Java Bugs and Fun Facts

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Java Bugs and Fun Facts
STRING
Superdry

Substring

```
@Benchmark
public String parseParam() {
    return param.substring(1);
}
```

jdk1.7.0_05	?	ns/op
jdk1.8.0_45	?	ns/op

VOTE
http://epa.ms/M1

Substring

```
@Benchmark
public String parseParam() {
    return param.substring(1);
}
```

jdk1.7.0_05	6.939 ± 0.279 ns/op
jdk1.8.0_45	38.137 ± 0.894 ns/op

Substring

```
// Package private constructor which shares value array for speed.
String(int offset, int count, char value[]) {
    this.value = value;
    this.offset = offset;
    this.count = count;
}
```

```
public String(char value[], int offset, int count) {
    // [...] Parameter checks
    this.value = Arrays.copyOfRange(value, offset, offset+count);
}
```

Hashcode

```
// Length: 1
String shortString = "1";                                   ?  ns/op
// Length: 10
String averageString = "1234567890";                        ?  ns/op
// Length: 100
String veryLongString = "1234567890...";                    ?  ns/op
// Length: 100
String veryLongRandomString = "JSwkCyZ3W7IWm6tzJ...";       ?  ns/op
// Length: 27
String someString = "electroanalytic exercisable";          ?  ns/op

@Benchmark
public int shortString() {
    return shortString.hashCode();
}
...
```

VOTE
http://epa.ms/M2

Hashcode

```
// Length: 1
String shortString = "1";                                   2.669 ± 0.022  ns/op
// Length: 10
String averageString = "1234567890";                        2.682 ± 0.019  ns/op
// Length: 100
String veryLongString = "1234567890...";                    2.658 ± 0.018  ns/op
// Length: 100
String veryLongRandomString = "JSwkCyZ3W7IWm6tzJ...";       2.646 ± 0.015  ns/op
// Length: 27
String someString = "electroanalytic exercisable";          23.723 ± 0.249  ns/op

@Benchmark
public int shortString() {
    return shortString.hashCode();
}
...
```

Hashcode

Spot the BUG!

```
/** Cache the hash code for the string */
private int hash; // Default to 0

public int hashCode() {
    int h = hash;
    if (h == 0 && value.length > 0) {
        char val[] = value;

        for (int i = 0; i < value.length; i++) {
            h = 31 * h + val[i];
        }
        hash = h;
    }
    return h;
}
```

Implementation SHOULD NOT impact API!

```
/**
 * Returns a hash code for this string. The hash code for a
 * <code>String</code> object is computed as
 * <blockquote><pre>
 * s[0]*31^(n-1) + s[1]*31^(n-2) + ... + s[n-1]
 * </pre></blockquote>
 * using <code>int</code> arithmetic, where <code>s[i]</code> is the
 * <i>i</i>th character of the string, <code>n</code> is the length of
 * the string, and <code>^</code> indicates exponentiation.
 * (The hash value of the empty string is zero.)
 *
 * @return  a hash code value for this object.
 */
public int hashCode() { ... }
```


