

Common Language

Computers are complex machines that require the near constant communication and synchronization to continue functioning. These systems consist of numerous modular parts, each containing their own components and core functions. From the procedure that powers on your computer to the process that controls electron flow within a integrated chip, standards are what define our global infrastructure and facilitate communication.

Building a global computer network, more commonly known as the Internet, requires a great deal of planning. We need to ensure that computers are created in a way that promote synergy and harmony – a method for ensuring parts can work together even when created by competitors. Building upon this foundation, we need to reach an accord about how each of these parts can communicate with the others to create larger systems.

As a collective, we convene to curate standards – or a mutually agreed upon definition about something and how it should operate. They are a [lingua franca](#), allowing us to bridge systems through common language each party can understand. Standards help set the stage for creation and collaboration on an unrivaled scale by ensuring the ability to share important information across a divide.

Coming to an agreement on standards can be a contentious process that is never quite finished. As computers gained prominence, many corporations vied to create their own proprietary standards in an attempt to corner the market. This meant that computers and parts created by one manufacturer would not always compatible with another's.

Everyone from engineers to corporations explored their own ideas about how the Internet should work. Starting in the 1960s, the [Protocol Wars](#) polarized researchers and nations alike as we debated how a World Wide Web of computers would take shape. This required finding robust and reliable means for computers to connect across vast distances. It wasn't until the early 1990s that we firmly agreed on a standard – just in time for the [Unix Wars](#) to begin.

Reasearchers were learning how to computers worked about as quickly as corporations sought to generate a profit from them. By creating divergent standards, consumers were often [locked-in to the ecosystem](#) of the hardware manufacturer.

The prevailing [Internet standard](#) was not created by any one corporation, but through an organization focused on the creation of open standards. This means that, instead of being owned by any one party, these standards are freely available for anyone to use so that no one can own the Internet.

Standards

During the first booms within digital computers, we quickly faced the reality that there were many ways to achieve the same end. [Finding a path](#) from one point to another can contain many complexities along the way. Standards ensure consistency and play an important role in defining expectations.

Hub

Interoperability

This allows individual components or entire systems to work seamlessly with other discrete parts. [Originally intended for technical information systems](#), it has expanded to [consider external factors](#) – such as social, political and power structure. Interoperability is crucial within technical fields – like computers and networks – for widespread adoption.

Security

Security

Standards often contain best practices that help guide security decisions and provide safety. This allows us to take steps to protect sensitive data through add-on mechanisms – such as [encryption](#), [authentication](#) and [access controls](#). By defining expectations, standards can help us avoid the risks caused by unsupported or incompatible systems

Verified

Reliability

Standards will often formalize the minimum requirements to ensure safety and continued operation. This can prevent accidents and injuries caused by product failures, as well as provide assurance that the system will keep functioning.

These are an [important part of global systems](#) like agriculture, communication, science and technology. Defining measurements, symbols and terms we can more easily have conversations across languages and geographical boundaries.

The metric system is an example of a standardized system – what you consider a kilogram is the same as everyone else. These form a foundation on which other standards can be built, enabling larger systems with more complexity.

[Technical standards](#) set the rules for building computer components that work together and networks that can seamlessly share information over great distances. They cover a broad area from dimensions and processes all the way to safety and performance requirements. Standards are used for creating both [hardware](#) and [software](#).

Software

Web

[HTML](#)

This is used to code websites made available on the World Wide Web.

Lan

[TCP/IP](#)

This forms the foundation for computers connecting over the internet.

Email

[SMTP](#)

This allows us to send emails to people regardless of where they are in the world.

Directory_sync

[FTP](#)

This enables two computers to exchange files over a network.

Docs

[TXT](#)

This file format can be used to store text files on a computer's storage.

Wysiwyg

[RTF](#)

This can be used to save text with rich formatting to your hard drive.

Hardware

Developer_board

[PCIe](#)

This allows computers to extend their hardware with add-on boards.

Memory

[SDRAM](#)

This forms the foundation for memory in modern computer systems.

Bluetooth

[Bluetooth](#)

This allows devices to communicate over a [personal area network](#).

