Secure Software Development

Assignment D1+D2: Defensive Programming

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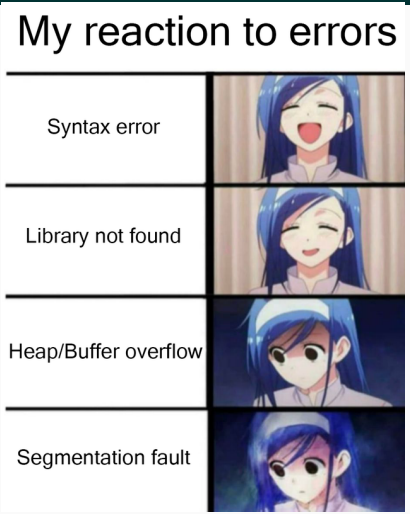
Winter 2020/21, www.iaik.tugraz.at/ssd

Defensive Programming

- Deadline D1: **11.12.2020 - 23:59:59** tag: **d1**
- Deadline D2: **18.12.2020 - 23:59:59** tag: **d2**

Since you're now an expert in exploiting bugs,
it is important to know how to avoid them.



- Mistakes happen everywhere (especially in C)
  - Look at the hacklets from assignments H1+H2
- It is up to you to write better, safer code

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https://stackoverflow.com/questions/7825055/what-does-the-operator-do-in-c

https://stackoverflow.com/questions/9229601/what-is-in-c-code

General goal

- Implement software in a secure manner
  - Use good coding style
  - Use defensive programming principles
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Task: S5

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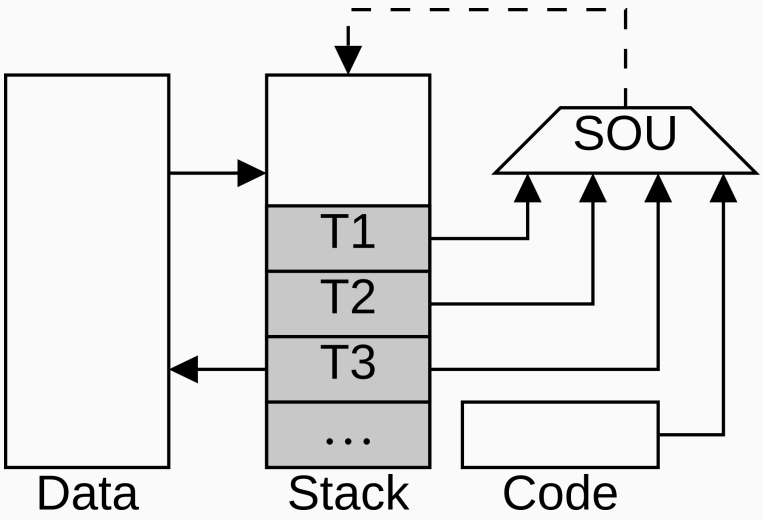
- Parse and execute S5 programs using libs5


SOU
T1
T2
T3
...
Data
Stack
Code

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Operations with S5

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  - Reverse (`~`), Insert (`^`), Slice (`:`), Split (`*`), Replace (`%`)

Example Program


```
3                ; three memory locations
 hello           ; mem[0]
world            ; mem[1]
                 ; mem[2]
7                ; eight instructions
@ 0              ; T1 = mem[0]
~                ; reverse T1
! 0              ; mem[0] = T1, T1 removed
@ 1              ; T1 = mem[1]
@ 0              ; T2 = T1, T1 = mem[0]
^ 0              ; T1 = insert T1 into T2 at 0
! 2              ; mem[2] = T1, T1 removed
```

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- API is pretty much the same

In our testing framework, some functions must work so that others can be tested. Here is a full overview of how these dependencies look:

ID	Function Name	Dependencies
A	Init	
B	Delete	A
C	Pop / Push / Store / Load	A B
E	Set Memory	A B
F	Get Memory / Size	A B C E
G	Get Stack / Pos	A B C E
H	Cmd Store / Cmd Load	A B E
I	Cmd Drop / Cmd Dup	A B C G
K	Cmd Over / Cmd Reverse	A B C
M	Cmd Insert / Cmd Slice	A B C
O	Cmd Split / Cmd Replace	A B C
Q	File Parsing	All

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  - Use of global variables
  - Compiler warnings with `-Wall`

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Implementation Flaws II

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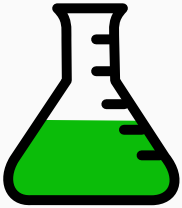
- Reuse code when possible and avoid duplication

- Implement your own exhaustive test cases



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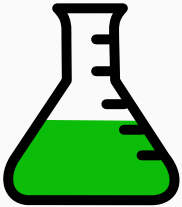

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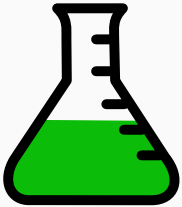

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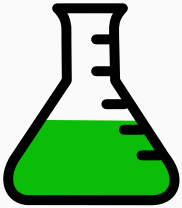

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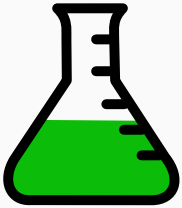

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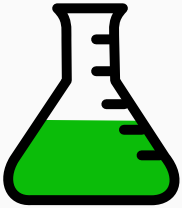

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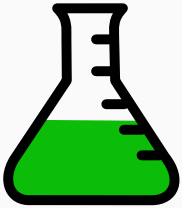

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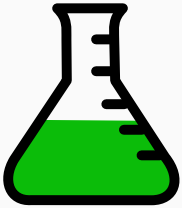

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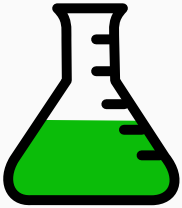

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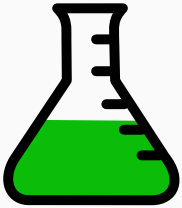

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Overall branch coverage	Bonus points
$75\% <= cov < 80\%$	4 (1%)
$80\% <= cov < 85\%$	8 (2%)
$85\% <= cov < 90\%$	12 (3%)
$90\% <= cov < 95\%$	16 (4%)
$95\% <= cov$	20 (5%)

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- Come by during question hours!

Any Questions?