Expression Language Specification
Version 2.2 Maintenance Release

A component of the JavaServer™ Pages Specification
Version 2.2

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Contents

Preface

This is the Expression Language specification version 2.1, developed jointly by the JSR-245 (JSP 2.1) and JSR-252 (Faces 1.2) expert groups under the Java Community Process. See http://www.jcp.org.

Historical Note

The EL was orginally inspired by both ECMAScript and the XPath expression languages. During its inception, the experts involved were very reluctant to design yet another expression language and tried to use each of these languages, but they fell short in different areas.

The JSP Standard Tag Library (JSTL) version 1.0 (based on JSP 1.2) was therefore first to introduce an Expression Language (EL) to make it easy for page authors to access and manipulate application data without having to master the complexity associated with programming languages such as Java and JavaScript.

Given its success, the EL was subsequently moved into the JSP specification (JSP 2.0/JSTL 1.1), making it generally available within JSP pages (not just for attributes of JSTL tag libraries).

JavaServer Faces 1.0 defined a standard framework for building User Interface components, and was built on top of JSP 1.2 technology. Because JSP 1.2 technology did not have an integrated expression language and because the JSP 2.0 EL did not meet all of the needs of Faces, an EL variant was developed for Faces 1.0. The Faces expert group (EG) attempted to make the language as compatible with JSP 2.0 as possible but some differences were necessary.

It is obviously desirable to have a single, unified expression language that meets the needs of the various web-tier technologies. The Faces and JSP EGs therefore worked together on the specification of a unified expression language, defined in this document, and which takes effect for the JSP 2.1 and Faces 1.2 releases.

The JSP/JSTL/Faces expert groups also acknowledge that the Expression Language(EL) is useful beyond their own specifications. It is therefore desirable to eventually move the Expression Language into its own JSR to give it more visibility and guarantee its general applicability outside of the JSP specification.

It has not been possible to give the EL its own JSR at this time. However, as a first step, JSP 2.1 delivers 2 specification documents, one specific to the JSP technology, and one specific to the Expression Language (this document). This makes the intent clear that the Expression Language does not carry a dependency on the JSP specification and will make it easier in the future should the decision be made to move it into its own JSR.

Related Documentation

Implementors of the Expression Language and web developers may find the following documents worth consulting for additional information:.

JavaServer Pages (JSP)	http://java.sun.com/products/jsp
JSP Standard Tag Library (JSTL)	http://java.sun.com/products/jsp/jstl
JavaServer Faces (JSF)	http://java.sun.com/j2ee/javaserverfaces
Java Servlet Technology	http://java.sun.com/servlet
Java 2 Platform, Standard Edition	http://java.sun.com/j2se
Java 2 Platform, Enterprise Edition	http://java.sun.com/j2ee
JavaBeans	http://java.sun.com/beans

Typographical Conventions

Font Style	Uses
Italic	Emphasis, definition of term.
`Monospace`	Syntax, code examples, attribute names, Java language types, API, enumerated attribute values.

Acknowledgments

This specification on the unified Expression Language is the joint work of the JSR-245 (JavaServer Pages) and JSR-252 (JavaServer Faces) expert groups. We want to thank members of these two expert groups for their spirit of collaboration and excellent work on the unification of the Expression Language.

Special mention is due to Jacob Hookom and Adam Winer for their leadership role in helping solve the complex technical issues we were faced with in this unification work.

The editors also want to give special thanks to the individuals within the Java Enterprise Edition platform team at Sun Microsystems, and especially to Bill Shannon, Eduardo Pellegri-Llopart, Jim Driscoll, Karen Schaffer, Jan Luehe, Nick Rodin, Sheri Shen, Jean-Francois Arcand, Jennifer Ball, Tony Ng, Ed Burns, Jayashri Visvanathan, Roger Kitain, Ryan Lubke, Dhiru Pandey, Greg Murray, and Norbert Lindenberg.

Comments

We are interested in improving this specification and welcome your comments and suggestions. We have a java.net project with an issue tracker and a mailing list for comments and discussions about this specification:

```
https://jsp-spec-public.dev.java.net/
```

CHAPTER 1

Language Syntax and Semantics

The syntax and semantics of the Expression Language (EL) are described in this chapter.

1.1 Overview

The EL is a simple language designed to meet the needs of the presentation layer in web applications. It features:

- A simple syntax restricted to the evaluation of expressions
- Variables and nested properties
- Relational, logical, arithmetic, conditional, and empty operators
- Functions implemented as static methods on Java classes
- Lenient semantics where appropriate default values and type conversions are provided to minimize exposing errors to end users

as well as

- A pluggable API for resolving variable references into Java objects and for resolving the properties applied to these Java objects
- An API for deferred evaluation of expressions that refer to either values or methods on an object
- Support for lvalue expressions (expressions a value can be assigned to)

These last three features are key additions to the JSP 2.0 EL resulting from the EL alignment work done in the JSP 2.1 and Faces 1.2 specifications.

1.1.1 EL in a nutshell

The syntax is quite simple. Model objects are accessed by name. A generalized `[]` operator can be used to access maps, lists, arrays of objects and properties of a JavaBeans object, and to invoke methods in a JavaBeans object; the operator can be nested arbitrarily. The `.` operator can be used as a convenient shorthand for property access when the property name follows the conventions of Java identifiers, but the `[]` operator allows for more generalized access. Simlarly, . operator can also be used to invoke methods, when the method name is known, but the [] operator can be used to invoke methods dynamically.

Relational comparisons are allowed using the standard Java relational operators. Comparisons may be made against other values, or against boolean (for equality comparisons only), string, integer, or floating point literals. Arithmetic operators can be used to compute integer and floating point values. Logical operators are available.

The EL features a flexible architecture where the resolution of model objects (and their associated properties), functions, and variables are all performed through a pluggable API, making the EL easily adaptable to various environments.

1.2 EL Expressions

An EL expression is specified either as an *eval-expression*, or as a *literal-expression*. The EL also supports *composite expressions*, where multiple EL expressions (eval-expressions and literal-expressions) are grouped together.

An EL expression is parsed as either a *value expression* or a *method expression*. A value expression refers to a value, whereas a method expression refers to a method on an object. Once parsed, the expression can optionally be evaluated one or more times.

Each type of expression (eval-expression, literal-expression, and composite expression) is described in its own section below.

1.2.1 Eval-expression

An eval-expression is formed by using the constructs `${expr}` or `#{expr}`. Both constructs are parsed and evaluated in exactly the same way by the EL, even though they might carry different meanings in the technology that is using the EL.

For instance, by convention the J2EE web tier specifications use the `${expr}` construct for immediate evaluation and the `#{expr}` construct for deferred evaluation. This difference in delimiters points out the semantic differences between the two expression types in the J2EE web tier. Expressions delimited by "#{}" are said to use "deferred evaluation" because the expression is not evaluated until its value is needed by the system. Expressions delimited by "${}" are said to use "immediate evaluation" because the expression is compiled when the JSP page is compiled and it is executed when the JSP page is executed. More on this in Section 1.2.4, “Syntax restrictions”.

Other technologies may choose to use the same convention. It is up to each technology to enforce its own restrictions on where each construct can be used.

Nested eval-expressions, such as `${item[${i}]}`, are illegal.

1.2.1.1 Eval-expressions as value expressions

When parsed as a value expression, an eval-expression can be evaluated as either an *rvalue* or an *lvalue*. If there were an assignment operator in the EL, an rvalue is an expression that would typically appear on the right side of the assignment operator. An lvalue would typically appear on the left side.

For instance, all EL expressions in JSP 2.0 are evaluated by the JSP engine immediately when the page response is rendered. They all yield rvalues.

In the following JSTL action

```
<c:out value="${customer.name}"/>
```

the expression `${customer.name}` is evaluated by the JSP engine and the returned value is fed to the tag handler and converted to the type associated with the attribute (`String` in this case).

Faces, on the other hand, supports a full UI component model that requires expressions to represent more than just rvalues. It needs expressions to represent references to data structures whose value could be assigned, as well as to represent methods that could be invoked.

For example, in the following Faces code sample:

```
<h:form>
    <h:inputText
      id="email"
      value="#{checkOutFormBean.email}"
      size="25" maxlength="125"
      validator="#{checkOutFormBean.validateEmail}"/>
</h:form>
```

when the form is submitted, the "apply request values" phase of Faces evaluates the EL expression `#{checkOutFormBean.email}` as a reference to a data structure whose value is set with the input parameter it is associated with in the form. The result of the expression therefore represents a reference to a data structure, or an lvalue, the left hand side of an assignment operation.

When that same expression is evaluated during the rendering phase, it yields the specific value associated with the object (rvalue), just as would be the case with JSP.

The valid syntax for an lvalue is a subset of the valid syntax for an rvalue. In particular, an lvalue can only consist of either a single variable (e.g. `${name}`) or a property resolution on some object, via the `.` or `[]` operator (e.g. `${employee.name}`).

When parsing a value expression, an expected type is provided. In the case of an rvalue, the expected type is what the result of the expression evaluation is coerced to. In the case of lvalues, the expected type is ignored and the provided value is coerced to the actual type of the property the expression points to, before that property is set. The EL type conversion rules are defined in Section 1.18, “Type Conversion”. A few sample eval-expressions are shown in FIGURE 1-1.

Expression	Expected Type	Result
`${customer.name}`	`String`	`Guy Lafleur` Expression evaluates to a String. No conversion necessary.
`${book}`	`String`	`Wonders of the World` Expression evaluates to a `Book` object (e.g. `com.example.Book`). Conversion rules result in the evaluation of `book.toString()`, which could for example yield the book title.

FIGURE 1-1 Sample eval-expressions

1.2.1.2 Eval-expressions as method expressions

In some cases, it is desirable for an EL expression to refer to a method instead of a model object.

For instance, in JSF, a component tag also has a set of attributes for referencing methods that can perform certain functions for the component associated with the tag. To support these types of expressions, the EL defines method expressions (EL class `MethodExpression`).

In the above example, the validator attribute uses an expression that is associated with type `MethodExpression`. Just as with `ValueExpressions`, the evaluation of the expression (calling the method) is deferred and can be processed by the underlying technology at the appropriate moment within its life cycle.

A method expression shares the same syntax as an lvalue. That is, it can only consist of either a single variable (e.g. `${name}`) or a property resolution on some object, via the `.` or `[]` operator (e.g. `${employee.name}`). Information about the expected return type and parameter types is provided at the time the method is parsed.

A method expression is evaluated by invoking its referenced method or by retrieving information about the referenced method. Upon evaluation, if the expected signature is provided at parse time, the EL API verifies that the method conforms to the expected signature, and there is therefore no coercion performed. If the expected signature is not provided at parse time, then at evaluation, the method is identified with the information of the parameters in the expression, and the parameters are coerced to the respective formal types.

1.2.2 Literal-expression

A literal-expression does not use the `${expr}` or `#{expr}` constructs, and simply evaluates to the text of the expression, of type `String`. Upon evaluation, an expected type of something other than `String` can be provided. Sample literal-expressions are shown in FIGURE 1-2.

Expression	Expected Type	Result
`Aloha!`	`String`	`Aloha!`
`true`	`Boolean`	`Boolean.TRUE`

FIGURE 1-2 Sample literal-expressions

To generate literal values that include the character sequence "`${`" or "`#{`", the developer can choose to use a composite expression as shown here:

`${``'${'`**`}`**`exprA}`

`#{``'#{'`**`}`**`exprB}`The resulting values would then be the strings `${exprA}` and `#{exprB}`.

Alternatively, the escape characters `\$` and `\#` can be used to escape what would otherwise be treated as an eval-expression. Given the literal-expressions:

```
\${exprA}
\#{exprB}
```

The resulting values would again be the strings `${exprA}` and `#{exprB}`.

A literal-expression can be used anywhere a value expression can be used. A literal-expression can also be used as a method expression that returns a non-void return value. The standard EL coercion rules (see Section 1.18, "Type Conversion") then apply if the return type of the method expression is not java.lang.String.

1.2.3 Composite expressions

The EL also supports *composite expressions*, where multiple EL expressions are grouped together. With composite expressions, eval-expressions are evaluated from left to right, coerced to `String`s (according to the EL type conversion rules), and concatenated with any intervening literal-expressions.

For example, the composite expression "`${firstName} ${lastName}`" is composed of three EL expressions: eval-expression "`${firstName}`", literal-expression " ", and eval-expression "`${lastName}`".

Once evaluated, the resulting `String` is then coerced to the expected type, according to the EL type conversion rules. A sample composite expression is shown in FIGURE 1-3.

Expression	Expected Type	Result
`Welcome ${customer.name} to our site`	`String`	`Welcome Guy Lafleur to our site` `${customer.name}` evaluates to a String which is then concatenated with the literal-expressions. No conversion necessary.

FIGURE 1-3 Sample composite expression

It is illegal to mix `${}` and `#{}` constructs in a composite expression. This restriction is imposed to avoid ambiguities should a user think that using `${expr}` or `#{expr}` dictates how an expression is evaluated. For instance, as was mentioned previously, the convention in the J2EE web tier specifications is for `${}` to mean immediate evaluation and for `#{}` to mean deferred evaluation. This means that in EL expressions in the J2EE web tier, a developer cannot force immediate evaluation of some parts of a composite expression and deferred evaluation of other parts. This restriction may be lifted in future versions to allow for more advanced EL usage patterns.

A composite expression can be used anywhere an EL expression can be used except for when parsing a method expression. Only a single eval-expression can be used to parse a method expression.

1.2.4 Syntax restrictions

While `${}` and `#{}` eval-expressions are parsed and evaluated in exactly the same way by the EL, the underlying technology is free to impose restrictions on which syntax can be used according to where the expression appears.

For instance, in JSP 2.1, `#{}` expressions are only allowed for tag attributes that accept deferred expressions. `#{expr}` will generate an error if used anywhere else.

1.3 Literals

There are literals for boolean, integer, floating point, string, and null in an eval-expression.

- Boolean - `true` and `false`
- Integer - As defined by the `IntegerLiteral` construct in Section 1.19
- Floating point - As defined by the `FloatingPointLiteral` construct in Section 1.19
- String - With single and double quotes - `"` is escaped as `\"`, `'` is escaped as `\'`, and `\` is escaped as `\\`. Quotes only need to be escaped in a string value enclosed in the same type of quote
- Null - `null`

1.4 Errors, Warnings, Default Values

The Expression Language has been designed with the presentation layer of web applications in mind. In that usage, experience suggests that it is most important to be able to provide as good a presentation as possible, even when there are simple errors in the page. To meet this requirement, the EL does not provide warnings, just default values and errors. Default values are type-correct values that are assigned to a subexpression when there is some problem. An error is an exception thrown (to be handled by the environment where the EL is used).

1.5 Resolution of Model Objects and their Properties or Methods

A core concept in the EL is the evaluation of a model object name into an object, and the resolution of properties or methods applied to objects in an expression (operators `.` and `[]`).

The EL API provides a generalized mechanism, an `ELResolver`, implemented by the underlying technology and which defines the rules that govern the resolution of model object names and their associated properties.

1.6 Operators `[]` and `.`

The EL follows ECMAScript in unifying the treatment of the `.` and `[]` operators.

`expr-a.identifier-b` is equivalent to `expr-a["identifier-b"]`; that is, the identifier `identifier-b` is used to construct a literal whose value is the identifier, and then the `[]` operator is used with that value.

Similarly, `expr-a.identifier-b(params)` is equivalent to `expr-a["identifier-b"](params)`.

The expression `expr-a["identifier-b"](params)` denotes a parametered method invocation, where `params` is a comma-separated list of expressions denoting the parameters for the method call.

To evaluate `expr-a[expr-b] or expr-a[expr-b](params)`:

- Evaluate `expr-a` into `value-a`.
- If `value-a` is `null`:
  - If `expr-a[expr-b]` is the last property being resolved:
    - If the expression is a value expression and `ValueExpression.getValue(context)` was called to initiate this expression evaluation, return `null`.
    - Otherwise, throw `PropertyNotFoundException`. *[trying to de-reference null for an lvalue]*
  - Otherwise, return `null`.
- Evaluate `expr-b` into `value-b` .
- If `value-b` is `null`:

- If `expr-a[expr-b]` is the last property being resolved:
  - If the expression is a value expression and `ValueExpression.getValue(context)` was called to initiate this expression evaluation, return `null`.
  - Otherwise, throw `PropertyNotFoundException`. *[trying to de-reference null for an lvalue]*
- Otherwise, return `null`.

- If the expression is a value expression:
  - If `expr-a[expr-b]` is the last property being resolved:
    - If `ValueExpression.getValue(context)` was called to initiate this expression evaluation.
      - If the expression is a parametered method call, evaluate `params` into `param-values`, and invoke `elResolver.invoke(context, value-a, value-b, null, param-values)`.
      - `Otherwise, invoke elResolver.getValue(value-a, value-b).`
    - If `ValueExpression.getType(context)` was called, invoke `elResolver.getType(context, value-a, value-b)`.
    - If `ValueExpression.isReadOnly(context)` was called, invoke `elResolver.isReadOnly(context, value-a, value-b)`.
    - If `ValueExpression.setValue(context, val)` was called, invoke `elResolver.setValue(context, value-a, value-b, val)`.
  - Otherwise:
    - If the expression is a parametered method call, evaluate `params` into `param-values`, and invoke `elResolver.invoke(context, value-a, value-b, null, params)`.
    - `Otherwise, invoke elResolver.getValue(value-a, value-b).`
- Otherwise, the expression is a method expression:
  - If `expr-a[expr-b]` is the last property being resolved:
    - Coerce `value-b` to `String`.
    - If the expression is not a parametered method call, fnd the method on object `value-a` with name `value-b` and with the set of expected parameter types provided at parse time. If the method does not exist, or the return type does not match the expected return type provided at parse time, throw `MethodNotFoundException`.
    - If `MethodExpression.invoke(context, params)` was called:

- If the expression is a parametered method call, evaluate `params` into `param-values`, and invoke `elResolver.invoke(context, value-a, value-b, paramTypes, param-values)`, where `paramTypes is the parameter types, if provided at parse time, and is null otherwise.`
- Otherwise, invoke the found method with the parameters passed to the invoke method.

- If `MethodExpression.getMethodInfo(context)` was called, construct and return a new `MethodInfo` object.

- Otherwise:
  - If the expression is a parametered method call, evaluate `params` into `param-values`, and invoke `elResolver.invoke(context, value-a, value-b, null, params).`
  - `Otherwise,` invoke `elResolver.getValue(value-a, value-b).`

1.7 Arithmetic Operators

Arithmetic is provided to act on integer (`BigInteger` and `Long`) and floating point (`BigDecimal` and `Double`) values. There are 5 operators:

- Addition: `+`
- Substraction: `-`
- Multiplication: `*`
- Division: `/` and `div`
- Remainder (modulo): `%` and `mod`

The last two operators are available in both syntaxes to be consistent with XPath and ECMAScript.

