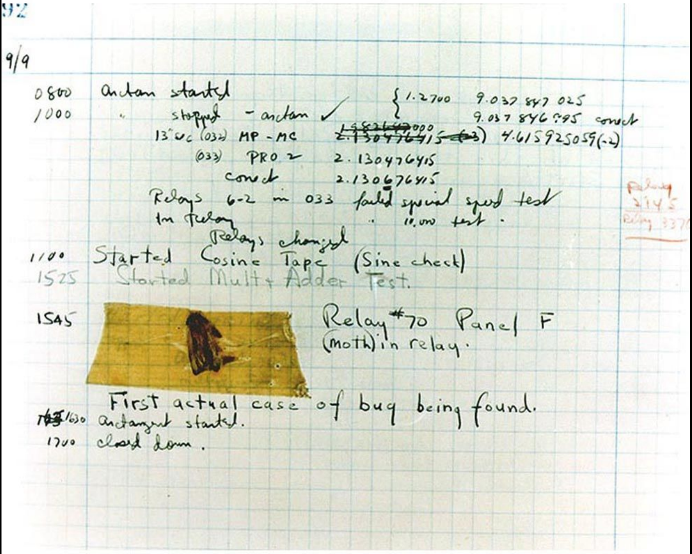
OSY.SSI[2015][9]

Software Lab: Code Injection

Question

Photo # NH 96566-KN (Color) First Computer "Bug", 1947



Remember: Bugs are our friends

Lesson: Bugs tell us something interesting about *how things work*.

Pedagogy: We're gonna cause bugs.

Programme

- Review of lhe compilation process, disassemble, analyse
- Stack overflow
- Control flow hijacking and exploits
- Break
- Bypassing protections
- Advanced injections / Attack planning

Beware: Vote.

Democracy yay

You must choose today what exam you'd like best.

./0 Short group presentation on a research paper

./1 Super Hacker Smash Brawl

`doodle.com/poll/7c4335pgczumagid`

I'll do my best to make it happen. Voting will close at midnight.

Important remark

Never analyse malware running directly on a production machine.

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- (As `root`) `echo 0 > /proc/sys/kernel/randomize_va_space`
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Cheating? We will re-enable them later on ;)

Table of Contents

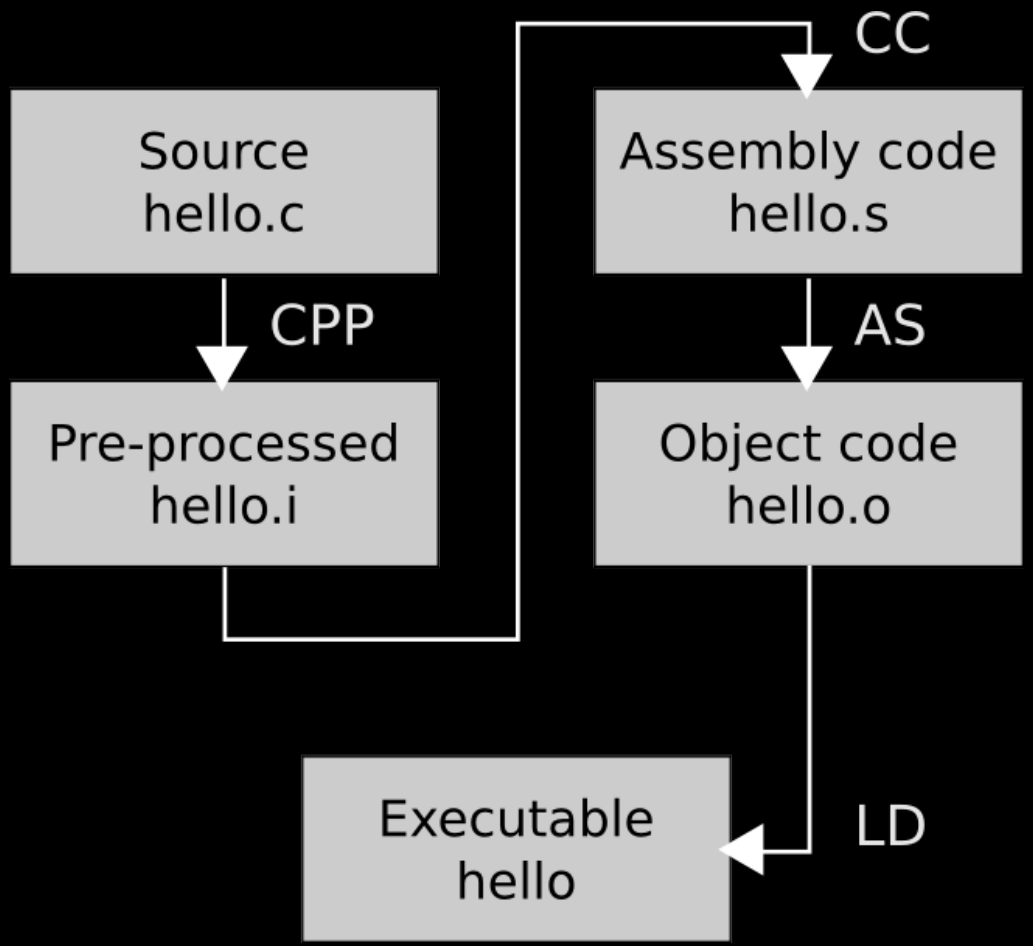
How do we make programs?

