

THE VIEW

LOTUS DEVELOPER 2007

Leverage DXL to Overcome Web Browser Rich Text Limitations

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What We'll Cover ...

- **Delivering Rich Text to the Web**
- Exploring workarounds for rendering Rich Text
- Understanding the DXL output of Rich Text
- Creating a DOM object from DXL text
- Transforming DXL to HTML via XSL Transformations
- Wrap-up

The Specific Problem to Be Addressed

- Users create Notes documents with Rich Text content
- The content needs to be presented with 100% fidelity on the Web
- The documents (or at least the Rich Text) will NOT be edited on the Web, just viewed



Usage Scenarios:

- Web sites
- Documentation databases
- Policies and procedures

How Does Domino Deliver Rich Text to the Web?

- **Notes stores Rich Text in an internal format of Composite Data (CD) records**
 - ♦ **CD records are streams of data structures with standardized headers for the type of record and the number of bytes it uses**
- **When a browser makes a Web request, the HTTP task asks Domino to convert the CD records to HTML**
 - ♦ **In this conversion process, most elements in a Rich Text field convert well**
 - ♦ **However, there are some elements that either do not convert well or do not convert at all**

What Rich Text Elements Does Domino Have Trouble With?

- **Tables**

- ♦ **All table borders are applied universally, regardless of individual cell border settings**
- ♦ **Borders are shown as 4px ridges**
- ♦ **Cell padding is ignored**
- ♦ **Table cells are divided evenly**
- ♦ **Wrapping text around the outside of the table is not supported**

What Rich Text Elements Does Domino Have Trouble With? (cont.)

- **Inline Pictures**

- ♦ Text wrapping, or “float,” isn’t maintained correctly
- ♦ Picture captions are lost
- ♦ Text will be pushed down below the picture
- ♦ Text will be jammed up against the picture

- **Bullets and Numbered Lists**

- ♦ Lists begin with an extra paragraph break
- ♦ All lists are indented an extra indent in the browser

Demonstration: How Domino Handles Rich Text on the Web

**Domino default
rendering of
Rich Text to
the Web**



Rich Text Input with the Notes Client

Rich Text Is Totally WICKED!

This is plain, normal text. **Now the text is bold.** *Now the text is italic and larger.*

Immediately below this text is a table with .10 cell margin settings.

This text is in the first cell of the table and the table borders for this cell have been set to 0.

This text is in the second row of the table. Table borders for this cell have been set to 1.

This text is in the second column of the table. The rows for this column have been merged to form a single cell. Table borders for this cell have been set to 2.

This is some text about Mikkel Heisterberg from Copenhagen, Denmark who has a great site at lekkimworld.com. His picture has been added and has been set to display to the right of this text by going into picture properties, and choosing wrap, float image right.



Mikkel Heisterberg

After a paragraph break, the next paragraph starts below Mikkel's picture. This text runs right below Mikkel's picture in fact.



test.pdf

This text comes after the table.

2nd row starts immediately

Cell padding

Table borders of varying thickness

Image floats right of text

Picture caption

Rich Text Rendering by Domino to Browser

Cell padding
is NOT
observed

Rich Text Is Totally WICKED!

This is plain, normal text. Now the text is bold. Now the text is italic and larger.

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This is some text about Mikkel Heisterberg from Copenhagen, Denmark who has a great site at lekkimworld.com. His picture has been added and has been set to display to the right of this text by going into picture properties, and choosing wrap, float image right. After a paragraph break, the next paragraph starts below Mikkel's picture. This text runs right below Mikkel's picture in fact.



This text comes after the table.

Table rows are
equally spaced

Table borders
are all visible
and set to
ridge style

Paragraph
wraps
incorrectly

Picture
caption
?

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Exploring Workarounds

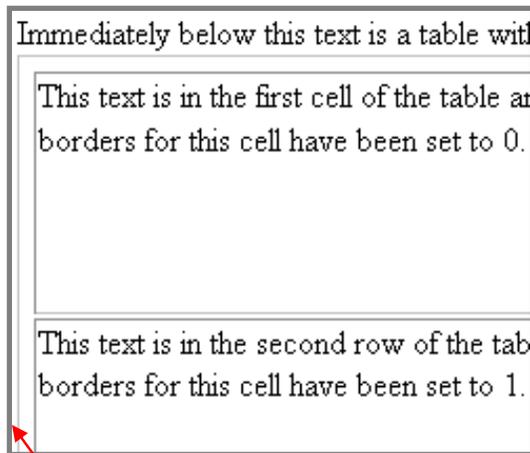
- **Domino automatically renders Rich Text on-the-fly per request**
- **You can:**
 1. **Alter the stored Rich Text so that Domino can supply a more faithful rendering at runtime**
 2. **Fix the rendering on-the-fly by supplying an alternate rendering engine that is called by a DSAPI filter at runtime**
 3. **Fix the rendering after the fact via JavaScript, CSS, or AJAX methods**
 4. **Provide alternate content for Domino to supply in place of the Rich Text rendering**

