COMP 264

THE STACK

CONSIDER THE PROCESS OF EDITING A DOCUMENT

Original

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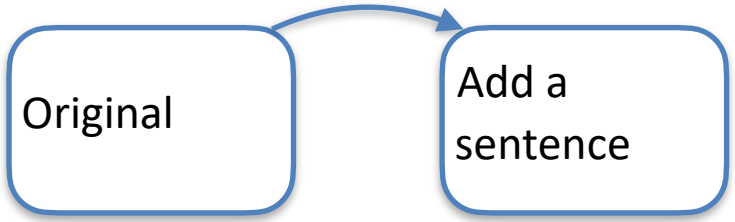

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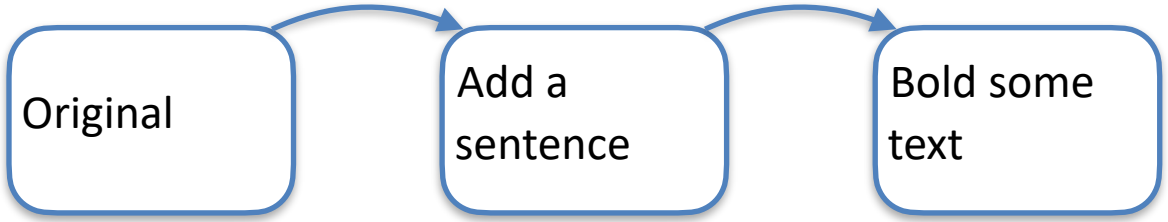

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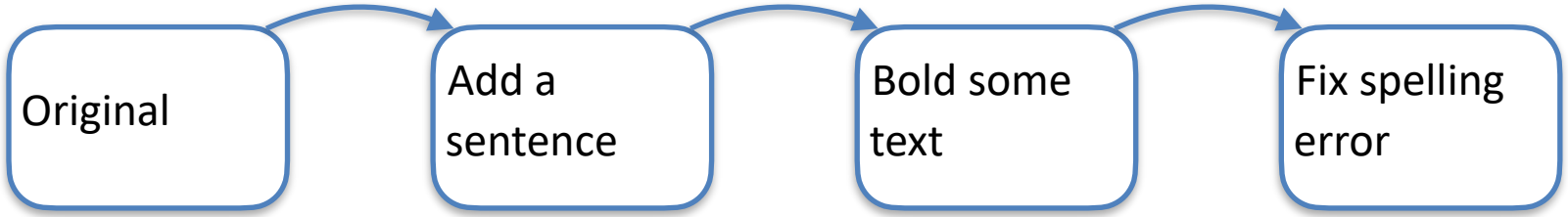

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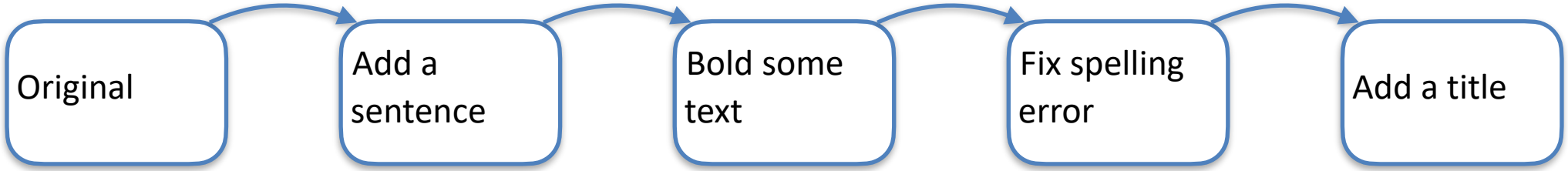

Lipsum

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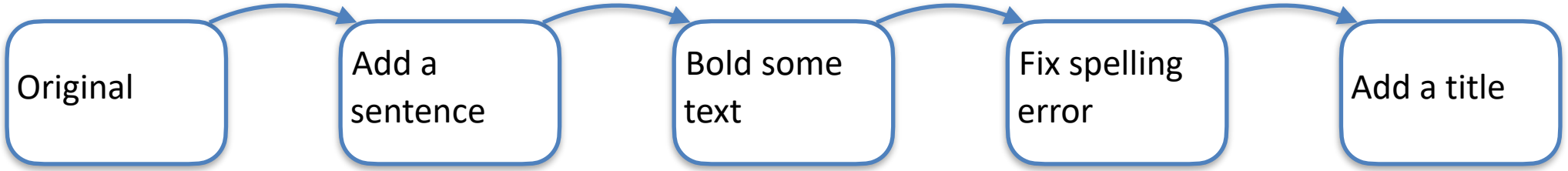
WHAT IF WE WANT TO ROLL BACK OUR CHANGES?



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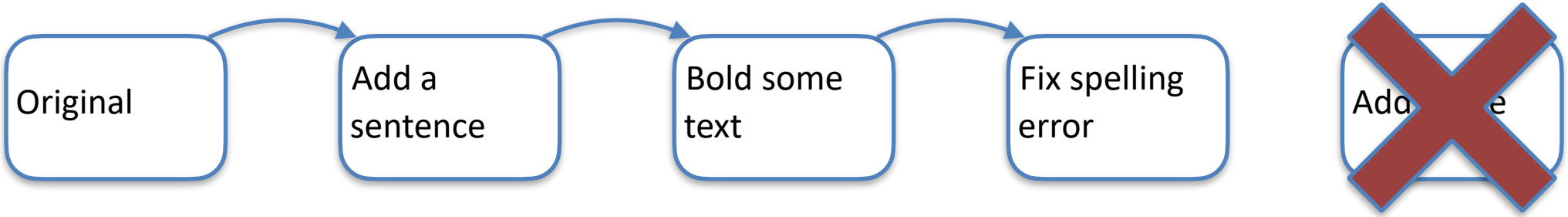

