T3D Technical Documentation

This documentation serves as a technical and development reference for maintenance and further development.

Functioning

The HTML documentation is created in 2 steps:

First, the TTCN-3 files are parsed and the information required for step two is written into XML files. These files are then used to generate the HTML files via XSL-Stylesheets. The XSL-Transformations are done by the Saxon XSLT Processor.

Creating the XML Files

TTCN-3 trees are generated by TRex and are then traversed by **Visitors** which gather all relevant information to be written into the XML files. The **Visitors** are instantiated for every TTCN-3 file:

Visitors

There are currently 3 Visitors:

- **T3DVisior** - gathers information used to generate the **project.xml**
- **DependencyVisitor** - gathers information used to generate the **dependencies.xml**
- **ImportVisitor** - gathers information used to generate the **imports.xml**

Creating new Visitors

To create a new Visitor to implement new functionalities or to gather new information from the TTCN-3 files, the following code can be used.

Basic structure of the new Visitor:

```
package org.etsi.t3d.visitor;

import de.ugoe.cs.swe.trex.core.analyzer.rfparser.LocationAST;

public class NewVisitor extends AbstractVisitor {
```

```
        @Override
        public void finish() {
        }

        @Override
        public void init() {
        }

        /*
                visitNodeType(LocationAST node) functions
        */
}
```

visitNodeType(LocationAST node) functions are called when nodes of certain types are traversed. For example, *visitFunctionDef(LocationAST node)* is called when a *FunctionDef* node is found. This node is represented by the *node* parameter. See *AbstractVisitor.java* for a full list of those functions.

Adding the new Visitor to T3D.java

The following code shows where to implement the new Visitor in T3D.java, so it will function properly.

T3D.java:

```
/* ... */
public void run(String[] args) {
        /* ... */
        for (int i = 0; i < ttcn3Resources.size(); i++) {
                analyzer = analyzerFactory.getTTCN3Analyzer(ttcn3Resources.get(i));
                T3DVisitor visitor = new T3DVisitor(xmlPrinter);
                DependencyVisitor dependencyVisitor = new DependencyVisitor(depPrinter);
                ImportVisitor importVisitor = new ImportVisitor(importPrinter);

                NewVisitor newVisitor = new NewVisitor();
                // ...
                newVisitor.acceptDFS((LocationAST) analyzer.getParser().getAST());
                // ...
        }
        /* ... */
}
/* ... */
```

Structure of the generated XML files

project.xml

This file contains the most comprehensive information and represents an abstracted version of the source TTCN-3 files, including module structure, the individual elements, their bodies (if configured so), and T3Doc comments for every module, group, and element of the processed TTCN-3 files. It serves as a basis for the main and the module parameter / test case views.

