U23 - Binary Exploitation

Stratum Auhuur

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November 21, 2016

Context

- OS: Linux

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- CPU: x86 (32 bit)

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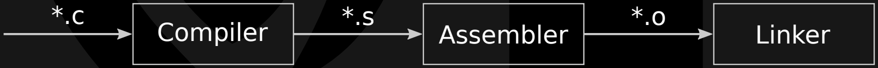
- CPU: x86 (32 bit)
- Address Space Layout Randomization: off
- No eXecution: off
- Stack cookies: off

From source code to binary

$$\begin{tikzcd}
{} \arrow[r, "*.c"] & \boxed{\text{Compiler}} \arrow[r, "*.s"] & \boxed{\text{Assembler}} \arrow[r, "*.o"] & \boxed{\text{Linker}}
\end{tikzcd}$$

From source code to binary



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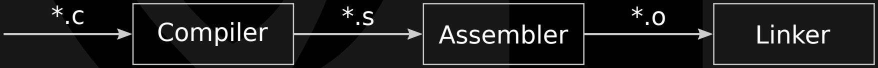

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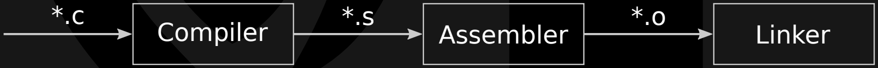

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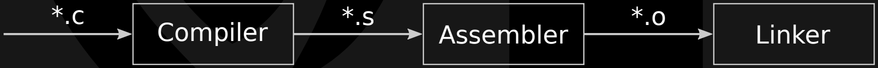

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   (There's also a preprocessor stage...)

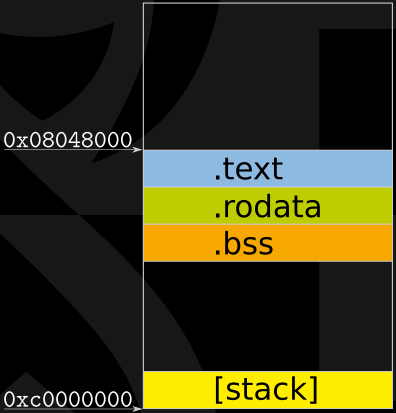
Memory layout: Flat memory model

- Userspace (3GB):
  `0x00000000` $\Longrightarrow$ `0xbfffffff`
- Kernelspace (1GB):
  `0xc0000000` $\Longrightarrow$ `0xffffffff`

00	01	02	03	04	...

- Every program has this address space available

A binary is loaded into memory...



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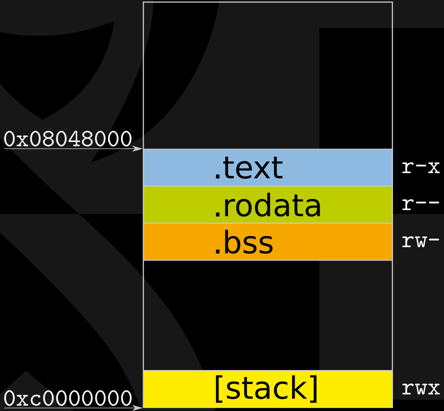

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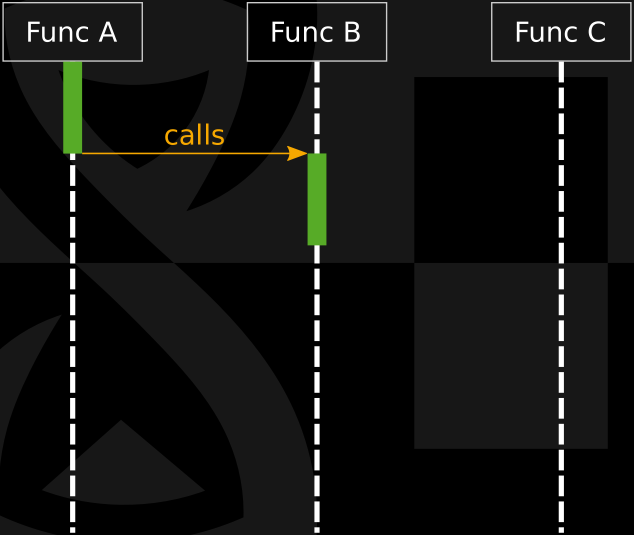
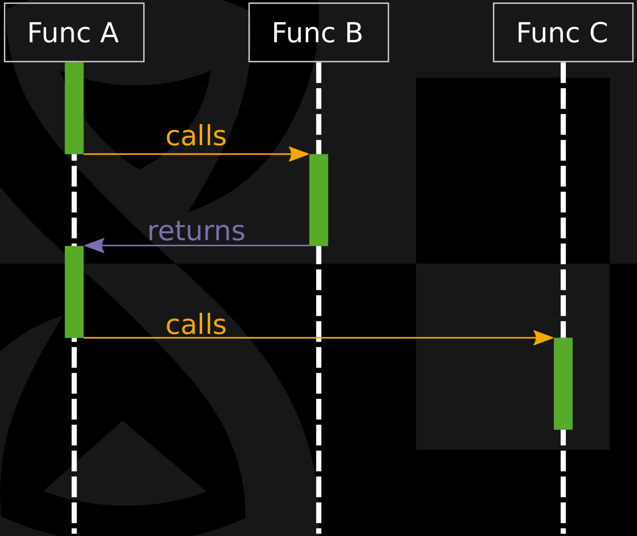
Demo of readelf

