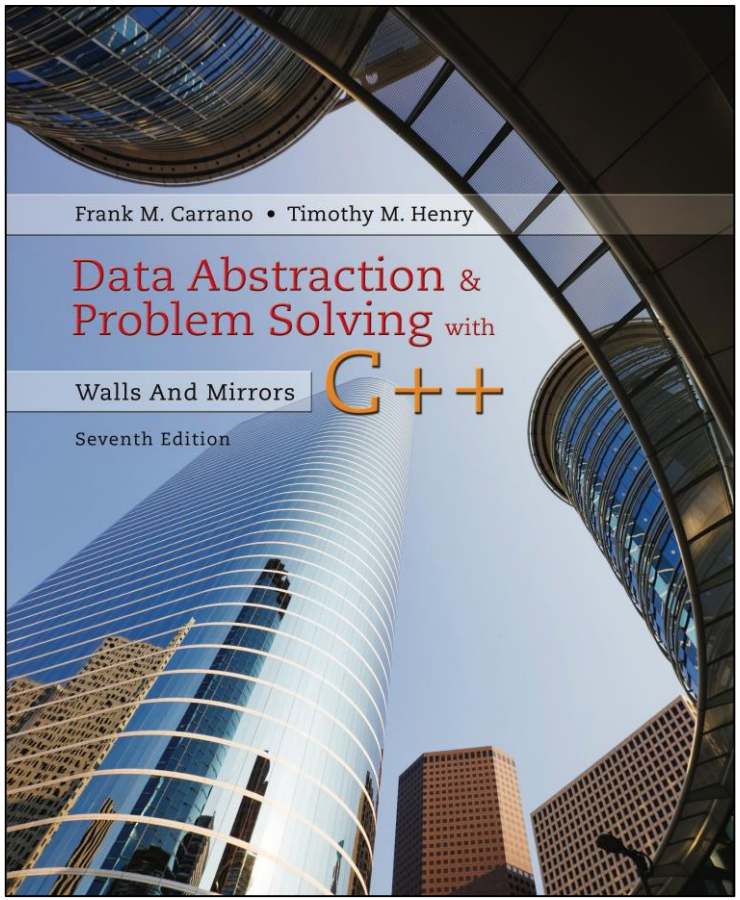
Data Abstraction & Problem Solving with C++: Walls and Mirrors