- Pay an intern to write code
- ???
- Profit!

How do we make programs when we're poor?

- Write code yourself
- Pre-processing, compiling, assembling, linking

The C compilation process



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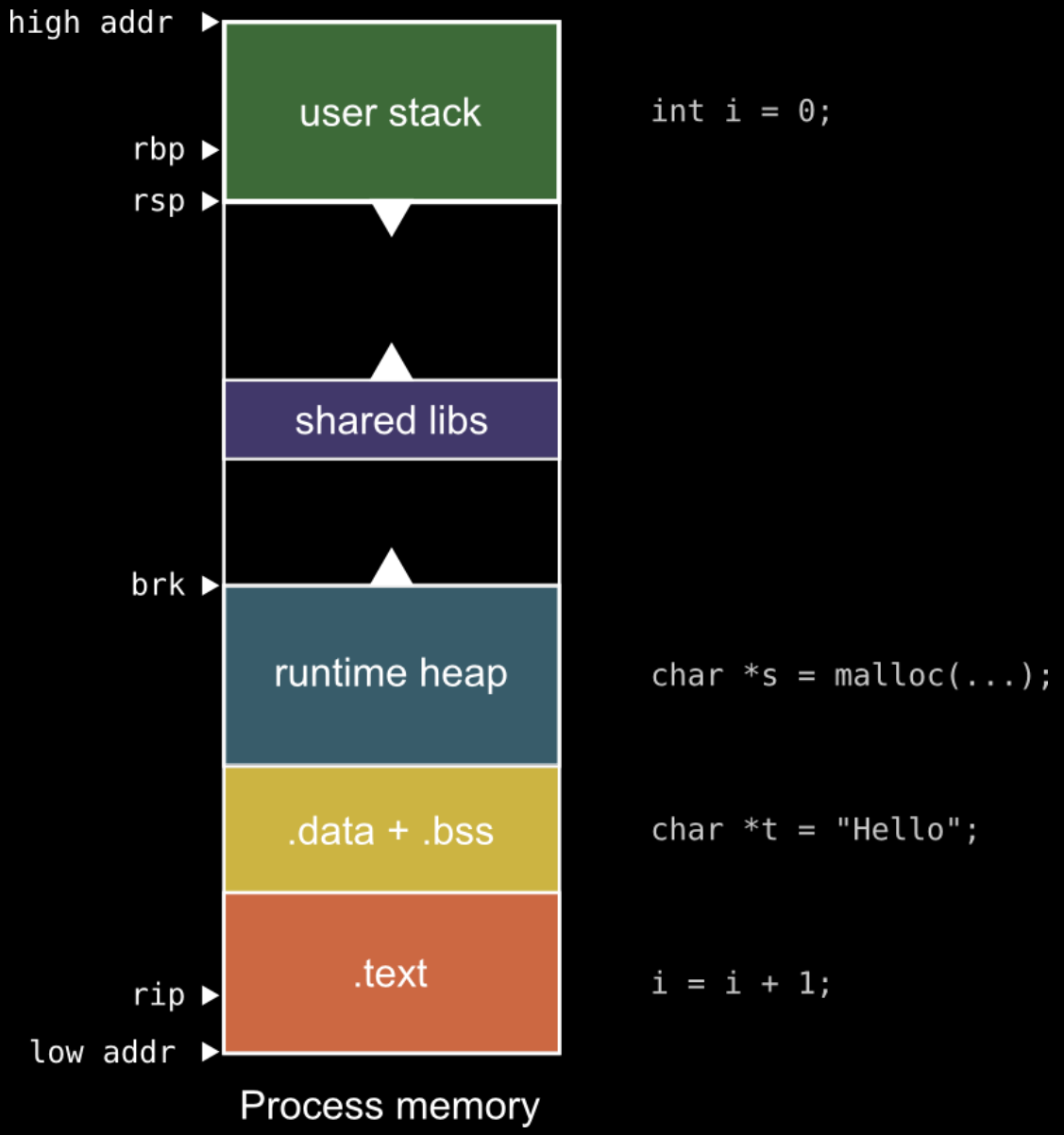
Question: What is the “exit value”?

