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# XSLT like transformations in Erlang

User Guide

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	Moved module xserl to xmerl application, renamed to xmerl_xs

## Abstract

Erlang has similarities to XSLT since both languages have a functional programming approach. Using the xpath implementation in the existing xmerl application it is possible to write XSLT like transforms in Erlang. One can also combine the transformations with the erlang scripting possibility in the yaws webserver to implement "on the fly" html conversions of xml documents.

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## Terminology

XML Extensible Markup Language

XSL Extensible Stylesheet Language: Transformations

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## Introduction

XSLT stylesheets are often used when transforming XML documents, to other XML documents or (X)HTML for presentation. There are a number of brick-sized books written on the topic. XSLT contains quite many functions and learning them all may take some effort, which could be a reason why the

author only has reached a basic level of understanding. This document assumes a basic level of understanding of XSLT.

Since XSLT is based on a functional programming approach with pattern matching and recursion it is possible to write similar style sheets in Erlang. At least for basic transforms. XPath which is used in XSLT is also already implemented in the xmerl application written in Erlang. This document describes how to use the XPath implementation together with Erlangs pattern matching and a couple of functions to write XSLT like transforms.

This approach is probably easier for an Erlanger but if you need to use real XSLT stylesheets in order to "comply to the standard" there is an adapter available to the Sablotron XSLT package which is written in C++.

This document is written in the Simplified Docbook DTD which is a subset of the complete one and converted to xhtml using a stylesheet written in Erlang.

## Tools

### xmerl

xmerl [<http://sowap.sourceforge.net/>] is a xml parser written in Erlang

### xmerl\_xpath

XPath is an important part of XSLT and is implemented in xmerl

### xmerl\_xs

xmerl\_xs [xmerl\_xs.yaws] is a very small module acting as "syntactic sugar" for the XSLT lookalike transforms. It uses xmerl\_xpath.

### yaws

Yaws [<http://yaws.hyber.org/>], Yet Another Webserver, is a web server written in Erlang that supports dynamic content generation using embedded scripts, also written in Erlang.

#### Figure 1. The Yaws logo

Yaws is not needed to make the XSLT like transformations, but combining yaws and xmerl it is possible to do transformations of XML documents to HTML in realtime, when clients request a web page. As an example I am able to edit this document using emacs with psgml tools, save the document and just do a reload in my browser to see the result. The parse/transform time is not visually different compared to loading any other document in the browser.

## Transformations

When xmerl\_scan parses an xml string/file it returns a record of:

```
-record(xmlElement, {  
    name,
```

```
parents = [],
pos,
attributes = [],
content = [],
language = [],
expanded_name = [],
nsinfo = [],% {Prefix, Local} | []
namespace = #xmlNamespace{}
}).
```

Where content is a mixed list of yet other xmlElement records and/or xmlText (or other node types).

## xmerl\_xs functions

Functions used:

xslapply/2	function to make things look similar to xsl:apply-templates.
value_of/1	Concatenates all text nodes within a tree.
select/2	select(Str, E) extracts nodes from the XML tree using xmerl_xpath.
built_in_rules/2	The default fallback behaviour, template fns should end with: template(E)->built_in_rules(fun template/1, E).

### Note

Text is escaped using xmerl\_lib:export\_text/1 for "<", ">" and other relevant xml characters when exported. So the value\_of/1 and built\_in\_rules/2 functions should be replaced when not exporting to xml or html.

## Examples

### Example 1. Using xslapply

original XSLT:

```
<xsl:template match="doc/title">
  <h1>
    <xsl:apply-templates/>
  </h1>
</xsl:template>
```

becomes in Erlang:

```
template(E = #xmlElement{ parents=[{'doc',_}|_], name='title'}) ->
  ["<h1>",
```

```
        xslapply(fun template/1, E),
        "</h1>"];
```

## Example 2. Using value\_of and select

```
<xsl:template match="title">
  <div align="center"><h1><xsl:value-of select="." /></h1></div>
</xsl:template>
```

becomes:

```
template(E = #xmlElement{name='title'}) ->
  ["<div align=\"center\"><h1>", value_of(select(".", E)), "</h1></div>"];
```

## Example 3. Simple xsl stylesheet

A complete example with the XSLT sheet in the xmerl distribution.

```
<xsl:stylesheet version="1.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns="http://www.w3.org/TR/xhtml1/strict">

  <xsl:strip-space elements="doc chapter section"/>
  <xsl:output
    method="xml"
    indent="yes"
    encoding="iso-8859-1"
  />

  <xsl:template match="doc">
    <html>
      <head>
        <title>
          <xsl:value-of select="title"/>
        </title>
      </head>
      <body>
        <xsl:apply-templates/>
      </body>
    </html>
  </xsl:template>
```

```
<xsl:template match="doc/title">
  <h1>
    <xsl:apply-templates/>
  </h1>
</xsl:template>

<xsl:template match="chapter/title">
  <h2>
    <xsl:apply-templates/>
  </h2>
</xsl:template>

<xsl:template match="section/title">
  <h3>
    <xsl:apply-templates/>
  </h3>
</xsl:template>

<xsl:template match="para">
  <p>
    <xsl:apply-templates/>
  </p>
</xsl:template>

<xsl:template match="note">
  <p class="note">
    <b>NOTE: </b>
    <xsl:apply-templates/>
  </p>
</xsl:template>

<xsl:template match="emph">
  <em>
    <xsl:apply-templates/>
  </em>
</xsl:template>

</xsl:stylesheet>
```

