PPS{CYBERTACTICSFEST}

Harnessing Competition to
Drive Deep Understanding

link to slides

objectives

objectives

utilize the competitive spirit of adolescence to increase exploration and innovation

provide tools and skill-focused content to ensure that lessons were actionable

reduce barriers to entry by explicitly teaching every skill to be used in the competition

connect students to a community of like-minded peers where they could be recognized for their skills and efforts

how it begins

how it begins -students

invites sent to former students/participants

posters placed in high schools

5x7 challenge cards placed strategically

Tinyurl.com/ppsctf-invite-base

Tinyurl.com/ppsctf-invite-sherlock

Tinyurl.com/ppsctf-invite-betwixt

Tinyurl.com/ppsctf-invite-mise

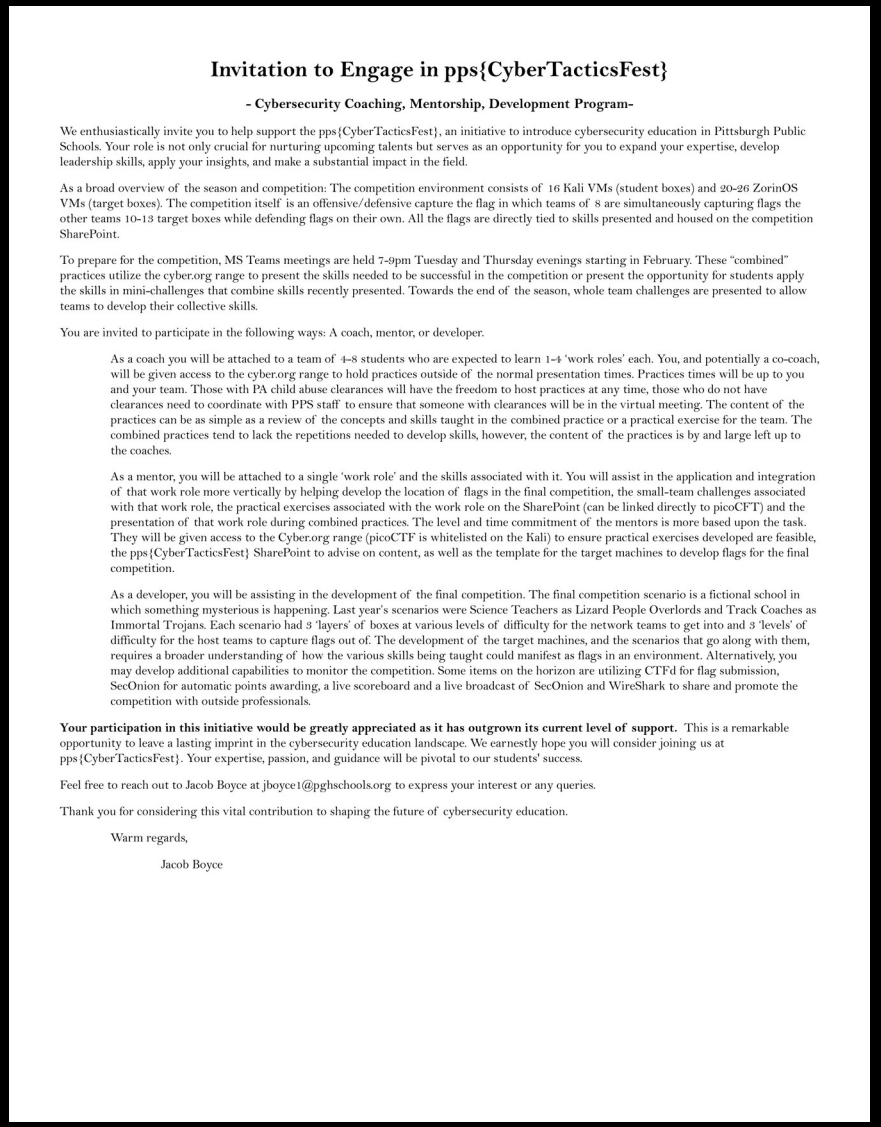
how it begins -students

simple ctfs with hints on the page

to submit the flag, you submit a form that expresses interest

a total of 52 students submitted flags and were invited to join a team

how it begins -staff/admin



Invitation to Engage in pps{CyberTacticsFest}

- Cybersecurity Coaching, Mentorship, Development Program-

We enthusiastically invite you to help support the pps{CyberTacticsFest}, an initiative to introduce cybersecurity education in Pittsburgh Public Schools. Your role is not only crucial for nurturing upcoming talents but serves as an opportunity for you to expand your expertise, develop leadership skills, apply your insights, and make a substantial impact in the field.

As a broad overview of the season and competition: The competition environment consists of 16 Kali VMs (student boxes) and 20-26 ZorinOS VMs (target boxes). The competition itself is an offensive/defensive capture the flag in which teams of 8 are simultaneously capturing flags the other teams 10-13 target boxes while defending flags on their own. All the flags are directly tied to skills presented and housed on the competition SharePoint.

To prepare for the competition, MS Teams meetings are held 7-9pm Tuesday and Thursday evenings starting in February. These "combined" practices utilize the cyber.org range to present the skills needed to be successful in the competition or present the opportunity for students apply the skills in mini-challenges that combine skills recently presented. Towards the end of the season, whole team challenges are presented to allow teams to develop their collective skills.

You are invited to participate in the following ways: A coach, mentor, or developer.

As a coach you will be attached to a team of 4-8 students who are expected to learn 1-4 'work roles' each. You, and potentially a co-coach, will be given access to the cyber.org range to hold practices outside of the normal presentation times. Practices times will be up to you and your team. Those with PA child abuse clearances will have the freedom to host practices at any time, those who do not have clearances need to coordinate with PPS staff to ensure that someone with clearances will be in the virtual meeting. The content of the practices can be as simple as a review of the concepts and skills taught in the combined practice or a practical exercise for the team. The combined practices tend to lack the repetitions needed to develop skills, however, the content of the practices is by and large left up to the coaches.

As a mentor, you will be attached to a single 'work role' and the skills associated with it. You will assist in the application and integration of that work role more vertically by helping develop the location of flags in the final competition, the small-team challenges associated with that work role, the practical exercises associated with the work role on the SharePoint (can be linked directly to picoCFT) and the presentation of that work role during combined practices. The level and time commitment of the mentors is more based upon the task. They will be given access to the Cyber.org range (picoCTF is whitelisted on the Kali) to ensure practical exercises developed are feasible, the pps{CyberTacticsFest} SharePoint to advise on content, as well as the template for the target machines to develop flags for the final competition.

