Programmazione

Prof. Marco Bertini
marco.bertini@unifi.it
http://www.micc.unifi.it/bertini/

Coding style guidelines

"Good code is its own best documentation."

- Steve McConnell

Why using a coding standard ?

- A coding standard may help to reduce errors due to poorly written code, i.e. code that uses programming facilities in (unnecessarily) error-prone way or that expresses ideas in obscure ways.
- As noted by Guido van Rossum (creator of Python language): code is read much more often than it is written.
- There's no standard coding standard.

Consistency

- A style guide is about consistency. Consistency with a style guide is important. Consistency within a project is more important. Consistency within one module, class or function is the most important.
- However, know when to be inconsistent - sometimes style guide recommendations just aren't applicable.

Classes and Objects

- Names representing types (i.e. classes) and namespaces must be in mixed case starting with upper case, e.g.:

```
Line, SavingsAccount
```

- Variable names must be in mixed case starting with lower case, e.g.:

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This is the style enforced in Java

Classes and Objects - cont.

- Bjarne Stroustrup despises this "camel" coding style and in JSF++ proposes the use of underscores, e.g.:

  `number_of_elements, Device_driver`

  instead of

  `numberOfElements, DeviceDriver`

- Suggestion: pick whatever you like and be consistent

Classes and Objects - cont.

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  This standard in used in Python

  instead of

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Classes and Objects - cont.

- The parts of a class must be sorted public, protected and private.
- All sections must be identified explicitly.
- Not applicable sections should be left out.

Classes and Objects - cont.

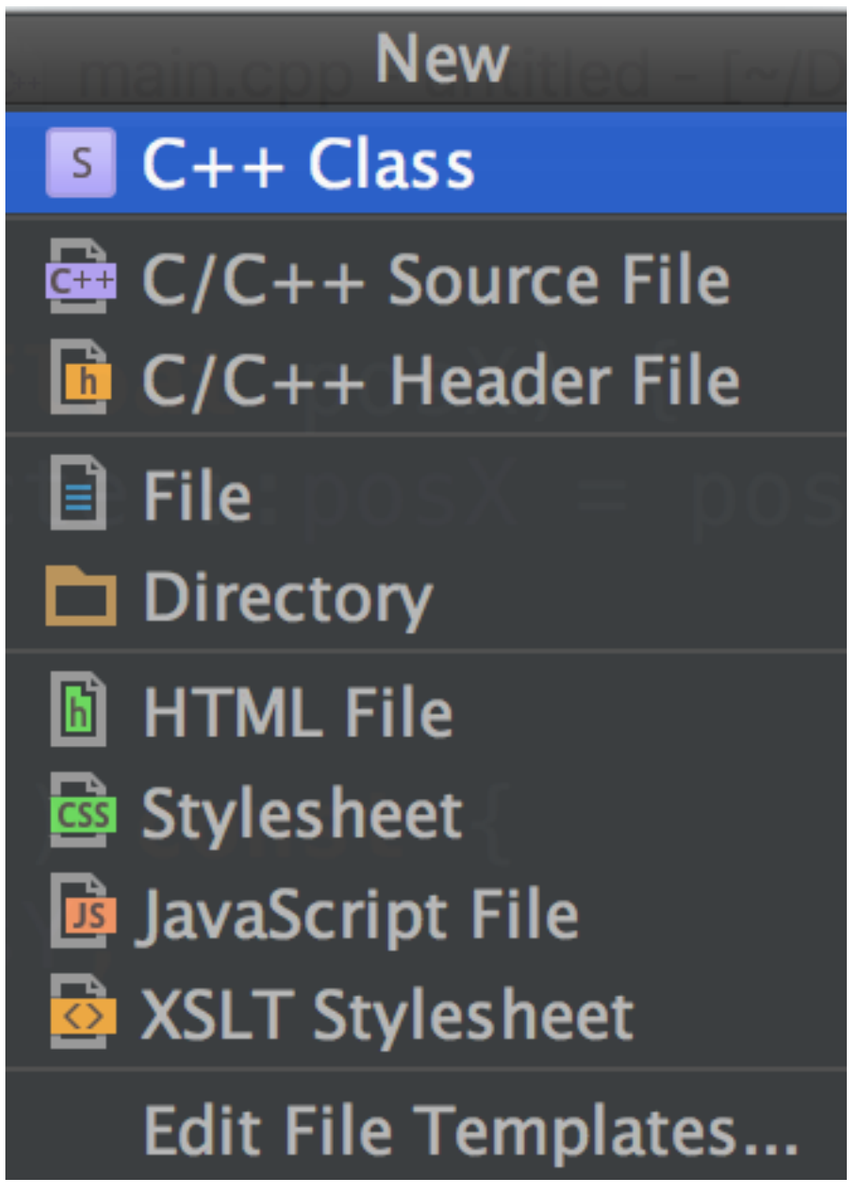
- A class should be declared in a header file and defined in a source file where the name of the files match the name of the class.