#### **Example 4. Erlang version**

Erlang transformation of previous example:

```
-include("xmerl.hrl").

-import(xmerl_xs,
  [ xslapply/2, value_of/1, select/2, built_in_rules/2 ]).

doctype()->
  "<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN\\"
  \ "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd \">".

process_xml(Doc)->
  template(Doc).
```

```

template(E = #xmlElement{name='doc'})->
  [ "<?xml version='1.0' encoding='iso-8859-1'>",
    doctype(),
    "<html xmlns='http://www.w3.org/1999/xhtml' >"
    "<head>"
    "<title>", value_of(select("title",E)), "</title>"
    "</head>"
    "<body>",
    xslapply( fun template/1, E),
    "</body>"
    "</html>" ];

template(E = #xmlElement{ parents=[{'doc',_}|_], name='title'}) ->
  ["<h1>",
   xslapply( fun template/1, E),
   "</h1>"];

template(E = #xmlElement{ parents=[{'chapter',_}|_], name='title'}) ->
  ["<h2>",
   xslapply( fun template/1, E),
   "</h2>"];

template(E = #xmlElement{ parents=[{'section',_}|_], name='title'}) ->
  ["<h3>",
   xslapply( fun template/1, E),
   "</h3>"];

template(E = #xmlElement{ name='para'}) ->
  ["<p>", xslapply( fun template/1, E), "</p>"];

template(E = #xmlElement{ name='note'}) ->
  ["<p class='note'>"
   "<b>NOTE: </b>",
   xslapply( fun template/1, E),
   "</p>"];

template(E = #xmlElement{ name='emph'}) ->
  ["<em>", xslapply( fun template/1, E), "</em>"];

template(E)->
  built_in_rules( fun template/1, E).

```

It is important to end with a call to `xmerl_xs:built_in_rules/2` if you want any text to be written in "push" transforms. That are the ones using a lot `xslapply( fun template/1, E )` instead of `value_of(select("xpath",E))`, which is pull...

The largest example is the stylesheet to transform this document from the Simplified Docbook XML format to xhtml. The source file is `sdocbook2xhtml.erl`.

## Tips and tricks

### for-each

The function `for-each` is quite common in XSLT stylesheets. It can often be rewritten and replaced by `select/1`. Since `select/1` returns a list of `#xmlElements` and `xslapply/2` traverses them it is more or less the

same as to loop over all the elements.

## position()

The XSLT `position()` and `#xmlElement.pos` are not the same. One has to make an own position in Erlang.

### Example 5. Counting positions

```
<xsl:template match="stanza">
  <p><xsl:apply-templates select="line" /></p>
</xsl:template>

<xsl:template match="line">
  <xsl:if test="position() mod 2 = 0">&#160;&#160;</xsl:if>
  <xsl:value-of select="." /><br />
</xsl:template>
```

Can be written as

```
template(E = #xmlElement{name='stanza'}) ->
  {Lines,LineNo} = lists:mapfoldl(fun template_pos/2, 1, select("line", E)),
  ["<p>", Lines, "</p>"].

template_pos(E = #xmlElement{name='line'}, P) ->
  {[indent_line(P rem 2), value_of(E#xmlElement.content), "<br />"], P + 1 }.

indent_line(0)->"&#160;&#160;";
indent_line(_)->"".
```

## Global tree awareness

In XSLT you have "root" access to the top of the tree with XPath, even though you are somewhere deep in your tree.

The `xslapply/2` function only carries back the child part of the tree to the template fun. But it is quite easy to write template funs that handles both the child and top tree.

### Example 6. Passing the root tree

The following example piece will prepend the article title to any section title

```
template(E = #xmlElement{name='title'}, ETop) ->
  [{"<h3>", value_of(select("title", ETop))," - "},
```

```
xslapply( fun(A) -> template(A, ETop) end, E),  
"</h3>" ];
```

## Utility functions

The module `xmerl_xs` contains the functions `mapxml/2`, `foldxml/3` and `mapfoldxml/3` to traverse `#xmlElement` trees. They can be used in order to build cross-references, see `sdocbook2xhtml.erl` for instance where `foldxml/3` and `mapfoldxml/3` are used to number chapters, examples and figures and to build the Table of contents for the document.

## Future enhancements

More wish- than task-list at the moment.

- More stylesheets
- On the fly exports to PDF for printing and also more "polished" presentations.

## References

1. XML source file [`sdocbookex1src.yaws`] for this document.
2. Erlang style sheet [`sdocbooker1src.yaws`] used for this document. (Simplified Docbook DTD).
3. Open Source Erlang [<http://www.erlang.org/>]