



ADCSS-2013  
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## Software Factories Application within the ASE5 project



Nieves Salor Moral ([n.salor\\_moral@vitrocisetbelgium.com](mailto:n.salor_moral@vitrocisetbelgium.com))

ESTEC, Noordwijk, The Netherlands



- **Software Factories Decision Table**
- **ASE-5 Brief Explanation**
- **Factories applied in ASE-5**
- **Results**



| WHERE  | WHY   | HOW   |
|--|---|---|
| Use of design patterns and/or templates                    | <ul style="list-style-type: none"> <li>• Design patterns are mapped one to one.</li> <li>• Templates are used for the code generation via configuration.</li> <li>• Support multiple target languages.</li> </ul> | <ul style="list-style-type: none"> <li>• Apply software architectural and design patterns.</li> <li>• Create coding templates</li> </ul>          |
| Existence of conceptual design                             | <ul style="list-style-type: none"> <li>• From conceptual we can automate to logical and physical software systems.</li> </ul>   | <ul style="list-style-type: none"> <li>• Design conceptual data models.</li> <li>• Design conceptual behavioral processes.</li> </ul>             |
| Systems with high rate of changes                          | <ul style="list-style-type: none"> <li>• Time and cost increase exponentially.</li> <li>• Testing needs to be done each time.</li> <li>• Increase of consistency errors.</li> </ul>                               | <ul style="list-style-type: none"> <li>• Identify volatile components.</li> <li>• Use of annotations</li> </ul>                                   |
| Existence of tools/framework supporting software factories | <ul style="list-style-type: none"> <li>• Avoid re-inventing the wheel.</li> <li>• Saving time.</li> <li>• Existence of support and forums groups for development.</li> </ul>                                      | <ul style="list-style-type: none"> <li>• Technology assessment before coding.</li> <li>• Create automation frameworks if not existing.</li> </ul> |



- ASE means **Activity Scheduler Executor**
- Goal: **Automate** the preparation and execution of AIT and operations
- Implementation of the following standards:
  - **Space System Model** (ECSS-E-ST-70-31)
  - **Procedural language**(ECSS-E-ST-70-32)

- Main tasks:

**SSM Browser/Editor**

**Activity editor**

**Activity executor**

Consistency Checker

Configuration Manager

**Procedure Parser/Compiler**

Session Management

**Database Manager**

Scheduler

Reporter

**Logger**

| Component               | Software Factories Used |  |
|-------------------------|-------------------------|--|
| <b>Database Manager</b> | <b>Methodology</b>      | Object-Role Modeling (ORM)   |
|                         | <b>Tool</b>             | NORMA  |
|                         | <b>Automation</b>       | <ul style="list-style-type: none"> <li>• Generation of the E/R Diagram</li> <li>• Creation of the PostgreSQL, MySQL and Oracle scripts</li> <li>• Generation of the system data requirements.</li> </ul> |
|                         | <b>Methodology</b>      | Object-Relational Mapping  |
|                         | <b>Tool</b>             | JPA/Text   |
|                         | <b>Automation</b>       | <ul style="list-style-type: none"> <li>• Generation of the PoJos/Java Beans according to the DB.</li> <li>• Persistence methods of the data.</li> </ul>  |

20130611-70-32 Formal.orm X 20130611-70-32 For....sql - no conectado ssm\_schema.xsd

**Conceptual Data Model** →

**Logical representation** ←

**Target Physical Schemas** →

Explorador de soluciones

- Solución 'SSMDB' (1 proyecto)
  - SSMDB
    - Properties
    - References
    - 20130611-70-32 Formal.orm
      - 20130611-70-32 Formal\ORMCustomToolReports.cs
      - 20130611-70-32 Formal.DCIL.xml
      - 20130611-70-32 Formal.DDIL.xml
      - 20130611-70-32 Formal.MySQL.sql
      - 20130611-70-32 Formal.Oracle.sql
      - 20130611-70-32 Formal.PostgreSQL.sql
      - Program.cs

