Forrest Sitemap Reference

$Revision: 1.6 $

Technically, Forrest can be thought of as a Cocoon distribution that has been stripped down and optimized for people with simple site publishing needs. Central to Cocoon, and hence Forrest, is the **sitemap**. The sitemap defines the site's URI space (what pages are available), and how each page is constructed. Understanding the sitemap is the key to understanding Forrest.

The Cocoon sitemap syntax is documented fully in Cocoon's documentation. This page provides an overview of the sitemap we have written for Forrest.

1. Getting started

If you have a binary distribution, Forrest's sitemap comprises the $FORREST_HOME/context/*.xmap files. Projects may override these files by copying them into src/documentation/.

The best way to experiment with the sitemap is to run `forrest run` on a Forrest-using site. Changes to the `build/webapp/*.xmap` files will now be immediately visible on http://localhost:8888/.

2. Sitemap Overview

Forrest's sitemap is divided both physically and logically. The most obvious is the physical separation. There are no less than thirteen *.xmap files, each defining pipelines in a functional area. Each *.xmap file has its purpose documented in comments at the top. Here is a brief overview of the files, in order of importance.

sitemap.xmap	Primary sitemap file, which delegates responsibility for serving certain URIs to the others (technically called subsitemaps). More on the structure of this file later.
forrest.xmap	Sitemap defining Source pipelines, which generate the body section of Forrest pages. All pipelines here deliver XML in Forrest's intermediate 'document-v12' format, regardless of originating source or format.
menu.xmap	Pipelines defining the XML that becomes the menu.
linkmap.xmap	Defines a mapping from abstract ('site:index') to physical ('../index.html') links for the current page. See Menus and Linking for a conceptual overview, and the Link rewriting section for technical details.
resources.xmap	Serves 'resource' files (images, CSS, Javascript).
raw.xmap	Serves files located in `src/documentation/content/` that are not to be modified by Forrest.
aggregate.xmap	Generates a single page (HTML or PDF) containing all the content for the site.
faq.xmap	Processes FAQ documents.

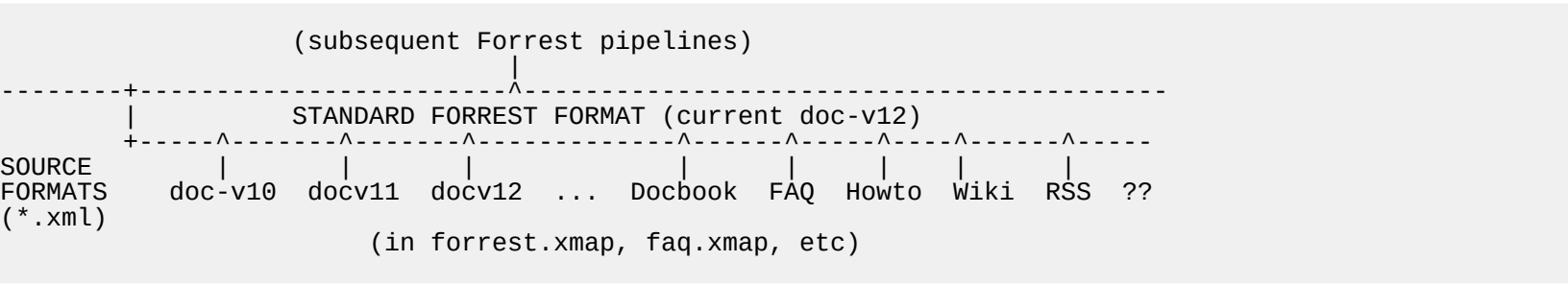
status.xmap	Generates changes and todo pages from a single `status.xml` in the project root.
issues.xmap	Generates a page of content from an RSS feed. Used in Forrest to generate a 'current issues' list from JIRA.
revisions.xmap	Support for HOWTO documents that want 'revisions'. Revisions are XML snippets containing comments on the main XML file. The main pipeline here automatically appends a page's revisions to the bottom.
dtd.xmap	A Source pipeline that generates XML from a DTD, using Andy Clark's DTD Parser. Useful for documenting DTD-based XML schemas, such as Forrest's own DTDs.
profiler.xmap	Defines the 'profiler' pipeline. allowing pipelines to be benchmarked.

3. Source pipelines (**.xml)

Most *.xmap files (forrest, aggregate, faq, status, issues, revisions, dtd) define Source pipelines. Source pipelines define the content (body) XML for site pages. The input XML format can be any format (doc-v12, Docbook, RSS, FAQ, Howto) and from any source (local or remote). The output format is always Forrest's intermediate 'doc-v12' format.