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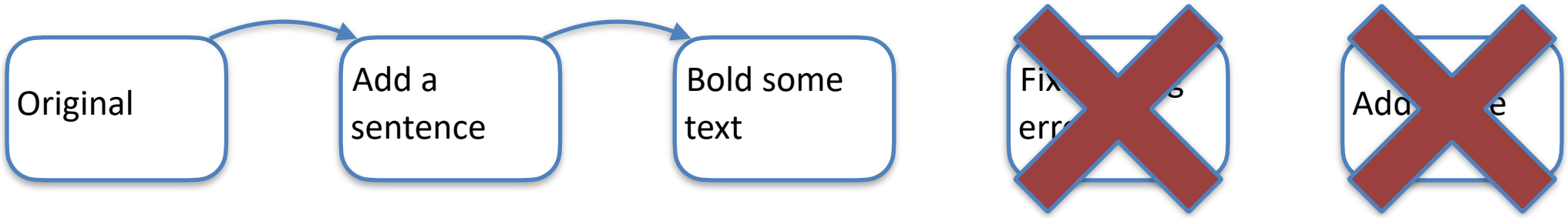

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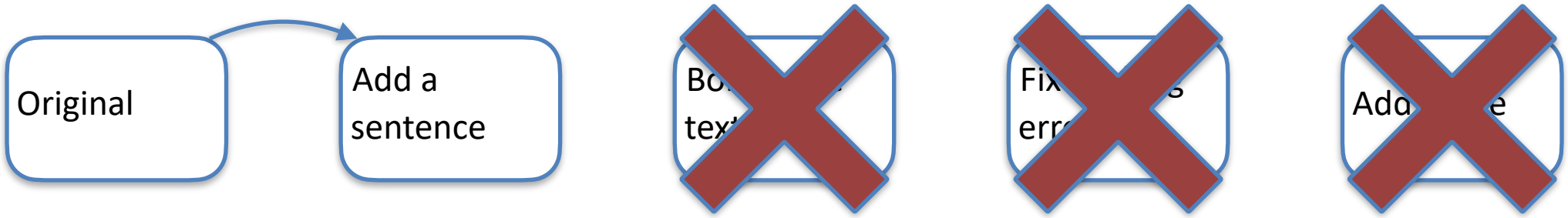

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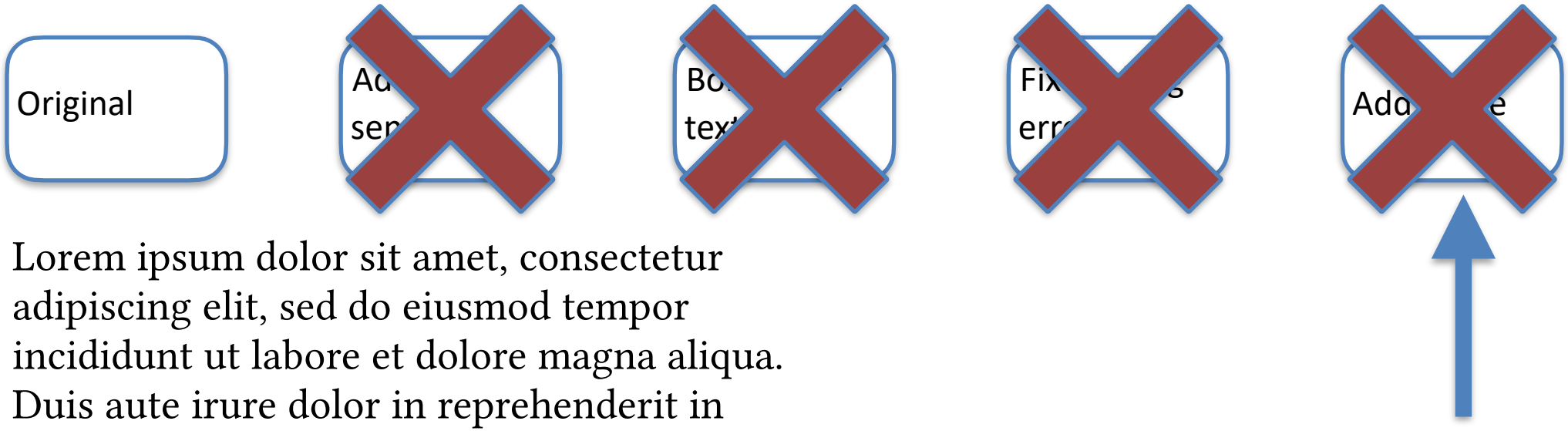

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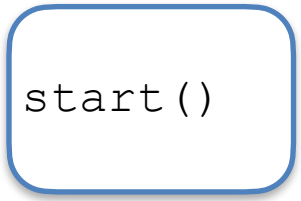
Last change to be made is the first change to be undone.

SAME WORKS FOR A FUNCTION CALL TREE



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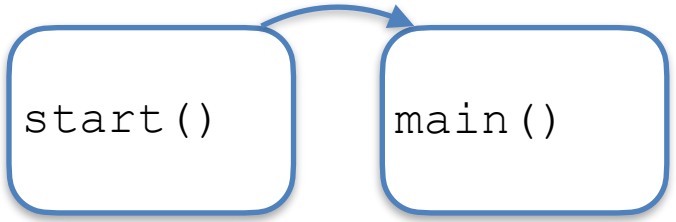

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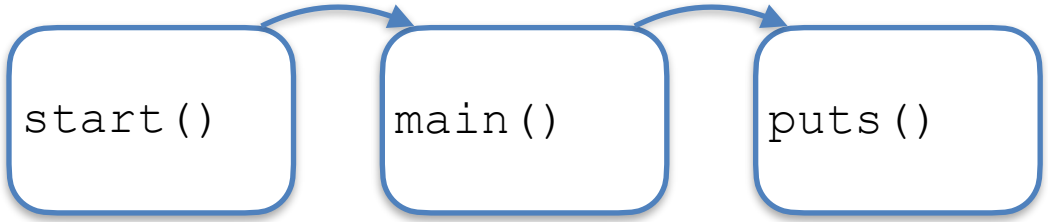

