Memory

MIPS Memory

32-bit addresses.

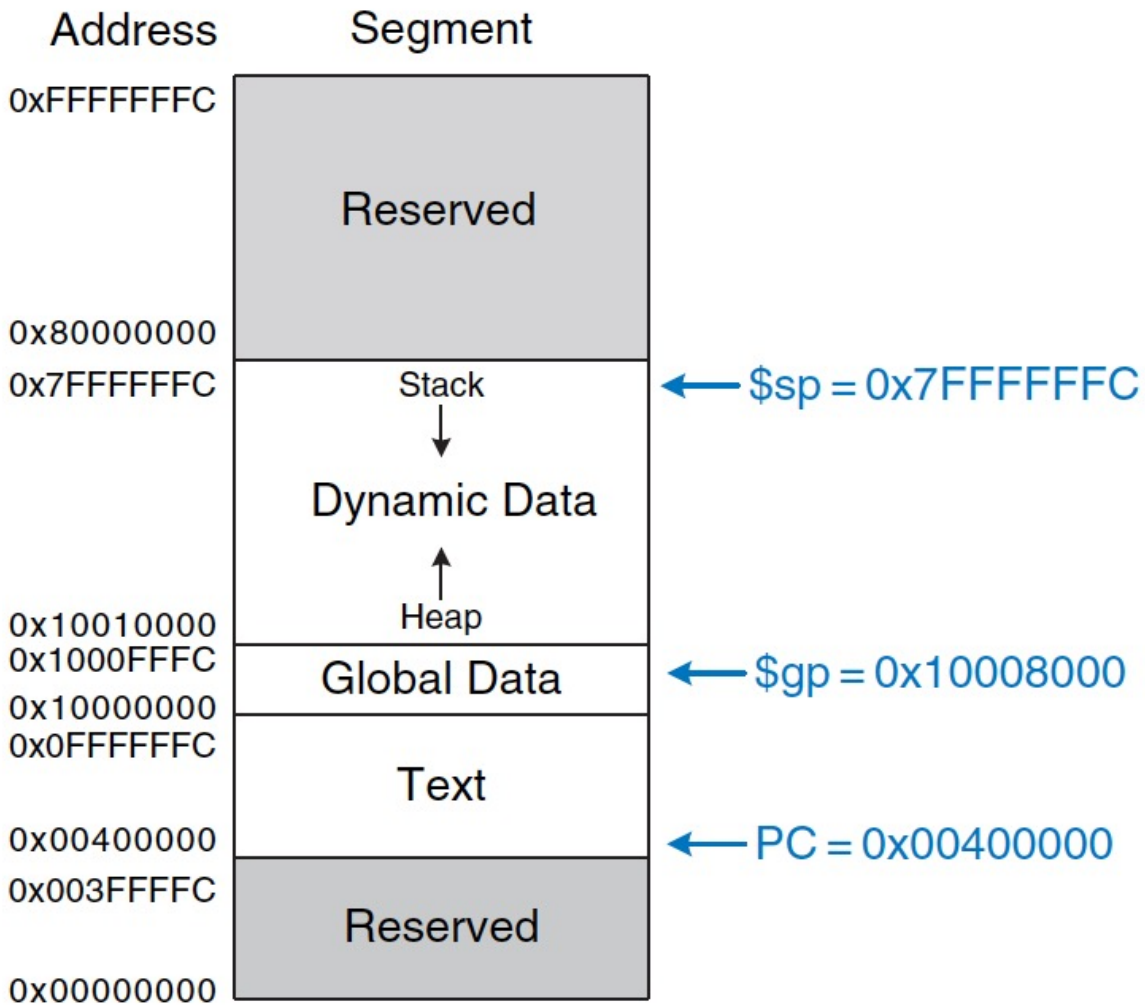
How many bytes can we address?

What is the maximum address we can label?

Splitting Memory by Topic

- Instructions
- Data
  - Global (static) data: allocated before program runs
  - Dynamic: allocated while program runs