Seventh Edition



Chapter 1

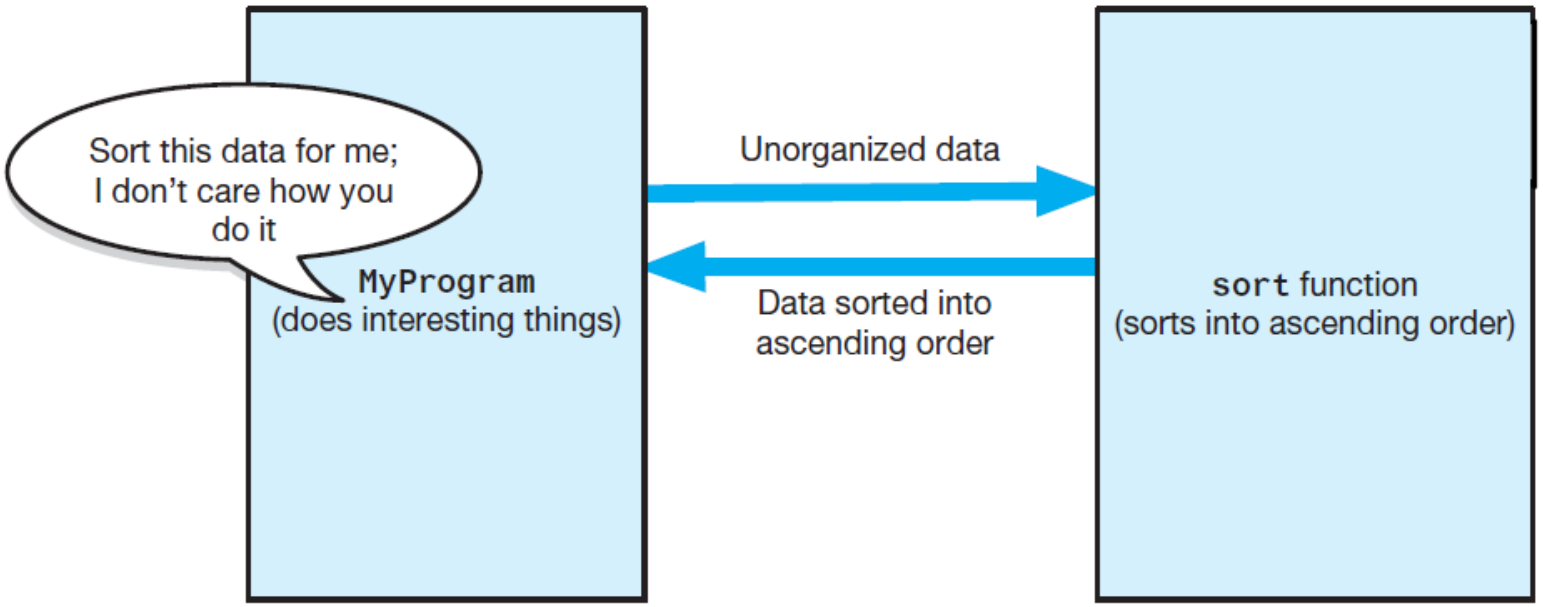
Data Abstraction: The Walls

Object-Oriented Analysis & Design

- Requirements of a solution
  - What solution must be, do
- Object-oriented design
  - Describe solution to problem
  - Express solution in terms of software objects
  - Create one or more models of solution

Specifications

Figure 1-1 The task sort is a module separate from the **MyProgram** module



Operation Contracts

- Documents
  - How method can be used
  - What limitations it has
- Specify
  - Purpose of modules
  - Data flow among modules
  - Pre-, post-condition, input, output of each module

Abstraction

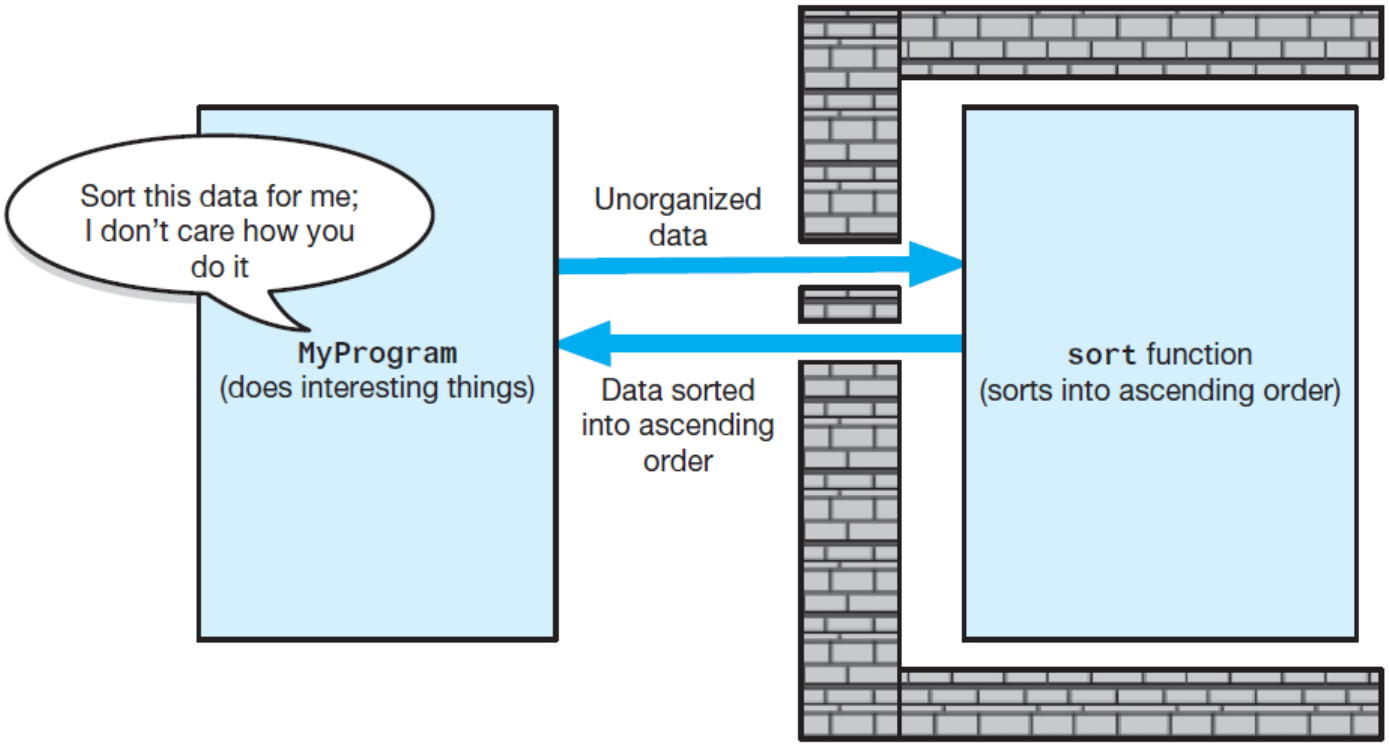
- Separate purpose of a module from its implementation
- Specifications do not indicate how to implement
  - Able to use without knowing implementation

Information Hiding (1 of 3)

