

# JSE Reference Manual

for release 0.9

Jonathan Bachrach  
MIT AI Lab

January 6, 2002

## 1 Introduction

In this manual we describe a macro facility, called the Java Syntactic Extender (JSE) [1], with the superior power and ease of use of Lisp macro systems, but for Java, a language with a more conventional algebraic syntax. We have written a Java implementation which is a preprocessor taking as input files with Java macro definitions and uses and producing pure Java. It uses a parser generator called ANTLR [2] and an associated extended ANTLR Java grammar to produce a Java text to code quote translator. JSE is made available under the GNU Public License (GPL).

## 2 Notation

Throughout this document JSE objects are described with definitions of the following form:

|      |           |               |
|------|-----------|---------------|
| Name | Signature | $\mathcal{N}$ |
|------|-----------|---------------|

*Documentation*

where the rightmost kind field has a one letter code as follows:

|   |               |               |
|---|---------------|---------------|
| N | Notation      | $\mathcal{N}$ |
| F | Flag          | $\mathcal{N}$ |
| S | Static Method | $\mathcal{N}$ |
| C | Constant      | $\mathcal{N}$ |
| M | Method        | $\mathcal{N}$ |
| W | Work Around   | $\mathcal{N}$ |

## 3 Installation

JSE is currently distributed as a gzipped tar file. Unpack the file as follows:

```
zcat jse-0-9.tar.gz | tar xpf -
```

This will create the following directory hierarchy:

```
jse
  antlr-2.6.0
```

```
antlr -> antlr-2.6.0
DOC
SRC
  EXAMPLES
  TESTS
```

In order to successfully install JSE, you need to make sure your `CLASSPATH` includes directories with ANTLR, JSE, and any macros you might be needing. For `tcsh` for example, I put the following:

```
setenv JSE_ROOT ${HOME}/jse
setenv ANTLR_ROOT ${JSE_ROOT}/antlr
setenv JSE_SRC ${JSE_ROOT}/SRC
setenv CLASSPATH bs
  ${ANTLR_ROOT}: bs
  ${JSE_SRC}/EXAMPLES: bs
  ${JSE_SRC}/TESTS: bs
  /usr/local/java: bs
.
```

in my `.tcshrc` file, where *bs* stands for a backslash. The `JSE_ROOT` and the Java system directory included in the above `CLASSPATH` will depend on your actual Java installation.

A 2.6.0 version of ANTLR is provided in `ANTLR_ROOT`. JSE will be upgraded to work with the latest version of ANTLR in the near future.

There is a `Makefile` in the `JSE_SRC` directory for rebuilding the system. Type `make` in that directory to build JSE.

## 4 Usage

From the command line you can preprocess a JSE file with the following command:

```
java JSE file.jse ...
```

which will translate *file.jse* to *file.java*. Then you just run your Java compiler on the output as follows:

```
javac file.java ...
```

which will produce *file.class*. Remember that macros must be compiled before you use them. JSE takes a few flags:

|   |                  |               |
|---|------------------|---------------|
| <code>-pretty</code>                              | <code>off</code> | $\mathcal{F}$ |
| <i>pretty print output</i>                        |                  |               |
| <code>-lineup</code>                              | <code>on</code>  | $\mathcal{F}$ |
| <i>maintain source line positions</i>             |                  |               |
| <code>-compile</code>                             | <code>off</code> | $\mathcal{F}$ |
| <i>runs javac on resulting java files</i>         |                  |               |
| <code>-stdio</code>                               | <code>off</code> | $\mathcal{F}$ |
| <i>take input from stdin and output to stdout</i> |                  |               |
| <code>-deep</code>                                | <code>on</code>  | $\mathcal{F}$ |
| <i>macro expands recursively</i>                  |                  |               |
| <code>-one</code>                                 | <code>off</code> | $\mathcal{F}$ |
| <i>macro expands only one level</i>               |                  |               |
| <code>-trace</code>                               | <code>off</code> | $\mathcal{F}$ |
| <i>turn on very verbose tracing</i>               |                  |               |