The evaluation of arithmetic operators is described in the following sections. `A` and `B` are the evaluation of subexpressions

1.7.1 Binary operators - `A {+,-,*} B`

- If `A` and `B` are null, return `(Long)0`
- If `A` or `B` is a `BigDecimal`, coerce both to `BigDecimal` and then:
  - If operator is `+`, return `A.add(B)`

- If operator is -, return A.subtract(B)
- If operator is *, return A.multiply(B)

- If A or B is a Float, Double, or String containing ., e, or E:
  - If A or B is BigInteger, coerce both A and B to BigDecimal and apply operator.
  - Otherwise, coerce both A and B to Double and apply operator
- If A or B is BigInteger, coerce both to BigInteger and then:
  - If operator is +, return A.add(B)
  - If operator is -, return A.subtract(B)
  - If operator is *, return A.multiply(B)
- Otherwise coerce both A and B to Long and apply operator
- If operator results in exception, error

1.7.2 Binary operator - A {/,div} B

- If A and B are null, return (Long)0
- If A or B is a BigDecimal or a BigInteger, coerce both to BigDecimal and return A.divide(B, BigDecimal.ROUND_HALF_UP)
- Otherwise, coerce both A and B to Double and apply operator
- If operator results in exception, error

1.7.3 Binary operator - A {%,mod} B

- If A and B are null, return (Long)0
- If A or B is a BigDecimal, Float, Double, or String containing ., e, or E, coerce both A and B to Double and apply operator
- If A or B is a BigInteger, coerce both to BigInteger and return A.remainder(B).
- Otherwise coerce both A and B to Long and apply operator
- If operator results in exception, error

1.7.4 Unary minus operator - -A

- If A is null, return (Long)0
- If A is a BigDecimal or BigInteger, return A.negate().

- If A is a String:
  - If A contains ., e, or E, coerce to a Double and apply operator
  - Otherwise, coerce to a Long and apply operator
  - If operator results in exception, error
- If A is Byte, Short, Integer, Long, Float, Double
  - Retain type, apply operator
  - If operator results in exception, error
- Otherwise, error

1.8 Relational Operators

The relational operators are:

- == and eq
- != and ne
- < and lt
- > and gt
- <= and le
- >= and ge

The second versions of the last 4 operators are made available to avoid having to use entity references in XML syntax and have the exact same behavior, i.e. < behaves the same as lt and so on.

The evaluation of relational operators is described in the following sections.

1.8.1 A {<,>,<=,>=,lt,gt,le,ge} B

- If A==B, if operator is <=, le, >=, or ge return true.
- If A is null or B is null, return false
- If A or B is BigDecimal, coerce both A and B to BigDecimal and use the return value of A.compareTo(B).
- If A or B is Float or Double coerce both A and B to Double apply operator
- If A or B is BigInteger, coerce both A and B to BigInteger and use the return value of A.compareTo(B).

- If A or B is Byte, Short, Character, Integer, or Long coerce both A and B to Long and apply operator
- If A or B is String coerce both A and B to String, compare lexically
- If A is Comparable, then:
  - If A.compareTo(B) throws exception, error.
  - Otherwise use result of A.compareTo(B)
- If B is Comparable, then:
  - If B.compareTo(A) throws exception, error.
  - Otherwise use result of B.compareTo(A)
- Otherwise, error

1.8.2 A {==,!=,eq,ne} B

- If A==B, apply operator
- If A is null or B is null return false for == or eq, true for != or ne.
- If A or B is BigDecimal, coerce both A and B to BigDecimal and then:
  - If operator is == or eq, return A.equals(B)
  - If operator is != or ne, return !A.equals(B)
- If A or B is Float or Double coerce both A and B to Double, apply operator
- If A or B is BigInteger, coerce both A and B to BigInteger and then:
  - If operator is == or eq, return A.equals(B)
  - If operator is != or ne, return !A.equals(B)
- If A or B is Byte, Short, Character, Integer, or Long coerce both A and B to Long, apply operator
- If A or B is Boolean coerce both A and B to Boolean, apply operato
- If A or B is an enum, coerce both A and B to enum, apply operatorr
- If A or B is String coerce both A and B to String, compare lexically
- Otherwise if an error occurs while calling A.equals(B), error
- Otherwise, apply operator to result of A.equals(B)

1.9 Logical Operators

The logical operators are:

- && and and

- `||` and `or`
- `!` and `not`

The evaluation of logical operators is described in the following sections.

1.9.1 Binary operator - `A {&&,||,and,or} B`

- Coerce both `A` and `B` to `Boolean`, apply operator

The operator stops as soon as the expression can be determined, i.e., `A and B and C and D` – if `B` is false, then only `A and B` is evaluated.

1.9.2 Unary not operator - `{!,not} A`

- Coerce `A` to `Boolean`, apply operator

1.10 Empty Operator - `empty A`

The `empty` operator is a prefix operator that can be used to determine if a value is null or empty.

To evaluate `empty A`

- If `A` is null, return `true`
- Otherwise, if `A` is the empty string, then return `true`
- Otherwise, if `A` is an empty array, then return `true`
- Otherwise, if `A` is an empty `Map`, return `true`
- Otherwise, if `A` is an empty `Collection`, return `true`
- Otherwise return `false`

1.11 Conditional Operator - `A ? B : C`

Evaluate `B` or `C`, depending on the result of the evaluation of `A`.

- Coerce `A` to `Boolean`:

- If `A` is `true`, evaluate and return `B`
- If `A` is `false`, evaluate and return `C`

1.12 Parentheses

Parentheses can be used to change precedence, as in: `${(a*(b+c))}`

1.13 Operator Precedence

Highest to lowest, left-to-right.

- `[] .`
- `()`
- `-` (unary) `not ! empty`
- `* / div % mod`
- `+ -` (binary)
- `< > <= >= lt gt le ge`
- `== != eq ne`
- `&& and`
- `|| or`
- `? :`

Qualified functions with a namespace prefix have precedence over the operators. Thus the expression `${c?b:f()}` is illegal because `b:f()` is being parsed as a qualified function instead of part of a conditional expression. As usual, `()` can be used to make the precedence explicit, e.g `${c?b:(f())}`

1.14 Reserved Words

The following words are reserved for the language and must not be used as identifiers.

```
and    eq     gt     true   instanceof
or     ne     le     false  empty
not    lt     ge     null   div        mod
```

Note that many of these words are not in the language now, but they may be in the future, so developers must avoid using these words.

1.15 Functions

The EL has qualified functions, reusing the notion of qualification from XML namespaces (and attributes), XSL functions, and JSP custom actions. Functions are mapped to public static methods in Java classes.

The full syntax is that of qualified n-ary functions:

`[ns:]f([a1[,a2[,...[,an]]]])`

Where `ns` is the namespace prefix, `f` is the name of the function, and `a` is an argument.

EL functions are mapped, resolved and bound at parse time. It is the responsibility of the `FunctionMapper` class to provide the mapping of namespace-qualified functions to static methods of specific classes when expressions are created. If no `FunctionMapper` is provided (by passing in `null`), functions are disabled.

1.16 Variables

Just like `FunctionMapper` provides a flexible mechanism to add functions to the EL, `VariableMapper` provides a flexible mechanism to support the notion of EL variables. An EL variable does not directly refer to a model object that can then be resolved by an `ELResolver`. Instead, an EL variable refers to an EL expression. The evaluation of that EL expression yields the value associated with the EL variable.

EL variables are mapped, resolved and bound at parse time. It is the responsibility of the `VariableMapper` class to provide the mapping of EL variables to `ValueExpressions` when expressions are created. If no `VariableMapper` is provided (by passing in `null`), variable mapping is disabled.

See the `javax.el` package description for more details.

1.17 Enums

The Unified EL supports Java SE 5 enumerated types. Coercion rules for dealing with enumerated types are included in the following section. Also, when referring to values that are instances of an enumerated type from within an EL expression, use the literal string value to cause coercion to happen via the below rules. For example, Let's say we have an enum called Suit that has members Heart, Diamond, Club, and Spade. Furthermore, let's say we have a reference in the EL, mySuit, that is a Spade. If you want to test for equality with the Spade enum, you would say ${mySuit == 'Spade'}. The type of the mySuit will trigger the invocation of Enum.valueOf(Suit.class, 'Spade').

1.18 Type Conversion

Every expression is evaluated in the context of an expected type. The result of the expression evaluation may not match the expected type exactly, so the rules described in the following sections are applied.

1.18.1 To Coerce a Value X to Type Y

- If `X` is of a primitive type, Let `X'` be the equivalent "boxed form" of `X`. Otherwise, Let `X'` be the same as `X`.
- If `Y` is of a primitive type, Let `Y'` be the equivalent "boxed form" of `Y`. Otherwise, Let `Y'` be the same as `Y`.
- Apply the rules in Sections 1.18.2-1.18.7 for coercing `X'` to `Y'`.
- If `Y` is a primitive type, then the result is found by "unboxing" the result of the coercion. If the result of the coercion is null, then error.
- If `Y` is not a primitive type, then the result is the result of the coercion.

For example, if coercing an `int` to a `String`, "box" the `int` into an `Integer` and apply the rule for coercing an `Integer` to a `String`. Or if coercing a `String` to a `double`, apply the rule for coercing a `String` to a `Double`, then "unbox" the resulting `Double`, making sure the resulting `Double` isn't actually `null`.

1.18.2 Coerce A to String

- If `A` is `String`: return `A`
- Otherwise, if `A` is `null`: return `""`
- Otherwise, if A is Enum, return A.name()
- Otherwise, if `A.toString()` throws an exception, error
- Otherwise, return `A.toString()`

1.18.3 Coerce A to Number type N

- If `A` is `null` or `""`, return 0.
- If `A` is `Character`, convert `A` to `new Short((short)a.charValue())`, and apply the following rules.
- If `A` is `Boolean`, then error.
- If `A` is `Number` type `N`, return A
- If `A` is `Number`, coerce quietly to type `N` using the following algorithm:
  - If `N` is `BigInteger`
    - If `A` is a `BigDecimal`, return `A.toBigInteger()`
    - Otherwise, return `BigInteger.valueOf(A.longValue())`
  - If `N` is `BigDecimal`,
    - If `A` is a `BigInteger`, return `new BigDecimal(A)`
    - Otherwise, return `new BigDecimal(A.doubleValue())`
  - If `N` is `Byte`, return `new Byte(A.byteValue())`
  - If `N` is `Short`, return `new Short(A.shortValue())`
  - If `N` is `Integer`, return `new Integer(A.intValue())`
  - If `N` is `Long`, return `new Long(A.longValue())`
  - If `N` is `Float`, return `new Float(A.floatValue())`
  - If `N` is `Double`, return `new Double(A.doubleValue())`
  - Otherwise, error.
- If `A` is `String`, then:
  - If `N` is `BigDecimal` then:
    - If `new BigDecimal(A)` throws an exception then error.
    - Otherwise, return `new BigDecimal(A)`.
- If `N` is `BigInteger` then:
    - If `new BigInteger(A)` throws an exception then error.
    - Otherwise, return `new BigInteger(A)`.
  - If `N.valueOf(A)` throws an exception, then error.
  - Otherwise, return `N.valueOf(A)`.

- Otherwise, error.

1.18.4 Coerce A to Character

- If `A` is `null` or `""`, return `(char)0`
- If `A` is `Character`, return `A`
- If `A` is `Boolean`, error
- If `A` is `Number`, coerce quietly to type `Short`, then return a `Character` whose numeric value is equivalent to that of a `Short`.
- If `A` is `String`, return `A.charAt (0)`
- Otherwise, error

1.18.5 Coerce A to Boolean

- If `A` is `null` or `""`, return `false`
- Otherwise, if `A` is a `Boolean`, return A
- Otherwise, if `A` is a `String`, and `Boolean.valueOf(A)` does not throw an exception, return it
- Otherwise, error

1.18.6 Coerce A to an Enum Type T

- If A is null, return null
- If A is assignable to T, coerce quietly
- If A is "", return null.
- If A is a String call Enum.valueOf(T.getClass(), A) and return the result.

1.18.7 Coerce A to Any Other Type T

- If `A` is `null`, return `null`
- If `A` is assignable to `T`, coerce quietly
- If `A` is a `String`, and `T` has no `PropertyEditor`:
  - If `A` is `""`, return `null`
  - Otherwise error

- If `A` is a `String` and `T`'s `PropertyEditor` throws an exception:
  - If `A` is `""`, return `null`
  - Otherwise, error
- Otherwise, apply `T`'s `PropertyEditor`
- Otherwise, error

1.19 Collected Syntax

The valid syntax for an expression depends on its type.

For value expressions, the parser first attempts to parse the expression using the `LValue` production. If parsing fails, the `ValueExpression` will be read-only and parsing is attempted again using the `RValue` production. For method expressions, the parser must use only the `MethodExpression` production.]

These productions take into consideration literal-expressions and composite expressions wherever they are accepted.

```
LValue            ::=    '${' LValueInner '}'
                      |  '#{' LValueInner '}'
LValueInner       ::=    Identifier
                      |  NonLiteralValuePrefix (ValueSuffix)*
RValue            ::=    (RValueComponent1)+
                      |  (RValueComponent2)+
RValueComponent1  ::=    '${' Expression '}'
                      |  LiteralExpression
RValueComponent2  ::=    '#{' Expression '}'
                      |  LiteralExpression
MethodExpression  ::=    LValue
LiteralExpression::=    (LiteralComponent)* ([$#])?
                     i.e., a string of any characters that
                     doesn't include ${ or #{ unless escaped by
                     \${ or \#{.
LiteralComponent  ::=    ([^$#\])*\([$#])?
                      |  ([^$#])*([$#][^{])
                      |  ([^$#])*
Expression        ::= Expression1 ExpressionRest?
```

```
ExpressionRest   ::= ‘?’ Expression ‘:’ Expression
Expression1      ::=    Expression BinaryOp Expression
                    |   UnaryExpression
BinaryOp         ::=    'and'
                    |   ‘&&’
                    |   ‘or’
                    |   ‘||’
                    |   '+'
                    |   '-'
                    |   '*'
                    |   '/'
                    |   'div'
                    |   '%'
                    |   'mod'
                    |   '>'
                    |   'gt'
                    |   '<'
                    |   'lt'
                    |   '>='
                    |   'ge'
                    |   '<='
                    |   'le'
                    |   '=='
                    |   ‘eq’
                    |   ‘!=’
                    |   ‘ne’
UnaryExpression  ::=    UnaryOp UnaryExpression
                    |    Value
UnaryOp          ::=    '-'
                    |   ‘!’
                    |   ‘not’
                    |   ‘empty’
Value            ::=    ValuePrefix (ValueSuffix)*
ValuePrefix      ::=    Literal
                    |   NonLiteralValuePrefix
NonLiteralValuePrefix ::= '(' Expression ')'
                    |   Identifier
                    |   FunctionInvocation
ValueSuffix      ::=    ‘.’ Identifier MethodParameters?
                    |   ‘[‘ Expression ‘]’ MethodParameters?
MethodParameters ::= '(' (Expression (‘,’ Expression )* )? ')'
Identifier       ::= Java language identifier
FunctionInvocation::=(Identifier ‘:’)? Identifier ‘(‘
                    ( Expression ( ‘,’ Expression )* )? ‘)’
```

```
Literal          ::=    BooleanLiteral
                    |   IntegerLiteral
                    |   FloatingPointLiteral
                    |   StringLiteral
                    |   NullLiteral

BooleanLiteral   ::=    'true'
                    |   'false'

StringLiteral    ::=    '([^'\]|\'|\\)*'
                    |   "([^"\]|\"|\\)*"
                    i.e., a string of any characters enclosed by
                    single or double quotes, where \ is used to
                    escape ', ",and \. It is possible to use single
                    quotes within double quotes, and vice versa,
                    without escaping.

IntegerLiteral   ::= ['0'-'9']+

FloatingPointLiteral::= (['0'-'9'])+ '.' (['0'-'9'])* Exponent?
                    |   '.' (['0'-'9'])+ Exponent?
                    |   (['0'-'9'])+ Exponent?

Exponent         ::= ['e','E'] (['+','-'])? (['0'-'9'])+

NullLiteral      ::= 'null'
```

Notes

- * = 0 or more, + = 1 or more, ? = 0 or 1.
- An identifier is constrained to be a Java identifier - e.g., no `-`, no `/`, etc.
- A `String` only recognizes a limited set of escape sequences, and `\` may not appear unescaped.
- The relational operator for equality is `==` (double equals).
- The value of an `IntegerLiteral` ranges from `Long.MIN_VALUE` to `Long.MAX_VALUE`
- The value of a `FloatingPointLiteral` ranges from `Double.MIN_VALUE` to `Double.MAX_VALUE`
- It is illegal to nest `${` or `#{` inside an outer `${` or `#{`.

CHAPTER 2

Java APIs

This chapter describes the Java APIs exposed by the EL specification. The content of this chapter is generated automatically from Javadoc annotations embedded into the actual Java classes and interfaces of the implementation. This ensures that both the specification and implementation are synchronized.

2.0 Package
javax.el

2.0.1 Description

Provides the API for the **Unified Expression Language 2.2** used by the JSP 2.2 and JSF 2.0 technologies.

The Expression Language (EL) is a simple language designed to satisfy the specific needs of web application developers. It is currently defined in its own specification document within the JavaServer Pages (tm) (JSP) 2.2 specification, but does not have any dependencies on any portion of the JSP 2.2 specification. It is intended for general use outside of the JSP and JSF specifications as well.

This package contains the classes and interfaces that describe and define the programmatic access to the Expression Language engine. The API is logically partitioned as follows:

- EL Context
- Expression Objects
- Creation of Expressions
- Resolution of Model Objects and their Properties
- EL Functions
- EL Variables

2.0.2 EL Context

An important goal of the EL is to ensure it can be used in a variety of environments. It must therefore provide enough flexibility to adapt to the specific requirements of the environment where it is being used.

Class `ELContext`$_{52}$ is what links the EL with the specific environment where it is being used. It provides the mechanism through which all relevant context for creating or evaluating an expression is specified.

Creation of `ELContext` objects is controlled through the underlying technology. For example, in JSP, the `JspContext.getELContext()` factory method is used.

Some technologies provide the ability to add an `ELContextListener`$_{58}$ so that applications and frameworks can ensure their own context objects are attached to any newly created `ELContext`.

2.0.3 Expression Objects

At the core of the Expression Language is the notion of an *expression* that gets parsed according to the grammar defined by the Expression Language.

There are two types of expressions defined by the EL: *value expressions* and *method expressions*. A `ValueExpression`$_{102}$ such as `"${customer.name}"` can be used either as an *rvalue* (return the value associated with property `name` of the model object `customer`) or as an *lvalue* (set the value of the property `name` of the model object `customer`).

A `MethodExpression`$_{87}$ such as `"${handler.process}"` makes it possible to invoke a method (`process`) on a specific model object (`handler`).

In version 2.2, either type of EL expression can represent a method invocation, such as `${trader.buy("JAVA")}`, where the arugments to the mothod invocation are specified in the expression.

All expression classes extend the base class `Expression`$_{68}$, making them serializable and forcing them to implement `equals()` and `hashCode()`. Morevover, each method on these expression classes that actually

evaluates an expression receives a parameter of class ELContext[52], which provides the context required to evaluate the expression.

2.0.4 Creation of Expressions

An expression is created through the ExpressionFactory[71] class. The factory provides two creation methods; one for each type of expression supported by the EL.

To create an expression, one must provide an ELContext[52], a string representing the expression, and the expected type (ValueExpression) or signature (MethodExpression). The ELContext provides the context necessary to parse an expression. Specifically, if the expression uses an EL function (for example ${fn:toUpperCase(customer.name)}) or an EL variable, then FunctionMapper[75] and VariableMapper[108] objects must be available within the ELContext so that EL functions and EL variables are properly mapped.

