Exploiting buggy C programs on modern x86_64 Linux systems.
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What is this?

Exploiting buggy C programs\(^1\) on modern x86\(_{64}\)\(^2\) Linux\(^3\) systems.

\(^1\)Disclaimer: There might be a little C++ as well...
\(^2\)Disclaimer: There might be a little 32-bit x86 as well...
\(^3\)Just kidding — no Windows (yet). We kindly refer you to abx.😊
You should...

- understand how computers work
- know the basics of the Intel x86 assembly language
- have a reasonable grasp of the C programming language

...but most importantly:
You should...

▶ ...understand how computers work
▶ ...know the basics of the Intel x86 assembly language
▶ ...have a reasonable grasp of the C programming language

...but most importantly:
▶ ...enjoy banging your head against tough challenges
Process

Phase I (~ 10 weeks):
▶ "Usual" practical course (weekly meetings and assignments)

Phase II (~ 4 weeks):
▶ Final project (vulnerable program, exploit and presentation)
| Team       | pwn00 | pwn01 | pwn02 | pwn03 | pwn04 | pwn05 | pwn06 | pwn07 | pwn08 | pwn09 | pwn10 | pwn11 | pwn12 | pwn13 | pwn14 | pwn15 | pwn16 | pwn17 | pwn18 | pwn19 | pwn20 | pwn21 | pwn22 | pwn23 | pwn24 |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| team404    | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
| team203    | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
| team0xce   | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
| team202    | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
| team205    | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
| team207    | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
| team208    | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
| team209    | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
| team210    | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     | ✔     |
Process — Phase I

- Teams of two
- Every week: Introduction to a new topic
  - Submission of solutions before the following week’s meeting
  - Private explanation of the solution during that meeting
Final project

- Development of a **vulnerable application**
- Creation of an **exploit** (ab)using the vulnerability/ies
- **Presentation** (about 15 minutes)
- Hack the other teams’ applications 😊
- Create **Write-Up(s)** about other teams’ applications
- Details follow when the time has come
Contents

- Analysis and debugging tools
- Hijacking the control flow
- Shellcode
- Format string vulnerabilities
- Stack- and heap-based buffer overflows
- Exploiting heap management logic
- Bypassing protection mechanisms
Don’t say we didn’t warn you

- Assume up to **30h of workload per week**
- (But: You reach **state-of-the-art uber 1337 h4x0r skillz** knowledge about binary exploitation techniques on Linux systems)
Time and place

When?  Wednesday, 14:00
Where?  BBB/01.05.013
Registration

- Solve our qualification challenge!
- Available at: `honeynet.sec.in.tum.de:1337`
- Registration `honeynet.sec.in.tum.de/bx`
- **Deadline:** 2021-07-20 (23:59 pm)
- Details: See the course web page after the premeeting
- Registration using the **matching system** (formally required)
- `2^4` slots
Contact us at {kilger, peuckert}@sec.in.tum.de
Contact us at {kilger, peuckert}@sec.in.tum.de

Questions?