Writing I-Ds and RFCs using XML2RFC

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Why are we here?

To learn an easy way to create well-presented I-Ds ...

... and help avoid sleepless night with idnits

xml2rfc

- **makes it easy to create a well-presented document**
- **looks after the boiler plate for you**
- **leaves you more time to do the engineering**

Agenda

- What is xml2rfc?
- Demonstration of xml2rfc using XMLmind
- The way of XML
- Describing your document
  The Language of xml2rfc
- Tools for the job
- Fine tuning the result
  Processing Instructions
- Extra Tips and Tricks
- Resources to help you
- Questions and (hopefully) Answers

The nature of RFCs and I-Ds

RFCs and I-Ds have a relatively simple format

See Instructions to RFC Authors (rfc2223bis) at :
ftp://ftp.rfc-editor.org/in-notes/rfc-editor/instructions2authors.txt

'Front, Middle, Back'

Front & Back contain a lot of standard 'boiler plate'

BUT – 'boiler plate' is important legal stuff – RFC3978/9

- Has to be there! – IPR and Copyright positions
- Has to be right (and this week's version)!

The technical core is the 'filling' in the Middle

What is in the sandwich filling?

- **Numbered sections – 'outline numbered'**
  - Tree structure of sections/sub-sections/sub-sub-sections...
- **In the sections…**
  - Paragraphs of text
    - Lists and indentation defined by the author
    - Author (mostly) doesn't need to micro-manage word layout
      - Words can be laid out by the tools
  - Tables, Figures, Pieces of Example Code, ABNF, MIBs, etc
    - Layout of these is critical – needs author control
  - References
    - Cross references to other parts of the document
    - References to external documents

Requirements for xml2rfc

Technical requirements:

- Automate:
  - structure and numbering
  - references
  - producing table of contents and reference lists
  - producing correct overall document & page layout
- Insert the right boiler plate

Political Requirements

- ASCII input
- Standards compliant solution
- Easy learning and editing
- Free tools
- Simple and fast operation

So why should I do it this way???

A small demonstration....

There are trade-offs today:

- **Speed & Convenience vs Absolute Precision Control of Layout**
- **'Good enough' in multiple formats vs Exact control of content per format**

Adopting xml2rfc today doesn't stop it getting better!

- **The trade-offs are not fundamental problems**
- **Improvements are possible and happening**
- **User input is essential:**
  - **Minimum complexity for maximum functionality**

Markup Languages and xml2rfc

Basic Solution for requirements:

1. Document Description Language (aka Markup Language)
2. Transformation Tool

A standard markup language is XML (from W3C)

XML = eXtensible Markup Language

RFC 2629 (and its unofficial successor) define an XML Document Type Description (DTD) for RFCs and I-Ds

Reflects the required structure of I-Ds and RFCs

Also good for other sorts of technical memos

The xml2rfc Tool

A tool to transform source text into output text

Source text: conforms to RFC/I-D DTD

Output formats:

- ASCII text (standard form or unpaginated), or
- HTML (with hyperlinks & more elegant formatting)
- nroff markup language
  (because that is what the RFC Editor archives)

The Way of XML

DISCLAIMER:

This is NOT a course on XML

- **Just enough XML to understand and use the xml2rfc DTD**
- **Syntax is (deceptively) simple!**

Basic Principles of XML

XML markup uses markup 'elements' embedded in the ordinary text

Elements have three purposes

- **Provide document structure**
- **Provide semantic context for the content**

  i.e., what it 'means' in some sense
- **Control the formatting of an output document**

Elements impose a strict tree structure

Exactly one root element in each document

Characters

Special Characters in XML –
need to be 'escaped' in normal text

< **introduces 'elements'**

& **introduces 'entities'**

WARNING: Letter case is significant in XML:
so…

`A ≠ a` `<rfc> ≠ <RFC>`

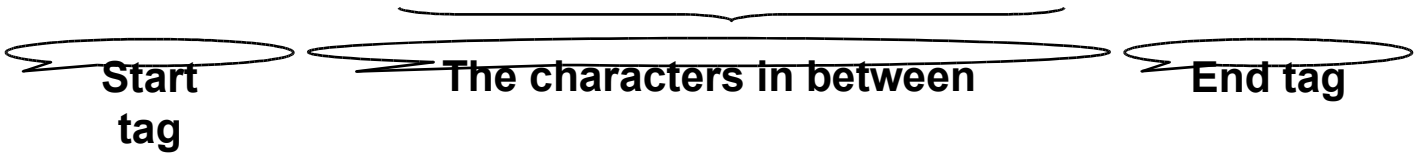
XML Elements

An Element consists of 3 parts:

- **Start tag containing the element name**
- **End tag repeating the element name**
- **All the characters in between**

Example for an element named 'example':

```
<example>text and/or NESTED elements</example>
```



Elements must be properly nested (unlike HTML)

Shorthand - if the "text in between" is empty

`<example/>` ≡ `<example></example>` - an 'empty element'

Attributes

Attributes are part of elements

If an element has attributes

they appear in the start tag
after the element name

Example:

```
<example name='value'>blurb<example />
```

They can also appear in empty elements:

```
<empty name="value" />
```

The value *MUST* be quoted

Use either matched single (') or double quotes (")

If the value has one sort of quote in it, use the other one

Entities

An Entity is a textual macro

Example:

&macro_name;

The 'value' of the macro replaces the complete entity in the output.

Mostly needed as escapes for & and <

& ≡ & < ≡ <

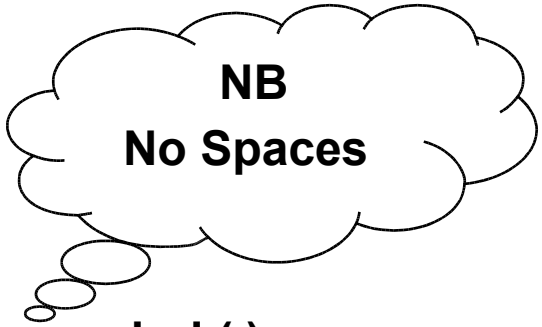
xml2rfc also predefines some other entities, e.g.,

" (") ' (') -- needed in attributes with both " and '

> (>)   (non-breaking space)

– (a short dash '-') — (a longer dash '—' or '--')

Tokens



A Token is a string of characters

- Starts with letter or underscore
- Followed by
  - letters, numbers, underscore, hyphen or period (.)
- For regular expression fiends: `[A-Za-z_][A-Za-z0-9_.-]*`

Examples:

```
_Token_string19
a
```

XML names have to be tokens, including

- Element names
- Attribute names
- Entity names

Technically, you can also use ':' in tokens but this should be avoided because it has special meaning in XML (namespaces).

Other things starting with <

Comments

All the text between `<!--` and `-->`

BEWARE: Nested comments are not possible!

Processing Instructions

```
<?processor_target pi_name='value' ?>
```

`processor_target` for xml2rfc is `rfc`

Defining Entities

`<!ENTITY name "value" >` (and some variants)

Note: no '=' between name and value

Literal text – CDATA block

All the text between `<![CDATA[` and `]]>`

When is a space not a space?

The significance of white space in xml2rfc

First the easy one:

- Inside CDATA blocks
  - white space is copied literally to output

Then where it just makes the XML more readable

- Inside tags extra white space around tokens doesn't change meaning
- BUT beware of splitting up multi-character 'atoms' … watch out for
  - comment delimiters: `<!--` and `-->`
  - end tag markers: `</` and `/>`
- Example:

```
<example name="value"/> ≡ <example name ="value" />
```

In the text between the tags of an element (outside CDATA)

- Generally any amount of white space together is treated like 'one space'
- Output layout depends on the formatting tool
- Allows 'tidy' XML source
  - Indented to show structure.

Describing your document
The language of xml2rfc

Alpha and Omega:

```
<?xml version="1.0" encoding="US-ASCII"?>          ①
<!DOCTYPE rfc SYSTEM 'rfcXXXX.dtd'>                ②
<rfc>                                              ③s
      ....
</rfc>                                             ③e
```

① XML Declaration: Must be first line; 'encoding' is optional

② Reference to DTD used: currently rfcXXXX.dtd => rfc2629.dtd

c. The root 'rfc' element start & end tags – No text after end tag!

