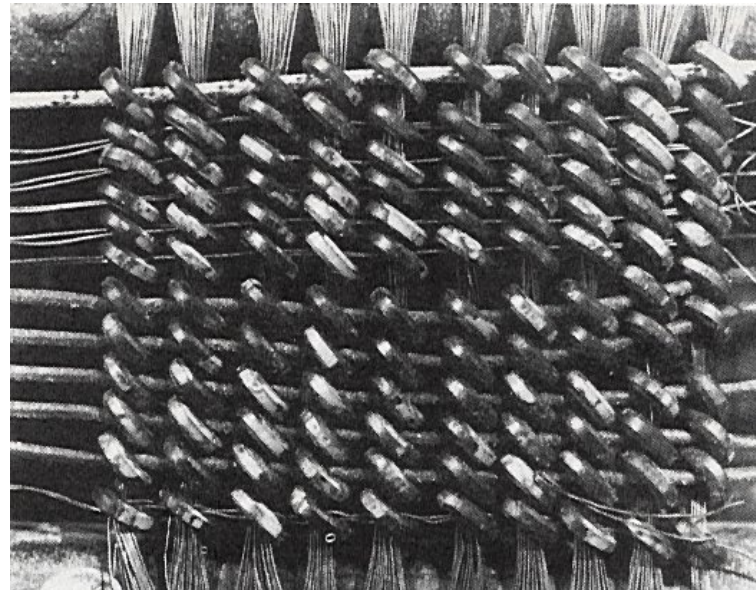


History of Operating Systems

- Eniac (1945 – 1955)
 - Considered first general purpose, electronic computer
 - Used to compute the trajectory of shells
 - 50,000 instructions/ sec, 1/20000 of a cell phone
- Early usage pattern
 - Batch processing
 - Single user at a time, at the console
 - Make efficient use of hardware

Program Input and Storage

- Punch Card
 - Submit programs on the punch cards
 - Get results in a few days/weeks
- Core Memory
 - “Dump Core”
 - “Debug”



Batch Systems

- OS 360
- Large, complex systems
- Mythical Man Month
 - Adding developers late further delays a late product
 - Second system effect
- Computation waits for I/O to finish

