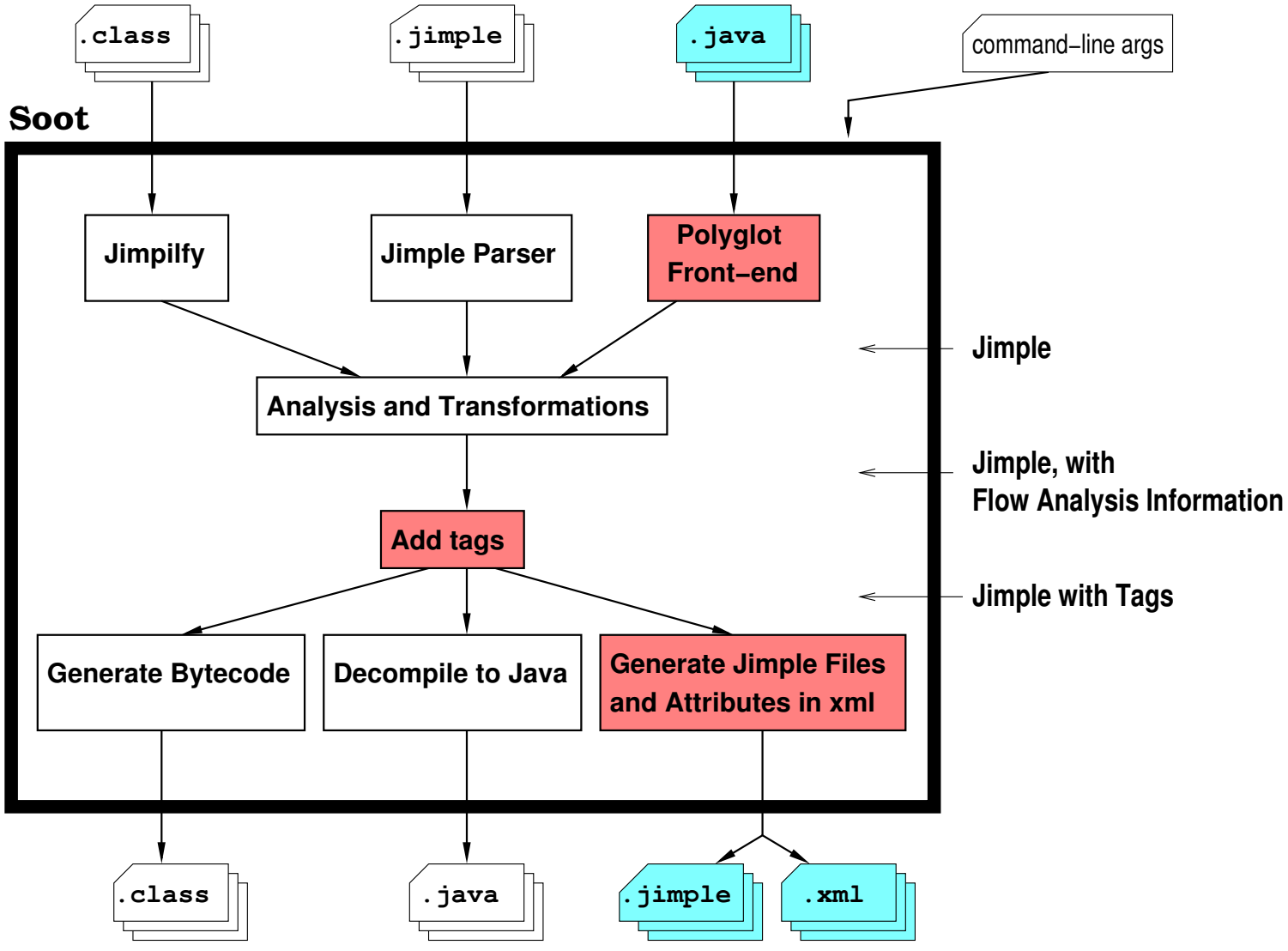
Soot



Soot can now also take Android bytecode as input and generate Android bytecode as output

Soot Resources

- Soot main page:
  `http://sable.github.io/soot/`
- Soot download page:
  `http://www.sable.mcgill.ca/soot/soot_download.html`
- Soot tutorials:
  `https://github.com/Sable/soot/wiki/Tutorials`

(Temporarily: soot-2.5.0.jar is available through the course website)

Installing Soot

Command-line Soot

Download `soot-2.5.0.jar` and add to CLASSPATH environment variable:

```
export CLASSPATH=soot-2.5.0.jar:$CLASSPATH
```

