



SuperPath (vePath) A Necessary Primitive for Vector Graphic Formats

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SVG Open 2010



What is SuperPath (vePath)?

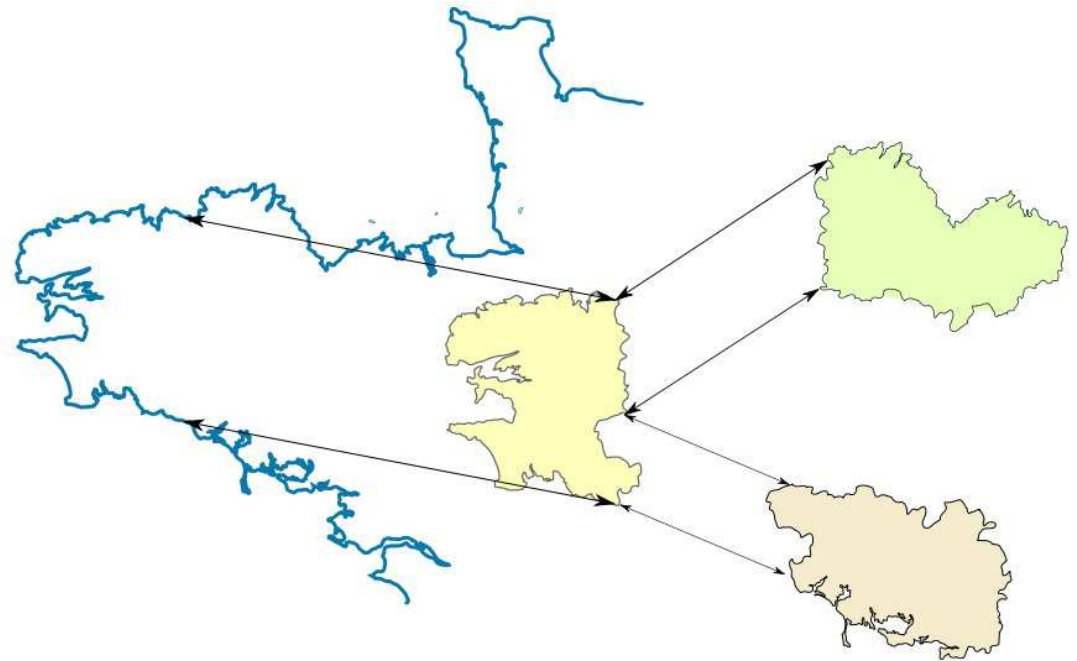
- **SuperPath is the capabilities**
 - to describe one polygon or polyline by grouping several smaller polylines
 - to share some smaller polylines among polygons or polylines