2.0.5 Resolution of Model Objects and their Properties

Through the ELResolver[61] base class, the EL features a pluggable mechanism to resolve model object references as well as properties of these objects.

The EL API provides implementations of ELResolver supporting property resolution for common data types which include arrays (ArrayELResolver[29]), JavaBeans (BeanELResolver[34]), Lists (ListELResolver[77]), Maps (MapELResolver[82]), and ResourceBundles (ResourceBundleELResolver[98]).

Tools can easily obtain more information about resolvable model objects and their resolvable properties by calling method getFeatureDescriptors on the ELResolver. This method exposes objects of type java.beans.FeatureDescriptor, providing all information of interest on top-level model objects as well as their properties.

2.0.6 EL Functions

If an EL expression uses a function (for example ${fn:toUpperCase(customer.name)}), then a FunctionMapper[75] object must also be specified within the ELContext. The FunctionMapper is responsible to map ${prefix:name()} style functions to static methods that can execute the specified functions.

2.0.7 EL Variables

Just like FunctionMapper[75] provides a flexible mechanism to add functions to the EL, VariableMapper[108] provides a flexible mechanism to support the notion of **EL variables**.

An EL variable does not directly refer to a model object that can then be resolved by an ELResolver. Instead, it refers to an EL expression. The evaluation of that EL expression gives the EL variable its value.

For example, in the following code snippet

```
<h:inputText value="#{handler.customer.name}"/>
```

handler refers to a model object that can be resolved by an EL Resolver.

However, in this other example:

```
<c:forEach var="item" items="#{model.list}">
   <h:inputText value="#{item.name}"/>
</c:forEach>
```

item is an EL variable because it does not refer directly to a model object. Instead, it refers to another EL expression, namely a specific item in the collection referred to by the EL expression #{model.list}.

Assuming that there are three elements in ${model.list}, this means that for each invocation of <h:inputText>, the following information about item must be preserved in the VariableMapper[108]:

first invocation: item maps to first element in ${model.list}
second invocation: item maps to second element in ${model.list}
third invocation: item maps to third element in ${model.list}

VariableMapper provides the mechanisms required to allow the mapping of an EL variable to the EL expression from which it gets its value.

Class Summary

Interfaces

ELContextListener 58	The listener interface for receiving notification when an ELContext 52 is created.

Classes

ArrayELResolver 29	Defines property resolution behavior on arrays.
BeanELResolver 34	Defines property resolution behavior on objects using the JavaBeans component architecture.
BeanELResolver.BeanProperties 41	
BeanELResolver.BeanProperty 42	
CompositeELResolver 44	Maintains an ordered composite list of child ELResolvers.
ELContext 52	Context information for expression evaluation.
ELContextEvent 56	An event which indicates that an ELContext 52 has been created.
ELResolver 61	Enables customization of variable, property and method call resolution behavior for EL expression evaluation.
Expression 68	Base class for the expression subclasses ValueExpression 102 and MethodExpression 87, implementing characterstics common to both.
ExpressionFactory 71	
FunctionMapper 75	The interface to a map between EL function names and methods.
ListELResolver 77	Defines property resolution behavior on instances of java.util.List.
MapELResolver 82	Defines property resolution behavior on instances of java.util.Map.
MethodExpression 87	An Expression that refers to a method on an object.
MethodInfo 90	Holds information about a method that a MethodExpression 87 evaluated to.
ResourceBundleELResolver 98	Defines property resolution behavior on instances of java.util.ResourceBundle.
ValueExpression 102	An Expression that can get or set a value.
ValueReference 106	This encapsulates a base model object and one of its properties.
VariableMapper 108	The interface to a map between EL variables and the EL expressions they are associated with.

Exceptions

Class Summary

ELException[59]	Represents any of the exception conditions that can arise during expression evaluation.
MethodNotFoundException[92]	Thrown when a method could not be found while evaluating a MethodExpression[87].
PropertyNotFoundException[94]	Thrown when a property could not be found while evaluating a ValueExpression[102] or MethodExpression[87].
PropertyNotWritableException[96]	Thrown when a property could not be written to while setting the value on a ValueExpression[102].

2.1 javax.el
ArrayELResolver

2.1.1 Declaration

```
public class ArrayELResolver extends ELResolver61
```

```
java.lang.Object
  |
  +--javax.el.ELResolver61
        |
        +--javax.el.ArrayELResolver
```

2.1.2 Description

Defines property resolution behavior on arrays.

This resolver handles base objects that are Java language arrays. It accepts any object as a property and coerces that object into an integer index into the array. The resulting value is the value in the array at that index.

This resolver can be constructed in read-only mode, which means that `isReadOnly` will always return `true` and `setValue(ELContext, Object, Object, Object)`33 will always throw `PropertyNotWritableException`.

`ELResolvers` are combined together using `CompositeELResolver`44s, to define rich semantics for evaluating an expression. See the javadocs for `ELResolver`61 for details.

Since: JSP 2.1

See Also: `CompositeELResolver`44, `ELResolver`61

Member Summary	
Constructors	
	`ArrayELResolver()`30
	`ArrayELResolver(boolean isReadOnly)`30
Methods	
`java.lang.Class`	`getCommonPropertyType(ELContext context, java.lang.Object base)`30
`java.util.Iterator`	`getFeatureDescriptors(ELContext context, java.lang.Object base)`31
`java.lang.Class`	`getType(ELContext context, java.lang.Object base, java.lang.Object property)`31
`java.lang.Object`	`getValue(ELContext context, java.lang.Object base, java.lang.Object property)`31
`boolean`	`isReadOnly(ELContext context, java.lang.Object base, java.lang.Object property)`32
`void`	`setValue(ELContext context, java.lang.Object base, java.lang.Object property, java.lang.Object val)`33

Inherited Member Summary

Fields inherited from class ELResolver[61]

RESOLVABLE_AT_DESIGN_TIME[62], TYPE[63]

Methods inherited from class ELResolver[61]

invoke(ELContext, Object, Object, Class[], Object[])[65]

Methods inherited from class Object

clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.1.3 ArrayELResolver()

```
public ArrayELResolver()
```

Creates a new read/write `ArrayELResolver`.

2.1.4 ArrayELResolver(boolean)

```
public ArrayELResolver(boolean isReadOnly)
```

Creates a new `ArrayELResolver` whose read-only status is determined by the given parameter.

Parameters:

`isReadOnly` - `true` if this resolver cannot modify arrays; `false` otherwise.

Methods

2.1.5 getCommonPropertyType(ELContext, Object)

```
public java.lang.Class getCommonPropertyType(javax.el.ELContext[52] context,
            java.lang.Object base)
```

If the base object is a Java language array, returns the most general type that this resolver accepts for the `property` argument. Otherwise, returns `null`.

Assuming the base is an array, this method will always return `Integer.class`. This is because arrays accept integers for their index.

Overrides: `getCommonPropertyType`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The array to analyze. Only bases that are a Java language array are handled by this resolver.

Returns: `null` if base is not a Java language array; otherwise `Integer.class`.

2.1.6 getFeatureDescriptors(ELContext, Object)

```
public java.util.Iterator getFeatureDescriptors(javax.el.ELContext52 context,
            java.lang.Object base)
```

Always returns `null`, since there is no reason to iterate through set set of all integers.

The `getCommonPropertyType(ELContext, Object)`30 method returns sufficient information about what properties this resolver accepts.

Overrides: `getFeatureDescriptors`63 in class `ELResolver`61

Parameters:

`context` - The context of this evaluation.

`base` - The array to analyze. Only bases that are a Java language array are handled by this resolver.

Returns: `null`.

2.1.7 getType(ELContext, Object, Object)

```
public java.lang.Class getType(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is an array, returns the most general acceptable type for a value in this array.

If the base is a `array`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Assuming the base is an `array`, this method will always return `base.getClass().getComponentType()`, which is the most general type of component that can be stored at any given index in the array.

Overrides: `getType`64 in class `ELResolver`61

Parameters:

`context` - The context of this evaluation.

`base` - The array to analyze. Only bases that are Java language arrays are handled by this resolver.

`property` - The index of the element in the array to return the acceptable type for. Will be coerced into an integer, but otherwise ignored by this resolver.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the most general acceptable type; otherwise undefined.

Throws:

`PropertyNotFoundException`94 - if the given index is out of bounds for this array.

`java.lang.NullPointerException` - if context is `null`

`ELException`59 - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.1.8 getValue(ELContext, Object, Object)

```
public java.lang.Object getValue(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is a Java language array, returns the value at the given index. The index is specified by the `property` argument, and coerced into an integer. If the coercion could not be performed, an `IllegalArgumentException` is thrown. If the index is out of bounds, `null` is returned.

If the base is a Java language array, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Overrides: `getValue`$_{65}$ in class `ELResolver`$_{61}$

Parameters:

`context` - The context of this evaluation.

`base` - The array to analyze. Only bases that are Java language arrays are handled by this resolver.

`property` - The index of the value to be returned. Will be coerced into an integer.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the value at the given index or `null` if the index was out of bounds. Otherwise, undefined.

Throws:

`java.lang.IllegalArgumentException` - if the property could not be coerced into an integer.

`java.lang.NullPointerException` - if context is `null`.

`ELException`$_{59}$ - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.1.9 isReadOnly(ELContext, Object, Object)

```
public boolean isReadOnly(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is a Java language array, returns whether a call to `setValue(ELContext, Object, Object, Object)`$_{33}$ will always fail.

If the base is a Java language array, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

If this resolver was constructed in read-only mode, this method will always return `true`. Otherwise, it returns `false`.

Overrides: `isReadOnly`$_{66}$ in class `ELResolver`$_{61}$

Parameters:

`context` - The context of this evaluation.

`base` - The array to analyze. Only bases that are a Java language array are handled by this resolver.

`property` - The index of the element in the array to return the acceptable type for. Will be coerced into an integer, but otherwise ignored by this resolver.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `true` if calling the `setValue` method will always fail or `false` if it is possible that such a call may succeed; otherwise undefined.

Throws:

`PropertyNotFoundException`$_{94}$ - if the given index is out of bounds for this array.

`java.lang.NullPointerException` - if context is `null`

`ELException`$_{59}$ - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.1.10 setValue(ELContext, Object, Object, Object)

```
public void setValue(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property, java.lang.Object val)
```

If the base object is a Java language array, attempts to set the value at the given index with the given value. The index is specified by the `property` argument, and coerced into an integer. If the coercion could not be performed, an `IllegalArgumentException` is thrown. If the index is out of bounds, a `PropertyNotFoundException` is thrown.

If the base is a Java language array, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller can safely assume no value was set.

If this resolver was constructed in read-only mode, this method will always throw `PropertyNotWritableException`.

Overrides: `setValue`[66] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The array to be modified. Only bases that are Java language arrays are handled by this resolver.

`property` - The index of the value to be set. Will be coerced into an integer.

`val` - The value to be set at the given index.

Throws:

`java.lang.ClassCastException` - if the class of the specified element prevents it from being added to this array.

`java.lang.NullPointerException` - if context is `null`.

`java.lang.IllegalArgumentException` - if the property could not be coerced into an integer, or if some aspect of the specified element prevents it from being added to this array.

`PropertyNotWritableException`[96] - if this resolver was constructed in read-only mode.

`PropertyNotFoundException`[94] - if the given index is out of bounds for this array.

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.2 javax.el
BeanELResolver

2.2.1 Declaration

```
public class BeanELResolver extends ELResolver61

java.lang.Object
  |
  +--javax.el.ELResolver61
        |
        +--javax.el.BeanELResolver
```

2.2.2 Description

Defines property resolution behavior on objects using the JavaBeans component architecture.

This resolver handles base objects of any type, as long as the base is not `null`. It accepts any object as a property or method, and coerces it to a string.

For property resolution, the property string is used to find a JavaBeans compliant property on the base object. The value is accessed using JavaBeans getters and setters.

For method resolution, the method string is the name of the method in the bean. The parameter types can be optionally specified to identify the method. If the parameter types are not specified, the parameter objects are used in the method resolution.

This resolver can be constructed in read-only mode, which means that `isReadOnly` will always return `true` and `setValue(ELContext, Object, Object, Object)`39 will always throw `PropertyNotWritableException`.

`ELResolvers` are combined together using `CompositeELResolver`44s, to define rich semantics for evaluating an expression. See the javadocs for `ELResolver`61 for details.

Because this resolver handles base objects of any type, it should be placed near the end of a composite resolver. Otherwise, it will claim to have resolved a property before any resolvers that come after it get a chance to test if they can do so as well.

Since: JSP 2.1

See Also: `CompositeELResolver`44, `ELResolver`61

Member Summary	
Nested Classes	
protected static class	BeanELResolver.BeanProperties41
protected static class	BeanELResolver.BeanProperty42
Constructors	
	BeanELResolver()35
	BeanELResolver(boolean isReadOnly)35
Methods	
java.lang.Class	getCommonPropertyType(ELContext context, java.lang.Object base)35

Member Summary	
java.util.Iterator	getFeatureDescriptors(ELContext context, java.lang.Object base)[36]
java.lang.Class	getType(ELContext context, java.lang.Object base, java.lang.Object property)[36]
java.lang.Object	getValue(ELContext context, java.lang.Object base, java.lang.Object property)[37]
java.lang.Object	invoke(ELContext context, java.lang.Object base, java.lang.Object method, java.lang.Class[] paramTypes, java.lang.Object[] params)[37]
boolean	isReadOnly(ELContext context, java.lang.Object base, java.lang.Object property)[38]
void	setValue(ELContext context, java.lang.Object base, java.lang.Object property, java.lang.Object val)[39]

Inherited Member Summary

Fields inherited from class ELResolver[61]

RESOLVABLE_AT_DESIGN_TIME[62], TYPE[63]

Methods inherited from class Object

clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.2.3 BeanELResolver()

```
public BeanELResolver()
```

Creates a new read/write BeanELResolver.

2.2.4 BeanELResolver(boolean)

```
public BeanELResolver(boolean isReadOnly)
```

Creates a new BeanELResolver whose read-only status is determined by the given parameter.

Parameters:

isReadOnly - true if this resolver cannot modify beans; false otherwise.

Methods

2.2.5 getCommonPropertyType(ELContext, Object)

```
public java.lang.Class getCommonPropertyType(javax.el.ELContext[52] context,
            java.lang.Object base)
```

If the base object is not `null`, returns the most general type that this resolver accepts for the `property` argument. Otherwise, returns `null`.

Assuming the base is not `null`, this method will always return `Object.class`. This is because any object is accepted as a key and is coerced into a string.

Overrides: `getCommonPropertyType`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The bean to analyze.

Returns: `null` if base is `null`; otherwise `Object.class`.

2.2.6 getFeatureDescriptors(ELContext, Object)

```
public java.util.Iterator getFeatureDescriptors(javax.el.ELContext[52] context,
            java.lang.Object base)
```

If the base object is not `null`, returns an `Iterator` containing the set of JavaBeans properties available on the given object. Otherwise, returns `null`.

The `Iterator` returned must contain zero or more instances of `java.beans.FeatureDescriptor`. Each info object contains information about a property in the bean, as obtained by calling the `BeanInfo.getPropertyDescriptors` method. The `FeatureDescriptor` is initialized using the same fields as are present in the `PropertyDescriptor`, with the additional required named attributes "`type`" and "`resolvableAtDesignTime`" set as follows:

`ELResolver.TYPE`[63] - The runtime type of the property, from `PropertyDescriptor.getPropertyType()`.
`ELResolver.RESOLVABLE_AT_DESIGN_TIME`[62] - `true`.

Overrides: `getFeatureDescriptors`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The bean to analyze.

Returns: An `Iterator` containing zero or more `FeatureDescriptor` objects, each representing a property on this bean, or `null` if the `base` object is `null`.

2.2.7 getType(ELContext, Object, Object)

```
public java.lang.Class getType(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is not `null`, returns the most general acceptable type that can be set on this bean property.

If the base is not `null`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

The provided property will first be coerced to a `String`. If there is a `BeanInfoProperty` for this property and there were no errors retrieving it, the `propertyType` of the `propertyDescriptor` is returned. Otherwise, a `PropertyNotFoundException` is thrown.

Overrides: `getType`[64] in class `ELResolver`[61]

Parameters:
`context` - The context of this evaluation.

`base` - The bean to analyze.

`property` - The name of the property to analyze. Will be coerced to a `String`.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the most general acceptable type; otherwise undefined.

Throws:
`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`$_{94}$ - if `base` is not `null` and the specified property does not exist or is not readable.

`ELException`$_{59}$ - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.2.8 getValue(ELContext, Object, Object)

```
public java.lang.Object getValue(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is not `null`, returns the current value of the given property on this bean.

If the base is not `null`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

The provided property name will first be coerced to a `String`. If the property is a readable property of the base object, as per the JavaBeans specification, then return the result of the getter call. If the getter throws an exception, it is propagated to the caller. If the property is not found or is not readable, a `PropertyNotFoundException` is thrown.

Overrides: `getValue`$_{65}$ in class `ELResolver`$_{61}$

Parameters:
`context` - The context of this evaluation.

`base` - The bean on which to get the property.

`property` - The name of the property to get. Will be coerced to a `String`.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the value of the given property. Otherwise, undefined.

Throws:
`java.lang.NullPointerException` - if context is `null`.

`PropertyNotFoundException`$_{94}$ - if `base` is not `null` and the specified property does not exist or is not readable.

`ELException`$_{59}$ - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.2.9 invoke(ELContext, Object, Object, Class[], Object[])

```
public java.lang.Object invoke(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object method, java.lang.Class[] paramTypes,
            java.lang.Object[] params)
```

If the base object is not `null`, invoke the method, with the given parameters on this bean. The return value from the method is returned.

If the base is not `null`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

The provided method object will first be coerced to a `String`. The methods in the bean is then examined and an attempt will be made to select one for invocation. If no suitable can be found, a `MethodNotFoundException` is thrown. If the given paramTypes is not `null`, select the method with the given name and parameter types. Else select the method with the given name that has the same number of parameters. If there are more than one such method, the method selection process is undefined. Else select the method with the given name that takes a variable number of arguments. Note the resolution for overloaded methods will likely be clarified in a future version of the spec. The provide parameters are coerced to the correcponding parameter types of the method, and the method is then invoked.

Overrides: `invoke`$_{65}$ in class `ELResolver`$_{61}$

Parameters:

`context` - The context of this evaluation.

`base` - The bean on which to invoke the method

`method` - The simple name of the method to invoke. Will be coerced to a `String`. If method is "<init>"or "<clinit>" a MethodNotFoundException is thrown.

`paramTypes` - An array of Class objects identifying the method's formal parameter types, in declared order. Use an empty array if the method has no parameters. Can be `null`, in which case the method's formal parameter types are assumed to be unknown.

`params` - The parameters to pass to the method, or `null` if no parameters.

Returns: The result of the method invocation (`null` if the method has a `void` return type).

Throws:

`MethodNotFoundException`$_{92}$ - if no suitable method can be found.

`ELException`$_{59}$ - if an exception was thrown while performing (base, method) resolution. The thrown exception must be included as the cause property of this exception, if available. If the exception thrown is an `InvocationTargetException`, extract its `cause` and pass it to the `ELException` constructor.

Since: EL 2.2

2.2.10 isReadOnly(ELContext, Object, Object)

```
public boolean isReadOnly(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is not `null`, returns whether a call to `setValue(ELContext, Object, Object, Object)`$_{39}$ will always fail.

