

Memento for the Kermeta Language

It is an Object language

```
class MyMainClass {
  operation main_method() : Void is do
    stdio.writeln("My first Kermeta run")
  end
}
```

Kermeta offers genericity...

```
class Queue<G> {
  reference elements : oset G[*]
  operation enqueue(e : G) : Void is do
    elements.add(e)
  end
  operation dequeue() : G is do
    result := elements.first
    elements.removeAt(0)
  end
}
```

.. and multiple inheritance

```
class CapitalText inherits LeftHand, RightHand {
  method addOp(textToAdd : String)
    from LeftHand is
  do
    super(textToAdd)
  end
}
```

Block of code

```
do
  // my code : locally declared variables
  // are not visible outside the block
end
```

Conditions

```
var boolCond : Boolean init true
// conditional block
if boolCond then
  // block for true value of the condition
else
  // block for false value of the condition
end
// conditional expression => affectation
var s : kermeta::standard::String
s := if boolCond then "its true !"
    else "its a joke ;-)" end
```

Loop

```
from
  var i : kermeta::standard::Integer init 0
until
  i == 10
loop
  /* code to be done 10 times
  .... */
  i := i + 1 // don't forget to increment
end
```

Exceptions

```
operation raiseException() is do
  raise kermeta::exceptions::Exception.new
end

operation handleException() is
do // some code which raise an exception
  self.raiseException
rescue (e : kermeta::exceptions::Exception)
  // do something if an Exception has been raised
end
```

Kermeta language : bases

Syntaxe elements

```
package my_package::subpackage;
```

```
require kermeta
```

```
class SyntaxClass {
  // composition attributes
  attribute myAtt : X
  // pointer-like attributes
  reference myObj : X
  // assignment to an "attribute" deletes former
  // container attribute
  operation main() : Void is do
    // temporary variable declaration
    // + initialization
    var v1 : SyntaxClass init SyntaxClass.new
    var v2 : SyntaxClass init SyntaxClass.new
    var anObj : X // declaration without
                  // initialization
    anObj := X.new // affectation with a new object

    v1.myAtt := anObj
    // v1 has an attribute
    stdio.writeln(v1.myAtt.toString)

    v2.myAtt := v1.myAtt // transfert of "anObj"
                       // from v1 to v2
    // v1 has loose its attribute (print <void>)
    stdio.writeln(v1.myAtt.toString)
  end
}

class X {
  method toString() : kermeta::standard::String is do
    result := "I'm an X object"
  end
}
```

```
class Rectangle {
  attribute length : kermeta::standard::Integer
  attribute width : kermeta::standard::Integer

  // read-only property derived from length/width
  property surface : kermeta::standard::Integer
  getter is do
    result := length * width
  end
}

class Cube {
  attribute width : kermeta::standard::Integer
  attribute surface : kermeta::standard::Integer
  attribute volume : kermeta::standard::Integer

  // read-write property
  property edge : kermeta::standard::Integer
  getter is do
    result := width
  end
  setter is do
    width := value
    surface := value * value * 6
    volume := value * value * value
  end
}
```

Kermeta language : bases

Comments

End of line

```
// a "line" comment
```

Multiple lines

```
/* a multi line
   comment */
```

Named annotation

```
@descr "a named annotation"
operation myAnnotatedMethod() is abstract
```

Anonymous annotation

```
/** anonymous multi line annotation */
reference anAnnotatedObject :
kermeta::language::structure::Object
```

Syntatic sugar

```
package root_package;
require kermeta
using kermeta::language::structure

class X {
  /* avoid writing kermeta::language::structure::Object */
  reference anAnnotatedObject : Object
}
```

Enumerations

Declaration

```
enumeration Seasons { spring; summer; autumn; winter; }
```

Use

```
operation x ( val : Seasons) is do
  if val == Seasons.spring
  then stdio.writeln("It's Spring") end
end
```

Variables

Syntax : a..z, A..Z, 0..9, « ~ », « _ »

Keywords : usable in names if prefixed by « ~ »

Primitive types

Integer <=> Java Integer

String <=> Java String

Boolean <=> Java Boolean

Character [partial]

Real [partial]

4 main collection kinds

| | Not Ordered | Ordered |
|------------|-------------|------------|
| Unique | Set | OrderedSet |
| Not Unique | Bag | Sequence |

Use

```
var myColl : (set) Integer[0..*] init
  kermeta::standard::Set<Integer>.new
// Fill in myColl
myColl.add(10)
myColl.add(50)
```

