Operating System

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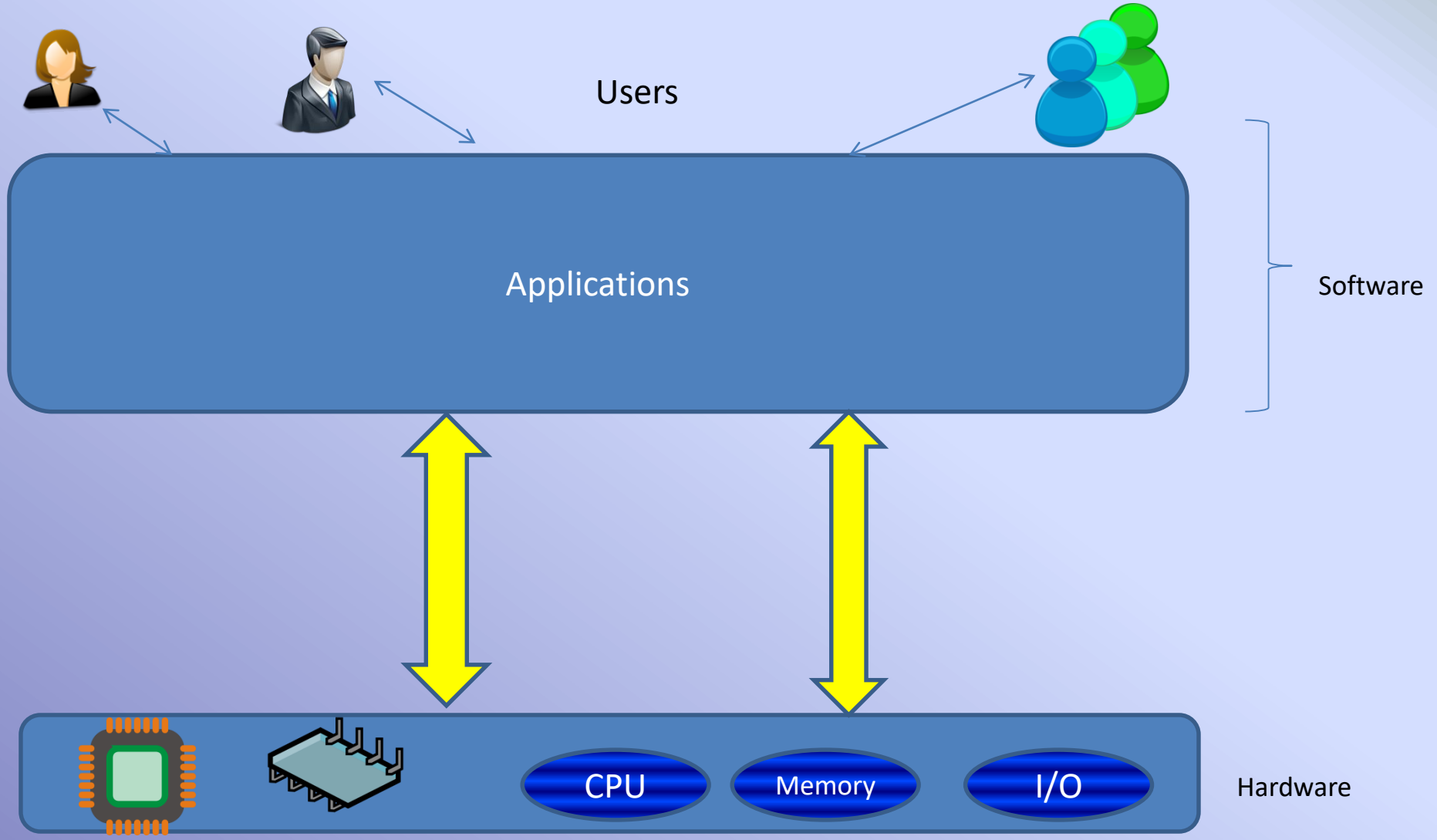
Computer without Operating System



What was the motivation to build an Operating system

Operating System was not build over night to solve a problem instead it evolved to the solve the growing needs to computer industry

Computer can work with out Operating system even today we have computer which work with out OS. Still why an OS evolved ?

