ENHANCING CYBERSECURITY SKILLS
BY CREATING SERIOUS GAMES

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What we did

Two courses

Undergrads

CS faculty

Cybersecurity

Games

Open day
Why we did it

Workforce shortage

Need for hands-on training

Importance of adversary thinking
What we achieved

Cybersecurity + Game design

Understanding + Practical result

Awareness + New collaborators

Enhancing Cybersecurity Skills by Creating Games
Page 4 / 15
Presentation outline

- Example game, background
- Courses design after 3 semesters of innovation
- Case study of student projects
- Our experience and lessons learned
Capture the flag (CTF) game

Kali-attacker / 10.10.20.2

HTTP-server / 10.10.10.2
Capture the flag (CTF) game

Kali-attacker / 10.10.20.2

HTTP-server / 10.10.10.2

connect
Capture the flag (CTF) game

Kali-attacker / 10.10.20.2

connect

HTTP-server / 10.10.10.2

Level 1
Task: Scan the HTTP server.
Flag format: The number of the highest open port.
Points available: 6/8

Need help?
Hint 1: What tool to use
Hint 2: How to use the tool
Show Hint 1 (-2 points)
Use nmap.
KYPO – Cyber Exercise & Research Platform

Enhancing Cybersecurity Skills by Creating Games
Page 7 / 15
## Our courses

<table>
<thead>
<tr>
<th></th>
<th>Focus</th>
<th>Students</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intro course</strong></td>
<td>Attack</td>
<td>Small teams</td>
<td>Game</td>
</tr>
<tr>
<td><strong>Follow-up course</strong></td>
<td>Defense</td>
<td>Individuals</td>
<td>Tutorial</td>
</tr>
</tbody>
</table>

Enhancing Cybersecurity Skills by Creating Games
Page 8 / 15
Structure and content of the courses

- Practical experience from a cybersecurity team CSIRT-MU
  - [https://csirt.muni.cz](https://csirt.muni.cz)

<table>
<thead>
<tr>
<th>Week</th>
<th>Intro course</th>
<th>Follow-up course</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–6</td>
<td>Security basics, hands-on labs</td>
<td>Project work, consultations</td>
<td>Formative</td>
</tr>
<tr>
<td>7–10</td>
<td>Project work, consultations</td>
<td>Test run</td>
<td>Summative</td>
</tr>
<tr>
<td>11</td>
<td>Open day</td>
<td>Final result</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Open day
Case study: Open day 2017 – Overview

- 18 students
- 7 games
- 3 tutorials

- 3 hours
- 41 sessions
- 41 surveys
Case study: Open day 2017 – Results

<table>
<thead>
<tr>
<th>Playing time [min]</th>
<th>Educational value</th>
<th>Overall quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 expected</td>
<td>5 × Huge</td>
<td>7 × Excellent</td>
</tr>
<tr>
<td>5–70 actual</td>
<td>27 × High</td>
<td>23 × Very good</td>
</tr>
<tr>
<td>40 average</td>
<td>9 × Medium</td>
<td>10 × Good</td>
</tr>
<tr>
<td>40 median</td>
<td>0 × Small</td>
<td>1 × Sufficient</td>
</tr>
<tr>
<td></td>
<td>0 × Small</td>
<td>0 × Poor</td>
</tr>
</tbody>
</table>
Lessons learned: Successes

- Learning by teaching
- Practical result
- Awareness
- New collaborators
Lessons learned: Challenges

- Instructor effort
- Technical infrastructure
Creating games has a strongly beneficial impact on cybersecurity education and R&D.

www.kypo.cz/en/kypolab
@csirtmu

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