- All definitions should reside in source files.

  Eclipse CDT let you decide to create the getter/setter as inline methods within the class declaration or in the .cpp file...

Classes and Objects - cont.

- Many IDEs (e.g. CLion) have a wizard to create classes and follow the `Classname.h` + `Classname.cpp` approach:



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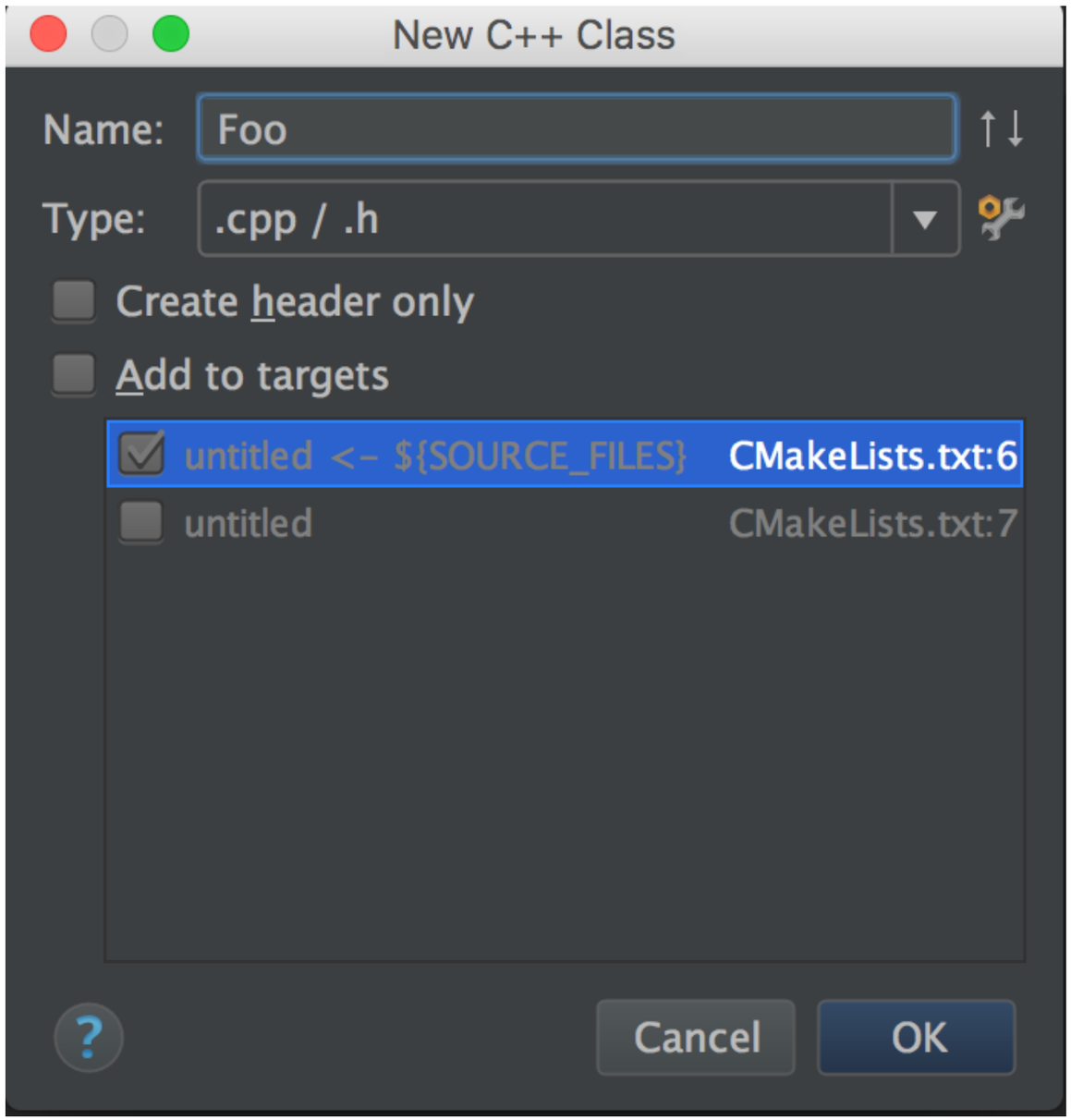

