UNIT - I

# Design Issues of an OS

# The Various Design Issues

- Efficiency
- Robustness
- Flexibility
- Portability
- Security
- Compatibility

# The Various Design Issues

- **Efficiency**

  Operating system efficiency is characterized by the amount of useful work accomplished by system compared to the time and resources used.

  The ratio of actual operating time to scheduled operating time of a computer system. In time-sharing system, the ratio of user time to the sum of user time plus system time.

- **Robustness**

  The word *robust*, when used with regard to computer software, refers to an operating system or other program that performs well not only under ordinary conditions but also under unusual conditions that stress its designers' assumptions.

  A major feature of Unix-like operating systems is their robustness. That is, they can operate for prolonged periods (sometimes years) without *crashing* (i.e., stopping operating) or requiring *rebooting* (i.e., restarting). And although individual application programs sometimes crash, they almost always do so without affecting other programs or the operating system itself.

# The Various Design Issues

- **Flexibility**

  The ease with which a system or component can be modified for use in application or environment other than those for which it was designed.

  Eg. The RAM Capacity of a desktop computer can be expanded only if the hardware and OS were specifically designed to accommodate it.

- **Portability**

  **Portability is the ability to run a program on different platforms.**

  **Portability of the OS means the operating system itself can be run easily (after re-compilation) on a different hardware platform**

- **Compatability**

  A family of computer models is said to be **compatible** if certain software that runs on one of the models can also be run on all other models of the family.

  The main Compatibility goal for Windows 7 is to make sure that most all applications which work on Windows Vista will continue to work seamlessly on Windows 7

# The Various Design Issues

- **Security**

  One use of the term computer security refers to technology to implement a secure operating system.

  Microsoft operating system updates are releases of new software that upgrade, add features to, and protect Microsoft Windows, the software that runs your computer.

# Design Issues of Distributed System

- **Transparency** – the distributed system should appear as a conventional, centralized system to the user
- **Fault tolerance** – the distributed system should continue to function in the face of failure
- **Scalability** – as demands increase, the system should easily accept the addition of new resources to accommodate the increased demand
- **Clusters** – a collection of semi-autonomous machines that acts as a single system

# Robustness

- Failure detection
- Reconfiguration

# Failure Detection

- Detecting hardware failure is difficult
- To detect a link failure, a handshaking protocol can be used
- Assume Site A and Site B have established a link
  - At fixed intervals, each site will exchange an *I-am-up* message indicating that they are up and running
- If Site A does not receive a message within the fixed interval, it assumes either (a) the other site is not up or (b) the message was lost
- Site A can now send an *Are-you-up?* message to Site B
- If Site A does not receive a reply, it can repeat the message or try an alternate route to Site B

# Failure Detection (cont)

- If Site A does not ultimately receive a reply from Site B, it concludes some type of failure has occurred

- Types of failures:
  - Site B is down
  - The direct link between A and B is down
  - The alternate link from A to B is down
  - The message has been lost

- However, Site A cannot determine exactly **why** the failure has occurred

# Reconfiguration

- When Site A determines a failure has occurred, it must reconfigure the system:

  1. If the link from A to B has failed, this must be broadcast to every site in the system

  2. If a site has failed, every other site must also be notified indicating that the services offered by the failed site are no longer available

- When the link or the site becomes available again, this information must again be broadcast to all other sites