Treat ① and ② as opaque strings for now

We'll look at the attributes of <rfc> later

Matching and Nesting

***ALL* elements *MUST* be properly MATCHED and NESTED**

Matching: `<example>` must eventually be followed by `</example>`

Empty elements are inherently matched

Nesting: Elements are properly nested if they don't overlap

Elements not overlapped:

```
<outer>
    ...
    <inner>
        ...
    </inner>
    ...
</outer>
```

Properly nested ✓

Elements overlapped:

```
<outer>
    ...
    <inner>
        ...
    </outer>
    ...
</inner>
```

NOT properly nested ✗

Overall Structure

RFCs and I-Ds have a <front>, <middle> & <back>

```
<?xml version="1.0" encoding="US-ASCII"?>
<!DOCTYPE rfc SYSTEM 'rfc2629.dtd'>
<rfc>
   <front>
       <!-- The front matter goes here -->
   </front>
   <middle>
       <!-- The technical sections go here -->
   </middle>
   <back>
       <!-- The back matter goes here -->
   </back>
</rfc>
```

Front Matter

<front> follows straight after <rfc>

Order of elements in <front> matters!

```
<?xml version="1.0" encoding="US-ASCII"?>
<!DOCTYPE rfc SYSTEM 'rfc2629.dtd'>
<rfc>
   <front>
      <title ...>
      <author ...>
      <date ...>
      <area ...>
      <workgroup ...>
      <keyword ...>
      <abstract ...>
      <note ...>
   </front>
   ...
</rfc>
```

<title ...>	Must be present
<author ...>	One or more
<date ...>	Must be present
<area ...>	Zero or more
<workgroup ...>	Zero or more
<keyword ...>	Zero or more
<abstract ...>	One (or zero) - must have for I-D/RFC
<note ...>	Zero or more

The title Element

Specifies the title of the document:

```
<title abbrev='Much Ado about Nothing'>
   The IETF's Discussion on
   "Source Format of RFC Documents"
</title>
```

Abbreviation gives short form for page headers

- Needed if full title longer than 39 characters
  - Actual space available varies according to the month in date!
- Full title used if omitted

The author Element

One for each document author

… the ones with their names on the front page

Each author that is a person must have attributes

`initials`
`surname`
`fullname`

```
<author initials='F.J.' surname='Flintstone'
        fullname='Frederick Flintstone'>
```

Optional `role` attribute: must have value `'editor'` if used

author element consists of

organization element (exactly one required), plus
address element (optional)

The organization Element

Very similar to title element

```
<organization abbrev='IETF'>
    Internet Engineering Task Force
</organization>
```

The abbreviation will be used on the front page

Full organization name used in ‘Authors’ section

Must be present but can be empty if not relevant

The address Element

Consists of up to 5 elements – each is optional

`postal` - `phone` - `facsimile` - `email` - `uri`

`postal` element consists of

- One or more `street` elements, followed by
- Any combination of up to one each of elements
  - `city` - `region` (state/province) - `code` (zip/postal) - `country`
- Allows for different national flavours of postal addressing
  - Formatters have to preserve the order of elements
- `country` text should be a two letter code from ISO3166

The good news: there are no attributes to remember

Tip: Exchange author elements with fellow authors

address Element Example

Notice how indentation is used to highlight structure

```
<address>
   <postal>
      <street>301 Cobblestone Way</street>
      <city>Bedrock</city>
      <region>CA</region>
      <code>94110</code>
      <country>US</country>
   </postal>
   <phone>+1 916 555 1234</phone>
   <email>fred@example.com</email>
   <uri>http://example.com/</uri>
</address>
```

Please use full international phone numbers with country codes in all cases!

The date Element

Specifies the publication date of the document

`date` element has `day`, `month` and `year` attributes

- No text between tags – so always an empty element

Current rules (@ xml2rfc v1.30, under review):

- Day and month are optional, year is currently required
- If day and month are not specified
  - Today's day and month are used by xml2rfc tool irrespective of year (silly if not current year)
- If month is specified but not day:
  - Today's day is used if month and year match today's date
  - Otherwise, the day is not output

```
<date month='March' year='2006' />
```

Meta-data Elements

Document meta-data is specified in `area`, `workgroup` and `keyword` elements

- Zero or more of each type is allowed – order matters

What happens to meta-data?

- `workgroup`: Replaces “Network Working Group” in page 1 header
- `area`: Is not used in any format as far as I can tell!
- `keyword`: In HTML they are output in meta keywords tag; not used in text/nroff

```
<area>General</area>
<workgroup>RFC Beautification Working Group</workgroup>
<keyword>I-D</keyword>
<keyword>XML</keyword>
<keyword>Extensible Markup Language</keyword>
<keyword>Anything else that might be relevant</keyword>
```

The abstract Element

A document MAY have an `abstract` element

- But the I-D Editor and RFC Editor get upset if they don't

The abstract contains one or more `t` elements

- (`t` element = paragraph of text – more later)
- Generally one `t` element is considered enough for an abstract

```
<abstract>
   <t>This memo presents a technique for using XML
   (Extensible Markup Language) as a source format
   for documents in the Internet-Drafts (I-Ds) and
   Request for Comments (RFC) series.</t>
</abstract>
```

The note Element

- Documents may have one or more `note` elements
  - note element consists of one or more `t` elements
- Mandatory `title` attribute printed before note
- Usual usage is for comments from the IESG

```
<note title='IESG Note'>
   <t>The IESG has something to say.</t>
</note>
```

What about the Boiler Plate?

How to distinguish an I-D from an RFC....

RFC and I-D have different `rfc` element attributes

For I-D: Specify Document Name (`docName`) & IPR Position (`ipr`)
If relevant: numbers of RFCs it `obsoletes` and/or `updates`

For RFC: Replace Document Name with RFC Number
See RFC2629 for more details … mostly for RFC Editor use

For 'usual' I-D (default IPR terms):

```
<rfc ipr='full3978' docName='draft-mrose-writing-rfcs-01'>
```

Alternative IPR – see RFC 3978 for meaning:

Use `ipr='noModification3978'/'noDerivatives3978'`

Optional `iprExtract` gives '`anchor`' of section which can be extracted for separate use (like a MIB)

xml2rfc will now handle all the boiler plate

Remember to change the version #. This is NOT the file name (but xml2rfc won't check)!

A Whole Lot of Front

```
<front>
   <title>
   Writing I-Ds and RFCs using XML
   </title>

   <author initials='F.J.'
           surname='Flintstone'
           fullname='Frederick Flintstone'>
      <organization>
      Slate Rock and Gravel, Inc.
      </organization>

      <address>
        <postal>
          <street>301 Cobblestone Way</street>
          <city>Bedrock</city>
          <region>CA</region>
          <code>94110</code>
          <country>US</country>
        </postal>

        <phone>+1 916 555 1234</phone>
        <email>fred@example.com</email>
        <uri>http://example.com/</uri>
      </address>
   </author>

   <!- continued... -->
```

```
   <date month='February' year='1999' />

   <!-- Meta-data -->
   <area>General</area>
   <workgroup>
   RFC Beautification Working Group
   </workgroup>
   <keyword>RFC</keyword>
   <keyword>
   Request for Comments
   </keyword>
   <keyword>I-D</keyword>
   <keyword>Internet-Draft</keyword>
   <keyword>XML</keyword>
   <keyword>
   Extensible Markup Language
   </keyword>

   <abstract>
   <t>This memo presents a technique for
   using XML (Extensible Markup Language)
   as a source format for documents in
   the Internet-Drafts (I-Ds) and Request
   for Comments (RFC) series.</t>
   </abstract>
</front>
```

The Middle

The `middle` element contains all document sections

- **Except for bibliography (references), the boilerplate & appendices**
- **i.e., all the really interesting bits!**

It is very simple…

```
...
</front>
<middle>
    <section ...>
    <section ...>
      ...
    <section ...>
</middle>
<back>
...
```

Note:

Ignore the bit in RFC2629bis about appendices in `middle`!

The section Element

`section` elements are the core of a document

- Must have a `title` attribute
- Optionally has
  - `anchor` attribute – needed for cross-referencing with `xref`
    - `anchor` value must be an XML Token – no spaces, limited punctuation!
      (xml2rfc may be more forgiving about this!)
  - `toc` attribute – controls if title is in Table of Contents
    - Choices are
      - `include` – force it in
      - `exclude` – force it out
      - `default` – in or out depends on the 'level' of the section
        (`default` is the default)

```
<section anchor='intro' title='Introduction'>
        ...
</section>
```

What's in a section?

