Text File Input and Output
Chapter 12

Course: CPSC 1150

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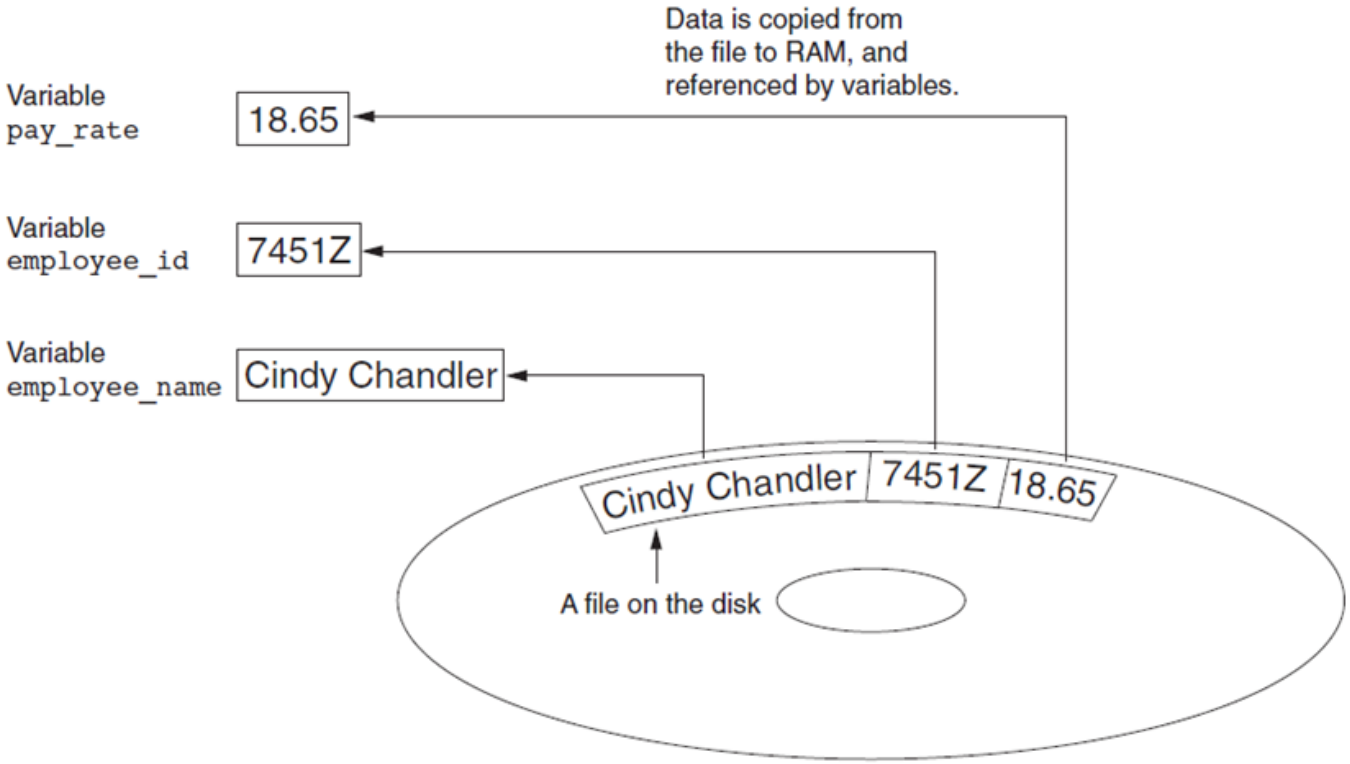
Lecture 18

