Structured Documents on the Web

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Presentation Outline:

- Introduction and historical background
- Multiple delivery publishing (MDP)
- MDP & the Web
- Style sheets
- Conclusion

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Documents vs. other data

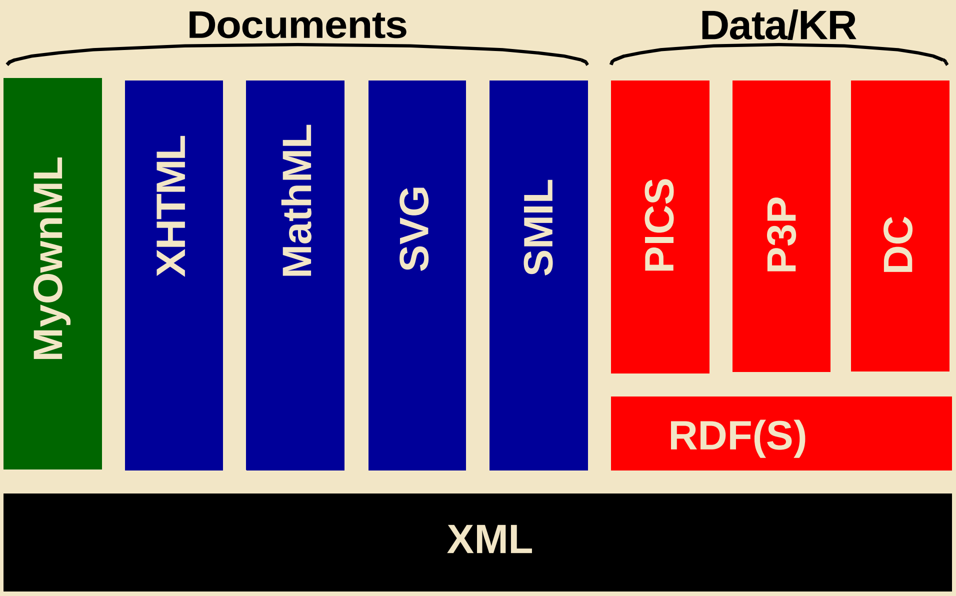
A document is

- a self-contained unit of information,
- intended to be communicated to human interpreter
- examples:
  - book, poem
  - article, paper, report
  - memo, E-mail, letter, etc.

Whereas data can also be

- fragmentary
- intended solely for further machine processing
- examples:
  - database records
  - HTTP requests
  - schemas
  - ontology fragments

Web representation languages



Documents

Data/KR

MyOwnML

XHTML

MathML

SVG

SMIL

PICS

P3P

DC

RDF(S)

XML

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Electronic Documents

Historically:

- Production electronic
- Dissemination and final-form still on paper
- Goal (final-form): obtain same typographic quality as traditional print
- Goal (authoring): WYSIWYG authoring interfaces (WP,DTP)
  - authoring & storage format mimics final-form presentation format

Currently:

- Both production & dissemination is electronic
- Goal (final-form): exploit presentation possibilities of new media
  - use of audio, video, animation, etc.
  - interactivity (hyperlinks, forms, etc.)
  - dissemination over internet (WWW)
  - use of document technology to access (legacy) information
- Goal (authoring): efficient publication process on industrial scale
  - authoring & storage format differs radically from presentation format

Electronic Documents: Issues

Problem: many document formats cannot cope with changing environment

- hardware dependencies (use of printer/typesetter specific control sequences)
- software dependencies (use of proprietary formats)
- presentation dependencies (layout and style)

Related Issues:

- Longevity (many documents need to last >30 years)
- Maintenance & reuse (c.f. issues in software engineering)
- Flexibility & tailorability (,, ,, ,,)

“Solution”:

- (semi-automatically) convert all documents to new format or new layout
  - expensive & time consuming
  - errorprone (& pretty boring too!)
  - almost always loss of (implicit) information

Real solution:

- multiple delivery publishing model

Multiple delivery publishing (MDP)

MDP distinguishes formats

- one for authoring and long term storage (the “source” format)
- another one final-form presentation (the “target” format)

Needs mapping from source to target format

- mapping can be hard wired into the application
  - e.g. 1st generation HTML browsers
- better: specify the mapping separately
  - such specifications are know as *style sheets*

Source format can now abstract from all details that are likely to change:

- hardware, software, style, ...
- sounds pretty straightforward eh?
- but it actually meant....