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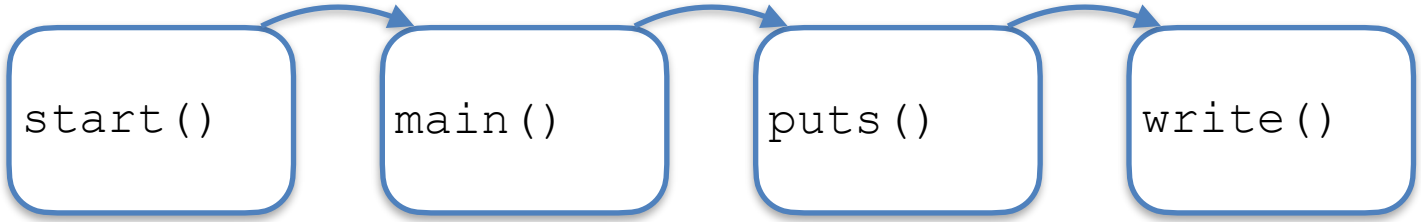
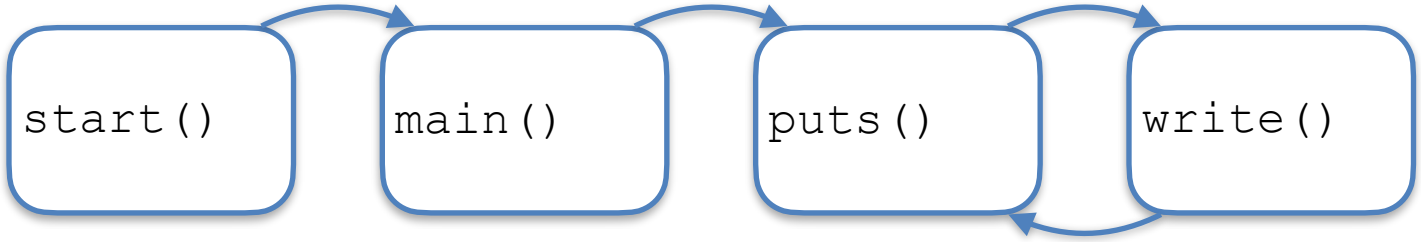


When `write()` is ready to return, it just needs to know how to get back to `puts()`.

SAME WORKS FOR A FUNCTION CALL TREE



It uses the link register (`lr`) to remember where it came from. The `bx lr` instruction causes the program to branch back to where it came from.

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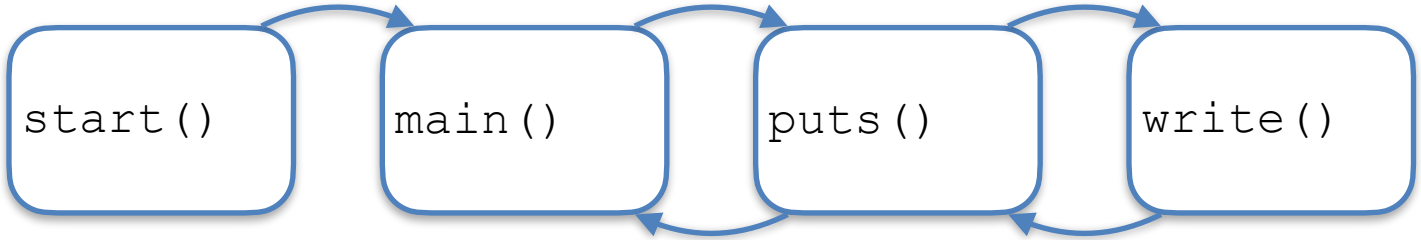

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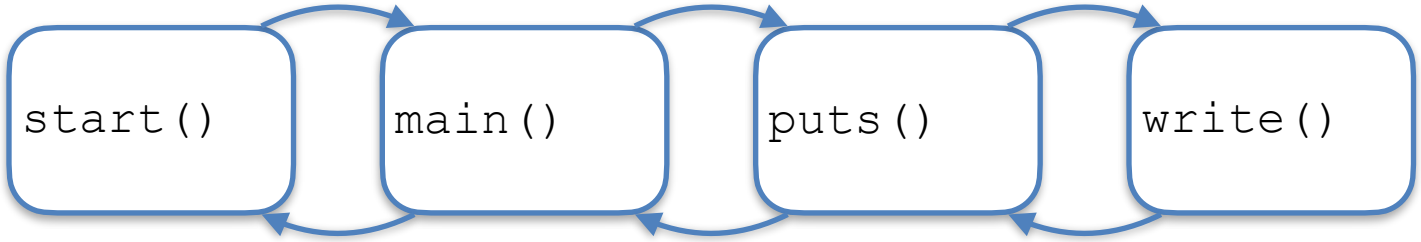

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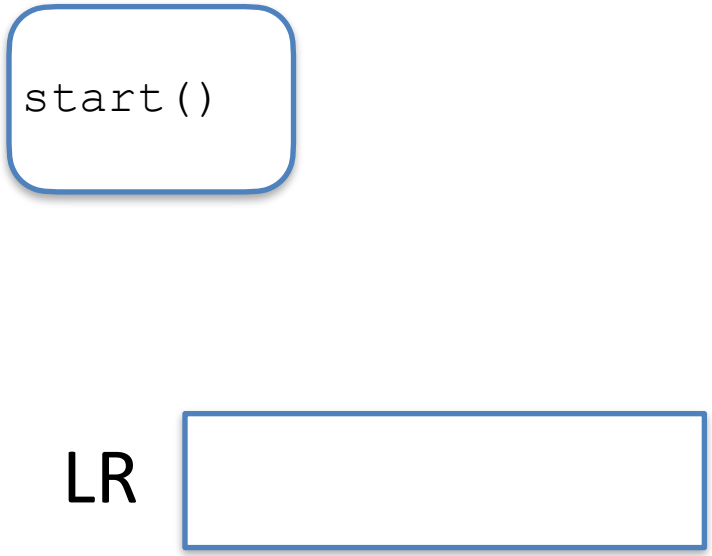

