softserve experience matters

Java Core

String
Regular Expression

IT Academy
05/2016

Agenda

- Java String methods
  - String
  - StringBuffer
  - StringBuilder
- Regular Expression
- Practical tasks

Class String

As you know we have a number of primitive types in Java which represents next entities:

- Integer numbers (`byte, short, int, long`)
- Real numbers (`float, double`)
- Symbols (`char`)
- Boolean (`boolean`)

For Strings represents Java doesn't has a primitive type!!!

String

- Strings, which are widely used in Java programming, are a sequence of characters.
- In the Java programming language, strings are ***objects***.
- The Java platform provides the ***String*** class to create and manipulate strings.
- Literal automatically creates an object of type String

```
String s1 = "sun.com";
String s2 = new String("sun.com");
```

- String objects are immutable.
- After creating the content can not be changed.
- You can always create a new string that contains all changes.

String

String class supports multiple constructors

- `String( );`
- `String(String str);`
- `String(char[ ] unicodechar); ...`
- `String(StringBuffer sbuf);`
- `String(StringBuilder sbuild);`

- Just assignee value to variable

```
String strFirst = "First String";
```

- Call constructor of String class

```
String strSecond = new String("Second String");
```

- Call constructor of String class

```
char[] chA = {'A', 'B', 'C', 'D', 'E', 'F'};
String strThird = new String(chA);
String strFourth = new String(chA, 2, 4); // CDEF
```

Basic methods

- **Concat strings**

```
 String concat(String s) or "+"
String str1 = "Hello ";
String str2 = "World!";
String str3 = str1 + str2;
String str4 = str1.concat(str2);
System.out.println(str3 + str4);
```

- **Get length of string**

```
    int length()
// str3Length = 12
int str3Length = str3.length();
```

Basic methods

- **Compare strings**

```
boolean equals(Object obj)
boolean equalsIgnoreCase(String s)
int compareTo(String s)
int compareToIgnoreCase(String s)
boolean contentEquals(StringBuffer obj)
```

```
String a = "a"; What will be the results?
String A = "A";
String b = "a";
System.out.println(a.equals(A));
System.out.println(a.equals(b));
System.out.println(a.equalsIgnoreCase(A));
System.out.println(a.compareTo(A));
System.out.println(a.compareToIgnoreCase(A));
System.out.println(a.contentEquals(A));
```

Basic methods

- **Get part of string**
  - extract a substring of length m-n, starting at position n

```
String substring(int n, int m)
```

  - extract a substring starting at position n

```
String substring(int n)
int indexOf(char ch)
boolean startsWith(String s)
boolean endsWith(String s)
char charAt(int position)
```

```
String str =
      "I study Java language";
int n = str.indexOf('J'); //8
char c = str.charAt(8);   //J
```

```
String str1 = str.substring(13);     // language
String str2 = str.substring(8, 12);  //Java

Boolean res = str.startsWith("I study"); //true
res = str.startsWith("Java", 8);         //true
res = str.endsWith("I study");           //false
```

Basic methods

- **Working with case of symbols**

```
String toLowerCase()

String toUpperCase()
```

- **Trim strings**

```
String str = "\tTabulated String\t";
String tStr = str.trim();
```