Source pipelines always have a `.xml` extension. Thus, index.xml gives you the XML source for the index page. Likewise, faq.xml gives you XML for the FAQ (transformed from FAQ syntax), and changes.xml returns XML from status.xml. Take any page, and replace its extension (`.html` or `.pdf`) with `.xml`, and you'll have the Source XML.

This is quite powerful, because we now have an abstraction layer, or 'virtual filesystem', on which the rest of Forrest's sitemap can build. Subsequent layers don't need to care whether the XML was obtained locally or remotely, or from what format. Wikis, RSS, FAQs and Docbook files are all processed identically from here on.



3.1. forrest.xmap

Most of the usual Source pipelines are defined in `forrest.xmap`, which is the default (fallback) handler for `**.xml` pages. forrest.xmap uses the SourceTypeAction to work out the type of XML it is processing, and converts it to doc-v12 if necessary.

For instance, say we are rendering a Howto document called 'step1.xml'. It contains this DOCTYPE declaration:

```
<!DOCTYPE howto PUBLIC "-//APACHE//DTD How-to V1.0//EN" "howto-v10.dtd">
```

The SourceTypeAction sees this, and applies this transform to get it to doc-v12:

```
        <map:when test="howto-v10">
          <map:transform src="resources/stylesheets/howto2document.xsl" />
        </map:when>
```

The intermediate result is visible at the URL community/howto/multi/step1.xml.

3.2. Other source pipelines

As mentioned above, all non-core Source pipelines are distributed in independent `*.xmap` files. There is a block of `sitemap.xmap` which simply delegates certain requests to these subsitemaps:

```
<!-- Body content -->
<map:match pattern="**.xml">
  <map:match pattern="changes.xml">
    <map:mount uri-prefix="" src="status.xmap" check-reload="yes" />
  </map:match>

  <map:match pattern="todo.xml">
    <map:mount uri-prefix="" src="status.xmap" check-reload="yes" />
  </map:match>

  <map:match pattern="**dtdx.xml">
    <map:mount uri-prefix="" src="dtd.xmap" check-reload="yes" />
  </map:match>

  <map:match pattern="forrest-issues.xml">
    <map:mount uri-prefix="" src="issues.xmap" check-reload="yes" />
  </map:match>

  <map:match pattern="**faq.xml">
    <map:mount uri-prefix="" src="faq.xmap" check-reload="yes" />
  </map:match>

  <map:match pattern="site.xml">
    <map:mount uri-prefix="" src="aggregate.xmap" check-reload="yes" />
  </map:match>
  ....
  ....
```

3.2.1. Late-binding pipelines

One point of interest here is that the subsitemap is often not specific about which URLs it handles, and relies on the caller (the section listed above) to only pass relevant requests to it. We term this "binding a URL" to a pipeline.

For instance, the main pipeline in `faq.xmap` matches `**.xml`, but only `**faq.xml` requests are sent to it.

This "late binding" is useful, because the whole URL space is managed in `sitemap.xmap`, and not spread over lots of *.xmap files. For instance, say you wish all `*.xml` inside a `faq/` directory to be processed as FAQs. Just override `sitemap.xmap`, and redefine the relevant source matcher:

```
  <map:match pattern="**faq.xml">
    <map:mount uri-prefix="" src="faq.xmap" check-reload="yes" />
  </map:match>
```

4. Output pipelines

To recap, we now have a `*.xml` pipeline defined for each page in the site, emitting standardized XML. These pipeline definitions are located in various *.xmap files, notably forrest.xmap.

We now wish to render the XML from these pipelines to output formats like HTML and PDF.

4.1. PDF output

Easiest case first; PDFs don't require menus or headers, so we can simply transform our intermediate format into XSL:FO, and from there to PDF. This is done by the following matcher in `sitemap.xmap`:

```
1   <map:match type="regexp" pattern="^(.*?)([^/]*).pdf$">
2     <map:generate src="cocoon:/{1}{2}.xml"/>
3     <map:transform type="xinclude"/>
4     <map:transform type="linkrewriter" src="cocoon://{1}linkmap-{2}.pdf"/>
5     <map:transform src="skins/{forrest:skin}/xslt/fo/document2fo.xsl">
6       <map:parameter name="ctxbasedir" value="{realpath:.}/"/>
7       <map:parameter name="xmlbasedir" value="content/xdocs/{1}"/>
8     </map:transform>
9     <map:serialize type="fo2pdf"/>
10  </map:match>
```

1. The first line uses a matching regexp to break the URL into directory `(.*?)` and filename `([^/]*)` part.
2. We then generate XML from a Source pipeline, with the URL `cocoon:/{1}{2}.xml`
3. We then expand any XInclude statements..
4. and rewrite links..
5. and finally apply the document2fo.xsl stylesheet, to generate XSL:FO XML.

