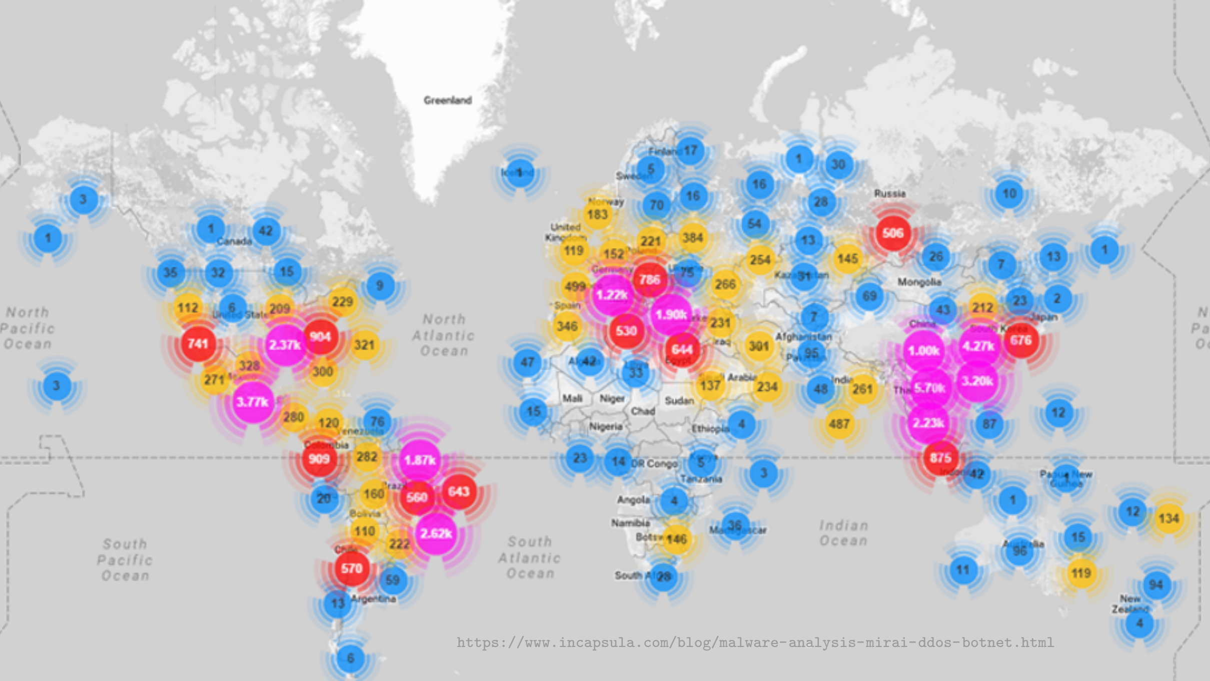
Runtime Security Lab

Michael Schwarz

September 16, 2019

Security Week Graz 2019



https://www.incapsula.com/blog/malware-analysis-mirai-ddos-botnet.html

Large IoT Incidents

- September 21, 2016

  > **600 Gbps** on Brian Krebs (security researcher) website (Mirai botnet)

- September 30, 2016

  Mirai source code published

- October 21, 2016

  ~**1 Tbps** on DNS provider Dyn

- November 26, 2016

  > **900 000** routers of Deutsche Telekom attacked and offline

- February, 2018

  > **1.35 Tbps** attack on GitHub

BUGS
LIGHTYEAR
SPACE RANGER
BUGS EVERYWHERE

Top 10 IoT Bugs

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1. Insecure Web Interface

Default usernames and passwords

Top 10 IoT Bugs

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2. Insecure Network Services

Unnecessary ports open

Top 10 IoT Bugs

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3. Insecure Ecosystem Interfaces

Encryption is not available

Top 10 IoT Bugs

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4. Lack of Secure Update Mechanism

Updates are not signed

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5. Insecure or Outdated Components

Software with security vulnerabilities

Top 10 IoT Bugs

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5. Insecure or Outdated Components
6. Insufficient Privacy Protection

Collected information not properly protected

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6. Insufficient Privacy Protection
7. Insecure Data Transfer and Storage

SSL/TLS not available

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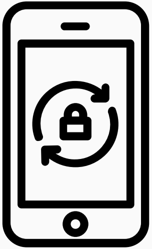
8. Lack of Device Management



No device monitoring

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Everything runs as root

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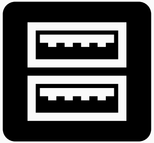
10. Lack of Physical Hardening



Unnecessary external ports like USB

Summary

The 90s called...