As a developer, you will be assisting in the development of the final competition. The final competition scenario is a fictional school in which something mysterious is happening. Last year's scenarios were Science Teachers as Lizard People Overlords and Track Coaches as Immortal Trojans. Each scenario had 3 'layers' of boxes at various levels of difficulty for the network teams to get into and 3 'levels' of difficulty for the host teams to capture flags out of. The development of the target machines, and the scenarios that go along with them, requires a broader understanding of how the various skills being taught could manifest as flags in an environment. Alternatively, you may develop additional capabilities to monitor the competition. Some items on the horizon are utilizing CTFd for flag submission, SecOnion for automatic points awarding, a live scoreboard and a live broadcast of SecOnion and WireShark to share and promote the competition with outside professionals.

Your participation in this initiative would be greatly appreciated as it has outgrown its current level of support. This is a remarkable opportunity to leave a lasting imprint in the cybersecurity education landscape. We earnestly hope you will consider joining us at pps{CyberTacticsFest}. Your expertise, passion, and guidance will be pivotal to our students' success.

Feel free to reach out to Jacob Boyce at jboyce1@pghschools.org to express your interest or any queries.

Thank you for considering this vital contribution to shaping the future of cybersecurity education.

Warm regards,

Jacob Boyce

invited all staff/admin within 65 miles of PPS

invited CMU, Pitt, ARCPB

invited local cybersecurity firms

invited diversity-focused organizations

A total of 247 invitations sent

how it begins -staff/admin

https://tinyurl.com/ppsCTF-gradinvite-25

Received volunteers to mentor/coach from:

BlackGirlsHack.org

Carnegie Mellon University picoCTF

US Army CPT 186

Building a community of support for the program is small and incremental

how we trained

Sections

- pps{CyberTacticsFest} 2024-25 Season
- A nod of respect to those who have helped this process

pps{CyberTacticsFest} 2024-25 Season

Schedule of Events

2/4 Tuesday 7-9pm Teams Meeting: Intro and overview, cyber.org range, big picture scenario, intro to outside resources; picoCTF.

2/6 Thursday 7-9pm Teams Meeting: SSHerlock (Network)

2/11 Tuesday 7-9pm Teams Meeting: HashHound (Host)

2/13 Thursday 7-9pm Teams Meeting: Small Team Challenge (based on newly introduced skills)

2/20 Thursday 7-9pm Teams Meeting: CyberCartographer (Network)

2/25 Tuesday 7-9pm Teams Meeting: Ms. Disin (Host)

2/27 Thursday 7-9pm Teams Meeting: Small Team Challenge

3/4 Tuesday 7-9pm Teams Meeting: Q/A Session

3/6 Thursday 7-9pm Teams Meeting: Small Team Challenge Preperation/ Review

3/11 Tuesday 7-9pm Teams Meeting: Small Team Challenge

3/13 Thursday 7-9pm Teams Meeting: LANgeist (Network)

3/18 Tuesday 7-9pm Teams Meeting: MALchemist (Host)

3/20 Thursday 7-9pm Teams Meeting: Small Team Challenge

3/22 Saturday 9am-1pm Live Meeting: 1400 Crucible St. Pittsburgh, PA 15205

3/25 Tuesday 7-9pm Teams Meeting: PortalLord (Network)

3/27 Thursday 7-9pm Teams Meeting: 8ball (Host)

3/29 Saturday 9am-1pm Live Meeting: 1400 Crucible St. Pittsburgh, PA 15205

4/1 Tuesday 7-9pm Teams Meeting: Whole Team Challenge

4/3 Thursday 7-9pm Teams Meeting: Whole Team Challenge Review

4/9 Wednesday 9am-2pm Greenway: Round 1 A (Brashear/CAPAdice)

4/10 Thursday 9am-2pm Greenway: Round 1 B (SciTech/ObamaHouse)

4/11 Friday 9am-2pm Greenway: Round 2 A/B

Upcoming Events:

- **May-June**: Western PA PicoCTF Regional Invitational Competition (Date TBD)

A nod of respect to those who have helped this process

Carnegie Melon’s PicoCTF Team - Supplying Coaches and Mentors
BlackGirlsHack - Supplying Coaches and Mentors

ppsCTF

SSHerlock (Network)
HashHound (Host)
CyberCartographer (Network)
MsDisin (Host)
LANgeist (Network)
Malchemist (Host)
Portalord (Network)
8ball (Host)

how we trained

8 "workroles" divided into host and network

participants encouraged to attend meetings and challenges for one host and one network

Tuesday Thursday 7-9pm teams meetings to present workroles

MS Teams meetings allowed for more participation but many students did not feel as engaged online, adjustments being made for next season

how we trained

meet the work-roles:

Network Roles

Cyber-cartographer

SSHerlock

Langeist

Ms. Disin

Host Roles

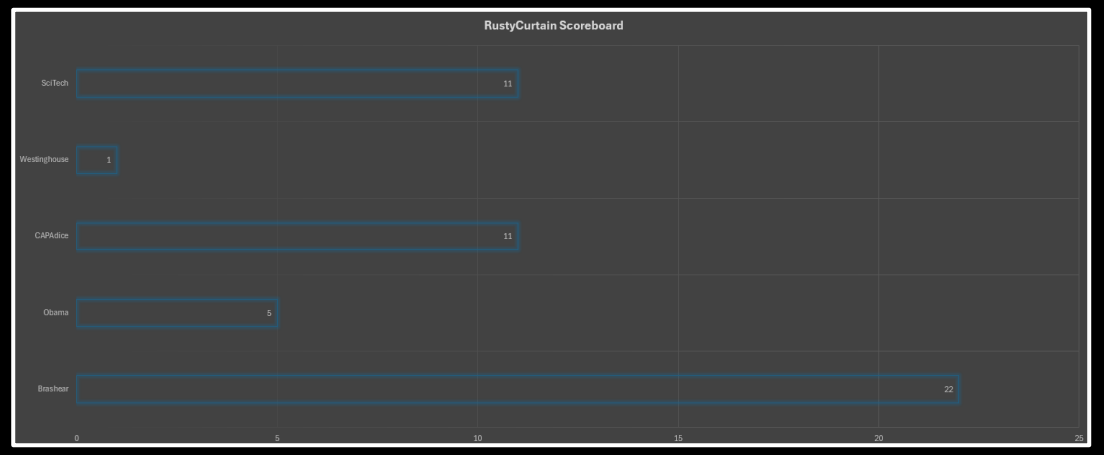
Hash Hound

8ball

Mal-Chemist

how we trained

meet the mini-challenges:



ppsCTF / challenges / **rustycurtain** /

jboyce1 Update challenge_instructions.txt ✓

Name	Last commit message
..	
boris.zip	Add files via upload
challenge_instructions.txt	Update challenge_instructions.txt
ctf1.py	Update and rename setup_ctf_cpu1.py to ctf1.py
ctf2.py	Create ctf2.py
deploy-telnet-23.py	Add files via upload
ftp-anon-highport.py	Add files via upload
ftp-anon-login.py	Add files via upload
ivan.zip	Add files via upload
nikoli.zip	Add files via upload
rustycurtain-prep-setup.txt	Create rustycurtain-prep-setup.txt
ssh-highport-generator.py	Update ssh-highport-generator.py
tanya.zip	Add files via upload
yuri.zip	Add files via upload

ppsCTF / challenges / CornerPocket / **instructions**

Code | Blame | 64 lines (50 loc) · 1.45 KB

```
23  sudo sed -i 's/^#\?PasswordAuthentication .*/P
24
25
26  Box 2:
27
28  adduser <choose from below>
29
30  stjones8
31  stmiller4
32  stbrown8
33
34  password:
35  Y0uf0undm3B@!
36  P@ssw0rd!
37  Secur1ty!
38  Cha1nL0ck!
39  H@ckM3N0w!
40  Saf3Guard!
41  K33p0ut!
42  Pr0t3ct!
43  F0rtR3ss!
44  Gu@rd1@n!
45  LockD0wn!
46
47  su <user>
48  password <password>
49
```

