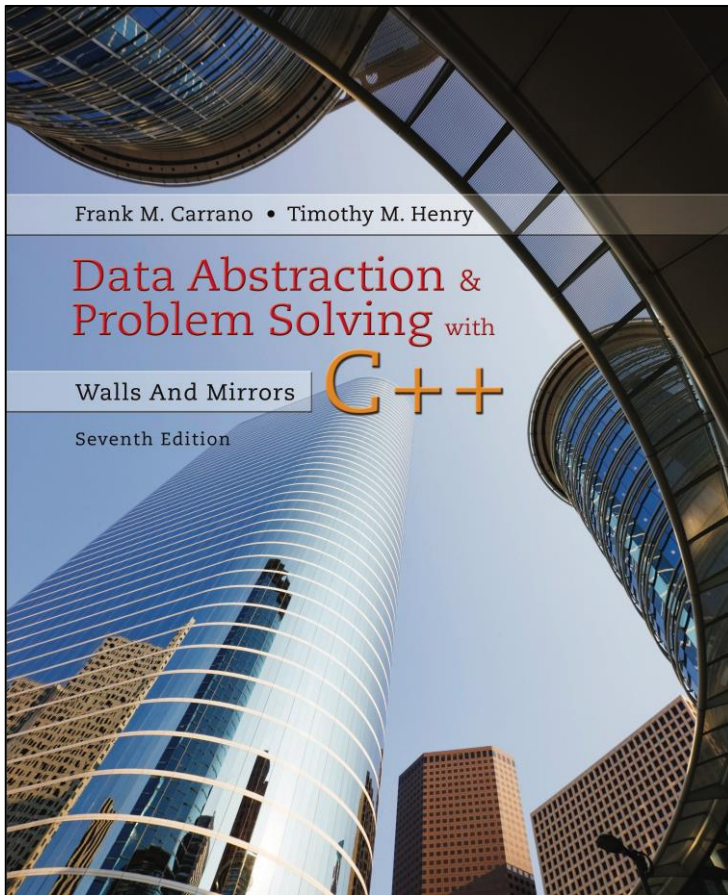


Data Abstraction & Problem Solving with C++: Walls and Mirrors

Seventh Edition



Chapter 1

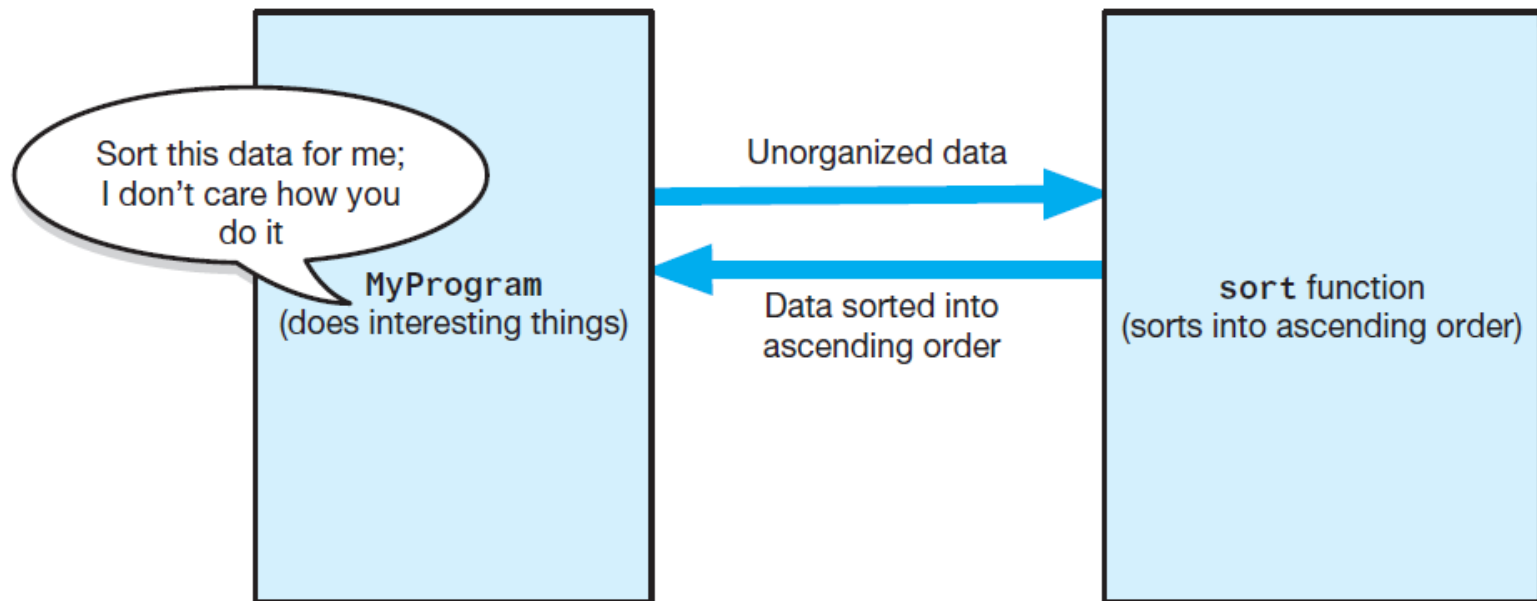
Data Abstraction: The Walls

