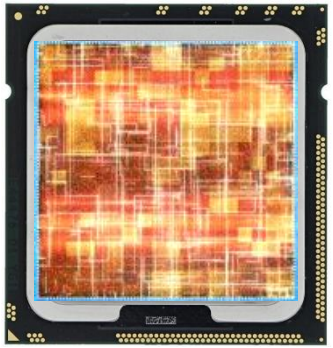

Data communication
starting in 5:00
Dr. Goran Soldar
Dr. Khuong An Nguyen

The most important component ?



Computer interfaces

1. “Technologies come and go, interfaces should last forever”.
2. Provides a set of standard specs for developers.
3. Allows consumers to install the latest technology on their existing machine.

Interface

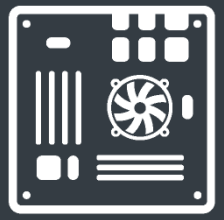
Bus

Communication

1 | The evolution of computer interfaces.

2 | Computer buses.

3 | Serial and parallel communication.

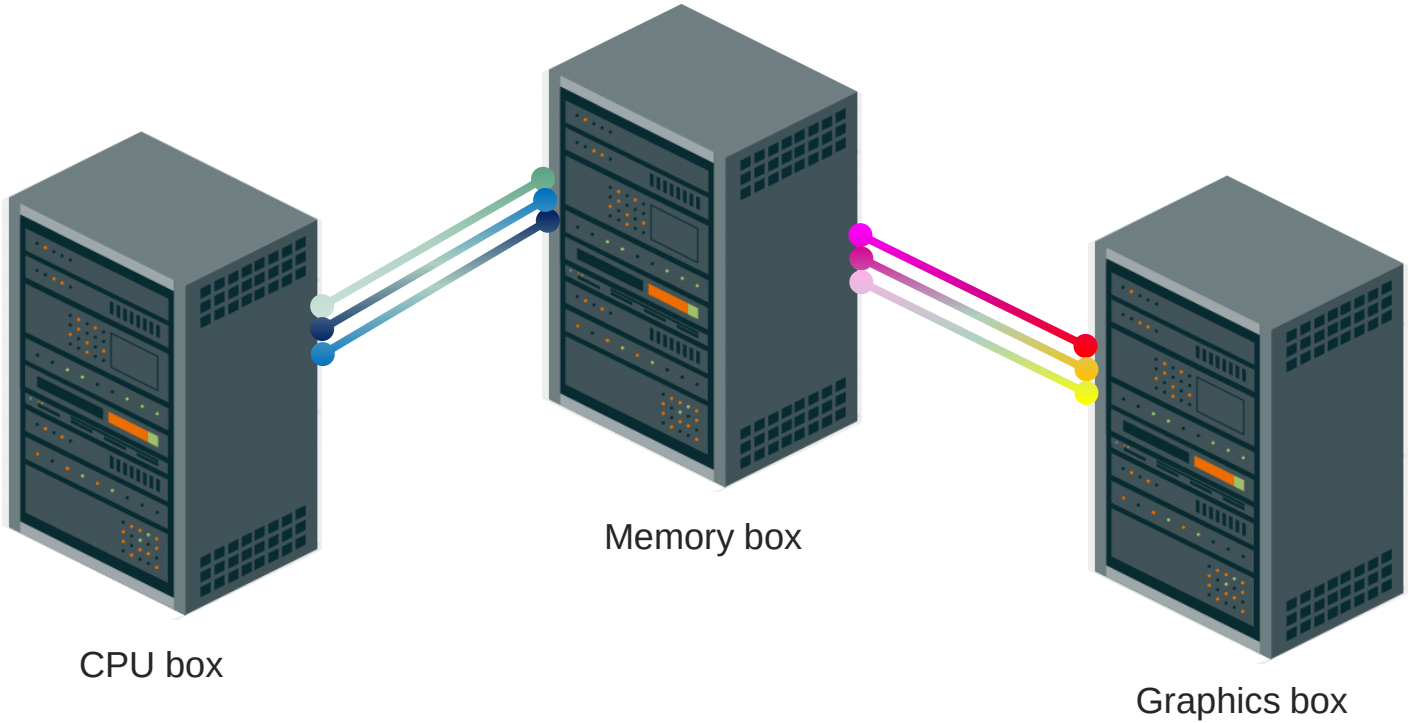


Interface

Bus

Communication

Ad hoc interface

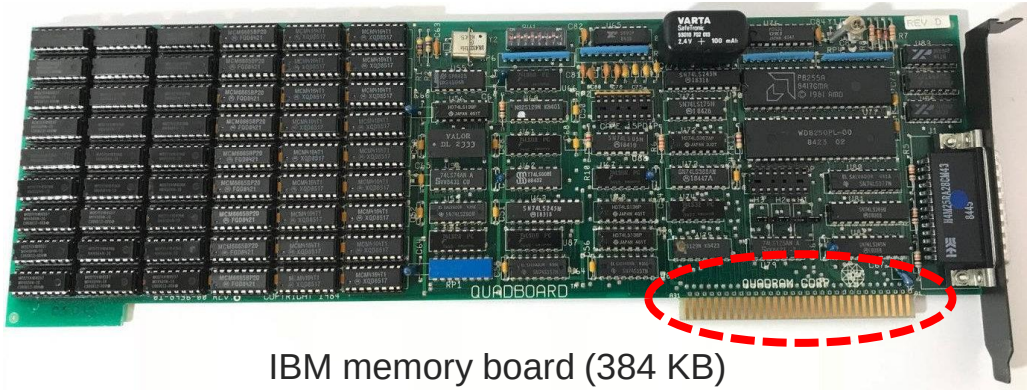


CPU box

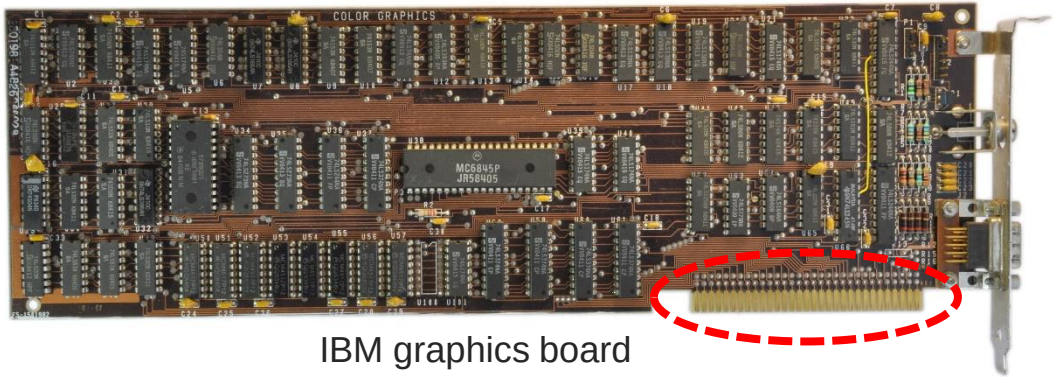
Memory box

Graphics box

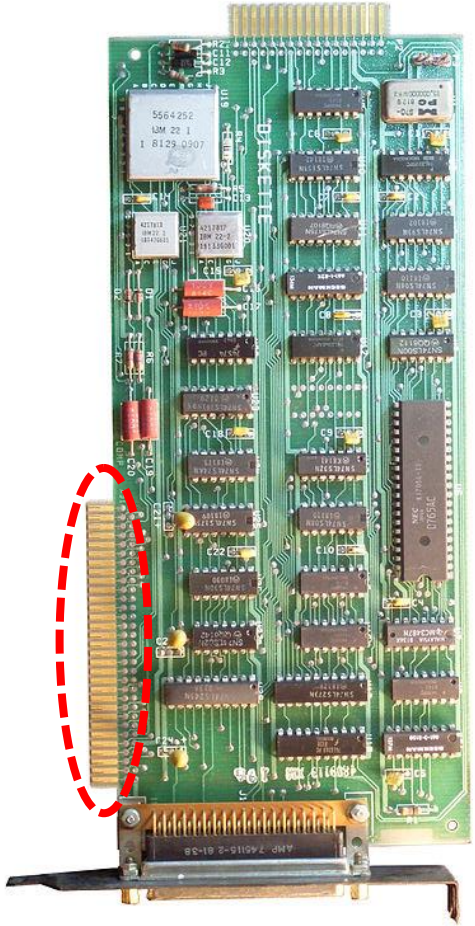
Modular interface



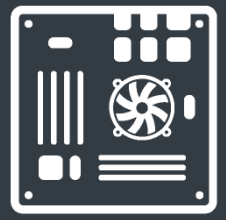
IBM memory board (384 KB)



