Taming XML: Objects First, Then Markup

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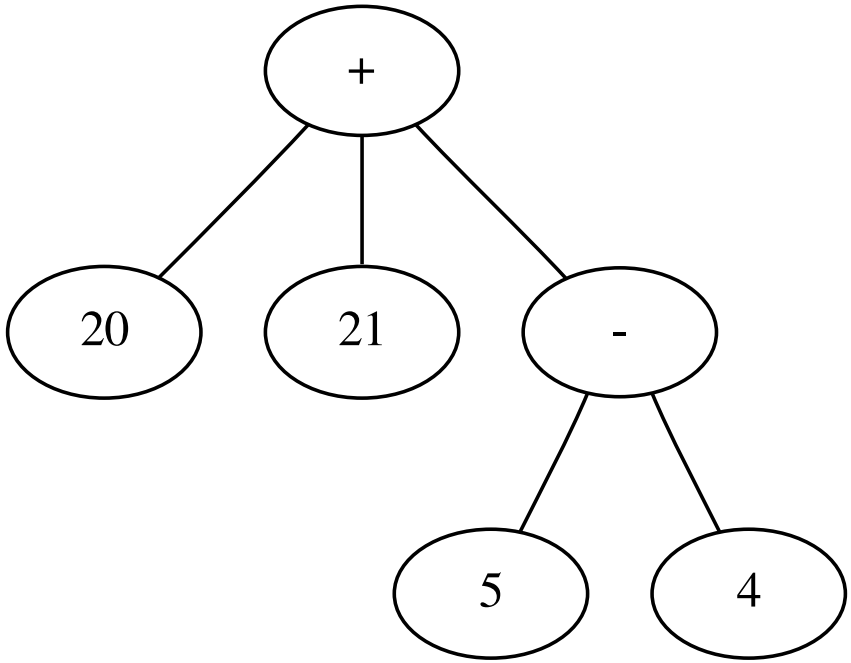
Motivation

The BetterXML framework aims to:

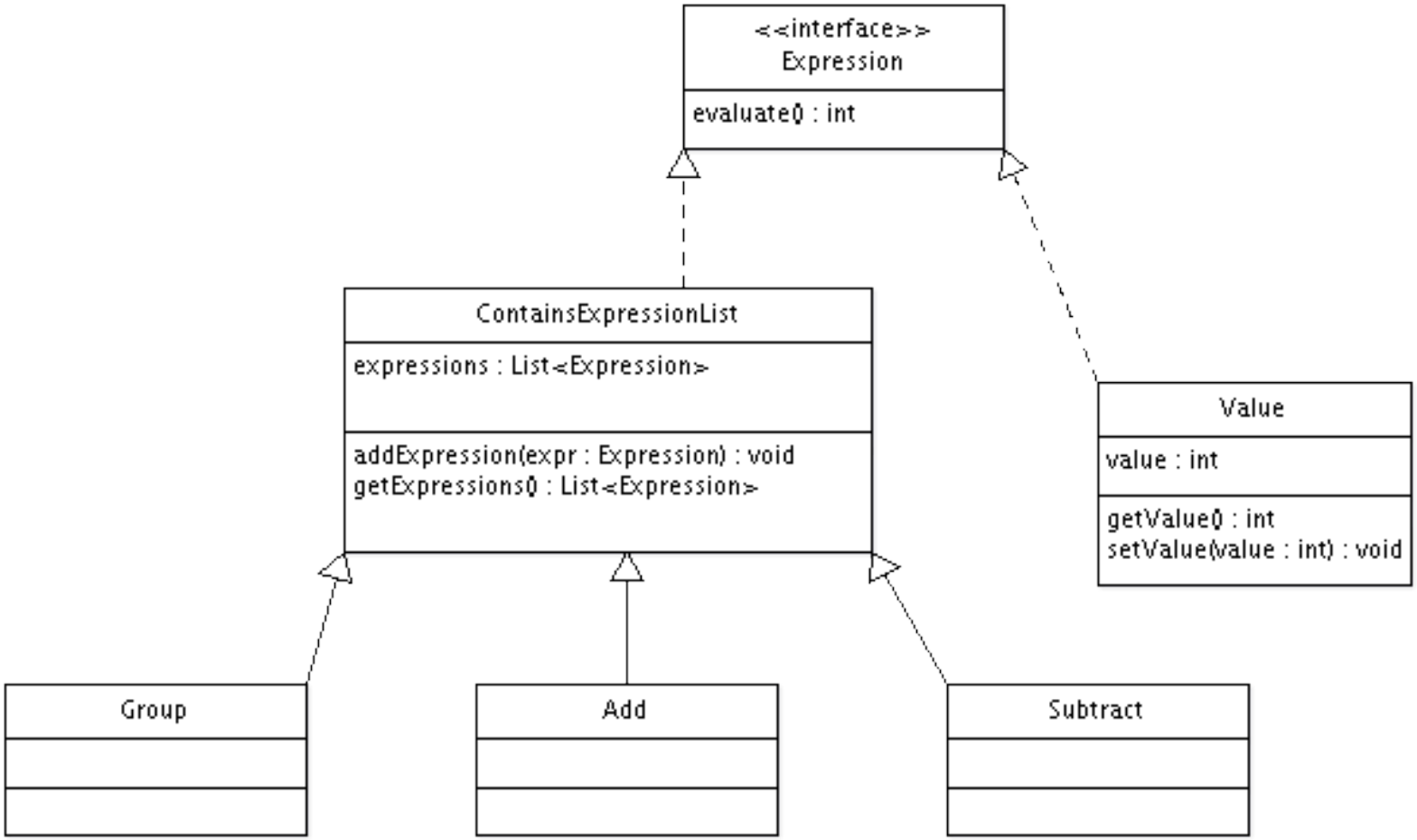
- Minimize the accidental complexity of handling XML
- Focus on the domain objects and bind to XML later