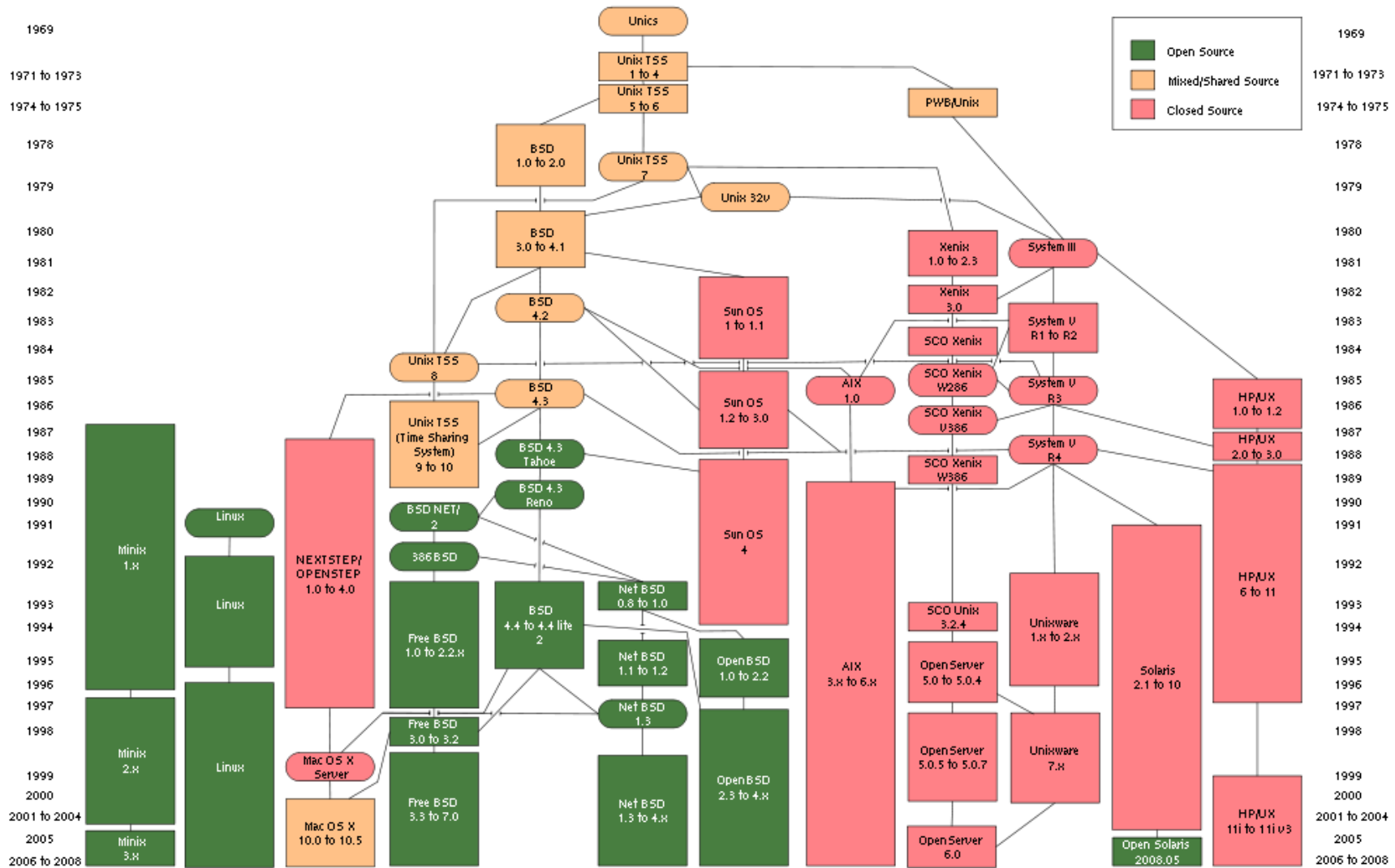
Multiprogramming and Multics

- Multiprogramming
 - Allocation of resource to multiple users
 - Mix of small (interactive) and large (batch) jobs
 - Protection and Isolation between different users
- Multics (Multiplexed Information and Computing Service)
 - 1777 people contributed to code
 - Many seminal papers
 - Very Complex, perhaps ahead of its time

Unix

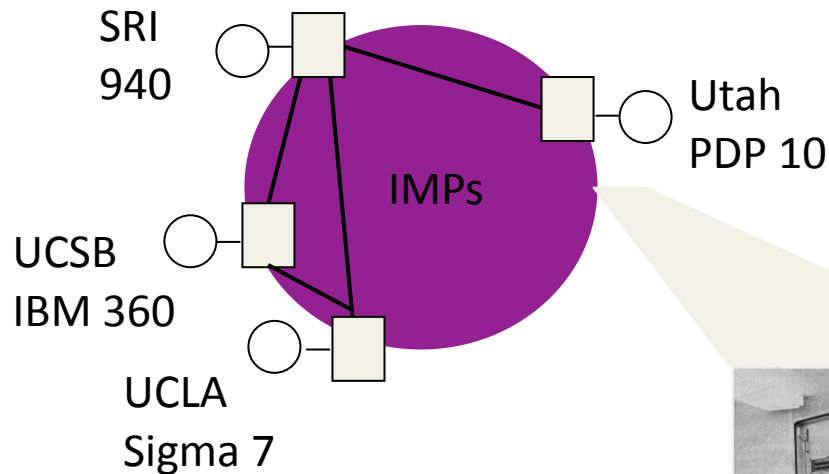
- 1969 – Today
- C Programming language
- UNICS (Uniplexed Information and Computing Services)
- Ken Thompson (Cal Alum), part of Multics
- BSD variant developed here

Unix and Unix-like systems



Source: http://en.wikipedia.org/wiki/File:Unix_history-simple.en.svg

The ARPANet (1968-1970's)



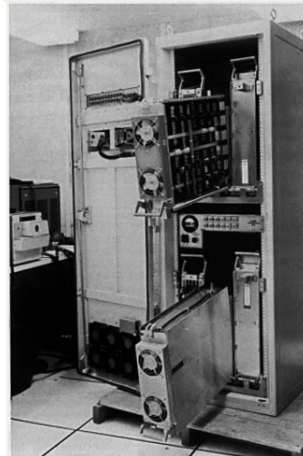
- Paul Baran
 - RAND Corp, early 1960s
 - Communications networks that would survive a major enemy attack

ARPANet: Research vehicle for "Resource Sharing Computer Networks"

- 2 September 1969: UCLA first node on the ARPANet
- December 1969: 4 nodes connected by 56 kbps phone lines
- 1971: First Email
- 1970's: <100 computers