ORM Verbalization Browser

BodyStatement is stepStatement.  
**In each population of BodyStatement is stepStatement, each BodyStatement occurs at most once.**  
 RepeatBody contains BodyStatement.  
**Each RepeatBody contains some BodyStatement.**  
**Each BodyStatement is contained in at most one RepeatBody.**  
**It is possible that some RepeatBody contains more than one BodyStatement.**  
 Derivation Note: Fully derived from the entries in the repeatBody.  
**If some BodyStatement is contained in some RepeatBody then that BodyStatement is stepStatement.**  
 Body is an entity type.  
 Reference Scheme: Body has Body\_Id.  
 Reference Mode: .Id.

**Data Requirements** ←

ORM Diagram Spy | ORM Reading Editor | ORM Verbalization Browser

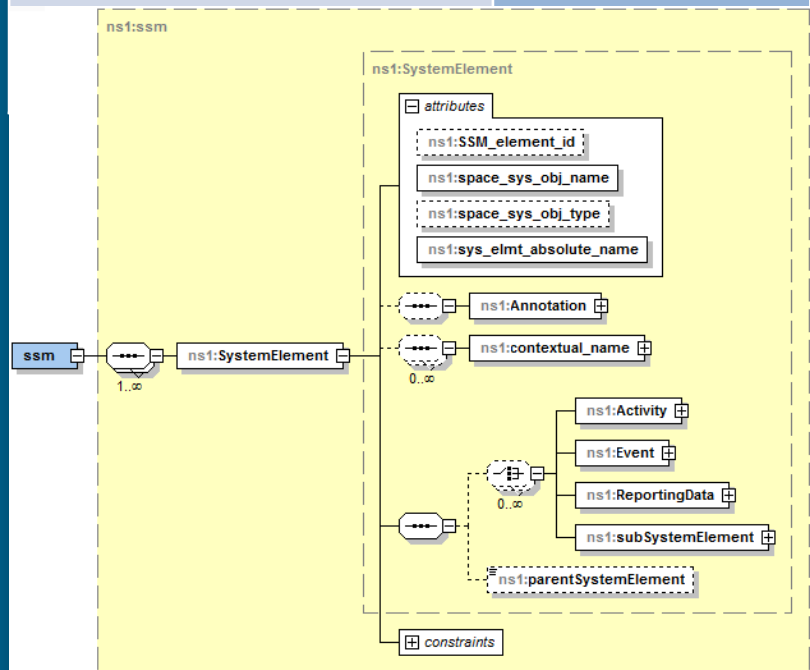
ORM Mo... Explorad... Team Ex... Vista de...

