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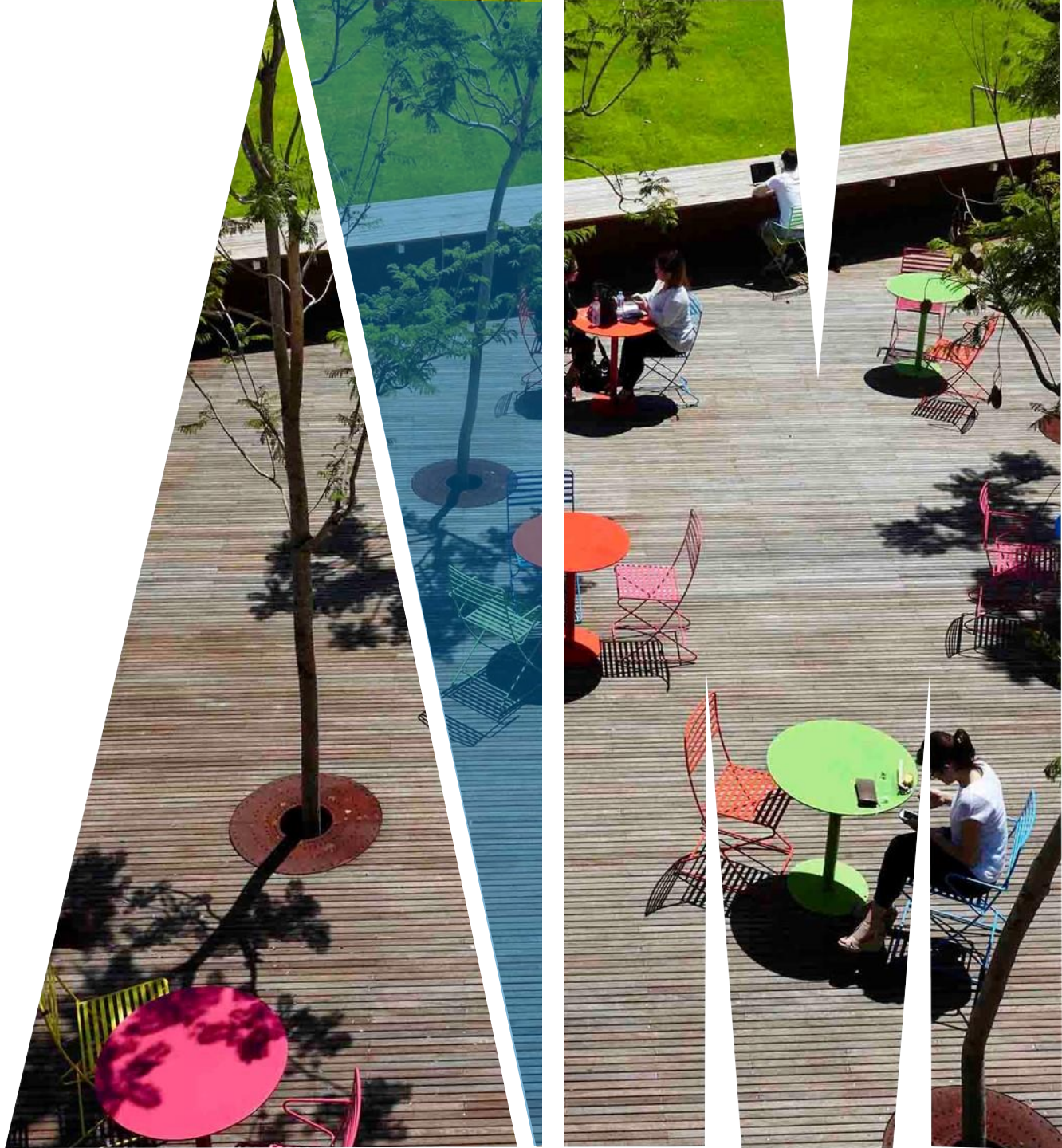
FIT2099 Object-Oriented Design and Implementation

Classes and objects



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Outline

Encapsulation and Information hiding

Class members

- Attributes
- Methods

Access modifiers (public and private)

Getters/setters

WHAT IS ENCAPSULATION?

