



A Data Usability Company

ANTENNA HOUSE

XSL-FO

More declarative than you know

Declarative Amsterdam
2024

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XSL-FO: More declarative than you know

- What's in a name?
- Prehistory
- XSL processing model
- Initial letters
- Overflowing text
- Comparison with CSS

What's in a name?

- "XSL-FO" is undefined
- XSL Recommendation is:
 - Transformation
 - Formatting
- "XSL" these days refers to "XSLT"
 - Except when it doesn't
- "XSLT" means XSLT

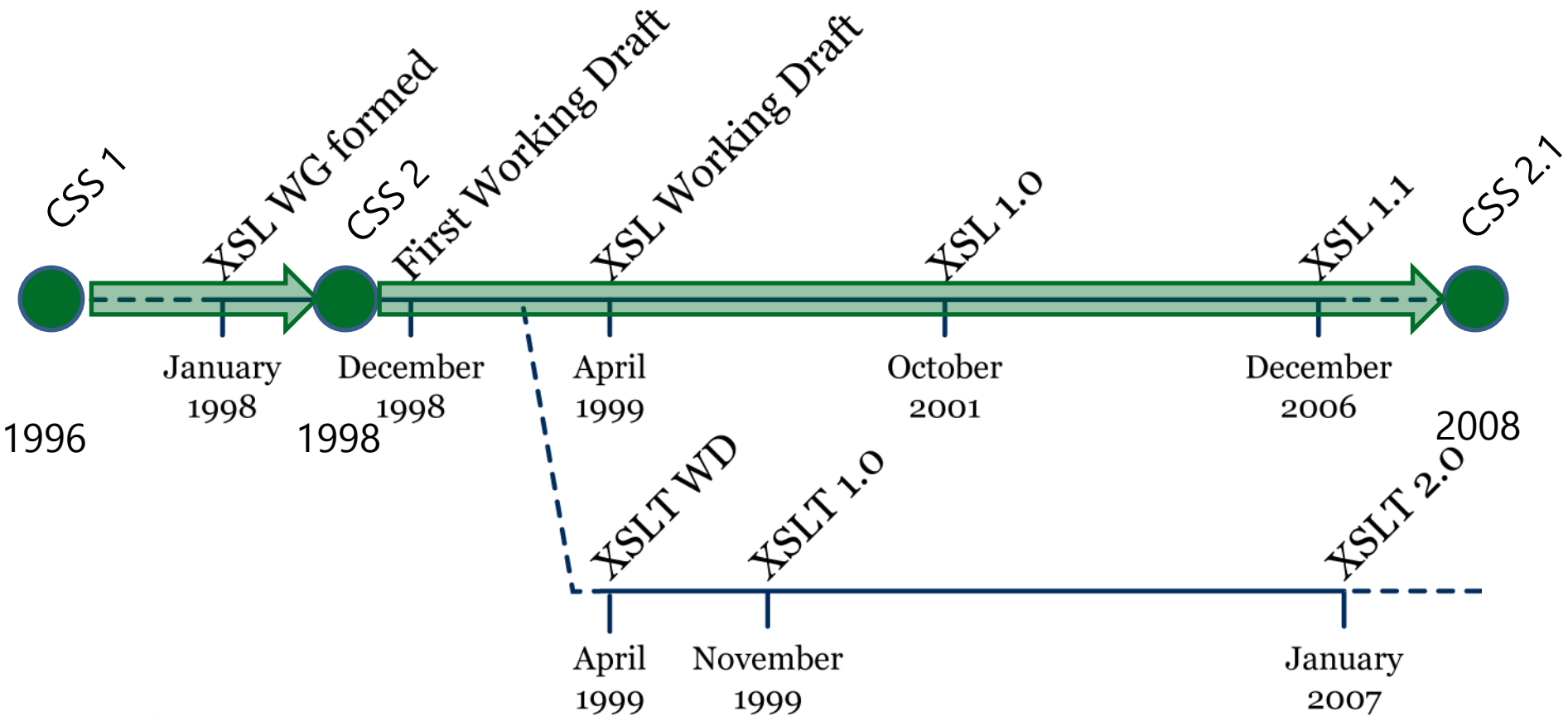
Prehistory

- XSL (T + FO) builds on CSS and DSSSL
- “to define a style specification language that covers at least the formatting functionality of both CSS and DSSSL.”

