15-6 Graphs

A graph is a collection of nodes, called vertices, and a collection of segments, called lines, connecting pairs of vertices. In other words, a graph consists of two sets, a set of vertices and a set of lines.

Topics discussed in this section:

Graph Traversal

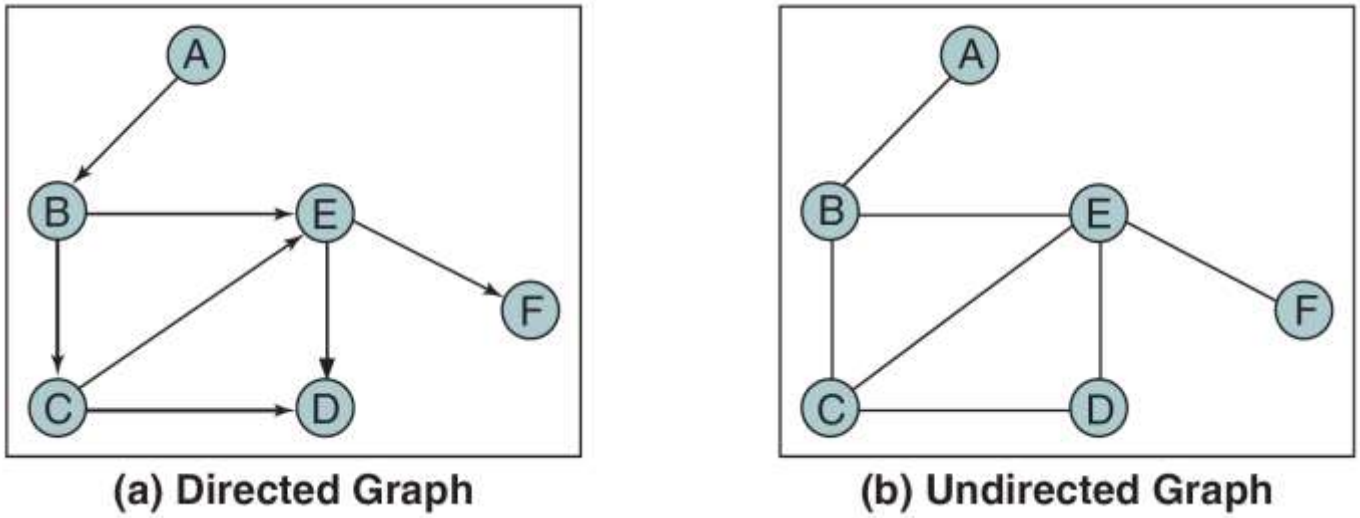

FIGURE 15-45 Directed and Undirected Graphs

Note

Graphs may be directed or undirected. In a directed graph, each line, called an arc, has a direction indicating how it may be traversed. In an undirected graph, the line is known as an edge, and it may be traversed in either direction.

Note

A file is an external collection of related data treated as a unit.