One simple example is to compile and test the `when` macro:

```
> java JSE EXAMPLES/whenSExpander.jse
> java JSE -stdio
when (true) doit();
eof
if (true) doit() ;
>
```

## 4.1 Makefiles

You can write Makefiles to do the JSE preprocessing and Java compilation automatically by including implicit rules for JSE and java suffixed files. For example, in GNU's `Make` you include the following at the top of a Makefile:

```
.SUFFIXES: .java .class .jse
```

to teach it about your new implicit rules and your actual implicit rules at the bottom of your Makefile:

```
.java.class:
$(COMPILER) $(COPTIONS) $?
.jse.java:
java JSE $?
```

## 5 Status

Information and updates will be made available on <http://www.jbot.org/jse>. A paper on JSE can be found in <http://www.jbot.org/jse/jse.pdf>.

JSE is much slower than it can be made to be. Future releases will include efficiency enhancements.

Currently the following are not implemented:

|                                      |                     |               |
|--------------------------------------|---------------------|---------------|
| <code>tracing</code>                 | <code>-trace</code> | $\mathcal{W}$ |
| <code>error trailing</code>          | <code>none</code>   | $\mathcal{W}$ |
| <code>hygiene</code>                 | <code>genSym</code> | $\mathcal{W}$ |
| <code>default in syntaxSwitch</code> | <code># ...</code>  | $\mathcal{W}$ |

|                                  |                    |               |
|----------------------------------|--------------------|---------------|
| use of ... outside of codeQuotes | * pattern variable | $\mathcal{W}$ |
|----------------------------------|--------------------|---------------|

Please send bug reports or suggestions to [jb@jbot.org](mailto:jb@jbot.org).

## 6 API

The following is a beginning of an API to JSE.

### 6.1 Hierarchy

```
Fragment
  CompoundFragment
    NestedFragment
      BracesFragment
      BracketsFragment
      ParensFragment
      PatternVariableFragment
      DotDotDotFragment
      SequenceFragment
      Expansion
      Template
  LeafFragment
    IdentifierFragment
    LiteralFragment
      CharacterFragment
      StringFragment
      IntegerFragment
      FloatFragment
      PunctuationFragment
      QuestionFragment
      DotFragment
      SeparatorFragment
      CommaFragment
      SemicolonFragment
  SyntaxException
  SyntaxMatchFailure
  SyntaxConstraint
  GrammarSyntaxConstraint
  List
    FragmentList
  LooseFragmentParser
  MacroExpander
  PrettyStream
```

### 6.2 Methods

Here is a partial list of methods. Consult the source code for the rest.

#### 6.2.1 Fragment Methods

|                       |                              |               |
|-----------------------|------------------------------|---------------|
| <code>out</code>      | <code>PrettyStream ()</code> | $\mathcal{S}$ |
| <i>pretty printer</i> |                              |               |
| <code>getInt</code>   | <code>int ()</code>          | $\mathcal{M}$ |

|   |                 |               |
|---|-----------------|---------------|
| <i>converts to an integer if possible</i> |                 |               |
| getString                                 | String ()       | $\mathcal{M}$ |
| <i>converts to a string if possible</i>   |                 |               |
| getFloat                                  | float ()        | $\mathcal{M}$ |
| <i>converts to a float if possible</i>    |                 |               |
| getValue                                  | Object ()       | $\mathcal{M}$ |
| <i>converts to a value if possible</i>    |                 |               |
| tokens                                    | List ()         | $\mathcal{M}$ |
| <i>returns token representation</i>       |                 |               |
| collectBoundVariables                     | FragmentList () | $\mathcal{M}$ |
| <i>finds all pattern variables</i>        |                 |               |

## 6.2.2 CompoundFragment Methods

|                    |                 |               |
|--------------------|-----------------|---------------|
| getInsideFragments | FragmentList () | $\mathcal{M}$ |
|--------------------|-----------------|---------------|

