Exchanger XML Editor - XML Schema, RelaxNG and DTDs

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XML Schema, DTD and RelaxNG

Exchanger XML Editor has significant built-in support for XML Schemas, DTDs, RelaxNG and the Namespace Routing Language. There are three separate ways of using grammars in the Exchanger XML Editor:

- Instance Validation
- Tag Completion
- Schema Viewer and Outliner

Tag Completion and Instance Validation have already been covered in the earlier section on Editing XML Content. One special case worth mentioning is the use of one grammar for validation and a separate one for tag completion (or tag prompting). An occasion to do this may be when the grammar has a very large tag vocabulary and the user typically only needs a very small subset. In this case, it is convenient to use a reduced grammar for tag completion, while still validating against the full grammar. See the section on "Infer XML Schema" below for more information on creating reduced grammars based on sample input data. To set up a grammar for use in Tag Completion, select **XML->Set Properties...** and in the **Tag Completion** section of the dialog, choose the grammar type and set the appropriate location.

Schema Viewer

The schema viewer is a convenient tool for browsing an XML Schema in a tree view and seeing the details for element and attribute definitions. Note that the schema viewer currently only works with XML Schemas but it is possible to convert DTDs and RelaxNG grammars for use in the schema viewer with the functionality available through **Schema->Convert Schema** as described later in this section.

Open the file `schema/contacts.xsd` in the **Schema Viewer** project. The Schema Viewer displays a tree representation of the top level of the schema. Click on the Editor button (or select **View->Editor** or press **Ctrl-3**) to see the corresponding tag-based version of the file.

Alternatively it is possible to view the tree representation of the schema when editing an instance document. Ensure that validation is turned off when opening files by selecting **File->Preferences** and on the Views tab, ensure that **Validate Document on Opening** is turned off.

Open the file `contacts.xml` in the **Schema Viewer** project.

Select **XML->Set Properties** and in the **Outliner/Schema Viewer** section of the dialog, set the file location to `projects/Schema Viewer/schema/contacts.xsd`. The Schema and Outliner buttons now become active.

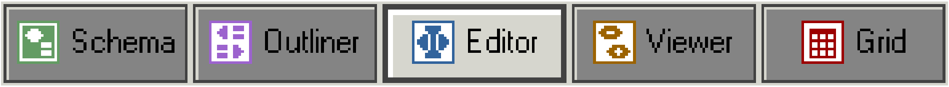


Figure 1. View Buttons

Click on the Schema button. The Schema Viewer displays a tree representation of the top level of the schema.

Schema Tree Viewer

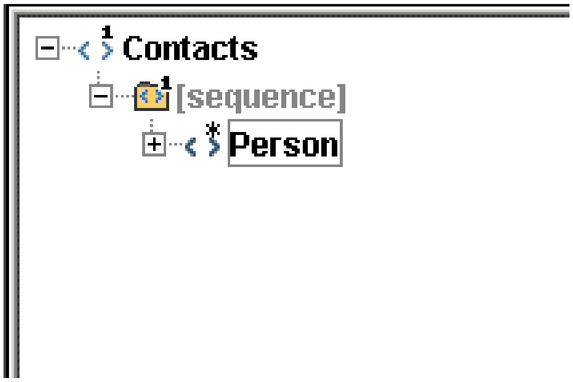


Figure 2. Schema Viewer top level tree

Double-click on the Person node to expand the node. Click on the **Expand All Nodes** button ( ).

Note: **Expand All Nodes** does not always expand the tree completely in the Schema Viewer, because of the possibility of endless recursion.

The Schema Viewer displays a tree representation of the complete schema.