IBM graphics board



IBM floppy disk board



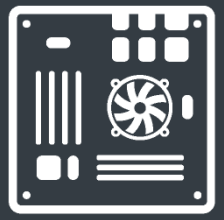
Interface

Bus

Communication

IBM 5150 active backplane

slots

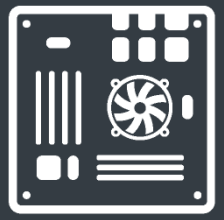


Interface

Bus

Communication

Passive backplane

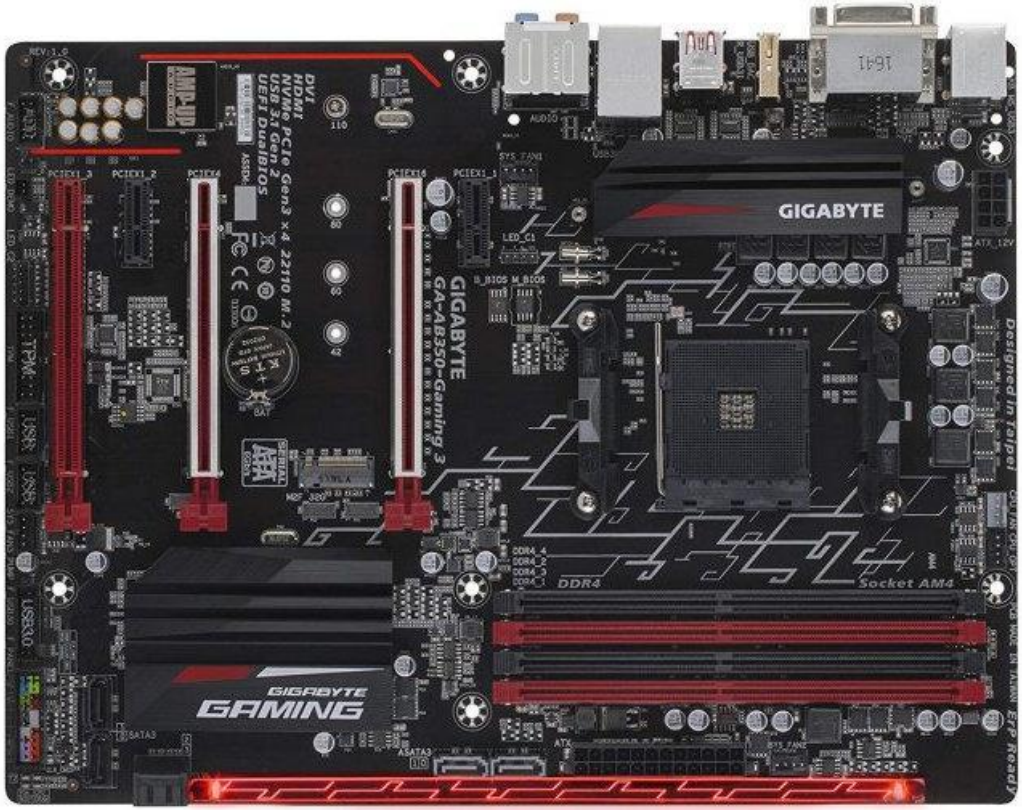


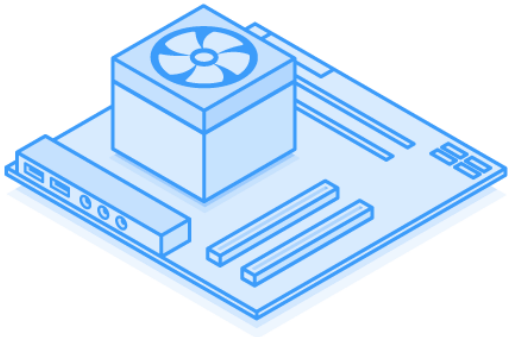
Interface

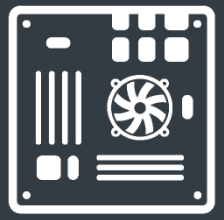
Bus

Communication

Motherboard





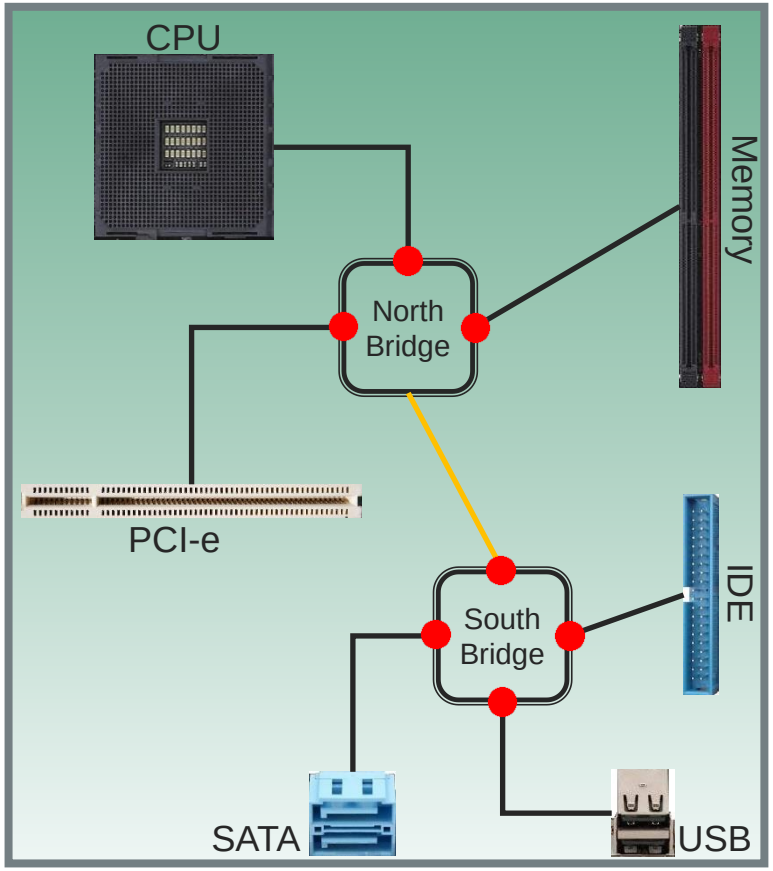


Interface