Soot-Eclipse plugin

Follow installation instructions at: `https://github.com/Sable/soot/wiki/Running-Soot-as-Eclipse-Plugin`

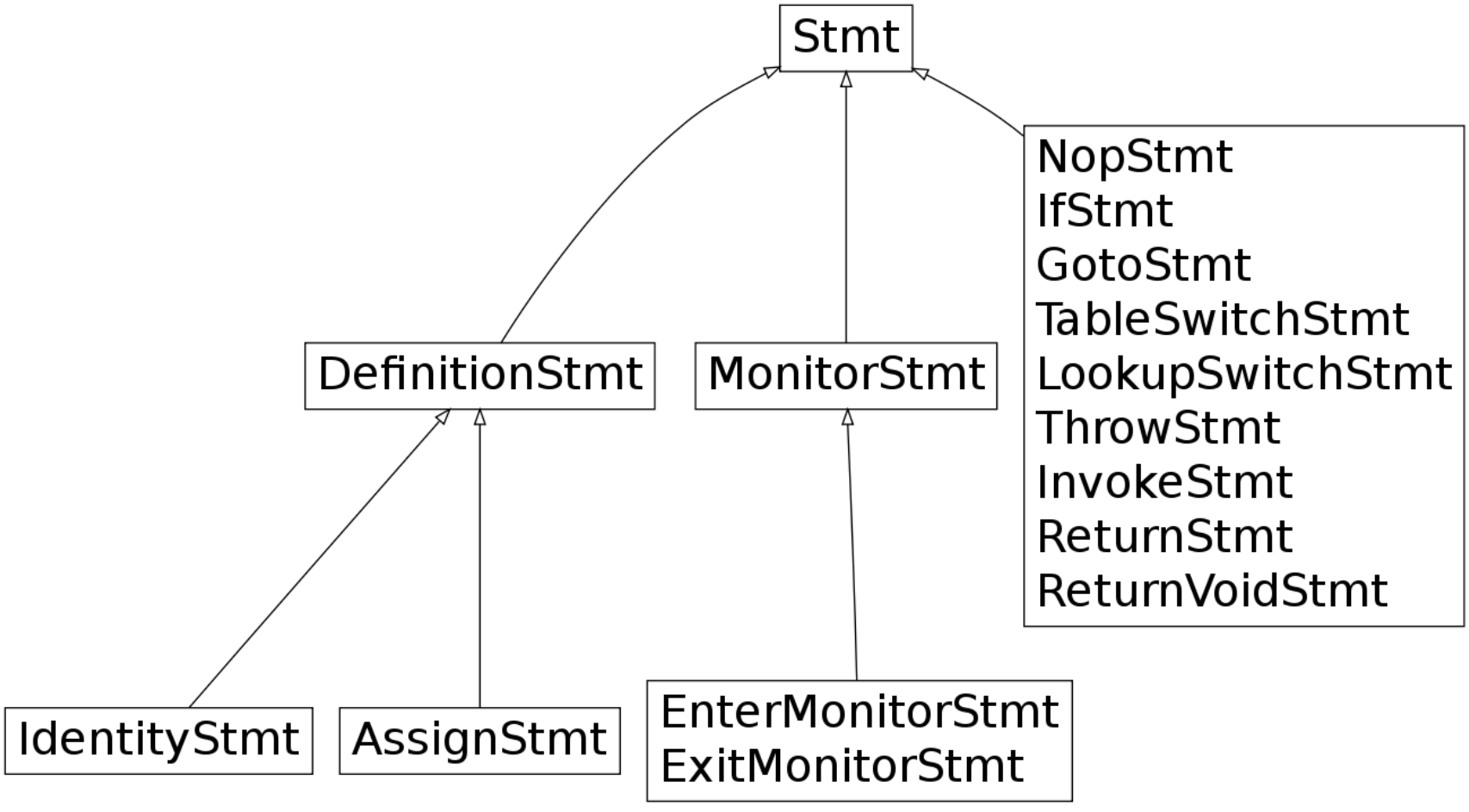
Command-line Examples

- List command line options
  `java soot.Main --help`
- Process MyClass.class, output .class file
  `java soot.Main MyClass`
- Process MyClass.class, output .jimple file
  `java soot.Main -f jimple MyClass`
- Process MyClass.java, output .class file
  `java soot.Main -src-prec java MyClass`
- Process MyClass.class, output .jimple file with tags
  `java soot.Main -f jimple -print-tags MyClass`

