Stack Organization

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Stack Organization

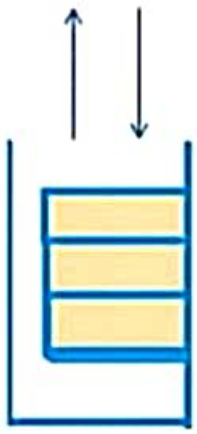
- **Stack:-** A stack storage device that stores information in such a manner that the item stored last is the first item retrieved.

- Also called **last-in first-out(LIFO) list.** Useful for compound arithmetic operations and nested subroutine calls.

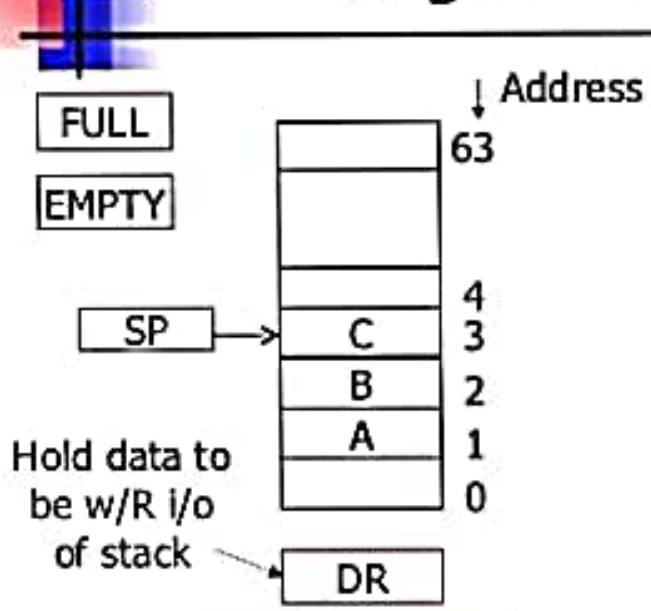
Stack Organization

- **Stack Pointer(SP):-** A register that holds the address of the top item in the stack.

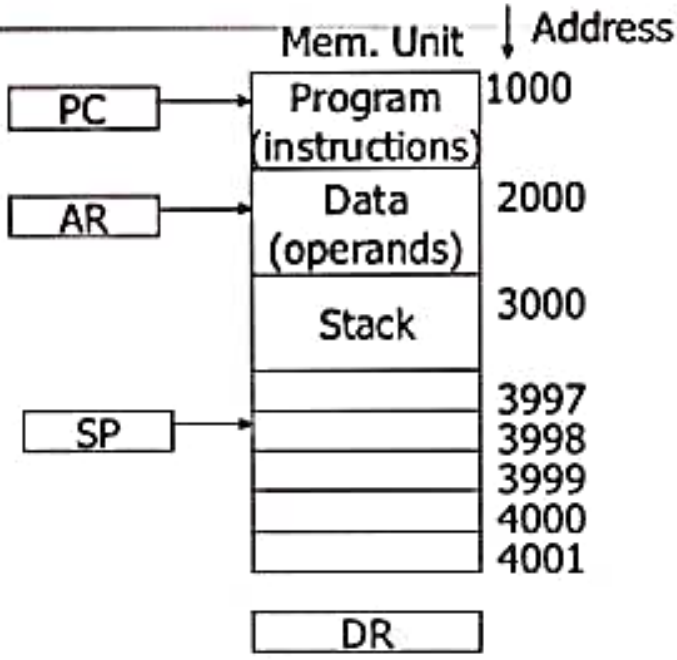
  SP always points at the top item in the stack.
- Push:- Operation to insert an item into the stack.
- Pop:- Operation to retrieve an item from the stack.



Central Processing Unit
Stack Organization



Block diagram of a 64 word-register stack bit SP 6



Computer memory with program, data & stack segments

Stack Operation Reverse Polish Notation (postfix)

- **Reverse polish notation:** is a **postfix notation**(places operators after operands).
- **(Example)**

  Infix notation A + B

  Reverse Polish notation AB+ also called postfix.

Stack Operation Reverse Polish Notation (postfix)

- A stack organization is very effective for evaluating arithmetic expression.
- **A * B + C * D → (AB*)+(CD*) → AB* CD*+**
- **(3 * 4) + (5 * 6) → 34 * 56 *+**
- first convert the arithmetic expression into the equal to polish notation.
- Push the operands into stack in the order in which they appear.
- Use the 2 top most operation for evaluation.
- The stack is pop and the result often the operation is again push into the stack
- Finally only the result of the operation is left on stack top.

Example 1: A*B+C*D, first add ")" to the given expression i.e., A*B+C*D) and also push "(" onto the stack.

InfixCharacter Scanned	Stack	Postfix Expression
	(	
A	(	A
*	(*	A
B	(*	AB
+	(+	AB*
C	(+	AB*C
*	(+*	AB*C
D	(+*	AB*CD
)	(+*	AB*CD*+

Evaluation of Arithmetic Expressions

(1) Push the operands into the stack until an operator is reached
(2) Pop the top two operands from the stack, compute the result and also push the result back into the stack.
(3) Continue this process until there are no more operators in the RPN and the final result is in the stack.

The following numerical example may clarify this procedure. Consider the arithmetic expression

(3 * 4) + (5 * 6)

In reverse Polish notation, it is expressed as

34 * 56 * +