Evolution of Operating Systems

Early Systems (1950s)

- No OS, single-user systems.
- Programs loaded via punched cards/paper tape.
- Serial processing: very slow, no user interaction, only one job at a time.
- Examples: Assemblers, compilers, device drivers.

Simple Batch Systems (1960s)

- Jobs collected in batches and executed sequentially.
- Resident Monitor introduced – first rudimentary OS.
- Job Control Language (JCL) used to describe jobs.
- Improved efficiency, but still no interaction.

Multiprogrammed Batch Systems (1970s)

- Multiple jobs kept in memory; CPU switches between them.
- Improved CPU utilization.
- Required memory protection, CPU scheduling, and interrupts.
- Two types: Multitasking OS (Windows, etc.) & Multi-user OS (Linux, Unix).

Time-Sharing and Real-Time Systems (1970s)

- Time-sharing: Many users share CPU time (interactive). Faster response time.
- Real-time: Correctness depends on timeliness.
- Hard real-time: strict deadlines.
- Soft real-time: tolerates some delay.

Personal Computing Systems (1980s)

- Single-user PCs with keyboard, mouse, monitors.
- Portable devices (laptops, palmtops).
- Focus on convenience and user-friendliness.

Multiprocessor Systems (1980s)

- More than one CPU in close communication.

- Parallel processing, reliability, higher throughput.
- Types: symmetric & asymmetric multiprocessing.
- Examples: Windows NT, Solaris, Linux.

Distributed Systems (1980s onwards)

- Multiple computers connected via communication lines.
- No shared memory – loosely coupled.
- Types: Client-server, Peer-to-peer, Middleware.
- Applications: Internet, airline systems, banking, GPS, cloud.
- Advantages: resource sharing, reliability, scalability.
- Limitations: complexity, cost, security issues.

Overall Summary

- 1950s → Manual & serial processing.
- 1960s → Batch processing with Resident Monitor.
- 1970s → Multiprogramming, time-sharing, real-time OS.
- 1980s → Personal computers, multiprocessor systems.
- 1980s+ → Distributed systems, networking, cloud integration.