Each `section` contains any number & combination of `t`, `figure`, `texttable`, `iref` & nested `section` elements

```
<section title='The Middle'>
    ...
    <section title='The section Element'>
        ...
        <section title='The t Element'>...</section>
        <section title='The list Element'>...</section>
        <section title='The figure Element'>...</section>
        <section title='The texttable Element'>...</section>
        <section title='The xref Element'>...</section>
        <section title='The eref Element'>...</section>
        <section title='The iref Element'>...</section>
        <section title='The cref Element'>...</section>
        <section title='The spanx Element'>...</section>
        <section title='The vspace Element'>...</section>
    </section>
</section>
```

Outline Numbering

The `section` element is recursive…

Recursion level determines numbering:

XML	Output
`<section title="Top Level">`	1. Top Level
`<section title= ="2nd Level">`	1.1 2nd Level
`<section title="3rd Level">`	1.1.1 3rd Level
`</section>`	
`</section>`	
`</section>`	
`<section title="Next Top Level">`	2. Next Top Level
`</section>`	

The ‘t’ element

- Fundamental but slightly odd element!
- Basically a paragraph of text
  - Output is rearranged to form ‘right ragged’ filled lines
- Text can contain elements to produce…
  - Embedded lists (`list`)
  - References of various kinds (`xref`, `eref`, `iref` and `cref`)
  - Formatting guidance
    - Layout hints (`vspace`)
    - Parts of text that should be rendered specially (`spanx`)
- Originally `figure` elements could be in `t` elements
  - This is now deprecated – they should be directly in sections
- Note: RFC2629 is misleading: the `t` element is NOT directly recursive (but lists can contain more `t`’s)

Lists

The `list` element contains one or more items

- Each item is a `t` element
- Means `list` elements can be (indirectly) recursive

```
<t>Some text before the list.
   <list style='numbers'>
      <t>The first item.</t>
      <t>The second item which contains
         two bulleted sub-items:
        <list style='symbols'>
           <t>The first sub-item.</t>
           <t>The second sub-item.</t>
        </list>
      </t>
   </list>
Some text after the list.</t>
```

```
Some text before the list.

  1.  The first item.

  2.  The second item which
      contains two bulleted
      sub-items:

        -  The first sub-item.

        -  The second sub-item.

Some text after the list.
```

Lots of Styles of Lists

The `list` element has an optional `style` attribute

`style='empty'`: Generates indented paragraph (default)

`style='numbers'`: Numbered items using arabic numbers

Each new (sub-)list starts again from item #1

`style='letters'`: Alphabetic lists using lower case (a, b, ...)

`style='symbols'`: Bulleted lists

Level determines bullet symbol - use '`format`' for alternatives

`style='hanging'`: Items with 'hanging' labels

Label taken from optional `hangText` attribute on `t`

`style='format {str}'`: Auto-formatted lists

{str} is used as label

Can contain either %d or %c exactly once

`counter` attribute specifies an auto-increment variable substituted for %d (decimal #) or %c (letter)

Space between items depends on formatter. More later.

Hanging Labels

```
<list style='hanging'>
   <t hangText="counter:">the "counting
   designation" is rendered
   (e.g., "2.1" or "A.2");</t>

   <t hangText="title:">the title
   attribute of the corresponding
   element is rendered (e.g., "XML
   Basics");</t>

   <t hangText="none:">no additional
   designation is rendered; or,</t>

   <t hangText="default:">a suitable
   designation is rendered, e.g.,
   "Section 2.1" or "&lt;a
   href='#xml_basics'>XML Basics&lt;/a>"
   (the default).</t>
</list>
```

```
counter: the "counting
   designation" is
   rendered (e.g., "2.1"
   or "A.2");

title: the title attribute
   of the corresponding
   element is rendered
   (e.g., "XML Basics");

none: no additional
   designation is
   rendered; or,

default: a suitable
   designation is
   rendered, e.g.,
  "Section 2.1" or "<a
   href='#xml_basics'>XML
   Basics</a>" (the
   default).
```

Auto-formatted Lists

```
<list style='format R%d:'
      counter='Requirements'>
   <t>Text for R1.</t>
   <t>Text for R2.</t>
</list>
  ...
<list style='format Directive    %c:'
      counter='Directives'>
   <t>Text for A.</t>
   <t>Text for B.</t>
</list>
    ...
<list style='format R%d:'
      counter='Requirements'>
   <t>Text for R3.</t>
</list>
```

```
R1: Text for R1.

R2: Text for R2.

...

Directive    a: Text for A.

Directive    b: Text for B.

...

R3: Text for R3.
```

Controlling Indentation

The indentation of the item text can be adjusted...

for all kinds of `list` elements

```
<list style='format R%d:'
      hangIndent='5'>
   <t>Text for R1.</t>
   <t>Text for R2.</t>
   <t>Text for R3.</t>
   <t>Text for R4.</t>
   <t>Text for R5.</t>
   <t>Text for R6.</t>
   <t>Text for R7.</t>
   <t>Text for R8.</t>
   <t>Text for R9.</t>
   <t>Text for R10.</t>
</list>
```

```
R1:  Text for R1.
R2:  Text for R2.
R3:  Text for R3.
R4:  Text for R4.
R5:  Text for R5.
R6:  Text for R6.
R7:  Text for R7.
R8:  Text for R8.
R9:  Text for R9.
R10: Text for R10.
```

PS: Lists are being improved from v1.31, including more auto-formats and bug fixes to nested lists.

Figures

Used to display ASCII 'artwork' - where horizontal and vertical whitespace is significant!

`figure` element contains elements:

- **`preamble` (optional) - contains text - rendered like a `t` element ***
- **`artwork` (required) - all whitespace is significant here ****
  - **Use a `CDATA` block if lots of < or & in the figure**
- **`postamble` (optional) - as for `preamble`**

`figure` has attributes `anchor` , `title` and `align`

- **`anchor`, `title`: Same as attributes for `section` element**
- **`align`: Alignment for all components**

WARNING: Figure numbering only works properly if all figures have non-empty anchor attributes

* except no list elements allowed

** no elements allowed in artwork - pure text

'Typed' Artwork

`figure` element also good for text where layout is significant, e.g.,

- Code samples, algorithms, ABNF, MIBs and PIBs

`artwork` element has optional attributes

- `type`: May do some clever verification/display for special values
  - currently only for `'abnf'` in v1.31 and up - colorized HTML!
  - may work for `'mib'` and 'pib' in v1.31; `'xml'` in future?
- `align`: `'left'`, `'center'` or `'right'` - overides `figure` alignment
  - Default for `align` is same as for parent `figure` element
- `name`: Something to do with filenames - ignore it for now!

`figure` and `artwork` have extra attributes - only used for HTML output - see xml2rfc README

My Figure ;-)

```
<figure anchor="my_figure"
        title="Some boxes">
   <preamble>The preamble is printed
   before the figure.</preamble>

   <artwork><![CDATA[
******     +-------+
* && * <-->|  box  |
******     +-------+
]]></artwork>

   <postamble>The postamble ambles
   along after it.</postamble>
</figure>
```

```
The preamble is printed
before the figure.

******     +-------+
* && * <-->|  box  |
******     +-------+

The postamble ambles along
after it.

Figure 1: Some boxes
```

None of this appears if the anchor attribute is not present

The texttable Element

Used for generating tables (surprise!)

Very similar to `figure`

- Has `preamble` and `postamble`, plus same attributes
- Default for texttable element `align` is `'center'`

`artwork` is replaced by

- `ttcol` elements (at least one) - column headers with attributes
  - `width` (optional) - % of available space occupied (e.g. '30%')
    - Rest distributed equally over columns without width attribute
  - `align` (optional) - how cell contents are justified
    - `'left'` (default), `'center'` or `'right'`
- `c` elements - contents of each cell
  - Order: left to right along row 1, then repeat for other rows
  - Can include references and index elements

A Very Simple Table

```
<texttable anchor='table_example'>
   <preamble>So, putting it all together,
   we have, e.g.,</preamble>
   <ttcol align='center'>ttcol #1</ttcol>
   <ttcol align='center'>ttcol #2</ttcol>
   <c>c #1</c>
   <c>c #2</c>
   <c>c #3</c>
   <c>c #4</c>
   <c>c #5</c>
   <c>c #6</c>
   <postamble>which is a very simple
   example with no title.</postamble>
</texttable>
```

So, putting it all together, we have, e.g.,

ttcol #1	ttcol #2
c #1	c #2
c #3	c #4
c #5	c #6

which is a very simple example with no title.