Lastly, we generate a PDF using the fo2pdf serializer.

4.2. HTML output

Generating HTML pages is more complicated, because we have to merge the page body with a menu and tabs, and then add a header and footer. Here is the `*.html` matcher in `sitemap.xmap`:

```
        <map:match pattern="*.html">
          <map:aggregate element="site">
          <map:part src="cocoon:/tab-{0}"/>
          <map:part src="cocoon:/menu-{0}"/>
          <map:part src="cocoon:/body-{0}"/>
          </map:aggregate>
          <map:call resource="skinit">
            <map:parameter name="type" value="site2xhtml"/>
            <map:parameter name="path" value="{0}"/>
          </map:call>
        </map:match>
```

So index.html is formed from aggregating body-index.html, menu-index.html and tab-index.html, and then applying the `site2xhtml.xsl` stylesheet to the result.

There is a nearly identical matcher for HTML files in subdirectories:

```
        <map:match pattern="**/*.html">
          <map:aggregate element="site">
          <map:part src="cocoon:/{1}/tab-{2}.html"/>
          <map:part src="cocoon:/{1}/menu-{2}.html"/>
          <map:part src="cocoon:/{1}/body-{2}.html"/>
          </map:aggregate>
          <map:call resource="skinit">
            <map:parameter name="type"
              value="site2xhtml"/>
            <map:parameter name="path"
              value="{0}"/>
          </map:call>
        </map:match>
```

5. Intermediate pipelines

5.1. Page body

Here is the matcher which generates the page body:

```
1   <map:match pattern="**body-*.html">
2     <map:generate src="cocoon:/{1}{2}.xml"/>
3     <map:transform type="idgen"/>
4     <map:transform type="xinclude"/>
5     <map:transform type="linkrewriter" src="cocoon:/{1}linkmap-{2}.html"/>
6     <map:call resource="skinit">
7       <map:parameter name="type" value="document2html"/>
8       <map:parameter name="path" value="{1}{2}.html"/>
9       <map:parameter name="notoc" value="false"/>
10    </map:call>
11  </map:match>
```

1. In our matcher pattern, {1} will be the directory (if any) and {2} will be the filename.
2. First, we obtain XML content from a source pipeline
3. We then apply a custom-written `IdGeneratorTransformer`, which ensures that every <section> has an 'id' attribute, by generating one from the <title> if necessary. For example, <idgen> will transform:

   ```
   <section>
   <title>How to boil eggs</title>
   ...
   ```

   into:

   ```
   <section id="How+to+boil+eggs">
   <title>How to boil eggs</title>
   ...
   ```

   Later, the `document2html.xsl` stylesheet will create an <a name> element for every section, allowing this section to be referred to as `index.html#How+to+boil+eggs`.
4. We then expand XInclude elements.
5. and rewrite links..
6. and then finally apply the stylesheet that generates a fragment of HTML (minus the outer elements like <html> and <body>) suitable for merging with the menu and tabs.

5.2. Page menu

In `sitemap.xmap`, the matcher generating HTML for the menu is:

```
  <map:match pattern="**menu-*.html">
    <map:generate src="cocoon:/{1}book-{2}.html"/>
    <map:transform type="linkrewriter" src="cocoon:/{1}linkmap-{2}.html"/>
    <map:call resource="skinit">
      <map:parameter name="type" value="book2menu"/>
      <map:parameter name="path" value="{1}{2}.html"/>
    </map:call>
  </map:match>
```

We get XML from a 'book' pipeline, rewrite links, and apply the `book2menu.xsl` stylesheet to generate HTML.

How the menu XML is actually generated (the *book-*.html pipeline) is sufficiently complex to require a section of its own.