Revolution!

Software developers

- no longer control their application’s own file format

Document authors

- no longer control style and layout of their documents

Tools

- no longer used the “sacred” WYSIWYG paradigm

So multiple delivery publishing was/is not obvious at all!

Note: this approach was already advocated by Goldfarb et al. in the 70’s!

- Source documents encoded using IBM’s Generic Markup Language (GML)
- GML was standardized by ISO in 1986 as SGML
- First publicly available parser developed here at the VU
  - Amsterdam SGML Parser by Warmer, Van Egmond and Van Vliet (late 80’s)

Multiple delivery publishing & SGML

MDP and SGML remained highly controversial

- People do not like to give up control or change the way they work
- MDP tools could not always match the output quality of more traditional tools
- MDP is no silver bullet!
  - primarily suited for *content-driven* applications
  - not for *layout-driven* applications
- SGML standard is extremely complex
  - still not fully implemented
  - huge and inflexible
  - mainly used in academics and large organizations
  - Netscape’s CEO: “Netscape will never use SGML. Never”

Revival due the World Wide Web

- HTML was an application of SGML (eh... sort of)
- XML is a stream-lined and simplified subset of SGML (really!)
- Published in 1998, XML already has more applications than SGML ever had

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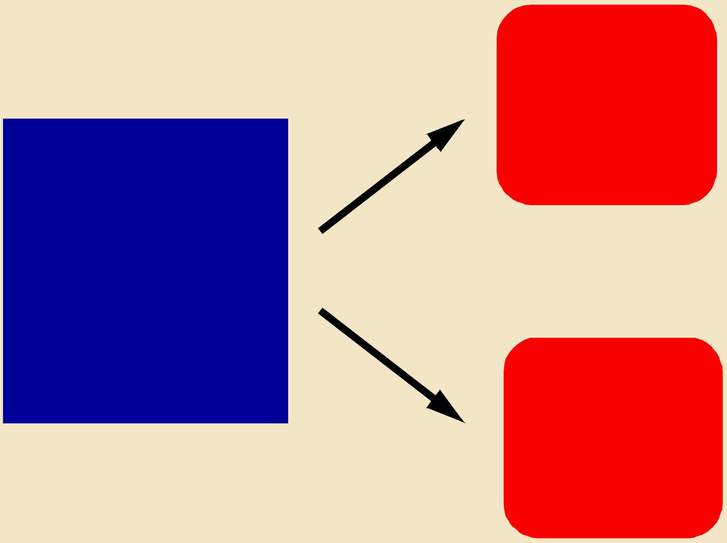
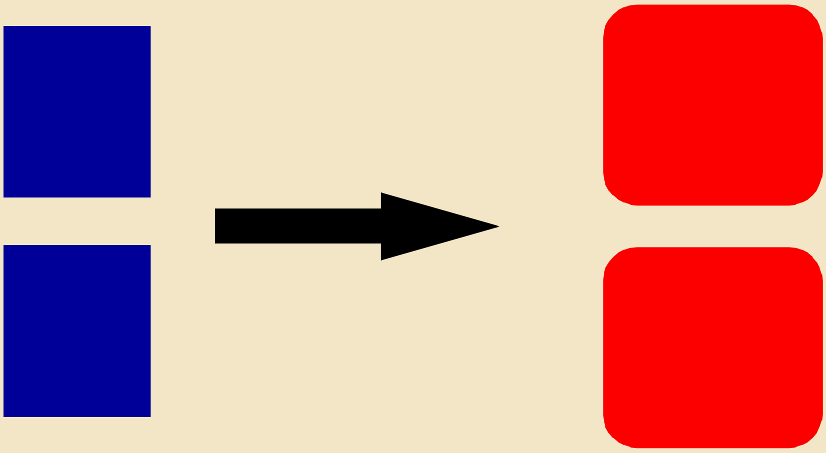
MDP: easy reuse of source document



source document **target presentations**

MDP: easy reuse of style specification



source

presentations

Issues for source & presentations formats

Think about design dimensions such as:

- Content versus markup
  - what is in the tags, what is between the tags?
- Embedded versus external markup
  - what is encoded in the same file, what is stored elsewhere?
- Declarative versus procedural
  - specify what or specify how
- Domain independent versus domain specific
  - **`<title>`** or **`<product-shelf-number>?`**
- Layout-driven versus content-driven applications
  - magazine cover or technical manual?
- Visual markup versus structured markup
  - **`<i>`** or **`<emph>?`**

Source vs. presentation format

Source format:

- Structured, declarative markup
- Can be domain independent but...
- ...is usually tailored to a specific domain
- Provide sufficiently rich structure for style sheets and other processing

Presentation format:

- Visual, often procedural markup
- Can be platform/medium independent but...
- ... is usually tailored to a specific output medium/device
- Provide sufficient information to obtain high quality output

How do you classify your favorite document format?

