



Binhexa

binhexa

Easy

General Skills

picoCTF 2024

browser_webshell_solvable

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Description

How well can you perform basic binary operations?
Start searching for the flag here `nc titan.picoctf.net 62862`

This challenge launches an instance on demand.
Its current status is: **RUNNING**
Instance Time Remaining: **28:53**

Restart Instance

Hints ?

(None)

24,327 users solved

80% Liked

picoCTF{FLAG}

Submit Flag

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Challenge: Binhexa

Category: General Skills

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I. Objective

The objective of this challenge is to correctly perform a series of **binary operations** on two given binary numbers and convert the final result into **hexadecimal** in order to obtain the flag.

II. Background

Binary challenges in Capture The Flag (CTF) competitions are designed to test a participant's understanding of **binary arithmetic, bitwise operations, and number base conversions**.

Common binary operations include:

- **Left shift (<<) and right shift (>>)**
- **Bitwise operators** such as AND (&), OR (|), and XOR (^)
- **Arithmetic operators** such as addition (+), subtraction (-), and multiplication (*)

Some operations require comparing each bit directly, while others require converting binary values to **decimal**, performing the operation, and converting the result back to binary. The final step often involves converting a binary value into **hexadecimal**, which is widely used in computing and cybersecurity.

This challenge was accessed through a **remote service using netcat (nc)**, where the binary values and operations are dynamically generated for each instance.

III. Tool Used

- **Oracle VirtualBox (Kali Linux)** – Used as the Linux environment
- **Linux Terminal** – Used to interact with the challenge
- **netcat (nc)** – Used to connect to the remote challenge server
- **Online Binary to Decimal Converter** – Used to verify binary-to-decimal conversions (<https://www.rapidtables.com/convert/number/ascii-hex-bin-dec-converter.html>)



- **Online Binary Calculator** – Used to validate arithmetic operations
(<https://www.calculator.net/binary-calculator.html>)

IV. Methodology

1. Launched the challenge instance on the CTF platform.
2. Opened Kali Linux using Oracle VirtualBox.
3. Connected to the remote challenge using the provided hostname and port via nc.

```
nc titan.picocft.net 62862

Welcome to the Binary Challenge!
Your task is to perform the unique operations in the given order and find the final result in hexadecimal that yields the flag.

Binary Number 1: 11110111
Binary Number 2: 01110000
```

4. Read and analyzed each binary operation presented by the server.
5. Solved Question 1 by applying a left shift operation.

```
Question 1/6:
Operation 1: '<<'
Perform a left shift of Binary Number 1 by 1 bits.
Enter the binary result: 111101110
Correct!
```

6. Solved Question 2 using a bitwise operator.

```
Question 2/6:
Operation 2: '&'
Perform the operation on Binary Number 1&2.
Enter the binary result: 01110000
Correct!
```

7. Solved Question 3 using an arithmetic operation.



```
Question 3/6:  
Operation 3: '+'  
Perform the operation on Binary Number 162.  
Enter the binary result: 0101100111  
Correct!
```

8. Solved Question 4 by applying a right shift operation.

```
Question 4/6:  
Operation 4: '>>'  
Perform a right shift of Binary Number 2 by 1 bits .  
Enter the binary result: 00111000  
Correct!
```

9. Solved Question 5 using multiplication or addition as required.

```
Question 5/6:  
Operation 5: '*'  
Perform the operation on Binary Number 162.  
Enter the binary result: 0110110000010000  
Correct!
```

10. Solved Question 6 using a bitwise OR operation.

```
Question 6/6:  
Operation 6: '|'  
Perform the operation on Binary Number 162.  
Enter the binary result: 11110111  
Correct!
```

11. Converted the final binary result into hexadecimal.

Hex (bytes)
<input type="text" value="F7"/>
Binary (bytes)
<input type="text" value="11110111"/>

12. Submitted the hexadecimal value to retrieve the flag.



```
Question 6/6:  
Operation 6: '|'  
Perform the operation on Binary Number 162.  
Enter the binary result: 11110111  
Correct!  
  
Enter the results of the last operation in hexadecimal: F7  
Correct answer!
```

V. Result

picoCTF{b1tw^3se_0p3eR@tI0n_su33essFuL_d6f8047e}

```
Enter the results of the last operation in hexadecimal: F7  
Correct answer!  
The flag is: picoCTF{b1tw^3se_0p3eR@tI0n_su33essFuL_6ab1ad84}
```

VI. Explanation

The challenge provided two binary values, referred to as **Binary Number 1** and **Binary Number 2**, and required solving six operations sequentially.

Left Shift (<<)

A left shift moves all bits to the left and appends a 0 on the right. In this challenge, **bits were not truncated**, meaning the binary length increased after the shift.

Bitwise Operations (&, |, ^)

Bitwise operators compare each corresponding bit of the two binary numbers:

- **AND (&)** outputs 1 only if both bits are 1
- **OR (|)** outputs 1 if at least one bit is 1
- **XOR (^)** outputs 1 if the bits are different

Arithmetic Operations (+, *)



Arithmetic operations required converting binary numbers into **decimal**, performing the operation, and converting the result back into binary.

Right Shift (>>)

A right shift moves all bits to the right and inserts a 0 on the left. Bits shifted out on the right are discarded.

Final Conversion

After completing all six operations correctly, the final binary result was converted into **hexadecimal**, which was submitted to obtain the flag.

It is important to note that both the binary values and operations are **randomized per instance**, meaning results may differ for each participant.

VII. Conclusion

This challenge strengthened fundamental skills in **binary manipulation, bitwise logic, and number base conversion**, which are essential in cybersecurity and CTF competitions. It also reinforced the importance of carefully reading problem constraints, particularly regarding **bit-width handling during shift operations**. Mastering these foundational concepts is crucial for solving more advanced challenges in future CTF events.

— **The Analyst: Hyposelenia**