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# FACULTY OF ENGINEERING & TECHNOLOGY

## BCS-501 Operating System

## Lecturer-21

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# MEMORY MANAGEMENT

- Fragmentation
- Segmentation
- Logical View of Segmentation
- Segmentation Architecture

# Fragmentation

➢External Fragmentation – total memory space exists to satisfy a request, but it is not contiguous

➢Internal Fragmentation – allocated memory may be slightly larger than requested memory; this size difference is memory internal to a partition, but not being used

➢First fit analysis reveals that given N blocks allocated, 0.5 N blocks lost to fragmentation
1/3 may be unusable -> 50-percent rule

➢Reduce external fragmentation by compaction

- Shuffle memory contents to place all free memory together in one large block
- Compaction is possible only if relocation is dynamic, and is done at execution time
- I/O problem
  - Latch job in memory while it is involved in I/O
  - Do I/O only into OS buffers

Now consider that backing store has same fragmentation problems

# Segmentation

•Memory-management scheme that supports user view of memory

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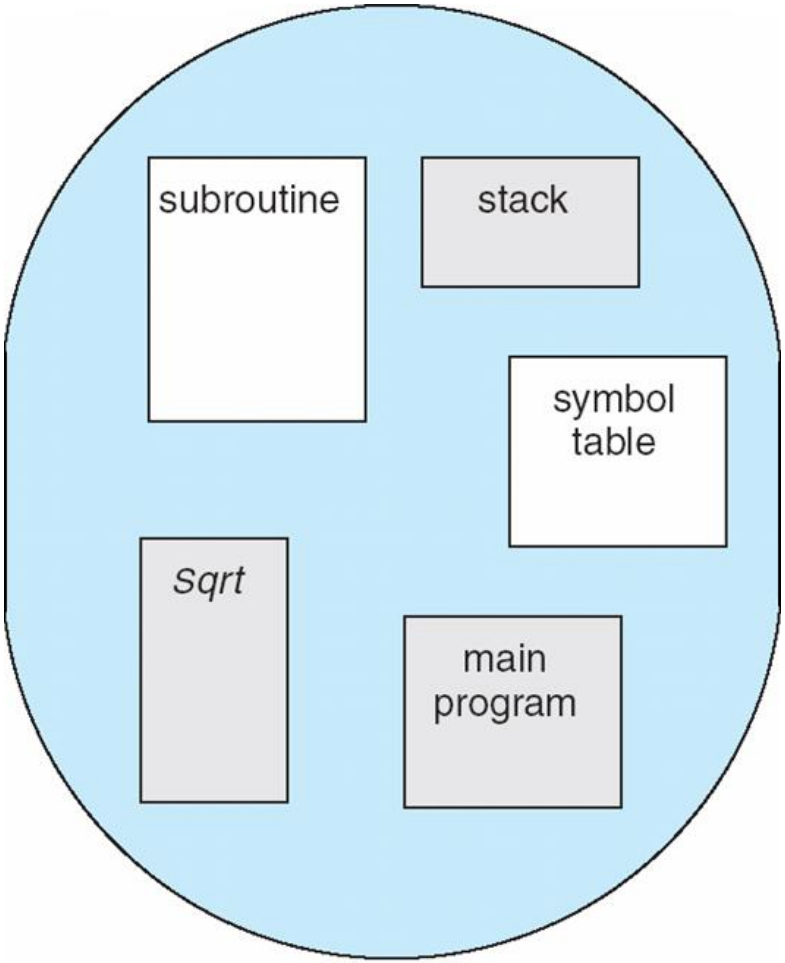
•A program is a collection of segments

