Saint Columban College
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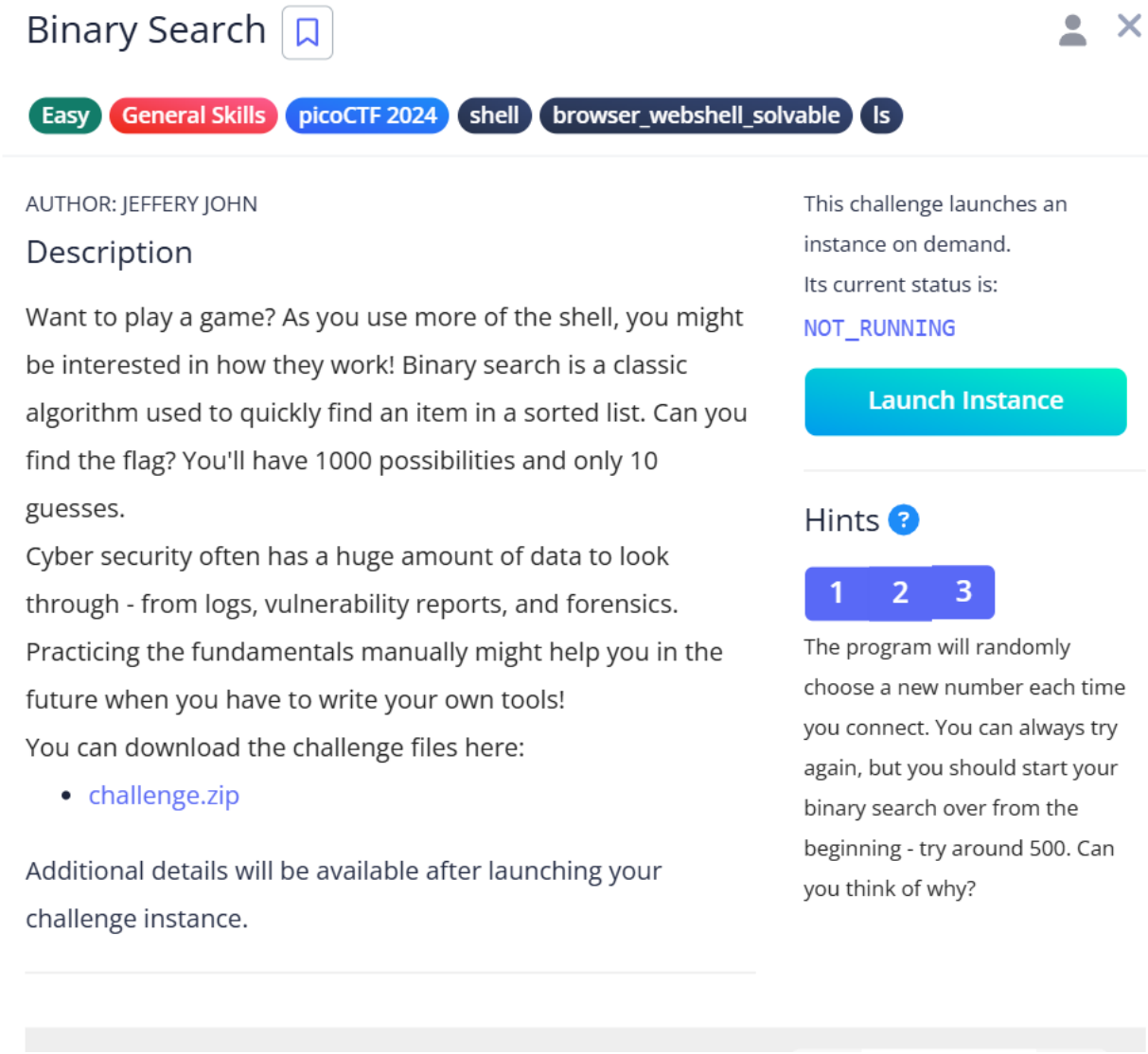
Binary Search



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Challenge: Binary Search

Category: General Skills

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I. Objective

The objective of this challenge was to obtain the hidden flag by correctly guessing a number generated by a remote server using the **binary search technique** within a limited number of attempts.

II. Background

Binary search is a classic algorithm used to efficiently find a value within a **sorted range** by repeatedly dividing the search space in half. Instead of guessing numbers randomly, binary search uses feedback such as **"higher"** or **"lower"** to eliminate half of the remaining possibilities after each guess.

In this challenge, the server generated a number between **1 and 1000** and allowed only **10 guesses**, which strongly implies that binary search is the intended solution.

III. Tool Used

- **Oracle VirtualBox (Kali Linux)** – Used as the Linux environment
- **Linux Terminal** – Used to execute decoding commands
- **ssh (Secure Shell)** – Used to securely connect to the challenge instance

IV. Methodology

1. Opened Oracle VirtualBox and launched Kali Linux (the picoCTF webshell may also be used).
2. Connected to the remote challenge instance using SSH:

   ssh -p <port> <username>@<hostname>

3. Accepted the SSH fingerprint by typing yes.
4. Entered the provided password (note: passwords do not display while typing for security reasons).

5. Used the **binary search strategy** by guessing the midpoint of the current range.
6. Adjusted guesses based on the server's feedback ("Higher" or "Lower").
7. Repeated the process until the correct number was found.
8. The flag was displayed after successfully guessing the number.

V. Result

picoCTF{g00d_gu355_de9570b0}

VI. Explanation

This challenge demonstrates how **binary search works in practice**. At the start, there are **1000 possible numbers**. Each guess divides the possible range into **two halves**:

- If the server replies **"Lower"**, all higher numbers are discarded.
- If the server replies **"Higher"**, all lower numbers are discarded.

By always guessing the **middle number** of the remaining range, the search space is reduced by half every time. Because binary search reduces possibilities exponentially, it guarantees finding the correct number within **10 guesses**, which matches the challenge limit.

This method is far more efficient than random guessing and is commonly used in computing and cybersecurity when searching large datasets quickly.

VII. Conclusion

The Binary Search challenge reinforces the importance of algorithmic thinking in cybersecurity. By applying the binary search technique, the correct number was found efficiently within the allowed attempts, resulting in the successful retrieval of the flag.

Understanding binary search is valuable not only for programming but also for real-world cybersecurity tasks such as log analysis, vulnerability testing, and data searching.

— The Analyst: Hyposelenia