§7 File IO

ENGG1111

Computer Programming and Applications

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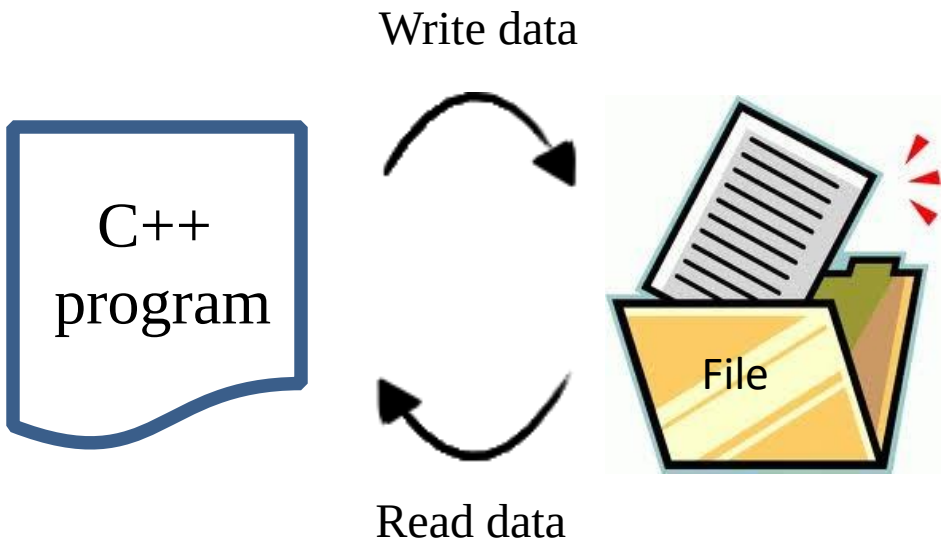
We are going to learn…

- How to open a file and write content into the file
- How to open a file and read content from the file



Streams

- C++ uses a convenient abstraction called streams to perform input and output operations