Domain independent vs. domain specific

Domain independent

- Examples: HTML, Docbook, (LaTeX)
- Wide deployment: easy to learn, many (cots) tools available
- Weak semantics for automatic processing other than presentation
- Tools only need to deal with predefined markup semantics

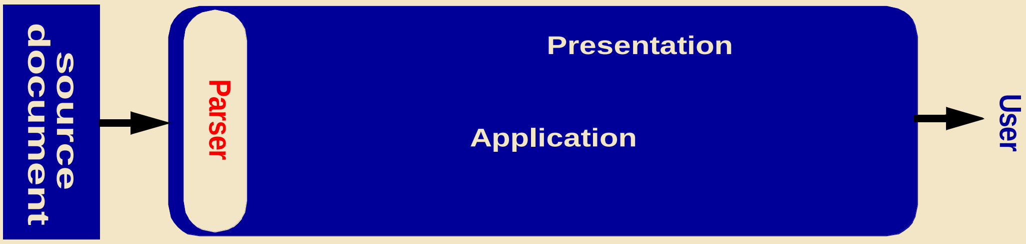
Domain specific

- Examples: product specific document standards (e.g. automobile and aircraft industry)
- Users need training, tailor-made tools might need to be developed
- Rich (domain-specific) semantics for further processing (validation, indexing, etc.)

Consequence:

- Need tools tailored to domain-specific document formats or ...
- Generic tools that can process user-defined markup
  - no predefined (presentation) semantics

Presentation of domain dependent document formats



source document

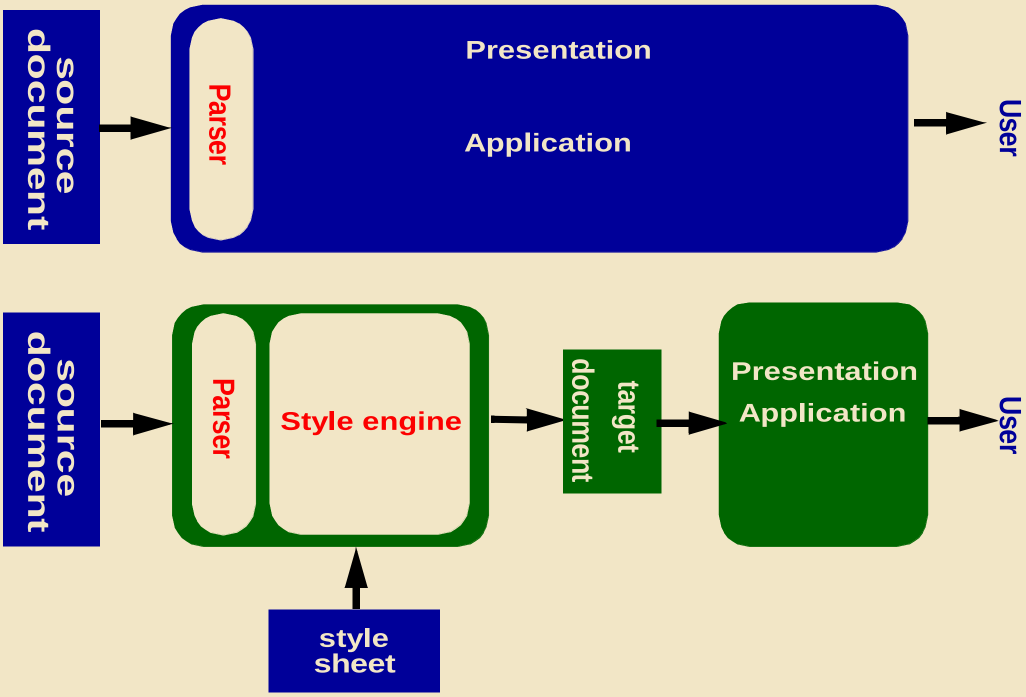
Parser

Presentation

Application

User

Presentation of domain dependent document formats



source document

Parser

Presentation

Application

User

source document

Parser

Style engine

style sheet

target document

Presentation Application

User

Beyond presentation semantics

Document-oriented semantics

- static: style and layout (e.g. style sheets, focus second half of this talk)
- dynamic: scheduling & animation
- interaction: linking & forms

Other semantics:

- do not describe the document, but the domain of the document’s content
- can still be related to document: annotations & meta data
  - RDF(S), DAML+OIL, etc.