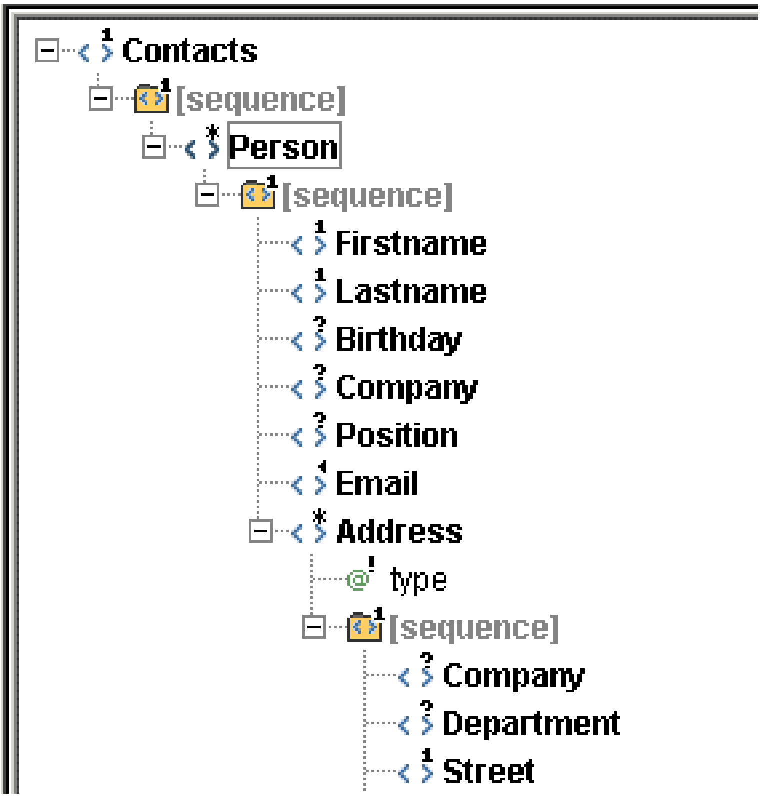
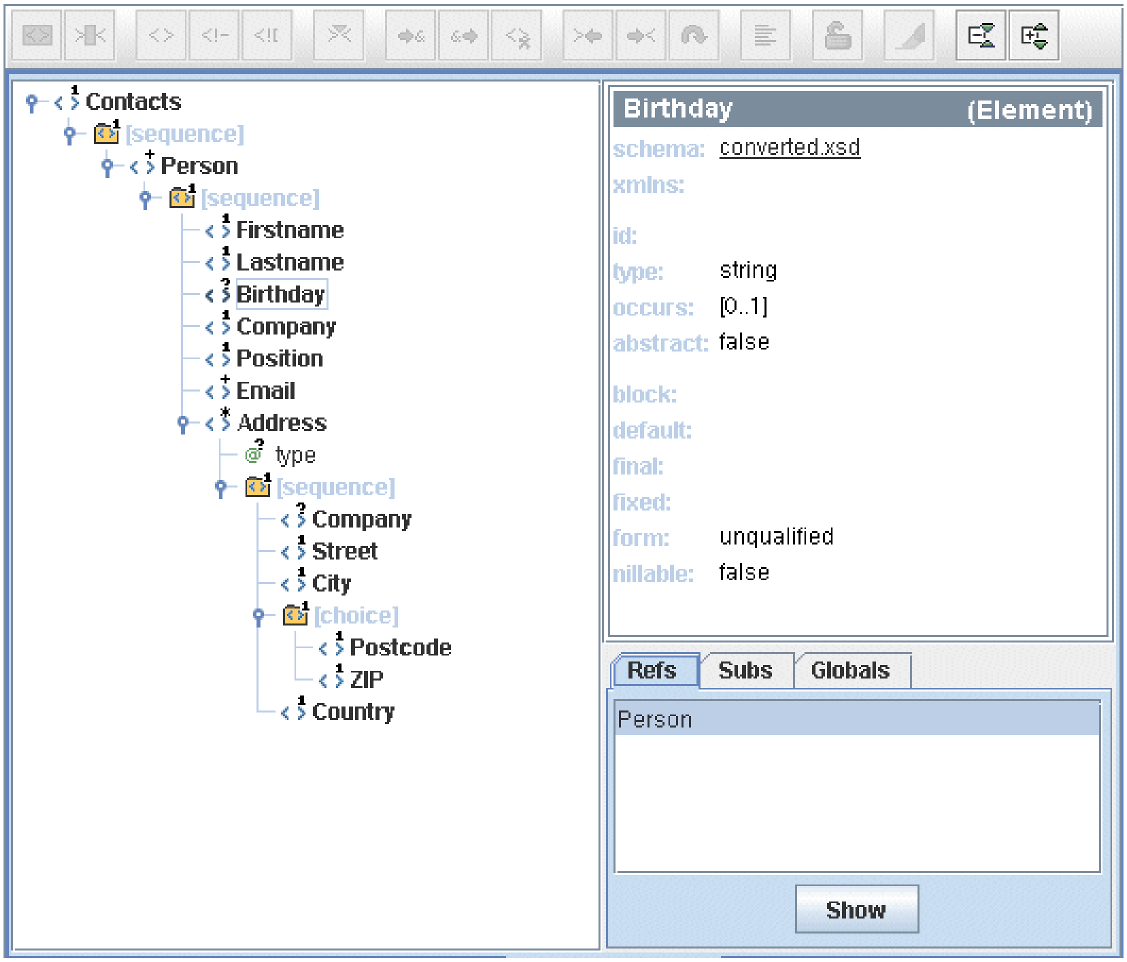


Figure 3. Schema Viewer expanded tree

Details

Click on the **Birthday** node in the tree view and teh corresponding details are displayed in 2 windows to the right.