Tv

[HDMI](#)

This allows high-quality video and other data to be transmitted over a cable.

Usb

USB

This enables devices to share power and data on a local connection.

Hard_disk

SATA

This provides an interface for accessing locally installed hard disk drives.

For standards to be used and become widely accepted, they need to be formalized with technical aspects thoroughly documented. They are often maintained by [organizations](#) that focus on their continued development. How complex it will vary based on the specific problem it is addressing.

The prominence of a standard can be greatly affected by how it is implemented:

Gavel

By Regulation

These [du jure](#) standards have been created by officially recognized [Standards organizations](#) – such as [IEEE](#), [ISO](#), and [ANSI](#). These standards help ensure [global collaboration](#) by defining important terms.

For example: the [Internet](#), [websites](#), [email](#), [mobile broadband](#), and [cellphone service](#)

Stars

By Convention

These [de facto](#) standards are not created by any official organization so they are not strictly required. They are often created by private manufacturers and have gained widespread adoption within consumers.

For example: [PDFs](#), [MP3s](#), [HDMI cables](#), [USB connectors](#), [PCIe extension ports](#), [Bluetooth](#) and [3.5mm audio cables](#).

Not all standards are created equal and come from many different entities. They can be proprietary "closed" standards or community-focused open standards. They each fill their own niche, coming with their own intentions and complexities

Some standards are maintained by a private corporation and are not available to the general public. Generally, these cost a fee or require some other contribution before they can be used. While this may increase profit, adoption may be limited because of the additional steps and

increased cost.

This has the potential to create [perverse incentives](#) for the standard owner to [focus solely on their profit generation](#). Membership can provide corporations means of providing their voice to its development and push back against this.

[HDMI](#), [Bluetooth](#) and [USB](#) are examples of "closed" standards that require licensing to claim compliance.

This process [may drive manufacturers to alternative open standards](#) that are community-developed. All necessary documentation and specifications are openly available to the public. These also generally come with an open license that opens the avenue to extensibility and new features. Based on how they are implemented, there may be variability from the standards as written.

The [Internet](#) and [cell phone mobile broadband](#) are examples of open standards.

Standard Systems

When independent computer systems need to communicate, they need to use a well-defined format. The messages exchanged between two computers have a precisely defined intention, resulting in an expected effect based. The content of these messages and they receive are all determined as part of their related standards.

That's why it is imperative for every party involved to mutually agree on these '[call and responses](#)'. The same way that [programming languages](#) define our expectations for writing applications, standards can be used to [formalize how they communicate](#).

While a standard is the guideline for maintaining uniformity, they can be employed in different ways:

Rule

Specification

Standards often come with specifications that provide details about the requirements – such as dimensions, materials and procedures – for a specific entity. They are used to describe both the [problem](#) and its [solution](#).

These can be incredibly in-depth because they are used to explicitly describe integral parts, including manufacturing, testing and handling. They are important for creating contracts because they are a mutually agreed-upon definition for expectations.

[Motherboard](#) standards contain specifications about their dimensions and fastener locations.

Forum

Protocol

Defined through specifications, these create the means for communication across disparate systems. While standards ensure devices are compatible, protocols enable them to agree upon the language to communicate with.

They govern how data is shared through our global information infrastructure by formalizing parameters:

- **Syntax:** The data's structure and format.
- **Semantics:** Rules for understanding data.
- **Sequence:** The order the data is sent.
- **Timing:** When the data is sent.
- **Flow:** How quickly the data is sent.
- **Security:** Ensures the privacy of data.
- **Errors:** Finding and fixing data corruption.

Protocols are often implemented at both the hardware and software level to ensure compliance. Multiple protocols are often used to handle various dimensions of communication – such as finding a computer on the network, establishing the connection, and ensuring its continued security.

The [Internet standards](#) define the protocols required for global network communications.

Interface

This is a shared boundary between two separate systems that is used to share information through direct interaction. While a standard dictates how an individual process *should* occur, an interface enumerates what processes *can* occur.

A graphical user interface allows us to control our computer with a mouse and keyboard. Similarly, a hardware interface allows computer parts to communicate with software applications.

The UEFI specification creates an interface for controlling hardware components.

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