Audit - Rules - Possible Errors

Description

This group contains audit rules that look for places where the code might contain errors.

Rules:

- Accidental Concatenation
- Array Is Stored Without Copying
- Assignment In Condition
- Assignment to Non-final Static
- Avoid Comparing Classes By String Names
- Avoid Future Keywords
- Avoid null Return Values
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Details

Accidental Concatenation

Summary
Two numbers concatenated without any characters in between is probably an error.

Description
This audit rule finds places where two or more numbers are being concatenated without intervening strings or characters. This is usually a mistake caused by forgetting to parenthesize the sub-expression.

Example
The addition of the two integers in the code below would be flagged as a violation:

```
public String getSummary(int passCount, int failCount) {
    return "Of the " + passCount + failCount + " students, "
        + passCount + " passed and " + failCount + " failed.";
}
```

Array Is Stored Without Copying

Summary
Storing of arrays without copying should not be used.

Description
This audit rule looks for places where arrays are stored without copying.

Security Implications
If constructors and methods receive and store arrays without copying, these arrays could be unpredictably changed from outside of the class.

Example

The following declaration of the `setArray` method will be marked as a violation because it does not copy its parameter:

```
private String[] array;
....
public void setArray( String[] newArray){
        this.array = newArray;
}
```

Assignment In Condition

Summary
The assignment operator should never be used in a condition.

Description
This audit rule finds places in the code where an assignment operator is used within a condition associated with an if, for, while or do statement. Such uses are often caused by mistyping a single equal (=) where a double equal (==) was intended.

Example

```
if (a = 0) {
    ...
}
```

Assignment to Non-final Static

Summary

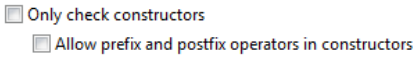
Static fields should only be changed in static methods.

Description

Assignments to a static field in a non-static context are usually not intended, and therefore usually represent an error.

Example

```
public class Foo {
    static int x = 2;
    public doSomething(int y) {
        x = y;
    }
}
```



Avoid Comparing Classes By String Names

Summary

String comparisons should not occur with the output from Class.getName()

Description

This audit rule looks for places where a class name is compared using the methods String.equals or String.equalsIgnoreCase, or the == or != operators.

Specifically, this audit rule flags the following patterns:

```
[class].getName().equals(*)
*.equals([class].getName())
[class].getName().equalsIgnoreCase(*)
*.equalsIgnoreCase([class].getName())
[class].getName() == *
* == [class].getName()
[class].getName() != *
* != [class].getName()
```

Where [class] is any instance of `java.lang.Class`.

Security Implications

By not making comparisons in this way, code is prevented from malicious users creating a class with the same name in order to gain access to blocks of code not intended by the programmer.

Example

The following method invocation of equals would be flagged a violation:

```
if ("SomeClassName".equals(class.getName())) ...
```

Avoid Future Keywords

Summary

Avoid using names that conflict with future keywords.

Description

Words that will be keywords in later versions of Java should not be used as an identifier. Otherwise, you will have to rewrite the code in order to migrate.

Example

Any variable, method, or type named "assert" or "enum" will be flagged.

Avoid null Return Values

Summary

Return values should not be null.

Description

This audit rule finds places where null is returned rather than array types or simple types.

Example

The return statement in the following method would be flagged as a violation:

```
public int[] getRowSums()
{
    if (table == null) {
        return null;
    }
    ...
}
```

Beware of URL equals() and hashCode()

Summary

Be careful when and how you use the `equals()` and `hashCode()` methods of the `URL` class.

Description

Both the `equals()` and `hashCode()` methods of the `URL` class resolve the domain name using the Internet. This operation can cause unexpected performance problems. Also, the `hashCode()` method takes the resolved IP address into account when generating the hash code. This can cause serious problems since many web sites use dynamic DNS. It is possible to store a `URL` in a hashed collection, and later be unable to retrieve it if the `URL` resolves to a different IP address.

Because of these implementation problems, it is a good idea to convert `URL`s to `URI`s before storing them in collections, or using their `equals()` or `hashCode()` methods. This can be done easily using `URL`'s `toURI()` method, and reversed using `URI`'s `toURL()` method.

This rule finds places where `equals()` or `hashCode()` are explicitly invoked on `URL` objects and places where URL objects are used in hashed Collections classes.