Propiedades

20130611-70-32 Formal.orm Propiedades del archivo

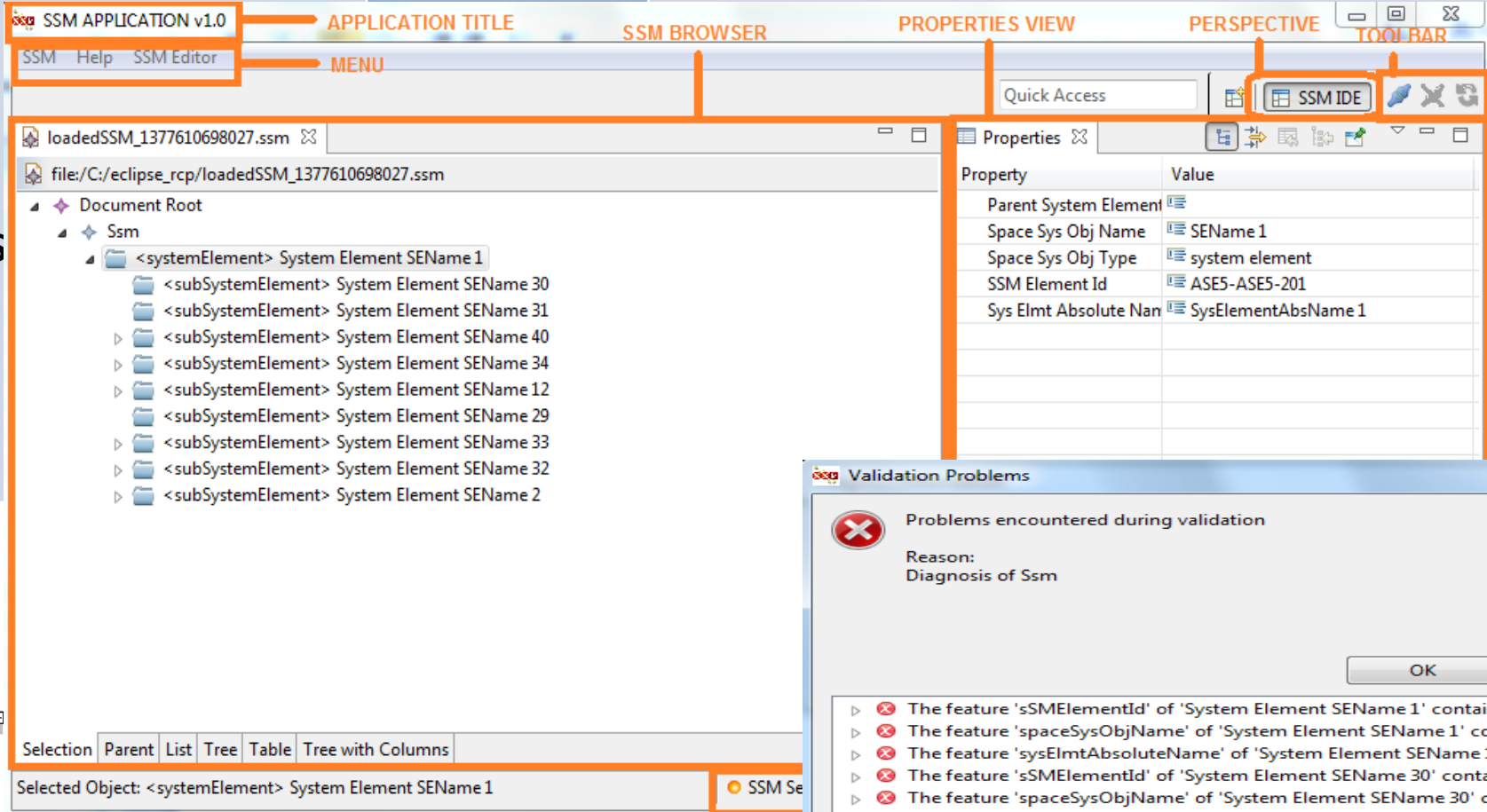
- Avanzadas
  - Acción de compilación Ninguna
  - Copiar en el directorio de rr No copiar
  - Espacio de nombres de la h
  - Herramienta personalizada ORMCustomTool
- Varios
  - Nombre de archivo 20130611-70-32 Formal.orm
  - ORMGeneratorSettings
  - Ruta de acceso completa C:\Users\Nieves\documents\visua

| Component  | Software Factories Used |   |
|--|-------------------------|---|
| <p style="text-align: center;"><b>SSM Browser/Editor</b></p> | Methodology             | EMF   |
|  | Tool                    | Eclipse EMF Framework Plugins   |
|  | Automation              | <ul style="list-style-type: none"> <li>• Automatic generation of the EMF model from XSD of the SSM.</li> <li>• Automatic generation of the EMF Editor plugin (either standalone or integrated within Eclipse).</li> <li>• Automatic generation of the testing and validation classes.</li> <li>• Automatic wizard for the edition of the model</li> </ul> |



Component

Software Factories Used



SSM APPLICATION v1.0

SSM Help SSM Editor

APPLICATION TITLE

SSM BROWSER

PROPERTIES VIEW

PERSPECTIVE

TOOL BAR

Quick Access

SSM IDE

file:/C:/eclipse\_rcp/loadedSSM\_1377610698027.ssm

Document Root

- Ssm
  - <systemElement> System Element SEName 1
    - <subSystemElement> System Element SEName 30
    - <subSystemElement> System Element SEName 31
    - <subSystemElement> System Element SEName 40
    - <subSystemElement> System Element SEName 34
    - <subSystemElement> System Element SEName 12
    - <subSystemElement> System Element SEName 29
    - <subSystemElement> System Element SEName 33
    - <subSystemElement> System Element SEName 32
    - <subSystemElement> System Element SEName 2