Workaround 1 — Alter the Stored Rich Text, Attempt 1

- **Add HTML-specific properties in the properties box to overcome Domino rendering**
- **Lots of elements support additional HTML properties:**
 - ♦ **Paragraphs**
 - ♦ **Images**
 - ♦ **Tables**

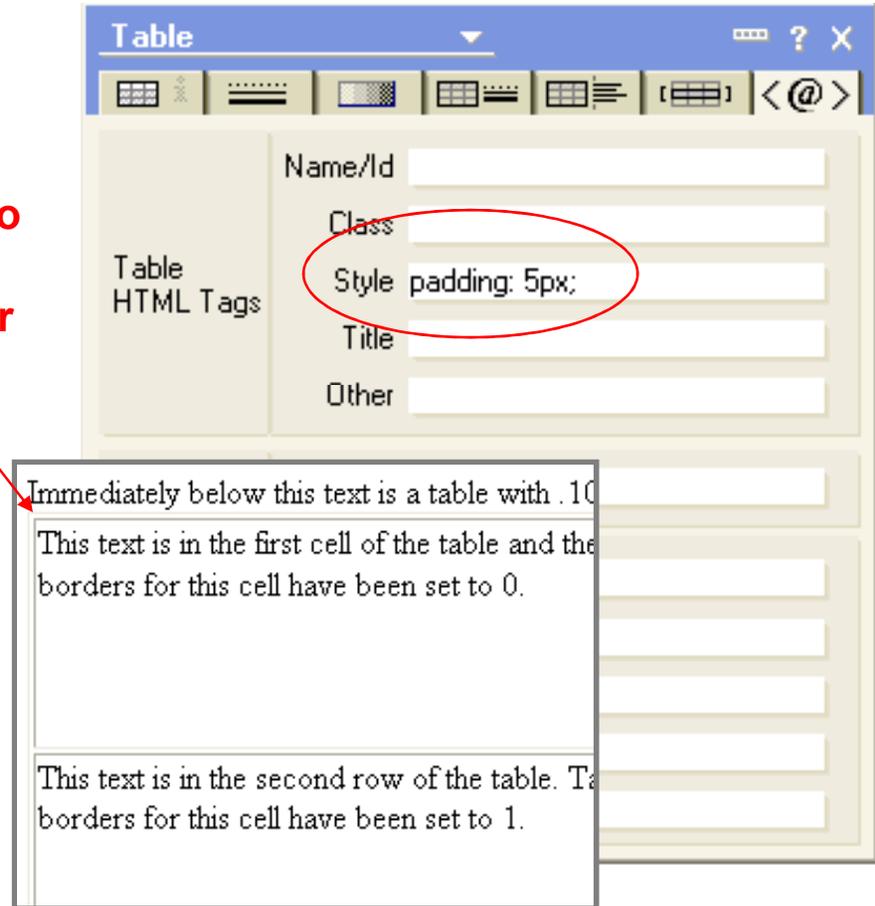
Setting HTML Properties to Fix Cell Padding