The upper window contains details of the **Birthday** element definition.



Birthday (Element)

schema: converted.xsd
xmlns:
id:
type: string
occurs: [0..1]
abstract: false
block:
default:
final:
fixed:
form: unqualified
nillable: false

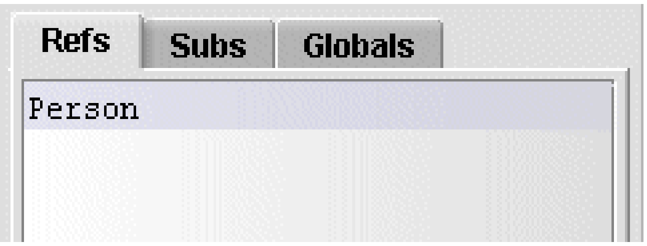
Person

Figure 4. Schema Viewer element details

To see details about the particular schema that includes the current element, click on the link in the **schema** field in the Details panel. (This is useful where there are imported/included schemas).

References, Substitutions and Globals

The lower window on the right hand side shows References (elements where Birthday is used), Substitutions (elements that can be used in place of Birthday) and Globals (top-level element definitions).



Person

Figure 5. Schema Viewer element references, substitutions and globals

Choose the **Globals** tab, click on **Address** and press **Show**. The tree view will now have Address as its root element, and the Details panel will change to show the details for the Address element. Using the References, Substitutions and Globals tabs provide an easy way to navigate through a schema definition.

Editing Associated Grammars

Any associated grammars can be easily viewed or edited by double-clicking on the appropriate filename in the **Document Properties** window. This causes a new window to be opened in the Editor for the chosen grammar.

Grammar Validation

An XML Schema, DTD or RelaxNG grammar can be validated by opening the grammar in the editor using **File->Open** (or alternatively double-clicking on the appropriate filename in the **Document Properties** window as explained above) and then choosing **Schema->Validate XML Schema** or **Schema->Validate Relax NG** or **Schema->Validate DTD** depending on the type of grammar.

Infer XML Schema

Given a sample XML file, it is possible to "learn" or infer an XML Schema to which the file adheres. Open the file `contacts.xml` in the **Schema Viewer** project in the editor, and select **Schema->Infer XML Schema**. When prompted for a location in which to save the inferred schema, enter `projects/Schema Viewer/schema/inferred.xsd` and press **Save**. Use the schema viewer to compare the original **contacts.xsd** with the inferred version - you will notice that there is less detail in the latter, particularly with regards choices and lower and upper bounds. However, using **Schema->Infer XML Schema** can be helpful when creating a schema from scratch, given sample data.

One place where the Infer XML Schema functionality can be very useful is when dealing with a complex schema/DTD like Docbook where there are a lot of elements/attributes but you typically only use a small subset of those available. Open one of your sample (say, Docbook) documents and then use Infer XML Schema to create a temporary schema that can then be used for tag prompting (in the Tag Completion section of the **XML->Set Properties...** dialog). This will restrict the prompting to the subset of tags that you regularly use while facilitating the use of the full schema/DTD for validation purposes. This technique is also very helpful in the Outliner tool for simplifying data entry.

