2 had a built-in DVD player and a huge number of PS1 owners looking to upgrade to the new, backward compatible console.[22] In addition, Sega's short-lived support/success of its post-Mega Drive products the Mega-CD, 32X and Saturn had left developers and customers skeptical, with some holding out to see whether the Dreamcast or PlayStation 2 would come out on top.[23]

Sega's decision to implement a GD-ROM (though publicly advertised as a CD-ROM) for storage medium did save costs but it did not compare well against the PS2's much-touted DVD capabilities. Sega was either unable or unwilling to spend the advertising money necessary to compete with Sony, who themselves took massive losses on the PlayStation 2 to gain market share. With the announcements of the Xbox and GameCube in late 2000, Sega's console was considered by some to be outdated only two years after its release. The previous losses from the Saturn, 32X, and Sega/Mega-CD,

stagnation of sales due to the PlayStation 2, and impending competition from Microsoft and Nintendo caused Sega's revenue to shrink and announce their intention on killing the system in early 2001,[24] dropping the system entirely and leaving the console market in early 2004 in Japan and much earlier in other countries. Sega also announced it would shut down SegaNet, an online gaming community that supported online-capable Dreamcast titles. Due to user outcry over the decision, Sega delayed the service's closure by an additional 6 months.[24] Since the Dreamcast's discontinuation, Sega transitioned to software developing making games as a third-party company.

PlayStation 2

The brand Sony had established with the original PlayStation was a major factor in the PlayStation 2's dominance, both in terms of securing a consumer base and attracting third-party developers, with the gradual increase in one reinforcing the other. The PlayStation 2 was also able to play DVDs and was backward compatible with PlayStation games, which many say helped the former's sales.[25] Sony Computer Entertainment secured licensing for key games such as *Final Fantasy X*, *Grand Theft Auto III*, and *Metal Gear Solid 2: Sons of Liberty*, enabling the PS2 to outperform its competitors' launches. The console ended up becoming the top-selling console of this generation, while its competing consoles, the Xbox and the GameCube, went on to be modestly successful consoles.[26][27]

GameCube

Nintendo struggled with conflicting brand images, particularly the family-friendly one developed during the 1990s. Its arsenal of franchises and history in the industry, though earning it a loyal fan base, failed to give it an advantage against the Xbox and PlayStation 2 which captured audiences seeking 'Mature' titles of which Nintendo had fewer. Nintendo also made little headway into online gaming (releasing a small handful of online-capable games, the most popular of which was *Phantasy Star Online Episode I and II*, which was an enhanced port of the Dreamcast game with various new features and content), instead emphasizing Game Boy Advance connectivity. As a result, the GameCube failed to match the sales of its predecessor, the Nintendo 64, but the console wasn't a financial failure. Nintendo did however rejuvenate its relationship with many developers,[28] often working in close collaboration with them to produce games based upon its franchises, in contrast to the past where it was frequently seen as bullying developers in the late 1980s, back when the Nintendo Entertainment System was out on the market. As a result, the GameCube had more first and second party releases than its competitors,[28] whose most successful titles were mainly products of third-party developers.[28]

Xbox

Although the Xbox had the formidable financial backing of Microsoft, it was unable to significantly threaten the dominance of the PlayStation 2 as market leader.[29] However, the Xbox attracted a large fanbase and strong third-party support in the United States and Europe and became a recognizable brand amongst the mainstream. The Xbox Live online service with its centralized model proved particularly successful, prompting Sony to boost the online capabilities of the PlayStation 2. Xbox Live also gave the Xbox an edge over the GameCube, which had a near-total lack of online games. The flagship of Xbox Live was the game *Halo 2*, which was the best-selling Xbox game with over 8 million copies sold worldwide.[30][31] However, the Xbox failed to gain a following in Japan, with reasons cited including lack of brand recognition, lack of commitment to the console from Japanese publishers and developers, failure of Microsoft staff to fully understand important cultural differences, and ethnocentric preferences of the Japanese public for native products.[32][33]

Comparison

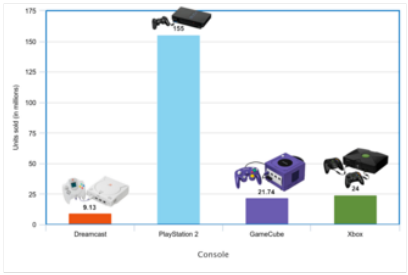
Comparison of sixth-generation video game home consoles[7]

Name		Dreamcast	PlayStation 2	GameCube	Xbox
Logo		Dreamcast	PlayStation 2	NINTENDO GAMECUBE	XBOX
Manufacturer		Sega	Sony (SCE)	Nintendo	Microsoft
Image(s)					
		Dreamcast and controller with VMU	**Left:** Original PlayStation 2 **Right:** Slimline PlayStation 2 with DualShock 2 controller	GameCube and controller	Xbox and controllers
Release date		JP: November 27, 1998 NA: September 9, 1999 EU: September 23, 1999 AU: October 14, 1999	JP: March 4, 2000 NA: October 26, 2000 EU: November 24, 2000 AU: November 30, 2000	JP: September 14, 2001 NA: November 18, 2001 EU: May 3, 2002 AU: May 17, 2002	NA: November 15, 2001 JP: February 22, 2002 EU: March 14, 2002 AU: March 14, 2002
Launch prices	US$	US$199.99 (equivalent to $390 in 2025)[34]	US$299.99 (equivalent to $560 in 2025)	US$199.99 (equivalent to $360 in 2025)	US$299.99 (equivalent to $550 in 2025)
	€	DEM499.99 (Equivalent to €255.64 in 1999 or €420 in 2023)	DEM869.99[35] (Equivalent to €444.31 in 2000 or €720 in 2023)	€199.99 (equivalent to €320 in 2023)[36]	€479.99 (Changed to €399.99 shortly before Launch and equivalent to €620 in 2023)
	GBP	£199.99 (equivalent to £380 in 2025)[34]	£299.99 (equivalent to £570 in 2025)	£129.99 (equivalent to £240 in 2025)[36]	£299.99 (equivalent to £560 in 2025)
	A$				
	JP¥	¥29,000 (equivalent to ¥31,990 in 2024)	¥39,800 (equivalent to ¥44,330 in 2024)	¥25,000 (equivalent to ¥25,800 in 2019)	
Discontinued		WW: March 31, 2001[37]	JP: December 28, 2012[39] WW: January 4, 2013[38]	WW: 2007[40]	JP: June 4, 2006 EU: March 11, 2007 NA: March 2, 2009[41][42]
Media	Type	GD-ROM, CD	DVD, CD	GameCube Game Disc[a]	DVD, CD
	Regional lockout	Region locked	Region locked	Region locked	Region locked
	Backward compatibility	None	PlayStation	Game Boy family (with Game Boy Player)[b]	None
Best-selling game		*Sonic Adventure*, 2.5 million (as of June 2006)[43]	*Grand Theft Auto: San Andreas*, 20.81 million (as of August 24, 2013)	*Super Smash Bros. Melee*, 7.5 million (as of August 24, 2013)	*Halo 2*, 8.49 million (as of August 24, 2013)
Accessories (retail)		▪ VMU ▪ Dreamcast mouse and keyboard ▪ Fishing Rod ▪ Microphone ▪ Light gun ▪ Dreameye camera ▪ Samba de Amigo Maracas (controller) ▪ More...	▪ PlayStation 2 HDD Internal hard drive supported by PlayStation 2 Expansion Bay (models 30000 and 50000 only) ▪ Network adapter Built-in on slimline models (PSTwo, model 70000 onwards) ▪ EyeToy ▪ PlayStation 2 DVD remote control ▪ Guitar controllers ▪ More...	▪ WaveBird ▪ GameCube – GBA link cable ▪ GameCube Broadband Adapter and Modem Adapter ▪ Game Boy Player ▪ DK Bongos ▪ Dance pad ▪ GameCube Microphone ▪ More...	▪ Xbox Live Starter Kit ▪ Xbox Media Center Extender ▪ DVD Playback Kit ▪ Xbox Music Mixer ▪ Memory Unit (8 MB) ▪ Logitech Wireless Controller (2.4 GHz) ▪ More...
CPU		200 MHz SuperH SH-4	294 MHz MIPS "Emotion Engine" 299 MHz later models	485 MHz PowerPC "Gekko"	733 MHz x86 Intel Celeron/Pentium III Custom Hybrid
GPU		100 MHz NEC/VideoLogic PowerVR CLX2 "Holly"	147 MHz "Graphics Synthesizer"	162 MHz ATI "Flipper"	233 MHz Custom Nvidia NV2A
RAM		Main RAM 16 MB SDRAM Video RAM 8 MB Sound RAM 2 MB	Main RAM 32 MB dual-channel, RDRAM Video RAM 4 MB eDRAM Sound RAM 2 MB	Main RAM 24 MB 1T-SRAM, Video RAM 3 MB embedded 1T-SRAM Audio/Alternative RAM 16 MB DRAM	64 MB unified DDR SDRAM
Audio		Stereo audio, with: ▪ 64 PCM/ADPCM channels ▪ 128 step DSP ▪ Yamaha XG MIDI support ▪ Optional Dolby Surround support	5.1 ch. surround sound audio, with: ▪ 48 ADPCM channels ▪ Software-mixed audio ▪ Dolby Pro Logic II ▪ Dolby Digital (for full motion video only) ▪ DTS (for full motion video only)	Stereo audio, with: ▪ 64 ADPCM channels ▪ Optional use of Dolby Pro Logic II	5.1 ch. surround sound audio, with: ▪ 64 channels of 3D sound, or 256 channels of 16-bit stereo audio ▪ Also supports MIDI, mono audio, Dolby Surround and Dolby Digital Live 5.1 in games

				▪ DTS support when playing back DVD movies only
Video outputs	VGA (RGBHV), SCART (RGBS), S-Video, composite	Component (YP_BP_R, RGsB), VGA (RGsB; progressive scan games/PS2 Linux only), SCART (RGBS), S-Video, composite	Component (YC_BC_R), SCART (RGBS; PAL consoles only), S-Video (NTSC consoles only), composite	Component (YP_BP_R), SCART (RGBS), S-Video, composite
Online service	JP: Dricas (1998–2007) NA: Sega Net (2000–2002) EU: Dreamarena (2000–2003)	Non-unified services (2002–2016)	Non-unified services (2003–2009)	Xbox Live (2002–2010)
System software	Proprietary OS	Proprietary OS, PS2 Linux	Proprietary OS	Proprietary OS, Xbox Windows Media Center

Worldwide sales standings

Console	Units sold
PlayStation 2	160 million (as of November 26, 2024)[10]
Xbox	24 million (as of May 10, 2006)[11][12]
GameCube	21.74 million (as of September 30, 2010)[13]
V.Smile	11 million
Dreamcast	9.13 million (as of September 6, 2002)[14]



Bar chart showing the sales of the main 6th generation consoles

Other consoles

These consoles were created for the mass market, like the 4 consoles listed above. However, they are less often noted, never saw a worldwide release, and/or have sold fewer units overall, and are therefore listed as 'Other'.


Nuon, a hybrid DVD player/gaming system that had a very small game library. Released by VM Labs in 2000.


Panasonic Q, a DVD player hybrid version of the GameCube. Released by Panasonic in 2001.


PSX, a PlayStation compatible digital video recorder. Released by Sony in 2003.


XaviX, a video gaming base console for the XaviX Interactive System. Released by SSD Company Limited in 2004.


V.Smile, an educational video game console. Released by VTech in 2004.

Bits and system power

Bit ratings for consoles largely fell by the wayside after the fifth generation (32/64-bit) era. The number of "bits" cited in console names referred to the CPU word size, but there was little to be gained from increasing the word size much beyond 32 bits; performance depended on other factors, such as central processing unit speed, graphics processing unit speed, channel capacity, data storage size, and memory speed, latency, and size.

The importance of the number of bits in the modern console gaming market has thus decreased due to the use of components that process data in varying word sizes. Previously, console manufacturers advertised the "*n*-bit talk" to overemphasize the hardware capabilities of their system. The Dreamcast and the PlayStation 2 were the last systems to use the term "128-bit" in their marketing to describe their capability.

It is not easy to compare the relative "power" of the different systems. Having a larger CPU word size does not necessarily make one console more powerful than another. Likewise, the operating frequency (clock rate, measured in terms of Hertz) of a system's CPU is not an accurate measure of performance either, except between systems of the same or similar architecture.

The Microsoft Xbox uses a 32-bit (general purpose) CISC x86 architecture CPU, with an instruction set equal to that of the Coppermine core Mobile Celeron, though it has less cache (128 kB) than the PC equivalent. It has 64 MB RAM (shared) and runs at 733 MHz. Because the Pentium 3 introduced SSE, the Xbox also had 128-bit SIMD capabilities. Its *NV2A* GPU, which is very similar to the GeForce 3 series of desktop GPUs, makes it the only console in its time with traditional vertex and pixel shaders.[44]

The GameCube's CPU is a PowerPC CPU codenamed Gekko that runs at 485 MHz and was built by IBM. Its graphics processor, codenamed "Flipper", is comparable to the original ATI Radeon. The console has 43 MB of non-unified memory (24 MB of 1T-SRAM, 3 MB embedded 1T-SRAM, and 16 MB DRAM).[45]

The PlayStation 2's CPU (known as the "128-bit Emotion Engine") has a 64-bit core with a 32-bit FPU. Coupled to two 128-bit Vector Units, this hybrid R5900 CPU is based on MIPS architecture. The PS2 also has an internal 10 Channel DMA Bus which is fully 128 bits wide. Paths between the Emotion Engine, RAM and the Graphics Synthesizer (GS) are also 128 bits wide. The PS2's unique hardware arrangement with no less than 10 processing units were difficult to come to grips with. Many developers struggled initially with programming the hardware. The PS2's Graphics Synthesizer (GS) has fast dedicated video memory, though it is limited in the amount of data it can hold. The 10 Channel 128 bit wide DMA bus could pump data to GS Memory as fast as the screen could update. Consequently, with the main memory being limited to 32MB, many of the PS2's games have reduced textures compared with versions for other consoles. It also does not have a hardware dedicated transform and lighting unit like the ones found in the Xbox and GameCube GPUs.

However the PS2's design allows a remarkable degree of flexibility and choice. For example, program control and general arithmetic could be handled by the CPU, while the Vector Units 0 and 1, could provide parallel processing of physics, clipping and transform and lighting to the scene. The Vector units were noted to be so versatile that *Shadow of The Colossus* used one of the vector units to do full Pixel shading for the fur of the Collossi.

The Dreamcast features a SuperH-4 32-bit reduced instruction set computing (RISC) instruction set architecture (ISA) using 16-bit fixed-length instructions, alongside a 64-bit double-precision superscalar unit, a 64-bit data bus allowing a variable width of either 8, 16, 32 or 64-bits, and a 128-bit floating-point bus.[46] The PowerVR 2DC CLX2 chipset uses a unique method of rendering a 3D scene called Tile Based Deferred Rendering (TBDR): while storing polygons in triangle strip format in memory, the display is split into tiles associated with a list of visibly overlapping triangles onto which, using a process similar to ray tracing, rays are cast and a pixel is rendered from the triangle closest to the camera. After calculating the depths associated with each polygon for one tile row in 1 cycle, the whole tile is flushed to video memory before passing on to render the next tile. Once all information has been collated for the current frame, the tiles are rendered in turn to produce the final image.

Handheld systems

During the sixth generation era, the handheld game console market expanded with the introduction of new devices from many different manufacturers. Nintendo maintained its dominant share of the handheld market with the release in 2001 of the Game Boy Advance, which featured many upgrades and new features over the Game Boy. Two redesigns of this system followed, the Game Boy Advance SP in 2003 and the Game Boy Micro in 2005. Also introduced was the Bandai's WonderSwan, launched in Japan in 1999. South Korean company Game Park introduced its GP32 handheld in 2001, and with it came the dawn of open source handheld consoles. The Game Boy Advance line of handhelds has sold 81.51 million units worldwide as of September 30, 2010.[13]

The Game Boy Advance was the best-selling handheld system.

A major new addition to the market was the trend for corporations to include a large number of "non-gaming" features into their handheld consoles, including cell phones, MP3 players, portable movie players, and PDA-like features. The handheld that started this trend was Nokia's N-Gage, which was released in 2003 and doubled primarily as a mobile phone. It went through a redesign in 2004 and was renamed the N-Gage QD. A second handheld, the Zodiac from Tapwave, was released in 2004; based on the Palm OS, it offered specialized gaming-oriented video and sound capabilities, but it had an unwieldy development kit due to the underlying Palm OS foundation.

A fairly uncommon handheld of the 6th generation was the vtech V.SMILE Pocket. A handheld version of their V.SMILE home console.

With more and more PDAs arriving during the previous generation, the difference between consumer electronics and traditional computing began to blur and cheap console technology grew as a result. It was said of PDAs that they were "the computers of handheld gaming" because of their multi-purpose capabilities and the increasingly powerful computer hardware that resided within them. This capability existed to move gaming beyond the last generation's 16-bit limitations; however, PDAs were still geared towards the typical businessman, and lacked new, affordable software franchises to compete with dedicated handheld gaming consoles.

Handheld comparison

Product Line		WonderSwan			Game Boy Advance			N-Gage	
Name		WonderSwan	WonderSwan Color	SwanCrystal	Game Boy Advance	Game Boy Advance SP	Game Boy Micro	N-Gage	N-Gag
Logo		WonderSwan			GAME BOY ADVANCE			N-GAG	
Manufacturer		Bandai			Nintendo			Nokia	
Console									
Release dates		JP: March 4, 1999	JP: December 9, 2000	JP: July 12, 2002	JP: March 21, 2001 NA: June 11, 2001 PAL: June 22, 2001	JP: February 14, 2003 NA: March 23, 2003 PAL: March 28, 2003	JP: September 13, 2005 NA: September 19, 2005 AU: November 3, 2005 EU: November 4, 2005	October 7, 2003	May 26, 2
Launch prices	US$	-	-	-	US$99.99 (equivalent to $180 in 2025)	US$99.99 (equivalent to $180 in 2025)	US$99.99 (equivalent to $160 in 2025)	US$299.99 (equivalent to $530 in 2025)	US$179.9 (equivalen $310 in 2
	€	-	-	-	DEM249.99 (Equivalent to €127.82 in 2001 or €200 in 2023)	€129.99 (equivalent to €200 in 2023)		€289.99 (equivalent to €440 in 2023)	€229.99 (equivalen €350 in 2
	GBP	-	-	-		£89 (equivalent to £160 in 2025)		£229.99 (equivalent to £420 in 2025)	
	A$	-	-	-		AU$199.99 (equivalent to $320 in 2022)			
	JP¥	¥4,800 (equivalent to ¥5,310 in 2024)	¥6,800 (equivalent to ¥7,520 in 2024)	¥7,800 (equivalent to ¥8,630 in 2024)	¥9,800 (equivalent to ¥11,130 in 2024)	¥12,500 (equivalent to ¥14,200 in 2024)			
Discontinued		2003			2007			2006	
Media	Type	WonderSwan cartridge			Game Boy Advance Game Pak			MultiMediaCard (MMC)	
	Regional lockout	—			Unrestricted			Unrestricted	
	Backward compatibility	—	WonderSwan		Game Boy, Game Boy Color		none	—	
Best-selling game		*Final Fantasy*			*Pokémon Ruby* and *Sapphire*, 16.22 million combined (as of November 25, 2004)[47]			?	
Accessories (retail)		▪ WonderSwan WS Headphone Adapter ▪ WonderWave ▪ WonderWitch ▪ WonderBorg			▪ Wireless Adapter ▪ Infra-Red Adapter ▪ GameCube – Game Boy Advance link cable: ▪ Play-Yan ▪ e-Reader ▪ Video ▪ Cleaning Cartridge ▪ Mobile Adapter ▪ More...				
OS								Symbian S60	
CPU		16-bit, NEC V30 MZ			16.8 MHz, 32-bit, ARM7TDMI with embedded memory			104 MHz, 32-bit, RISC based ARM9 series	
Memory		512 kbit (64 KB) RAM			32 kilobyte + 96 kilobyte VRAM (internal to the CPU), 256 kilobyte WRAM (outside the CPU)			16 megabyte RAM, 16 megat ROM (3.4 MB accessible for storage)	
Display		2.49-inch liquid-crystal display (LCD)	2.8-inch LCD	2.8-inch LCD	2.9-inch LCD	2.9-inch LCD	2-inch LCD		
Resolutions		224 x 144			240 × 160			176 × 208	
Audio		4-bit PCM channels			Stereo audio, with: ▪ 8-bit DAC, capable of either streaming wave data or outputting wave samples processed and mixed in software ▪ Two square wave voices ▪ One programmable WS voice ▪ One white noise generator ▪ Optional sampling through the WS channel			Stereo audio (using headphor with: ▪ Support for Standard MID MIDI and AMR audio	
Interface		▪ Two D-pads			▪ D-pad			▪ D-pad	

	▪ Two face buttons			▪ Four face buttons ▪ Two shoulder buttons			▪ Numbered keypad ▪ Music player, Radio and M hotkeys ▪ Dial and hang up buttons ▪ Four other face buttons ▪ Microphone	
Dimensions		12.8 × 24.5 × 82mm (5.04 in × 2.93 in × 0.96 in)		144.5 × 24.5 × 82 mm (5.69 × 0.96 × 3.2 inches)	84 × 82 × 24.4 mm (3.3 × 3.23 × 0.96 inches)	50 × 101 × 17.2 mm (2 × 4 × 0.7 inches)	70 mm (2.8 in) *(h)* 134 mm (5.3 in) *(w)* 20 mm (0.79 in) *(d)*:	118 mm (*(w)* 68 mr (2.7 in) *(h* 22 mm (0 *(d)*
Weight		96 g (3.4 oz)		140 g (4.9 oz)	142 g (5.0 oz)	80 g (2.8 oz)	137 g (4.8 oz)	143 g (5.(
Online service							N-Gage Arena	
Storage							3.4 MB internal storage, MMC	
Battery life	40 hours	15 hours		GBA: 15 hours GBA SP: GB Micro:	10 hours continuous play with light on, 18 hours with light off	5 hours with top brightness and sound, 8 hours with both features on default	2 hours continuous play	4 hours continuou
Units sold (all models combined)	Japan: 3.5 million (combined) WonderSwan: 1.55 million WonderSwan Color: 1.1 million			Worldwide: 81.51 million (as of September 30, 2010) Japan: 16.96 million Americas: 41.64 million Other: 22.91 million			Worldwide: 3 million (as of July 2007)	

Note: First year of release is the first year of the system's worldwide availability.

Other handhelds

VMU (1998) Created by Sega as a memory card for the Dreamcast

Cybiko (2000)

Pokémon Mini (2001)

GP32
Released in 2001, discontinued around 2005 – South Korea only

Leapster Learning Game System (2003)

Tapwave Zodiac (2003)

Sales

Console	Units sold
Game Boy Advance (figure includes GBA SP and Game Boy Micro)	81.51 million[13]
Leapster	4 million
WonderSwan	3.5 million
N-Gage	3 million[48]
Cybiko	500,000[49]
Tapwave Zodiac	less than 200,000 units[50]
GP32	30,000

Trends

Market convergence

Major publishers, such as Activision, Electronic Arts, and Ubisoft adopted a cross-platform strategy, releasing versions of their games for PC, all major consoles, and in some cases, handhelds as well. The sixth generation was the first to help console and computer software grow closer together as well as outperform the arcade market in features, graphics and business. The Dreamcast, which had an official Windows CE Development Kit to help porting games from PCs to Dreamcast, and the Xbox, which was made from off-the-shelf PC parts and hosted many PC ports, factored into this also.

Controversial games

While the sixth generation was not the first to have its share of controversial games, this generation was noted to have extensive criticism by public figures of "objectionable" content in gaming such as sex, crime, violence, profanity, and drug use as well as topics of debate such as religion, politics and economics.

The sixth generation was also notable because it saw the continuation of lawmakers taking actions against the video game industry. The most famous were Rockstar Games' *Manhunt* and *Grand Theft Auto* games (*Grand Theft Auto III* and *Grand Theft Auto: Vice City*) facing lawsuits over allegedly influencing minors to commit crimes, while *Grand Theft Auto: San Andreas* was briefly given an adult rating and removed from most stores over the availability of an abandoned sex mini-game using the Hot Coffee mod.[51][52][53]

The sixth generation also coincided with the September 11 attacks in New York City and the Pentagon, which had a huge impact on the entertainment industry, including the video game industry; in the subsequent market climate, multiple games were edited in response to the sensitivity surrounding the event. Prior to its release, *Metal Gear Solid 2: Sons of Liberty* depicted a submersible mobile fortress hijacked by terrorists destroying a good portion of Manhattan in view of the twin towers (this can be found in the "Document of Metal Gear Solid 2" making-of feature). Similarly, several undisclosed modifications were made in *Grand Theft Auto III*, such as a change to the police cars' color scheme (the old scheme resembled that of NYPD's older blue and white design) and altered cover art (the European release featured the original artwork); Rockstar Games estimates that the changes amounted to 1% in changed content.[54] The Dreamcast game *Propeller Arena* was never officially released, possibly due to a certain level which was visually very similar to the September 11 attacks.

Emulation and retro gaming

Because of the increased computing power of video game consoles and the widespread usage of emulators, the sixth generation saw the rise of console emulation and retro gaming on a vast scale. Many games for older systems were updated with superior graphics or sound and re-released for current consoles. Commonly emulated games included those released for the Nintendo Entertainment System, the Super Nintendo Entertainment System, the Mega Drive/Genesis, the PlayStation (the PS2 can play PS1 games natively), and the Nintendo 64.

Also during this generation, the computing power of handheld consoles became capable of supporting games made for some of the earliest gaming consoles and several companies released remakes of classic games for the handhelds. Nintendo introduced a line of NES and SNES games for its Game Boy Advance handheld, including remakes such as *Final Fantasy I & II: Dawn of Souls* and Nintendo's *Metroid: Zero Mission*. Also, an increasing number of third-party developers, including Midway Games, Capcom, Namco, Atari, Tecmo, and Sega, released anthology collections of some of their old games. Additionally, many video games and video game series that were originally confined to Japan were released in North America and Europe for the first time.

Rise of online gaming

Online gaming, which in previous generations had been almost an exclusive domain of PC games, became more prominent in video game consoles during this generation. The Dreamcast initiated this change with its built in modem, internet browsing software, and ability to play certain games online. The PlayStation 2, Xbox and GameCube also offered online gaming, though their approaches and commitment to it varied greatly. The Xbox offered an integrated service called Xbox Live that cost $50 per year and was only compatible with a broadband internet connection. Its ability to connect gamers for online multi-player matches and its ideal experience was a considerable factor in allowing the Xbox to gain a foothold in the western market, especially in the first-person shooter genre. The PlayStation 2 left its online gaming service up to each individual game publisher, and though it was free to use, it was not always an ideal experience, especially with games published by small developers. The *SOCOM* series was one of the most popular online competitive games for the PS2.[55] The GameCube did not offer online play for any of its first-party titles, with only Sega's *Phantasy Star Online* series and *Homeland* making official use of the console's online capabilities. In addition, online capability was not out-of-the-box; an adapter was needed to hook the GameCube to the internet.

Mergers

Many game publishing companies with a long established history merged with their competitors: Microsoft bought second-party developer Rare in 2002; Square merged with Enix to form Square Enix in 2003 and then later bought Taito; Sega merged with Sammy to form Sega Sammy Holdings in 2004; Konami bought a majority share of Hudson Soft; Namco merged with Bandai to form Bandai Namco Holdings in 2006.

