

GOT MISCONFIGURATIONS?

- For Cyber Defense teams to effectively practice, they require a network full of vulnerabilities that is unfamiliar and genuinely exploitable.
- While Capture-The-Flag competitions provide hands-on experience to students learning how to exploit vulnerabilities, Cyber Defense competitions focus on a separate set of skills*:
 - System Administration
 - Incident Response
 - Security Log Analysis
 - Threat Hunting
- An effective simulation requires coming into an unfamiliar network and investigating the network itself and how an attacker compromised the hosts.
- However, reliably building vulnerable networks by hand is time and labor intensive. Juno automates this process.

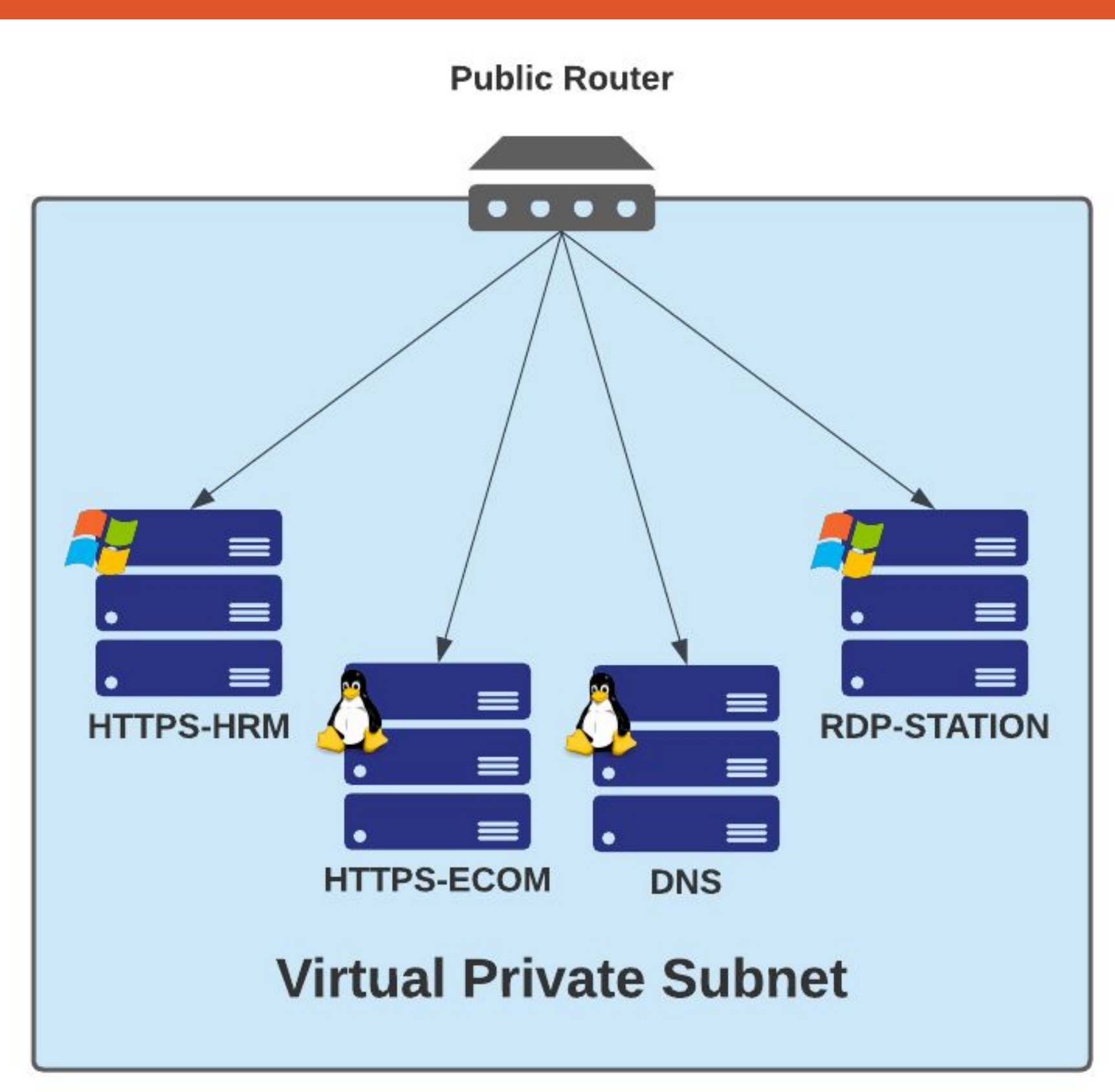


Diagram of a practice network



JUNO

Automated configuration and deployment of virtual machines for cybersecurity games.

The screenshot shows the Juno interface for 'Game 2'. It displays the time (May 12, 2023, 6 a.m. - 8 a.m.) and players (lemon8, Itj-bukem, perfecto, sama). Below is a scoreboard table with columns for time points and rows for different server types.