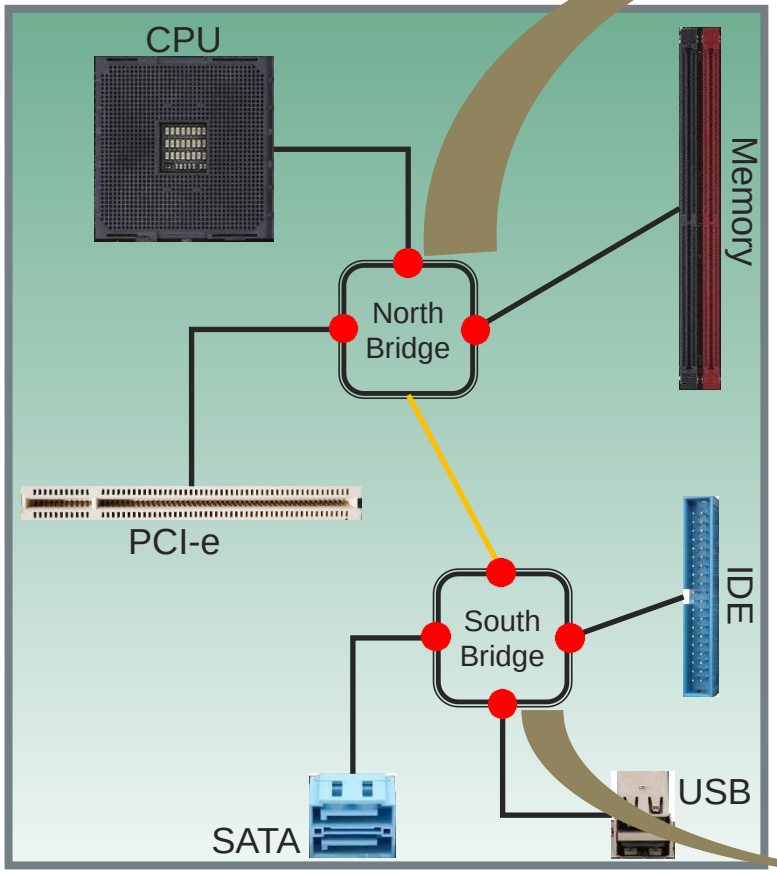
Bus

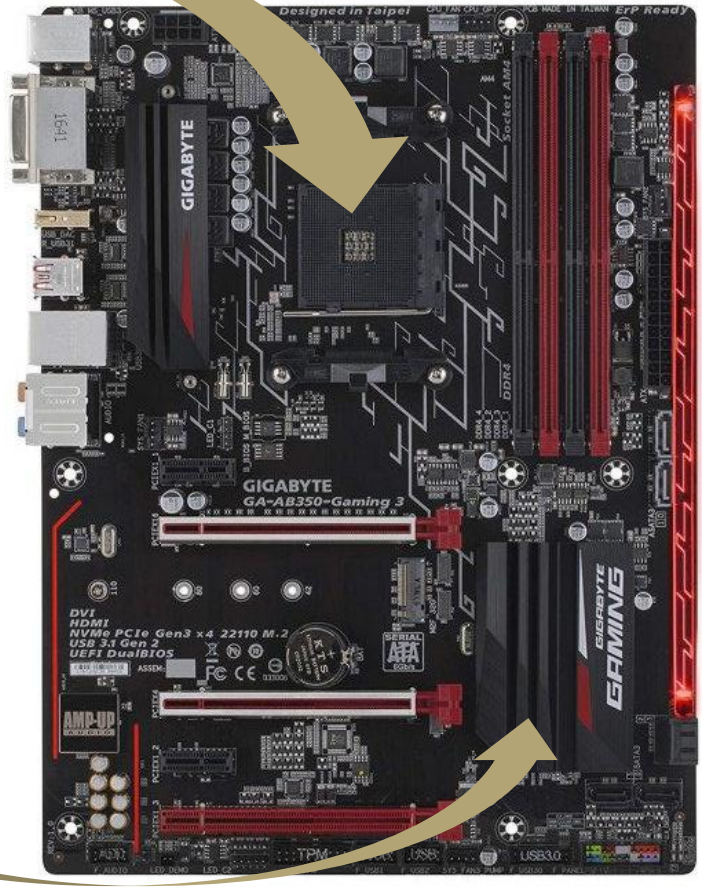
Communication

Chipset



Chips integration

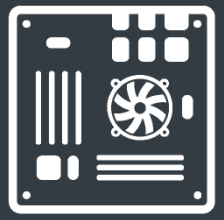




Interface

Bus

Communication



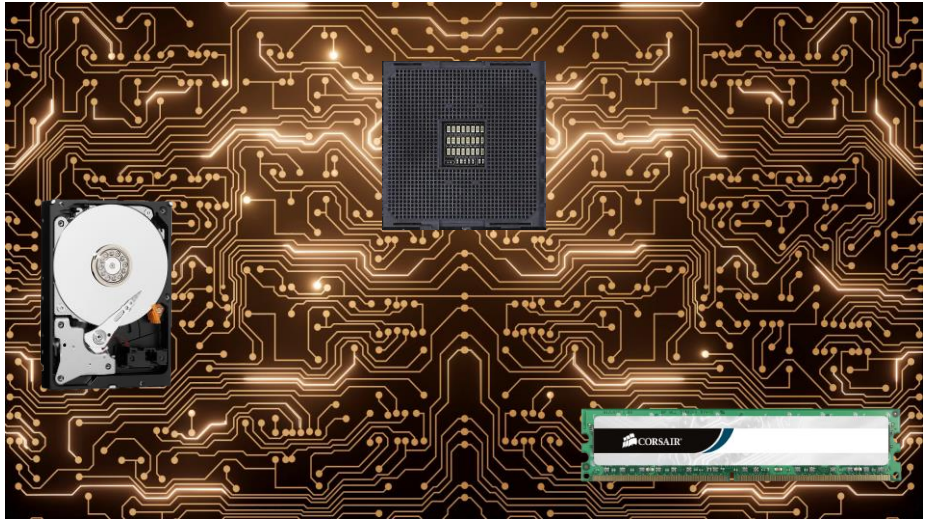
Interface

Bus

Communication

Computer bus

1. A group of wires carrying electrical signal (data).
2. Provides the communication channels among the computer components.
3. Includes the data bus, address bus, and control bus.



Interface

Bus

