# CS6265: Information Security Lab

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# CS6265: Information Security Lab

- A special course: supervised, hands-on laboratory
- Designed for seniors and above (including InfoSec MS)
  - Prerequisite: OS, system programming, architecture
  - Background: low-level programming (e.g., C, asm)

# Course Goal: Capture-the-flag

# Topics

- Reverse engineering
- Binary exploitation
- Binary analysis
- Memory forensic
- etc.

Schedule: https://tc.gtisc.gatech.edu/cs6265/2017/cal.html

# Weekly Structure

- Fri: Cover single topic (e.g., stack overflow)
- Wed: Recitation at 4:30-5:30pm (CBC 104A)
- Thr: Deadline for this week's problem set (i.e., 10 challenges)
    - Submit: *flag, write-up, and exploit* of ***each*** challenge

# In-class Meeting (on Fri)

- 30 min: discus last week's challenges (you will be asked to explain)
- 30 min: cover this week's topic
- 30-60 min: in-class tutorial (so bring your laptop!)
- 30-60 min: TA-ing

# Course Grading

- 100% Lab (if you didn't turn in a single lab, you will get F)
- No midterm and final exams
- 40%: A , 30-40%: B , 30-20%: C and below
- (but if you solve 6 challenges on average from lab3, you will get A)
- But, grading in each group: undergraduates, Masters and PhDs
- See Game Rules

# Scoring Each Lab (Game Rules)

- Approximately **10 challenges**
- 20 pt (flag) x 1.0 (write-up/exploit) = 20 pt (each challenge)
- So, 200 pt (20 pt x 10 challenges) in each lab
- Bonus : two fastest solvers get 10 and 5 bonus pt
- Late policy : 50% of the original points (an extra week)

# Online Competition

Class | Problems | Scoreboard | Status | Chart New api-key

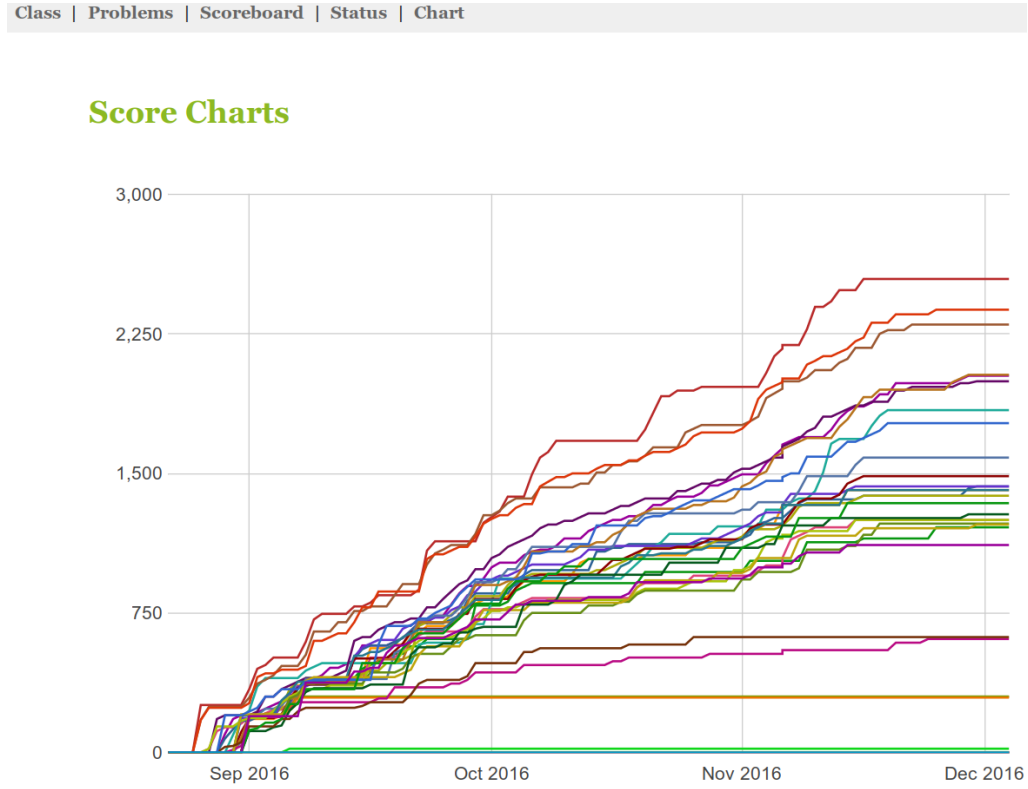
## lab11

| Name | Points | Release | Deadline | Solved | Flag | Exploits |
|---|---|---|---|---|---|---|
| sandbox-ptrace | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 9 | Submit | Submit |
| sandbox-seccomp | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 4 | Submit | Submit |
| sandbox-ptrace2 | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 8 | Submit | Submit |
| srop | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 7 | Submit | Submit |
| simple-aeg | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 3 | Submit | Submit |
| sandbox-pin | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 1 | Submit | Submit |
| kproc-zeropage | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 2 | Submit | Submit |
| kproc-bufovfl | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 1 | Submit | Submit |
| kproc-ret2dir | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 0 | Submit | Submit |
| kproc-uaf | 20 | 11-18-2016 00:00:00 | 12-01-2016 00:00:00 | 0 | Submit | Submit |