Table 1

Internal Cross-References

Almost all pieces of text can contain `xref` elements

- Exception: `artwork`

Cross-reference can refer to any `anchor` attribute

- From `section`, `figure`, `texttable`, bibliographic `reference`

What gets into the output?

- If `xref` is an empty element... e.g.,
  `as described in <xref target='xml_basics' />.`
- xml2rfc inserts ‘an appropriate phrase’
- .... and that depends on optional `format` attribute
- .... and, also, on the output format - HTML gets hyperlinks

`counter`	Just section number, figure/table number or reference index
`title`	Value of `title` attribute (doesn’t work for bibliographic refs)
`none`	Same as default for empty elements. Otherwise nothing extra.
`default`	"Section 2.1"/"Section A.4", "Figure 5", "Table 2", "[17]"/"[RFC2233]"

Non-empty Cross References

If the xref element has content, e.g.,

```
You will find it at <xref target='intro'>the start</xref>.
```

xml2rfc adds 'appropriate designation' to content... something like '`the start (Section 1)`'

- **... and again that depends on `format` attribute and output format**
- **Guarantee: The choice will be consistent over one document!**

`format='none'` is useful for HTML output....

- **The text of the hyperlink is just the xref element content**

You need to experiment to see the possibilities!

Hints about Formatting - 1

The `vspace` element can only be used in t elements

Tells formatter to leave some blank lines

- `blankLines` attribute [NB upper case L!] indicates how many
- Default is 0 - this forces a physical line break but no blank lines
- The `vspace` element is *always* empty - contents discarded (or error)

The amount of blank inserted should never extend beyond the end of the current page in (text) output

- Using `blanklines='100'` will force a page break (100 > page length!).

```
<list style='numbers'>
   <t>This is a list item.
   <vspace blankLines='1' />
   This is part of the same list item,
   although when displayed, it appears
   as a separate paragraph.</t>
</list>
```

```
1.  This is a list item.

    This is part of the same
    list item, although when
    displayed, it appears as a
    separate paragraph.
```

This is a useful trick!

More possibilities for the Middle

For most I-Ds, this should be enough

Some extra capabilities not used in most I-Ds

- **eref element - external references**
- **iref element - index mechanism**
- **cref element - for review comments**
- **spanx element - for fount hints and controlling line breaks**
  - **(more relevant to HTML output)**

After the ‘Middle’

What’s left to do?

- Bibliographic references
- Appendices

What comes automatically?

- Authors’ Addresses section
  - Doesn’t cover contributors - not automated now (but may be)
- More boiler plate
  - IPR Statement
  - Disclaimer of Validity
  - Copyright Statement
  - ISOC Acknowledgement (only)
    - You have to do the ‘Oscars Speech’ thanks section in ‘middle’!!

The Back Matter

References and Appendices are here...

...	
</middle>	(The end of the 'middle')
<back>	
<references>	Zero or more `references` elements
<reference ...>	each containing one or more
<reference ...>	`reference` elements
</references>	
<section ...>	Zero or more `section` elements which
<section ...>	will be labelled as 'Appendix A.' etc
</back>	in the output
</rfc>	(REALLY THE END)

Appendix sections can have nested sub-section elements

Labelled A.1, A.1.2, etc.

References Sections

In the beginning...

There was a single and undivided ‘References’ section

But then there was an edict from on high...

References shall be divided one from the other and they shall be ...

Normative References, and

Informative References

So the `references` element got a `title` attribute...

```
<references title="Normative References">
   <reference> ... </reference>
</references>

<references title="Informative References">
   <reference> ... </reference>
</references>
```

The normative references

The illustrative references

Output as sub-sections of a numbered ‘References’ section

URIs from any `eref`s get put in third unnumbered ‘URIs’ reference section

References the Hard Way

The Bad News:

- Compiling a reference manually is tedious
- Arguably the worst task in xml2rfc!

```
<reference anchor='RFC2200' target='http://a.org/doc'>
   <front>
      <!-- Provides title, author(s) and date info -->
      <title>A Good Read</title>
      <author> ... </author>
      <date month='June' year='1997' />
   </front>
   <seriesInfo name='RFC' value='2200' />
   <seriesInfo name='STD' value='1' />
   <format type='TXT' octets='94506'
   target='ftp://ftp.isi.edu/in-notes/rfc2200.txt' />
</reference>
```

`xref` points at `anchor`

same as `front` in `rfc`

but only these bits...

Compulsory `title`

One or more `author`s

Compulsory `date`

(no meta-data, abstract)

Zero or more `seriesInfo`

`Format` is optional

(only used for HTML)

... but now some tips to reduce the pain ➔

If You Have to do it the Hard Way...

- If you want to show a URL for the reference material ...
  - put it in `target` attribute of `reference` element, NOT in `format` element
- Authors need an `organization` attribute but...
  - If the author has a name, the `organization` isn't displayed...
    - So, you can leave it empty
  - If the 'author' is an organization, put it in `organization` attribute, and ...
    - Omit the `fullname`, `initials` and `surname` attributes
  - If there are 'many' authors - no way to get 'et al' but...
    - Put in first few - last one has no name and has org of 'others'
- Authors don't need `address` attribute - it isn't displayed
- The values of the `seriesInfo` attributes are just text
  - They are concatenated (with a space in between) and displayed as is
  - Useful for any other info (like a book publisher or ISBN #)
- format elements are optional - only used in HTML output

The Easier Way

The Good News:

- You mostly don't have to do it the Hard Way
- Tools can take the pain out of the remaining ones (e.g., XMLmind)

Using bibliography databases

- The author(s) of xml2rfc maintain 'citation libraries'
- Libraries at http://xml.resource.org/public for
  - IETF RFCs and Internet Drafts (automatically updated hourly!)
  - W3C and 3GPP documents
  - Miscellaneous (selected documents from ANSI, CCITT, FIPS, IEEE, ISO, ITU. NIST. OASIS and PKCS)
- Also Jabber Enhancement Proposals from jabber.org

Reference citations can be imported automatically

- Directly from the original libraries with a network connection
- Or from a local copy (but you have to keep it up to date!)

Citation libraries have a file per ref with xml2rfc reference element source

Howto for Citations - 1

Two things to do to add (say) a reference to an RFC:

Remember the two lines at the start of the file

```
<?xml version="1.0" encoding="US-ASCII"?>          ①
<!DOCTYPE rfc SYSTEM 'rfcXXXX.dtd'>                ②
```

For each RFC reference you need, add an Entity to ②:

```
<!DOCTYPE rfc SYSTEM 'rfcXXXX.dtd'[
<!ENTITY RFC2119 SYSTEM
"http://xml.resource.org/public/rfc/bibxml/reference.RFC.2119.xml">
]>
```

SYSTEM could be PUBLIC ""

This defines a new entity
- name: RFC2119
- value: XML for the reference to RFC 2119

That's an empty string

URL could also be a local file name - then you don't need network access to process doc... see also 'include' PI

To use the new entity:

In the references element

Insert `&RFC2119;` instead of `<reference>...</reference>`

Howto for Citations - 2

The entity name for the entity is *your choice*

***The citation file chooses* the `anchor` for the ref**

- **For RFCs it is '`RFCxxxx`' - *Always* 4 digits - left padded with 0**
  - **It is OK to choose the entity name to be the same as anchor!**
- **For Internet Drafts, e.g. draft-aboba-802-context-02.txt**
  - **`anchor` is `I-D.aboba-802-context`**
  - **Always references the most current version - convenient!**
- **For other series... Go look at the files!**

If you *must* reference expired drafts.....  **!**

- **Cannot rely on the citation database forever!**

To use the reference - use the `anchor` in an `xref`

- **Just like if you had defined it the hard way!**

Now You are Ready to Use xml2rfc!