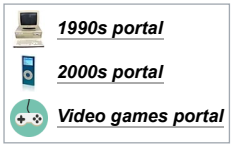
Software

Milestone titles

- *Burnout 3: Takedown* (PS2, Xbox) by Criterion Games and EA Games was released to universal acclaim from critics, for their addictive gameplay, visuals and a shift to a more aggressive style of racing game in comparison to its predecessors. Retrospective coverage of the game has been highly positive with some publications declaring it as the greatest arcade racer game ever made and the peak of the *Burnout* series.
- *Dead or Alive 2* (Arcade, DC, PS2) by Team Ninja and Tecmo received universal acclaim with a GameRankings and Metacritic score of 91/100, and is considered as one of the greatest fighting games of all time. It was notable for improving and popularizing the concept of multi-tierd environments.[56] *Dead or Alive 3* (Xbox) also received acclaim and was a bestseller with over 2 million units sold worldwide, scoring 37 out of 40 on *Famitsu*. It was notable for improving and expanding on what the previous game offered, praised for its advanced graphics and was declared "The most technologically advanced fighting game ever made".[57][58][59][60]
- *Final Fantasy X* (PS2) by Square (now Square Enix) refined many elements found in its predecessors, adding a completely different battle system. Within four days of its release in Japan the game had sold over 1.4 million copies in pre-orders, setting the record for the fastest-selling console RPG.[61]
- *Forza Motorsport* (Xbox) by Turn 10 Studios and Microsoft Studios received universal critical acclaim[62] and is considered to have set a new standard for the racing genre.[63][64][65] This game received universal acclaim according to the review aggregation website Metacritic.[66]
- *God of War* and *God of War II* (PS2) by Santa Monica Studio and Sony Computer Entertainment (SCE) were both released to universal acclaim from critics for their gameplay, graphics and story.
- *Grand Theft Auto III*, *Vice City*, and *San Andreas* (PS2, Xbox, PC) by Rockstar popularized "sandbox" style gameplay in an urban crime setting, which has since been widely imitated. In addition, it brought violence and other potentially objectionable content in video games back into the mainstream spotlight, thus reviving the video game controversy.
- *Half-Life 2* (PC, Xbox) by Valve was praised for its advanced physics, animation, sound, AI, graphics, gameplay, and narrative, and was named Game of the Decade at the Spike Video Game Awards.
- *Halo: Combat Evolved* (Xbox, PC) by Bungie and Microsoft Studios was by far the most successful launch title for the Xbox. *Halo 2* set records as the fastest grossing release in entertainment history [67] and was still very successful on the Xbox Live online gaming service until support was dropped in April 2010.

- *Jet Set Radio* (DC) by Smilebit and Sega received universal acclaim for its arcade-style gameplay, up-tempo music and cel-shaded visuals. It popularized the use of cel-shaded visuals in video games.[68] *Jet Set Radio Future* (Xbox) improved and expanded on what the original game offered, and also received critical acclaim.
- *The Legend of Zelda: The Wind Waker* (GC) by Nintendo EAD and Nintendo remains one of the most critically acclaimed games of the generation. Critics praised the vivid artistry and timeless gameplay. It has a score of 96% on Metacritic, and it is the fourth game to obtain a perfect score from video game reviewer Famitsu. Likewise, *The Legend of Zelda: Twilight Princess* (GC) proved to be another important title in the series released this generation. The title is perhaps best remembered for the excitement caused by its announcement trailer at E3 2004. It was released to widespread critical acclaim with an average of 96% on Metacritic. The game drew much praise for its scale and cinematic style with many reviewers declaring it the best game in the series.[69] Likewise, it was seen as a transitional title being released on both the GameCube and Wii – which resulted in it being the best-selling title in the series since *Ocarina of Time*.
- *Metal Gear Solid 2: Sons of Liberty* (PS2, Xbox, PC) and *Metal Gear Solid 3: Snake Eater* (PS2) by Konami Computer Entertainment Japan and Konami improved upon the stealth genre by adding many new abilities, and for the first time in its respective genre made the surroundings nearly completely interactive. Both games achieved widespread critical acclaim, as they improved many elements from their predecessor.
- *Metroid Prime* (GC) by Retro Studios and Nintendo is one of the generation's highest-rated titles, with a score of 96.3 on GameRankings and a 97 on Metacritic.[70][71] The game garnered critical praise and commercial success, selling more than a million units in North America alone.[72] It was also the eighth best-selling GameCube game in Australia,[73] and more than 78,000 copies were sold in Japan.[74] It won a number of Game of the Year awards, and it is considered by many critics and gamers to be one of the greatest video games ever made, remaining one of the highest-rated games on Metacritic.[75]
- *NFL 2K1* (DC) by Visual Concepts and Sega was the first football game to feature online play.[76]
- *Ninja Gaiden* (Xbox) by Team Ninja and Tecmo received universal acclaim with a GameRankings score of 93% and Metacritic score of 91/100, praised for its intense difficulty and attention to detail,[77][78] selling over 1.5 million copies worldwide.[79] *Ninja Gaiden Black* (Xbox), an update to the original, also received acclaim and praised for its additional content along with the addition of an easy mode difficulty setting.[80][81]
- *Phantasy Star Online* (DC, GC, Xbox, PC) by Sonic Team and Sega, the first console MMORPG, has been cited as one of the most groundbreaking and influential games of the generation.[82] It received "generally favorable" reviews per ratings aggregator Metacritic.[83]
- *Pokémon Ruby* and *Sapphire* (GBA) Despite the fact that the games received some backlash due to connectivity issues with the older games, which was resolved with the release of future games, these games still received positive reception from critics and a loyal fanbase for adding much more features innovation to the Pokémon series that are still a part of the franchise to this very day.[84][85][86][87] They eventually became the best-selling games for the Game Boy Advance,[88][89] selling roughly over 16.22 million copies worldwide as of October 2013.[90][91]
- *Resident Evil 4* (GC, PS2, PC) by Capcom Production Studio 4 and Capcom revamped the franchise in a new, more action-oriented direction.[92] It remains one of the highest rated games of the generation.
- *Rez* (DC, PS2) by United Game Artists and Sega received significant critical acclaim.[93][94] The game, about a computer virus named Swayzak invading the mainframe of a computer, has been cited as one of the greatest videogames ever made[95][96] and a significant example of videogames as art.[97]
- *Shadow of the Colossus* (PS2) by Team Ico and SCE has been frequently cited as an example of video games as art.[98][99][100] Many reviewers consider the game's soundtrack to be one of its greatest aspects. In addition to *Roar of the Earth* won the award for "Soundtrack of the Year" in the US-based video game magazine *Electronic Gaming Monthly*,[101] *GameSpot* commented that the musical score conveyed, and often intensified, the mood of any given situation,[102] while it was described as "one of the finest game soundtracks ever" by a reviewer from *Eurogamer*.[103]
- *Shenmue* (DC) by Sega AM2 and Sega is regarded as a major step forward for 3D open-world gameplay,[104][105][106][107][108] introduced the quick time event mechanic in its modern form,[109] and has been widely cited as one of the best and most influential games ever made.[110][111][112][113]
- *Sonic Adventure* (DC, GC, PC) by Sonic Team was the first main *Sonic the Hedgehog* game to feature 3D gameplay. It received a perfect score from *Computer and Video Games*, who called it one of the greatest video games of all time,[114] and *GamesRadar* wrote it "changed the gaming world forever".[115]
- *Soulcalibur* (Arcade, DC) by Project Soul and Namco is the first fighting game on any platform to have ever received a perfect 10.0 rating from IGN[116] and GameSpot[117] and also a perfect 40/40 (second of only fifteen games)[118] from Japanese gaming magazine, *Famitsu*. *Soul Calibur II* (Arcade, PS2, GC, Xbox) was a bestseller for all three home consoles on which it was released and was notable for featuring exclusive characters for every version released.
- *Star Wars: Knights of the Old Republic* (PC, Xbox) by BioWare and LucasArts has been cited as one of the best games of the generation[119] and greatest games of all time.[120][121] Its sequel, *Star Wars Knights of the Old Republic II: The Sith Lords*, also garnered critical acclaim.[122]
- *Super Mario Sunshine* (GC) by Nintendo Entertainment Analysis & Development (Nintendo EAD) and Nintendo is the highest-rated 3D platformer of the generation with a Metacritic score of 92/100.[123] This game was the first 3D *Super Mario* game which included the ability to ride Yoshi.[124] This feature reappeared in *Super Mario Galaxy 2* where the Twisty Trials Galaxy in World S is another recurring theme from *Super Mario Sunshine*, based on one of the missions "The Secret of Ricco Tower" (https://www.mariowiki.com/Ricco_Harbor#Episode_4:_The_Secret_of_Ricco_Tower).[125]
- *Super Smash Bros. Melee* (GC) by Hal Laboratory and Nintendo went on to become one of the most popular and most played games on the GameCube console which is a widely played competitive video game and has been featured in several high-profile tournaments.[126] Many consider it to be the most competitively viable game in the series.[127][128][129]
- *Tekken Tag Tournament* (PS2) was a launch title for the PlayStation 2 and is regarded as one of the best PS2 titles ever,[130] and is also considered one of if not the most significant entry to the *Tekken* series. Throughout the sixth generation, *Tekken Tag* was the fighting game of choice for many tournaments. The game was also praised for its graphical leap from the arcade on to the then, new generation of consoles, on the PlayStation 2.[131]
- *Virtua Fighter 4* (Arcade, PS2) by Sega AM2 and Sega received universal acclaim, with a Metacritic score of 94/100, and is considered to have set a new standard for 3D fighting games.[132][133] In Japan, the PlayStation 2 version sold 356,897 during its first week on sale in early 2002.[134] Worldwide sales of the PS2 port exceeded 1.5 million by June 2002.[135] On release, *Famitsu* magazine scored the PlayStation 2 version of the game a 37 out of 40.[136]

See also



- 1990s in video games

- 2000s in video games

Notes

a. Panasonic Q models: DVD
b. The **Game Boy Player**, released in 2003, adds Game Boy Advance functionality to a GameCube. It is also backward compatible with Game Boy and Game Boy Color games. A few titles are not supported. The Game Boy Player was sold separately upon its launch, but it was later included with select GameCube bundles.[137][138]

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Seventh generation of video game consoles

The **seventh generation** of home video game consoles began on November 22, 2005, with the release of Microsoft's Xbox 360 home console. This was followed by the release of Sony's PlayStation 3 on November 17, 2006, and Nintendo's Wii on November 19, 2006. Each new console introduced new technologies. The Xbox 360 offered games rendered natively at high-definition video (HD) resolutions, the PlayStation 3 offered HD movie playback via a built-in 3D Blu-ray Disc player, and the Wii focused on integrating controllers with movement sensors as well as joysticks.[1] Some Wii controllers could be moved about to control in-game actions, which enabled players to simulate real-world actions through movement during gameplay. By this generation, video game consoles had become an important part of the global IT infrastructure; it is estimated that video game consoles represented 25% of the world's general-purpose computational power in 2007.[2]

Joining Nintendo in releasing motion devices and software, Sony Computer Entertainment released the PlayStation Move in September 2010, which featured motion-sensing gaming similar to that of the Wii. In November 2010, Microsoft released Kinect for use with the Xbox 360. Kinect did not use controllers, instead using cameras to capture the player's body motion and using that to direct gameplay, effectively making the players act as the "controllers". Having sold eight million units in its first 60 days on the market, Kinect claimed the Guinness World Record of being the "fastest selling consumer electronics device".[3][4]

Among handheld consoles, the seventh generation began somewhat earlier than the home consoles. November 2004 saw the introduction of the Nintendo DS,[5] and the PlayStation Portable (PSP) came out in December. The DS features a touch screen and built-in microphone, and supports wireless standards.[6] The PSP became the first handheld video game console to use an optical disc format as its primary storage media.[7][8] Sony also gave the PSP multimedia capability;[9] connectivity with the PlayStation 3, PlayStation 2, other PSPs; as well as Internet connectivity.[10][11] Despite high sales numbers for both consoles, PSP sales consistently lagged behind those of the DS.[12]

A crowdfunded console, the Ouya, received $8.5 million in preorders before launching in 2013. Post-launch sales were poor, and the device was a commercial failure. Additionally, microconsoles like the Nvidia Shield TV, Amazon Fire TV, Mojo, Razer Switchblade, GamePop, GameStick, and more powerful PC-based Steam Machine consoles have attempted to compete in the video game console market; however they are seldom classified as "seventh-generation" consoles.[13][14][15]

The seventh generation slowly began to wind down when Nintendo began cutting back on Wii production in the early 2010s. In 2014, Sony announced they were discontinuing the production of the PSP worldwide, and the release of new games for the DS eventually ceased later that year with the last third-party titles. Microsoft announced in that same year that they would discontinue the Xbox 360. The following year, Sony announced that it would soon discontinue the PlayStation 3. Around that time, the remaining Wii consoles were discontinued, ending the generation as all hardware was discontinued. The final Xbox 360 physical games were released in 2018, as *FIFA 19* and *Just Dance 2019*. Despite this, several more Wii games were released, including a few more annual *Just Dance* sequels,[16][17] as well as a limited 3,000-copy print run of a physical release of *Retro City Rampage DX*. The eighth generation had already begun in early 2011, with the release of the Nintendo 3DS.

Home video game consoles

Xbox 360

The Xbox 360 gained an early lead in terms of market share, largely due to its established Xbox Live online gaming system, and its early launch date, which was one year before its rivals. Sales in North America and Europe continued to be strong, even after the release of the Wii and PlayStation 3. Like its predecessor, the Xbox 360 received a muted reception in Japan,[18] attributed to the lack of content aimed at Japanese gamers, which was a key reason why its predecessor underperformed in that country.[19][20][21] Despite its early launch date, the Xbox 360 finished in 3rd place behind its competitors.

The Xbox 360 Pro console and controller

This early launch did come with some trouble, as technical problems appeared in a portion of Xbox 360 units sold. The most well-known problem is the "red ring of death" and Error E74, which received a great deal of attention due to some users having to replace their consoles multiple times. Microsoft attempted to address this by offering a three-year warranty on all affected consoles and repairing them free of charge.[22] It also retroactively reimbursed owners of affected systems who paid for repairs,[22] and ultimately made several adjustments to the console's design to improve reliability, consulting with "an established ASIC vendor".[23]

As they share many cross-platform games and competed for the same audience as their predecessors, frequent comparisons are made between the Xbox 360 and PlayStation 3.[24] The PS3 uses the Blu-ray format, while the Xbox 360 uses a standard DVD9. The Xbox 360 was less expensive to produce and broke even on manufacturing costs earlier than the PS3,[25] while industry consensus was that the Xbox 360's conventional architecture is easier to develop for.[26][27]

At the end of the first half of 2007, the console stabilized at 11.6 million units shipped as sales dropped 60% while its rival, Wii, gained momentum and Sony announced a competitive price drop on the PlayStation 3.[28][29] Microsoft's strategy to boost sales with the release of the highly anticipated *Halo 3* in September 2007 paid off, outselling the Wii that month in North America.[30] Microsoft's Entertainment

and Devices Division experienced a huge increase in revenue, largely driven by the release of *Halo 3*, and posted a quarterly profit for the first time in two years.[31]

The Xbox 360 focused on the release of high-profile games, such as additions to the Halo franchise. The 2007 Game Critics Awards honored the platform with 38 nominations and 12 wins – more than any other platform.[32][33] At the 2008 Game Developers Conference, Microsoft announced that it expected over 1,000 games available for Xbox 360 by the end of the year.[34] The Xbox 360 has managed to gain a simultaneous release of titles that were initially planned to be PS3 exclusives, including *Devil May Cry*,[35] *Ace Combat*,[36] *Virtua Fighter*,[37] *Grand Theft Auto IV*,[38] *Final Fantasy XIII*,[39] *Tekken 6*,[40] *Metal Gear Rising: Revengeance*,[41] and *L.A. Noire*.[42]

In November 2010, Microsoft released Kinect. Kinect did not use controllers, instead making the players act as the "controllers". Having sold eight million units in its first 60 days on the market, Kinect claimed the Guinness World Record of being the "fastest selling consumer electronics device".[3][4] At E3 2010, Microsoft revealed a new Xbox 360 SKU known officially as the Xbox 360 S and referred to as the "Slim" by various media outlets. At E3 2013 Microsoft revealed the Xbox 360 E, the final iteration of the Xbox 360 series, to be succeeded by Xbox One.[43] The 360 E featured a new square design with a simplified exterior akin to the Xbox One.[44]

PlayStation 3


The PlayStation 3 console and controller

Sony's PlayStation 3 was released on November 11, 2006, in Japan and November 17, 2006, in the United States and Canada. The system's reliance on new technologies such as the Cell microprocessor and Blu-ray format caused difficulties in manufacturing, especially the Blu-ray diode, leading to shortages at launch and the delay of the PAL region launches; however, by early December 2006, Sony announced that all production issues had been resolved.[45] Market analysts[46] and Sony executives noted that the success of the PlayStation 3 and the Blu-ray format were dependent on each other; Rich Marty, VP of New Business Development at Sony Pictures Home Entertainment stated that the "PS3 is critical to the success of Blu-ray",[47] while Phil Harrison stated that the PlayStation 3's success would be ensured by "the growth of the Blu-ray Disc movie market".[48]

Sony would provide support for its console with new titles from first-party franchises such as *Gran Turismo*, *Ratchet & Clank*, and *God of War*, while establishing series such as *LittleBigPlanet* and *Uncharted*. Sony also secured a number of highly anticipated third-party exclusive titles, including *Metal Gear Solid 4: Guns of the Patriots*, *Yakuza 3* and *Valkyria Chronicles*. Titles that were originally exclusive or recognized with the platform, such as *Devil May Cry*,[35] *Ace Combat*,[36] *Virtua Fighter*,[37] and *Monster Hunter*,[49] have been released on other platforms. The previous *Grand Theft Auto* titles were originally timed exclusives on the PlayStation 2, before making their release on other platforms, such as the Xbox, months later; however, *Grand Theft Auto IV*, the latest installment, was released simultaneously on the Xbox 360 and PlayStation 3.[38] Titles initially announced as PlayStation 3 exclusives, such as *Assassin's Creed*;[50] *Bladestorm: The Hundred Years' War*, and *Fatal Inertia*, were ultimately released on Xbox 360 as well, with the latter making its appearance on Xbox 360 before the PlayStation 3 version.[51] Sony blamed lower-than-expected sales of the PS3 on the loss of exclusive titles in its software library, its higher price, and stock shortages.[52][53][54]

The high launch price of the PlayStation 3 was considered a major drag on its popularity.[55] In July 2007, Sony announced a drop in the price of the already-discontinued 60 GB models of the console by $100 in the United States and Canada.[56][57] On October 18, 2007, Sony announced a US$100 price drop for the 80 GB model and a new US$399 40 GB model to launch on November 2, 2007,[58] with reduced features such as the removal of backward compatibility with PS2 games. Within weeks, Sony announced that sales of the 40 GB and 80 GB models by major retailers had increased 192%.[59] In November 2008, Sony launched a 160 GB model,[60] and on August 18, 2009, Sony announced the PS3 Slim. The PS3 slim sold 1 million in under a month. It was then announced that a 250 GB slim model was to be released. It was released on September 1 (or 3 depending on country).[61]

In September 2012, Sony announced a new slimmer PS3 redesign (CECH-4000), commonly referred to as the "Super Slim" PS3. It was released in late 2012, available with either a 250 GB or 500 GB hard drive. The "Super Slim" model was the last model to be produced by Sony before the system was slowly discontinued around the world. Shipments of new units to the United States were terminated in October 2016 and Sony officially discontinued the system in Japan on May 29, 2017, the last territory where it was selling new units up until then.[62][63]

Wii


The Wii and the Wii Remote

Nintendo entered the generation with a new approach embodied by its Wii. The company planned to attract current hardcore and casual gamers,[64] non-gamers,[65] and lapsed gamers by focusing on new gameplay experiences and new forms of interaction with games rather than cutting edge graphics and expensive technology.[66] This approach was previously implemented in the portable market with the Nintendo DS.[67] Nintendo expressed hope that the new control schemes it had implemented would render conventionally controlled consoles obsolete, leading to Nintendo capturing a large portion of the existing market as well.[68] This strategy paid off, with demand for the Wii outstripping supply throughout 2007.[69] Since Nintendo profited on each console right from the start unlike its competitors,[70] it achieved very positive returns.[71] With only a few exceptions, monthly worldwide sales for the Wii were higher than those of the Xbox 360 and PlayStation 3,[30][72][73] eroding Microsoft's early lead and widening the gap between its market share and Sony's.[67] In 2007, it was reported by the British newspaper *Financial Times* that the Wii's sales surpassed those of the Xbox 360, which had been released one year previously, and became the market leader in worldwide home console sales for the generation.[74]

As in previous generations, Nintendo provided support for its new console with first-party franchises like *Mario*, *The Legend of Zelda*, *Metroid*, and *Pokémon*. To appeal to casual and non-gamers, Nintendo developed a group of core Wii games, consisting of *Wii Sports*, *Wii Play*, *Wii Fit*,[75] and *Wii Music*,[76] where players make use of the motion-sensing abilities of the console and its peripherals to simulate real world activities.[77]

Publishers such as Ubisoft, Electronic Arts, Capcom, and Majesco Entertainment continued to release exclusive titles for the console, but the Wii's strongest titles remained within its first-party line-up. Analysts speculated that this would change in time as the Wii's growing popularity persuaded third-party publishers to focus on it;[72][78] however, some third-party developers expressed frustration at low software sales.[79] Goichi Suda, developer of *No More Heroes* for the Wii, noted that "only Nintendo titles are doing well" and that he "expected more games for hardcore gamers".[80] Conversely, the PAL publisher of *No More Heroes* Rising Star Games were greatly impressed with the game's sales.[81] Goichi Suda later retracted his comment, saying his "point was that *No More Heroes*, unlike a lot of Nintendo Wii titles currently available is the kind of product that will attract a different kind of consumer to the hardware".[82]

In early 2008, the NPD Group revealed sales data showing that, while the Wii's life-to-date attach rate was low, in December 2007, it reached 8.11 – higher than the attach rates for the Xbox 360 and PlayStation 3 in that month.[83] The Wii's low overall attach rate could be explained by reference to its rapidly increasing installed base, as financial analysts have pointed to the Xbox 360's high attach rates as indicative of an unhealthy lack of installed base growth, and warned that what actually benefits third-party developers is "quicker adoption of hardware and a rapidly growing installed base on which to sell progressively more game units", which tends to lower the attach rate of a product.[84]

Comparison

Comparison of seventh-generation video game home consoles

Console		Xbox 360		PlayStation 3		Wii	Wii Mini
Logo		XBOX 360		PS3 PlayStation 3		Wii	
Manufacturer		Microsoft		Sony (SCE/SIE)		Nintendo	
Image							
Release dates		NA: November 22, 2005 EU: December 2, 2005 JP: December 10, 2005 AU: March 23, 2006 More...		JP: November 11, 2006 NA: November 17, 2006 PAL: March 23, 2007 More...		NA: November 19, 2006 JP: December 2, 2006 AU: December 7, 2006 EU: December 8, 2006 More...	CAN: December 7, 2012[86] EU: March 22, 2013[85] USA: November 17, 2013[87]
Launch prices	Launch Version	Xbox 360 Core[88]	Xbox 360 (20 GB)[88]	20 GB[89][90]	60 GB[91][92][93]		
	US$	US$299 (equivalent to $490 in 2025)	US$399 (equivalent to $660 in 2025)	US$499.99 (equivalent to $800 in 2025)	US$599.99 (equivalent to $960 in 2025)	US$249.99 (equivalent to $400 in 2025)	
	€	€299 (equivalent to €430 in 2023)	€399 (equivalent to €580 in 2023)	[94]	€599 (equivalent to €830 in 2023) €629 in Ireland[95] (equivalent to €880 in 2023)	€249.99 (equivalent to €360 in 2023)	
	GBP	£209 (equivalent to £370 in 2025)	£279 (equivalent to £490 in 2025)	-	£425 (equivalent to £720 in 2025)	£179.99 (equivalent to £310 in 2025)	
	A$			-	AU$999.95 (equivalent to $1,450 in 2022)	AU$399.95 (equivalent to $590 in 2022)	
	JP¥			¥49,980 (equivalent to ¥56,780 in 2024)	¥60,000 (equivalent to ¥68,160 in 2024)	¥25,000 (equivalent to ¥28,400 in 2024)	
Discontinued		WW: April 20, 2016[96]		NZL: September 29, 2015[97] EU: March 2016 AU: March 2016 NA: October 2016 JP: May 29, 2017[note 1]		WW: October 21, 2013[98]	
Units sold		84 million [99]		87.4 million [100]		101.63 million [101]	
Media	Game media	DVD-DL		Blu-ray Disc		Wii Optical Disc (proprietary DVD-DL)	Wii Optical Disc
	Optical media	12× DVD (65.6–132 Mbit/s), CD		2× BD-ROM (72 Mbit/s), 8× DVD, 24× CD, 2× SACD* *Compatibility removed in 3rd & 4th gen models		Wii Optical Disc, GameCube Game Disc (DVD-Video playback was announced for Japan	Wii Optical Disc

				in 2007, but was not released)[102]	
	Regional lockout	Region locked	Unrestricted except for PlayStation 1 and 2 games which are region locked[103]	Region locked	
	Backward compatibility	465 Selected Xbox games (as of November 2007). Additions made with software updates. Official Xbox hard drive required.	The first-generation model is backward compatible with PS1 and PS2 titles through the inclusion of the Emotion Engine and Graphics Synthesizer chips.[104] The second-generation model offers less backward compatibility for PS2 titles. Owing to only featuring the Graphics Synthesizer, and having to emulate the CPU.[105] Third- and later slim redesign-generation models dropped support for all PS2 titles via disc, but some games in digital format, marketed as "PS2 Classics" via the PlayStation Store are still compatible via software emulation.[106] All PS3 models will play most PS1 discs regardless of PS2 compatibility.	Only the first generation models supports all GameCube software and most accessories. The "Family Edition" and "Mini" models drops support for GameCube games.[107]	
Best-selling game		*Kinect Adventures* (pack-in with Kinect peripheral), 24 million[108] Best selling non-bundled game: *Grand Theft Auto V*, 15.34 million[109]	*Grand Theft Auto V*, 17.27 million[110]	*Wii Sports* (pack-in, except in Japan), 82.87 million (As of March 31, 2019)[111] Best selling non-bundled game: *Mario Kart Wii* (37.20 million) (As of March 31, 2019)[111]	
CPU		3.2 GHz IBM PowerPC tri-core codenamed "Xenon"	Cell Broadband Engine (3.2 GHz Power ISA 2.03-based PPE with seven 3.2 GHz SPEs)	729 MHz PowerPC-based IBM "Broadway"[112]	
GPU		500 MHz codenamed "Xenos" (ATI custom design)	550 MHz RSX 'Reality Synthesizer'[113] (based on NVIDIA G70 architecture)[114]	243 MHz ATI "Hollywood"	
Memory		512 MB GDDR3 @ 700 MHz shared between CPU & GPU 10 MB EDRAM GPU frame buffer memory	256 MB XDR @ 3.2 GHz 256 MB GDDR3 @ 650 MHz	24 MB "internal" 1T-SRAM integrated into graphics package 64 MB "external" GDDR3 SDRAM 3 MB GPU frame buffer memory	
Dimensions		Original: 310 × 80 × 260 mm (12.2 × 3.2 × 10.2 in)[115] Xbox 360S: 270 × 75 × 264 mm (10.6 × 3.0 × 10.4 in)[116]	Original: 325 × 98 × 274 mm (12.8 × 3.9 × 10.8 in)[117] Slim: 290 × 65 × 290 mm (11.4 × 2.6 × 11.4 in)[118] Super Slim : 290 × 60 × 230 mm (11.4 × 2.36 × 9.05 in)	4.4 × 16 × 21.5 cm (1,513.6 cm^3) / 1.7 × 6.3 × 8.5 in (92.4 in^3)	19.3 × 16 × 4.6 cm (1,420.5 cm^3) / 7.6 × 6.3 × 1.81 in (86.7 in^3)
Weight		Original: 3.5 kg (7.7 lb)[115] Xbox 360S: 2.9 kg (6.4 lb)[116]	Original: 5 kg (11 lb)[117][119] Slim (2009): 3.2 kg (7.1 lb)[118] Slim (2011): 2.6 kg (5.7 lb)[120] Super Slim (2012): 2.08 kg (4.6 lb)[121]	1.2 kg (2.6 lb)[122]	0.7 kg (1.5 lb)[123]
Included accessories[a]		▪ Controller:	▪ Controller:	▪ Composite AV cable	▪ Composite AV cable

