Chapter 14

Strings

OBJECTIVES

After studying this chapter you will be able to:

- Understand the basic types of strings.
- Define and use the string class and C-type strings.
- Read and write strings.
- Access and manipulate characters or substrings within a string.
- Concatenate and compare strings.
- Insert, replace, swap, or erase a substring in a string.
- Understand the seven steps in the design of a program:
- Use transform analysis to create a structure chart.

STRING CONCEPTS

Figure 14-1 String taxonomy

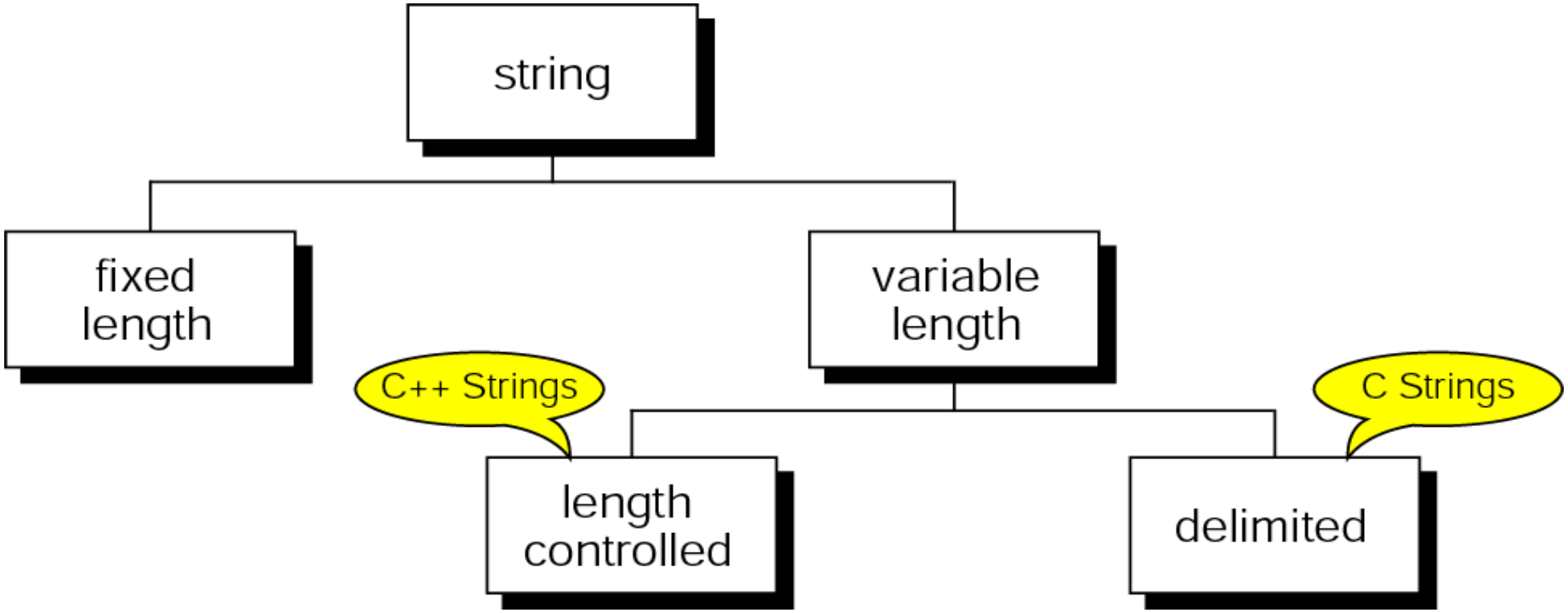
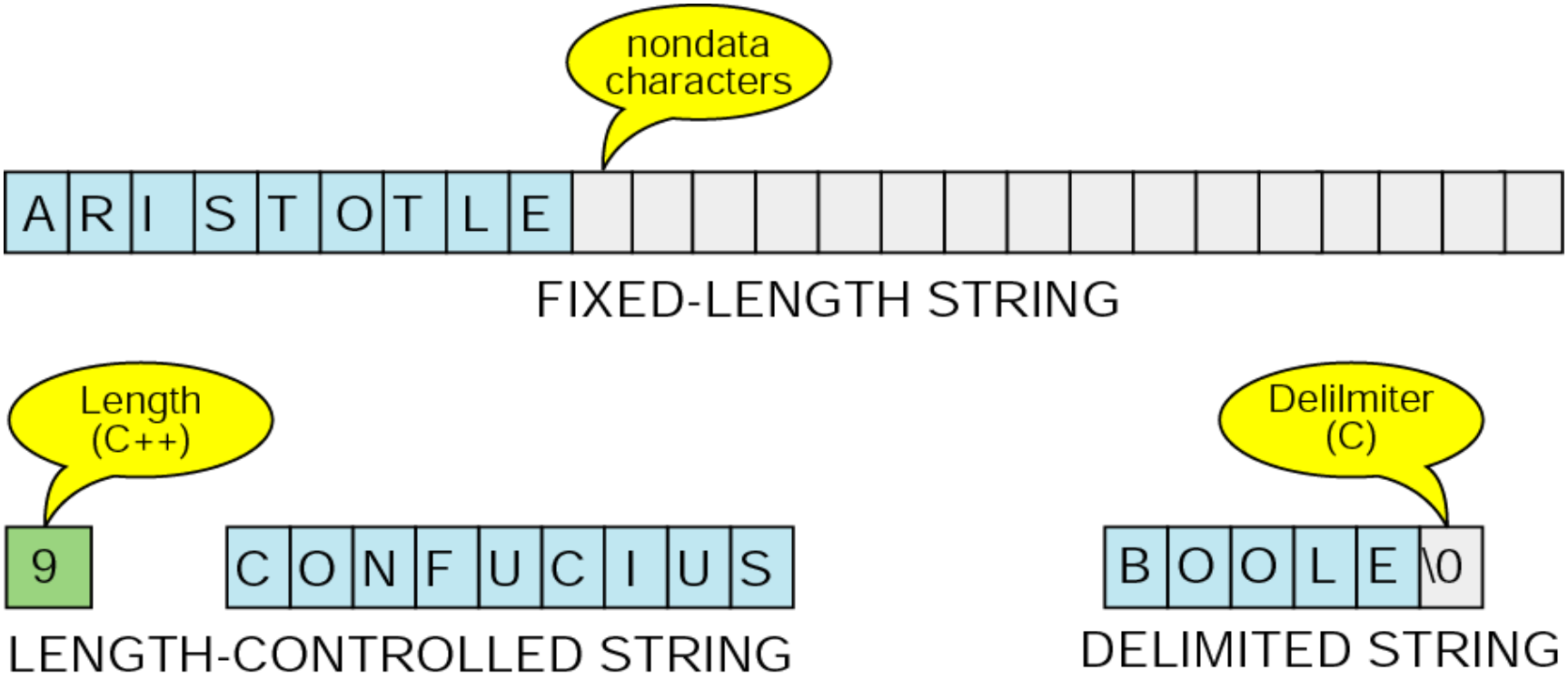
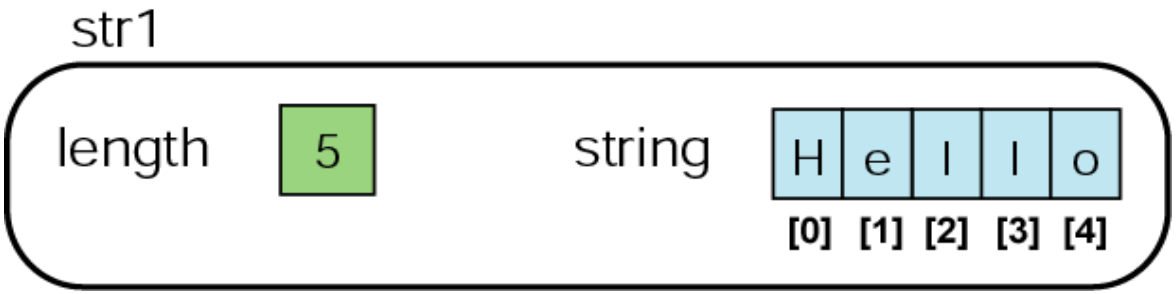