Functions



- We can call functions and they return

Functions



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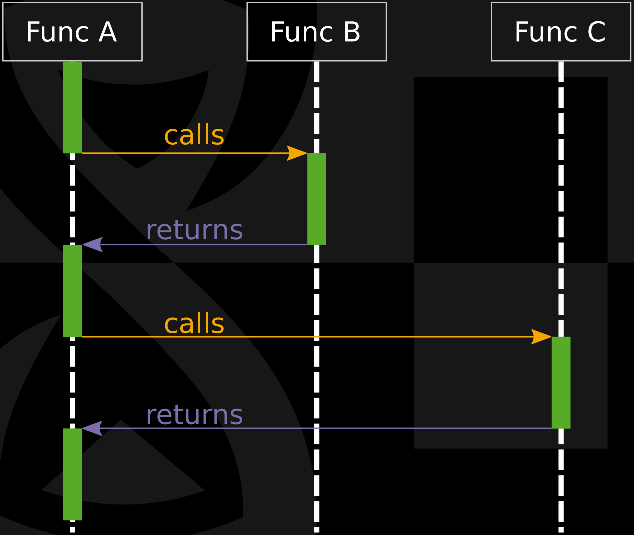

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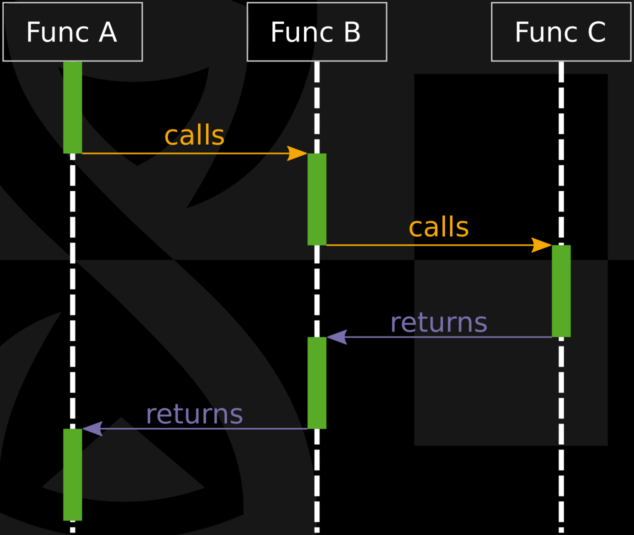
Functions 2



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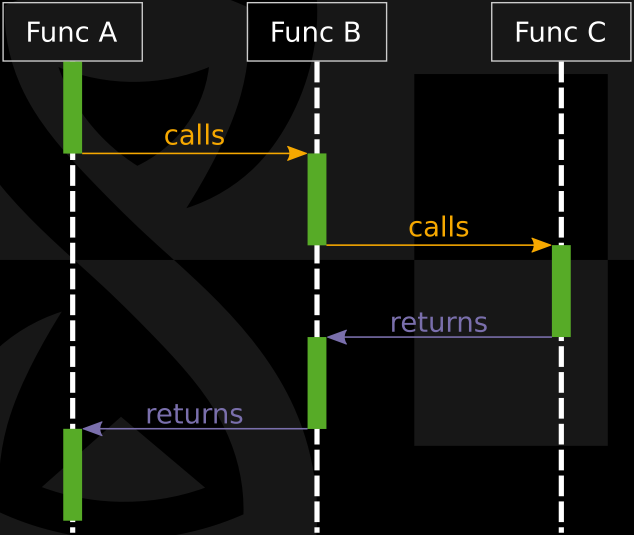
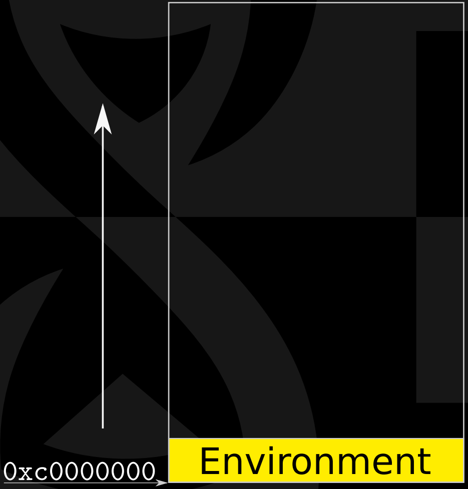


- How does the CPU know where to return to?

