XSLT 4.0

XSLT 4.0

Extra Features

- Enhancements to the type system to allow more expressive constraints, especially for maps and atomic values.
- Additional functionality for processing arrays.
- Exploitation of the power afforded by first-class function items

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- xsl:item-type
- For-each and apply-templates separator
- mode/@as
- Extension instructions
- map/@duplicates cf map:build()
- Xsl:for-each-group/@split-when
- Named record types
- Xsl:record
- @select on xsl:map|result-document|when|otherwise|(non-)matching-substring
- Xsl:select
- Self-referential Global variables of function() type
- Parameters passed automatically to apply-imports and next-match
- Optional parameters to xsl:function
- Xsl:switch
- Xsl:note stylesheet/@main-module
- stylesheet/@fixed-namespaces
- Type-based patterns
- Xsl:array
- Enclosing mode
- Shallow-copy-all for map/array trees
- Ordered maps (XPath)

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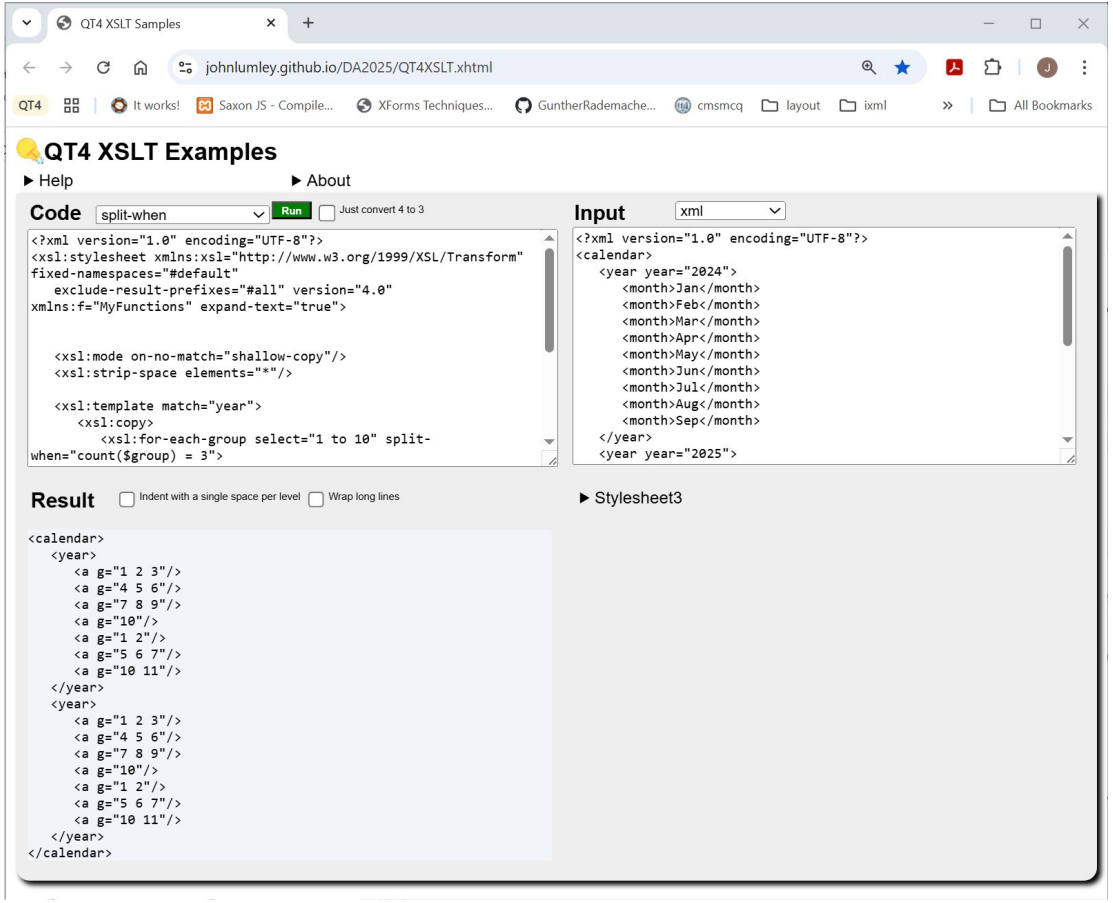
Syntax additions