CyberBully

HamHunt

RustyCurtain

CornerPocket

Hayloft

how we trained

meet the mini-challenges:

CyberBully

In the CyberBully challenge, students responded to a hostile digital campaign between two feuding families, where siblings from one side were launching cyberattacks to harass and intimidate the other. Players used Wireshark to analyze network traffic, identify malicious IP addresses, and trace the source of bullying messages hidden in packet captures. As they dug deeper, they uncovered a piece of malware embedded in a shared file that revealed the attackers' plans and network backdoors. Students had to block ports, isolate systems, and launch precision packet-based countermeasures, including TCP resets and memory-level defenses, to protect the victim’s systems and expose the perpetrators.

how we trained
meet the mini-challenges:

HamHunt

In the HamHunt challenge, students investigated suspicious transmissions from a ham radio operator convinced he had made contact with extraterrestrials. By pivoting across a family’s network of devices—starting with a teenage son's laptop, brute-forcing the mother’s credentials, and finally accessing the father's computer—participants uncovered odd logs, encrypted files, and a mismatched hash pointing to a fabricated “alien message.” The challenge emphasized user profiling, SSH exploitation, hash analysis, and adversarial file tracing, blending the SSHerlock and HashHound roles to reconstruct the delusional operator’s digital trail.

how we trained

meet the mini-challenges:

RUstyCurtain

In the RUstyCurtain challenge, students explored a Cold War intelligence leak in which altered texts were injected into public archives to manipulate perceptions of historical events. Working in the roles of Ms. Disin and CyberCartographer, they used text comparison tools to uncover embedded disinformation and leveraged file structure and network mapping to trace the origin of tampered documents. Success required identifying inconsistencies across versions, detecting strategic word replacements, and correlating document paths to their points of compromise. The exercise emphasized critical analysis of digital text manipulation and metadata-driven mapping to expose a covert campaign to reshape history.

how we trained

meet the mini-challenges:

CornerPocket

In the CornerPocket challenge, students uncovered a covert data pipeline hidden across three networked machines. An image file shared by the user “EightBall” contained a concealed zip archive, which led to user credentials embedded in steganographic PDFs and images. Chained access across the machines revealed scrambled metadata pointing to a high-port FTP server masked within normal traffic. The final flag was stored in a falsified scoreboard file, requiring precise extraction and coordination. The scenario emphasized image-based steganography, credential discovery, and the dangers of hidden services in layered network environments.

how we trained

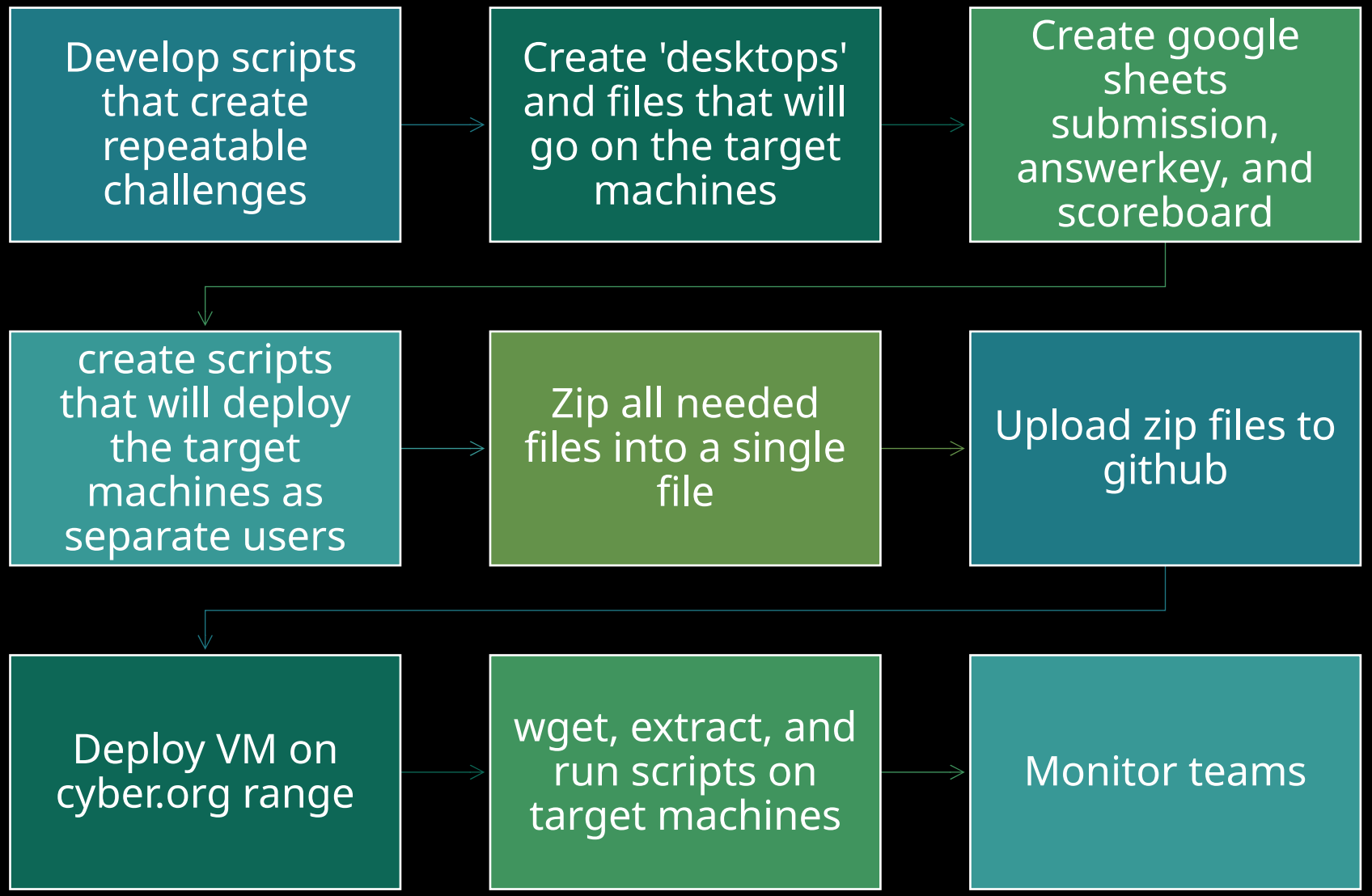
meet the mini-challenges:

Hayloft

In the Hayloft challenge, students started by investigating inconsistencies in a farm’s pig counts, where numbers were quietly manipulated in official reports. What began as a simple data-check turned deeply personal when the boy managing the farm uncovered secret messages embedded inside daily photos sent from his missing father, who had vanished during a classified space program. Through decoding hidden images and corrupted files, players realized the boy’s father had been alive much longer than the family was told, sending increasingly desperate communications. As students broke into protected home devices and sifted through hidden correspondence, they pieced together a heartbreaking cover-up.

develop and deploy

develop and deploy



steps to deploy a cyber.org challenge

develop and deploy

ppsCTF / challenges / rustycurtain / **rustycurtain-prep-setup.txt**

jboyce1 Update rustycurtain-prep-setup.txt

Code | Blame | 34 lines (25 loc) · 1.38 KB | Code 55% faster with GitHub Copilot

```
1   This is before the rusty curtain challenge to familiarize the participants with the types of things they might need
2   first, open up and access the services
3
4   Walk the students through the following from cybercartographer Practice and explore:
5   Step 1: Start your ubuntu machine from the cyber.org range and open up some services
6
7   start telnet
8   wget https://raw.githubusercontent.com/jboyce1/ppsCTF/main/classes/CyberCartographer/flagscripts/deploy-telnet-23.py
9   sudo python3 deploy-telnet-23.py
10
11  start an ftp server and place a file in it
12  wget https://raw.githubusercontent.com/jboyce1/ppsCTF/main/classes/CyberCartographer/flagscripts/ftp-anon-login.py
13  sudo python3 ftp-anon-login.py
14  nano test.txt
15  chmod 777 test.txt
16
17  start ssh on a highport
18  wget https://raw.githubusercontent.com/jboyce1/ppsCTF/main/classes/CyberCartographer/flagscripts/ssh-highport-generator.py
19  sudo python3 ssh-highport-generator.py
20
21  start ftp on a highport
22  wget https://raw.githubusercontent.com/jboyce1/ppsCTF/main/classes/CyberCartographer/flagscripts/ftp-anon-highport.py
23  sudo python3 ftp-anon-highport.py
24
25  Step 2: Start your kali machine from the cyber.org range try to find your open ports
26
27  MsDisin
28  Things to practice:
29  use wc to put together a phrase based on the number of words given
30  use sed and 'replaced words' to make a quote that has a famous year
31  sqlite search for most visited websites
32  sqlsearch for a spike in website usage
```

take explicit notes on what needs to be taught before each mini-challenge

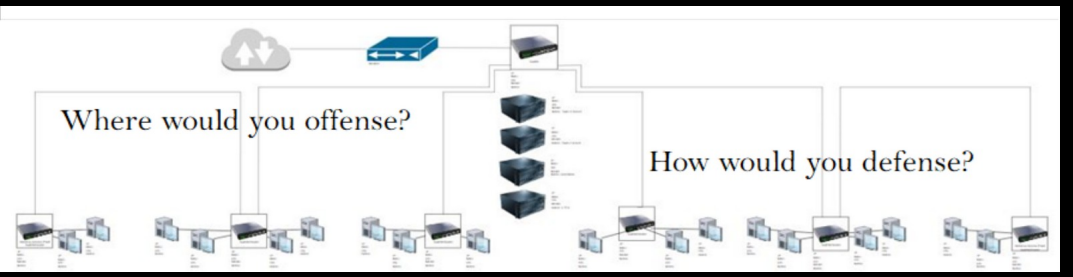
develop and deploy

write clear instructions on target deployment

```
note# double check ctf2.py for functinoality, students were not able to see contents Feb 2025
instructions:

from ubuntu mahcine:
sudo git clone https://github.com/jboyce1/ppsCTF.git

Complete all the zip files on VM
navigate to
cd ppsCTF/challenges/rustycurtain
ls to ensure the files are there


run ctf1.py on as many cyber.org vms as teams are competing
sudo python3 ctf1.py
rung ctf2.py on as many cyber.org vms as teams are competing
sudo python3 ctf2.py

use the rustycurtainchallengemap.doc and rustycurtainanswerkey.xlxs to guide challenge.
```

how we competed

how we competed



pps{CyberTacticsFest}

3 rounds

10 targets each round

separate environments

rules of engagement

3 'scenerios'

how we competed

answer key

Kairos War-Elephants Challenge AnswerKey

File Edit View Insert Format Data Tools Extensions Help

M5 =importrange("https://docs.google.com/spreadsheets/d/1vkjZXf06ypaLBSssb3WLS40CvCq4sWntr

	A	M	N
1			
2		ObamaHouseResponse	ObamaHouseF
3			138
4	**Flag**	**ObamaResponse**	**ObamaPoir**
5	pps{1x1_Dir3ct0ryaandFil3_98hhk}	pps{1x1_F0undR00sevelt}	1
6	pps{1x1_NanoCat3aandir3ct0ry_987y9h}	pps{1x1_Fil3aandir3ct0ry_dfgdg}	1
7	pps{1x1_Fil3aandir3ct0ry_dfgdg}	pps{1x1_ThatsOneSmallStep}	1
8	pps{1x1_F0undR00sevelt}	pps{1x1_Fil3aandir3ct0ry_rfwer5}	1
9	pps{1x1_Dir3ct0ryaandFil3_9556u}	pps{1x1_Dir3ct0ryaandFil3_9556u}	1
10	pps{1x1_NanoCat3aandir3ct0ry_342t5}	pps{1x1_NanoCat3aandir3ct0ry_342t5}	1

flag submission

Kairos War-Dragons Challenge ObamaHouse

File Edit View Insert Format Data Tools Extensions Help

C1

	A	B
1	ObamaHouse	138
2	**Flag**	**ObamaPoints**
3	pps{1x1_F0undR00sevelt}	1
4	pps{1x1_Fil3aandir3ct0ry_dfgdg}	1
5	pps{1x1_ThatsOneSmallStep}	1
6	pps{1x1_Fil3aandir3ct0ry_rfwer5}	1
7	pps{1x1_Dir3ct0ryaandFil3_9556u}	1
8	pps{1x1_NanoCat3aandir3ct0ry_342t5}	1
9	pps{1x2_scp_krdoxz}	2
10	pps{1x1_MorseOverload}	1