Example

The following would be flagged as a violation:

```
URL aUrl = new URL("http://address.com");
Set aSet = new HashSet();
aSet.add(aUrl);
```

Check Type In Equals

Summary

Implementations of equals() should check the type of the parameter.

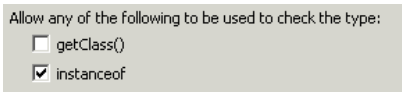
Description

This audit rule finds implementations of the method equals() that do not check the type of the parameter. The rule can be configured for how the type of the parameter should be checked.

Example

The following declaration of the equals() method would be flagged because the type of the argument is not checked:

```
public boolean equals(Object other)
{
    return getName().equals((Employee) other).getName());
}
```




```
@Override
public boolean equals(Object obj) {
 if (! (obj instanceof Employee))
  return false;
 Employee other = (Employee) obj;
 ...
}
```

Close In Finally

Summary

The method close() should be invoked inside a finally block.

Description

This rule finds places where the method close() is invoked outside of a finally block.

Example

The following invocation would be flagged as a violation because it occurs outside of a finally block:

```
public void readFile(FileReader reader)
{
    ...
    reader.close();
}
```

```
 public void readFile(BufferedReader reader)
throws IOException {
  try {
   ...
  } finally {
   if (reader != null) {
    reader.close();
   }
  }
 }
```

Close Where Created

Summary

Streams, readers, writers and sockets should be closed in the method where they are created.

Description

Instances of subclasses of java.io.InputStream, java.io.OutputStream, java.io.Reader, java.io.Writer, and java.net.Socket should be closed in the same method in which they are created in order to avoid errors caused when they are not closed at all.

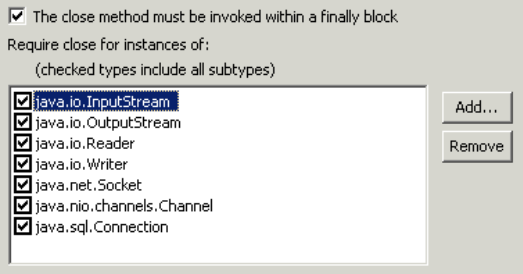
Example

The creation of a reader in the following method would be flagged as a violation because the reader is not closed:

```
public void readFile(String filePath)
{
    FileReader reader;

    reader = new FileReader(new File(filePath));
    readFile(reader);
}
```

```
public void readFile(String filePath) throws IOException {
 BufferedReader reader = null;
 try {
  reader = new BufferedReader(new FileReader(filePath));
 } catch (FileNotFoundException fnfe) {
  err.println("can't found the '" + filePath + "' file.");
 } finally {
  if (reader != null) {
   reader.close();
  }
 }
}
```



Comparison Of Constants

Summary

Constants should not be directly compared.

Description

Comparisons of two constant values waste processor cycles.

Example

Given the following declarations:

```
static final int ZERO = 0;
static final int ONE = 1;
```

The following condition would be flagged:

```
if (ZERO != ONE) {
```

Comparison Of Short And Char

Summary

Values of type short and char should not be directly compared.

Description

Comparisons between short and char values are performed by widening both to the type int and then performing the comparison. However, because shorts are signed and chars are unsigned, this can produce unintended results.

Example

The following would be flagged:

```
short s;
char c;
if (s == c) ...
```

Constant Conditional Expression

Summary

Conditional expressions should usually not be constant valued.

Description

This audit rule looks for conditional expressions in if, do, for, and while statements whose value is a compile-time constant. Because the value of such conditions cannot change, either the conditional code will never execute or will always execute (and in the case of a loop, the loop will never terminate).

Example

The expression in the following code would be flagged as a violation:

```
if (false) {
    thisWillNeverBeExecuted();
}
```

Constructors Only Invoke Final Methods

Summary

Constructors should only invoke final methods on the object being constructed.

Description

Subclasses can override non-final methods. Invoking them from a constructor can cause errors because the object is not in a valid state.

Example

The constructor in the following class would be flagged as a violation:

```
public class Point
{
    ...
    public Point()
    {
        x = initialX();
        y = initialY();
    }
    protected int initialX()
    {
        return 0;
    }
    ...
}
```

Dangling Else

Summary

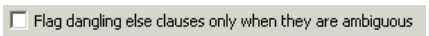
Use blocks to prevent dangling else clauses.