	▪ Wired (*Core* model only) ▪ Wireless controller (all models except *Core*)[note 1] ▪ Wired headset (all models except *Core*, *Arcade* and 4 GB Xbox 360 S consoles) ▪ AV cable: ▪ Composite AV cable (all models except *Pro/Premium* and pre-Sept 2009 *Elite*) ▪ Component HD AV cable (*Pro/Premium* and pre-Sept 2009 *Elite* only) [note 2] ▪ Ethernet cable (*Pro/Premium* and pre-Sept 2009 *Elite* only) ▪ HDMI cable and audio adapter (pre-Sept 2009 *Elite* only) ▪ Removable storage: ▪ Various removable hard disk drives, size dependent on SKU (all models except *Core*, *Arcade* and 4 GB Xbox 360 S consoles) ▪ 256 MB Memory Unit (some *Arcade* models only, later replaced with on-board (non-removable) storage) **^note 1** 250 GB "Super Elite" consoles come with 2 Wireless controllers. 320 GB Xbox 360 S consoles come with a "transforming d-pad" controller. **^note 2** replaced with the D-Terminal HD AV Cable (D 端子 HD AV ケーブル) in Japan	▪ Sixaxis wireless controller (1st, 2nd, and 3rd (40 GB) generation only) ▪ DualShock 3 wireless controller (3rd (80 GB, 160 GB) and 4th generation) ▪ USB A → mini-B cable ▪ AV cable (composite video/stereo audio) ▪ Ethernet Cable 1st generation (20 GB and 60 GB)	▪ Wii Remote controller and Nunchuk attachment ▪ Sensor Bar ▪ Console stand and plate	▪ Wii Remote Plus controller and Nunchuk attachment ▪ Sensor Bar
Accessories (retail)	see Xbox 360 accessories	see PlayStation 3 accessories	▪ Wii Remote ▪ Composite AV cable ▪ RGB Scart cable ▪ Component AV cable ▪ D-Terminal cable ▪ S-Video Cable ▪ Wired LAN adapter ▪ Wii Wheel ▪ Wii Zapper ▪ Classic Controller ▪ Classic Controller Pro	

Controller[b]	▪ Xbox 360 controller (up to 4; any combination of wired or wireless) ▪ Xbox 360 Wireless Racing Wheel ▪ Big Button Controller/Scene It Trivia Controller (up to 8) ▪ Xbox Live Vision Camera ▪ Xbox 360 Universal Media Remote ▪ Kinect Motion sensor	▪ Sixaxis/DualShock 3 controller (up to 7 via Bluetooth or USB) ▪ PSP or PS Vita via Wi-Fi* or USB (supported titles only) ▪ PlayStation Eye camera ▪ Buzz!: Quiz TV wireless buzzers ▪ PlayStation Move motion controller ▪ PS3 Bluetooth Blu-ray remote ▪ Various generic USB HIDs, including keyboards, mice and game controllers	▪ Wii Remote (up to 4 via Bluetooth) ▪ Wii MotionPlus attachment ▪ Nunchuk attachment ▪ Classic Controller ▪ GameCube controller with selected Wii games, all GameCube and Virtual Console games* (up to 4) ▪ GBA via Link Cables* ▪ Nintendo DS (via Wi-Fi) ▪ Wii Balance Board ▪ Wii Zapper *Original Model Only	
User interface	Xbox 360 Dashboard New Xbox Experience (NXE)	XrossMediaBar (XMB)	Wii Menu	
System software features	▪ Audio file playback (non-DRM AAC, MP3, WMA) ▪ Video file playback (MPEG4, WMV, DivX, XviD[124]) ▪ Image slideshows ▪ Connectivity with Windows PCs for more codec support and external playback (compatible natively with Windows XP Media Center Edition and Windows Vista, with Windows XP with downloadable utility)[125] ▪ Keyboard support	▪ Audio file playback (ATRAC3, AAC, MP3, MP3 Surround, WAV, WMA) ▪ Video file playback (MPEG1, MPEG2, MPEG4, WMV, DivX, XviD) ▪ Image editing and slideshows (JPEG, GIF, PNG, TIFF, BMP) ▪ Connectivity with DLNA compliant servers ▪ Mouse and keyboard support ▪ Folding@home client with visualizations from the RSX	▪ Audio file playback (Previously MP3, now only AAC) ▪ Video file playback (Motion JPEG)[126] ▪ Image editing and slideshows (JPG) ▪ Keyboard support[127]	
Online services[d]	Xbox Live Xbox Live Marketplace	PlayStation Network PlayStation Store	Nintendo Wi-Fi Connection WiiConnect24	
Consumer programmability	Development on PC with XNA Game Studio ($99/year subscription, binary distribution with XNA 1.0 Refresh)[128]	Featured development on console (excluding RSX graphics acceleration) via free Linux platform or PC (excluding all Slim models and any console updated to firmware 3.21 and later)		
I/O	IrDA-compliant infrared for remote 2 Memory Card slots* 3 USB 2.0 ports** 1 Ethernet port *Discontinued on Slim models **5 USB 2.0 ports on Slim models	Bluetooth 2.1 EDR 4 USB 2.0 ports* 1 Gigabit Ethernet port 1 Memory Stick slot Pro/Duo** 1 SD/mini SD port** 1 Compact Flash port** *2 USB 2.0 ports on 3rd gen and 4th gen (slim) models **60 GB and 2nd gen 80 GB models only	Bluetooth 2.0 2 USB 2.0 ports Four controller and two memory card ports* 1 SD(HC) Card slot[129][130] *Original Model Only	Bluetooth 2.0 2 USB 2.0 ports
Video outputs	HDMI 1.2a (on models manufactured after August 2007),[131] VGA (RGBHV),[132] Component/D-Terminal (YP_BP_R), SCART	HDMI 1.3a, Component/D-Terminal (YP_BP_R), SCART (RGBS), S-Video, Composite	Component/D-Terminal (YP_BP_R), SCART (RGBS), S-Video, Composite	

	(RGBS), S-Video, Composite			
Resolutions	HDTV-capable (480i, 480p, 576i (50 Hz), 576p, 720p, 1080i, 1080p) Various monitor resolutions available via VGA and HDMI/DVI (640×480, 848×480, 1024×768, 1280×720, 1280×768, 1280×1024, 1360×768, 1440×900, 1680×1050 & 1920×1080)	HDTV-capable (480i, 480p, 576i, 576p, 720p, 1080i, 1080p)	EDTV-capable (240p, 480i, 480p, 576i)	
Audio	Dolby Digital, WMA Pro, DTS*, DTS-ES* *(DVD and HD DVD movies only) ▪ 256+ audio channels ▪ 320 independent decompression channels ▪ 32-bit processing; 48 kHz 16-bit support	Dolby Digital, DTS, Dolby Digital Plus*, Dolby TrueHD*, DTS-HD Master Audio*, DTS-HD High Resolution Audio*,[133] DTS-ES‡, DTS 96/24‡, DTS-ES Matrix†[134] *DVD and Blu-ray movies only. ‡DVD movies only. †Blu-ray movies only. ▪ Audio mixed by software	Dolby Pro Logic II surround, stereo sound and an additional Mono speaker is built into the controller. ▪ Audio mixed by software	
Network	100BASE-TX Ethernet Optional 802.11a/b/g/n Wi-Fi adapter (Built in with the Slim models)	10BASE-T/100BASE-TX/1000BASE-T Ethernet Built-in 802.11 b/g Wi-fi (all models except 20 GB)	Built-in 802.11 b/g Wi-fi Optional Ethernet via USB adapter	
Storage	Included/Optional* detachable SATA upgradeable 20 GB, 60 GB, 120 GB, 250 GB, 320 GB, or 500 GB hard drive. Xbox 360 memory cards USB mass storage Cloud storage (512MB) (Xbox Live Gold subscription required) *Premium version includes 20 GB or 60 GB HDD, Elite includes 120 GB HDD, and all HDDs are available for separate purchase.	2.5-inch upgradeable SATA hard drive (upgradeable with any 2.5-inch SATA 1.0 compliant HDD or SSD). Memory Stick, SD, & Type I/II CompactFlash / Microdrive* USB mass storage Cloud storage (2GB) (PlayStation Plus subscription required) *60 GB and 2nd gen 80 GB models only	512 MB built-in flash memory SD card (up to 32 GB with 4.0 software) GameCube Memory Cards The Wii Remote contains a 16 KiB EEPROM chip from which a section of 6 kilobytes can be freely read and written (used to store up to 10 Miis).	512 MB built-in flash memory The Wii Remote contains a 16 KiB EEPROM chip from which a section of 6 kilobytes can be freely read and written (used to store up to 10 Miis).
Integrated 3DTV support[c]	Yes	Yes	No	

^a Game packages not listed. Bundles, special editions and limited editions may include additional or exchanged items.

^b There is a variety of other input devices available for all three consoles, including rhythm game controllers, microphones and third-part gamepads/controllers.

^c All consoles are capable of producing 3D images using anaglyph or frame-compatible systems (side-by-side/SbS, top and bottom/TaB), as these do not require any special output hardware. As such, these display modes are dependent on the software being displayed rather than the console.

^d Facebook and Twitter apps for Xbox 360 were retired in October 2012.[135]

Sales standings

Worldwide figures are based on data from the manufacturers. The Canada and the United States figures are based on data from the NPD Group, the Japan figures are based on data from *Famitsu*/Enterbrain, and the United Kingdom figures are based on data from GfK Chart-Track.

Region	Wii	PlayStation 3	Xbox 360	Total
Australia	2 million[136] (as of October 2010)	1.8 million[137] (as of December 31, 2010)	1.2 million[138] (as of April 20, 2010 and include sales from New Zealand)	4.2 million
Canada	2 million[139] (as of December 16, 2009)	2 million[140] (as of October 6, 2010)	870,000[141] (as of July 31, 2008)	4.4 million
Europe	25 million[142] (as of December 2010)	15.7 million[142] (as of December 2010)	13.7 million[142] (as of December 2010)	53.4 million
Japan	12.75 million[143] (as of December 31, 2013)	11 million[144] (as of April 11, 2010)	1.5 million[145] (as of February 28, 2010)	24.0 million
United States	39 million[146] (as of February 28, 2011)	16.9 million[142] (as of December 2010)	25.6 million[142] (as of December 2010)	79.8 million
Worldwide	**101.63 million[143] (as of June 30, 2017)**	**87.4 million[147] (as of March 31, 2017)**	**84 million[148][149] (as of June 9, 2017)**	**273.03 million**

Discontinuations and revisions

- The PlayStation 3 20 GB was discontinued in North America in April 2007[150] and effectively discontinued in Japan in early 2008.[151]
- The PlayStation 3 60 GB was discontinued in NTSC territories by September 2007, and replaced with the 80 GB version.[152]
- The PlayStation 3 60 GB was effectively discontinued for PAL territories in late 2007. When the remaining stock in stores was sold, the 40 GB version served as its replacement.
- Sony announced before the PS3 launch in Europe that the PlayStation 2's Emotion Engine CPU would be removed from it for cost savings, and all backward compatibility would be software-based.[153] This is also the same for the 80 GB model launched in the North American market in 2007.[154]
- An HDMI out port was added to the Premium Xbox 360 in May 2007.[155]
- The Xbox 360 Core system was discontinued and replaced by the "Arcade" version in October 2007.[156]
- The price of the Xbox 360 Premium version was dropped to US$299 in North America on July 13, 2008. Supplies of the existing 20 GB model were exhausted by early August and it was replaced by an identical model with a 60 GB HDD at a MSRP of US$349.[157]
- The PlayStation 3 40 GB was discontinued in all territories in early August 2008 and the new 80 GB version served as its replacement.
- The Xbox 360 Arcade 256 MB internal memory SKU was discontinued in all territories in early 2009 and a new 512 MB internal memory SKU still named the Xbox 360 Arcade was released.[158]
- The PlayStation 3 Slim was introduced on August 18, 2009. At US$299, it is US$100 cheaper than the previous model; it is also approximately $\frac{1}{3}$ lighter and more energy efficient.[159] The two original PS3 Slim models, priced at US$299.99 and US$349.99 respectively, hold 120/250 GB. These were then superseded by 160 GB and 320 GB models, which are priced at US$249.99 and US$299.99 respectively.
- The black Wii console was released in Japan on August 1, 2009[160] and in Europe in November 2009.[161]
- The Wii package for North America has been updated to include a copy of *Wii Sports Resort* as well as the required Wii MotionPlus accessory to play it, beginning May 9, 2010. The console is also available in black.[162]
- A special edition red Wii console was released in honor of *Super Mario Bros.* 25th Anniversary.
- The Xbox 360 S was announced at E3 2010 by Microsoft. It is a smaller revision of the Xbox 360 hardware, which includes either a built-in 250 GB hard drive or 4 GB of Flash storage, 802.11n Wi-Fi, a TOSLINK connector, 5 USB ports and an AUX connector for the Kinect sensor device.[163]
- The Wii Family Edition was released on October 23, 2011. It drops support for GameCube games and accessories, and is designed to sit horizontally.[107]
- The PlayStation 3 Super Slim was released on September 25, 2012.[164] It has manual sliding disc cover instead of a motorized loading slot disc cover.
- The Wii Mini was released on December 7, 2012.[86] It has a top-loading disc drive instead of a motorized loading slot disc drive and drops Wi-Fi support, online connectivity and the SD card slot.
- The Xbox 360 E was revealed and released at E3 2013 on June 10, 2013.[165] It featured a new slimmer design, that was quieter than previous models.

Backward compatibility

Early models of the Wii are fully backward compatible with GameCube software and most of its accessories; the Wii Family Edition and the Wii Mini iterations lack GameCube support.[107] Early models of the PlayStation 3 and all models of the Xbox 360 only offer partial support and use software emulation for backward compatibility. Later models of the PS3 do not offer PlayStation 2 compatibility, though PS1 compatibility is retained. Some models of the first generation of the PS3 offered full backward compatibility for PS2 games. The Xbox 360's compatibility is increased through game-specific patches automatically downloaded from Xbox Live or downloaded and burned to a CD or DVD from the Xbox website[166] and the PS3's compatibility is expanded with firmware updates.

All three consoles provide titles from older consoles for download; the Xbox 360 through the Xbox Originals service, the PlayStation 3 through the PlayStation Store, and the Wii through the Virtual Console. When purchased, the game is saved to console's internal memory or, optionally on the Wii, to an inserted SD/SDHC card. Initially the Xbox 360 also provided Xbox Live support for backward compatible games, but the service has since been discontinued for original Xbox games. No more games will be added to the list of backward compatible games for the Xbox 360. In response to the lack of backward compatibility for most PS3s, many popular games have been released for download as PlayStation 2 Classics and other popular series have been updated with gameplay/graphics as high-definition remasters for PlayStation consoles and have been released on Blu-ray Disc or are available for download on the PlayStation Network.

HDTV-capable video support and service

Both the PlayStation 3[167] and the Xbox 360[168] support 1080p high definition video output. However, the output signal may be protected by digital rights management and may require an HDCP-compliant display if HDMI is used. The Xbox Live Marketplace service and the PlayStation Store offer HD movies, TV shows, movie trailers, and clips for download to the console's HDD.[169][170] Other regional PlayStation Stores only allow download of movie trailers and short segment clips. As of November 2009, the Video Download service present on the American PlayStation Store will be available for select European countries.

While only a small number of games render video in native 1080p, many games can be automatically scaled to output this resolution. The Wii is capable of outputting 480p for the Wii Menu and most games through a component cable, which must be purchased separately.

Reliability

In the September 2009 issue of *Game Informer* magazine, survey results were published in which among nearly 5000 readers who responded, 54.2% of those who owned an Xbox 360 had experienced a console failure for that system, compared with 10.6% for PlayStation 3, and 6.8% for Wii.[171]

In August 2009, warranty provider SquareTrade published console failure rate estimates, in which the proportion of its customers reporting a system failure in the first two years is 23.7% for Xbox 360, 10.0% for PlayStation 3, and 2.7% for Wii.[172]

Other consoles

There were also other consoles released during the seventh generation time period. Generally, they are either niche products or less powerful.

Game Wave Family Entertainment System, commonly abbreviated as Game Wave. Released in October 2005.

HyperScan, created by Mattel. Released on October 23, 2006.

V.Flash, created by VTech. Released in September 2006.

V.Motion/V.Smile Motion, created by VTech. Released in September 2007.

Zeebo, designed for emerging countries. Released in 2009 in Mexico and Brazil only.

OnLive Game System. Released on November 17, 2010.

Sport Vii, often shortened to Vii, released in 2007 China, 2008 Japan.

Handheld systems

For video game handhelds, the seventh generation began with the release of the Nintendo DS on November 21, 2004. This handheld was based on a design fundamentally different from the Game Boy and other handheld video game systems. The Nintendo DS offered new modes of input over previous generations such as a touch screen, the ability to connect wirelessly using IEEE 802.11b, as well as a microphone to speak to in-game NPCs.[173] On December 12, 2004, Sony released its first handheld, PlayStation Portable. The PlayStation Portable was marketed at launch to an above-25-year-old[174] or "core gamer" market,[175] while the Nintendo DS proved to be popular with both core gamers and new customers.[176]

Nokia revived its N-Gage platform in the form of a service for selected S60 devices. This new service launched on April 3, 2008.[177] Other less-popular handheld systems released during this generation include the Gizmondo (launched on March 19, 2005, and discontinued in February 2006) and the GP2X (launched on November 10, 2005, and discontinued in August 2008). The GP2X Wiz, Pandora, and Gizmondo 2 were scheduled for release in 2009.

Another aspect of the seventh generation was the beginning of direct competition between dedicated handheld gaming devices, and increasingly powerful PDA/cell phone devices such as the iPhone and iPod Touch, and the latter being aggressively marketed for gaming purposes. Simple games such as Tetris and Solitaire had existed for PDA devices since their introduction, but by 2009 PDAs and phones had grown sufficiently powerful to where complex graphical games could be implemented, with the advantage of distribution over wireless broadband.

Sony announced in 2014 that they had discontinued the production of the PlayStation Portable worldwide.

Handheld game console comparison

Product line		Nintendo DS family		PlayStation Portable		
Console		Nintendo DS/ Nintendo DS Lite	Nintendo DSi/ Nintendo DSi XL	PSP	PSP Go	PSP Street
Logo		NINTENDO DS / NINTENDO DS lite	NINTENDO DSi / NINTENDO DSi XL	PSP PlayStation Portable		
Manufacturer		Nintendo		Sony (SCE)		
Image						
Release dates		**DS**: NA: November 21, 2004 JP: December 2, 2004 AU: February 24, 2005 EU: March 11, 2005 **DS Lite**: JP: March 21, 2006 AU: June 1, 2006 NA: June 11, 2006 EU: June 23, 2006	**DSi**: JP: November 1, 2008 AU: April 2, 2009 EU: April 3, 2009 NA: April 5, 2009 **DSi XL**: JP: November 21, 2009 EU: March 5, 2010 NA: March 28, 2010 AU: April 15, 2010	JP: December 12, 2004 NA: March 24, 2005 EU/AU: September 1, 2005	NA/EU: October 1, 2009 JP: November 1, 2009	PAL: July 20, 2012
Launch prices		**DS**: US$149.99 **DS Lite**: US$129.99	**DSi**: US$169.99 **DSi XL**: US$189.99	US$249.99		
Discontinuation		Yes; date undisclosed[178]		2014[179]		
Media	Type	Nintendo DS Game Card Game Boy Advance Game Pak	Nintendo DS Game Card	Universal Media Disc Digital distribution via PSN	Digital distribution via PSN	Universal Media Disc
	Regional lockout	Only for IQue DS Games	Only for DSiWare and DSi-enhanced/exclusive Game Cards	Unrestricted (Video discs are region locked)		
	Backward compatibility	Game Boy Advance	None	None		
Display		2 × 3 in (76 mm) TFT LCD, bottom with resistive touch	**DSi**: 2 × 3.25 in (83 mm) TFT LCD, bottom with resistive touch **DSi XL**: 2 × 4.2 in (110 mm) TFT LCD, bottom with resistive touch	4.3 in (110 mm) TFT LCD	3.8 in (97 mm) TFT LCD	4.3 in (110 mm) TFT LCD
Resolutions		256 × 192 (both screens)		480 × 272		
Color depth		18-bit		24-bit		
Best-selling game		*New Super Mario Bros.* (30.8 million)[180]		*Grand Theft Auto: Liberty City Stories* (2 million)[181]		
Accessories (retail)		▪ Rumble Pak ▪ Nintendo DS Headset ▪ Nintendo MP3 Player ▪ Nintendo DS Browser ▪ Nintendo DS Memory Expansion Pak ▪ Nintendo DS Digital TV Tuner ▪ More...		▪ PSP Camera attachment ▪ GPS attachment ▪ PSP Extended Battery Pack ▪ PSP Portable Travel Case ▪ LocationFree Player ▪ PSP Microphone ▪ PSP Media Manager ▪ PSP analog AV cable ▪ PSP component cable ▪ PSP USB cable		
CPU		67 MHz ARM9 and 33 MHz ARM7	133 MHz ARM9 and 33 MHz ARM7	MIPS R4000-based; clocked from 1 to 333 MHz (2 of these)		
Memory		4 MB SRAM	16 MB SRAM	**PSP-1000**: 32 MB EDRAM **PSP-2000/3000**: 64 MB EDRAM	64 MB EDRAM	
Interface		▪ D-pad ▪ Six face buttons ▪ Two shoulder buttons ▪ Touch screen ▪ Microphone	▪ D-pad ▪ Six face buttons ▪ Two shoulder buttons ▪ Touch screen ▪ Microphone ▪ 2 × cameras	▪ D-pad ▪ Six face buttons ▪ Two shoulder buttons ▪ "Home/PS" button ▪ Analog nub ▪ Microphone (PSP-3000 and PSP Go)		

Dimensions (H × W × D)	**DS**: 148.7 × 84.7 × 28.9 mm (5.85 × 3.33 × 1.14 in) **DS Lite**: 133 × 73.9 × 21.5 mm (5.24 × 2.91 × 0.85 in)	**DSi**: 137 × 74.9 × 18.9 mm (5.39 × 2.95 × 0.74 in) **DSi XL**: 161 × 91.4 × 21.2 mm (6.34 × 3.60 × 0.83 in)	**PSP 1000**: 74 × 170 × 23 mm (2.91 × 6.69 × 0.91 in) **PSP-2000/3000**: 71.4 × 169.4 × 18.6 mm (2.81 × 6.67 × 0.73 in)	69 × 128 × 16.5 mm (2.72 × 5.04 × 0.65 in)	73.4 × 172.4 × 21.6 mm (2.89 × 6.79 × 0.85 in)
Weight	**DS**: 275 g (9.7 oz) **DS Lite**: 218 g (7.7 oz)	**DSi**: 214 g (7.5 oz) **DSi XL**: 314 g (11.1 oz)	**PSP 1000**: 280 g (9.9 oz) **PSP-2000/3000** 189 g (6.7 oz)	158 g (5.6 oz)	189 g (6.7 oz)
Online service	Nintendo Wi-Fi Connection	Nintendo Wi-Fi Connection, DSi Shop	PlayStation Network, PlayStation Store		—
System software	Nintendo DS Menu	Nintendo DSi Menu	XrossMediaBar (XMB)		
Network	Wi-Fi (802.11b)	Wi-Fi (802.11b/g)	Wi-Fi (802.11b) IrDA (PSP-1000)	Wi-Fi (802.11b) Bluetooth	—
Audio	Stereo speakers, headphone jack, with 16 PCM/ADPCM channels		Stereo speakers, headphone jack		
I/O	1 Nintendo DS Game Card slot 1 GBA slot	1 Nintendo DS Game Card slot 1 SD (HC) card slot	UMD drive 1 USB device port (mini-b connector) 1 Memory Stick Duo/PRO Duo slot 1 IrDA (PSP-1000 series only)	1 USB device port (proprietary connector) 1 Memory Stick Micro (M2)	UMD drive 1 USB device port (mini-b connector) 1 Memory Stick Duo/PRO Duo slot
Storage	—	≤32 GB SD card 256 MB internal flash memory	≤32 GB Memory Stick Duo	≤32 GB Memory Stick Micro 16 GB internal flash memory	≤32 GB Memory Stick Duo
Lithium-ion battery	**DS**: 850 mAh, 6–10-hour life **DS Lite**: 1000 mAh, 15–19-hour life[182]	**DSi**: 840 mAh, 9–14 -hour life[182] **DSi XL**: 1050 mAh, 13–17-hour life	**PSP-1000**: 1800 mAh, 4–6-hour life **PSP-2000/3000**: 1200 mAh, 4–6-hour life	930 mAh, 3–6-hour life	900 mAh
Units sold (all models combined)	Worldwide: 154.02 million[143] Americas: 59.93 million Japan: 32.99 million Other: 61.10 million		Worldwide: 82 million[183] Japan: 11.08 million[184][185] U.S.: 10.47 million[186][187][188] Other: 60.45 million		

Note: First year of release is the first year of the system's worldwide availability.

Other handhelds

Gizmondo. Released on March 19, 2005.

GP2X. Released on November 10, 2005, in South Korea.

GP2X Wiz. May 13, 2009.

GP2X Caanoo. August 16, 2010.

Dingoo A320. Released in February 2009 in China only.

Pandora. Released in May 2010.

Software

Milestone titles

- The *Call of Duty* series by Activision (individual games by Treyarch and Infinity Ward) was immensely popular during the seventh generation, with the franchise popularizing online multiplayer on consoles along with its cinematic single-player campaigns.
- *Dark Souls* (PS3, 360, PC) by FromSoftware was one of the most influential games of its generation, receiving acclaim for its combat, atmosphere, and level design. It also proved that the Japanese game industry was still competitive at a time when Western games were generally considered superior.
- *Halo 3* (360) by Bungie and Microsoft Studios was immediately met with critical acclaim, and was the top selling video game of 2007.
- *LittleBigPlanet* and its sequel (PS3) by Media Molecule popularized user-generated content on consoles, and were additionally praised for their unique hand-made aesthetic.
- *Minecraft* (PC, 360, PS3, mobile) by Mojang Studios was critically acclaimed for the level of freedom it provided to players, and was also one of the first games to spread by word-of-mouth on social media.
- *Grand Theft Auto IV*, *Red Dead Redemption* and *Grand Theft Auto V* (PS3, Xbox 360, PC) by Rockstar Games were critically acclaimed for their story mode and expanded open world thanks to new graphics systems.
- *God of War III* (PS3, PS4) by Santa Monica Studio was acclaimed by critics and fans who claimed it was a perfect ending to a saga.
- *Super Meat Boy* (PS3, Xbox 360, PC) by Team Meat was highly acclaimed marking its name as a first indie game success.
- *Super Mario Galaxy* (Wii) by Nintendo became the third best-selling non-bundled Wii game on the console and became a critical and commercial darling upon its release in 2007.

See also

2000s portal

Video games portal

- 2000s in video games
- List of video game consoles

Notes

1. Japan was the last territory where Sony was still selling new PlayStation 3 units until May 29, 2017[62][63]

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Eighth generation of video game consoles

The **eighth generation of video game consoles** began in 2012, and consists of four home video game consoles: the Wii U released in 2012, the PlayStation 4 family in 2013, the Xbox One family in 2013, and the Nintendo Switch family in 2017.

The generation offered few signature hardware innovations. Sony and Microsoft continued to produce new systems with similar designs and capabilities as their predecessors, but with improved performance (processing speed, higher-resolution graphics, and increased storage capacity) that further moved consoles into confluence with personal computers, and furthering support for digital distribution and games as a service. Motion-controlled games of the seventh generation had waned in popularity, but consoles were preparing for advancement of virtual reality (VR), with Sony introducing the PlayStation VR in 2016.[1][2] Sony focused heavily on its first-party developers and console exclusives as key selling points, while Microsoft expanded its gaming services, creating the Xbox Game Pass subscription service for Xbox and Windows computers, and its xCloud game streaming service. Microsoft and Sony consoles saw mid-generation refreshes, with high-end revisions PlayStation 4 Pro and the Xbox One X, and lower-cost PlayStation 4 Slim and Xbox One S models that lacked some features. As of September 2023, the PlayStation 4 and Xbox One families had sold an estimated 117 and 58 million units, respectively.