If the base is not `null`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller can safely assume no value was set.

If this resolver was constructed in read-only mode, this method will always return `true`.

The provided property name will first be coerced to a `String`. If property is a writable property of `base`, `false` is returned. If the property is found but is not writable, `true` is returned. If the property is not found, a `PropertyNotFoundException` is thrown.

Overrides: `isReadOnly`$_{66}$ in class `ELResolver`$_{61}$

Parameters:

`context` - The context of this evaluation.

`base` - The bean to analyze.

`property` - The name of the property to analyzed. Will be coerced to a `String`.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `true` if calling the `setValue` method will always fail or `false` if it is possible that such a call may succeed; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`$_{94}$ - if `base` is not `null` and the specified property does not exist.

`ELException`$_{59}$ - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.2.11 setValue(ELContext, Object, Object, Object)

```
public void setValue(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property, java.lang.Object val)
```

If the base object is not `null`, attempts to set the value of the given property on this bean.

If the base is not `null`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller can safely assume no value was set.

If this resolver was constructed in read-only mode, this method will always throw `PropertyNotWritableException`.

The provided property name will first be coerced to a `String`. If property is a writable property of `base` (as per the JavaBeans Specification), the setter method is called (passing `value`). If the property exists but does not have a setter, then a `PropertyNotFoundException` is thrown. If the property does not exist, a `PropertyNotFoundException` is thrown.

Overrides: `setValue`$_{66}$ in class `ELResolver`$_{61}$

Parameters:

`context` - The context of this evaluation.

`base` - The bean on which to set the property.

`property` - The name of the property to set. Will be coerced to a `String`.

`val` - The value to be associated with the specified key.

Throws:

`java.lang.NullPointerException` - if context is `null`.

`PropertyNotFoundException`$_{94}$ - if `base` is not `null` and the specified property does not exist.

PropertyNotWritableException[96] - if this resolver was constructed in read-only mode, or if there is no setter for the property.

ELException[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.3 javax.el
BeanELResolver.BeanProperties

2.3.1 Declaration

```
protected static final class BeanELResolver.BeanProperties

java.lang.Object
  |
  +--javax.el.BeanELResolver.BeanProperties
```

Enclosing Class: BeanELResolver[34]

Member Summary	
Constructors	
	BeanELResolver.BeanProperties(java.lang.Class baseClass)[41]
Methods	
	getBeanProperty(java.lang.String property)[41]
BeanELResolver.BeanProperty	

Inherited Member Summary
Methods inherited from class `Object`
clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.3.2 BeanELResolver.BeanProperties(Class)

```
public BeanELResolver.BeanProperties(java.lang.Class baseClass)
```

Methods

2.3.3 getBeanProperty(String)

```
public javax.el.BeanELResolver.BeanProperty[42] getBeanProperty(java.lang.String property)
```

2.4 javax.el
BeanELResolver.BeanProperty

2.4.1 Declaration

```
protected static final class BeanELResolver.BeanProperty

java.lang.Object
  |
  +--javax.el.BeanELResolver.BeanProperty
```

Enclosing Class: BeanELResolver[34]

Member Summary	
Constructors	
	BeanELResolver.BeanProperty(java.lang.Class baseClass, java.beans.PropertyDescriptor descriptor)[42]
Methods	
java.lang.Class	getPropertyType()[43]
java.lang.reflect.Method	getReadMethod()[43]
java.lang.reflect.Method	getWriteMethod()[43]
boolean	isReadOnly()[43]

Inherited Member Summary
Methods inherited from class `Object`
clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.4.2 BeanELResolver.BeanProperty(Class, PropertyDescriptor)

```
public BeanELResolver.BeanProperty(java.lang.Class baseClass,
            java.beans.PropertyDescriptor descriptor)
```

Methods

2.4.3 getPropertyType()

```
public java.lang.Class getPropertyType()
```

2.4.4 getReadMethod()

```
public java.lang.reflect.Method getReadMethod()
```

2.4.5 getWriteMethod()

```
public java.lang.reflect.Method getWriteMethod()
```

2.4.6 isReadOnly()

```
public boolean isReadOnly()
```

2.5 javax.el
CompositeELResolver

2.5.1 Declaration

```
public class CompositeELResolver extends ELResolver61

java.lang.Object
  |
  +--javax.el.ELResolver61
        |
        +--javax.el.CompositeELResolver
```

2.5.2 Description

Maintains an ordered composite list of child `ELResolvers`.

Though only a single `ELResolver` is associated with an `ELContext`, there are usually multiple resolvers considered for any given variable or property resolution. `ELResolvers` are combined together using a `CompositeELResolver`, to define rich semantics for evaluating an expression.

For the `getValue(ELContext, Object, Object)`47, `getType(ELContext, Object, Object)`46, `setValue(ELContext, Object, Object, Object)`50 and `isReadOnly(ELContext, Object, Object)`49 methods, an `ELResolver` is not responsible for resolving all possible (base, property) pairs. In fact, most resolvers will only handle a `base` of a single type. To indicate that a resolver has successfully resolved a particular (base, property) pair, it must set the `propertyResolved` property of the `ELContext` to `true`. If it could not handle the given pair, it must leave this property alone. The caller must ignore the return value of the method if `propertyResolved` is `false`.

The `CompositeELResolver` initializes the `ELContext.propertyResolved` flag to `false`, and uses it as a stop condition for iterating through its component resolvers.

The `ELContext.propertyResolved` flag is not used for the design-time methods `getFeatureDescriptors(ELContext, Object)`46 and `getCommonPropertyType(ELContext, Object)`45. Instead, results are collected and combined from all child `ELResolvers` for these methods.

Since: JSP 2.1

See Also: `ELContext`52, `ELResolver`61

Member Summary	
Constructors	
	`CompositeELResolver()`45
Methods	
void	`add(ELResolver elResolver)`45
java.lang.Class	`getCommonPropertyType(ELContext context, java.lang.Object base)`45
java.util.Iterator	`getFeatureDescriptors(ELContext context, java.lang.Object base)`46

Member Summary	
java.lang.Class	getType(ELContext context, java.lang.Object base, java.lang.Object property)[46]
java.lang.Object	getValue(ELContext context, java.lang.Object base, java.lang.Object property)[47]
java.lang.Object	invoke(ELContext context, java.lang.Object base, java.lang.Object method, java.lang.Class[] paramTypes, java.lang.Object[] params)[48]
boolean	isReadOnly(ELContext context, java.lang.Object base, java.lang.Object property)[49]
void	setValue(ELContext context, java.lang.Object base, java.lang.Object property, java.lang.Object val)[50]

Inherited Member Summary

Fields inherited from class ELResolver[61]

RESOLVABLE_AT_DESIGN_TIME[62], TYPE[63]

Methods inherited from class Object

clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.5.3 CompositeELResolver()

```
public CompositeELResolver()
```

Methods

2.5.4 add(ELResolver)

```
public void add(javax.el.ELResolver[61] elResolver)
```

Adds the given resolver to the list of component resolvers.

Resolvers are consulted in the order in which they are added.

Parameters:
`elResolver` - The component resolver to add.

Throws:
`java.lang.NullPointerException` - If the provided resolver is `null`.

2.5.5 getCommonPropertyType(ELContext, Object)

```
public java.lang.Class getCommonPropertyType(javax.el.ELContext[52] context,
            java.lang.Object base)
```

Returns the most general type that this resolver accepts for the `property` argument, given a `base` object. One use for this method is to assist tools in auto-completion. The result is obtained by querying all component resolvers.

The `Class` returned is the most specific class that is a common superclass of all the classes returned by each component resolver's `getCommonPropertyType` method. If `null` is returned by a resolver, it is skipped.

Overrides: `getCommonPropertyType`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The base object to return the most general property type for, or `null` to enumerate the set of top-level variables that this resolver can evaluate.

Returns: `null` if this `ELResolver` does not know how to handle the given `base` object; otherwise `Object.class` if any type of `property` is accepted; otherwise the most general `property` type accepted for the given `base`.

2.5.6 getFeatureDescriptors(ELContext, Object)

```
public java.util.Iterator getFeatureDescriptors(javax.el.ELContext[52] context,
            java.lang.Object base)
```

Returns information about the set of variables or properties that can be resolved for the given `base` object. One use for this method is to assist tools in auto-completion. The results are collected from all component resolvers.

The `propertyResolved` property of the `ELContext` is not relevant to this method. The results of all `ELResolvers` are concatenated.

The `Iterator` returned is an iterator over the collection of `FeatureDescriptor` objects returned by the iterators returned by each component resolver's `getFeatureDescriptors` method. If `null` is returned by a resolver, it is skipped.

Overrides: `getFeatureDescriptors`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose set of valid properties is to be enumerated, or `null` to enumerate the set of top-level variables that this resolver can evaluate.

Returns: An `Iterator` containing zero or more (possibly infinitely more) `FeatureDescriptor` objects, or `null` if this resolver does not handle the given `base` object or that the results are too complex to represent with this method

2.5.7 getType(ELContext, Object, Object)

```
public java.lang.Class getType(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

For a given `base` and `property`, attempts to identify the most general type that is acceptable for an object to be passed as the `value` parameter in a future call to the `setValue(ELContext, Object, Object, Object)`[50] method. The result is obtained by querying all component resolvers.

If this resolver handles the given (base, property) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

First, `propertyResolved` is set to `false` on the provided `ELContext`.

Next, for each component resolver in this composite:

1. The `getType()` method is called, passing in the provided `context`, `base` and `property`.
2. If the `ELContext`'s `propertyResolved` flag is `false` then iteration continues.
3. Otherwise, iteration stops and no more component resolvers are considered. The value returned by `getType()` is returned by this method.

If none of the component resolvers were able to perform this operation, the value `null` is returned and the `propertyResolved` flag remains set to `false`

.

Any exception thrown by component resolvers during the iteration is propagated to the caller of this method.

Overrides: `getType`[64] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose property value is to be analyzed, or `null` to analyze a top-level variable.

`property` - The property or variable to return the acceptable type for.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the most general acceptable type; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`[94] - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property does not exist or is not readable.

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.5.8 getValue(ELContext, Object, Object)

```
public java.lang.Object getValue(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

Attempts to resolve the given `property` object on the given `base` object by querying all component resolvers.

If this resolver handles the given (base, property) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

First, `propertyResolved` is set to `false` on the provided `ELContext`.

Next, for each component resolver in this composite:

1. The `getValue()` method is called, passing in the provided `context`, `base` and `property`.
2. If the `ELContext`'s `propertyResolved` flag is `false` then iteration continues.

3. Otherwise, iteration stops and no more component resolvers are considered. The value returned by `getValue()` is returned by this method.

If none of the component resolvers were able to perform this operation, the value `null` is returned and the `propertyResolved` flag remains set to `false`

.

Any exception thrown by component resolvers during the iteration is propagated to the caller of this method.

Overrides: `getValue`[65] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose property value is to be returned, or `null` to resolve a top-level variable.

`property` - The property or variable to be resolved.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the result of the variable or property resolution; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`[94] - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property does not exist or is not readable.

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.5.9 invoke(ELContext, Object, Object, Class[], Object[])

```
public java.lang.Object invoke(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object method, java.lang.Class[] paramTypes,
            java.lang.Object[] params)
```

Attemps to resolve and invoke the given `method` on the given `base` object by querying all component resolvers.

If this resolver handles the given (base, method) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

First, `propertyResolved` is set to `false` on the provided `ELContext`.

Next, for each component resolver in this composite:

1. The `invoke()` method is called, passing in the provided `context`, `base`, `method`, `paramTypes`, and `params`.
2. If the `ELContext`'s `propertyResolved` flag is `false` then iteration continues.
3. Otherwise, iteration stops and no more component resolvers are considered. The value returned by `getValue()` is returned by this method.

If none of the component resolvers were able to perform this operation, the value `null` is returned and the `propertyResolved` flag remains set to `false`

.

Any exception thrown by component resolvers during the iteration is propagated to the caller of this method.

Overrides: `invoke`[65] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The bean on which to invoke the method

`method` - The simple name of the method to invoke. Will be coerced to a `String`. If method is “”or “” a NoSuchMethodException is raised.

`paramTypes` - An array of Class objects identifying the method’s formal parameter types, in declared order. Use an empty array if the method has no parameters. Can be `null`, in which case the method’s formal parameter types are assumed to be unknown.

`params` - The parameters to pass to the method, or `null` if no parameters.

Returns: The result of the method invocation (`null` if the method has a `void` return type).

Since: EL 2.2

2.5.10 isReadOnly(ELContext, Object, Object)

```
public boolean isReadOnly(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

For a given `base` and `property`, attempts to determine whether a call to `setValue(ELContext, Object, Object, Object)`[50] will always fail. The result is obtained by querying all component resolvers.

If this resolver handles the given (base, property) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

First, `propertyResolved` is set to `false` on the provided `ELContext`.

Next, for each component resolver in this composite:

1. The `isReadOnly()` method is called, passing in the provided `context`, `base` and `property`.
2. If the `ELContext`’s `propertyResolved` flag is `false` then iteration continues.
3. Otherwise, iteration stops and no more component resolvers are considered. The value returned by `isReadOnly()` is returned by this method.

If none of the component resolvers were able to perform this operation, the value `false` is returned and the `propertyResolved` flag remains set to `false`

.

Any exception thrown by component resolvers during the iteration is propagated to the caller of this method.

Overrides: `isReadOnly`[66] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose property value is to be analyzed, or `null` to analyze a top-level variable.

`property` - The property or variable to return the read-only status for.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `true` if the property is read-only or `false` if not; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`[94] - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property does not exist.

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.5.11 setValue(ELContext, Object, Object, Object)

```
public void setValue(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property, java.lang.Object val)
```

Attempts to set the value of the given `property` object on the given `base` object. All component resolvers are asked to attempt to set the value.

If this resolver handles the given (base, property) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller can safely assume no value has been set.

First, `propertyResolved` is set to `false` on the provided `ELContext`.

Next, for each component resolver in this composite:

1. The `setValue()` method is called, passing in the provided `context`, `base`, `property` and `value`.
2. If the `ELContext`'s `propertyResolved` flag is `false` then iteration continues.
3. Otherwise, iteration stops and no more component resolvers are considered.

If none of the component resolvers were able to perform this operation, the `propertyResolved` flag remains set to `false`

.

Any exception thrown by component resolvers during the iteration is propagated to the caller of this method.

Overrides: `setValue`[66] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose property value is to be set, or `null` to set a top-level variable.

`property` - The property or variable to be set.

`val` - The value to set the property or variable to.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`[94] - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property does not exist.

`PropertyNotWritableException`[96] - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property is not writable.

ELException[59] - if an exception was thrown while attempting to set the property or variable. The thrown exception must be included as the cause property of this exception, if available.

2.6 javax.el
ELContext

2.6.1 Declaration

```
public abstract class ELContext

java.lang.Object
  |
  +--javax.el.ELContext
```

2.6.2 Description

Context information for expression evaluation.

To evaluate an `Expression`[68], an `ELContext` must be provided. The `ELContext` holds:

- a reference to the base `ELResolver`[61] that will be consulted to resolve model objects and their properties
- a reference to `FunctionMapper`[75] that will be used to resolve EL Functions.
- a reference to `VariableMapper`[108] that will be used to resolve EL Variables.
- a collection of all the relevant context objects for use by `ELResolvers`
- state information during the evaluation of an expression, such as whether a property has been resolved yet

The collection of context objects is necessary because each `ELResolver` may need access to a different context object. For example, JSP and Faces resolvers need access to a `javax.servlet.jsp.JspContext` and a `javax.faces.context.FacesContext`, respectively.

Creation of `ELContext` objects is controlled through the underlying technology. For example, in JSP the `JspContext.getELContext()` factory method is used. Some technologies provide the ability to add an `ELContextListener`[58] so that applications and frameworks can ensure their own context objects are attached to any newly created `ELContext`.

Because it stores state during expression evaluation, an `ELContext` object is not thread-safe. Care should be taken to never share an `ELContext` instance between two or more threads.

Since: JSP 2.1

See Also: `ELContextListener`[58], `ELContextEvent`[56], `ELResolver`[61], `FunctionMapper`[75], `VariableMapper`[108], `javax.servlet.jsp.JspContext`

Member Summary	
Constructors	
	`ELContext()`[53]
Methods	
`java.lang.Object`	`getContext(java.lang.Class key)`[53]
`abstract ELResolver`	`getELResolver()`[53]
`abstract FunctionMapper`	`getFunctionMapper()`[54]
`java.util.Locale`	`getLocale()`[54]

Member Summary	
abstract VariableMapper	getVariableMapper()[54]
boolean	isPropertyResolved()[54]
void	putContext(java.lang.Class key, java.lang.Object contextObject)[54]
void	setLocale(java.util.Locale locale)[55]
void	setPropertyResolved(boolean resolved)[55]

Inherited Member Summary
Methods inherited from class `Object`
`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)`

Constructors

2.6.3 ELContext()

```
public ELContext()
```

Methods

2.6.4 getContext(Class)

```
public java.lang.Object getContext(java.lang.Class key)
```

Returns the context object associated with the given key.

The `ELContext` maintains a collection of context objects relevant to the evaluation of an expression. These context objects are used by `ELResolvers`. This method is used to retrieve the context with the given key from the collection.

By convention, the object returned will be of the type specified by the `key`. However, this is not required and the key is used strictly as a unique identifier.

Parameters:
`key` - The unique identifier that was used to associate the context object with this `ELContext`.

Returns: The context object associated with the given key, or null if no such context was found.

Throws:
`java.lang.NullPointerException` - if key is null.

2.6.5 getELResolver()

```
public abstract javax.el.ELResolver[61] getELResolver()
```

Retrieves the `ELResolver` associated with this context.

The `ELContext` maintains a reference to the `ELResolver` that will be consulted to resolve variables and properties during an expression evaluation. This method retrieves the reference to the resolver.

Once an `ELContext` is constructed, the reference to the `ELResolver` associated with the context cannot be changed.

Returns: The resolver to be consulted for variable and property resolution during expression evaluation.

2.6.6 getFunctionMapper()

```
public abstract javax.el.FunctionMapper75 getFunctionMapper()
```

Retrieves the `FunctionMapper` associated with this `ELContext`.

Returns: The function mapper to be consulted for the resolution of EL functions.

2.6.7 getLocale()

```
public java.util.Locale getLocale()
```

Get the `Locale` stored by a previous invocation to `setLocale(Locale)`55. If this method returns non `null`, this `Locale` must be used for all localization needs in the implementation. The `Locale` must not be cached to allow for applications that change `Locale` dynamically.

Returns: The `Locale` in which this instance is operating. Used primarily for message localization.

2.6.8 getVariableMapper()

```
public abstract javax.el.VariableMapper108 getVariableMapper()
```

Retrieves the `VariableMapper` associated with this `ELContext`.

Returns: The variable mapper to be consulted for the resolution of EL variables.

2.6.9 isPropertyResolved()

```
public boolean isPropertyResolved()
```

Returns whether an `ELResolver`61 has successfully resolved a given (base, property) pair.

The `CompositeELResolver`44 checks this property to determine whether it should consider or skip other component resolvers.

Returns: true if the property has been resolved, or false if not.

See Also: `CompositeELResolver`44

2.6.10 putContext(Class, Object)