Memory Partitioning



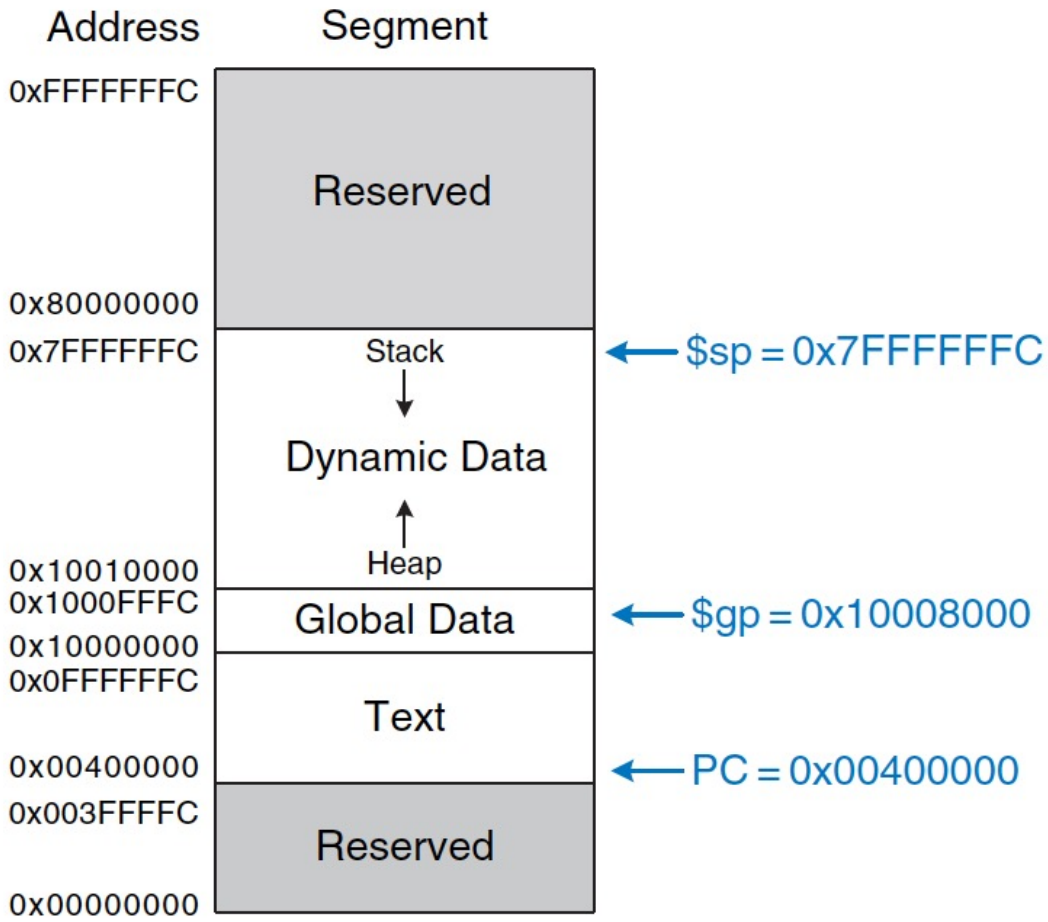
Text Segment

Stores the machine language program.

Four most significant bits are 0

How much code can we store?

How might it impact the jump instruction?



Global Data Segment

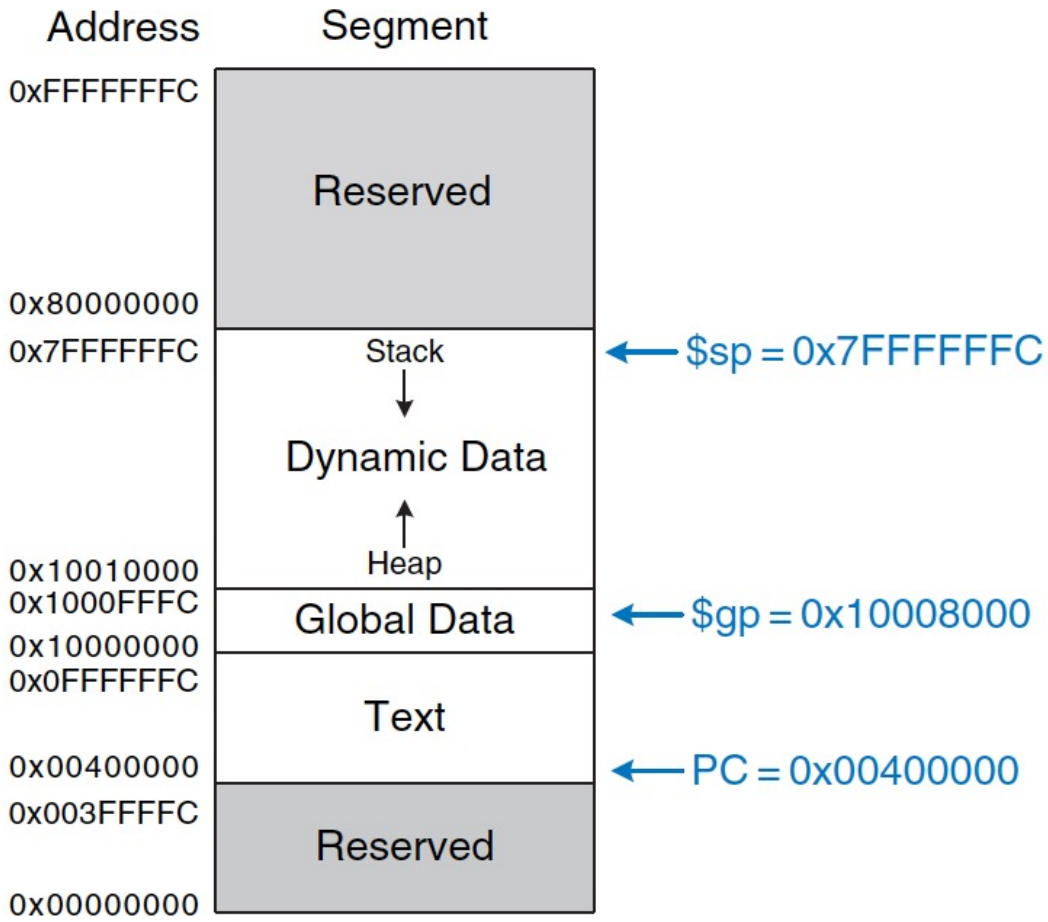
Any function in a program can access.