Nintendo remained on a separate strategic path from Sony or Microsoft. The Wii U was designed to be a more robust Wii to appeal to dedicated gamers, but its means and intended use cases were lost in how it was marketed. The Wii U substantially undersold Nintendo's projections, selling only 13.5 million units by its discontinuation in 2017, which drove Nintendo to release the Nintendo Switch by 2017, its design and marketing accounting for several of the faults of the Wii U while meeting a broad range of global demographics and possible gaming configurations, including hybrid use between a home and handheld console. Later, Nintendo released the Nintendo Switch Lite, a version that lacked the Switch's docking capabilities but had other component optimizations and was otherwise compatible with all games, and the Nintendo Switch – OLED Model, a mid-lifetime refreshed model that featured an OLED screen with a built-in Ethernet port for a wired internet connection, though it did not introduce any performance improvements. By June 2025, all Switch models have shipped over 158.92 million units,[3] outselling the Wii and ranking third in all-time console sales.

Handheld consoles fought against increasing pressure of mobile gaming. The Nintendo 3DS and 2DS succeeded the Nintendo DS line, while the PlayStation Vita was the successor to the PlayStation Portable. Combined shipped units of the Nintendo 3DS/2DS family had reached 75 million by September 2019, but the Vita was estimated to have only sold about 10 million by the end of 2015. Sony discontinued the unit in 2019 and stated it had no present plans for handheld systems. Nintendo discontinued the Nintendo 3DS in 2020, ending the Nintendo DS families of systems. The Switch Lite acts as its de facto handheld successor.

The eighth-generation console market was also influenced by the lifting of China's ban on video game consoles in 2015, as well as the growth of the mobile gaming sector. A number of retro microconsoles were also released during this period.

In November 2020, Sony and Microsoft released the PlayStation 5 and Xbox Series X and Series S respectively. Considered to be their highly anticipated next-generation systems, they continue the trend from the eighth generation with overall general improved computational performance, graphical output, and strong backward compatibility support to minimize the disruption of upgrading to the new platform.

Background

This generation was predicted to face competition from smartphones, tablets, and smart TVs.[4][5][6][7][8][9] In 2013, gaming revenue on Android overtook portable game console revenue, while remaining a distant second to iOS gaming revenue.[10] In fiscal year (FY) 2013 (ending early 2013), Nintendo sold 23.7 million consoles,[11] while Apple sold 58.2 million iPads in FY 2012 (ending late 2012).[12] One particular threat to the traditional console game sales model has been the free-to-play model, wherein most users play free, and either a small number of dedicated players spend enough to cover the rest, or the game is supported by advertising.[13]

The PlayStation 4, Xbox One, and Wii U all use AMD GPUs, and two of them (PS4 and XBO) also use AMD CPUs on an x86-64 architecture, similar to common personal computers (as opposed to the IBM PowerPC Architecture used in the previous generation). Microsoft, Nintendo, and Sony were not aware that they were all using AMD hardware until their consoles were announced.[14] This shift was considered to be beneficial for multi-platform development, due to the increased similarities between PC hardware and console hardware. It also provided a boost in market share for AMD (which had faced increased competition from Intel in the PC market).[15]

Various microconsoles (which are smaller and mostly Android-based) have been released since 2012, although they are seldom referred to as being part of the eighth (or any) generation of video game consoles. These microconsoles have included the Ouya, Nvidia Shield Console, Amazon Fire TV, PlayStation TV, MOJO, Razer Switchblade, GamePop, GameStick, and PC-based Steam Machine consoles.[16][17][18] A number of microconsoles that were modeled as scaled-down versions of consoles from previous generations, running a selection of games from that console, were also released. These included the NES Classic Edition, the SNES Classic Edition, the PlayStation Classic, and the Sega Genesis Mini.

Cloud gaming options for the consoles also were developed in the eighth generation. PlayStation Now enables cloud gaming of PlayStation 2, 3, and 4 games to current PlayStation consoles and personal computers. Microsoft began developing a comparable service xCloud for Xbox and Windows games. Google released Stadia, a dedicated cloud gaming platform designed around reduced latency and advanced features not typical of these other cloud gaming options.

Transition

While earlier console generations generally lasted five to six years, the shift from seventh to eighth generation lasted about eight.[19] Unusually, the prior generation's best-selling unit, the Wii, was the first to be replaced in the eighth generation.[19] In 2011, Microsoft and Sony officials said they considered themselves only halfway through a ten-year lifecycle for their seventh-generation offerings.[20][21][22][23] The companies also said the addition of cameras and motion-based controllers like Xbox's Kinect and PlayStation Move extended these systems' lifetimes.[24] Nintendo president Satoru Iwata said that his company would release the Wii U due to declining sales of seventh-generation home consoles and that "the market is now waiting for a new proposal for home consoles".[25] Sony considered making its next console a digital download-only machine, but decided against it due to concerns about the inconsistency of internet speeds available globally, especially in developing countries.[26]

The introduction of the high-end PlayStation 4 Pro and Xbox One X in 2016 and 2017, respectively, led to some journalists to call these machines part of a "half generation" step within the 8th generation, new consoles that would continue to drive sales without introducing a significantly different line of hardware that would segment their consumer base.[27][28]

In 2020, Microsoft and Sony released their 9th-generation consoles: Xbox Series X and PlayStation 5. Both said they wanted a soft transition, meaning that the new hardware plays most or all of the platform's previous games.[29][30][31][32] Microsoft said Xbox Series X can play all Xbox One games, including games from the Xbox 360 and original Xbox console that are playable on the Xbox One, and introduced its Smart Delivery program to update some Xbox One games to enable play on the Xbox Series X. Sony has said the "overwhelming majority" of PlayStation 4 games play on the PlayStation 5, and that many run at higher frame rates and resolutions.[33]

Chinese market

The eighth generation of consoles also saw manufacturers re-enter the Chinese market. Since 2000, the Chinese government had banned the sale and distribution of video game consoles, citing concerns on their effect on youth. The ban led console gaming to a niche sector, including a black market for the purchase of these consoles, while also causing personal computing gaming to take off within China, including the spread of Internet cafes and PC bangs.[34] This ban lasted through January 2014, where the Chinese government first opened up to allow the sale of consoles in the Shanghai Free-Trade Zone (FTZ).[35] By July 2015, the ban on video game consoles was wholly lifted.[36] Access to the Chinese video game market is lucrative, having an estimated 500 million potential players[37] and representing over US$24 billion in revenues as of 2016.[38]

Microsoft and Sony quickly took advantage of the lifting of the ban, announcing sales of the Xbox One and PlayStation 4 platforms within the FTZ shortly after the 2014 announcement. Microsoft established a partnership with BesTV New Media Co, a subsidiary of the Shanghai Media Group, to sell Xbox One units in China,[39] with units first shipping by September 2014.[40] Sony worked with Shanghai Oriental Pearl Media in May 2014 to establish manufacturing in the FTZ,[37] with the PlayStation 4 and PlayStation Vita shipping into China by March 2015.[41] CEO of Sony Computer Entertainment Andrew House explained in September 2013 that the company intended to use the PlayStation Vita TV as a low-cost alternative for consumers in an attempt to penetrate the Chinese gaming market.[42]

Nintendo did not initially seek to bring the Wii U into China; Nintendo of America president Reggie Fils-Aimé stated that China was of interest to the company after the ban was lifted, but considered that there were similar difficulties with establishing sales there as they had recently had with Brazil.[43] Later, Nintendo had teamed up with Tencent by April 2019 to help sell and distribute the Nintendo Switch as well as aid its games through the Chinese government approval process led by National Radio and Television Administration.[44][45]

Home consoles

Wii U

In November 2010, Nintendo of America CEO Reggie Fils-Aimé stated that the release of the next generation of Nintendo would be determined by the continued success of the Wii.[46] Nintendo announced its successor to the Wii, the Wii U, at the Electronic Entertainment Expo 2011 on June 7, 2011.[47] After the announcement, several journalists classified the system as the first eighth generation home console.[19][48][49] However, prominent sources have disputed this because of its comparative lack of power and older disc media type with respect to the announced specifications for PlayStation 4 and the Xbox One.[50][51]

The Wii U's main controller, the Wii U GamePad, features an embedded touchscreen that can work as an auxiliary interactive screen in a fashion similar to the Nintendo DS/3DS, or if compatible with "Off TV Play", can even act as the main screen itself, enabling games to be played without the need of a television. The Wii U is compatible with its predecessor's peripherals, such as the Wii Remote Plus, the Nunchuk, and the Wii Balance Board.[52]

The Wii U was released in North America on November 18, 2012, in Europe on November 30, 2012, and in Japan on December 8, 2012. It came in two versions, the white *Basic Model* and the black *Deluxe/Premium Model*, at the price of $299 and $349 US Dollars, respectively. On August 28, 2013, Nintendo announced the production of the Basic model has ended and expected supplies to be exhausted by September 20, 2013. On October 4, 2013, the Deluxe/Premium model was price cut from US$349 to US$299.[53]

The Wii U was initially expected to have lifetime sales of about over 100 million, comparable to the Wii.[54] However, it only managed to have lifetime sales of about only 13 million, in sharp contrast with the Wii. This financially hurt Nintendo, with several financial quarters running at a loss through 2014. Nintendo had anticipated the Wii U would sell similarly to the Wii, but it ended up selling worse than the GameCube and became Nintendo's least successful home console to date.[55] Nintendo officially discontinued the Wii U on January 31, 2017, due to its commercial failure, to make way for its second competitor, the Nintendo Switch, released one month later.[56]

PlayStation 4

On February 20, 2013, Sony announced the PlayStation 4 during a press conference in New York City. The console places an emphasis on features surrounding social interaction. Gameplay videos can be shared via the PlayStation Network and other services. Users can stream games being played by themselves or others (either through the console, or directly to Twitch). The DualShock 4 is similar to the previous DualShock 3 controller with the addition of a touchpad and a "Share" button along with a Light-emitting diode bar on the front to allow motion tracking. The PlayStation Camera camera accessory is offered for the system, with stereo camera lenses up to 1280×800px resolution with support for depth sensing similar to Microsoft's Kinect. It also remains compatible with the PlayStation Move peripherals. Second screen capabilities are available through mobile apps and the PlayStation Vita, as well as cloud gaming streaming through the Gaikai service.[57][58]

The PlayStation 4 was released on November 15, 2013, in North America and November 29, 2013, in Australia and Europe at US$399.99, A$549 and €399 respectively.

Xbox One

On May 21, 2013, Microsoft announced the Xbox One at an event in Redmond, Washington. The console focuses on entertainment, including the ability to pass television programming from a set-top box over HDMI and use a built-in electronic program guide, and the ability for computer multitasking by snapping applications (such as Skype and Internet Explorer) to the side of the screen, similarly to Windows 8. The controller has "Impulse Triggers" that provide Haptic technology feedback, and the ability to automatically record and save highlights from gameplay. An updated version of Kinect was developed with a 1080p camera and expanded voice controls. Originally bundled with the console it has since been excluded.[59][60]

The Xbox One was released in North America, Europe, and Australia on November 22, 2013, at a launch price of US$499.99, €499 and A$599 respectively with Japan, and was later released in 26 other markets in 2014. It had two mid-generation upgrades, one cheaper option released in 2016 called the Xbox One S, and the other called the Xbox One X which added 4K gaming. Microsoft claimed that the Xbox One X was the "World's most powerful console" and 40% more powerful than any other console at the time of its release.

Production of the Xbox One family of consoles were discontinued shortly after the launch of their successor, the Xbox Series X and S, at the end of 2020.[61]

Nintendo Switch

Due to the commercial failure of the Wii U, along with competition from mobile gaming, then-president Satoru Iwata sought to revitalize the company by creating a new strategy for Nintendo that included embracing mobile gaming, and developing new hardware that would be attractive to a wider range of audiences.[62] The hardware product was announced under the codename NX in a press conference held with DeNA on March 17, 2015,[63] and fully revealed as the Nintendo Switch on October 20, 2016. It was released worldwide on March 3, 2017, competing with the Xbox One and PlayStation 4.

The Switch is considered by Nintendo a home console that has multiple ways to play. The main unit, the Console, is a tablet-sized device with a touch-sensitive screen. It can be inserted into a Docking Station which allows games to be played on a connected television. Alternatively, two Joy-Con, motion-sensitive controllers comparable to the Wii Remotes, can be slotted onto the sides of the Console so the unit can be played as a handheld. Further, the Console can be set on a kickstand, allowing multiple players to see the screen and play games with separate Joy-Con. Additionally, Nintendo built the Switch on standard industry components, allowing for ease of porting games onto the system using standard software libraries and game engines rather than Nintendo's usual proprietary approaches. This enabled them to bring several third-party and independent game developers on board prior to launch to assure some third-party games in their software library.

Despite the Switch being significantly weaker in terms of processing power than its competitors, it was met with critical praise and commercial success. Nintendo had anticipated selling about 10 million Switches in the first year of release but ended up exceeding this projection with total first-year sales of over 17 million units, exceeding the Wii U's lifetime sales. In late 2017, the Nintendo Switch was the fastest selling console in US history, and in November 2018 it was the fastest selling of all the 8th generation consoles in the US.[64]

A hardware revision, the Switch Lite, was announced on July 10, 2019, and was released on September 20, 2019. The unit integrates the Joy-Con onto the main console with a smaller form-factor, making the unit strictly handheld rather than a hybrid system. Further details are described below under Handhelds. A refreshed model, the Nintendo Switch – OLED Model, was announced on July 6, 2021, and was released on October 8, 2021, featuring a 7-inch OLED screen, a wider and adjustable stand, enhanced audio, a wired LAN port built into the dock, and 64 GB of internal storage.

Comparison

This table lists all major consoles and subsequent mid-generation releases, and does not include minor revisions or hardware changes, such as the "slim" revision of the PlayStation 4.

Comparison of eighth-generation video game home consoles

Console		Wii U	Nintendo Switch	Nintendo Switch – OLED Model	PlayStation 4	PlayStation 4 Pro	Xbox One	Xbox One S	Xbox One X
Logo									
Manufacturer		Nintendo			Sony Interactive		Microsoft		
Image									
Release dates		NA: November 18, 2012 EU: November 30, 2012 AU: November 30, 2012 JP: December 8, 2012	WW: March 3, 2017[65]	WW: October 8, 2021	PlayStation 4 NA: November 15, 2013 EU: November 29, 2013 AU: November 29, 2013 JP: February 22, 2014 PlayStation 4 Slim WW: September 15, 2016[66]	WW: November 10, 2016[67]	NA: November 22, 2013 EU: November 22, 2013 (select countries only)[68] AU: November 22, 2013 JP: September 4, 2014[69]	NA: August 2, 2016 (select countries only) EU: August 2, 2016 (select countries only) AU: August 2, 2016 JP: November 24, 2016 WW: April 16, 2019 (all digital edition)	WW: November 7, 2017 [70]
Launch prices	US$	US$299.99 (equivalent to $420 in 2025)[a]	US$299.99 (equivalent to $390 in 2025)[65]	US$349.99 (equivalent to $420 in 2025)	PlayStation 4 US$399.99 (equivalent to $550 in 2025)[71] PlayStation 4 Slim US$299.00 (equivalent to $400 in 2025)	US$399.00 (equivalent to $540 in 2025)[67]	US$499.99 (equivalent to $690 in 2025)	US$299.00 (equivalent to $400 in 2025)	US$499.99 (equivalent to $660 in 2025)
	€	Set by retailers	€320 (equivalent to €400 in 2023)	€349 (equivalent to €420 in 2023)	PlayStation 4 €399.00 (equivalent to €490 in 2023)[71] PlayStation 4 Slim €299.99 (equivalent to €370 in 2023)[72]	€399.99 (equivalent to €490 in 2023)[72]	€499 (equivalent to €620 in 2023)	€299 (equivalent to €370 in 2023)[73]	€499.99 (equivalent to €610 in 2023)[74]
	GBP	Set by retailers	£279.99 (equivalent to £370 in 2025)[65]	£309.99 (equivalent to £380 in 2025)	PlayStation 4 £349.00 (equivalent to £490 in 2025)[71]	£345.00 (equivalent to £470 in 2025)[67]	£429.00 (equivalent to £600 in 2025)	£249 (equivalent to £340 in 2025)[73]	
	A$	A$348.00 (equivalent to $440 in 2022)	A$469.95 (equivalent to $540 in 2022)[65]	A$540.00 (equivalent to $580 in 2022)	PlayStation 4 A$549.00 (equivalent to $680 in 2022)[71]	A$560.00 (equivalent to $650 in 2022)[67]	A$599.00 (equivalent to $740 in 2022)		

	JP¥	¥26,250 (equivalent to ¥30,120 in 2024)	¥29,980 (equivalent to ¥33,140 in 2024)[65]	¥52,500 (equivalent to ¥57,090 in 2024)	PlayStation 4 ¥41,979 (equivalent to ¥47,740 in 2024)				
Current prices	**US$**	Discontinued	US$339.99[75]	US$399.99[75]	Same as launch prices	Discontinued	Discontinued		
	€		Same as launch prices						
	GBP								
	A$								
	JP¥								
Discontinued		January 31, 2017[76]	In production		In production	Japan: January 5, 2021[77]	August 25, 2017[78]	Q4 2020 (All-Digital version discontinued July 16, 2020)[61]	July 16, 2020[79]
Sales	**Shipped**	13.56 million (as of December 31, 2018)[80]	153.10 million (all models)[b] (as of June 30, 2025)[81]		117.2 million (as of March 31, 2022)[82]		58 million (as of June 30, 2023)[83]		
	Sold	Not reported	Not reported		>113.5 million (as of September 30, 2020)[84]				
	Best-selling game	*Mario Kart 8*, 8.46 million (as of March 31, 2022)[85]	*Mario Kart 8 Deluxe*, 48.41 million (as of September 30, 2022)[86]		*God of War* (2018), 19.50 million (as of February 3, 2022)[87]		*PlayerUnknown's Battlegrounds*, 8.00 million (as of July 2018)[88]		
		List of best-selling Wii U video games	List of best-selling Nintendo Switch video games		List of best-selling PlayStation 4 video games		List of best-selling Xbox One video games		
Media	**Game media**	Wii U Optical Disc (25 GB) (5x CAV)[89]	Nintendo Switch game card (1-32 GB)[90]		Blu-ray (25/50 GB) (6x CAV)[91]		Blu-ray (25/50/66/100 GB)		
	Other	Wii Optical Disc (4.7/8.5 GB) (6x CAV)	—		Blu-ray, DVD		Blu-ray, DVD, CD	Ultra HD Blu-ray, Blu-ray, DVD, CD[92]	
	Regional lockout	Region locked[93]	Unrestricted		Almost fully[94] Only DLC is region locked[95]		Unrestricted[96][97]		
	Backward compatibility	Wii[c]	Partial[d]		Partial[e]		Partial[f]		
CPU	**Type**	Tri-Core IBM PowerPC Espresso[102]	Quad-core ARM Cortex-A57, quad-core ARM Cortex-A53[g][103]		Octa-core AMD Jaguar-based[g][104]	Octa-core AMD Jaguar-based[g]	Octa-core AMD Jaguar-based[g][105]		Octa-core AMD Jaguar-based[g][106]
	ISA	PowerPC	ARMv8-A		x86-64				
	Clock speed	1.24 GHz	1.02 GHz		1.60 GHz	2.13 GHz	1.75 GHz		2.30 GHz
	L1 cache	192 kB[h]	576 kB[i]		512 kB[h]		512 kB[h]		
	L2 cache	3 MB eDRAM @ 1.24 GHz (CPU) (159.1 GB/s)[j]	2.5 MB[k]		4 MB[l][107]		4 MB[l][108]		
	L3 cache	32 MB eDRAM @ 550 MHz (70.4 GB/s)[m][109]	—		—		32 MB eSRAM @ 853 MHz (204 GB/s)[n][110]	32 MB eSRAM @ 914 MHz (219 GB/s)[n][110]	—[111]

		3 MB eSRAM[o]							
	Process	45 nm	20 nm[p]	16 nm	PlayStation 4 28 nm PlayStation 4 Slim 16 nm	16 nm[112][113]	28 nm	16 nm	
	Secondary	ARM9 processor (for background tasks)	—		ARM processor (for background tasks)[114]	—	—		
GPU	**Type**	AMD Radeon-based "Latte"[115][116]	Nvidia GM20B Maxwell-based[117][118]		AMD Radeon-based "Liverpool"	AMD Radeon-based "Neo"[119]	AMD Radeon-based "Durango"		AMD Radeon-based "Scorpio Engine"
	Clock speed	550 MHz[116]	307.2-768 MHz[q][120]	800 MHz	800 MHz	911 MHz[119]	853 MHz	914 MHz	1,172 MHz[121]
	Stream processors	320[51][116]	256[118]		1152	2304[119]	768[122][123]		2560[124][121]
	TFLOP/s	0.352[116]	0.157-0.393[q][120]		1.843	4.198[119]	1.310	1.404	6.001[121]
	TMUs	16[116]	16[118]		72	144[119]	48		160[121]
	Texture rate	8.8 GTexel/s[116]	4.9-12.3 GTexel/s		57.6 GTexel/s	131.2 GTexel/s[119]	40.9 GTexel/s[125]	43.8 GTexel/s	187.5 GTexel/s[121]
	ROPs	8[116]	16[118]		32	64[119]	16		32[121]
	Pixel rate	4.4 GPixel/s[126][116]	4.9-12.3 GPixel/s		25.6 GPixel/s[127]	29.15 GPixel/s[119]	13.6 GPixel/s[125]	14.6 GPixel/s	37.5 GPixel/s[121]
	Compute units	5[116]	2[118]		18	36[119]	12		40[121]
	Process	40 nm[116]	20 nm[118]		PlayStation 4 28 nm PlayStation 4 Slim 16 nm	16 nm[119]	28 nm	16 nm[121]	
Memory	**Main**	2 GB DDR3 SDRAM[128]	4 GB LPDDR4 SDRAM[129]		8 GB GDDR5 SDRAM[108]	8 GB GDDR5 SDRAM	8 GB DDR3 SDRAM[108]		12 GB GDDR5 SDRAM
	Clock speed	800 MHz (1600 MHz effective)	1600 MHz (3200 MHz effective)	1700 MHz (6800 MHz effective)	1375 MHz (5500 MHz effective)	1700 MHz (6800 MHz effective)	1066.5 MHz (2133 MHz effective)		1700 MHz (6800 MHz effective)
	Bandwidth	12.8 GB/s	25.6 GB/s		176.0 GB/s	217.6 GB/s	68.3 GB/s		326.4 GB/s
	Reserved	1 GB[130]	1 GB		3.5 GB[131]		3 GB[132]		
	Secondary	—	—		256 MB DDR3 RAM[114]	1 GB DDR3 RAM	—		
Storage	**Internal**	8 GB/32 GB eMMC flash memory (non-replaceable) 1 GB flash memory (reserved for the OS)	32 GB eMMC NAND flash memory (non-replaceable)[117]	64 GB eMMC NAND flash memory (non-replaceable)	500 GB HDD or 1 TB HDD (user replaceable)[133][134]	1 TB HDD or 2 TB (user replaceable)	500 GB HDD, 1 TB HDD (non-replaceable)[135] 8 GB flash memory (reserved for the OS)[125]	500 GB HDD, 1 TB HDD, 2 TB HDD (non-replaceable) 8 GB flash memory (reserved for the OS)	1 TB HDD, (non-replaceable) 8 GB flash memory (reserved for the OS)
	External	Supports up to 32 GB SDHC cards Supports up to 2 TB USB HDD (*Wii U Mode* only)[136]	Supports microSD/microSDHC/microSDXC up to 2 TB[137]		Supports USB HDD over 240 GB up to 8 TB (with System Software 4.50 or higher)[138]		Supports USB 3.0 HDD larger than 256 GB up to 16 TB[139][140]		

	Game Installation	Only downloaded games can be installed to storage	Downloaded games can be installed to internal memory or SD card		All games must be installed to a connected HDD[141]		All games must be installed to a connected HDD		
Network	**Wireless**	▪ 802.11 a/b/g/n Wi-Fi @ 2.4 GHz ▪ 802.11n Wi-Fi @ 5.0 GHz[r]	802.11 a/b/g/n/ac Wi-Fi @ 2.4 and 5.0 GHz[137]		PlayStation 4 802.11b/g/n Wi-Fi @ 2.4 GHz[142] PlayStation 4 Slim 802.11b/g/n/ac Wi-Fi @ 2.4 GHz	802.11a/b/g/n/ac Wi-Fi 2.4 GHz/5 GHz[143]	802.11a/b/g/n dual-band Wi-Fi @ 2.4 GHz and 5.0 GHz[144]	802.11a/b/g/n/ac dual-band Wi-Fi @ 2.4 GHz and 5.0 GHz[145]	
	Wired	Fast Ethernet[s]	Fast Ethernet[t]	Gigabit Ethernet	Gigabit Ethernet		Gigabit Ethernet		
Dimensions		When lying down on its side: **Width:** 172 mm (6.7 in) **Height:** 46 mm (1.8 in) **Length:** 268.5 mm (10.5 in) (can be oriented vertically using a stand)	Console laying flat: **Width:** 102 mm (4.0 in) **Height:** 13.9 mm (0.55 in) **Length:** 203.1 mm (8.00 in) (Console only) 239 mm (9.4 in) (Joy-Con attached) (must be oriented vertically)	Console laying flat: **Width:** 102 mm (4.0 in) **Height:** 13.9 mm (0.55 in) **Length:** 203.1 mm (8.00 in) (Console only) 239 mm (9.4 in) (Joy-Con attached) (must be oriented vertically)	PlayStation 4 When lying down on its side: **Width:** 275 mm (10.8 in) **Height:** 53 mm (2.0 in) **Length:** 305 mm (12.0 in) (can be oriented vertically using a stand) PlayStation 4 Slim When lying down on its side: **Width:** 265 mm (10.4 in) **Height:** 39 mm (1.5 in) **Length:** 288 mm (11.3 in) (can be oriented vertically using a stand)	When lying down on its side: **Width:** 295 mm (11.6 in) **Height:** 55 mm (2.2 in) **Length:** 327 mm (12.9 in) (can be oriented vertically using a stand)[143]	When lying down on its side: **Width:** 309 mm (12.1 in) **Height:** 83 mm (3.2 in) **Length:** 258 mm (10.1 in) (must be oriented horizontally)[146]	When lying down on its side: **Width:** 295 mm (11.6 in) **Height:** 64 mm (2.5 in) **Length:** 227 mm (8.9 in) (can be oriented vertically using a stand)[92]	When lying down on its side: **Width:** 300 mm (11.8 in) **Height:** 60 mm (2.4 in) **Length:** 240 mm (9.4 in) (can be oriented vertically using a stand)[106][147]
Weight		1.5 kg (3.3 lb)	0.297 kg (0.65 lb) (Console only) 0.398 kg (0.88 lb) (Joy-Con attached)	0.319 kg (0.70 lb) (Console only) 0.420 kg (0.93 lb) (Joy-Con attached)	PlayStation 4 2.8 kg (6.2 lb) PlayStation 4 Slim 2.1 kg (4.6 lb)	3.3 kg (7.3 lb)[143]	3.2 kg (7.1 lb)	2.9 kg (6.4 lb)[92]	3.8 kg (8.4 lb)[106]
Power		75 W (external power supply)[148]	4,310 mAh, 3.7 V lithium-ion battery Max. 39 W (external power supply)		PlayStation 4 Max. 223 W (internal power supply) PlayStation 4 Slim Max. 163 W (internal power supply)	Max. 289 W (internal power supply)[143] (PSU) Max. 310 W (internal power supply)[143] (Product Page)	Max. 220 W (external power supply)	Max. 125 W (internal power supply)	Max. 245 W (internal power supply)[106]
Included accessories		**All Models** ▪ Wii U GamePad ▪ Stylus ▪ Wii Sensor Bar ▪ HDMI cable	▪ Two Joy-Con controllers (L and R) ▪ Two Joy-Con straps ▪ Joy-Con Grip ▪ Switch Dock ▪ HDMI cable		▪ DualShock 4 controller ▪ Micro-USB cable (for charging DualShock 4) ▪ Wired mono headset ▪ HDMI cable		▪ Xbox Wireless Controller ▪ Kinect sensor (in some bundles)	▪ Xbox Wireless Controller ▪ Wired mono headset ▪ HDMI cable	