## 6.2.3 SequenceFragment Methods

|              |                     |               |
|--------------|---------------------|---------------|
| FragmentList | SequenceFragment () | $\mathcal{S}$ |
|--------------|---------------------|---------------|

## 6.2.4 IdentifierFragment Methods

|                    |                                  |               |
|--------------------|----------------------------------|---------------|
| IdentifierFragment | IdentifierFragment(String)       | $\mathcal{S}$ |
| genSym             | IdentifierFragment (String name) | $\mathcal{S}$ |
| capitalize         | String ()                        | $\mathcal{M}$ |
| equals             | boolean (IdentifierFragment)     | $\mathcal{M}$ |
| equals             | boolean (String)                 | $\mathcal{M}$ |

## 6.2.5 FragmentList Methods

|                                      |                         |               |
|--------------------------------------|-------------------------|---------------|
| fnil                                 | FragmentList            | $\mathcal{C}$ |
| <i>empty list</i>                    |                         |               |
| flist                                | FragmentList (Fragment) | $\mathcal{S}$ |
| <i>creates a one fragment list</i>   |                         |               |
| felt                                 | Fragment (int)          | $\mathcal{M}$ |
| <i>gets nth element</i>              |                         |               |
| fpush                                | FragmentList (Fragment) | $\mathcal{M}$ |
| <i>pushes arg onto front of list</i> |                         |               |
| fpush                                | FragmentList (int)      | $\mathcal{M}$ |
| <i>fpush(new IntegerFragment(x))</i> |                         |               |
| fpush                                | FragmentList (float)    | $\mathcal{M}$ |
| <i>fpush(new FloatFragment(x))</i>   |                         |               |
| fpush                                | FragmentList (String)   | $\mathcal{M}$ |
| <i>fpush(new StringFragment(x))</i>  |                         |               |

|  |   |               |
|--|---|---------------|
| fpush                                  | FragmentList (char)                       | $\mathcal{M}$ |
| <i>fpush(new CharacterFragment(x))</i> |   |               |
| fhead                                  | Fragment ()                               | $\mathcal{M}$ |
| <i>gets head of list</i>               |   |               |
| ftail                                  | FragmentList ()                           | $\mathcal{M}$ |
| <i>gets tail of list</i>               |   |               |
| fappend                                | FragmentList (FragmentList)               | $\mathcal{M}$ |
| <i>concatenation of two lists</i>      |   |               |
| freverse                               | FragmentList ()                           | $\mathcal{M}$ |
| <i>reverses list</i>                   |   |               |
| tokens                                 | List ()                                   | $\mathcal{M}$ |
| <i>returns token representation</i>    |   |               |
| expandMacros                           | void (MacroExpander, boolean isRecursive) | $\mathcal{M}$ |
| expandTemplates                        | void ()                                   | $\mathcal{M}$ |
| pprint                                 | void (PrettyStream)                       | $\mathcal{M}$ |
| lprint                                 | void (PrettyStream)                       | $\mathcal{M}$ |

## 6.2.6 LooseFragmentParser Methods

|                     |                                     |               |
|---------------------|-------------------------------------|---------------|
| LooseFragmentParser |                                     |               |
| LooseFragmentParser | (String filename, boolean isTraced) | $\mathcal{S}$ |
| parse               | FragmentList ()                     | $\mathcal{M}$ |

## 6.2.7 PrettyStream Methods

|              |                            |               |
|--------------|----------------------------|---------------|
| PrettyStream | PrettyStream (PrintStream) | $\mathcal{S}$ |
| getLine      | int ()                     | $\mathcal{M}$ |
| println      | void ()                    | $\mathcal{M}$ |
| println      | void (String)              | $\mathcal{M}$ |
| print        | void (Object)              | $\mathcal{M}$ |
| close        | void ()                    | $\mathcal{M}$ |
| println      | void (Object)              | $\mathcal{M}$ |

## References

- [1] Jonathan Bachrach and Keith Playford. The java syntactic extender. In *Proceedings of OOPSLA '01*, October 2001.
- [2] Terence Parr. Antlr. <http://wwwantlr.org/>, 1999.