Communication

Data bus

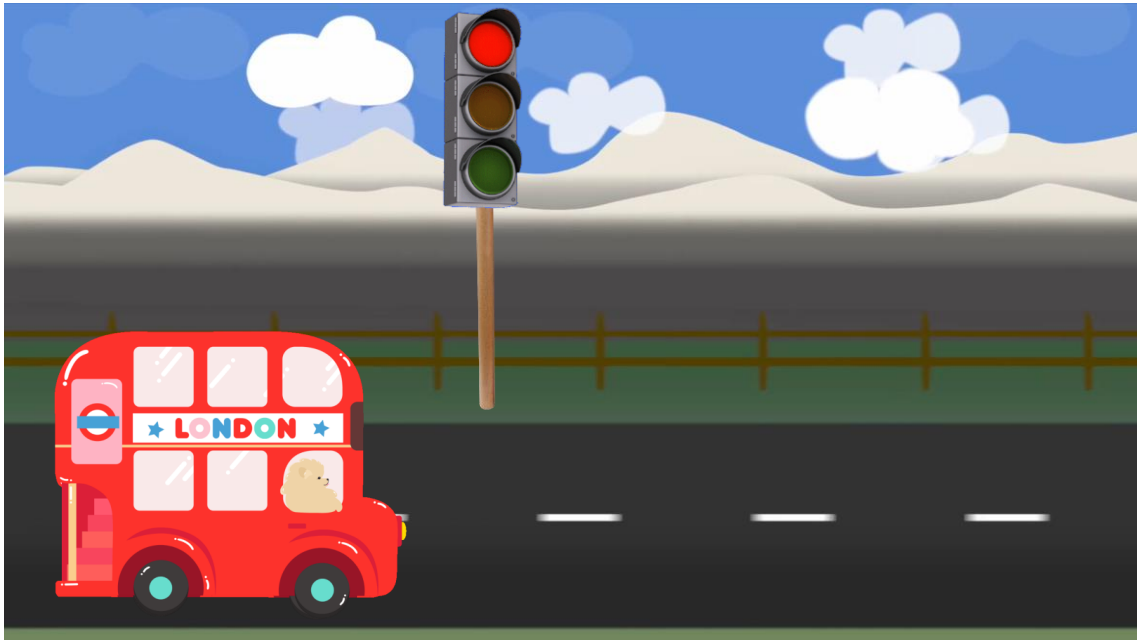
1. Works similarly to a real-life bus.
2. Has a limited number of bits (seats).
3. Only departs when all of its seats are occupied.

Address bus

1. Serves as the roads and streets.
2. Tells the data bus where to go.

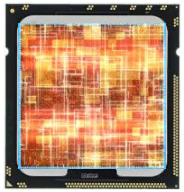
Control bus

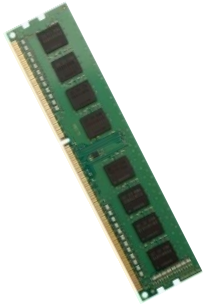
1. Acts as the traffic light to prevent collision between data.
2. Decides when the data bus departs.



