C++

Inheritance: access control

# Example

Let us add a method print() to the class Teacher:

```
Teacher::print()
{
    cout << name << " "
        << employee_id << " "
        << lab
        << endl;
}
```

This code will not compile

# Example: remarks

- The previous example does not compile
- Teacher::print() can not access the member name
  - Reason: name is a private member of the base class, therefore is accessible to the base class only
  - Despite the public inheritance, private data can only be accessed by their own class and not by other classes (including derived classes)

# Example: solution

 One solution to the previous problem is to make the member data name in the class Person protected instead of private

```
class Person {
  protected:
    string name;
  // ...
};
```

```
class Student {
   protected:
   int student_id;
   int year;
   // ...
};
```

```
class Teacher {
  protected:
  int employee_id;
  std::string lab;
  // ...
};
```

### Access control in C++

- C++ offer three levels of access control:
  - Public: members (data and methods) can be used by the class and everybody else (other classes, functions, etc)
  - Protected: members can be accessed by the class (and its friends) and its derived classes
  - Private: members can be accessed only by the class (and its friends)
- Remark: without inheritance private and protected are the same

### Protected vs private

- When to use protected and when to use private?
- Protected is weakening encapsulation so:
  - Use protected only when you have no choices and private rest of the time

#### Example:

- in class Person, we decide to change the type of name from string to a class CName then:
- If name is protected then derived classes need to have their code reviewed since implementation details of the base class changed
- If name is private, since nobody else could access it, no code outside of the class will break

# Protected vs private

 For the previous example, it is better to keep name private and used the accessor get\_name() and set\_name() that are provided by the base class