5.3. Page tabs

Tab generation is quite tame compared to menus:

```
  <map:match pattern="**tab-*.html">
    <map:generate src="content/xdocs/tabs.xml" />
    <map:transform type="linkrewriter" src="cocoon:/{1}linkmap-{2}.html"/>
```

```
    <map:call resource="skinit">
      <map:parameter name="type" value="tab2menu"/>
      <map:parameter name="path" value="{1}{2}.html"/>
    </map:call>
  </map:match>
```

All the smarts are in the `tab2menu.xsl` stylesheet, which needs to choose the correct tab based on the current path. Currently, a "longest matching path" algorithm is implemented. See the `tab2menu.xsl` stylesheet for details.

6. Menu XML generation

The 'book' pipeline is defined in `sitemap.xmap`as:

```
    <map:match pattern="**book-*.html">
      <map:mount uri-prefix="" src="menu.xmap" check-reload="yes" />
    </map:match>
```

Meaning that it is defined in `menu.xmap`. In there we find the real definition, which is quite complicated, because there are three supported menu systems (see menus and linking). We will not do through the sitemap itself (menu.xmap), but will instead describe the logical steps involved:

1. Take site.xml, and expand hrefs so that they are all root-relative.
2. Depending on the `forrest.menu-scheme` property, we now apply one of the two algorithms for choosing a set of menu links (described in menu generation):

   - For "@tab" menu generation, we first ensure each site.xml node has a tab attribute (inherited from a parent if necessary), and then pass through nodes whose tab attribute matches that of the "current" node.

     For example, say our current page's path is `community/howto/index.html`. In `site.xml` we look for the node with this `href`, and discover its `tab` attribute value is `howtos`. We then prune the `site.xml`-derived content to contain only nodes with `tab="howtos"`.

     All this is done with XSLT, so the sitemap snippet does not reveal this complexity:

     ```
     <map:transform src="resources/stylesheets/site2site-normalizetabs.xsl" />
     <map:transform src="resources/stylesheets/site2site-selectnode.xsl">
       <map:parameter name="path" value="{1}{2}"/>
     </map:transform>
     ```

   - For 'directory' menu generation, we simply use an `XPathTransformer` to include only pages in the current page's directory, or below:

     ```
     <map:transform type="xpath">
       <map:parameter name="include" value="//*[@href='{1}']" />
     </map:transform>
     ```

     Here, `{1}` is the directory part of the current page. So if our current page is `community/howto/index.html`, `{1}` will be `community/howto/`, and the transformer will include all nodes in that directory.

   We now have a `site.xml` subset relevant to our current page.
3. The `href` nodes in this are then made relative to the current page.
4. The XML is then transformed into a legacy `'book.xml'` format, for compatibility with existing stylesheets, and this XML format is returned (hence the name of the matcher; `**book-*.html`).

7. Link rewriting

In numerous places in `sitemap.xmap`, you will see the "linkrewriter" transformer in action. For example:

```
<map:transform type="linkrewriter" src="cocoon:/{1}linkmap-{2}.html"/>
```

This statement is Cocoon's linking system in action. A full description is provided in Menus and Linking. Here we describe the implementation of linking.

7.1. Cocoon foundations: Input Modules

The implementation of `site:` linking is heavily based on Cocoon Input Modules, a little-known but quite powerful aspect of Cocoon. Input Modules are generic Components which simply allow you to look up a value with a key. The value is generally dynamically generated, or obtained by querying an underlying data source.

In particular, Cocoon contains an `XMLFileModule`, which lets one look up the value of an XML node, by interpreting the key as an XPath expression. Cocoon also has a `SimpleMappingMetaModule`, which allows the key to be rewritten before it is used to look up a value.

The idea for putting these together to rewrite `site:` links was described in this thread. The idea is to write a Cocoon Transformer that triggers on encountering <link href="`scheme:address`">, and interprets the `scheme:address` internal URI as `inputmodule:key`. The transformer then uses the named InputModule to look up the key value. The `scheme:address` URI is then rewritten with the found value. This transformer was implemented as LinkRewriterTransformer, currently distributed as a "block" in Cocoon 2.1.

7.2. Implementing site:-rewriting

Using the above components, `site:` URI rewriting is accomplished as follows.