Original CSS goals

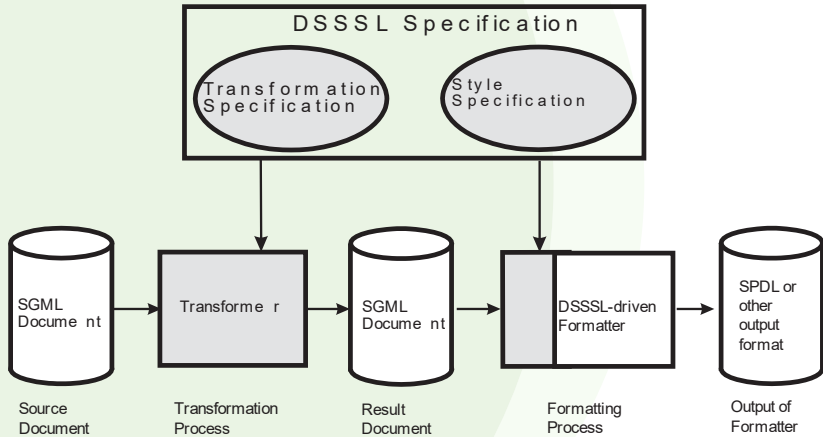
- “CSS supports stream-based (or ‘incremental’ formatting) where possible”
- “CSS offers both readers and authors control over the style”
- “avoiding an uncontrolled growth of HTML extensions”

Timeline

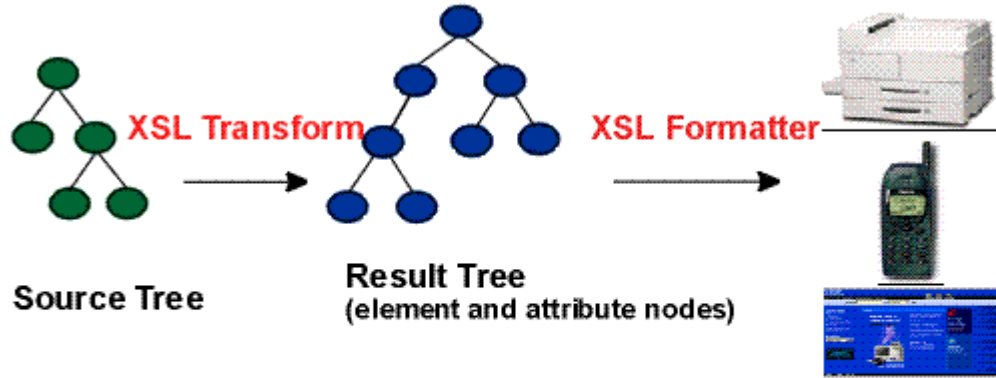


XSL Processing Model

DSSSL

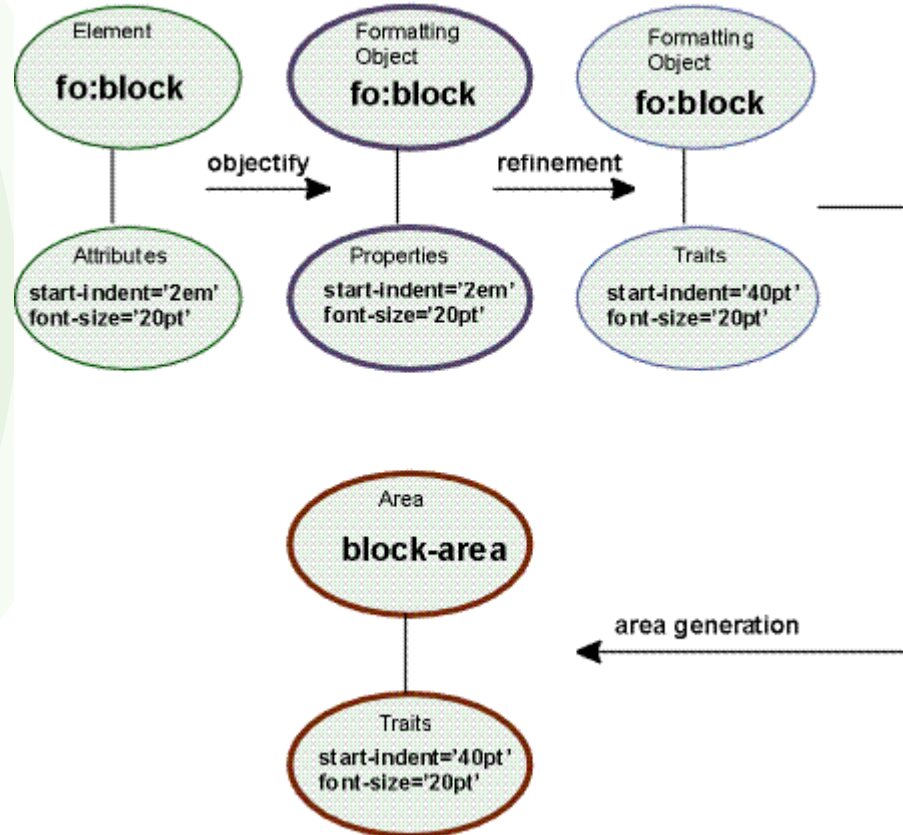


XSL



Result XML tree is the result of XSLT processing.

