Object-Oriented Programming in C++

(Course "Computer Systems")

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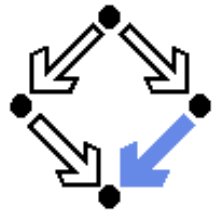
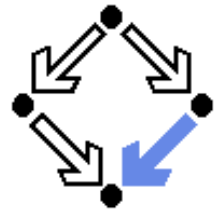


Overview

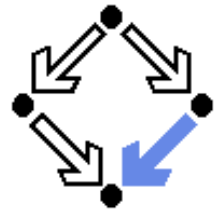


A continuation of the course "Programming" in the last semester.

- Last semester: procedural ("imperative") programming in C++.
  - Focus on organization of control flow.
  - Passive entities ("data") processed by active entities ("functions").
  - Programs organized as sets of functions.
- This semester: object-oriented programming in C++.
  - Focus on organization of data.
  - "Classes" combine data and functions to "objects".
  - Programs organized as sets of classes.

Modern approach to "programming in the large".

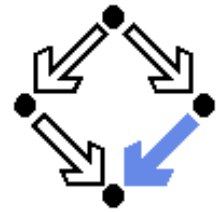
Example



```
struct Date {
  int day;
  int month;
}

static void print(Date d)
{
  cout << d.day << "."
    << d.month << ".";
}

Date d;
d.day = 24;
d.month = 12;
print(d);
```

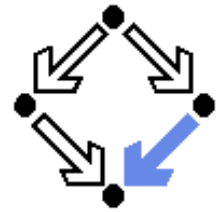
```
class Date {
  private:
    int day;
    int month;
  public:
    Date(int d, int m) {
      day = d;
      month = m;
    }
    void print() {
      cout << day << "."
        << month << ".";
    }
}

Date d = Date(24, 12);
d.print();
```

Topics



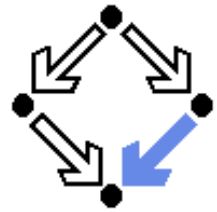
- Classes: combining data and functions.
  - Classes versus records ("structs").
  - Construction, destruction, assignments.
  - Static members versus non-static members.
- Inheritance: building class hierarchies.
  - Classes and subclasses.
  - Virtual functions and overriding.
  - Abstract classes, interfaces, frameworks.
- Templates: type-generic ("polymorphic") programming.
  - Function templates.
  - Class templates.
- The C++ Standard Library: reusing existing functionality.
  - Basic features (I/O, numerics, etc).
  - Containers, iterators, and algorithms.

Organization



- Lecture: concepts and examples.
  - Slides, blackboard, online demonstrations.
- Assignments: moderate programming exercises.
  - 6 assignments are given.
    - Results to be submitted within 2 weeks.
  - Tutors: Andreas Müller, Mikhael Yuditsky.
    - See the course site for the dates of the meetings offered every week.
- Grades: based on final exam and assignments.
  - Final exam (50%): concepts and very small programming tasks.
  - Assignments (50%): best 5 results are evaluated.
  - Both exam and assignments have to be positive.
- Literature: any good C++ book will do for this course.
  - Ray Lischner: "C++ in a Nutshell", O'Reilly, 2003.

Moodle Course

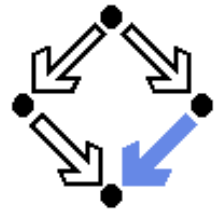


Central point for electronic communication.

- Register as a participant in the Moodle course.
  - All forum messages will be sent as emails to registered participants.
- Submit assignments via Moodle.
  - No email submissions are accepted.
- Post general questions in the "course forum".
  - Answered by Wolfgang Schreiner.
- Post assignment-specific questions in "assignment forum".
  - Answered by one of the tutors.

http://www.risc.uni-linz.ac.at/people/schreine/courses/ss2009/compsys

C++ Software



Any C++ compiler and program editor will do for this course.