  - cin for taking input from keyboard
  - cout for sending output to the screen
- C++ also provides ifstream and ofstream, for reading and writing data from and to files
  - Include the header file

```
#include <fstream>
```

ifstream

ifstream

- Step 1. Declare an ifstream

```
ifstream fin;
```

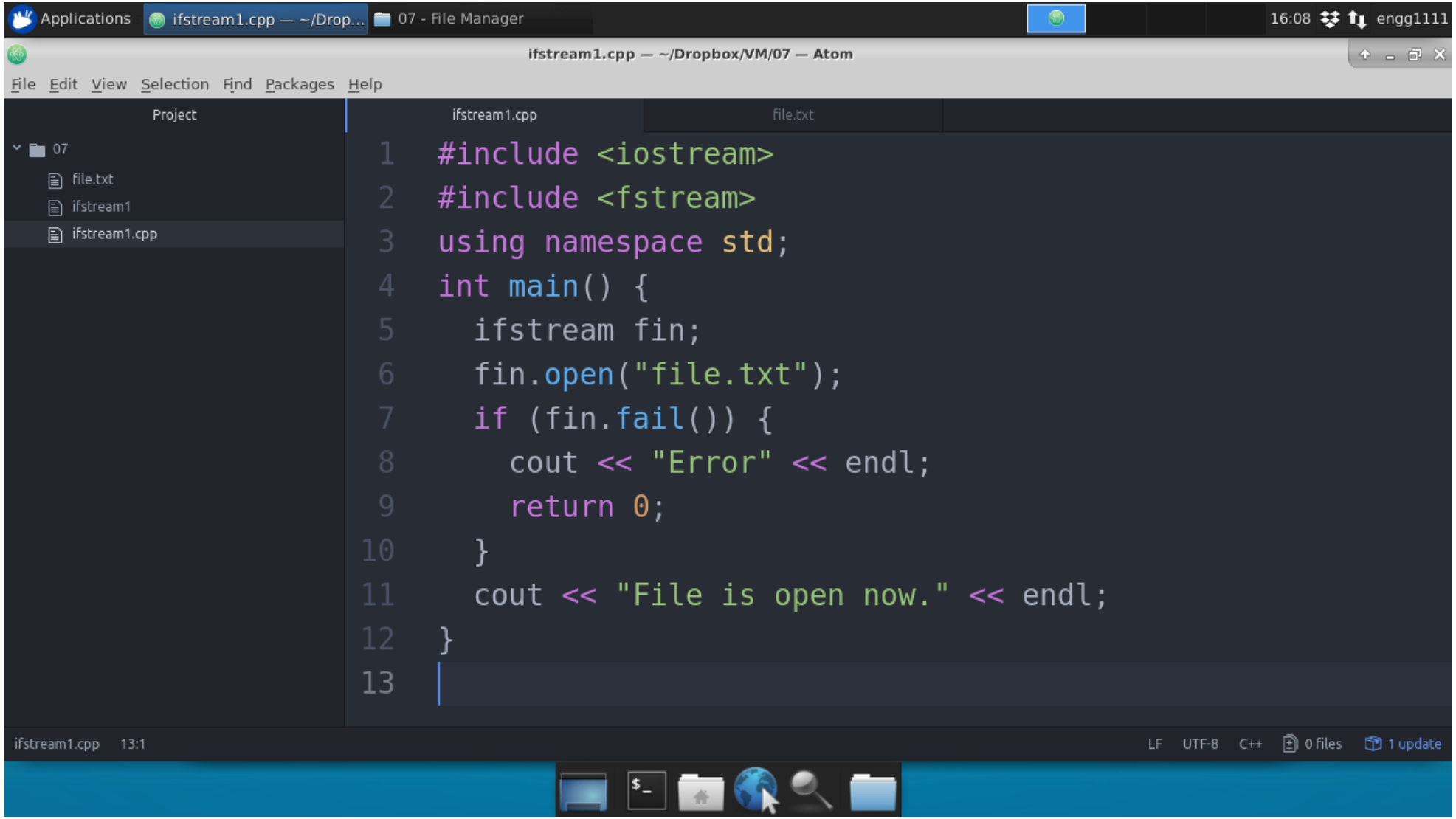
- Step 2. Open the file

```
fin.open("file.txt");
```