		Deluxe/Premium Model only ▪ Wii U GamePad stand ▪ Wii U GamePad charging cradle ▪ Wii U console stand					▪ Wired mono headset ▪ HDMI cable	
Video	**Output**	1080p, 1080i, 720p, 480p ▪ HDMI out 1.4b ▪ Component video ▪ YP_BP_R (D-Terminal out Japan only) 576i, 480i (standard 4:3 and 16:9 anamorphic widescreen) ▪ Composite video ▪ S-Video (NTSC consoles only) ▪ RGB SCART (PAL consoles only) ▪ D-Terminal (Japanese consoles only)	720p (undocked)[137] ▪ Via 6.2-inch, 1280 × 720p LCD screen @ 237 ppi 1080p, 720p and 480p (docked) ▪ HDMI out 1.4b	720p (undocked) ▪ Via 7-inch, 1280 × 720p OLED screen @ 210 ppi 1080p, 720p and 480p (docked) ▪ HDMI out 2.0a	1080p, 1080i, 720p, and 480p ▪ HDR10 ▪ HDMI out 1.4b	4K 2160p, 1080p, 1080i, 720p, and 480p ▪ HDR10 ▪ HDMI out 2.0a	1080p, 720p, and 480p[149][150] ▪ HDMI in/out 1.4b	4K 2160p, 1440p, 1080p, 720p, and 480p[106][149][151] ▪ HDR10 ▪ Dolby Vision ▪ HDMI out 2.0a (Xbox One S) ▪ HDMI out 2.0b (Xbox One X) ▪ HDMI in 1.4b ▪ AMD FreeSync support
	Integrated 3DTV support	Yes	No		Yes		Yes[152]	
	Second screen	Wii U GamePad (bundled with console)	—		PlayStation Vita PlayStation App on iOS and Android devices		Xbox Console Companion on Android, iOS, Windows 8, Windows 8.1, Windows 10, Windows Phone	
	Remote	Local game streaming via Off-TV Play to Wii U GamePad for some games	—		Local and remote game streaming via Remote Play to PS Vita, macOS and Windows, or selected Sony Xperia smartphone[153] for all games, except those that require the PS Camera or PS Move[154][155]		Local game streaming via Xbox App to Windows 10 PC[156]	
Audio		▪ 5.1 LPCM output via HDMI ▪ Analog stereo via "AV Multi Out" port ▪ Stereo speakers on Wii U GamePad ▪ Stereo output via 3.5mm jack on Wii U GamePad	▪ 5.1 LPCM output via HDMI ▪ Stereo speakers on Console ▪ Stereo output via 3.5mm jack on Console[137]		▪ 7.1 LPCM and bitstreaming output via HDMI ▪ 5.1 LPCM and bitstreaming output via optical out ▪ Stereo output via 3.5mm jack on DualShock 4 ▪ Mono speaker on DualShock 4		▪ 7.1 LPCM and bitstreaming output via HDMI ▪ 2.0 LPCM and bitstreaming output via optical out ▪ Internal system speaker[157] ▪ Stereo output via extension port on controller (requires adapter for 3.5 mm jacks) and via 3.5 mm jack port (present only on 2nd and 3rd controller revisions)	
Peripheral abilities		▪ Bluetooth 4.0 ▪ HDMI (1 out port)	▪ Bluetooth 4.1 ▪ HDMI (1 out port on dock)	▪ Bluetooth 4.1 ▪ HDMI (1 out port on dock)	▪ Bluetooth 2.1 + EDR	▪ Bluetooth 4.0 (LE)[143]	▪ Wi-Fi Direct	▪ IR Blaster

		▪ "AV Multi Out" port ▪ 4 USB 2.0 ports (2 at front of console, 2 at rear) ▪ Sensor Bar power port ▪ Near Field Communication (NFC)	▪ 1 USB 3.0 port (on dock) ▪ 2 USB 2.0 ports (on dock) ▪ 1 USB-C port (on Console) ▪ Near Field Communication (NFC)	▪ 1 LAN port (on dock) ▪ 2 USB 2.0 ports (on dock) ▪ 1 USB-C port (on Console) ▪ Near Field Communication (NFC)[137]	(PlayStation 4) or Bluetooth 4.0 (LE) (PlayStation 4 Slim) ▪ HDMI (1 out port) ▪ 2 USB 3.0 ports (at front of console) ▪ PS Camera AUX port ▪ Optical out port ▪ Ethernet port	▪ HDMI (1 out port) ▪ 3 USB 3.1 (gen 1) ports[143] ▪ PS Camera AUX port ▪ Optical out port ▪ Ethernet port	▪ 2 HDMI (1 in port and 1 out port)[158] ▪ 3 USB 3.0 ports (1 at side of console, 2 at rear) ▪ Kinect port ▪ Optical out port ▪ Ethernet port	▪ Bluetooth 4.0[159] ▪ 2 HDMI (1 in port and 1 out port)[92] ▪ 3 USB 3.0 ports (1 at front of console, 2 at rear) ▪ Optical out port ▪ S/PDIF ▪ Ethernet port

Controller		▪ Wii U GamePad
		▪ Wii U Pro Controller (up to 7)
		▪ Wii Remote/Plus (up to 7)
		  ▪ Nunchuk attachment
		  ▪ Classic Controller attachment
		▪ Wii Balance Board
		▪ Nintendo 3DS (select games only)
		▪ Nintendo GameCube controller (adapter required, only supports *Super Smash Bros. for Wii U*)[160]
			▪ Joy-Con controller (up to 8)
			▪ Nintendo Switch Pro Controller (up to 8)[161]
			▪ Nintendo GameCube controller (since version 4.0, adapter required)
					▪ DualShock 4 controller (up to 4)
					▪ PlayStation Move
					▪ PlayStation Camera
					▪ PlayStation Vita (select games only)[162]
							▪ Xbox Wireless Controller (up to 8)
							▪ Xbox Series X controller
							▪ Kinect
							▪ Computer mouse (select games only)
							▪ Computer keyboard (select games only)
							▪ Amazon Alexa (voice controls only)	

Touch capability		Wii U GamePad includes an integrated resistive touchscreen	Console includes multi-touch capacitive touchscreen[137]		DualShock 4 controller includes an integrated 2 point capacitive touchpad		—	
Camera		Wii U GamePad camera (bundled with all consoles)	—		PlayStation Camera		Kinect	Kinect (adapter required to use)[163]
Online services	**Network**	Nintendo Network ▪ Nintendo eShop ▪ Miiverse (discontinued) ▪ Nintendo TVii (discontinued)	Nintendo Switch Online ▪ Nintendo eShop		PlayStation Network ▪ PlayStation Store ▪ PlayStation Now ▪ PlayStation Music ▪ PlayStation Video ▪ PlayMemories Online ▪ PlayStation Vue		Xbox Live ▪ Microsoft Store ▪ Microsoft Movies & TV	
	Downloads	Downloads games and automatic updates in the background via SpotPass	Downloads automatic updates in the background		Downloads games and automatic updates in the background		Downloads games and automatic updates in the background[164]	
	Subscription	Free	Paid Nintendo Switch Online subscription required for online multiplayer, except for free-to-play titles[165]		Paid PlayStation Plus subscription required for online multiplayer and cloud saves except for free-to-play titles[166][167]		Paid Xbox Live Gold subscription required for online multiplayer, except for free-to-play titles free cloud saves[168]	

Game DVR	**Image**	Screenshots with Miiverse integration (can be shared to Facebook, Twitter, Google Plus and Tumblr)	Screenshots with Facebook and Twitter integration[169]	Screenshots with Twitter integration	Screenshots with Twitter integration
	Video	Gameplay replays with YouTube integration (select games only)	Up to 30 seconds of gameplay with Facebook and Twitter integration[170][171]	Up to 1 hour of gameplay with Dailymotion, Facebook, Twitter and YouTube integration; 720p for all PS4 models, 1080p for PS4 Pro	Up to 5 minutes of gameplay; 1080p for all Xbox One models,[172] 4K for Xbox One X (external storage required)[173]
	Live streaming	—	—	Live streaming with Dailymotion, Twitch, Ustream and YouTube Gaming integration	Live streaming with Mixer and Twitch integration
		Free	Free	Free	Paid subscription to Xbox Live Gold required[174]
List of games		List of Wii U games	List of Nintendo Switch games	List of PlayStation 4 games	List of Xbox One games
System software	**OS**	Wii U system software	Nintendo Switch system software	PlayStation 4 system software	Xbox One system software
	Updates	Updates are downloaded and installed automatically in Standby Mode	Automatic updates can be enabled by turning on Automatic Software Updates in System Settings[175]	Updates are downloaded and installed automatically in Rest Mode	Updates are downloaded and installed automatically in Instant-on Mode

Notes

a. Deluxe/Premium Model: US$349.99, GBP and € set by retailers, A$428.00, ¥31,500
b. Nintendo Switch: 96.66 million,
Switch Lite: 25.72 million,
OLED model: 30.72 million
c. Supports Wii software on disc and downloaded from Wii Shop Channel. Games from previous generations available for digital purchase and download via Virtual Console on Nintendo eShop.
d. Select games from previous generations are available for digital purchase and download on Nintendo's eShop. This is limited to games published by third parties, or specifically ported to the Nintendo Switch. No Virtual Console system exists, and no legacy games purchased on previous consoles may be transferred to the Nintendo Switch, as they could be from the Wii to the Wii U.
e. PlayStation Now cloud support for selected PlayStation 3 games began in January 2015 for North America. Subscription required.[98]
f. Select Xbox 360 and Xbox games; Requires download of digital version of game at no additional charge to existing owners of the game.[99][100][101]
g. The central processing unit is composed of two quad-core modules.
h. 64 kB per core (32 kB for instructions and 32 kB for data).
i. The quad-core ARM Cortex-A57 cluster has a total of 320 kB of L1 cache, distributed by 80 kB per each core (48 kB for instructions and 32 kB for data). The quad-core ARM Cortex-A53 cluster has a total of 256 kB of L1 cache, distributed by 64 kB per each core (32 kB for instructions and 32 kB for data).
j. Cores 0 and 2 have 512 kB of L2 cache each, while core 1 has 2 MB.
k. The quad-core ARM Cortex-A57 cluster has 2 MB of shared L2 cache. The quad-core ARM Cortex-A53 cluster has 512 kB of shared L2 cache.
l. 2 MB of L2 cache per quad-core module.
m. The 32 MB eDRAM module is located off the central processing unit (CPU) die and is in the graphics processing unit (GPU), running at the GPU's clock speed.
n. The 32 MB eSRAM module is located off the central processing unit (CPU) die and is in the graphics processing unit (GPU), running at the GPU's clock speed.
o. Reserved for Wii backward compatibility.
p. Consoles manufactured after August 2019 featured chips made on the 16nm process, improving battery life and performance. These consoles were shipped featuring slightly different boxes those manufactured before August, but Nintendo has not otherwise differentiated between the two models.
q. When docked, the graphics processing unit (GPU) can run at from 307.2 to 768 MHz (capable of 0.157 to 0.393 TFLOP/s, respectively). When undocked, the GPU can run at from 307.2 to 460 MHz (capable of 0.157 to 0.236 TFLOP/s, respectively).
r. Reserved for connecting with the Wii U GamePad.
s. A LAN adapter accessory is required.
t. A LAN adapter accessory is required.

Handheld systems

A trend starting from the eighth generation of handheld systems was the general shift from dedicated handheld gaming consoles to mobile gaming on smart devices, such as smartphones and tablets. As such, smart devices had eroded sales of dedicated handheld gaming consoles, with analysts of the time predicting that smart devices would have replaced handheld gaming consoles.[176]

Nintendo 3DS

The Nintendo 3DS is a portable game console produced by Nintendo. It is the successor to the Nintendo DS. The autostereoscopic device is able to project stereoscopic 3D effects without the use of 3D glasses or any additional accessories.[177] The Nintendo 3DS features backward compatibility with Nintendo DS series software, including Nintendo DSi software.[177] Announcing the device in March 2010, Nintendo officially unveiled it at E3 2010,[177][178] with the company inviting attendees to use demonstration units.[179] The console succeeds the Nintendo DS series of handheld systems,[177] which primarily competes with PlayStation Portable.[180] It competes with Sony's handheld, the PlayStation Vita.[181]

The Nintendo 3DS was released in Japan on February 26, 2011; in Europe on March 25, 2011; in North America on March 27, 2011;[182][183] and in Australia on March 31, 2011. On July 28, 2011, Nintendo announced a major price drop starting August 12. In addition, as of September 2011 consumers who bought the system at its original price have access to ten Nintendo Entertainment System games before they are available to the general public, after which the games may be updated to the versions publicly released on the Nintendo eShop. In December 2011, ten Game Boy Advance games were made available to consumers who bought the system at its original price at no charge, with Nintendo stating it has no plans to release to the general public.[184]

On June 21, 2012, Nintendo announced a bigger model of the 3DS called the Nintendo 3DS XL. Both screens are 90% larger than the original 3DS, but the resolution is the same. It also has a slightly longer battery life. It was released on July 28, 2012, in Europe and August 19, 2012, in North America as well as Australasia on August 23, 2012, and Brazil on September 1, 2012.[185]

On August 28, 2013, Nintendo announced a low cost, 2D version of the 3DS called the Nintendo 2DS. This redesign plays all Nintendo DS and Nintendo 3DS games, albeit without a stereoscopic 3D option. Unlike previous machines of the DS family, the Nintendo 2DS uses a slate-like design instead of a clamshell one. The console launched on October 12 in both Europe and North America[186] as well as Australasia.[187]

On August 29, 2014, Nintendo announced an enhanced revision of the 3DS called the New Nintendo 3DS and New Nintendo 3DS XL. The newer system uses microSD cards rather than full-sized and has a second analog "nub" input, the C-stick, Super-Stable 3D™ (face-tracking technology that allows the glasses-free stereoscopic 3D display to constantly adapt to the user's exact eye position as the player shifts his or her arms and body) and an upgraded processor that allows for more advanced NN3DS-exclusive games (e.g., a 3D port of acclaimed Wii game *Xenoblade Chronicles*) which cannot be played on the original Nintendo 3DS/2DS, although New Nintendo 3DS can still be played with all 3DS *and* most DSi games. It was released in Japan on October 11, 2014; in Australasia on November 21, 2014; in Europe on February 13, 2015; in North America on February 13, 2015, for the XL version. The smaller version for North America was released on September 25, 2015, bundled with the game *Animal Crossing: Happy Home Designer*.[188] In April 2017, Nintendo announced the New Nintendo 2DS XL, released in Japan on July 13, 2017, and in North America on July 28, 2017. It is a streamlined version of the New Nintendo 3DS XL, with identical screen sizes, but with a thinner build and without stereoscopic 3D.[189]

The 3DS family was formally discontinued in September 2020.

PlayStation Vita

The PlayStation Vita is the second handheld game console developed by Sony Computer Entertainment.[190] It is the successor to the PlayStation Portable as part of the PlayStation brand of gaming devices. It was released in Japan on December 17, 2011[191] and was released in Europe and North America on February 22, 2012.[192][193]

The handheld includes two analog sticks, a 5-inch (130 mm) OLED/LCD multi-touch capacitive touchscreen, and supports Bluetooth, Wi-Fi and optional 3G. Internally, the PS Vita features a 4-core ARM Cortex-A9 MPCore processor and a 4-core SGX543MP4+ graphics processing unit (GPU), as well as LiveArea software as its main user interface, which succeeds the XrossMediaBar.[194][195]

The device is backward-compatible with a subset of the PSP and PS One games digitally released on the PlayStation Network via the PlayStation Store.[196] The graphics for PSP releases are upscaled, with a smoothing filter to reduce pixelation.[197]

Lifetime sales of the Vita have not been released by Sony but have been estimated between 15 and 16 million.[198][199] Sony discontinued the PlayStation Vita on March 1, 2019,[200] and has no plans for a successor.[201][202]

Nintendo Switch Lite

Nintendo released the Nintendo Switch Lite, a hardware revision of the Switch, worldwide on September 20, 2019. Designed as a less expensive version of the Switch, the Switch Lite integrates the Joy-Con onto the hardware unit itself, eliminating some of the Joy-Con's features, which prevents a small number of games in the Switch's library that exclusively require television or tabletop modes from being used on the Switch. Additionally, the Switch Lite cannot be docked. The unit is smaller and lighter than the main Switch console, and uses updated lower-powered hardware that improves its battery performance. It otherwise supports all other features of the Switch, including its communication capabilities.

Handheld comparison

Product line	Nintendo 3DS family			PlayStation Vita	Nintendo Switch Lite
Console	**Nintendo 3DS/ Nintendo 3DS XL**	**Nintendo 2DS**	**New Nintendo 3DS/ New Nintendo 3DS XL / New Nintendo 2DS XL**	**PCH-1000 / PCH-2000**	**Nintendo Switch Lite**
Logo	NINTENDO 3DS			PS VITA PlayStation Vita	NINTENDO SWITCH
Manufacturer	Nintendo			Sony (SCE/SIE)	Nintendo
Image					
Release dates	**Nintendo 3DS**: JP: February 26, 2011 EU: March 25, 2011 NA: March 27, 2011 AU: March 31, 2011 KOR: April 28, 2012 **Nintendo 3DS XL**: JP: July 28, 2012 EU: July 28, 2012 NA: August 19, 2012 AU: August 23, 2012 KOR: September 20, 2012	EU: October 12, 2013 NA: October 12, 2013 AU: October 12, 2013 KOR: December 2013 JP: February 27, 2016	**New Nintendo 3DS**: JP: October 11, 2014 AU: November 20, 2014 EU: January 6, 2015 (Ambassador Edition) EU: February 13, 2015 (General release) NA: September 25, 2015 **New Nintendo 3DS XL**: JP: October 11, 2014 AU: November 20, 2014 EU: February 13, 2015 NA: February 13, 2015 **New Nintendo 2DS XL**: AU: June 15, 2017 JP: July 13, 2017 KOR: July 13, 2017 NA: July 28, 2017 EU: July 28, 2017	**PCH-1000**: JP: December 17, 2011 EU: February 22, 2012 NA: February 22, 2012 AU: February 23, 2012 **PCH-2000**: JP: October 10, 2013 EU: February 7, 2014 NA: May 6, 2014	WW: September 20, 2019
Launch prices	**Nintendo 3DS**: ▪ ¥25,000 ▪ US$249.99[203] ▪ £/€, set by individual retailers[204] ▪ A$349.95[205]	▪ US$129.99 ▪ £/€, set by individual retailers ▪ A$149.95	**New Nintendo 3DS**: ▪ ¥16,000 ▪ A$219.95 ▪ £/€, set by individual retailers **New Nintendo 3DS XL**:	**Wi-Fi+3G** ▪ ¥29,980 ▪ US$299 ▪ €299 ▪ £279.99[207] ▪ A$419.95	US$199.99

	Nintendo 3DS XL: ▪ ¥18,900 ▪ US$199.99 ▪ £/€, set by individual retailers ▪ A$249.90		▪ ¥18,900 ▪ A$249.95 ▪ £/€, set by individual retailers ▪ US$199.99 **New Nintendo 2DS XL**: ▪ US$149.99[189] ▪ A$199.95[206]	**Wi-Fi** ▪ ¥24,980 ▪ US$249 ▪ €249 ▪ £229.99 ▪ A$349.95[208] **PCH-2000** ▪ ¥19,929 ▪ £180	
Current prices	**Nintendo 3DS**: ▪ ¥15,000[209] ▪ US$169.99[210] ▪ £/€, set by individual retailers ▪ A$249.99[209]			**Wi-Fi** / **Wi-Fi+3G**: ▪ ¥19,980 ▪ US$199.99[211] ▪ €199 ▪ £, set by individual retailers[212] ▪ A$269.95	US$229.99[75]
Discontinued	January 5, 2015[213][214]	September 17, 2020[215][216][217]	**New Nintendo 3DS**: July 2017[218][219] **New Nintendo 3DS XL**: July 25, 2019[220] **New Nintendo 2DS XL**: September 17, 2020	March 1, 2019[200]	In production
Units shipped	75.94 million (as of March 31, 2022)[221]			—[a]	21.02 million (as of March 31, 2023)[222]
Best-selling game	*Mario Kart 7*, 18.97 million units (as of March 31, 2022)[223]			*Uncharted: Golden Abyss*, 500,000 units (as of June 3, 2012)[224]	*Mario Kart 8 Deluxe*, 45.33 million units (as of March 31, 2022)[86]
Regional lockout	Region locked[225]			No region lock	No region lock[226]
Backward compatibility	Nintendo DS / Nintendo DSi			PlayStation Portable (digitally downloaded games only)	—
Display	**Top Screen:** ▪ Autostereoscopic (3D) LCD ▪ Screen size: ▪ **3DS**: 3.53 in (90 mm) ▪ **3DS XL**: 4.88 in (124 mm) ▪ Screen pixel: ▪ **3DS/3DS XL**: 800 × 240 px (400 × 240 px per eye in 3D) **Bottom Screen:** ▪ 2D LCD resistive touchscreen ▪ Screen size:	**Top Screen:** ▪ 2D LCD ▪ Screen size: ▪ 3.53 in (90 mm) ▪ Screen pixel: ▪ 400 × 240 px **Bottom Screen:** ▪ 2D LCD resistive touchscreen ▪ Screen size: ▪ 3.02 in (77 mm)	**Top Screen:** ▪ Autostereoscopic (3D) LCD (New 3DS, New 3DS XL only) ▪ 2D LCD (New 2DS XL only) ▪ Screen size: ▪ **New 3DS**: 3.88 in (99 mm) ▪ **New 3DS XL**: 4.88 in (124 mm) ▪ **New 2DS XL**: 4.88 in (124 mm) ▪ Screen pixel: ▪ **New 3DS/New 3DS XL**: 800 × 240 px (400 × 240 px per eye in 3D) ▪ **New 2DS XL**: 400 × 240 px	**PCH-1000**: 5 in (130 mm) OLED capactive touchscreen 960 × 544 px **PCH-2000**: 5 in (130 mm) IPS LCD capacitive touchscreen 960 × 544 px	▪ 2D LCD ▪ 5.5 in (140 mm) ▪ 1280 × 720 px

	▪ **3DS**: 3.02 in (77 mm) ▪ **3DS XL**: 4.18 in (106 mm) ▪ 320 × 240 px QVGA	▪ 320 × 240 px QVGA	**Bottom Screen:** ▪ 2D LCD resistive touchscreen ▪ Screen size: ▪ **New 3DS**: 3.33 in (85 mm) ▪ **New 3DS XL**: 4.18 in (106 mm) ▪ **New 2DS XL**: 4.18 in (106 mm) ▪ 320 × 240 px QVGA		
	Approximately 16.77 million colors[227]			Approximately 16.77 million colors	Approximately 16.77 million colors
	5 brightness levels			0-100% brightness levels	0-100% brightness levels
Autostereoscopy (3D)	Yes Yes, with 'Super Stable 3D' technology	No	Yes (New 3DS, New 3DS XL only) No (New 2DS XL only)	No	No
CPU	Dual-core ARM11 MPCore[228] & Dual-core VFP Co-Processor[228]		Quad-core ARM11 MPCore[228] & Quad-core VFP Co-Processor[228]	Quad-core ARM Cortex-A9 MPCore[229][230]	Quad-core Cortex-A57 + quad-core Cortex-A53 @ 1.02 GHz
GPU	Digital Media Professionals PICA200			PowerVR SGX543MP4+[229]	Nvidia GM20B Maxwell-based GPU
RAM	128 MB FCRAM, 6 MB VRAM		256 MB FCRAM, 10 MB VRAM	512 MB RAM, 128 MB VRAM[231]	4 GB LPDDR4
Camera	One front-facing and a set of two rear-facing 3D 0.3 MP (VGA) camera sensors			Front and rear 0.3 MP (VGA) camera sensors[229]	—
Audio	▪ Stereo speakers (2) (with pseudo-surround support) ▪ Mono speaker (1) (2DS only) ▪ Headphone jack			▪ Stereo speakers (2) ▪ Headphone jack	▪ Stereo speakers (2) ▪ Headphone jack
Storage	1 GB internal flash memory			1 GB internal flash memory (PCH-2000 only)	32 GB eMMC
	Supports up to 32 GB SD/SDHC cards		Supports up to 32 GB microSD/microSDHC cards	Supports 4 GB, 8 GB, 16 GB, 32 GB and 64 GB proprietary removable memory cards	Supports up to 2 TB microSD/HC/XC cards
	2 GB SD card included (3DS only) 4 GB SDHC card included (3DS XL)	4 GB SDHC card included	4 GB microSDHC card included	No external storage included	No external storage included
Media	Nintendo 3DS Game Card (1–8 GB) / Nintendo DS Game Card (8–512 MB) Digital distribution			PlayStation Vita Game Card (2–4 GB) Digital distribution	Nintendo Switch Game Card
User interface	▪ Circle Pad (2× with add-on (3DS/3DS XL only)) ▪ D-pad ▪ Autostereoscopic (3D) 15:9(5:3) screen (top screen) (2DS displays 2D only) ▪ Resistive 4:3 touchscreen (bottom screen) ▪ 3-axis accelerometer and 3-axis gyroscope[227] ▪ Volume slider ▪ 3D depth slider (Not available on 2DS) ▪ Front 2D camera and rear 3D camera sensors ▪ Microphone ▪ Wireless communications switch (3DS/3DS XL only) ▪ SLEEP switch (2DS only) ▪ 12 × buttons (X, Y, A, B, L, R (ZL and ZR with add-on(3DS/3DS XL only)), START, SELECT,		▪ Circle Pad ▪ C-Stick ▪ D-pad ▪ Autostereoscopic (3D) 15:9(5:3) screen (top screen) (New 2DS XL displays 2D only) ▪ Resistive 4:3 touchscreen (bottom screen) ▪ 3-axis accelerometer and 3-axis gyroscope[227] ▪ Volume slider ▪ 3D depth slider (Not available on New 2DS XL) ▪ Front 2D camera and rear 3D camera sensors ▪ Microphone	▪ 2 × analog sticks[194] ▪ D-pad[194] ▪ Capacitive 16:9 touchscreen[194] ▪ Rear touchpad[194] ▪ Sixaxis motion sensing (3-axis accelerometer and 3-axis gyroscope)[194] ▪ Three-axis electronic compass[194] ▪ Front & rear 2D camera sensors[229] ▪ Microphone[229] ▪ 12 × buttons (△, ○, ✕, □, L, R, Start, Select, Home, Volume ±, Power)[194]	▪ 2 C-Sticks ▪ 1 D-pad ▪ Capacitive touchscreen ▪ 3-axis accelerometer and 3-axis gyroscope ▪ Volume swivel switch ▪ 13 × buttons (X, Y, A, B, L, ZL, R, ZR, +, -, HOME, SHARE, POWER)