- Setting a CSS padding style to achieve cell spacing doesn't work



Firefox works, but exposes table border problem

IE shows no change whatsoever

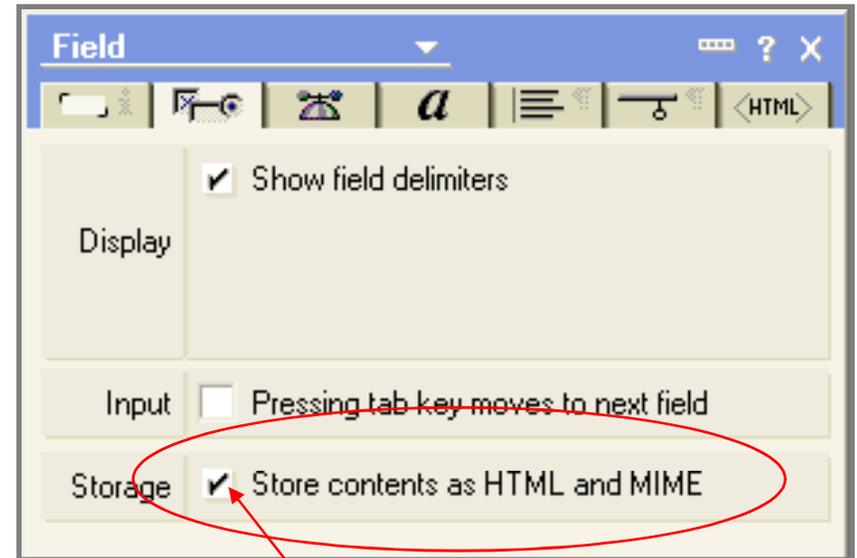


Workaround 1 — Alter the Stored Rich Text, Attempt 2

- **Don't let Notes store the Rich Text as CD records and don't let Domino render it on-the-fly**
- **At document save, store the content as HTML/MIME**

Store Contents as HTML and MIME

- For Rich Text fields, there is a field design property to “Store contents as HTML and MIME”
 - On document save, instead of saving Rich Text content in CD record format, Notes immediately performs an HTML/MIME conversion and saves the content that way
 - The conversion process in storing content as HTML/MIME is not the same as that used by Domino to render Rich Text CD records to HTML



Converts to HTML/MIME on document save. Results are MUCH WORSE!

Potential Workaround Methods

- **Add HTML-specific properties in the properties box to overcome Domino rendering**
- **Bypass Domino rendering by setting the Rich Text field property to store content as HTML/MIME**
- **Intercept Domino rendering of HTML via a DSAPI filter and take over rendering**

Browser Rendering of Content Stored as HTML/MIME

Rich Text Is Totally WICKED!

This is plain, normal text. **Now the text is bold.** *Now the text is italic and larger.*

Immediately below this text is a table with .10 cell margin settings.

This text is in the first cell of the table and the table borders for this cell have been set to 0.	This text is in the second column of the table. The rows for this column have been merged to 2.
This text is in the second row of the table. Table borders for this cell have been set to 1.	 <p>This is some text about Mikkel Heisterberg from Copenhagen. It has been added and has been set to display to the right of this text by going into picture mode. After a paragraph break, the next paragraph starts below Mikkel's picture. This text runs across the bottom of the table cell.</p>

Wrap properties for picture are completely lost

This text comes after the table.



Attachment has moved out of the table

Table size is no longer fixed width, but has been converted to page width

Browser Rendering Now Closely Matches Notes?!?

- **That's a joke in case you missed it**
 - ♦ When viewing the content in a Notes client and in a browser, the results will look very similar
 - ♦ The problem is BOTH clients now render very poorly, if consistently
 - ▶ **The author will see significant change in the document from when the document is saved to the next time he opens it**

Demonstration: Saving Rich Text Content as MIME and Viewing It

**Saving RT
content as
MIME/HTML**



Workaround 1 — Alter the Stored Rich Text, Attempt 3

- **Continuing with the “Store Contents as HTML/MIME” theme, alter the stored HTML/MIME after the document is saved**
 - ♦ **With this approach, the generated HTML is saved in the document and, theoretically, the known issues can be accounted for, corrected, and the document re-saved**

Issues with Fixing Stored HTML/MIME

- **Once the Rich Text is saved, there is data loss**
 - ◆ It's unclear what the author actually intended
- **Therefore, any fix that's applied would be a best-guess and would still not render the content faithfully**

Workaround 2 — Fix the Rendering On-the-Fly

- **Do you have any idea how difficult this would be?**
- **Deep knowledge of the following is required:**
 - ♦ **Architect level knowledge of Rich Text data structures**
 - ♦ **Highly competent C programming skills**
 - ♦ **Lotus Notes C API**
 - ♦ **DSAPI and HTML libraries**
 - ♦ **HTTP protocol handling**
 - ♦ **HTML/CSS construction**



Heads Up!

**I am a highly paid (I wish) professional.
Please, do not try this at home!**

Workaround 3 — Fix the Rendering After the Fact

- This would involve adding a JavaScript function to the Web page, probably invoking an AJAX library
- Domino would send the page to the browser
- The JavaScript code would have to compare the delivered (and possibly hidden) HTML with the original Rich Text
- Accessing the Rich Text would have to be done by an agent/servlet
- And so on ...



