Functions in Hack VM: Syntax and implementation

John Lapinskas, University of Bristol

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- The syntax to return from a function is `return`, which returns the top value of the stack.

An example of function syntax in use

[See video for a demonstration with the VM simulator with sum.vm.]

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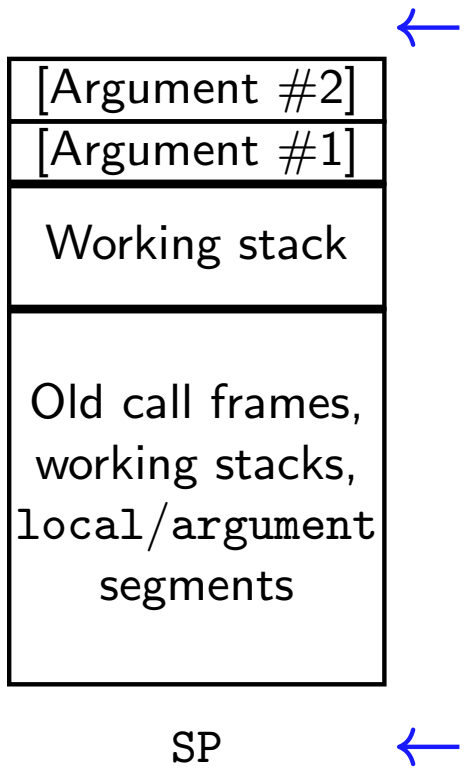

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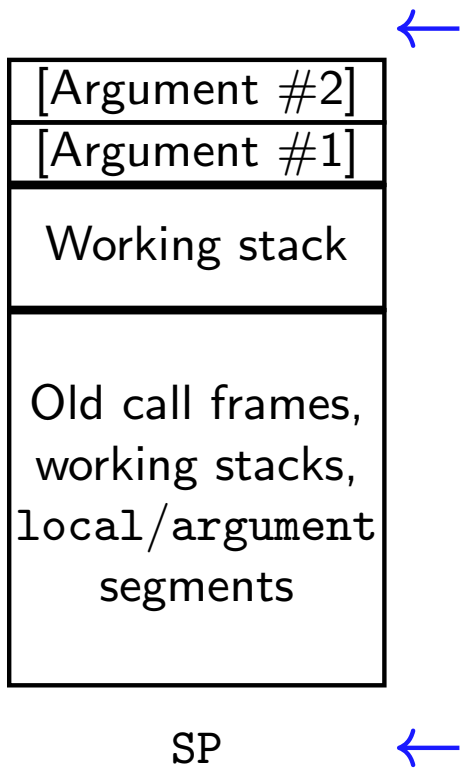

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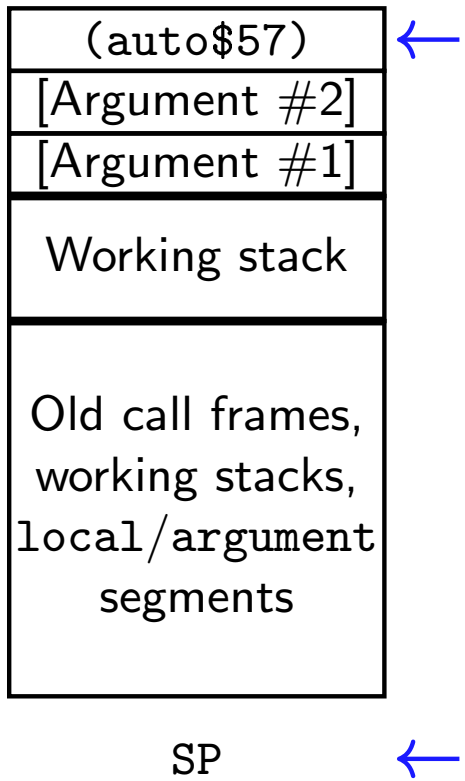

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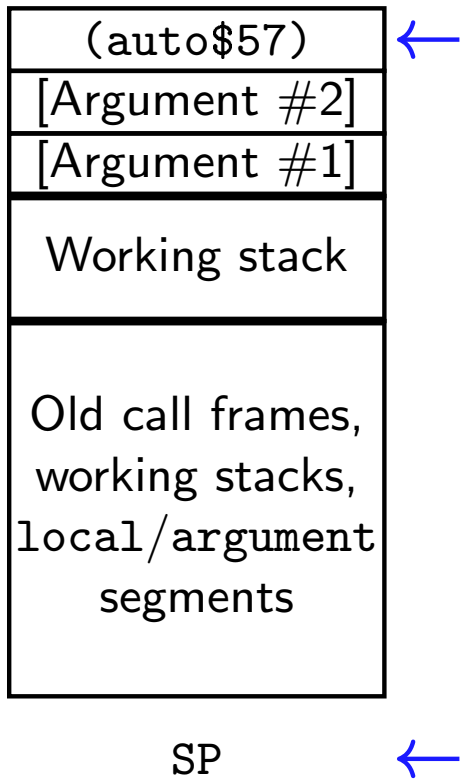

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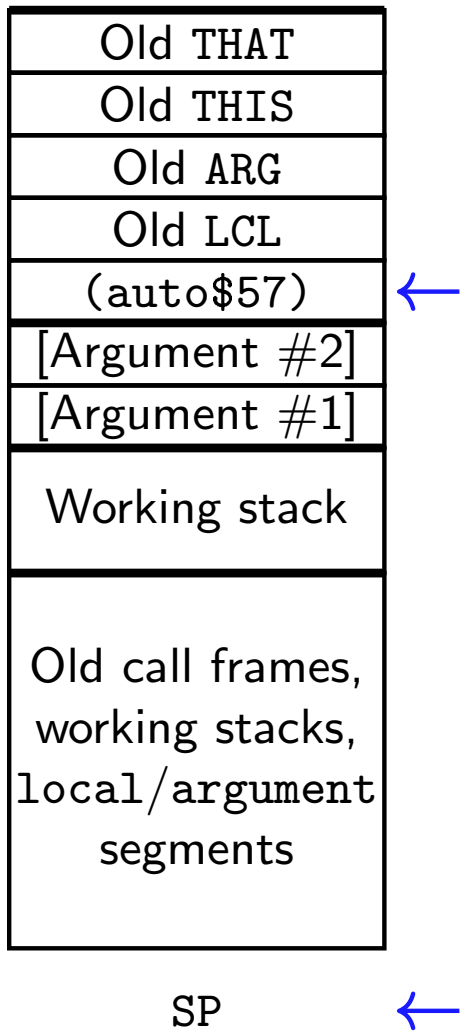