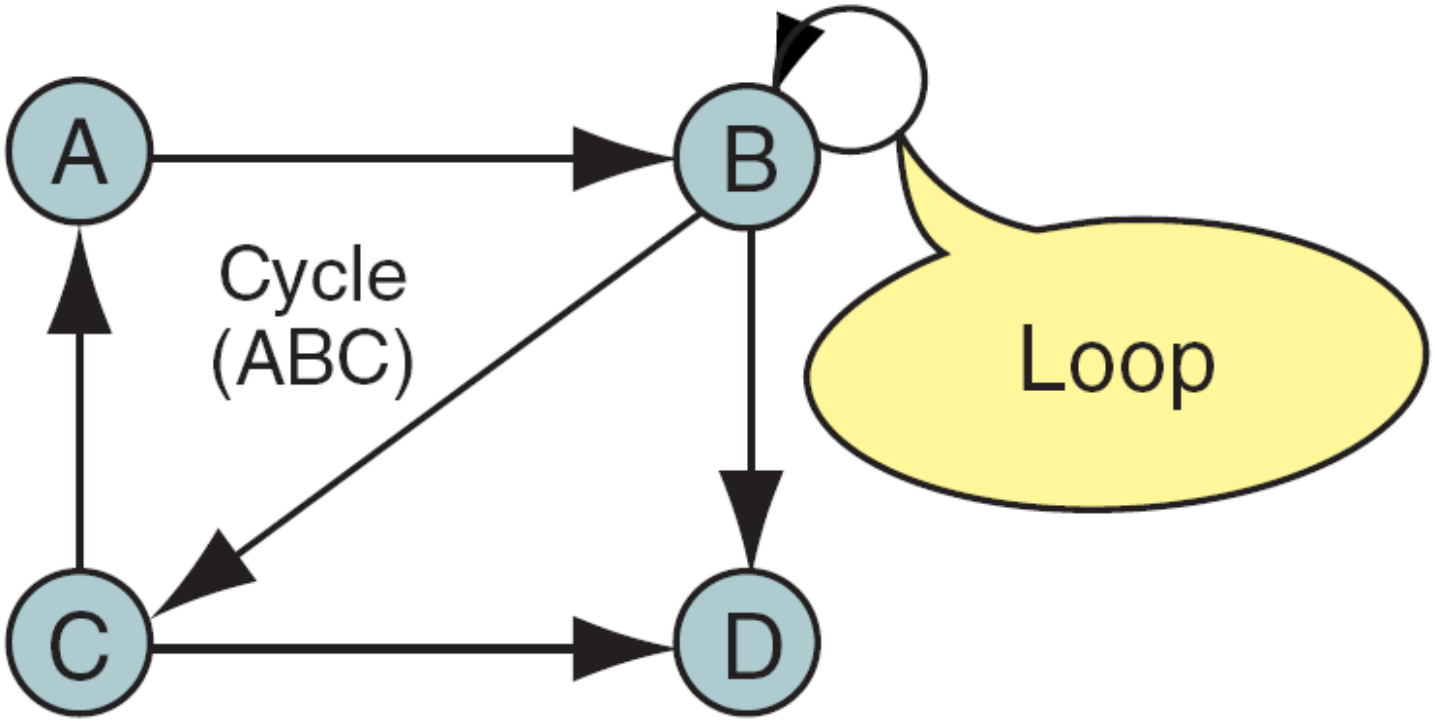

FIGURE 15-46 **Cycles and Loops**

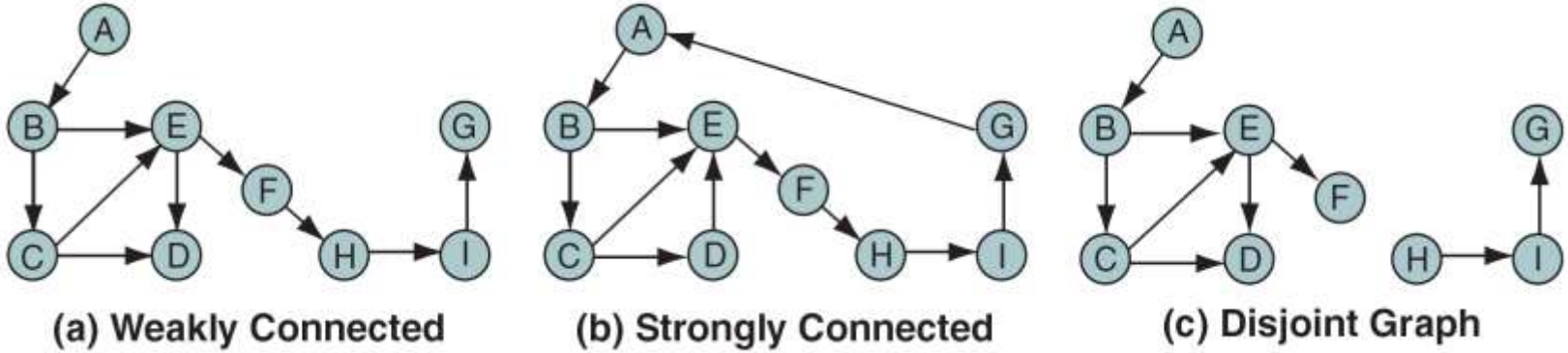

FIGURE 15-47 Connected and Disjoint Graphs

