Data Structures
CS 2014

Introduction

By

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Data Structure - What

- **Data** is the basic entity or fact that is used in calculation or manipulation process
- **Data structure** is a way of organizing data items by considering its relationship to each other.


WHY DATA
STRUCTURES?

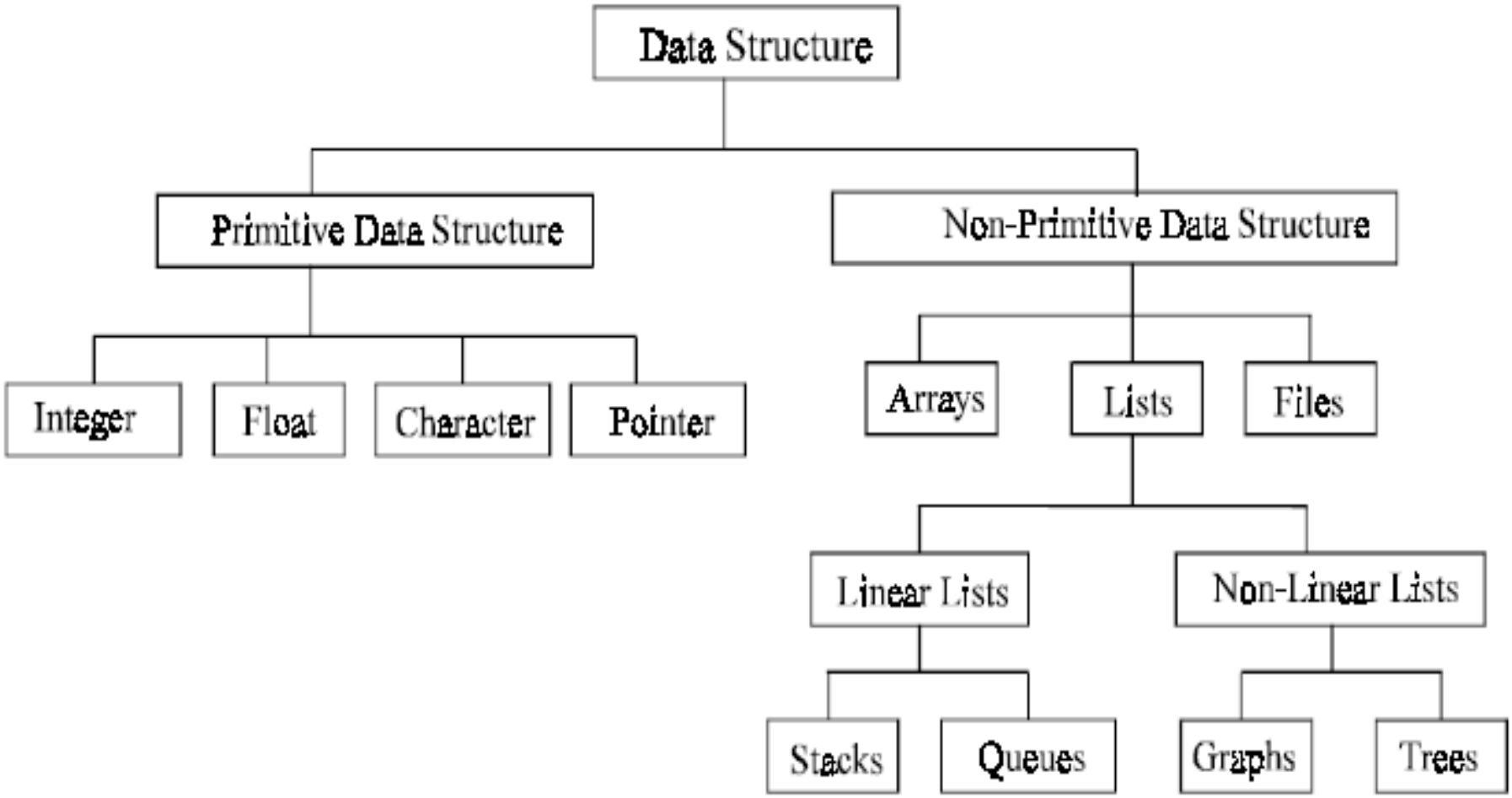
Data Structure - Why

- The selection of **good data structure** will help the programmer to design more **efficient programs.**

- The efficiency of the program depends on two measurements :
  1. Space complexity
  2. Time complexity

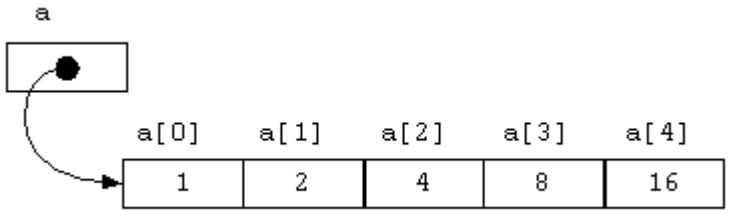
Have you ever tried to structure your data before?