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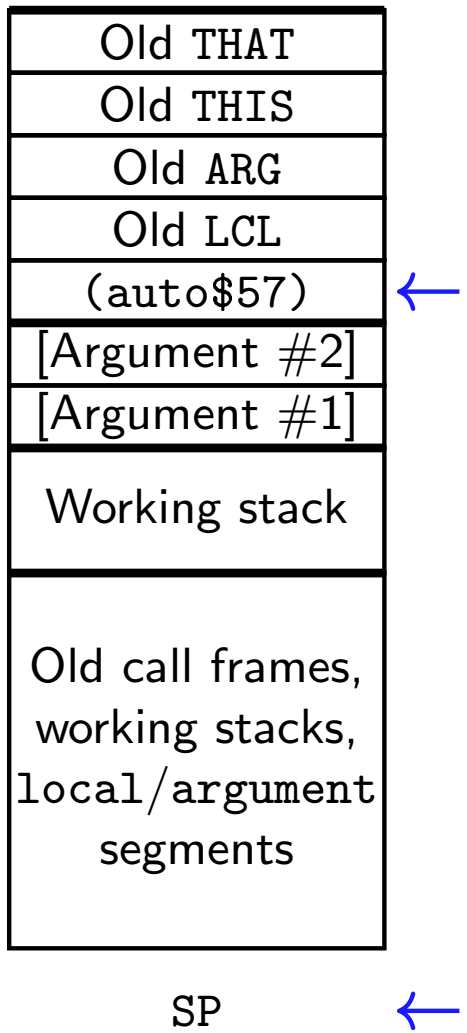

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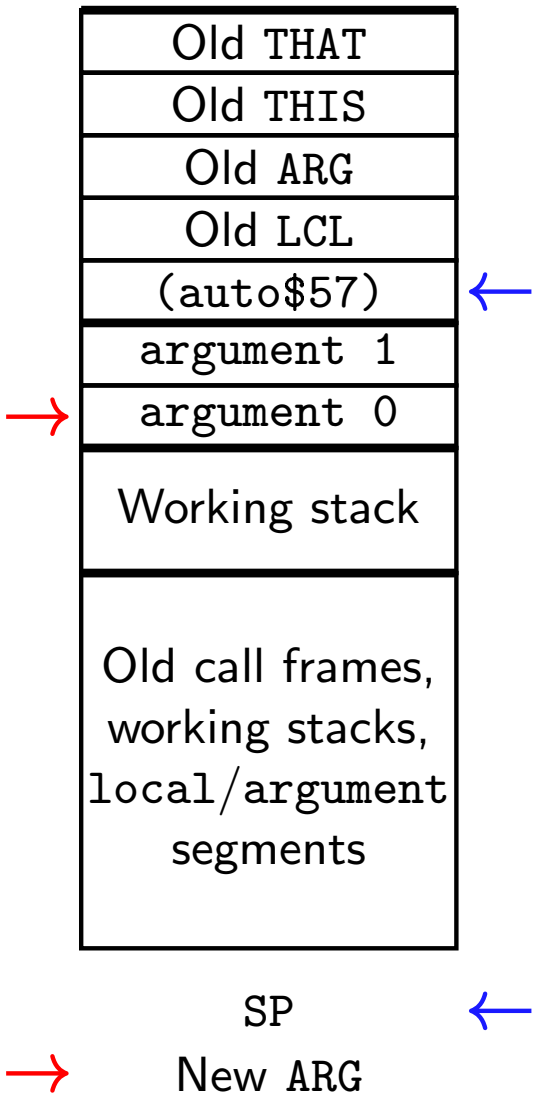

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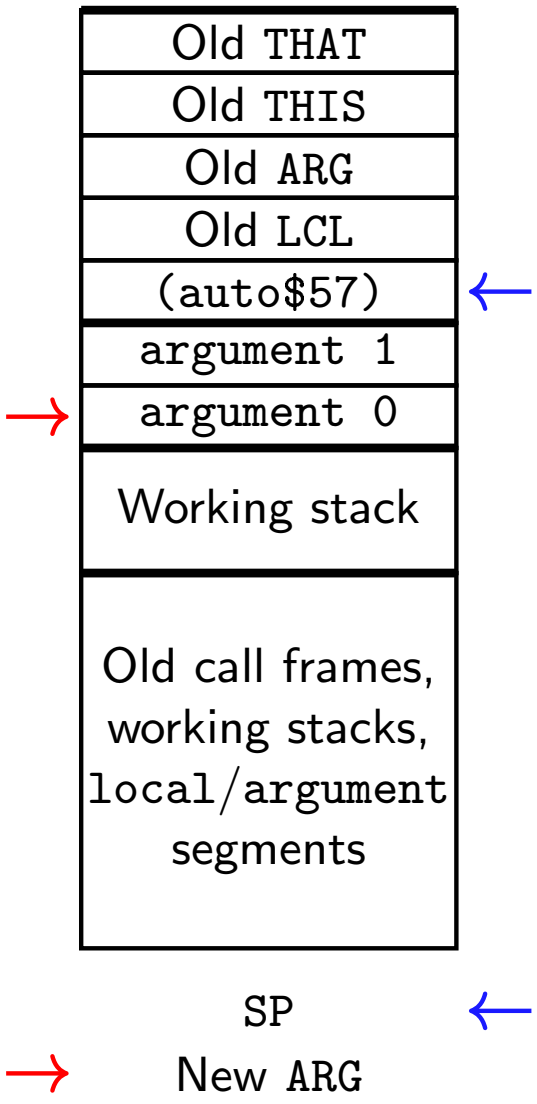

