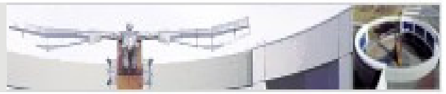

Java Coding Standards

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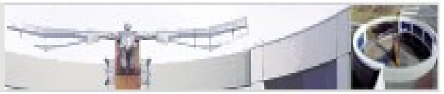
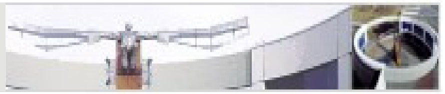
29.10.2010

Why Coding Standards are Important



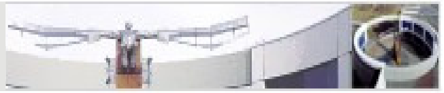
- “Any fool can write code that a computer can understand. Good programmers write code that humans can understand.” -- *Martin Fowler, "Refactoring: Improving the Design of Existing Code"*
- Improve the readability of code by providing a consistent level of quality
- Code is easier to understand, develop and maintain
- Transition of code to other developers for further maintenance and enhancement is easy

  → Hardly any software is maintained for its whole life by the original author
- Reduce overall costs of the application



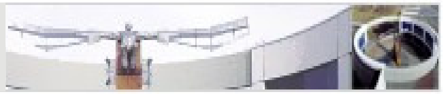
Code Formatting and Organization

Formatting Code



- Indent and paragraph your code
- Use spaces for indentation instead of tabs
  - ➢ Recommendation: 2 spaces per indentation level
- Only a single statement per line
- A line of code should not be longer than 80 characters
- If you have to break a line
  - ➢ break *after* a comma
  - ➢ break *before* an operator
- If a method is more than a screen then it is probably too long

Formatting Code

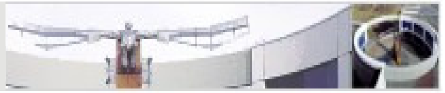


- Use whitespaces in your code

  -
    ```
    grandTotal = invoice.total() + getAmountDue();
    ```

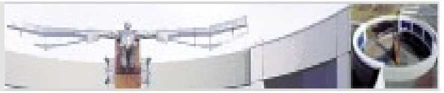
  -
    ```
    grandTotal=invoice.total()+getAmountDue();
    ```
- Only use ASCII characters in your code

General Code Organization

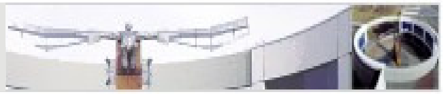


- Follow the Thirty-Seconds Rule:
  - Another programmer should be able to fully understand what a method does, why it does it, and how it does it in less than 30 seconds

Class Body Organization

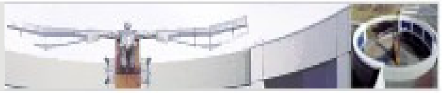


- Static fields
  - constants
  - non-constants
- Non-static fields
- Constructors
- Methods
  - setters and getters
  - other methods



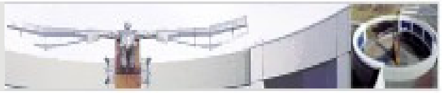
Naming Conventions

What Makes Up a Good Name



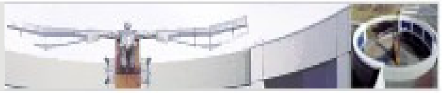
- Use mixed case to make names readable
  - lower letters in general
  - capitalize first letter of class and interface names
  - capitalize first letter of non-initial words → CamelCase
  - e.g. `StringTokenizer`
- Use full English descriptors that accurately describe the variable/field/class
  - `firstName, totalSum`
  - `x1, x2, fn`
  - The name is already the first part of the documentation!
- Avoid long names (< 15 characters is a good idea)

What Makes Up a Good Name



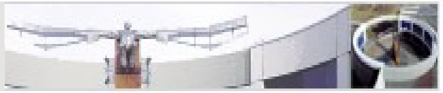
- Do not abbreviate names by removing vowels
  - ➢ `appendSignature(String signature)`
  - ➢ `appndSgntr(String sgntr)`
- Capitalize only the first letter in acronyms
  - ➢ `loadXmlDocument()`
  - ➢ `loadXMLDocument()`
- Avoid names that are similar or differ only in case
  - ➢ `sqlDataBase` vs `sqlDatabase`