The Stack layout



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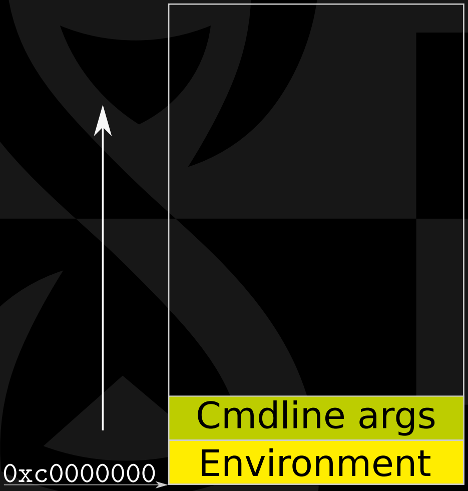

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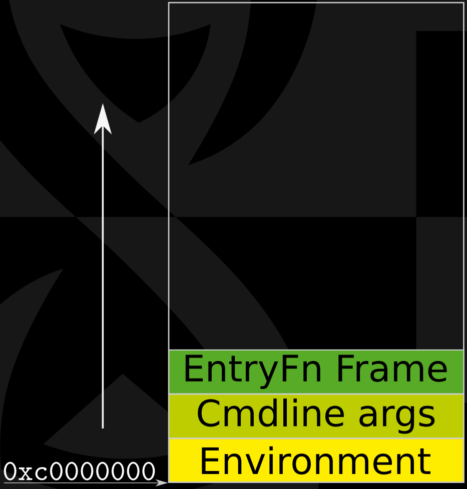

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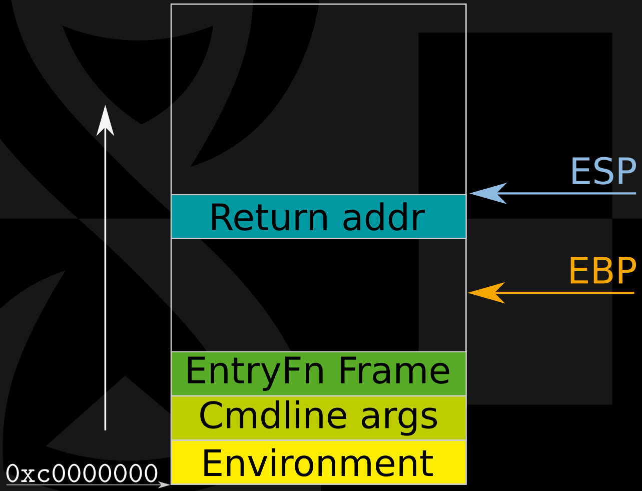

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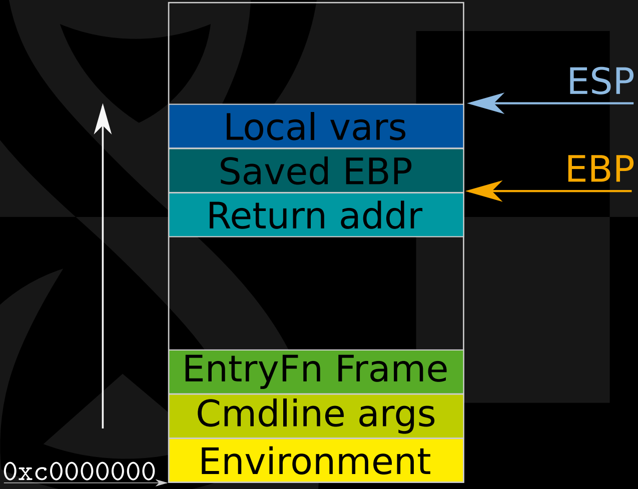

Demo of gdb

CPU Registers: dumbed down

- Stack related: ESP, EBP

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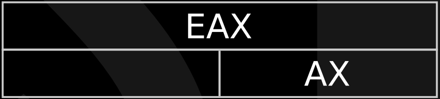

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EAX		
	AX	
	AH	AL

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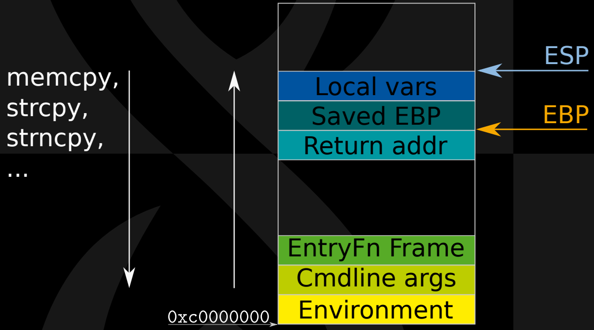
- rep movsb, ... (from [%esi] to [%edi], %ecx bytes)

Stack growth vs copy operations



pwn demo

Pwning

- Check /u23/pwn for sources and binaries
- Use gdb and reproduce my exploit
- Use the shellcode provided and try to execute it instead
- Pwn sob2 (advanced)