## lab10

| Name | Points | Release | Deadline | Solved | Flag | Exploits |
|---|---|---|---|---|---|---|
| dlmalloc | 20 | 11-11-2016 00:00:00 | 12-01-2016 00:00:00 | 20 | Submit | Submit |
| ptmalloc | 20 | 11-11-2016 00:00:00 | 12-01-2016 00:00:00 | 14 | Submit | Submit |
| uaf-basic | 20 | 11-11-2016 00:00:00 | 12-01-2016 00:00:00 | 23 | Submit | Submit |
| heap-spray | 20 | 11-11-2016 00:00:00 | 12-01-2016 00:00:00 | 20 | Submit | Submit |

# Online Competition



# Tips to Complete CS6265 Successfully

- Study in group (e.g., discussion)
- Come to the recitation
- Understand your time budget
- Tackle binaries in order
- Learn basic tools (e.g., editor, debugger, python)

# Misconduct Policy

- Cheating vs. collaboration
- Refer GT's Academic Misconduct Policy
- ***Never ever*** use/copy other students' code/write-up
- Please ***write down names*** of your collaborators

# About Course Material

- You should ***never*** share exploits/write-up online
- Once found, you will get F (even after the semester)

# Administrivia

- TA: Jinho Jung, Max Wolotsky, Insu Yun, Wen Xu, Ren Ding
- Contact: 6265-staff@cc.gatech.edu
- Website: https://tc.gtisc.gatech.edu/cs6265/2017/index.html
- Scoreboard: https://tc.gtisc.gatech.edu/cs6265/2017/submit/handin.py
- Join Piazza (https://piazza.com/gatech/fall2017/cs6265/home)!
  - Please actively participate; bonus grades to two participants

# TA Rules

- Please come to the recitation on Wed (4:30-5:30pm)
- Please post your questions on Piazza
- Contact 6265-staff@cc.gatech.edu to make an appointment

# Next Two Weeks

| Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|
| Aug 21<br>*First day of class (**No class**)* | Aug 22 | Aug 23 | Aug 24 | Aug 25<br>**LEC 1:** Warm-up: x86, Tools<br>**TUT 1:** GDB/x86<br>**Preparation:** Read asm<br>**Assigned:** Lab 01: Bomb Lab1 |
| Aug 28 | Aug 29 | Aug 30<br>**REC 1:** Lab 01 | Aug 31<br>**DUE:** Lab 01 | Sep 1<br>**LEC 2:** Warm-up: x86_64, Shellcode, Tools<br>**TUT 2:** PEDA, Shellcode (video/slides)<br>**Preparation:** Read x86_64<br>**Assigned:** Lab 02: Bomb Lab2 / Shellcode |
| Sep 4<br>Labor day | Sep 5 | Sep 6<br>**REC 2:** Lab 02 | Sep 7<br>**DUE:** Lab 02 | Sep 8<br>**LEC 3:** Writing exploits<br>**TUT 3:** IDA, Your first control hijacking<br>**Preparation:** Read Phrack #49-14<br>**Assigned:** Lab 03: Stack Overflow |

# Today's Topics

- This week: Bomblab !
- Quick introduction to GDB
- In-class tutorial
  - Walk over x86 asm and tools
  - Be familiarized with GDB and x86 (32-bit)
  - Let's crack crackme0x00 ~ crackme0x06

# Note on Flag

- Random looking bytes, but be careful. It is designed to include tons of information unique to you, so we can easily check plagiarism

```
$ cat /proc/flag
CB25682B33EF8BF23545A767562A1D5AA33C88EEACC1AE562D950CB9F1E5725D
864725DB51460902ECBD52BA4CBED86A10F3A98A35F6FB71871019702A0E9199
5BC59332C390A3C27D0EC2CE85BC13E956A6027E3171352F90467A8C12346D9A
2A26EE914B3078ED031FDB14BB6224C3D743D79A733FB49EB4E9C1F383CF810E
F6841EE935FE2DA2C57DB4804B6823884B36AE62B08848486918C120E4C2AA94
E1D3F8A6E9E2251AC39E5F37971FB07DFF839E0BC1C4E6C1D4A24E0948F8751B
25BFFE854CD84A8D8E28814398FF192CD9AD37150D83DA872E944DF1552F97DD
...
```