- Step 3. Check if the file was opened successfully

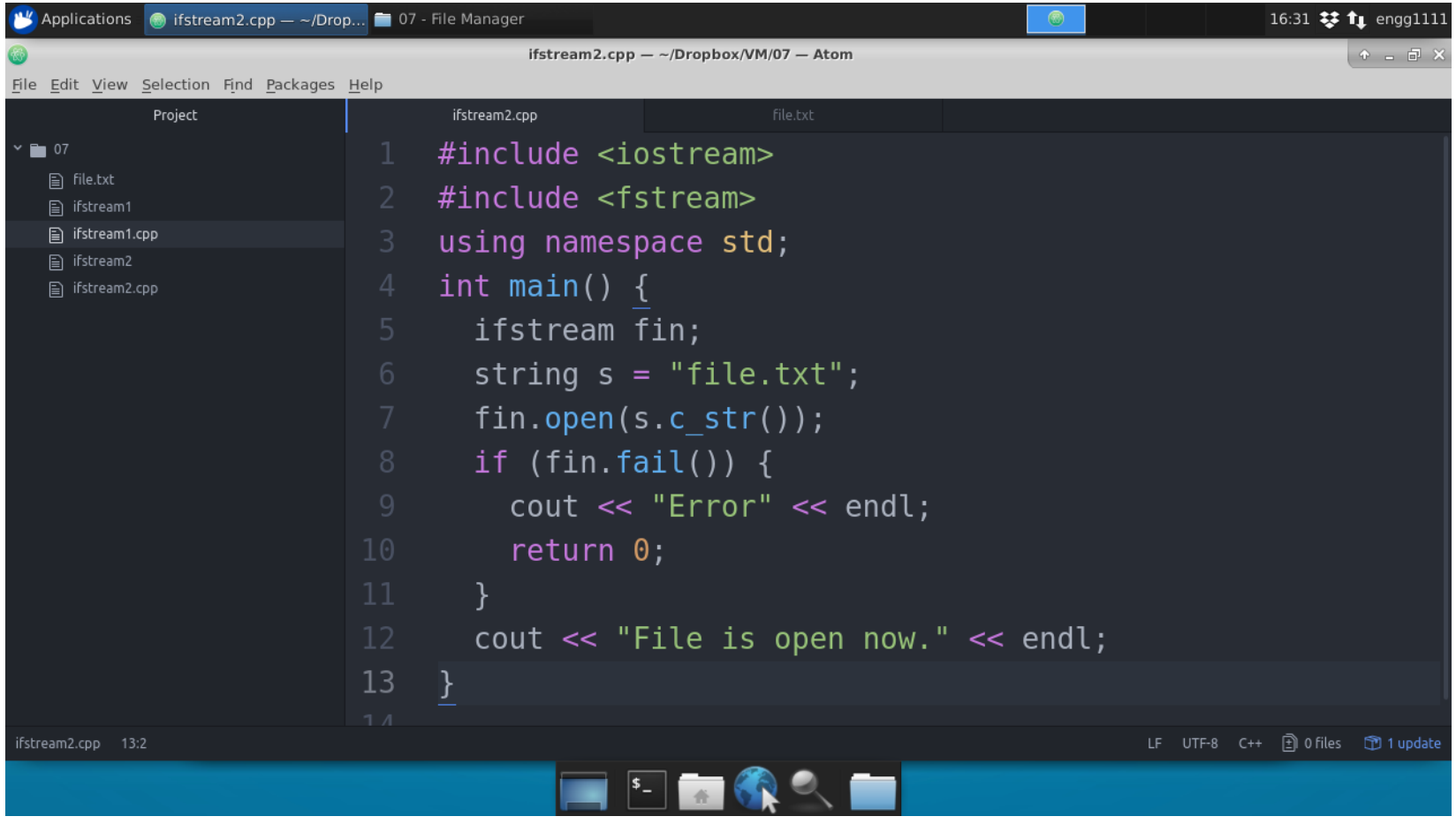
```
if (fin.fail())
```

ifstream


Applications
ifstream1.cpp — ~/Drop...
07 - File Manager
16:08
engg1111
ifstream1.cpp — ~/Dropbox/VM/07 — Atom
File Edit View Selection Find Packages Help
Project
07
file.txt
ifstream1
ifstream1.cpp
ifstream1.cpp
file.txt
1 #include <iostream>
2 #include <fstream>
3 using namespace std;
4 int main() {
5 ifstream fin;
6 fin.open("file.txt");
7 if (fin.fail()) {
8 cout << "Error" << endl;
9 return 0;
10 }
11 cout << "File is open now." << endl;
12 }
13
ifstream1.cpp 13:1
LF UTF-8 C++ 0 files 1 update