```
public void putContext(java.lang.Class key, java.lang.Object contextObject)
```

Associates a context object with this `ELContext`.

The `ELContext` maintains a collection of context objects relevant to the evaluation of an expression. These context objects are used by `ELResolvers`. This method is used to add a context object to that collection.

By convention, the `contextObject` will be of the type specified by the `key`. However, this is not required and the key is used strictly as a unique identifier.

Parameters:

`key` - The key used by an @{link ELResolver} to identify this context object.

`contextObject` - The context object to add to the collection.

Throws:
`java.lang.NullPointerException` - if key is null or contextObject is null.

2.6.11 setLocale(Locale)

```
public void setLocale(java.util.Locale locale)
```

Set the `Locale` for this instance. This method may be called by the party creating the instance, such as JavaServer Faces or JSP, to enable the EL implementation to provide localized messages to the user. If no `Locale` is set, the implementation must use the locale returned by `Locale.getDefault( )`.

2.6.12 setPropertyResolved(boolean)

```
public void setPropertyResolved(boolean resolved)
```

Called to indicate that a `ELResolver` has successfully resolved a given (base, property) pair.

The `CompositeELResolver`[44] checks this property to determine whether it should consider or skip other component resolvers.

Parameters:
`resolved` - true if the property has been resolved, or false if not.

See Also: `CompositeELResolver`[44]

2.7 javax.el
ELContextEvent

2.7.1 Declaration

```
public class ELContextEvent extends java.util.EventObject

java.lang.Object
  |
  +--java.util.EventObject
        |
        +--javax.el.ELContextEvent
```

All Implemented Interfaces: `java.io.Serializable`

2.7.2 Description

An event which indicates that an `ELContext`[52] has been created. The source object is the ELContext that was created.

Since: JSP 2.1

See Also: `ELContext`[52], `ELContextListener`[58]

Member Summary	
Constructors	
	`ELContextEvent(ELContext source)`[57]
Methods	
`ELContext`	`getELContext()`[57]

Inherited Member Summary
Fields inherited from class `EventObject`
`source`
Methods inherited from class `EventObject`
`getSource(), toString()`
Methods inherited from class `Object`
`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), wait(), wait(long), wait(long, int)`

Constructors

2.7.3 ELContextEvent(ELContext)

`public` **`ELContextEvent`**`(`javax.el.ELContext[52] `source)`

Constructs an ELContextEvent object to indicate that an `ELContext` has been created.

Parameters:

`source` - the `ELContext` that was created.

Methods

2.7.4 getELContext()

`public` javax.el.ELContext[52] **`getELContext`**`()`

Returns the `ELContext` that was created. This is a type-safe equivalent of the `java.util.EventObject.getSource()` method.

Returns: the ELContext that was created.

2.8 javax.el
ELContextListener

2.8.1 Declaration

```
public interface ELContextListener extends java.util.EventListener
```

All Superinterfaces: `java.util.EventListener`

2.8.2 Description

The listener interface for receiving notification when an `ELContext`[52] is created.

Since: JSP 2.1

See Also: `ELContext`[52], `ELContextEvent`[56]

Member Summary	
Methods	
`void`	`contextCreated(ELContextEvent ece)`[58]

Methods

2.8.3 contextCreated(ELContextEvent)

```
public void contextCreated(javax.el.ELContextEvent[56] ece)
```

Invoked when a new `ELContext` has been created.

Parameters:

`ece` - the notification event.

2.9 javax.el
ELException

2.9.1 Declaration

```
public class ELException extends java.lang.RuntimeException
```

```
java.lang.Object
  |
  +--java.lang.Throwable
        |
        +--java.lang.Exception
              |
              +--java.lang.RuntimeException
                    |
                    +--javax.el.ELException
```

All Implemented Interfaces: `java.io.Serializable`

Direct Known Subclasses: `MethodNotFoundException`[92], `PropertyNotFoundException`[94], `PropertyNotWritableException`[96]

2.9.2 Description

Represents any of the exception conditions that can arise during expression evaluation.

Since: JSP 2.1

Member Summary	
Constructors	
	`ELException()`[60]
	`ELException(java.lang.String pMessage)`[60]
	`ELException(java.lang.String pMessage, java.lang.Throwable pRootCause)`[60]
	`ELException(java.lang.Throwable pRootCause)`[60]

Inherited Member Summary
Methods inherited from class `Object`
`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), wait(), wait(long), wait(long, int)`
Methods inherited from class `Throwable`
`fillInStackTrace(), getCause(), getLocalizedMessage(), getMessage(), getStackTrace(), initCause(Throwable), printStackTrace(), printStackTrace(PrintStream), printStackTrace(PrintWriter), setStackTrace(StackTraceElement[]), toString()`

Constructors

2.9.3 ELException()

`public` **`ELException`**`()`

Creates an `ELException` with no detail message.

2.9.4 ELException(String)

`public` **`ELException`**`(java.lang.String pMessage)`

Creates an `ELException` with the provided detail message.

Parameters:

`pMessage` - the detail message

2.9.5 ELException(Throwable)

`public` **`ELException`**`(java.lang.Throwable pRootCause)`

Creates an `ELException` with the given cause.

Parameters:

`pRootCause` - the originating cause of this exception

2.9.6 ELException(String, Throwable)

`public` **`ELException`**`(java.lang.String pMessage, java.lang.Throwable pRootCause)`

Creates an ELException with the given detail message and root cause.

Parameters:

`pMessage` - the detail message

`pRootCause` - the originating cause of this exception

2.10 javax.el
ELResolver

2.10.1 Declaration

```
public abstract class ELResolver

java.lang.Object
  |
  +--javax.el.ELResolver
```

Direct Known Subclasses: ArrayELResolver[29], BeanELResolver[34], CompositeELResolver[44], ListELResolver[77], MapELResolver[82], ResourceBundleELResolver[98]

2.10.2 Description

Enables customization of variable, property and method call resolution behavior for EL expression evaluation.

While evaluating an expression, the ELResolver associated with the ELContext[52] is consulted to do the initial resolution of the first variable of an expression. It is also consulted when a . or [] operator is encountered.

For example, in the EL expression ${employee.lastName}, the ELResolver determines what object employee refers to, and what it means to get the lastName property on that object.

Most methods in this class accept a base and property parameter. In the case of variable resolution (e.g. determining what employee refers to in ${employee.lastName}), the base parameter will be null and the property parameter will always be of type String. In this case, if the property is not a String, the behavior of the ELResolver is undefined.

In the case of property resolution, the base parameter identifies the base object and the property object identifies the property on that base. For example, in the expression ${employee.lastName}, base is the result of the variable resolution for employee and property is the string "lastName". In the expression ${y[x]}, base is the result of the variable resolution for y and property is the result of the variable resolution for x.

In the case of method call resolution, the base parameter indentifies the base object and the method parameter identifies a method on that base. In the case of overloaded methods, the paramTypes parameter can be optionally used to identify a method. The paramsparameter are the parameters for the method call, and can also be used for resolving overloaded methods when the paramTypes parameter is not specified.

Though only a single ELResolver is associated with an ELContext, there are usually multiple resolvers considered for any given variable or property resolution. ELResolvers are combined together using CompositeELResolver[44]s, to define rich semantics for evaluating an expression.

For the getValue(ELContext, Object, Object)[65], getType(ELContext, Object, Object)[64], setValue(ELContext, Object, Object, Object)[66] and isReadOnly(ELContext, Object, Object)[66] methods, an ELResolver is not responsible for resolving all possible (base, property) pairs. In fact, most resolvers will only handle a base of a single type. To indicate that a resolver has successfully resolved a particular (base, property) pair, it must set the propertyResolved property of the ELContext to true. If it could not handle the given pair, it must leave this property alone. The caller must ignore the return value of the method if propertyResolved is false.

The `getFeatureDescriptors(ELContext, Object)`[63] and `getCommonPropertyType(ELContext, Object)`[63] methods are primarily designed for design-time tool support, but must handle invocation at runtime as well. The `java.beans.Beans.isDesignTime()` method can be used to determine if the resolver is being consulted at design-time or runtime.

Since: JSP 2.1

See Also: `CompositeELResolver`[44], `ELContext.getELResolver()`[53]

Member Summary

Fields

static java.lang.String	RESOLVABLE_AT_DESIGN_TIME[62]
static java.lang.String	TYPE[63]

Constructors

	ELResolver()[63]

Methods

abstract java.lang.Class	getCommonPropertyType(ELContext context, java.lang.Object base)[63]
abstract java.util.Iterator	getFeatureDescriptors(ELContext context, java.lang.Object base)[63]
abstract java.lang.Class	getType(ELContext context, java.lang.Object base, java.lang.Object property)[64]
abstract java.lang.Object	getValue(ELContext context, java.lang.Object base, java.lang.Object property)[65]
java.lang.Object	invoke(ELContext context, java.lang.Object base, java.lang.Object method, java.lang.Class[] paramTypes, java.lang.Object[] params)[65]
abstract boolean	isReadOnly(ELContext context, java.lang.Object base, java.lang.Object property)[66]
abstract void	setValue(ELContext context, java.lang.Object base, java.lang.Object property, java.lang.Object value)[66]

Inherited Member Summary

Methods inherited from class `Object`

`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)`

Fields

2.10.3 RESOLVABLE_AT_DESIGN_TIME

```
public static final java.lang.String RESOLVABLE_AT_DESIGN_TIME
```

The attribute name of the named attribute in the `FeatureDescriptor` that specifies whether the variable or property can be resolved at runtime.

2.10.4 TYPE

```
public static final java.lang.String TYPE
```

The attribute name of the named attribute in the `FeatureDescriptor` that specifies the runtime type of the variable or property.

Constructors

2.10.5 ELResolver()

```
public ELResolver()
```

Methods

2.10.6 getCommonPropertyType(ELContext, Object)

```
public abstract java.lang.Class getCommonPropertyType(javax.el.ELContext52 context,
            java.lang.Object base)
```

Returns the most general type that this resolver accepts for the `property` argument, given a `base` object. One use for this method is to assist tools in auto-completion.

This assists tools in auto-completion and also provides a way to express that the resolver accepts a primitive value, such as an integer index into an array. For example, the `ArrayELResolver`29 will accept any `int` as a `property`, so the return value would be `Integer.class`.

Parameters:

`context` - The context of this evaluation.

`base` - The base object to return the most general property type for, or `null` to enumerate the set of top-level variables that this resolver can evaluate.

Returns: `null` if this `ELResolver` does not know how to handle the given `base` object; otherwise `Object.class` if any type of `property` is accepted; otherwise the most general `property` type accepted for the given `base`.

2.10.7 getFeatureDescriptors(ELContext, Object)

```
public abstract java.util.Iterator getFeatureDescriptors(javax.el.ELContext52 context,
            java.lang.Object base)
```

Returns information about the set of variables or properties that can be resolved for the given `base` object. One use for this method is to assist tools in auto-completion.

If the `base` parameter is `null`, the resolver must enumerate the list of top-level variables it can resolve.

The `Iterator` returned must contain zero or more instances of `java.beans.FeatureDescriptor`, in no guaranteed order. In the case of primitive types such as `int`, the value `null` must be returned. This is to prevent the useless iteration through all possible primitive values. A return value of `null` indicates that this resolver does not handle the given `base` object or that the

results are too complex to represent with this method and the `getCommonPropertyType(ELContext, Object)`[63] method should be used instead.

Each `FeatureDescriptor` will contain information about a single variable or property. In addition to the standard properties, the `FeatureDescriptor` must have two named attributes (as set by the `setValue` method):

- `TYPE`[63]- The value of this named attribute must be an instance of `java.lang.Class` and specify the runtime type of the variable or property.
- `RESOLVABLE_AT_DESIGN_TIME`[62]- The value of this named attribute must be an instance of `java.lang.Boolean` and indicates whether it is safe to attempt to resolve this property at design-time. For instance, it may be unsafe to attempt a resolution at design time if the `ELResolver` needs access to a resource that is only available at runtime and no acceptable simulated value can be provided.

The caller should be aware that the `Iterator` returned might iterate through a very large or even infinitely large set of properties. Care should be taken by the caller to not get stuck in an infinite loop.

This is a "best-effort" list. Not all `ELResolvers` will return completely accurate results, but all must be callable at both design-time and runtime (i.e. whether or not `Beans.isDesignTime()` returns `true`), without causing errors.

The `propertyResolved` property of the `ELContext` is not relevant to this method. The results of all `ELResolvers` are concatenated in the case of composite resolvers.

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose set of valid properties is to be enumerated, or `null` to enumerate the set of top-level variables that this resolver can evaluate.

Returns: An `Iterator` containing zero or more (possibly infinitely more) `FeatureDescriptor` objects, or `null` if this resolver does not handle the given `base` object or that the results are too complex to represent with this method

See Also: `java.beans.FeatureDescriptor`

2.10.8 getType(ELContext, Object, Object)

```
public abstract java.lang.Class getType(javax.el.ELContext[52] context,
            java.lang.Object base, java.lang.Object property)
```

For a given `base` and `property`, attempts to identify the most general type that is acceptable for an object to be passed as the `value` parameter in a future call to the `setValue(ELContext, Object, Object, Object)`[66] method.

If this resolver handles the given (base, property) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

This is not always the same as `getValue().getClass()`. For example, in the case of an `ArrayELResolver`[29], the `getType` method will return the element type of the array, which might be a superclass of the type of the actual element that is currently in the specified array element.

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose property value is to be analyzed, or `null` to analyze a top-level variable.

`property` - The property or variable to return the acceptable type for.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the most general acceptable type; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`$_{94}$ - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property does not exist or is not readable.

`ELException`$_{59}$ - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.10.9 getValue(ELContext, Object, Object)

```
public abstract java.lang.Object getValue(javax.el.ELContext52 context,
            java.lang.Object base, java.lang.Object property)
```

Attempts to resolve the given `property` object on the given `base` object.

If this resolver handles the given (base, property) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose property value is to be returned, or `null` to resolve a top-level variable.

`property` - The property or variable to be resolved.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the result of the variable or property resolution; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`$_{94}$ - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property does not exist or is not readable.

`ELException`$_{59}$ - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.10.10 invoke(ELContext, Object, Object, Class[], Object[])

```
public java.lang.Object invoke(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object method, java.lang.Class[] paramTypes,
            java.lang.Object[] params)
```

Attemps to resolve and invoke the given `method` on the given `base` object.

If this resolver handles the given (base, method) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

A default implementation is provided that returns null so that existing classes that extend ELResolver can continue to function.

Parameters:

`context` - The context of this evaluation.

`base` - The bean on which to invoke the method

`method` - The simple name of the method to invoke. Will be coerced to a `String`.

`paramTypes` - An array of Class objects identifying the method's formal parameter types, in declared order. Use an empty array if the method has no parameters. Can be `null`, in which case the method's formal parameter types are assumed to be unknown.

`params` - The parameters to pass to the method, or `null` if no parameters.

Returns: The result of the method invocation (`null` if the method has a `void` return type).

Throws:

`MethodNotFoundException`[92] - if no suitable method can be found.

`ELException`[59] - if an exception was thrown while performing (base, method) resolution. The thrown exception must be included as the cause property of this exception, if available. If the exception thrown is an `InvocationTargetException`, extract its `cause` and pass it to the `ELException` constructor.

Since: EL 2.2

2.10.11 isReadOnly(ELContext, Object, Object)

```
public abstract boolean isReadOnly(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

For a given `base` and `property`, attempts to determine whether a call to `setValue(ELContext, Object, Object, Object)`[66] will always fail.

If this resolver handles the given (base, property) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose property value is to be analyzed, or `null` to analyze a top-level variable.

`property` - The property or variable to return the read-only status for.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `true` if the property is read-only or `false` if not; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`[94] - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property does not exist.

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.10.12 setValue(ELContext, Object, Object, Object)

```
public abstract void setValue(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property, java.lang.Object value)
```

Attempts to set the value of the given `property` object on the given `base` object.

If this resolver handles the given (base, property) pair, the `propertyResolved` property of the `ELContext` object must be set to `true` by the resolver, before returning. If this property is not `true` after this method is called, the caller can safely assume no value has been set.

Parameters:

`context` - The context of this evaluation.

`base` - The base object whose property value is to be set, or `null` to set a top-level variable.

`property` - The property or variable to be set.

`value` - The value to set the property or variable to.

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`$_{94}$ - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property does not exist.

`PropertyNotWritableException`$_{96}$ - if the given (base, property) pair is handled by this `ELResolver` but the specified variable or property is not writable.

`ELException`$_{59}$ - if an exception was thrown while attempting to set the property or variable. The thrown exception must be included as the cause property of this exception, if available.

2.11 javax.el
Expression

2.11.1 Declaration

```
public abstract class Expression implements java.io.Serializable

java.lang.Object
  |
  +--javax.el.Expression
```

All Implemented Interfaces: `java.io.Serializable`

Direct Known Subclasses: `MethodExpression`[87], `ValueExpression`[102]

2.11.2 Description

Base class for the expression subclasses `ValueExpression`[102] and `MethodExpression`[87], implementing characterstics common to both.

All expressions must implement the `equals()` and `hashCode()` methods so that two expressions can be compared for equality. They are redefined abstract in this class to force their implementation in subclasses.

All expressions must also be `Serializable` so that they can be saved and restored.

`Expressions` are also designed to be immutable so that only one instance needs to be created for any given expression String / `FunctionMapper`[75]. This allows a container to pre-create expressions and not have to re-parse them each time they are evaluated.

Since: JSP 2.1

Member Summary	
Constructors	
	`Expression()`[69]
Methods	
abstract boolean	`equals(java.lang.Object obj)`[69]
abstract	`getExpressionString()`[69]
java.lang.String	
abstract int	`hashCode()`[69]
abstract boolean	`isLiteralText()`[70]

Inherited Member Summary
Methods inherited from class `Object`
`clone(), finalize(), getClass(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)`

Constructors

2.11.3 Expression()

```
public Expression()
```

Methods

2.11.4 equals(Object)

```
public abstract boolean equals(java.lang.Object obj)
```

Determines whether the specified object is equal to this `Expression`.

The result is `true` if and only if the argument is not `null`, is an `Expression` object that is the of the same type (`ValueExpression` or `MethodExpression`), and has an identical parsed representation.

Note that two expressions can be equal if their expression Strings are different. For example, `${fn1:foo()}` and `${fn2:foo()}` are equal if their corresponding `FunctionMappers` mapped `fn1:foo` and `fn2:foo` to the same method.

Overrides: `equals` in class `Object`

Parameters:
`obj` - the `Object` to test for equality.

Returns: `true` if `obj` equals this `Expression`; `false` otherwise.

See Also: `java.util.Hashtable`, `java.lang.Object.equals(Object)`

2.11.5 getExpressionString()

```
public abstract java.lang.String getExpressionString()
```

Returns the original String used to create this `Expression`, unmodified.

This is used for debugging purposes but also for the purposes of comparison (e.g. to ensure the expression in a configuration file has not changed).

This method does not provide sufficient information to re-create an expression. Two different expressions can have exactly the same expression string but different function mappings. Serialization should be used to save and restore the state of an `Expression`.

Returns: The original expression String.

2.11.6 hashCode()

```
public abstract int hashCode()
```

Returns the hash code for this `Expression`.

See the note in the `equals(Object)` [69] method on how two expressions can be equal if their expression Strings are different. Recall that if two objects are equal according to the `equals(Object)` method, then calling the `hashCode` method on each of the two objects must produce the same integer result. Implementations must take special note and implement `hashCode` correctly.