- **Replace symbols**

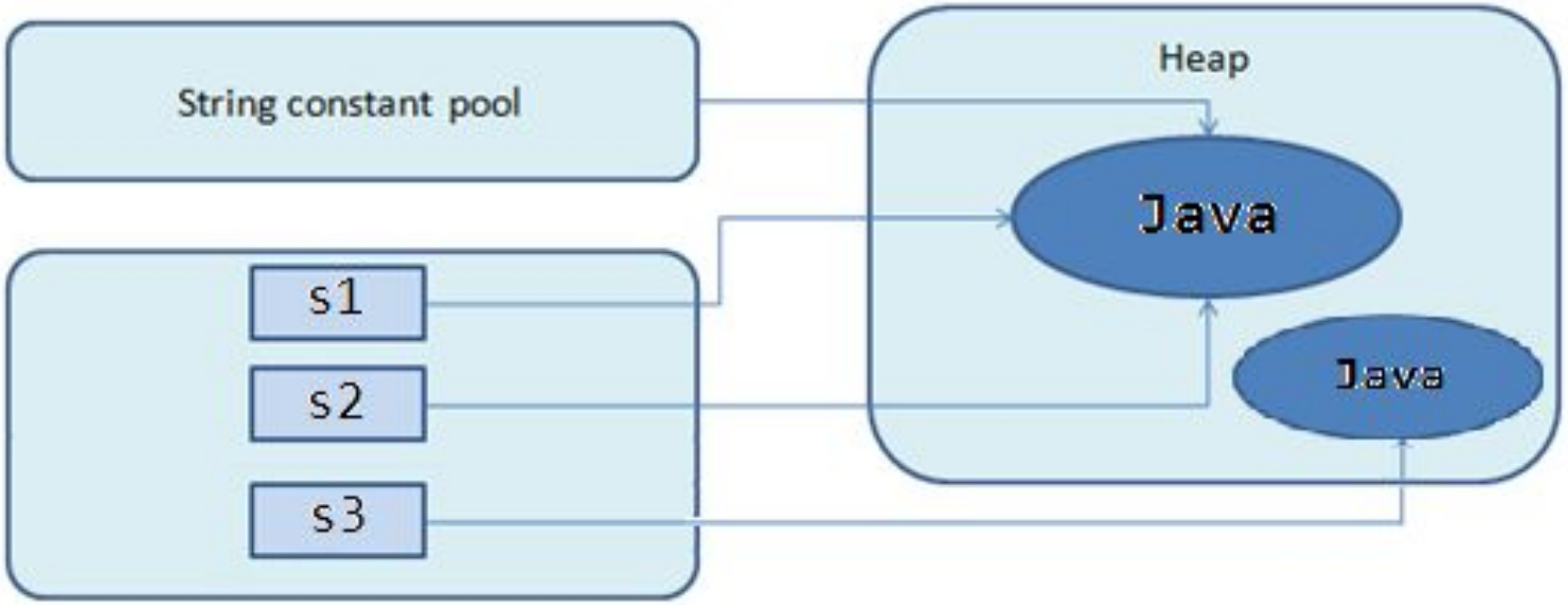
```
String str = "abracadabra";
String rStr = str.replace('a', 'o');
```

```
boolean isEmpty()
```

Java String methods

```
public static void main(String[] args) {
String s1 = "Java";
String s2 = "Java";
String s3 = new String("Java");
System.out.println(s1 + "==" + s2 + " : "
          + (s1 == s2));      // true
System.out.println(s1 + "==" + s3 + " : "
          + (s1 == s3));      // false
System.out.println(s1 + " equals " + s2 + " : "
          + s1.equals(s2));      // true
System.out.println(s1 + " equals " + s3 + " : "
          + s1.equals(s3));      // true
System.out.println(s1.hashCode());
}
```

String Constant Pool



Example

```
public static void main(String[ ] args) {
    int i;
    char s[ ] = { 'J', 'a', 'v', 'a' };
    String str = new String(s);          // str = "Java"
    if (!str.isEmpty( )) {
        i = str.length( );               // i = 4
        str = str.toUpperCase( );        // str = "JAVA"
        String num = String.valueOf(8);   // num = "8"
        num = str.concat("-" + num);     // num = "JAVA-8"
        char ch = str.charAt(2);         // ch = 'V'
```

Example

```
    i = str.lastIndexOf('A');     // i = 3 or -1
    num = num.replace("8","SE"); // num = "JAVA-SE"
    str.substring(0, 4).toLowerCase( );  // java
    str = num + "-8";             // str = "JAVA-SE-8"
    String[ ] arr = str.split("-");
    for (String s : arr) {
       System.out.println(s);
     }
  }
}
```