**Tedious, and more importantly,
performance would be awful**

Workaround 4 — Provide Alternate Content via DXL

- **Similar in nature to the idea of storing Rich Text content as HTML/MIME**
- **However, rather than trying to fix the errors introduced by storing Rich Text content as HTML/MIME, bypass it altogether**
- **Allow the document to save the Rich Text**
- **Post save, read the Rich Text and create your own HTML representation and save it to the document**
- **When serving the document to the browser, provide the custom HTML representation rather than the Rich Text field (i.e., hide it)**

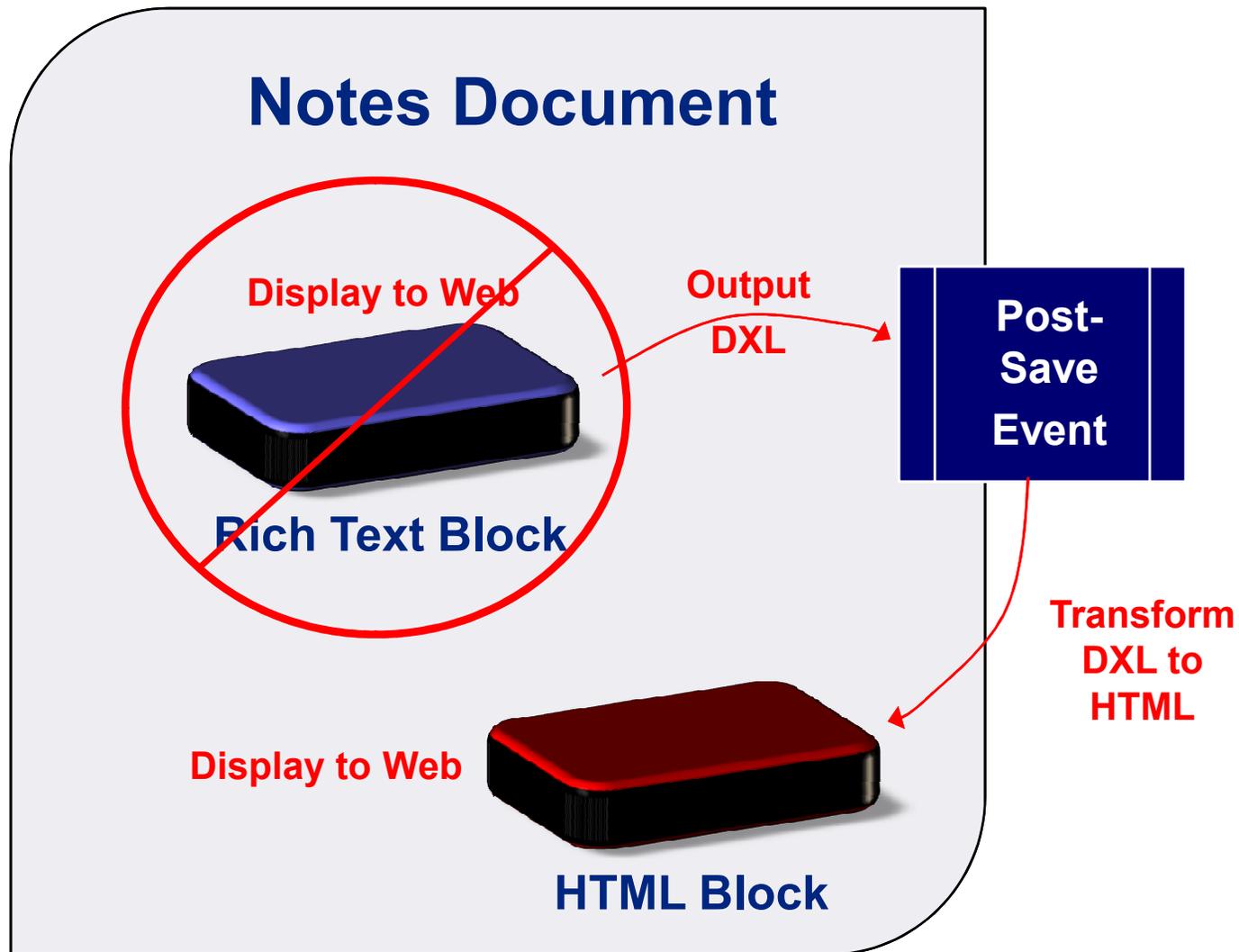
The Secret Sauce is Domino Extensible Language (DXL)