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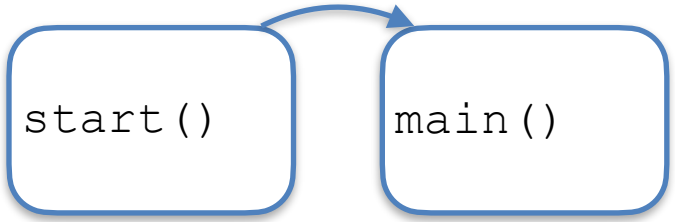
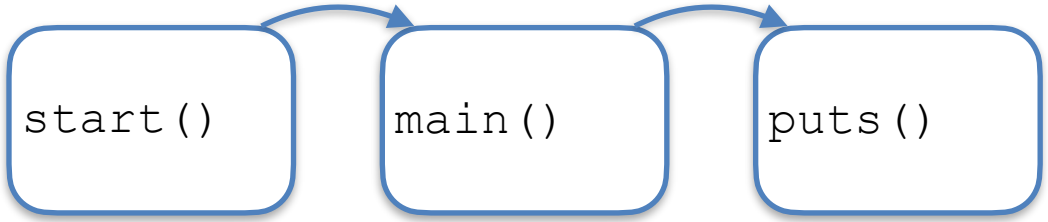


LR

SAME WORKS FOR A FUNCTION CALL TREE



LR

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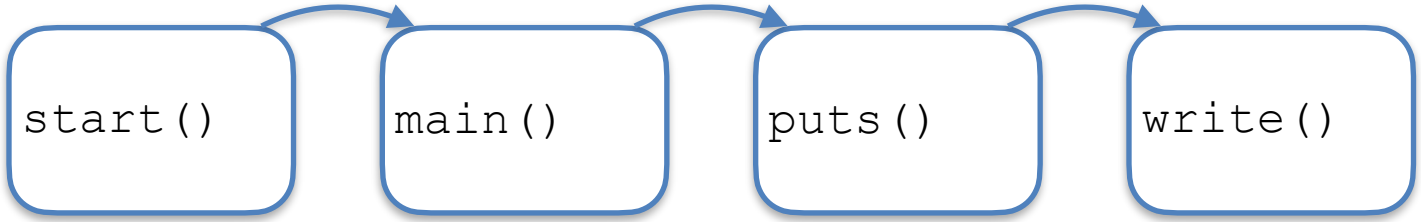

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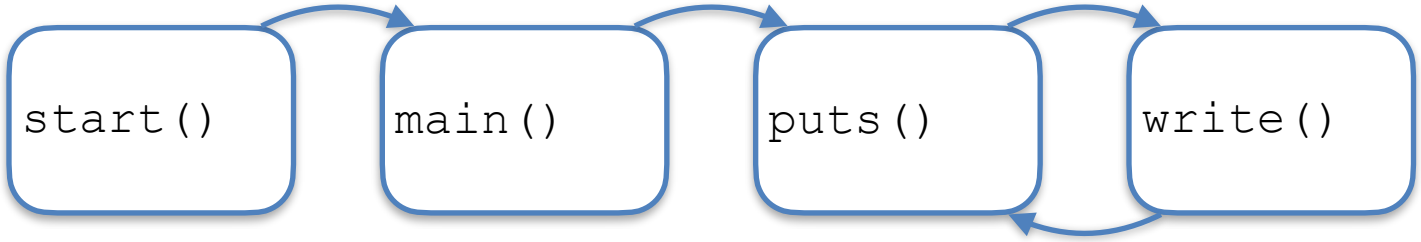

LR 

Uh oh…how do I get back from `puts()` to `main()`?

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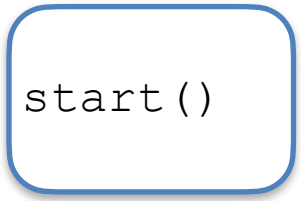

Stack

LR

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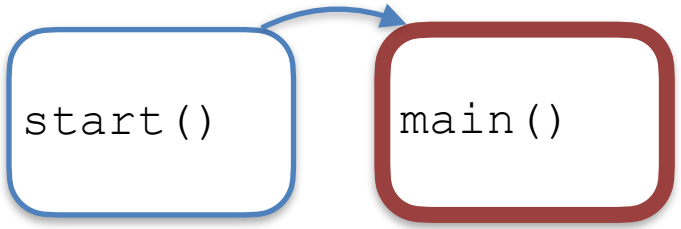

Stack

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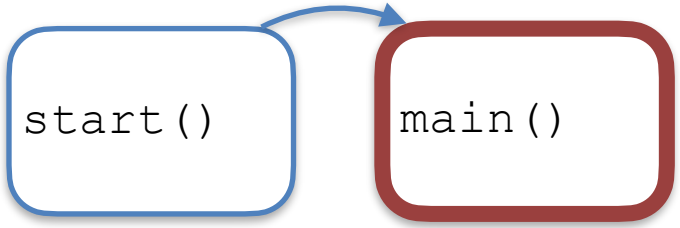

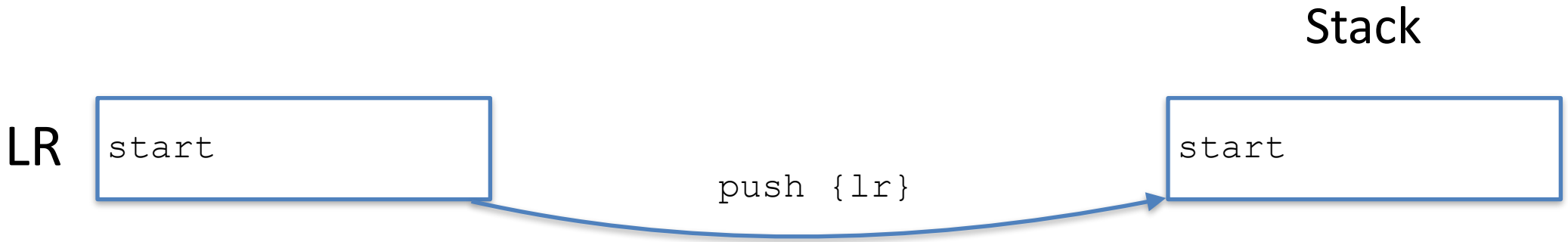

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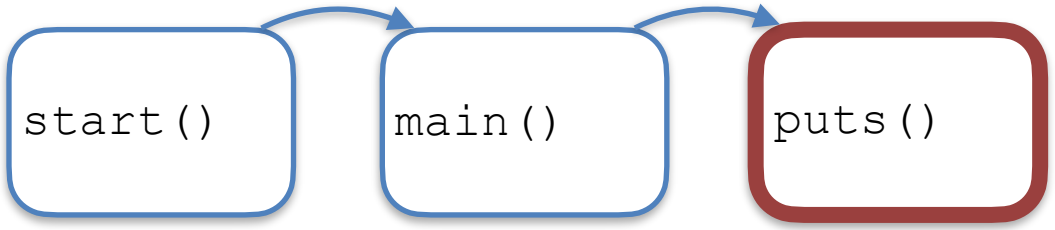