Naming Packages, Classes and Interfaces



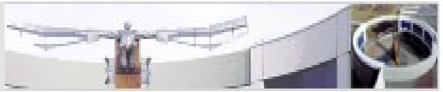
- Use the reversed, lowercase form of the Internet domain name as root qualifier for package names
  - ➢ `de.dfki.lt.<project>.<subpackage>`
  - ➢ `javakurs.uebung<xx>.aufgabe<xx>`
- Use nouns to names classes
  - ➢ nouns define objects or *things*
  - ➢ `class CustomerAccount  { ...`
- Use nouns or adjectives for interfaces
  - ➢ `public interface ActionListener { ...`
  - ➢ adjectives describe the capability of the implementing class
  - ➢ `public interface Runnable { ...`

Naming Methods



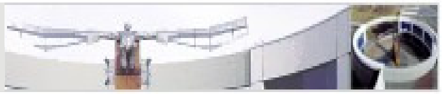
- Use a strong, active verb for the first word of a method
  - ➢ `openAccount(), printMailingLabel()`
- Getters
  - ➢ return the value of a field
  - ➢ prefix the word ‘get’ to the name of the field
  - ➢ if it is a boolean field, prefix ‘is’ to the name of the field
  - ➢ `getFirstName(), isPersistent()`
- Setters
  - ➢ modify the values of a field
  - ➢ prefix the word ‘set’ to the name of the field
  - ➢ `setFirstName(String name)`
  - ➢ `setPersistent(boolean flag)`

Naming Variables



- Use nouns to name variables
- Pluralize the names of collection references such as arrays and lists
  - ➢ **`Customer[] customers = ...`**
  - ➢ Alternative: a suffix like **`Set`** or **`List`**
- Standard names for "throwaway" variables
  - ➢ Loop counters: i, j, k
  - ➢ Streams: in, out, inOut
  - ➢ Strings: s
  - ➢ Exceptions: e
- The shorter the name of a variable, the smaller its scope

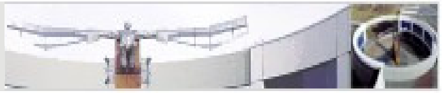
Naming Fields and Parameters



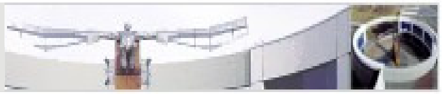
- Qualify field variables with **`this.`** to distinguish them from local variables
- When a constructor or setter assigns a parameter to a field variable, give that parameter the same name as the field

  -
    ```
    public Person(String name) {
      this.name = name;
    }
    ```
  - This is the only situation where name shadowing should occur!

Naming Constants



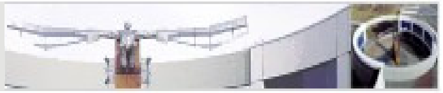
- Implemented as static final field variables of classes
- Use full English words, all in uppercase, with underscores between the words
  - ➢ **`MINIMUM_BALANCE, MAX_VALUE`**



Documentation Conventions

“If your program isn't worth documenting, it probably isn't worth running.” – *Jonathan Nagler, "Coding Style and Good Computing Practices"*

Comment Types



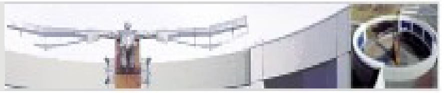
- *Documentation comments* describe the programming interface

  -
    ```
    /**
     * This is a documentation comment.
     */
    ```
- *Standard comments* hide code without removing it

  -
    ```
    /*
     This is a standard comment.
     */
    ```
- *One-line comments* explain implementation details

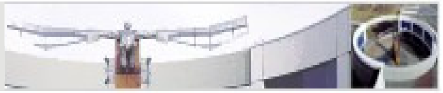
  -
    ```
    // This is a one-line comment.
    ```

General Documentation Guidelines



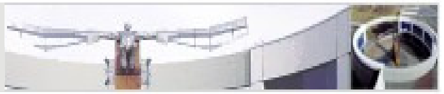
- Comments should add to the clarity of your code
- Keep comments simple
- Keep comments and code in sync
- Write the comments before you write the code
  - ➢ at least comment your code as you write it!
- Write your comments in English!