Overrides: `hashCode` in class `Object`

Returns: The hash code for this `Expression`.

See Also: `equals(Object)` 69, `java.util.Hashtable`, `java.lang.Object.hashCode()`

2.11.7 isLiteralText()

```
public abstract boolean isLiteralText()
```

Returns whether this expression was created from only literal text.

This method must return `true` if and only if the expression string this expression was created from contained no unescaped EL delimeters (`${...}` or `#{...}`).

Returns: `true` if this expression was created from only literal text; `false` otherwise.

2.12 javax.el
ExpressionFactory

2.12.1 Declaration

```
public abstract class ExpressionFactory

java.lang.Object
  |
  +--javax.el.ExpressionFactory
```

Member Summary	
Constructors	
	ExpressionFactory() 71
Methods	
abstract java.lang.Object	coerceToType(java.lang.Object obj, java.lang.Class targetType) 72
abstract MethodExpression	createMethodExpression(ELContext context, java.lang.String expression, java.lang.Class expectedReturnType, java.lang.Class[] expectedParamTypes) 72
abstract ValueExpression	createValueExpression(ELContext context, java.lang.String expression, java.lang.Class expectedType) 73
abstract ValueExpression	createValueExpression(java.lang.Object instance, java.lang.Class expectedType) 73
static ExpressionFactory	newInstance() 74
static ExpressionFactory	newInstance(java.util.Properties properties) 74

Inherited Member Summary
Methods inherited from class `Object`
clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.12.2 ExpressionFactory()

```
public ExpressionFactory()
```

Methods

2.12.3 coerceToType(Object, Class)

```
public abstract java.lang.Object coerceToType(java.lang.Object obj,
            java.lang.Class targetType)
```

Coerces an object to a specific type according to the EL type conversion rules.

An `ELException` is thrown if an error results from applying the conversion rules.

Parameters:

`obj` - The object to coerce.

`targetType` - The target type for the coercion.

Throws:

`ELException`[59] - thrown if an error results from applying the conversion rules.

2.12.4 createMethodExpression(ELContext, String, Class, Class[])

```
public abstract javax.el.MethodExpression[87] createMethodExpression(javax.el.ELContext[52]
            context, java.lang.String expression, java.lang.Class expectedReturnType,
            java.lang.Class[] expectedParamTypes)
```

Parses an expression into a `MethodExpression`[87] for later evaluation. Use this method for expressions that refer to methods.

If the expression is a String literal, a `MethodExpression` is created, which when invoked, returns the String literal, coerced to expectedReturnType. An ELException is thrown if expectedReturnType is void or if the coercion of the String literal to the expectedReturnType yields an error (see Section "1.16 Type Conversion").

This method should perform syntactic validation of the expression. If in doing so it detects errors, it should raise an `ELException`.

Parameters:

`context` - The EL context used to parse the expression. The `FunctionMapper` and `VariableMapper` stored in the ELContext are used to resolve functions and variables found in the expression. They can be `null`, in which case functions or variables are not supported for this expression. The object returned must invoke the same functions and access the same variable mappings regardless of whether the mappings in the provided `FunctionMapper` and `VariableMapper` instances change between calling `ExpressionFactory.createMethodExpression()` and any method on `MethodExpression`.

Note that within the EL, the ${} and #{} syntaxes are treated identically. This includes the use of VariableMapper and FunctionMapper at expression creation time. Each is invoked if not null, independent of whether the #{} or ${} syntax is used for the expression.

`expression` - The expression to parse

`expectedReturnType` - The expected return type for the method to be found. After evaluating the expression, the `MethodExpression` must check that the return type of the actual method matches this type. Passing in a value of `null` indicates the caller does not care what the return type is, and the check is disabled.

`expectedParamTypes` - The expected parameter types for the method to be found. Must be an array with no elements if there are no parameters expected. It is illegal to pass `null`, unless the method

is specified with arugments in the EL expression, in which case these arguments are used for method selection, and this parameter is ignored.

Returns: The parsed expression

Throws:

`ELException`[59] - Thrown if there are syntactical errors in the provided expression.

`java.lang.NullPointerException` - if paramTypes is `null`.

2.12.5 createValueExpression(ELContext, String, Class)

```
public abstract javax.el.ValueExpression[102] createValueExpression(javax.el.ELContext[52]
            context, java.lang.String expression, java.lang.Class expectedType)
```

Parses an expression into a `ValueExpression`[102] for later evaluation. Use this method for expressions that refer to values.

This method should perform syntactic validation of the expression. If in doing so it detects errors, it should raise an `ELException`.

Parameters:

`context` - The EL context used to parse the expression. The `FunctionMapper` and `VariableMapper` stored in the ELContext are used to resolve functions and variables found in the expression. They can be `null`, in which case functions or variables are not supported for this expression. The object returned must invoke the same functions and access the same variable mappings regardless of whether the mappings in the provided `FunctionMapper` and `VariableMapper` instances change between calling `ExpressionFactory.createValueExpression()` and any method on `ValueExpression`.

Note that within the EL, the ${} and #{} syntaxes are treated identically. This includes the use of VariableMapper and FunctionMapper at expression creation time. Each is invoked if not null, independent of whether the #{} or ${} syntax is used for the expression.

`expression` - The expression to parse

`expectedType` - The type the result of the expression will be coerced to after evaluation.

Returns: The parsed expression

Throws:

`java.lang.NullPointerException` - Thrown if expectedType is null.

`ELException`[59] - Thrown if there are syntactical errors in the provided expression.

2.12.6 createValueExpression(Object, Class)

```
public abstract javax.el.ValueExpression[102] createValueExpression(java.lang.Object
            instance, java.lang.Class expectedType)
```

Creates a ValueExpression that wraps an object instance. This method can be used to pass any object as a ValueExpression. The wrapper ValueExpression is read only, and returns the wrapped object via its `getValue()` method, optionally coerced.

Parameters:

`instance` - The object instance to be wrapped.

`expectedType` - The type the result of the expression will be coerced to after evaluation. There will be no coercion if it is Object.class,

Throws:

`java.lang.NullPointerException` - Thrown if expectedType is null.

2.12.7 newInstance()

```
public static javax.el.ExpressionFactory71 newInstance()
```

Creates a new instance of a `ExpressionFactory`. This method uses the following ordered lookup procedure to determine the `ExpressionFactory` implementation class to load:

- Use the Services API (as detailed in the JAR specification). If a resource with the name of `META-INF/services/javax.el.ExpressionFactory` exists, then its first line, if present, is used as the UTF-8 encoded name of the implementation class.
- Use the properties file "lib/el.properties" in the JRE directory. If this file exists and it is readable by the `java.util.Properties.load(InputStream)` method, and it contains an entry whose key is "javax.el.ExpressionFactory", then the value of that entry is used as the name of the implementation class.
- Use the `javax.el.ExpressionFactory` system property. If a system property with this name is defined, then its value is used as the name of the implementation class.
- Use a platform default implementation.

2.12.8 newInstance(Properties)

```
public static javax.el.ExpressionFactory71 newInstance(java.util.Properties properties)
```

Create a new instance of a `ExpressionFactory`, with optional properties. This method uses the same lookup procedure as the one used in `newInstance()`.

If the argument `properties` is not null, and if the implementation contains a constructor with a single parameter of type `java.util.Properties`, then the constructor is used to create the instance.

Properties are optional and can be ignored by an implementation.

The name of a property should start with "javax.el."

The following are some suggested names for properties.

- javax.el.cacheSize

Parameters:

`properties` - Properties passed to the implementation. If null, then no properties.

2.13 javax.el
FunctionMapper

2.13.1 Declaration

```
public abstract class FunctionMapper

java.lang.Object
  |
  +--javax.el.FunctionMapper
```

2.13.2 Description

The interface to a map between EL function names and methods.

A `FunctionMapper` maps `${prefix:name()}` style functions to a static method that can execute that function.

Since: JSP 2.1

Member Summary	
Constructors	
	FunctionMapper() 75
Methods	
abstract java.lang.reflect.Method	resolveFunction(java.lang.String prefix, java.lang.String localName) 76

Inherited Member Summary
Methods inherited from class `Object`
clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.13.3 FunctionMapper()

```
public FunctionMapper()
```

Methods

2.13.4 resolveFunction(String, String)

```
public abstract java.lang.reflect.Method resolveFunction(java.lang.String prefix,
            java.lang.String localName)
```

Resolves the specified prefix and local name into a `java.lang.Method`.

Returns `null` if no function could be found that matches the given prefix and local name.

Parameters:

`prefix` - the prefix of the function, or "" if no prefix. For example, `"fn"` in `${fn:method()}`, or `""` in `${method()}`.

`localName` - the short name of the function. For example, `"method"` in `${fn:method()}`.

Returns: the static method to invoke, or `null` if no match was found.

2.14 javax.el
ListELResolver

2.14.1 Declaration

```
public class ListELResolver extends ELResolver61

java.lang.Object
  |
  +--javax.el.ELResolver61
        |
        +--javax.el.ListELResolver
```

2.14.2 Description

Defines property resolution behavior on instances of `java.util.List`.

This resolver handles base objects of type `java.util.List`. It accepts any object as a property and coerces that object into an integer index into the list. The resulting value is the value in the list at that index.

This resolver can be constructed in read-only mode, which means that `isReadOnly` will always return `true` and `setValue(ELContext, Object, Object, Object)`81 will always throw `PropertyNotWritableException`.

`ELResolvers` are combined together using `CompositeELResolver`44s, to define rich semantics for evaluating an expression. See the javadocs for `ELResolver`61 for details.

Since: JSP 2.1

See Also: `CompositeELResolver`44, `ELResolver`61, `java.util.List`

Member Summary

Constructors

	`ListELResolver()`78
	`ListELResolver(boolean isReadOnly)`78

Methods

`java.lang.Class`	`getCommonPropertyType(ELContext context, java.lang.Object base)`78
`java.util.Iterator`	`getFeatureDescriptors(ELContext context, java.lang.Object base)`79
`java.lang.Class`	`getType(ELContext context, java.lang.Object base, java.lang.Object property)`79
`java.lang.Object`	`getValue(ELContext context, java.lang.Object base, java.lang.Object property)`79
`boolean`	`isReadOnly(ELContext context, java.lang.Object base, java.lang.Object property)`80
`void`	`setValue(ELContext context, java.lang.Object base, java.lang.Object property, java.lang.Object val)`81

Inherited Member Summary

Fields inherited from class `ELResolver`[61]

`RESOLVABLE_AT_DESIGN_TIME`[62], `TYPE`[63]

Methods inherited from class `ELResolver`[61]

`invoke(ELContext, Object, Object, Class[], Object[])`[65]

Methods inherited from class `Object`

`clone()`, `equals(Object)`, `finalize()`, `getClass()`, `hashCode()`, `notify()`, `notifyAll()`, `toString()`, `wait()`, `wait(long)`, `wait(long, int)`

Constructors

2.14.3 ListELResolver()

```
public ListELResolver()
```

Creates a new read/write `ListELResolver`.

2.14.4 ListELResolver(boolean)

```
public ListELResolver(boolean isReadOnly)
```

Creates a new `ListELResolver` whose read-only status is determined by the given parameter.

Parameters:

`isReadOnly` - `true` if this resolver cannot modify lists; `false` otherwise.

Methods

2.14.5 getCommonPropertyType(ELContext, Object)

```
public java.lang.Class getCommonPropertyType(javax.el.ELContext[52] context,
            java.lang.Object base)
```

If the base object is a list, returns the most general type that this resolver accepts for the `property` argument. Otherwise, returns `null`.

Assuming the base is a `List`, this method will always return `Integer.class`. This is because `Lists` accept integers as their index.

Overrides: `getCommonPropertyType`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The list to analyze. Only bases of type `List` are handled by this resolver.

Returns: `null` if base is not a `List`; otherwise `Integer.class`.

2.14.6 getFeatureDescriptors(ELContext, Object)

```
public java.util.Iterator getFeatureDescriptors(javax.el.ELContext52 context,
            java.lang.Object base)
```

Always returns `null`, since there is no reason to iterate through set set of all integers.

The `getCommonPropertyType(ELContext, Object)`78 method returns sufficient information about what properties this resolver accepts.

Overrides: `getFeatureDescriptors`63 in class `ELResolver`61

Parameters:

`context` - The context of this evaluation.

`base` - The list. Only bases of type `List` are handled by this resolver.

Returns: `null`.

2.14.7 getType(ELContext, Object, Object)

```
public java.lang.Class getType(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is a list, returns the most general acceptable type for a value in this list.

If the base is a `List`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Assuming the base is a `List`, this method will always return `Object.class`. This is because `Lists` accept any object as an element.

Overrides: `getType`64 in class `ELResolver`61

Parameters:

`context` - The context of this evaluation.

`base` - The list to analyze. Only bases of type `List` are handled by this resolver.

`property` - The index of the element in the list to return the acceptable type for. Will be coerced into an integer, but otherwise ignored by this resolver.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the most general acceptable type; otherwise undefined.

Throws:

`PropertyNotFoundException`94 - if the given index is out of bounds for this list.

`java.lang.NullPointerException` - if context is `null`

`ELException`59 - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.14.8 getValue(ELContext, Object, Object)

```
public java.lang.Object getValue(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is a list, returns the value at the given index. The index is specified by the `property` argument, and coerced into an integer. If the coercion could not be performed, an `IllegalArgumentException` is thrown. If the index is out of bounds, `null` is returned.

If the base is a `List`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Overrides: `getValue`[65] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The list to be analyzed. Only bases of type `List` are handled by this resolver.

`property` - The index of the value to be returned. Will be coerced into an integer.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the value at the given index or `null` if the index was out of bounds. Otherwise, undefined.

Throws:

`java.lang.IllegalArgumentException` - if the property could not be coerced into an integer.

`java.lang.NullPointerException` - if context is `null`.

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.14.9 isReadOnly(ELContext, Object, Object)

```
public boolean isReadOnly(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is a list, returns whether a call to `setValue(ELContext, Object, Object, Object)`[81] will always fail.

If the base is a `List`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

If this resolver was constructed in read-only mode, this method will always return `true`.

If a `List` was created using `java.util.Collections.unmodifiableList(List)`, this method must return `true`. Unfortunately, there is no Collections API method to detect this. However, an implementation can create a prototype unmodifiable `List` and query its runtime type to see if it matches the runtime type of the base object as a workaround.

Overrides: `isReadOnly`[66] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The list to analyze. Only bases of type `List` are handled by this resolver.

`property` - The index of the element in the list to return the acceptable type for. Will be coerced into an integer, but otherwise ignored by this resolver.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `true` if calling the `setValue` method will always fail or `false` if it is possible that such a call may succeed; otherwise undefined.

Throws:

`PropertyNotFoundException`[94] - if the given index is out of bounds for this list.

`java.lang.NullPointerException` - if context is `null`

ELException[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.14.10 setValue(ELContext, Object, Object, Object)

```
public void setValue(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property, java.lang.Object val)
```

If the base object is a list, attempts to set the value at the given index with the given value. The index is specified by the `property` argument, and coerced into an integer. If the coercion could not be performed, an `IllegalArgumentException` is thrown. If the index is out of bounds, a `PropertyNotFoundException` is thrown.

If the base is a `List`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller can safely assume no value was set.

If this resolver was constructed in read-only mode, this method will always throw `PropertyNotWritableException`.

If a `List` was created using `java.util.Collections.unmodifiableList(List)`, this method must throw `PropertyNotWritableException`. Unfortunately, there is no Collections API method to detect this. However, an implementation can create a prototype unmodifiable `List` and query its runtime type to see if it matches the runtime type of the base object as a workaround.

Overrides: setValue[66] in class ELResolver[61]

Parameters:

`context` - The context of this evaluation.

`base` - The list to be modified. Only bases of type `List` are handled by this resolver.

`property` - The index of the value to be set. Will be coerced into an integer.

`val` - The value to be set at the given index.

Throws:

`java.lang.ClassCastException` - if the class of the specified element prevents it from being added to this list.

`java.lang.NullPointerException` - if context is `null`, or if the value is `null` and this `List` does not support `null` elements.

`java.lang.IllegalArgumentException` - if the property could not be coerced into an integer, or if some aspect of the specified element prevents it from being added to this list.

PropertyNotWritableException[96] - if this resolver was constructed in read-only mode, or if the set operation is not supported by the underlying list.

PropertyNotFoundException[94] - if the given index is out of bounds for this list.

ELException[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.15 javax.el
MapELResolver

2.15.1 Declaration

```
public class MapELResolver extends ELResolver61

java.lang.Object
  |
  +--javax.el.ELResolver61
        |
        +--javax.el.MapELResolver
```

2.15.2 Description

Defines property resolution behavior on instances of `java.util.Map`.

This resolver handles base objects of type `java.util.Map`. It accepts any object as a property and uses that object as a key in the map. The resulting value is the value in the map that is associated with that key.

This resolver can be constructed in read-only mode, which means that `isReadOnly` will always return `true` and `setValue(ELContext, Object, Object, Object)`86 will always throw `PropertyNotWritableException`.

`ELResolvers` are combined together using `CompositeELResolver`44s, to define rich semantics for evaluating an expression. See the javadocs for `ELResolver`61 for details.

Since: JSP 2.1

See Also: `CompositeELResolver`44, `ELResolver`61, `java.util.Map`

Member Summary

Constructors

	`MapELResolver()`83
	`MapELResolver(boolean isReadOnly)`83

Methods

`java.lang.Class`	`getCommonPropertyType(ELContext context, java.lang.Object base)`83
`java.util.Iterator`	`getFeatureDescriptors(ELContext context, java.lang.Object base)`84
`java.lang.Class`	`getType(ELContext context, java.lang.Object base, java.lang.Object property)`84
`java.lang.Object`	`getValue(ELContext context, java.lang.Object base, java.lang.Object property)`85
`boolean`	`isReadOnly(ELContext context, java.lang.Object base, java.lang.Object property)`85
`void`	`setValue(ELContext context, java.lang.Object base, java.lang.Object property, java.lang.Object val)`86

Inherited Member Summary

Fields inherited from class ELResolver[61]

RESOLVABLE_AT_DESIGN_TIME[62], TYPE[63]

Methods inherited from class ELResolver[61]

invoke(ELContext, Object, Object, Class[], Object[])[65]

Methods inherited from class Object

clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.15.3 MapELResolver()

```
public MapELResolver()
```

Creates a new read/write MapELResolver.

2.15.4 MapELResolver(boolean)

```
public MapELResolver(boolean isReadOnly)
```

Creates a new MapELResolver whose read-only status is determined by the given parameter.

Parameters:

isReadOnly - true if this resolver cannot modify maps; false otherwise.

Methods

2.15.5 getCommonPropertyType(ELContext, Object)

```
public java.lang.Class getCommonPropertyType(javax.el.ELContext[52] context,
            java.lang.Object base)
```

If the base object is a map, returns the most general type that this resolver accepts for the property argument. Otherwise, returns null.

Assuming the base is a Map, this method will always return Object.class. This is because Maps accept any object as a key.

Overrides: getCommonPropertyType[63] in class ELResolver[61]

Parameters:

context - The context of this evaluation.

base - The map to analyze. Only bases of type Map are handled by this resolver.

Returns: null if base is not a Map; otherwise Object.class.

2.15.6 getFeatureDescriptors(ELContext, Object)

```
public java.util.Iterator getFeatureDescriptors(javax.el.ELContext52 context,
            java.lang.Object base)
```

If the base object is a map, returns an `Iterator` containing the set of keys available in the `Map`. Otherwise, returns `null`.

The `Iterator` returned must contain zero or more instances of `java.beans.FeatureDescriptor`. Each info object contains information about a key in the Map, and is initialized as follows:

displayName - The return value of calling the `toString` method on this key, or `"null"` if the key is `null`. name - Same as displayName property. shortDescription - Empty string expert - `false` hidden - `false` preferred - `true`

In addition, the following named attributes must be set in the returned `FeatureDescriptors`:

`ELResolver.TYPE`[63] - The return value of calling the `getClass()` method on this key, or `null` if the key is `null`. `ELResolver.RESOLVABLE_AT_DESIGN_TIME`[62] - `true`

Overrides: `getFeatureDescriptors`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The map whose keys are to be iterated over. Only bases of type `Map` are handled by this resolver.

Returns: An `Iterator` containing zero or more (possibly infinitely more) `FeatureDescriptor` objects, each representing a key in this map, or `null` if the base object is not a map.

2.15.7 getType(ELContext, Object, Object)

```
public java.lang.Class getType(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is a map, returns the most general acceptable type for a value in this map.