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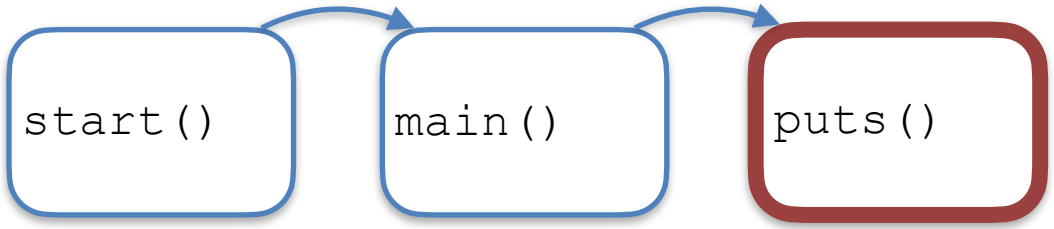

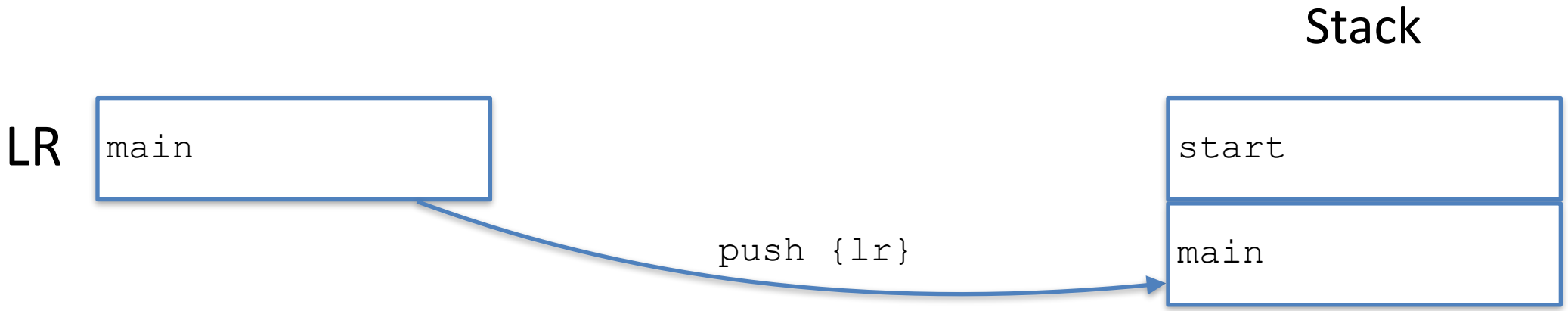

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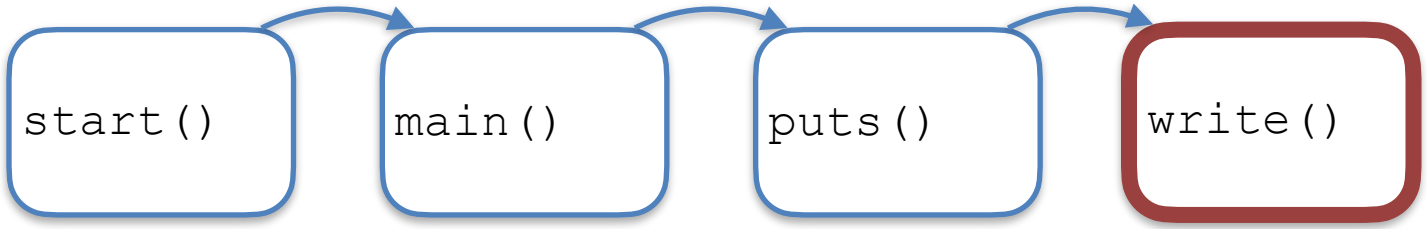

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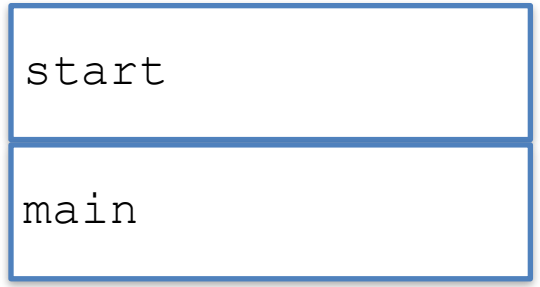

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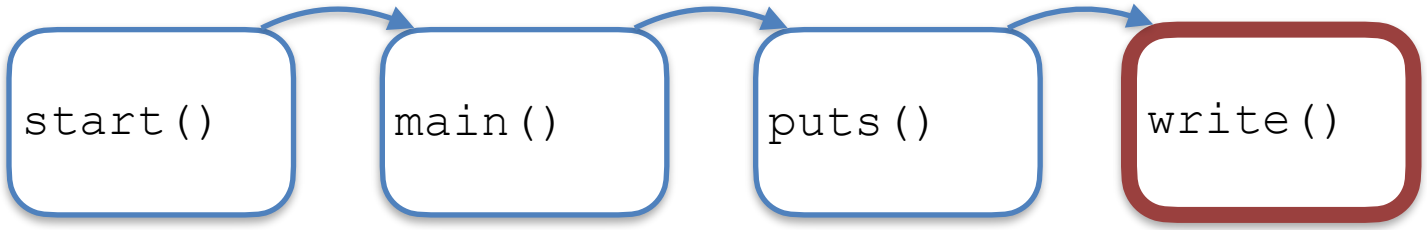