Properties

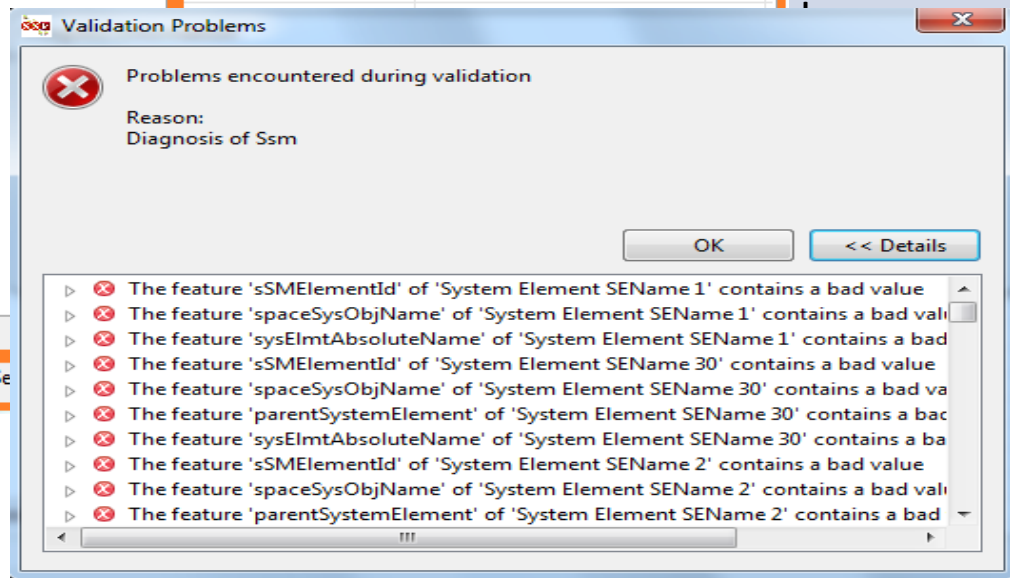
| Property               | Value               |
|------------------------|---------------------|
| Parent System Element  |                     |
| Space Sys Obj Name     | SEName 1            |
| Space Sys Obj Type     | system element      |
| SSM Element Id         | ASE5-ASE5-201       |
| Sys Elmt Absolute Name | SysElementAbsName 1 |

Selection Parent List Tree Table Tree with Columns

Selected Object: <systemElement> System Element SEName 1

SSM Se

in XSD of  
in (either  
relation



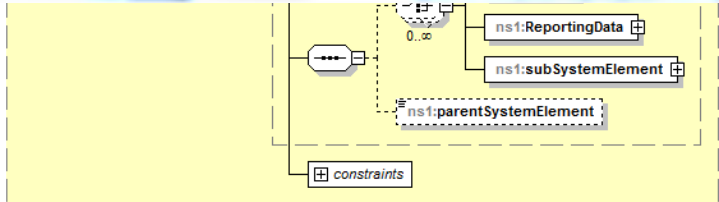
Validation Problems

Problems encountered during validation

Reason:  
Diagnosis of Ssm

OK << Details

- The feature 'sSMElementId' of 'System Element SEName 1' contains a bad value
- The feature 'spaceSysObjName' of 'System Element SEName 1' contains a bad value
- The feature 'sysElmtAbsoluteName' of 'System Element SEName 1' contains a bad value
- The feature 'sSMElementId' of 'System Element SEName 30' contains a bad value
- The feature 'spaceSysObjName' of 'System Element SEName 30' contains a bad value
- The feature 'parentSystemElement' of 'System Element SEName 30' contains a bad value
- The feature 'sysElmtAbsoluteName' of 'System Element SEName 30' contains a bad value
- The feature 'sSMElementId' of 'System Element SEName 2' contains a bad value
- The feature 'spaceSysObjName' of 'System Element SEName 2' contains a bad value
- The feature 'parentSystemElement' of 'System Element SEName 2' contains a bad value