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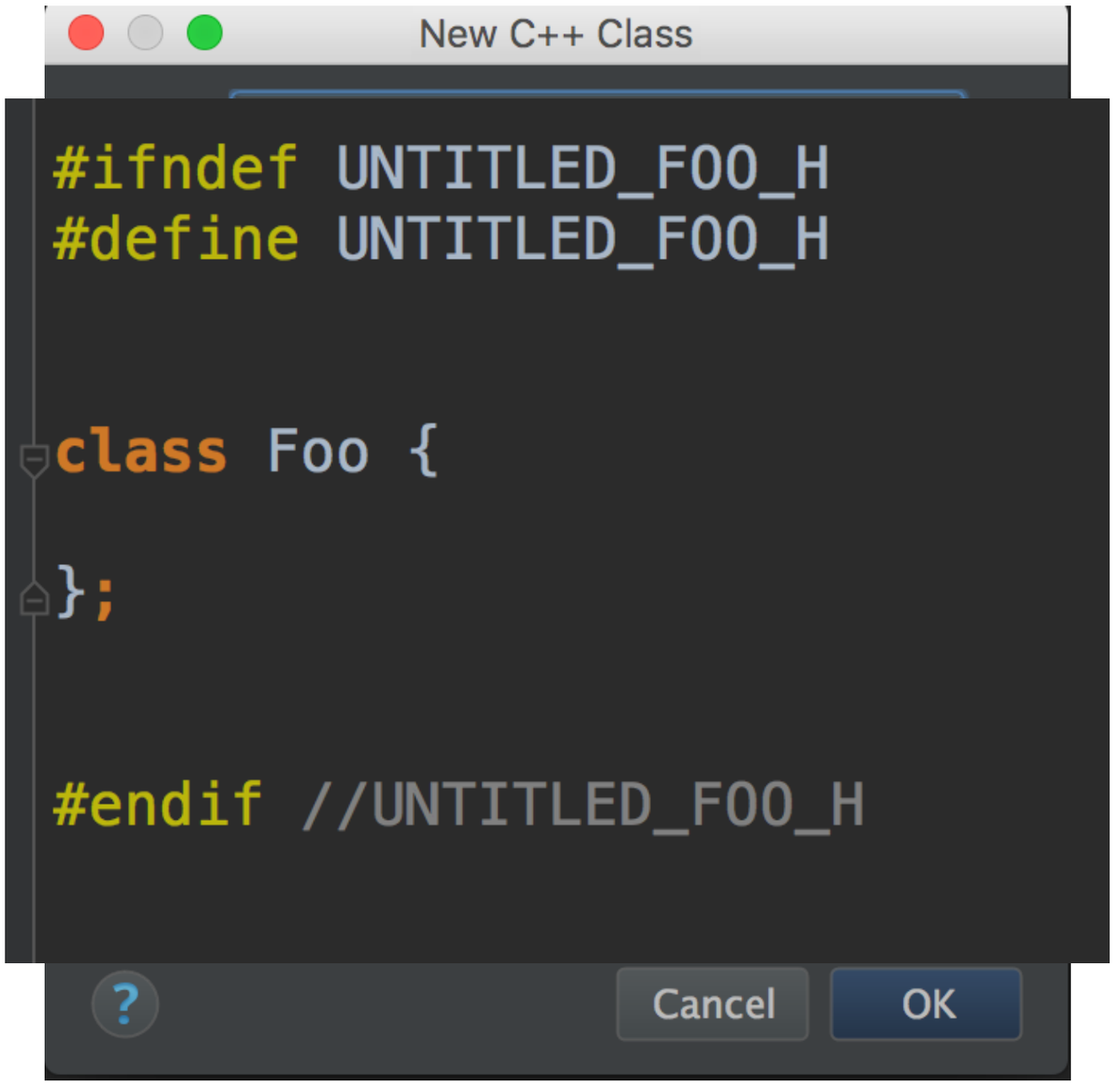
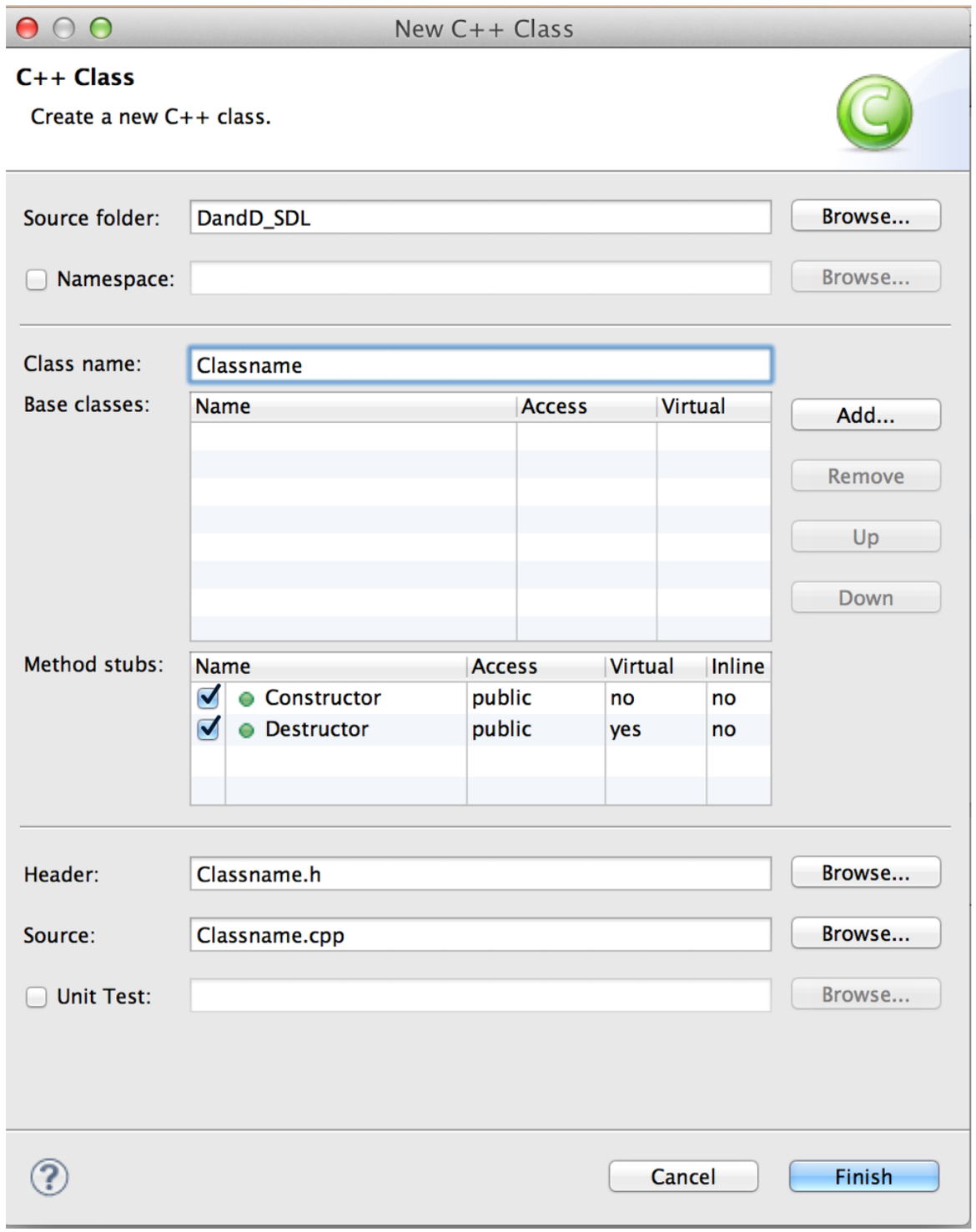