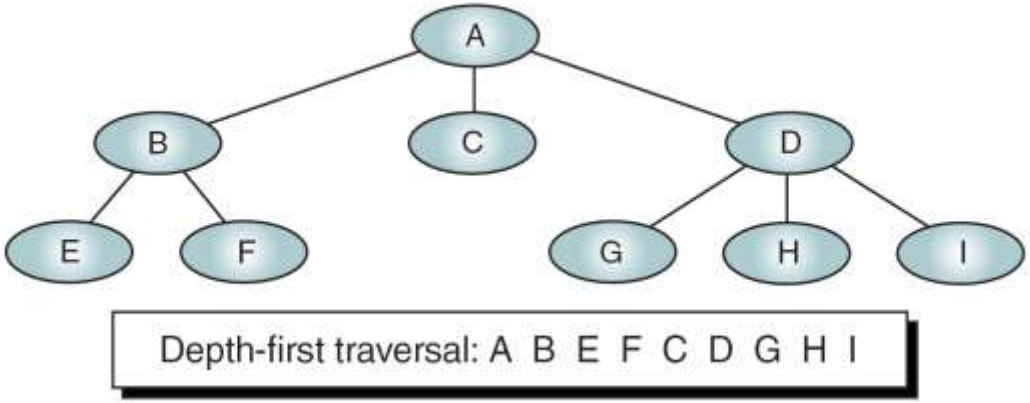

FIGURE 15-48 Depth-first Traversal of a Tree

Note

In the depth-first traversal, all of a node's descendents are processed before moving to an adjacent node.

