OPERATING SYSTEM OVERVIEW

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Contents

O.S. Classification

Internal structure
→ uniprogramming
→ multiprogramming
→ time sharing

O.S. Classification

User

→ Batch   → PC, PDA

→ Interactives   → Real time

→ Embedded   → Distributed

Batch systems

Operators batch together programs with similar or different needs in terms of computer resources

Batch systems

Programs are loaded on a mass memory as a group and then processed by multiprogramming

Batch systems

Target: throughput improvement

Choice of the set
of programs (job mix)
in main memory to optimize
resource utilization

Interactive systems

Users give instructions
to the O.S. or to a program
directly, using either
a keyboard or a mouse, and
wait for immediate results

Interactive systems

Accordingly, the response time should be short, typically within 1 second or so

Interactive systems

Use of the time-sharing technique

Embedded systems

The computer is dedicated to one single application

E.g.: electronic control unit that controls one or more electrical subsystems in a modern car

Embedded systems

The functions
of an embedded O.S. are,
generally, very simple

Embedded systems

To maximize efficiency more O.S. functions are left to realize to the application level

Embedded systems

Moreover, memory and other resources are statically assigned to programs

Personal Computer

→ multiprogramming

→ virtual terminal:
  window system

Windows (Microsoft),
MacOS (Apple), Linux

Personal Data Assistant (PDA) and Smartphone

handheld devices that combine computing, telephone, Internet and networking

Palm OS, Pocket PC (Windows CE), Linux, Symbian, etc…

Real time systems

They aim to **control** and **react** to events that take place in the outside world

Real time systems

The correctness of the system depends not only from the logical result of the computation, but also from the time to produce the results

Real time systems

deadline associated with a particular task (start time or completion time)
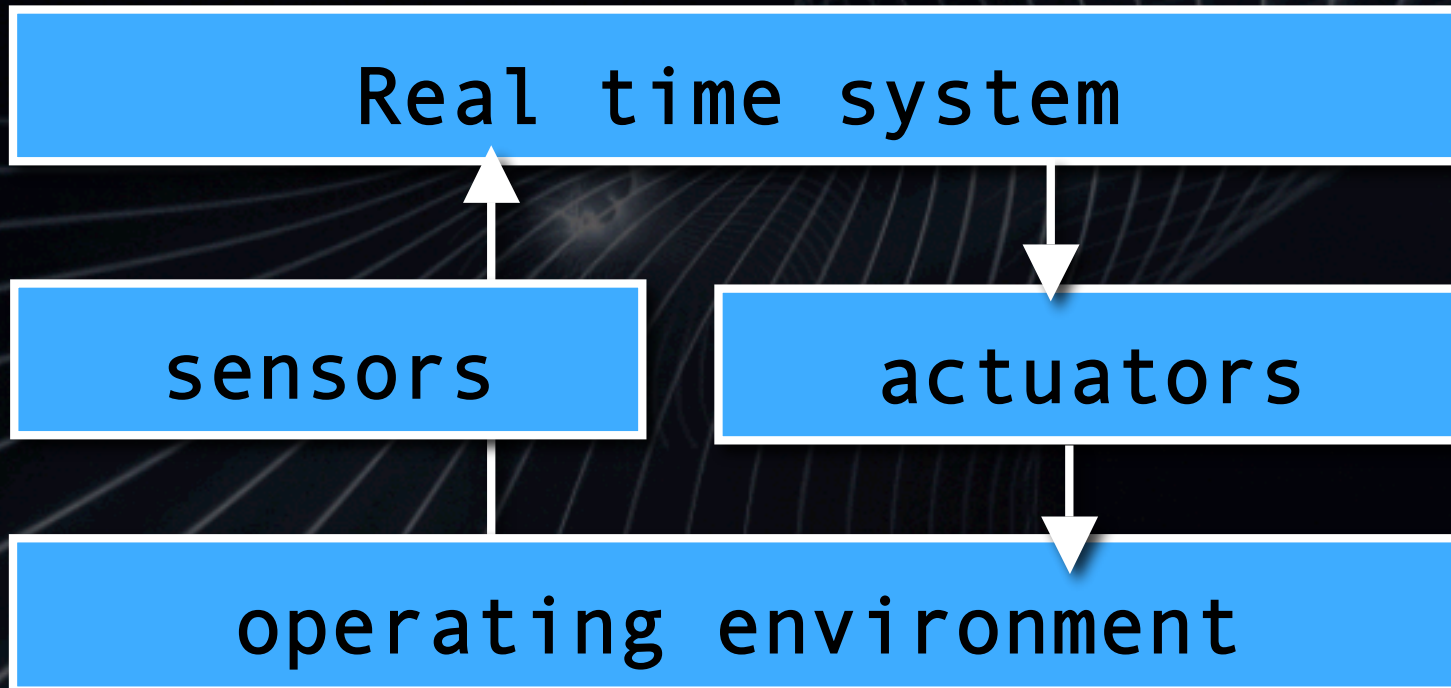
Real time systems

hard real-time
Goal: All tasks must
meet their deadline

Real time systems

soft real time
Goal: there are several deadlines that are desirable to meet but not mandatory

Real time systems

Real time system

sensors		actuators

operating environment

Real time systems

Real time O.S.
→ VxWorks
→ RT-Linux

Transactions

Interaction between
a client and a server
in which databases are
searched or modified

Transactions

High number of potential users and geographical dislocation of the system (e.g.: ticket booking)

Transactions properties

Es.: bank transaction

Objects: bank accounts

Programs: operations of reading, writing,…, referring to several objects together

Transactions properties

Withdrawing money from account
O_1 and deposit to O_2

Consistency property:
O1 value + O2 value =
constant

Transactions properties

Atomicity

The internal states of objects during the transaction are not consistent

Transactions properties

Atomicity

They must be not visible, i.e., it must not possible that others transactions can access to them

Transactions properties

All or nothing: only two possibilities to complete the transaction

Transactions properties

In a correct way, the changes to the data are permanent (commit)

Transactions properties

In a incorrect way, the initial state of data is restored (abort)

Distributed systems

Collection of processors that do not share memory or a clock.

Each processor has its own local memory

Distributed systems

The processors communicate with one another through various communications lines (such as high speed buses or telephone lines)

Distributed systems

Network O.S.: provides features such as **file sharing** across the network

Distributed systems

and includes a communication scheme that allows different processes residing on different computers to exchange messages

Distributed systems

Distributed O.S.:
The users access remote resources the same way as if they were local resources

Distributed systems

Data and process migration
from one site to another are under control of the distributed O.S.