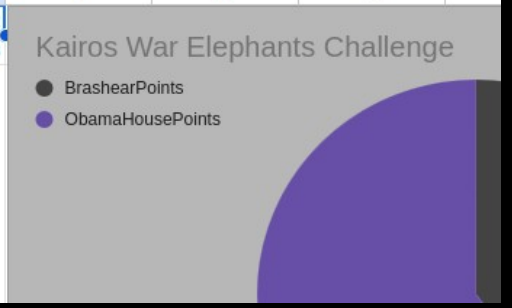
public scoreboard

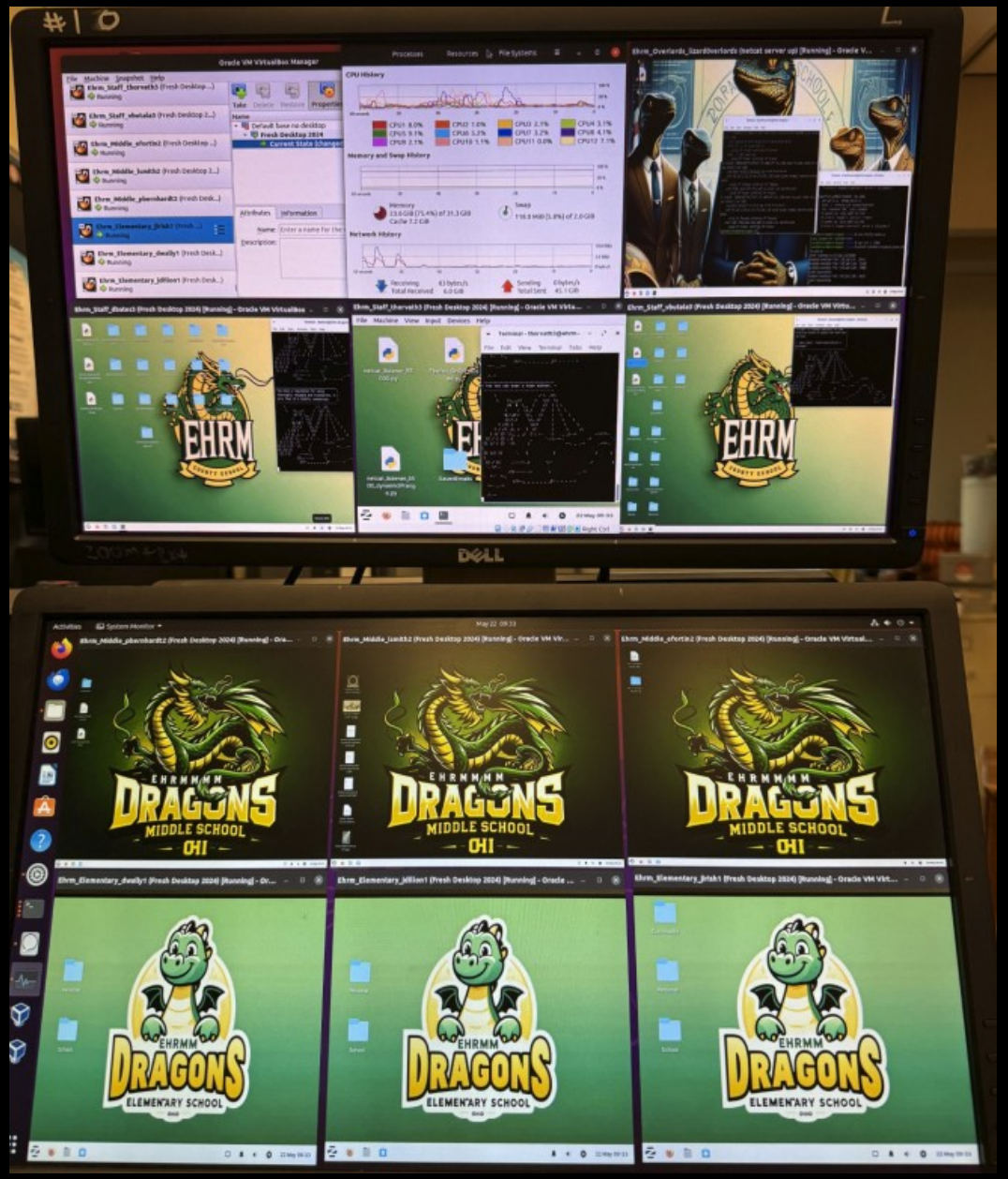
pps{CyberTacticsFest} ScoreBoard

File Edit View Insert Format Data Tools Extensions Help

B1 =importrange("https://docs.google.com/spreadsheets/d/1nOS490_nvtecTtBoub

	A	B	C	D	E
1	BrashearPoints	92			
2	ObamaHousePoints	138			





how we competed

Ehrm, Dragons

scenario overview:

lizard people overlords are biology teachers with an agenda teach students lizards are superior beings

how we competed

Homers, Trojans

scenario overview:

track coaches are immortal greek warriors sent to find Odysseus but got lost in the search and are now keeping greek warfare alive

how we competed

Kairos, War Elephants

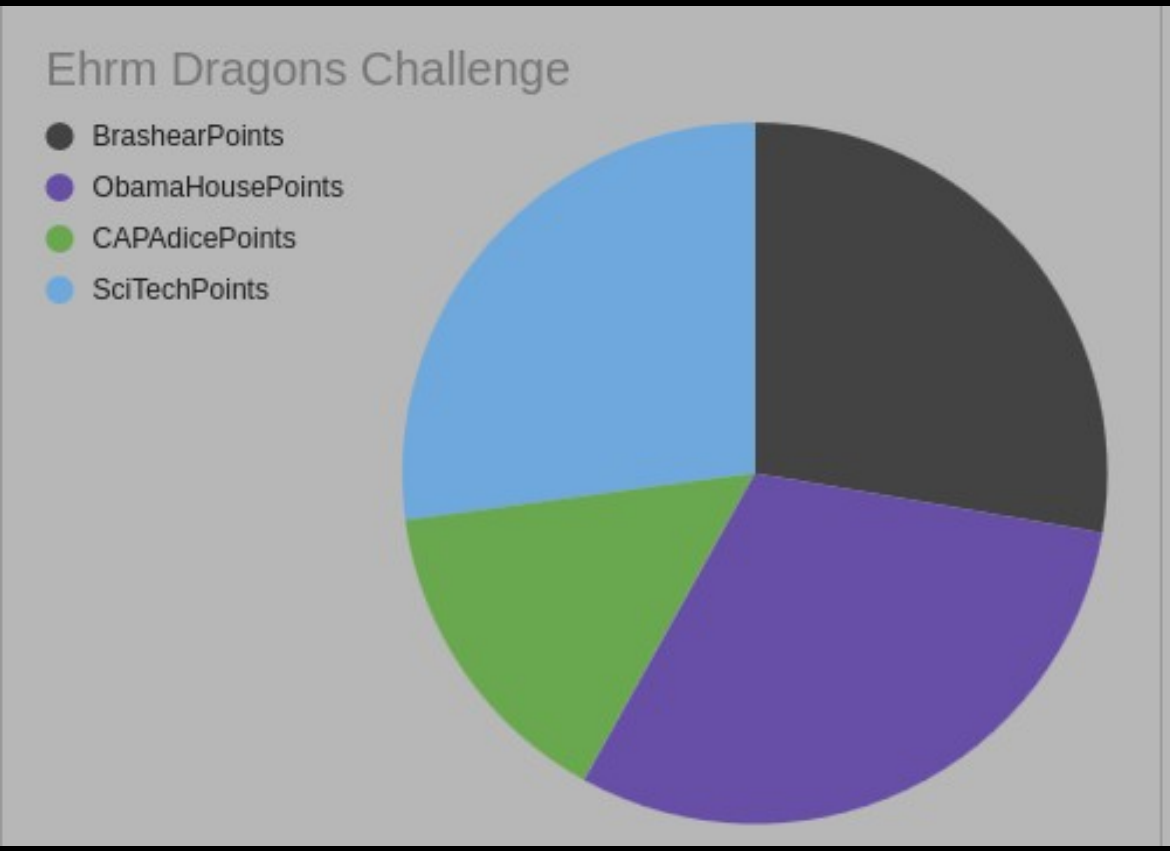
scenario overview:

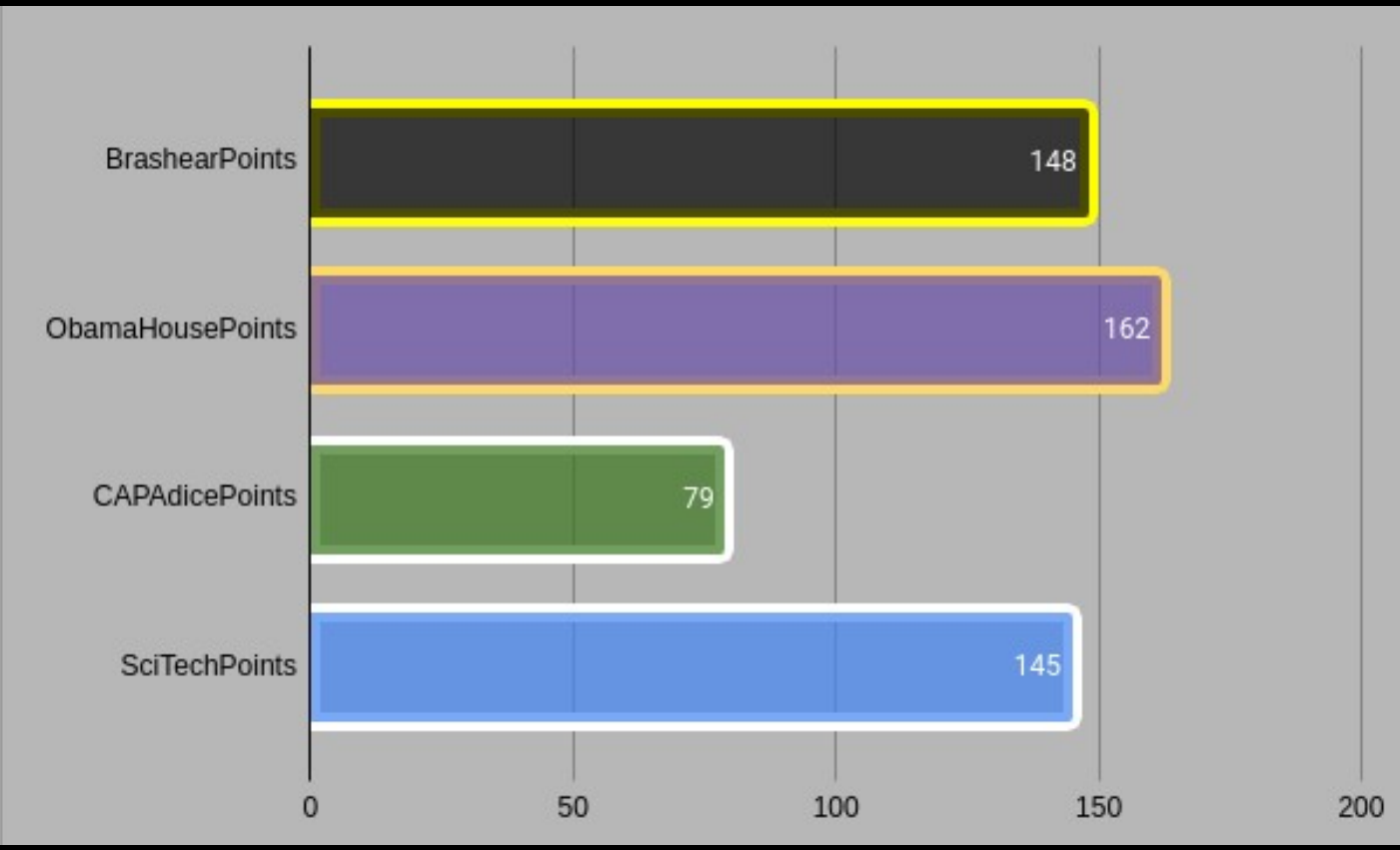
a history teacher brings back real historical figures through a time portal that are trying to flush brain rot from modern youth