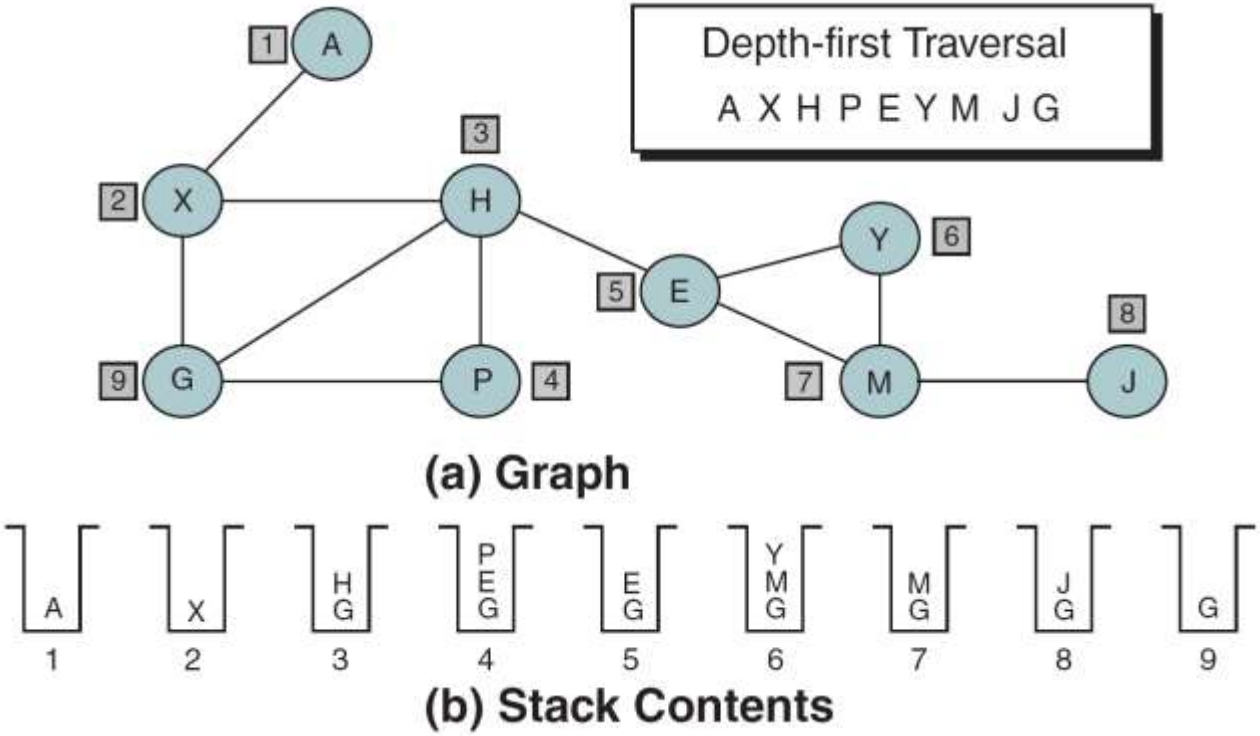

FIGURE 15-49 **Depth-first Traversal of a Graph**

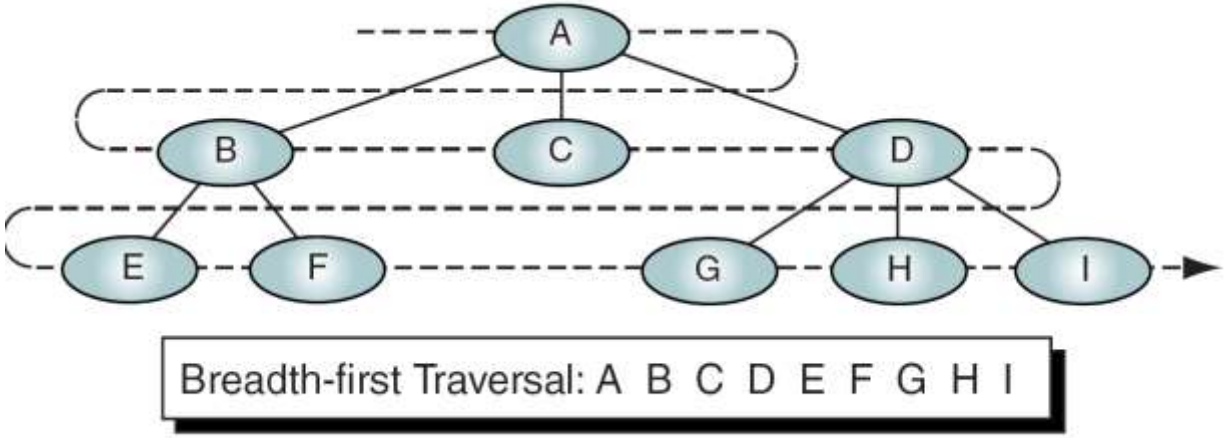

FIGURE 15-50 Breadth-first Traversal of a Tree

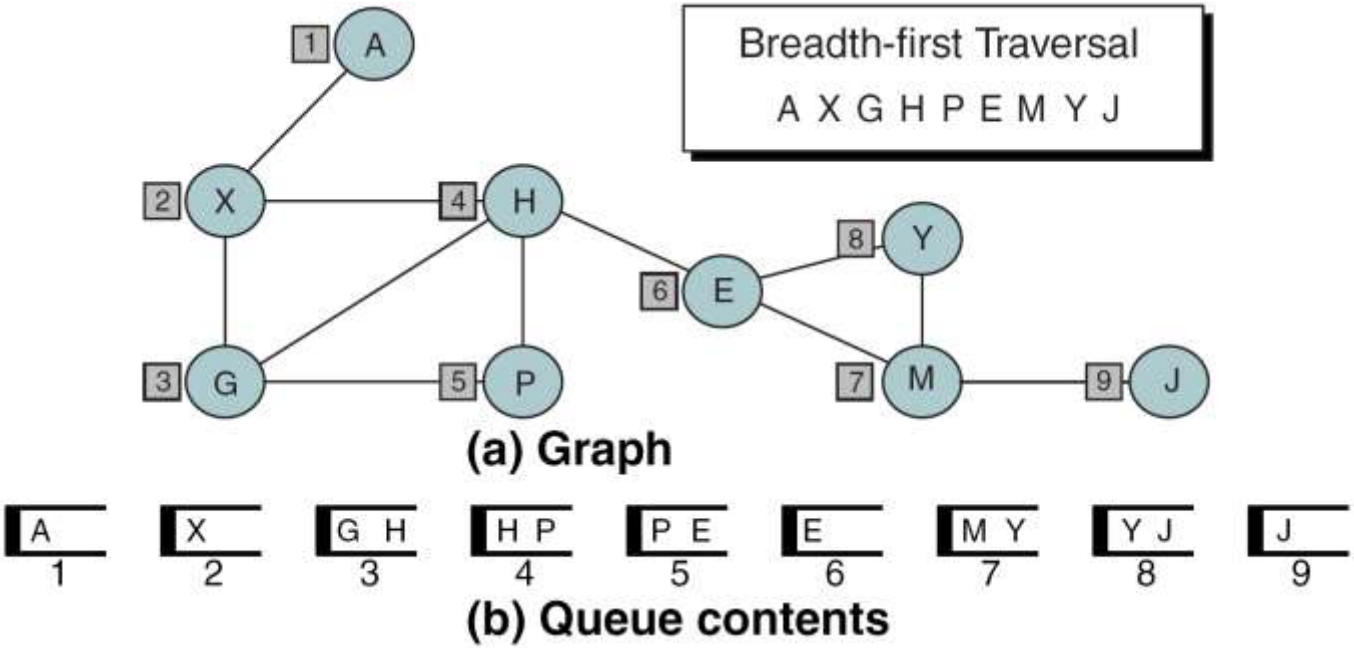

FIGURE 15-51 Breadth-first Traversal of a Graph

Note

In the breadth-first traversal, all adjacent vertices are processed before processing the descendents of a vertex.

15-7 Software Engineering

Because lists are useful structures, programmers use them in many applications. Rather than rewrite their functions each time we need them, we can write functions once and put them in a library. The name given to a complete set of these functions is abstract data type (ADT).

Topics discussed in this section:

Atomic and Composite Data
Data Structure and Abstract Data Type
A Model for an Abstract Data Type
ADT Data Structure

Note

Atomic Data Type

1. A set of values.

2. A set of operations on the values.

Note

Data Structure

1. **A combination of elements, each of which is either a data type or another data structure.**
2. **A set of associations or relationships (structure) involving the combined elements.**

array	struct
A homogeneous combination of data structures. Position association.	A heterogeneous combination of data structures. No association.

Table 15-2 Two Structures

Note

In the concept of abstraction
We know what a data type can do.
How it is done is hidden.