Figure 14-2 String formats



C++ STRINGS

Figure 14-3 A C++ string



C++ STRING INPUT/OUTPUT

Note:

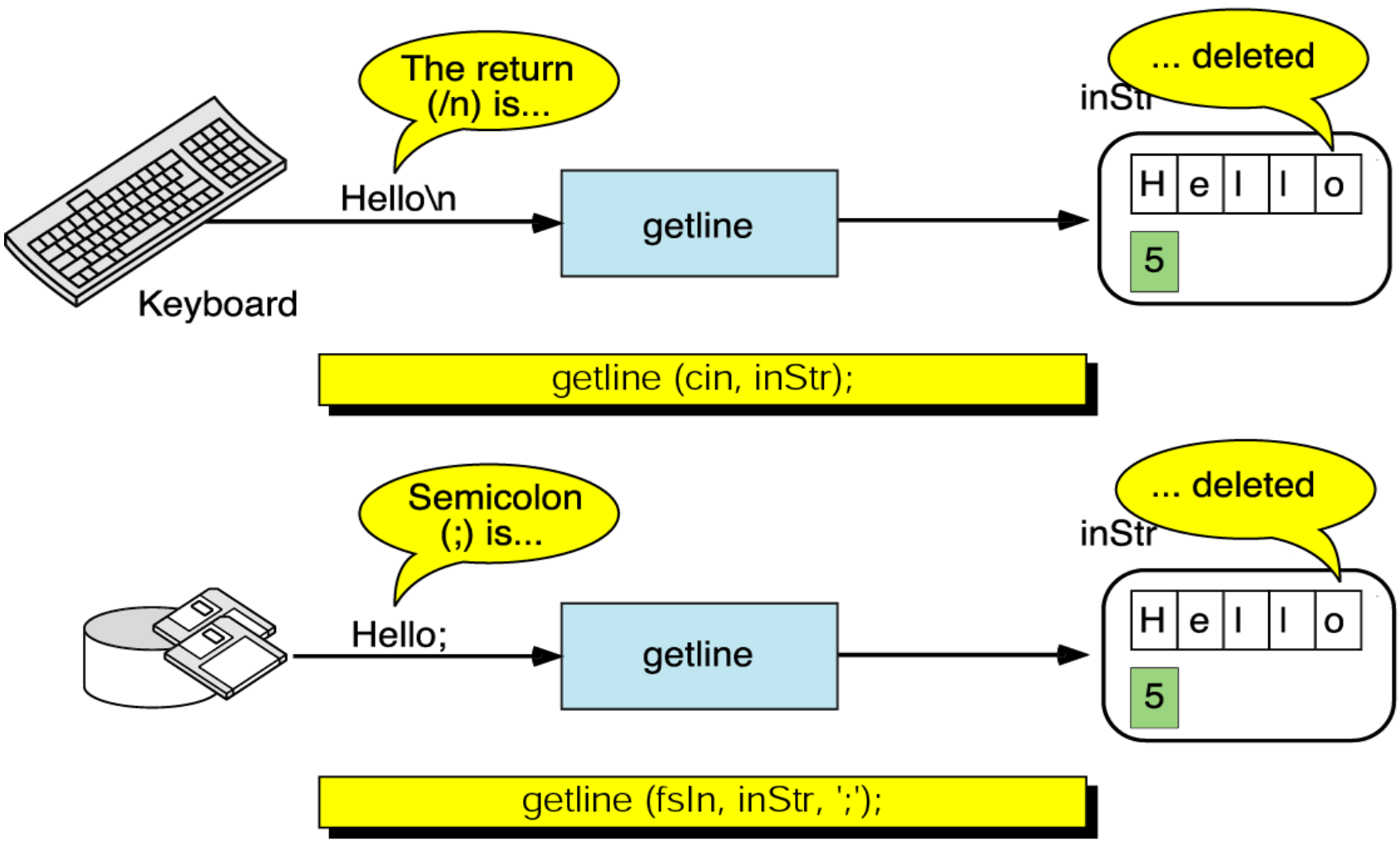
The extraction operator stops at whitespace.

To read a string with spaces, we must use getline.

Note:

The string input /output operators and functions are defined in the string header file, not the I/O stream header file.

Figure 14-4 getline function



Note:

The getline function is overloaded to work with two or three arguments.

