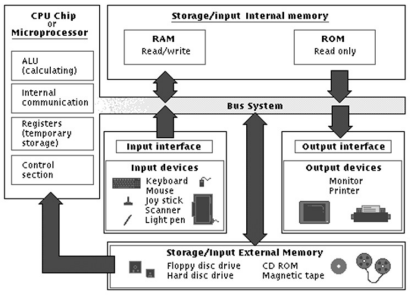
COMP25111
Operating Systems
Lectures 12



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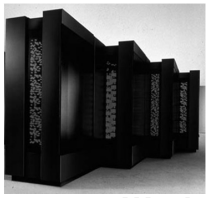
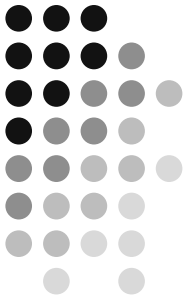


Room: G12 Kilburn Building, Bottom floor

Week

8

NOTE: The **up-to-date** version of this lecture is kept on the associated web site – available [on-line] @ Blackboard select: COMP25111 Introduction to Computer Systems **www.manchester.ac.uk/portal**



THIS week's Short Exam Questions **Q1**

1. Question

   Differentiate between the write-through strategy and the write-back strategy.

   ANSWER(S):

   a) Write-through strategy:

      all write operations are carried out on both physical and secondary;

   b) Write-back strategy:

      if dirty bit set; then when the block is replaced copies it into memory.

- NOTE: In the exam approximately 2 question are taken from the topics (and program examples) coved in each lecture.

Getting ready for next week
Do next week's Q3's NOW

- Once you have re-read the lecture notes; and listened to the audio recording [while stepping through the PPT] of the lecture again:
- Please have a think about next week's Q3's
  - on the next page
- If you try to answer the Q3's now you will be in a much better position to recall the information.
- Once you have done this, transfer your answers to next weeks "Student [OWN answers] version" at the start of next weeks lecture.
  - YES this implies bringing the last weeks lecture notes to the next lecture …

THIS week's Q3

Short Exam Questions

1. Question
   Differentiate between the write-through strategy and the write-back strategy.
   ANSWER(S):
   a) Write-through strategy: all write operations are carried out on both memories consistently; both physical and secondary;
   b) Write-back strategy sets the dirty bit; then when the block is replaced [if the dirty bit is set] copies [writes block back] it into memory [secondary memory (hard drive)].

2. Question
   What does the dirty bit indicate. State how it is utilised.
   ANSWER(S):
   The dirty bit indicates when the memory has been modified. The dirty bit is a status bit which marks the block that has been modified.

3. Question
   Discuss the differences between '*page fault*' and '*page demand*.'
   ANSWER(S):
   a) '*Page fault*:' During an address translation if the page is not in memory [page absent], then a trap to the *operating system, known as a 'page fault,' occurs and a service routine loads the page [block] from disk [secondary memory].*
   b) 'Page demand [or demand paging]:' load pages ONLY as then are needed; this is called demand paging.

- NOTE: In the exam approximately 2 question are taken from the topics (and program examples) coved in each lecture

SEE: **GLOSSARY & AUX. DATA for expanded answers.**

GLOSSARY & AUX. DATA for expanded answers

- Dirty bit; how it is utilised:

  The dirty bit indicates when the memory has been modified. The dirty bit is a status bit which marks the block that has been modified. When a modification happens the bit is set. With the write-back strategy when the marked [dirty bit set] block is written back to secondary memory the dirty bit is reset; as a clean block replaces it.

Questions

Introduction to Questions:

The set of questions are based on lecture 12.

Answer Sheet will be given later in year and will contain the answers to these questions.

- Remember to find detailed and comprehensive answer you should [also] reference associated text books in the library.
- A reasonable starting place for associated book titles are:

1) This units 'module guide'; given to you in RN's first lecture – or on the web [Blackboard];
2) Those books mentioned in 'Background Reading;'
3) Those books [and web resources] mentioned in Learning Resources.

Questions

1. Question

Briefly explain the difference between a *page* and a *segment* in a virtual memory system.

Answer:

Very basic answer is: Page is fixed size, segment is variable size.

In a paged virtual memory system, the pages are all the same size.

In a segmented virtual memory system, the segments are of variable size.

Segmentation is less about mapping a larger virtual address space onto a smaller physical memory (the purpose of paging), and more about supporting the operating system in general.

Questions

2. Question

Segmented and paged virtual memory systems are often combined.

Explain how a 'segmented paged virtual memory' system is organised and explain the benefits of using such a system.

Answer:

Segments divided into pages.

Makes efficient use of block transfers from disks (pages); and provides the protection required by an operating system.

- Segmentation and paging are often used together; the virtual memory is divided into segments, then each segment is divided into pages, the rational for this is:

  Segments provide the multiple virtual address spaces that support operating systems and other system software; &

  Pages provide a mapping between a smaller physical memory and larger virtual memory; transferring pages from disk to memory.

3. Question

In the context of the Intel Pentium processor and paging the 32-bit linear address is broken into 3 fields. State the names of the three fields and give a description of each.

3. Answer

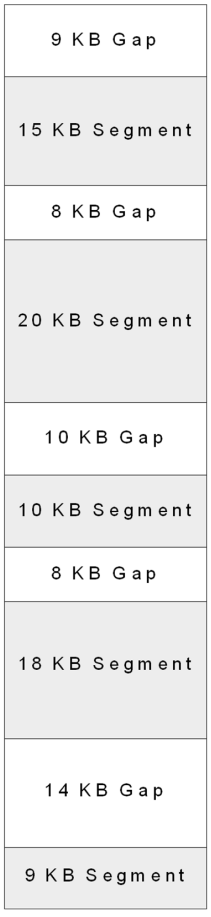
- The 32-bit linear address is broken into 3 fields [names underlined]:
  1) 10-bit page table field;
     - States which page table is being used.
  2) 10-bit page field;
     - State which page is being used.
  3) 12-bit offset;
     - To address the byte in physical memory.

4. Question

- A computer system uses *segmented* virtual memory (no pages). The state of the memory at a given time is shown in the figure overleaf. Indicate what happens when a segment requiring 9KB of memory space is loaded using the following algorithms:
  1) Best Fit; and
  2) First Fit.

  State where the 9KB will be placed given 1) and 2).
- Note that it is assumed that the lowest address is at the bottom of the diagram.

- Present state of the memory for Question 4.



Lowest address is at the bottom of the diagram ⟶

Questions

4. Answer

1) The Best Fit algorithm will map it to the 9KB gap at the top of the memory
2) The first fit algorithm will place it in the 14KB gap. This will leave an additional 5KB gap between the new segment and the 18KB segment.

Revision Exercises

- Scan read Lecture 12's Questions.
  - Answer Lecture 12's Questions
    - Particularly those questions you had difficulties with when you first tried them.