Mid-Atlantic Collegiate
Cyber Defense Competition

2023 Qualifying Round
Blue Team Packet

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Mid-Atlantic Collegiate
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Overview

CCDC Mission

“The goal of a Cyber Defense Competition is to provide hands-on application of information assurance skills; as such, they enhance students' understanding of both theory and practice. They provide students a laboratory in which to experiment, just as in other fields of science. They fulfill the same role as capstone projects in a traditional engineering program (i.e., projects that allow students to synthesize and integrate knowledge acquired through course work and other learning experiences into a project usually conducted in a workplace). The competition combines legal, ethical, forensics, and technical components while emphasizing a team approach. Such experiential education increases the knowledge and expertise of future professionals who may be in a position to contribute to the secure design and operation of critical information and its supporting infrastructure" (from Exploring a National Cyber Security Exercise for Colleges and Universities, Ron Dodge, Lance J. Hoffman, Daniel Ragsdale, and Tim Rosenberg, 2004).

Competition Objectives

- Build a meaningful mechanism by which institutions of higher education may evaluate their programs.
- Provide an educational venue in which students can apply the theory and skills they have learned in their course work.
- Foster a spirit of teamwork, ethical behavior, and effective communication both within and across teams.
- Open a dialog and awareness among participating institutions and students.

Competition Goals

1. To promote fair and equitable standards for cyber defense and technology-based competitions that can be recognized by industry.
2. To evaluate the defensive and responsive skills of each team under exact hardware, software application, and operating system configurations using a joint academic and industry rating scale.
3. To demonstrate the effectiveness of each participating institution’s academic security program.
4. To be executed by a preponderance of industry professionals.
5. To have industry recognition, participation, and acceptance of each competition.
6. To rate the effectiveness of each competition against a predefined standard of competition rules.

7. To provide a cooperative and competitive atmosphere among industry partners and academia in cyber defense education.
8. To provide recognition for participating teams.
9. To increase public awareness of academic and industry efforts in cyber defense education.

Competition Teams

Throughout this document, the following terms will be used:

- **Gold/Operations Team**: Competition officials who organize, run, and manage the competition. Responsibilities include, but are not limited to:
    - Administer, staff, and orchestrate the event.
    - Manage scoring elements and determine final standings.
    - Has the authority to dismiss any team, team member, or visitor for violation of competition rules, inappropriate, and/or unprofessional conduct
    - Make provision for awards and recognition.
- **Black Team**: Competition support members who design and implement the competition infrastructure, provide technical support, and provide overall administrative support to the competition.
- **White Team**: Competition officials who evaluate team performance, ensure rule compliance, deliver and score injects, and volunteer in various other positions during the competition.
- **Blue Teams**: The student teams competing in a CCDC event.
    - **Team Captain**: A student member of the Blue Team identified as the primary liaison between the Blue Team and the Gold/White Teams.
    - **Team Representatives**: A faculty or staff representative of the Blue Team's host institution responsible for serving as a liaison between competition officials and the Blue Team's institution.
- **Red Team**: Penetration testing professionals simulating external hackers attempting to gain unauthorized access to competition teams' systems.

MACCDC Overview

The MACCDC is one of the 9 regional CCDC events in the United States. Now in its 18th year, our region represents four-year universities and community colleges from Delaware, the District of Columbia, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, and West Virginia. Since its inception, over 3,500 students have participated in the MACCDC.

MACCDC consists of both a qualifying round and a regional final round. The 2023 virtual qualifying round will be held on February 4th. The top 8 teams will advance to the in-person

regional competition held at the Price George's Community College in Largo, MD on March 31st - April 1st.

The competition is designed to test each student team's ability to secure networked systems while maintaining standard business functionality. Each year's scenario involves team members simulating a group of employees from a fictitious company who must "inherit-and-defend" an IT infrastructure. The teams are expected to manage the systems, keep them operational, and prevent unauthorized access. Each team will start the competition with a set of identically configured systems. This is not just a technical competition, but also one built upon the foundation of business operations, policies, and procedures. A technical success that adversely impacts the business operation will result in a lower score as will a business success which results in security weaknesses.

Student teams are scored on their ability to detect and respond to outside threats, while maintaining availability of existing network and application services, responding to business requests, also known as injects, and balancing security against varying business needs. For more details, see the Scoring section below.