A Quick Overview of javadoc



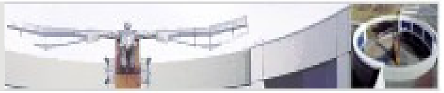
- @param <name> <description>
  - ➢ Used for methods and constructors
  - ➢ Describes the usage of a passed parameter
  - ➢ Declare what happens with extreme values (null etc.)
  - ➢ Use one tag per parameter
- @return <description>
  - ➢ Used for methods
  - ➢ Describes the return value, if any, of a method
  - ➢ Indicate the potential use(s) of the return value and the type/class

A Quick Overview of javadoc



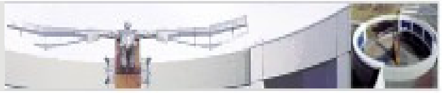
- @throws <name> <description>
  - ➢ Used for methods and constructors
  - ➢ Describes the exceptions that may be thrown
  - ➢ Use one tag per exception
- {@inheritDoc}
  - ➢ Used for methods
  - ➢ Copies documentation from super class or interface
- @author <name>
  - ➢ Used for interfaces and classes
  - ➢ Indicates the author(s) of the code
  - ➢ Use one tag per author

A Quick Overview of javadoc



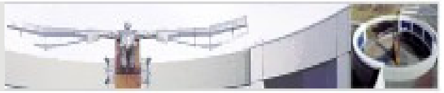
- @version <text>
  - Used for interfaces and classes
  - Indicates the version information for a given piece of code
- {@link <ClassName>}
  - Used for any javadoc comment
  - Generates a hypertext link in the documentation to the specified class
- {@code <text>}
  - Used for any javadoc comment
  - Text is displayed verbatim in a fixed-width font
  - Indicates that the text is used in source code

A Quick Overview of javadoc



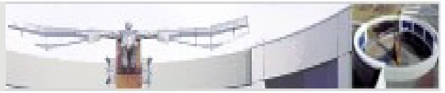
```
/**
 * Returns a new string that is a substring of this string. The
 * substring begins with the character at the specified index and
 * extends to the end of this string. <p>
 * Examples: <blockquote><pre>
 * "unhappy".substring(2) returns "happy"
 * "Harbison".substring(3) returns "bison"
 * "emptiness".substring(9) returns "" (an empty string)
 * </pre></blockquote>
 *
 * @param beginIndex the beginning index, inclusive
 * @return the specified substring, the empty string on border
 * cases, never returns {@code null}
 * @throws IndexOutOfBoundsException if {@code beginIndex}
 * is negative or larger than the length of this {@link String}
 * object
 */
public String substring(int beginIndex) {...}
```

Documenting Class Headers



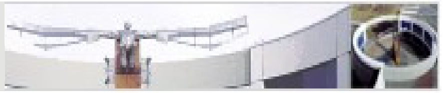
- The purpose of the class
- Known bugs or restrictions
- Author and version using the appropriate javadoc tags **`@author`** and **`@version`**
- When repository keyword substitution is enabled, you can use **`$Id$`** as version
  - ➢ **`$Id: <file> <revision> <date> <author> $`**

Documenting Method Headers



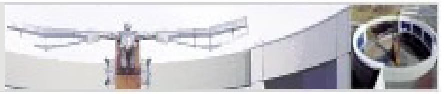
- What and why the method does what it does
- How a method changes the object with side effects
- Document parameters, return value and possible exceptions using the appropriate javadoc tags **`@param`**, **`@return`** and **`@exception`**

Documenting Method Bodies



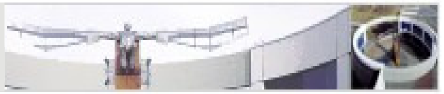
- Rule of thumb: if your code isn't obvious, then you need to document it
- Document why something is being done, not just what

  -
    ```
    // increase the count variable by one
    count++;
    ```
- Avoid the use of end-line comments
- Document empty blocks



Programming Conventions

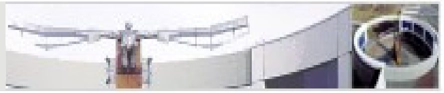
Statements and Expressions



- Specify the order of operations using round brackets, even if redundant
  - `(a && b) || c`
- Put blocks in brackets, even if they only contain a single statement

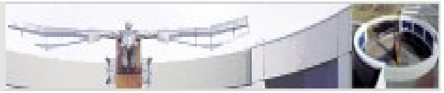
  -
    ```
    if (a.equals(b)) {
      c = b;
    }
    ```
- Try to avoid **`return`** in the middle of a method
- Try to avoid **`do .. while`** loops

