

Traces

Overture Workshop
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Agenda

- Traces
- Motivation
- Goal
- Approach
- Specification overview
- Integration in Eclipse
- Demo

Trace definition

- Named trace
 - Choice definition
 - `a.Push(1) | a.Reset()`
 - Sequence definition
 - `a.Push(1) ; a.Reset()`
 - Trace apply
 - `a.Push(1)`
 - Repeat pattern
 - `a.Push(1) {1,4}`

RepeatPattern				
<code>a*</code>	<code>a+</code>	<code>a?</code>	<code>a{x}</code>	<code>a{x,y}</code>
0	1	0	x	x
*	*	1	x	y

Traces

```
class Stack  
end Stack
```

```
class UseStack
```

```
instance variables
```

```
s : Stack := new Stack();
```

```
traces
```

```
PushBeforePop : s.Reset();  
                 s.Push(6){1,4};  
                 s.Pop()
```

```
end UseStack
```

Motivation

- Improve the testing in VDM
- Introduce Combinatorial Testing

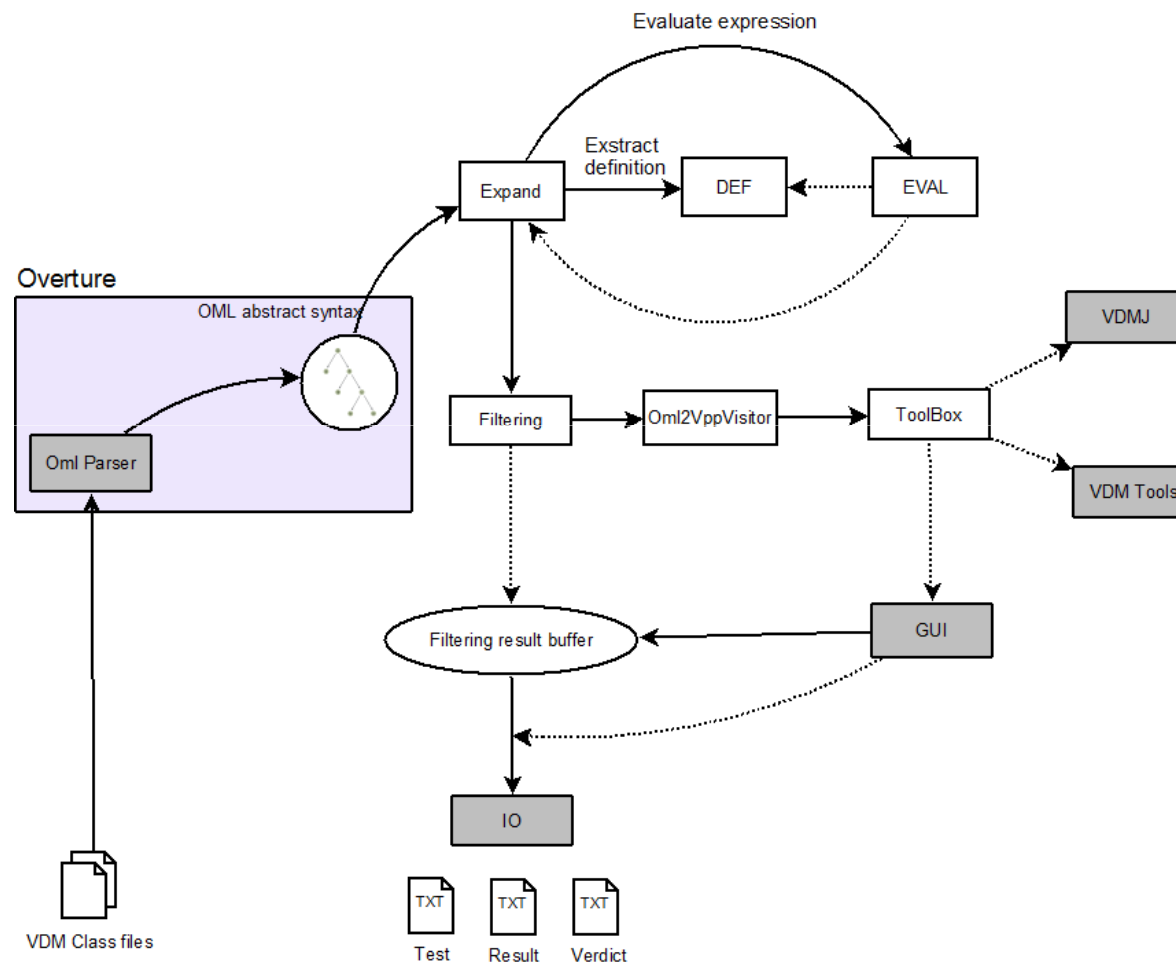
Goal

- Create a CT test tools to facilitate VDM modeling
- Minimize the computation when expanding test cases
 - Limit the amount of test cases
- Integrate to tool with Eclipse for easy use

Approach

- Reuse of overture tool components
 - AST
 - Parser
 - VDMJ for evaluation
- Specification of CT in VDM++
- Code generation to Java
- Creation of Eclipse specific code
 - Views
- Combining Eclipse plug-ins and core components

