Linux System Programming

Using C

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1. Introduction

1.1 Topics

1. Process Management
2. File and file management
3. Memory and memory management
4. Signals and Signal handling
5. Thread and Thread management
6. Inter Process Communication
7. Process Synchronisation
8. Shell Scripitng

1.2 Defenition's

Operating System OS is a resource manager/allocater (rather than a mere interface between the user and hardware) which is responsible for managing the resources which is connected to the CPU

BIOS Basic Input Output Systems When we switch ON the system, BIOS program is executed. First job of BIOS is to check if basic input output are connected or not. After that the BIOS executes a program called Bootloader

Bootloader picks ups an OS from hard disk and loads it into RAM. Load time/Boot time is the time taken for this operation.

Grub loader Boot loader in Linux

NT loader Boot loader in Windows

1.3 OS in Embedded Systems

Why OS in embedded systems?

Without OS only one program can be run at a time

With OS multiple process can be run simultaneously. Thus performance of the product increases.

1.4 Components of an OS

1. Application
2. Services

Appication are optional services. Applications runs only when we intentionally run it.
Services are mandatory. Kernel starts executing when OS is loaded into RAM
Kernel All the services combined is called a kernel

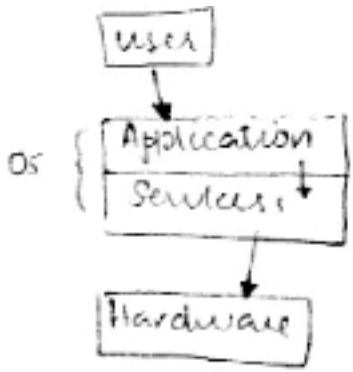

Figure 1.1: OS

2. Process Management

Process Thre program which is in execution is called as the process.To execute a file say a.out, a copy of a.out is loaded into RAM

Process Manager - Manages the different process.

ps -e Command to display the processes which are currently running

title

ps -e Command to display the processes which are currently running

title

ps -e Command to display the processes which are currently running

2.1 Process Manager

For every process, the process manager will provide a process ID, ie; the process manager identifies each process with a process ID.

- ***./a.out & :*** If we want to run a command in background
- ***fg :*** command to bring the background process to foreground
- ***fg <jobId>:*** To move a specific process to foregraound
- ***ps -e | grep pts/0:*** If we want to list all programs running in terminal *pts/0*

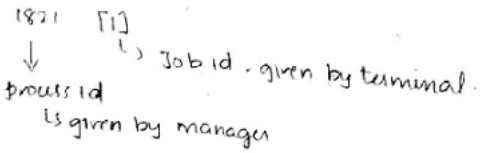

Figure 2.1: Output

Shell - Command Interpreter. When user wants to interact with the OS we use the shell. **ex: bash**

kill: - command used to send signals to a particular process
ex: kill -9 1769, where 1769 is process id

2.2 Definitions

This is an example of a definition. A definition could be mathematical or it could define a concept.

Definition 2.2.1 — Definition name. Given a vector space E, a norm on E is an application, denoted $||\cdot||$, E in $\mathbb{R}^+ = [0, +\infty[$ such that:

$$||\mathbf{x}|| = 0 \Rightarrow \mathbf{x} = \mathbf{0} \tag{2.1}$$
$$||\lambda \mathbf{x}|| = |\lambda| \cdot ||\mathbf{x}|| \tag{2.2}$$
$$||\mathbf{x} + \mathbf{y}|| \leq ||\mathbf{x}|| + ||\mathbf{y}|| \tag{2.3}$$

2.3 Notations

Notation 2.1. *Given an open subset G of $\mathbb{R}^n$, the set of functions φ are:*

1. *Bounded support G;*
2. *Infinitely differentiable;*

a vector space is denoted by $\mathscr{D}(G)$.

2.4 Remarks

This is an example of a remark.

R The concepts presented here are now in conventional employment in mathematics. Vector spaces are taken over the field $\mathbb{K} = \mathbb{R}$, however, established properties are easily extended to $\mathbb{K} = \mathbb{C}$.

2.5 Corollaries

This is an example of a corollary.

Corollary 2.5.1 — Corollary name. The concepts presented here are now in conventional employment in mathematics. Vector spaces are taken over the field $\mathbb{K} = \mathbb{R}$, however, established properties are easily extended to $\mathbb{K} = \mathbb{C}$.

2.6 Propositions

This is an example of propositions.

2.6.1 Several equations

Proposition 2.6.1 — Proposition name. It has the properties:

$$\big|\,||\mathbf{x}|| - ||\mathbf{y}||\,\big| \leq ||\mathbf{x}-\mathbf{y}|| \tag{2.4}$$

$$||\sum_{i=1}^{n}\mathbf{x}_i|| \leq \sum_{i=1}^{n}||\mathbf{x}_i|| \quad \text{where } n \text{ is a finite integer} \tag{2.5}$$

2.6.2 Single Line

Proposition 2.6.2 Let $f, g \in L^2(G)$; if $\forall \varphi \in \mathscr{D}(G)$, $(f,\varphi)_0 = (g,\varphi)_0$ then $f = g$.

2.7 Examples

This is an example of examples.

2.7.1 Equation and Text

■ **Example 2.1** Let $G = \{x \in \mathbb{R}^2 : |x| < 3\}$ and denoted by: $x^0 = (1,1)$; consider the function:

$$f(x) = \begin{cases} \mathrm{e}^{|x|} & \text{si } |x-x^0| \leq 1/2 \\ 0 & \text{si } |x-x^0| > 1/2 \end{cases} \tag{2.6}$$

The function f has bounded support, we can take $A = \{x \in \mathbb{R}^2 : |x-x^0| \leq 1/2+\varepsilon\}$ for all $\varepsilon \in]0;5/2-\sqrt{2}[$. ■

2.7.2 Paragraph of Text

■ **Example 2.2 — Example name.** Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

■

2.8 Exercises

This is an example of an exercise.

Exercise 2.1 This is a good place to ask a question to test learning progress or further cement ideas into students' minds. ■

2.9 Problems

Problem 2.1 What is the average airspeed velocity of an unladen swallow?

2.10 Vocabulary

Define a word to improve a students' vocabulary.
Vocabulary 2.1 — Word. Definition of word.

II

Part Two

3. Presenting Information

3.1 Table

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table 3.1: Table caption

3.2 Figure

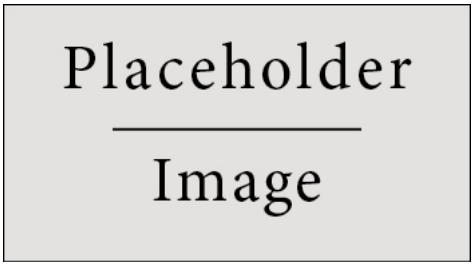

Figure 3.1: Figure caption

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Articles

[Smi13] James Smith. “Article title”. In: 14.6 (Mar. 2013), pages 1–8.

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