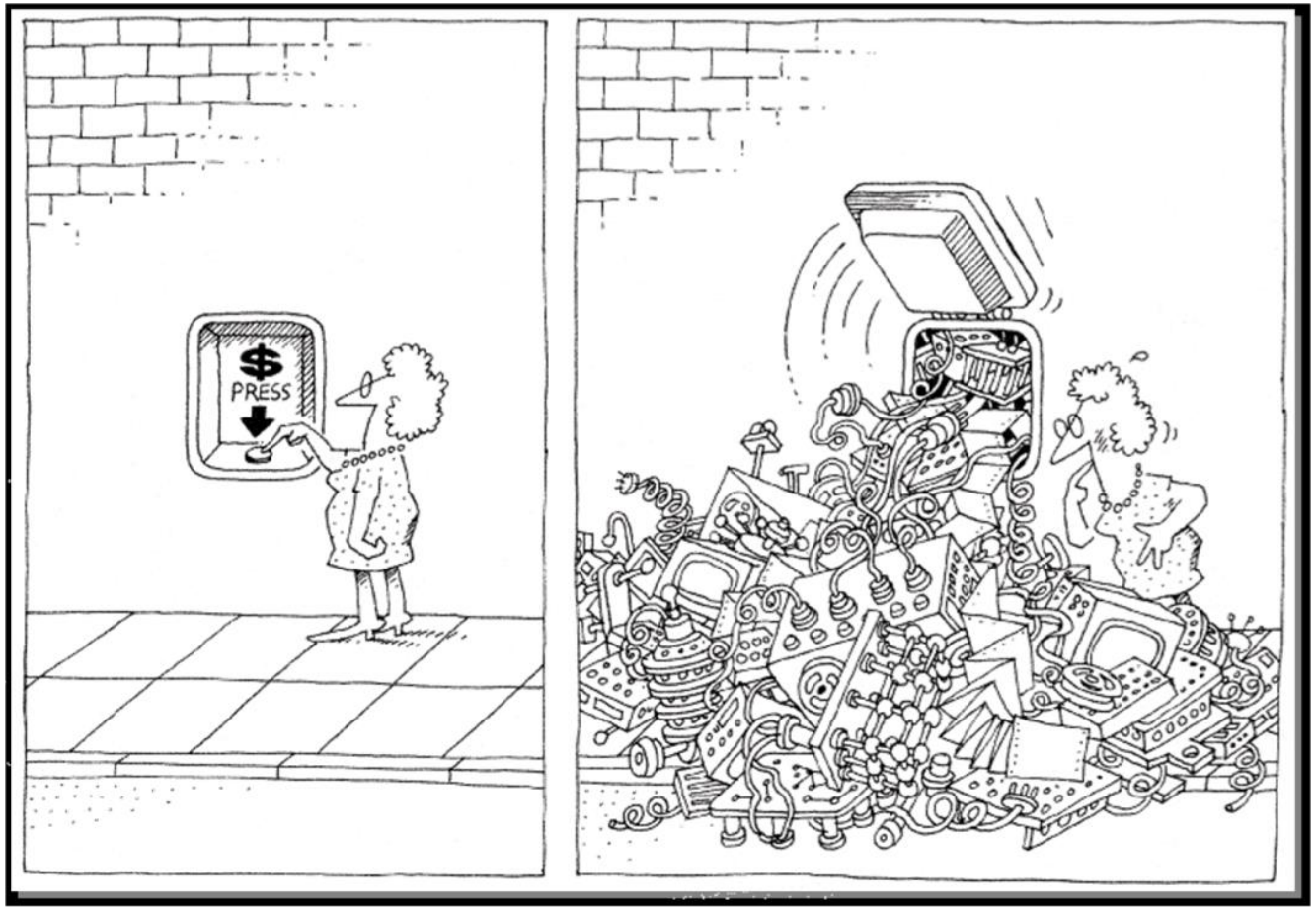
A software development technique that consists of **isolating a system function** or a set of data and operations on those data within a module and providing precise specifications for the module

--IEEE Software Engineering Vocabulary

WHAT IS ENCAPSULATION?

Access to the **names, meanings, and values** of the responsibilities of a class is entirely separated from access to their **realization**.