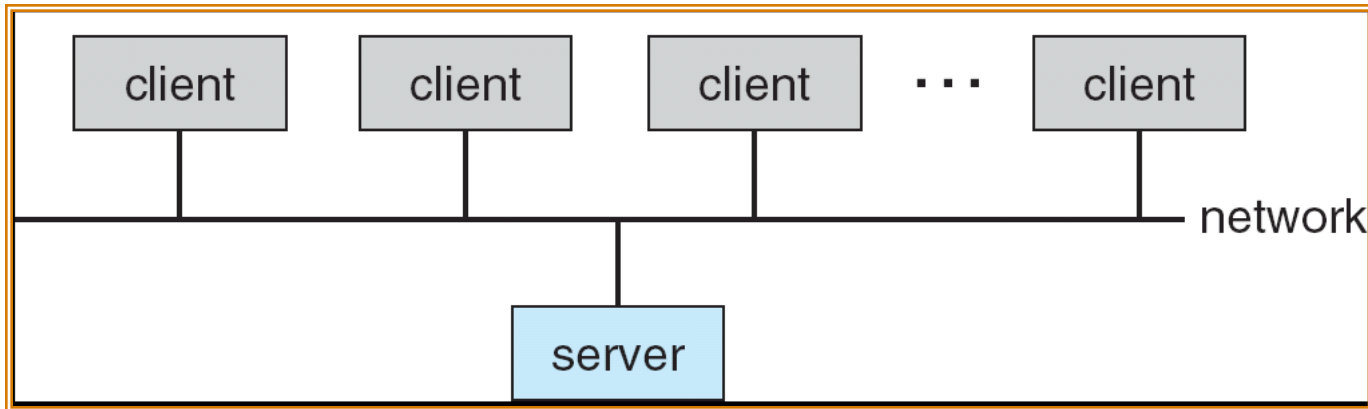


BBN team that implemented the interface message processor

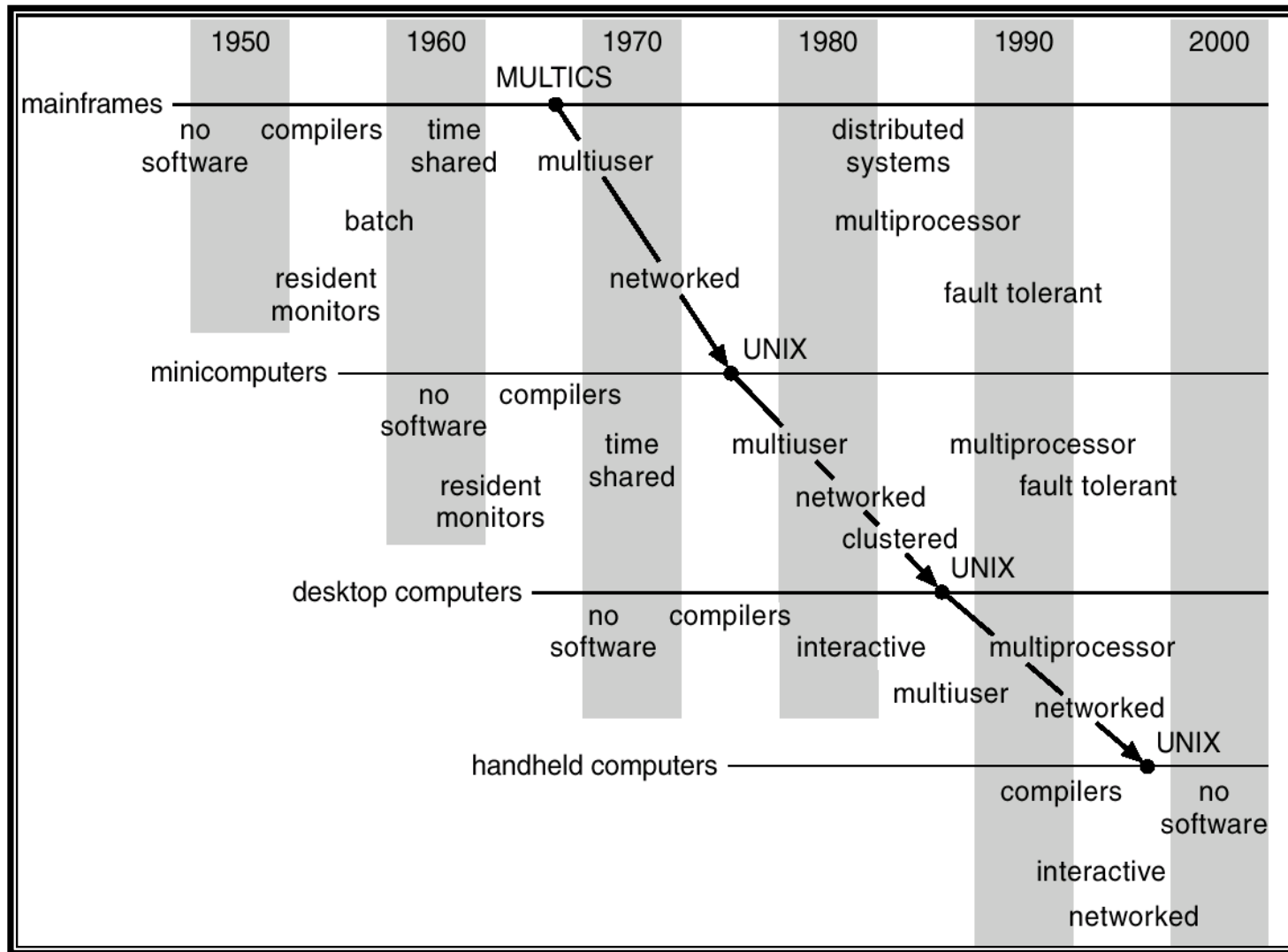


Distributed Systems

- Networking (Local Area Networking)
 - Different machines share resources
 - Printers, File Servers, Web Servers
 - Client – Server Model
- Services
 - Computing
 - File Storage



Operating System Features and Trends



What's next? Datacenter + Mobile systems

- Datacenter computing
 - “Cloud”
 - Heavy lifting, fast processing, lots of storage
 - Centralized storage
 - Enables easy sharing, collaboration
- Mobile
 - Personalized, interactive
 - Private, context dependent
 - Power constraint