Today, such capabilities are not available in MPEG-4 BIFS or SVG



Illustration

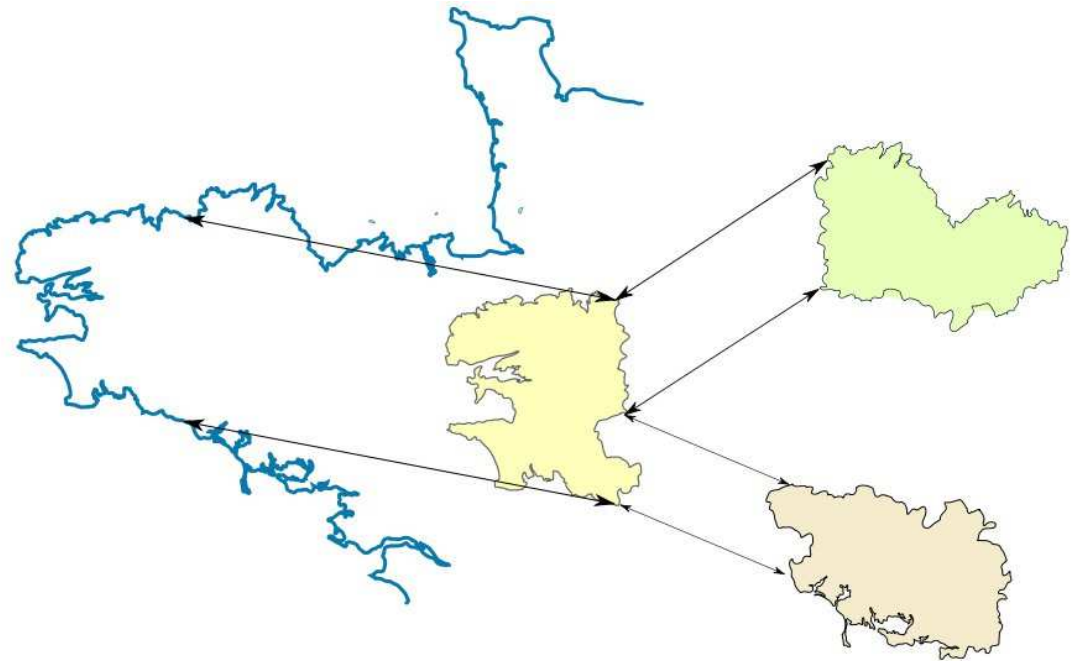
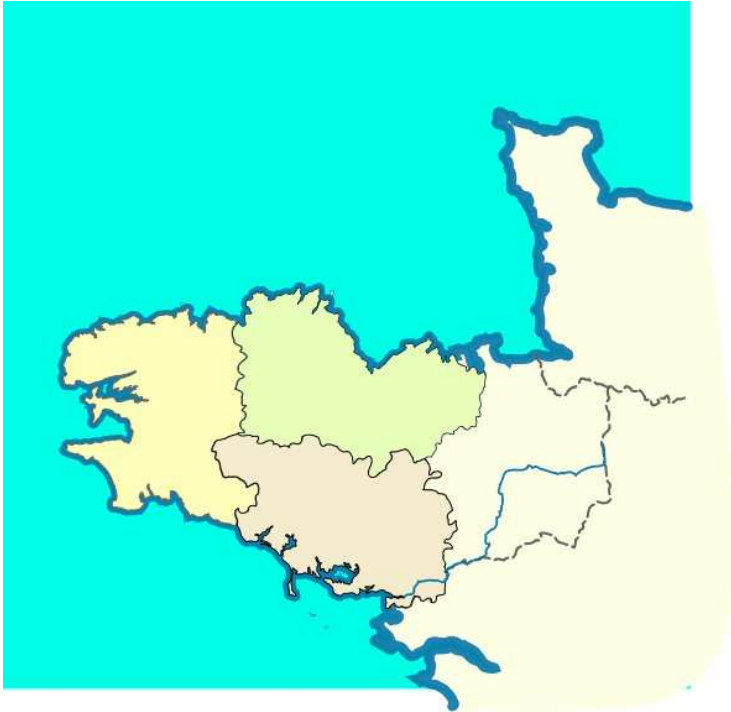