Virtual Qualifying Round

Communications

Excluding a few emails here and there, *Discord (https://discord.gg/mtpS3en4zT) will be the main communications platform for the 2023 Qualifying Round*. Be sure to check out the #readme channel once logged in for naming conventions.

For questions during the competition, the team captain or coach can open a ticket in Discord. Please follow the instructions in the #readme channel.

Primary Gold/Operations Team point of contact:
Discord: [Gold Team] Roman Bohuk
Email: roman@metactf.com

Primary Black Team point of contact:
Discord: [Black Team] Rob Fuller

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Schedule

Thursday, February 2nd, 2023

7:00pm	Deadline to submit software download requests. You may submit requests after the deadline, but there is no guarantee that they will be looked at. See Qualifiers Logistics for more information.

Friday, February 3rd, 2023

2:00-6:00pm	Students will be able to test their access to the competition environment. The time is subject to change. Information will be sent via Discord. Please submit support tickets in your team's #ticket-requests channel if you encounter issues.
7:00pm	Qualifying round overview session, Q&A, and access troubleshooting Zoom Link: https://us02web.zoom.us/j/81347206779?pwd=Zk04NWhhcGxPTlRSR3ZKcys2ZWNUQT09 Meeting ID: 813 4720 6779 Passcode: 189521 Phone: +1 (646) 931-3860

Saturday, February 4th, 2023

11:00am	Qualifying round start
5:00pm	Qualifying round end
7:30pm	Winner Announcements & Debrief Zoom Link: https://us02web.zoom.us/j/88656565244?pwd=NmwzN1NVNnBhOHR2eWxkK2JuaUo1QT09 Meeting ID: 886 5656 5244 Passcode: 341251 Phone: +1 (646) 931-3860

Teams

29 teams from the following 26 schools will compete in the 2023 qualifying round. Only one team from each school is eligible to advance to the regional competition.

- Bowie State University
- Capitol Technology University
- Christopher Newport University
- College of Southern Maryland
- Community College of Baltimore County
- East Carolina University
- George Mason University
- James Madison University
- Liberty University
- Marshall University
- Messiah University
- Millersville University
- Northern Virginia Community College
- Old Dominion University
- Regent University
- Rowan College At Burlington County
- Rutgers University
- Saint Vincent College
- The Pennsylvania State University
- Towson University
- University of Maryland, Baltimore County
- University of Maryland, College Park
- University of Maryland, Global Campus
- University of Virginia
- Virginia Tech
- West Virginia University

CCDC Rules

Mid-Atlantic CCDC follows the competition rules established by the National CCDC (http://nationalccdc.org/index.php/competition/competitors/rules). They provide structure for the makeup of student teams, permitted actions during competition play, and contingencies for handling disputes. They also document expectations for appropriate conduct during the entire time participants are guests at a host site or are competing from their academic institution. Coaches, Remote Site Judges, and all student participants are expected to know and follow all CCDC rules and guidelines. Coaches and team captains are responsible for deploying the competition rules to the remaining members of their team. Host sites reserve the right to

stipulate additional rules conforming to local policies and guidelines. Access to the competition stadium environment (both virtual and/or in-person) implies their acknowledgement of competition rules and their commitment to abide by them.

Qualifiers Scoring

Scoring is based on keeping required services up, controlling/preventing unauthorized access, and completing business tasks (injects) that will be provided throughout the competition.

Scores are maintained by the Gold/Operations Team, working in conjunction with the Black, Red, and White Team leads. Individual tracking of services may be available to respective teams during the competition. Blue Team members should use available the available scoring engine and manual testing to assess the integrity of their networks and systems. Blue Team members should refrain from making direct requests to the Black or White Teams for routine service verification.

