Computer Science CSCI 261

Computer Architecture and Assembly Language

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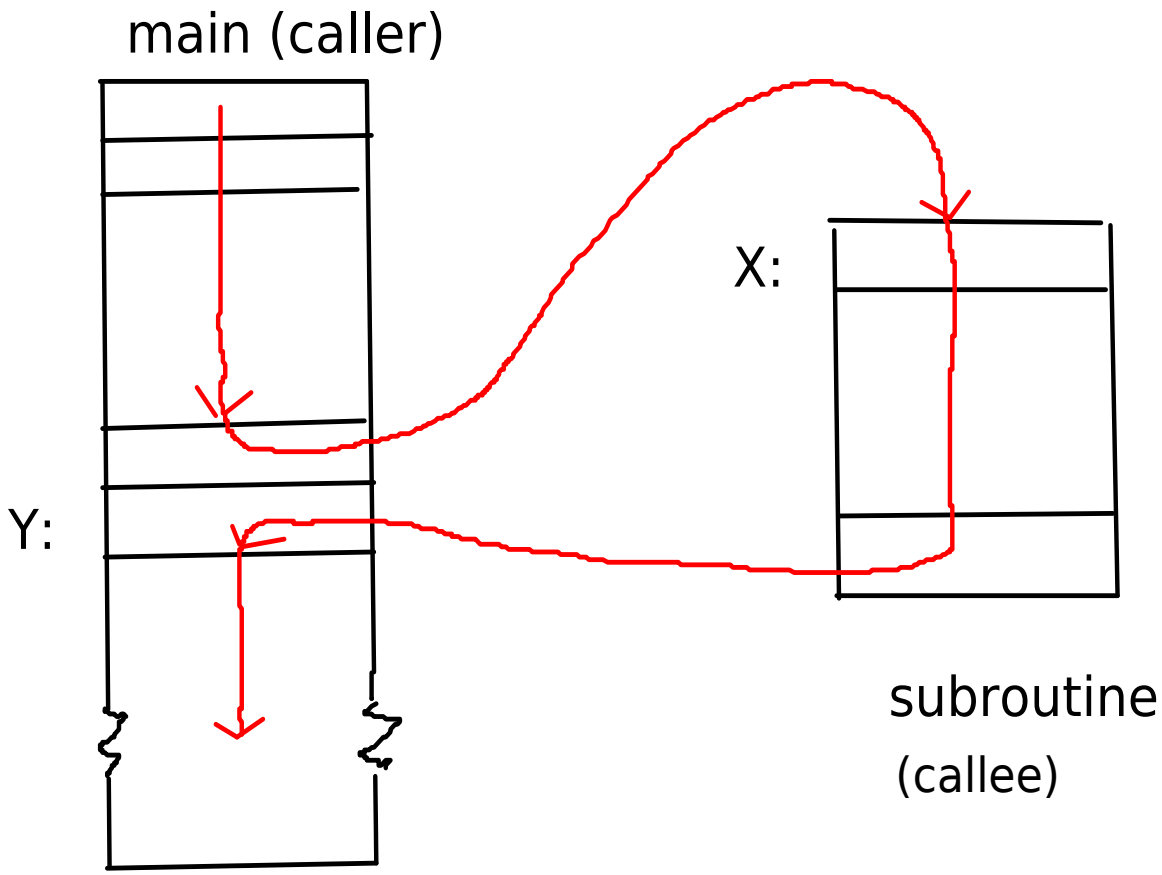
Subroutine Control Flow