For Early day Computer without OS
S/w Developers need to know the H/W in details
They need to take care of everything from memory management, I/O, scheduling ….

Over time s/w developer found that there are lot of module they developed are common across may applications and they can be reused. So developed a layer with all these common modules between h/w and s/w applications, this made life very easy. Over time this layer which interfaced between h/w and s/w underwent lot of reseach and evolved into a well defined called Operating System.

Evolution of Operating System

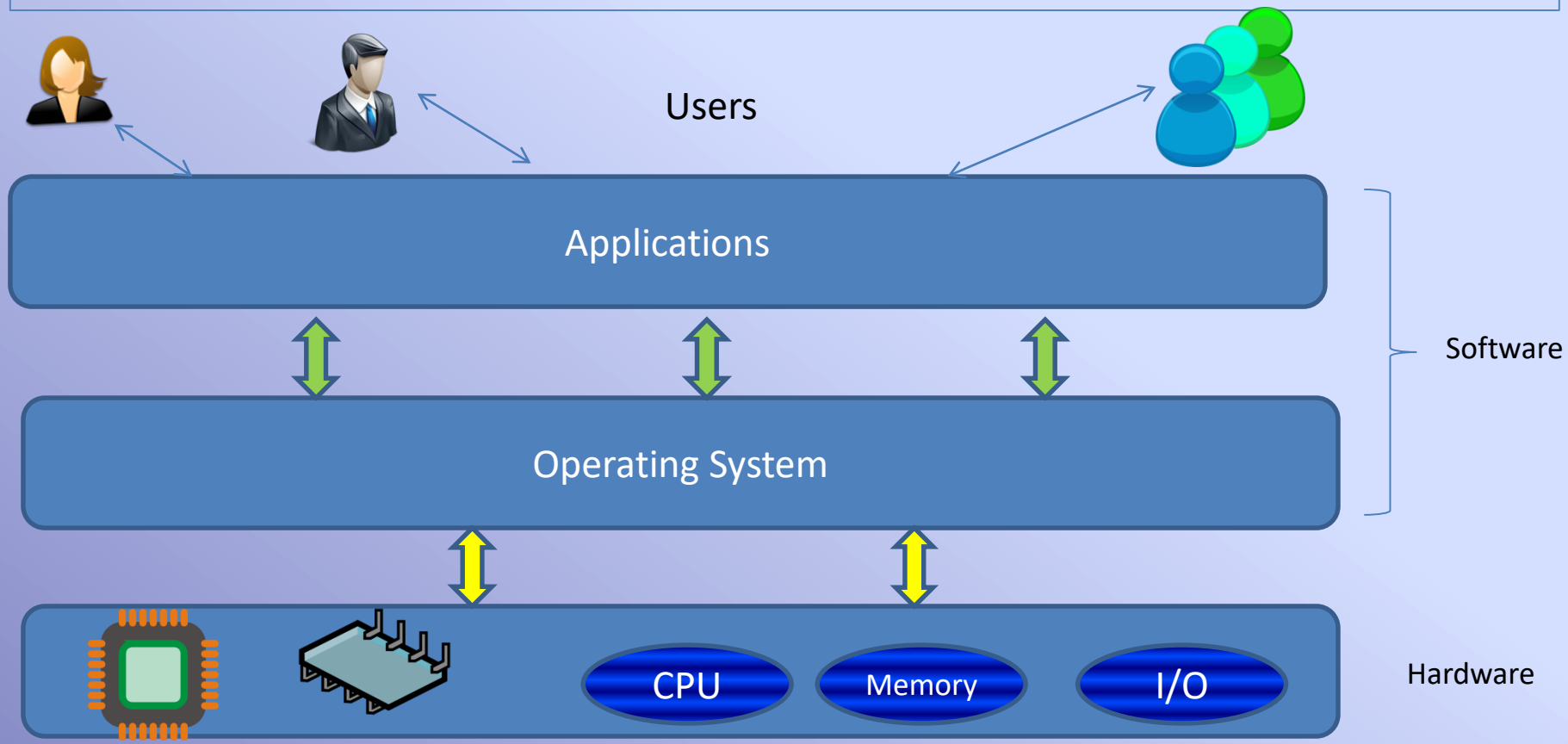
1971: Intel announces the microprocessor
1972: IBM comes out with VM: the Virtual Machine Operating System
1973: UNIX 4th Edition is published
1973: Ethernet
1974 The Personal Computer Age begins
1974: Gates and Allen wrote BASIC for the Altair
1976: Apple II
1981: IBM introduces the IBM PC
1983 Microsoft begins work on MS-Windows
1984 Apple Macintosh comes out
1990 Microsoft Windows 3.0 comes out
1991 GNU/Linux
1992 The first Windows virus comes out
1993 Windows NT
2007: iOS
2008: Android OS