	HOME, POWER)		▪ 12 × buttons (X, Y, A, B, L, R ZL, ZR, START, SELECT, HOME, POWER)		
Battery	▪ **Nintendo 3DS**: 1300 mAh lithium-ion battery ▪ **3DS Mode:** 3–5 hours ▪ **DS Mode:** 5–8 hours ▪ **Nintendo 3DS XL**: 1750 mAh lithium-ion battery ▪ **3DS Mode:** 3.5–6.5 hours ▪ **DS Mode:** 6–10 hours	▪ 1300 mAh lithium-ion battery[232] ▪ **3DS Mode:** 3.5–5.5 hours ▪ **DS Mode:** 6–9 hours	▪ **New Nintendo 3DS**: 1400 mAh lithium-ion battery ▪ **3DS Mode:** 3.5–6 hours ▪ **DS Mode:** 6.5-10.5 hours ▪ **New Nintendo 3DS XL**: 1750 mAh lithium-ion battery ▪ **3DS Mode:** 3.5–7 hours ▪ **DS Mode:** 7–12 hours ▪ **New Nintendo 2DS XL**: 1300 mAh lithium-ion battery ▪ **3DS Mode:** 3.5–5.5 hours ▪ **DS Mode:** 6–9 hours	▪ **PCH-1000**: 2200 mAh lithium-ion battery ▪ **Gameplay:** 3–5 hours ▪ **Video playback:** 5 hours ▪ **Music:** 9 hours[233] ▪ **PCH-2000**: 2210 mAh lithium-ion battery ▪ **Gameplay:** 4–6 hours ▪ **Video playback:** 6 hours ▪ **Music:** 10 hours	3570 mAh lithium-ion battery 3–7 hours
	Determined by screen brightness, Wi-Fi, sound volume, and whether 3D is active (3DS models only)			Determined by screen brightness, Wi-Fi, sound volume, and whether 3G is active (3G model only)	Determined by screen brightness, Wi-Fi, and sound volume
Connectivity	▪ Integrated 802.11 b/g Wi-Fi ▪ IR port ▪ NFC for Amiibo support (only on New 3DS/3DS XL; older 3DS series need to use a 3DS NFC reader accessory)			▪ Integrated 802.11 b/g/n Wi-Fi (PCH-1000 model only) ▪ Integrated 802.11 b/g/n Wi-Fi (PCH-2000 model only) ▪ 3G (3G model only) ▪ Bluetooth 2.1 + EDR	▪ Integrated 802.11a/b/g/n/ac Wi-Fi @ 2.4, 5 GHz ▪ Bluetooth 4.1 ▪ NFC for Amiibo support
Console Connection	Wii / Wii U			PlayStation 3 / PlayStation 4	—
Stylus	**3DS**: Extendable up to 100 mm (3.9 in) long **3DS XL**: 96 mm (3.8 in) long	96 mm (3.8 in) long	**New 3DS**: 76.5 mm (3.01 in) long **New 3DS XL/New 2DS XL**: 86 mm (3.4 in) long	—	—
Weight	**3DS**: 235 g (8.3 oz) **3DS XL**: 336 g (11.9 oz)	260 g (9.2 oz)	**New 3DS**: 253 g (8.9 oz) **New 3DS XL**: 329 g (11.6 oz) **New 2DS XL**: 260 g (9.2 oz)	**Wi-Fi**: 260 g (9.2 oz) **Wi-Fi+3G**: 279 g (9.8 oz) **PCH-2000**: 219 g (7.7 oz)	280 g (9.9 oz)
Dimensions	▪ **3DS**: ▪ **Width:** 134 mm (5.3 in) ▪ **Depth:** 74 mm (2.9 in) ▪ **Height:** 21 mm (0.83 in) ▪ **3DS XL**: ▪ **Width:** 156 mm (6.1 in) ▪ **Depth:** 93 mm (3.7 in) ▪ **Height:** 22 mm (0.87 in)	▪ **Width:** 144 mm (5.7 in) ▪ **Depth:** 127 mm (5.0 in) ▪ **Height:** 20.3 mm (0.80 in)	▪ **New 3DS**: ▪ **Width:** 156 mm (6.1 in) ▪ **Depth:** 93 mm (3.7 in) ▪ **Height:** 22 mm (0.87 in) ▪ **New 3DS XL/New 2DS XL**: ▪ **Width:** 160 mm (6.3 in) ▪ **Depth:** 93.5 mm (3.68 in) ▪ **Height:** 21.5 mm (0.85 in)	▪ **PCH-1000**: ▪ **Width:** 182 mm (7.2 in) ▪ **Depth:** 83.6 mm (3.29 in) ▪ **Height:** 18.6 mm (0.73 in)[229] ▪ **PCH-2000**: ▪ **Width:** 183.6 mm (7.23 in) ▪ **Depth:** 85.1 mm (3.35 in) ▪ **Height:** 15 mm (0.59 in)[234]	▪ **Width:** 208 mm (8.2 in) ▪ **Depth:** 91 mm (3.6 in) ▪ **Height:** 14 mm (0.55 in)
Online services	**Nintendo Network** ▪ Nintendo eShop ▪ Miiverse (discontinued)			**Sony Entertainment Network** ▪ PlayStation Network ▪ PlayStation Store	Nintendo Switch Online ▪ Nintendo eShop

	▪ Nintendo Video (discontinued) ▪ Swapnote (Nintendo Letter Box in PAL region) (discontinued) ▪ StreetPass ▪ StreetPass Mii Plaza (local & online players met) ▪ SpotPass ▪ Internet Browser	▪ PlayStation Video ▪ PlayStation Music ▪ PlayStation Mobile	
	Full game download/installation and automatic updates in the background via SpotPass	Full game download/installation in the background	Full game download/installation and automatic updates in the background
	Free	Free	Paid Nintendo Switch Online subscription required for online multiplayer, except for free-to-play titles[235]
Preloaded applications	**Applications** ▪ Health & Safety Information ▪ Nintendo 3DS Camera (Photo + Video Recording and Editing) ▪ Nintendo 3DS Sound ▪ Nintendo eShop ▪ Mii Maker ▪ StreetPass Mii Plaza ▪ AR Games ▪ Face Raiders ▪ Swapnote (Nintendo Letter Box in PAL regions) ▪ Nintendo Video ▪ Netflix (w/ paid subscription) ▪ Hulu Plus (w/ paid subscription) ▪ YouTube ▪ Nintendo Zone ▪ Activity Log[236] ▪ Download Play[237] ▪ System Settings **Multitasking Applications** ▪ Game Notes ▪ Friend List ▪ Notifications ▪ Internet Browser ▪ Miiverse	▪ *Welcome Park* ▪ *near* ▪ Photos ▪ Music ▪ Videos ▪ PlayStation Store ▪ Trophies ▪ Friends ▪ Party ▪ Group Messaging ▪ Notifications ▪ Internet Browser ▪ Email ▪ Maps ▪ Content Manager ▪ Remote Play ▪ Cross-Controller ▪ Settings	Nintendo eShop
List of games	List of Nintendo 3DS games	List of PlayStation Vita games	List of Nintendo Switch games Can only play games that support handheld mode
System software	Nintendo 3DS system software	PlayStation Vita system software	Nintendo Switch system software

a. Estimated between 15 and 16 million

See also

- 2010s in video games
- List of video game consoles
  - List of home video game consoles
  - List of handheld game consoles
  - List of dedicated video game consoles
  - List of microconsoles
  - List of virtual reality headsets

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Eighth generation of video game consoles

The **eighth generation of video game consoles** began in 2012, and consists of four home video game consoles: the Wii U released in 2012, the PlayStation 4 family in 2013, the Xbox One family in 2013, and the Nintendo Switch family in 2017.

The generation offered few signature hardware innovations. Sony and Microsoft continued to produce new systems with similar designs and capabilities as their predecessors, but with improved performance (processing speed, higher-resolution graphics, and increased storage capacity) that further moved consoles into confluence with personal computers, and furthering support for digital distribution and games as a service. Motion-controlled games of the seventh generation had waned in popularity, but consoles were preparing for advancement of virtual reality (VR), with Sony introducing the PlayStation VR in 2016.[1][2] Sony focused heavily on its first-party developers and console exclusives as key selling points, while Microsoft expanded its gaming services, creating the Xbox Game Pass subscription service for Xbox and Windows computers, and its xCloud game streaming service. Microsoft and Sony consoles saw mid-generation refreshes, with high-end revisions PlayStation 4 Pro and the Xbox One X, and lower-cost PlayStation 4 Slim and Xbox One S models that lacked some features. As of September 2023, the PlayStation 4 and Xbox One families had sold an estimated 117 and 58 million units, respectively.

Nintendo remained on a separate strategic path from Sony or Microsoft. The Wii U was designed to be a more robust Wii to appeal to dedicated gamers, but its means and intended use cases were lost in how it was marketed. The Wii U substantially undersold Nintendo's projections, selling only 13.5 million units by its discontinuation in 2017, which drove Nintendo to release the Nintendo Switch by 2017, its design and marketing accounting for several of the faults of the Wii U while meeting a broad range of global demographics and possible gaming configurations, including hybrid use between a home and handheld console. Later, Nintendo released the Nintendo Switch Lite, a version that lacked the Switch's docking capabilities but had other component optimizations and was otherwise compatible with all games, and the Nintendo Switch – OLED Model, a mid-lifetime refreshed model that featured an OLED screen with a built-in Ethernet port for a wired internet connection, though it did not introduce any performance improvements. By June 2025, all Switch models have shipped over 158.92 million units,[3] outselling the Wii and ranking third in all-time console sales.

Handheld consoles fought against increasing pressure of mobile gaming. The Nintendo 3DS and 2DS succeeded the Nintendo DS line, while the PlayStation Vita was the successor to the PlayStation Portable. Combined shipped units of the Nintendo 3DS/2DS family had reached 75 million by September 2019, but the Vita was estimated to have only sold about 10 million by the end of 2015. Sony discontinued the unit in 2019 and stated it had no present plans for handheld systems. Nintendo discontinued the Nintendo 3DS in 2020, ending the Nintendo DS families of systems. The Switch Lite acts as its de facto handheld successor.

The eighth-generation console market was also influenced by the lifting of China's ban on video game consoles in 2015, as well as the growth of the mobile gaming sector. A number of retro microconsoles were also released during this period.

In November 2020, Sony and Microsoft released the PlayStation 5 and Xbox Series X and Series S respectively. Considered to be their highly anticipated next-generation systems, they continue the trend from the eighth generation with overall general improved computational performance, graphical output, and strong backward compatibility support to minimize the disruption of upgrading to the new platform.

Background

This generation was predicted to face competition from smartphones, tablets, and smart TVs.[4][5][6][7][8][9] In 2013, gaming revenue on Android overtook portable game console revenue, while remaining a distant second to iOS gaming revenue.[10] In fiscal year (FY) 2013 (ending early 2013), Nintendo sold 23.7 million consoles,[11] while Apple sold 58.2 million iPads in FY 2012 (ending late 2012).[12] One particular threat to the traditional console game sales model has been the free-to-play model, wherein most users play free, and either a small number of dedicated players spend enough to cover the rest, or the game is supported by advertising.[13]

The PlayStation 4, Xbox One, and Wii U all use AMD GPUs, and two of them (PS4 and XBO) also use AMD CPUs on an x86-64 architecture, similar to common personal computers (as opposed to the IBM PowerPC Architecture used in the previous generation). Microsoft, Nintendo, and Sony were not aware that they were all using AMD hardware until their consoles were announced.[14] This shift was considered to be beneficial for multi-platform development, due to the increased similarities between PC hardware and console hardware. It also provided a boost in market share for AMD (which had faced increased competition from Intel in the PC market).[15]

Various microconsoles (which are smaller and mostly Android-based) have been released since 2012, although they are seldom referred to as being part of the eighth (or any) generation of video game consoles. These microconsoles have included the Ouya, Nvidia Shield Console, Amazon Fire TV, PlayStation TV, MOJO, Razer Switchblade, GamePop, GameStick, and PC-based Steam Machine consoles.[16][17][18] A number of microconsoles that were modeled as scaled-down versions of consoles from previous generations, running a selection of games from that console, were also released. These included the NES Classic Edition, the SNES Classic Edition, the PlayStation Classic, and the Sega Genesis Mini.

Cloud gaming options for the consoles also were developed in the eighth generation. PlayStation Now enables cloud gaming of PlayStation 2, 3, and 4 games to current PlayStation consoles and personal computers. Microsoft began developing a comparable service xCloud for Xbox and Windows games. Google released Stadia, a dedicated cloud gaming platform designed around reduced latency and advanced features not typical of these other cloud gaming options.

Transition

While earlier console generations generally lasted five to six years, the shift from seventh to eighth generation lasted about eight.[19] Unusually, the prior generation's best-selling unit, the Wii, was the first to be replaced in the eighth generation.[19] In 2011, Microsoft and Sony officials said they considered themselves only halfway through a ten-year lifecycle for their seventh-generation offerings.[20][21][22][23] The companies also said the addition of cameras and motion-based controllers like Xbox's Kinect and PlayStation Move extended these systems' lifetimes.[24] Nintendo president

Satoru Iwata said that his company would release the Wii U due to declining sales of seventh-generation home consoles and that "the market is now waiting for a new proposal for home consoles".[25] Sony considered making its next console a digital download-only machine, but decided against it due to concerns about the inconsistency of internet speeds available globally, especially in developing countries.[26]

The introduction of the high-end PlayStation 4 Pro and Xbox One X in 2016 and 2017, respectively, led to some journalists to call these machines part of a "half generation" step within the 8th generation, new consoles that would continue to drive sales without introducing a significantly different line of hardware that would segment their consumer base.[27][28]

In 2020, Microsoft and Sony released their 9th-generation consoles: Xbox Series X and PlayStation 5. Both said they wanted a soft transition, meaning that the new hardware plays most or all of the platform's previous games.[29][30][31][32] Microsoft said Xbox Series X can play all Xbox One games, including games from the Xbox 360 and original Xbox console that are playable on the Xbox One, and introduced its Smart Delivery program to update some Xbox One games to enable play on the Xbox Series X. Sony has said the "overwhelming majority" of PlayStation 4 games play on the PlayStation 5, and that many run at higher frame rates and resolutions.[33]

Chinese market

The eighth generation of consoles also saw manufacturers re-enter the Chinese market. Since 2000, the Chinese government had banned the sale and distribution of video game consoles, citing concerns on their effect on youth. The ban led console gaming to a niche sector, including a black market for the purchase of these consoles, while also causing personal computing gaming to take off within China, including the spread of Internet cafes and PC bangs.[34] This ban lasted through January 2014, where the Chinese government first opened up to allow the sale of consoles in the Shanghai Free-Trade Zone (FTZ).[35] By July 2015, the ban on video game consoles was wholly lifted.[36] Access to the Chinese video game market is lucrative, having an estimated 500 million potential players[37] and representing over US$24 billion in revenues as of 2016.[38]

Microsoft and Sony quickly took advantage of the lifting of the ban, announcing sales of the Xbox One and PlayStation 4 platforms within the FTZ shortly after the 2014 announcement. Microsoft established a partnership with BesTV New Media Co, a subsidiary of the Shanghai Media Group, to sell Xbox One units in China,[39] with units first shipping by September 2014.[40] Sony worked with Shanghai Oriental Pearl Media in May 2014 to establish manufacturing in the FTZ,[37] with the PlayStation 4 and PlayStation Vita shipping into China by March 2015.[41] CEO of Sony Computer Entertainment Andrew House explained in September 2013 that the company intended to use the PlayStation Vita TV as a low-cost alternative for consumers in an attempt to penetrate the Chinese gaming market.[42]

Nintendo did not initially seek to bring the Wii U into China; Nintendo of America president Reggie Fils-Aimé stated that China was of interest to the company after the ban was lifted, but considered that there were similar difficulties with establishing sales there as they had recently had with Brazil.[43] Later, Nintendo had teamed up with Tencent by April 2019 to help sell and distribute the Nintendo Switch as well as aid its games through the Chinese government approval process led by National Radio and Television Administration.[44][45]

Home consoles

Wii U

In November 2010, Nintendo of America CEO Reggie Fils-Aimé stated that the release of the next generation of Nintendo would be determined by the continued success of the Wii.[46] Nintendo announced its successor to the Wii, the Wii U, at the Electronic Entertainment Expo 2011 on June 7, 2011.[47] After the announcement, several journalists classified the system as the first eighth generation home console.[19][48][49] However, prominent sources have disputed this because of its comparative lack of power and older disc media type with respect to the announced specifications for PlayStation 4 and the Xbox One.[50][51]

The Wii U's main controller, the Wii U GamePad, features an embedded touchscreen that can work as an auxiliary interactive screen in a fashion similar to the Nintendo DS/3DS, or if compatible with "Off TV Play", can even act as the main screen itself, enabling games to be played without the need of a television. The Wii U is compatible with its predecessor's peripherals, such as the Wii Remote Plus, the Nunchuk, and the Wii Balance Board.[52]

The Wii U was released in North America on November 18, 2012, in Europe on November 30, 2012, and in Japan on December 8, 2012. It came in two versions, the white *Basic Model* and the black *Deluxe/Premium Model*, at the price of $299 and $349 US Dollars, respectively. On August 28, 2013, Nintendo announced the production of the Basic model has ended and expected supplies to be exhausted by September 20, 2013. On October 4, 2013, the Deluxe/Premium model was price cut from US$349 to US$299.[53]

The Wii U was initially expected to have lifetime sales of about over 100 million, comparable to the Wii.[54] However, it only managed to have lifetime sales of about only 13 million, in sharp contrast with the Wii. This financially hurt Nintendo, with several financial quarters running at a loss through 2014. Nintendo had anticipated the Wii U would sell similarly to the Wii, but it ended up selling worse than the GameCube and became Nintendo's least successful home console to date.[55] Nintendo officially discontinued the Wii U on January 31, 2017, due to its commercial failure, to make way for its second competitor, the Nintendo Switch, released one month later.[56]

PlayStation 4

On February 20, 2013, Sony announced the PlayStation 4 during a press conference in New York City. The console places an emphasis on features surrounding social interaction. Gameplay videos can be shared via the PlayStation Network and other services. Users can stream games being played by themselves or others (either through the console, or directly to Twitch). The DualShock 4 is similar to the previous DualShock 3 controller with the addition of a touchpad and a "Share" button along with a Light-emitting diode bar on the front to allow motion tracking. The PlayStation Camera camera accessory is offered for the system, with stereo camera lenses up to 1280×800px resolution with support for depth sensing similar to Microsoft's Kinect. It also remains compatible with the PlayStation Move peripherals. Second screen capabilities are available through mobile apps and the PlayStation Vita, as well as cloud gaming streaming through the Gaikai service.[57][58]

The PlayStation 4 was released on November 15, 2013, in North America and November 29, 2013, in Australia and Europe at US$399.99, A$549 and €399 respectively.

Xbox One

On May 21, 2013, Microsoft announced the Xbox One at an event in Redmond, Washington. The console focuses on entertainment, including the ability to pass television programming from a set-top box over HDMI and use a built-in electronic program guide, and the ability for computer multitasking by snapping applications (such as Skype and Internet Explorer) to the side of the screen, similarly to Windows 8. The controller has "Impulse Triggers" that provide Haptic technology feedback, and the ability to automatically record and save highlights from gameplay. An updated version of Kinect was developed with a 1080p camera and expanded voice controls. Originally bundled with the console it has since been excluded.[59][60]

The Xbox One was released in North America, Europe, and Australia on November 22, 2013, at a launch price of US$499.99, €499 and A$599 respectively with Japan, and was later released in 26 other markets in 2014. It had two mid-generation upgrades, one cheaper option released in 2016 called the Xbox One S, and the other called the Xbox One X which added 4K gaming. Microsoft claimed that the Xbox One X was the "World's most powerful console" and 40% more powerful than any other console at the time of its release.

Production of the Xbox One family of consoles were discontinued shortly after the launch of their successor, the Xbox Series X and S, at the end of 2020.[61]

Nintendo Switch

Due to the commercial failure of the Wii U, along with competition from mobile gaming, then-president Satoru Iwata sought to revitalize the company by creating a new strategy for Nintendo that included embracing mobile gaming, and developing new hardware that would be attractive to a wider range of audiences.[62] The hardware product was announced under the codename NX in a press conference held with DeNA on March 17, 2015,[63] and fully revealed as the Nintendo Switch on October 20, 2016. It was released worldwide on March 3, 2017, competing with the Xbox One and PlayStation 4.

The Switch is considered by Nintendo a home console that has multiple ways to play. The main unit, the Console, is a tablet-sized device with a touch-sensitive screen. It can be inserted into a Docking Station which allows games to be played on a connected television. Alternatively, two Joy-Con, motion-sensitive controllers comparable to the Wii Remotes, can be slotted onto the sides of the Console so the unit can be played as a handheld. Further, the Console can be set on a kickstand, allowing multiple players to see the screen and play games with separate Joy-Con. Additionally, Nintendo built the Switch on standard industry components, allowing for ease of porting games onto the system using standard software libraries and game engines rather than Nintendo's usual proprietary approaches. This enabled them to bring several third-party and independent game developers on board prior to launch to assure some third-party games in their software library.

Despite the Switch being significantly weaker in terms of processing power than its competitors, it was met with critical praise and commercial success. Nintendo had anticipated selling about 10 million Switches in the first year of release but ended up exceeding this projection with total first-year sales of over 17 million units, exceeding the Wii U's lifetime sales. In late 2017, the Nintendo Switch was the fastest selling console in US history, and in November 2018 it was the fastest selling of all the 8th generation consoles in the US.[64]

A hardware revision, the Switch Lite, was announced on July 10, 2019, and was released on September 20, 2019. The unit integrates the Joy-Con onto the main console with a smaller form-factor, making the unit strictly handheld rather than a hybrid system. Further details are described below under Handhelds. A refreshed model, the Nintendo Switch – OLED Model, was announced on July 6, 2021, and was released on October 8, 2021, featuring a 7-inch OLED screen, a wider and adjustable stand, enhanced audio, a wired LAN port built into the dock, and 64 GB of internal storage.

Comparison

This table lists all major consoles and subsequent mid-generation releases, and does not include minor revisions or hardware changes, such as the "slim" revision of the PlayStation 4.

Comparison of eighth-generation video game home consoles

Console		Wii U	Nintendo Switch	Nintendo Switch – OLED Model	PlayStation 4	PlayStation 4 Pro	Xbox
Logo							
Manufacturer		Nintendo			Sony Interactive		
Image							
Release dates		NA: November 18, 2012 EU: November 30, 2012 AU: November 30, 2012 JP: December 8, 2012	WW: March 3, 2017[65]	WW: October 8, 2021	PlayStation 4 NA: November 15, 2013 EU: November 29, 2013 AU: November 29, 2013 JP: February 22, 2014 PlayStation 4 Slim WW: September 15, 2016[66]	WW: November 10, 2016[67]	NA: Nove 22, 2013 EU: Nove 22, 2013 countries c AU: Nove 22, 2013 JP: Septe 2014[69]
Launch prices	US$	US$299.99 (equivalent to $420 in 2025)[a]	US$299.99 (equivalent to $390 in 2025)[65]	US$349.99 (equivalent to $420 in 2025)	PlayStation 4 US$399.99 (equivalent to $550 in 2025)[71] PlayStation 4 Slim US$299.00 (equivalent to $400 in 2025)	US$399.00 (equivalent to $540 in 2025)[67]	US$499. (equivale $690 in 2
	€	Set by retailers	€320 (equivalent to €400 in 2023)	€349 (equivalent to €420 in 2023)	PlayStation 4 €399.00 (equivalent to €490 in 2023)[71] PlayStation 4 Slim €299.99 (equivalent to €370 in 2023)[72]	€399.99 (equivalent to €490 in 2023)[72]	€499 (eq to €620 i
	GBP	Set by retailers	£279.99 (equivalent to £370 in 2025)[65]	£309.99 (equivalent to £380 in 2025)	PlayStation 4 £349.00 (equivalent to £490 in 2025)[71]	£345.00 (equivalent to £470 in 2025)[67]	£429.00 (equivale £600 in 2
	A$	A$348.00 (equivalent to $440 in 2022)	A$469.95 (equivalent to $540 in 2022)[65]	A$540.00 (equivalent to $580 in 2022)	PlayStation 4 A$549.00 (equivalent to $680 in 2022)[71]	A$560.00 (equivalent to $650 in 2022)[67]	A$599.0 (equivale $740 in 2
	JP¥	¥26,250 (equivalent to ¥30,120 in 2024)	¥29,980 (equivalent to ¥33,140 in 2024)[65]	¥52,500 (equivalent to ¥57,090 in 2024)	PlayStation 4 ¥41,979 (equivalent to ¥47,740 in 2024)		
Current prices	US$	Discontinued	US$339.99[75]	US$399.99[75]	Same as launch prices	Discontinued	
	€		Same as launch prices				
	GBP						
	A$						
	JP¥						
Discontinued		January 31, 2017[76]	In production		In production	Japan: January 5, 2021[77]	Augu 201
Sales	Shipped	13.56 million (as of December 31, 2018)[80]	153.10 million (all models)[b] (as of June 30, 2025)[81]		117.2 million (as of March 31, 2022)[82]		58 millior
	Sold	Not reported	Not reported		>113.5 million (as of September 30, 2020)[84]		
	Best-selling game	*Mario Kart 8*, 8.46 million (as of March 31, 2022)[85]	*Mario Kart 8 Deluxe*, 48.41 million (as of September 30, 2022)[86]		*God of War* (2018), 19.50 million (as of February 3, 2022)[87]		*PlayerUr* July 2018)
		List of best-selling Wii U video games	List of best-selling Nintendo Switch video games		List of best-selling PlayStation 4 video games		List of be
Media	Game media	Wii U Optical Disc (25 GB) (5x CAV)[89]	Nintendo Switch game card (1-32 GB)[90]		Blu-ray (25/50 GB) (6x CAV)[91]		Blu-ray (2
	Other	Wii Optical Disc (4.7/8.5 GB) (6x CAV)	—		Blu-ray, DVD		Blu-ray, D
	Regional lockout	Region locked[93]	Unrestricted		Almost fully[94] Only DLC is region locked[95]		
	Backward compatibility	Wii[c]	Partial[d]		Partial[e]		