String Formatting

```
System.out.printf("format-string" [, arg1, arg2, ... ] );
```

Format String:

% [flags] [width] [.precision] conversion-character

Flags: '-' (align), '+' (sign), 0 (forces zero), ',' ' ' (space)
Width - minimum number of characters to be written to the output.
Precision - the number of digits of precision when outputting floating-point values or the length of a substring to extract from a String.
Conversion-Characters:

- **d** : decimal integer [byte, short, int, long]
- **f** : floating-point number [float, double]
- **c** : character Capital C will uppercase the letter
- **s** : String Capital S will uppercase all the letters in the string
- **h** : hashcode A hashcode is like an address.
- **n** : newline use %n instead of \n

String Formatting

Supported by String.format() and System.out.printf() methods:

```
public class StringSamples {
    public static void main(String... args) {
        final double PI = 3.1415926;
        String format = "%.2f";
        String s = String.format(format, PI);
        System.out.println(s);
        System.out.printf(format, PI);
    }
}
```

```
"C:\Program
3,14
3.14
```

Detailed tutorial with samples:
https://examples.javacodegeeks.com/core-java/lang/string/java-string-format-example/

StringBuilder and StringBuffer

- String objects are immutable
- Defined equal classes StringBuffer and StringBilder allow changes to lines
- StringBuffer is synchronized, StringBuilder is not.

```
String s1 = new String("Hello");
String s2 = "And Goodbye";
String str = s1 + s2;
str = s1.concat(s2);
```

```
StringBuilder sb =
    new StringBuilder(s1);
sb.append(s2);
str = sb.toString( );
```

```
StringBuffer sa =
    new StringBuffer( );
sa.append(s1);
sa.append(s2);
String str =  sa.toString( );
```

StringBuilder

Constructors

- `StringBuilder()`
- `StringBuilder(char[] seq)`
- `StringBuilder(int capacity)`
- `StringBuilder(String str)`

Methods

- `append(...)` adds a string to the end of the buffer.
- `insert(...)` adds a string to any location (insert the substring).
- `delete(int begin, int end)` deletes a sequence of characters.
- `int capacity()` returns the current capacity of the buffer.
- `void ensureCapacity(int i)` changes the value of capacity
- `reverse()` causes this character sequence to be replaced by the reverse of the sequence

Regular Expression

A regular expression is a kind of pattern that can be applied to text (Strings, in Java)

A regular expression either matches the text (or part of the text), or it fails to match

If a regular expression matches a part of the text, then you can easily **find** out which part

- Beginning with Java 1.4, Java has a regular expression package, java.util.regex

The regular expression "[a-z]+" will match a sequence of one or more lowercase letters

- [a-z] means any character from a through z, inclusive
- + means "one or more"

Regular Expression

Suppose we apply this pattern to the String

"Now is the time"

First, you must *compile* the pattern

```
import java.util.regex.*;
Pattern p = Pattern.compile("[a-z]+");
```

Next, you must create a *matcher* for a specific piece of text by sending a message to your pattern

```
Matcher m = p.matcher("Now is the time");
```

Neither Pattern nor Matcher has a public constructor; you create these by using methods in the Pattern class

Regular Expression

Now that we have a matcher m:

- `m.matches()` returns true if the pattern matches the entire text string, and false otherwise
- `m.lookingAt()` returns true if the pattern matches at the beginning of the text string, and false otherwise
- `m.find()` returns true if the pattern matches **any part** of the text string, and false otherwise

If called again, `m.find()` will start searching from where the last match was found

`m.find()` will return true for as many matches as there are in the string; after that, it will return false

When `m.find()` returns false, matcher m will be *reset* to the beginning of the text string (and may be used again)

Regular Expression

```
import java.util.regex.*;
public class Appl {
  public static void main(String[] args) {
     String pattern = "[a-z]+";
     String text = "Now is the time";
     Pattern p = Pattern.compile(pattern);
     Matcher m = p.matcher(text);
     while (m.find()) {
        System.out.print(text
          .substring(m.start(), m.end()) + "*");
  }
}
```