Getting started:

- Use the template... Helps you remember the ‘clichés’!
- Plagiarize somebody else’s source!
- Use some helpful tools.

Basic resources:

- The xml2rfc website: http://xml.resource.org/
- The xml2rfc mailing list mailto:xml2rfc@lists.xml.resource.org
  and its archives
  http://drakken.dbc.mtview.ca.us/pipermail/xml2rfc/

Tools: What do You Need?

Absolute minimum:

- A ‘bog standard’ text editor - e.g., vi or emacs
- Access to a web browser to use the online xml2rfc tools
- Oh! And a computer to run them on! ?

Reasonable Outfit adds:

- XML Syntax-aware text editor (suggestions at back of slide pack)
  - Colorizing XML syntax elements
  - Doing smart indentation of structure (‘pretty printing’)
  - Optionally, checking XML structure using the xml2rfc DTD
- TCL installation allowing local use of xm2rfc tools offline

Desirable:

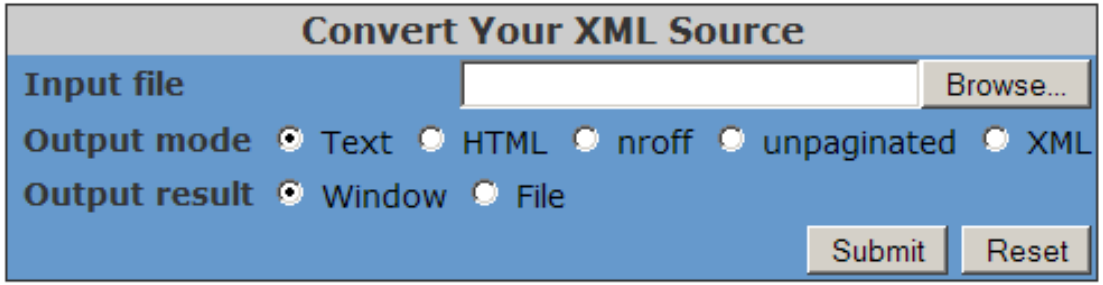
- XMLmind + Bill Fenner’s xxe plugin - gives WYSIKN editing

xml2rfc - The Tool

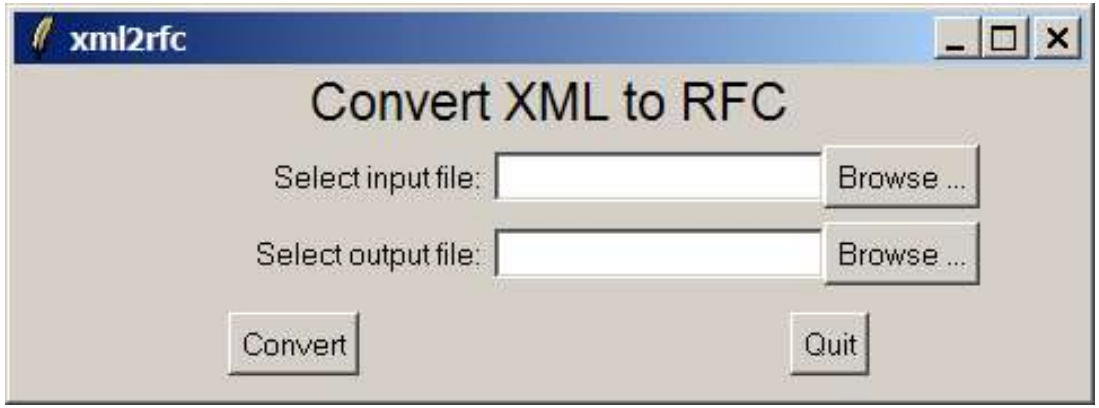
- **Written in TCL scripting language**
  - Runs on any platform that supports TCL
  - Command line or GUI operation
  - Deals with vagaries of Windows vs Unix filing systems
- **Online tool available on web site - http://xml.resource.org/**
  - Many people prefer the convenience of this
  - Hassle-free access to citation libraries
- **Or download the tool for local use**
  - You may wish to download the citation libraries also...
    - Gives you ability to work freely without net access
- **Tool is still developing - contribute your ideas!**

xml2rfc Screen Shots - Windows

xml2rfc - web service



xml2rfc - local tool



The XMLmind Plug-in

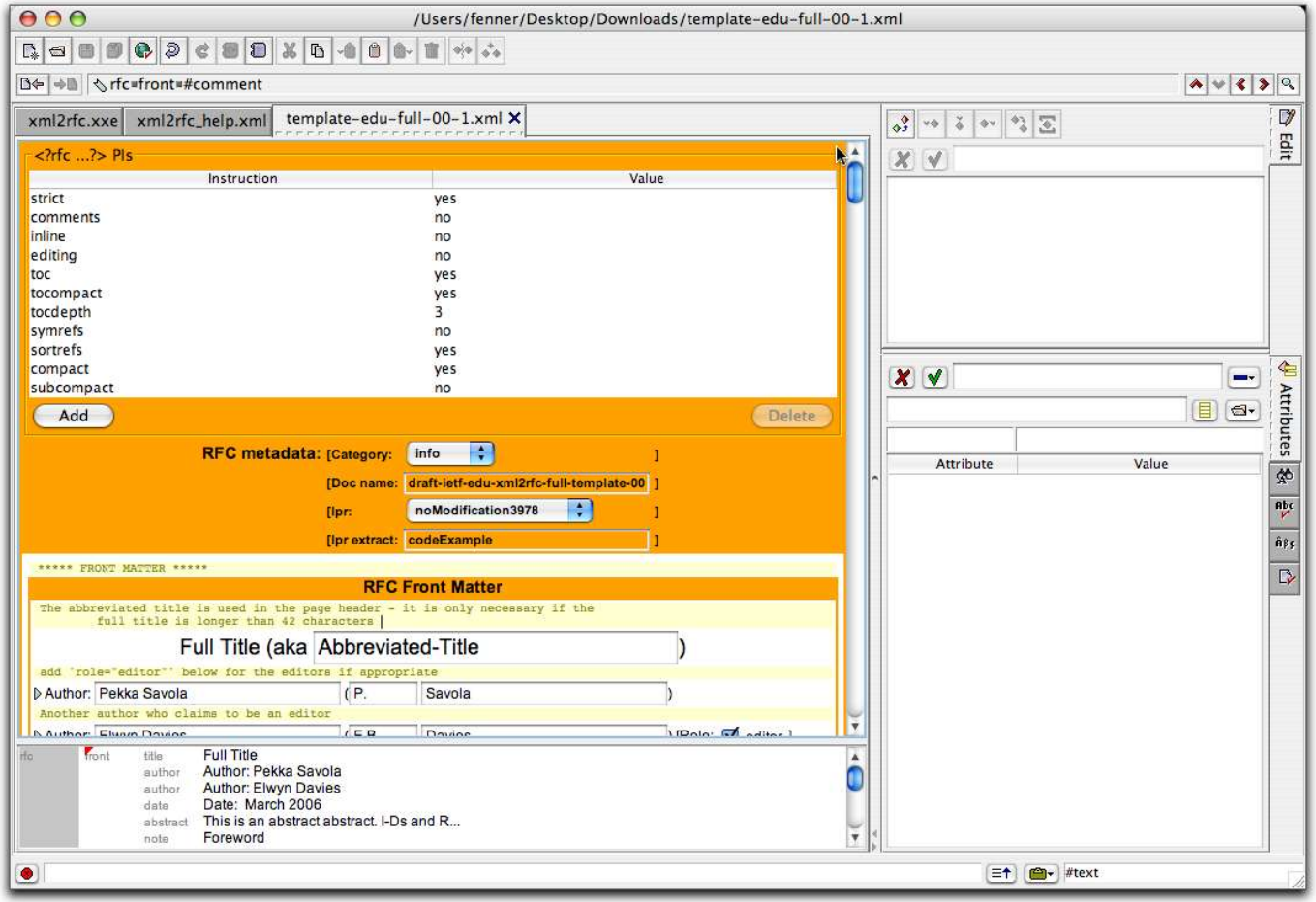
Available (free) from
http://rtg.ietf.org/~fenner/ietf/xml2rfc-xxe/
- **Add-in for XMLmind XML editor - http://www.xmlmind.com/xmleditor/**