	6:40 a.m.	6:30 a.m.	6:20 a.m.	6:10 a.m.	6 a.m.
HTTPS-HRM	↑	↑	↓	↓	↑
HTTPS-ECOM	↓	↓	↑	↑	↑
DNS	↑	↑	↑	↑	↑
RDP-STATION	↓	↓	↓	↓	↓

Deployed via Juno

Scoreboard representing servers on the practice network

ON-DEMAND DEPLOYMENT

- Juno is a system of distributed programs that automatically generates networks of virtual machines with unique combinations of vulnerabilities per game.
- Juno then deploys these virtual machines and sets up virtual networking to host the game for players.
- Juno also controls and manages players' access to each game's virtual environment.
- The scoring engine automatically keeps track of players progress in the environment (shown above).

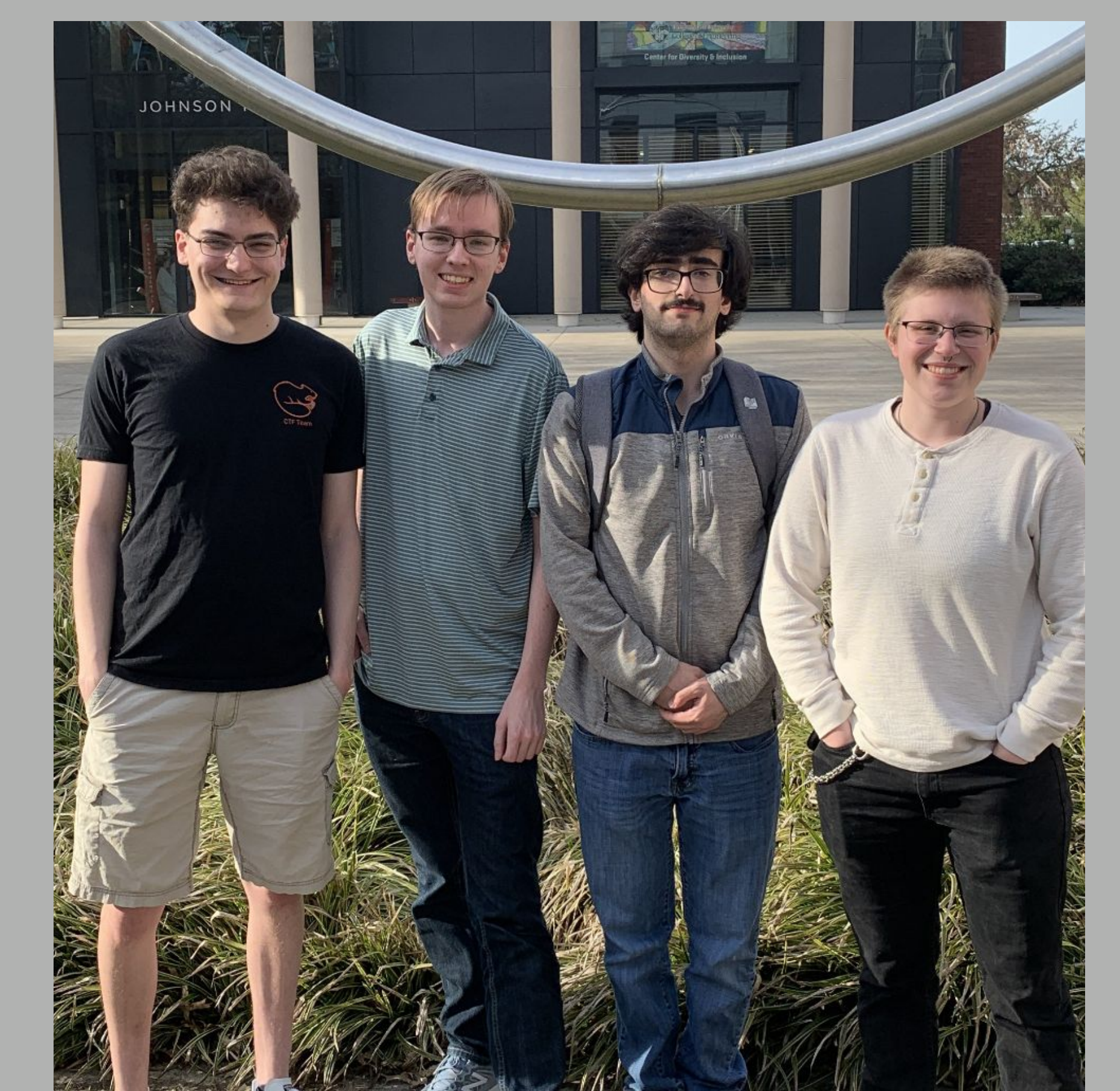
GAMIFIED LEARNING

- Juno provides a lower barrier of entry to players to gain important hands-on experience with advanced cybersecurity concepts.
- Juno offers various levels of difficulty in vulnerabilities, so that games are valuable for students of various skill sets.
- The short, frequent games encourage repeated knowledge reinforcement and rapid development of new tools and strategies.
- The scoreboard interface provides easy-to-understand feedback and competitive spirit that draws in players.

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* A. Conklin, "Cyber defense competitions and information security education: An active learning solution for a capstone course," in Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06), vol. 9. IEEE, 2006, pp. 220b–220b.



Left to right: Alexander, Carter, Arian, Casey