Classes and Objects - cont.

- Also Eclipse CDT has a wizard to create classes and follow the `Classname.h` + `Classname.cpp` approach:



Naming a variable

- The name of a variable should describe fully and accurately the entity the variable represents.
- State in words what the variable represents, probably you'll immediately see a good name.
- Do not be cryptic, do not use strange acronyms

Naming a variable: examples

Purpose of the variable	**Good name**	**Bad name**
Current Date	`currentDate`	`CD, current, cD`
Lines per page	`linesPerPage`	`LPP, lines, l`
Running total of checks written to date	`runningTotal, checksTotal, numChecks, nChecks`	`checks, written, checkTTL, x1`

The 2 worst variable names

- "`data`" is a terrible name: every variable contains data... a variable name should describe what data is contained
- "`data2`" is another terrible name, like any other `variableX` with X∈N
  - rethink what's the difference w.r.t. `variable` and what it should contain.
    Avoid to write code like:
    `if( total2 < total3 )`

Variables

- Declarations shall be declared in the smallest possible scope:
  - keeping initialization and use close together minimize chance of confusion;
    - letting a variable go out of scope releases its resources.
- In C++ you can declare a variable wherever you want: do it!
- Initialize a variable: uninitialized variables are a common source of errors

Methods

- Names representing methods or functions must be verbs (followed by an object) and written in mixed case starting with lower case (like Java), e.g.:

```
getName(), computeTotalWidth()
```

- The name of the object is implicit, and should be avoided in a method name, e.g.:

```
line.getLength();// NOT:
line.getLineLength();
```

Methods

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```
getName(), computeTotalWidth()
```

- The name
should be

```
line.ge
line.getLineLength();
```

Alternatively, as in JSF++ standard:

```
example_function_name()
```

Methods - cont.

- Use strong verbs, not wishy-washy verbs:
  - OK: `calcMonthlyRevenue()`
  - NO: `handleCalculation()`, `processInput()`

Attributes

- Private class variables often have underscore suffix, e.g.:

```
class SomeClass {
  private:
    int length_;
};
```

- This is HIGHLY controversial. Other acceptable approaches are: underscore prefix, `m_` prefix, no suffix/prefix (use syntax highlighting of the IDE)

Numbers

- Avoid "magic" numbers, i.e. numbers that appear in code without being explained
- E.g.:

```
for(int i = 0; i < 255; i++)...
```

versus

```
for(int i = 0; i < maxEntries; i++)...
```

Numbers

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- E.g.:

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for(int i = 0; i < 255;
```

versus

```
for(int i = 0; i < maxEntries; i++)...
```

Consider the case in which the number, used through the code, has to be changed...

String

- Avoid “magic” strings as you avoid “magic” numbers. E.g.:

```
if ( inputChar == ‘\027’ )...
```

versus

```
if ( inputChar == ESCAPE )...
```

Indentation

- In C/C++ whitespace is insignificant, but indentation of code blocks help readability showing relationships between control flow constructs.
- Can use tabs or spaces: many guidelines suggest spaces, though.
- 1 space is to low, 5 is too much: 2, 3 or 4 are OK.
  Suggestion: use 2 or 4 spaces.

Indentation

Python uses indentation instead of { and } so you better learn to be very precise when indenting code.
Python uses spaces not tabs.

Any good editor and IDE will help to indent code while writing, and will re-indent badly written code: learn how to do it.