Formatting stages



XSL formatter handles...

- Applying font family, size, style, colour, etc
- Superscripts, subscripts, alignment baseline
- Height, width, margins, borders, and padding
- Page size and orientation for each page
- Headers and footers for each page
- Breaking long lines of text
- Stacking adjacent lines
- Breaking long blocks of text
- Keeping required minimum number of lines before and after the break
- Aligning text in one or all of the lines in a block
- Stacking adjacent blocks
- Formatting tables
- Hyphenation
- Honouring keeps and breaks
- Formatting footnotes and sidenotes
- Sizing and placing graphics
- Float graphics to the top (or elsewhere) on the page
- Adjusting lines of text so a side float does not overlap the text

XSL formatter might also...

- Generate drop capitals
- Treat a two-page spread as one large page
- Add line numbers
- Generate output files as multiple volumes
- Add marks at line breaks
- Force the document to be a multiple of a fixed number of pages
- Align text to defined tab stops
- Suppress content depending on whether it is or isn't the first content on a page
- Make lines of text fit to a defined baseline grid
- Hang punctuation characters at the start and/or end of a line into the margin
- Modify properties of text that overflows an area to make text fit its area

Initial letters

Raised initial letter

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Fusce sit amet risus ut sapien vehicula aliquam molestie vitae lacus.

Language-specific letter selection

IJzel zorgt voor zeer gevaarlijke omstandigheden op de weg. IJzel zorgt voor zeer gevaarlijke omstandigheden op de weg.
Black ice creates very dangerous conditions on the road. Black ice creates very dangerous conditions on the road.

Individual color

Zorem ipsum dolor sit amet, consectetur adipiscing elit. Fusce sit amet risus ut sapien vehicula aliquam molestie vitae lacus.

Change indent only for first line

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Fusce sit amet risus ut sapien vehicula aliquam molestie vitae lacus. In aliquam sem quis suscipit iaculis. In vitae nibh volutpat, blandit mi at, cursus ipsum.

Combination with small-capitals

LOREM IPSUM dolor sit amet, consectetur adipiscing elit. Fusce sit amet risus ut sapien vehicula aliquam molestie vitae lacus. In aliquam sem quis suscipit iaculis. In vitae nibh volutpat, blandit mi at, cursus ipsum.

Partially raised

g

azing on that which seems to dim thy sight? What seest thou there? King Henry's diadem, encased with all the honours of the world? If so, gaze on, and grovel on thy face, until thy head be circled with the same.

Type alone when used properly with correct sizes, proper leading and proportioned well on the page and carefully printed, can be an aesthetic delight, because of its beauty, color and harmony.

A. P. Tedesco

- Cut type or print separately
- Optically align initial to text block



Partially-raised initial “g”

```
<fo:block >  
padding="(0  
margin=0  
font-fa  
axf:ini  
text-ir  
axf:ini  
>gazing c  
thou there?  
honours of  
face, until
```



azing on that which seems
to dim thy sight? What
seest thou there? King
Henry's diadem, enchased
with all the honours of the world? If
so, gaze on, and grovel on thy face,
until thy head be circled with the
same. Put forth thy hand, reach at

ways“

stify”

6em”
est

k>

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Declarative markup in 1986



azing on that which seems
to dim thy sight? What
seest thou there? King
Henry's diadem, enchased
with all the honours of the world? If
so, gaze on, and grovel on thy face,
until thy head be circled with the
same. Put forth thy hand, reach at

Figure 1: An enormous lowercase letter is used as an initial. Optical alignment of the left edge of the letterform with the text is important.