A Guiding Example

Thinking of a simple calculator, we can represent a calculation like $21 + 20 + (5 - 4)$ as an expression tree:



Expression Tree In an Object Oriented Language



Expression Tree as Markup

```
<group>
  <add>
    <value value="21"/>
    <value value="20"/>
    <subtract>
      <value value="5"/>
      <value value="4"/>
    </subtract>
  </add>
</group>
```

Mapping the Expression Tree to Markup with XElement

```
public class Add extends XElement implements Expression{

  public int evaluate() {
    int result=0;

    for (XElement element: this.getChildrenElements()) {
      if (element instanceof Expression)
      result += ((Expression) element).evaluate();
    }

    return result;
  }
}
```

Mapping the Expression Tree to Markup with XElement

Using XElement is quite similar except that individual classes may be bound to individual elements:

```
ToXElementContentHandler handler =
    new ToXElementContentHandler();
handler.registerElementClass(Add.class, "add");
handler.registerElementClass(Subtract.class, "subtract");
handler.registerElementClass(Group.class, "group");
handler.registerElementClass(Value.class, "value");
```

Mapping the Expression Tree to Markup with NaturalXML

```
@Element("add")
public class Add extends ContainsExpressionList {

  public int evaluate() {
    int sum = 0;

    for(Expression expression: expressions) {
      sum += expression.evaluate();
    }

    return sum;
  }
}
```

Mapping the Expression Tree to Markup with NaturalXML

```
public abstract class ContainsExpressionList
    implements Expression {

  @Children({Group.class, Add.class,
    Subtract.class, Value.class})
  protected List<Expression> expressions =
    new ArrayList<Expression>();

  public List<Expression> getExpressions() {
    return expressions;
  }

  public void addExpression(Expression expression) {
    this.expressions.add(expression);
  }
}
```

Mapping the Expression Tree to Markup with NaturalXML

```
@Element("value")
public class Value implements Expression {

  @Attribute("value")
  private String value;

  public String getValue() { return value; }
  public void setValue(String value) { this.value = value; }

  public int evaluate() {
    return Integer.valueOf(value);
  }
}
```

NaturalXML Annotations

NaturalXML allows the binding of elements to classes with class metadata:

- @Element
- @Attribute
- @Children
- @CData
- @Singleton
- @Namespace

XML Intermediate Representation (XIR)

- A record oriented, lossless representation of XML
- Character data encoded as Base64
- Easy to parse

Some Simple XML...

```
<value value="5">some cdata</value>
```

...translated to XIR

```
xir.type:verbatim=element
ns:verbatim=
xir.subtype:verbatim=begin
qname:verbatim=value
name:verbatim=value
attributes:verbatim=1

xir.type:verbatim=attribute
ns:verbatim=
xir.subtype:verbatim=none
qname:verbatim=value
name:verbatim=value
value:verbatim=5

xir.type:verbatim=characters
cdata:base64=c29tZSBjZGF0YQ==
xir.subtype:verbatim=none
length:verbatim=10
```

Future Directions

- XElement expressed as a subset of NaturalXML
- Various Input/Output formats: YAML, s-expressions
- RelaxNG Schema to BetterXML transformer
- Interesting applications: BetterPipes

Any questions?

Availability

The BetterXML framework can be downloaded at:
`http://betterxml.googlecode.com`