- Abstraction helps identify details that should be hidden from public view
  - Ensured no other module can tamper with these hidden details.
- Isolation of the modules cannot be total, however
  - Client must know what tasks can be done, how to initiate a task

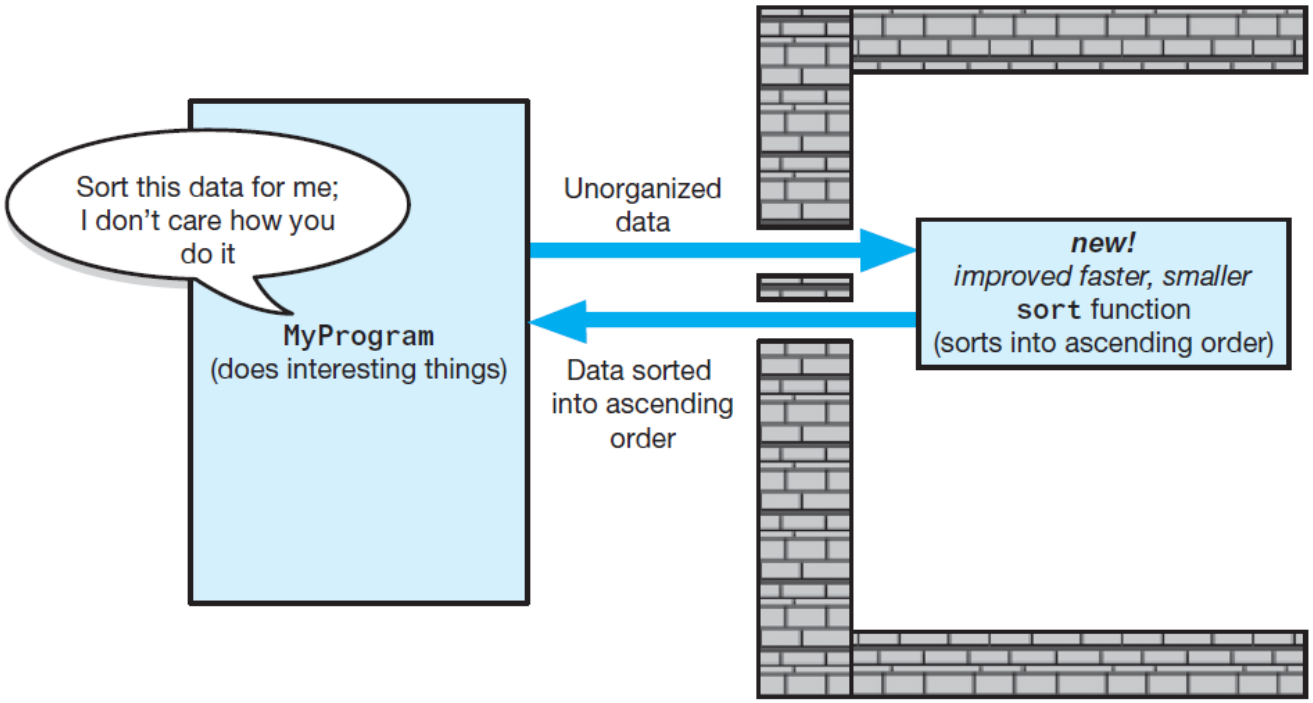
Information Hiding (2 of 3)

Figure 1-2 Tasks communicate through a slit in the wall



Information Hiding (3 of 3)

Figure 1-3 A revised implementation communicates through the same slit in the wall