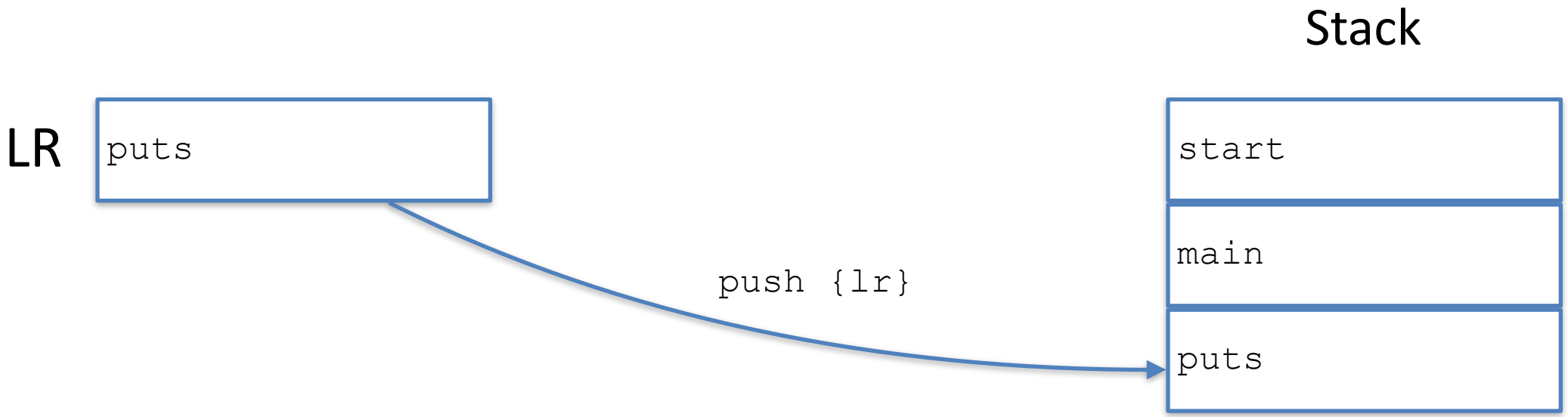

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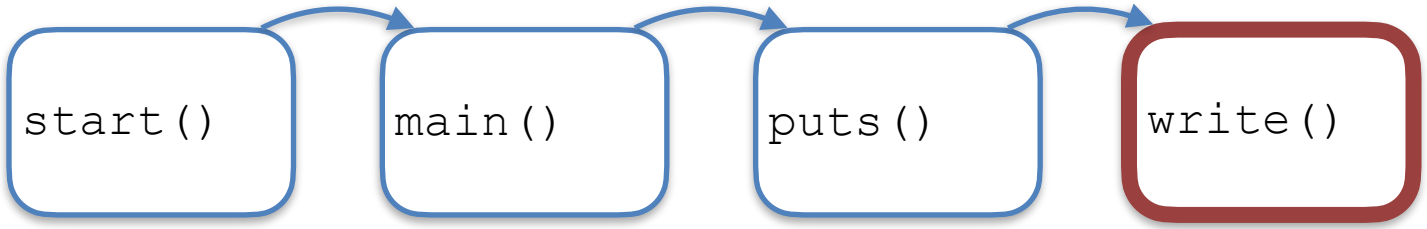

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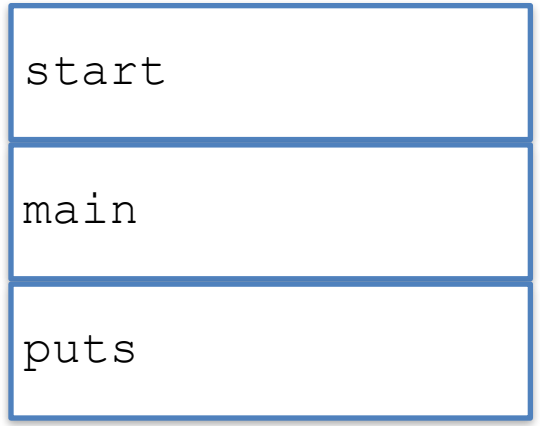

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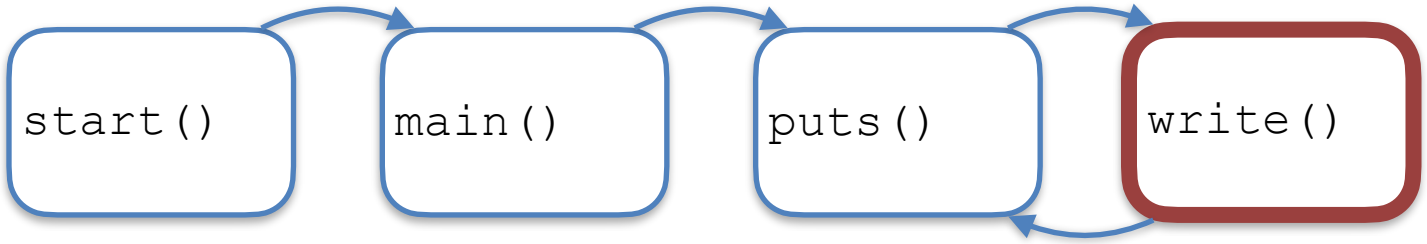