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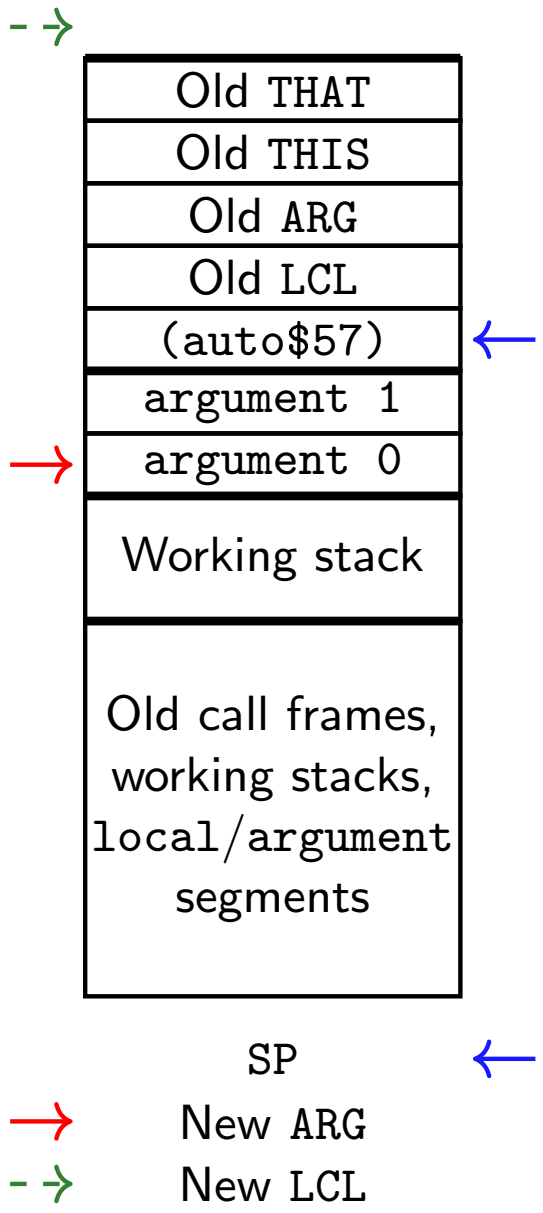

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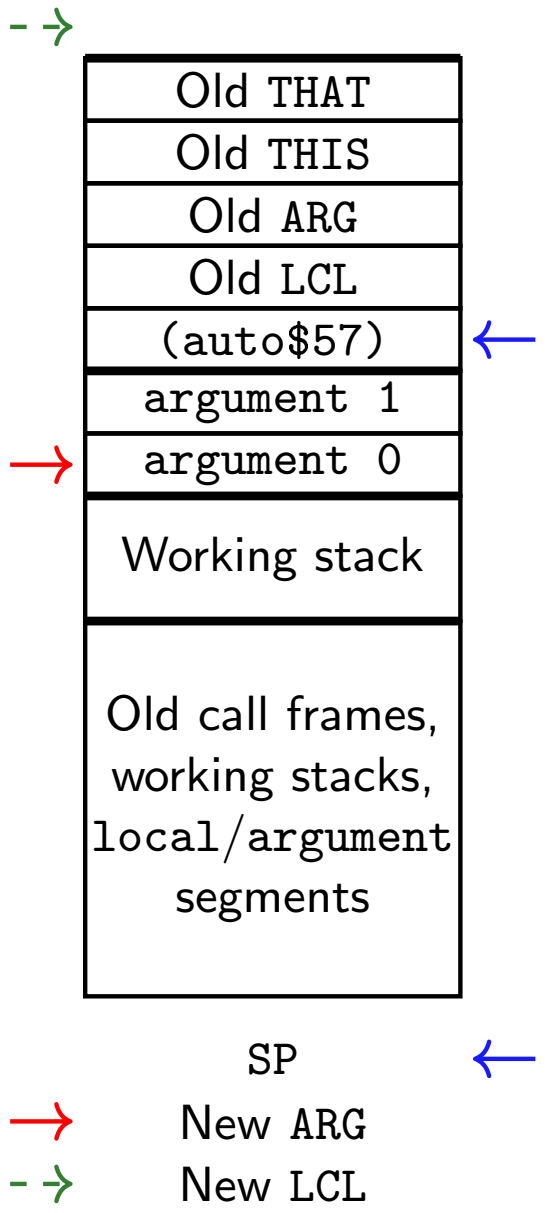
- Jump to the function label (which we will generate from the function definition elsewhere in the VM code).



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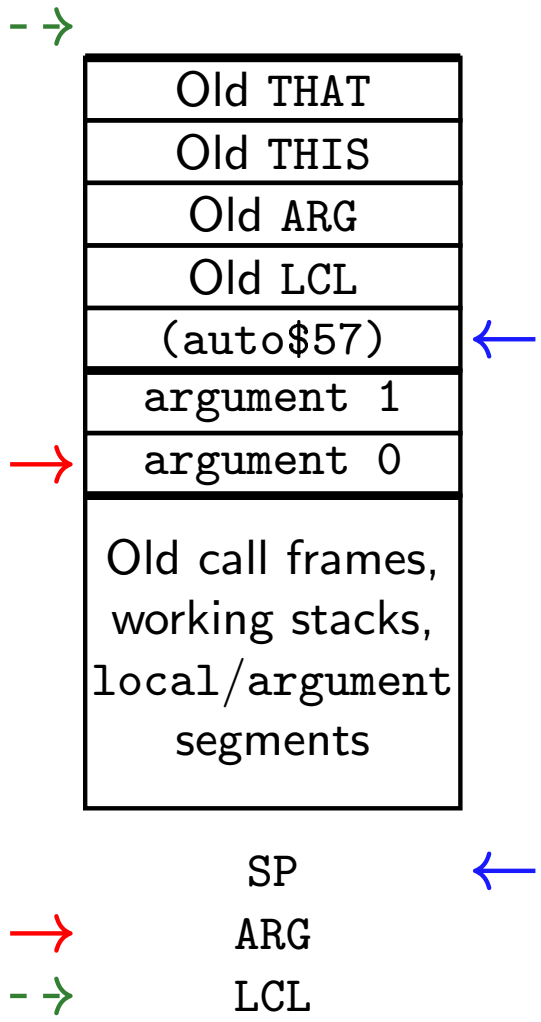