Scoring Metrics

1. **Services**. All scored services must remain up and available, with a high degree of integrity. All services are given a predefined point value and will be checked periodically using Service Round Checks. The actual number of service rounds is not disclosed prior to or during the competition. For each service that passes the necessary check, the team will receive the appropriate number of points for that service. The more service points a team receives, the better.
    a. **Service Level Agreements (SLAs)**. There will be no SLA penalties during the qualifying round.
    b. **Recovery Services.** In the event of system lock or failure, teams can request that a virtual machine (VM) be reset to a known good state (revert to snapshot). Teams are allowed one (1) free revert total for the entire event, per team. Each additional request for a VM snapshot revert will carry a 10% point penalty in the total service score for the event.
    c. **Black Team Agent (BTA).** Every host on the competition network will be running a special Black Team Agent service that will be used to help score machine uptime, service uptime, and red team activity.
        i. The BTA needs to be able to reach the scoring server via HTTPS (port 443) at the IP address 10.250.250.11. BTA check-ins will be reported on the scoreboard.
        ii. If the BTA is disabled or blocked from reaching the scoring server, severe point penalties will be applied.
        iii. The BTA will be running as the root or Administrator user and installed as an auto-start service named `bta` on all platforms.
        iv. The Red Team has been instructed not to inject into or tamper with the BTA in any way.

v. Any attempt by Blue Teams to tamper with, impersonate, or hinder communication of the BTA will result in heavy point penalties or disqualification.
vi. The Blue Teams will be able to verify the status of the BTA on their machines in the Scoring Engine.
vii. The BTA may perform additional checks on local network services such as SMB, HTTP, LDAP, and SSH. These additional checks will be made locally only (i.e. to localhost), so no additional ports need to be opened for the BTA for it to function properly. Any questions about the BTA should be asked before the competition starts.

2. **Injects**. Throughout the competition, Blue Teams will be presented with injects. An inject is any assigned task to be completed in the assigned amount of time. Inject types vary and point totals are based on the difficulty and time sensitivity of the task. Tasks may contain multiple parts.
    a. Sample injects include creating policy documents, making technical changes to a system, and attending meetings.
    b. Injects can be announced through any number of methods, including electronically and orally. Inject submission instructions are covered later in this document.
    c. Injects will be scored by a White Team member. If the inject is completed on time and to the standard required, the Blue Team will receive the appropriate number of points. Different injects may have different point values.
    d. No points will be awarded for the inject if the inject is submitted late.
    e. Unless indicated otherwise, the Team Captain may assign injects to specific team members for completion.
    f. Red Team (or Blue Team) activity can adversely affect a team's ability to complete injects. It is the Blue Teams' responsibility to maintain system availability. No extra time or point credit will be given for injects that are not completed because of inability to access a system.
    g. Injects will be released automatically to all teams at the same time on the Scoring Engine platform that will also be used to score services.
    h. It is the team's responsibility to periodically check the Scoring Engine for new injects.
    i. Blue Teams will only be allowed to submit injects from the virtual machines within the competition network.
    j. Teams will be asked to submit their inject responses as PDFs. The file must include the randomly assigned team number (see your Discord team channel category name) and must not include the teams university or any other identifying information. If applicable, please include screenshots or any other supporting information in that same PDF as opposed to submitting several files unless specified otherwise.

k. Please note that the White Team will not see your comments and uploaded files in the Scoring Engine until you finalize your submission.
l. You will not be able to re-submit injects.

3. **Red Team Activity.** The activities performed by the Red Team have an impact on many of the scoring categories. It is imperative that Blue Teams work to prevent Red Team activities. The Red Team will have specific goals during the event (e.g., compromising a server, stealing data). All Red Team activities are meant to disrupt or misinform. At the conclusion of each competition day, the Red Team will rank each team from best to worst.

Calculating Scores

- Raw scores are used for the above scoring metrics, excluding the Red Team.
- Blue Teams will be assigned a rank for each scoring metric using standard competition ranking, which is a measurement scale that assigns values to objects based on their ranking with respect to one another. For example, a first-place finish in the service scoring metric warrants an ordinal score of 1, a second-place finish warrants an ordinal score of 2, and on. Same raw scores will have the same rank. For example, four teams with scores of 2000, 1750, 1750, and 1500, will be ranked 1, 2, 2, and 4 respectively. This process will be repeated for all the scoring metrics, excluding the Red Team.
- The ordinal scores from all the scoring metrics are then totaled for each Blue Team, yielding a *combined ordinal score*, which is used to rank the Blue Teams from first through last place. The winning Blue Team will be determined based on the lowest combined ordinal score obtained during the competition time.
- In the event of a tie, the team with the higher raw inject score will place better. If there's still a tie, the raw service score and then the Red Team ranking will be used as secondary and tertiary tie breakers respectively.