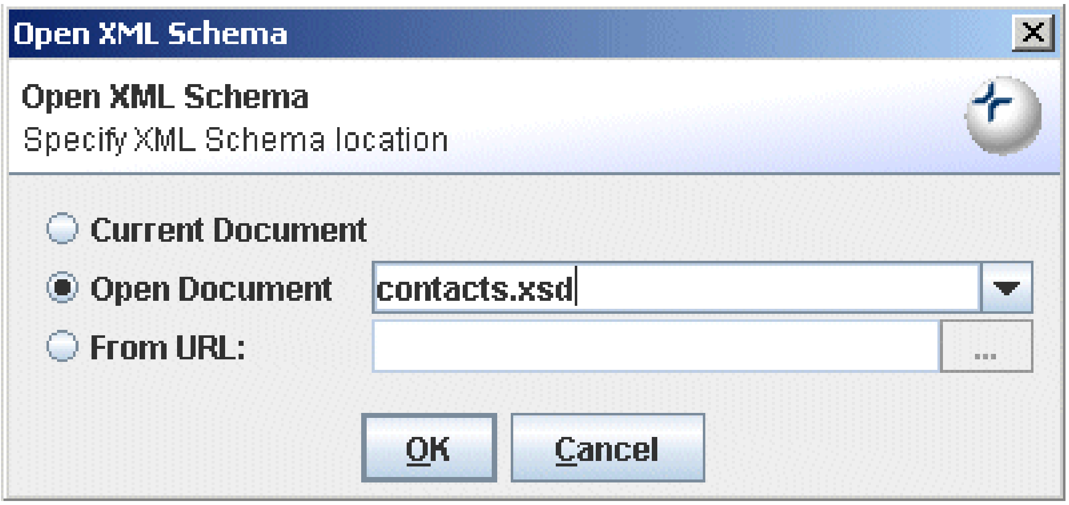
Convert Schema

While it is possible to use Exchanger to edit and validate XML files that use DTD or RelaxNG, it is necessary to have a valid XML Schema to take full advantage of some functionality such as easy content generation using the Outliner or schema browsing in the Schema Viewer. To convert an existing DTD or RelaxNG file to XML Schema, access the Schema Converter by selecting **Tools->Convert Schema**. Set the Input Grammar Type to DTD, for example, and the Input URL to `projects/Schema Viewer/dtd/contacts.dtd`. Set the Output Grammar Type to XSD (XML Schema) and Output URL to `projects/Schema Viewer/schema/converted.xsd` and press **Convert**.

Convert Schema can be used to convert in any direction between DTDs, XML Schemas and RelaxNG grammars (both regular and compact systax). It also provides equivalent functionality to **Schema->Infer XML Schema** when the input is an ordinary XML document.

Generating Sample Instance from XML Schema

It is possible to create an example document that conforms to an XML Schema using the **Schema->Schema Instance Generation** function. First open the schema `schema/contacts.xsd` from the Schema Viewer project in the editor. Now, select **Schema->Schema Instance Generation** and set a target schema in the displayed dialog.



Open XML Schema

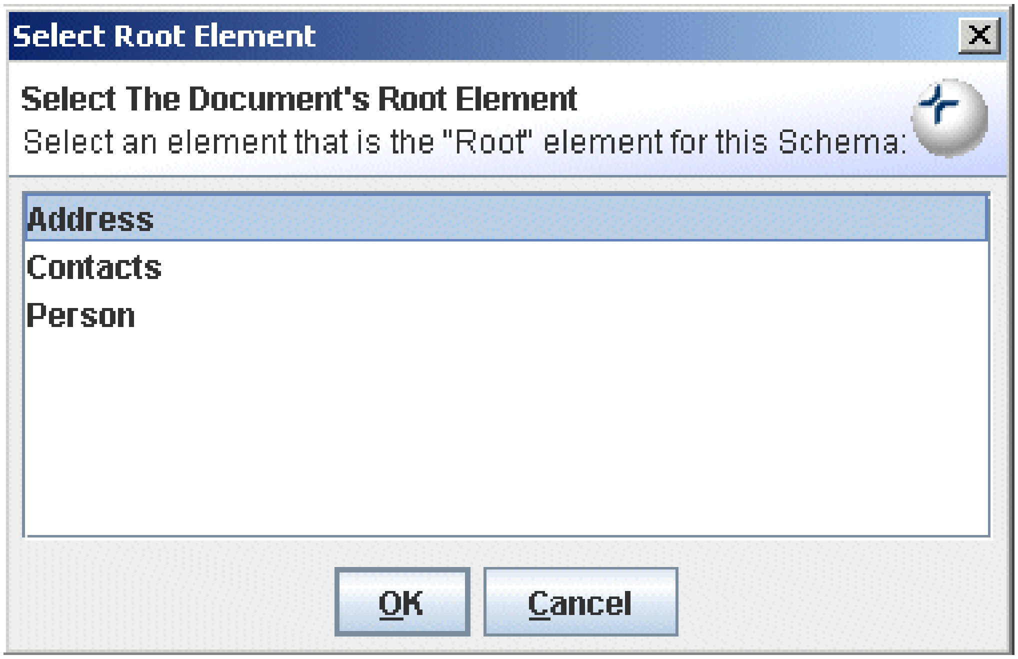
Open XML Schema
Specify XML Schema location

○ Current Document
● Open Document: contacts.xsd
○ From URL:

Figure 6. Schema Instance Generation

Because you have the schema already open in the editor, you can select it using **Current Document** or the **Open Document** drop-down in the dialog. Alternatively, you could choose any other schema using the **From URL** option.

