Sequences and Sets

Lesson Objectives

- After completing this lesson, you should be able to:
  - Describe the various kinds of sequence collections and their properties
  - Outline the desirable properties of the Vector collection type
  - Describe the properties of set collections

Typesafe

What is a Sequence?

- An ordered collection of data
- Duplicates are permitted
- May or may not be indexed
- Array, List, Vector
- The apply method on an instance is a lookup

Array

- A fixed size, ordered sequence of data
- Very fast on the JVM
- Values are contiguous in memory
- Indexed by position

Array

```
scala> Array(1, 2, 3, 4, 5)
res0: Array[Int] = Array(1, 2, 3, 4, 5)

scala> res0(2)
res1: Int = 3

scala> res0(5) = 6
java.lang.ArrayIndexOutOfBoundsException: 5
  ... 33 elided
```

Typesafe

List

- A linked list implementation, with a value and a pointer to the next element
- Theoretically unbounded in size
- Poor performance as data could be located anywhere in memory, and must be accessed via “pointer chasing”

List

```
scala> List(1, 2, 3, 3, 4)
res0: List[Int] = List(1, 2, 3, 3, 4)

scala> res0.distinct
res1: List[Int] = List(1, 2, 3, 4)

scala> res0
res2: List[Int] = List(1, 2, 3, 3, 4)

scala> res0 :+ 5
res3: List[Int] = List(1, 2, 3, 3, 4, 5)

scala> 0 +: res1
res4: List[Int] = List(0, 1, 2, 3, 4)
```

Vector

- A linked list of 32 element arrays
- 2.15 billion possible elements
- Indexed by hashing
- Good performance across all operations without having to copy arrays when more space is needed

What is a Set?

- A “bag” of data, where no duplicates are permitted
- Order is not guaranteed
- HashSet, TreeSet, BitSet, KeySet, SortedSet, etc
- The apply method on an instance checks to see if the set contains a value

Set

```
scala> Set(1, 2, 3, 3, 4)
res0: scala.collection.immutable.Set[Int] = Set(1, 2, 3, 4)

scala> res0.getClass
res1: Class[_ <: scala.collection.immutable.Set[Int]] =
  class scala.collection.immutable.HashSet$HashTrieSet

scala> res0 + 5
res2: scala.collection.immutable.Set[Int] = Set(1, 5, 2, 3, 4)

scala> res2 + 2
res3: scala.collection.immutable.Set[Int] = Set(1, 5, 2, 3, 4)
```

Set

```
scala> Set(1, 2, 3, 4)
res0: scala.collection.immutable.Set[Int] = Set(1, 2, 3, 4)

scala> res0(5)
res1: Boolean = false

scala> res0(2)
res2: Boolean = true

scala> res0.toSeq
res3: Seq[Int] = ArrayBuffer(1, 2, 3, 4)

scala> res3.toSet
res4: scala.collection.immutable.Set[Int] = Set(1, 2, 3, 4)
```

Lesson Summary

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