Internal & External bus

Internal buses



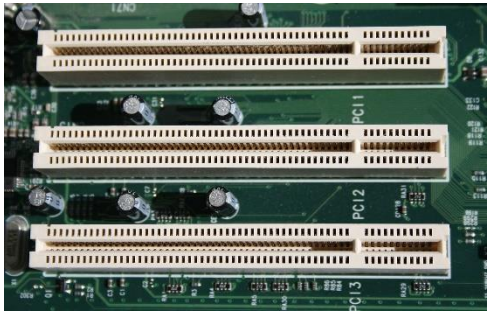


External buses

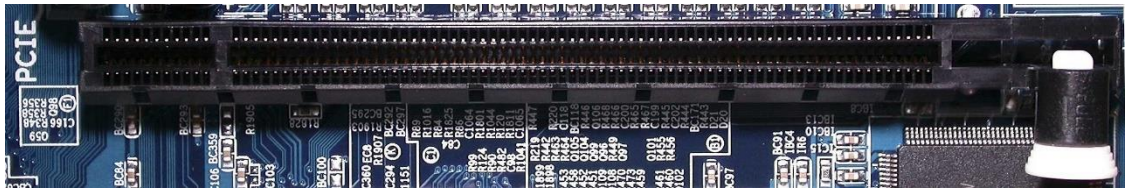
Expansion bus

1. Allows different types of hardware to connect to.
2. Expansion slots.

ISA



PCI



PCI-Express x16

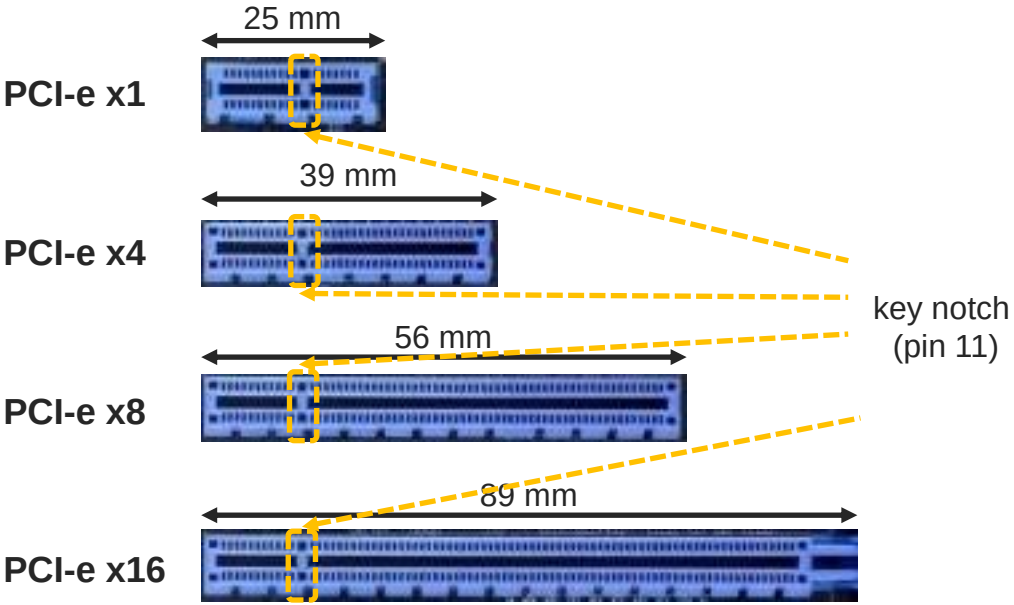
Interface

Bus

Communication

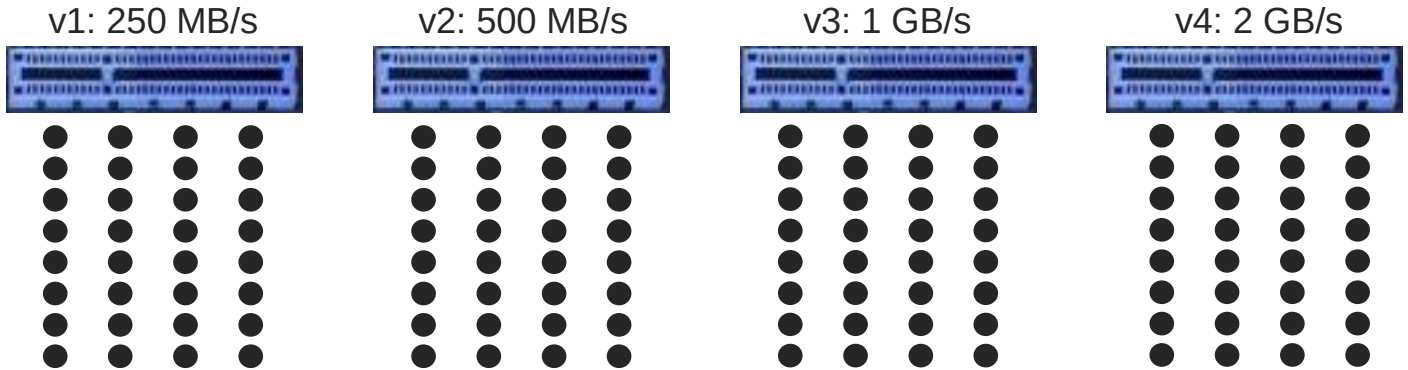
PCI-Express

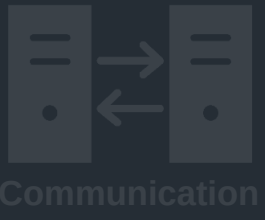
1. Peripheral Component Interconnect Express.
2. Data are communicated to/from PCI-e using lanes.



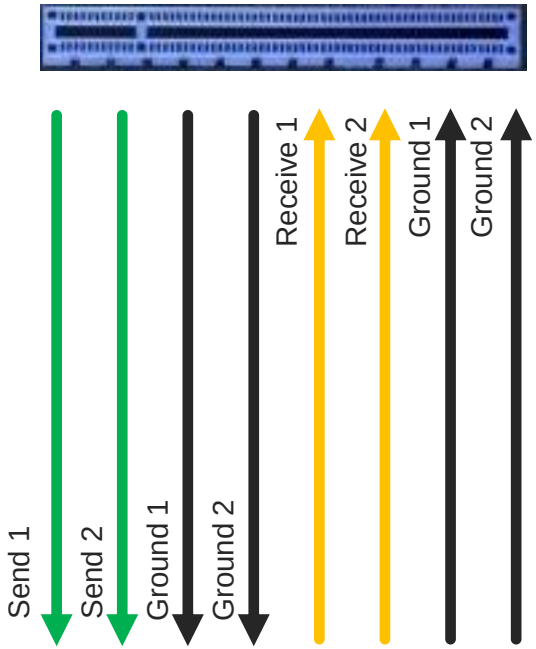
PCI-Express (updated versions)

1. Retains the same physical shape of the slot.
2. Doubles the transmission speed after each version.





PCI-Express lane



Interface

Bus

Communication

Mini PCI-Express

1. Using the same PCI-Express interface and bus architecture.