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

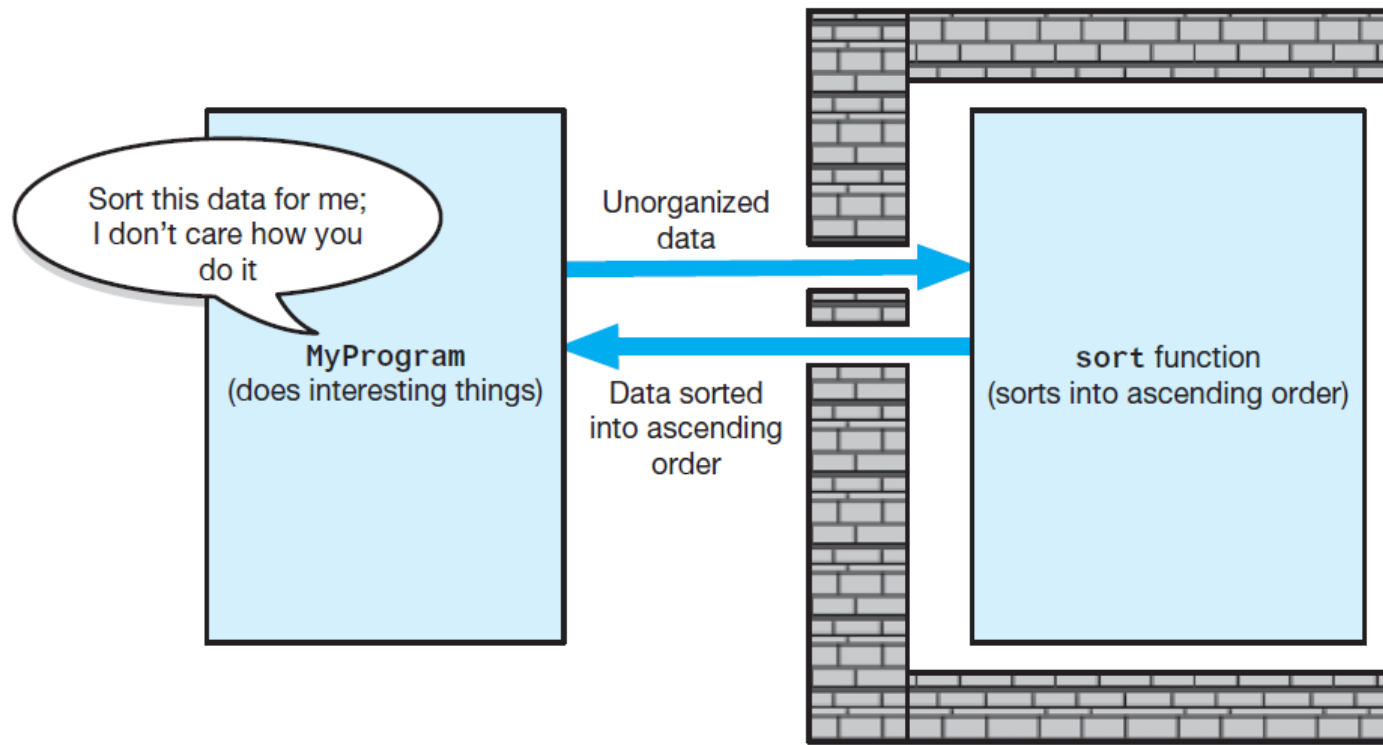
- Separate purpose of a module from its implementation
- Specifications do not indicate how to implement
 - Able to use without knowing implementation

