

Universal Serial Bus Specification

Compaq

Hewlett-Packard

Intel

Lucent

Microsoft

NEC

Philips

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Scope of this Revision

The 2.0 revision of the specification is intended for product design. Every attempt has been made to ensure a consistent and implementable specification. Implementations should ensure compliance with this revision.

Revision History

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Universal Serial Bus Specification
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Chapter 1

Introduction

1.1 Motivation

The original motivation for the Universal Serial Bus (USB) came from three interrelated considerations:

- **Connection of the PC to the telephone**

It is well understood that the merge of computing and communication will be the basis for the next generation of productivity applications. The movement of machine-oriented and human-oriented data types from one location or environment to another depends on ubiquitous and cheap connectivity. Unfortunately, the computing and communication industries have evolved independently. The USB provides a ubiquitous link that can be used across a wide range of PC-to-telephone interconnects.

- **Ease-of-use**

The lack of flexibility in reconfiguring the PC has been acknowledged as the Achilles' heel to its further deployment. The combination of user-friendly graphical interfaces and the hardware and software mechanisms associated with new-generation bus architectures have made computers less confrontational and easier to reconfigure. However, from the end user's point of view, the PC's I/O interfaces, such as serial/parallel ports, keyboard/mouse/joystick interfaces, etc., do not have the attributes of plug-and-play.

- **Port expansion**

The addition of external peripherals continues to be constrained by port availability. The lack of a bi-directional, low-cost, low-to-mid speed peripheral bus has held back the creative proliferation of peripherals such as telephone/fax/modem adapters, answering machines, scanners, PDA's, keyboards, mice, etc. Existing interconnects are optimized for one or two point products. As each new function or capability is added to the PC, a new interface has been defined to address this need.

The more recent motivation for USB 2.0 stems from the fact that PCs have increasingly higher performance and are capable of processing vast amounts of data. At the same time, PC peripherals have added more performance and functionality. User applications such as digital imaging demand a high performance connection between the PC and these increasingly sophisticated peripherals. USB 2.0 addresses this need by adding a third transfer rate of 480 Mb/s to the 12 Mb/s and 1.5 Mb/s originally defined for USB. USB 2.0 is a natural evolution of USB, delivering the desired bandwidth increase while preserving the original motivations for USB and maintaining full compatibility with existing peripherals.

Thus, USB continues to be the answer to connectivity for the PC architecture. It is a fast, bi-directional, isochronous, low-cost, dynamically attachable serial interface that is consistent with the requirements of the PC platform of today and tomorrow.

1.2 Objective of the Specification

This document defines an industry-standard USB. The specification describes the bus attributes, the protocol definition, types of transactions, bus management, and the programming interface required to design and build systems and peripherals that are compliant with this standard.

The goal is to enable such devices from different vendors to interoperate in an open architecture. The specification is intended as an enhancement to the PC architecture, spanning portable, business desktop, and home environments. It is intended that the specification allow system OEMs and peripheral developers adequate room for product versatility and market differentiation without the burden of carrying obsolete interfaces or losing compatibility.

1.3 Scope of the Document

The specification is primarily targeted to peripheral developers and system OEMs, but provides valuable information for platform operating system/ BIOS/ device driver, adapter IHVs/ISVs, and platform/adaptor controller vendors. This specification can be used for developing new products and associated software.

1.4 USB Product Compliance

Adopters of the USB 2.0 specification have signed the USB 2.0 Adopters Agreement, which provides them access to a reciprocal royalty-free license from the Promoters and other Adopters to certain intellectual property contained in products that are compliant with the USB 2.0 specification. Adopters can demonstrate compliance with the specification through the testing program as defined by the USB Implementers Forum. Products that demonstrate compliance with the specification will be granted certain rights to use the USB Implementers Forum logo as defined in the logo license.

1.5 Document Organization

Chapters 1 through 5 provide an overview for all readers, while Chapters 6 through 11 contain detailed technical information defining the USB.

- Peripheral implementers should particularly read Chapters 5 through 11.
- USB Host Controller implementers should particularly read Chapters 5 through 8, 10, and 11.
- USB device driver implementers should particularly read Chapters 5, 9, and 10.

This document is complemented and referenced by the *Universal Serial Bus Device Class Specifications*. Device class specifications exist for a wide variety of devices. Please contact the USB Implementers Forum for further details.

Readers are also requested to contact operating system vendors for operating system bindings specific to the USB.