**Lecture 2b** - Runtime Stack Diagram This lecture goes with Lecture 2a.

Note:

These diagrams of the runtime stack correspond to the program at the beginning of Lecture 2.

**RUNTIME STACK**

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

0

0

main

stack

0

frame

ra

0

When main() is called, an activation record (stack frame) is pushed on the runtime stack.

adr

secondAge (arg)

getAges

firstAge (arg)

adr

stack (No local var)

frame (No return value)

return address

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

ra

0

0

main

stack

0

frame (No arguments)

ra

0

When getAges() is called, an activation record (stack frame) is pushed on the runtime stack.

adr

secondAge (arg)

getAges

firstAge (arg)

adr

stack (No local var)

frame (No return value)

return address

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

ra

0

22

main

stack

21

frame (No arguments)

ra

0

When the getAges() function terminates, the stack frame is popped off the runtime stack.

getAges

stack frame

popped

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

0

23

main

stack

21

frame (No arguments)

ra

0

?

avgAge (local var)

secondAge (arg)

22

**calcAvg**

21

firstAge (arg)

**stack**

**frame**

return address

ra

space for return value

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

?

0

22

main

stack

21

frame (No arguments)

ra

0

When calcAvg() is called, an activation record (stack frame) is pushed on the runtime stack.

The value to be returned to *main()* is not returned directly from the local variable, *avgAge*.

Instead, the value in the local variable (*avgAge*) is first copied into the return value space.

Then the value in the return value space is returned to *main()* (copied into the local variable, *avg*)

avgAge (local var)

21.5

secondAge (arg)

22

(No local var)

21

firstAge (arg)

**calcAvg**

return address

ra

**stack**

**frame**

space for return value

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

21.5

21.5

23

main

stack

21

frame (No arguments)

ra

0

calcAvg

stack frame

popped

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

21.5

23

main

stack

21

frame (No arguments)

ra

0

When the calcAvg() function terminates, the stack frame is popped off the runtime stack.

When displayAvg() is called, an activation record (stack frame) is pushed on the runtime stack.

**avg (arg)**

**21.5**

**displayAvg (No local var)**

**stack frame** **(No return value)**

**return address**

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

**ra**

21.5

23

main

stack

21

frame (No arguments)

ra

0

When the displayAvg() function terminates, the stack frame is popped off the runtime stack.

**displayAvg**

**stack frame**

avg (local var)

secondAge (local var)

firstAge (local var)

return address

space for return value

**popped**

21.5

23

main

stack

21

frame (No arguments)

ra

0

When main() terminates, the stack frame is popped off the runtime stack.

main

stack

popped