MOTIVATION OF SUPERPATH

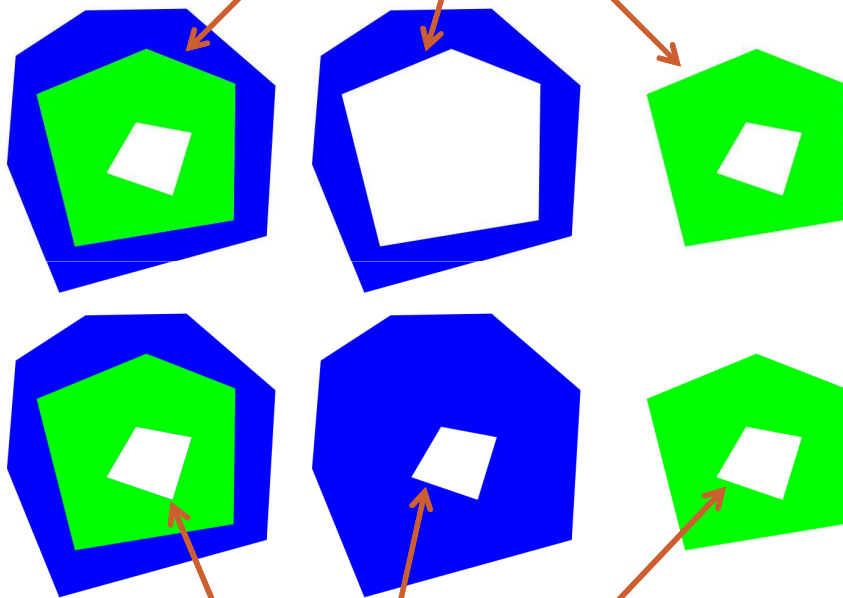
Benefits of SuperPath

To avoid replication of shared chunks



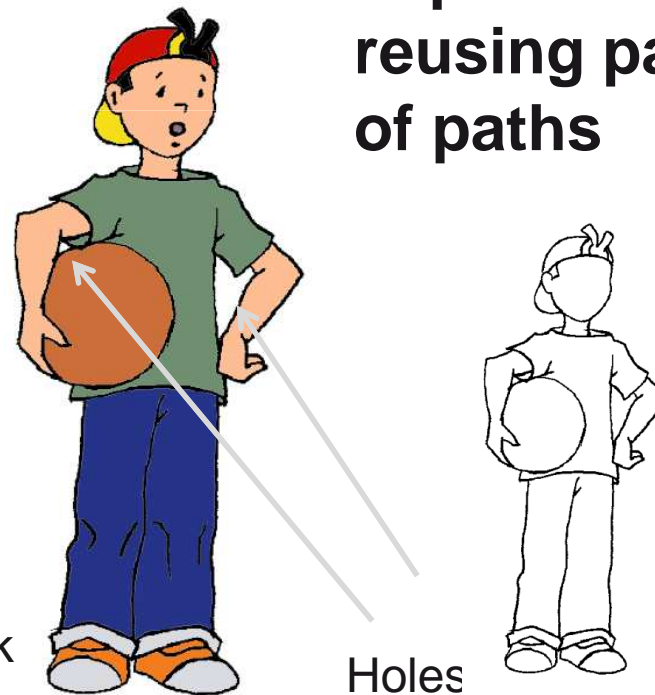
To reduce the file size

The internal path of the blue shape is the external path of the green shape
Each shape has a hole that reveals the shapes below it