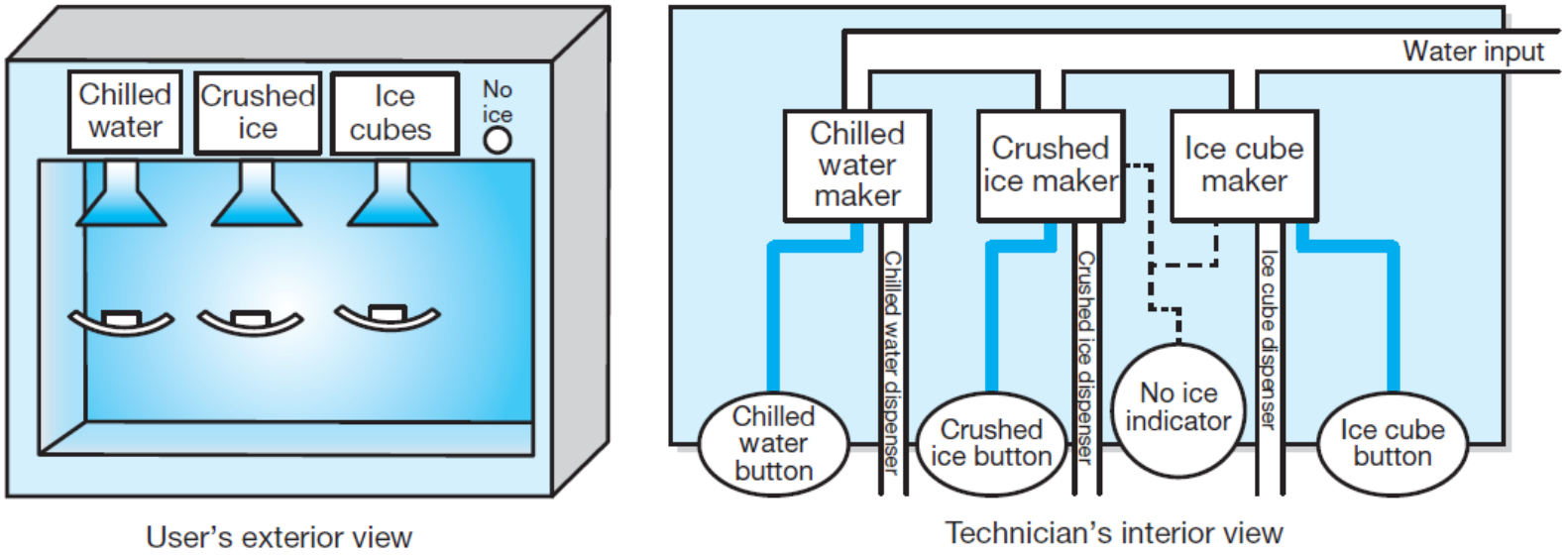


Abstract Data Types (ADT) (1 of 3)

- Typical operations on data
  - Add data to a data collection.
  - Remove data from a data collection.
  - Ask questions about the data in a data collection.
- An ADT : a collection of data **and** a set of operations on data
- A data structure : an implementation of an ADT within a programming language

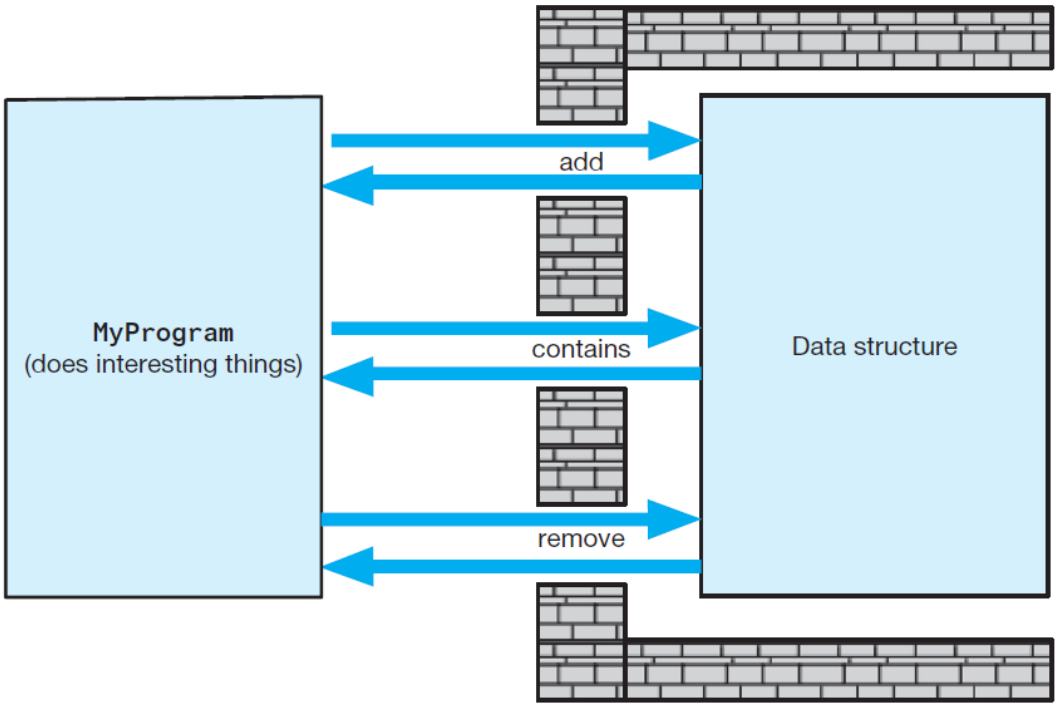
Abstract Data Types (ADT) (2 of 3)

Figure 1-4 A dispenser of chilled water, crushed ice, and ice cubes



Abstract Data Types (ADT) (3 of 3)

Figure 1-5 A wall of ADT operations isolates a data structure from the program that uses it



Designing an ADT

- Evolves naturally during the problem-solving process
  - What data does a problem require?
  - What operations does a problem require?
- ADTs typically have initialization and destruction operations
  - Assumed but not specified at this stage

Copyright