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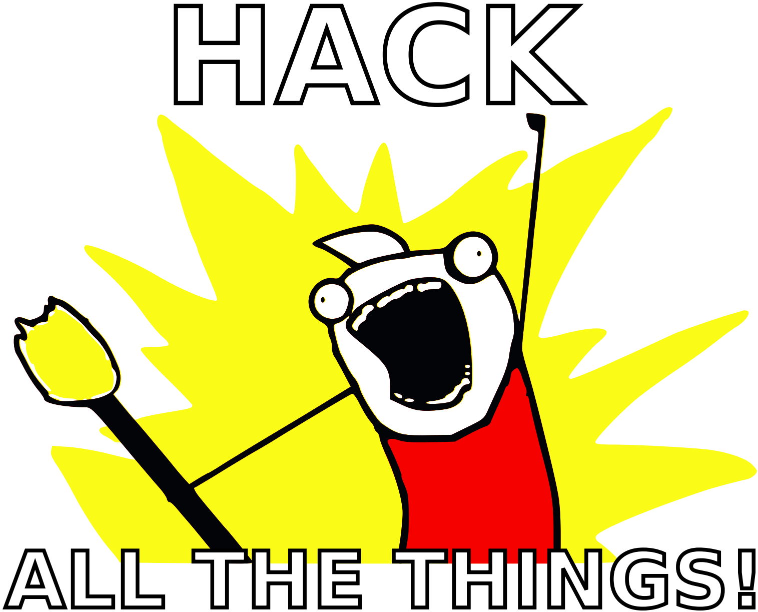
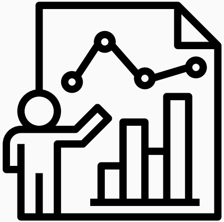
...they want their bugs back!


HACK
ALL THE THINGS!

Infrastructure



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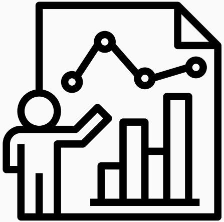

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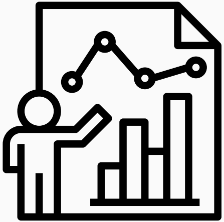

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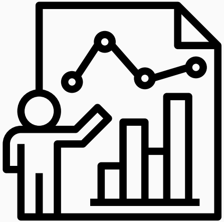
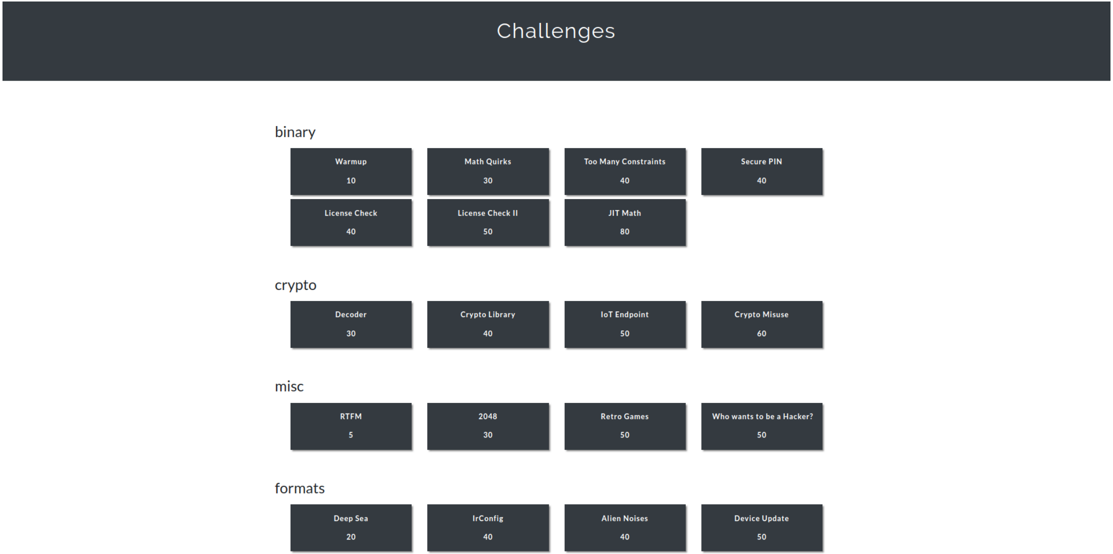