- Defined before program begins executing.

Store 64 KB of global variables.

$gp - Global pointer

- Access global variables with $gp +- a constant 16-bit offset.



Dynamic Data Segment

Hold the stack and the heap.

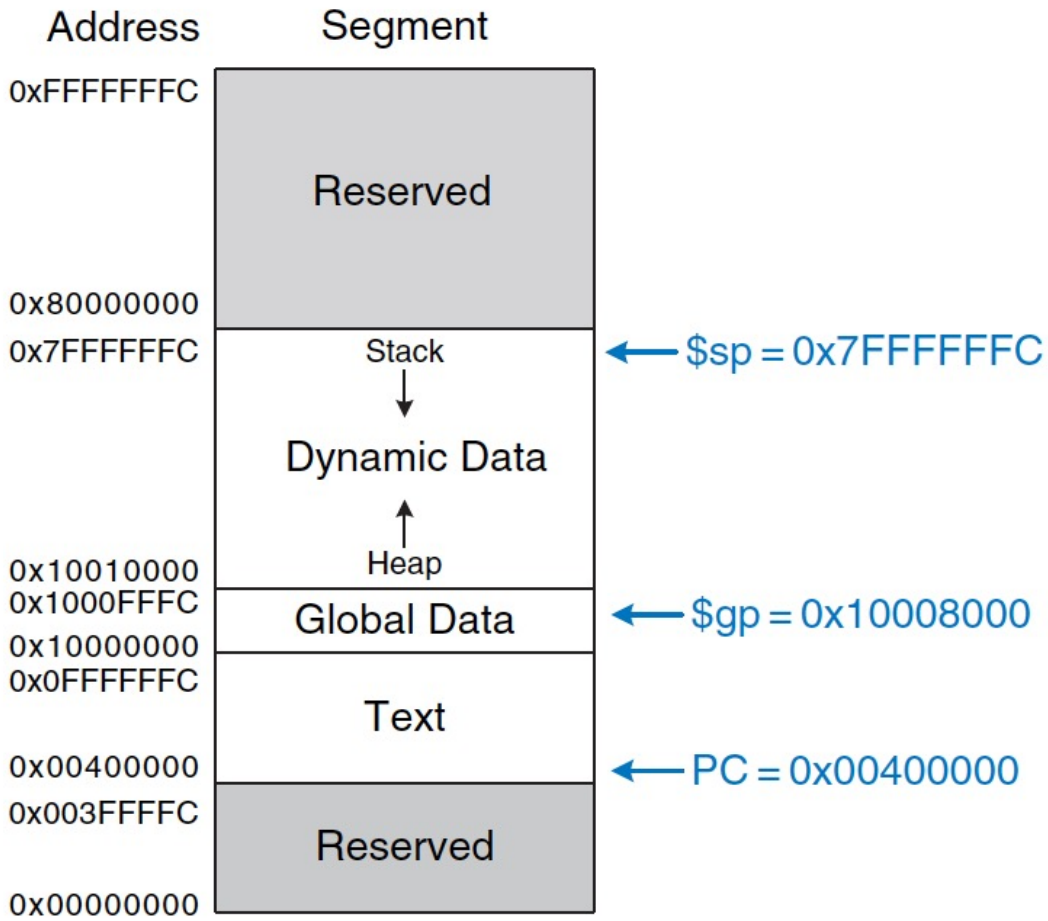
Stack grows down from top

Heap grows upward

- Stores data allocated during runtime not on the stack.
- Malloc in C, new in C++ and Java.

What happens if the two collide?

- Memory corruption.
- Memory allocator tries to avoid this problem.



Reserved Segments

Used by the system.

Not directly used by the program.

System interrupts, memory-mapped I/O, etc.