DTD:

```
<!ELEMENT project (module, element, group)*>
<!ELEMENT module (name, comment?, behaviour, modulename, import*)>
<!ELEMENT group (name, location, comment?, behaviour, modulename, path)>
<!ELEMENT element (name, location, comment?, behaviour, modulename, mpview_ModuleParDef?, path
 <!ATTLIST element type CDATA #REQUIRED>

<!ELEMENT path (path_group)>
<!ELEMENT path_group (path_group)>
 <!ATTLIST path_group loc CDATA #REQUIRED name CDATA #REQUIRED>
<!--
Contains information on which groups an element or group belongs to
<path>
 <path_group loc="..." name="subsubgroup">
  <path_group loc="..." name="subgroup">
   <path_group loc="..." name="group">
   </path_group>
  </path_group>
 </path_group>
<path>
-->

<!ELEMENT mpview_ModuleParDef((mpview_TestcaseDef | mpview_FunctionDef | mpview_AltstepDef)*)
<!ELEMENT mpview_FunctionDef((mpview_TestcaseDef | mpview_FunctionDef | mpview_AltstepDef)*)
<!ELEMENT mpview_TestcaseDef((mpview_TestcaseDef | mpview_FunctionDef | mpview_AltstepDef)*)
<!ELEMENT mpview_AltstepDef((mpview_TestcaseDef | mpview_FunctionDef | mpview_AltstepDef)*)
 <!ATTLIST mpview_ModuleParDef loc CDATA #REQUIRED name CDATA #REQUIRED>
 <!ATTLIST mpview_FunctionDef loc CDATA #REQUIRED name CDATA #REQUIRED>
 <!ATTLIST mpview_TestcaseDef loc CDATA #REQUIRED name CDATA #REQUIRED>
 <!ATTLIST mpview_AltstepDef loc CDATA #REQUIRED name CDATA #REQUIRED>
<!-- contains information on how module parameters are connected to testcases -->

<!ELEMENT behaviour (#PCDATA | keyword | constructbody | link)*>
<!ELEMENT constructbody (#PCDATA | keyword | link)*>
 <!ATTLIST constructbody id CDATA #REQUIRED>
<!ELEMENT keyword (#PCDATA)>
```

```
<!-- <keyword> elements are used around keywords of TTCN3 like "function" -->
<!-- <link> elements are used to identifiy crossreferences -->
<!-- the <constructbody> tag surrounds the parts of the behaviour which can be toggled in the

<!ELEMENT link (#PCDATA)>
 <!ATTLIST link loc CDATA #REQUIRED>

<!ELEMENT newline EMPTY>
<!ELEMENT tab EMPTY>

<!ELEMENT name (#PCDATA)>
<!ELEMENT location (#PCDATA)>

<!ELEMENT comment (author | config | desc | exception | member | param | purpose | remark
                 | return | see | since | status | url | verdict | version)*>
 <!-- @version 2.0.1 ist stored as <version>2.0.1</version> -->

<!ELEMENT author (#PCDATA | esee | eurl)*>
<!ELEMENT config (#PCDATA | esee | eurl)*>
<!ELEMENT desc (#PCDATA | esee | eurl)*>
<!ELEMENT exception (#PCDATA | esee | eurl)*>
<!ELEMENT purpose (#PCDATA | esee | eurl)*>
<!ELEMENT param (#PCDATA | esee | eurl)*>
<!ELEMENT remark (#PCDATA | esee | eurl)*>
<!ELEMENT return (#PCDATA | esee | eurl)*>
<!ELEMENT see (#PCDATA)>
<!ELEMENT since (#PCDATA | esee | eurl)*>
<!ELEMENT status (#PCDATA | esee | eurl)*>
<!ELEMENT url (#PCDATA | esee | eurl)*>
<!ELEMENT verdict (#PCDATA | esee | eurl)*>
<!ELEMENT version (#PCDATA | esee | eurl)*>
<!ELEMENT member (#PCDATA | esee | eurl)*>

<!ELEMENT esee (#PCDATA)>
<!ELEMENT eurl (#PCDATA)>
```

Examples

	TTCN-3	

Behaviour	testcase tc2() runs on sampleComponent1 system sampleComponent3{
	map(mtc:p1, system:p1)
	var sampleComponent2 component2, component3;
	component2 := sampleComponent2.create;
	component3 := sampleComponent2.create;
	component2.start(f3());
	component3.start(f4(1, "a"));
	unmap(mtc:p1, system:p1)
		<behaviour><keyword>
		<keyword>runs</
		<keyword>system
		<keyword>map<
		<keyword>var<
		component2 :=
		component3 :=
		component2.st

	TTCN-3	
	} 	component3.st <keyword>unma }</constructbody> </behaviour>

Path	group group1{
	group group1_1{
	group group1_1_1{
	//...
	}
	}
	}
		<path>
		<path_group loc="gr
		<path_group loc="g
		<path_group loc="
		</path_group>
		</path_group>
		</path_group>
		</path>

import.xml

This file contains information about the imports and dependency relations of the processed TTCN-3 modules. It serves as a basis for the import / module dependency view.

DTD:

```
<!ELEMENT imports module*>
<!ELEMENT module import*>
<!ELEMENT import (import_behaviour, import*) | EMPTY>
 <!ATTLIST import name CDATA #REQUIRED>
<!ELEMENT import_behaviour (#PCDATA | link)*>
<!ELEMENT link (#PCDATA)>
 <!ATTLIST link loc CDATA #REQUIRED>
```

dependencies.xml

This file can be thought of as a blend between an abstracted version of the main project.xml file and a low-level version of the import.xml file, featuring a compact representation of the low-level dependencies at the module definition (element) level - it contains all the module definitions and all the known elements referenced directly within each module definition. There is no separate view associated to this file, since it is basically a compact representation of the main view and its main intent is the use with third-party tools to perform custom tasks, such as slicing or markup of definitions related to a particular module definition (e.g. approved / locked definitions, etc.).

