

Lecture 3 - File Processing

Meng-Hsun Tsai
CSIE, NCKU

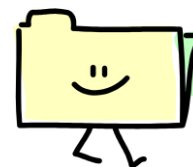


program

ifstream



ofstream



file

write_file.cpp

```
1 #include <iostream>
2 #include <string>
3 #include <fstream>
4 #include <cstdlib>
5 using namespace std;
6 int main()
7 {
8     string name;
9     float proj, exam;
10    ofstream outFile("outfile", ios::out);
11    if(!outFile) {
12        cerr << "Failed opening" << endl;
13        exit(1);
14    }
15    cout << "Enter NAME PROJ EXAM
        each line.\n"
16        << "EOF to finish.\n" << "? ";
17    outFile <<
"Name\tProj\tExam\tTotal\n";
```

```
18    while(cin >> name >> proj >> exam) {
19        outFile << name << "\t" << proj << "\t" <<
        exam << "\t"
20        << proj*0.65 + exam*0.35 << endl;
21        cout << "? ";
22    }
23    cout << endl;
24    return 0;
25 }
```

```
> ./write_file
Enter NAME PROJ EXAM each line.
EOF to finish.
? Winner 99 100
? Loser 23 61
? ^D
> cat outfile
```

Name	Proj	Exam	Total
Winner	99	100	99.35
Loser	23	61	36.3

Creating a Sequential File

- Two arguments are passed to an `ofstream` object's **constructor**—the **filename** and the **file-open mode** (line 10).

```
10  ofstream outFile("outfile", ios::out);
```

- Existing files** opened with mode `ios::out` are **truncated**—all data in the file is discarded.
- If the specified file **does not yet exist**, then the `ofstream` object **creates the file**, using that filename.

Creating a Sequential File (cont.)

- For an `ofstream` object, the file-open mode can be either `ios::out` to output data to a file or `ios::app` to append data to the end of a file.

Mode	Description
<code>ios::app</code>	<i>Append all output to the end of the file</i>
<code>ios::ate</code>	<i>Open a file for output and move to the end of the file (normally used to append data to a file). Data can be written anywhere in the file.</i>
<code>ios::in</code>	<i>Open a file for input.</i>
<code>ios::out</code>	<i>Open a file for output.</i>
<code>ios::trunc</code>	<i>Discard the file's contents (this also is the default action for <code>ios::out</code>).</i>
<code>ios::binary</code>	<i>Open a file for binary (i.e., nontext) input or output.</i>

Creating a Sequential File (cont.)

- An `ofstream` object can be created without opening a specific file—a file can be attached to the object later.
- For example, the statement
 - `ofstream outFile;`
- creates an `ofstream` object named `outFile`.
- The `ofstream` member function `open` opens a file and attaches it to an existing `ofstream` object as follows:
 - `outFile.open("outfile", ios::out);`

Creating a Sequential File (cont.)

- The if statement in lines 11–14 uses the overloaded ios member function **operator!** to determine **whether the open operation succeeded**.
- Some possible errors are
 - attempting to open a **nonexistent file for reading**
 - attempting to open a file for reading or writing **without permission**
 - opening a file for **writing** when **no disk space is available**

```
11  if(!outFile) {  
12      cerr << "Failed opening" << endl;  
13      exit(1);  
14  }
```

Creating a Sequential File (cont.)

- When **end-of-file is encountered** or bad data is entered, the **while** statement terminates.
- **Ctrl-D** in **Unix** and **Ctrl-Z** in **Windows** represent end-of-file.

```
18  while(cin >> name >> proj >> exam) {  
19      outFile << name << "\t" << proj << "\t" <<  
      exam << "\t"  
20      << proj*0.65 + exam*0.35 << endl;  
21      cout << "? ";  
22  }
```

? ^D

Creating a Sequential File (cont.)

- Line 19 **writes** a set of data to the file `outfile`, using the stream insertion **operator** `<<` and the `outfile` object associated with the file at the beginning of the program.

```
19     outfile << name << "\t" << proj << "\t" << exam << "\t"  
20     << proj*0.65 + exam*0.35 << endl;
```

- Once the user enters the end-of-file indicator, `main` terminates.
- This **implicitly** invokes `outfile`'s **destructor**, which closes the `outfile` file.
- You also can close the `ofstream` object explicitly, using member function **close** in the statement

read_file.cpp

```
1 #include <iostream>
2 #include <string>
3 #include <fstream>
4 #include <cstdlib>
5 using namespace std;
6 int main()
7 {
8     string name, headline;
9     float proj, exam, total;
10    ifstream inFile("infile", ios::in);
11    if(!inFile) {
12        cerr << "Failed opening" << endl;
13        exit(1);
14    }
15    getline(inFile, headline);
16    cout << headline << endl;
17    while(inFile >> name >> proj >> exam >> total) {
18        cout << name << "\t" << proj << "\t"
19            << exam << "\t" << total << endl;
20    }
21    return 0;
22 }
```

```
> cat infile
Name  Proj  Exam  Total
Winner 99    100   99.35
Loser  23    61    36.3
> ./read_file
Name  Proj  Exam  Total
Winner 99    100   99.35
Loser  23    61    36.3
```

Reading Data from a Sequential File

- Creating an `ifstream` object opens a file **for input**.
- The `ifstream` constructor can receive the **filename** and the **file open mode** as arguments.
- Line 10 creates an `ifstream` object called `inFile` and associates it with the `infile` file.

```
10    ifstream inFile("infile", ios::in);
```

- Objects of class `ifstream` are opened for input by default.
- We could have used the statement

```
    ifstream inFile("infile");
```

to open `infile` for input.

Reading Data from a Sequential File (cont.)

- Just as with an `ofstream` object, an `ifstream` object can be created without opening a specific file, because a file can be attached to it later.
- Each time line 17 executes, it reads another record from the file into the variables `name`, `proj`, `exam` and `total`.
- When the end of file has been reached, the `ifstream` destructor function closes the file and the program terminates.

```
17  while(inFile >> name >> proj >> exam >> total) {  
18      cout << name << "\t" << proj << "\t"  
19          << exam << "\t" << total << endl;  
20  }
```