- In the post-save process, the Rich Text is output as DXL
- All Notes design and data elements can be output as DXL, a Domino XML data structure
- DXL can be transformed to HTML with an XSL stylesheet
- The resulting HTML is stored in the Notes document
- When a browser request is made, the HTML field is shown for a speedy response
 - Rather than the Rich Text field
- Handles styled text, tables, inline pictures, attachments
- Does not support bidirectional editing from both clients



Warning

Rich Text Transformed to Correct HTML on Post Save



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The Rich Text to DXL to HTML Process Overview

1. **Design a form with a hidden from Web Rich Text field and a hidden from Notes HTMLTransform field**
2. **QueryClose event (after a save) runs code to produce DXL from the document**
3. **DXL is converted into a W3C DOM object**
4. **Code parses for <picture> elements and creates file attachments**
5. **An XSL stylesheet is applied against the DOM object to produce HTML output for the Rich Text fields**
6. **HTML is saved to the HTMLTransform field**

Understanding the DXL Output of Rich Text

- **DXL is a specific implementation of XML for Domino data**
- **There is a DTD (Document Type Definition) for DXL that defines the XML tags and structures for Domino**
- **DXL can be used for both data (documents) and design (forms, views, agents, etc.)**
- **Rich Text is just another type of Domino data where the DTD has specified the output tags and structure for DXL**

Demonstration: DXL Process — Rich Text to DXL to HTML

**Overview of
the process
for RT to DXL
to HTML**



Inline Images in Rich Text and DXL

- **An inline image is an image the user copied and pasted into the Rich Text field**
- **When reading a document, the image is visible to the user**
 - **It's not an attachment**
- **Notes saves an inline image in Rich Text as a Notes bitmap, a proprietary format**
- **When Rich Text is exported as DXL, the inline image can be exported as either a Notes bitmap or a GIF**

Code That Produces DXL Output

- **Code can be LotusScript or Java**
- **By default, DXL export of inline images generates an internal Notes bitmap format**
 - ◆ **An export flag must be set to convert to GIF format**
- **By default, DXL export will contain a DOCTYPE reference**
 - ◆ **An export flag must be set to omit this output so that later DOM processing will not fail**

Code Example for DXL Export

```
try {
```

```
...
```

```
DxlExporter dxl = session.createDxlExporter();
```

```
...
```

```
// handle inline images in the Rich Text
```

```
dxl.setConvertNotesBitmapsToGIF(true);
```

Changes output of inline
pictures from Notes
bitmap to GIF

```
// turn DOCTYPE output off because DOM processor
```

```
// can't find the DOCTYPE declaration file and errors
```

```
dxl.setOutputDOCTYPE(false);
```

```
String docDxl = dxl.exportDxl(doc);
```

Exports document as
XML to a string

Reviewing DXL Export of Rich Text

- Every field on a document is represented in DXL with an `<item>` tag
- For Rich Text fields, the next tag after `<item>` will be `<richtext>`



See `doc_dxl.xml` for complete sample DXL listing

Identifying the Rich Text Items in DXL Output

```
<item name='MIME_Version'>
```

```
<text>1.0</text>
```

```
</item>
```

Text Item

vs.

Rich Text Item

```
<item name='body'><richtext>
```

```
<pardef id='1' align='center' leftmargin='1in' />
```

```
<par def='1'><run>
```

```
<font size='18pt' style='bold' />
```

```
Rich Text Is Totally WICKED!
```

```
</run>
```

```
</par>...
```

The PARDEF Tag: Style Definitions for Paragraphs

- Pardef is shorthand for paragraph definition
- It contains style settings to apply to a paragraph
- Pardef has a unique ID attribute within the Rich Text field scope to be referenced by paragraph elements

```
<pardef id='1' align='center' leftmargin='1in'/>
```

The PAR Tag: Paragraphs That Are Styled by DEF Attribute

- **Par is shorthand for paragraph**
 - It is used to indicate that a paragraph has started within the Rich Text field
- **The def attribute is used to identify which paragraph definition (pardef) styling is applied to this paragraph**

```
<par def='1'>
```

```
<run>
```

```
<font size='18pt' style='bold'/>
```

```
Rich Text Is Totally WICKED!
```

```
</run>
```

```
</par>
```