DTD:

```
<!ELEMENT dependencies element*>
<!ELEMENT element reflist>
 <!ATTLIST element id ID #REQUIRED,
                   type CDATA #REQUIRED
                   line CDATA #REQUIRED
                   module CDATA #REQUIRED>
<!ELEMENT reflist ref*>
<!ELEMENT ref EMPTY>
 <!ATTLIST ref id IDREF #REQUIRED>
```

log.xml

This file contains all informations, warnings and errors for each TTCN-3 module that are logged by T3D.

DTD:

```
<!ELEMENT t3dlog file*>
 <!ATTLIST t3dlog t3dversion CDATA #REQUIRED>

<!ELEMENT file (warning | error )*>
 <!ATTLIST file path CDATA #REQUIRED>

<!ELEMENT warning #PCDATA>
 <!ATTLIST warning level CDATA #REQUIRED
                   lines CDATA #REQUIRED>

<!ELEMENT error #PCDATA>
 <!ATTLIST error level CDATA #REQUIRED
                   lines CDATA #REQUIRED>
```

Generation of HTML files

The HTML documentation is generated with the **project.xml** and the **imports.xml**:

The **Main View** and **Module Parameter/Testcase? View** of the documentation are generated with the **html.xsl** stylesheet using the **project.xml** and the **Import View** is generated with the **html_import.xsl** stylesheet using the **imports.xml** .

Structure of the XSL-stylesheets

Below, the structure and templates of the XSL-Stylesheets are described to simplify making modifications. See {$T3D_HOME}/css/doc.css for descriptions of the HTML elements.

html.xsl

Structure of the html.xsl:

```
<xsl:stylesheet>
 <xsl:template match="/">
  <xsl:result-document href="..." format="html">
   <!-- generates index.html -->
  </xsl:result-document>

  <xsl:result-document href="..." format="html">
   <!-- generates import_index.html -->
  </xsl:result-document>

  <xsl:result-document href="..." format="html">
   <!-- generates mp_index.html -->
  </xsl:result-document>

  <xsl:for-each select="//module">
   <xsl:variable name="currentmodule" select="name/text()"/>
   <xsl:variable name="currentindex">
    <!--...-->
   </xsl:variable>
   <xsl:variable name="currentmp_index">
    <!--...-->
   </xsl:variable>

   <xsl:result-document href="..." format="html">
    <!-- generates Main View Documentation of modules -->
   </xsl:result-document>

   <xsl:result-document href="..." format="html">
    <!-- generates MP/TC View Documentation of modules -->
   </xsl:result-document>

   <xsl:for-each select="//element[modulename/text() eq $currentmodule]">
    <xsl:result-document href="..." format="html">
     <!-- generates Main View Documentation of elements -->
    </xsl:result-document>

    <xsl:if test="@type eq 'testcase'">
     <xsl:result-document href="..." format="html">
```

```
      <!-- generates MP/TC View Documentation of testcases -->
     </xsl:result-document>
    </xsl:if>

    <xsl:if test="@type eq 'parameter'">
     <xsl:result-document href="..." format="html">
      <!-- generates MP/TC View Documentation of module parameters -->
     </xsl:result-document>
    </xsl:if>
   </xsl:for-each>
  </xsl:for-each>

  <xsl:for-each select="//group">
   <xsl:result-document href="..." format="html">
    <!-- generates Main View Documentation of groups -->
   </xsl:result-document>

   <xsl:result-document href="..." format="html">
    <!-- generates MP/TC View Documentation of groups -->
   </xsl:result-document>
  </xsl:for-each>
 </xsl:template>

 <!--
    Templates
   -->

</xsl:stylesheet
```

The following table contains descriptions of parameters and function of the used XSLT templates in **html.xsl** .

Template	Parameters	Function
main_allElements	**$this** = module\|group\|element **$currentindex** = complete construct index	calls **views** template inserts **$currentindex** calls **header** template calls **element_withcomment** template
mp_allTables	**$testcases** = testcases **$parameters** = parameters	generates **div_mp** element for groups, modules and the MP/TC index
html_head	**$title** = title of page	generates **head** element
views	**$main** = location of Main View documentation of	generates **div_views** element and