Description

This audit rule finds places in the code where else clauses are not preceded by a block because these can lead to dangling else errors.

Example

```
if (a > 0)
    if (a > 100)
        b = a - 100;
else
    b = -a;
```




```
public static long parseLong(String s, long defaultValue) {
 try {
  long l = Long.parseLong(s, 10);
  return l;
 } catch (NumberFormatException nfe) {
  return defaultValue;
 }
}
```

Empty Catch Clause

Summary

Catch clauses should not be empty.

Description

This rule finds places where an exception is caught and nothing is done. It can be configured to allow the existence of a comment to substitute for actual Java code.

Example

```
try {
    ...
} catch (Exception exception) {
}
```

Empty Class

Summary

Empty classes should not be declared.

Description

This audit rule checks for class declarations that do not include any members (fields, methods, or inner classes). Such classes usually occur if either the implementation was not finished or if the class was being used as a marker. In the latter case the class should be replaced by an interface.

Example

The following class definition would be flagged as being a violation:

```
public class EmptyClass
{
}
```

Empty Do Statement

Summary

Do statements should not be empty.

Description

This rule finds do statements whose body is empty.

Example

```
do {
} while(someCondition());
```

Empty Enhanced For Statement

Summary

The body of an enhanced for loop should never be empty.

Description

This audit rule finds enhanced for loops whose body is empty.

Example

```
for (int count : counts) {
}
```

Empty Finalize Method

Summary

The body of a finalize method should never be empty.

Description

This audit rule finds finalize methods whose body is empty.

Example

```
protected void finalize()
{
}
```

Empty Finally Clause

Summary

Finally clauses should never be empty.

Description

This audit rule finds finally clauses whose block is empty.

Example

```
try {
    ...
} finally {
}
```

Description

This set of audit rules checks the value of expressions for certain conditions. It detects constant and zero values, divide-by-zero, and others.

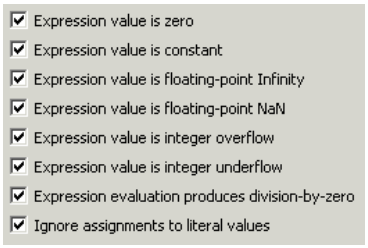
Example

The following expression would be flagged as a violation because it always produces the same value:

```
int secondsPerDay = 24 * 60 * 60;
```

The following expression would be flagged as a violation because it will always cause a divide by zero exception:

```
return 23 / 0;
```



Field Might Have Null Value

Summary

You should check fields used in methods beacuse they might have `null` value.

Description

This audit rule looks for references to fields whose value can be `null` where the value of the field is not checked before being dereferenced.

Security Implications

Use checks on a null pointer because `NullPointerException` might be thrown.

Example

The following usage of the field `date` will be marked as a violation beacuse it is not checked:

```
public class TestClass {
    private Date date = null;
    public void badUsage() {
        String myStr = date.toString();
    }
}
```

```
private String content;

public String getContent() {
 if (content == null)
  content = "";
 return content;
}
```

Floating Point Use

Summary

Floating point values should not be used.

Description

This audit rule checks for uses of floating point values. It finds such uses as the declared type of variables, the return type of methods, literal values, references to floating point valued variables, and the invocation of methods that return floating point values. Floating point values should rarely be used because of the potential for rounding errors.

Example

The following declaration would be flagged as a violation:

```
private float accountBalance;
```

Handle Numeric Parsing Errors

Summary

Numeric parsing errors should be handled where they occur.

```
public static long parseLong(String s, long defaultValue) {
 try {
  long l = Long.parseLong(s, 10);
  return l;
 } catch (NumberFormatException nfe) {
  return defaultValue;
 }
}
```

Description

This audit rule finds invocations of methods that parse numeric values from Strings (and hence can throw a NumberFormatException) where the exception is not handled (caught) in the same scope.

Example

The following invocation of parseInt would be flagged because it is not wrapped in a try statement that catches NumberFormatException:

```
int value = Integer.parseInt("42");
```

Improper calculation of array hashCode

参考Arrays.hashCode(...)系列方法实现

Summary

Because the `hashCode()` method of an array returns the identityhashCode, this method should not be used to generate hash codes for arrays.