CPU	**Type**	Tri-Core IBM PowerPC Espresso[102]	Quad-core ARM Cortex-A57, quad-core ARM Cortex-A53[g][103]		Octa-core AMD Jaguar-based[g][104]	Octa-core AMD Jaguar-based[g]	Octa-cor based[g][
	ISA	PowerPC	ARMv8-A		x86-64		
	Clock speed	1.24 GHz	1.02 GHz		1.60 GHz	2.13 GHz	1.75 GHz
	L1 cache	192 kB[h]	576 kB[i]		512 kB[h]		512 kB[h]
	L2 cache	3 MB eDRAM @ 1.24 GHz (CPU) (159.1 GB/s)[j]	2.5 MB[k]		4 MB[l][107]		4 MB[l][10
	L3 cache	32 MB eDRAM @ 550 MHz (70.4 GB/s)[m][109] 3 MB eSRAM[o]	—		—		32 MB eS @ 853 M (204 GB/s)
	Process	45 nm	20 nm[p]	16 nm	PlayStation 4 28 nm PlayStation 4 Slim 16 nm	16 nm[112][113]	28 nm
	Secondary	ARM9 processor (for background tasks)	—		ARM processor (for background tasks)[114]	—	
GPU	**Type**	AMD Radeon-based "Latte"[115][116]	Nvidia GM20B Maxwell-based[117][118]		AMD Radeon-based "Liverpool"	AMD Radeon-based "Neo"[119]	AMD Rad
	Clock speed	550 MHz[116]	307.2-768 MHz[q][120]	800 MHz	800 MHz	911 MHz[119]	853
	Stream processors	320[51][116]	256[118]		1152	2304[119]	
	TFLOP/s	0.352[116]	0.157-0.393[q][120]		1.843	4.198[119]	1.3
	TMUs	16[116]	16[118]		72	144[119]	
	Texture rate	8.8 GTexel/s[116]	4.9-12.3 GTexel/s		57.6 GTexel/s	131.2 GTexel/s[119]	40.9 GTe
	ROPs	8[116]	16[118]		32	64[119]	
	Pixel rate	4.4 GPixel/s[126][116]	4.9-12.3 GPixel/s		25.6 GPixel/s[127]	29.15 GPixel/s[119]	13.6 GPi
	Compute units	5[116]	2[118]		18	36[119]	
	Process	40 nm[116]	20 nm[118]		PlayStation 4 28 nm PlayStation 4 Slim 16 nm	16 nm[119]	28
Memory	**Main**	2 GB DDR3 SDRAM[128]	4 GB LPDDR4 SDRAM[129]		8 GB GDDR5 SDRAM[108]	8 GB GDDR5 SDRAM	8 GB DD
	Clock speed	800 MHz (1600 MHz effective)	1600 MHz (3200 MHz effective)	1700 MHz (6800 MHz effective)	1375 MHz (5500 MHz effective)	1700 MHz (6800 MHz effective)	1066.5 M
	Bandwidth	12.8 GB/s	25.6 GB/s		176.0 GB/s	217.6 GB/s	68.3 GB/
	Reserved	1 GB[130]	1 GB		3.5 GB[131]		3 GB[132]
	Secondary	—	—		256 MB DDR3 RAM[114]	1 GB DDR3 RAM	
Storage	**Internal**	8 GB/32 GB eMMC flash memory (non-replaceable) 1 GB flash memory (reserved for the OS)	32 GB eMMC NAND flash memory (non-replaceable)[117]	64 GB eMMC NAND flash memory (non-replaceable)	500 GB HDD or 1 TB HDD (user replaceable)[133][134]	1 TB HDD or 2 TB (user replaceable)	500 GB H 1 TB HDI replaceabl 8 GB flas memory for the OS
	External	Supports up to 32 GB SDHC cards Supports up to 2 TB USB HDD (*Wii U Mode* only)[136]	Supports microSD/microSDHC/microSDXC up to 2 TB[137]		Supports USB HDD over 240 GB up to 8 TB (with System Software 4.50 or higher)[138]		Supports 16 TB[139
	Game Installation	Only downloaded games can be installed to storage	Downloaded games can be installed to internal memory or SD card		All games must be installed to a connected HDD[141]		All g
Network	**Wireless**	▪ 802.11 a/b/g/n Wi-Fi @ 2.4 GHz ▪ 802.11n Wi-Fi @ 5.0 GHz[r]	802.11 a/b/g/n/ac Wi-Fi @ 2.4 and 5.0 GHz[137]		PlayStation 4 802.11b/g/n Wi-Fi @ 2.4 GHz[142] PlayStation 4 Slim 802.11b/g/n/ac Wi-Fi @ 2.4 GHz	802.11a/b/g/n/ac Wi-Fi 2.4 GHz/5 GHz[143]	802.11a/ dual-ban @ 2.4 GH 5.0 GHz[
	Wired	Fast Ethernet[s]	Fast Ethernet[t]	Gigabit Ethernet	Gigabit Ethernet		Gigabit E
Dimensions		When lying down on its side: **Width:** 172 mm (6.7 in) **Height:** 46 mm (1.8 in) **Length:** 268.5 mm (10.5 in) (can be oriented vertically using a stand)	Console laying flat: **Width:** 102 mm (4.0 in) **Height:** 13.9 mm (0.55 in) **Length:** 203.1 mm (8.00 in) (Console only) 239 mm (9.4 in) (Joy-Con attached) (must be oriented vertically)	Console laying flat: **Width:** 102 mm (4.0 in) **Height:** 13.9 mm (0.55 in) **Length:** 203.1 mm (8.00 in) (Console only) 239 mm (9.4 in) (Joy-Con attached) (must be oriented vertically)	PlayStation 4 When lying down on its side: **Width:** 275 mm (10.8 in) **Height:** 53 mm (2.0 in) **Length:** 305 mm (12.0 in) (can be oriented vertically using a	When lying down on its side: **Width:** 295 mm (11.6 in) **Height:** 55 mm (2.2 in) **Length:** 327 mm (12.9 in) (can be oriented vertically using a stand)[143]	When lyi on its sid **Width:** 3 (12.1 in) **Height:** 8 (3.2 in) **Length:** (10.1 in) (must be o horizontall

					stand) PlayStation 4 Slim When lying down on its side: **Width:** 265 mm (10.4 in) **Height:** 39 mm (1.5 in) **Length:** 288 mm (11.3 in) (can be oriented vertically using a stand)		
Weight		1.5 kg (3.3 lb)	0.297 kg (0.65 lb) (Console only) 0.398 kg (0.88 lb) (Joy-Con attached)	0.319 kg (0.70 lb) (Console only) 0.420 kg (0.93 lb) (Joy-Con attached)	PlayStation 4 2.8 kg (6.2 lb) PlayStation 4 Slim 2.1 kg (4.6 lb)	3.3 kg (7.3 lb)[143]	3.2 kg
Power		75 W (external power supply)[148]	4,310 mAh, 3.7 V lithium-ion battery Max. 39 W (external power supply)		PlayStation 4 Max. 223 W (internal power supply) PlayStation 4 Slim Max. 163 W (internal power supply)	Max. 289 W (internal power supply)[143] (PSU) Max. 310 W (internal power supply)[143] (Product Page)	Max. 2 (externa sup
Included accessories		**All Models** ▪ Wii U GamePad ▪ Stylus ▪ Wii Sensor Bar ▪ HDMI cable **Deluxe/Premium Model only** ▪ Wii U GamePad stand ▪ Wii U GamePad charging cradle ▪ Wii U console stand	▪ Two Joy-Con controllers (L and R) ▪ Two Joy-Con straps ▪ Joy-Con Grip ▪ Switch Dock ▪ HDMI cable		▪ DualShock 4 controller ▪ Micro-USB cable (for charging DualShock 4) ▪ Wired mono headset ▪ HDMI cable		▪ Xbox Wirel Contr ▪ Kinec (in sor bundle ▪ Wired heads ▪ HDM
Video	**Output**	1080p, 1080i, 720p, 480p ▪ HDMI out 1.4b ▪ Component video ▪ YP_BP_R (D-Terminal out Japan only) 576i, 480i (standard 4:3 and 16:9 anamorphic widescreen) ▪ Composite video ▪ S-Video (NTSC consoles only) ▪ RGB SCART (PAL consoles only) ▪ D-Terminal (Japanese consoles only)	720p (undocked)[137] ▪ Via 6.2-inch, 1280 × 720p LCD screen @ 237 ppi 1080p, 720p and 480p (docked) ▪ HDMI out 1.4b	720p (undocked) ▪ Via 7-inch, 1280 × 720p OLED screen @ 210 ppi 1080p, 720p and 480p (docked) ▪ HDMI out 2.0a	1080p, 1080i, 720p, and 480p ▪ HDR10 ▪ HDMI out 1.4b	4K 2160p, 1080p, 1080i, 720p, and 480p ▪ HDR10 ▪ HDMI out 2.0a	1080p, 7 480p[149] ▪ HDM 1.4b
	Integrated 3DTV support	Yes	No		Yes		
	Second screen	Wii U GamePad (bundled with console)	—		PlayStation Vita PlayStation App on iOS and Android devices		Xbox Co Windows
	Remote	Local game streaming via Off-TV Play to Wii U GamePad for some games	—		Local and remote game streaming via Remote Play to PS Vita, macOS and Windows, or selected Sony Xperia smartphone[153] for all games, except those that require the PS Camera or PS Move[154][155]		Local ga PC[156]
Audio		▪ 5.1 LPCM output via HDMI ▪ Analog stereo via "AV Multi Out" port ▪ Stereo speakers on Wii U GamePad ▪ Stereo output via 3.5mm jack on Wii U GamePad	▪ 5.1 LPCM output via HDMI ▪ Stereo speakers on Console ▪ Stereo output via 3.5mm jack on Console[137]		▪ 7.1 LPCM and bitstreaming output via HDMI ▪ 5.1 LPCM and bitstreaming output via optical out ▪ Stereo output via 3.5mm jack on DualShock 4 ▪ Mono speaker on DualShock 4		▪ 7.1 L ▪ 2.0 L ▪ Interr ▪ Stere (requ jack revisi
Peripheral abilities		▪ Bluetooth 4.0 ▪ HDMI (1 out port) ▪ "AV Multi Out" port ▪ 4 USB 2.0 ports (2 at	▪ Bluetooth 4.1 ▪ HDMI (1 out port on dock) ▪ 1 USB 3.0 port (on dock) ▪ 2 USB 2.0 ports (on	▪ Bluetooth 4.1 ▪ HDMI (1 out port on dock) ▪ 1 LAN port (on dock) ▪ 2 USB 2.0 ports (on	▪ Bluetooth 2.1 + EDR (PlayStation 4) or Bluetooth 4.0 (LE)	▪ Bluetooth 4.0 (LE)[143] ▪ HDMI (1 out port) ▪ 3 USB 3.1 (gen 1) ports[143]	▪ Wi-Fi ▪ 2 HD port a port)[1

		front of console, 2 at rear) ▪ Sensor Bar power port ▪ Near Field Communication (NFC)	dock) ▪ 1 USB-C port (on Console) ▪ Near Field Communication (NFC)	dock) ▪ 1 USB-C port (on Console) ▪ Near Field Communication (NFC)[137]	(PlayStation 4 Slim) ▪ HDMI (1 out port) ▪ 2 USB 3.0 ports (at front of console) ▪ PS Camera AUX port ▪ Optical out port ▪ Ethernet port	▪ PS Camera AUX port ▪ Optical out port ▪ Ethernet port	▪ 3 USI ports of con rear) ▪ Kinec ▪ Optic port ▪ Ether

Controller		▪ Wii U GamePad
		▪ Wii U Pro Controller (up to 7)
		▪ Wii Remote/Plus (up to 7)
		  ▪ Nunchuk attachment
		  ▪ Classic Controller attachment
		▪ Wii Balance Board
		▪ Nintendo 3DS (select games only)
		▪ Nintendo GameCube controller (adapter required, only supports *Super Smash Bros. for Wii U*)[160]
			▪ Joy-Con controller (up to 8)
			▪ Nintendo Switch Pro Controller (up to 8)[161]
			▪ Nintendo GameCube controller (since version 4.0, adapter required)
					▪ DualShock 4 controller (up to 4)
					▪ PlayStation Move
					▪ PlayStation Camera
					▪ PlayStation Vita (select games only)[162]
							▪ Xbox
							▪ Xbox
							▪ Kinec
							▪ Comp
							▪ Comp
							▪ Amaz

Touch capability		Wii U GamePad includes an integrated resistive touchscreen	Console includes multi-touch capacitive touchscreen[137]		DualShock 4 controller includes an integrated 2 point capacitive touchpad		
Camera		Wii U GamePad camera (bundled with all consoles)	—		PlayStation Camera		Kin
Online services	**Network**	Nintendo Network ▪ Nintendo eShop ▪ Miiverse (discontinued) ▪ Nintendo TVii (discontinued)	Nintendo Switch Online ▪ Nintendo eShop		PlayStation Network ▪ PlayStation Store ▪ PlayStation Now ▪ PlayStation Music ▪ PlayStation Video ▪ PlayMemories Online ▪ PlayStation Vue		Xbox Liv ▪ Micro ▪ Micro
	Downloads	Downloads games and automatic updates in the background via SpotPass	Downloads automatic updates in the background		Downloads games and automatic updates in the background		Dow
	Subscription	Free	Paid Nintendo Switch Online subscription required for online multiplayer, except for free-to-play titles[165]		Paid PlayStation Plus subscription required for online multiplayer and cloud saves except for free-to-play titles[166][167]		Paid X multi
Game DVR	**Image**	Screenshots with Miiverse integration (can be shared to Facebook, Twitter, Google Plus and Tumblr)	Screenshots with Facebook and Twitter integration[169]		Screenshots with Twitter integration		
	Video	Gameplay replays with YouTube integration (select games only)	Up to 30 seconds of gameplay with Facebook and Twitter integration[170][171]		Up to 1 hour of gameplay with Dailymotion, Facebook, Twitter and YouTube integration; 720p for all PS4 models, 1080p for PS4 Pro		Up to 5 m models,[required)[1
	Live streaming	—	—		Live streaming with Dailymotion, Twitch, Ustream and YouTube Gaming integration		Live strea
		Free	Free		Free		Paid
List of games		List of Wii U games	List of Nintendo Switch games		List of PlayStation 4 games		
System software	**OS**	Wii U system software	Nintendo Switch system software		PlayStation 4 system software		
	Updates	Updates are downloaded and installed automatically in Standby Mode	Automatic updates can be enabled by turning on Automatic Software Updates in System Settings[175]		Updates are downloaded and installed automatically in Rest Mode		Update

Notes

a. Deluxe/Premium Model: US$349.99, GBP and € set by retailers, A$428.00, ¥31,500

b. Nintendo Switch: 96.66 million,
Switch Lite: 25.72 million,
OLED model: 30.72 million

c. Supports Wii software on disc and downloaded from Wii Shop Channel. Games from previous generations available for digital purchase and download via Virtual Console on Nintendo eShop.

d. Select games from previous generations are available for digital purchase and download on Nintendo's eShop. This is limited to games published by third parties, or specifically ported to the Nintendo Switch. No Virtual Console system exists, and no legacy games purchased on previous consoles may be transferred to the Nintendo Switch, as they could be from the Wii to the Wii U.

e. PlayStation Now cloud support for selected PlayStation 3 games began in January 2015 for North America. Subscription required.[98]

f. Select Xbox 360 and Xbox games; Requires download of digital version of game at no additional charge to existing owners of the game.[99][100][101]

g. The central processing unit is composed of two quad-core modules.

h. 64 kB per core (32 kB for instructions and 32 kB for data).

i. The quad-core ARM Cortex-A57 cluster has a total of 320 kB of L1 cache, distributed by 80 kB per each core (48 kB for instructions and 32 kB for data). The quad-core ARM Cortex-A53 cluster has a total of 256 kB of L1 cache, distributed by 64 kB per each core (32 kB for instructions and 32 kB for data).

j. Cores 0 and 2 have 512 kB of L2 cache each, while core 1 has 2 MB.

k. The quad-core ARM Cortex-A57 cluster has 2 MB of shared L2 cache. The quad-core ARM Cortex-A53 cluster has 512 kB of shared L2 cache.

l. 2 MB of L2 cache per quad-core module.

m. The 32 MB eDRAM module is located off the central processing unit (CPU) die and is in the graphics processing unit (GPU), running at the GPU's clock speed.
n. The 32 MB eSRAM module is located off the central processing unit (CPU) die and is in the graphics processing unit (GPU), running at the GPU's clock speed.
o. Reserved for Wii backward compatibility.
p. Consoles manufactured after August 2019 featured chips made on the 16nm process, improving battery life and performance. These consoles were shipped featuring slightly different boxes those manufactured before August, but Nintendo has not otherwise differentiated between the two models.
q. When docked, the graphics processing unit (GPU) can run at from 307.2 to 768 MHz (capable of 0.157 to 0.393 TFLOP/s, respectively). When undocked, the GPU can run at from 307.2 to 460 MHz (capable of 0.157 to 0.236 TFLOP/s, respectively).
r. Reserved for connecting with the Wii U GamePad.
s. A LAN adapter accessory is required.
t. A LAN adapter accessory is required.

Handheld systems

A trend starting from the eighth generation of handheld systems was the general shift from dedicated handheld gaming consoles to mobile gaming on smart devices, such as smartphones and tablets. As such, smart devices had eroded sales of dedicated handheld gaming consoles, with analysts of the time predicting that smart devices would have replaced handheld gaming consoles.[176]

Nintendo 3DS

The Nintendo 3DS is a portable game console produced by Nintendo. It is the successor to the Nintendo DS. The autostereoscopic device is able to project stereoscopic 3D effects without the use of 3D glasses or any additional accessories.[177] The Nintendo 3DS features backward compatibility with Nintendo DS series software, including Nintendo DSi software.[177] Announcing the device in March 2010, Nintendo officially unveiled it at E3 2010,[177][178] with the company inviting attendees to use demonstration units.[179] The console succeeds the Nintendo DS series of handheld systems,[177] which primarily competes with PlayStation Portable.[180] It competes with Sony's handheld, the PlayStation Vita.[181]

The Nintendo 3DS was released in Japan on February 26, 2011; in Europe on March 25, 2011; in North America on March 27, 2011;[182][183] and in Australia on March 31, 2011. On July 28, 2011, Nintendo announced a major price drop starting August 12. In addition, as of September 2011 consumers who bought the system at its original price have access to ten Nintendo Entertainment System games before they are available to the general public, after which the games may be updated to the versions publicly released on the Nintendo eShop. In December 2011, ten Game Boy Advance games were made available to consumers who bought the system at its original price at no charge, with Nintendo stating it has no plans to release to the general public.[184]

On June 21, 2012, Nintendo announced a bigger model of the 3DS called the Nintendo 3DS XL. Both screens are 90% larger than the original 3DS, but the resolution is the same. It also has a slightly longer battery life. It was released on July 28, 2012, in Europe and August 19, 2012, in North America as well as Australasia on August 23, 2012, and Brazil on September 1, 2012.[185]

On August 28, 2013, Nintendo announced a low cost, 2D version of the 3DS called the Nintendo 2DS. This redesign plays all Nintendo DS and Nintendo 3DS games, albeit without a stereoscopic 3D option. Unlike previous machines of the DS family, the Nintendo 2DS uses a slate-like design instead of a clamshell one. The console launched on October 12 in both Europe and North America[186] as well as Australasia.[187]

On August 29, 2014, Nintendo announced an enhanced revision of the 3DS called the New Nintendo 3DS and New Nintendo 3DS XL. The newer system uses microSD cards rather than full-sized and has a second analog "nub" input, the C-stick, Super-Stable 3D™ (face-tracking technology that allows the glasses-free stereoscopic 3D display to constantly adapt to the user's exact eye position as the player shifts his or her arms and body) and an upgraded processor that allows for more advanced NN3DS-exclusive games (e.g., a 3D port of acclaimed Wii game *Xenoblade Chronicles*) which cannot be played on the original Nintendo 3DS/2DS, although New Nintendo 3DS can still be played with all 3DS *and* most DSi games. It was released in Japan on October 11, 2014; in Australasia on November 21, 2014; in Europe on February 13, 2015; in North America on February 13, 2015, for the XL version. The smaller version for North America was released on September 25, 2015, bundled with the game *Animal Crossing: Happy Home Designer*.[188] In April 2017, Nintendo announced the New Nintendo 2DS XL, released in Japan on July 13, 2017, and in North America on July 28, 2017. It is a streamlined version of the New Nintendo 3DS XL, with identical screen sizes, but with a thinner build and without stereoscopic 3D.[189]

The 3DS family was formally discontinued in September 2020.

PlayStation Vita

The PlayStation Vita is the second handheld game console developed by Sony Computer Entertainment.[190] It is the successor to the PlayStation Portable as part of the PlayStation brand of gaming devices. It was released in Japan on December 17, 2011[191] and was released in Europe and North America on February 22, 2012.[192][193]

The handheld includes two analog sticks, a 5-inch (130 mm) OLED/LCD multi-touch capacitive touchscreen, and supports Bluetooth, Wi-Fi and optional 3G. Internally, the PS Vita features a 4-core ARM Cortex-A9 MPCore processor and a 4-core SGX543MP4+ graphics processing unit (GPU), as well as LiveArea software as its main user interface, which succeeds the XrossMediaBar.[194][195]

The device is backward-compatible with a subset of the PSP and PS One games digitally released on the PlayStation Network via the PlayStation Store.[196] The graphics for PSP releases are upscaled, with a smoothing filter to reduce pixelation.[197]

Lifetime sales of the Vita have not been released by Sony but have been estimated between 15 and 16 million.[198][199] Sony discontinued the PlayStation Vita on March 1, 2019,[200] and has no plans for a successor.[201][202]

Nintendo Switch Lite

Nintendo released the Nintendo Switch Lite, a hardware revision of the Switch, worldwide on September 20, 2019. Designed as a less expensive version of the Switch, the Switch Lite integrates the Joy-Con onto the hardware unit itself, eliminating some of the Joy-Con's features, which prevents a small number of games in the Switch's library that exclusively require television or tabletop modes from being used on the Switch. Additionally, the

Switch Lite cannot be docked. The unit is smaller and lighter than the main Switch console, and uses updated lower-powered hardware that improves its battery performance. It otherwise supports all other features of the Switch, including its communication capabilities.

Handheld comparison

Product line	Nintendo 3DS family			PlayStation Vita	Nintendo Switch Lite
Console	Nintendo 3DS/ Nintendo 3DS XL	Nintendo 2DS	New Nintendo 3DS/ New Nintendo 3DS XL / New Nintendo 2DS XL	PCH-1000 / PCH-2000	Nintendo Switch Lite
Logo	NINTENDO 3DS			PS VITA PlayStation Vita	NINTENDO SWITCH
Manufacturer	Nintendo			Sony (SCE/SIE)	Nintendo
Image					
Release dates	**Nintendo 3DS**: JP: February 26, 2011 EU: March 25, 2011 NA: March 27, 2011 AU: March 31, 2011 KOR: April 28, 2012 **Nintendo 3DS XL**: JP: July 28, 2012 EU: July 28, 2012 NA: August 19, 2012 AU: August 23, 2012 KOR: September 20, 2012	EU: October 12, 2013 NA: October 12, 2013 AU: October 12, 2013 KOR: December 2013 JP: February 27, 2016	**New Nintendo 3DS**: JP: October 11, 2014 AU: November 20, 2014 EU: January 6, 2015 (Ambassador Edition) EU: February 13, 2015 (General release) NA: September 25, 2015 **New Nintendo 3DS XL**: JP: October 11, 2014 AU: November 20, 2014 EU: February 13, 2015 NA: February 13, 2015 **New Nintendo 2DS XL**: AU: June 15, 2017 JP: July 13, 2017 KOR: July 13, 2017 NA: July 28, 2017 EU: July 28, 2017	**PCH-1000**: JP: December 17, 2011 EU: February 22, 2012 NA: February 22, 2012 AU: February 23, 2012 **PCH-2000**: JP: October 10, 2013 EU: February 7, 2014 NA: May 6, 2014	WW: September 20, 2019
Launch prices	**Nintendo 3DS**: ▪ ¥25,000 ▪ US$249.99[203] ▪ £/€, set by individual retailers[204] ▪ A$349.95[205] **Nintendo 3DS XL**: ▪ ¥18,900 ▪ US$199.99 ▪ £/€, set by individual retailers ▪ A$249.90	▪ US$129.99 ▪ £/€, set by individual retailers ▪ A$149.95	**New Nintendo 3DS**: ▪ ¥16,000 ▪ A$219.95 ▪ £/€, set by individual retailers **New Nintendo 3DS XL**: ▪ ¥18,900 ▪ A$249.95 ▪ £/€, set by individual retailers ▪ US$199.99 **New Nintendo 2DS XL**: ▪ US$149.99[189] ▪ A$199.95[206]	**Wi-Fi+3G** ▪ ¥29,980 ▪ US$299 ▪ €299 ▪ £279.99[207] ▪ A$419.95 **Wi-Fi** ▪ ¥24,980 ▪ US$249 ▪ €249 ▪ £229.99 ▪ A$349.95[208] **PCH-2000** ▪ ¥19,929 ▪ £180	US$199.99
Current prices	**Nintendo 3DS**: ▪ ¥15,000[209] ▪ US$169.99[210] ▪ £/€, set by individual retailers ▪ A$249.99[209]			**Wi-Fi / Wi-Fi+3G**: ▪ ¥19,980 ▪ US$199.99[211] ▪ €199 ▪ £, set by individual retailers[212] ▪ A$269.95	US$229.99[75]
Discontinued	January 5, 2015[213][214]	September 17, 2020[215][216][217]	**New Nintendo 3DS**: July 2017[218][219] **New Nintendo 3DS XL**: July 25, 2019[220] **New Nintendo 2DS XL**: September 17, 2020	March 1, 2019[200]	In production
Units shipped	75.94 million (as of March 31, 2022)[221]			—[a]	21.02 million (as of March 31, 2023)[222]

Best-selling game	*Mario Kart 7*, 18.97 million units (as of March 31, 2022)[223]			*Uncharted: Golden Abyss*, 500,000 units (as of June 3, 2012)[224]	*Mario Kart 8 Deluxe*, 45.33 million units (as of March 31, 2022)[86]
Regional lockout	Region locked[225]			No region lock	No region lock[226]
Backward compatibility	Nintendo DS / Nintendo DSi			PlayStation Portable (digitally downloaded games only)	—
Display	**Top Screen:** ▪ Autostereoscopic (3D) LCD ▪ Screen size: ▪ **3DS**: 3.53 in (90 mm) ▪ **3DS XL**: 4.88 in (124 mm) ▪ Screen pixel: ▪ **3DS/3DS XL**: 800 × 240 px (400 × 240 px per eye in 3D) **Bottom Screen:** ▪ 2D LCD resistive touchscreen ▪ Screen size: ▪ **3DS**: 3.02 in (77 mm) ▪ **3DS XL**: 4.18 in (106 mm) ▪ 320 × 240 px QVGA	**Top Screen:** ▪ 2D LCD ▪ Screen size: ▪ 3.53 in (90 mm) ▪ Screen pixel: ▪ 400 × 240 px **Bottom Screen:** ▪ 2D LCD resistive touchscreen ▪ Screen size: ▪ 3.02 in (77 mm) ▪ 320 × 240 px QVGA	**Top Screen:** ▪ Autostereoscopic (3D) LCD (New 3DS, New 3DS XL only) ▪ 2D LCD (New 2DS XL only) ▪ Screen size: ▪ **New 3DS**: 3.88 in (99 mm) ▪ **New 3DS XL**: 4.88 in (124 mm) ▪ **New 2DS XL**: 4.88 in (124 mm) ▪ Screen pixel: ▪ **New 3DS/New 3DS XL**: 800 × 240 px (400 × 240 px per eye in 3D) ▪ **New 2DS XL**: 400 × 240 px **Bottom Screen:** ▪ 2D LCD resistive touchscreen ▪ Screen size: ▪ **New 3DS**: 3.33 in (85 mm) ▪ **New 3DS XL**: 4.18 in (106 mm) ▪ **New 2DS XL**: 4.18 in (106 mm) ▪ 320 × 240 px QVGA	**PCH-1000**: 5 in (130 mm) OLED capactive touchscreen 960 × 544 px **PCH-2000**: 5 in (130 mm) IPS LCD capacitive touchscreen 960 × 544 px	▪ 2D LCD ▪ 5.5 in (140 mm) ▪ 1280 × 720 px
	Approximately 16.77 million colors[227]			Approximately 16.77 million colors	Approximately 16.77 million colors
	5 brightness levels			0-100% brightness levels	0-100% brightness levels
Autostereoscopy (3D)	Yes Yes, with 'Super Stable 3D' technology	No	Yes (New 3DS, New 3DS XL only) No (New 2DS XL only)	No	No
CPU	Dual-core ARM11 MPCore[228] & Dual-core VFP Co-Processor[228]		Quad-core ARM11 MPCore[228] & Quad-core VFP Co-Processor[228]	Quad-core ARM Cortex-A9 MPCore[229][230]	Quad-core Cortex-A57 + quad-core Cortex-A53 @ 1.02 GHz
GPU	Digital Media Professionals PICA200			PowerVR SGX543MP4+[229]	Nvidia GM20B Maxwell-based GPU
RAM	128 MB FCRAM, 6 MB VRAM		256 MB FCRAM, 10 MB VRAM	512 MB RAM, 128 MB VRAM[231]	4 GB LPDDR4
Camera	One front-facing and a set of two rear-facing 3D 0.3 MP (VGA) camera sensors			Front and rear 0.3 MP (VGA) camera sensors[229]	—
Audio	▪ Stereo speakers (2) (with pseudo-surround support) ▪ Mono speaker (1) (2DS only) ▪ Headphone jack			▪ Stereo speakers (2) ▪ Headphone jack	▪ Stereo speakers (2) ▪ Headphone jack
Storage	1 GB internal flash memory			1 GB internal flash memory (PCH-2000 only)	32 GB eMMC
	Supports up to 32 GB SD/SDHC cards		Supports up to 32 GB microSD/microSDHC cards	Supports 4 GB, 8 GB, 16 GB, 32 GB and 64 GB proprietary removable memory cards	Supports up to 2 TB microSD/HC/XC cards
	2 GB SD card included (3DS only) 4 GB SDHC card included (3DS XL)	4 GB SDHC card included	4 GB microSDHC card included	No external storage included	No external storage included
Media	Nintendo 3DS Game Card (1–8 GB) / Nintendo DS Game Card (8–512 MB) Digital distribution			PlayStation Vita Game Card (2–4 GB) Digital distribution	Nintendo Switch Game Card
User interface	▪ Circle Pad (2× with add-on (3DS/3DS XL only)) ▪ D-pad ▪ Autostereoscopic (3D) 15:9(5:3) screen (top screen) (2DS displays 2D only) ▪ Resistive 4:3 touchscreen (bottom screen) ▪ 3-axis accelerometer and 3-axis gyroscope[227] ▪ Volume slider ▪ 3D depth slider (Not available on 2DS) ▪ Front 2D camera and rear 3D camera sensors ▪ Microphone ▪ Wireless communications switch (3DS/3DS XL only) ▪ SLEEP switch (2DS only)		▪ Circle Pad ▪ C-Stick ▪ D-pad ▪ Autostereoscopic (3D) 15:9(5:3) screen (top screen) (New 2DS XL displays 2D only) ▪ Resistive 4:3 touchscreen (bottom screen) ▪ 3-axis accelerometer and 3-axis gyroscope[227] ▪ Volume slider ▪ 3D depth slider (Not available on New 2DS XL)	▪ 2 × analog sticks[194] ▪ D-pad[194] ▪ Capacitive 16:9 touchscreen[194] ▪ Rear touchpad[194] ▪ Sixaxis motion sensing (3-axis accelerometer and 3-axis gyroscope)[194] ▪ Three-axis electronic compass[194] ▪ Front & rear 2D camera sensors[229] ▪ Microphone[229]	▪ 2 C-Sticks ▪ 1 D-pad ▪ Capacitive touchscreen ▪ 3-axis accelerometer and 3-axis gyroscope ▪ Volume swivel switch ▪ 13 × buttons (X, Y, A, B, L, ZL, R, ZR, +, -, HOME, SHARE, POWER)

