CS 211: Enumerations

Chris Kauffman

Week 9-1

Logistics

Exam 1

Back Wednesday (probably)

Today

- Top-level Kinds in Java
- Enumerations
- P4 discussion

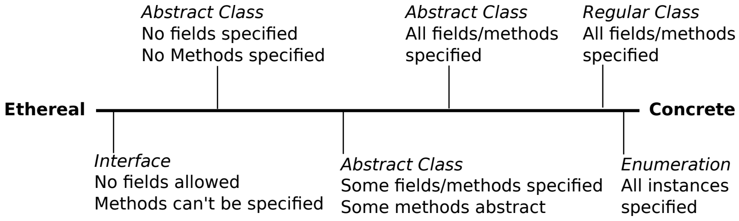
Lab 8: Exercises

Enumerations

P4 Circuits

- Due in 3 weeks
- Big-ish
- Abstract classes
- Enumerations (today)
- Interfaces (next)

The Continuum of Java's Top-Level Entities


Ethereal
Concrete
Abstract Class No fields specified No Methods specified
Abstract Class All fields/methods specified
Regular Class All fields/methods specified
Interface No fields allowed Methods can't be specified
Abstract Class Some fields/methods specified Some methods abstract
Enumeration All instances specified

- Regular classes are more concrete
- Abstract classes are more ethereal
- Enumerations are as concrete as possible
- Interfaces are as ethereal as possible

Java has 4 Top-Level Kinds

`class`

- Run of the mill concrete objects
- Child classes `extend`

`enum`

- Like a class (fields methods) except...
- All instances declared up front, automatically `static final`
- Good for modeling fixed collections
- Cannot `extend`

`abstract class`

- Can't instantiate but good for *single* inheritance hierarchies,
- Child classes `extend`

`interface`

- Can't instantiate
- Good for capabilities cutting across class hierarchies: savable, accessible, observable, comparable
- Child classes `implement`

`enum`: An Enumeration

Like saying `class`

- Can have fields
- Can have methods
- Can have constructors
- BUT all possible instances are declared up front
- NO public constructors allowed
  - You'll never get to `new` one

`enum` will be a fixed set

Typical Uses

Create a fixed set of objects for modeling

States of a baby: no properties

- `BState` used by `Baby`
- `BabyWithState` has an inner enum
- Latter indicates `enum` isn't meant for public use
- Irritating need to include `BState` or `State` for all enum values
- Note weird .class files after compiling `BabyWithState`

Exercise: Cards in a Deck

- Create an `enum Card` for the *value* of a playing card
- Values: two, three, four, ... ten, jack, king, queen, ace
- Should take you 2 minutes

Enums are functional

- Can have fields, Can implement methods

Cards: `beats(c)` method

```
Card x = Card.two;
Card y = Card.ten;
boolean wins = x.beats(y); // false
Card z = Card.king;
wins = z.beats(y);         // true
```

Exercise: Discuss implementation

How can one easily implement the `beats(c)` method?

Answer: Include fields for face value

- Each card has an integer `faceValue` field
- Method `beats(c)` uses that value

```
public enum Card{
  two(2), three(3), four(4), five(5), six(6), seven(7), eight(8),
  nine(9), ten(10), jack(11), queen(12), king(13), ace(14);

  public int faceValue;
  private Card(int v){
    this.faceValue = v;
  }
  public boolean beats(Card c){
    return this.faceValue > c.faceValue;
  }
}
```

Enumerations in P4: `Signal`

```
Values: HI, LO, X

public Signal invert()
  HI -> LO
  LO -> HI
  X  -> X

public static Signal fromString(char c)
  '1' -> HI
  '0' -> LO
  'X' -> X
  'x' -> X

public static List<Signal> fromString(String inps)
  List<Signal> sigs = Signal.fromString("1001x1X0");
  sigs -> [HI, LO, LO, HI, X, HI, X, LO]

@Override public String toString()
  HI -> "1"
  LO -> "0"
   X -> "X"
```