Description

This audit rule looks for invocations of `hashCode()` on arrays, as well as common functions that will invoke `hashCode()` on an array.

Example

The following would be flagged as a violation:

```
new Person[] {
    new Person("Alice"),
    new Person("Bob"),
    new Person("Charlie")
}.hashCode();
```

Improper conversion of Array to String

参考Arrays.toString(...)系列方法实现

Summary

Because the `toString()` method of an array does not generate useful information, some functions that accept object parameters will display useless results when an array is passed to them.

Description

This audit rule looks for invocations of `toString()` on arrays, as well as common functions that will convert an array to a String using the `toString()` method. `toString()` does not return the contents of the array in a useful format, instead, it generates a string similar to `[C@16f0472`.

Example

The following would be flagged as a violation:

```
System.out.println(new Person[] {
    new Person("Alice"),
    new Person("Bob"),
    new Person("Charlie")
});
```

```
long[] longArray = { 3L, 7L, 10L };
out.println(Arrays.toString(longArray));
```

Incompatible types stored in a collection

Summary

You should avoid incompatible casts because a `ClassCastException` will be thrown.

Description

This audit rule looks for places in the code that cast elements retrieved from a collection to a type that is not compatible with the type of elements being put into that very collection.

Security Implications

Incompatible cast will cause a `ClassCastException` to be thrown. This could be used to create a potential denial-of-service state or reveal security-sensitive parts of an application's design through the stack trace.

Example

The following invocation of the `get()` method will be marked as a violation because its return value is cast to a type incompatible with the one being put into collection:

```
public class MyClass {
    ...
    private List testList;
    ...
    public void myMethod(MyClass obj) {
        testList.add(obj);
        Integer test = (Integer)testList.get(0);
}
```

Inconsistent Use of Override

Summary

The Override annotation should be used for all overridden methods.

Description

This audit rule finds classes that use the Override annotation for some overridden methods but not for others and flags those for which it is missing.

Integer Division in a Floating-point Expression

Summary
Integers should be converted to floats before division if the result will be converted.

Description
When integer values are divided, any remainder is truncated. If the result of that division is going to be converted to a floating-point value, one of the integers should probably be cast to that same floating-point type in order to avoid the rounding error.

Example
The following division would be flagged as a violation:

```
int a, b;
float result;
result = a / b;
```

Invalid Loop Construction

Summary
Loops should be properly bounded.

Description
This audit rule checks for loops whose initial and/or final values could allow the index to go outside the bounds of the collection being accessed within the body of the loop.

Example
The following loop would allow the loop variable to take on a value of `array.length`, causing an IndexOutOfBoundsException to be thrown:

```
for (int i = 0; i <= array.length; i++) {
    System.out.println(" [" + i + "] = " + array[i]);
}
```

Loss of Precision in Cast

Summary
Casting to a lower precision type can cause loss of data.

Description
This audit rule checks for places where one numeric type is being cast to another type of lower precision than the first. Doing so can result in a loss of data, which is generally not desirable.

Example
Given a declaration of the form:

```
double oneThird = 1.0 / 3.0;
```

The following expression would be flagged as a violation:

```
(float) oneThird
```

Missing Constants In Switch

Summary
Switch statements should include all possible enumeration constants.

Description
This audit rule checks for the existence of switch statements whose case labels are constants declared by an enum but which do not include all of the declared constants.

Example
Given the following declarations:

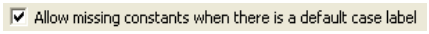
```
public enum PopcornSize {MEDIUM, LARGE, EXTRA_LARGE};

private PopcornSize size;
```

the following switch statement would be flagged as a violation because it does not contain a case label for EXTRA_LARGE:

```
switch (size) {
case MEDIUM:
    promptForUgradeToLarge();
```

```
        break;
    case LARGE:
        promptForDrinksAndCandy();
    }
```



Missing Default in Switch

Summary

Every switch statement should have a default clause.

Description

This audit rule checks for the existence of a default case within every switch statement.

Example

The following switch statement would be flagged as a violation because it does not contain a "default" case label:

```
    switch (accountType) {
    case CHECKING_ACCOUNT:
        balance = ((CheckingAccount) account).getCheckingBalance();
        break;
    case SAVINGS_ACCOUNT:
        balance = ((SavingsAccount) account).getSavingsBalance();
    }
```

Missing static method in non-instantiable class

Summary

Non-instantiable classes should have at least one static method.