Java Bugs and Fun Facts
COLLECTIONS
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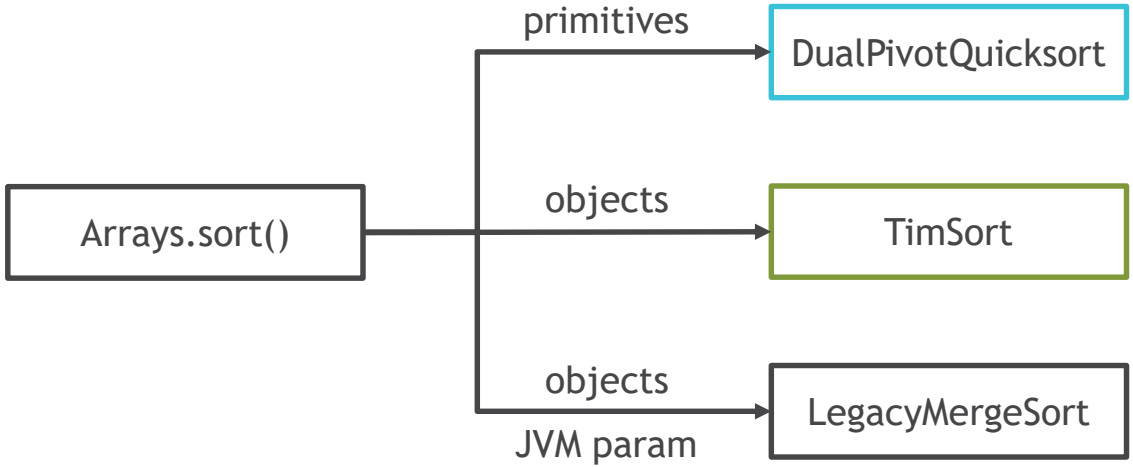
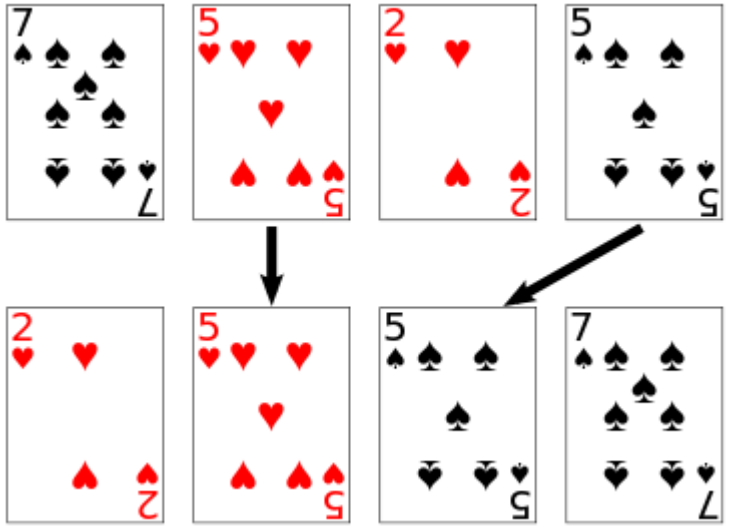
Sort

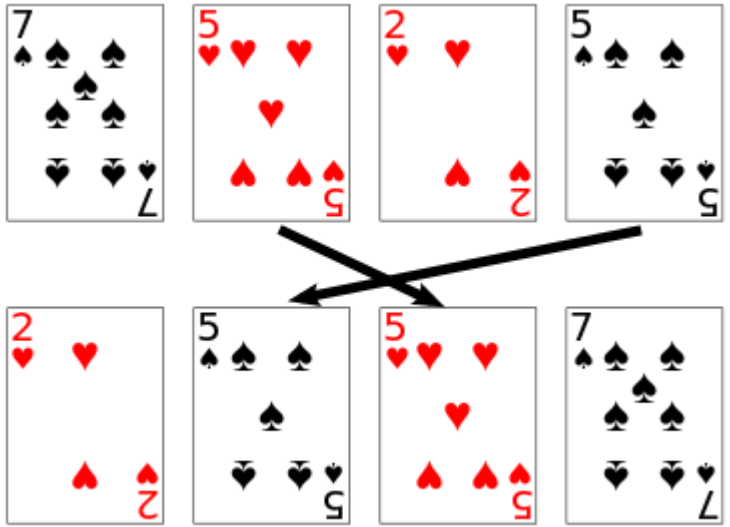

primitives
DualPivotQuicksort
Arrays.sort()
objects
TimSort
objects
JVM param
LegacyMergeSort