2. Is physically shrank for laptops.

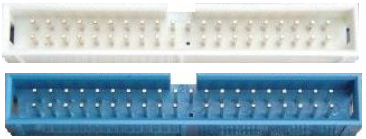
GPS card

WiFi card

3G/4G card

Storage bus

1. To communicate with storage devices.
2. The most popular connection is SATA (Serial ATA).



(PATA) Parallel ATA
(IDE) Integrated Drive Electronics

SATA (Serial ATA)

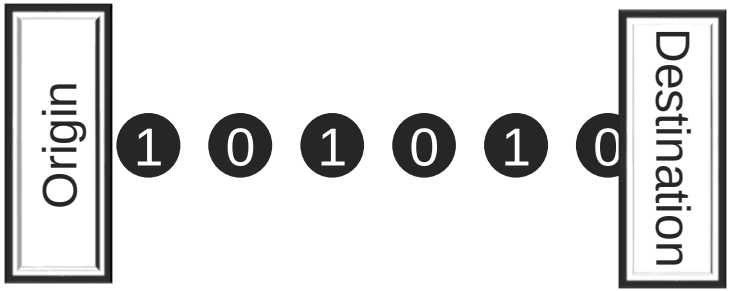
Interface

Bus

Communication

Serial transmission

1. Data are transferred using only one channel, one bit at a time.
2. Cheap and easy to implement, but was slow in the early days.



Interface

Bus

Communication

Parallel transmission

1. Data are transferred simultaneously on multiple channels.
2. All channels must be in sync.

Parallel transmission

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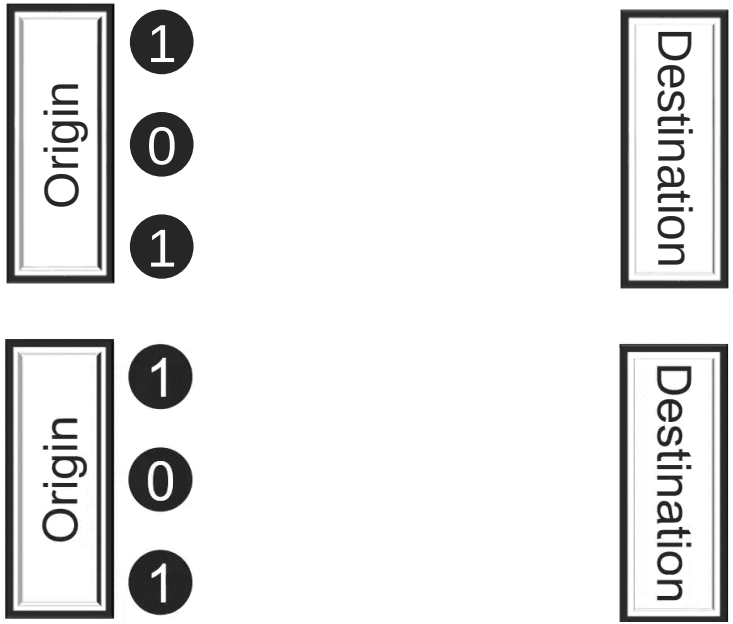


