CMSC 132: OBJECT-ORIENTED PROGRAMMING II

Java I/O

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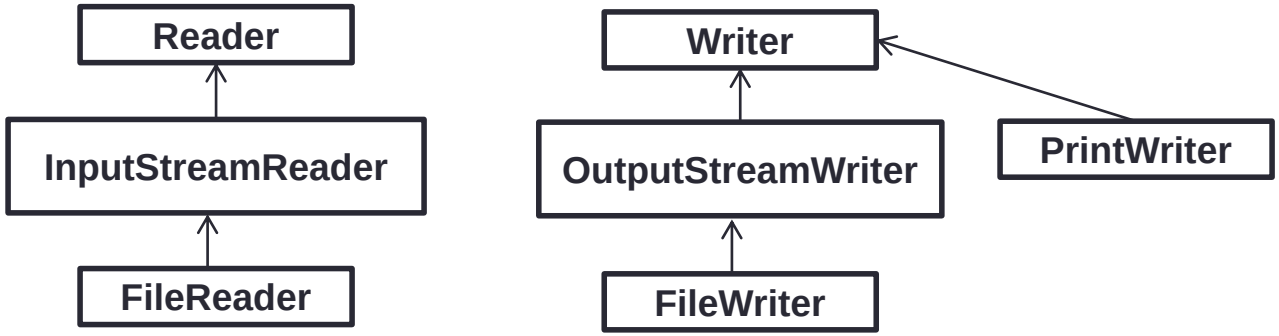
Storing Data

- Approaches to store file data
  - Text files
    - Data represented in human-readable form
    - Example: Java source programs
    - Use text editor to manipulate the data
  - Binary files
    - Data represented as a sequence of bytes
    - Designed to be read by programs
    - More compact
    - More efficient to process (no encoding/decoding required)
- Keep in mind all files are stored in binary format
- Text I/O provides a level of abstraction to encode/decode characters

Input/Ouput in Java

- Two sets of classes
  - Readers and Writers → deal with text data
    - **Responsible for converting between characters and bytes**
  - Streams → deal with binary data
- Relying on java.io.*
- Readers/Writers



File Class

- Encapsulates the properties of a file or directory
- Does not provide methods to read/write from/to a file
- Example: File file = new File(“data.txt”);
- Methods
  - exists() → tests whether file/directory exists
  - delete() → deletes file/directory
  - others

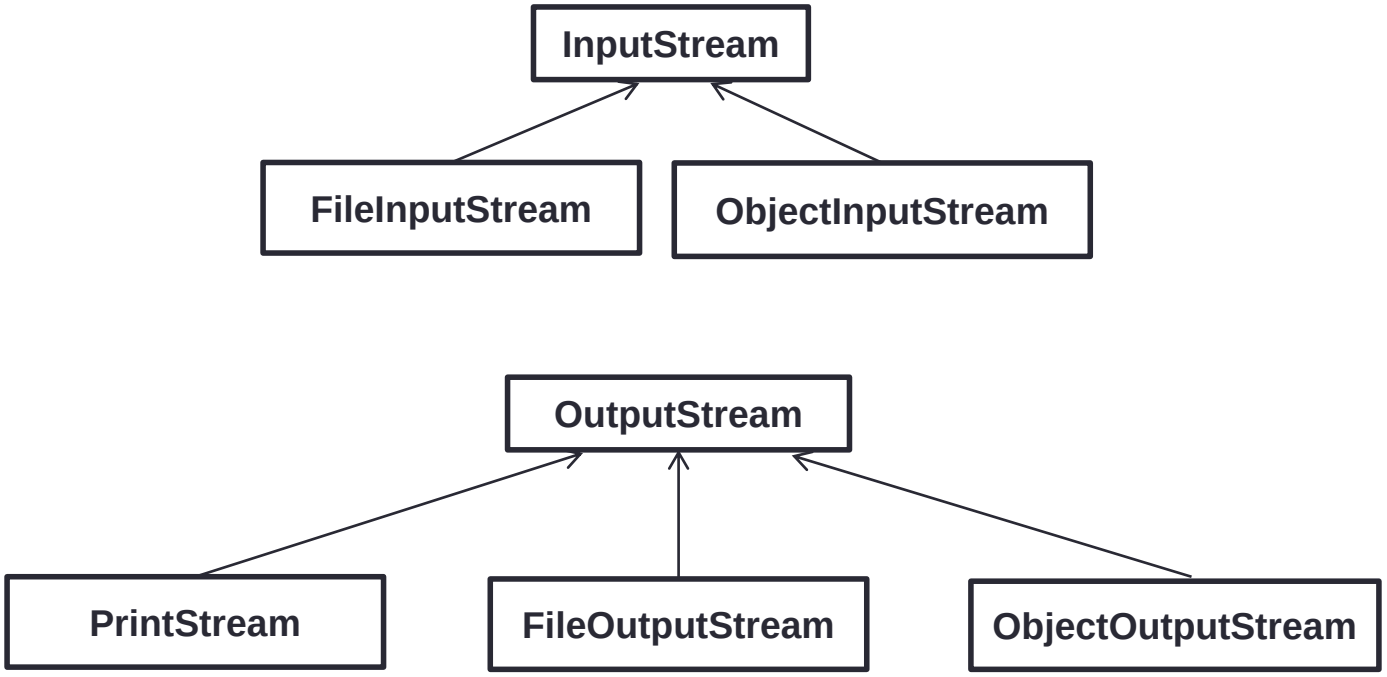
Text Files Input Classes

- FileReader
  - **read** method → returns a character or -1 (end of stream)
  - **close** method → closes the stream and releases any system resources
  - **Example:** FileReaderEx.java
- BufferedReader
  - Reads text from character-input stream, buffering characters for efficiency
  - **readLine** method available → reads a line of text
  - **Example:** BufferedReaderEx.java
- Scanner
  - Breaks input into tokens delimited by whitespace
  - Methods: hasNext(), nextInt(), nextDouble(), next(), Others
  - **Example:** ScannerEx*.java

Text Files Output Classes

- FileWriter
  - **write(int c)** method → writes a single character
  - **close** method → closes the stream and releases any system resources
  - **Example:** FileWriterEx.java
- BufferedWriter
  - Writes text to a character-output stream, buffering characters for efficiency
  - **Example:** BufferedWriterEx.java
- PrintWriter
  - **print** method
  - **println** method
  - **printf** method
  - **Example:** PrintWriterEx.java, FileReadWriteEx.java

Binary Data Input/Output Classes



Standard Input/Output

- **Standard I/O**
  - Provided in System class in java.lang
  - **System.in**
    - An instance of InputStream
  - **System.out**
    - An instance of PrintStream
  - **System.err**
    - An instance of PrintStream
- We can use the Scanner class with System.in

Examples

- Network
  - **Example:** WebSiteContents.java
- Serialization
  - **Example:** Driver.java, Phonebook.java

Binary Files

- Output
  - FileOutputStream → for writing bytes to a file
  - BufferedOutputStream → adds a buffer
  - DataOutputStream → converts primitive type values or strings into bytes and outputs them to the stream
  - **Example:** BinaryFileWriterEx.java
- Input
  - FileInputStream → for reading bytes from a file
  - BufferedInputStream → adds a buffer
  - DataInputStream → reads data from a stream and converts data into appropriate primitive type or strings
  - **Example:** BinaryFileReaderEx.java
- **Example:** CopyingBytes.java