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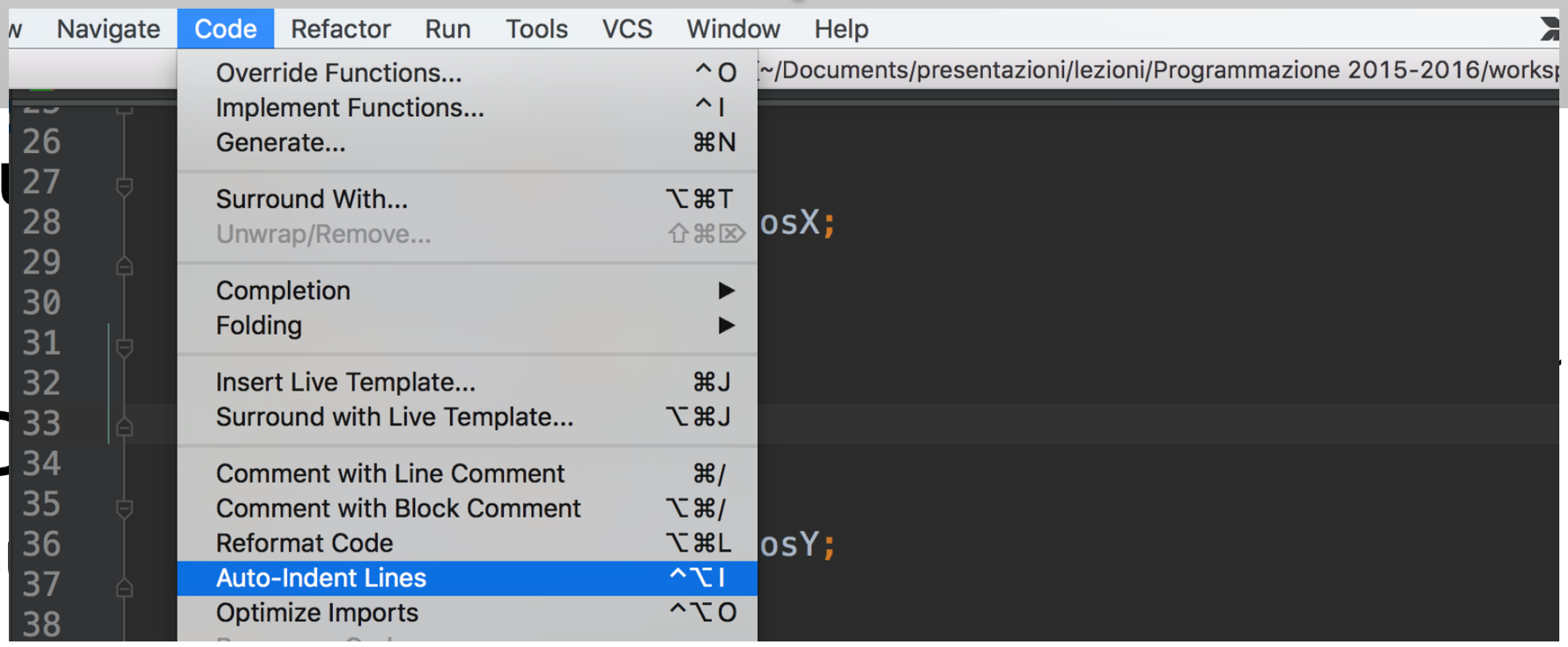

Layout - cont.

- Use only one statement per line, to improve readability / debugging, e.g.:

```
// NO:
if ( p > q ) cout << p;

// OK:
if ( p > q )
    cout << p;  // notice also the use
                // of indentation
```

Layout - cont.

- Group lines in "paragraphs" using empty lines
- If there's need to split a line (some coding standards require a certain length) make it obvious and indent, e.g.:

```
totalBill = shippingCost + customerPurchase[ customerID ] +
    salesTax;
drawLine( window.North, window.South, window.East,
    window.West, currentWidth);
```

Layout - cont.