7.2.1. cocoon.xconf

First, we declare all the input modules we will be needing:

```
<!-- For the site: scheme -->
<component-instance
  class="org.apache.cocoon.components.modules.input.XMLFileModule"
  logger="core.modules.xml" name="linkmap"/>

<!-- Links to URIs within the site -->
<component-instance
  class="org.apache.cocoon.components.modules.input.SimpleMappingMetaModule"
  logger="core.modules.mapper" name="site"/>

<!-- Links to external URIs, as distinct from 'site' URIs -->
<component-instance
  class="org.apache.cocoon.components.modules.input.SimpleMappingMetaModule"
  logger="core.modules.mapper" name="ext"/>
```

- **linkmap** will provide access to the contents of `site.xml`; for example, `linkmap:/site/about/index/@href` should return the value 'index.html'.
- **site** provides a 'mask' over **linkmap** such that `site:index` expands to `linkmap:/site//index/@href`.
- **ext** provides another 'mask' over **linkmap**, such that `ext:ant` would expand to `linkmap:/site/external-refs//ant/@href`

However at the moment, we have only declared the input modules. They will be configured in `sitemap.xmap` as described in the next section.

7.2.2. sitemap.xmap

Now in the sitemap, we define the LinkRewriterTransformer, and insert it into any pipelines dealing with user-editable XML content:

```
....
```

```
<!-- Rewrites links, e.g. transforming
     href="site:index" to href="../index.html"
-->
<map:transformer name="linkrewriter"
  logger="sitemap.transformer.linkrewriter"
  src="org.apache.cocoon.transformation.LinkRewriterTransformer">
  <link-attrs>href src</link-attrs>
  <schemes>site ext</schemes>

  <input-module name="site">
    <input-module name="linkmap">
      <file src="{src}" reloadable="false" />
    </input-module>
    <prefix>/site//</prefix>
    <suffix>/@href</suffix>
  </input-module>
  <input-module name="ext">
    <input-module name="linkmap">
      <file src="{src}" reloadable="false" />
    </input-module>
    <prefix>/site/external-refs//</prefix>
    <suffix>/@href</suffix>
  </input-module>
</map:transformer>
....
....
<map:match pattern="**body-*.html">
  <map:generate src="cocoon:/{1}{2}.xml"/>
  <map:transform type="idgen"/>
  <map:transform type="xinclude"/>
  <map:transform type="linkrewriter" src="cocoon:/{1}linkmap-{2}.html"/>
  ...
</map:match>
```

As you can see, our three input modules are configured as part of the LinkRewriterTransformer's configuration.

- Most deeply nested, we have:

  ```
                <input-module name="linkmap">
                  <file src="{src}" reloadable="false" />
              </input-module>
  ```

  The `{src}` text is expanded to the value of the `src` attribute in the `linkrewriter` instance, namely `cocoon:/{1}linkmap-{2}.html`. Thus the `linkmap` module reads dynamically generated XML specific to the current request.

- One level out, we configure the `site` and `ext` input modules, to map onto our dynamically configured `linkmap` module.

- Then at the outermost level, we configure the `linkrewriter` transformer. First we tell it which attributes to consider rewriting:

  ```
                <link-attrs>href src</link-attrs>
                <schemes>site ext</schemes>
  ```

  So, `href` and `src` attributes starting with `site:` or `ext:` are rewritten.

  By nesting the `site` and `ext` input modules in `linkrewriter`'s configuration, we tell `linkrewriter` to use these two input modules when rewriting links.

The end result is that, for example, the source XML for the `community/body-index.html` page has its links rewritten by an XMLFileModule reading XML from `cocoon:/community/linkmap-index.html`.

7.2.3. Dynamically generating a linkmap

Why do we need this 'linkmap' pipeline generating dynamic XML from `site.xml`, instead of just using `site.xml` directly? The reasons are described in the linkmap RT: we need to concatenate @hrefs and add ..'s to the paths, depending on which directory the linkee is in. This is done with the following pipelines in `linkmap.xmap`:

```
<!-- site.xml with @href's appended to be context-relative. -->
<map:match pattern="abs-linkmap">
  <map:generate src="content/xdocs/site.xml" />
  <map:transform src="resources/stylesheets/absolutize-linkmap.xsl" />
  <map:serialize type="xml" />
</map:match>

<!-- Linkmap for regular pages -->
<map:match pattern="**linkmap-*">
  <map:generate src="cocoon://abs-linkmap" />
  <map:transform src="resources/stylesheets/relativize-linkmap.xsl">
    <map:parameter name="path" value="{1}{2}" />
    <map:parameter name="site-root" value="{conf:project-url}" />
  </map:transform>
  <map:serialize type="xml" />
</map:match>
```

You can try these URIs out directly on a live Forrest to see what is going on (for example, Forrest's own abs-linkmap and linkmap-index.html.