ARRAYS OF STRINGS

STRING MANIPULATION FUNCTIONS

Figure 14-5 Substring concept

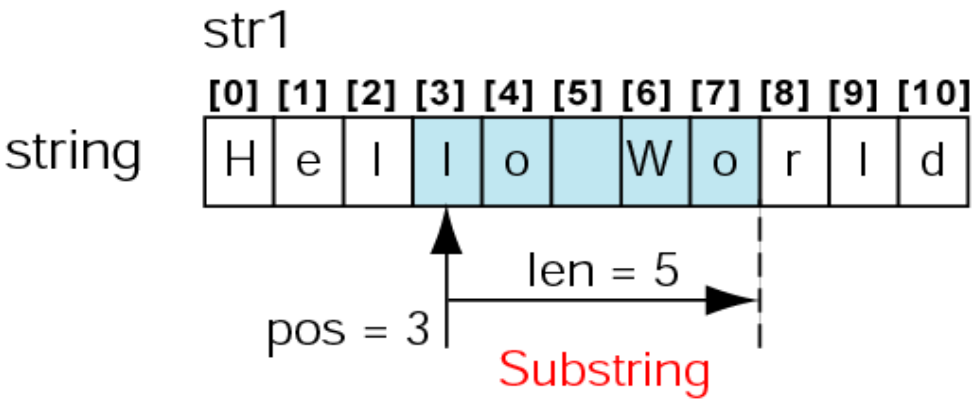


Figure 14-6 String compares

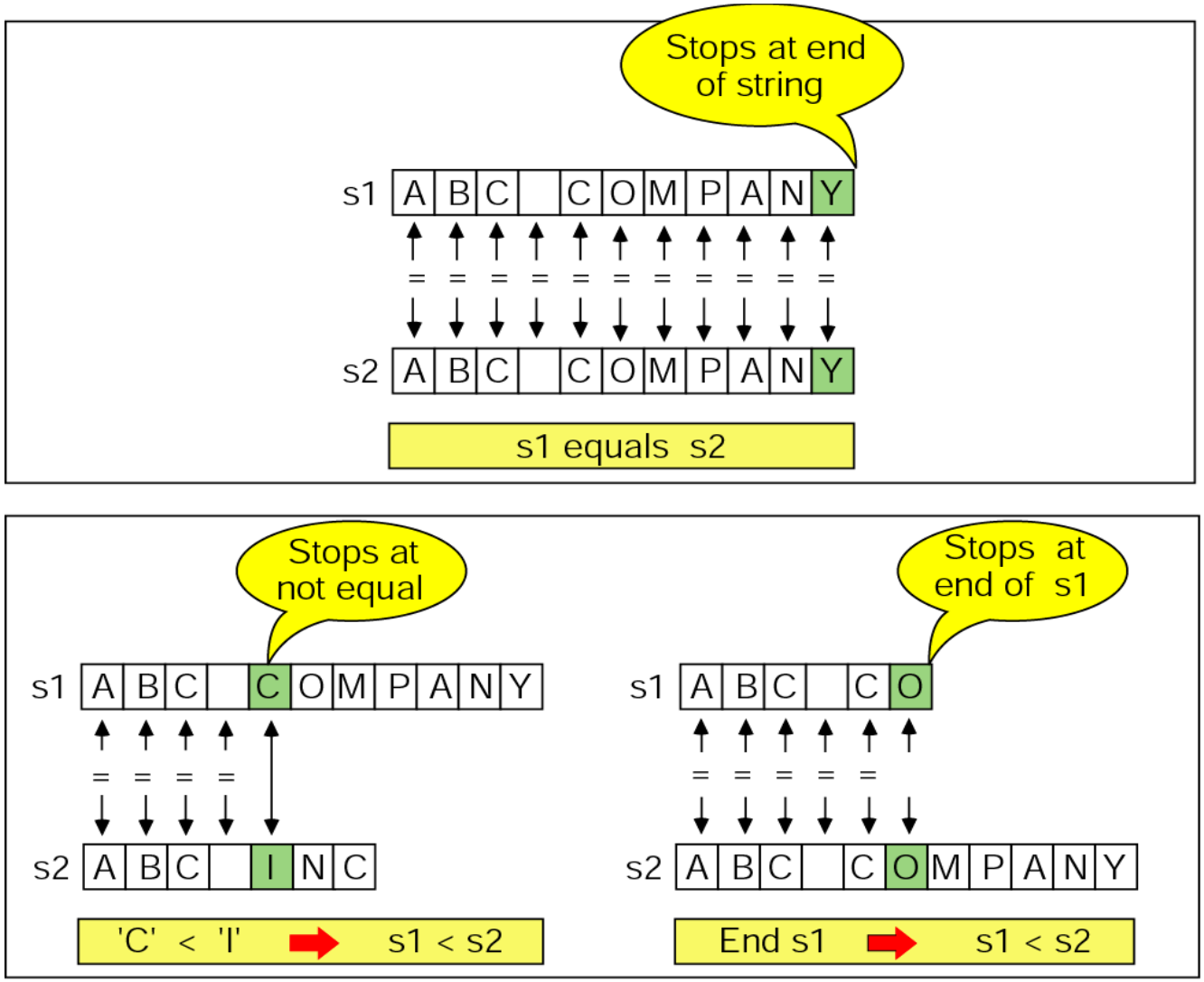


Figure 14-7 String append