--IEEE Software Engineering Vocabulary



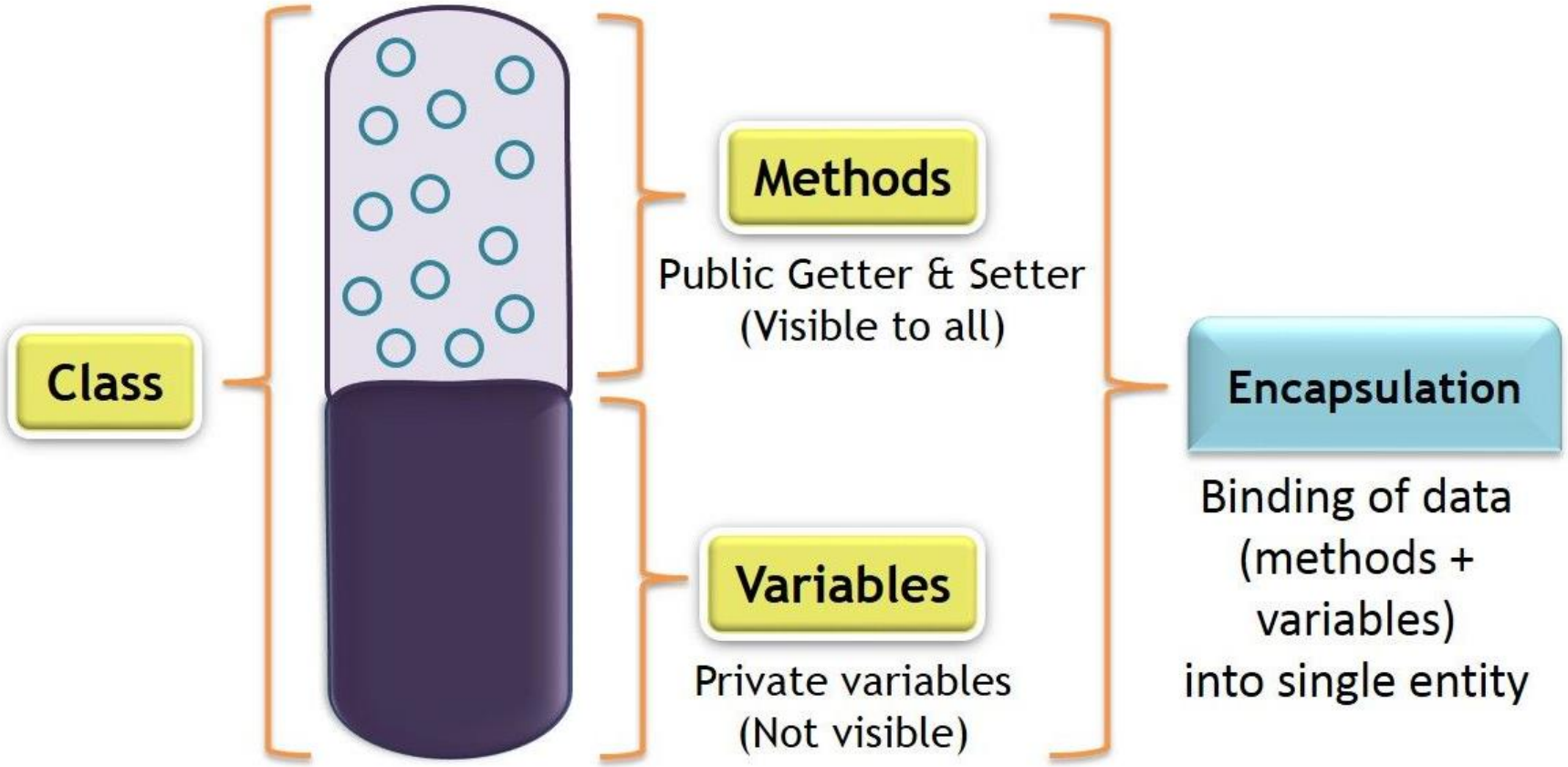
WHAT IS ENCAPSULATION?

The idea that a module has an outside that is distinct from its inside, that it has an **external interface** and an **internal implementation**

cf. data abstraction, information hiding

--IEEE Software Engineering Vocabulary

ONE WAY TO ACHIEVE
ENCAPSULATION



THE CLASS

A class is an extensible program-code-template for creating objects.
The members of a class may be:

i) initial values for state (attributes also called *fields* or *data members*).

An object's attributes store its state

These look like variables that are part of the class but not part of a method

ii) implementations of behaviour (member functions or methods also called *operations*)

syntax similar to function definitions in non-OO languages

can tell the object to do something (a command)

can ask the object a question about itself (a query)

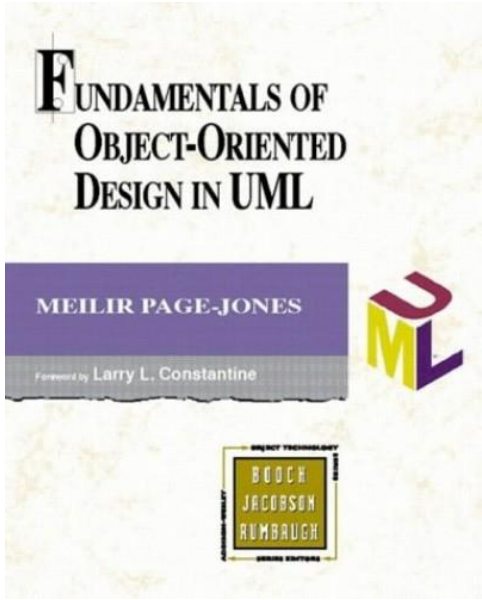
PAGE-JONES ON ENCAPSULATION

Encapsulation is the **grouping of ideas into one unit**, which can thereafter be referred to by a **single name**.

Object-oriented encapsulation is the **packaging of operations and attributes** representing state into an object type so that state is accessible or modifiable only via the **interface** provided by the encapsulation.