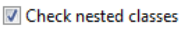
Description

If a class has been made non-instantiable by making all constructors private, it should define at least one non-private static method, otherwise the class will be unusable.

Example

The following would be flagged as a violation:

```
    public class Foo {
        private Foo() {
        }
    }
```



Missing Update in For Statement

Summary

Every for statement should have an update clause.

Description

This audit rule checks for the existence of an update clause within every for statement. If a for statement does not require an update clause it should be replaced by a while statement.

Example

The following for statement would be flagged as a violation:

```
    for (Iterator i = set.iterator(); i.hasNext(); ) {
        Object element = i.next();
        ...
    }
```

Misspelled Method Name

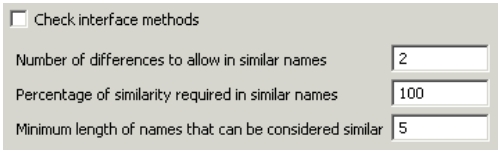
Summary

Methods with incorrectly spelled names do not override the superclass method.

Description

This rule detects small differences in spelling between methods defined in two different types in a hierarchy where both methods have the same parameter lists. Such methods

may be intended to be identical but only the superclass method will be invoked.



Next method invoked without hasNext method

Summary

Do not invoke the `next` method if you do not invoke `hasNext` method before that because NoSuchElementException can be thrown.

Description

This rule looks for places where the `next` method is invoked without or before the `hasNext` method.

Security Implications

If the `next` method is invoked without first invoking the `hasNext` method, in loop for example, a NoSuchElementException may be thrown.

Example

The following invocation of the `next` method will be flagged as a violation because the `hasNext` method is not invoked:

```
public void myMethod(Collection myList)
{
        .......
        Iterator iter = myList.iterator();
        for (int i = 0; i < 10; i++) {
                iter.next();
        }
}
```

Non-case Label in Switch

Summary

Switch statements should only contain case labels.

Description

This audit rule finds labels other that case labels that appear within a switch statement. Such labels are often the result of forgetting to type the keyword "case" rather than an intent to use a labeled statement. If it isn't the result of an accident, having a labeled statement in a switch statement makes the logic much harder to understand because it can easily be mistaken for a case label.

Example

The statement labeled "SAVINGS_ACCOUNT" would be flagged as a violation:

```
switch (accountType) {
case CHECKING_ACCOUNT:
    balance = ((CheckingAccount) account).getCheckingBalance();
SAVINGS_ACCOUNT:
    balance = ((SavingsAccount) account).getSavingsBalance();
}
```

Non-terminated Case Clause

Summary

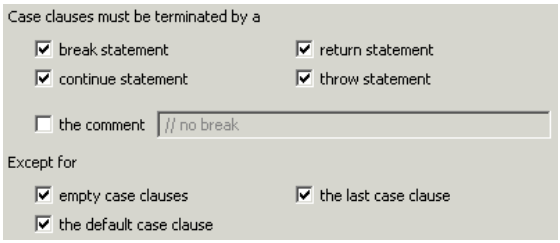
Case clauses should never fall through into the following case.

Description

This audit rule checks for the existence of either a break, continue, return, or throw statement at the end of each case clause in a switch statement. The lack of either of these statements means that control will fall through to the next case, which is usually not what is intended. It is possible to configure this rule to also accept a user-defined comment (such as "no break") as a signal that the developer knew what was happening.

Example

```
switch (accountType) {
case CHECKING_ACCOUNT:
    balance = ((CheckingAccount) account).getCheckingBalance();
case SAVINGS_ACCOUNT:
    balance = ((SavingsAccount) account).getSavingsBalance();
}
```



Overloaded Equals

Summary

The equals method should always take a parameter of type Object.

Description

This audit rule looks for declarations of the method equals whose single parameter has a declared type different from java.lang.Object. Overloading the equals method can easily lead to situations where a.equals(b) != b.equals(a).

Example

```
public boolean equals(String string)
{
...
}
```

```
@Override
public boolean equals(Object obj) {
 ...
}
```

Overloaded Methods

Summary

Overloading method names can cause confusion and errors.