If the root element of the schema cannot be detected automatically, a list of potential root elements will be displayed.



Select Root Element

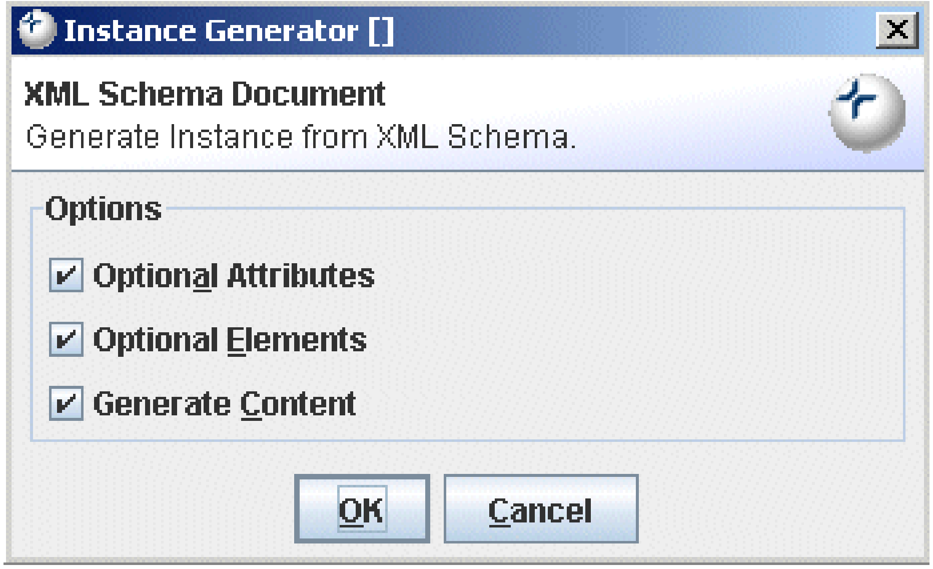
Select The Document's Root Element

Select an element that is the "Root" element for this Schema:

- Address
- Contacts
- Person

Figure 7. Schema Instance Generation Root Element

Select **Contacts** from the list of global elements and press **OK**.



Instance Generator []

XML Schema Document

Generate Instance from XML Schema.