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

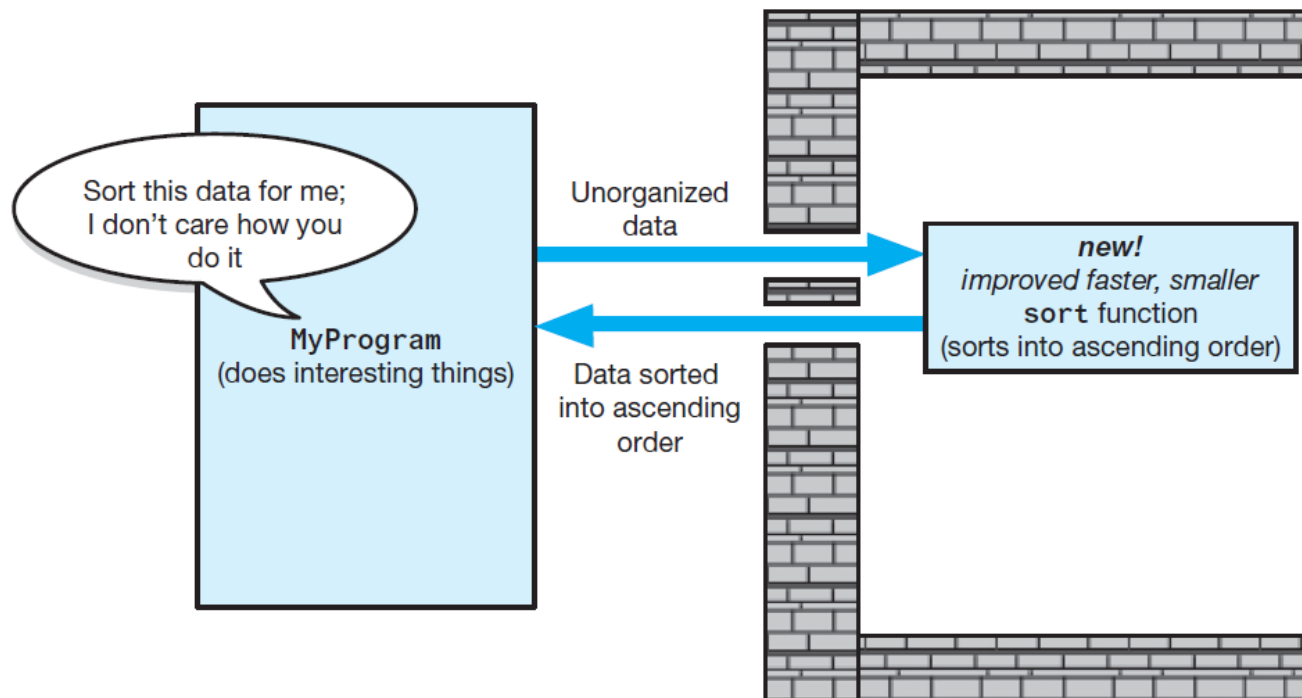
Information Hiding (2 of 3)