| Component              | Software Factories Used |   |
|------------------------|-------------------------|---|
| <b>Activity editor</b> | <b>Methodology</b>      | TMF, EMF  |
|                        | <b>Tool</b>             | Xtext Eclipse Plugin  |
|                        | <b>Automation</b>       | <ul style="list-style-type: none"> <li>• Generation of the procedural meta-grammar persistence model.</li> <li>• Development of the syntax highlighting capabilities.</li> <li>• Development of the basic content-assist capabilities</li> <li>• Generation of a basic parser/compiler.</li> <li>• Create adapter for further development of formatting capabilities.</li> <li>• Create adapter for further content-assist capabilities</li> <li>• Display of edition error and warnings.</li> <li>• Create adapter for AST generation and display</li> </ul> |
|                        | <b>Methodology</b>      | <ul style="list-style-type: none"> <li>• Eclipse</li> </ul>   |
|                        | <b>Tool</b>             | <ul style="list-style-type: none"> <li>• Eclipse templates</li> </ul>   |
|                        | <b>Automation</b>       | <ul style="list-style-type: none"> <li>• Activity text completion according to context</li> </ul>   |



```

grammar com.vitrocisetbelgium.compiler.Pluto hidden(WS, ML_COMMENT, SL_COMMENT)
//with org.eclipse.xtext.common.Terminals

generate pluto "http://www.vitrocisetbelgium.com/compiler/Pluto"
import "platform:/resource/SSMModel/model/ssm.ecore" as ssm
import "http://www.eclipse.org/emf/2002/Ecore" as ecore

Procedure returns Procedure:
  '<PROCEDURE>' (procedureDeclarationBody = Procedure_declaration_body)? (preconditionsBody=Precondition

Procedure_declaration_body returns ProcedureDeclarationBody:
  '<DECLARE>' (eventDecls += EventDeclaration)+ '</DECLARE>';

EventDeclaration returns LocalEvent:
  '<EVENT>' name = ID ('<DESCRIPTION>' eventDescr = STRING '</DESCRIPTION>')? '</EVENT>';

PreconditionsBody returns PreconditionsBody:
  '<PRECONDITIONS>' (preCondition += (Expression|Wait_statement))+ '</PRECONDITIONS>';

ConfirmationsBody: '<CONFIRM>' (confirmCondition += (Expression|Wait_statement))+ '</CONFIRM>';

Wait_statement returns WaitStatement:
  '<WAIT>' (('<EVENT>' event=[LocalEvent] '</EVENT>')| expression=Expression) (saveContextStmt = SaveCor

Timeout returns Timeout:
  '<TIMEOUT>' expression=Expression ('<RAISE_EVENT>' event =[LocalEvent] '</RAISE_EVENT>')? '</TIMEOUT>'
;

```



Project Explorer

testSample

---

Outline

- Procedure
  - Procedure Declaration Body
    - Local Event=event0
    - Local Event=eventName
    - Local Event=eventName
    - Local Event=event1
    - Local Event=event3
  - Preconditions Body
    - Wait Statement
      - Waiting Event:event0
      - Save Context
      - Timeout
  - Procedure Main Body
    - Inform user
      - Message
    - Initiate & confirm activity null
      - Activity Alias: actSpecificationInstance
      - Activity Directives
        - Continuation Test
          - confirmed: continue
          - not confirmed: restart
      - Log
        - Message
      - Initiate & confirm step step1
        - Step Declaration Body
        - Step Main Body

test.pluto

```

<PROCEDURE>
  <DECLARE>
    <EVENT> event0
      <DESCRIPTION> "descr" </DESCRIPTION>
    </EVENT>
    <EVENT> eventName
      <DESCRIPTION> "description" </DESCRIPTION>
    </EVENT>
    <EVENT> eventName
      <DESCRIPTION> "description" </DESCRIPTION>
    </EVENT>
    <EVENT> event1 </EVENT>
    <EVENT> event3
      <DESCRIPTION> "descr2" </DESCRIPTION>
    </EVENT>
  </DECLARE>
  <PRECONDITIONS>
  <WAIT>