ifstream

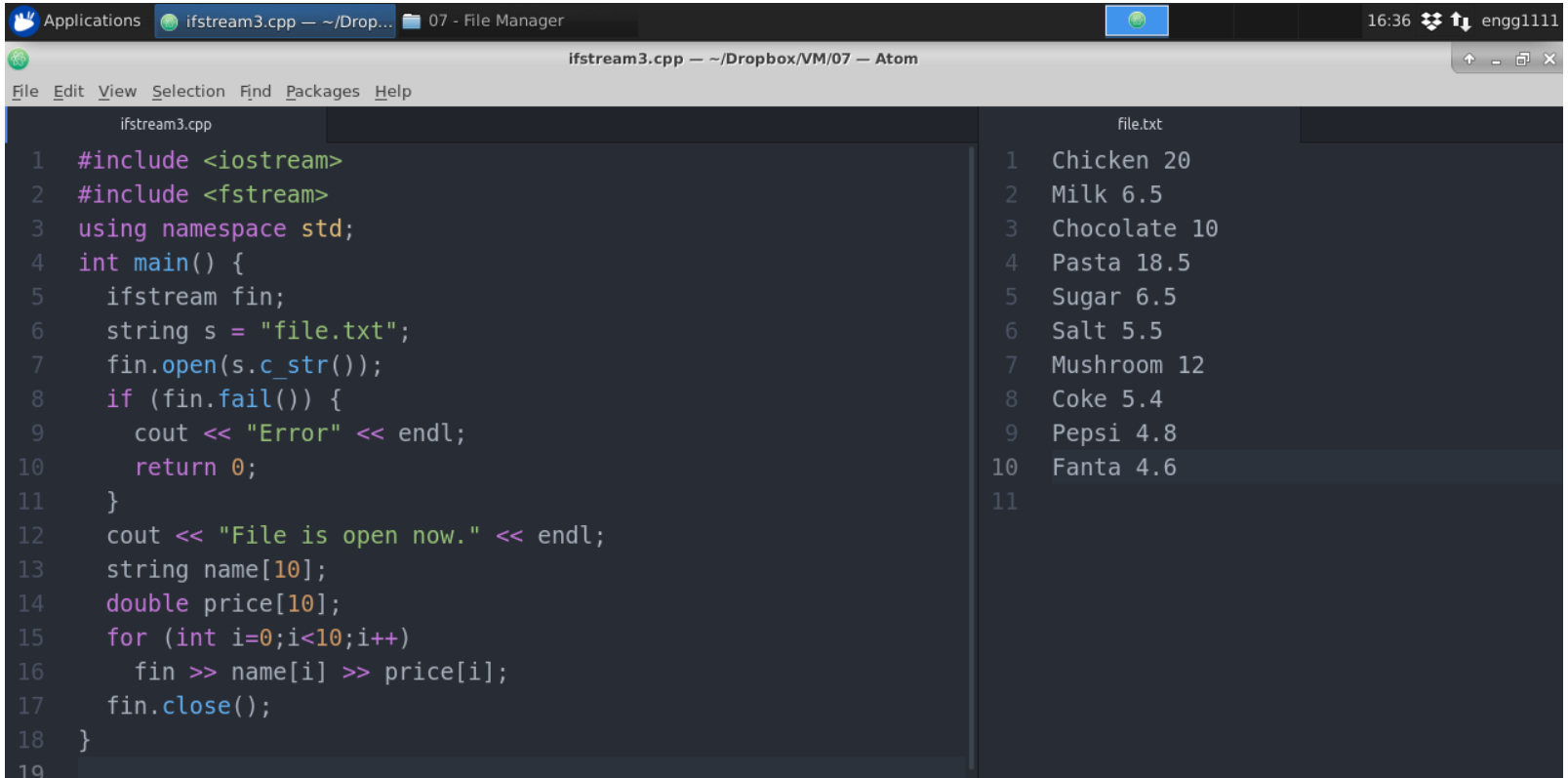
- We can replace "/Users/sdirk/Desktop/file.txt" by a string variable s
  - In this case you need to call fin.open(s.c_str())



ifstream

- Step 4. Read content from the file
- Step 5. Close the file

```
fin.close();
```



Continuously Reading a File

- Note that fin >> … will return true if we can extract content from the file
  - It returns false if there is no more content to extract

```cpp
#include <iostream>
#include <fstream>
using namespace std;
int main() {
  ifstream fin;
  string s = "file.txt";
  fin.open(s.c_str());
  if (fin.fail()) {
  cout << "File is open now." << endl;
  string name;
  double price;
  while (fin >> name >> price)
    cout << name << " " << price << endl;
  fin.close();
}
```

```
ifstream4
File is open now.
Chicken 20
Milk 6.5
Chocolate 10
Pasta 18.5
Sugar 6.5
Salt 5.5
Mushroom 12
Coke 5.4
Pepsi 4.8
Fanta 4.6
Press any key to continue...
```