•1961: The dawn of minicomputers
•1962 Compatible Time-Sharing System (CTSS) from MIT
•1963 Burroughs Master Control Program (MCP) for the B5000 system
•1964: IBM System/360
•1960s: Disks become mainstream
•1966: Minicomputers get cheaper, more powerful, and really useful
•1967-1968: The mouse
•1964 and onward: Multics
•1969: The UNIX Time-Sharing System from Bell Telephone Laboratories

What is an Operating System

•A underlying Computer program which basic hardware-management, software-scheduling and memory management, resource management etc.

•It acts as an interface between the user and the computer hardware and controls the execution of all instructions (programs)



Functions of a Operating System

- ✓ Service to applications
- ✓ CPU Management
- ✓ Memory Management
- ✓ Management of attached devices.
- ✓ File Management.
- ✓ System performance handling.
- ✓ Security.
- ✓ Diagnostics & Error handling.
- ✓ User Management (in Multi User system)

Operating System
Services to applications

- ✓ Program Execution
- ✓ Inter-process Communication
- ✓ I/O operations

Types of Operating System

- Batch operating system
- Time Shared Operating System
- Distributed Operating System
- Real Time Operating System

What is a Real time System

Word Real means : Ability to process events from "Real Word" which is related to a real time clock

Those systems in which the correctness of the system depends not only on the logical result of computation, but also on the definite time limits within which the results are to be produced

Classification of Real Time Systems

There are two types of real time Operating Systems

- Hard Real Time
  - An OS where **response time** is very critical and it will very short
    - Health monitoring devices
    - Air Craft Control
    - Weapons, Radar etc

- Soft Real Time
  - An OS where **response time is less critical**
    - Multimedia devices
    - Home entertainment

Classification

- Firm Real Time
  - An OS where **response time has hard dead line after which the results are not useful**
    - Weather Forecast
    - Stock Prices
    - Live Streaming

Realization of Real time system

- General (Soft in most cases, but can be hard too)
  - Responds to real time events like
    - Stock market price which changes in less than sec
    - Online Train reservation system

- Embedded (Usually hard real time)
  - Patient Monitoring applications
  - Industrial Plant control
  - Mobile phone base stations and towers
  - Weapons
  - Air Craft Control and Monitoring

QUIZ

1. In a Real time how small the response time can be ?
2. How do we fix the response time of a OS
3. What type of OS is Android ?