Variables



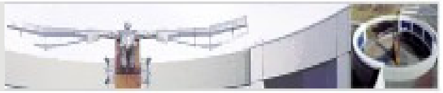
- Declare local variables immediately before their use
- Use local variables for one thing only
- Use interfaces for variable types instead of implementing classes if possible
  - ➢ e.g. **`Set`** instead of **`HashSet`**, **`List`** or **`Collection`** instead of **`ArrayList`**
  - ➢ more flexible when replacing the implementation
  - ➢ the same is true for the parameters and return types of methods

Class Visibility



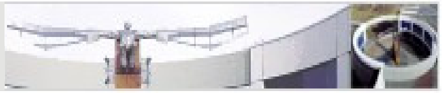
- Use default visibility for classes internal to a component
- Use public visibility for the facades of components

Method Visibility



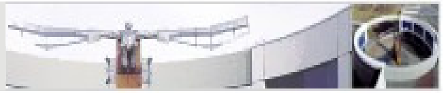
- Be as restrictive as possible!
- If a method doesn’t have to be public, make it protected
- If a method doesn’t have to be protected, make it private or default
- Minimize the public and protected interface
  - ➢ Improved learnability
  - ➢ Reduced coupling

Field Visibility



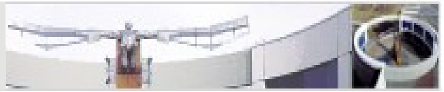
- All non-constant field variables should be declared *private*
- Ideal Case: The only methods that are allowed to directly work with a field are the accessor methods
  - ➢ Fields are encapsulated
  - ➢ Complete control over how fields are accessed and by whom
  - ➢ Enables lazy initialization
  - ➢ Handling of side effects
- Relaxation: Define getter/setter for fields that have to be accessed/modified from external classes
  - ➢ Internal methods may access fields directly
  - ➢ Use the prefix **`this.`** to distinguish between local variables and field variables

Exceptions



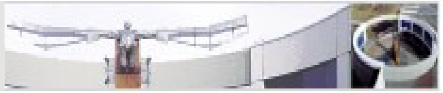
- Use unchecked runtime exceptions to indicate errors in your program's logic that cannot be reasonably recovered from at run time
  - ➢ document runtime exceptions with **`@throws`**, but don't declare them in the method signature
  - ➢ avoid catching runtime exceptions
- Use checked exceptions to indicate invalid conditions in areas outside the immediate control of the method

Exceptions



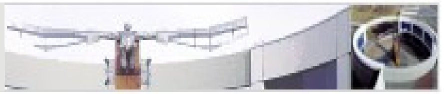
- Don't do `catch (Exception e)` because this also includes runtime exceptions
- Don't do `throws Exception` because it forces the client to do a `catch (Exception e)`
- Don't use empty catch blocks
  - at least, add a comment

Efficiency



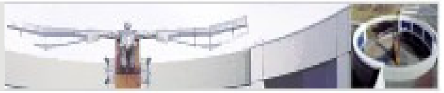
- “Premature optimization is the root of all evil.” – *Donald Knuth, "Structured Programming with Goto Statements"*
- Don’t waste time optimizing unless you are sure you need it
- 80-20 Rule:
    - 20 percent of the code use 80 percent of the resources (on average)
- If you optimize make sure you optimize these 20 percent

Final Remarks



- There is not one ultimate style guide for Java
- There are several standards to choose from
- Often, companies define a style guide that is applied to all their software projects
- For the Java II course, follow the style guide presented in these slides

Further Reading



- Sun Java Coding Style Guide

  http://java.sun.com/docs/codeconv/html/CodeConvTOC.doc.html
- AmbySoft Inc. Coding Standards for Java

  http://www.ambysoft.com/downloads/javaCodingStandards.pdf
- How To Write Unmaintainable Code

  http://mindprod.com/jgloss/unmain.html