ofstream

ofstream

- Step 1. Declare an ofstream

```
ofstream fout;
```

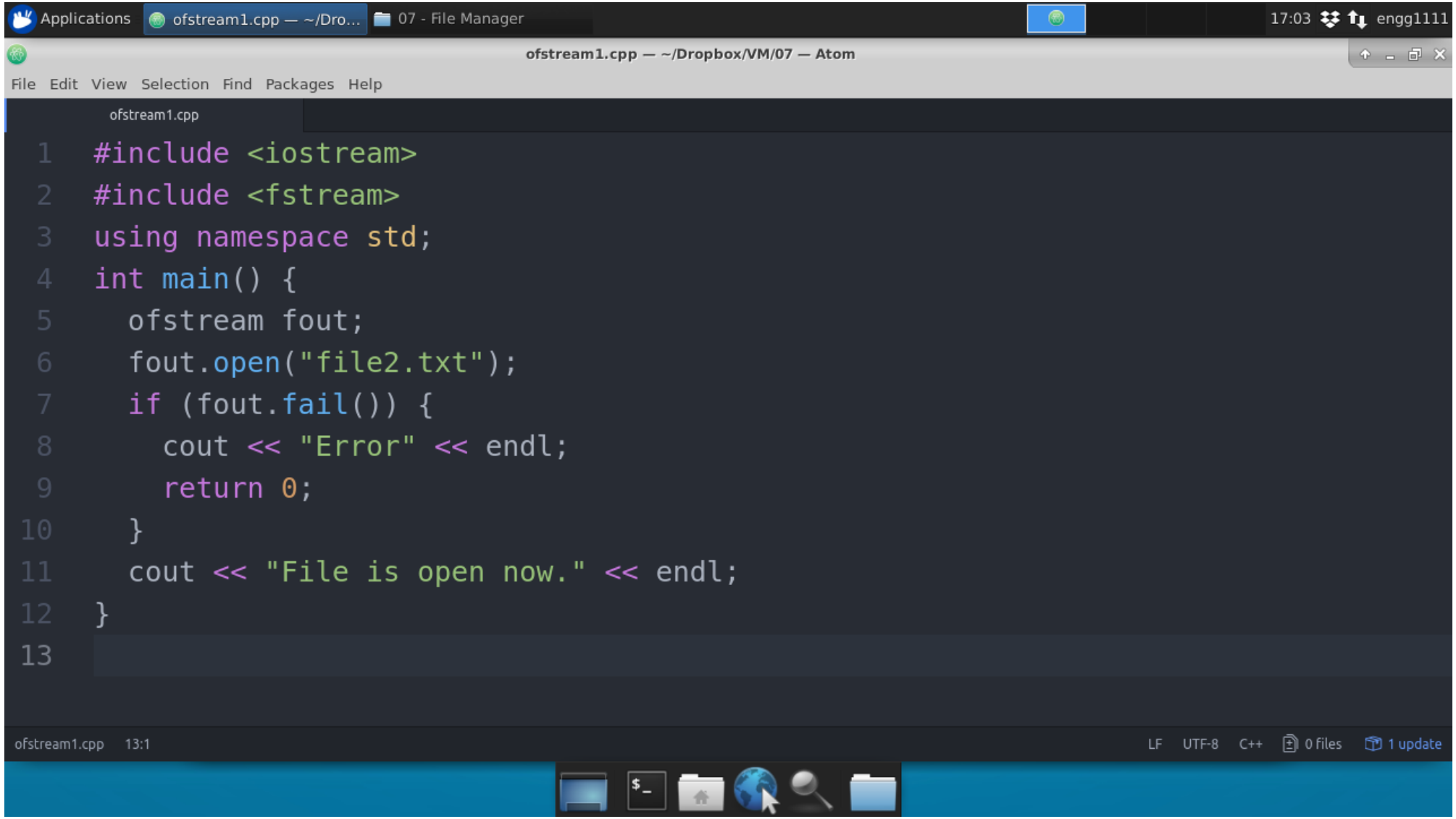
- Step 2. Open the file

```
fout.open("file.txt");
```