-- Meilir Page-Jones,

Fundamentals of Object-Oriented Design in UML

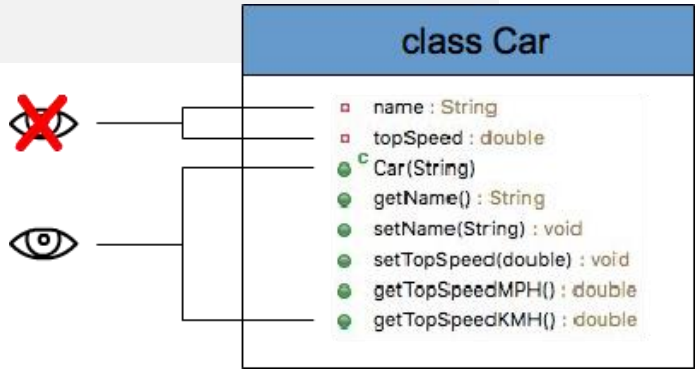


WHAT IS INFORMATION HIDING?

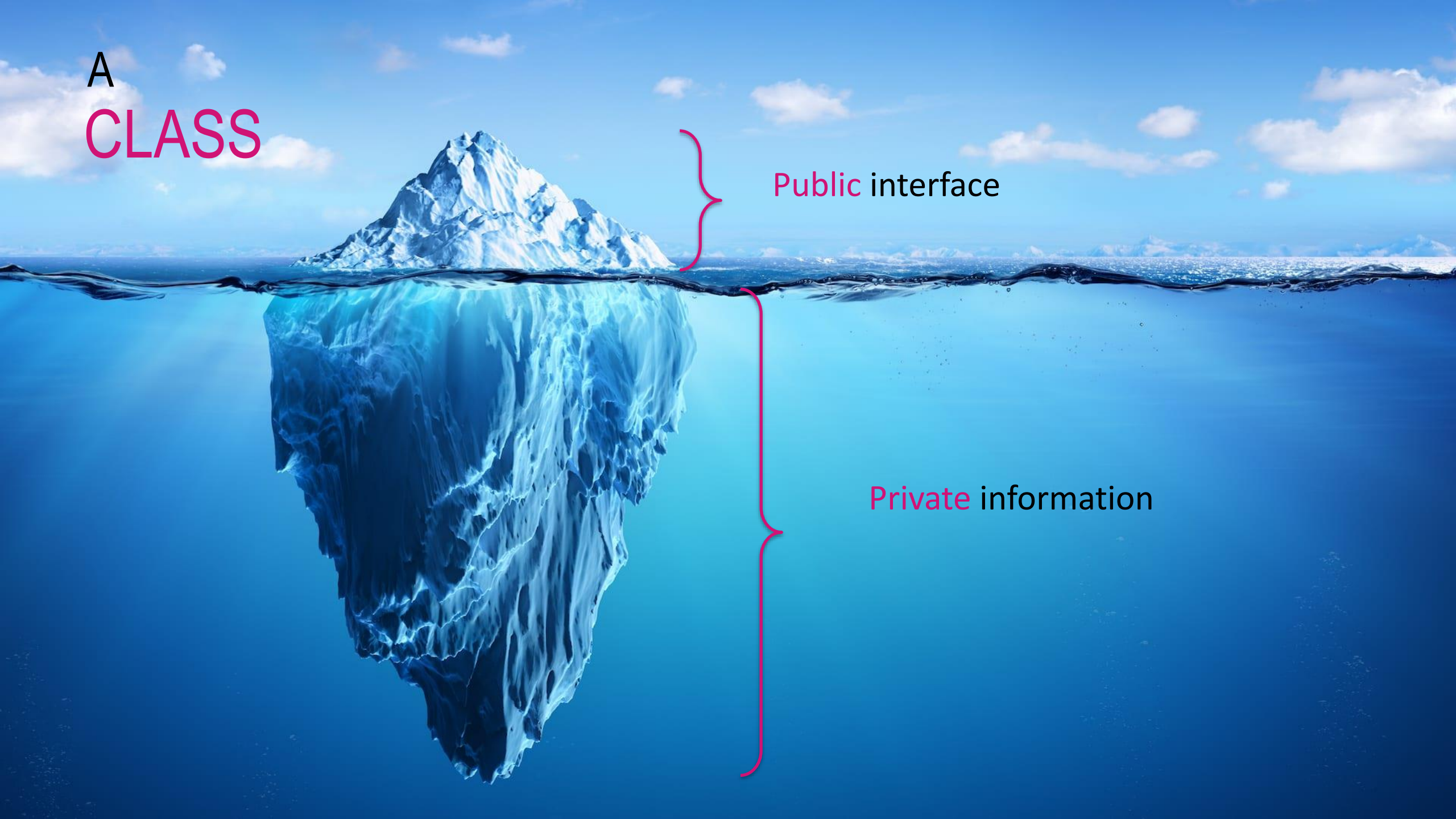
Every module is characterized by its **knowledge of a design decision which it hides from all others**. Its *interface* or *definition* was chosen to reveal as little as possible about its inner workings: data structures, its internal linkings, accessing procedures and modifying procedures are part of a single module.
-- David Parnas (**1972**)

Information/implementation hiding is the use of encapsulation to **restrict from external visibility** certain information or implementation decisions that are internal to the encapsulation structure.