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Scenario & Infrastructure

Hulk Bulk Shipping

Hulk Bulk Shipping is a leading online retail and distribution company. Operating globally, the company offers a wide range of products and services to customers around the world from many third-party sellers.

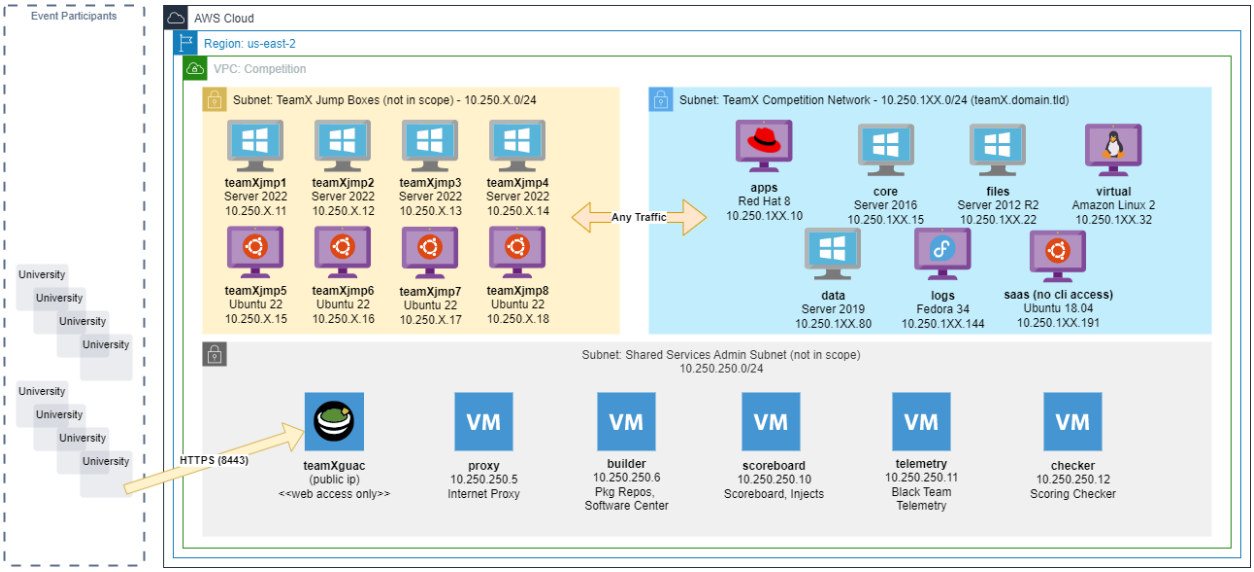
In addition to its e-commerce operations, "Hulk Bulk Shipping" also boasts an efficient and reliable delivery service. With a network of warehouses and fulfillment centers around the world, the company is able to get purchases to customers quickly and efficiently, no matter where they are located.

Due to a recent breach, the company underwent a major restructuring of its IT department, and a new IT team was brought in to replace the former team. The new IT team is tasked with securing and defending the company's network while also ensuring that business operations can continue smoothly.

Competition Topology

Each team will be responsible for managing and protecting the 7 in-scope virtual machines in their network. They are listed in the “TeamX Competition Network” in the diagram below.

The X’s in the IP addresses correspond to each team’s randomly assigned team number. You can find the number in Discord.



Scored Services

The in-scope virtual machines may contain one or more scored services that will be periodically checked by the scoring service. In addition to being up and accepting connections, the services must be functional and serve the intended business purpose.

Hostname	IP Address	Operating System	Description	Scored Services
apps	10.250.1XX.10	Red Hat 8	Web application server	SSH (22) HTTP (80) HTTP (8161)
core	10.250.1XX.15	Windows Server 2016	Domain controller	DNS (53) LDAP (389) SMB (445) WinRM (5985)
files	10.250.1XX.22	Windows Server 2012 R2	Shared file storage	SMB (445) NFS (2049) WinRM (5985)
virtual	10.250.1XX.32	Amazon Linux 2	Miscellaneous hosting	SSH (2222) HTTPS (5601) HTTP (8080) HTTP (8161)
data	10.250.1XX.80	Windows Server 2019	Database hosting	HTTPS (443) MySQL (3306) RDP (3389) PostgreSQL (5432)
logs	10.250.1XX.144	Fedora 34	SIEM	SSH (22) HTTP (9000) Elasticsearch (9200)
saas	10.250.1XX.191	Ubuntu 18.04	Git SaaS platform	HTTP (8080)

Credentials

Blue Teams will be able to log into the virtual machines and applications using the following default credentials. Pick the username specific to the operating system.

