Time-Sharing

Introduction

- Origin
- Why Time-Sharing is good
- Batch VS Time-Sharing
- Sun Technologies
- MIT CTSS System
- Operating systems
- Teletype
- 1st computers developed for TS

Origin - Claim to the Term

- "Time Sharing" or "Time-Sharing" (1957-1966)
- Who invented the term: "Time-Sharing"?

Why Time-Sharing is good

- Most of the time the CPU is idle
- Waiting for input/output

Time-Sharing

- Time-sharing refers to sharing a computing resources among many users by **multitasking**
- Hardware only design to support the TS while software is responsible to all TS
- Lots of users at the same time

Multitasking

- Multiple tasks, also known as **processes**, share common processing resources such as a **CPU**
- Illusion of **parallelism** is achieved
Why Time-Sharing is good
Finance
- Sharing devices – one main computer and the rest are terminals
- Saves CPU unused time while waiting for others I/O

Batch vs. Time-Sharing
- Batch
  Advantage –
  - Efficient for ensuring that computer not sitting idle
  - Jobs can run unsupervised

Batch vs. Time-Sharing
- Time-Sharing
  Advantage –
  - Work directly with the computer and see results immediately
  - CPU is used most of the time

Batch vs. Time-Sharing
- Batch
  Disadvantage –
  - Takes hours/overnight to see results
  - Not interactive
  - Single user at the same time
  - CPU can be idle most of the time

Batch vs. Time-Sharing
- Time-Sharing
  Disadvantages
  - Much more expensive to develop
  - Hard to implement
  - New hardware

Sun Microsystems
- Unix’s influence in academic circles led to large-scale adoption of Unix by commercial startups, the most notable of which is Sun Microsystems.
**Sun Microsystems**

- **Bill Joy** studied at Berkeley, released the first free version of UNIX (1978) operating system which is now known as **BSD UNIX**
- Later he co-founded **Sun Microsystems** in 1982

**Sun - 1**

- The first generation of **UNIX computer workstations** and **servers** produced by Sun
- Less than 200 Sun-1 systems were sold
- The CPU board used a 10 MHz
- Had 256 KB of **RAM**, (Max 4MB)

**Sun - 2**

- Had a 10 MHz which enabled it to be the first Sun architecture to run a full **virtual memory** UNIX implementation, **SunOS 1.0**
- 8MB of physical and 16MB of virtual memory

**Sun386i**

- An **Intel 80386**-based machine
- Was designed to be a hybrid system, running SunOS but at the same time supporting DOS applications
- A follow-up "486i" - a few prototype units were ever manufactured

**Sun Workstations**

- Sun was predominantly a vendor of technical **workstations**, competing successfully as a low-cost vendor during the Workstation Wars of the 1980s
- In 1987 Sun takes lead in workstation market

**Sun SPARC**

- SPARCstation 1 system introduced. Features are so tightly integrated it fits in a 3-16-16-inch enclosure - the first "pizza box."
- In 1990 - new models including the first workstation for under $5,000
The MIT CTSS System

- **CTSS** - *Compatible Time-Sharing System*
  - Developed at MIT's Computation Center
  - Was one of the first *time-sharing operating systems*
  - Operated at MIT until 1973

- Designed for IBM-7090’s computer (mainly 7094)
  - In 1963 came IBM 7750 – capable of supporting up to 112 *teletypewriter* terminals

The MIT CTSS System

The Algorithm

- **Find next task with highest priority**
- **Task that don’t ran for 60 sec. gets higher priority**
- **In level q, run task for till I/O occur or** $0.5 \times 2^q$ (max is 128 Sec)
- **Schedule next task**

The MIT CTSS System

- **IMPORTANT -**
  - **Have you seen the similarity** between nowadays scheduler and 50 before?
  - **Right !!!** The same concepts Little more sophisticated

Tops-10

- Had an interesting *scheduler* with many run queues.
- Very fast and flexible operating system that was far ahead of its time
- One of the 1st *multi-player game*

Tops 20

- The direct descendant of TOPS-10
- Was available with a variety of higher level language compilers & application tools such as FORTRAN, COBOL, BASIC, ALGOL, CPL, APL & DB Management
- Its architecture remained as it was designed in 1969, development had started in 1973
Tops 20

- By DEC, the second OS for the PDP-10.
- Was very popular, when DEC tried to replaced it with VMS in VAX (1980) most users left to Unix

VMS-Virtual Mem. System

- Runs on the VAX and Alpha family
- Designed for use in time sharing, batch processing, real time
- Still used & developed today.

Operating Systems

Unix – 1969+

- Unix originally developed 1969 by a group of AT&T (MIT) employees at Bell Labs on PDP-7
- Originally named Unics

Windows

- 1st Windows cooperative multitasking include Windows 1.0 (1985) and Windows 2.0 (1987)
- Windows/386 introduced a 32-bit protected mode kernel and virtual machine monitor (1992)

GooBunto

- Google OS – should be released at 2010
- 64-bit support, full multitasking & time-sharing

- Nowadays all OS are multitasking & Time-Sharing
- Most OS’s are implemented on 1950s concepts
TeleType

- A teleprinter is now called a typewriter.
- Used to communicate typed messages point-to-point often by a pair of wires.
- On 1922, the 1st teleprinter was used.

Teletype 33-ASR

- Teletype Corporation's ASR33 was a very popular model of teleprinter.
- Designed for light-duty office use, it was much flimsier and cheaper than its heavy-duty cousin, the model 35ASR.
- These mechanical parts printed up to 10 characters per second.

Time-Sharing Machines

- 1957 - IBM 709, 1961 IBM 7090 – both were modified to the Time-Sharing concept.
- 1964 - IBM 360 and its successors are the most profitable line of computer systems in history.

Time-Sharing Machines

- Common systems used for time-sharing included the SDS 940 (1966), the PDP-10 (1968).
- Later on, Vax 11/870 (1977) – design for BSD UNIX up to 4.3BSD, Ultrix-32 and VAXel OS.

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