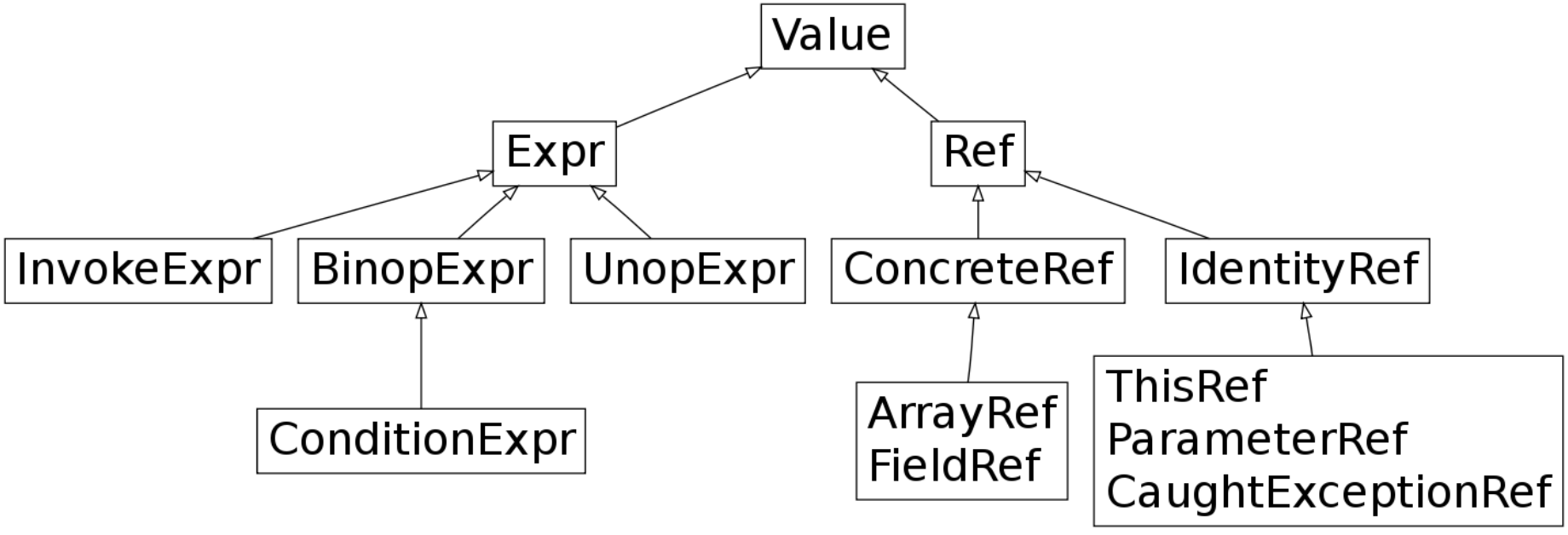
Command-line Examples Warning

- Soot has its own class path and loads only classes from that path.
- `java soot.Main MyClass` will not run.
- Use the -cp option to Soot to specify a path:
  `java soot.Main -cp .  MyClass` will still not run
- Need to provide Java library classes:
  `java soot.Main -cp .:<path-to-rt.jar> MyClass`
  will run