-- Meilir Page-Jones



A
CLASS



WHY ENCAPSULATING?

Lets us define a **boundary** around chunks of code

- then we can hide what's inside that boundary from code outside the boundary

Hiding the stuff that is inside makes those chunks **look simpler** from the outside

- simple things are easier to use

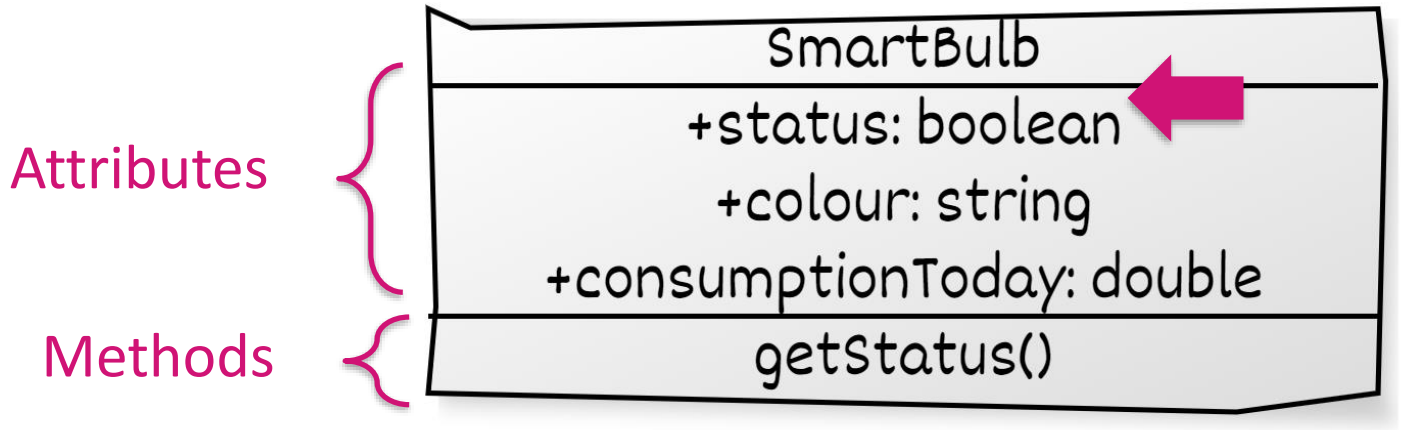
Also allows us to prevent unnecessary code dependencies

(ReD: **Reducing Dependencies**)

- can't depend on something that you can't see

EXAMINING
A CLASS

A class is represented by a rectangle having three sections –
- the **top** section containing the **name of the class**
- the **middle** section containing class **attributes**
- the **bottom** section representing **methods** of the class