Kermeta language : models

Declaration of the needed metamodel

```
// calling a metamodel stored in the project
require "../metamodels/RDBMS.ecore"
require "platform:/resource/myproject/metamodels/RDBMS.ecore"
// calling a metamodel in a plugin (better)
require "platform:/plugin/org.eclipse.uml2.uml/model/UML.ecore"
// calling a metamodel in the workspace or in a plugin
require "platform:/lookup/org.eclipse.uml2.uml/model/UML.ecore"
// calling the registered metamodel singleton (the best)
require "http://www.eclipse.org/uml2/2.1.0/UML"
```

Loading a model

```
operation loadUmlModel() is do
    var inputRep : kermeta::persistence::EMFRepository
        init kermeta::persistence::EMFRepository.new
    var inputRes : kermeta::persistence::EMFResource
    inputRes ?= inputRep.createResource(
        "../models/myUmlModel.uml",
        "platform:/plugin/org.eclipse.uml2.uml/model/UML.ecore")
    inputRes.load() // if use getResource(aModel), no need load()
    var pack : uml::Package
    pack ?= inputRes.one
end
```

Serializing a model

```
operation saveRdbmsModel() is do
    var outputRepository : kermeta::persistence::EMFRepository
        init kermeta::persistence::EMFRepository.new
    var outputResource : kermeta::persistence::EMFResource
    outputResource ?= outputRepository.createResource(
        "../models/myBaseModel.xml", "../metamodels/RDBMS.ecore")
    outputResource.add(baseModel)
    outputResource.save()
end
```

Functions on collections

```
aCollection.each { e | do
    /* process 'e' */
end }
aBoolean := aCollection.forAll { e |
    /* condition */ }
aCollection2 := aCollection.select { e |
    /* condition */ }
aCollection2 := aCollection.reject { e |
    /* condition */ }
aCollection2 := aCollection.collect { e |
    /* value */ }
anObject := aCollection.detect { e |
    /* condition */ }
aBoolean := aCollection.exists { e |
    /* condition */ }
```

Other functions

```
10.times { i | do
    /* code to execute 10 times */
end }
```

Kermeta language : associations



1

```
class A {
    attribute b : B
}
class B {}
```

use

```
var a1 : A init A.new
var b1 : B init B.new
a1.b := b1
var b2 : B
b2 := a1.b
```



2

```
class A {
    attribute b :
B[0..*]
}
class B {}
```

```
var a1 : A = A.new
var b1 : B = B.new
a1.b.add(b1)
var bees : OrderedSet<B>
bees := a1.b
```



3

```
class A {
    attribute b :
    B[0..*]#a
}
class B {
    reference a :
    A[1..1]#b
}
```

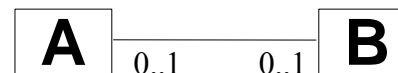
```
var a1 : A init A.new
var b1 : B init B.new
a1.b.add(b1)
var a2 : A
a2 := b1.a
```



4

```
class A { }
class B {
    reference a : A
}
```

```
var a1 : A init A.new
var b1 : B init B.new
b1.a := a1
var a2 : A
a2 := b1.a
```



5

```
class A {
    reference b : B#a
}
class B {
    reference a : A#b
}
```

use

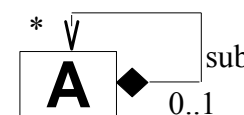
```
var a1 : A init A.new
var b1 : B init B.new
a1.b := b1
var b2 : B
b2 := b2.a.b
var a2 : A
a2 := b1.a
```



6

```
class A {
    reference b : B[0..*]
}
class B {
    reference a : A[0..*]
}
```

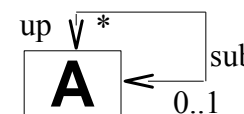
```
var a1 : A init A.new
var b1 : B init B.new
a1.b.add(b1)
var bees : OrderedSet<B>
bees := a1.b
var aees : OrderedSet<A>
aees := b1.a
```



7

```
class A {
  attribute sub : A[0..*]
}
```

```
var a1 : A init A.new
var a2 : A init A.new
a1.sub.add(a2)
var a3 : A
a3 := a1.sub.first
```