If the base is a `Map`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Assuming the base is a `Map`, this method will always return `Object.class`. This is because `Maps` accept any object as the value for a given key.

Overrides: `getType`[64] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The map to analyze. Only bases of type `Map` are handled by this resolver.

`property` - The key to return the acceptable type for. Ignored by this resolver.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the most general acceptable type; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.15.8 getValue(ELContext, Object, Object)

```
public java.lang.Object getValue(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is a map, returns the value associated with the given key, as specified by the `property` argument. If the key was not found, `null` is returned.

If the base is a `Map`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Just as in `java.util.Map.get(Object)`, just because `null` is returned doesn't mean there is no mapping for the key; it's also possible that the `Map` explicitly maps the key to `null`.

Overrides: `getValue`[65] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The map to be analyzed. Only bases of type `Map` are handled by this resolver.

`property` - The key whose associated value is to be returned.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then the value associated with the given key or `null` if the key was not found. Otherwise, undefined.

Throws:

`java.lang.ClassCastException` - if the key is of an inappropriate type for this map (optionally thrown by the underlying `Map`).

`java.lang.NullPointerException` - if context is `null`, or if the key is null and this map does not permit null keys (the latter is optionally thrown by the underlying `Map`).

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.15.9 isReadOnly(ELContext, Object, Object)

```
public boolean isReadOnly(javax.el.ELContext52 context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is a map, returns whether a call to `setValue(ELContext, Object, Object, Object)`[86] will always fail.

If the base is a `Map`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

If this resolver was constructed in read-only mode, this method will always return `true`.

If a `Map` was created using `java.util.Collections.unmodifiableMap(Map)`, this method must return `true`. Unfortunately, there is no Collections API method to detect this. However, an implementation can create a prototype unmodifiable `Map` and query its runtime type to see if it matches the runtime type of the base object as a workaround.

Overrides: `isReadOnly`[66] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The map to analyze. Only bases of type `Map` are handled by this resolver.

`property` - The key to return the read-only status for. Ignored by this resolver.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `true` if calling the `setValue` method will always fail or `false` if it is possible that such a call may succeed; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.15.10 setValue(ELContext, Object, Object, Object)

```
public void setValue(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property, java.lang.Object val)
```

If the base object is a map, attempts to set the value associated with the given key, as specified by the `property` argument.

If the base is a `Map`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller can safely assume no value was set.

If this resolver was constructed in read-only mode, this method will always throw `PropertyNotWritableException`.

If a `Map` was created using `java.util.Collections.unmodifiableMap(Map)`, this method must throw `PropertyNotWritableException`. Unfortunately, there is no Collections API method to detect this. However, an implementation can create a prototype unmodifiable `Map` and query its runtime type to see if it matches the runtime type of the base object as a workaround.

Overrides: `setValue`[66] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The map to be modified. Only bases of type `Map` are handled by this resolver.

`property` - The key with which the specified value is to be associated.

`val` - The value to be associated with the specified key.

Throws:

`java.lang.ClassCastException` - if the class of the specified key or value prevents it from being stored in this map.

`java.lang.NullPointerException` - if context is `null`, or if this map does not permit `null` keys or values, and the specified key or value is `null`.

`java.lang.IllegalArgumentException` - if some aspect of this key or value prevents it from being stored in this map.

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

`PropertyNotWritableException`[96] - if this resolver was constructed in read-only mode, or if the put operation is not supported by the underlying map.

2.16 javax.el
MethodExpression

2.16.1 Declaration

```
public abstract class MethodExpression extends Expression[68]

java.lang.Object
  |
  +--javax.el.Expression[68]
        |
        +--javax.el.MethodExpression
```

All Implemented Interfaces: `java.io.Serializable`

2.16.2 Description

An `Expression` that refers to a method on an object.

The `ExpressionFactory.createMethodExpression(ELContext, String, Class, Class[])`[72] method can be used to parse an expression string and return a concrete instance of `MethodExpression` that encapsulates the parsed expression. The `FunctionMapper`[75] is used at parse time, not evaluation time, so one is not needed to evaluate an expression using this class. However, the `ELContext`[52] is needed at evaluation time.

The `getMethodInfo(ELContext)`[88] and `invoke(ELContext, Object[])`[88] methods will evaluate the expression each time they are called. The `ELResolver`[61] in the `ELContext` is used to resolve the top-level variables and to determine the behavior of the `.` and `[]` operators. For any of the two methods, the `ELResolver.getValue(ELContext, Object, Object)`[65] method is used to resolve all properties up to but excluding the last one. This provides the `base` object on which the method appears. If the `base` object is null, a `PropertyNotFoundException` must be thrown. At the last resolution, the final `property` is then coerced to a `String`, which provides the name of the method to be found. A method matching the name and expected parameters provided at parse time is found and it is either queried or invoked (depending on the method called on this `MethodExpression`).

See the notes about comparison, serialization and immutability in the `Expression`[68] javadocs.

Since: JSP 2.1

See Also: `ELResolver`[61], `Expression`[68], `ExpressionFactory`[71]

Member Summary

Constructors

	`MethodExpression()`[88]

Methods

abstract MethodInfo	`getMethodInfo(ELContext context)`[88]
abstract java.lang.Object	`invoke(ELContext context, java.lang.Object[] params)`[88]
boolean	`isParmetersProvided()`[89]

Inherited Member Summary
Methods inherited from class `Expression` [68] `equals(Object)` [69], `getExpressionString()` [69], `hashCode()` [69], `isLiteralText()` [70] **Methods inherited from class `Object`** `clone()`, `finalize()`, `getClass()`, `notify()`, `notifyAll()`, `toString()`, `wait()`, `wait(long)`, `wait(long, int)`

Constructors

2.16.3 MethodExpression()

```
public MethodExpression()
```

Methods

2.16.4 getMethodInfo(ELContext)

```
public abstract javax.el.MethodInfo[90] getMethodInfo(javax.el.ELContext[52] context)
```

Evaluates the expression relative to the provided context, and returns information about the actual referenced method.

Parameters:
`context` - The context of this evaluation

Returns: an instance of `MethodInfo` containing information about the method the expression evaluated to.

Throws:
`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException` [94] - if one of the property resolutions failed because a specified variable or property does not exist or is not readable.

`MethodNotFoundException` [92] - if no suitable method can be found.

`ELException` [59] - if an exception was thrown while performing property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.16.5 invoke(ELContext, Object[])

```
public abstract java.lang.Object invoke(javax.el.ELContext[52] context,
            java.lang.Object[] params)
```

If a String literal is specified as the expression, returns the String literal coerced to the expected return type of the method signature. An `ELException` is thrown if `expectedReturnType` is void or if the coercion of the String literal to the `expectedReturnType` yields an error (see Section “1.18 Type Conversion” of the EL specification). If not a String literal, evaluates the expression relative to the provided context, invokes the method that was found using the supplied parameters, and returns the result of the

method invocation. Any parameters passed to this method is ignored if isLiteralText() or isParametersProvided() is true.

Parameters:

`context` - The context of this evaluation.

`params` - The parameters to pass to the method, or `null` if no parameters.

Returns: the result of the method invocation (`null` if the method has a `void` return type).

Throws:

`java.lang.NullPointerException` - if context is `null`

`PropertyNotFoundException`$_{94}$ - if one of the property resolutions failed because a specified variable or property does not exist or is not readable.

`MethodNotFoundException`$_{92}$ - if no suitable method can be found.

`ELException`$_{59}$ - if a String literal is specified and expectedReturnType of the MethodExpression is void or if the coercion of the String literal to the expectedReturnType yields an error (see Section "1.18 Type Conversion").

`ELException`$_{59}$ - if an exception was thrown while performing property or variable resolution. The thrown exception must be included as the cause property of this exception, if available. If the exception thrown is an `InvocationTargetException`, extract its `cause` and pass it to the `ELException` constructor.

2.16.6 isParmetersProvided()

```
public boolean isParmetersProvided()
```

Return whether this MethodExpression was created with parameters.

This method must return `true` if and only if parameters are specified in the EL, using the expr-a.expr-b(...) syntax.

Returns: `true` if the MethodExpression was created with parameters, `false` otherwise.

Since: EL 2.2

2.17 javax.el
MethodInfo

2.17.1 Declaration

```
public class MethodInfo

java.lang.Object
  |
  +--javax.el.MethodInfo
```

2.17.2 Description

Holds information about a method that a `MethodExpression`[87] evaluated to.

Since: JSP 2.1

Member Summary	
Constructors	
	`MethodInfo(java.lang.String name, java.lang.Class returnType, java.lang.Class[] paramTypes)`[90]
Methods	
`java.lang.String`	`getName()`[91]
`java.lang.Class[]`	`getParamTypes()`[91]
`java.lang.Class`	`getReturnType()`[91]

Inherited Member Summary
Methods inherited from class `Object`
`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)`

Constructors

2.17.3 MethodInfo(String, Class, Class[])

```
public MethodInfo(java.lang.String name, java.lang.Class returnType,
            java.lang.Class[] paramTypes)
```

Creates a new instance of `MethodInfo` with the given information.

Parameters:

`name` - The name of the method

`returnType` - The return type of the method

`paramTypes` - The types of each of the method's parameters

Methods

2.17.4 getName()

```
public java.lang.String getName()
```

Returns the name of the method

Returns: the name of the method

2.17.5 getParamTypes()

```
public java.lang.Class[] getParamTypes()
```

Returns the parameter types of the method

Returns: the parameter types of the method

2.17.6 getReturnType()

```
public java.lang.Class getReturnType()
```

Returns the return type of the method

Returns: the return type of the method

2.18 javax.el
MethodNotFoundException

2.18.1 Declaration

```
public class MethodNotFoundException extends ELException59
```

```
java.lang.Object
  |
  +--java.lang.Throwable
        |
        +--java.lang.Exception
              |
              +--java.lang.RuntimeException
                    |
                    +--javax.el.ELException59
                          |
                          +--javax.el.MethodNotFoundException
```

All Implemented Interfaces: `java.io.Serializable`

2.18.2 Description

Thrown when a method could not be found while evaluating a `MethodExpression`87.

Since: JSP 2.1

See Also: `MethodExpression`87

Member Summary	
Constructors	
	`MethodNotFoundException()`93
	`MethodNotFoundException(java.lang.String message)`93
	`MethodNotFoundException(java.lang.String pMessage, java.lang.Throwable pRootCause)`93
	`MethodNotFoundException(java.lang.Throwable exception)`93

Inherited Member Summary
Methods inherited from class `Object`
`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), wait(), wait(long), wait(long, int)`
Methods inherited from class `Throwable`
`fillInStackTrace(), getCause(), getLocalizedMessage(), getMessage(), getStackTrace(), initCause(Throwable), printStackTrace(), printStackTrace(PrintStream), printStackTrace(PrintWriter), setStackTrace(StackTraceElement[]), toString()`

Constructors

2.18.3 MethodNotFoundException()

```
public MethodNotFoundException()
```

Creates a `MethodNotFoundException` with no detail message.

2.18.4 MethodNotFoundException(String)

```
public MethodNotFoundException(java.lang.String message)
```

Creates a `MethodNotFoundException` with the provided detail message.

Parameters:

`message` - the detail message

2.18.5 MethodNotFoundException(Throwable)

```
public MethodNotFoundException(java.lang.Throwable exception)
```

Creates a `MethodNotFoundException` with the given root cause.

Parameters:

`exception` - the originating cause of this exception

2.18.6 MethodNotFoundException(String, Throwable)

```
public MethodNotFoundException(java.lang.String pMessage,
            java.lang.Throwable pRootCause)
```

Creates a `MethodNotFoundException` with the given detail message and root cause.

Parameters:

`pMessage` - the detail message

`pRootCause` - the originating cause of this exception

2.19 javax.el
PropertyNotFoundException

2.19.1 Declaration

```
public class PropertyNotFoundException extends ELException59
```

```
java.lang.Object
  |
  +--java.lang.Throwable
        |
        +--java.lang.Exception
              |
              +--java.lang.RuntimeException
                    |
                    +--javax.el.ELException59
                          |
                          +--javax.el.PropertyNotFoundException
```

All Implemented Interfaces: `java.io.Serializable`

2.19.2 Description

Thrown when a property could not be found while evaluating a `ValueExpression`$_{102}$ or `MethodExpression`$_{87}$.

For example, this could be triggered by an index out of bounds while setting an array value, or by an unreadable property while getting the value of a JavaBeans property.

Since: JSP 2.1

Member Summary	
Constructors	
	`PropertyNotFoundException()`$_{95}$ `PropertyNotFoundException(java.lang.String message)`$_{95}$ `PropertyNotFoundException(java.lang.String pMessage, java.lang.Throwable pRootCause)`$_{95}$ `PropertyNotFoundException(java.lang.Throwable exception)`$_{95}$

Inherited Member Summary
Methods inherited from class `Object`
`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), wait(), wait(long), wait(long, int)`
Methods inherited from class `Throwable`

Inherited Member Summary
`fillInStackTrace(), getCause(), getLocalizedMessage(), getMessage(), getStackTrace(), initCause(Throwable), printStackTrace(), printStackTrace(PrintStream), printStackTrace(PrintWriter), setStackTrace(StackTraceElement[]), toString()`

Constructors

2.19.3 PropertyNotFoundException()

```
public PropertyNotFoundException()
```

Creates a `PropertyNotFoundException` with no detail message.

2.19.4 PropertyNotFoundException(String)

```
public PropertyNotFoundException(java.lang.String message)
```

Creates a `PropertyNotFoundException` with the provided detail message.

Parameters:

`message` - the detail message

2.19.5 PropertyNotFoundException(Throwable)

```
public PropertyNotFoundException(java.lang.Throwable exception)
```

Creates a `PropertyNotFoundException` with the given root cause.

Parameters:

`exception` - the originating cause of this exception

2.19.6 PropertyNotFoundException(String, Throwable)

```
public PropertyNotFoundException(java.lang.String pMessage,
            java.lang.Throwable pRootCause)
```

Creates a `PropertyNotFoundException` with the given detail message and root cause.

Parameters:

`pMessage` - the detail message

`pRootCause` - the originating cause of this exception

2.20 javax.el
PropertyNotWritableException

2.20.1 Declaration

```
public class PropertyNotWritableException extends ELException59

java.lang.Object
  |
  +--java.lang.Throwable
        |
        +--java.lang.Exception
              |
              +--java.lang.RuntimeException
                    |
                    +--javax.el.ELException59
                          |
                          +--javax.el.PropertyNotWritableException
```

All Implemented Interfaces: `java.io.Serializable`

2.20.2 Description

Thrown when a property could not be written to while setting the value on a `ValueExpression`[102].

For example, this could be triggered by trying to set a map value on an unmodifiable map.

Since: JSP 2.1

Member Summary	
Constructors	
	`PropertyNotWritableException()`[97] `PropertyNotWritableException(java.lang.String pMessage)`[97] `PropertyNotWritableException(java.lang.String pMessage, java.lang.Throwable pRootCause)`[97] `PropertyNotWritableException(java.lang.Throwable exception)`[97]

Inherited Member Summary
Methods inherited from class `Object`
`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), wait(), wait(long), wait(long, int)`
Methods inherited from class `Throwable`
`fillInStackTrace(), getCause(), getLocalizedMessage(), getMessage(), getStackTrace(), initCause(Throwable), printStackTrace(), printStackTrace(PrintStream), printStackTrace(PrintWriter), setStackTrace(StackTraceElement[]), toString()`

Constructors

2.20.3 PropertyNotWritableException()

```
public PropertyNotWritableException()
```

Creates a `PropertyNotWritableException` with no detail message.

2.20.4 PropertyNotWritableException(String)

```
public PropertyNotWritableException(java.lang.String pMessage)
```

Creates a `PropertyNotWritableException` with the provided detail message.

Parameters:

`pMessage` - the detail message

2.20.5 PropertyNotWritableException(Throwable)

```
public PropertyNotWritableException(java.lang.Throwable exception)
```

Creates a `PropertyNotWritableException` with the given root cause.

Parameters:

`exception` - the originating cause of this exception

2.20.6 PropertyNotWritableException(String, Throwable)

```
public PropertyNotWritableException(java.lang.String pMessage,
            java.lang.Throwable pRootCause)
```

Creates a `PropertyNotWritableException` with the given detail message and root cause.

Parameters:

`pMessage` - the detail message

`pRootCause` - the originating cause of this exception

2.21 javax.el
ResourceBundleELResolver

2.21.1 Declaration

```
public class ResourceBundleELResolver extends ELResolver61

java.lang.Object
  |
  +--javax.el.ELResolver61
        |
        +--javax.el.ResourceBundleELResolver
```

2.21.2 Description

Defines property resolution behavior on instances of `java.util.ResourceBundle`.

This resolver handles base objects of type `java.util.ResourceBundle`. It accepts any object as a property and coerces it to a `java.lang.String` for invoking `java.util.ResourceBundle.getObject(String)`.

This resolver is read only and will throw a `PropertyNotWritableException`$_{96}$ if `setValue` is called.

`ELResolvers` are combined together using `CompositeELResolver`$_{44}$s, to define rich semantics for evaluating an expression. See the javadocs for `ELResolver`$_{61}$ for details.

Since: JSP 2.1

See Also: `CompositeELResolver`$_{44}$, `ELResolver`$_{61}$, `java.util.ResourceBundle`

Member Summary	
Constructors	
	`ResourceBundleELResolver()`$_{99}$
Methods	
`java.lang.Class`	`getCommonPropertyType(ELContext context, java.lang.Object base)`$_{99}$
`java.util.Iterator`	`getFeatureDescriptors(ELContext context, java.lang.Object base)`$_{99}$
`java.lang.Class`	`getType(ELContext context, java.lang.Object base, java.lang.Object property)`$_{100}$
`java.lang.Object`	`getValue(ELContext context, java.lang.Object base, java.lang.Object property)`$_{100}$
`boolean`	`isReadOnly(ELContext context, java.lang.Object base, java.lang.Object property)`$_{101}$
`void`	`setValue(ELContext context, java.lang.Object base, java.lang.Object property, java.lang.Object value)`$_{101}$

Inherited Member Summary

Fields inherited from class `ELResolver`[61]

`RESOLVABLE_AT_DESIGN_TIME`[62], `TYPE`[63]

Methods inherited from class `ELResolver`[61]

`invoke(ELContext, Object, Object, Class[], Object[])`[65]

Methods inherited from class `Object`

`clone()`, `equals(Object)`, `finalize()`, `getClass()`, `hashCode()`, `notify()`, `notifyAll()`, `toString()`, `wait()`, `wait(long)`, `wait(long, int)`

Constructors

2.21.3 ResourceBundleELResolver()

```
public ResourceBundleELResolver()
```

Methods

2.21.4 getCommonPropertyType(ELContext, Object)

```
public java.lang.Class getCommonPropertyType(javax.el.ELContext[52] context,
            java.lang.Object base)
```

If the base object is a ResourceBundle, returns the most general type that this resolver accepts for the `property` argument. Otherwise, returns `null`.

