Apache Cocoon
A versatile middleware for multi-\{format, channel, device, modal\} applications

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Agenda

- About...
- What is Apache Cocoon?
- Multi-format and multi-channel applications
- Handling multi-device applications
- Extending to multi-modal applications
About Anyware Technologies

- Founded in 2000, now employs 45 people

- Core technologies
  - XML, Java, HTTP
  - Apache Cocoon server-side, Eclipse client-side

- 3 business areas
  - Information Systems: web applications, content management, consulting & training
  - Industrial automation: browser-based operating portal
  - Machine to Machine: embedded webservices server in GPRS modules
What is Apache Cocoon?

- The Apache Software Foundation
  - Non-profit organization developing open source server software
  - Apache httpd: powers 2/3 of the Internet websites
  - 1300 developers, 30 main projects
  - Speaker is a V.P. of the Foundation

- Apache Cocoon: a web application framework
  - Relies heavily on XML technologies
  - Written in Java
  → http://cocoon.apache.org
Cocoon: an evolving framework

- 1999: version 1.0
  - A publication framework for Apache websites
  - Transforms XML to HTML using XSLT

- 2001: version 2.0
  - A multi-format, multi-channel publication framework
  - The sitemap, a language to build XML pipelines

- 2003: version 2.1
  - Handling complex user interactions
  - The flowscript, based on continuations
Cocoon's main features

- Views are defined using XML processing pipelines
  - Strong separation between content and rendering
  - Makes it easy to provide several renderings depending on the user's browser (whatever "browser" means)

- Interaction flow is handled using continuations
  - Continuation = the execution state of a program
  - Can be stored, and later retrieved and "resurrected"

- The http request/response paradigm is abstracted
  - http, smtp, internal requests, other implementations...
Cocoon's environment

Web clients
- Browser
- PDA
- Phone
- VoiceXML
- Web service
- PDF, Word, Excel...

Web Server

J2EE Server (servlets)

Cocoon

Web services

Databases

Files, SAP, Repository...

Other web applications
Cocoon pipelines principles

Request:
- http
- smtp
- command line
- others...

Generator  →  Transformer  →  Serializer

- Files
- Databases
- Application data
- Dynamic pages (JSP)
- XML
- XSLT
- Query engine
- Internationalization
- Aggregation
- ...  

Binary response

- HTML
- XML, WML, SVG, VoiceXML
- PDF, RTF, XLS, MIF
- GIF, JPEG
- ...
Building pipelines: the sitemap

- A language to define pipelines
  - XML syntax composed of control structures and pipeline components

- Sample: publishing news in html

```xml
<map:match pattern="news/\*\.html">
  <map:generate type="file" src="news-dir/{1}.xml"/>
  <map:transform type="xslt" src="news2html.xsl"/>
  <map:serialize type="html"/>
</map:match>
```

`news/3.html` ➔ `file` ➔ `xslt` ➔ `html` ➔ `HTML`

Wildcard substitution
Multi-format publishing

- A single browser, different renderings

```xml
<map:match pattern="news/*.html">
  <map:generate type="file" src="news-dir/{1}.xml"/>
  <map:transform type="xslt" src="news2html.xsl"/>
  <map:serialize type="html"/>
</map:match>

news/3.html ➔ file ➔ xslt ➔ html ➔ HTML

<map:match pattern="news/*.pdf">
  <map:generate type="file" src="news-dir/{1}.xml"/>
  <map:transform type="xslt" src="news2xslfo.xsl"/>
  <map:serialize type="fo2pdf"/>
</map:match>

news/3.pdf ➔ file ➔ xslt ➔ fo2pdf ➔ PDF
```
Multi-format: use cases

- Printable format, book assembly
  - PDF

- Graphical presentation and reports
  - SVG, Excel, OpenOffice Calc

- Document management
  - RTF (word), OpenOffice Writer
  - Modifiable documents that can be used to edit content
Multi-format: PLC Animator

- Browser-based factory operating portal

![Diagram showing Multi-format PLC Animator system](image)
Multi-channel publishing

- Different browsers, a single URL

```xml
<map:match pattern="news/">  
  <map:generate src="news-data/{1}.xml"/>
  <map:select type="browser">  
    <map:when test="wap">  
      <map:transform type="xslt" src="news2wml.xsl"/>
      <map:serialize type="wml"/>
    </map:when>
    <map:otherwise>  
      <map:transform type="xslt" src="news2html.xsl"/>
      <map:serialize type="html"/>
    </map:otherwise>
  </map:select>
</map:match>
```
Multi-channel: use cases

- Mobile phone portals
  - Major european operators use Cocoon for their portal
  - Huge traffic, large number of devices

- Cocoon includes a CC/PP-UAPProf engine to find the detailed characteristics of the user's browser
Multi-channel: use cases

- Rely: in-car multimedia content delivery through satellite broadcast
  - IST European project (www.rely-europe.com)
  - Uses a shrinked-down version of Cocoon for embedded systems
Rely: user interfaces

- Dashboard GUI
  - Driven using an input pad (rotary + buttons)

- PDA GUI
  - Bluetooth connection
Flowscript: managing user interaction

- Sample scenario: checking out a shopping cart

```javascript
var cart, user;

function checkout() {
    while(user == null) {
        cocoon.sendPageAndWait("login");
        user = UserRegistry.getUser(cocoon.request.getParameter("name"));
    }
    cocoon.showForm("shippingAddress", {who: user});
    var address = cocoon.form.getValue("address");
    cocoon.showForm("creditCard");
    var creditCard = cocoon.form.getValue("creditCard");
    cocoon.sendPageAndWait("confirmOrder");

    if(cocoon.request.getParameter("ok")) {
        EnterpriseSystem.placeOrder(user, cart, address, creditCard);
        cocoon.sendPage("orderPlaced");
    } else {
        cocoon.sendPage("cancelled");
    }
}
```

Calls the sitemap and suspends the scenario
A sub-scenario to fill in and validate a form
What is a continuation?

- A frozen execution state
  - Contains program location and local variables

- An identifier
  - Created by the server
  - Placed in the response (URL or form field)
  - Sent by the browser back to the server

```html
<form action="cont-f6c433ace4a3148">
  <input name="foo"/>
  ...
</form>
```
Benefits of continuations

- For web applications
  - Sophisticated scenarios without complex state automata

- For multi-device applications
  - Continuations can be persisted...
  - ... and have an URL (bookmarkable)
  → Start on a device and continue on another one
Multi-user and multi-system gateway

- **Use case**: crisis management information system
  - Coordinators: need rich GUIs to be efficient
  - Rescuers in the field: phones or voice browsers
  - Radios & TVs: news feeds
  - The public: web site, voice browsers

- **Cocoon** acts as an information middleware
  - Data management and multi-channel interaction
  - Rich GUI using dedicated technologies
  → Partnership with [intuiLab](https://intuiLab.com)
Use case: crisis management

Coordinators
- IntuiKit

Rescuers
- VoiceXML
- WML
- HTML

Privileged users

Gateway

Cocoon

Publication server

Logistics engine

Public
- HTML
- VoiceXML

Radios & TVs
- RSS
- HTML

High loads

Publication
Thanks!

Questions?