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

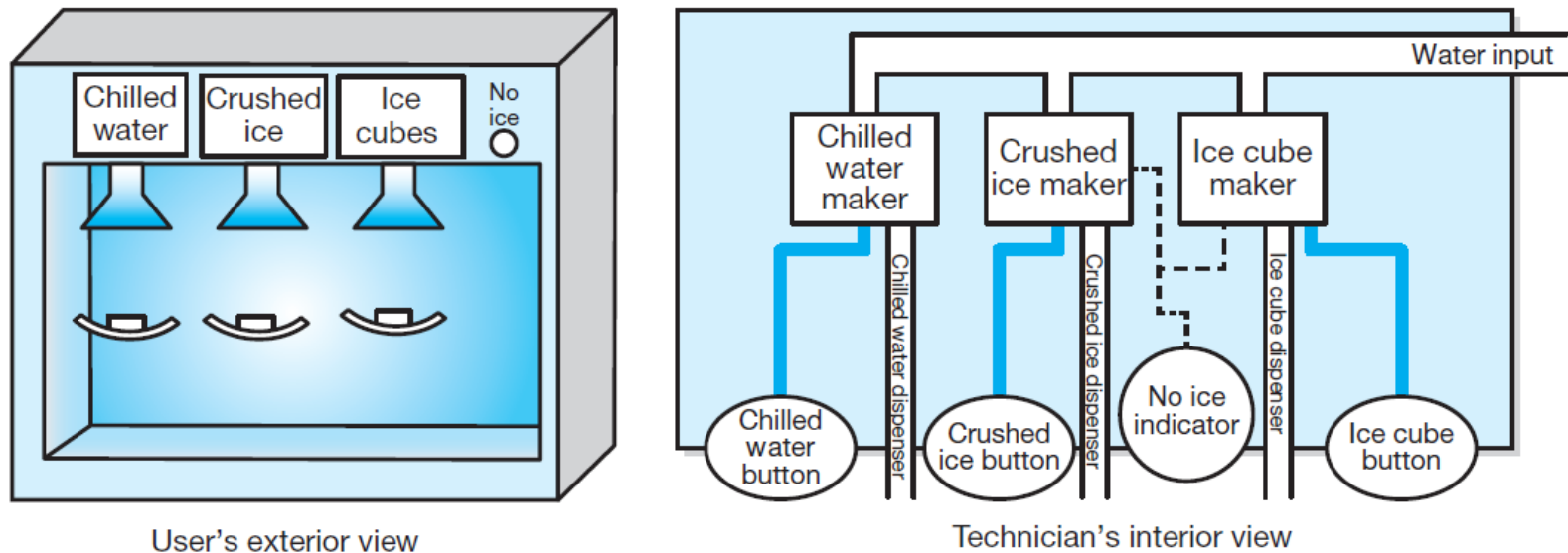


Abstract Data Types (ADT) (1 of 3)

- 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

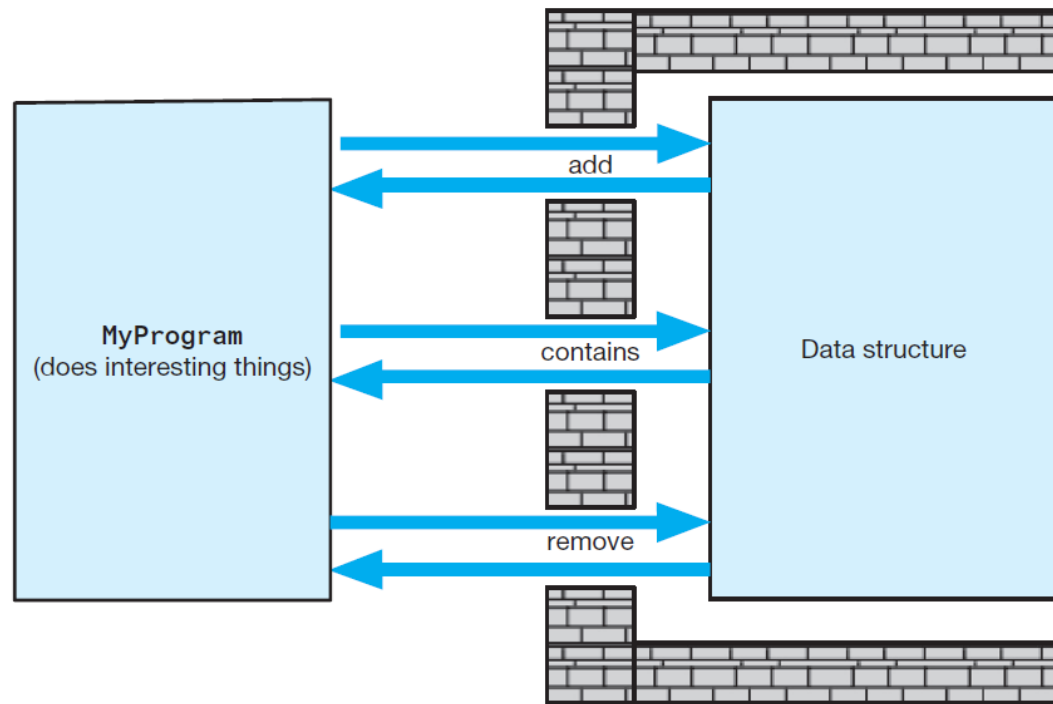
Abstract Data Types (ADT) (2 of 3)

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

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