Recall: The stack

The program's *Weltanschauung*



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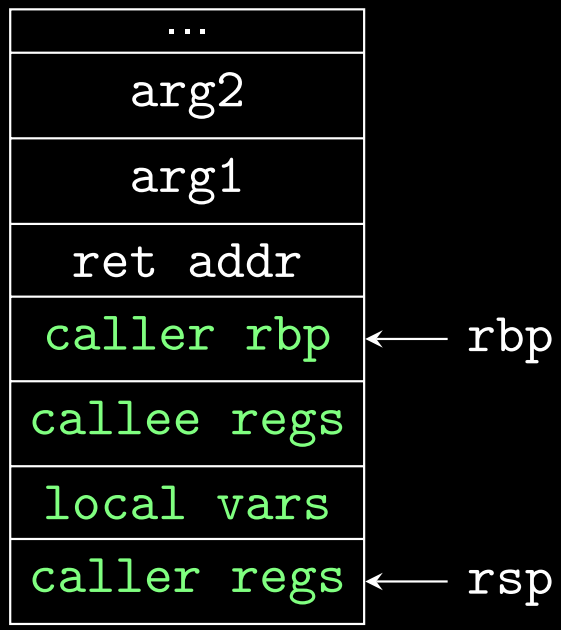
Q1: How are arguments sent to the function?
Q2: How is the result returned?
Q3: How does the program continue after the function returned?

Recall: How functions work

The stack



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Disassembly

Recall that assembly is just a representation of the program.
We will use `objdump` to understand binaries.
Such a tool is called a disassembler.