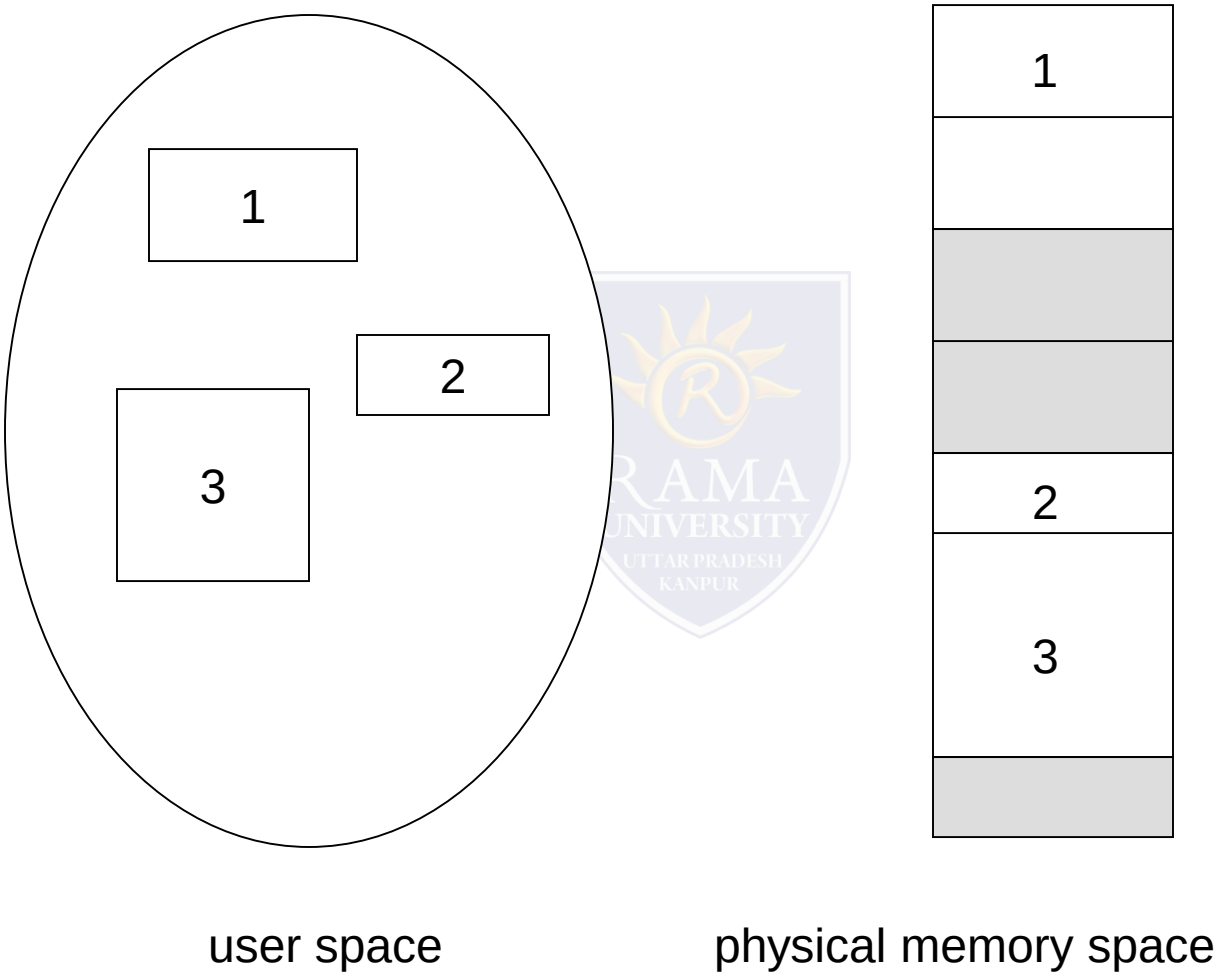
A segment is a logical unit such as:

- main program
- procedure
- Function
- Method
- Object
- local variables, global variables
- common block
- Stack
- symbol table
- arrays

# User's View of a Program



# Logical View of Segmentation



# Segmentation Architecture

•Logical address consists of a two tuple:
<segment-number, offset>,

•Segment table – maps two-dimensional physical addresses; each table entry has:
base – contains the starting physical address where the segments reside in memory
limit – specifies the length of the segment

•Segment-table base register (STBR) points to the segment table's location in memory

•Segment-table length register (STLR) indicates number of segments used by a program;
segment number *s* is legal if *s* < STLR

•Protection
With each entry in segment table associate:
validation bit = 0 ⇒ illegal segment
read/write/execute privileges

Protection bits associated with segments; code sharing occurs at segment level
Since segments vary in length, memory allocation is a dynamic storage-allocation problem
A segmentation example is shown in the following diagram

# MCQ

With relocation and limit registers, each logical address must be _____ the limit register.
A. less than
B. equal to
C. greater than
D. None of these

A process is thrashing if:
A. it is spending more time paging than executing
B. it is spending less time paging than executing
C. page fault occurs
D. swapping can not take place

When memory is divided into several fixed sized partitions, each partition may contain _____.
A. exactly one process
B. atleast one process
C. multiple processes at once
D. None of these

In fixed sized partition, the degree of multiprogramming is bounded by _____.
A. the number of partitions
B. the CPU utilization
C. the memory size
D. All of these

Transient operating system code is code that ....
A. is not easily accessible
B. comes and goes as needed
C. stays in the memory always
D. never enters the memory space