Data Structures



Arrays

- **Array** is one of the most familiar non-primitive linear **data structure**.



- It is a collection of items –which are of the same type- stored contiguously in the memory.

- We used to deal with the Array **without thinking about its details.**

Arrays

- The c statement: ***`int A[10];`***

  means:

  - rese… …o that:
    mer… …lements
  - givir…
- The c s…

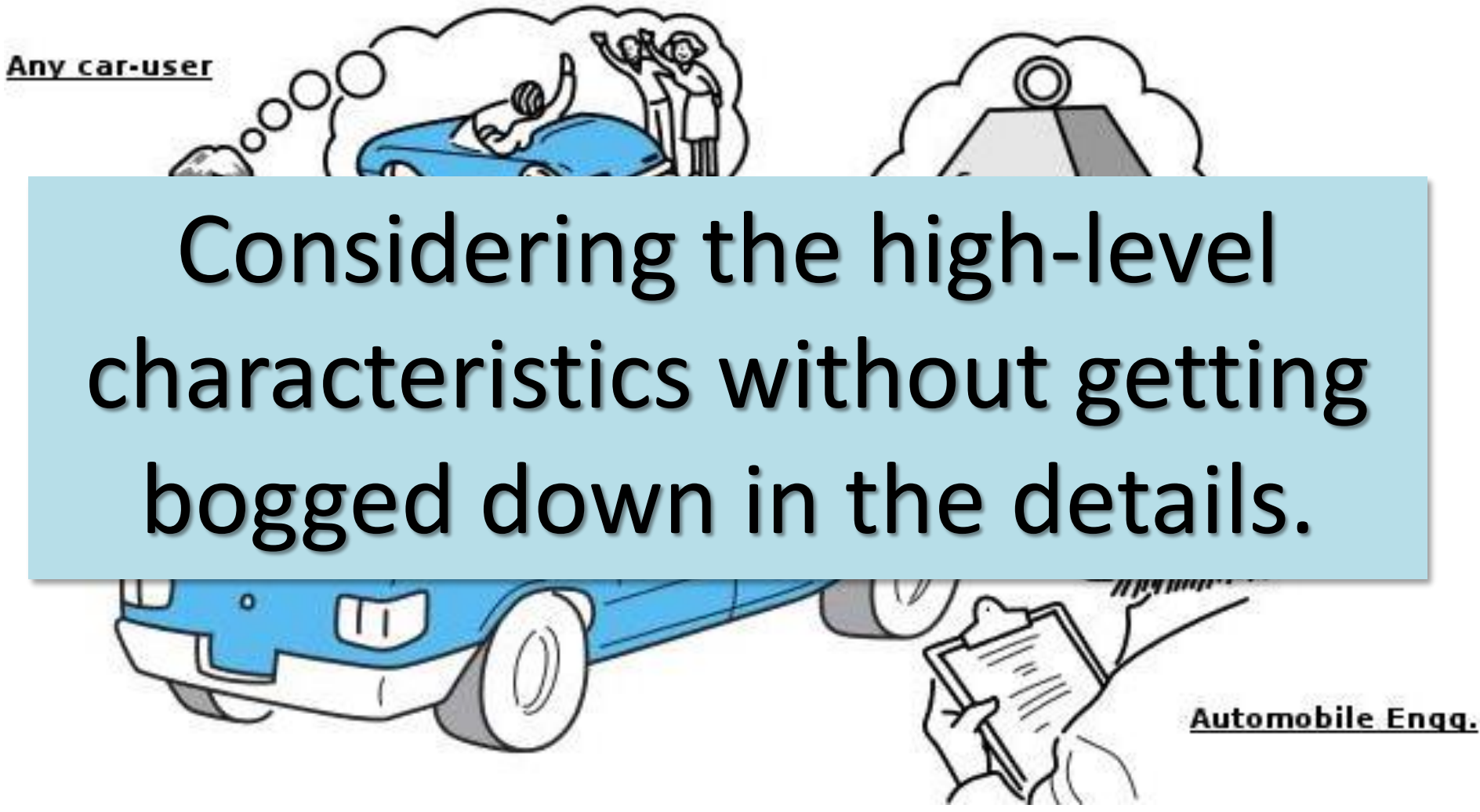
  means:

  - calculates the location address:

    Loc address = A+3* sizeof(int)
  - stores 27 in that location.