118pt 1.c. 4L DROP
AMER. TYPEWRITER MED.
HANG 4pts ON LEFT MARGIN

12/12 x 16 1/2 JUST.
AMER. TYPEWRITER
MED. - WRAP
AROUND INITIAL

azing on that whi
Henry's diadem, en
on, and grovel on
forth thy hand, re

Overflowing text

- XSL 1.1: show, hide, or error
- Adjust to condense to fit
- Fallback to next method if reach limit
 - font-size → line-height → font-stretch

```
overflow="hidden"
```

Declarative programming is a style of programming that expresses the logic of computation without describing its control

```
overflow="condense"
```

Declarative programming is a style of programming that expresses the logic of computation without describing its control flow.

```
overflow="condense"
```

```
axf:overflow-condense="font-size line-height"  
axf:overflow-condense-limit-font-size="9pt"
```

Declarative programming is a style of programming that expresses the logic of computation without describing its control flow.

```
overflow="condense"
```

```
axf:overflow-condense="font-size line-height  
font-stretch"
```

```
axf:overflow-condense-limit-font-size="9pt"  
axf:overflow-condense-limit-line-height="1"
```

Declarative programming is a style of programming that expresses the logic of computation without describing its control flow.

Chapter separator in 'Moby-Dick'

594 THE PEQUOD MEETS THE DELIGHT.

But already the sable wing was before the old man's eyes; the long hooked bill at his head: with a scream, the black hawk darted away with his prize.

An eagle flew thrice round Tarquin's head, removing his cap to replace it, and thereupon Tanaquil, his wife, declared that Tarquin would be king of Rome. But only by the replacing of the cap was that omen accounted good. Ahab's hat was never restored; the wild hawk flew on and on with it; far in advance of the prow: and at last disappeared, while from the point of that disappearance, a minute black spot was dimly discerned, falling from that vast height into the sea.



CHAPTER CXXXI.

THE PEQUOD MEETS THE DELIGHT.

The intense Pequod sailed on; the rolling waves and days went by; the life-buoy-coffin still lightly swung; and another ship, most miserably misnamed the Delight, was descried. As she drew nigh, all eyes were fixed upon her broad beams, called shears, which, in some whaling-ships, cross the quarter-deck at the height of eight or nine feet; serving to carry the spare, unrigged, or disabled boats.

Upon the stranger's shears were beheld the shattered, white ribs, and some few splintered planks, of what had once been a whale-boat, but you now saw through this wreck, as plainly as you see through the peeled, half-unhinged, and bleaching skeleton of a horse.

"Hast seen the White Whale?"

"Look!" replied the hollow-cheeked captain from his taff-rail; and with his trumpet he pointed to the wreck.

"Hast killed him?"

THE PEQUOD MEETS THE DELIGHT. 595

"The harpoon is not yet forged that will ever do that," answered the other, sadly glancing upon a rounded hammock on the deck, whose gathered sides some noiseless sailors were busy in sewing together.

"Not forged!" and snatching Perth's levelled iron from the crotch, Ahab held it out, exclaiming—"Look ye, Nantucketer; here in this hand I hold his death! Tempered in blood, and tempered by lightning are these barbs; and I swear to temper them triply in that hot place behind the fin, where the White Whale most feels his accursed life!"

"Then God keep thee, old man—see'st thou that!"—pointing to the hammock—"I bury but one of five stout men, who were alive only yesterday; but were dead ere night. Only that one I bury; the rest were buried before they died; you sail upon their tomb!" Then turning to his crew—"Are ye ready there? place the plank then on the rail, and lift the body; so, then—Oh! God"—advancing towards the hammock with uplifted hands—"may the resurrection and the life—"

"Brace forward! Up helm!" cried Ahab like lightning to his men.

But the suddenly started Pequod was not quick enough to escape the sound of the splash that the corpse soon made as it struck the sea; not so quick, indeed, but that some of the flying bubbles might have sprinkled her hull with their ghostly baptism.

As Ahab now glided from the dejected Delight, the strange life-buoy hanging at the Pequod's stern came into conspicuous relief.

"Ha! yonder! look yonder, men!" cried a foreboding voice in her wake. "In vain, oh, ye strangers, ye fly our sad burial; ye but turn us your taffrail to show us your coffin!"



596

THE SYMPHONY.

CHAPTER CXXXII.

THE SYMPHONY.

It was a clear steel-blue day: The firmaments of air and sea were hardly separable in that all-pervading azure; only, the pensive air was transparently pure and soft, with a woman's look, and the robust and man-like sea heaved with long, strong, lingering swells, as Samson's chest in his sleep.

Hither, and thither, on high, glided the snow-white wings of small, unspotted birds; these were the gentle thoughts of the feminine air; but to and fro in the deeps, far down in the bottomless blues, rushed mighty Leviathans, sword-fish, and sharks; and these were the strong, troubled, murderous thoughts of the masculine sea.

But though thus contrasting within, the contrast was only in shades and shadows without; those two seemed one; it was only the sex, as it were, that distinguished them.