Mystery file

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- Analyse the `mystery` file whose content is

```
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This kind of (short) program is known as a *shellcode*.

Thousands of shellcodes: `http://www.exploit-db.com/`.

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- What is a segmentation fault?

Note: the program is vulnerable to a denial of service attack.

Our friend the segmentation fault

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Note: the program is vulnerable to priviledge escalation.

BTW, how would you find the password if you needed it?

From segfault to hijack

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- Run `password` in `gdb`.

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- Show registers with `info registers`.

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- Show registers with `info registers`.
- What happens? What can we do with it?

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- Read, compile and run `hijack.c`

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This is called *control flow hijacking*.

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From hijack to exploit

Why stop there?

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Instead of padding, why not insert code?

From hijack to exploit

Why stop there?

Instead of padding, why not insert code? A shellcode for instance?

And then what do we do?

Arbitrary code execution (ACE)

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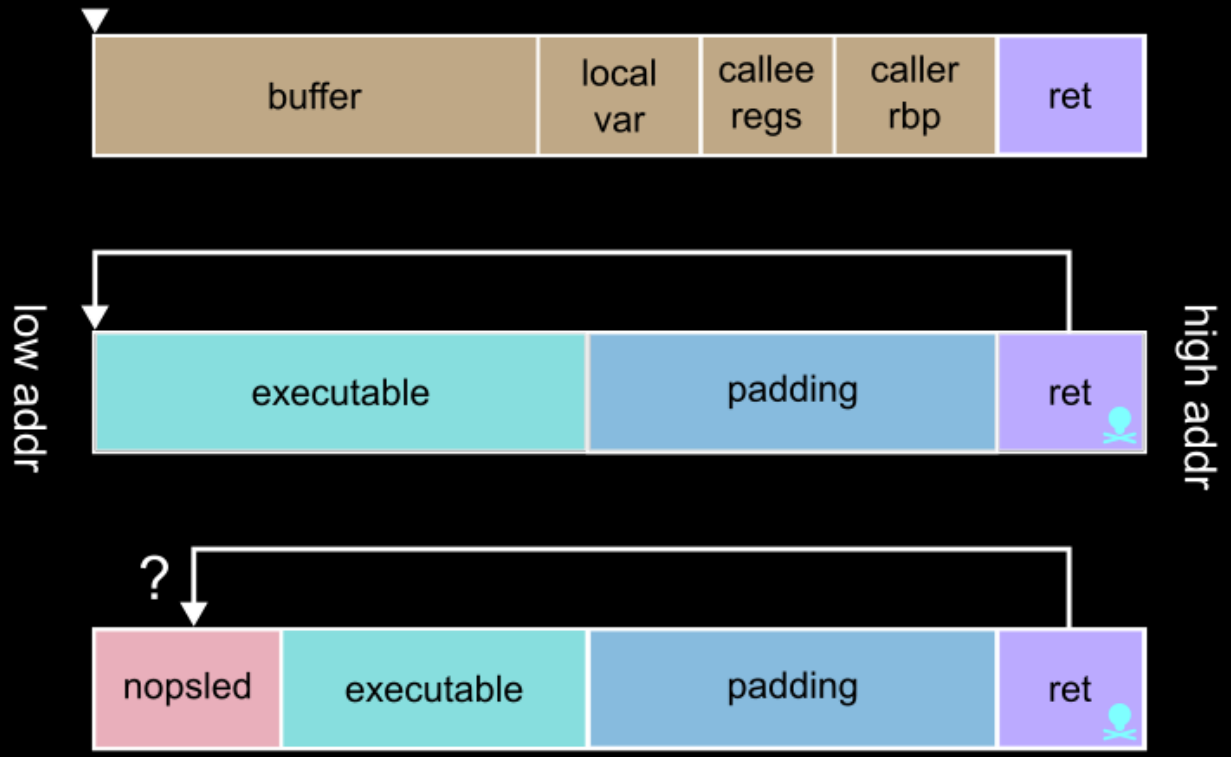
- Make it more robust using the *nop sled trick*.

Arbitrary code execution (ACE)



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What are the consequences?

Question: what key security principle was forgotten?

Traditional stack smashing

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Just a bug?

CVE-2015-3876

2 Oct 2015

`libstagefright` buffer overflow in Android up to 5.1.1 allows remote attackers to execute arbitrary code via crafted metadata in a MP3 or MP4 file.

Still unpatched as we speak. Probably never will be for older Android versions.

CVSS score: 9.3/10.
"Specialized access conditions or extenuating circumstances do not exist. Very little knowledge or skill is required to exploit."

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What works? At what cost?

Note: this is just **one** sort of vulnerability.

Break, now.

After the break:

- Bypassing protections
- Advanced techniques? or Attack planning?