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TECHNOLOGICAL UNIVERSITY DUBLIN
CITY CAMPUS

TU856 - BSc. (Honours) in Computer Science
TU858 - BSc. (Honours) in Computer Science (International)
Year 1

SEMESTER 2 EXAMINATIONS 2021/2022

Operating Systems 1

Internal Examiners:

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Instructions

Answer ALL questions.

All questions carry equal marks.

1. (a) A student group has decided to create a Local Area Network (LAN) using the machines available in their computer lab. The network will be used to allow the students to send and receive chat messages, images and videos on a messaging application. There are 10 students and 10 lab machines in total. Each lab machine has identical technical specifications.

In designing the network topology, the student group has come up with two alternatives: a *ring topology* or a *star topology*. Outline the benefits and drawbacks of each topology, in the context of the students' desired use case. Give a recommendation for which topology should be used.

(10 marks)

(b)

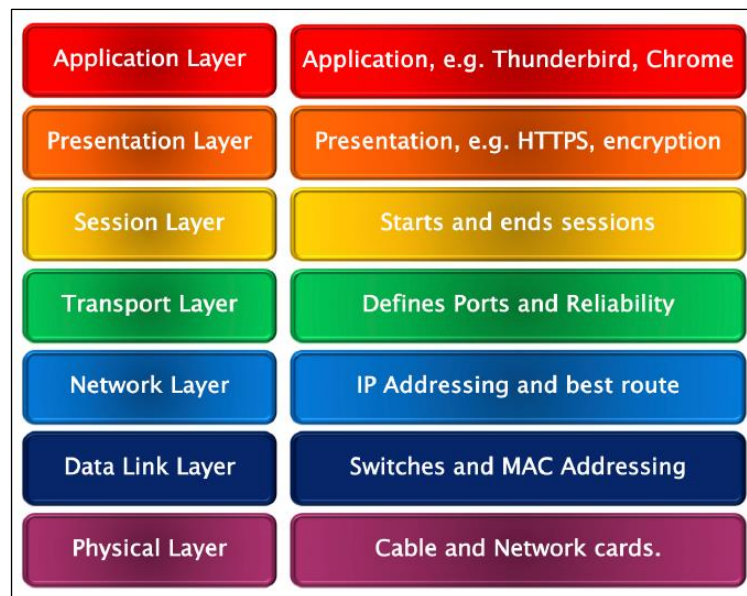


Fig 1: The Open System Interconnection (OSI) model

Figure 1 shows the layers of the OSI model. Discuss, in your own words, the main benefits of using the OSI model to system design. Give also a brief description of each layer of the OSI model.

(15 marks)

2.

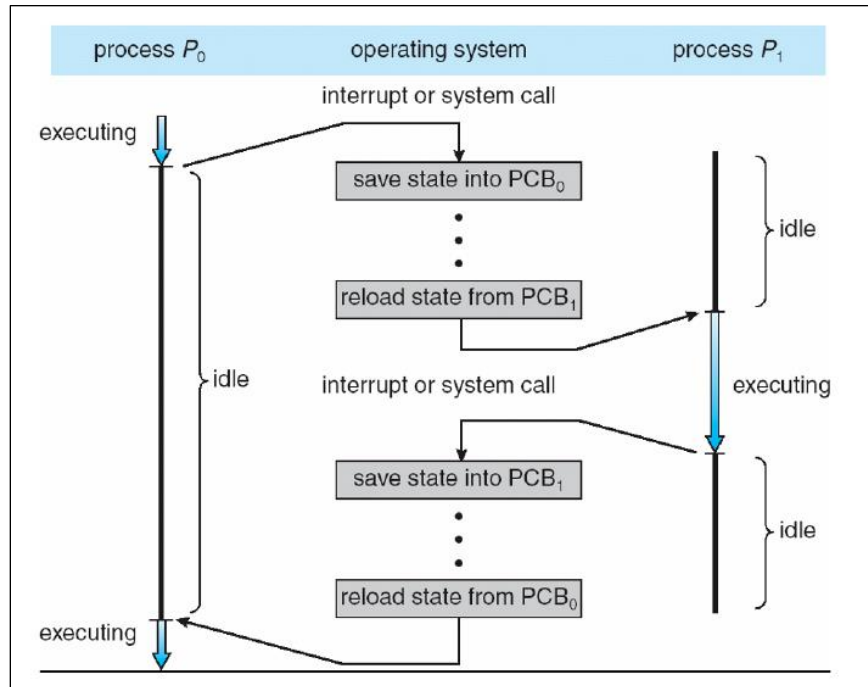


Figure 2: Example execution sequence of two processes under a pre-emptive scheduling policy

Figure 2 shows an example of how a process manager using a pre-emptive scheduling policy may execute two processes, A and B.

(a) Explain, in your own words, why process managers in modern operating systems behave in this way.

(10 marks)

(b) When deciding how to schedule jobs, a process manager makes a distinction between batch processes and interactive processes. Explain, in your own words, why these two types of processes are treated differently.

(5 marks each process)

(c) Explain, in your own words, how the dining philosopher's problem as described by Edsgar Dijkstra can help us to understand the problem of deadlock in an operating system.

(5 marks)

3. (a) Describe the main tasks of the File Manager.

(11 marks)

(b) Briefly discuss the following physical file storage allocation schemas (you can include diagrams of each schema):

- (i) Contiguous Storage
- (ii) Non-contiguous Storage
- (iii) Indexed Storage

(2 marks each)

(c) What does an Access Control Matrix do?

(3 marks)

(d) Describe what the following commands do:

- (i) ICACLS MakeABackup.bat /grant "Group Users 1":R
- (ii) ICACLS MakeABackup.bat /grant "Group Users 2":F
- (iii) ICACLS MakeABackup.bat /remove:d "Group Users 1"
- (iv) ICACLS MakeABackup.bat /grant " Group Users 1":F
- (v) ICACLS c:\docs\work /grant "Group Users 2":(OI)(CI)(D, RC, WDAC, WO, S, GA, RD, WD, DC)

(1 mark each)

4. (a) Discuss, in your own words, how a *fixed partition* of memory works and its advantages/disadvantages.

(5 marks)

- (b) Discuss, in your own words, how a *dynamic partition* of memory works and its advantages/disadvantages.

(5 marks)

- (c) Explain the difference between the *first-fit algorithm* and the best-fit algorithm to allocate memory to new jobs.

(5 marks)

- (d) Describe, in your own words, the three cases for deallocating space in memory when a job is completed.

(10 marks)