- There are 19 challenges
- Different difficulties (the more points, the harder)
- 4 different categories
- Play on your own or as team

https://ctf.attacking.systems



Challenges

binary

Warmup
10

Math Quirks
30

Too Many Constraints
40

Secure PIN
40

License Check
40

License Check II
50

JIT Math
80

crypto

Decoder
30

Crypto Library
40

IoT Endpoint
50

Crypto Misuse
60

misc

RTFM
5

2048
30

Retro Games
50

Who wants to be a Hacker?
50

formats

Deep Sea
20

IrConfig
40

Alien Noises
40

Device Update
50

Infrastructure

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- Every challenge has a hidden flag
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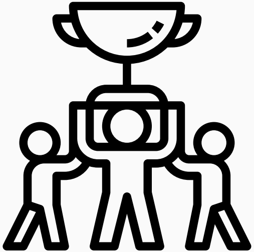
- A flag looks like `CTF{A_S4MPL3_FL4G!}`
- Goal is to get the flag and submit it to the CTF system

Timeline



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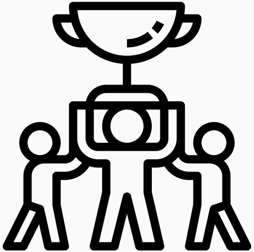

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- Best player/team gets a price

How to Start

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- For example on Linux/Mac in the shell:

```
netcat hacklets2.attacking.systems 8000
```

The Categories

There are 4 categories: binary (🔍), crypto (🔑), formats (📄), misc (🃏)

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- 🔍 Vulnerable/insecure binaries which you have to exploit
- 🔑 Bad/Misused cryptography you have to break
- 📄 Understanding custom formats
- 🃏 Random and fun hacklets which do not fit into any category (often no programming required)

REGISTER FOR CTF
GET ALL THE HACKLETS
HOW TO START
HOW TO START
imgflip.com

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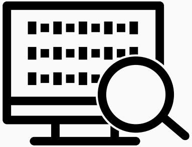
- Useful Linux tool: `file` – determines the file type

Unknown Files

- Maybe file is some archive...



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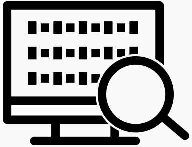

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- Can also extract files

Readable Information

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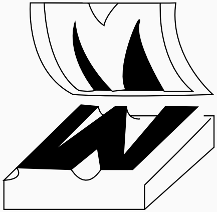

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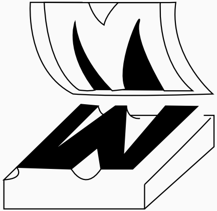

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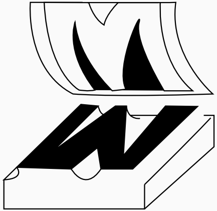

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- Use a network monitor (Wireshark) to detect connections

Reverse Engineering

- Command-line disassembler
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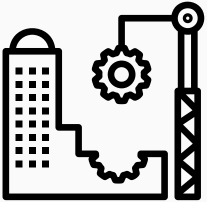

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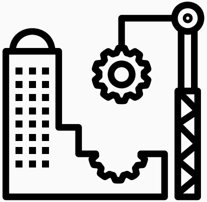

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- GUI disassembler: cutter

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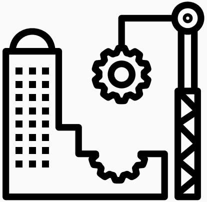

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- Open source, supports many architectures

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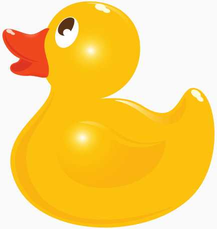

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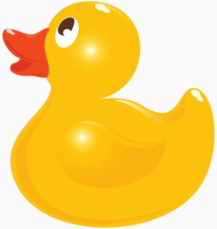

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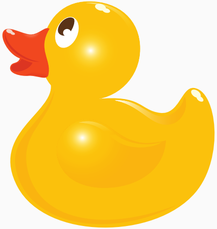

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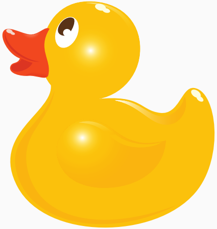
- If none available/interested: use a rubber duck!



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- Additionally: Slides from our lecture “Security Aspects in Software Development”
  https://teaching.iaik.tugraz.at/sase/slides

A Challenge a Day Keeps the Boredom Away

Questions?