Alternative OS – Lecture 1 Alternative Operating Systems

The Course Structure:

1. Operating systems review
2. Unix overview
3. Working with Unix
4. Setup and configuration of Linux

Introduction

- Ok, what is an operating system?

Definition. An operating system (OS) is a collection of system programs that together control the operation of a computer system.

A different way to define an operating system would be

Descriptive definition. An Operating System, or OS, is a software program that enables the computer hardware to communicate and operate with the computer software. Without a computer Operating System, a computer would be useless.

- What does an operating system do?

An operating system controls the way in which the computer system functions. In order to do this, the operating system includes programs that

- initialize the hardware of the computer system
- provide basic routines for device control
- provide for the management, scheduling and interaction of tasks
- maintain system integrity and handle errors

- Where are operating systems found?

Surprisingly or not, operating systems are found in nearly everything nowadays! Consider several examples:

- Computer
- Cell phone
- PDA
- Video recorder
- Car
- Airplane
- Washing machine

Variety of the devices where operating systems found suggests operating systems come in different tastes and flavors.

Types of operating systems

Operating systems are divided into categories that define their characteristics. Modern systems may use combinations of those described below.

BATCH The earliest type, allowed only one program to run at a time. A "batch" of programs was entered into the computer, each run after another then till completed. The data used by each of the programs could not be modified whilst the program was running. Any errors in the program or data mean starting all over again. The system would execute all programs in the "batch", that is the list, and then halt.

INTER-ACTIVE These allow the modification and entry of data whilst the program is running. Typical systems are airline reservations and languages such as BASIC. Some early personal minicomputers used BASIC as an operating system. The examples are Russian BK 0010, BK0010-01, Finnish ZX Spectrum and the like.

TIME-SHARING/MULTI-USER These share the computer system amongst more than one user, and employ pre-emptive scheduling techniques.

MULTI-TASKING More than one process may be executed at once. The processor is switched rapidly between the processes. A user may run more than one process at a time.

REAL-TIME Primarily used in process control, telecommunications, etc. The OS monitors various inputs which affect the execution of processes, changing the computers model of the environment, thus affecting the outputs, within a guaranteed time period (usually < 1 second). This type of operating system is used whenever time delay in reaction is not acceptable. It is the case for airplane control, Spacecrafts, Medical equipment etc.

MULTI-PROCESSOR A computer that has more than one processor dedicated to running processes needs an operating system that can operate the extra processor unites, divide tasks between the processors, parallelize computation.

EMBEDDED An embedded operating system means the operating system is self-contained in the device and resident in ROM (Read-Only Memory).

Typical systems that use embedded operating systems are household appliances, car management systems, traffic control systems and energy management systems.

NETWORKED operating systems are designed to work in a network of similar devices. Examples are Windows 3.11, Unix, Windows XP, Mac OS etc.

DISTRIBUTED operating systems are designed to operate in a network of similar devices, but in contrast to the previous type, they operate the network as a single computer.

A brief history of operating system

The operating systems development initially followed the evolution of computer hardware, and at some point it began even drive the hardware development. Therefore hardware and software evolution is a single process, we consider it as such.

1850 – 1946 *GENERATION 0*

1850 Charles Babbage's "Analytical Engine" – a mechanical computer prototype.
1940 First Electronics Digital Computer on the ABC.
1944 Mark I, designed by Howard Aiken and IBM at Harward.
1945 ENIAC (Electronic Numerical Integrator And Computer), designed by Wallace Eckert and John Maunchly. The computer weighed 30 tones and consumed 200kW of energy. The computer was situated in the University of Pennsylvania. It was used for ballistics, weather prediction, atomic energy, cosmic ray research etc.
1944-1946 EDVAC (Electronic Discrete Variable Automatic Computer), designed by John von Neumann (only formal chief of research) Arthur Burks, Herman Goldstine. This computer could store programs, and performed only seriel execution of instructions.

The characteristics of the 0 Generation computers are:

- Machine language programming (no higher level languages like Fortran, Pascal, C, Basic etc.)
- No operating system – each program contained code for initiation of the machine.
- "Open-Shop" operation. Each user personally worked with the computer.

1951 – 1956 *GENERATION 1*

1951 UNIVAC (Universal Automatic Computer), designed by Eckert and Mauchly,
IBM 701 Defense Calculator.

The characteristics of the Generation 1 computers are:

- Based on vacuum tube as the active component technology;
- "Closed Shop" operation. Users handed their programs to an Operator, and only the Operator had access to the computer.
- Programa could be written in higher-level procedure-oriented languages;
- There was no provision to move a program from one memory block to be executed in another block of memory.

1956 – 1964 *GENERATION 2*

The characteristics of the Generation 1 computers are:

- Transistors as the active component technology;
- Cards and tapes are used to store data and programs;
- Batch processing OS;
- Data buffer – a separate computer used to organize a data channel;
- Use of interrupts ("Input-output complete"). Execution of programs could be interrupted by user. Interactive programs become possible.
- Spooling.

1964 – 1979 *GENERATION 3*

1964 system /360 IBM

The characteristics of the Generation 1 computers are:

- Integrated circuits as the active component technology;
- Multiprogramming OS;
- OS become the main topic of the theory of computing.

1979 – present time *GENERATION 4*

- VLSI (Very Large Scale Integration - not less than thousands of transistors on a small chip) as the active component technology;
- Desktop computers;
- "Open Shop" environment is back again;
- User-friendly interface;
- Multiprogramming, timesharing OS.