Learning Outcomes

- Read from a file
- Write into a file

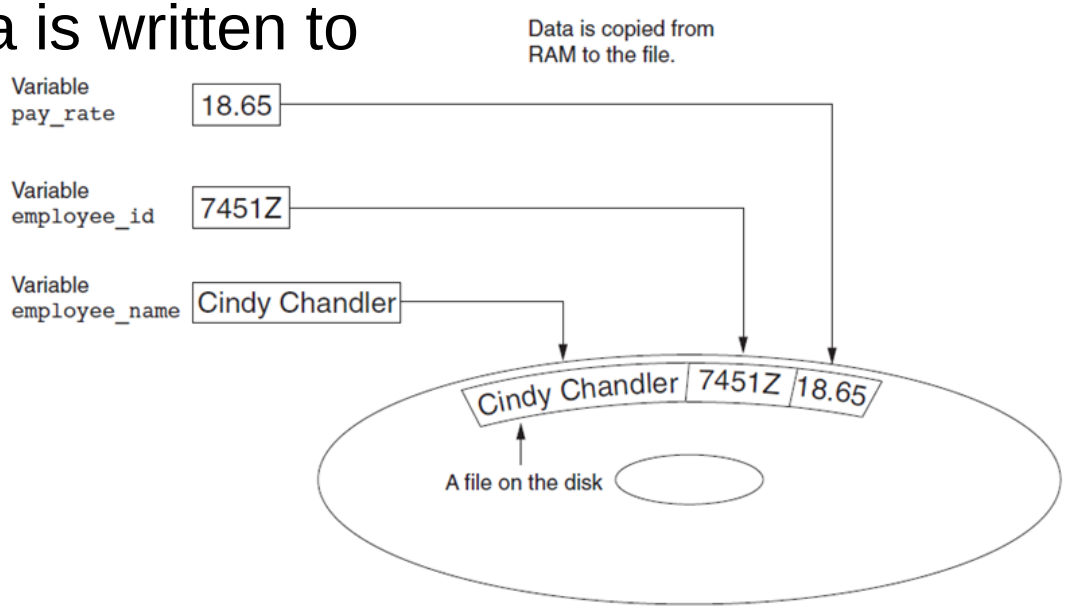
Reading data from a file

- "Reading data from a file" means process of retrieving data from a file
- Input file is a file from which data is read