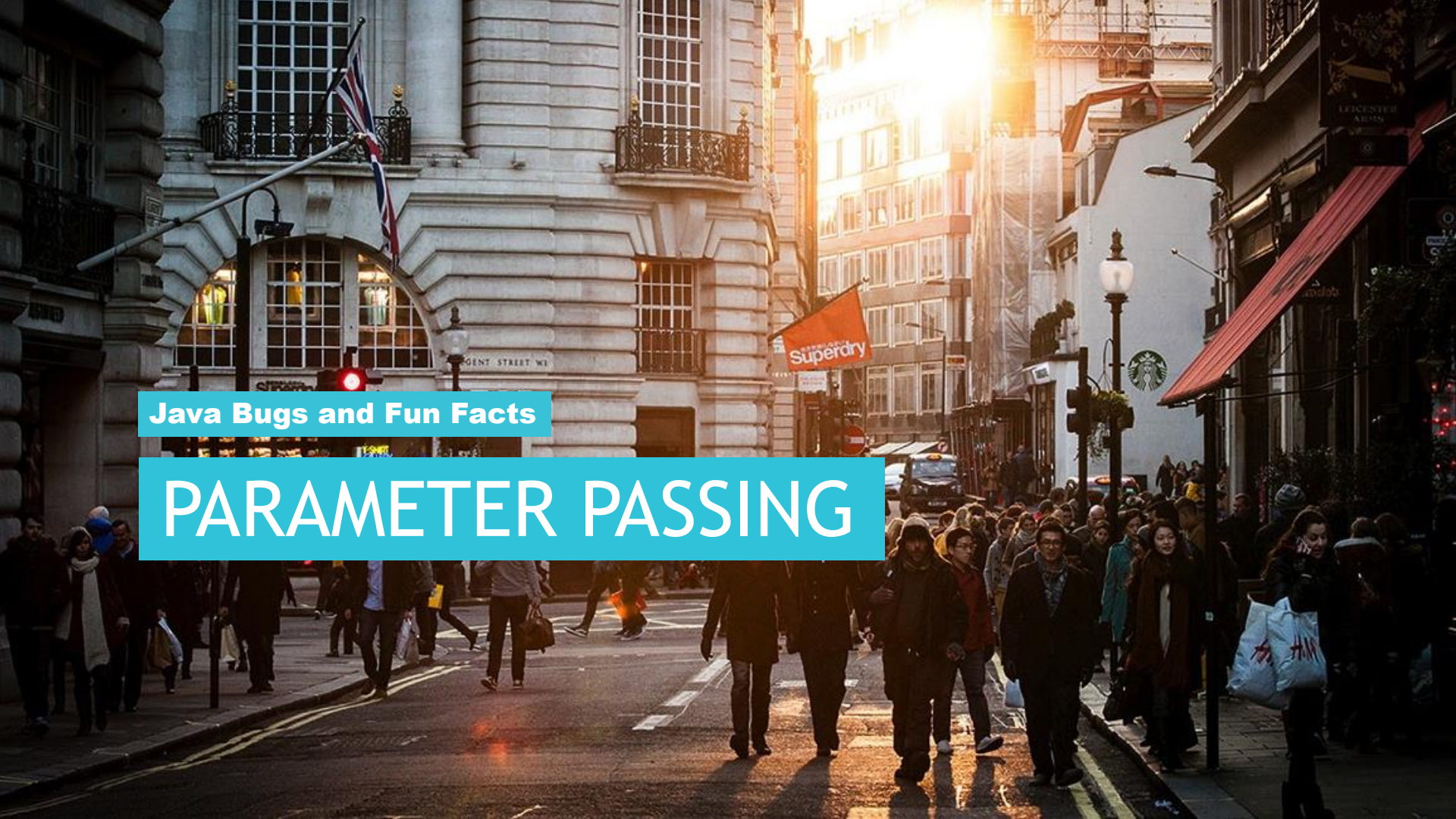
Stable sort

Stable



Not stable





Java Bugs and Fun Facts

PARAMETER PASSING

Parameter passing

```
public void inc1(int number) {
    number++;
}

public void inc2(Integer number) {
    number++;
}
```

```
// Test code
int n = 0;
inc1(n);
System.out.println(n);
```

VOTE
http://epa.ms/M3

Parameter passing

```
public void inc1(final int number) {
    number++;
}

public void inc2(final Integer number) {
    number++;
}
```

```
// Test code
int n = 0;
inc1(n);
System.out.println(n);
```

Parameter passing

```
public void inc1(Date date) {
     date = new Date(date.getTime() + DAY);
}

public void inc2(Date date) {
     date.setTime(date.getTime() + DAY);
}
```

```
// Test code
Date date = new Date();
inc1(date);
System.out.println(date);
```

VOTE
http://epa.ms/M4

Parameter passing

```
public void inc1(final Date date) {
     date = new Date(date.getTime() + DAY);
}

public void inc2(final Date date) {
     date.setTime(date.getTime() + DAY);
}
```

Works, but…

```
// Test code
Date date = new Date();
inc1(date);
System.out.println(date);
```