Specification Overview



Integration in Eclipse

The screenshot shows the Eclipse IDE with the Overture Combinatorial Testing (CT) plugin. The main editor displays a VPP script for a project named 'UseBuffers'. The script includes a class definition and several test cases (S1, S1', S2, S3). A test case is highlighted, and the CT Overview window shows a tree of test cases. A context menu is open over the 'S1 (5)' test case, showing options like 'Run selected', 'Send to Interpreter', and 'Fail test'. The Problems window shows an error: '1: A boolean was expected.' at line 49.

```
end Buffers
class UseBuffers

instance variables

  b : Buffers := new Buffers()

traces
S_Error : let x = if false
           then false
           else 2
           in
let y = x and true in b.Add(9) {1,3}

S1: let x in set {1,...,5} in b.Add(x); b.getBuffers()
S1': b.Add(1); (b.Add(2) | b.Add(3)); b.Add(4)
S2: b.Add(2); ((let x in set {1,...,5} in b.Add(x)) |
              (let y in set {1,3,5} in b.Remove(y))) {1,2}; b.getBuffers()
S3: b.Add(5) {7}; ((let x in set {1,...,5} in b.Add(x)) |
                  (let y in set {1,3,5} in b.Remove(y))) {1,2}; b.getBuffers()
```

Description	Resource	Path	Location	Type
Errors (1 item)				
1: A boolean was expected.	buffers2.vpp	Buffers error project	line 49	Problem
Warnings (1 item)				
Definition 'y' not used	buffers2.vpp	Buffers error project	line 49	Problem

Eclipse plug-ins

- Two Eclipse Views have been build
 - CT Overview with projects
 - CT Results
- Integration with two external tools
 - VDMJ
 - VDM Tools
- Two Eclipse plug-in projects
 - One for wrapping the core functionality
 - One for extending the Eclipse GUI with the views

Eclipse views

The screenshot displays the Eclipse IDE interface for Overture Combinatorial Testing. The main editor shows the source code for `UseBuffers` in `buffers2.vpp`. A red error icon is visible on line 49, which is highlighted in blue. The `CT Overview` view on the right shows a tree structure of test cases: `UseBuffers` (expanded) containing `S1' (2)`, `S1 (5)`, `S2 (72)`, `S3 (72)`, and `S4 (2920)`, along with `Buffers project`. The `Problems` view at the bottom shows a table of errors and warnings.

```
end Buffers
class UseBuffers

instance variables

    b : Buffers := new Buffers()

traces
S_Error : let x = if false
           then false
           else 2
           in
           let y = x and true in b.Add(9){1,3}

S1: let x in set {1,...,5} in b.Add(x); b.getBuffers()
S1': b.Add(1); (b.Add(2) | b.Add(3)); b.Add(4)
S2: b.Add(2); ((let x in set {1,...,5} in b.Add(x)) |
              (let y in set {1,3,5} in b.Remove(y))){1,2}; b.getBuffers()
S3: b.Add(5){7}; ((let x in set {1,...,5} in b.Add(x)) |
                 (let y in set {1,3,5} in b.Remove(y))){1,2}; b.getBuffers()
```

Description	Resource	Path	Location	Type
1 error, 1 warning, 0 others				
Errors (1 item)				
1: A boolean was expected.	buffers2.vpp	Buffers error project	line 49	Problem
Warnings (1 item)				
Definition 'y' not used	buffers2.vpp	Buffers error project		Problem

Eclipse plug-in projects

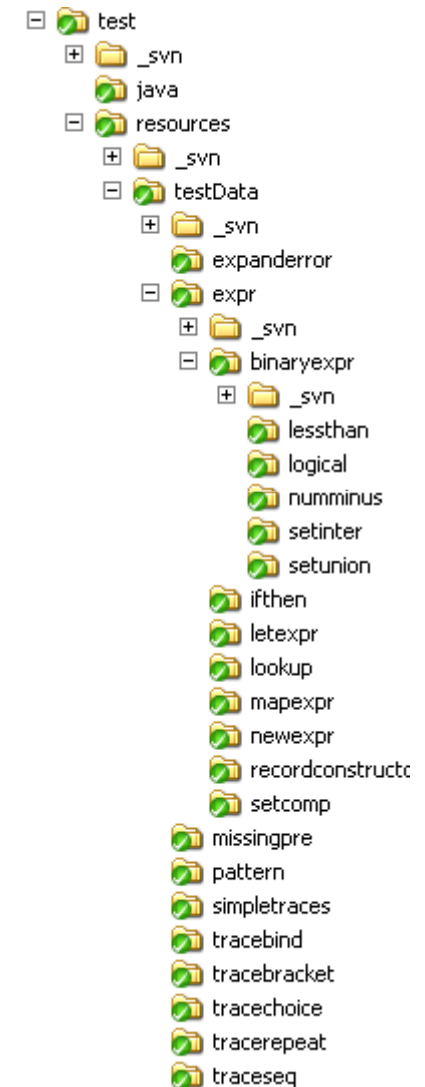
- Core component
 - org.overturetool.traces
- Eclipse plug-ins
 - org.overturetool.eclipse.plugins.traces.core
 - Wrapper for the core component
 - org.overturetool.eclipse.plugins.traces
 - Eclipse GUI

Demo

- Buffers

Test of the CT Component

- Script (for both windows and Linux)
- `java -classpath "lib\StdLib-1.0.0.jar;lib\parser-1.0.0.jar;overtureUtility.jar;lib\umltrans-1.0.0.jar;lib\ast-1.0.0.jar" MainClass -vdmjEx -vdmjDir "vdmj" -project "..\..\java\CT_vdmtools_project.prj" -vdmjSpec "vdmj" -argumentFile "vdmj\vdmArgument.bat"`



Test cases and expected results

begin Stack

...

end Stack

class UseStack

```
{"UseStack|PushBeforePop|1" |-> ["s.Reset()"],  
"UseStack|PushBeforePop|2" |-> ["s.Push(6)"]}
```

instance variables

s : Stack := **new** Stack();

traces

PushBeforePop : s.Reset() | s.Push(6)

end UseStack

Update site

- <http://mt.lausdahl.com/CT/updatesite>