- Step 3. Check if the file was opened successfully

```
if (fout.fail())
```

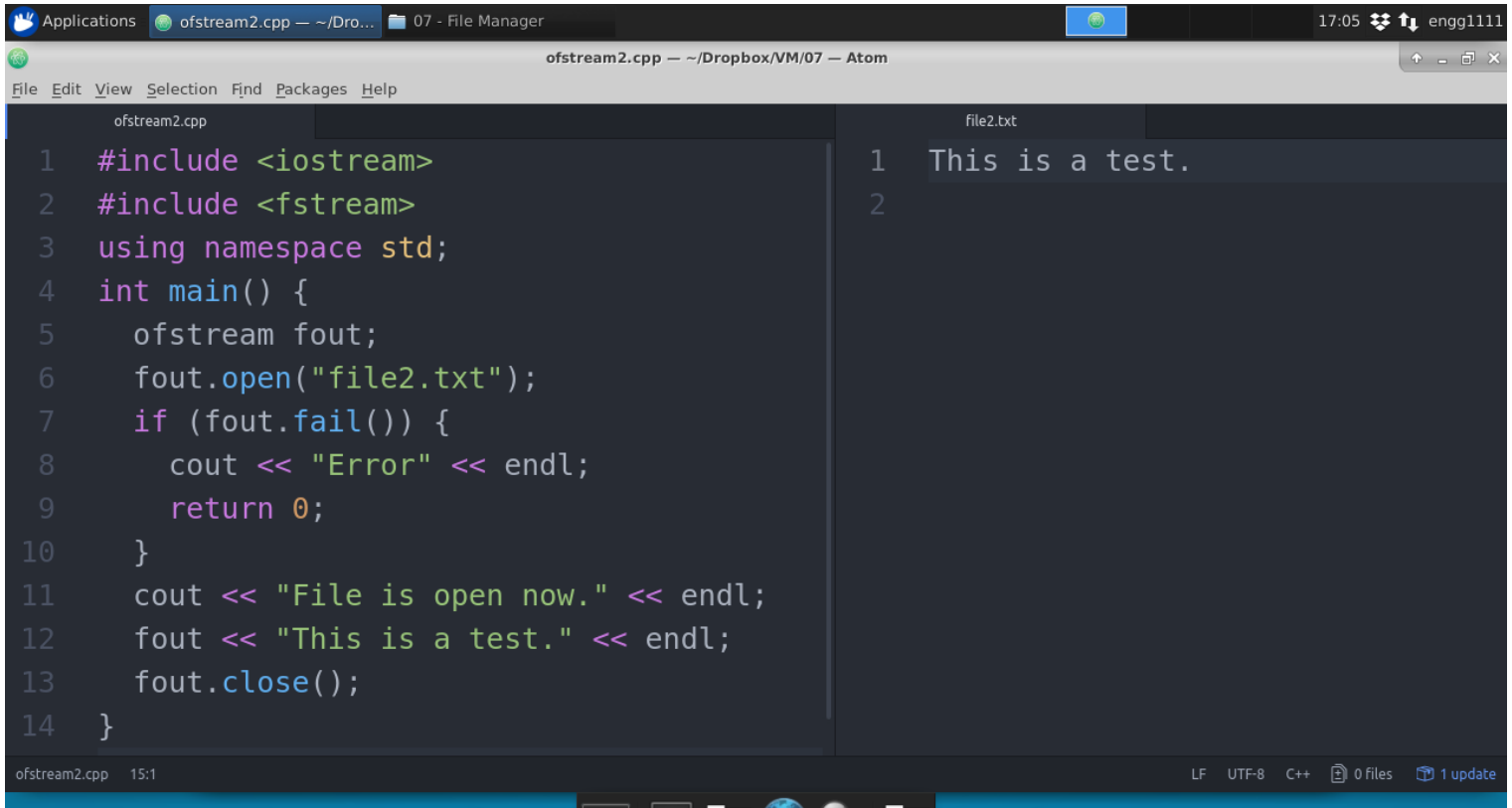
ofstream


Applications
ofstream1.cpp — ~/Dro...
07 - File Manager
17:03
engg1111
ofstream1.cpp — ~/Dropbox/VM/07 — Atom
File Edit View Selection Find Packages Help
ofstream1.cpp
1 #include <iostream>
2 #include <fstream>
3 using namespace std;
4 int main() {
5 ofstream fout;
6 fout.open("file2.txt");
7 if (fout.fail()) {
8 cout << "Error" << endl;
9 return 0;
10 }
11 cout << "File is open now." << endl;
12 }
13
ofstream1.cpp 13:1
LF UTF-8 C++ 0 files 1 update

ofstream

- Step 4. Write content to the file
- Step 5. Close the file

```
fout.close();
```

