MEMORY MANAGEMENT

What is Memory Management?

■ Each process must reside in computer memory

– Assembly code occupies space

– Process may require memory space to hold data (variables)

■ OS allocates resources

– Shared nicely

– Keeps track of where program resides in memory

– Releases resources after process terminates

■ Convert Logical address to Physical address,

- Logical address: – Location in memory relative to the program
- Physical address: – Actual address in the main memory

Memory management – the process

■ Partly in hardware called memory management unit

■ Keeps track of which areas of memory are in use, and which are free

■ Allocates memory to processes when the need it

– And deallocate when no longer required

■ Protect memory from other processes

■ Manage Swapping & Paging

Fixed-size partition:

■ Memory divided up into fixed sized spaces (eg. 300kB).

■ Memory space allocated, just big enough to hold process.

■ Problems:

– Wasted space

– Unable to allocate resource to a process

Variable-sized partition:

■ Exact amount required is allocated.

■ Memory can be allocated:

– until the whole memory space is filled or

– until the remaining free space is too small to accommodate.

the new process

■ Memory from terminated processed is freed.

Paged memory - General

■ Processes can be divided up into pages.

■ All these pages must be of a fixed size – determined by the architecture

■ Stored in memory frames when loaded into memory.

– A Frame is a fixed-size portion of main memory that holds a process page.

– A Page is a fixed-sized portion of a process that is stored into a memory frame.

– A Page-map Table (PMT) is a table used by the OS to keep track of page/frame

relationships.

Paged Memory Management – Demand, swapping and thrashing

■ Demand paging

– Paging memory as demanded

– Not all parts of program need to be in memory at the same time

■ Pages are brought into memory on demand

■ Page swapping

– Bringing in a page from secondary memory

■ Writing back another page to secondary memory

■ Thrashing

– Too much page swapping can seriously degrade performance

Swapping / Virtual memory

■ RAM (Primary memory) is very fast

■ Hard disks are slower

■ When more memory is required than exists in the system – processes cannot be

allocated resources

■ Swapping / virtual memory:

– Allocating part of the hard disk as an extension of the primary memory.

– Disk area is called Swap Space

– Swapped in, Swapped out

Virtual memory:

■ Addresses used within program refers to a virtual address in memory – not the real address

■ Process has a virtual memory whose size and characteristics differ from those of real memory.

■ Transparent – Program does not need to know whether it is using real memory or VM