Description

This audit rule finds methods that are overloaded. Overloaded methods are methods that have the same name and the same number of parameters, but do not have the same types of parameters. Such methods can cause confusion and errors because it is not always obvious which method will be selected at run time.

Example

```
public void process(Person person)
public void process(Employee employee)
```

Possible Null Pointer

Summary

A pointer is being dereferenced when it might be null.

Description

This rule identifies places where an object-valued variable is being dereferenced without first ensuring that it cannot be null.

Example

Given the following method declaration:

```
public String[] split(String string)
{
    int index = string.indexOf(":");
    ...
}
```

```
private static final String[] EMPTY_STRING_ARRAY = new String[0];
public static String[] split(String s) {
 if (s == null) {
  return EMPTY_STRING_ARRAY;
 }
 int index = s.indexOf(':');
 ...
}
```

The invocation of the indexOf method would be flagged.

Potential Infinite Loop

Summary

Some loops can be written in such a way that they will never terminate. This is bad practice, and usually not intended.

Description

Loops can exit in several ways. Either their exit condition can be satisfied, an exception can be thrown, a value can be returned, or a `break` or a `continue` can transfer control out of the loop. In the body of the loop, something should happen to either modify the value of the exit condition, or modify the value of a condition leading to a return, throw, or branching statement.

Example

The following would be flagged as a violation, since the value of a is not changed in the body of the loop.

```
int a = 0; int b = 2;
while (a < 10) {
    b++;
}
```

Recursive Call With No Check

Summary

Don't recursively call a method without a conditional check.

Description

This audit rule flags methods that recursively call themselves with no conditional check, or return escape. Violations are either infinite loops, or the logic of the method relies on exceptions being thrown. In the first case the infinite loop needs to be removed. In the second case, thrown exceptions should not be relied on as they are much more expensive than writing the equivalent conditional.

Example

```
private void countDownToZero(int i) {
    System.out.print("i = " + i);
    i--;
    countDownToZero(i);
    // never reached!
    if(i == 0) {
        return;
    }
}
```

Repeated Assignment

Summary

A single variable should not be assigned the same value multiple times.

Description

This audit rule checks for multiple assignments of the same value to a single variable within the same statement.

Example

The following assignment would be flagged because the variable x is assigned the same value twice:

```
    x = y = x = 0;
```

Return in Finally

Summary

Finally blocks should not contain a return statement.

Description

This audit rule finds places where a return statement is contained in a finally block.

Example

The following return statement would be flagged as a violation:

```
try {
    ...
} finally {
    return 0;
}
return array.length;
```

String indexOf Use

不熟悉API返回值的约定！建议：多看文档

Summary

Don't compare output from String.indexOf with > 0 or <= 0.

Description

This audit rule looks for the common off-by-one-error caused by comparing String.indexOf() to 0, for example: "indexOf(..) > 0." This is read as "if indexOf is greater than 0 then the there doesn't exist an instance of what we are looking for", but the mistake here is that indexOf returns -1 if nothing was found, not 0. Hence, the user meant ">=", not ">".

The opposite mistake is made with "indexOf <= 0."

All "indexOf" methods in java.lang.String are detected by this rule, see indexOf(int), indexOf(int, int), lastIndexOf(int), lastIndexOf(int, int), indexOf(String), etc.

Example
The following comparison would be flagged as a violation:

```
str.indexOf('.') > 0
```

Subclass should override method

Summary
If you want to override a method declared in a superclass, you should not change the signature of a method which belongs to the subclass.

Description
This rule looks for places where a method of defined in a subclass has the same name as a method defined in a superclass but a different signature.

Security Implications
If you want to override the method in the superclass, you should change signature method which belongs to subclass.

Example
The following invocation method which belongs to subclass will be flagged as a violation because a signatures do not match.

```
public class Parent
{
    public void func(int a) {
        .........
    }
}    public class Child extends Parent
{
    public void func(double a) {
        ...
    }
}
```

Throw in Finally

Summary
Finally blocks should not contain a throw statement.

Description
This audit rule finds places where a throw statement is contained in a finally block.

Example
The following throw statement would be flagged as a violation because it occurs within a finally block:

```
try {
    ...
} finally {
    throw new Exception("This is never OK");
}
```

Unassigned Field

Summary
Private fields should be assigned a value.