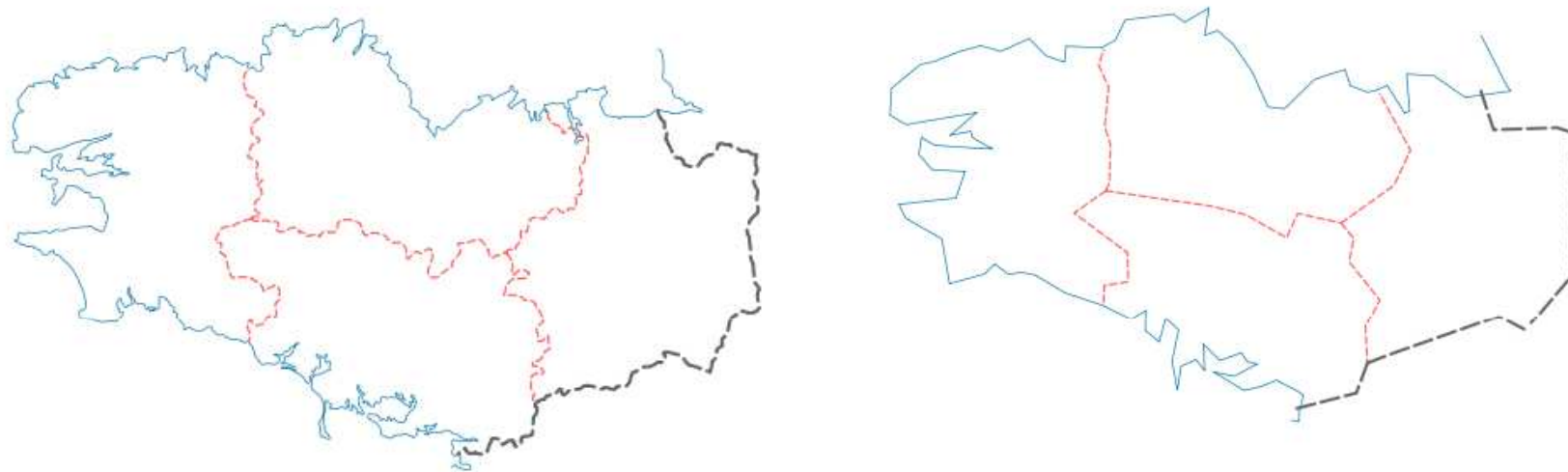


Same hole repeated for each shape in the stack

■ **Representing holes always implies reusing parts of paths**

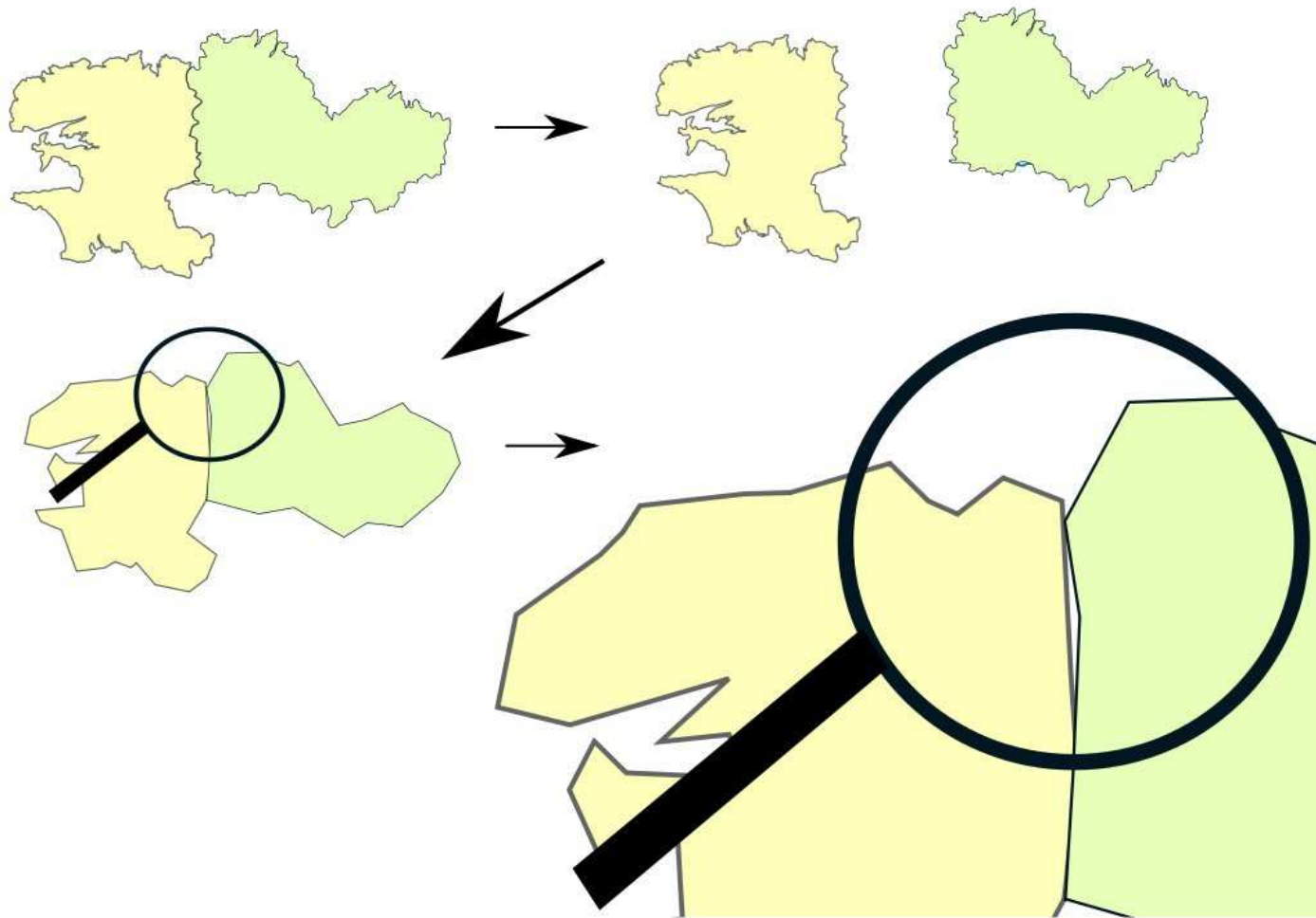


To enable coherent adaptation



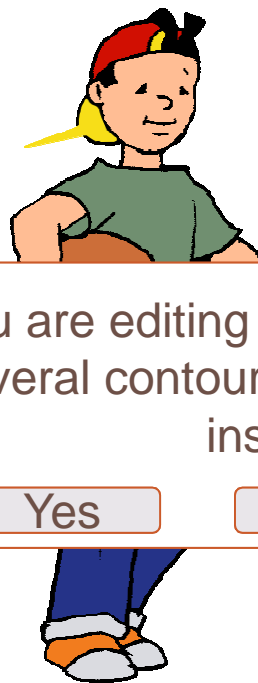
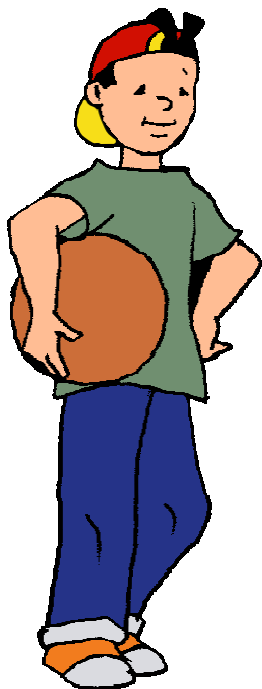
- **Coherent adaptation: two neighboring polygons share a border part; when adapting that part, the adaptation must be coherent**

Sample of problematic adaptation



To facilitate editing the contours

- If the SVG file contains the information that two chunks of contours are the same, an editor can suggest to the user either to modify both in the same manner, or to make different modifications.