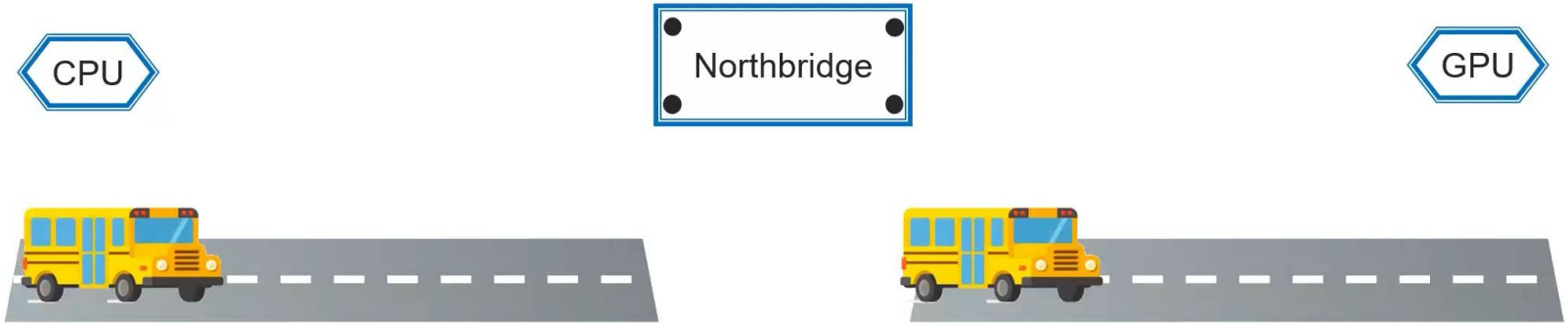
Interface

Bus

Communication

Buffering

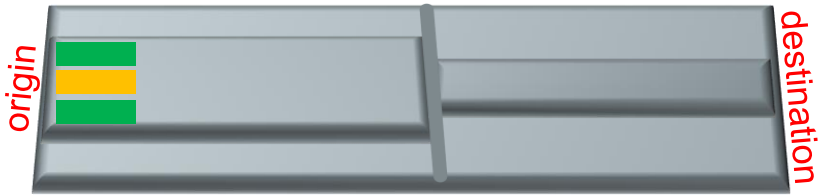
1. A solution to control the speed between different components.
2. Data stay in a buffer until they are ready for despatch.
3. A ‘stop’ signal is sent to incoming buses, when the buffer is full.



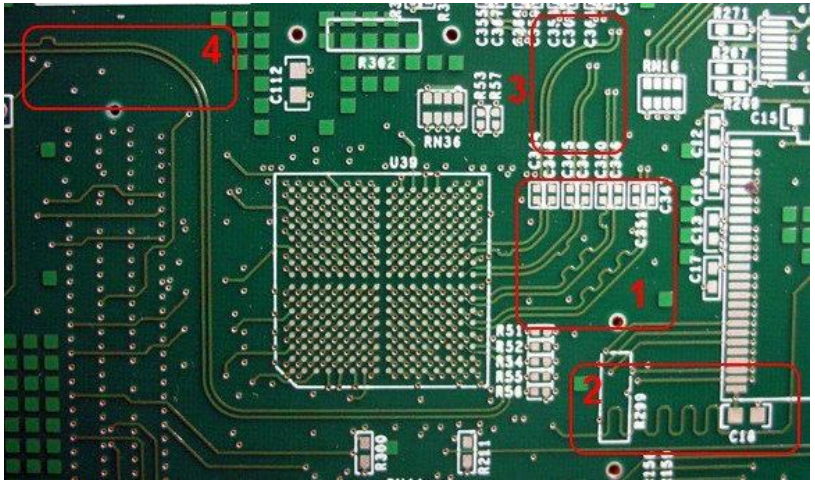
Signal reflection (cause)

1. Some signal is reflected back to the origin, rather than to the destination.

2. Caused by the imperfections or discontinuities in the transmission cable.



change of PCB thickness



change of routing shape

Signal reflection (problem)

Interface

Bus

Communication

Signal reflection (solution)

1. Requires a gap between transmission to avoid reflection.
2. Consequence: the bus cannot utilises its high speed.

Interface

Bus

Communication

Serial point-to-point link

1. Each link is uni-directional, with 1 sender and 1 receiver.
2. Very high signalling rates (in GHz).
3. QuickPath Interconnect (QPI).

Questions, feedback

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