Multiple delivery publishing on the Web

	W3C/HTML		
Markup	HTML		
Style	CSS		
Linking	<a href=		
Addressing	<a name=		

Multiple delivery publishing on the Web

	W3C/HTML		ISO/SGML
Markup	HTML		SGML
Style	CSS		DSSSL
Linking	<a href=		HyTime/TEI
Addressing	<a name=		HyTime/TEI

Multiple delivery publishing on the Web

	W3C/HTML	W3C/XML	ISO/SGML
Markup	HTML	XML	SGML
Style	CSS	CSS,XSLT,XSL	DSSSL
Linking	<a href=	XLink	HyTime,TEI
Addressing	<a name=	XPath,XPointer	HyTime,TEI

Style sheets: HTML & CSS

HTML with embedded visual markup:

```
<h3 align="center">
  <font color="black">
     The Need for Style Sheets
 </font>
</h3>
```

versus HTML with separate CSS style sheet:

HTML:

```
<h3>The Need for Style Sheets</h3>
```

CSS:

```
h3 { text-align: center; color: black }
```

Style sheets: XML & CSS

Example fragment using MyOwnML (XML):

```
<product>
  <type>X112332</type>
  <color>dark blue</color>
  ...
</product>
```

With XML, your style sheet needs to specify more than just the style

CSS2:

```
product { display: list-item; ...}
type    { display: none;      ...}
color   { display: block;     ...}
```

Note:

- with XML, style sheets are no longer optional
- information presented with CSS remains in the same order
  - Source tree and target tree have similar structure (allows *cascading*)
- style properties are inherited via the source tree (!)

Transformations: XML and XSLT

What if the desired target tree differs radically from the source tree?

- assigning CSS properties will not suffice
- need a language to describe XML (tree) transformations:
  - XSL Transformations (XSLT)
  - more on XSL later!

XSLT

- Transforms from XML to:
  - XML (includes XHTML)
  - HTML (for legacy browsers, use old SGML syntax)
  - plain text (can be used to generate other text formats such as RTF, BibTeX)
- Uses XML syntax (unlike CSS)
  - so you can transform XSLT using XSLT
- Because the structure of the target tree and source tree can differ:
  - XSLT style sheets can be chained, not cascaded

XSLT template rules

Transformations are described as a set of one or more *template rules*

Each template rule consists of two parts:

- A pattern that is matched against the source tree: the *selector*
- A template to be filled in and added to the result tree

XSLT selectors are based on XPath, e.g:

```
/
*
product
color|type
product/color
catalog//product
text()
id("W11")
product[1]
@class
```

XSLT: Example (1)

A single template rule may already be sufficient...

```
<xsl:template match="/">
 <html><head>
   <title>Product Report Summary</title>
  </head><body>
  <p>...<table>
   <tr><td>
    <xsl:value-of select="product/type"/>
   </td><td>
    <xsl:value-of select="product/color"/>
  <td> ... </tr></table>...</body></html>
</xsl:template>
```

XSLT: Example (2)

... or a style sheet can contain many (smaller) template rules

```
<xsl:template match="/">
  <table>
   <xsl:apply-templates/>
  </table>
</xsl:template>

<xsl:template match=”product”>
  <tr>
   <xsl:apply-templates/>
  </tr>
</xsl:template>

<xsl:template match=”color|type”>
  <td>
   <xsl:apply-templates/>
  </td>
</xsl:template>

...
```

Style sheets: Formatting objects(1)

All these style sheet examples do actually *two* things:

- specify how an XML document should be presented
- specify how that presentation should be encoded in HTML