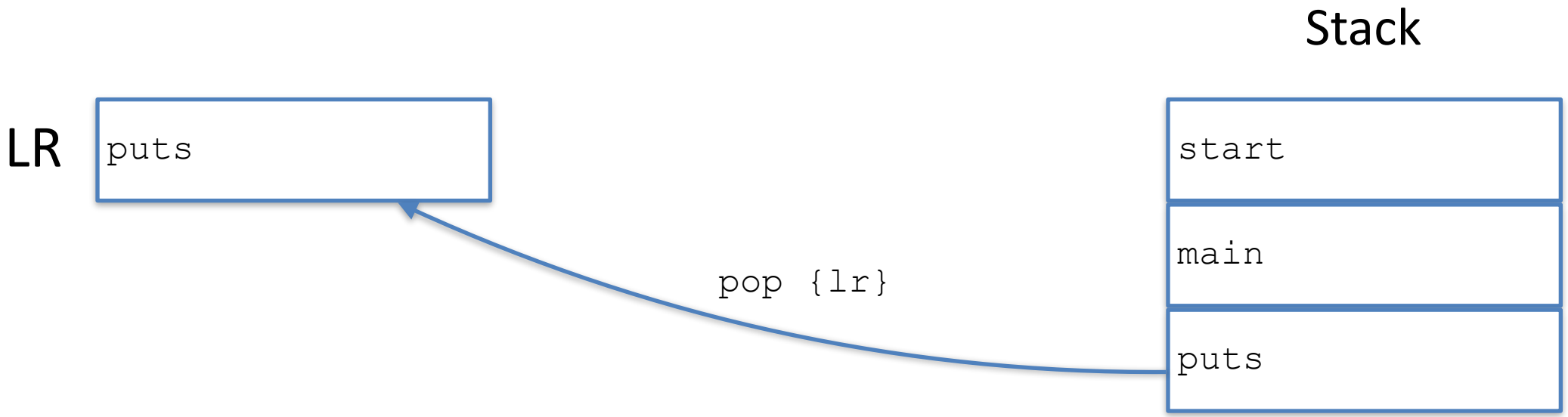

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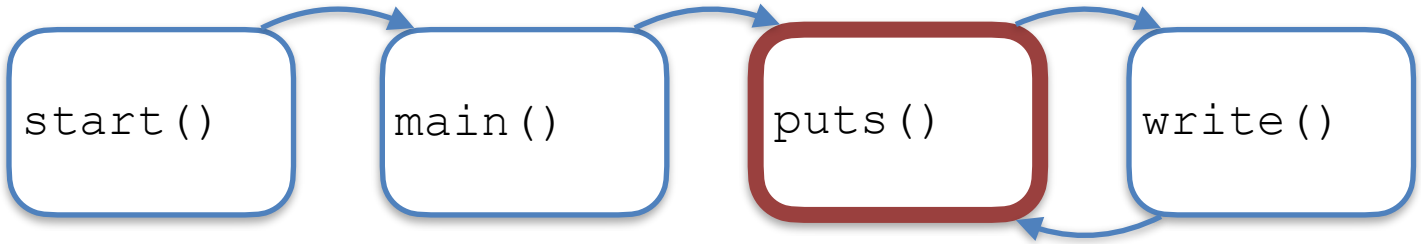


Stack

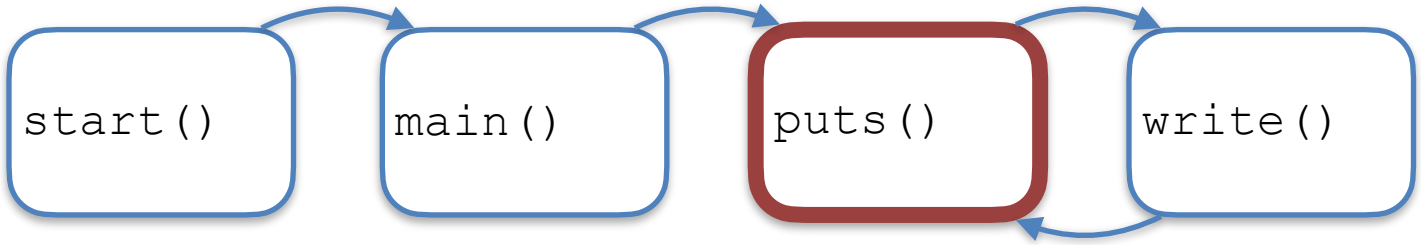
LR | puts

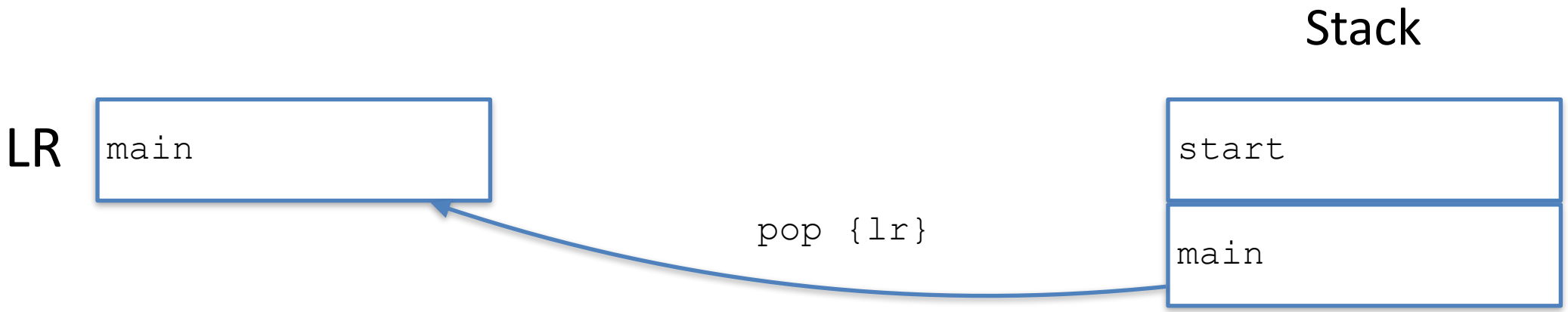
start

main

bx lr

SAME WORKS FOR A FUNCTION CALL TREE





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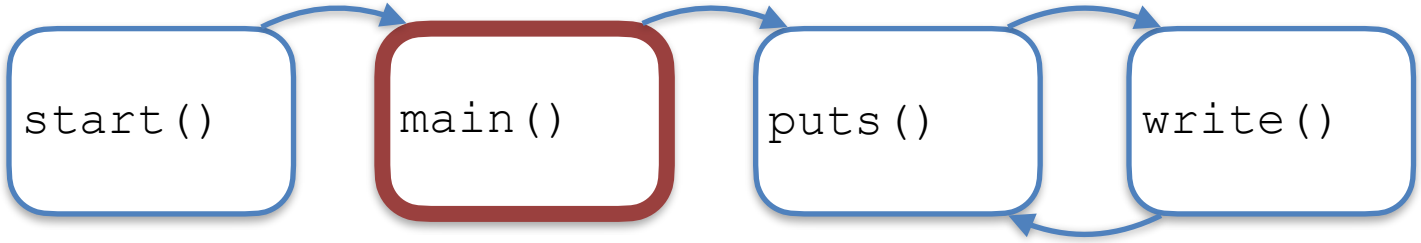