Java Bugs and Fun Facts
NUMBERS
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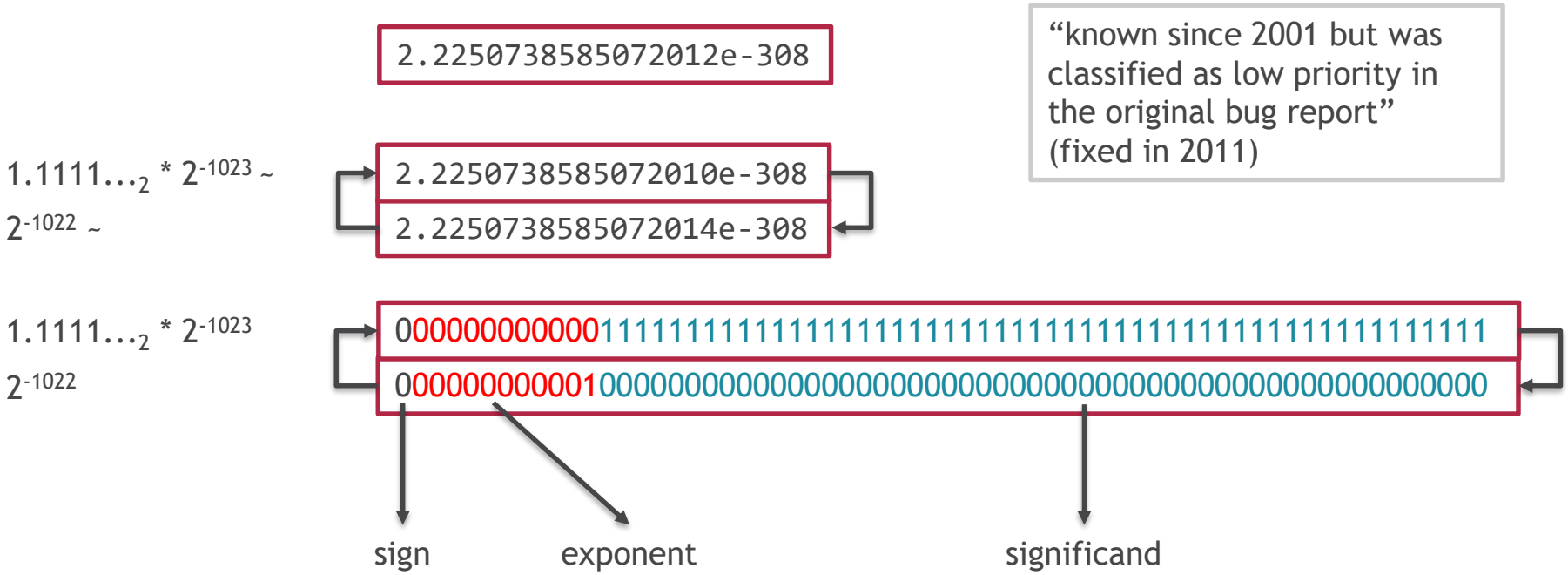
The magic number (CVE-2010-4476)