Description
This audit rule looks for private fields that are never assigned a value.

Unnecessary "instanceof" Test

Summary
Unnecessary instanceof tests should be removed.

Description
This audit rule looks for unnecessary uses of "instanceof". An "instanceof" test against a superclass or superinterface of the static type of an object is unnecessary and should be removed.

Example

```
"this is a string" instanceof String;
```

Unnecessary Null Check

Summary

A variable is being checked against null when it is not necessary.

Description

This rule identifies places where an object-valued variable is being compared to null when the comparison is unnecessary because of preceding code.

Example

The following comparison would be flagged as a violation:

```
airplane.prepareForTakeOff();
if (airplane != null) ...
```

Unnecessary Return

Summary

Methods that do not return a value should not end with a return.

Description

This audit rule finds methods that are declared to not return a value (void) but whose last statement is a return statement.

Example

```
public void markChanged()
{
    changed = true;
    return;
}
```

Unused Return Value

Summary

The value returned from methods should be used.

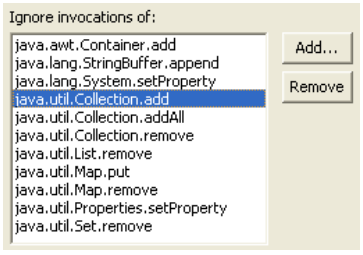
Description

This audit rule looks for invocations of methods that return values where the value is ignored. Most methods that return a value either have no side-effect or are using the returned value as an indication of success or failure. In the first case, the invocation should be removed if the value is not needed. In the second case, the status value should be checked.

Example

The following method invocation would be flagged as a violation if the method `getX` returns a value:

```
point.getX();
```



Unused StringBuffer

Summary

The contents of a StringBuffer should be used.

Description

This audit rule checks for any instances of the class StringBuffer whose contents are not retrieved. This usually means that the code to use the contents of the buffer was omitted, but can also indicate that old code is no longer needed and should have been deleted.

Example

The StringBuffer declared in the following method would be flagged as a violation:

```
private String toString()
```

```
{
    StringBuffer buffer;

    buffer = new StringBuffer();
    buffer.append("Product #");
    buffer.append(getName());
    return getName();
}
```

Unused StringBuilder

Summary

The contents of a StringBuilder should be used.

Description

This audit rule checks for any instances of the class StringBuilder whose contents are not retrieved. This usually means that the code to use the contents of the builder was omitted, but can also indicate that old code is no longer needed and should have been deleted.

Example

The StringBuilder declared in the following method would be flagged as a violation:

```
private String toString()
{
    StringBuilder builder;

    builder = new StringBuilder();
    builder.append("Product #");
    builder.append(getName());
    return getName();
}
```

Usage Of Binary Comparison

Summary

You should use short-circuit operations instead of binary operations.

Description

This rule looks for places where a binary operation is used that could be replaced by a short-circuit operator.

Security Implications

Usage of binary operation instead of short-circuit can cause unexpected situation when RuntimeException or NullPointerException can be thrown.

Example

The following code would be flagged as a violation because a binary and operator (&) is used where a conditional-and operator (&&) could be used:

```
public void func(int[] a)
{
    if (a != null & a.length() != 0) {
            doSomething();
    }
}
```

Use == to Compare With null

Summary

A null value should not be compared using methods equals() or equalsIgnoreCase().

Description

This audit rule finds places where an object is compared to the null value using either the equals() or (if the object is a String) the equalsIgnoreCase() method. In both cases, the contract of the method requires this comparison to always return false. Either the test is unnecessary, or it should be replaced by an identity comparison.

Example

The following comparison would be flagged as a violation:

```
if (object.equals(null))
```

```
if (o == null) {
```

Variable Has Null Value

Summary

A variable that is guaranteed to have a null value and is used in an expression may indicate that the programmer forgot to initialize variable with its actual value.

Description

This rule looks for a places where variables with `null` values are used in an expression.

Security Implications

Such an error may indicate a flaw in the program's logic that may leave the software vulnerable if present in the security-sensitive part of an application.

Example

The following usage of variable should be marked as violation because the variable is always `null`:

```
public boolean myMethod(String param)
{
    String tmp = null;
    if (tmp.equals(param)) {
        return true;
    } else {
        return false;
}
}
```

Variable Usage