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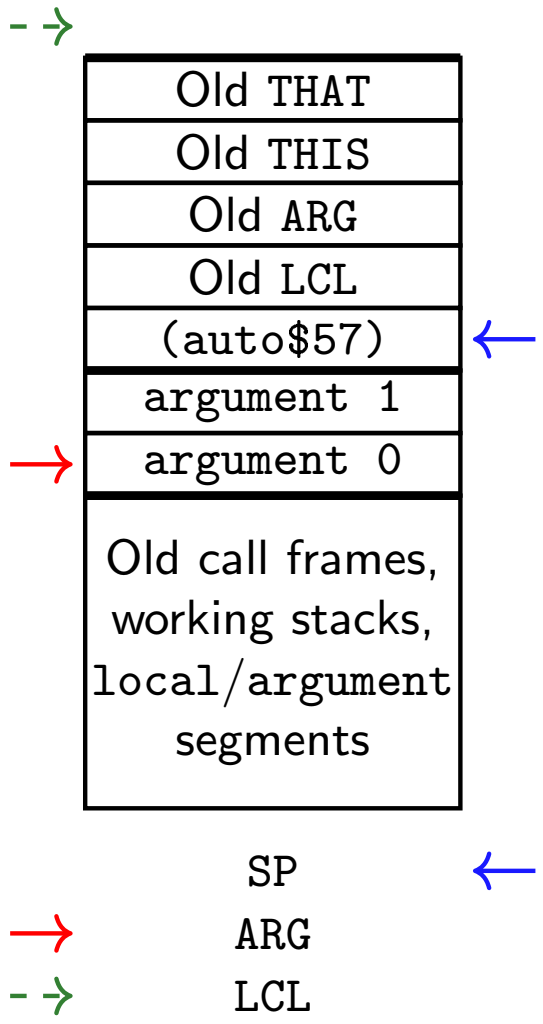

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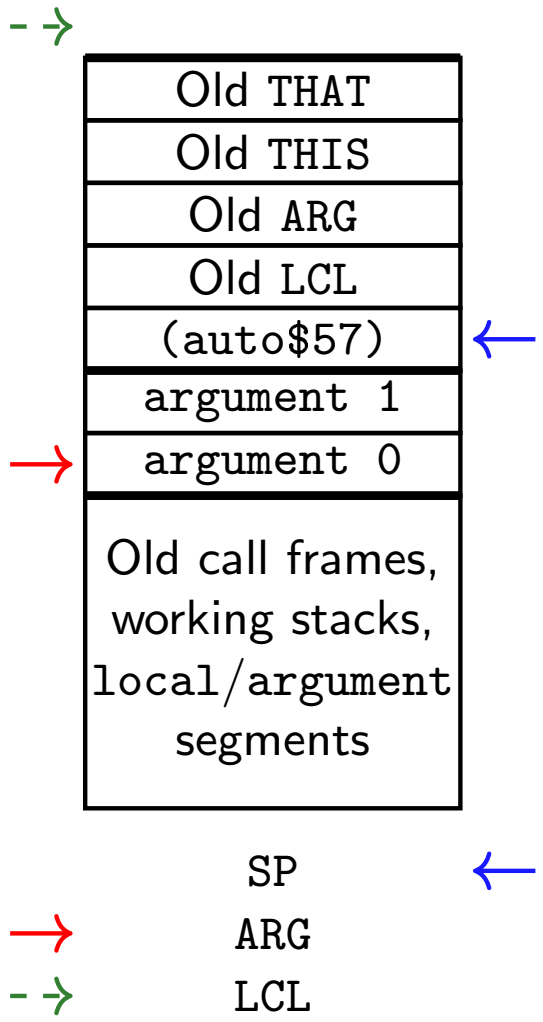

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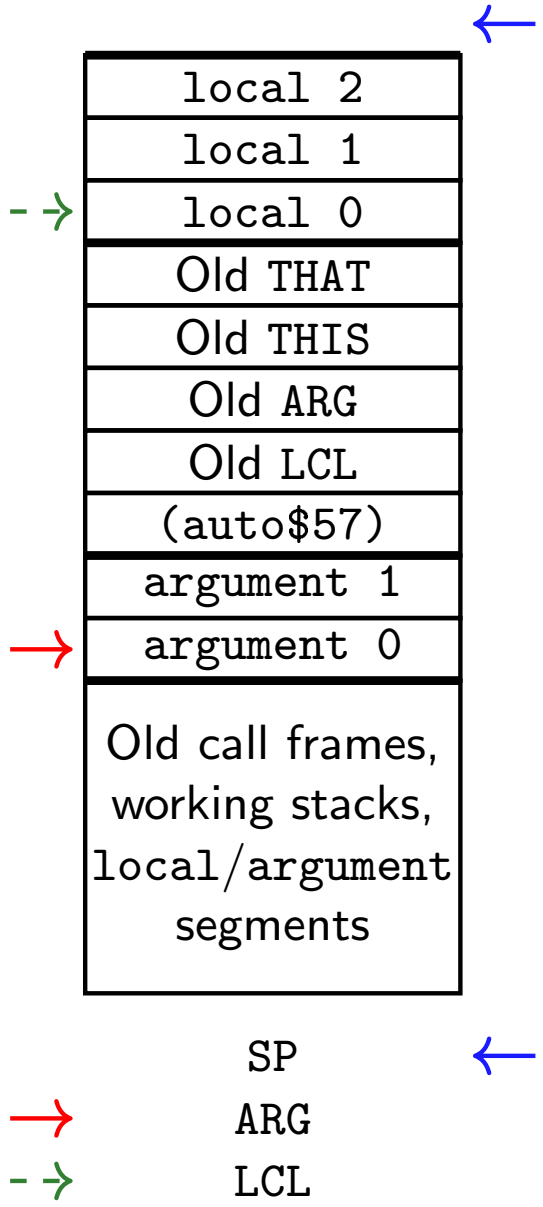

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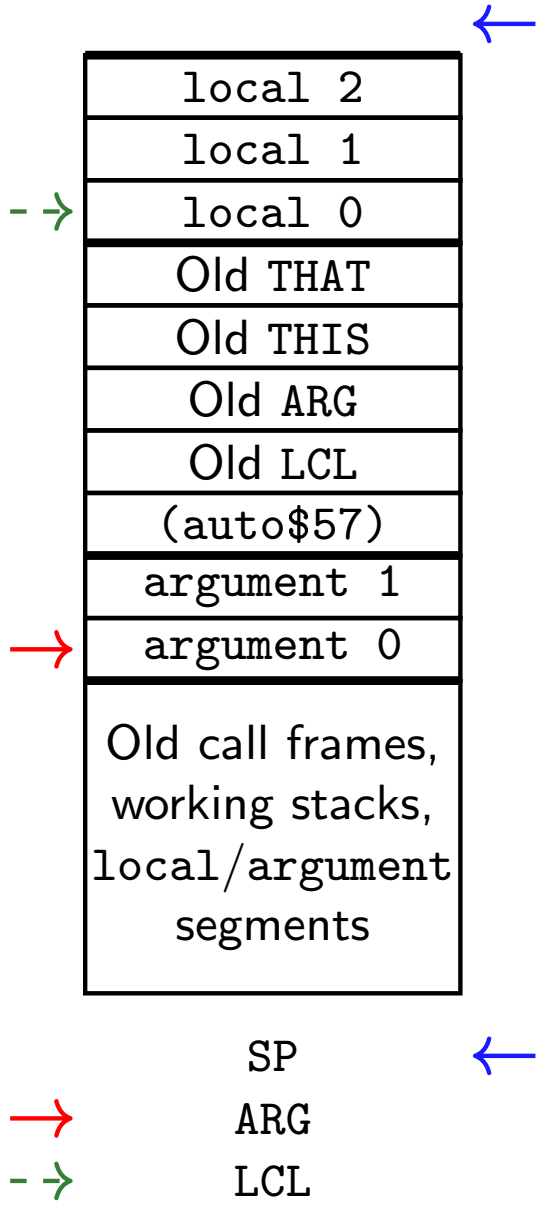

