Lowering the Barriers to Capture The Flag Administration and Participation

Kevin Chung, CTFd LLC
What is a Capture The Flag

- Teams of users participate in an online/LAN competition
  - Receive cyber security “challenges”
  - By exploiting, patching, or reverse engineering each challenge, a team receives points
  - Whoever has the most points at the end wins
What are CTFs used for?

- Games of skill
  - CTFs began as a way of testing and teaching cyber security techniques
- Education & Internal Training
  - Educational institutions and companies use CTFs to teach their students and employees
- Recruitment
  - Some companies leverage CTFs as a means of filtering and identifying candidates
The Future of CTF

- De-facto security training interface?
- Expand into more than just cyber security?
- Can a security CTF become an e-sport?
CTF as an e-sport

• What drives a decision?

• How do you add meta game to CTF?
  • e.g. Types of units/utilities, map layouts, item economy

• Would someone watch a CTF for 30 mins to an hour?
• Started life at CSAW CTF in 2014 and was open sourced in 2015

• Focuses on ease of use and extensibility
  • Written in Python, Flask, and JavaScript

• CTFd comes with everything needed code-wise to run a CTF
  • Anything additional can be implemented with a theme or plugin
Features

• Team Scoring algorithm
• User profiles
• Graph visualizations
• Challenge board interface
• Content Management System
• Hints and Awards

• Plugins
• Themes
• CTF backup and restoration
• Automatic CTF starting and ending
• Mail server configuration
CTFd gives users a clean and simple interface to access challenges
Challenges

• Information appears when you click the associated button

• Descriptions are written in Markdown/HTML

• When a user has found the flag they can submit it for validation
CTFd provides hints, files, solves, and associated other information.
CTFd keeps track of who solves what and when. This is all rendered on a large score graph.
Scoring Algorithm

1. Who has the most points
   - Sum the value of all the challenges the team has solved

2. Apply any extra awarded points
   - Admins can award points for good behavior

3. In the case of a tie, who was quicker to achieve the score
   - Sort by the recorded time of the team’s last solve
CTFd also generates statistics graphs for individual teams. All graphs are downloadable.
CTFd’s admin interface lets us change data without leaving the browser.

We can do the same for team information and website pages.
Tags, Hints, Keys

- Tags - An additional way to mark challenges to be customized by themes/plugins for the end user
- Hints - Reveal hints to the user and optionally charge points for the hint
- Keys - Add and delete keys/flags that are accepted by the challenge
Customizability

- CTFd exposes plugins and themes to heavily customize a CTF
- Themes are written in Jinja2, HTML, CSS, and Javascript
- Plugins and CTFd itself are written in Python and Flask
Example CTFd Themes
Plugins

- CTFd will load specially written Python modules as plugins
- These plugins override default behavior and add additional behavior
Plugin Examples

• Private Registration - Only accept users with unique tokens
  • [https://github.com/farisv/CTFd-Private-Registration](https://github.com/farisv/CTFd-Private-Registration)

• Instancing Plugin - Unique Challenges per team
  • [https://github.com/tamuctf/ctfd-instancing-plugin](https://github.com/tamuctf/ctfd-instancing-plugin)

• Competitor Shells - Web terminals for teams
  • [https://github.com/tamuctf/ctfd-shell-plugin](https://github.com/tamuctf/ctfd-shell-plugin)
CTFd supports custom challenges
CTFd allows you customize how challenges are seen and solved
Custom Challenges

- Based on the observation that CTFs are primarily about solving challenges, not the challenge format
- Challenges can define how they look to competitors and how they are edited by CTF administrators
- Answer acceptance can be defined with Python
- End result is that CTF challenges gain format diversity
- Multiple Choice Questions

- Programming Challenges
CTF Backups

- CTFd supports the export and import of backups
- Meant to support CTFd itself, offline analysis, & archival sites
- The backup format is a zip file containing
  - JSON files representing the serialized database
  - A copy of all files uploaded to CTFd
Installation

- Setup scripts provided for native installation
- Docker build files provided for Docker installation

1. git clone https://github.com/CTFd/CTFd.git
2. pip install -r CTFd/requirements.txt
3. python CTFd/serve.py
Planned Improvements

- More documentation around CTFd’s feature set
- Fully RESTful API
- Attack and Defense format support
A small sample of companies and schools using CTFd
Managed Hosting

We offer managed hosting for CTFd instances for those not interested in hosting on their own.

### Hosting Services

We offer managed hosting for CTFd because you have better things to do than worry about infrastructure.

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<th>Basic</th>
<th>Professional</th>
<th>Enterprise</th>
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<td>$50/mo</td>
<td>$100/mo</td>
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- Unlimited users
- Unique ctfd.io subdomain
- Secure TLS/SSL connection

- Unlimited users
- Unique ctfd.io subdomain
- Secure TLS/SSL connection
- Unlockable Challenges
- Programming Challenges
- Multiple Choice Questions

- Unlimited users
- Unique ctfd.io subdomain or your own domain
- Secure TLS/SSL connection
- Custom Feature Development
- Custom Plugin Development
- Custom Challenge Development
- Dedicated Support

[Check out a CTFd demo here](#)
Questions?
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