- Many of the XSLT syntax additions can be source-converted to XSLT3
- A browser-based workbench does this and executes



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Syntax additions – increasing XSLT code density

```
<xsl:choose>
   <xsl:when test="$n lt $low">
      <xsl:sequence select="../below"/>
   </xsl:when>
   <xsl:when test="$n gt $high">
      <xsl:sequence select="../above"/>
   </xsl:when>
   <xsl:otherwise>
      <xsl:sequence select="../within"/>
   </xsl:otherwise>
</xsl:choose>
```

XSLT 3.0 code

Terser XSLT 4.0 equivalent

```
<xsl:choose>
   <xsl:when test="$n lt $low" select="../below"/>
   <xsl:when test="$n gt $high" select="../above"/>
   <xsl:otherwise select="../within"/>
</xsl:choose>
```

Examples will be simple, possibly nonsensical, but illustrative

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Selection i

@select vs xsl:sequence[@select]

```
<xsl:choose>
   <xsl:when test="$n lt $low">
      <xsl:sequence select="../below"/>
   </xsl:when>
   <xsl:when test="$n gt $high">
      <xsl:sequence select="../above"/>
   </xsl:when>
   <xsl:otherwise>
      <xsl:sequence select="../within"/>
   </xsl:otherwise>
</xsl:choose>
```

Similarly for:
xsl:map |
xsl:result-document |
xsl:matching-substring |
xsl:non-matching-substring

```
<xsl:choose>
   <xsl:when test="$n lt $low" select="../below"/>
   <xsl:when test="$n gt $high" select="../above"/>
   <xsl:otherwise select="../within"/>
</xsl:choose>
```

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Selection ii

preserving formatted XPath expressions

```
<xsl:function name="f:book-to-json" as="map(*)">
   <xsl:param name="book" as="element(book)">
   <xsl:sequence select=”
      {  ‘title’  : string($book/title),
         ‘author’ : array { $book/author ! string() },
         ‘date’   : let $d := $book/publication return
                    if(current-date() lt xs:date($d))
                    then $d else ‘Don&apos;t release’
      }”/>
</xsl:function>
```

Attribute value normalization

```
<xsl:function name="f:book-to-json" as="map(*)">
   <xsl:param name="book" as="element(book)">
   <xsl:sequence select=”{  ‘title’ : string($book/title),
 ‘author’ : array { $book/author ! string() }, ‘date’ : let
 $d := $book/publication return if(current-date() lt
 xs:date($d)) then $d else ‘Don&apos;t release’}”/>
</xsl:function>
```

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Selection iii

preserving formatted XPath expressions

```
<xsl:function name="f:book-to-json" as="map(*)">
   <xsl:param name="book" as="element(book)">
   <xsl:select>
      {  'title'  : string($book/title),
         'author' : array { $book/author ! string() },
         'date'   : let $d := $book/publication return
                    if(current-date() lt xs:date($d))
                    then $d else "Don't release"
      }
   </xsl:select>
</xsl:function>
```

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If @then @else

```
<xsl:choose>
   <xsl:when test="$n ge $low and $n le $high">
      <xsl:sequence select="../within"/>
   </xsl:when>
   <xsl:otherwise>
      <xsl:sequence select="../without"/>
   </xsl:otherwise>
</xsl:choose>
```

```
<xsl:if test="$n ge $low and $n le $high"
        then="../within" else="../without"/>
```