PAR and PARDEF Equivalencies in HTML/CSS

PARDEF = CSS Selector

PARDEF ID attribute = CSS Class

PAR = HTML <p>

PAR DEF attribute = HTML <p class="">



Sample PARDEF and PAR Equivalencies

Rich Text

`<pardef id='1' align='center'
leftmargin='1in'/>` →

HTML/CSS

`.par_1 { text-align: center;
margin-left: 70px; }`

`<par def="1">` →

`<p class="par_1">`

DXL's Representation of Inline Images

- Copying and pasting a picture into a Rich Text field results in Notes saving the image in a proprietary format called a Notes bitmap
- When producing DXL output, use the `.setConvertNotesBitmapsToGif` method to produce a GIF format output instead of a Notes bitmap
- The DXL output of the image is a Base64 encoded string
- Later, we'll use code libraries to take the Base64 string and save it as an external file
 - ◆ This can be done with one line of code

DXL Output with setConvertNotesBitmapsToGIF(true);

```
<picture width='160px' height='135px' scaledheight='1.4063in'  
scaledwidth='1.6667in' align='right'>
```

```
<gif>
```

```
R0IGODIhoACHAOcAAPD4+P///xgYICAgKLjAwKiwuBAYGB  
AQGBgglOjw+BAQECgoMAgQEKCwsKiw  
sCAoKLC4wCAoMDA4QPDw+HB4gDhASCgwMCgwOLC4u  
Oj4+AgIEBggKBgYGDA4OLjAyAgICEBIUGhw  
eDAwODhAQKCosEBISEhQWFhgaCAgIDg4QGBocFBYYC  
goKDAoKEhQUdGwKHiAiCgglGh4gOjw8EBA  
SEhIUFBYWki4uFhgYAAAADAoILDawCgoIJB4aPDw8AAIC  
DAwMKCwuDg4OHCAiBAYILDAyAAACKCo...
```

```
</gif>
```

```
<caption>Mikkel Heisterberg</caption>
```

```
</picture>
```

Base64 encoded
content of GIF that
can be saved to
a file

DXL's Representation of Attachments

- **An attachment is split into two elements**
 - ◊ **<Attachmentref>** which includes attributes for the actual file name and the icon to visually represent the attachment
 - ◊ **<file>** which includes attributes for the host type, and created and modified dates
- **The <file> element will be found inside the \$File item as a child of <object>**
- **If there are multiple file attachments, there will be multiple <object><file> elements contained within <item name="\$File">**

DXL for File Attachments (cont.)

The file element

```
<item name='$FILE' summary='true' sign='true' seal='true'>
```

```
<object>
```

```
<file hosttype='msdos' compression='none'  
flags='storedindoc' encoding='none' name='test.pdf'>
```

```
<created>
```

```
<datetime>20051111T180304,3906</datetime>
```

```
</created>
```

```
<modified>
```

```
<datetime>20051111T180304,39-06</datetime>
```

```
</modified>
```

```
<filedata>
```

```
JVBERi0xLjQNCiXDpMO8w7bDnw0KMiAwIG9iag0KPDwgL0xl  
bmd0aCAzIDAglUg0KICAgL0ZpbHRI...
```

The attachment filename

Base64 encoded data of
the attachment

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Produce a W3C DOM Object from Rich Text DXL

- **By creating a W3C DOM object from the DXL output, an XSL transformation can be performed**
- **Inline <picture> elements can be parsed and saved back to the document as file attachments**

Create a DOM Object from DXL Text

- **DXL from the earlier code example is simply an in-memory string**
- **The DXL needs to be converted into a DOM object so that it:**
 - ♦ **Can be parsed to look for inline picture elements**
 - ♦ **Can be transformed with an XSL stylesheet**

Code for Obtaining a DOM Document from DXL String

```
private org.w3c.dom.Document getDOMDoc(String dxl) {  
    try {  
        // Get Document Builder Factory  
        DocumentBuilderFactory factory =  
        DocumentBuilderFactory.newInstance();  
        ...  
  
        // Obtain a document builder object  
        DocumentBuilder builder = factory.newDocumentBuilder();  
        builder.setErrorHandler(new ErrorHandler());  
  
        // Parse the document and return it  
        StringReader reader = new StringReader(dxl);  
        InputSource source = new InputSource(reader);  
        return builder.parse(source);  
        ...  
    }  
}
```