```

Event name eventName declared multiple times

---

Tasks Error Log Problems Console

6 errors, 1 warning, 0 others

| Description   | Resource   | Path            | Location                             | Type          |
|---|------------|-----------------|--------------------------------------|---------------|
| Errors (6 items)  |            |                 |                                      |               |
| Couldn't resolve reference to Activity 'ad'.                              | test.pluto | /testSample/src | line: 233 /testSample/src/test.pluto | Pluto Problem |
| Couldn't resolve reference to Activity 'as'.                              | test.pluto | /testSample/src | line: 60 /testSample/src/test.pluto  | Pluto Problem |
| Couldn't resolve reference to Activity 'dd'.                              | test.pluto | /testSample/src | line: 276 /testSample/src/test.pluto | Pluto Problem |
| Couldn't resolve reference to Activity 'sd'.                              | test.pluto | /testSample/src | line: 311 /testSample/src/test.pluto | Pluto Problem |
| Couldn't resolve reference to ReportingData 'ad'.                         | test.pluto | /testSample/src | line: 23 /testSample/src/test.pluto  | Pluto Problem |
| Event name eventName declared multiple times                              | test.pluto | /testSample/src | line: 6 /testSample/src/test.pluto   | Pluto Problem |
| Warnings (1 item)   |            |                 |                                      |               |
| For not defined confirmation status, default confirmation actions will be | test.pluto | /testSample/src | line: 105 /testSample/src/test.pluto | Pluto Problem |



Preferences

type filter text

- General
- Ant
- Code Recommenders
- Data Management
- Help
- Install/Update
- Java
- Maven
- Mwe2
- Mylyn
- Plug-in Development
- Pluto
  - Compiler
  - Refactoring
  - Syntax Coloring
  - Templates
- Run/Debug
- Team
- Validation
- WindowBuilder
- Xcore
- XML
- Xtend
- Xtend/Xpand
- Xtext

### Templates

Create, edit or remove templates:

| Name   | Context                                 | Description                             | Auto Ins... |
|--|---|---|-------------|
| <input checked="" type="checkbox"/> addEventDeclar...    | EventDeclaration                        | add a declaration of an event wit...    | on          |
| <input checked="" type="checkbox"/> addEventDeclar...    | EventDeclaration                        | add event declaration without de...     | on          |
| <input checked="" type="checkbox"/> addForStatement      | For_Statement                           | specifies a block of tasks to be p...   | on          |
| <input checked="" type="checkbox"/> addFunction          | Function                                | defines a specific function witho...    | on          |
| <input checked="" type="checkbox"/> addFunction          | Function                                | specifies a function with a set of ...  | on          |
| <input checked="" type="checkbox"/> addHexadecima...     | Constant                                | set up an hexadecimal value as c...     | on          |
| <input checked="" type="checkbox"/> addIfStatement       | If_Statement                            | add a flow control statement exe...     | on          |
| <input checked="" type="checkbox"/> AddInComparis...     | InComparison                            | Defines a series of values to be m...   | on          |
| <input checked="" type="checkbox"/> addInformState...    | Inform_user_statement                   | adds a series of messages to be n...    | on          |
| <input checked="" type="checkbox"/> addInitiateActivi... | Initiate_activity_statement             | initiates the specified activity an...  | on          |
| <input checked="" type="checkbox"/> addInitiateAndC...   | Initiate_and_confirm_activity_statement | initiates and activity and waits fo...  | on          |
| <input checked="" type="checkbox"/> addInitiateAndC...   | Initiate_and_confirm_step_statement     | initiates a step and waits for its c... | on          |

Buttons: New..., Edit..., Remove, Restore Removed, Revert to Default, Import..., Export...