Username: **`root`** / **`Administrator`** / **`admin`**
Password: **`SuperChiapet23`**

Many of the systems will be domain-joined, so you may need to specify the domain when logging in: **`TEAMX\Administrator`** or **`Administrator@teamX.hulkbulkshipping.com`**

Scored Service Descriptions

Below you will find the descriptions of each of the scored service types and an overview of how they will be scored. The scored services are subject to change. Refer to the Scoring Engine during the competition for most up-to-date information.

Some of the services below require authentication. The team will be able to manually update credentials for specified users in the Scoring Engine. This allows teams to rotate credentials without failing the checks in the scoring system.

HTTP - Hypertext Transfer Protocol
A request for a specific web page will be made and the response will be compared to the expected result. The returned page must match the expected content for points to be awarded.

HTTPS - Hypertext Transfer Protocol Secure
A request for a specific web page will be made over SSL. Similarly to HTTP, the response will compared to the expected value.

RDP - Remote Desktop
A specified user will attempt to log in via RDP to the service. If a desktop appears, the check will be successful.

SMB - Server Message Block
A specified user will attempt to connect to and read a designated file from the remote host. This file will then be hashed and compared against the expected value.

DNS - Domain Name System
DNS lookups will be performed against the team's DNS server. Each successfully served request will be awarded points.

MySQL (Database)
A connection to the database will be made with a specified user and a query will be run. The output of the query will be compared to the expected stored value.

PostgreSQL (Database)
Similar to the MySQL check, a connection to the database will be made with a specified user and a query will be run.

FTP - File Transfer Protocol
A connection to the server will be made with a specified user, a file will be retrieved, and its contents will be checked against an expected value.

SSH - Secure Shell
A connection to the server will be made with a specified user, and commands will be executed as that user. The output of the commands and the ability to connect will be scored.

LDAP - Lightweight Directory Access Protocol
An authenticated query to the Active Directory LDAP service will be performed.

WinRM - Windows Remote Management
A WinRM session will be created with specified credentials and a command will be executed.

Elasticsearch
A record will be inserted using the Elasticsearch HTTP API and a request will be made to verify that the newly created record exists.

NFS - Network File System
The scoring script will connect to the NFS service and attempt to write to a file. It will then attempt to log in again and see if the file exists.

Initial Connection

There are two (2) separate systems that are used to provide the services and scoring necessary to meet the goals of the MACCDC.

System 1: AWS Jump Boxes

This is how teams access the competition network. Teams will access an Apache Guacamole Web interface in their browsers, which lets them connect over both RDP for GUI access to Windows jump hosts, as well as VNC to the Linux jump hosts.

IP addresses, usernames, and passwords for the Jump Hosts/Guacamole portal will be provided prior to the competition for connectivity testing via the private Discord channels for each team.

The connectivity testing period is tentatively scheduled for 2pm-6pm ET on Friday, February 3rd. Information will be sent to team's private Discord channels.

System 2: Scoreboard

This will only be accessible (via a browser) internally to the competition network.

Usernames and passwords for the Scoreboard will be provided prior to the competition via the private Discord channels for each team.