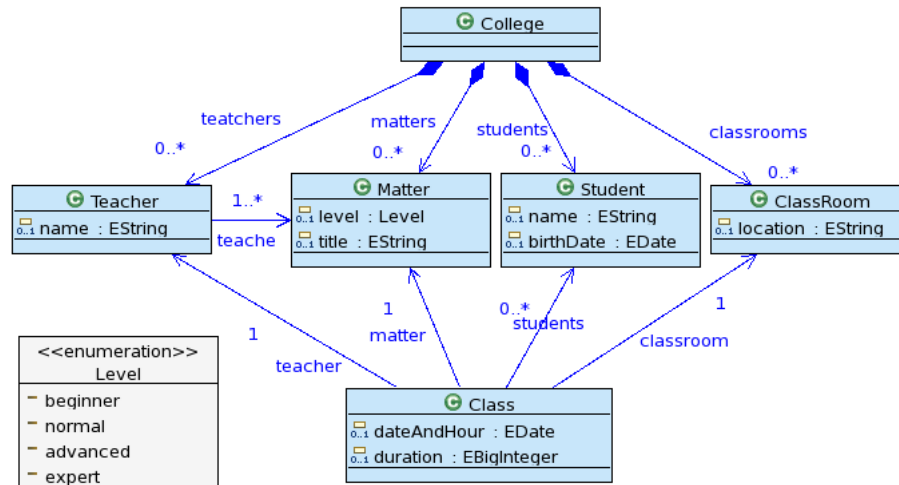
8

```
class A {
  reference sub : A[0..*]#up
  reference up : A#sub
}
```

```
var a1 : A init A.new
var a2 : A init A.new
a1.sub.add(a2)
var a3 : A
a3 := a2.up
```

Aspects : enhance your metamodels

Imagine a metamodel about schools



Reference it

```

package CollegeMM;

require kermeta
require "../metamodel/CollegeMM.ecore"

```

Add a class with aspect

```

aspect class Note {
    attribute ~value : kermeta::standard::Integer

    reference student : Student
    reference matter : Matter
}

```

Add opposites + new operation

```

package CollegeMM;

```

```

require kermeta
require "../metamodel/CollegeMM.ecore"

```

```

aspect class Note {
    attribute ~value : kermeta::standard::Real
    // add the opposite for managing notes from students/matters
    reference student : Student#notes
    reference matter : Matter#notes
}

```

```

aspect class Student {
    reference notes : Note[0..*]#student
    property average : kermeta::standard::Real
    getter is do
        var total : kermeta::standard::Real
        notes.each{ n | total := total + n.~value }
        result := total / notes.size.toReal
    end
}

```

```

aspect class Matter {
    reference notes : Note[0..*]#matter
    property average : kermeta::standard::Real
    getter is do
        var total : kermeta::standard::Real
        notes.each{ n | total := total + n.~value }
        result := total / notes.size.toReal
    end
}

```

Autres : programmation par contrats



Syntax

```
class StringTool
{
  reference stringTable : Collection<String>

  // an invariant constraint
  inv noVoidTable is
    do stringTable != void end

  // an operation with contracts
  operation concatenate(first : String,
                        second : String) : String
    pre noVoidInput is
      do first != void and second != void end

    post noVoidOutput is
      do result != void end

  // operation body
  is do
    result := first
    result.append(second)
  end
}
```

Program which verify contracts

```
class MyClass
{
  operation main() : Void is do
    // new tool : its stringTable must be initialized
    var st1 : StringTool init StringTool.new
    st1.stringTable := Set<String>.new
    var s1 : String
    var s2 : String

    do
      // void strings should raise exception
      st1.concatenate(s1, s2)
    rescue (err : ConstraintViolatedPre)
      stdio.writeln("expected err " + err.toString)
    end

    do
      // new tool without table
      var st2 : StringTool init StringTool.new
      st2.checkInvariants
    rescue (err : ConstraintViolatedInv)
      stdio.writeln("expected err " + err.toString)
    end
  end
}
```

Other functionalities

- **Dynamic expressions**

Code passed as parameter is interpreted on the fly

- **Gateway to Java**

Call Java types and functions

```
/** An implementation of a StdIO class in Kermeta using existing Java standard input/output */
class StdIO {
  /** write the object to standard output */
  operation write(object : Object) : Void is do
    result ?= extern fr::irisa::triskell::kermeta::runtime::basetypes::StdIO.write(object)
  end
  /** read an object from standard input */
  operation read(prompt : String) : String is do
    result ?= extern fr::irisa::triskell::kermeta::runtime::basetypes::StdIO.read(prompt)
  end
}

/** Java Implementation of wrapper called from kermeta */
public class StdIO{
  // ..... //
  // Implementation of method read(prompt : String)
  public static RuntimeObject read(RuntimeObject prompt) {
    java.lang.String input = null;
  }
}
```

- Lambda expressions

Create your own functions

- Functionalities under development

- “Model” type
- Require OCL rules file