Tecnológico de Monterrey

Act 3.4 - Comprehensive BST activity (competence evidence)

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Programming of Data Structures and Fundamental Algorithms

(Gpo 613)

The importance of the IPs Addresses

IP address stands for “Internet Protocol address”. These are very important in the area of electronic devices and communication. Thanks to this we can have a verification of the device, even to a location close to where the user is using his device. This is why VPN services exist, which are used to protect your IP address when you are browsing through the web or any other platform. Protecting the IP address of your device is very important, as, for some hackers, knowing the IP address of a device can give them access to the platforms that the user has been accessing. This is mostly encountered in cybersecurity situations.

In many applications on the web, your IP address can be taken, which is why it is important to know a bit about cybersecurity and protect our IP addresses.

“The purpose of an IP address is to handle the connection between devices that send and receive information across a network. The IP address uniquely identifies every device on the internet; without one, there’s no way to contact them. IP addresses allow computing devices (such as PCs and tablets) to communicate with destinations like websites and streaming services, and they let websites know who is connecting.” (Avast, 26 Sep. 2022)

Platforms which have a login such as instagram, facebook, tik tok, netflix, among others, use your IP address of the device on which you are logged in in order to determine your location and provide you with better content.

In this project we can apply what we have learned to determine if there is an external server trying to access a platform such as those mentioned above.

Since we are looking to obtain the top 5 IPs with the most access attempts, we conclude that these IPs may be involved in some form of malicious software due to the error that is thrown to the device used to access an account.

How could you determine if a network is infected or not?

It is important that you protect your IP address. Malicious people can use it to download illegal content, where it would appear as if you had done it, spy on your web browsers, attack you directly, or even trace your home address.

Here are some tips on how to identify whether your server is compromised by malware or not.

- Your data is locked with malware, and you're getting ransom request messages demanding money to unlock it.
- Your computer is running more slowly than usual, this could be from malware slowing your computer performance significantly.
- Your computer programs are randomly crashing.
- You notice several fake antivirus messages in pop up windows on your screen.
- Your web browser has new toolbars names you don't recognize.
- Your internet searches are redirected to websites you aren't trying to reach.
- Your passwords to online accounts aren't working, or you are missing funds from your online banking account.
- You find new software unexpectedly installed on your computer.

(Inspired ELearning, 17 Mar. 2020)

Reflection

The main operation of the project is to use a BST data structure to access the data record in the .txt file available. This is to determine the IPs with the most accesses and to check if you have any suspicious activity.

We implement a Binary search tree using heaps. These to find the IP access frequency, the error thrown by the system and the port.

It was decided to make this search system using a doubly linked list, nodes, pointers, pointers to pointers and heaps.

The program is based on object-oriented programming, as this makes it much easier to reuse a function.

It uses a struct called IPRegistry, which is defined by the characteristics found in the IP address .txt file. Access frequency, error and ports. A map template is used to check the IPs that are found to have been repeated, and these are the ones that would have the highest access attempts. Each element has a key value and a mapped value. No two mapped values can have the same key values.

The program implements a search for IPs with more than 16,000 records. A counter is used to keep track of each repeated IP.The main advantage of this code is that it allows you to see the most frequently accessed IPs along with the error as to why the server could not be accessed, as well as the IP port. The importance of knowing the port is that, thanks to these, we can identify what type of device is being used to connect to the server.

Throughout the activity, several challenges were presented, such as the code execution time it took to search for the 5 IPs with the most accesses. In the end, thanks to the use of the binary search tree and heapsort, it was possible to reach a suitable implementation.

Conclusion

Thanks to this program we can identify hackers, malware and other things. Within the area of cybersecurity, great importance is given to this type of situation. As mentioned above, knowing the IPs with the most accesses, their error, why they could not establish a connection with the server and the port, is of vital importance in order to prevent any type of cyber attack.

APA References

- **Inspired eLearning. "How to Tell If Your Router Is Infected & What to Do about It." Inspired ELearning, 17 Mar. 2020, retrieved from https://inspiredelearning.com/blog/router-is-infected-what-to-do/.**
- **"Map in C++ Standard Template Library (STL)." GeeksforGeeks, 25 July 2022, retrieved from https://www.geeksforgeeks.org/map-associative-containers-the-c-standard-template-library-stl/.**
- **Patrizio, Andy. What Is an IP Address?, Avast, 26 Sep. 2022, retrieved from https://www.avast.com/c-what-is-an-ip-address.**