Aloft, like a royal czar and king, the sun seemed giving this gentle air to this bold and rolling sea; even as bride to groom. And at the girdling line of the horizon, a soft and tremulous motion—most seen here at the equator—denoted the fond, throbbing trust, the loving alarms, with which the poor bride gave her bosom away.

Tied up and twisted; gnarled and knotted with wrinkles; haggardly firm and unyielding; his eyes glowing like coals, that still glow in the ashes of ruin; untoppling Ahab stood forth in the clearness of the morn; lifting his splintered helmet of a brow to the fair girl's forehead of heaven.

Oh, immortal infancy, and innocence of the azure! Invisible winged creatures that frolic all round us! Sweet childhood of air and sky! how oblivious were ye of old Ahab's close-coiled

Automatic chapter separator

```
<xsl:template
  match="div[@type = 'chapter']
    [exists(head[@type = 'sub'] |
      fw[@type = 'head'])]">
  <xsl:if
    test="exists(preceding-sibling::div
      [@type = current()/@type])">
    <fo:block axf:suppress-if-first-on-page="true"
      space-after="0.2in"
      space-after.precedence="force">
      <fo:external-graphic src="separator.svg" />
    </fo:block>
  </xsl:if>
  <fo:block
    id="{@type}-{count(preceding::div
      [@type = current()/@type]) + 1}">
```

```
<fo:block
  id="{@type}-{count(preceding::div
    [@type = current()/@type]) + 1}">
  <fo:block-container
    axf:baseline-grid="none"
    axf:baseline-block-snap="none"
    keep-together.within-page="always"
    keep-with-next.within-page="always"
    space-before="{
      if (exists(preceding::div[1]
        [@type = 'chapter']))
        then '0.5in'
        else '0.72in'}"
    space-before.conditionality="retain">
    <xsl:apply-templates select="head" />
  </fo:block-container>
  <xsl:apply-templates select="* except head" />
</fo:block>
</xsl:template>
```

Is CSS as declarative?

Yes?

```
div {  
    font-size: 12pt;  
    other-property: one of  
myriad micro-syntaxes and  
keywords;  
}
```

No?

```
<script>  
document.body.offsetTop;  
document.getElementById('  
target').style.height =  
'50px';  
</script>
```

CSS Object Model (CSSOM)

“The core features of the CSSOM are oriented towards providing basic capabilities to author-defined scripts to permit access to and manipulation of style related state information and processes.”

Lengths and spaces

- Length (XSL-FO & CSS): 12pt, 4em, 20%
- Length-range (XSL-FO):
leader-length.minimum=0pt,
.optimum=12.0pt, .maximum=100%

Lengths and spaces

- Length-conditional (XSL-FO):
.conditionality to retain or discard border or padding at break
- Space (XSL-FO): .minimum, .optimum, .maximum, .conditionality, and .precedence – priority over adjacent spaces

Effect of margins and spaces

```
margin-bottom="10mm"  
keep-with-next="always"
```

```
margin-top="5mm"  
margin-bottom="5mm"  
keep-with-next="always"
```

```
margin-top="10mm"
```

```
space-after.optimum="10mm"  
space-after.minimum="3mm"  
keep-with-next="always"
```

```
space-before.optimum="5mm"  
space-after.optimum="5mm"
```

```
space-after.optimum="10mm"  
space-after.minimum="3mm"  
keep-with-next="always"
```

```
space-before.optimum="5mm"  
space-after.optimum="5mm"  
keep-with-next="always"
```

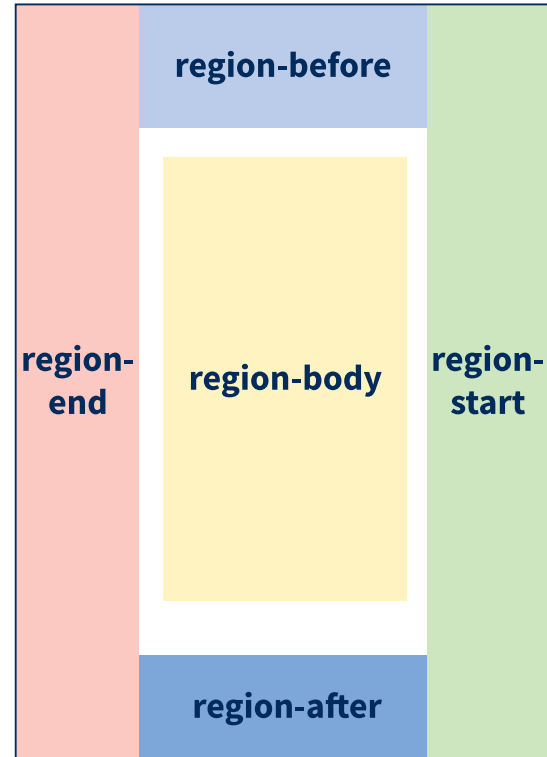
```
space-before.optimum="10mm"  
space-before.minimum="3mm"
```