You are editing a sub-path which is shared by several contours. Do you want to keep all the instances identical?

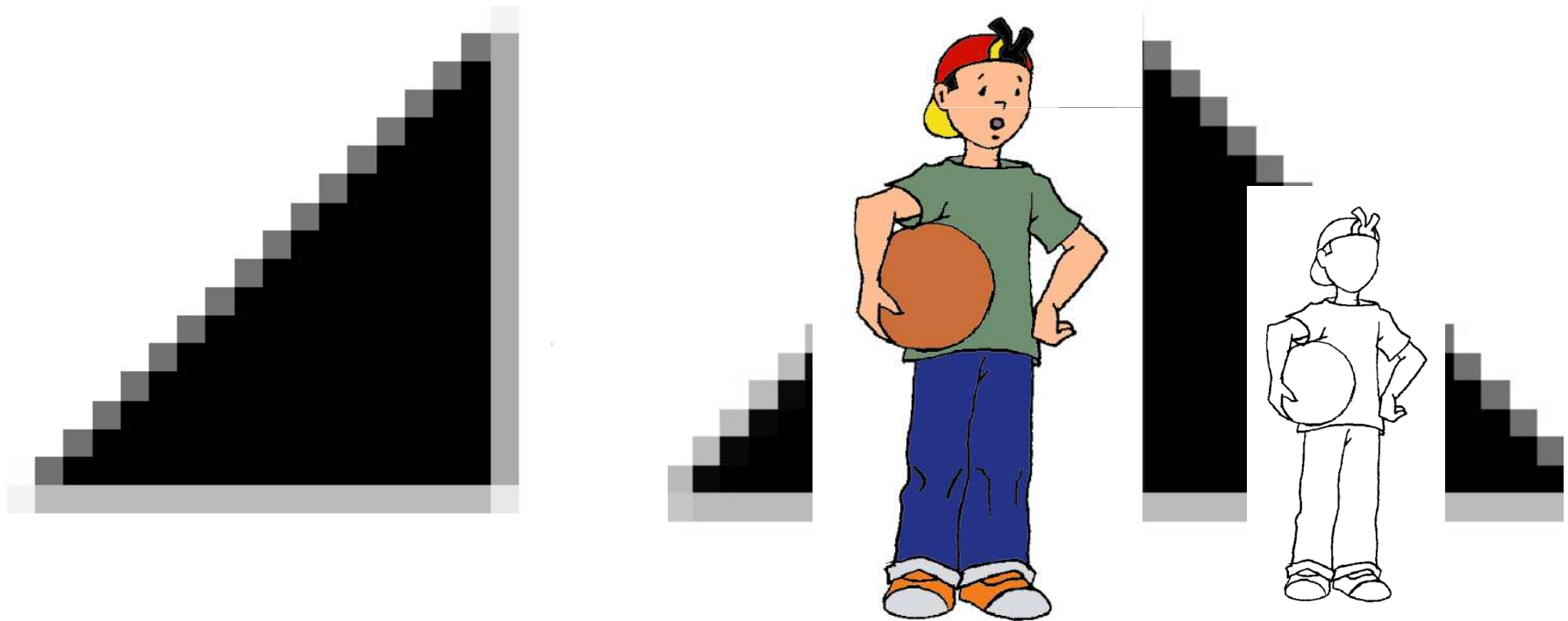
Yes

No

Some...

To manage the anti-aliasing problem

- Two black triangles with a common anti-aliasing problem with the painter's algorithm: a grey line is visible between the triangles





To optimize the display

- **Memory used to get a path in memory**
- **CPU needed to parse a path**
 - We parse each subpath only once

Processing a shared path can be optimized in some cases



And more generally...

■ **SuperPath**

preserves the knowledge that
two chunks are identical

**Which is useful in all the situations seen above
and**

potentially for a lot of other situations not foreseen today



What is needed to define a SuperPath?