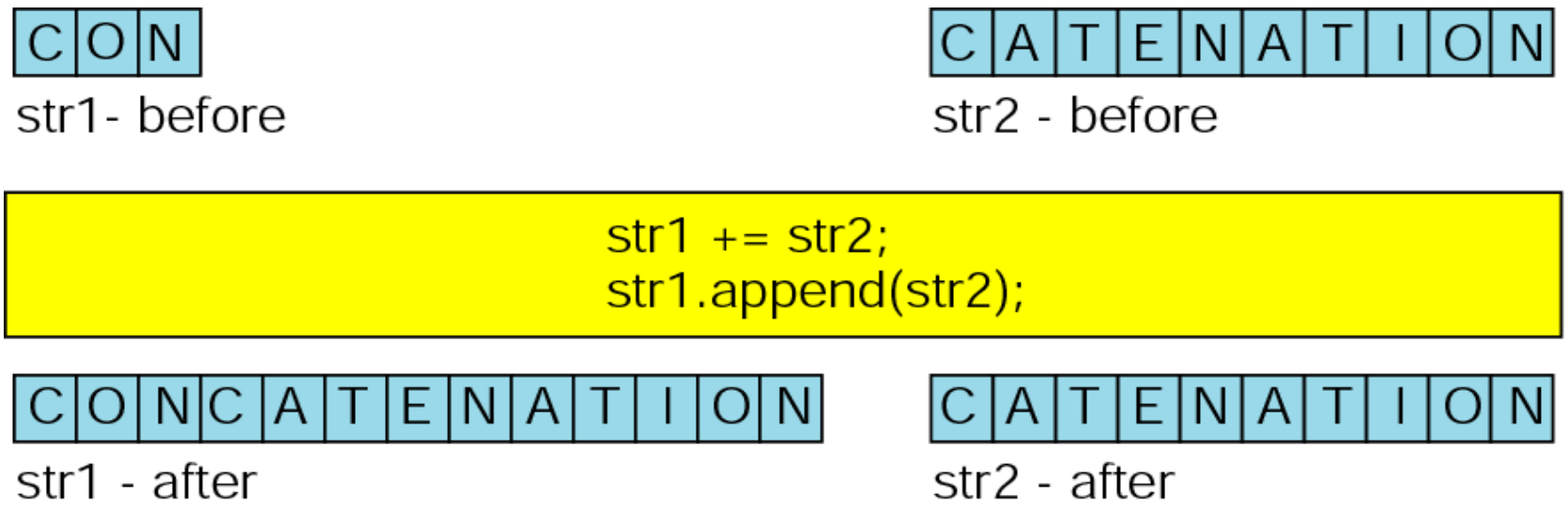


Figure 14-8 Find first

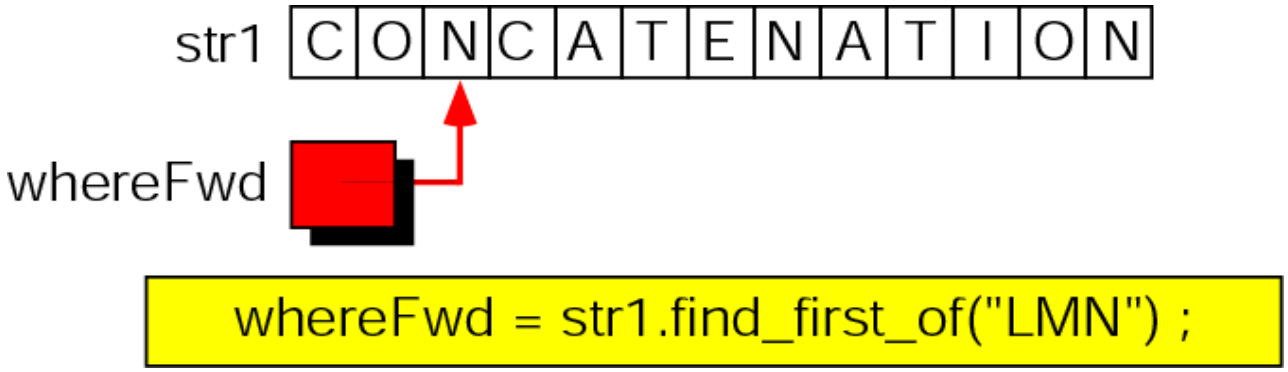


Figure 14-9 Find first not

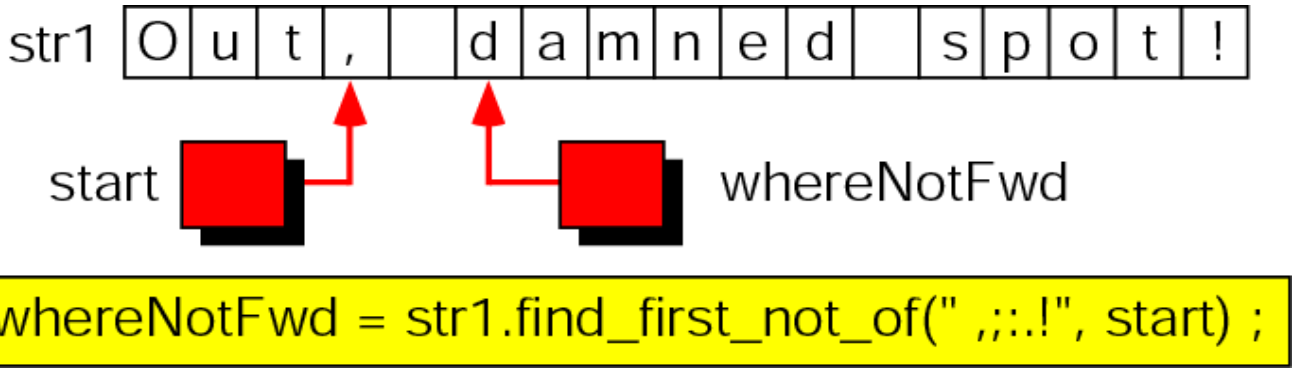
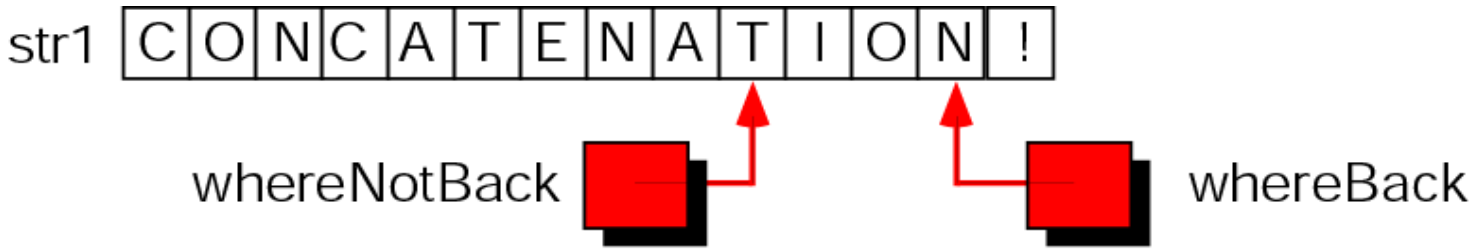


