

IV. ORGANIZATION OF OTHER COMPUTER SYSTEMS

Memory Organization and
Management

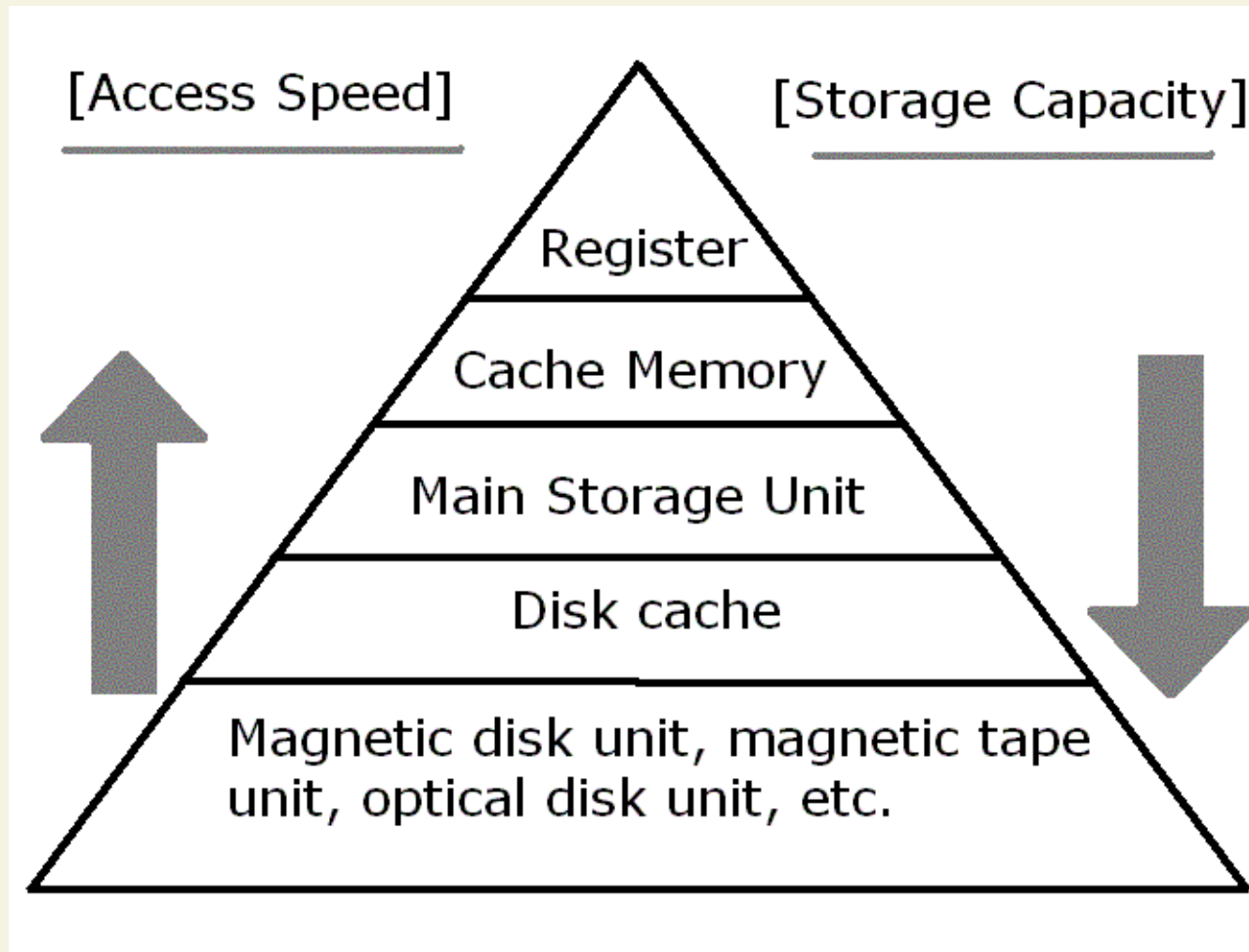


Memory Devices

- Storage units:
 - Main storage unit:
 - RAM (Random Access Memory)
 - Composed of semiconductor elements
 - Auxiliary storage devices
 - Magnetic tape, magnetic disk, floppy disk, optical disk, etc.



Memory Hierarchical Structure



Memory Organization and Management

- The following are determined through a knowledge of the memory organization of a particular computer system:
 - how the code is stored in the memory
 - how to get data values from memory
 - how would the memory be managed



Memory Organization

- Byte-addressable memory
- Word-addressable memory
- N-byte addressable memory
- Table-based Memory



Memory Organization

- Byte-Addressable Memory
 - Data are fetched byte by byte
 - This is needed when registers are byte-size or byte-addressable as well
 - This can be used for word-size data but the data can be stored in a different way: say backwards format



Memory Organization

- Word-Addressable Memory
 - Data are fetched two bytes at a time
 - If actual data is byte-sized, value at the higher byte is not really used
 - Registers cannot be divided into higher and lower byte



Memory Organization

- N-byte Addressable Memory
 - Data are fetched N bytes at a time
 - A certain register would have to contain the starting address and another register to contain the length/number of bytes to be fetched
 - Registers are commonly divided into higher and lower byte



Memory Organization

- Table-based Memory
 - A table in the memory is used to translate logical address to physical address
 - Example: protected mode



Memory Management

- Linear – continuous physical addresses
- Segmented – segment registers are used
- Paged – memory is divided into pages and pages are swapped in and out of the memory when needed (for multitasking)



Memory Management

- Linear memory management can be used for any of the given memory organization.
- Segmented memory is not very appropriate for N-byte addressable memory due to segment bounds.
- Paged memory is applicable for byte or word addressable memory but bounds must be considered in the case of N-byte and table-based memory organization.