Page regions in XSL-FO

Left to right



Right to left



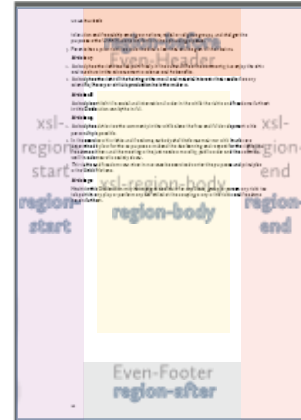
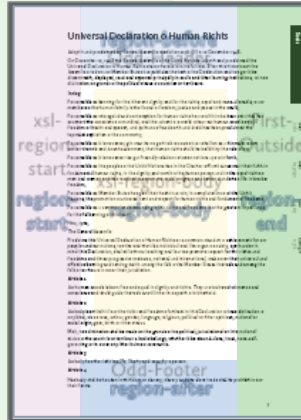
Static content directed to page regions

First

Even

Odd

Even



```

<fo:static-content flow-name="Even-Header">
  <fo:block>UDHR in Unicode</fo:block>
</fo:static-content>
<fo:static-content flow-name="First-Outside">
  <fo:block-container reference-orientation="270">
    ...
  </fo:block-container>
</fo:static-content>
<fo:static-content flow-name="Odd-Outside">
  <fo:block-container reference-orientation="270">
    ...
  </fo:block-container>
</fo:static-content>

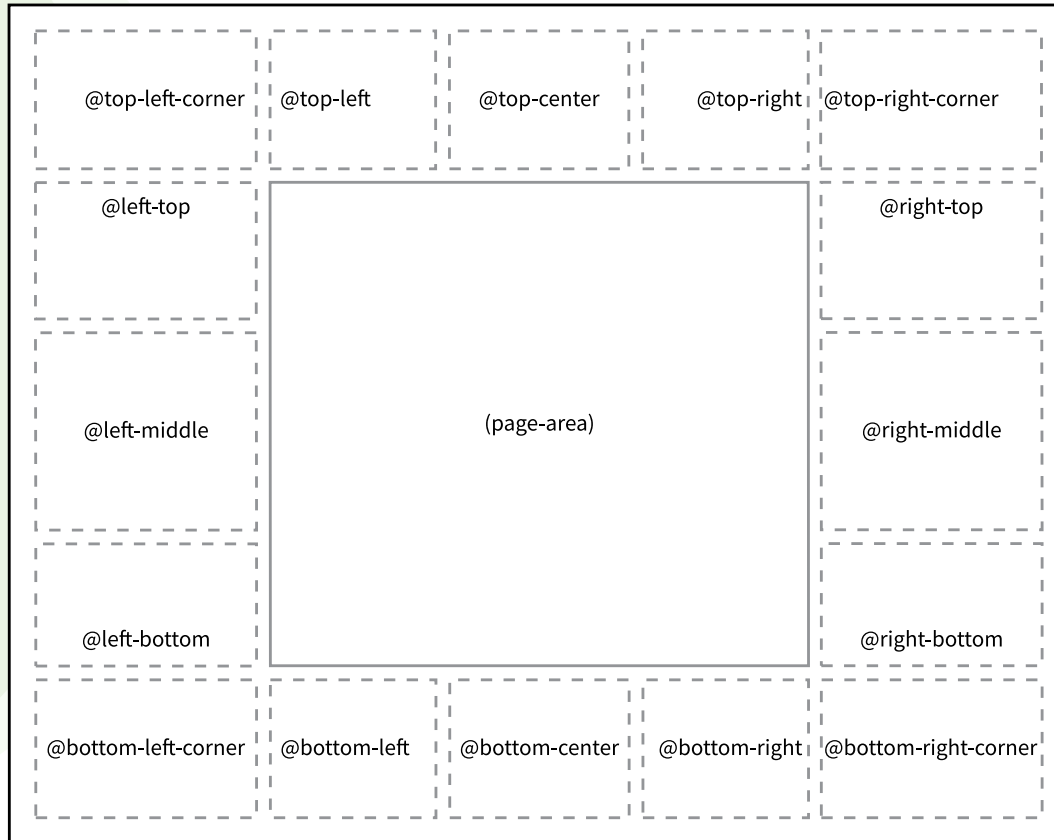
```

```

<fo:static-content flow-name="Odd-Header">
  <fo:block>...</fo:block>
</fo:static-content>
<fo:static-content flow-name="Even-Footer">
  <fo:block><fo:page-number/></fo:block>
</fo:static-content>
<fo:static-content flow-name="Odd-Footer">
  <fo:block><fo:page-number/></fo:block>
</fo:static-content>
<fo:flow flow-name="xsl-region-body" id="sco">
  ...
</fo:flow>