**DocumentBuilder parses
a String InputSource to
create a DOM Document**

Working with DXL Output of Rich Text Inline Image

- Remember, when Rich Text is exported as DXL, inline images can be exported as either Notes bitmap or GIF
- The DXL image data is encoded as a Base64 string
- The string can be decoded and saved to a file

Base64 Libraries Allow Data to Be Decoded and Saved to File

- **With the Java library, saving the GIF data to a file is a static call of a single method**

```
//decode the base64 stream to a temp file  
Base64.decodeToFile(base64Stream, fullfilepath);
```

Isolating the Inline Images and Saving Them to Files

```
Element element = domDoc.getDocumentElement();
```

Collects all the picture elements

```
// find all the inline images in the richtext fields get the picture nodes
```

```
NodeList pictureNodes = element.getElementsByTagName("picture");
```

```
int numOfPictures = pictureNodes.getLength();
```

```
...
```

```
for (int k=0; k<numOfPictures; k++) {
```

```
    NodeList picChildren = pictureNodes.item(k).getChildNodes(); // gif tags
```

```
    int numOfNodes = picChildren.getLength();
```

```
    for (int i=0; i<numOfNodes; i++) { // loop through the <gif> tags
```

```
        Node binaryNode = numOfNodes.item(i).getFirstChild();
```

```
        String base64Stream = binaryNode.getNodeValue();
```

Gets the Base64 data for the picture as a String

```
        String fullfilepath = filename; // filename set earlier in code
```

```
        Base64.decodeToFile(base64Stream, fullfilepath);
```

Decodes and saves file to filesystem

```
    }
```

```
}
```

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Customizing HTML

- **After the DXL has been converted to a DOM object, it can be loaded into a Transformer with an XSL applied to it**
 - ◊ **The result will be customized HTML that meets author's expectations**
- **HTML is saved to the document and shown to Web clients instead of the Rich Text field**

Applying XSL to the DXL DOM Object

- **The DOM object represents the whole document, not just the Rich Text portion**
 - Due to the DXL export's lowest granularity level being the document
- **XSL will ignore the rest of the Notes document and only transform the targeted Rich Text**
 - XSL can be developed to generically look for any Rich Text field
 - XSL can be developed to look for a specific Rich Text field identified by name attribute



**Take-
Home**

See DXL2HTML.xsl for complete XSL listing

Selecting the Rich Text Items to Apply Template Rules

```
<xsl:template match="d:document">
  <xsl:apply-templates select="d:item"/>
</xsl:template>
<xsl:template match="d:item">
  <xsl:apply-templates select="d:richtext"/>
</xsl:template>
<xsl:template match="d:richtext">
  <xsl:apply-templates/>
</xsl:template>
```

Starts with document, looks for items, selects only Rich Text items, then applies remaining templates to Rich Text items only

Sample Template for Handling Table Elements

```
<xsl:template match="d:table">
  <table width="100%" cellspacing="0" cellpadding="0">
    <xsl:attribute name="width">
      <xsl:if test="@widthtype='fitmargins'">100%</xsl:if>
    </xsl:attribute>
    <xsl:attribute name="style">border-collapse: collapse;
      <xsl:if test="string(d:border/@style)"> border-style:
        <xsl:choose>
          <xsl:when test="d:border/@style='dot'">dotted</xsl:when>
          <xsl:when test="d:border/@style='dash'">dashed</xsl:when>
          <xsl:otherwise><xsl:value-of
select="d:border/@style"/></xsl:otherwise>
        </xsl:choose>;
      </xsl:if>
      ...
    </xsl:attribute>
  </table>
</xsl:template>
```

Template illustrates getting the style attribute from the DXL and converting that to CSS selectors

Implementing the XSL Transformation in Code

```
XSLProcessor xp = new XSLProcessor(new XML4JLiaison4dom());
```

```
StringReader xmlSource2 = new StringReader(docDxl);
```

The DXL source

```
StringReader xslSource2 =
```

```
    new StringReader(xslProfile.getItemValueString("RTXSL"));
```

```
StringWriter sw = new StringWriter();
```

```
XSLTInputSource xs = new XSLTInputSource(xmlSource2);
```

```
XSLTInputSource xt = new XSLTInputSource(xslSource2);
```

XSL is retrieved from a text field in a Notes document

```
XSLTResultTarget tout = new XSLTResultTarget(sw);
```

```
xp.process(xs, xt, tout);
```

DXL is transformed to HTML and saved to the document

```
RichTextItem rt = doc.createRichTextItem("HTMLTransform");
```

```
rt.appendText(sw.toString());
```

Demonstration: Live Debug Session for DXL2HTML.xsl

Visual Studio
Debugger for
DXL2HTML.xsl



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Extending the Idea ...