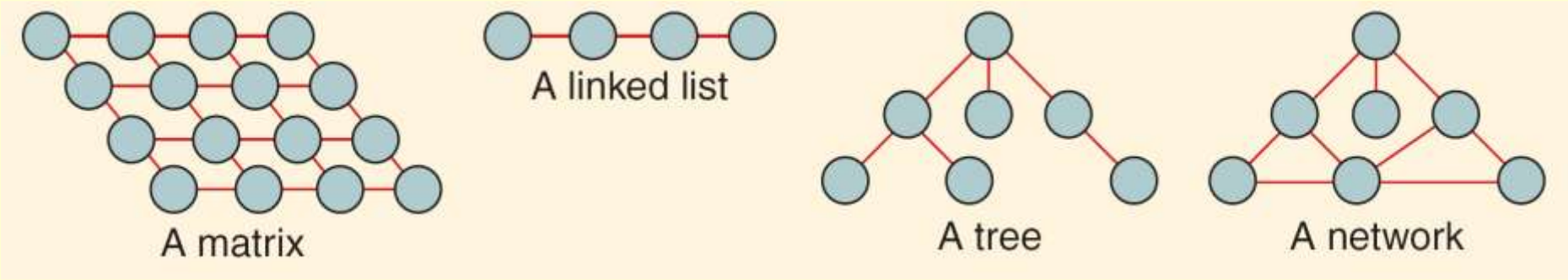

FIGURE 15-52 Structures for Holding a List

Note

Abstract Data Type

1. Declaration of data.

2. Declaration of operations.

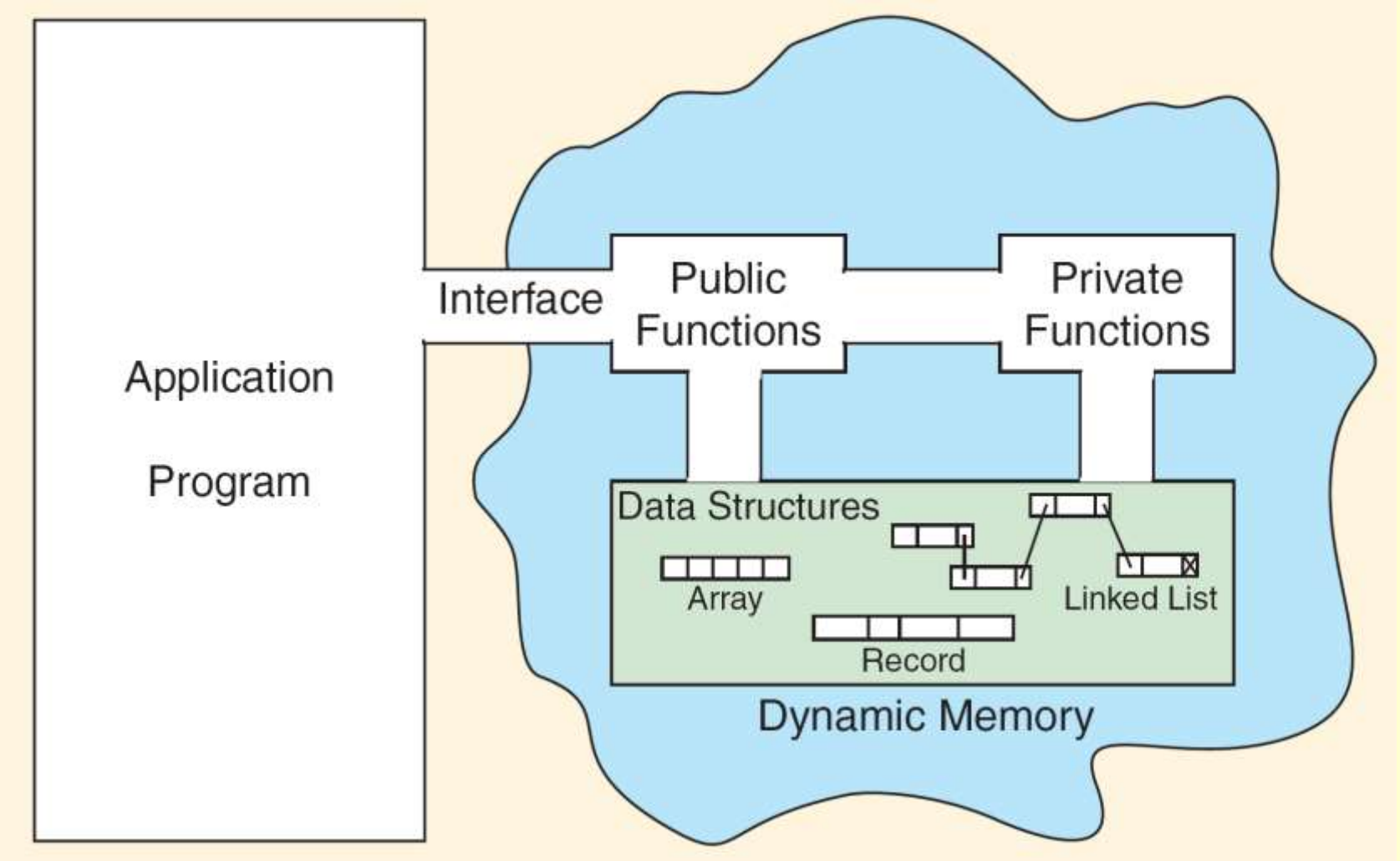

FIGURE 15-53 Abstract Data Type Model