Assuming the base is a `ResourceBundle`, this method will always return `String.class`.

Overrides: `getCommonPropertyType`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The bundle to analyze. Only bases of type `ResourceBundle` are handled by this resolver.

Returns: `null` if base is not a `ResourceBundle`; otherwise `String.class`.

2.21.5 getFeatureDescriptors(ELContext, Object)

```
public java.util.Iterator getFeatureDescriptors(javax.el.ELContext[52] context,
            java.lang.Object base)
```

If the base object is a ResourceBundle, returns an `Iterator` containing the set of keys available in the `ResourceBundle`. Otherwise, returns `null`.

The `Iterator` returned must contain zero or more instances of `java.beans.FeatureDescriptor`. Each info object contains information about a key in the ResourceBundle, and is initialized as follows:

displayName - The `String` key name - Same as displayName property. shortDescription - Empty string expert - `false` hidden - `false` preferred - `true`

In addition, the following named attributes must be set in the returned `FeatureDescriptors`:

`ELResolver.TYPE`[63] - `String.class` `ELResolver.RESOLVABLE_AT_DESIGN_TIME`[62] - `true`

Overrides: `getFeatureDescriptors`[63] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The bundle whose keys are to be iterated over. Only bases of type `ResourceBundle` are handled by this resolver.

Returns: An `Iterator` containing zero or more (possibly infinitely more) `FeatureDescriptor` objects, each representing a key in this bundle, or `null` if the base object is not a ResourceBundle.

2.21.6 getType(ELContext, Object, Object)

```
public java.lang.Class getType(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is an instance of `ResourceBundle`, return `null`, since the resolver is read only.

If the base is `ResourceBundle`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Overrides: `getType`[64] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The ResourceBundle to analyze.

`property` - The name of the property to analyze.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `null`; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

2.21.7 getValue(ELContext, Object, Object)

```
public java.lang.Object getValue(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is an instance of `ResourceBundle`, the provided property will first be coerced to a `String`. The `Object` returned by `getObject` on the base `ResourceBundle` will be returned.

If the base is `ResourceBundle`, the `propertyResolved` property of the `ELContext` object must be set to `true` by this resolver, before returning. If this property is not `true` after this method is called, the caller should ignore the return value.

Overrides: `getValue`[65] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The ResourceBundle to analyze.

`property` - The name of the property to analyze. Will be coerced to a `String`.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `null` if property is `null`; otherwise the `Object` for the given key (property coerced to `String`) from the `ResourceBundle`. If no object for the given key can be found, then the `String` "???" + key + "???".

Throws:

`java.lang.NullPointerException` - if context is `null`

`ELException`[59] - if an exception was thrown while performing the property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.21.8 isReadOnly(ELContext, Object, Object)

```
public boolean isReadOnly(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property)
```

If the base object is not null and an instanceof `java.util.ResourceBundle`, return `true`.

Overrides: `isReadOnly`[66] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The ResourceBundle to be modified. Only bases that are of type ResourceBundle are handled.

`property` - The String property to use.

Returns: If the `propertyResolved` property of `ELContext` was set to `true`, then `true`; otherwise undefined.

Throws:

`java.lang.NullPointerException` - if context is `null`

2.21.9 setValue(ELContext, Object, Object, Object)

```
public void setValue(javax.el.ELContext[52] context, java.lang.Object base,
            java.lang.Object property, java.lang.Object value)
```

If the base object is a ResourceBundle, throw a `PropertyNotWritableException`[96].

Overrides: `setValue`[66] in class `ELResolver`[61]

Parameters:

`context` - The context of this evaluation.

`base` - The ResourceBundle to be modified. Only bases that are of type ResourceBundle are handled.

`property` - The String property to use.

`value` - The value to be set.

Throws:

`java.lang.NullPointerException` - if context is `null`.

`PropertyNotWritableException`[96] - Always thrown if base is an instance of ReasourceBundle.

2.22 javax.el
ValueExpression

2.22.1 Declaration

```
public abstract class ValueExpression extends Expression 68

java.lang.Object
  |
  +--javax.el.Expression 68
        |
        +--javax.el.ValueExpression
```

All Implemented Interfaces: `java.io.Serializable`

2.22.2 Description

An `Expression` that can get or set a value.

In previous incarnations of this API, expressions could only be read. `ValueExpression` objects can now be used both to retrieve a value and to set a value. Expressions that can have a value set on them are referred to as l-value expressions. Those that cannot are referred to as r-value expressions. Not all r-value expressions can be used as l-value expressions (e.g. `"${1+1}"` or `"${firstName} ${lastName}"`). See the EL Specification for details. Expressions that cannot be used as l-values must always return `true` from `isReadOnly()`.

The `ExpressionFactory.createValueExpression(ELContext, String, Class)` 73 method can be used to parse an expression string and return a concrete instance of `ValueExpression` that encapsulates the parsed expression. The `FunctionMapper` 75 is used at parse time, not evaluation time, so one is not needed to evaluate an expression using this class. However, the `ELContext` 52 is needed at evaluation time.

The `getValue(ELContext)` 104, `setValue(ELContext, Object)` 105, `isReadOnly(ELContext)` 105, `getType(ELContext)` 103 and `getValueReference(ELContext)` 104 methods will evaluate the expression each time they are called. The `ELResolver` 61 in the `ELContext` is used to resolve the top-level variables and to determine the behavior of the `.` and `[]` operators. For any of the five methods, the `ELResolver.getValue(ELContext, Object, Object)` 65 method is used to resolve all properties up to but excluding the last one. This provides the `base` object. For all methods other than the `getValueReference(ELContext)` 104 method, at the last resolution, the `ValueExpression` will call the corresponding `ELResolver.getValue(ELContext, Object, Object)` 65, `ELResolver.setValue(ELContext, Object, Object, Object)` 66, `ELResolver.isReadOnly(ELContext, Object, Object)` 66 or `ELResolver.getType(ELContext, Object, Object)` 64 method, depending on which was called on the `ValueExpression`. For the `getValueReference` method, the (base, property) is not resolved by the ELResolver, but an instance of `ValueReference` 106 is created to encapsulate this (base ,property), and returned.

See the notes about comparison, serialization and immutability in the `Expression` 68 javadocs.

Since: JSP 2.1

See Also: ELResolver[61], Expression[68], ExpressionFactory[71]

Member Summary

Constructors

	ValueExpression()[103]

Methods

abstract java.lang.Class	getExpectedType()[103]
abstract java.lang.Class	getType(ELContext context)[103]
abstract java.lang.Object	getValue(ELContext context)[104]
ValueReference	getValueReference(ELContext context)[104]
abstract boolean	isReadOnly(ELContext context)[105]
abstract void	setValue(ELContext context, java.lang.Object value)[105]

Inherited Member Summary

Methods inherited from class Expression[68]

equals(Object)[69], getExpressionString()[69], hashCode()[69], isLiteralText()[70]

Methods inherited from class Object

clone(), finalize(), getClass(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.22.3 ValueExpression()

```
public ValueExpression()
```

Methods

2.22.4 getExpectedType()

```
public abstract java.lang.Class getExpectedType()
```

Returns the type the result of the expression will be coerced to after evaluation.

Returns: the `expectedType` passed to the `ExpressionFactory.createValueExpression` method that created this `ValueExpression`.

2.22.5 getType(ELContext)

```
public abstract java.lang.Class getType(javax.el.ELContext[52] context)
```

Evaluates the expression relative to the provided context, and returns the most general type that is acceptable for an object to be passed as the `value` parameter in a future call to the `setValue(ELContext, Object)`[105] method.

This is not always the same as `getValue().getClass()`. For example, in the case of an expression that references an array element, the `getType` method will return the element type of the array, which might be a superclass of the type of the actual element that is currently in the specified array element.

Parameters:
`context` - The context of this evaluation.

Returns: the most general acceptable type; otherwise undefined.

Throws:
`java.lang.NullPointerException` - if context is `null`.

`PropertyNotFoundException`[94] - if one of the property resolutions failed because a specified variable or property does not exist or is not readable.

`ELException`[59] - if an exception was thrown while performing property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.22.6 getValue(ELContext)

```
public abstract java.lang.Object getValue(javax.el.ELContext[52] context)
```

Evaluates the expression relative to the provided context, and returns the resulting value.

The resulting value is automatically coerced to the type returned by `getExpectedType()`, which was provided to the `ExpressionFactory` when this expression was created.

Parameters:
`context` - The context of this evaluation.

Returns: The result of the expression evaluation.

Throws:
`java.lang.NullPointerException` - if context is `null`.

`PropertyNotFoundException`[94] - if one of the property resolutions failed because a specified variable or property does not exist or is not readable.

`ELException`[59] - if an exception was thrown while performing property or variable resolution. The thrown exception must be included as the cause property of this exception, if available.

2.22.7 getValueReference(ELContext)

```
public javax.el.ValueReference[106] getValueReference(javax.el.ELContext[52] context)
```

Returns a `ValueReference`[106] for this expression instance.

Parameters:
`context` - the context of this evaluation

Returns: the `ValueReference` for this `ValueExpression`, or `null` if this `ValueExpression` is not a reference to a base (null or non-null) and a property. If the base is null, and the property is a EL variable, return the `ValueReference` for the `ValueExpression` associated with this EL variable.

Since: EL 2.2

2.22.8 isReadOnly(ELContext)

```
public abstract boolean isReadOnly(javax.el.ELContext52 context)
```

Evaluates the expression relative to the provided context, and returns `true` if a call to `setValue(ELContext, Object)`105 will always fail.

Parameters:

`context` - The context of this evaluation.

Returns: `true` if the expression is read-only or `false` if not.

Throws:

`java.lang.NullPointerException` - if context is `null`.

`PropertyNotFoundException`94 - if one of the property resolutions failed because a specified variable or property does not exist or is not readable.

`ELException`59 - if an exception was thrown while performing property or variable resolution. The thrown exception must be included as the cause property of this exception, if available. * @throws NullPointerException if context is `null`

2.22.9 setValue(ELContext, Object)

```
public abstract void setValue(javax.el.ELContext52 context, java.lang.Object value)
```

Evaluates the expression relative to the provided context, and sets the result to the provided value.

Parameters:

`context` - The context of this evaluation.

`value` - The new value to be set.

Throws:

`java.lang.NullPointerException` - if context is `null`.

`PropertyNotFoundException`94 - if one of the property resolutions failed because a specified variable or property does not exist or is not readable.

`PropertyNotWritableException`96 - if the final variable or property resolution failed because the specified variable or property is not writable.

`ELException`59 - if an exception was thrown while attempting to set the property or variable. The thrown exception must be included as the cause property of this exception, if available.

2.23 javax.el
ValueReference

2.23.1 Declaration

```
public class ValueReference implements java.io.Serializable

java.lang.Object
  |
  +--javax.el.ValueReference
```

All Implemented Interfaces: `java.io.Serializable`

2.23.2 Description

This encapsulates a base model object and one of its properties.

Since: EL 2.2

Member Summary	
Constructors	
	`ValueReference(java.lang.Object base, java.lang.Object property)` 106
Methods	
`java.lang.Object`	`getBase()` 107
`java.lang.Object`	`getProperty()` 107

Inherited Member Summary
Methods inherited from class `Object`
`clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)`

Constructors

2.23.3 ValueReference(Object, Object)

```
public ValueReference(java.lang.Object base, java.lang.Object property)
```

Methods

2.23.4 getBase()

```
public java.lang.Object getBase()
```

2.23.5 getProperty()

```
public java.lang.Object getProperty()
```

2.24 javax.el
VariableMapper

2.24.1 Declaration

```
public abstract class VariableMapper

java.lang.Object
  |
  +--javax.el.VariableMapper
```

2.24.2 Description

The interface to a map between EL variables and the EL expressions they are associated with.

Since: JSP 2.1

Member Summary	
Constructors	
	VariableMapper()[108]
Methods	
abstract ValueExpression	resolveVariable(java.lang.String variable)[108]
abstract ValueExpression	setVariable(java.lang.String variable, ValueExpression expression)[109]

Inherited Member Summary
Methods inherited from class `Object`
clone(), equals(Object), finalize(), getClass(), hashCode(), notify(), notifyAll(), toString(), wait(), wait(long), wait(long, int)

Constructors

2.24.3 VariableMapper()

```
public VariableMapper()
```

Methods

2.24.4 resolveVariable(String)

```
public abstract javax.el.ValueExpression[102] resolveVariable(java.lang.String variable)
```

Parameters:
`variable` - The variable name

Returns: the ValueExpression assigned to the variable, null if there is no previous assignment to this variable.

2.24.5 setVariable(String, ValueExpression)

```
public abstract javax.el.ValueExpression[102] setVariable(java.lang.String variable,
            javax.el.ValueExpression[102] expression)
```

Assign a ValueExpression to an EL variable, replacing any previously assignment to the same variable. The assignment for the variable is removed if the expression is `null`.

Parameters:
`variable` - The variable name

`expression` - The ValueExpression to be assigned to the variable.

Returns: The previous ValueExpression assigned to this variable, null if there is no previouse assignment to this variable.

setVariable(String, ValueExpression)

CHAPTER A

Changes

This appendix lists the changes in the EL specification. This appendix is non-normative.

A.1 Changes between Maintenance 1 and Maintenance Release 2

The main change in this release is the addition of method invokations with parameters in the EL, such as #{trader.buy("JAVA")}.

- Added one method in `javax.el.ELResolver`:
  - Object invoke(ELContext context, Object base, Object method, Class<?>[] paramTypes, Object[] params).
- Added one method in `javax.el.BeanELResolver`:
  - Object invoke(ELContext context, Object base, Object method, Class<?>[] paramTypes, Object[] params).
- Added one method in `javax.el.CompositeELResolver`:
  - Object invoke(ELContext context, Object base, Object method, Class<?>[] paramTypes, Object[] params).
- Section 1.1.1. Added to the first paragraph:

  Simlarly, . operator can also be used to invoke methods, when the method name is known, but the [] operator can be used to invoke methods dynamically
- Section 1.2.1. Change the last part of the last paragraph from

  Upon evaluation, the EL API verifies that the method conforms to the expected signature provided at parse time. There is therefore no coercion performed.

  to

Upon evaluation, if the expected signature is provided at parse time, the EL API verifies that the method conforms to the expected signature, and there is therefore no coercion performed. If the expected signature is not provided at parse time, then at evaluation, the method is identified with the information of the parameters in the expression and the parameters are coerced to the respective formal types.

- Section 1.6

  Added syntax for method invocation with parameters.

  The steps for evaluation of the expression was modified to handle the method invocations with parameters.

- Section 1.19

  Production of `ValueSuffix` includes the optional parameters.

A.2 Changes between 1.0 Final Release and Maintenance Release 1

- Added two methods in `javax.el.ExpressionFactory`:
  - `newInstance()`
  - `newInstance(Properties)`

A.3 Changes between Final Release and Proposed Final Draft 2

Added support for enumerated data types. Coercions and comparisions were updated to include enumerated type types.

A.4 Changes between Public Review and Proposed Final Draft

New constructor for derived exception classes

Exception classes that extend `ELException` (`PropertyNotFoundException`, `PropertyNotWritableException`, `MethodNotFoundException`) did not have a constructor with both '`message`' and '`rootCause`' as arguments (as it exists in `ELException`). The constructor has been added to these classes.

`javax.el.ELContext` API changes

- removed the `ELContext` constructor
  `protected ELContext(javax.el.ELResolver resolver)`
- added the following abstract method in `ELContext`
  `public abstract javax.el.ELResolver getELResolver();`

Section 1.8.1 - A {<,>,<=,>=,lt,gt,le,ge} B

- If the first condition (A==B) is false, simply fall through to the next step (do not return false). See See issue 129 at jsp-spec-public.dev.java.net.

`javax.el.ResourceBundleELResolver`

- New `ELResolver` class added to support easy access to localized messages.

Generics

- Since JSP 2.1 requires J2SE 5.0, we've modified the APIs that can take advantage of generics. These include:
  `ExpressionFactory:createValueExpression(), ExpressionFactory:createMethodExpression(), ExpressionFactory:coerceToType(), ELResolver:getType(), ELResolver:getCommonPropertyType(), MethodInfo:MethodInfo(), MethodInfo.getReturnType(), MethodInfo:getParamTypes()`

A.5 Changes between Early Draft Release and Public Review

New concept: EL Variables

The EL now supports the concept of EL Variables to properly support code structures such as <c:forEach> where a nested action accesses a deferred expression that includes a reference to an iteration variable.

- Resulting API changes are:
  - `The javax.el` package description describes the motivation behind EL variables.
  - `ElContext` has two additional methods to provide access to `FunctionMapper` and `VariableMapper`.
  - `ExpressionFactory` creation methods now take an `ELContext` parameter. `FunctionMapper` has been removed as a parameter to these methods.
  - Added new class `VariableMapper`
- At a few locations in the spec, the term "variable" has been replaced with "model object" to avoid confusion between model objects and the newly introduced EL variables.
- Added new section “Variables” after section 1.15 to introduce the concept of EL Variables.

EL in a nutshell (section 1.1.1)

- Added a paragraph commenting on the flexibility of the EL, thanks to its pluggable API for the resolution of model objects, functions, and variables.

javax.el.ELException

- `ElException` now extends `RuntimeException` instead of `Exception`.
- Method `getRootCause()` has been removed in favor of `Throwable.getCause()`.

javax.el.ExpressionFactory

- Creation methods now use `ELContext` instead of `FunctionMapper` (see EL Variables above).
- Added method `coerceToType()`. See issue 132 at jsp-spec-public.dev.java.net.

javax.el.MethodExpression

- `invoke()` must unwrap an `InvocationTargetExceptions` before re-throwing as an `ELException`.

Section 1.6 - Operators [] and .

- `PropertyNotFoundException` is now thrown instead of `NullPointerException` when this is the last property being resolved and we're dealing with an lvalue that is null.

Section 1.13 - Operator Precedence

- Clarified the fact that qualified functions with a namespace prefix have precedence over the operators.

Faces Action Attribute and MethodExpression

In Faces, the `action` attribute accepts both a String literal or a `MethodExpression`. When migrating to JSF 1.2, if the attribute's type is set as `MethodExpression`, an error would be reported if a String literal is specified because a String literal cannot evaluate to a valid `javax.el.MethodExpression`.

To solve this issue, the specification of MethodExpression has been expanded to also support String literal-expressions. Changes have been made to:

- Section 1.2.2
- `ExpressionFactory.createMethodExpression()`
- `javax.el.MethodExpression:invoke()`