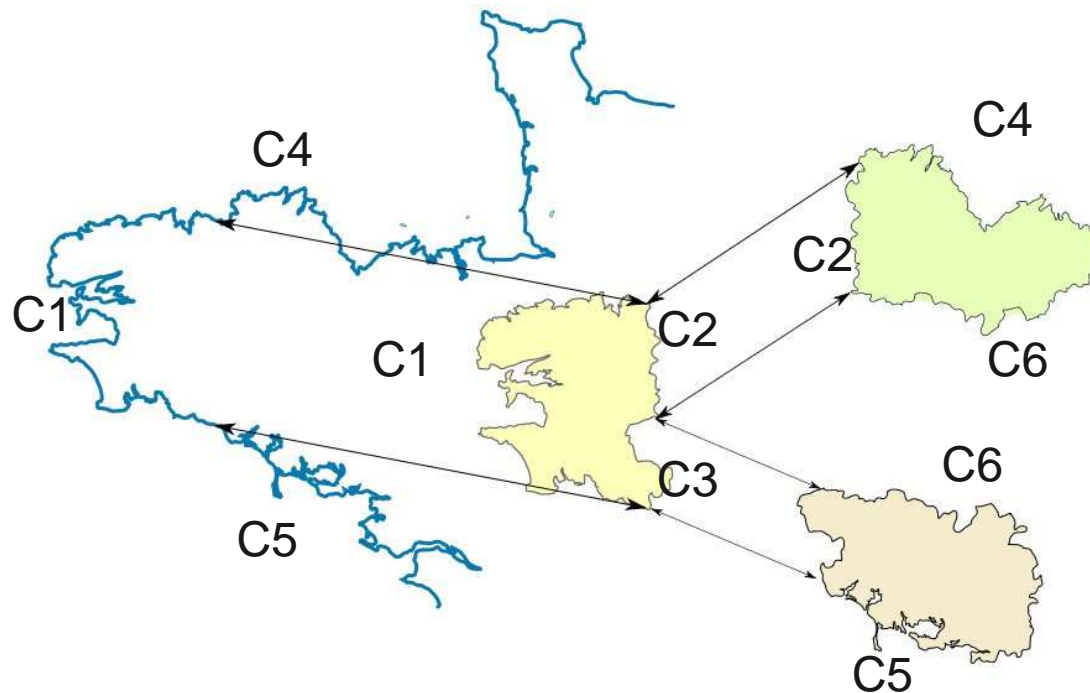
Defining the chunks

- **Chunks: the part of path which can be reused**
 - A chunk will be reused by contours with different display styles
 - A chunk
 - => not dependent on a style
 - => only geometrical data

Using chunks references

■ The mean to identify a chunk to reuse

- SVG uses an ID for internal or external references



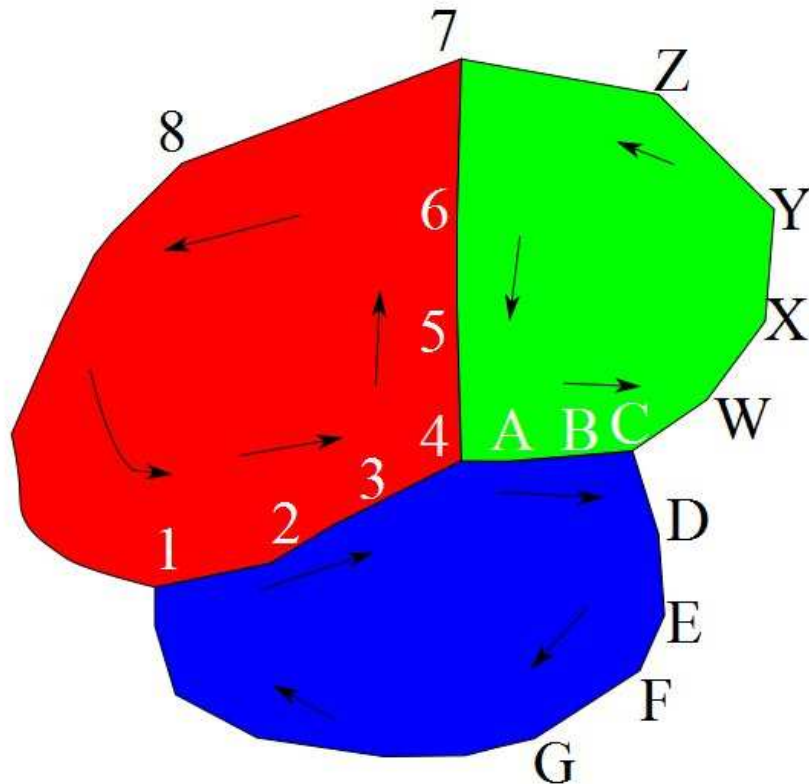
Yellow polygon is made of:
Chunk C1, C2, C3

Coastline is made of:
..., C4, C1, C5...