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    window.West, currentWidth);
```
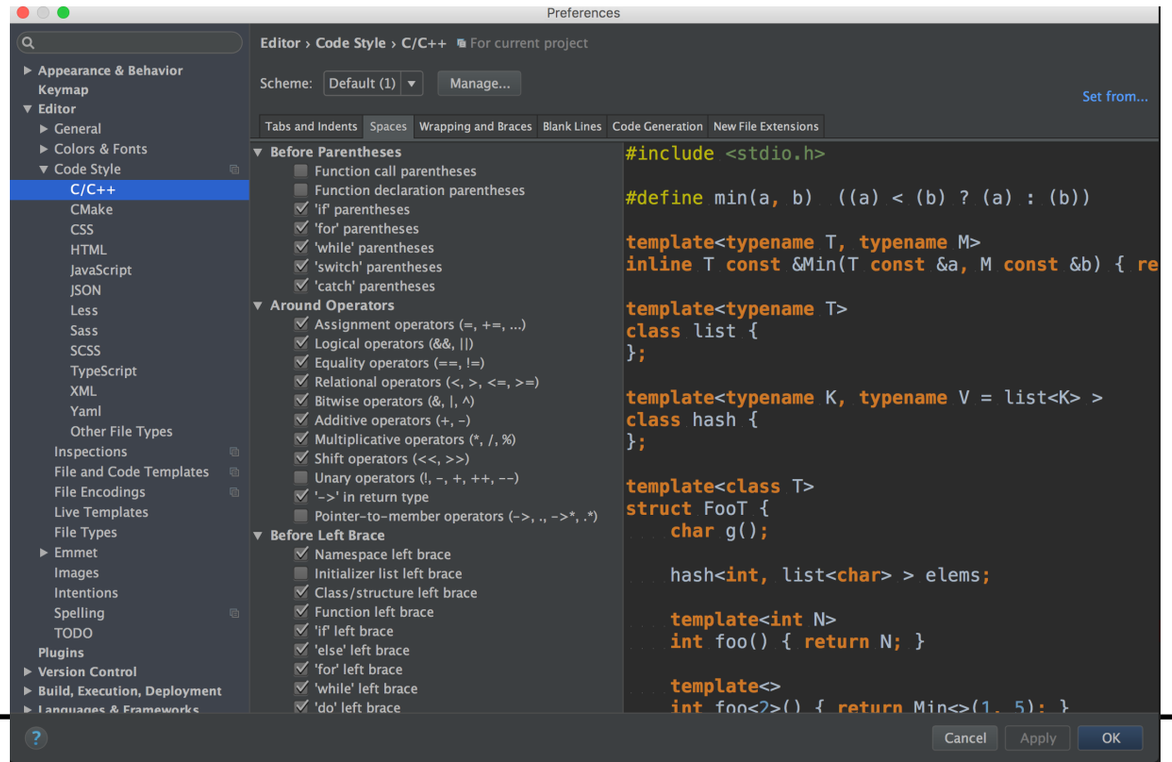

+ and , signal that the statement is not complete

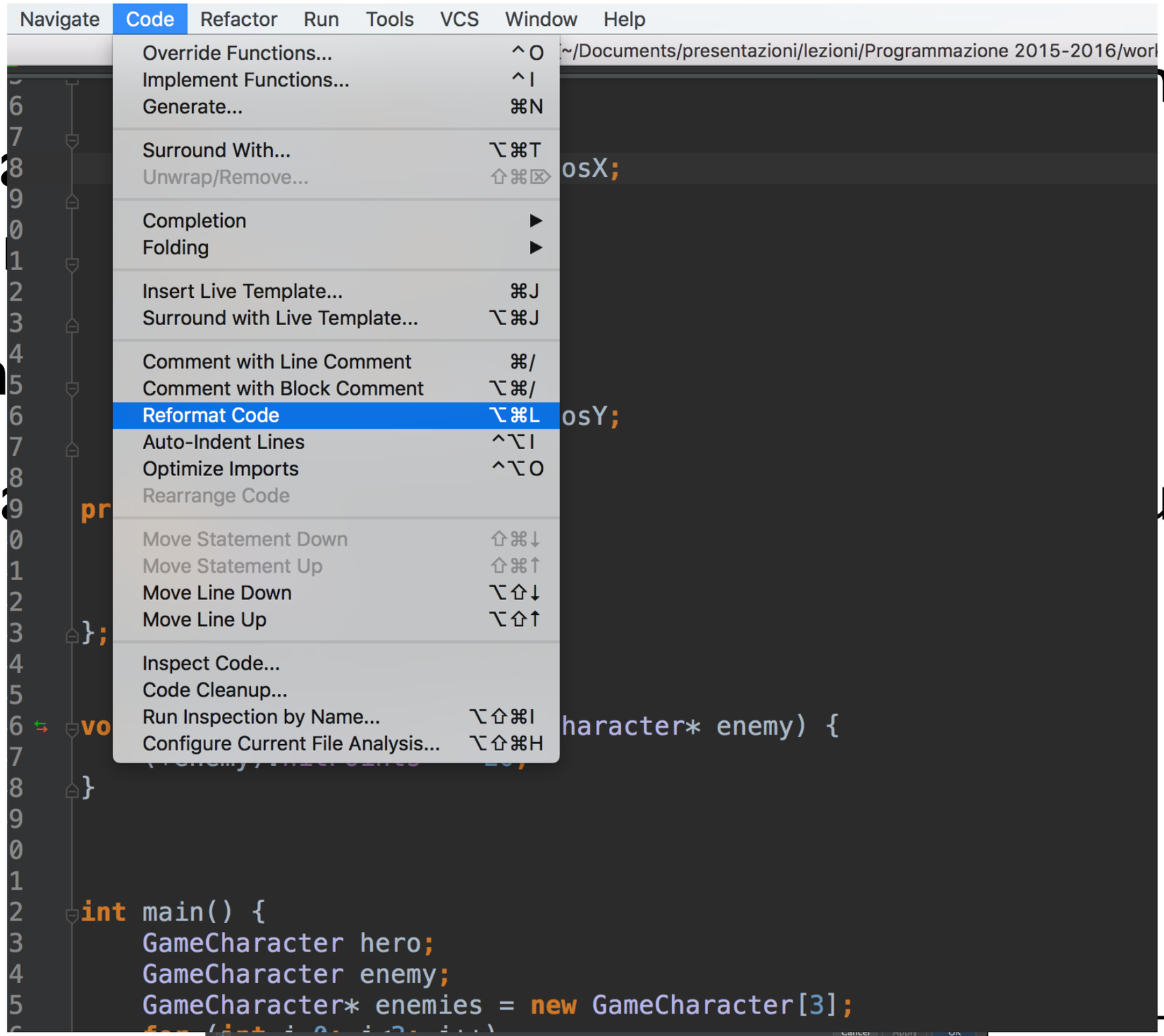
Format

- Formatting code is more than just indenting it. Spaces, wrapping and braces, blank lines all contribute to improve readability.
- There are several standards: choose one.
- Learn how to fully reformat code with your IDE.



Format

- Fo… …g it. Sp… co…
- Th…
- Le… …ur IDE.



Comments

- Describe code intent, e.g.:

