Stacks

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Outline

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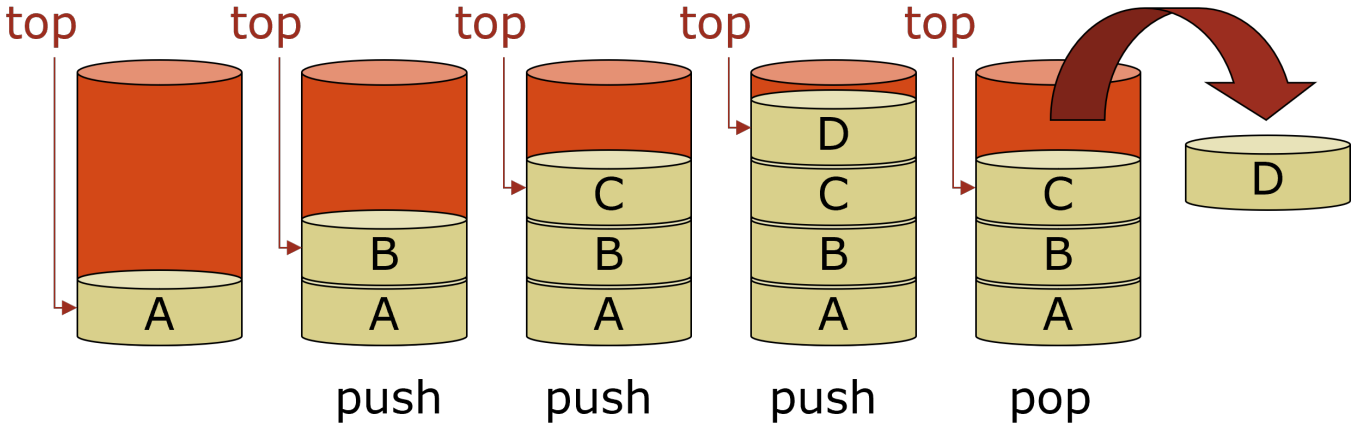
Definition

- A stack is an ordered list in which insertions and deletions are made at the end "top".
  - insertions: push/add
  - deletions: pop/remove
- Last-In-First-Out (LIFO).



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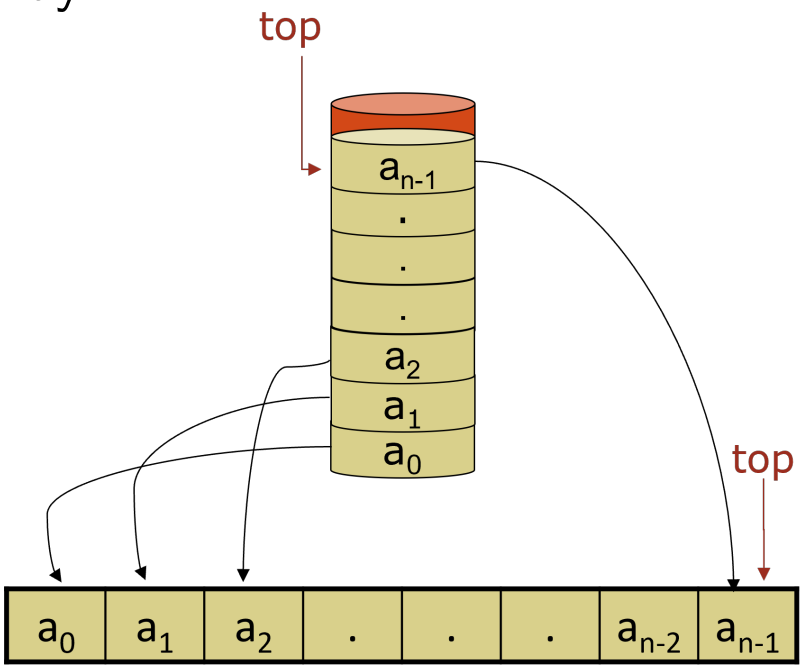
Stack Implementation: Array

- The easiest way to implement the stack ADT is using one-dimensional array.