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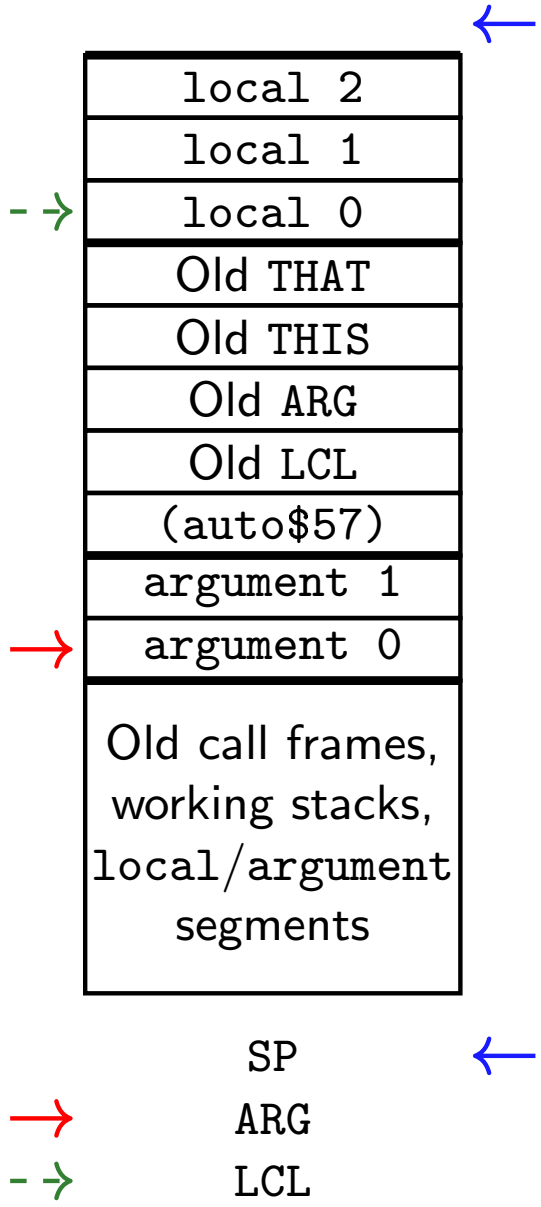
- Continue into the first line of actual function code.



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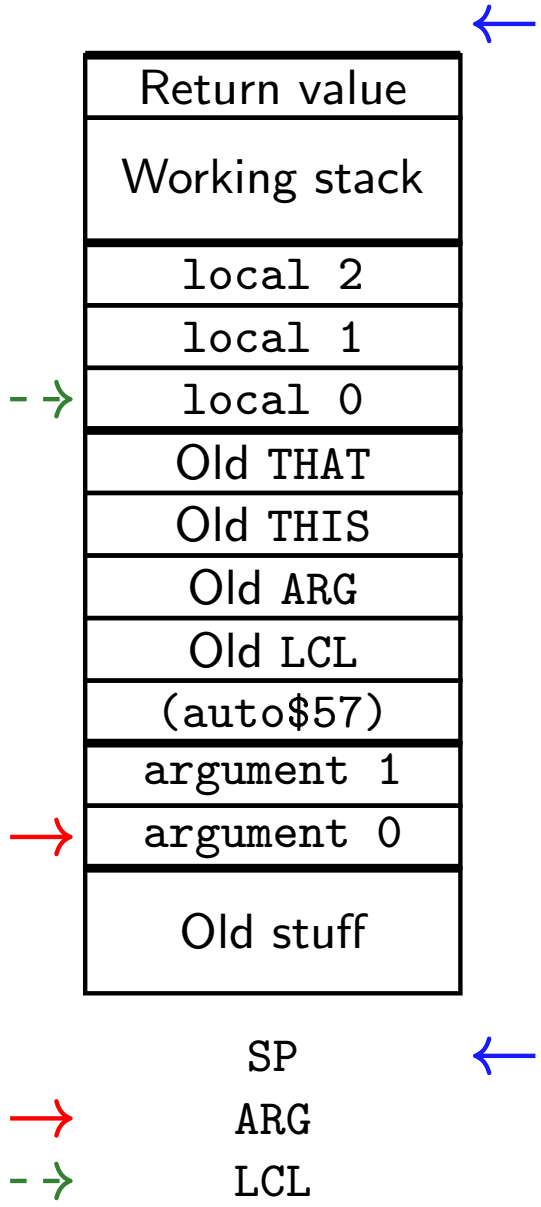