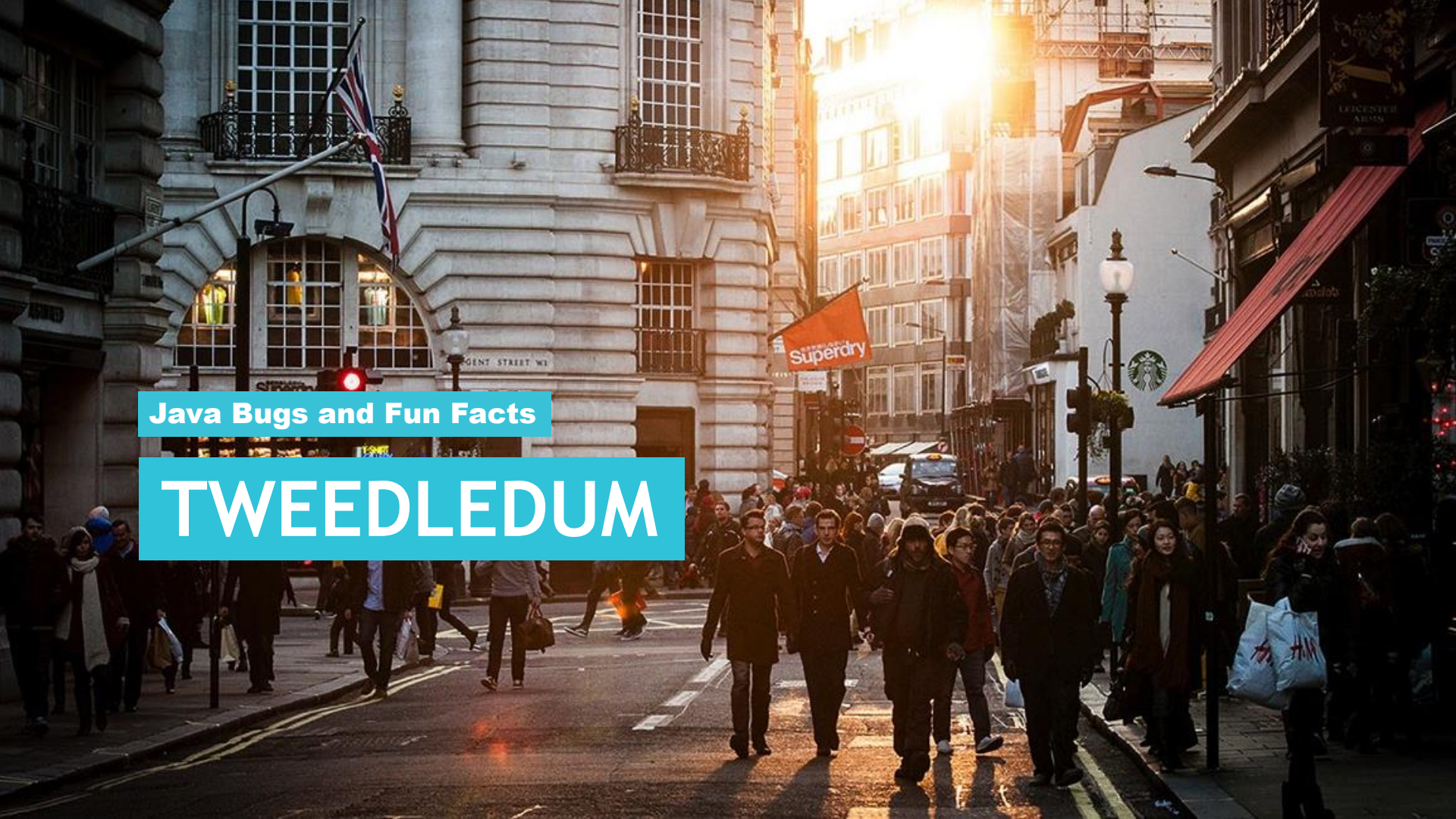


"known since 2001 but was classified as low priority in the original bug report" (fixed in 2011)

The magic number

```
// difference is non-trivial.
// could scale addend by ratio of difference to
// halfUlp here, if we bothered to compute that difference.
// Most of the time ( I hope ) it is about 1 anyway.
dValue += ulp( dValue, overvalue );
if ( dValue == 0.0 || dValue == Double.POSITIVE_INFINITY )
     break correctionLoop; // oops. Fell off end of range.
continue; // try again.
```

sun.misc.FloatingDecimal, JDK 6 Update 23
Excerpt from a very long method (348 lines)


Java Bugs and Fun Facts
TWEEDLEDUM
Superdry

Tweedledum

- Provide declarations for the variables **x** and **i** such that
  - Correct: `x = x + i`
  - Compile error: `x += i`

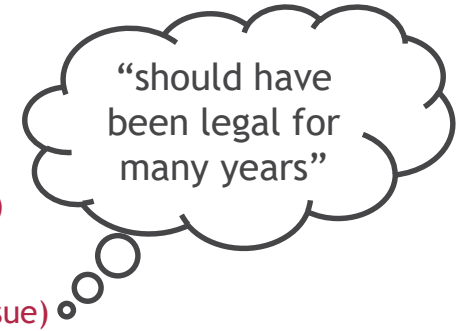
Tweedledum

- Provide declarations for the variables **x** and **i** such that
  - Correct: `x = x + i`
  - Compile error: `x += i`

Solution (1.4.2 <= Java version < 7)

```
Object x = "Hello ";
String i = "Java!";
```

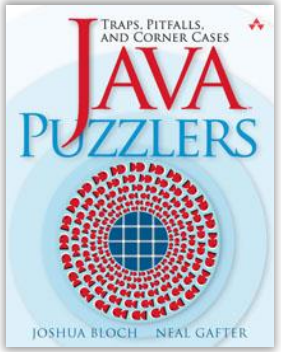
- **History**
  - 2002-09-02, JDK-4642850 : javac allows Object += String (Fixed)
  - 2008-04-10, JDK-6686855 : Section 15.26.2 in JLS 3 incorrectly allows... (Not an issue)
  - 2011-05-18, JDK-4741726 : allow Object += String (Fixed)
  - 2011-06-30, JDK-7058838 : Changed behavior of compound assignment (+=) (Not an issue)



Further reading

- *Java Puzzlers: Traps, Pitfalls, and Corner Cases*

  By Joshua Bloch and Neal Gafter



- Effective Java

  By Joshua Bloch

- java.lang.String Catechism [presentation]

  By Aleksey Shipilëv