Java Operators

Bitwise Operators: &, |, >>, and <<<

Bangobandhu Sheikh Mujibur Rahman Science and Technology University

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Heads off to...

- Preamble
- 2 Deep Dive
- 3 In the end





Start-UP

Name: Md. Kazi Iqbal Hossen ID: 18ICTCSE065 Department of CSE, BSMRSTU



This presentation is created and animated using LATEX-Beamer class. Please keep it in full-screen view mode to take a better experience.

Wanna explore beamer source code? click to:

Link 1: **Ubuntu pastebin**

Link 2: **Github**(recommended)

Or, scan(clickable in pdf) the following quick response code:









Basic Beyond

Info

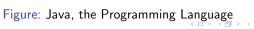
Java store values in memory as a binary string, except char type.

That's why Java provides bitwise operators to operate on them when we are regardless at focusing on original data.











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Java's Bitwise Operator

Tabular Illustration

| Bitwise Operators | | | | |
|-------------------|----------------------|--|--|--|
| Operators | Operation | | | |
| ~ | Unary NOT | | | |
| & | AND | | | |
| | OR | | | |
| \wedge | XOR | | | |
| >> | Right Shift | | | |
| >>> | Unsigned Right Shift | | | |
| << | Left Shift | | | |





Unary NOT



Also known as bitwise complement.

Inverts all the bits that is, if 0 then 1 otherwise 0.

| Α | Ā |
|---|---|
| 0 | 1 |
| 1 | 0 |

Truth Table





Unary NOT

An example

Example

 $A \to 1000 \ 1111$

 $\bar{A} \rightarrow 0111 \ 0000$





Bitwise AND



Operates bool logical AND operation on every bit of the given numbers.

| Α | В | A & B |
|---|---|-------|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

Truth Table





Bitwise AND

$$\begin{array}{cccc}
42 \to & 0010 \ 1010 \\
15 \to & 0000 \ 1111 \\
\hline
42 \& 15 = 10 \to & 0000 \ 1010
\end{array}$$





Bitwise OR

Bitwise OR: |

Combine bits such that if at least one bit is 1 then the resultant bit become 1.

| Α | В | A B |
|---|---|-------|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

Truth Table





Bitwise OR





Bitwise XOR

Bitwise XOR: ∧

Combines bits such that when exactly one bit is 1 then the result is 1 otherwise 0.

- There is a useful property for programmers, if the second bit is 1 then the first bit is inverted.
- Or, if the second bit is 0 then the first bit remains same.

| Α | В | $A \wedge B$ |
|---|---|--------------|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

Truth Table



Bitwise XOR

$$\begin{array}{ccc}
42 \to & 0010 \ 1010 \\
15 \to & 0000 \ 1111 \\
\hline
42 \land 15 = 37 \to & 0010 \ 0101
\end{array}$$





Right Shift

Right Shift: >>

Shifts all the bits in a value to the right a specified number of times.

First of all the value will be promoted to be int and then shifted by the specified number of times.

Right shift is an efficient way for programmers to dividing the number by 2 or multiplying it by 2^{-n} .





Right Shift





Left Shift



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Left Shift





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