Green polygon is made of:
..., C6, C2, C4...

...

Reversing the chunk order



- Three shapes and the sequence of points along each contour
- Red: 1 2 3 4 5 6 7 8...
- Blue: 1 2 3 4 A B C D...
- Green: 4 A B C W X Y Z 7 6 5 4

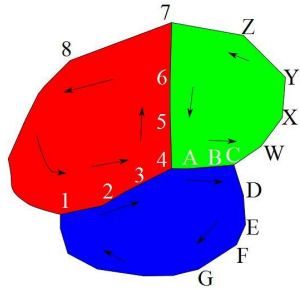
(1 2 3 4) is common to red and blue

(4 A B C) is common to blue and green

(4 5 6 7) is common to green and red, but in reverse order

Proposed syntax for SVG

SVG 1.2



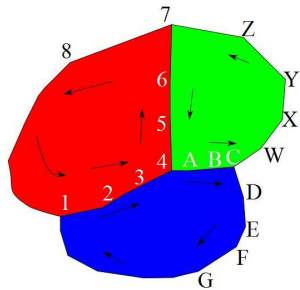
```
<path id=« redpath »  
  fill=« red » d=« M10 10... » />  
<path id=« bluepath »  
  fill=« blue » d=« M.... » />  
<path id=« greenpath »  
  fill=« green » d=« M.... » />
```

SVG 1.2 with SuperPath extension

```
<superpath id="redpath" fill="red">  
  <subpath id="sp1" d="M10 10..." />  
  <subpath id="sp2" d="..." />  
  <subpath id="sp3" d="..." />  
</superpath>  
<superpath id="bluepath" fill="green">  
  <subpath id="sp4" d="M..." />  
  <subpath id="sp5" d="..." />  
  <subpath xlink:href="#sp1" />  
</superpath>  
<superpath id="greenpath" fill="blue">  
  <subpath xlink:href="#sp2" />  
  <subpath id="sp6" d="..." />  
  <subpath xlink:href="#sp4" order="reverse" />  
</superpath>
```

Proposed syntax for SVG in previous work of SVG 1.2: vector effect, vePath

SVG 1.2



```
<defs>
<path id="sp1" d="M10 10..." />
<path id="sp2" d="..." />
<path id="sp3" d="..." />
<path id="sp4" d="M...." />
<path id="sp5" d="..." />
<path id="sp6" d="..." />
</defs>
```

```
<vectorEffect>
<vePath>
<vePathRef xlink:href="#sp1"/>
<vePathRef xlink:href="#sp2"/>
<vePathRef xlink:href="#sp3"/>
</vePath>
<veFill color="red"/>
<vePath>
<vePathRef xlink:href="#sp4"/>
<vePathRef reverse="true"
  xlink:href="#sp2"/>
<vePathRef xlink:href="#sp5"/>
</vePath>
<veFill color="blue"/>
...
</vectorEffect>
```

Examples (1)



Mapfrance.svg

873 KB

232 paths

40557 points

866 KB for the paths

99 % = path data/total data

865 KB with SuperPath

Examples (2)



indre.svg

119 KB

366 paths, 519 subpaths

9452 points

5434 duplicated points

81 KB for the paths

68 % = path data/total data

131 KB with SuperPath!!

**(a lot of very small
subpath)**

Examples (3)