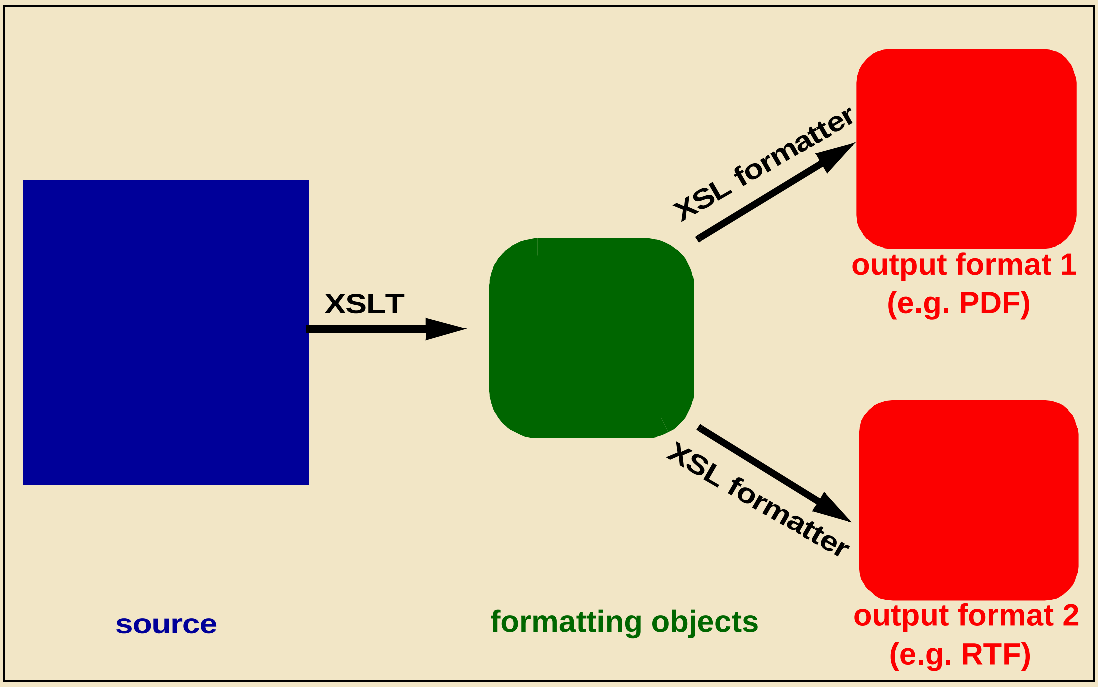
Drawbacks:

- need to start all over again for target formats other than HTML
- limited by the presentation capabilities of HTML & CSS

Solution:

- design new target language (argh!)
- a language that is designed to describe formatting semantics
- such a language is called a *formatting vocabulary*
- elements in the language are called *formatting objects (*FO)
- Example: the formatting vocabulary defined by XSL
  - fo:block, fo:flow, fo:footnote, fo:external-graphic, fo:page-sequence
- XSL suited for on-line and paper-based formatting

Style sheets: Formatting objects(2)



XSLT

XSL formatter

XSL formatter

source

formatting objects

output format 1
(e.g. PDF)

output format 2
(e.g. RTF)

Style sheets: Formatting objects(3)

Advantages:

- Style sheets can be independent from final-form presentation format
- Formatting objects have more advanced formatting semantics than HTML/ CSS

Disadvantages

- Yet another layer of abstraction
- Relative little tool support (XSL became a W3C Recommendation on 15 October 2001)
- XSL FOs are not suited for all output media (SMIL, SVG etc.)

Multiple delivery publishing wrap up: pros & cons

Advantages:

- Longevity
- Reusability
- Flexibility & Tailorability

Disadvantages:

- Complexity
- High dependency on tools (?!)
- Training
- High Initial investment

Works best for content-driven material

- becomes cheaper due to massive use on the Web
- free tool support
  - XML parsers, XSLT engines, XSL FO formatters, etc.
- many “off-the-shelf” source & target formats to choose from
  - XHTML, SVG, SMIL, MathML, Docbook, PDF, ...

Further reading

Overview pages at www.w3.org:

- http://www.w3.org/XML/
- http://www.w3.org/Style/XSL/
- http://www.w3.org/Style/CSS/

Recommendations (and drafts) at www.w3.org/TR/:

- http://www.w3.org/TR/xsl
- http://www.w3.org/TR/xslt
- http://www.w3.org/TR/REC-xml
- http://www.w3.org/TR/REC-CSS2

Tutorials and more

- http://www.xml.com
- http://www.mulberrytech.com/
- http://www.mulberrytech.com/quickref/ (personal favorite)