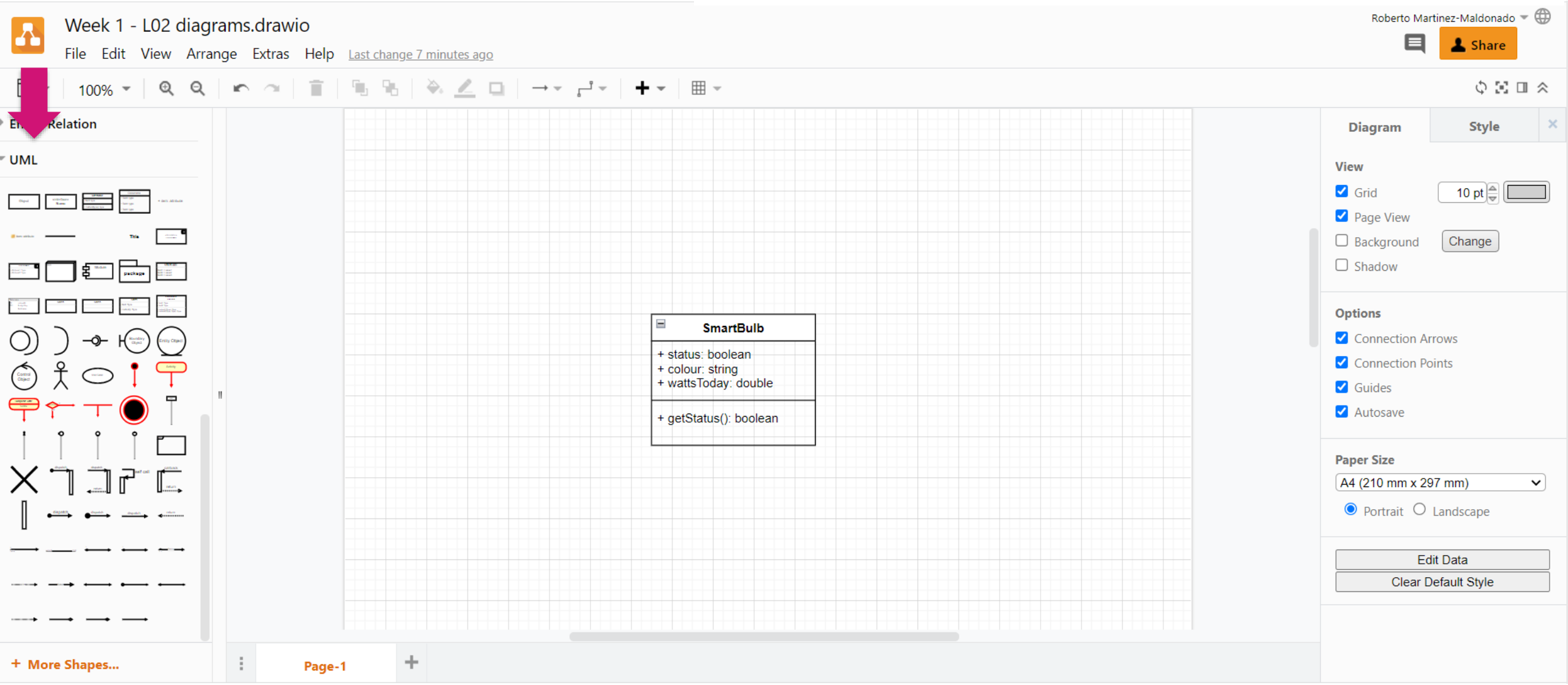


WHAT IS UML?

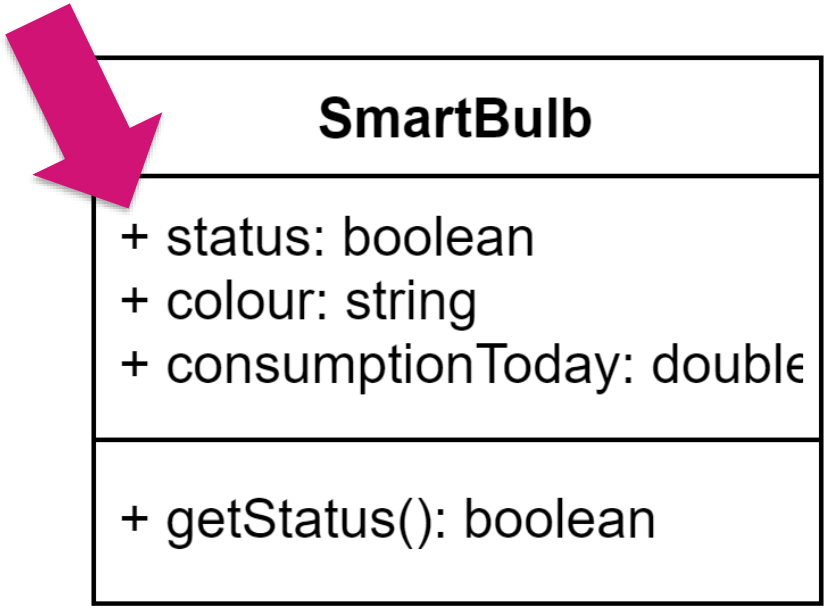
The Unified Modeling Language (UML) is a general-purpose, developmental, modeling **language** in the field of software engineering that is intended to provide **a standard way to visualize the design of a system.**