Qualifiers Logistics, Clarifications, and Additional Rules

1. For the qualifying round, teams are not allowed to configure firewall rules on any of the systems that block any inbound or outbound IP addresses or ranges. This includes the team's local network. Host based firewalls are allowed but only port blocking can be used.
2. Some competition machines may contain sensitive data or PII belonging to the fictitious company or its customers. This data may be necessary to complete service checks or injects and a leak of this data by the Red Team may also negatively impact the team's Red Team Activity rank. Teams are not forbidden from moving this data to other in-scope devices, but it may impact their ability to pass some service checks or complete some injects.
3. Please refer to the Scoring section above for more information about the new Black Team Agent. Neither the Blue nor the Red Teams are allowed to tamper with this service in any way.
4. Teams are allowed to have a shared Google Drive (or similar resource) for note taking and collaboration but only outside of the competition network.
5. You are not allowed to transfer files from outside the competition network (i.e. from your personal laptops, servers) into the competition virtual machines and vice versa.
6. Internet access from within the virtual machines will be limited during qualifiers. Participants will likely be able to download updates from the standard package repositories on their Linux systems, but other downloads will be restricted. Please submit requests for any tools, software, GitHub repositories, etc. that you might want to use during the competition here as issues: https://github.com/init6security/DownloadRequestList/issues.
    a. Explain why you want to use the tool and make sure it hasn't already been submitted by another team. Please limit the number of requests to under 15 per team. You may submit more requests, but we might not check them.
    b. Please refer to section 5.f. in the National CCDC rulebook for clarifications about requirements for tools written by team members.
    c. Requested and approved resources will be available for download from the competition network for all teams.
    d. There is no guarantee that your request will be approved.
    e. Please submit the requests by 7pm ET on Thursday, February 2nd. You may submit requests after that time, but there is no guarantee that they will be looked at.
7. You are allowed to restart your virtual machines as many times as you want with no point penalties (except points lost by your critical services being down while the machine is rebooting). Refer to the Scoring section for penalties if you need to completely reset a VM to its original state.
8. If you participated in previous MACCDC competitions, you may be familiar with incident response reports. These will not be collected or scored during the Qualifying Round.

Systems

1. Each team will start the competition with identically configured systems.
2. Teams should not assume any competition system is properly functioning, secure, or malware-free.
3. Throughout the competition, Gold and White Team members will occasionally need access to a team's systems for scoring, troubleshooting, etc. Teams must allow Gold and White Team member access when requested.
4. Network traffic generators may be used by competition organizers throughout the competition to generate traffic on each team's network. Traffic generators may generate typical user traffic as well as suspicious or potentially malicious traffic from random source IP addresses throughout the competition.
5. Teams are not permitted to alter the system names or IP address of their assigned systems unless directed by an inject or the Gold/Operations team; this may affect the results of the scoring mechanism.
6. The competition topology is subject to change.

Questions and Disputes

1. Team captains are encouraged to work with their remote site judge and White team staff to resolve any questions or disputes regarding the rules of the competition or scoring methods before the competition begins. Protests by any team will be presented by the Team Captain to the Regional Director as soon as possible. The Regional Director (in consultation with the Gold/Operations/White/Red teams) will be the final arbitrator for any protests or questions arising before, during, or after the competition and rulings by the competition officials are final.
2. In the event of an individual disqualification, that team member must leave the competition area immediately upon notification of disqualification and must not re-enter the competition area at any time. Disqualified individuals are also ineligible for individual awards or team trophies.
3. In the event of a team disqualification, the entire team must leave the competition area immediately upon notice of disqualification and is ineligible for any individual or team award.

Aftermath

Members of the MACCDC Gold, White, and Red Teams strive to make the MACCDC an enriching experience. All management and administrative teams are open to feedback and suggestions for improvement after the completion of the competition. This may include areas of concern or dissatisfaction.

Whether feedback is positive or negative, participants are forbidden from publishing, posting on the Internet, or publicly communicating details of the competition other than what is available at www.nationalccdc.org or maccdc.org. Institutions that fail to adhere to this rule may be refused participation in future competitions.

Institutions may publish, post on the Internet, or publicly communicate news stories of a general nature about the MACCDC, and may also enumerate participating teams and winners.

Errata

- 2/1/23
  - Updated participating schools
  - Updated SLA scoring section
  - Added a clarification to the BTA section
  - Added a note about Google Drive in logistics section
- 1/31/23
  - Added inject submission instructions and additional inject rules
  - Updated schedule
  - Added the list of scored services and scored service descriptions
  - Clarified IP/port blocking rules
  - Added deadline information to downloads requests section
  - Added connectivity testing timeline
- 1/30/23 10pm
  - Clarified “service tracking reports”
- 1/28/23 6:30pm
  - Fixed qualifier date from Feb 5th to Feb 4th and Zoom session from Feb 4th to Feb 3rd in the “Schedule” section