Figure 14-10 Find last




```
whereBack    = str1.find_last_of("CION") ;
whereNotBack = str1.find_last_not_of("CION") ;
```

A Programming Example: Morse Code

Figure 14-11 Character to Morse code structure

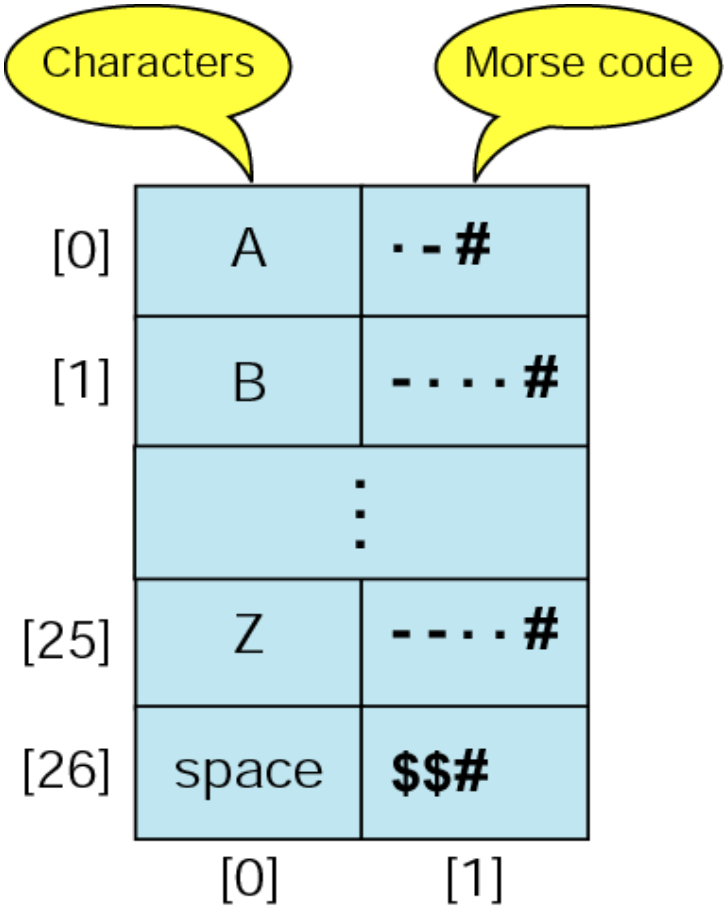
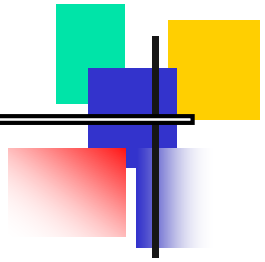


Figure 14-12 Morse code menu



M E N U

E encode

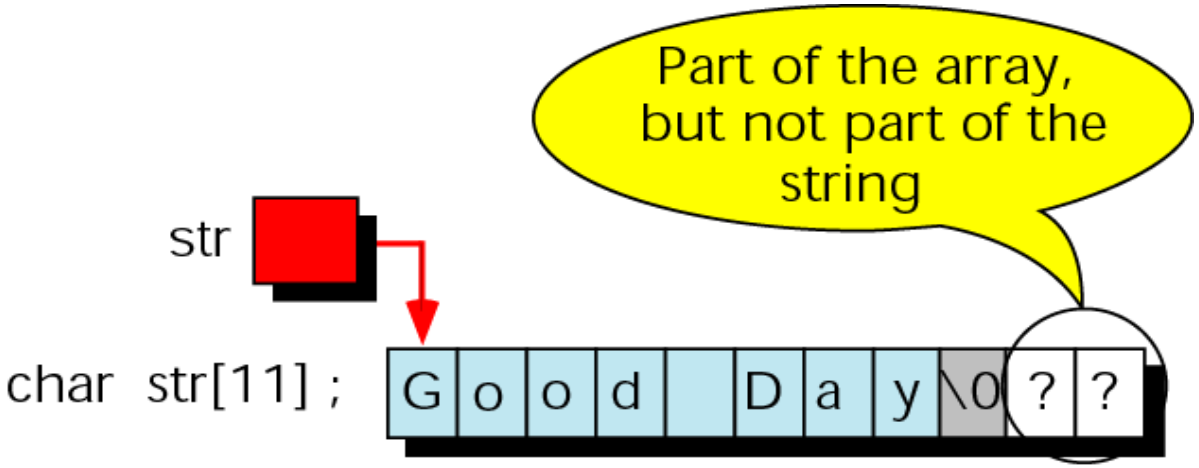
D decode

Q quit

Enter your option and press the return key.