Subroutine Control Flow Pseudocode

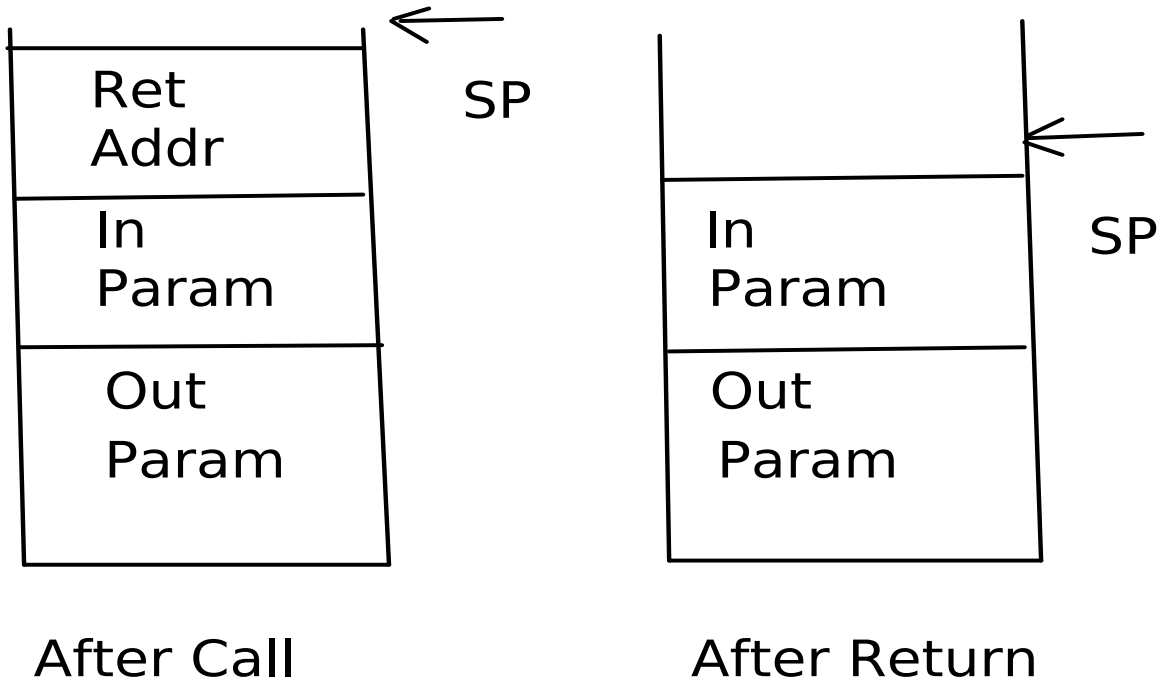
- Caller
  - reserves and initializes stack space for parameters
  - saves the return address on the stack
  - branches to the subroutine
- Callee
  - executes the body of the subroutine
  - saves any value to be returned on the stack
  - removes the return address from the stack
  - branches to the return address
- Caller
  - removes stack space previously allocated for params.
  - processes any returned value

Subroutine Instructions

- `call`
  - place the return address on top of the stack and branch to the callee (subroutine)
- `ret`
  - remove the return address from the top of the stack and branch back to the caller

Subroutine Control Flow cont.

- Processor Stack
  - with `call` and `ret` instructions



SSBC Subroutine Control Flow

- Call
  - how to branch to subroutine X?

    `clear Z; jnz X` (✓)
- Return
  - how to branch to return address Y?

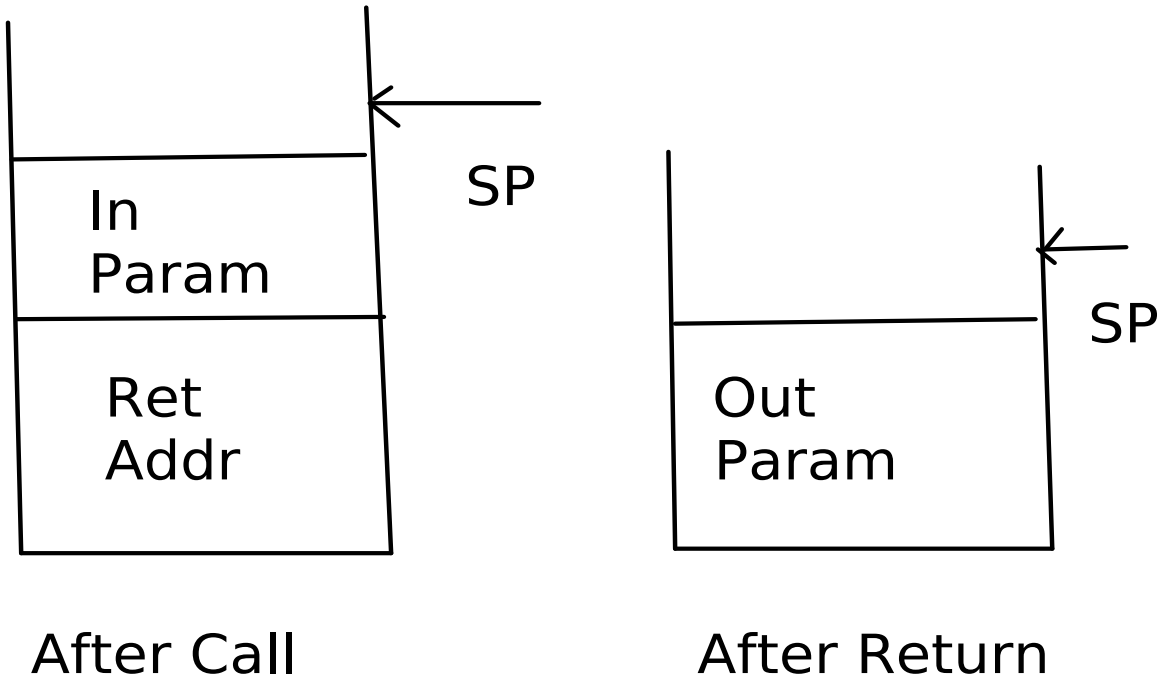
    `clear Z; jnz Y` (×)

    `save return address in W; clear Z; jnz W` (×)

    `save return address on the stack; clear Z;`
    `jnz return address` (✓)

SSBC Subroutine Control Flow cont.

- Processor Stack
  - without `call` and `ret` instructions



SSBC Virtual Return Instruction

- Boilerplate Code