BUILDING A
CLASS DIAGRAM

Go to: app.diagrams.net



EXAMINING
A CLASS

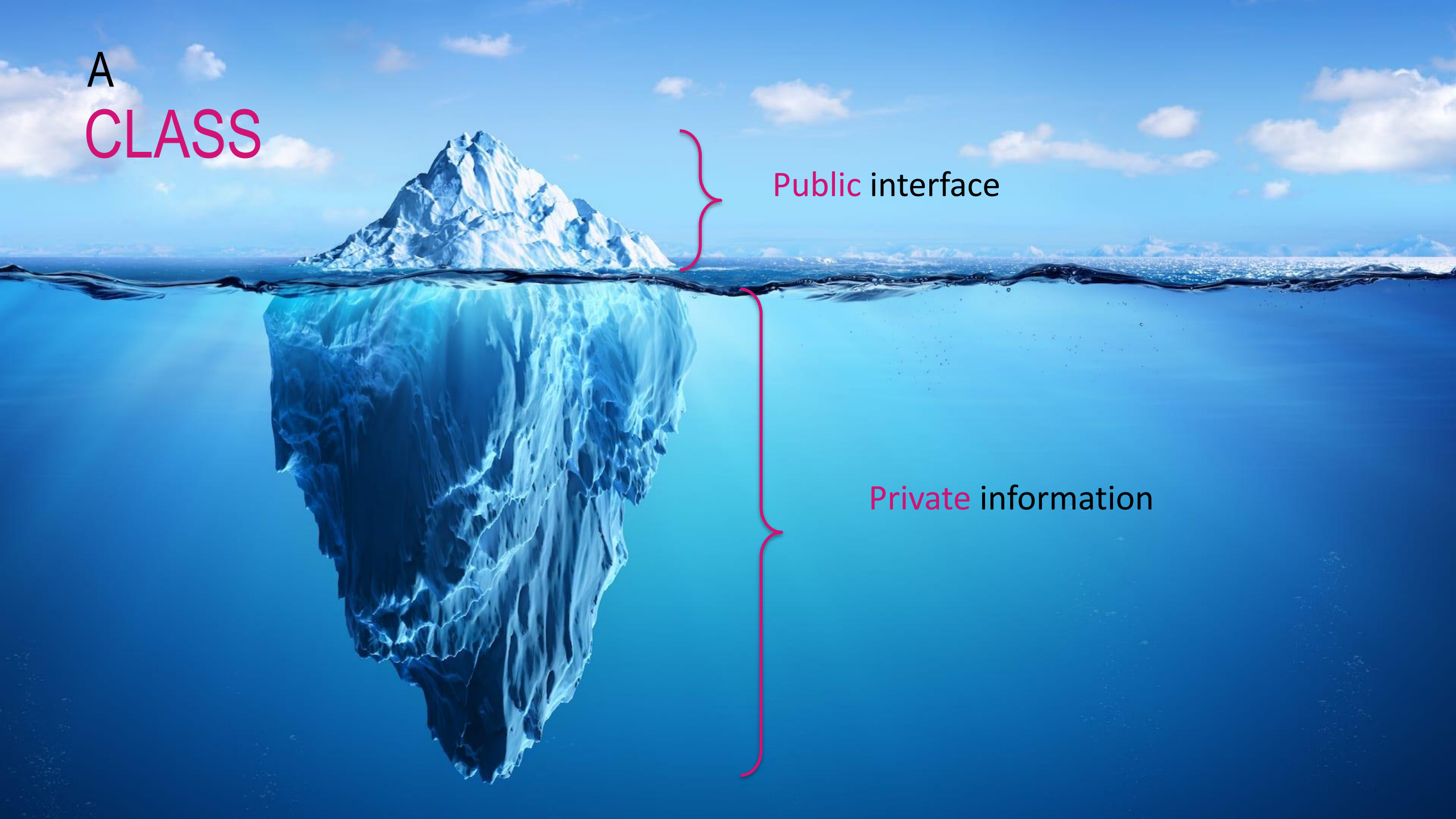


ACCESS MODIFIERS

Public – A public member is visible from **anywhere in the system**. In class diagram, it is prefixed by the symbol '+'.

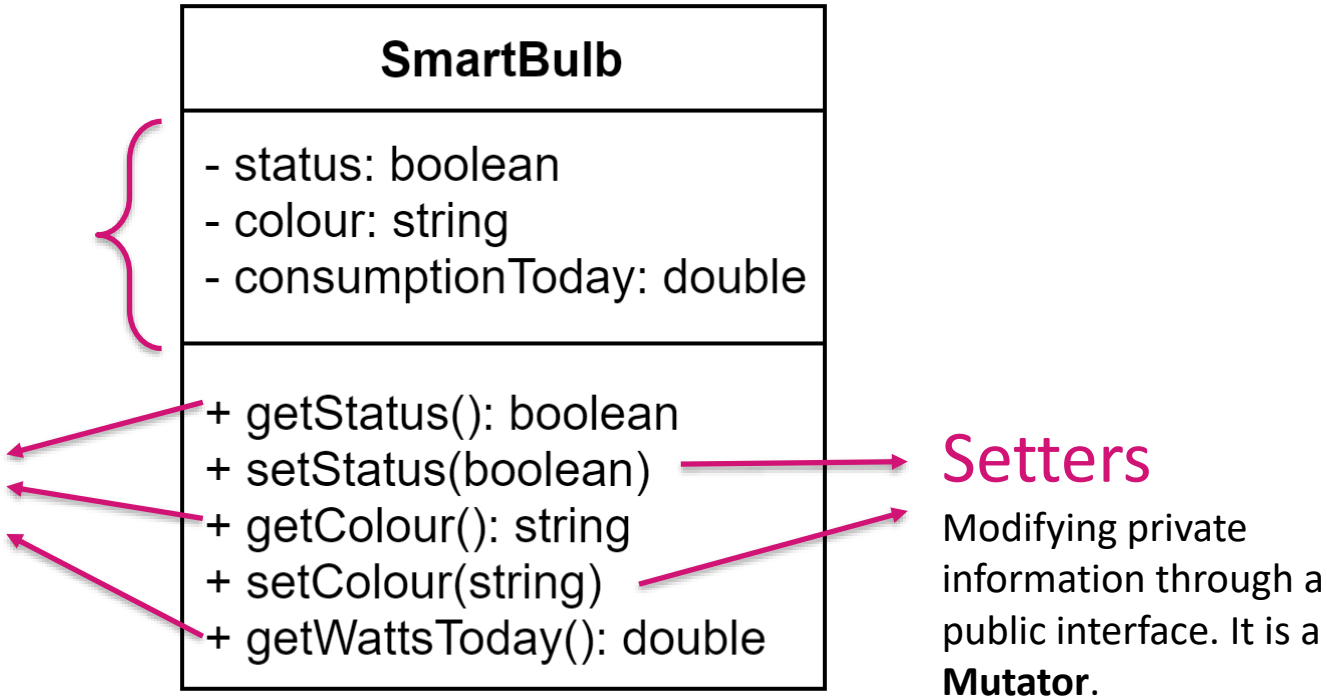
Private – A private member is visible only from **within the class**. **It cannot be accessed from outside the class**. A private member is prefixed by the symbol '–'.