	▪ 12 × buttons (X, Y, A, B, L, R (ZL and ZR with add-on(3DS/3DS XL only)), START, SELECT, HOME, POWER)		▪ Front 2D camera and rear 3D camera sensors ▪ Microphone ▪ 12 × buttons (X, Y, A, B, L, R ZL, ZR, START, SELECT, HOME, POWER)	▪ 12 × buttons (△, ○, ✕, □, L, R, Start, Select, Home, Volume ±, Power)[194]	
Battery	▪ **Nintendo 3DS**: 1300 mAh lithium-ion battery ▪ **3DS Mode:** 3–5 hours ▪ **DS Mode:** 5–8 hours ▪ **Nintendo 3DS XL**: 1750 mAh lithium-ion battery ▪ **3DS Mode:** 3.5–6.5 hours ▪ **DS Mode:** 6–10 hours	▪ 1300 mAh lithium-ion battery[232] ▪ **3DS Mode:** 3.5–5.5 hours ▪ **DS Mode:** 6–9 hours	▪ **New Nintendo 3DS**: 1400 mAh lithium-ion battery ▪ **3DS Mode:** 3.5–6 hours ▪ **DS Mode:** 6.5-10.5 hours ▪ **New Nintendo 3DS XL**: 1750 mAh lithium-ion battery ▪ **3DS Mode:** 3.5–7 hours ▪ **DS Mode:** 7–12 hours ▪ **New Nintendo 2DS XL**: 1300 mAh lithium-ion battery ▪ **3DS Mode:** 3.5–5.5 hours ▪ **DS Mode:** 6–9 hours	▪ **PCH-1000**: 2200 mAh lithium-ion battery ▪ **Gameplay:** 3–5 hours ▪ **Video playback:** 5 hours ▪ **Music:** 9 hours[233] ▪ **PCH-2000**: 2210 mAh lithium-ion battery ▪ **Gameplay:** 4–6 hours ▪ **Video playback:** 6 hours ▪ **Music:** 10 hours	3570 mAh lithium-ion battery 3–7 hours
	Determined by screen brightness, Wi-Fi, sound volume, and whether 3D is active (3DS models only)			Determined by screen brightness, Wi-Fi, sound volume, and whether 3G is active (3G model only)	Determined by screen brightness, Wi-Fi, and sound volume
Connectivity	▪ Integrated 802.11 b/g Wi-Fi ▪ IR port ▪ NFC for Amiibo support (only on New 3DS/3DS XL; older 3DS series need to use a 3DS NFC reader accessory)			▪ Integrated 802.11 b/g/n Wi-Fi (PCH-1000 model only) ▪ Integrated 802.11 b/g/n Wi-Fi (PCH-2000 model only) ▪ 3G (3G model only) ▪ Bluetooth 2.1 + EDR	▪ Integrated 802.11a/b/g/n/ac Wi-Fi @ 2.4, 5 GHz ▪ Bluetooth 4.1 ▪ NFC for Amiibo support
Console Connection	Wii / Wii U			PlayStation 3 / PlayStation 4	—
Stylus	**3DS**: Extendable up to 100 mm (3.9 in) long **3DS XL**: 96 mm (3.8 in) long	96 mm (3.8 in) long	**New 3DS**: 76.5 mm (3.01 in) long **New 3DS XL/New 2DS XL**: 86 mm (3.4 in) long	—	—
Weight	**3DS**: 235 g (8.3 oz) **3DS XL**: 336 g (11.9 oz)	260 g (9.2 oz)	**New 3DS**: 253 g (8.9 oz) **New 3DS XL**: 329 g (11.6 oz) **New 2DS XL**: 260 g (9.2 oz)	**Wi-Fi**: 260 g (9.2 oz) **Wi-Fi+3G**: 279 g (9.8 oz) **PCH-2000**: 219 g (7.7 oz)	280 g (9.9 oz)
Dimensions	▪ **3DS**: ▪ **Width:** 134 mm (5.3 in) ▪ **Depth:** 74 mm (2.9 in) ▪ **Height:** 21 mm (0.83 in) ▪ **3DS XL**: ▪ **Width:** 156 mm (6.1 in) ▪ **Depth:** 93 mm (3.7 in) ▪ **Height:** 22 mm (0.87 in)	▪ **Width:** 144 mm (5.7 in) ▪ **Depth:** 127 mm (5.0 in) ▪ **Height:** 20.3 mm (0.80 in)	▪ **New 3DS**: ▪ **Width:** 156 mm (6.1 in) ▪ **Depth:** 93 mm (3.7 in) ▪ **Height:** 22 mm (0.87 in) ▪ **New 3DS XL/New 2DS XL**: ▪ **Width:** 160 mm (6.3 in) ▪ **Depth:** 93.5 mm (3.68 in) ▪ **Height:** 21.5 mm (0.85 in)	▪ **PCH-1000**: ▪ **Width:** 182 mm (7.2 in) ▪ **Depth:** 83.6 mm (3.29 in) ▪ **Height:** 18.6 mm (0.73 in)[229] ▪ **PCH-2000**: ▪ **Width:** 183.6 mm (7.23 in) ▪ **Depth:** 85.1 mm (3.35 in) ▪ **Height:** 15 mm (0.59 in)[234]	▪ **Width:** 208 mm (8.2 in) ▪ **Depth:** 91 mm (3.6 in) ▪ **Height:** 14 mm (0.55 in)
Online services	**Nintendo Network** ▪ Nintendo eShop ▪ Miiverse (discontinued) ▪ Nintendo Video (discontinued) ▪ Swapnote (Nintendo Letter Box in PAL region) (discontinued) ▪ StreetPass ▪ StreetPass Mii Plaza (local & online players met) ▪ SpotPass ▪ Internet Browser			**Sony Entertainment Network** ▪ PlayStation Network ▪ PlayStation Store ▪ PlayStation Video ▪ PlayStation Music ▪ PlayStation Mobile	Nintendo Switch Online ▪ Nintendo eShop
	Full game download/installation and automatic updates in the background via SpotPass			Full game download/installation in the background	Full game download/installation and automatic updates in the background
	Free			Free	Paid Nintendo Switch Online subscription required for online multiplayer, except for free-to-play titles[235]
Preloaded applications	**Applications** ▪ Health & Safety Information ▪ Nintendo 3DS Camera (Photo + Video Recording and Editing)			▪ *Welcome Park* ▪ *near* ▪ Photos ▪ Music	Nintendo eShop

	▪ Nintendo 3DS Sound ▪ Nintendo eShop ▪ Mii Maker ▪ StreetPass Mii Plaza ▪ AR Games ▪ Face Raiders ▪ Swapnote (Nintendo Letter Box in PAL regions) ▪ Nintendo Video ▪ Netflix (w/ paid subscription) ▪ Hulu Plus (w/ paid subscription) ▪ YouTube ▪ Nintendo Zone ▪ Activity Log[236] ▪ Download Play[237] ▪ System Settings **Multitasking Applications** ▪ Game Notes ▪ Friend List ▪ Notifications ▪ Internet Browser ▪ Miiverse	▪ Videos ▪ PlayStation Store ▪ Trophies ▪ Friends ▪ Party ▪ Group Messaging ▪ Notifications ▪ Internet Browser ▪ Email ▪ Maps ▪ Content Manager ▪ Remote Play ▪ Cross-Controller ▪ Settings	
List of games	List of Nintendo 3DS games	List of PlayStation Vita games	List of Nintendo Switch games Can only play games that support handheld mode
System software	Nintendo 3DS system software	PlayStation Vita system software	Nintendo Switch system software

a. Estimated between 15 and 16 million

See also

2010s portal

Video games portal

- 2010s in video games
- List of video game consoles
  - List of home video game consoles
  - List of handheld game consoles
  - List of dedicated video game consoles
  - List of microconsoles
  - List of virtual reality headsets

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Ninth generation of video game consoles

The **ninth generation of video game consoles** began in November 2020 with the releases of Microsoft's Xbox Series X and Series S console family and Sony's PlayStation 5.[1][2][3]

Compared to the eighth-gen consoles Xbox One and PlayStation 4, the new consoles add faster computation and graphics processors, support for real-time ray tracing graphics,[4] output for 4K resolution, and in some cases, 8K resolution, with rendering speeds targeting 60 frames per second (FPS) or higher.[5] Internally, both console families introduced new internal solid-state drive (SSD) systems to be used as high-throughput memory and storage systems for games to reduce or eliminate loading times and support in-game streaming.[6] The Xbox Series S and the PlayStation 5 Digital Edition lack an optical drive while retaining support for online distribution and storing games on external USB devices.

Despite much weaker processing power and already previously competing with eighth-generation consoles, the original Nintendo Switch has also been noted as a competitor to ninth-generation consoles, particularly with the introduction of the "OLED Model" revision in 2021;[7][8] a successor, the Nintendo Switch 2, was released in June 2025.[9] Other handheld personal computer devices such as the Steam Deck introduced means to play Linux games, as well as most Windows games through Proton, on-the-go, further expanding hardware competition in the generation.

Background

The duration from the eighth generation until the start of the ninth was one of the longest in history, having started in 2012 with the release of Nintendo's Wii U. Past generations typically had five-year windows as a result of Moore's law,[10] but Microsoft and Sony instead launched mid-console redesigns, the Xbox One X and PlayStation 4 Pro.[11] Microsoft also launched a monthly console lease program, with the option to buy or upgrade.[12] Some analysts believed these factors signaled the first major shift away from the idea of console generations because the potential technical gains of new hardware had become nominal.[13]

Microsoft and Sony had announced their new consoles in 2019 for release by the end of 2020, prior to the COVID-19 pandemic.[14][15] When the pandemic struck in March 2020, it impacted both marketing and production of the consoles. The cancelled E3 2020 had been planned as a major venue to premiere the consoles, and instead both Microsoft and Sony turned to online showcases to highlight the systems and launch games. Both companies acknowledged that the pandemic had strained their production supplies due to hardware manufacturing slowdowns starting in March 2020, but would not impact their console release windows, and they set consumer expectations that console supplies would likely be limited in the launch window and would slowly become more relaxed as the pandemic waned.[16][17] This created a wave of scalping through online stores, which was countered by manufacturers and vendors.[18] The ongoing global chip shortage continued to affect console shipments through the end of 2021, with Sony warning of lower production numbers during the final calendar quarter of the year and into 2022; this also affected Nintendo's Switch console production rates and Valve's plans to release the portable Steam Deck handheld gaming computer, from its planned December 2021 release date to February 2022.[19]

A combination of factors including the 2024–present global memory supply shortage, tariffs placed by the United States, and the 2026 Iran war had led to both Sony and Microsoft to raise the base prices of their systems during 2025 and 2026.

Home consoles

PlayStation 5

The PlayStation 5 was developed by Sony as the successor to the PlayStation 4 and was first released on November 12, 2020.[20] The primary goal of the PlayStation 5's development was to reduce loading times in games, particularly those that use in-game streaming such as when the player moves across an open world. Sony developed a custom solid-state drive (SSD) architecture based on a 12-channel, 825 GB SSD along with a fast software decompression method that enables an input/output speed of up to 8 to 9 GB/s. In most early development tests, this virtually eliminated loading screens and masking loading times for open world games.[21] The main system is backed by an AMD Zen 2 system on a chip running at a variable frequency capped at 3.5 GHz, and a RDNA 2 GPU also running at a variable frequency capped at 2.23 GHz. The GPU has a total potential processing power of 10.28 teraflops. The system comes with 16 GB of memory.[22]

The PlayStation 5 was launched with two models. The base model includes an optical disc reader for most disc formats including Blu-ray, UHD Blu-ray, and retail PlayStation 5 games. A cheaper Digital model lacks the disc reader, but otherwise is equivalent to the base model. Both models support expanded memory options to store games and other data onto external drives, thus allowing players to obtain and store games through online distribution via the PlayStation Store. The PlayStation 5 has mostly complete backward compatibility with PlayStation 4 games, with only a limited number of games not currently supported on the console,[23] while the PlayStation Now cloud service is available for users to play games from the older PlayStation consoles.[24]

Mid-generation revision of both PlayStation 5 models were announced in late 2023, both unofficially considered the PlayStation 5 Slim. The units are to replace the two original PlayStation 5 models; both will have a slimmer design as well as 1 TB of internal storage and additional USB ports. The more expensive model includes an optical disc drive, while the second model, the Digital Edition, will not ship with a drive, though a drive expansion kit will be available to users.[25][26]

Xbox Series X and Series S

The Xbox Series X/S is the successor to the Xbox One and was released on November 10, 2020, in select regions.[27][28] Microsoft followed the Xbox One's dual console models: a high-end line (the Series X comparable to the Xbox One X), and a cheaper model (the Series S comparable to the Xbox One S).[29] The performance goal for the Xbox Series X was about four times that of the Xbox One X,[30] but without sacrificing game development for the lower-end Xbox Series S.[29]

Both the Xbox Series X and Series S use an AMD Zen 2 CPU and an RDNA 2 GPU but with different frequencies and compute units. The Series S has lower frequencies with reduced performance, and the Series X has graphics performance estimated at 12.155 teraflops compared to the Series S's 4.006 teraflops.[31][32] Microsoft developed a Velocity Architecture, which includes an internal SSD system (1 TB on the Series X, 500 GB on the Series S) used for storing games and new DirectX interfaces with improved input/output and in-game texture streaming and rendering. The Series X includes an optical disc reader supporting Blu-ray and UHD media, which is absent in the Series S.[33] Both consoles support external game storage media and online distribution via Xbox Live. Full backward compatibility was announced for all Xbox One games, including previously supported Xbox and Xbox 360 games but excluding Kinect games.[34][35] Microsoft encouraged third-party developers and publishers to use its Smart Delivery approach to give Xbox One games free performance upgrade patches for Xbox Series X/S.[36]

Comparison

The following table includes only named released models, and does not include minor hardware revisions or redesigns, such as the "slim" model of the PlayStation 5.

Product Line		PlayStation 5			Xbox Series X/S	
Name		PlayStation 5 Digital Edition	PlayStation 5	PlayStation 5 Pro	Xbox Series S	Xbox Series X
Logo						
Image						
		A PS5 Digital Edition with the DualSense controller	A standard PS5 with the DualSense controller	A standard PS5 Pro	An Xbox Series S with its controller	An Xbox Series X with its controller
Manufacturer		Sony Interactive Entertainment			Microsoft Gaming	
Release dates		AU/JP/KR/NA/NZ/SGP: November 12, 2020 WW: November 19, 2020[37] IND: January 22, 2021 INA: February 2, 2021[38] CHN: May 15, 2021[39]		WW: November 7, 2024	WW: November 10, 2020 CHN: June 10, 2021[40]	
Launch prices	US$	399.99	499.99	699.99	299.99[a]	499.99[b]
	€	399.99	499.99	799.99	299.99[a]	499.99[b]
	GBP	359.99	449.99	699.99	249.99[a]	449.99[b]
	A$	599.95	749.95	1,199.95	499[a]	749[b]
	JP¥	39,980	49,980	119,980	29,980[a]	49,980[b]
Current prices[41]	US$	599.99	649.99	899.99	399.99[a]/449.99[c]	649.99[b]/599.99[c]/799.99[d]
	€	599.99	649.99	899.99	349.99[a]/399.99[c]	599.99[b]/549.99[c]/699.99[d]
	GBP	519.99	569.99	789.99	299.99[a]/349.99[c]	499.99[b]/449.99[c]/589.99[d]
	A$	749.95	829.95	Same as launch price	549[a]/599[c]	849[b]/749[c]/1,049[d]
	JP¥	55,000[e][42]/89,980[f]	97,980	137,980	44,578[a]/49,978[c]	66,978[b]/59,978[c]
Sales	Shipped	65.5 million (as of 30 June 2024)[43]			28.3 million (as of 30 June 2024)[43]	
	Sold	61.7 million (as of 30 June 2024)[43]				
Media	Game media	Digital distribution	UHD Blu-ray, Blu-ray, digital distribution	Digital distribution (UHD Blu-ray and Blu-ray with optional disc drive)	Digital distribution	UHD Blu-ray, Blu-ray, DVD, CD, digital distribution
	Regional lockout	Unrestricted				
	Other	UHD Blu-ray, Blu-ray, and DVD with optional disc drive	UHD Blu-ray, Blu-ray, DVD	UHD Blu-ray, Blu-ray, and DVD with optional disc drive	—	UHD Blu-ray, Blu-ray, DVD, CD
	Backward compatibility	Almost all PlayStation 4 and PlayStation VR games			—	All Xbox One games (excluding Kinect-required games) and Xbox 360 and original Xbox games playable on Xbox One (list)
CPU	Type	Custom AMD 8-core based on Zen 2 architecture				
	ISA	x86-64				
	Clock speed	up to 3.5 GHz (variable) with SMT always on		up to 3.85 GHz (variable) with SMT always on	3.4 GHz with SMT, 3.6 GHz without SMT	3.6 GHz with SMT, 3.8 GHz without SMT
	Process	7 nm[g] or 6 nm[h]		4 nm[44]	7 nm	7 nm or 6 nm
GPU	Type	Custom AMD Radeon RDNA 2 architecture		Hybrid AMD RDNA 2 architecture with RDNA 3 features and RDNA 4 Raytracing cores	Custom AMD Radeon RDNA 2 architecture	
	Clock speed	up to 2.233 GHz (variable)		up to 2.35 GHz (variable)	1.565 GHz	1.825 GHz
	TFLOP/s	up to 10.28 TFLOPS (variable)		up to 18.048 TFLOPS (variable)[45]	4.006 TFLOPS	12.155 TFLOPS

	Compute units	36 out of 40 CUs (2304 out of 2560 SMs) enabled	60 CU	20 out of 24 CUs (1280 out of 1536 SMs) enabled	52 out of 56 CUs (3328 out of 3584 SMs) enabled
	Process	7 nm[g] or 6 nm[h]	4 nm	7 nm	7 nm or 6 nm
Memory	**Main & other**	16 GB GDDR6 SDRAM; 256-bit (unified) 512 MB DDR4 SDRAM (for background tasks)	16 GB GDDR6 SDRAM 2 GB DDR5 SDRAM	10 GB GDDR6 SDRAM; 128-bit (semi-unified)	16 GB GDDR6 SDRAM; 320-bit (semi-unified)
	Bandwidth	448 GB/s	576 GB/s	8 GB (128-bit) (GPU) @ 224 GB/s 2 GB (32-bit) (system) @ 56 GB/s	10 GB (320-bit) (GPU) @ 560 GB/s 6 GB (3.5 GB & 2.5 GB) (192-bit) (system) @ 336 GB/s
	Clock speed	1.75 GHz (14 GHz effective)	2.25 GHz (18 GHz effective)	1.75 GHz (14 GHz effective)	1.75 GHz (14 GHz effective)
Storage	**Internal**	825 GB[i] or 1 TB[j] PCIe Gen 4 custom NVMe SSD	2 TB PCIe Gen 4 custom NVMe SSD	512 GB or 1 TB PCIe Gen 4 custom NVMe SSD	1 TB or 2 TB PCIe Gen 4 custom NVMe SSD
	Reserved by OS	161 GB		200 GB	
	External	M.2 NVMe SSD support (with September 2021 system update),[46] USB 3.2 HDD Support (archive only for PS5 games)		Storage Expansion Card (up to 2 TB), USB 3.1 HDD Support (archive only for X/S games)[47]	
	Bandwidth	5.5 GB/s (raw or uncompressed), 8–9 GB/s, up to 22 GB/s (compressed)		2.4 GB/s (raw or uncompressed), 4.8 GB/s (compressed)	
	Game installation	Updates are downloaded and installed automatically in Rest Mode		Updates are downloaded and installed automatically in Instant-on Mode	
Network	**Wireless**	Dual-band Wi-Fi 6 @ 2.4 GHz and 5 GHz	Tri-band Wi-Fi 7 @ 2.4 GHz, 5 GHz and 6 GHz	Dual-band Wi-Fi 5 @ 2.4 GHz and 5 GHz	
	Wired	Gigabit Ethernet			
Dimensions		390 × 260 × 92 mm (15.4 × 10.2 × 3.6 in)[i] 358 × 216 × 80 mm (14.1 × 8.5 × 3.1 in)[j]	390 × 260 × 104 mm (15.4 × 10.2 × 4.1 in)[i] 358 × 216 × 96 mm (14.1 × 8.5 × 3.8 in)[j]	388 × 216 × 89 mm (15.3 × 8.5 × 3.5 in)	151 × 65 × 275 mm (5.9 × 2.6 × 10.8 in)	151 × 151 × 301 mm (5.9 × 5.9 × 11.9 in)
Weight		3.9 kg (8.6 lb)[k] 3.6 kg (7.9 lb)[l] 3.4 kg (7.5 lb)[m] 2.6 kg (5.7 lb)[j]	4.5 kg (9.9 lb)[k] 4.2 kg (9.3 lb)[l] 3.9 kg (8.6 lb)[m] 3.2 kg (7.1 lb)[j]	3.1 kg (6.8 lb)	1.92 kg (4.2 lb)	4.44 kg (9.8 lb)
Power		340 W[48]	350 W[48]	390 W	165 W[49]	315 W[49]
Included in the box		DualSense wireless controller USB Type-C to Type-A charging cable for the DualSense wireless controller HDMI cable (compatible with Ultra High Speed defined by HDMI v2.1) AC power cord Console base		Same as base model, minus console base	Xbox Wireless Controller HDMI cable (compatible with Ultra High Speed defined by HDMI v2.1) AC power cord	
Video	**Output**	HDMI: 720p, 1080i, 1080p, 1440p, 4K UHD, 8K UHD			HDMI: 720p, 1080p, 1440p, 4K UHD	HDMI: 720p, 1080p, 1440p, 4K UHD, 8K UHD
Audio		Custom Tempest 3D Engine, supports: Dolby Atmos & DTS:X (Blu-ray and Ultra HD Blu-ray disc video when connected to a supported device), Dolby Digital (max 5.1ch), Dolby Digital Plus (max 7.1ch), Dolby TrueHD (max 7.1ch), DTS (max 5.1ch), DTS-HD High Resolution Audio (max 7.1ch), DTS-HD Master Audio (max 7.1ch), AAC (max 5.1ch), Linear PCM (max 7.1ch), up to 7.1 surround sound overall			Custom Project Acoustics 3D Audio Dolby Atmos DTS:X 7.1 surround sound	
Peripheral abilities	**Controller**	DualSense wireless controller			Xbox Wireless Controller	
	Touch capability	DualSense controller includes a "touchpad"			—	
	Camera	PS5 HD camera			—	
Online services		PlayStation Network, PlayStation Now			Xbox network, Xbox Game Pass	
		Downloads games and automatic updates in the background				
		Paid PlayStation Plus subscription required for Cloud saves, online multiplayer, except for free-to-play titles			Paid Xbox Game Pass Core subscription required for online multiplayer, except for free-to-play titles, free cloud saves[50]	
Game DVR	**Image**	—				
	Video	—				
	Live streaming	Free				
List of games		List of PlayStation 5 games			List of Xbox Series X and Series S games	
System software		PlayStation 5 System Software			Xbox Series X/S System Software	
	Updates	Updates are downloaded and installed automatically in Rest Mode			Updates are downloaded and installed automatically in Instant-on Mode	
Sources		[51]	[52][53]		[54]	

Related platforms

Nintendo Switch and Nintendo Switch 2

Despite being a holdover from the eighth-generation, the Nintendo Switch has been positioned by sources as a primary competitor to other ninth-generation consoles, due to its continued hardware and software support as of 2024.[7][8][55] The financial failure of Nintendo's first eighth-gen console, the Wii U, resulted in the Switch's relatively late release in the eighth-generation, being released in March 2017.[56][57] An "OLED Model" revision was released on October 8, 2021, introducing an updated design and improved display, though it did not introduce any performance improvements.[58] Additionally, commercial performance of Switch-exclusive titles have remained high during the ninth-generation, with *Pokémon Scarlet and Violet* (2022) and *The Legend of Zelda: Tears of the Kingdom* (2023) both achieving 10 million units sold in their first three days after release.[59][60] Nintendo announced a successor, the Nintendo Switch 2, on January 16, 2025, with it releasing on June 5 in the same year.[61]

A docked original Nintendo Switch

A docked Nintendo Switch 2

Steam Deck and handheld gaming PCs

On February 25, 2022, Valve released the Steam Deck, a handheld gaming PC that runs SteamOS 3.0, a Linux distribution developed by Valve. The Deck includes Valve's own Proton compatibility layer, allowing nearly all Windows-based games to run on the Deck without modification. The handheld also allows users to install Windows or other software on the device. The Steam Deck was the first handheld to use an RDNA 2 GPU, which is also used on both the home consoles of the ninth generation.[62] The handheld was well received by many outlets, with an overall praising of its extensive game compatibility and portability.[63][64]

LCD-model Valve Steam Deck

The success of the Steam Deck led to the growth of the handheld gaming PC market and to the creation of direct competitors, such as the Asus ROG Ally, Lenovo Legion Go, MSI Claw A1M, and the Ayaneo running Microsoft Windows.[65]

Cloud gaming platforms

Cloud gaming has become part of the gaming landscape with Stadia and Amazon Luna being introduced in November 2019 and October 2020, respectively, as well as GeForce Now coming out of its four years of beta in February 2020. None of these systems have had any financial breakthrough as home video game consoles, but they are viable for multi platform ninth generation games.[66] Google, having failed to find a large player base, shut down Stadia on January 19, 2023.[67]

The official Stadia Controller and Chromecast Ultra (left to right), the primary way Stadia was intended to be played

Cloud gaming has also been used by Microsoft as part of its gaming subscription service, Xbox Game Pass. This gave Microsoft a head start in what analysts expected to be a major complementary service, supplementing the unprofitable console business and appealing to more entry-level players with better accessibility at a lower price.[68] Microsoft's Phil Spencer said that they believed that they could not compete on the console hardware space as much as Sony or Nintendo, and shifted their strategy towards Xbox Game Pass and cloud gaming.[69] Sony in turn revamped its PlayStation Plus subscription in mid-2022 by merging in PlayStation Now, its cloud-based service for games of past PlayStation generations, as a feature in a higher subscription tier.[70]

The continued growth of cloud gaming services has inspired the development of handhelds like the Logitech G CLOUD Gaming Handheld[71] and Razer Edge,[72] which advertise cloud streaming as a key selling point.

Virtual reality headsets

The ninth generation continued the trend of virtual reality. The previous generation mainly consisted of VR accessories made for mobile games (such as Google's Cardboard/Daydream and Samsung's Gear VR) or computers (HTC Vive and the Oculus Rift).[73][74] This generation has started to offer standalone headsets dedicated to virtual reality games. The Meta Quest Pro was released in 2022.[75] Additions in 2023 included the PlayStation VR2 (a PS5 accessory serving as a successor to 2016's PlayStation VR) and the Meta Quest 3.[76] 2024 also saw Apple's entry into the market with the release of the Apple Vision Pro.[77][78]

A Meta Quest 3 display-unit

Retro-focused consoles

Polymega[79] and Atari 2600+[80] are examples of game consoles released during the timespan of this generation, which focus on retro gaming and re-releases of older games.

While not directly focused on re-releases, Atari VCS is a Linux-based console that is pre-loaded with the compilation, Atari VCS Vault: Vol 1.[81] Additional titles, including a selection of indie games and remakes of classic Atari games, can be purchased from the console's digital storefront.[82]

See also

An Atari VCS and its official accessories

- 2020s portal
- Video games portal

- 2020s in video games
- Lists of video game consoles
  - List of home video game consoles
  - List of handheld game consoles
  - List of dedicated video game consoles
  - List of virtual reality headsets

Notes

a. 512 GB All-Digital
b. 1 TB Disc Drive
c. 1 TB All-Digital
d. 2 TB Disc Drive
e. Japanese language model
f. Multi-language model
g. 2020 & 2021 revisions
h. 2022 revision or slim
i. non-slim
j. slim
k. 2020 revision
l. 2021 revision
m. 2022 revision

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