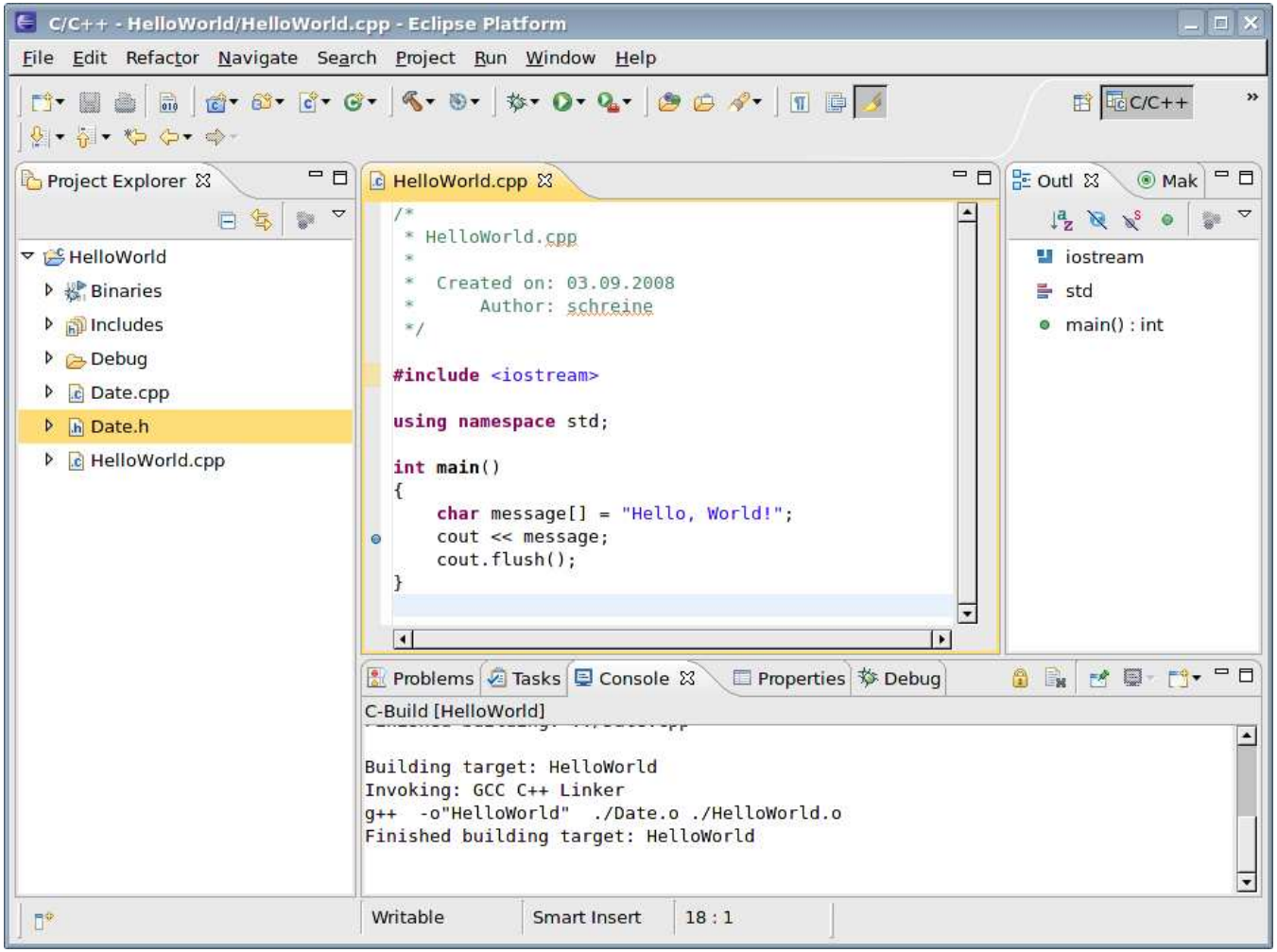
- Eclipse IDE for C/C++ Developers

  `http://www.eclipse.org/downloads`
- GNU/Linux: The GNU C++ Compiler.
  - Debian: `apt-get install g++`
- Windows: MinGW and MSYS.

  `http://www.mingw.org`
  `http://max.berger.name/howto/cdt`

A decent IDE makes program development much more productive.

Eclipse IDE for C/C++ Developers



Eclipse Debug View