Regular Expression

abc exactly this sequence of three letter

[abc] any *one* of the letters a, b, or c

[^abc] any character *except* one of the letters a, b, or c (immediately within an open bracket, ^ mean "not," but anywhere else it just means the character ^)

[a-z] any *one* character from a through z, inclusive

[a-zA-Z0-9] any *one* letter or digit

Regular Expression

If one pattern is followed by another, the two patterns must match consecutively

- For example, [A-Za-z]+[0-9] will match one or more letters immediately followed by one digit
- The vertical bar, |, is used to separate alternatives
- For example, the pattern abc|xyz will match either abc or xyz

X? optional, X occurs once or not at all

X* X occurs zero or more times

X+ X occurs one or more times

X{n} X occurs exactly n times

X{n,} X occurs n or more times

X{n, m} X occurs at least n but not more than m times

Regular Expression

.	any one character except a line terminator
\d	a digit: [0-9]
\D	a non-digit: [^0-9]
\s	a whitespace character: [\t\n\x0B\f\r]
\S	a non-whitespace character: [^\s]
\w	a word character: [a-zA-Z_0-9]
\W	a non-word character: [^\w]
^	the beginning of a line
$	the end of a line
\b	a word boundary
\B	not a word boundary

Regular Expression

In some implementations, a quantifier in regular expressions corresponds to the maximum line length is possible

For example, often expect that the expression (`<.*>`) will be found in the text tag HTML. However, if the text is more than one HTML-tag, this expression matches the entire string containing a set of tags.

```
   <p><b>Beginning with bold text</b> next,
text body,<i>italic text</i> end of text.</p>
```

Solved problem:

- Take into account characters that are not relevant to the desired pattern (`<[^>]*>` for the above case)

Regular Expression

```
import java.util.regex.*;

public class Appl {
public static void main(String[] args) {
//String pattern = "[a-z]+";
//String text = "Now is the time";
//
//String pattern = "<.*>";
//String pattern = "<[^>]*>";
//String text = "<p><b>Beginning with bold text</b> next,
text body,<i>italic text</i> end of text.</p>";
String pattern = "\\w+(\\.\\w+)*@(\\w+\\.)+\\w+";
String text = "my.mail@ua.ua";
```

Regular Expression

```
Pattern p = Pattern.compile(pattern);
Matcher m = p.matcher(text);

if (m.matches()) {
System.out.print("Matches the entire text string");
m.reset();
System.out.println();
}
while (m.find()) {
  System.out.print(text.substring(m.start(),m.end())+ "*");
}
}
}
```

Practical tasks

1. Enter the two variables of type String. Determine whether the first variable substring second. For example, if you typed «IT» and «IT Academy» you must receive true.
2. Enter surname, name and patronymic on the console as a variable of type String. Output on the console:
   - surnames and initials
   - name
   - name, middle name and last name
   3. The user name can be 3 to 15 characters of the Latin alphabet, numbers, and underscores. Using regular expressions implement checking the user name for validity. Input five names in the main method . Output a message to the console of the validation of each of the entered names.

Homework

1. Enter in the console sentence of five words.
   - display the longest word in the sentence
   - determine the number of its letters
   - bring the second word in reverse order
2. Enter a sentence that contains the words between more than one space. Convert all spaces, consecutive, one. For example, if we introduce the sentence "I am learning Java Core», we have to get the "I'm learning Java Core»
3. Implement a pattern for US currency: the first symbol "$", then any number of digits, dot and two digits after the dot. Enter the text from the console that contains several occurrences of US currency. Display all occurrences on the screen.

softserve experience matters

The end

USA HQ
Toll Free: 866-687-3588
Tel: +1-512-516-8880

Ukraine HQ
Tel: +380-32-240-9090

Bulgaria
Tel: +359-2-902-3760