Gives you WYSIKN editing
"What You See Is Kinda Neat"

Plug-in gives you
- **Automatic conformance to DTD structure**
- **'Graphical' editing of sections, anchors, lists, cross-ref, etc.**
- **Reminds you of available attributes**
- **Word processor-like behavior of 'enter' key**
  - **Creates new paragraph or list item**
- **Menu items to validate/format document from within XMLmind**

A few limitations at present
- **Limited handling of include files**
- **Limited texttable support**
- **Adding new citation library entries.**

XMLmind Screenshot



Extra Tools

Alternative formatter: XSLT transformation

Various utilities:

- **XML validators**
- **rfcdiff**
- **htmltidy - pretty printer for XML**
- **JavE - ASCII artwork editor**
- **Internet Explorer as an XSLT transformer**

More details on all of these at the back of the pack

Templates and Scripts

From *contrib* directory in xml2rfc source code archives

xml2rfcpp.pl - perl script to merge text from include PIs (Alex Rousskov)

Output doesn't need access to any local files
useful before sending xml2rfc to RFC Editor.

new-draft.xml - bare bones template for new I-Ds (Fred Baker)

template*.xml - 3 increasingly complete templates (Pekka Savola)

(template1b.xml developed into template-edu-full-01.xml)

concat.pl - another perl script to merge include PIs (Rob Austein)

fast-sync.sh - script to fast sync a local citation cache (Rob Austein)

Developed for this course

template-edu-full.xml - examples of many techniques in slides

template-edu-bare.xml - above with commentary stripped

intended as a starting point for new drafts

pi-sorted.xml - a complete commented list of PIs ready for use

arranged according to categories used in these slides

Processing Instructions

```
<?rfc pi_name="value" (possibly more PIs) ?>
```

PIs change the behavior of xml2rfc applications

- Many have 'boolean' values: value is either "yes" or "no"

Categories of PIs:

- File Inclusion
- Rigor Control
- Rendering Control
- Table of Contents Control
- Format Control
- HTML Specials
- Debugging Assistance

A couple of the directives are new in v1.31

- plus there will be one minor change of defaults

Most Popular PIs...

I-Ds will mostly want to use

`include`: Allows maintaining a document in manageable chunks

`strict`: Innoculates you against many idnits complaints

`symrefs`: RFCs use anchors rather than numeric references

`sortrefs`: Saves having to think about the order of references

`toc`: Many I-Ds will benefit from a Table of Contents

`compact`: To save the planet when printing out the I-D

`subcompact`: Compromise between æsthetics and planet saving

`needLines`: To avoid annoying splitting of figures across pages (This one is used wherever this is a problem)

Complete list at the end of this slide pack

Where to Put PIs in Source

Most should be once at beginning of file

A few can be used multiple times embedded in text

If editing with XMLmind

Best placed just after `<rfc>` rather than before `<rfc>`

At Position 2 below...

```
<?xml version="1.0" encoding="US-ASCII"?>
<!DOCTYPE rfc SYSTEM 'rfc2629.dtd'>
<!-- PIs can go here - Position 1 -->
<?rfc strict="yes" ?>
<rfc>
   <!-- Or PIs can go here - Position 2 -->
   <?rfc sortrefs="yes" symrefs="yes" ?>
   <?rfc toc="yes" ?>
   <front>
      ...
```

XMLmind will display these but can't edit them

XMLmind displays these differently: can add new ones and edit them. Remember to set PI target to 'rfc'

File Inclusion

Split up a large doc or include bits of ‘boiler plate’

- e.g., Author element blocks, reference elements
- Can be used as an alternative to external entities, BUT...
- WARNING: XSLT transformations don’t understand ‘include’

```
<?rfc include "file_or_uri_to_include.xml" ?>
```

- Remember file names may be case sensitive in some OSs!
- Content interpreted immediately
  - Other directives in same PI may cause unexpected effects

Finding the included file if the name is ‘relative’...

- If `XML_LIBRARY` environment variable is set
  - Gives search path of possible locations for ‘relative’ file names
  - Directory separator is ‘usual’ one for OS (`;` or `:`)
- Otherwise: In the directory where the file with the PI is found
- See the README file for ways to set up `XML_LIBRARY`

Should you use include or ENTITY?
Less typing vs more portability: YMMV

Hints, Tips and Tricks

An eclectic collection of stuff to help you...

Need to learn more about XML:

- **Try http://www.w3schools.com/xml/default.asp**

xml2rfc is still a work in progress

The latest developments can be found at http://xml.resource.org/experimental.html

- **You may find something to fix your problem there!**
- **Example: extra wide figures - v1.31 is trialling extra artwork attribute values for finer control of alignment - figures can now use the whole width of the page if needed.**

Getting Your First Output..

... can be frustrating!

Invalid XML can be hard to debug:

- Missing </t>'s, overlapped elements etc are not easy to find
- Catch 22 situation when tools that would help...
  won't read in your broken XML

Advice:

- If starting from scratch on a new project:
  - XMLmind + plug-in makes it very difficult to write broken XML
- If you are converting an old project:
  - Use the validator (see tools):
    - Does better error messages (although xml2rfc is much improved)
- Start with strict="no" when using xml2rfc
  - See multiple warnings per run (instead of one fatal error)

Character Set and Entities

I-Ds and RFCs can only use basic US-ASCII

- No accented or extension (like ¥ or β) characters
- Only basic mathematical symbols

Only use limited set of entities which are predefined and can be rendered in US-ASCII

- & < > " ' – —]

Two other entities help with formatting:

-   Non-breaking space: lines will not be broken here
- &nbhy; Non-breaking hyphen: --- ditto ---

Some special entities:

- &rfc.number; The RFC number of this document (xxxx while it is still an I-D)

Collected Hints from Earlier Slides

Case is significant in XML names

Remember to escape < (`<`) and & (`&`)

Tokens (names) mustn't include spaces (_ - . are allowed)

You can't nest comments

Remember to change the version # in rfc:docName

`t` and `list` are mutually, but not directly, recursive

Use `<vspace blankLines="100"/>` to force new page

Figures and tables won't be numbered if no `anchor`

Use `<vspace blankLines="1"/>` to simulate paragraph breaks in `list` items

3 pages of hints on easy ways to do references!

Put PIs just after `<rfc>` to allow XMLmind to edit them

Extra Tips

More on hanging labels, indentation and lists

Handy way to switch between private & public draft

Using unpaginated text output

Undocumented spanx styles

Details on these at the back of the slide pack

Useful Links

xml2rfc home page: http://xml.resource.org/

Bill Fenner's plug-in: http://rtg.ietf.org/~fenner/ietf/xml2rfc-xxe/

Julian Reschke's XSLT Transformer:
http://greenbytes.de/tech/webdav/rfc2629xslt/rfc2629xslt.html

A review page for XML editors: http://www.ivritype.com/xml/

XML Tutorial: http://www.w3schools.com/xml/default.asp

IETF Tools (rfcdiff, idnits, etc): http://tools.ietf.org/tools/

Other Documents

The xml2rfc website: http://xml.resource.org/

Provides:

2. Link to RFC2629 - The original specification of xm2rfc format
3. Link to 'RFC2629bis' - The 'unofficial' successor of RFC2629
4. Link to xml2rfc README file - how to drive the tool
5. The online web based xml2rfc converter
6. Links to download xml2rfc (current version)
7. Links to citation libraries
8. Some helpful hints
9. Link to a simple sample file (bigger one with this course)
10. Link to Julian Reschke's XSL transformation tool
11. Link to the xml2rfc DTD
12. Link to the developers' 'bleeding edge' next version snapshot

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For the original idea, 1st implementation, and ongoing drive:

Marshall Rose (mrose at dbc.mtview.ca.us)

For current versions of xml2rfc tool:

Charles Levert (charles.levert at gmail.com)

For XSLT transformer:

Julian Reschke (julian.reschke at greenbytes.de)

For XMLmind plug-in and XML validator:

Bill Fenner (fenner at gmail.com)

For IETF tools:

Henrik Levkowetz (and others)

For Hints, Tips and Review:

All the above plus Fred Baker, Frank Ellerman and Tony Hansen

* For explanation see the definition of rfcedstyle PI in v1.31 README

Questions?

Thank you!