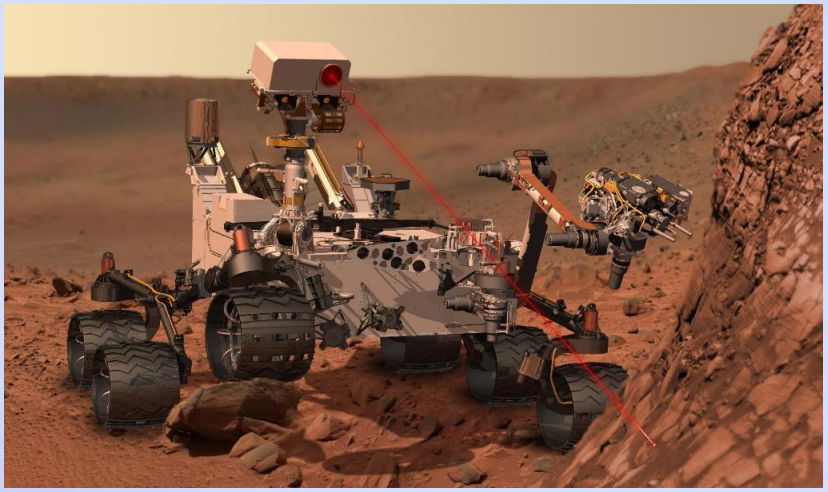
How does a Radar works

List of Real time Operating Systems

No	Name of OS
1	Andriod
2	Free RTOS
3	Debian Linux
4	Ubuntu
5	Green Hills Software INTEGRITY
6	VxWorks from Wind River
7	QNX Neutrino
8	Windows CE
9	TI RTOS

Mars Curiosity Facts

It's running 2.5 million lines of C on a RAD750 processor manufactured by BAE.



The underlying chipset is almost absurdly robust. Its specs may not seem like much at first but it is allowed to have one and only one "blue screen" every 15 years. Bear in mind, this is under bombardment from radiation that would kill a human many times over. In space, robustness wins out over speed. Of course, robustness like that comes at a cost. In this case, it's a cool $200,000 to $500,000.

Real time OS used for Mars Exploration by NASA

Rover (mission, organization, year)	CPUs	RAM	Flash	EEPROM	Operating system	CPU time available for the autonomy software
Sojourner Rover (Pathfinder, NASA, 1997)[1][2][3][4]	2 MHz[5] Intel 80C85	512 KB	176 KB	None	Custom cyclic executive	Not applicable to Cyclic Executives
Pathfinder Lander (NASA, 1997)[1] (Base station for *Sojourner* rover)	20 MHz MFC (IBM RAD6000 Precursor)	128 MB	None	6 MB	VxWorks[6](multitasking)	less than 75%
Spirit and *Opportunity* (Mars Exploration Rover (MER), NASA, 2004)[1]	20 MHz BAE RAD6000	128 MB	256 MB	3 MB	VxWorks (multitasking)	less than 75%
Curiosity (Mars Science Laboratory (MSL), NASA, 2011)[1][7][8]	200 MHz BAE RAD750	256 MB	2 GB	256 KB	VxWorks (multitasking)	less than 75%

What was the OS used by Apollo -11

The so-called Apollo Guidance Computer (AGC) used a real time operating system, which enabled astronauts to enter simple commands by typing in pairs of nouns and verbs, to control the spacecraft. It was more basic than the electronics in modern toasters that have computer controlled stop/start/defrost buttons.
It had approximately 64Kbyte of memory and operated at 0.043MHz.

The AGC was designed to be fault-tolerant and was able to run several sub programs in priority order. Each of these sub programs was given a time slot to use the computer's sparse resources.

Neil Armstrong [asked Mission Control for clarification] on the 1202 error. Jack Garman, a computer engineer at NASA, who worked on the Apollo Guidance Program Section, told mission control that the error could be ignored in this instance, which meant the mission could continue. Apollo 11 landed on moon a few seconds later.

QUIZ

What type of OS is used in

Have you noticed it any time ?

Example of Devices and OS

The Kindle Fire is a tablet computer developed by Amazon.com. Built with Quanta Computer, the Kindle Fire was first released in November 2011, featuring a color 7-inch multi-touch display with IPS technology and running a custom version of Google's Android operating system called Fire OS.

Cisco IOS (originally Internetwork Operating System) is a family of software used on most Cisco Systems routers and current Cisco network switches. (Earlier switches ran CatOS.) IOS is a package of routing, switching, internetworking and telecommunications functions integrated into a multitasking operating system. Although the IOS code base includes a cooperative multitasking kernel, most IOS features have been ported to other kernels such as QNX and Linux for use in Cisco products or simulators such as Cisco VIRL.