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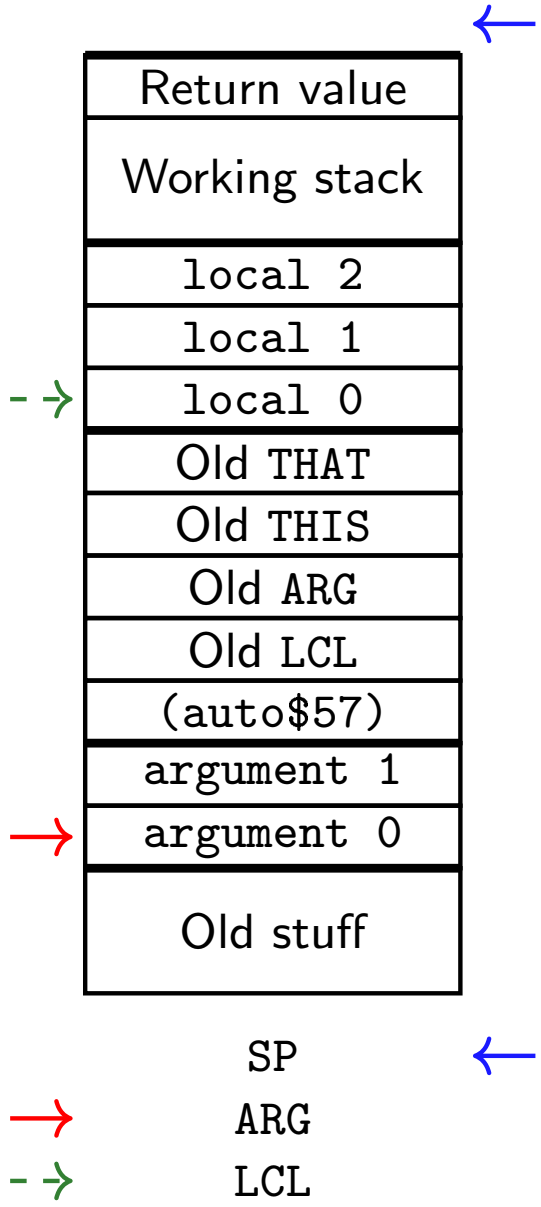

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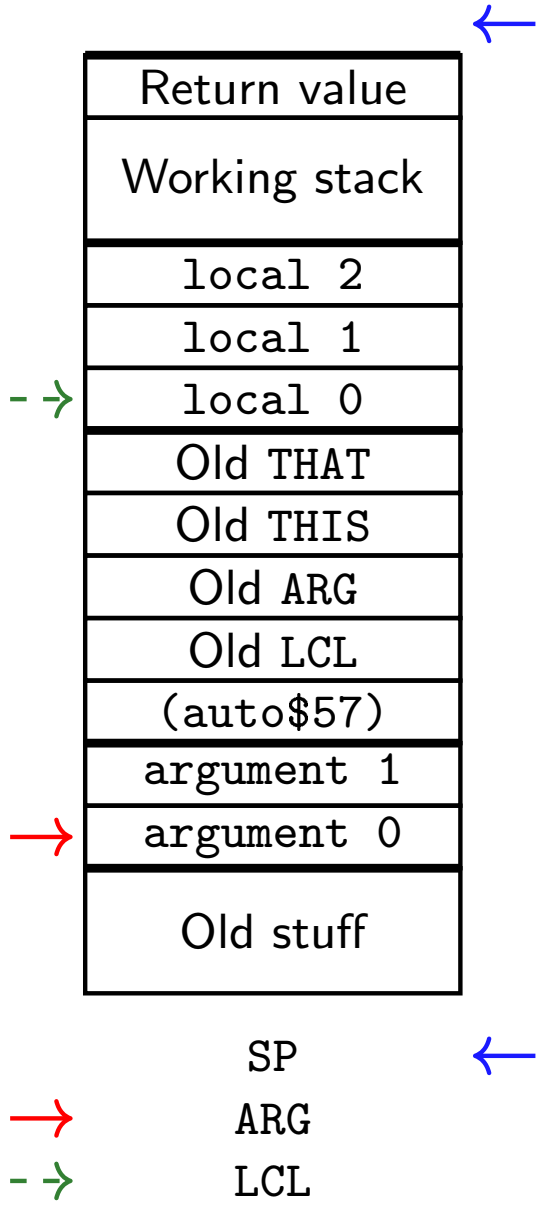

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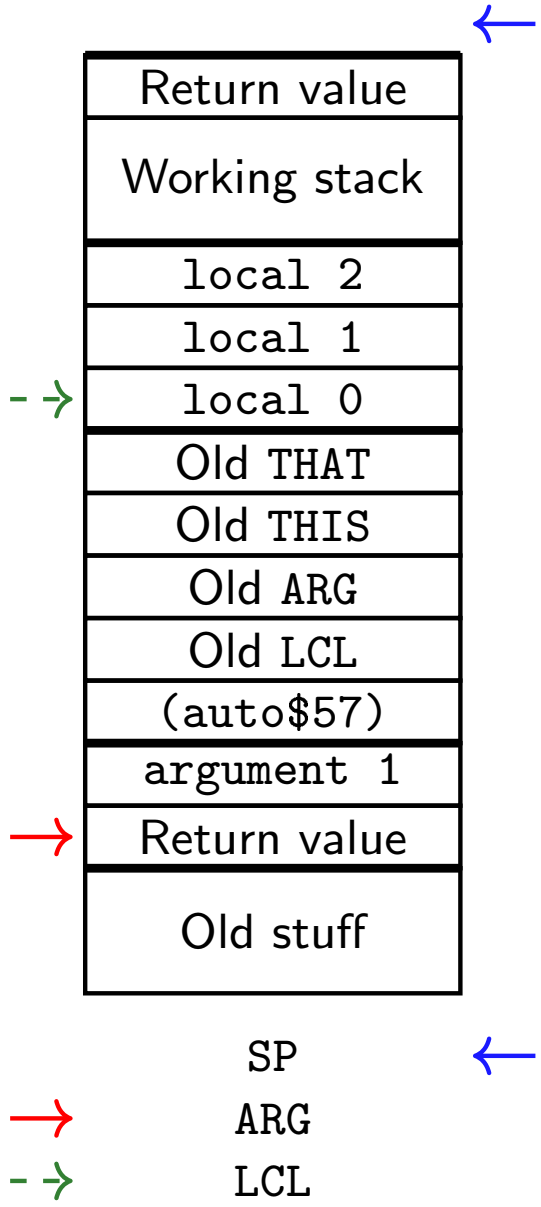