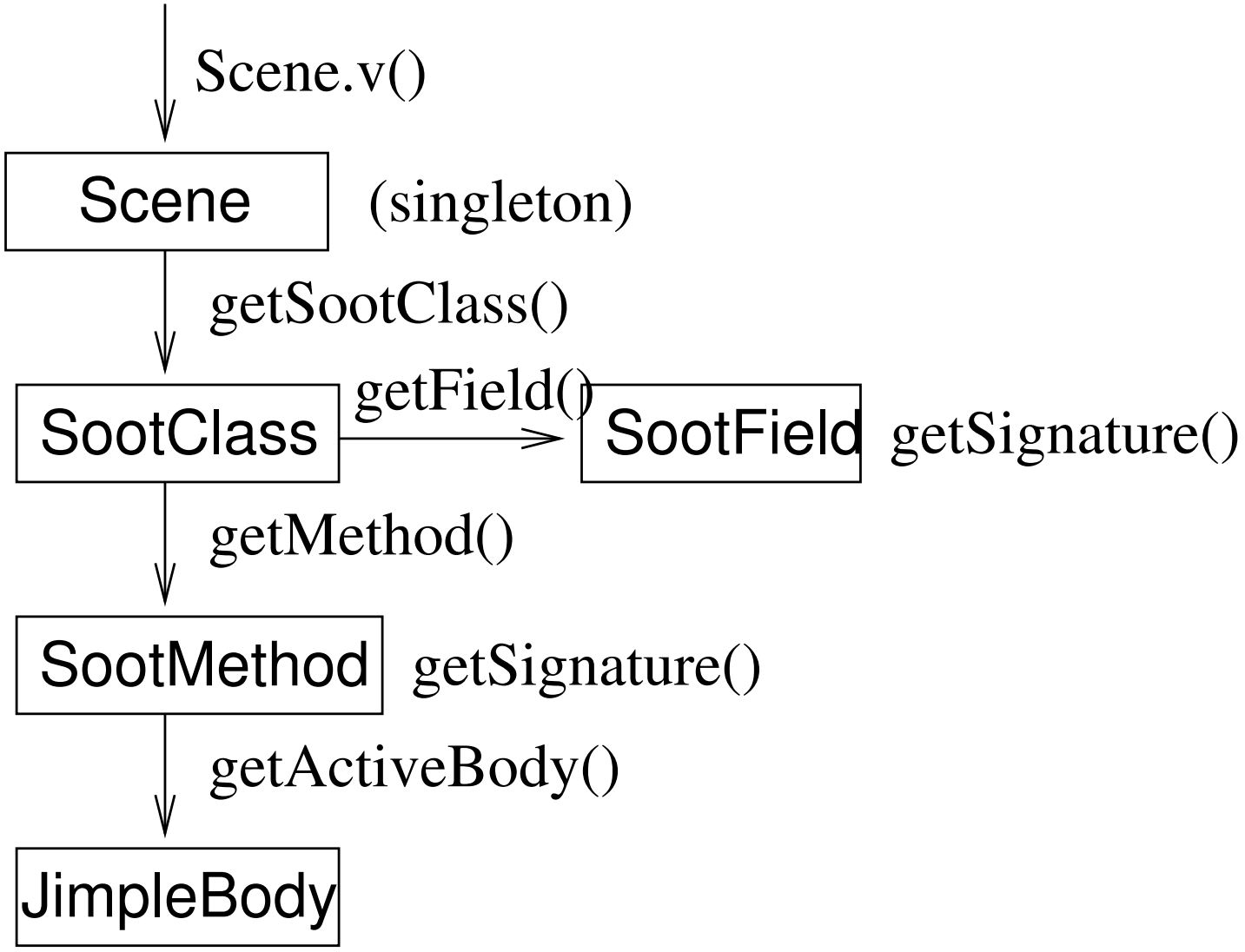
Jimple Statements



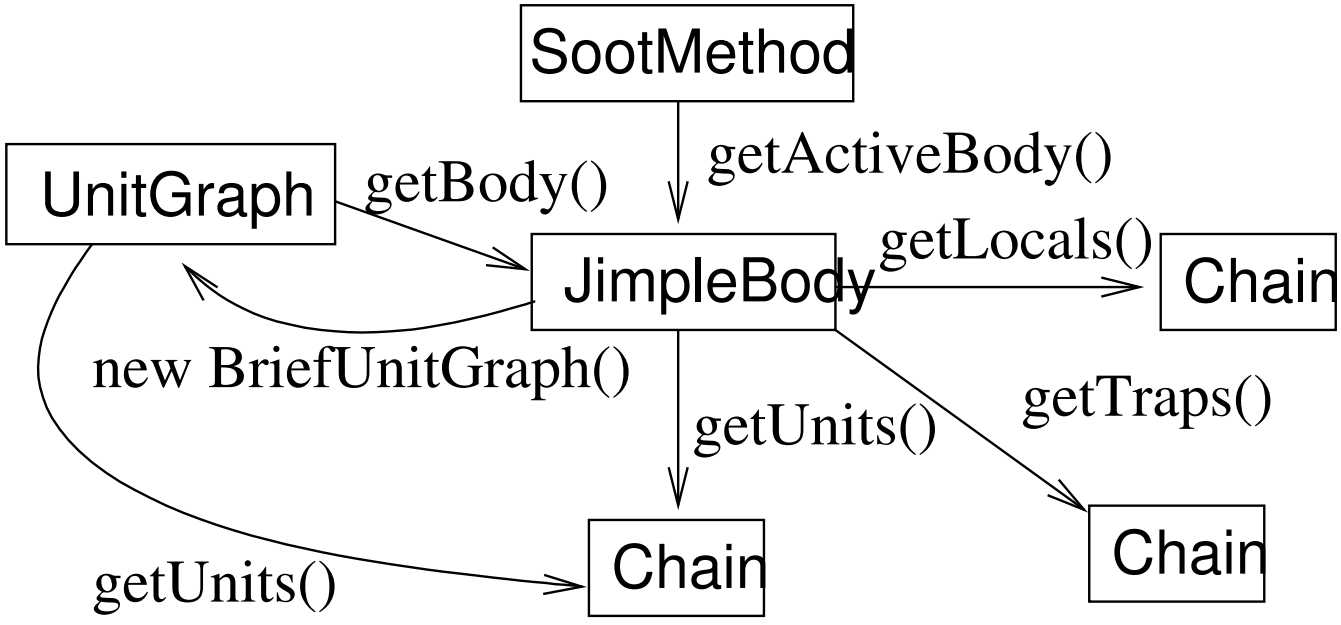
Jimple Expressions



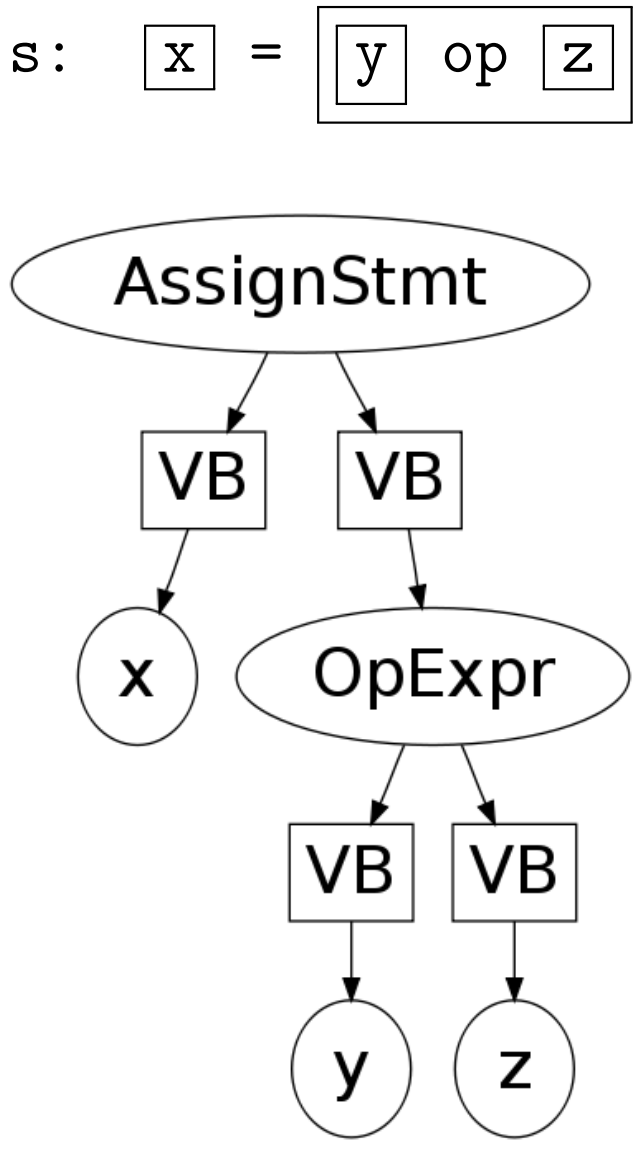
Soot Classes



Soot Classes



“Boxes” (References)



Soot Attributes

- We often want to attach annotations to code
  - to convey low-level analysis results, such as register allocation or array bounds check elimination to a VM
  - to convey analysis results to humans
  - to record profiling information

Tags

Tags are objects that can be attached to Hosts:

```
package soot.tagkit;
public interface Tag {
  public String getName ();
  public String toString();
}
```

Hosts

Hosts are objects that can hold Tags:

```
package soot.tagkit;
public interface Host {
  public void addTag (Tag t);
  public Tag getTag (String aName);
  public List getTags ();
  public void removeTag (String name);
  public boolean hasTag (String aName);
}
```

Implementations:

SootClass, SootField, SootMethod, Body, Unit, ValueBox

Visual Representations

- Three visual representations of attribute information:
  - Text displayed in tooltips
  - Color highlighting of chunks of code
  - Pop-up links

String Tags

- StringTags attach a string of information to a Host.

```
s.addTag(new StringTag(val+": NonNull"));
```

Color Tags

- ColorTags attach a color to a Host.

```
v.addTag(new ColorTag(ColorTag.GREEN));
v.addTag(new ColorTag(255, 0, 0));
```

Link Tags

- LinkTags attach a string of information, and a link to another part of code to a Host.

```
SootMethod m;
String text = "Target:"+m.toString();
Host h = m;
String cName = m.getDeclaringClass().getName();
s.addTag(new LinkTag(text, h, cName));
```