


Ch 20 

Technology comes & goes; interfaces last forever

- Interfaces typically deserve more engineering attention than the technologies they interface...
 - Abstraction: should outlast many technology generations
 - Often “virtualized” to extend beyond original function (e.g. memory, I/O, services, machines)
 - Represent more potential value to their proprietors than the technologies they connect.
- Interface sob stories:
 - Interface “warts”: Big/little Endian wars
 - Early IBM PC reliance on the exact signaling of 8086 chips
- ... and many success stories:
 - IBM 360 Instruction set architecture; Postscript; Compact Flash; ...
 - TCP/IP-based packet networks

Communication Technologies: Latency

- Theorist's view:
 - Each point-to-point link requires one hardware unit.
 - Each point-to-point communication requires one time unit.

Topology	\$	Theoretical Latency	Actual Latency
Complete graph	$O(n^2)$	$O(1)$	$O(\sqrt[3]{n})$
Crossbar	$O(n^2)$	$O(1)$	$O(n)$
ID Bus	$O(n)$	$O(1)$	$O(n)$
2D Mesh	$O(n)$	$O(\sqrt{n})$	$O(\sqrt{n})$
3D Mesh	$O(n)$	$O(\sqrt[3]{n})$	$O(\sqrt[3]{n})$
Tree	$O(n)$	$O(\log_2 n)$	$O(\sqrt[3]{n})$
N-cube	$O(n \log_D n)$	$O(\log_D n)$	$O(\sqrt[3]{n})$

- Engineer's view:
 - Loading increases with number of connections (bus, crossbar)
 - Nodes have size: limits possible 2D, 3D density (other topologies)