```
// get current employees info
```

  instead of

```
// update EmpRec vector
```

- Do not repeat the code, e.g.:

```
delete aVehicle; // free pointer
```

Code can only tell you how the program works; comments can tell you why it works.

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```
// get current employees info
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instead of

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- Do not repeat the code, e.g.:

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delete aVehicle; // free pointer
```

Preprocessor

- Do not use macros except for source control, using `#ifdef` and `#endif`
  - macros don't obey scope and type rules and make code hard to read. All that can be done with macros can be done using C++ features
- `#includes` should precede all non-preprocessor declarations
  - nobody will notice the `#include` in the middle of a file

Preprocessor

- Do not use macros except for source control, using `#ifdef` and `#endif`

Examples of MACRO used for source control:

```
#ifdef VERBOSE_DEBUG
std::cerr << “Checkpoint # reached” <<
          std::endl:
#endif

#ifdef __WIN
callSpecialWindowsAPI( somParam );
#endif
```

Header

- A suggested order of inclusion (Google's C++ guideline) is:
  - the header of the file
  - C library
  - C++ library
  - other libraries' .h
  - your project's .h.

Header

E.g., in `fooserver.cpp`:

```
#include "foo/public/fooserver.h" // file header

#include <sys/types.h> // C library
#include <unistd.h>
#include <hash_map> // C++ library
#include <vector>

#include “SDL/SDL.h” // other library header

#include “base/basictypes.h" // project’s headers
#include "base/commandlineflags.h"
#include "foo/public/bar.h"
```

Reading material

- M. Bertini, "Programmazione Object-Oriented in C++", parte III, cap. 1

Credits

- These slides are based on the material of:
  - C++ Programming Style Guidelines Geotechnical Software Services
    http://geosoft.no/development/cppstyle.html
  - "Code Complete", Steve McConnell, Microsoft Press
  - JSF++ coding guidelines
  - Python PEP-8 guideline