Arrays

CSE 142, Summer 2002

Computer Programming 1

http://www.cs.washington.edu/education/courses/142/02su/

Readings and References

- Reading
  - » Section 22.1, *An Introduction to Programming and Object Oriented Design using Java*, by Niño and Hosch
  - » Chapters 18 and 19, *Introduction to Programming in Java*, Dugan
- Other References
  - » Section *Arrays* of the Java tutorial
  - » http://java.sun.com/docs/books/tutorial/java/data/arrays.html

Arrays

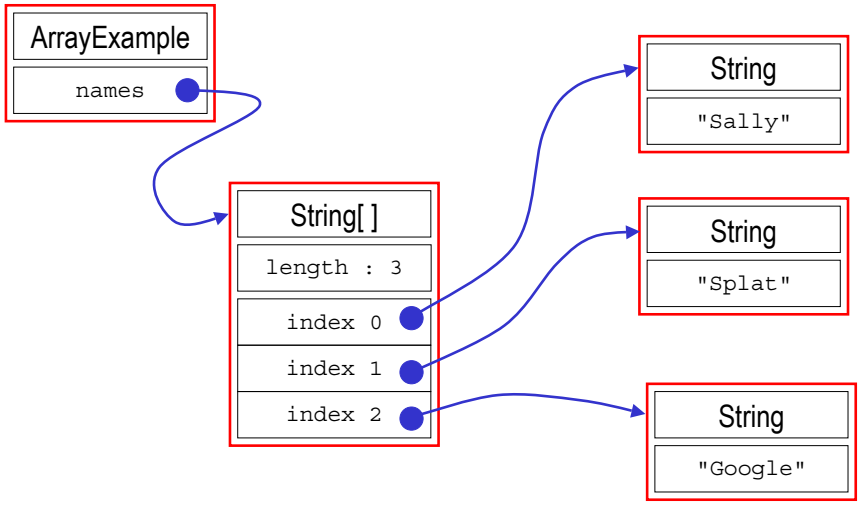
- Java (and many other languages) include *arrays* as the most basic kind of collection.
  - » Simple, ordered collections, similar to ArrayLists.
  - » Special syntax for declaring values of array type.
  - » Special syntax for accessing elements by position.
- Unlike ArrayLists:
  - » The size is fixed when the array is created.
  - » Can specify the type of the elements of arrays.

Array Example

```
public class ArraySample {
    public ArraySample() {
        names = new String[3];
        names[0] = "Sally";
        names[1] = "Splat";
        names[2] = "Google";
        for (int i=0; i<names.length; i++) {
            System.out.println("Name "+i+" is "+names[i]);
        }
    }

    String[] names;
}
```

Array Example



Java Array Object

- Arrays are objects! They...
  - » Must be instantiated with **`new`** unless immediately initialized
  - » Can contain **`Object`** references or primitive types
  - » Have class members (length, clone(),…)
  - » Have zero-based indexes
  - » Throw an exception if bounds are exceeded

Array Declaration and Creation

- Array have special type and syntax:

  <element type> **[ ]** *<array name>* = **new** ***<element type>*** **[** ***<length>*** **]**;
- Arrays can only hold elements of the specified type.
  - » Unlike ArrayList, element type can be int, double, etc.
  - » type can be Object, in which case very similar to ArrayList
- *<length>* is any positive integer expression
- Elements of newly created arrays are initialized
  - » but generally you should provide explicit initialization
- Arrays have an instance variable that stores the length

  <array name>`.length`

Declaring and Allocating Arrays

- Declare an Array of ten **`String`** references

```
String[] myArray = new String[10];
```

- Declare an array and initialize elements
  - » the compiler counts the number of elements in this case

```
String[] myArray = { "Java","is","cool"};
```

- Declare, initialize, and use an array
  - » this is an "anonymous" array

```
boolean okay = doLimitCheck(x,new int[] {1,100});
```

Array Element Access

- Access an array element using the array name and position: *<array name>* [*<position>*]
- Details:
  - » *<position>* is an integer expression.
  - » Positions count from zero, as with ArrayLists.
  - » Type of result is the element type of the array
- Can update an array element by assigning to it:

  <array name> [*<position>*] = *<new element value>* ;
  - » Like ArrayList's set method

Looping Over Array Contents

- The length attribute makes looping over Array objects easy:

```
for (index=0; index<myArray.length; index++) {
   System.out.println(myArray[index]);
}
```

- The length attribute is a read-only value
  - » You can't change the size of the array after it has been created

Passing Array Objects to Methods

- You must declare that a method parameter is an Array:

```
public static void main(String[] args)
```

- Arrays are objects and so you are passing a reference when you call a method with an array
  - » This means array contents can be changed by methods
  - » This may be what you want, but if not, you need to make sure that other methods only get a copy of your array and the elements in it

Array Summary

- Arrays are the fundamental low-level collection type built in to the Java language.
  - » Also found in essentially all programming languages
- Size fixed when created
- Indexed access to elements
- Used to implement higher-level, richer container types
  - » ArrayList for example
  - » More convenient, less error-prone for users

The Arrays Class

- There is also a class called java.util.Arrays
  - » Note the capital A, this is a class name
  - » part of package java.util
  - » utility functions for using arrays
    - search
    - sort
    - initialize
  - » These are **static** methods so they exist and can be used without creating an object first

The Collections Class

- There is also a class called java.util.Collections
  - » utility functions for using classes that implement the Collection interface
  - » This class consists exclusively of static methods that operate on or return collections. It contains polymorphic algorithms that operate on collections, "wrappers", which return a new collection backed by a specified collection, and a few other odds and ends.
  - » These are **static** methods so they exist and can be used without creating an object first

Useful methods in Collections class

- static void sort(List list)
  - » Sorts the specified list into ascending order, according to the natural ordering of its elements.
  - » "natural order" is defined when you implement the interface Comparable
- static void sort(List list, Comparator c)
  - » Sorts the specified list according to the order induced by the specified comparator
  - » Comparator lets you define several different orders