```


CSS page-margin boxes

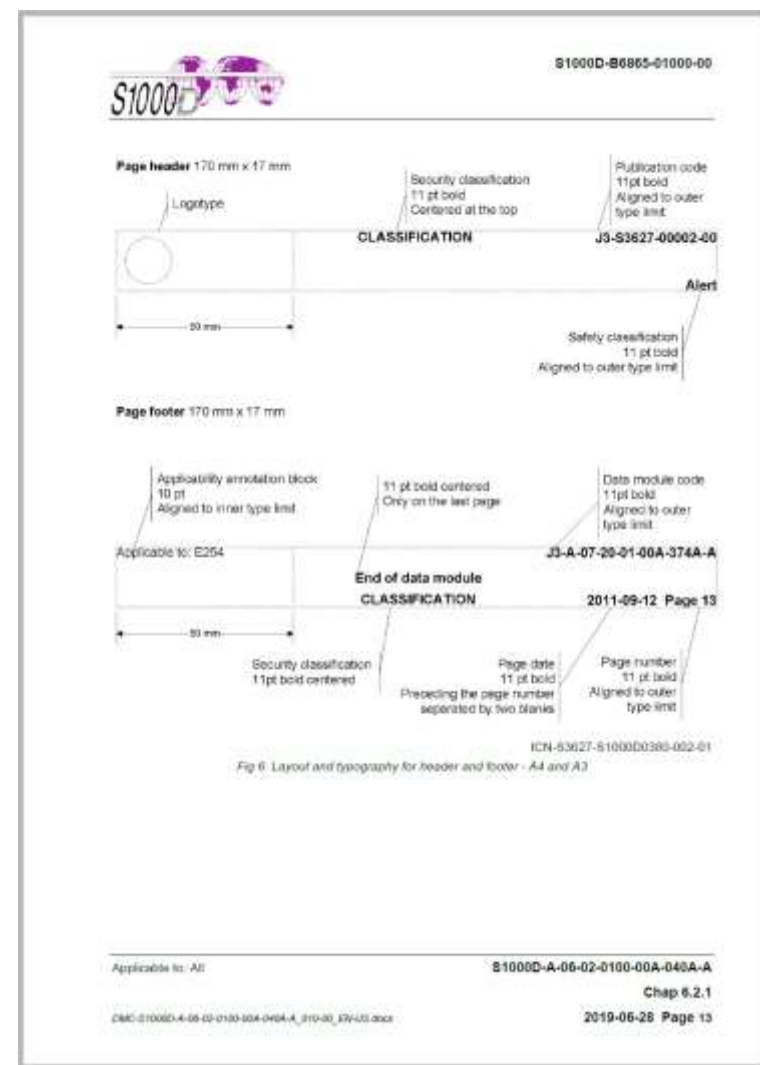


Variable text in headers & footers

- XSL-FO: fo:marker in flow and fo:retrieve-marker in static-content
 - Generate fo:marker in XSLT stage
- CSS: Either 'named strings' or 'running' elements taken from the flow
 - Generate 'running' elements how?

S1000D footer?

- CSS: 1-2 'running' elements for all content
- XSL-FO: multiple fo:marker and fo:retrieve-marker for parts of fo:static-content



Spreads

Lorem ipsum dolor sit amet consectetur adipiscing elit justo sociosqu, ridiculus eget hendrerit et dui ac conubia lacus condimentum, commodo fringilla est montes in penatibus quis curae. Nisl mi id nostra diam erat arcu at taciti facilisi, congue ante turpis morbi augue sagittis dictum. Ligula velit eget taciti facilisis neque felis, habitant ullamcorper ante phasellus libero habitasse posuere, lacinia eros senectus magna faucibus.

Sed viverra nulla orei vestibulum ac et purus tincidunt risus nec primis, aenean ultricies erat phasellus at volutpat eros facilisis ultrices non netas. Ultricies eros tristique metus netas ultrices purus a, portitor suspendisse nibh elementum risus et nisl viverra, cubilia morbi id imperdiet lobortis sagittis. Hac sociosqu pharetra potenti cras tempor nisi tincidunt sagittis erat, natoque lobortis libero nulla in lacinia volutpat tellus commodo vitae, eget facilisis congue urna varius placerat ad hendrerit. Hac facilisi ultrices dis volutpat taciti torquent, molestie arcu inceptos primis sagittis aptent tortor, nisi pretium vehicula massa enim.