A
CLASS



EXAMINING A CLASS

Hidden information



Getters

Accessing (reading) private information through a public interface. It is an **Accessor.**

Setters

Modifying private information through a public interface. It is a **Mutator**.

Summary

Encapsulation and Information hiding

Class members

- Attributes
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Access modifiers (public and private)

Getters/setters

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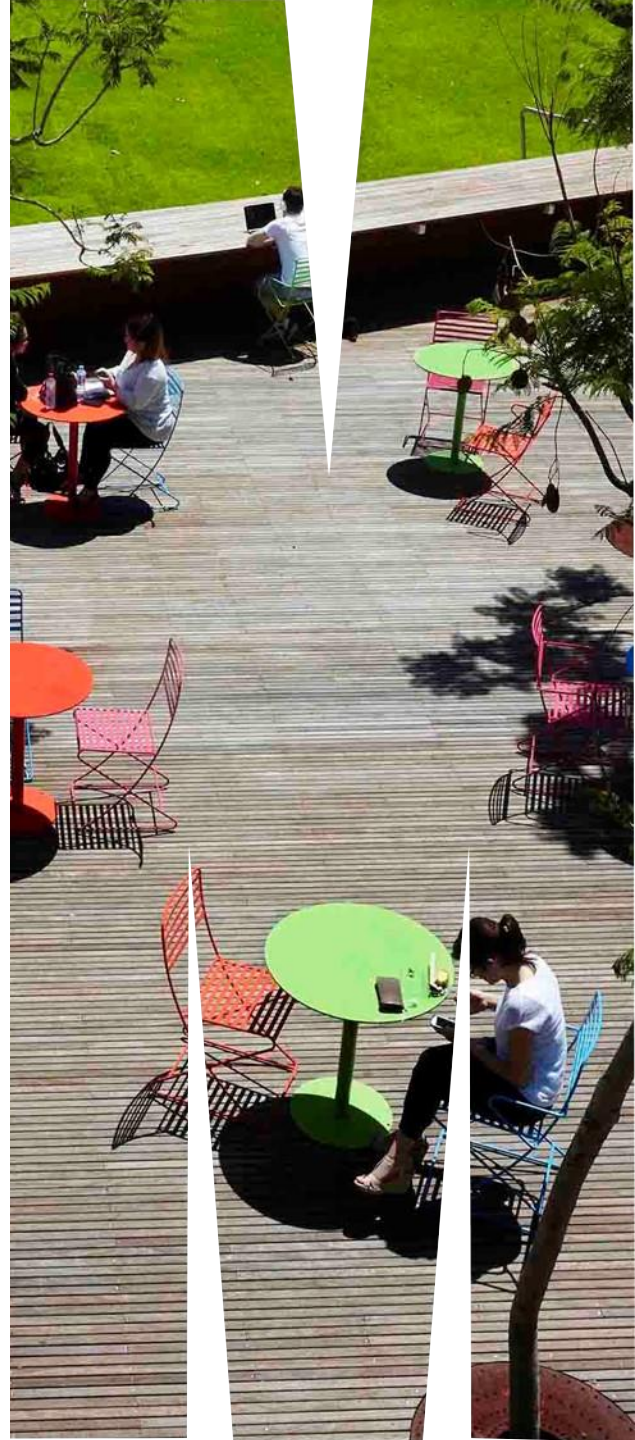
Thanks



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