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Enclosing Mode

```
<xsl:mode name="removePara" on-no-match="shallow-copy"/>

<xsl:template mode="removePara" as="element()*" match="/">
   <xsl:apply-templates mode="#current"/>
</xsl:template>

Lots of other stuff which makes finding all relevant matches difficult

<xsl:template mode="removePara" as="element()*" match="p"/>
```

```
<xsl:mode name="removePara" on-no-match="shallow-copy" as="element()*">
   <xsl:template match="/">
      <xsl:apply-templates/>
   </xsl:template>
   <xsl:template match="p"/>
</xsl:mode>
```

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Optional function parameters

```
<xsl:function name="f:inRange">
   <xsl:param name="n"/>
   <xsl:sequence select="f:inRange($n,0)"/>
</xsl:function>
<xsl:function name="f:inRange">
   <xsl:param name="n"/>
   <xsl:param name="low"/>
   <xsl:variable name="high">
      <xsl:call-template name="findLimit"/>
   </xsl:variable>
   <xsl:sequence select="f:inRange($n,$low,$high)"/>
</xsl:function>
<xsl:function name="f:inRange">
   <xsl:param name="n"/>
   <xsl:param name="low"/>
   <xsl:param name="high"/>
   <!-- Stuff -->
</xsl:function>
```

```
<xsl:function name="f:inRange">
   <xsl:param name="n" as="element()"/>
   <xsl:param name="low" required="no" select="0"/>
   <xsl:param name="high" required="no">
      <xsl:call-template name="findLimit"/>
   </xsl:param>
   <!-- Stuff -->
</xsl:function>
```

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Named Item Types

```
<xsl:param name="upscale" as="map(xs:string,function(xs:double) as xs:double)"/>
<xsl:param name="downscale" as="map(xs:string,function(xs:double) as xs:double)"/>
<xsl:variable name="converters" as="map(xs:string,function(xs:double) as xs:double)"
   select="map{
   'double': function ($x) {$x + $x},
   'quadruple': function ($x) {4 * $x}
   }""/>
```

```
<xsl:item-type name="f:converters"
    as="map(xs:string,function(xs:double) as xs:double)"/>

<xsl:param name="upscale" as="f:converters"/>
<xsl:param name="downscale" as="f:converters"/>
<xsl:variable name="converters" as="f:converters" select="
   map {
   'double': function ($x) {$x + $x},
   'quadruple': function ($x) {4 * $x}
   }"/>
```

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Record Types, Constructors

```
<xsl:record-type name="f:complex" constructor="true">
   <xsl:field name="r" as="xs:double"/>
   <xsl:field name="i" as="xs:double" required="no" default="0"/>
</xsl:record-type>
```

```
 <xsl:variable name="i" as="f:complex" select="f:complex(0, 1)"/>
```

```
$i
```

→

```
{'r': 0, 'i': 10}
```

```
<xsl:record xsl:as="f:complex"
  r="15" i="12"
  xsl:use-when="$use-records"/>
```

→

```
{'r': 15, 'i': 12}
```

This is an exception – standard attributes **must** be in XSLT namespace

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Extension Instructions to call templates

```
<xsl:template name="f:report">
   <xsl:param name="code" as="xs:integer" required=”yes”/>
   <xsl:param name="message" as="xs:string?"/>
   <report code="{$code}">{($message,’Emergency’)[1]}</report>
</xsl:template>

<xsl:call-template name="f:report">
   <xsl:with-param name="code" select="123"/>
   <xsl:with-param name="message" select="'All normal'"/>
</xsl:call-template>
```

```
… extension-element-prefixes=”f”…

<xsl:template name="f:report"> … </xsl:template/>

<f:report code="123" message="All normal"/>
<f:report code="999"/>
```