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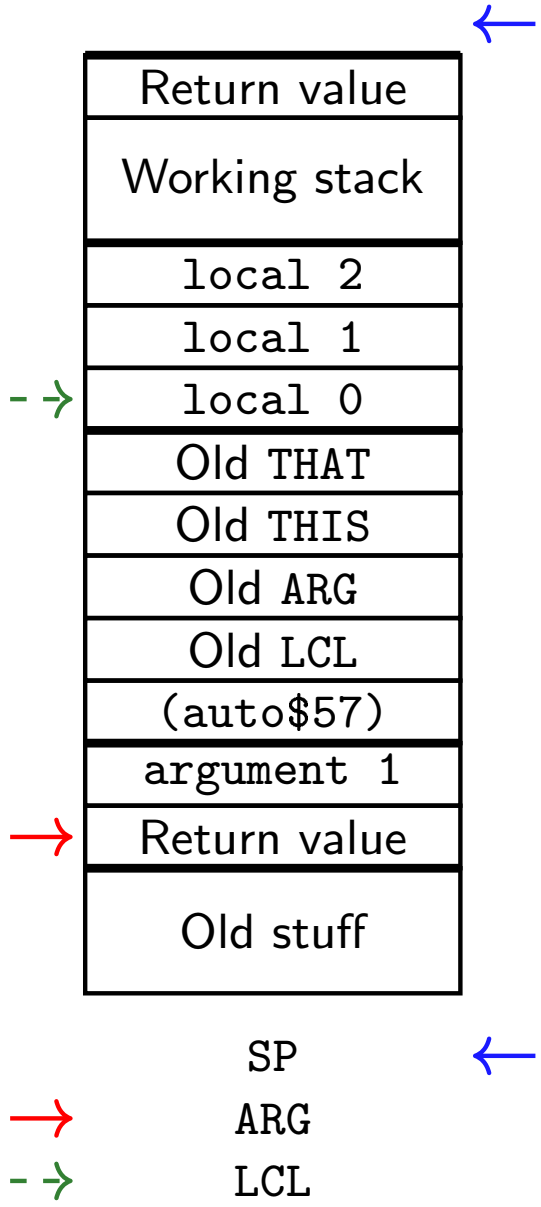

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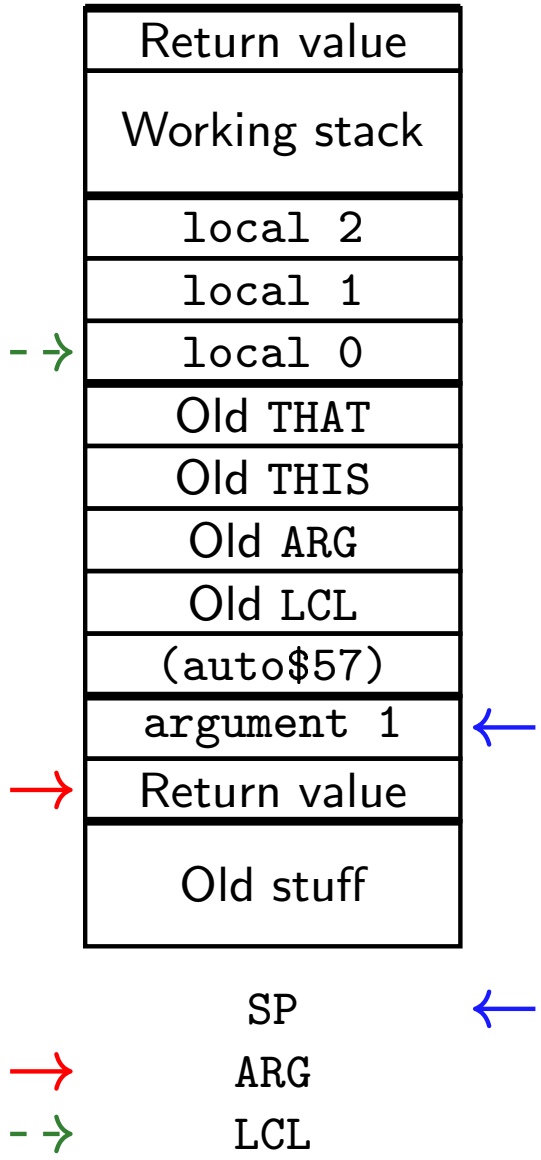

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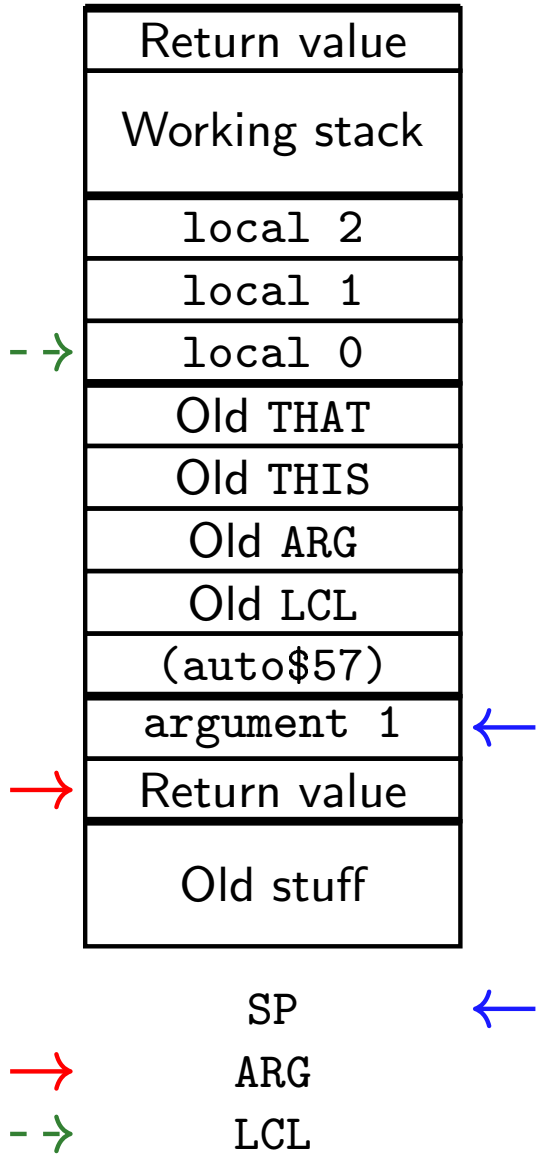