competition results

competition results

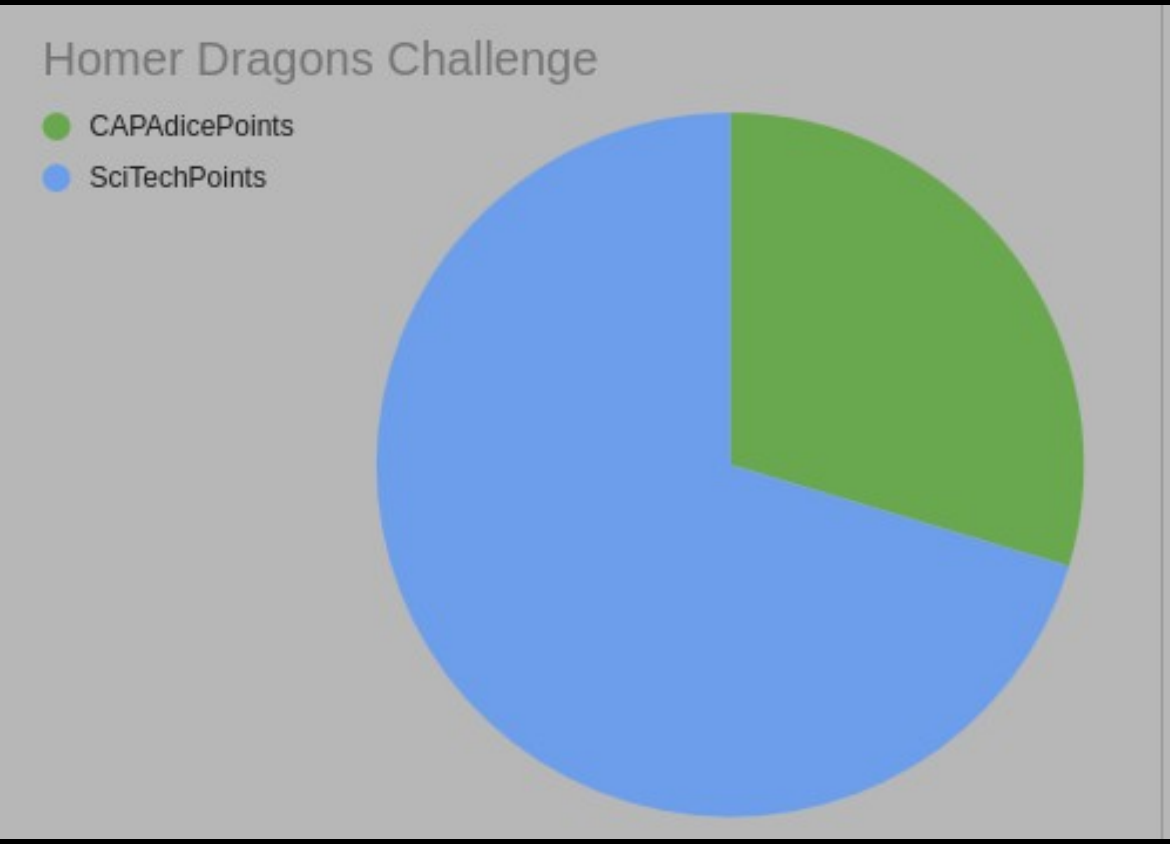
Round 1

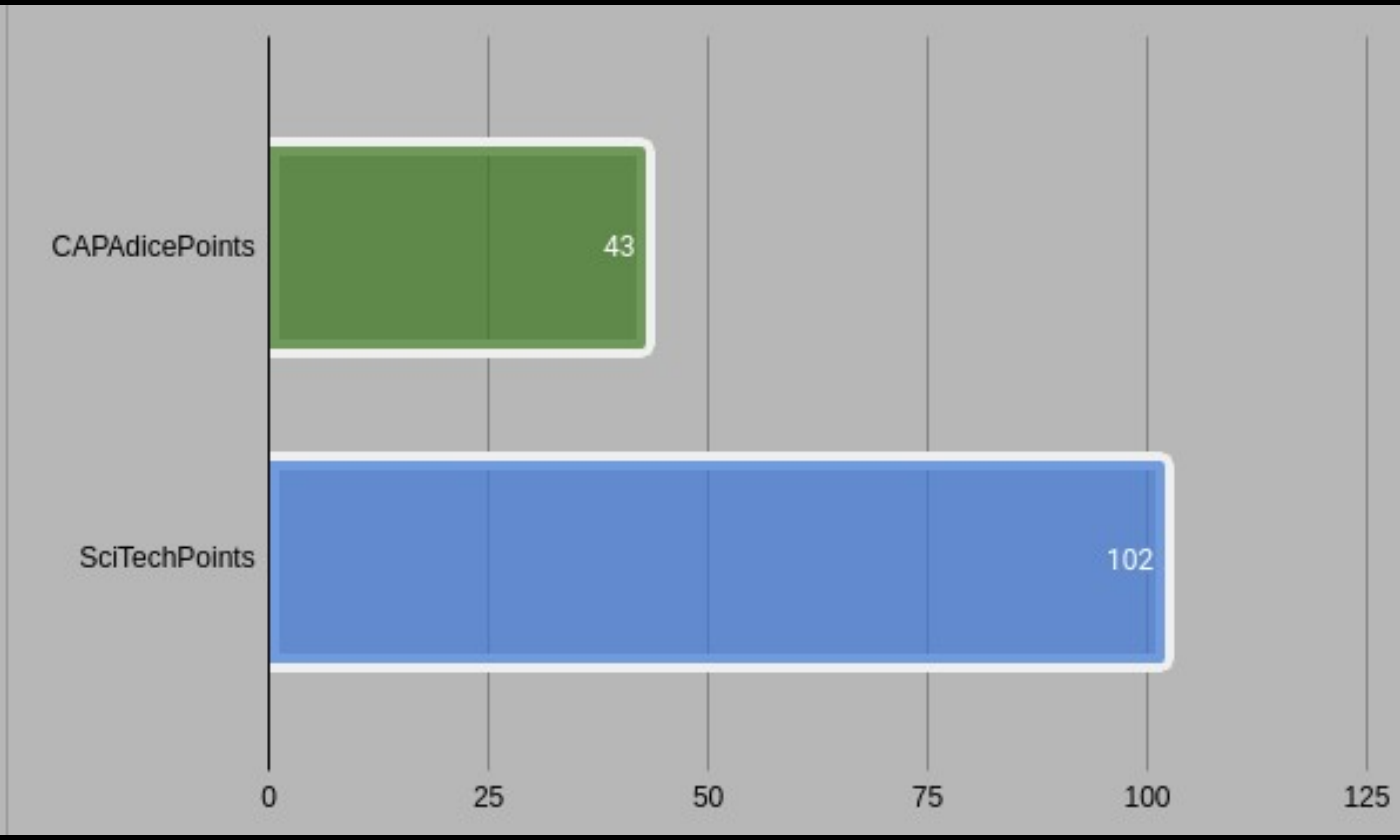




competition results

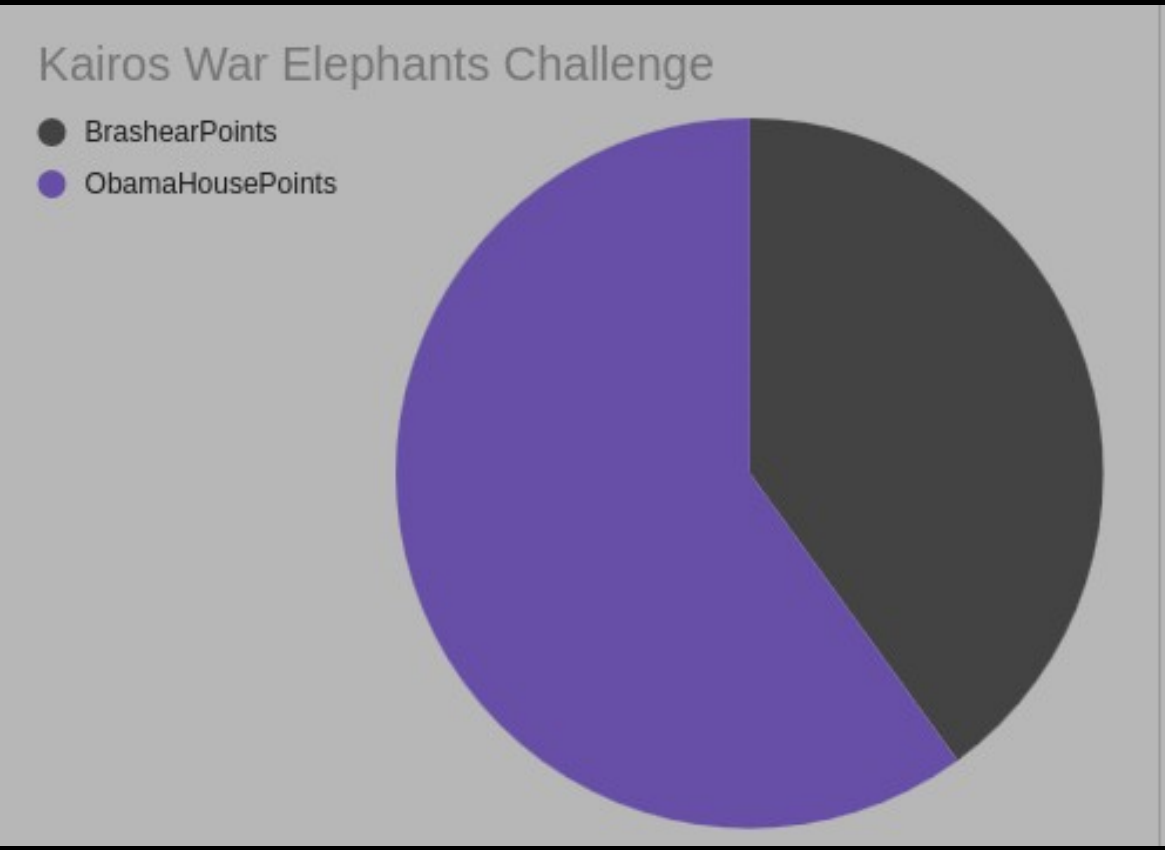
Round 2 (losers vs losers)

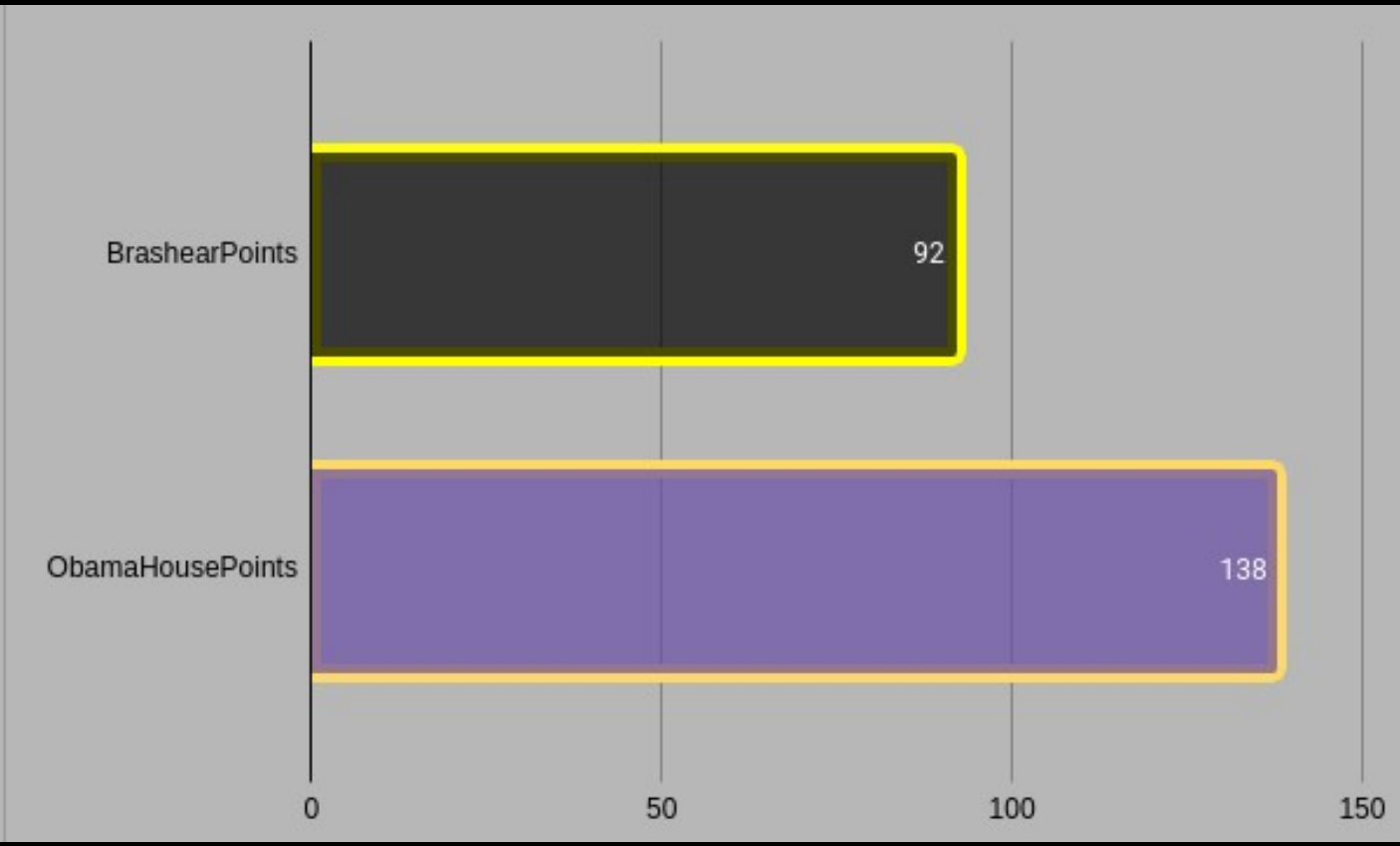




competition results

Round 3 (winners vs winners)





outcomes

outcomes

students on SciTech developed shared documentation and worked as a well oiled machine

students from Brashear hot swapped seats to complete challenges based on strengths

students from ObamaHouse made the development of challenges for next season into a long-term class project

students from CAPdice used untaught resources (hashcat) and wrote python scripts to solve challenges

next steps

develop non-profit (CyberTacticsForge)to facilitate voucher scholarships, intern opportunities, infrastucture upgrades

identify additional mentors; clarify work-roles and expectations

involve more schools from SW PA and OH

develop capability to deploy more persistent target boxes for more complex

focus on defensive actions; seconion and firewalls

express an interest

questions/
remarks

Share your feedback!

In your Accelevents app, click "View Details" for this session, then "Survey" on the Activity tab to complete a quick survey and let us know what you thought of this session.