augustin.svg

90 KB

48 paths; 49 subpaths

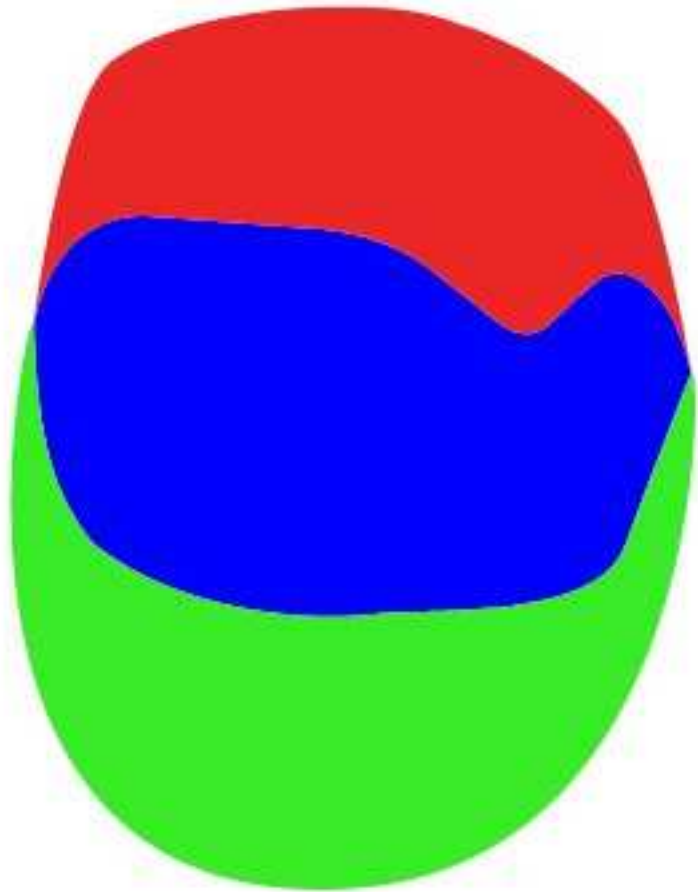
19069 points

89 KB for the paths

98 % = path data/total size

89 KB with SuperPath

Examples (4): a simple sample with curve



CurveSimple.svg

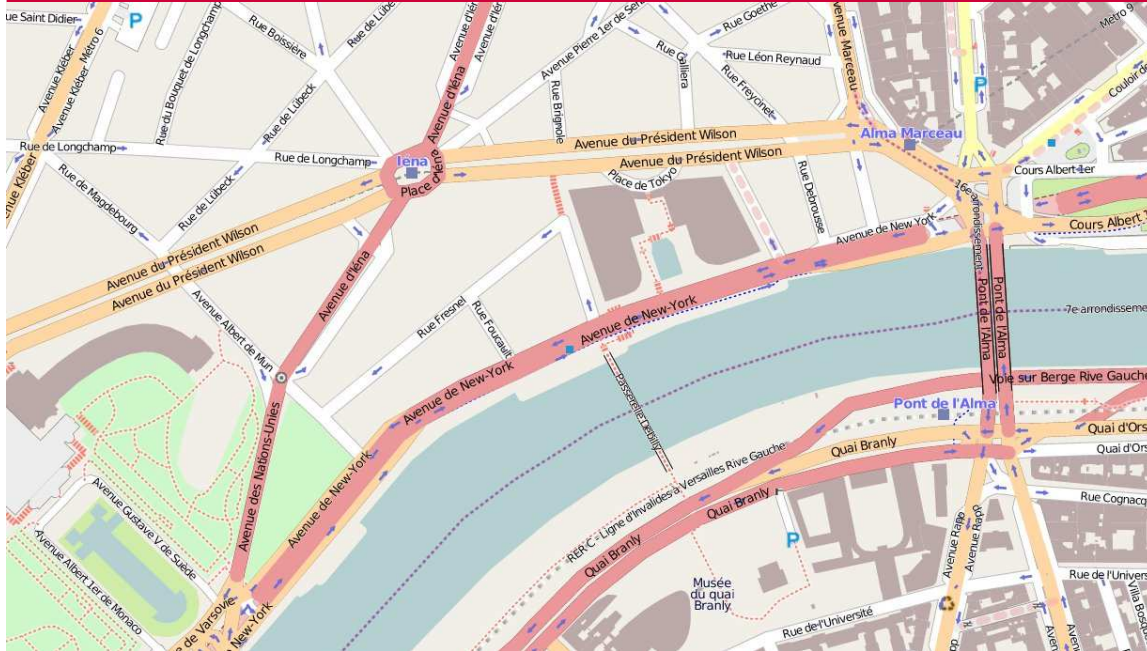
1429 Bytes

3 paths; 4 subpaths (2 reused)

75 points

1048 Bytes with superpath

Examples (5): map sample from OpenStreetMap



A map with a lot of small paths and subpaths

3690 KB (original)
3972 KB (with superpath)

134870 points
2758 KB for the d attributes
3363 KB for the paths
92 % = path data/total size

4539 paths
4808 subpaths
798 reused



SuperPath (vePath) is a 'must have'

- * simple
- * useful
- * efficient