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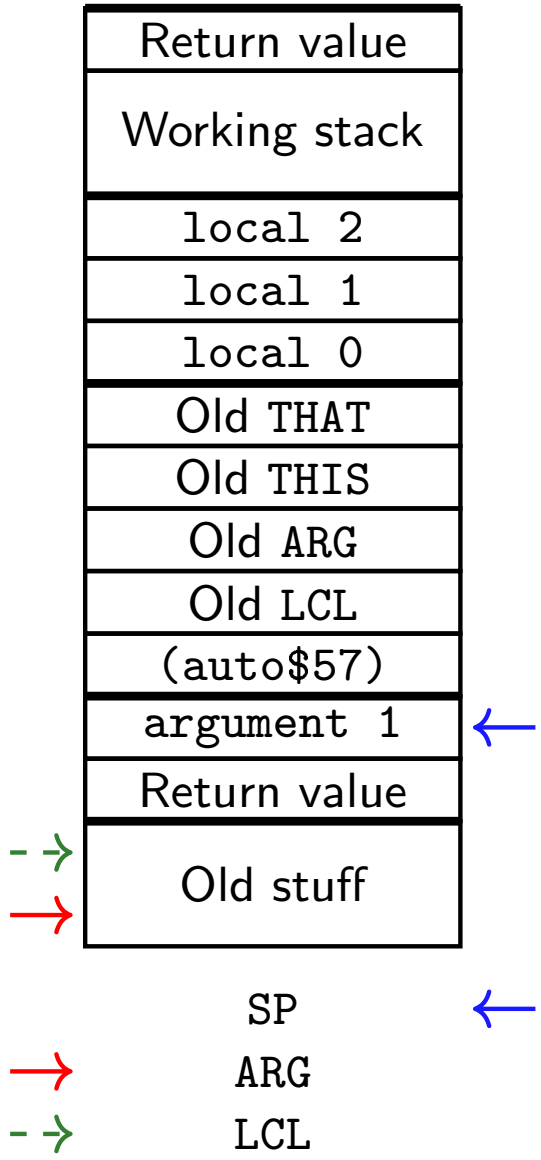

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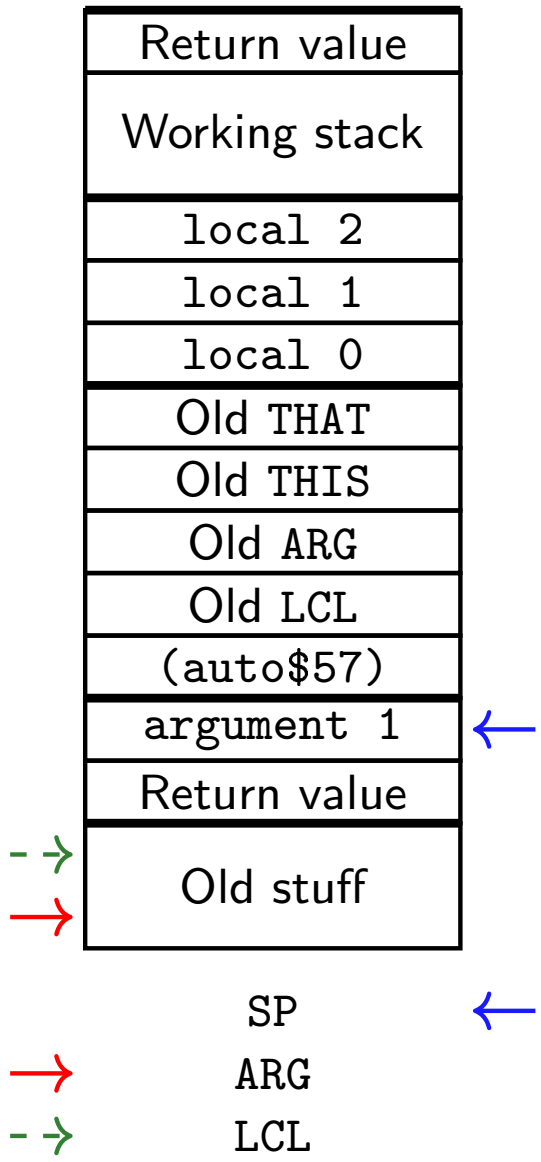

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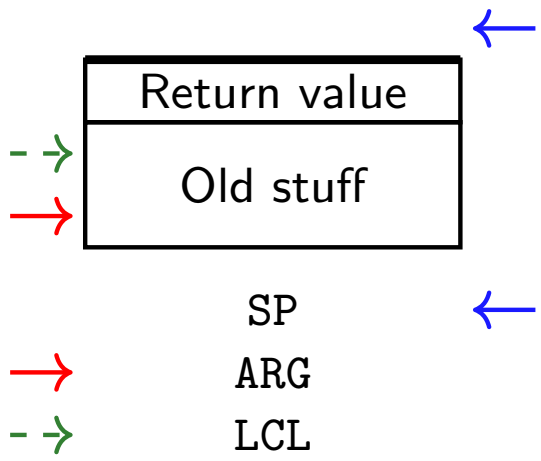

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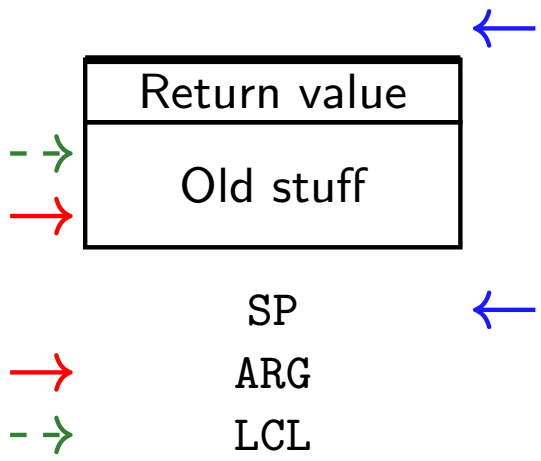
Notice that our code didn't ever need to know which function we called or where we called it from!



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Remember, multi-file Hack VM programs start by calling `Sys.init`. The values they have before this call don't matter. After the call, `LCL` and `ARG` will be set correctly in the usual way.

The default behaviour of the official `Sys.init` function is to call initialisation functions from all the other libraries, then call a function called `Main.main`, then enter an infinite loop.

(When compiling from Jack, `Main.main` will be the compiled analogue of the `main` function in C — the function the program starts in.)

Initialisation

But how do we set `LCL` and `ARG` at the start of the program?

Remember, multi-file Hack VM programs start by calling `Sys.init`. The values they have before this call don't matter. After the call, `LCL` and `ARG` will be set correctly in the usual way.

The default behaviour of the official `Sys.init` function is to call initialisation functions from all the other libraries, then call a function called `Main.main`, then enter an infinite loop.

(When compiling from Jack, `Main.main` will be the compiled analogue of the `main` function in C — the function the program starts in.)

You now have everything you need for this week's assignment. Next video we discuss heap memory allocation, i.e. implementing `malloc` and `free`.