Dis donec fringilla ligula hac eros arcu sodales suspendisse pre-



tium curabitur vitae sapien molestie, vel nisl ante malesuada digni-



'axf:spread-region' can cover only part of a spread. The region or its contents can have negative margins so that images extend past the edge of the page.

ssim sed nam class nibh id nullum aliquam sollicitudin eleifend,

montes risus bibendum vivamus semper egestas dapibus justo leo-

Indexes

ACM Symposium on Principles of Programming
Languages, Third (Atlanta, Ga., 1976), selected
papers*1858
ACM Symposium on Theory of Computing, Eighth
Annual (Hershey, Pa., 1976)1879, 4813,
5414, 6918, 6936, 6937, 6946, 6951, 6970, 7619,
9605, 10148, 11676, 11687, 11692, 11710, 13869
Software See *1858

ACM Symposium
on Principles of
Programming
Languages, Third
(Atlanta, Ga., 1976),
selected papers*1858
ACM Symposium on
Theory of Computing,
Eighth Annual
(Hershey, Pa., 1976)
..... 1879, 4813, 5414,
6918, 6936, 6937, 6946,
6951, 6970, 7619, 9605,
10148, 11676, 11687,
11692, 11710, 13869
Software See *1858

ACM Symposium on Principles of
Programming Languages, Third
(Atlanta, Ga., 1976), selected papers
..... *1858
ACM Symposium on Theory of
Computing, Eighth Annual
(Hershey, Pa., 1976)
1879, 4813, 5414, 6918, 6936, 6937,
6946, 6951, 6970, 7619, 9605, 10148,
11676, 11687, 11692, 11710, 13869
Software See *1858

Figure 11. These three extracts from a 'Key Index' were all typeset from identical input, with respective column widths of 225 points, 175 points, and 125 points. Note the combination of ragged right and ragged left setting, and the 'dot leaders'.

Indexes

```
Short Label ..... 10, 20, 30
Short Label ... 10, 20, 30, 40, 50, 60, 70, 80, 90, 100,
                110, 120, 130, 140, 150
Very Looooooooooooooooooooooooooooooooooooooooooooooooooooooooong Label ...
..... 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120,
                130, 140, 150
Very Very Very Looooooooooooooooooooooooooooooooooooooooooooooooooooooooong
Long Long Label ..... 10, 20, 30
Very Very Very Looooooooooooooooooooooooooooooooooooooooooooooooooooooooong
Long Long Label .... 10, 20, 30, 40, 50, 60, 70, 80, 90,
                100, 110, 120, 130, 140, 150
```

```
<fo:block text-align="justify" text-align-last="right" axf:text-align-first="justify"
          axf:leader-expansion="force">
  Label
  <fo:leader leader-length.minimum="0pt" leader-pattern="dots"/><fo:leader leader-pattern="dots"/>
  Pages
</fo:block>
```

FOs and properties for indexes

Index keys

- `fo:index-range-begin`
- `fo:index-range-end`
- `index-key`
- `index-class`

Building the index

- `fo:index-page-citation-list`
- `merge-sequential-page-numbers`
- `fo:index-key-reference`

Merging page references in CSS

- Refer to IDs on pages
1, 3, 4, 4, 5, 6, 8, 8, 9

```
<p class="index-page-citation-list">  
  <span class="index-item" href="#id1"/>,  
  <span class="index-item" href="#id2"/>,  
  <span class="index-item" href="#id3"/>,  
  <span class="index-item" href="#id4"/>,  
  <span class="index-item" href="#id5"/>,  
  <span class="index-item" href="#id6"/>,  
  <span class="index-item" href="#id7"/>,  
  <span class="index-item" href="#id8"/>,  
  <span class="index-item" href="#id9"/>  
</p>
```

- ```
span.index-item {
 content: target-counter(attr(href), page);
}
```

1, 3, 4, 4, 5, 6, 8, 8, 9

- ```
p.index-page-citation-list {  
  -ah-merge-sequential-page-numbers: merge;  
}  
span.index-item {  
  content: target-counter(attr(href), page);  
}
```

1, 3–6, 8, 9

XSL-FO: More declarative than you know

- XSL formatter is a black box
- *Everything* is declared up-front
- Formatter lays out lines, blocks and pages based on FOs and properties
- CSS is (or isn't) just as declarative
- Some things easier (or possible) in XSL-FO

References