C STRINGS

Figure 14-13 Strings in arrays



Note:

We cannot use the assignment operator to copy C strings. We must use the strcpy function.

Note:

Always use set width when reading C strings.

Comparison between C and C++ strings

SOFTWARE ENGINEERING AND PROGRAMMING STYLE

Figure 14-14 Requirements for case study

Payroll Case Study

1. Requirements:

   Given employees and their hours worked, compute net pay and record a payroll data for subsequent processing, such as W-2 statements. Prepare paychecks and a payroll ledger.

   Maintain data on a sequential payroll file.

2. Provide for the following nonstatutory deductions:
   a. Health plan
   b. United Way
   c. Union dues
3. The payroll data are:
   a. Employee number
   b. Pay rate
   c. Union member flag
   d. United Way contribution

Figure 14-14 Requirements for case study (continued)

4. Maintain the following year-to-date totals:
    a. Earnings
    b. FICA taxes
    c. SDI taxes
    d. Federal withholding
    e. State withholding
    f. Health plan fees
    g. United Way donations
    h. Union dues
5. Algorithms
    a. Gross Pay = (Reg Hours * Rate) + (OT Hours * Rate * 1.5)
    b. FICA Taxes = (Gross Pay * FICA Rate) if less than MaxFICA
    c. SDI Taxes = (Gross Pay * SDI Rate) if less than Max SDI
    d. Taxable Earnings = (Gross Pay – (Exemptions * Exemption Rate))
    e. Federal Taxes = (Taxable Earnings * Federal TaxRate)
    f. State Taxes = (Taxable Earnings * State Tax Rate)
    g. Net Pay = Gross Pay – (FICA Taxes + SDI Taxes + Taxable Earnings + Federal Taxes + State Taxes + Health Fee + United Way Donation + Union Dues)