Example
Callable
extension call

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Fixed namespaces

```
<xsl:stylesheet
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
   xmlns:array="http://www.w3.org/2005/xpath-functions/array"
   xmlns:err="http://www.w3.org/2005/xqt-errors"
   xmlns:fn="http://www.w3.org/2005/xpath-functions"
   xmlns:map="http://www.w3.org/2005/xpath-functions/map"
   xmlns:math="http://www.w3.org/2005/xpath-functions/math"
   xmlns:xs="http://www.w3.org/2001/XMLSchema"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   version="3.0">
   <!-- Stuff -->
</xsl:stylesheet>
```

```
<xsl:stylesheet
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
   fixed-namespaces="#default"
   version="4.0"
   <!-- Stuff -->
</xsl:stylesheet>
```

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Separators

```
<xsl:apply-templates select="AUTHOR">
   <xsl:sort select="LAST-NAME"/>
   <xsl:sort select="FIRST-NAME"/>
</xsl:apply-templates>

<xsl:template match="AUTHOR">
   <!-- Stuff -->
   <xsl:if test="position() lt last()">
      <xsl:text>, </xsl:text>
   </xsl:if>
</xsl:for-each>
```

```
<xsl:for-each select="AUTHOR">
   <xsl:sort select="LAST-NAME"/>
   <xsl:sort select="FIRST-NAME"/>
   <xsl:apply-templates select="."/>
   <xsl:if test="position() lt last()">
      <xsl:text>, </xsl:text>
   </xsl:if>
</xsl:for-each>
```

```
<xsl:apply-templates select="AUTHOR" separator=", ">
   <xsl:sort select="LAST-NAME"/>
   <xsl:sort select="FIRST-NAME"/>
</xsl:apply-templates>
```

Similarly for:
`xsl:for-each`

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Switch

```
<xsl:variable name="n" select="a" as="item()"/>
<xsl:choose>
   <xsl:when test="$n = (1, 2, 3, 4)">
      <xsl:sequence select="../small"/>
   </xsl:when>
   <xsl:when test="$n = (5 to 20)">
      <xsl:sequence select="../medium"/>
   </xsl:when>
   <xsl:otherwise>
      <xsl:sequence select="../large"/>
   </xsl:otherwise>
</xsl:choose>
```

```
<xsl:switch select="$n">
   <xsl:when test="1, 2, 3, 4" select="../small"/>
   <xsl:when test="5 to 20" select="../medium"/>
   <xsl:otherwise select="../large"/>
</xsl:switch>
```

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Grouping – split-when

```
<xsl:for-each-group select="1 to 4, 5, 7 to 9, 10 to 12, 14, 15, 20 to 22"
      split-when="$next ne ($group[last()] + 1)">
    <a g="{current-group()}"/>
</xsl:for-each-group>
```

Example
Grouping
split-when

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Arrays FIX!!!!!

```
<xsl:variable name="n" select="a" as="item()"/>
<xsl:choose>
   <xsl:when test="$n = (1, 2, 3, 4)">
      <xsl:sequence select="../small"/>
   </xsl:when>
   <xsl:when test="$n = (5 to 20)">
      <xsl:sequence select="../medium"/>
   </xsl:when>
   <xsl:otherwise>
      <xsl:sequence select="../large"/>
   </xsl:otherwise>
</xsl:choose>
```

```
<xsl:switch select="$n">
   <xsl:when test="1, 2, 3, 4" select="../small"/>
   <xsl:when test="5 to 20" select="../medium"/>
   <xsl:otherwise select="../large"/>
</xsl:switch>
```

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Development/documentation aid

```
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  main-module="toplevel-uri.xsl" ...>

   <xsl:note role="description">
      <p>This is a note <b>purely</b> for purposes outside XSLT. <br/>
       Think of it as a comment that can contain structured stuff.</p>
   </xsl:note>
   <xsl:function name="t:temp">
      <xsl:note class=”simple”>It can appear anywhere as a child element
         and can have any attributes …
      </xsl:note>
      <xsl:param name="a">
         <xsl:note continuation-of="previous::xsl:note[1]">
            … and is totally ignored by XSLT for any
            syntactic or semantic purposes.</xsl:note>
      </xsl:param>
      …
   </xsl:function>
</xsl:stylesheet>
```