- An example in C++

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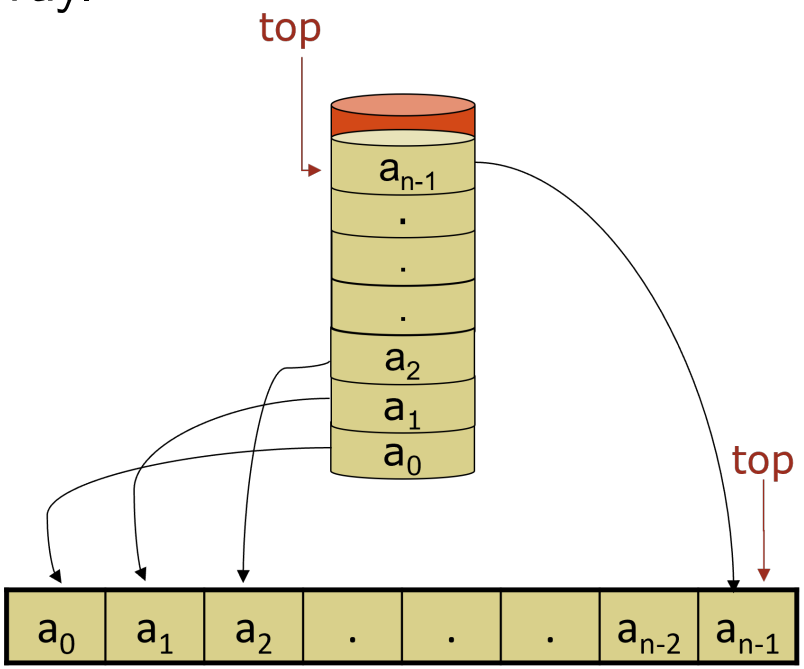

- An example in C++ (another way: using a linked list; will be introduced in the future).

Functions for Stacks

- Create a stack.
  - Create an empty stack with maximum size `MAX_STACK_SIZE`.

```c
#define MAX_STACK_SIZE 101

typedef struct {
    int key; // can be of other types...
    /* other fields? */
} element;

element stack a[MAX_STACK_SIZE];
int top = -1; // initially no element
```


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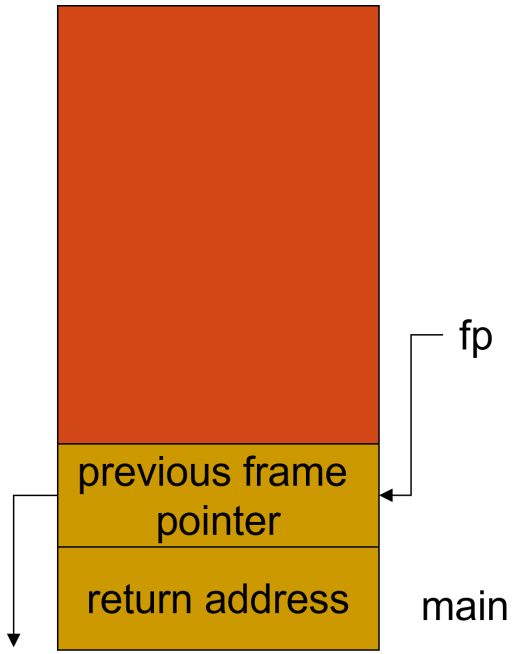
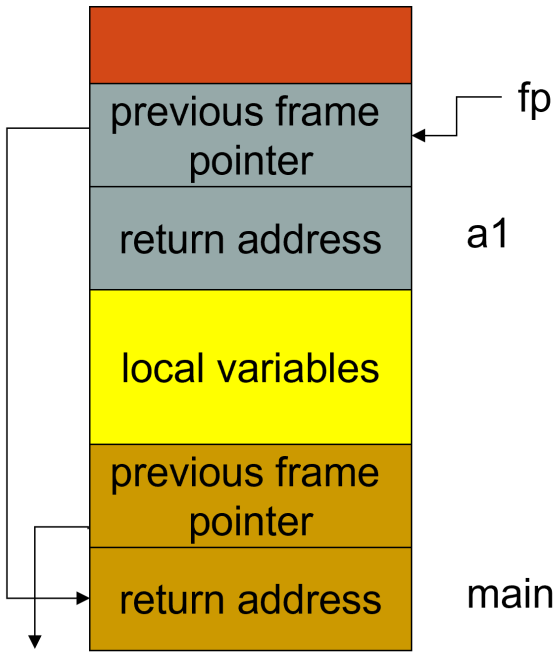
    `stack[++top] = element;`
- Pop (or Delete)
  - Remove and return the item on the top of the stack.
    `return stack[top--];`

Supplementary: System Stack

- Stack frame of a function call



system stack **before** a_1 is invoked



system stack **after** a_1 is invoked

Discussions