Figure 14-15 Afferent, efferent, and transform modules

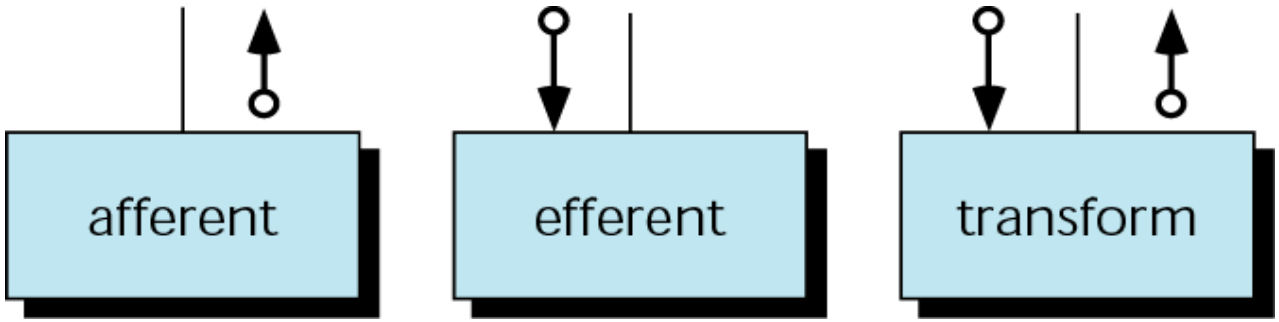


Figure 14-16 Basic structure chart organization

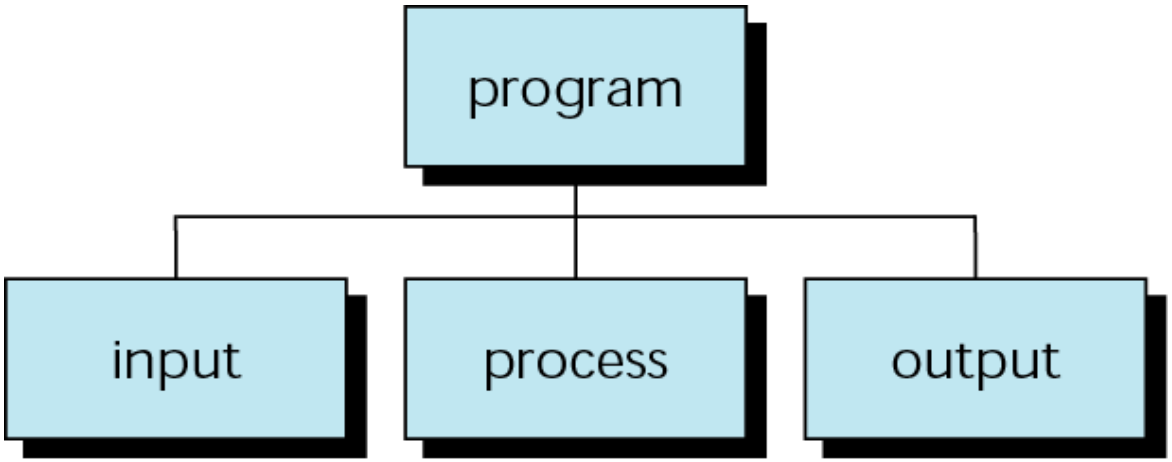


Figure 14-17 First-cut structure chart

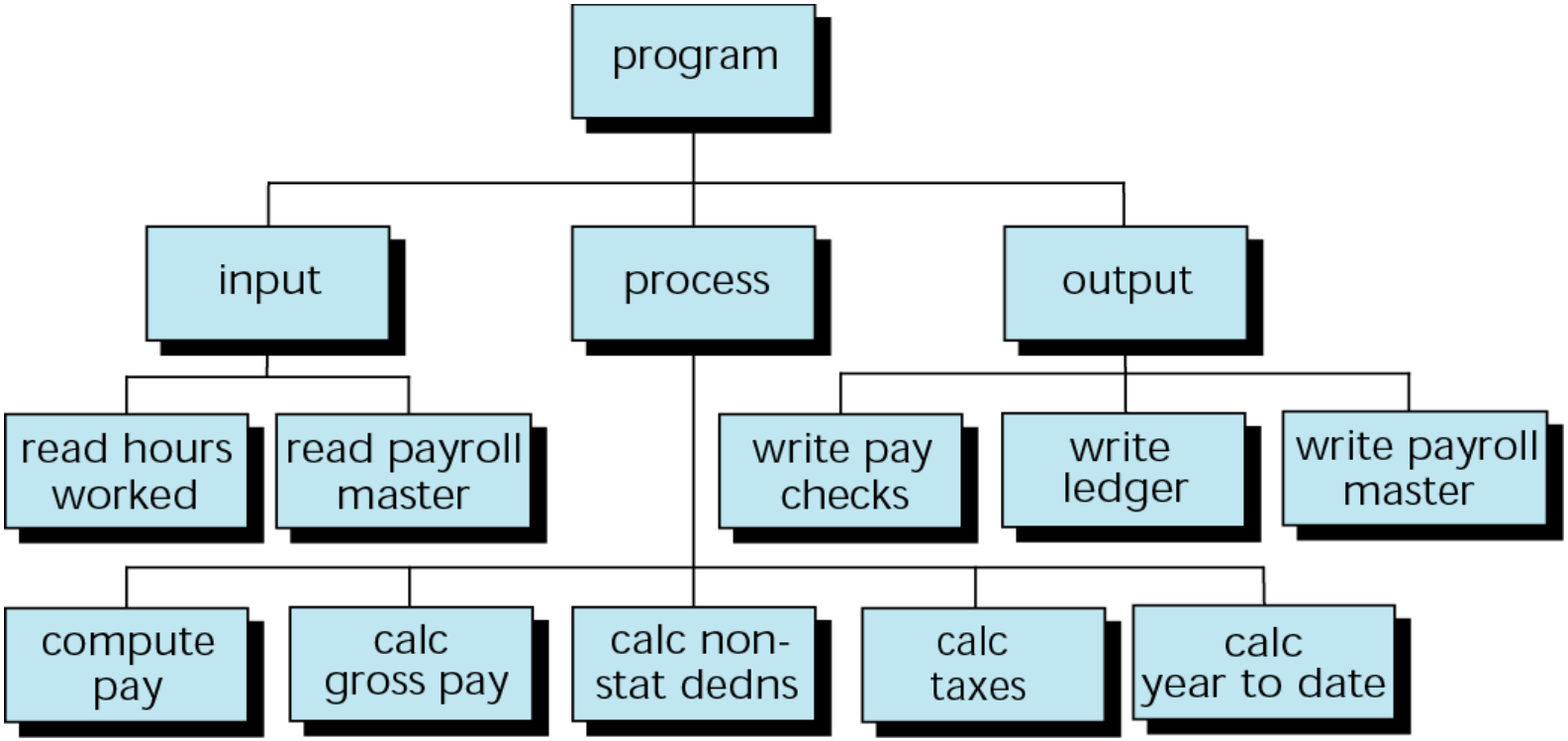


Figure 14-18 Final payroll structure chart