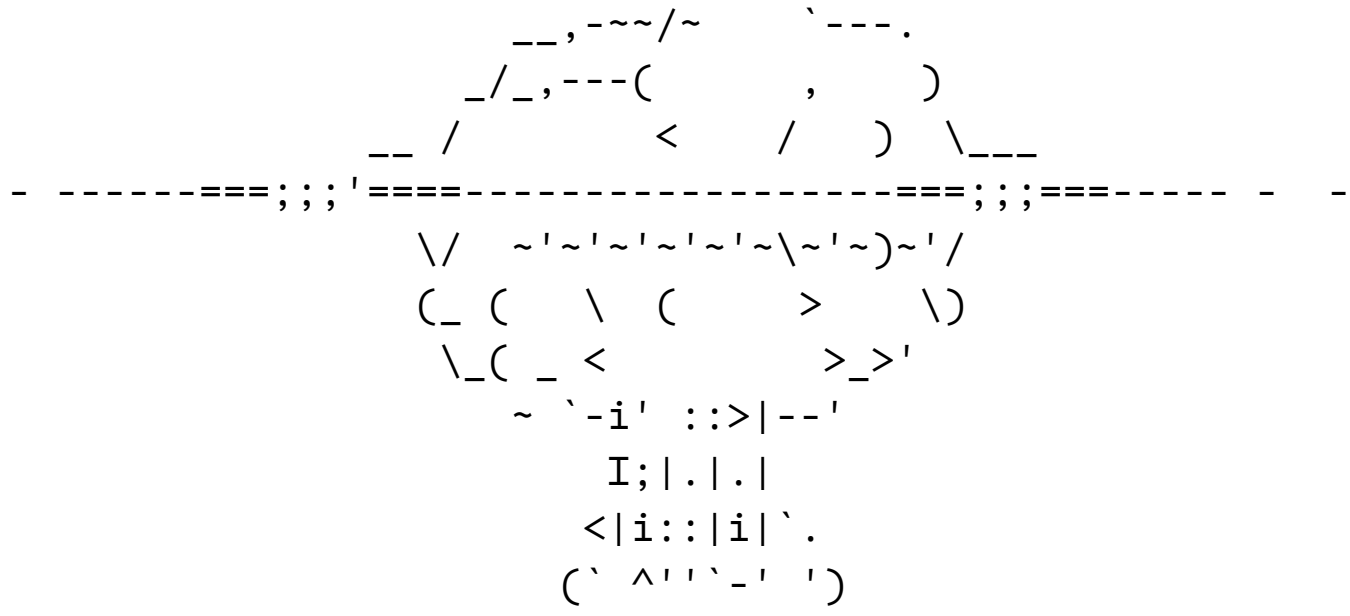
# Note on Bomblab

```
$ /home/seclab/lab01/bomb

          ,--.!,   ____                  _     _        _
       __/   -*-  | __ )  ___  _ __ ___ | |__ | | __ _| |__
     ,d08b.  '|`  |  _ \ / _ \| '_ ` _ \| '_ \| |/ _` | '_ \
    0088MM        | |_) | (_) | | | | | | |_) | | (_| | |_) |
     `9MMP'       |____/ \___/|_| |_| |_|_.__/|_|\__,_|_.__/
           cs6265

Welcome to my fiendish little bomb. You have N? phases with
which to blow yourself up. See you alive!
(hint: security question)
>
```

# Note on Explosion



# DEMO: GDB Summary

- run/continue
- break/tbreak/rbreak/delete
- stepi/nexti/advance/finish
- info reg/proc/break
- backtrace/examine
- python, gdbinit
- etc.

# In-class Tutorial

- Step 1: Setup environment
  - https://tc.gtisc.gatech.edu/cs6265/2017/rules.html
- Step 2: Tutorial (in CTF servers)

```
$ ssh YOURID@computron.gtisc.gatech.edu -p 2022
$ ssh YOURID@computron.gtisc.gatech.edu -p 2023
$ ssh YOURID@cyclonus.gtisc.gatech.edu -p 2022
$ ssh YOURID@cyclonus.gtisc.gatech.edu -p 2023

$ cd /home/seclab/
$ cat README
$ cd /home/seclab/lab01/tut
$ cat README
```

# In-class Tutorial (in own VM)

```
$ git clone git@tc.gtisc.gatech.edu:seclab-pub seclab
$ cd seclab/lab01
$ cat README
$ cd tut
$ cat README
```

# References

- GDB tutorial
- x86 instructions
- x86 architecture