Reference Section

Less Popular Middle Elements

External References

Very simple: `eref` element has a `target` attribute

- `target` attribute MUST be a URI of an external 'document'
- xml2rfc generates 'an appropriate designation' again

Convenient for email addresses

```
<eref target='mailto:xml2rfc@lists.xml.resource.org' />
```

If the eref element is empty

- The URI is rendered in the text where the eref is placed

```
<mailto:xml2rfc@lists.xml.resource.org>
```

If the eref element text is not empty

- The text is rendered at the eref position plus a reference link

```
xml2rfc mailing list [1]
```

- New reference section titled 'URIs' is created at end of document with

```
[1]  <mailto:xml2rfc@lists.xml.resource.org>
```

HTML output will generate a hyperlink

- If `eref` has content this is the text of the hyperlink

WARNING: xml2rfc has some 'features' around eref: complains inappropriately.

Creating an Index

Insert `iref` elements at appropriate points in text

Attributes:

- `item`: Main heading or only index term
- `sub-item` (optional): sub-items sharing a common item heading are pulled together in the index
- `primary`: boolean - if true, item is emphasised in (HTML) index (its page number is in bold)

If there is one or more `iref`, Index is generated

- Alphabetically sorted on `item` and then `sub-item`
- Placed towards the end of the document - no control over where!
- Has page number references - hyperlinked in HTML output

`iref` doesn't put any text into the main body of doc

Comments

Reviewers can insert comments into a document

Comment is text in a `cref` element

- **Optional `source` attribute identifies reviewer**

```
<cref source='Black Dog'>This is wrong!</cref>
```

Comments can be rendered, alternatively:

1. **In a special section at the end of the document**
   - **Cross-references are inserted at location of `cref`**
2. **Inline at the point the `cref` is placed**

Controlled by processing directives

Hints about Formatting - 2

The `spanx` element can be used in most text

- `style` attribute indicates how text should be rendered
- No fixed set of styles: `emph`, `strong` and `verb` usually available

NB: Line breaks will not occur in `spanx` text

XML	Text Output	HTML Output
`|<spanx style="emph"> with emph </spanx>|`	`|_ with emph _|`	|*with emph*|
`|<spanx style="emph">with emph</spanx>|`	`|_with emph_|`	|*with emph*|
`|<spanx style="strong"> with strong </spanx>|`	`|* with strong *|`	|with strong|
`|<spanx style="strong">with strong</spanx>|`	`|*with strong*|`	|with strong|
`|<spanx style="verb">  with verb  </spanx>|`	`|" with verb "|`	|with verb|
`|<spanx style="verb">with verb</spanx>|</t>`	`|"with verb"|`	|with verb|

`emph` and `strong` give grades of emphasis

`verb` is intended for program code and sample input

Notice what happens to white space at the beginning and end of the `spanx` element text

Suggestions for XML Editors and other tools

XML Syntax-aware Editors

Recommended by various users - YMMV!

emacs - http://www.gnu.org/software/emacs/emacs.html

- Free - builds for most OS's. Three XML major modes
  - PSGML - http://www.lysator.liu.se/projects/about_psgml.html
  - tdtd - http://www.menteith.com/tdtd/
  - nXML - http://www.thaiopensource.com/nxml-mode/

jEdit - http://www.jedit.org/ -

- Free - Java based, so usable on Windows, Mac, Linux etc.
- JTidyPlugin will do validation and 'tidying' of XML

XMLSpy - http://www.altova.com/

ALTOVA®

- Home edition is free - $$$ for Professional & Enterprise editions
- Windows only

TextWrangler - http://www.barebones.com/products/textwrangler/

- Free - also its paid-for big brother BBEdit
- Mac only

The IETF does not endorse any products.
You use them at your own risk.

XML Syntax-aware Editors – cont'd

Recommended by various users - YMMV!

oXygen - http://www.oxygenxml.com/

- $$ - $$$ - Windows, Mac, Linux, Java for any OS

XMLmind - http://www.xmlmind.com/xmleditor/

- Standard Edition is free - $$$ for Professional
- Bill Fenner's plugin makes this highly desirable

One pseudo-issue with 'tool compatibility':

- Each editor has its own idea of what is 'pretty printing'!
- Makes diffs on source from different tools more or less hopeless

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You use them at your own risk.

Alternative Tools

For HTML, PDF and other types of output:

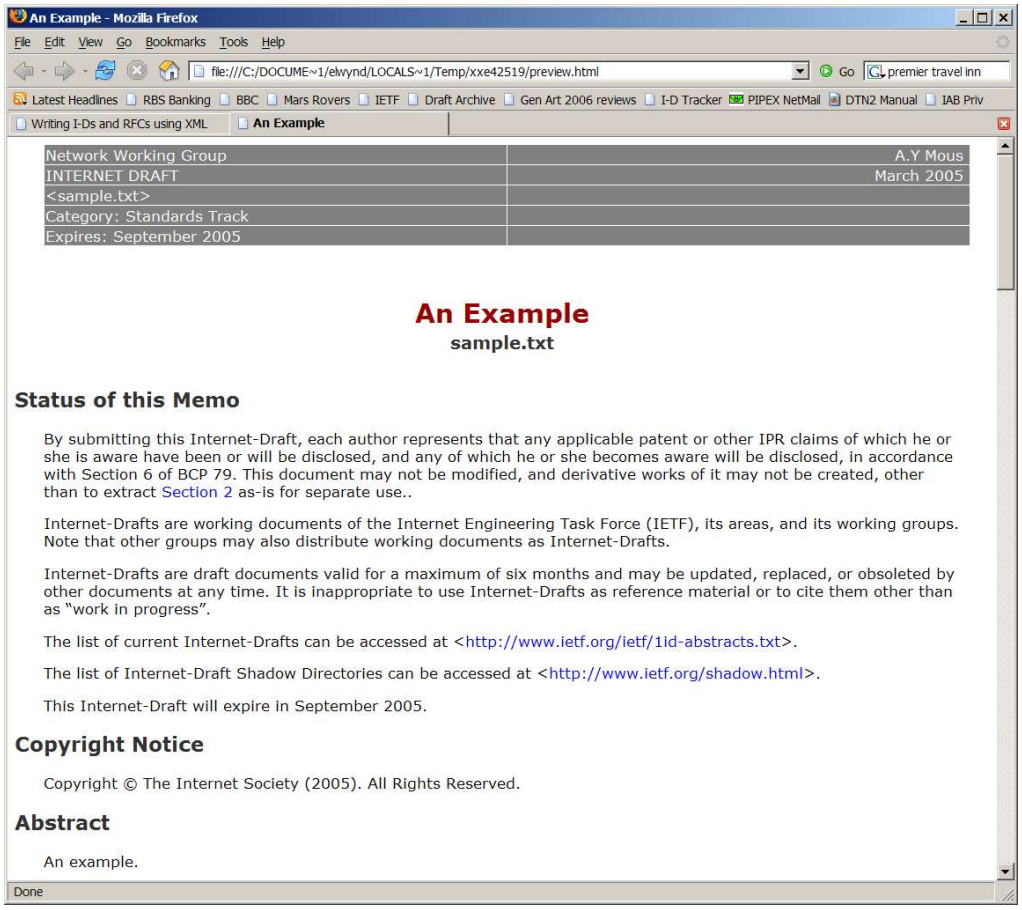
Julian Reschke's XSLT transformation suite

- **Many added features**
- **Elegant display**
- **Lots of hyperlinks**

Useful for other things than just I-Ds and RFCs

See http://greenbytes.de/tech/webdav/rfc2629xslt/rfc2629xslt.html

Example Output from XSLT



Assorted Helpful Tools - 1

Validation of xml2rfc source:

- Bill Fenner's validator: http://rtg.ietf.org/~fenner/ietf/xml2rfc-valid/
- This uses xmllint, part of Gnome libxml2: http://xmlsoft.org/
- Essential when converting old text to xml2rfc
  - Many sophisticated editors won't read in broken XML.
  - XMLmind insists on having almost right xml2rfc!

rfcdiff

- Comparison of two textual I-Ds or RFCs: http://tools.ietf.org/tools/

htmltidy

- Standalone pretty printer: http://tidy.sourceforge.net/
- Useful when converting old text to xml2rfc

Assorted Helpful Tools - 2

JavE

- Tool for drawing ASCII artwork: http://www.jave.de

Internet Explorer

- Will display colorized xml2rfc from a file using just DTD
  - Need rfc2629.dtd, rfc2629-xthml.ent & rfc2629-other.ent in same directory
- Built-in XSLT capabilities display files with Julian's XSLT
  - Need dtd files + rfc2629.xslt in same directory

Mozilla Firefox

- Firefox 1.5.0.1 displays most of xml2rfc using XSLT
  - Apparently there is a patch which would help
  - Raw xml2rfc is not displayed usefully.
- It is fine with HTML and text generated by xml2rfc!

