

Mainframe



Source: https://www-03.ibm.com/ibm/history/exhibits/mainframe/mainframe_2423PH3165.html

Minicomputer

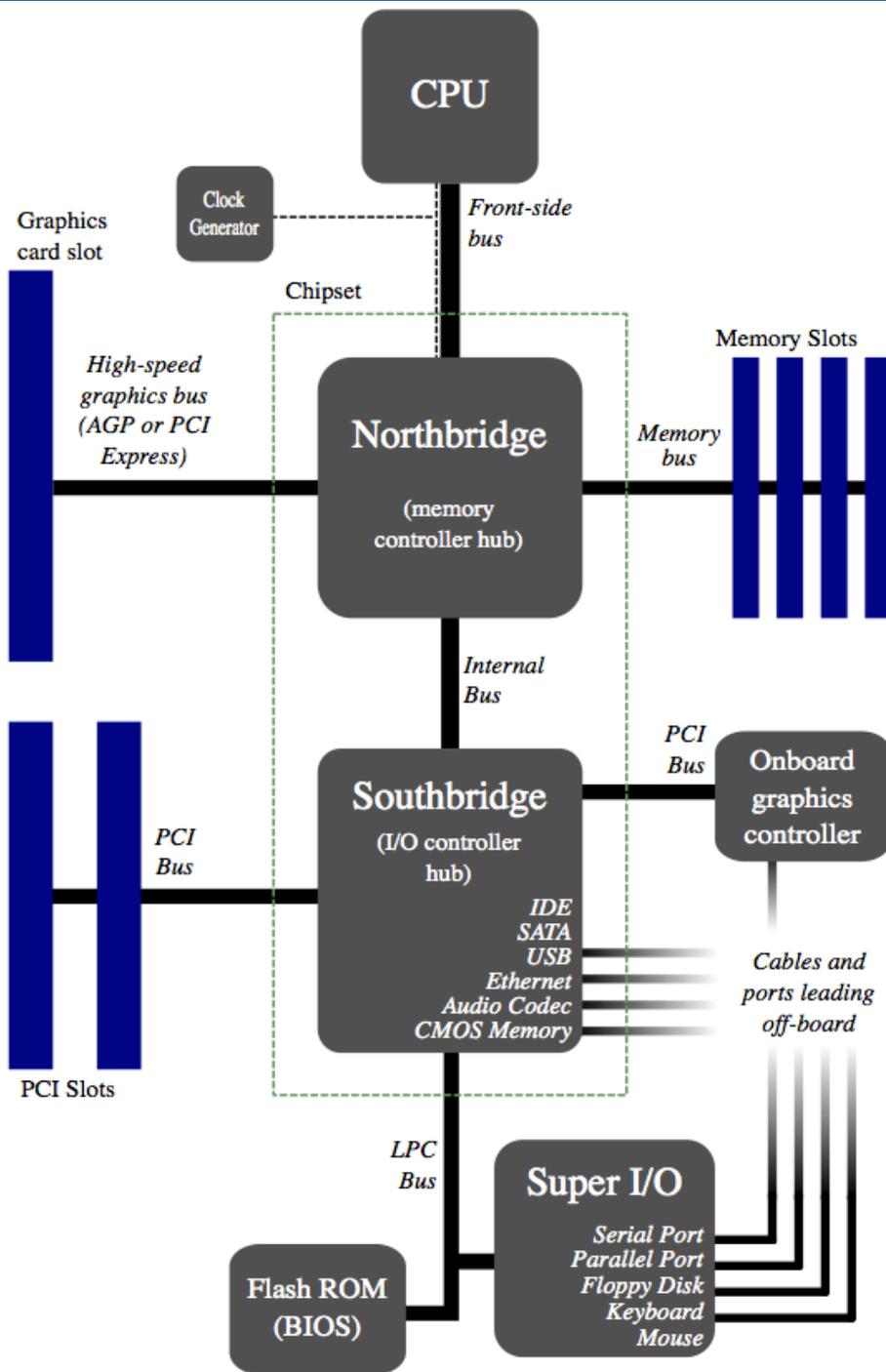


Source: <http://nl.wikipedia.org/wiki/Minicomputer#mediaviewer/File:Pdp-11-40.jpg>

Microcomputer



Source: http://www.tpsoft.com/museum_images/IBM%20PC.JPG



Source:
http://en.wikipedia.org/wiki/Northbridge_%28computing%29

Examples

- Disk drive:
 - OS requests transfer of disk blocks.
 - Once done, disk I/O controller generates an interrupt.
- Networking:
 - OS has enabled the network interface card.
 - Once a packet comes in, an interrupt is generated.

Computer-System Architecture

- Computer systems can be organized in different ways.
- Single-processor system
 - Actually becoming very hard to come by.
 - Only general-purpose CPUs are counted.
- Multi-processor system
 - Choice of multiple “cores” on one chip, or multiple CPUs within a single system (or both!).

Clustered Systems

- Combine multiple computers (nodes) into a single system.
 - Compare with multiple CPUs in one computer.
- Often interconnected with high-speed network.
- Require specially written software (parallelized software).
- Used for e.g. High Performance Computing.