Preview:

```

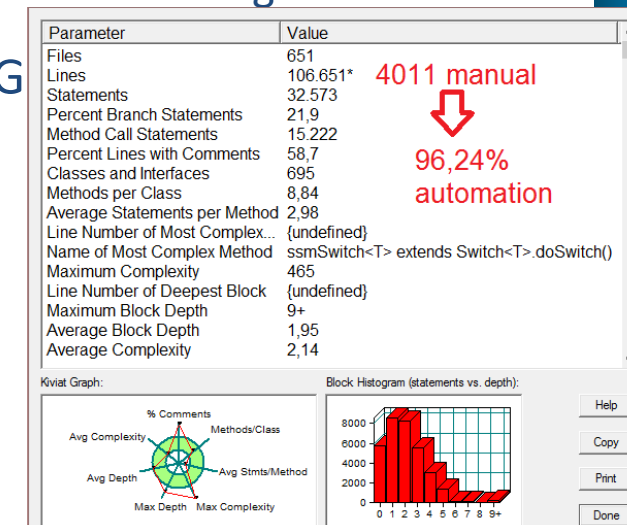
<INIT_AND_CONFIRM_STEP>
  ${addStepDefinition}${cursor}
  <CONTINUATION_TEST>
    <CONTINUATION_CASE>confirmed:continue</CONTINUATION_CASE>
    <CONTINUATION_CASE>not confirmed:ask user</CONTINUATION_CASE>
    <CONTINUATION_CASE>aborted:abort</CONTINUATION_CASE>
  </CONTINUATION_TEST>
</INIT_AND_CONFIRM_STEP>
    
```

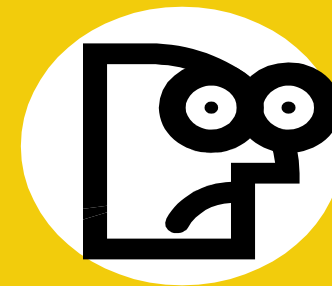
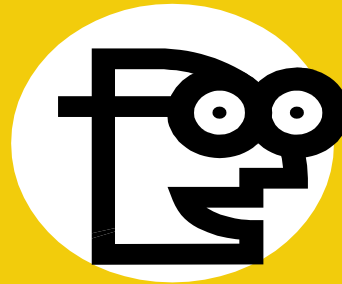
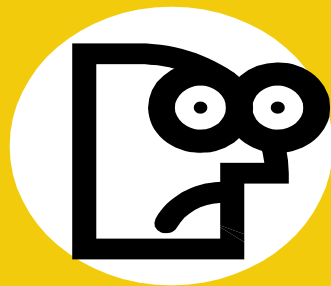
Buttons: Restore Defaults, Apply, OK, Cancel

| Component                            | Software Factories Used |   |
|--------------------------------------|-------------------------|---|
| <b>Procedure<br/>Parser/Compiler</b> | <b>Methodology</b>      | TMF, ANTLR  |
|                                      | <b>Tool</b>             | Xtext Eclipse Plugin  |
|                                      | <b>Automation</b>       | <ul style="list-style-type: none"><li>• Generation of the lexical analyzer</li><li>• Generation of the syntax analyzer</li><li>• Validation of the grammar correctness.</li><li>• Automatic Linker with the persisted data model.</li><li>• Create adapter for semantic analyzer.</li><li>• Create adapter for code generation.</li></ul> |



- Advantages
  - DECREASE OF MANUAL WORK AT MODIFICATIONS.
    - Testing is not required for the modified parts.
    - Consistency of the modifications is ensured by the software factories.
  - FOCUS INCREASE IN THE LOGIC.
- Problems found
  - REPETITION OF SOME TASKS
    - Due to missing knowledge and experience in some of the technologies
  - REQUIRED TIME FOR TECHNOLOGY UNDERSTANDING
    - And their integration and their customizations.
  - MATURITY OF THE FRAMEWORKS
- Future
  - Further application of the factories
  - Important to assess in depth the technologies before taking a decision.





**It's QUESTION TIME !!**