Template	Parameters	Function
	the current element **$mp** = location of MP/TC View documentation of the current element **$import** = location of Import View documentation of the current element **$togglemode**	**T3D Generation Stamp**
main_index	**$modulename** = name of the current module	generates **div_modules** element generates **div_index** element of the Main View of modules, elements and the index
main_groupindex	**$grouplocation** = location of the current group	generates **div_modules** element generates **div_index** of the Main View of groups
index_grouplist	**$this** = groups **$prefix** = '' or 'mp_'	generates list of hyperlinks to all groups given in parameter **$this**
index_elementlist	**$this** = elements **$prefix** = '' or 'mp_' **$type** = type of elements	generates list of hyperlinks to all elements given in parameter **$this**
mp_index	**$modulename** = name of the current module	generates **div_modules** element generates **div_index** of the MP/TC View
index_modulelist	**$prefix** = '', 'mp_' or 'import_'	generates list of hyperlinks to all modules
header	**$this** = module\|group\|element **$prefix** = '', 'mp_' or 'import_'	generates **p_header** element
element_withcomment	**$this** = module|group|element	generates **div_content** element generates **div_comment** element generates **div_element** element
path	**$this** = module\|group\|element **$prefix** = '', 'mp_' or 'import_'	calls **path_group** template
path_group	**$this** = module\|group\|element **$prefix** = '', 'mp_' or 'import_'	generates the group part of the path navigation
mp_testcase_table	**$this** = testcases	generates the MP/TC View table of testcase elements
mpview_path_testcase	**$this** = mpview_TestcaseDefs **$first** = true|false	generates **Path** part of the MP/TC View table of testcase elements

Template	Parameters	Function
match **mpview_ModuleParDef**		generates the MP/TC View table of module parameter elements
mpview_path_modulepar	**$this** = module\|group\|element **$first** = true|false	generates **Path** part of the MP/TC View table of module parameter elements

html_import.xsl

The following table contains descriptions of parameters and function of the used XSLT templates in **html_import.xsl** .

Template	Parameters	Function
import	**$module** = name of the current module **$importname** = name of imported module	generates a list of imports by **$module** from **$importname**
importby	**$imports** = list of indirect imports	generates a list of **$imports**
show_imports	**$module** = module **$currentmodule** = currently selected module	selects a color for **$currentmodule** and calls the **colored_module** template
colored_module	**$module** = module **$color** = class of **$module**	generates a colored hyperlink to **$currentmodule** (used for list of modules in the middle column)

html_head**$title** = title of pagegenerates **head** element**legend**generates Import View Legend

Using new XSL-Stylesheets and/or XML files

New XSL-Transformations can be executed by using the following code.
XSL-Transformation:

```
String foldername = getProperOutputPath() + "/" + getSubPath();
String xmlFileName = "name.xml";
String xsltFileName = "name.xsl";
String outputFileName = "outputName";

System.setProperty("javax.xml.transform.TransformerFactory", "net.sf.saxon.TransformerFactoryI
TransformerFactory tfactory = TransformerFactory.newInstance();
Transformer transformer;
try {
        transformer = tfactory.newTransformer(new StreamSource(new File(xsltFileName)));
        //transformer.setParameter("parameterName", <parameterValue>);
```

```
            transformer.transform(new StreamSource(new File(foldername + "/" + xmlFileName)),
                                  new StreamResult(new FileOutputStream(foldername + "/" + outputFileNam
    } catch (TransformerConfigurationException e) {
            e.printStackTrace();
    } catch (TransformerException e) {
            e.printStackTrace();
    } catch (FileNotFoundException e) {
            e.printStackTrace();
    }
```

Javascript

To toggle the visibility of certain elements in the HTMl documentation (e.g. navigation items), a Javascript file called *doc.js* is used. It can be found in {$T3D_HOME}/js.

Functions

The Javascript file consists of the following functions:

- **getElementsByClass(searchClass,node,tag)** : returns all HTML elements of a certain class
- **toggleConstructbodies(hide)** : toggles visibility of all construct bodies in the Main View of elements/groups/modules if hide == true
- **toggleImportDetails()** : toggles visibility of all details in the Import View of a module
- **togglePaths(hide)** : toggles visibility of all Path columns in the MP/TC View of module parameters/test cases/groups/modules if hide == true
- **toggleHideNotes()** : toggles visibility of all *(toggle)* notes in the Main View of elements/groups/modules
- **toggleElement(element)** : toggles the visibility of *element*
- **toggle(elementName)** : calls **toggleElement()** with the element with the Id *elementName*
- **mp_init(listName)** : collapses all construct lists in the construct index of the MP/TC View, except *listName*
- **init(listName)** : calls **toggleHideNotes()** and collapses all construct lists in the construct index of the Main View, except *listName*