Array is an Abstract Data Type

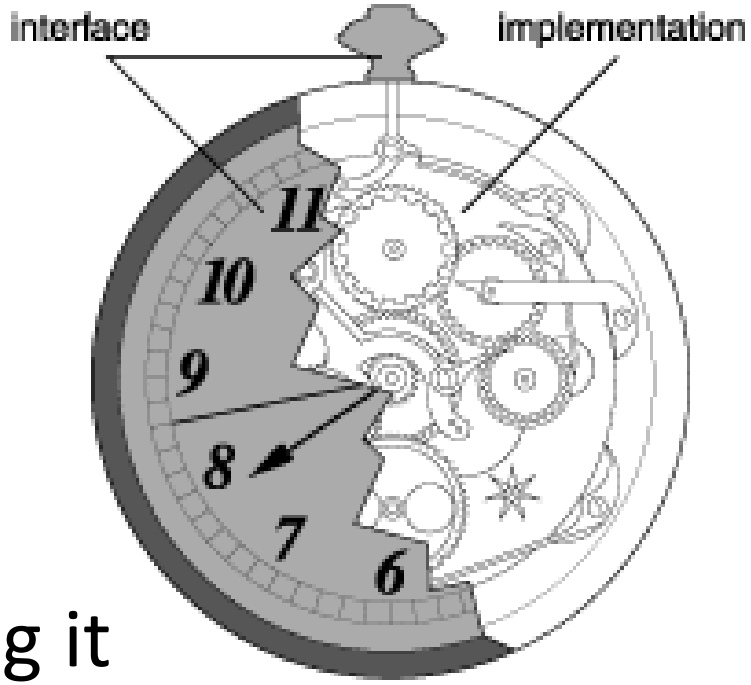
Abstraction



Considering the high-level characteristics without getting bogged down in the details.

Abstract Data Type (ADT)

- Data abstraction allows us to use a *data structure without* considering how it is implemented.



- Abstract Data Type (ADT)

  Is an organized data object and a set of operations for manipulating it

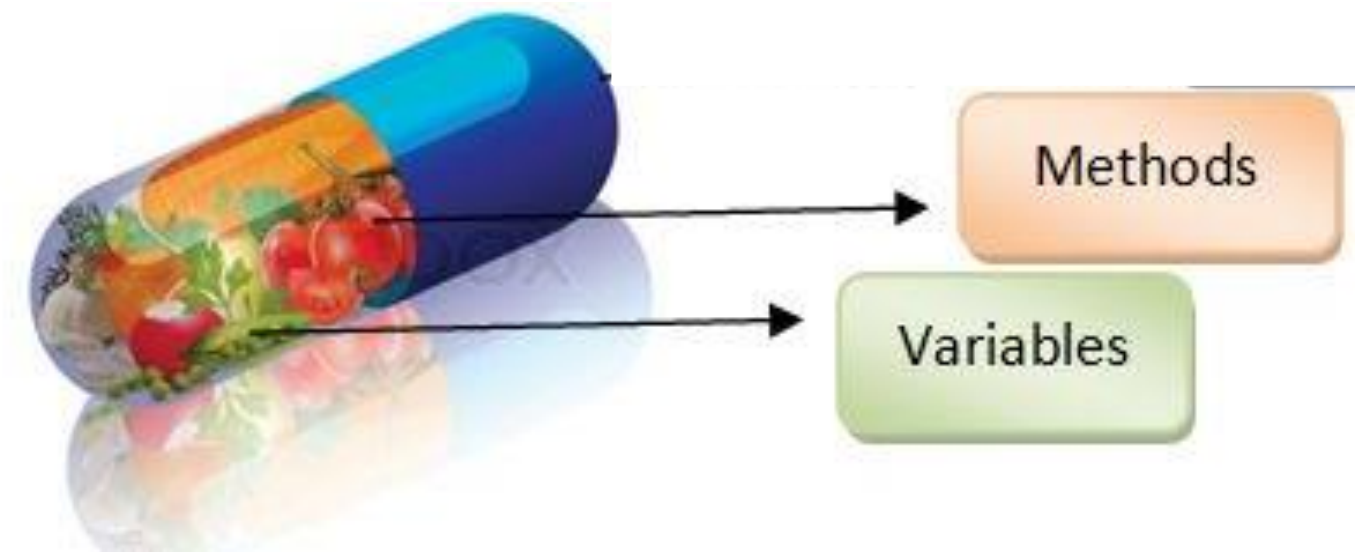
ADT = Organized data + Operations

Abstract Data Type (ADT)

- ADT is defined in terms of the operations that can be performed on instances of the type rather than by how those operations are actually implemented.
- In other words, an ADT defines the *interface* of the objects.
- The interface is considered a kind of contract between the implementers and the users of the ADT.

Information hiding (Encapsulation)

- The hiding of the data structure implementation inside the ADT is referred to as ***encapsulation*** *or* ***information hiding***.



Information hiding (Encapsulation)

- We refer to a program that uses an ADT as **user** and a program that specifies the ADT as an **implementation**
- You use the structure at the **"User Level"** without caring about the details at the **"Implementation Level".**
- Your program, i.e., the user level, does not change even if the implementation of the used structure is changed.

Why using ADT?

- Rather than having to understand the detailed implementation of the set operations, the user only has to study the interface at a much higher level so much time can be saved.
- The ADT can be used in a variety of different programs
- The implementation of the component can be changed without affecting some other component.

What You Should Do

- Join the course “Microsoft Teams” group using the code:”**xcvjt3e**”

- All course material (lecture notes “slides", announcements, assignments, any supplemental notes or documentation), will be made available (posted) online on weekly basis, on the teams group.

Thank you