Options

☑ Optional Attributes

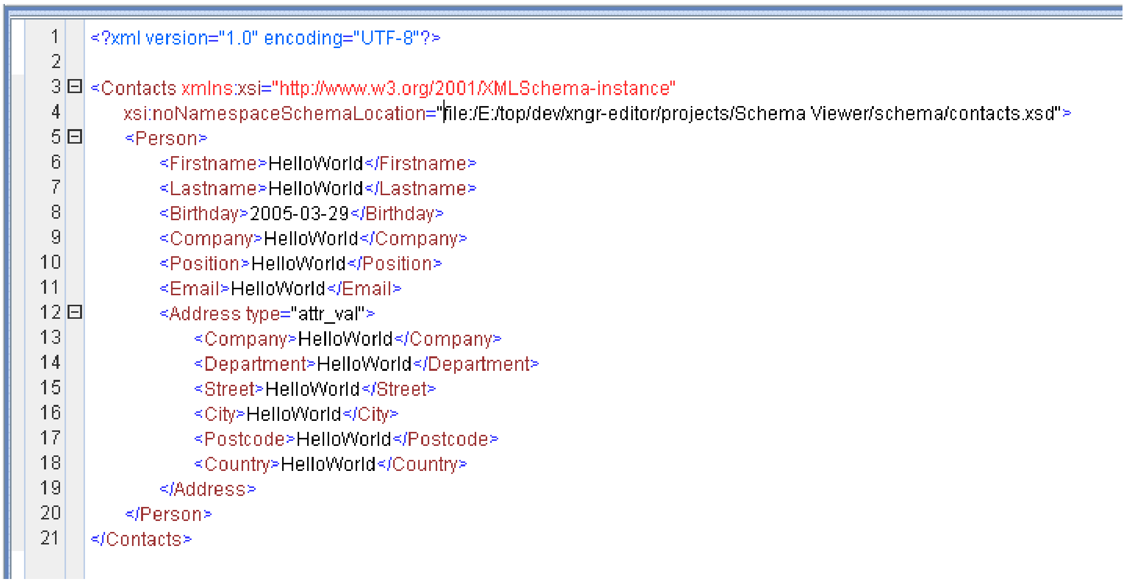
☑ Optional Elements

☑ Generate Content

Figure 8. Schema Instance Generation Options

When generating a sample instance, a number of options are available for configuring the output. Required elements and required attributes will always be generated but optional element, optional attributes and sample data can also be created. In this case , choose **Optional Attributes**, **Optional Elements** and **Generate Content**.

The generated instance will be opened in a new window. Press the **Format** button in the editor toolbar or choose **Edit->XML->Format** to tidy up the output.



```
<?xml version="1.0" encoding="UTF-8"?>

<Contacts xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:noNamespaceSchemaLocation="file:/E:/top/dev/xngr-editor/projects/Schema Viewer/schema/contacts.xsd">
    <Person>
        <Firstname>HelloWorld</Firstname>
        <Lastname>HelloWorld</Lastname>
        <Birthday>2005-03-29</Birthday>
        <Company>HelloWorld</Company>
        <Position>HelloWorld</Position>
        <Email>HelloWorld</Email>
        <Address type="attr_val">
            <Company>HelloWorld</Company>
            <Department>HelloWorld</Department>
            <Street>HelloWorld</Street>
            <City>HelloWorld</City>
            <Postcode>HelloWorld</Postcode>
            <Country>HelloWorld</Country>
        </Address>
    </Person>
</Contacts>
```

Figure 9. Schema Instance Generation Output

When generating the sample instance, Exchanger XML will attempt to insert a valid schema location in the output document. To validate the instance against this schema, ensure that the document properties are set that to validate using the location in stored in the document. To check, select **XML->Set Properties...** and tick **Location defined in Document** in the validation section. Now press the **Validate** button on the main toolbar or press the shortcut **F7** to check that the output conforms to the target schema.

It is not always possible to automatically generate a vaild sample from a schema, particularly when there are recursive structures and regular expressions, so some manual intervention may be needed on the output before it will validate againat the target schema.

As an example, generate an instance for the `schema/UBL_Library_0p70_Order.xsd` schema in the **UBL XSLFO** project. Set the root element to **Order** and initially set the options to only **Generate Content**. The output document should validate, but it is really just a skeleton and not very useful.

To create a more realistic sample, repeat the process but this time choose to generate **Optional Elements** as well. The output is a lot richer but it also fails to validate. This is because of the occurrence of the recursive structures that are generated.

To fix up the output, it is necessary to remove some of the recursive elements. Firstly format the output to make it easier to handle. Press Validate and and a number of errors are reported. Comment out the cat:DeliverySchedule from line 1035 to 1043, the cat:OrderLine on line 1044, the cat:TransportEquipmentMeasurement from line 1277 to 1284 and the second occurrences of cat:DeliverySchedule and cat:OrderLine on lines 1789 to 1798. The generated file should now validate against the original schema.

Editing XML Schemas, RelaxNG grammars and DTDs

It is possible to create an XML Schema or a RelaxNG grammar using the appropriate built-in types and to use the normal tag completion functionality to simplify the editing process. For DTDs, it is necessary to provide specific support as the underlying synax is not XML. To create a new DTD, simply choose **File->New** and select DTD Document. Now when you enter a less-than character, you are prompted with the appropiate keywords for a DTD. Syntax highlighting is also available for DTDs and can be specified in the Text tab of **File->Preferences**.

XML Catalogs

XML Catalogs provide a means to map the information in an XML external (PUBLIC or SYSTEM) identifier into a URI reference for the desired resource. This is convenient where the resource corresponding to an external identifier may not be available due to network issues or where the use of a local resource may be preferred (for performance reasons, maybe). It is possible to set up one or more catalog files in the System tab of **File->Preferences** to facilitate the locating of appropriate DTD/Entity files for PUBLIC and SYSTEM identifiers in an XML instance.