- **What if your boss says, “Move this app to SharePoint, .NET, WebSphere, etc.”?**
- **First of all ... boo! Integrate, not migrate!**
- **But if you must, use the DXL export process to get Rich Text and convert it to HTML and save it in the new system**

Acknowledgements

- **Much of the work shown here is a result of the dedicated effort of David Bockes at Workflow Studios**
- **I claim some of the inspiration, he provided much of the perspiration**
- **In particular, the efforts in developing the XSL stylesheet are entirely his doing**

Resources for Working with Base64 Encoded Data

- There are free LotusScript and Java libraries for encoding and decoding binary data as strings
- The Java library used in the sample db is from <http://iharder.net/base64> by Robert Harder. It is a comprehensive and widely used library.
- For reference, the resources section also includes a LotusScript class library from Johan Kanngard at http://dev.kanngard.net/Permalinks/ID_20030324233829.html based on work from Julian Robichaux.



**Take-
Home**

**See Script Libraries in `dxl_sample.nsf`
for both Java and LotusScript libraries**

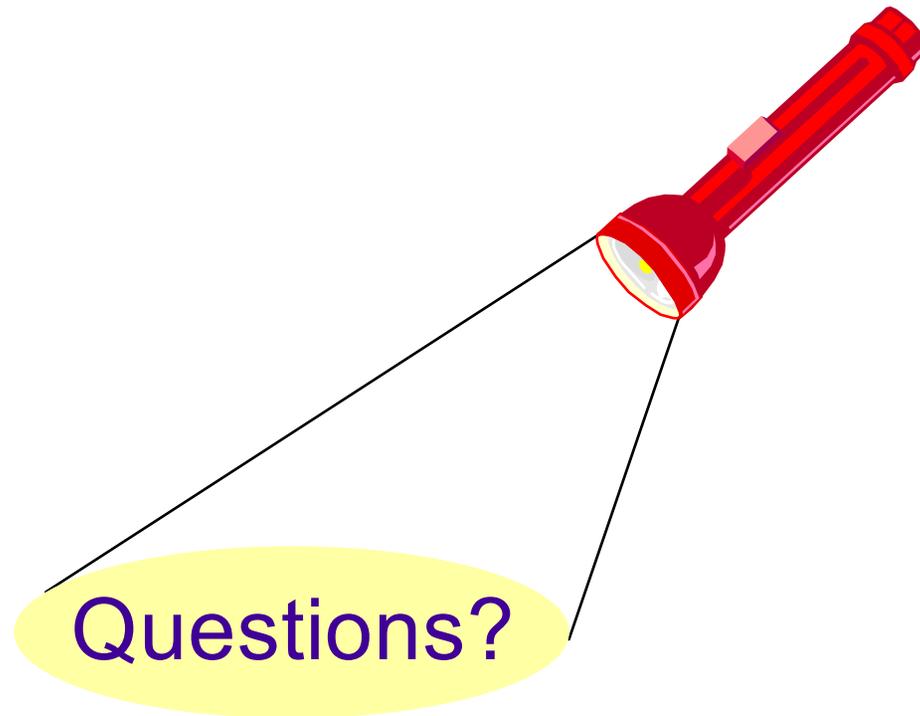
Rich Text Handling for Free Resources

- **Genii Software's CoexEdit for bidirectional Rich Text editing**
 - ♦ www.geniisoft.com/showcase.nsf/CoexEdit
- **Proposition Software's Portal Migrator, which handles Rich Text conversion to the .NET platform**
 - ♦ www.proposition.com

7 Key Points to Take Home

- **Domino's rendering of Rich Text to the Web requires alternatives for 100% rendering**
- **Storing Rich Text as HTML/MIME does not solve the problem, it makes it worse**
- **The complete data structure of a Rich Text field is available as XML when using DXL Export**
- **Inline images can be extracted from Rich Text DXL and saved as file attachments**
- **XSL can be used to transform the DXL into HTML**
- **This solution is one-way only ... from Notes to Web**
- **Use this approach to move Rich Text to other platforms**

Your Turn!



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