Processing Instructions Directory

File Inclusion/Rigor Control

Keyword	Default	Meaning
include	n/a	Incorporate contents of file specified as value of parameter. Searches for file on search path specified in XML_LIBRARY environment variable, or in directory of containing file if XML_LIBRARY not defined
strict	no	Check for adherence to the letter of the DTD law and compliance with idnits rules for I-Ds. See next slide.

Rigor Control

The IETF Thought Police are coming!

Try to rigorously

- enforce some ID-nits conventions
- check accurate DTD validity

```
<?rfc strict="yes" ?> <!-- default "no" -->
```

Some of the things `strict="yes"` does :

- Validates the XML tree structure against the DTD
- Checks there is an Abstract & a Security Considerations section
- No eref or xref elements in Abstract
- No more than 5 authors
- Strictly limits line lengths
- Must have a ToC if more than 15 pages
- Problems which xml2rfc could workaround become fatal

Rendering Control - 1

What gets output and how

Keyword	Default	Meaning
topblock	yes	Put the famous header block on the first page. I-D/RFC identification on the left; authors and date on the right.
iprnotified	no	Needed to acknowledge if the IETF is notified of IPR encumbrances. Include boilerplate from Section 10.4(d) of RFC 2026 (Bradner, S., “The Internet Standards Process -- Revision 3,” October 1996.)
symrefs	no	Use anchors rather than numbers as tags for references
sortrefs	no	Sort references - this only has an effect if symrefs are used. Otherwise references are numbered as they appear in the source.
comments	no	Render <cref> comment information
inline	no	If comments is "yes", then render comments inline at the <cref>; otherwise render them in an “Editorial Comments” section.
editing	no	Insert editing marks for ease of discussing draft versions. Editing marks are numeric labels on each paragraph of text. Applies to text output only - no effect on HTML output

Rendering Control - 2

What gets output and how

Keyword	Default	Meaning
`private`	""	Produce a private memo rather than an RFC or Internet-Draft. The parameter is the title of the document.
`footer`	""	Override the center footer string with the parameter.
`header`	""	Override the leftmost header string with the parameter.
`rfcedstyle` (new in v1.31)	no	Attempt to closely follow finer details from the latest observable RFC-Editor style so as to minimize the probability of being sent back corrections after submission. This directive is a kludge whose exact behavior is likely to change on a regular basis to match the current flavor of the month; The README file has more details of current effects.
`rfcprocack` (new in v1.31)	no	If there already is an automatically generated Acknowledg(e)ment section, pluralize its title and add a short sentence acknowledging that xml2rfc was used in the document's production to process an input XML source file in RFC 2629 format.

Table of Contents Control

What is in it - if anything - & format

Keyword	Default	Meaning
`toc`	`no`	If `"yes"`, generate a Table-of-Contents.
`tocappendix`	`yes`	Control whether the word “Appendix” appears in the Table-of-Contents entries for the relevant sections.
`tocdepth`	`3`	if `toc` is `"yes"`, then this determines the ‘depth’ of the Table-of-Contents, i.e., the number of levels of sub-sections that have entries in the Table-of-Contents.
`tocindent`	`yes`	if `toc` is `"yes"`, then setting this to `"yes"` will indent entries for subsections in the Table-of-Contents.
`tocompact`	`yes`	if `toc` is `"yes"`, then setting this to `"no"` will make the Table-of-Contents a little less compact. Typically this involves inserting blank lines at the end of the entries for a top level section and its sub-sections.

Format Control

Details of layout in text and nroff output

Keyword	Default	Meaning
`colonspace`	`no`	Put two spaces instead of one after each colon (“:”) in txt or nroff files.
`autobreaks`	`yes`	Automatically force page breaks to avoid widows and orphans (not perfect).

`compact`	`no`
	`From v1.31`
	`(rfcedstyle)`
		When producing a txt/nroff file, try to conserve vertical whitespace (the default value was `"no"` up to v1.30; from v1.31 the default is the current value of the `rfcedstyle` PI).

`subcompact`	`(compact)`	If `compact` is `"yes"`, then you can make things a little less compact by setting this to `"no"` (the default value is the current value of the `compact` PI).
`needLines`	`n/a`	An integer hint indicating how many contiguous lines are needed at this point in the output. This PI can appear anywhere in the source file.

If `compact="no"`:

- Top level sections start on a new page
- A blank line is forced between list items

HTML Specials

Things to do differently when doing HTML output

These PIs only have an affect on HTML output

Text and nroff output are unaffected.

Keyword	Default	Meaning
`background`	`""`	When producing a html file, use the image in the file specified in the parameter.
`emoticonic`	`no`	Automatically replaces input sequences such as `|*text|` by, e.g., `<strong>text</strong>` in html output. Affects `|'text|` and `|"text|` which are replaced by `<b>text</b>`.
`linkmailto`	`yes`	Generate mailto: URL, as appropriate.
`slides`	`no`	When producing a html file, produce multiple files for a slide show
`useobject`	`no`	When producing a html file, use the `<object>` html element with inner replacement content instead of the `<img>` html element, when a source xml element includes an `src` attribute.

Debugging Assistance

Two PIs useful for locating problems

Both can be placed anywhere in the file

`linefile`

A way to override xml2rfc's reckoning of the current input position as used for warning & error reporting purposes.

cf. #line and #file macros in C (header) files.

The change takes effect right after this PI.

Value: a string such as "35:file.xml" which changes both line number and file name or just "35" which changes the line number but leaves the file name as the containing file's real name or whatever the previous `linefile` PI set it to.

`typeout`

Applies only in processing pass 2.

Print the PI value to standard output at that point in processing.

Additional Useful Tips

More on Hanging Labels in Lists

short With a label shorter than the hangIndent there is white space after the label and before the item text starts although it starts on the same line - clearly separating the label from the column of items.

longer_label With a label longer than the hangIndent the label runs on into the text item and the separation is lost.

vspace_trick
Inserting a <vspace /> at the start of the item forces the new item to start on a new line emphasizing the separation again.

```
<list hangIndent="6" style="hanging">
   <t hangText="short">With a label shorter than the hangIndent there
   is white space after the label and before the item text starts
   although it starts on the same line - clearly separating the label
   from the column of items.</t>
   <t hangText="longer">With a label longer than the hangIndent the
   label runs on into the text item and the separation is lost.</t>
   <t hangText="vspace_trick"><vspace blankLines="0" />Inserting a
   &lt;vspace /&gt; at the start of the item forces the new item to
   start on a new line emphasizing the separation again.</t>
</list>
```

Quick Public-Private Switch

The difference between a private and a real draft...
can be only two characters:

```
<!-- is I-D - >
   <?rfc private="Creative Commons License:
   Attributions + ShareAlike" ?>
   <?rfc header="Interim draft" ?>
   <?rfc footer="draft-update-manually-for private-00" ?>
<! - is I-D -->

<!-- no I-D -->
   <?rfc private="Creative Commons License:
    Attributions + ShareAlike" ?>
   <?rfc header="Interim draft" ?>
   <?rfc footer="draft-update-manually-for private-00" ?>
<!-- no I-D -->
```

Spot the difference

This is a single comment... PIs are NOT interpreted!

Here there are two comments and three PIs that ARE interpreted.

Unpaginated Output

Unpaginated text output is

- a useful way to compare output to get diffs for editing, and
- useful for reading into a word processor for reading & making comments

Controlled by

- command line option (-unpg),
- file name extension (.unpg) on GUI, or
- radio button on web service

Undocumented spanx Styles

Code inspection yields extra styles

- vbare - vemph - vstrong - vdeluxe:
  - Fixed width fount forms - plain/italic/bold/italic-bold
- nobreak: Normal rendering but no line break allowed in text