CSCB07 - Software Design

I/O and Regular Expressions

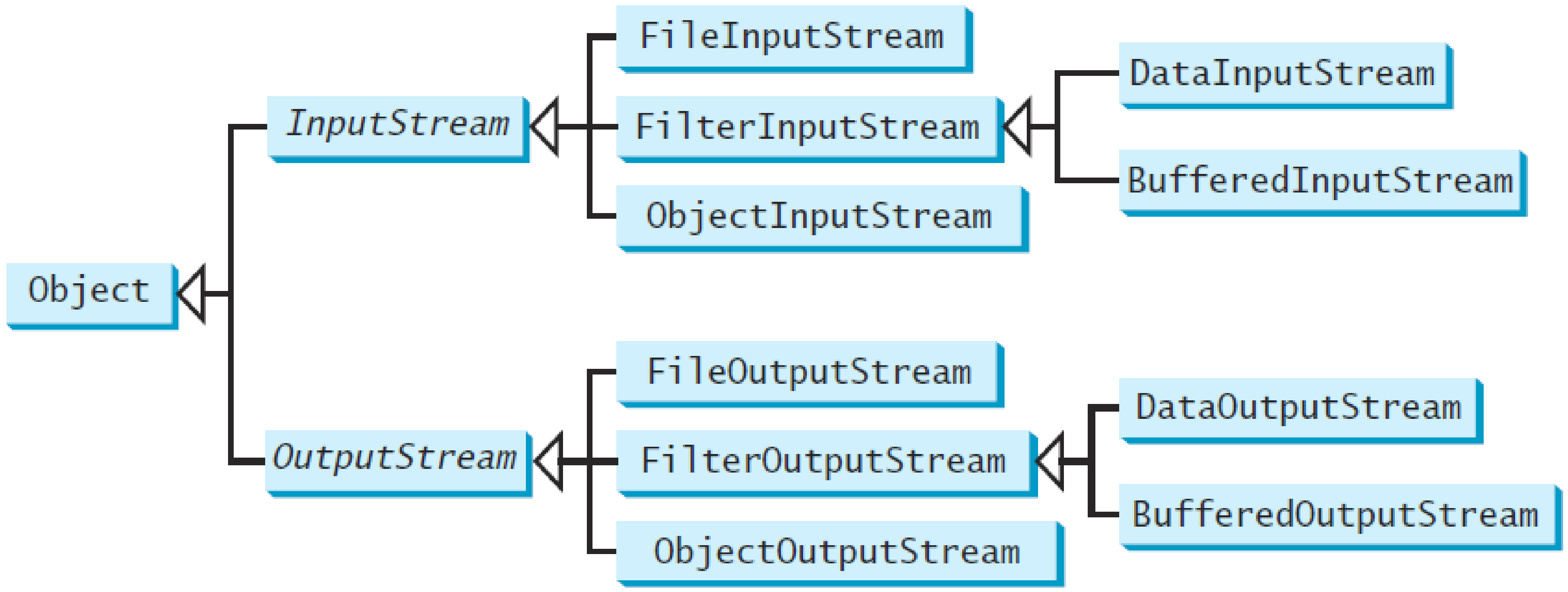
Summer 2021

Input and Output (I/O)

- Input sources include:
  - Keyboard
  - File
  - Network
- Output destinations include:
  - Console
  - File
  - Network

Input and Output Streams

- Java handles inputs and outputs using streams



Standard I/O

- **System.in**
  - Object of type **InputStream**
  - Typically refers to the keyboard
  - Reading data could be done using the **Scanner** class. Its methods include:
    - **String next()**
    - **String nextLine()**
    - **int nextInt()**
    - **double nextDouble()**
- **System.out**
  - Object of type **PrintStream**
  - Typically refers to the console

The **File** class

- Contains methods for obtaining the properties of a file/directory and for renaming and deleting a file/directory
- Files could be specified using absolute or relative names
- Constructing a **File** instance does not create a file on the machine
- Methods include:
  - **boolean createNewFile()**
  - **boolean delete()**
  - **boolean exists()**
  - **boolean isDirectory()**
  - **File [] listFiles()**

File I/O

- Reading could be done using the **Scanner** class
  - E.g. **Scanner input = new Scanner(new File(filename));**
- Writing could be done using the **FileWriter** class
  - E.g. **FileWriter output = new FileWriter(filename, append);**

Regular Expressions

- A regular expression (abbreviated regex) is a string that describes a pattern for matching a set of strings.
- Regular expressions provide a simple and effective way to validate user input
  - ➢ E.g. phone numbers

Regular Expressions

- Java supports regular expressions using the **java.util.regex** package
- The **Pattern** class can be used to define the pattern
  - The **compile** method takes a string representing the regular expression as an argument and compiles it into a pattern
- The **Matcher** class can be used to search for the pattern. Its methods include:
  - **boolean find()**
  - **boolean matches()**
- Example

```
Pattern pattern = Pattern.compile(“H.*d");
Matcher matcher = pattern.matcher(“Hello World");
System.out.printl(matcher.matches());
```

Commonly Used Regular Expressions

Regular Expression	*Matches*	*Example*
.	any single character	Java matches J..a
(ab|cd)	ab or cd	ten matches t(en|im)
[abc]	a, b, or c	Java matches Ja[uvwx]a
[^abc]	any character except a, b, or c	Java matches Ja[^ars]a
[a-z]	a through z	Java matches [A-M]av[a-d]
[^a-z]	any character except a through z	Java matches Jav[^b-d]
[a-e[m-p]]	a through e or m through p	Java matches [A-G[I-M]]av[a-d]

Commonly Used Regular Expressions

Regular Expression	*Matches*	*Example*
`[a-e&&[c-p]]`	intersection of a-e with c-p	`Java` matches `[A-P&&[I-M]]av[a-d]`
`\d`	a digit, same as [0-9]	`Java2` matches `"Java[\\d]"`
`\D`	a non-digit	`$Java` matches `"[\\D][\\D]ava"`
`\w`	a word character	`Java1` matches `"[\\w]ava[\\w]"`
`\W`	a non-word character	`$Java` matches `"[\\W][\\w]ava"`
`\s`	a whitespace character	`"Java 2"` matches `"Java\\s2"`
`\S`	a non-whitespace char	`Java` matches `"[\\S]ava"`

Liang, Introduction to Java Programming, Tenth Edition, © 2015 Pearson Education, Inc.

Commonly Used Regular Expressions

Regular Expression	*Matches*	*Example*
*p**	zero or more occurrences of pattern *p*	aaaabb matches "a*bb" ababab matches "(ab)*"
p+	one or more occurrences of pattern *p*	a matches "a+b*" able matches "(ab)+.*"
p?	zero or one occurrence of pattern *p*	Java matches "J?Java" Java matches "J?ava"
p{n}	exactly n occurrences of pattern *p*	Java matches "Ja{1}.*" Java does not match ".{2}"
p{n,}	at least n occurrences of pattern *p*	aaaa matches "a{1,}" a does not match "a{2,}"
p{n,m}	between n and m occurrences (inclusive)	aaaa matches "a{1,9}" abb does not match "a{2,9}bb"