

THE GENERATIONS OF USB

A Brief History of USB

USB was developed in **1994–1995** by a consortium of companies including **Intel, Microsoft, IBM, and Compaq**, aiming to replace the confusing mess of legacy ports (serial, parallel, PS/2, game ports, etc.) with a single, unified plug-and-play interface.

USB 1.x (1996–1998) — The Beginning

Version	Year	Max Speed	Key Notes
USB 1.0	1996	1.5 Mbps (Low Speed) / 12 Mbps (Full Speed)	Initial release, slow adoption
USB 1.1	1998	Same speeds	Improved compatibility & stability; first widely adopted version

- ◆ Perfect for basic peripherals: keyboards, mice, printers
- ◆ **Key innovation:** Hot-swapping (plug/unplug without rebooting)

USB 2.0 (2000) — The Breakthrough

Year	Max Speed	Key Feature
2000	480 Mbps (High Speed)	~40× faster than USB 1.1

- ◆ Introduced **High Speed** mode alongside backward-compatible Low/Full Speed
- ◆ Revolutionized use of external storage, high-res cameras, and faster peripherals
- ◆ **Legacy:** Still widely available on devices today
- ◆ This version truly made USB a household name

USB 3.x (2008–2017) — The Speed Revolution

The naming here got **notoriously confusing** due to rebranding:

Marketing Name	Original Name	Year	Speed	Also Known As
USB 3.2 Gen 1	USB 3.0	2008	5 Gbps	SuperSpeed
USB 3.2 Gen 2	USB 3.1	2013	10 Gbps	SuperSpeed+
USB 3.2 Gen 2×2	USB 3.2	2017	20 Gbps	Dual-lane SuperSpeed+

Key innovations in USB 3.x:

- ♦ **Full-duplex bidirectional** data transfer (send & receive simultaneously)
- ♦ Doubled the number of data lines from 4 to 8
- ♦ Improved **power delivery** and power management
- ♦ Introduced the blue-colored port (USB 3.0 standard)

USB4 (2019) — The Unification Era

Year	Max Speed	Key Feature
2019	40 Gbps	Integrates Thunderbolt 3 protocol

- ♦ **What USB4 brought:**
- ♦ **40 Gbps** — double USB 3.2's top speed
- ♦ Mandatory support for **Thunderbolt 3** compatibility
- ♦ **USB-C connector only** — the first standard to require it
- ♦ Simultaneous support for multiple **data and display protocols**
- ♦ Better **power delivery** up to 240W (USB PD 3.1)



USB4 v2.0 (2022) — The Cutting Edge

Year	Max Speed	Key Feature
2022	80 Gbps (up to 120 Gbps asymmetric)	Thunderbolt 4 integration

- ♦ **80 Gbps** symmetrical, or **120 Gbps** in asymmetric mode
- ♦ Backward compatible with all previous USB versions
- ♦ Supports next-gen displays, storage, and high-performance computing

The Connector Evolution

Connector	Shape	Introduced	Key Feature
USB-A	Rectangular	1996	The classic, one-way plug
USB-B	Square with bevel	1996	Printers & larger peripherals
Mini-USB	Smaller variant	Early 2000s	Older mobile devices
Micro-USB	Flat, compact	2007	Smartphones (pre-USB-C era)
USB-C	Oval, reversible	2014	The future — reversible, high power, high speed

USB-C is a game-changer:

reversible plug design, supports up to 240W power, video output

(DisplayPort Alt Mode), Thunderbolt, and all USB speeds up to USB4 v2.

USB Standard Comparison Chart

	 USB 1.0/1.1	 USB 2.0	 USB 3.0	 USB 3.1	 USB 3.2	 USB 4	 USB 4 Version 2.0
 Max Transfer Speed	1.5 Mbps / 12 Mbps	480 Mbps	5 Gbps	10 Gbps	20 Gbps	40 Gbps	80 Gbps
 Certification Logo							
 Compatible Connector Types	 Type-A  Type-B	 Type-A  Type-B  Mini-A  Mini-B	 Type-A  Type-B  Micro-A  Micro-B	 Type-A  Type-B  Micro-A  Micro-B  Type-C	 Type-A  Type-B  Micro-A  Micro-B  Type-C	 Type-C	 Type-C

Active Optical Cable (AOC) USB works by converting electrical signals to **light pulses** at the source end, transmitting them through fiber optics, then converting back to electrical signals at the destination — giving you clean, high-speed signals over vastly longer distances.

USB-C's flexible interface with **AOC's fiber-optic performance** sets a new standard for data centers, VR/AR, machine vision, and industrial automation.