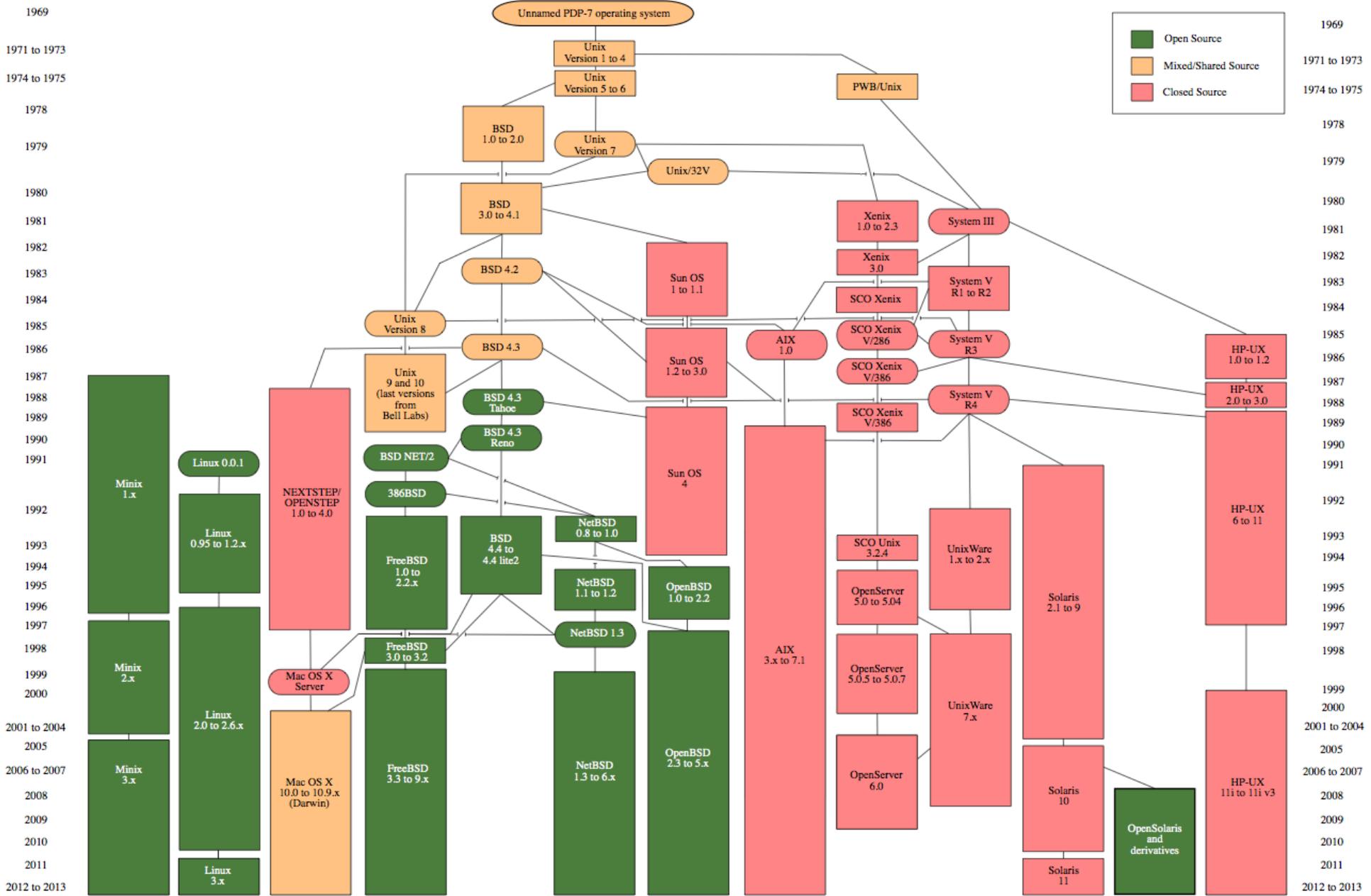
Table 2.2 Example Time Scale of System Latencies

| Event | Latency | Scaled |
|--|----------------|---------------|
| 1 CPU cycle | 0.3 ns | 1 s |
| Level 1 cache access | 0.9 ns | 3 s |
| Level 2 cache access | 2.8 ns | 9 s |
| Level 3 cache access | 12.9 ns | 43 s |
| Main memory access (DRAM, from CPU) | 120 ns | 6 min |
| Solid-state disk I/O (flash memory) | 50–150 μ s | 2–6 days |
| Rotational disk I/O | 1–10 ms | 1–12 months |
| Internet: San Francisco to New York | 40 ms | 4 years |
| Internet: San Francisco to United Kingdom | 81 ms | 8 years |
| Internet: San Francisco to Australia | 183 ms | 19 years |
| TCP packet retransmit | 1–3 s | 105–317 years |
| OS virtualization system reboot | 4 s | 423 years |
| SCSI command time-out | 30 s | 3 millennia |
| Hardware (HW) virtualization system reboot | 40 s | 4 millennia |
| Physical system reboot | 5 m | 32 millennia |

Source: *Systems Performance: Enterprise and the Cloud*, Brendan Gregg.

Data structures

- Linked list (single, double)
- Trees
- Hash tables
- Bitmaps



Source: <http://en.wikipedia.org/wiki/Unix-like>