Stack

LR


```
bx lr
```

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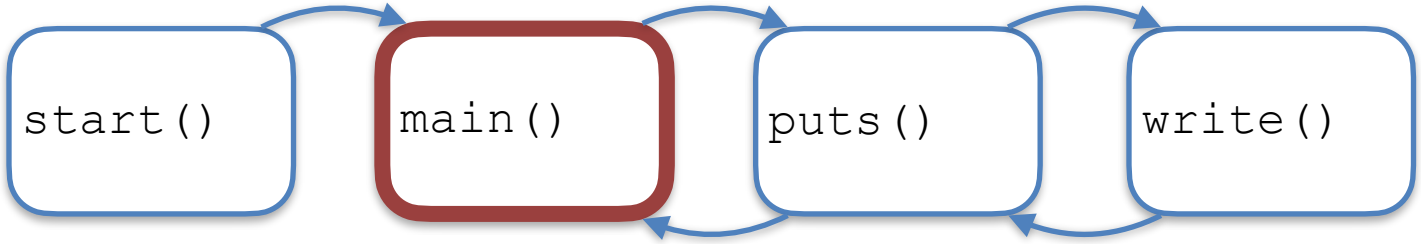

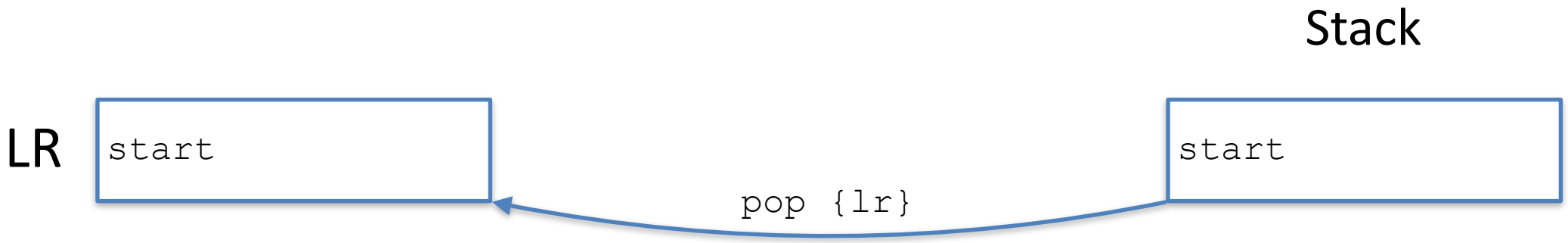

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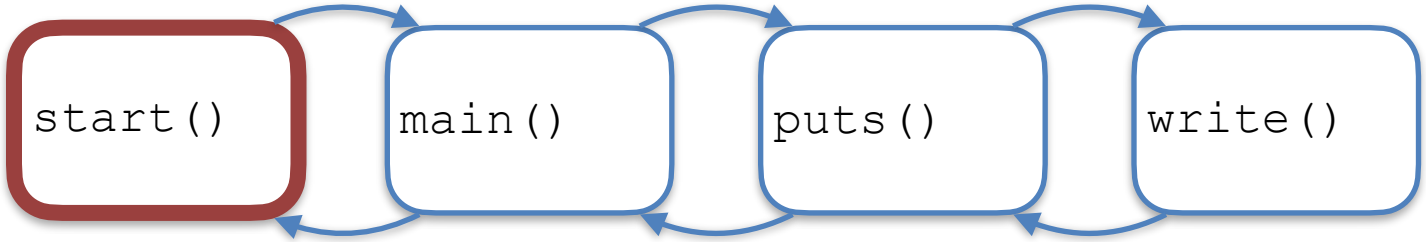


Stack

LR | start

```
bx lr
```

PROLOGUE AND EIPLOGUE

```
function:
   push {lr}

   …do some stuff…

   pop {lr}
   bx lr
```

Prologue

Epilogue

STACK FRAMES

CLOBBERED REGISTERS

```
main:
  push {lr}
  ldr r4,=10        ; Init local variable
  ldr r0,=string    ; strlen(string)
  bl strlen         ; Compute length of string
  pop {lr}
  bx lr
strlen:
  push {lr}
  ldr r4,=0         ; Init iterator
  …compute string length…
  pop{lr}
  bx lr
```

CLOBBERED REGISTERS

```
main:
  push {lr}
  ldr r4,=10        ; Init local variable
  ldr r0,=string    ; strlen(string)
  bl strlen         ; Compute length of string
  pop {lr}
  bx lr
strlen:
  push {lr}
  ldr r4,=0         ; Init iterator
  …compute string length…
  pop{lr}
  bx lr
```

`main` and `strlen` both use `r4` for local variables

`strlen` overwrites `main`'s local variable!

PROLOGUE AND EIPLOGUE

```
function:
   push {lr,r4,r5}
   …do some stuff…
   pop {lr,r4,r5}
   bx lr
```

Prologue

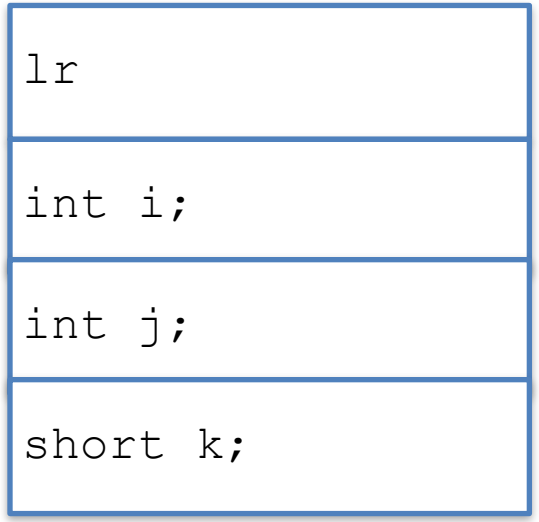
Epilogue

Stack Frame

LOCAL VARIABLES

```
function() {
   int i, j;
   short k;
   …
}
```

Stack Frame



LOCAL VARIABLES

```
function() {
   char array[8];
   …
}
```