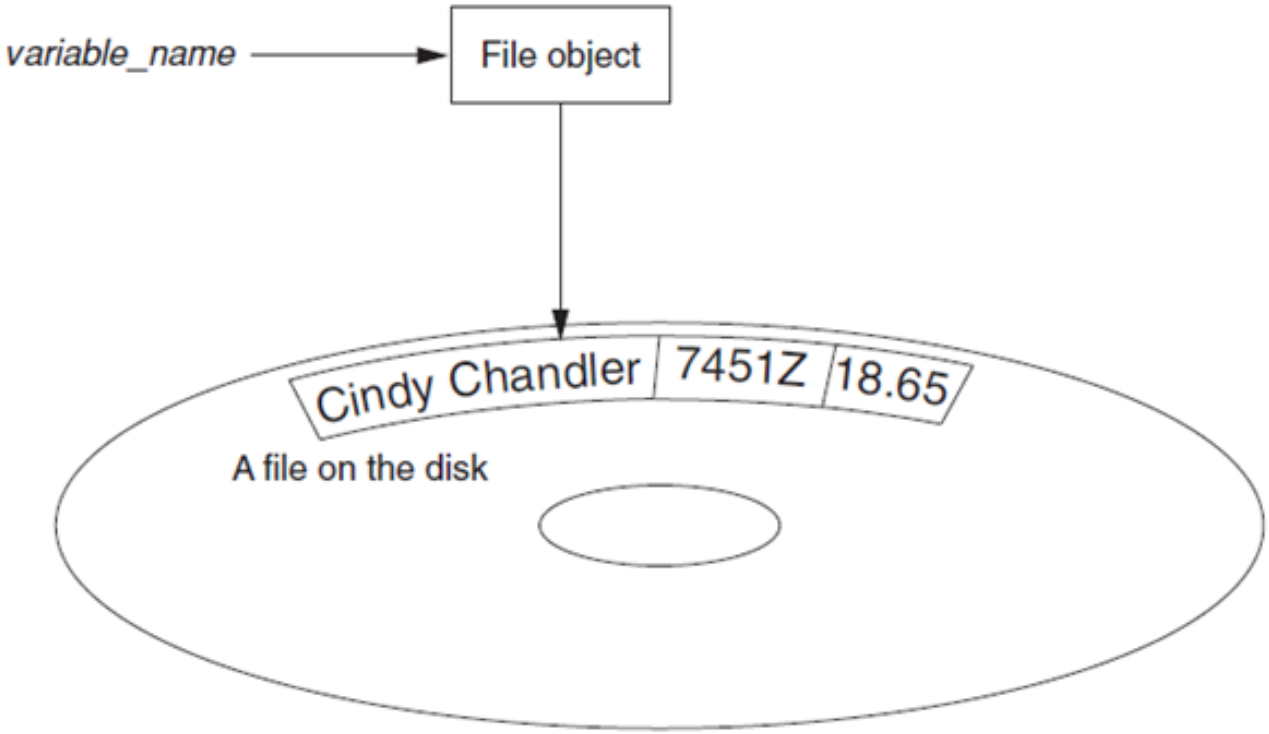
Writing data to a file

- For program to retain data between the times it is run, you must save the data
  - Data is saved to a file, typically on computer disk
  - Saved data can be retrieved and used at a later time
- "Writing data to a file" means saving data on a file
- Output file is a file that data is written to



Filenames and File Objects

- Whether you want to read from or write to a text file, you should create a File object in your program
- A variable name references a file object that is associated with a file



Types of Files and File Access Methods

- In general, two types of files
  - Text file: contains data that has been encoded as text
  - Binary file: contains data that has not been converted to text
- Two ways to access data stored in file
  - Sequential access: file read sequentially from beginning to end, can't skip ahead
  - Direct access: can jump directly to any piece of data in the file

Some methods in the File class

– These are all **instance** methods

Method	What it does...
`exists()`	Returns `true` if the file (or directory) exists.
`isDirectory()`	Returns `true` if the `File` object represents a directory.
`isFile()`	Returns `true` if the `File` object represents a file.
`getName()`	Returns a `String` containing the filename.
`getPath()`	Returns a `String` containing the path.
`lastModified()`	Returns a `long` containing a time (in ms).
`length()`	Returns a `long` containing the size.
`delete()`	Deletes the file and returns `true` if successful.
`mkdir()`	Creates a directory and returns `true` if successful.

– There are more in Section 12.10 in the textbook.

Creating a File object for a .txt file

- To use File objects, you need the following import statement at the top of your code:

```
import java.io.File;
```

Creating a File object

```
File myFile = new File("fileName.txt");
// myFile is a File object
```

- This statement does not create a file in your file system, but just creates a **Java object** to represent the file in your program
- Could also use a File object to represent a directory

Writing to a file

- General steps:
  1. Create a File object using the filename you want to write to.
  2. Check if that file exists (and is writeable, if you like). If it does, and you write to it, beware that you will overwrite the current contents of the file. Usually, it's good to warn the user that the file already exists, and they need to pick another filename.
  3. Create a `PrintWriter` object to allow you to write to the file.
  4. Use the usual `print, println, printf` methods with the `PrintWriter`.
  5. Close the PrintWriter when finished.

- Look at the program WriteToFile for an example of how to do this.

Creating a PrintWriter object

- You can use a PrintWriter in order to write to a file.
- To use PrintWriter objects, you need the following import statement at the top of your code:

```
import java.io.PrintWriter;
```

Creating a PrintWriter object

```
PrintWriter pw = new PrintWriter(myFile);  //throws
                                           // FileNotFoundException
//myFile is a File object
```

- From the API: “If the file exists then it will be truncated to zero size; otherwise, a new file will be created.”

Throwing exceptions

- In Java, you as a programmer are forced to explicitly deal with errors that might occur, instead of letting them crash your program
  - File I/O is prone to many possible errors
    - Creating PrintWriter object from a file throws exception
    - Creating Scanner object from a file throws exception
  - These exceptions must be handled otherwise compiler doesn't let go!
- In this course, we don't learn how to handle exceptions, so for now, we need to put the code throws Exception at the end of any method header (including main) which performs file I/O
- Now code that uses our methods must either catch (handle) or continue to throw the exception
  - Think of an exception as a hot potato or a grenade – you need to neutralize it or throw it away

Reading from a file

- General steps:
  1. Create a File object using the filename you want to read from.
  2. Check if that file exists (and is readable, if you like). If not, do not attempt to read it.
  3. Create a Scanner of the file.
  4. Use the usual Scanner methods to extract data.
  5. Process/use the data however you like, once you have extracted it.
  6. Make sure to close this Scanner when you are done!

- Look at the program ReadFromFile for an example of how to do this

More Practice

- Check programming exercise of chapter 12, questions 14,15, 19, 25.