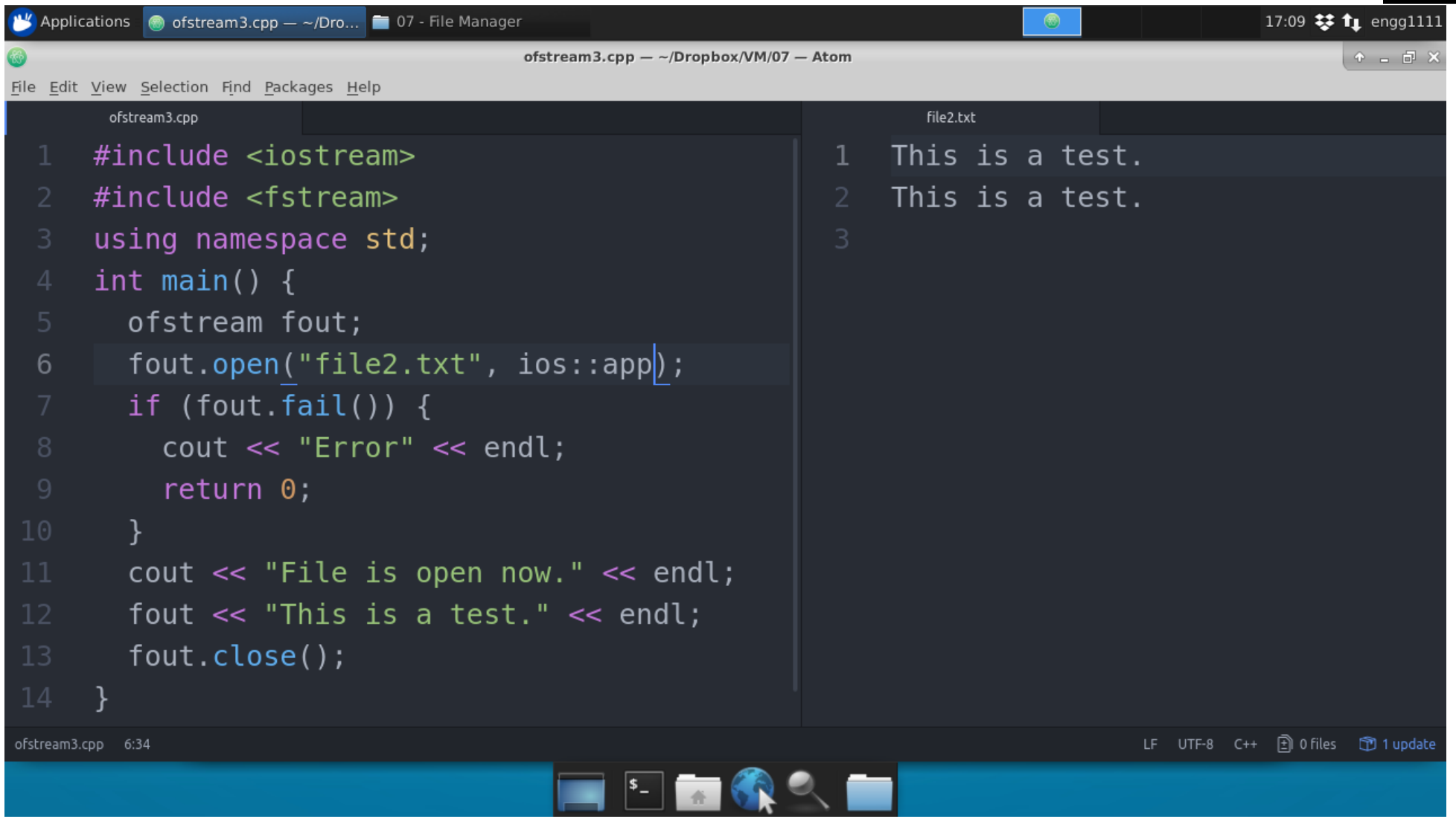


open

- When opening a file for output using the function open, a new file will be created if the file does not exist, otherwise the content of the existing file will be erased!
- To keep the content of the existing file and append new data to it, supply the constant value ios::app as the second argument to the function open

```
fout.open("file.txt", ios::app);
```

ios::app


Applications
ofstream3.cpp — ~/Dro...
07 - File Manager
17:09
engg1111
ofstream3.cpp — ~/Dropbox/VM/07 — Atom
File Edit View Selection Find Packages Help
ofstream3.cpp
#include <iostream>
#include <fstream>
using namespace std;
int main() {
ofstream fout;
fout.open("file2.txt", ios::app);
if (fout.fail()) {
cout << "Error" << endl;
return 0;
}
cout << "File is open now." << endl;
fout << "This is a test." << endl;
fout.close();
}
file2.txt
This is a test.
This is a test.
ofstream3.cpp 6:34
LF UTF-8 C++ 0 files 1 update

Example Application

Problem 6, Lab 5

- Recall problem 6 of lab 5

```cpp
#include <iostream>
using namespace std;
int productSelection(string name[], double price[], int numberOfProducts)
  for (int i=0;i<numberOfProducts;i++)
    cout << i <<": "<< name[i] <<" ($" << price[i] << ")" << endl;
  cout << "--> ";
  int productID;
  cin >> productID;
  if (productID >= 0 && productID < numberOfProducts)
    return productID;
  return productSelection(name, price, numberOfProducts);
}
double purchase(string name[], double price[], int numberOfProducts) {
  int productID = productSelection(name, price, numberOfProducts);
  int quantity;
  cout << "How many? --> ";
  cin >> quantity;
  return price[productID] * quantity;
}
int main() {
  const int numberOfProducts = 3;
  string name[numberOfProducts] = {"Chicken", "Milk", "Chocolate"};
  double price[numberOfProducts] = {20, 6.5, 10};
  double total = 0;
  char input = 'm';
  while (input == 'm') {
    total += purchase(name, price, numberOfProducts);
    cout << "Enter 'm' to purchase more! --> ";
    cin >> input;
  }
  cout << "Total: $" << total << endl;
}
```

Task

```cpp
#include <iostream>
using namespace std;
void readProducts(string name[], double price[], int numberOfProducts) {
  //TODO: read products.txt
}
int main() {
  const int numberOfProducts = 10;
  string name[numberOfProducts] = {};
  double price[numberOfProducts] = {};
  readProducts(name, price, numberOfProducts);
  for (int i=0;i<numberOfProducts;i++)
    cout << name[i] << " " << price[i] << endl;
}
```

```
Chicken 20
Milk 6.5
Chocolate 10
Pasta 18.5
Sugar 6.5
Salt 5.5
Mushroom 12
Coke 5.4
Pepsi 4.8
Fanta 4.6

```

Task - Solution

```cpp
#include <iostream>
#include <fstream>
using namespace std;
void readProducts(string name[], double price[], int numberOfProducts) {
  ifstream fin;
  fin.open("products.txt");
  if (fin.fail()) cout << "Error" << endl;
  for (int i=0;i<numberOfProducts;i++) {
    fin >> name[i] >> price[i];
  }
  fin.close();
}
int main() {
```

```
supermarket1Solution
Chicken 20
Milk 6.5
Chocolate 10
Pasta 18.5
Sugar 6.5
Salt 5.5
Mushroom 12
Coke 5.4
Pepsi 4.8
Fanta 4.6
Press any key to continue...
```

```
Chicken 20
Milk 6.5
Chocolate 10
Pasta 18.5
Sugar 6.5
Salt 5.5
Mushroom 12
Coke 5.4
Pepsi 4.8
Fanta 4.6
```

Example - Continued

supermarket2.cpp

```cpp
#include <iostream>
#include <fstream>
using namespace std;
void createReceipt(double total) {
  ofstream fout;
  fout.open("receipts.txt", ios::app);
  if (fout.fail()) {
    cout << "Error";
  } else {
    fout << "Welcome to ENGG111 supermarket" << endl;
    fout << "---" << endl;
    fout << "Purchase total: $ " << total << endl;
    fout << "---" << endl;
    fout << "Thank you ~ Please come again" << endl;
  }
}
int main() {
```

receipts.txt

```
Welcome to ENGG111 supermarket
---
Purchase total: $ 42
---
Thank you ~ Please come again
Welcome to ENGG111 supermarket
---
Purchase total: $ 42
---
Thank you ~ Please come again

```

Example - Continued

```
#include <iostream>
#include <fstream>
using namespace std;
void createReceipt(double total) {
void readProducts(string name[], double price[], int numberOfProducts) {
int productSelection(string name[], double price[], int numberOfProducts) {
double purchase(string name[], double price[], int numberOfProducts) {
int main() {
  const int numberOfProducts = 10;
  string name[numberOfProducts] = {};
  double price[numberOfProducts] = {};
  readProducts(name, price, numberOfProducts);
  double total = 0;
  char input = 'm';
  while (input == 'm') {
    total += purchase(name, price, numberOfProducts);
    cout << "Enter 'm' to purchase more! --> ";
    cin >> input;
  }
  cout << "Total: $" << total << endl;
  createReceipt(total);
}
```