

Die Extensible Markup Language (XML) und ihr Einsatz in Geoinformationssystemen

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Abt. Prozeßkette Produktentwicklung (FT3/EK)

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Motivation:

Wozu eine (generische) Auszeichnungs-Sprache?



geometr.
Körper

Begin: Rechteck
45° gedreht
End: Rechteck

Farbin-
formation

Begin: blau
End: blau

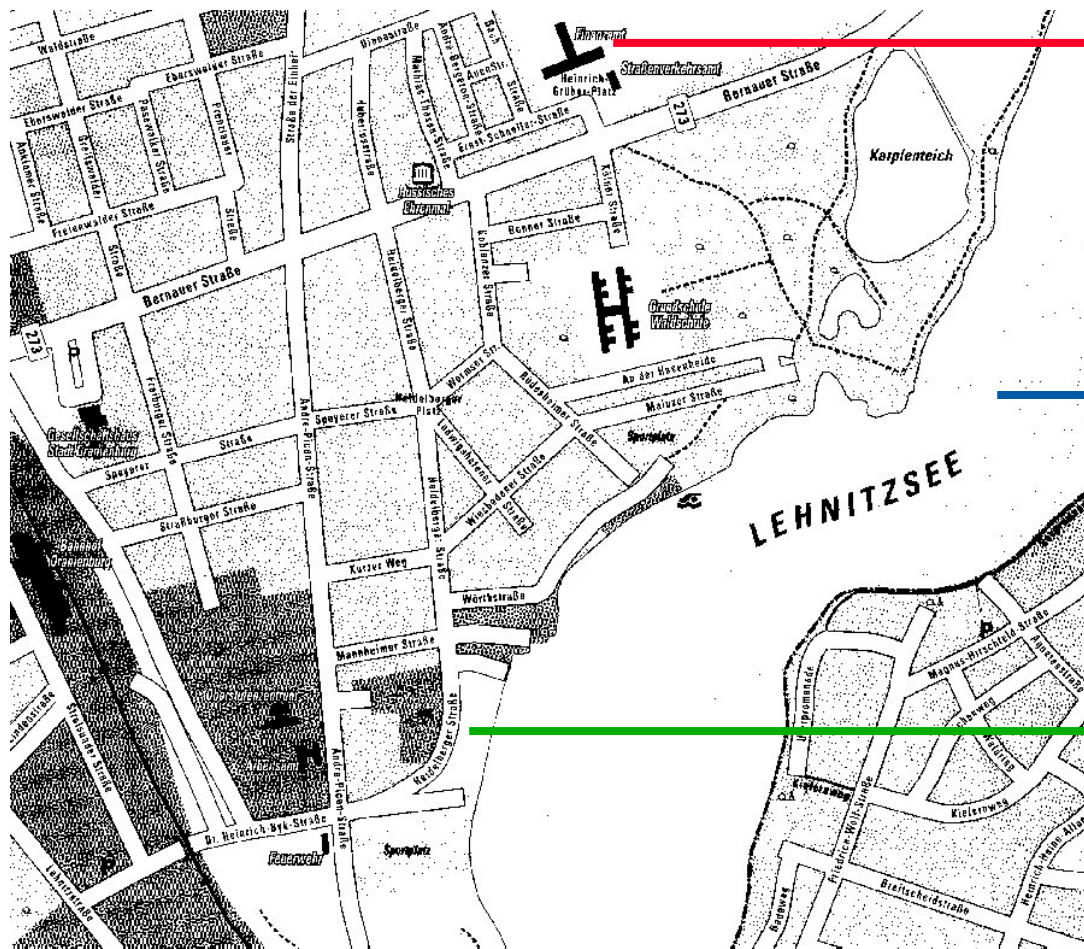
geometr.
Körper

Begin: Kreissegment
Position: 30,12
End: Kreissegment

Trennung von Präsentation und Information

Motivation:

Wozu eine (generische) Auszeichnungs-Sprache?



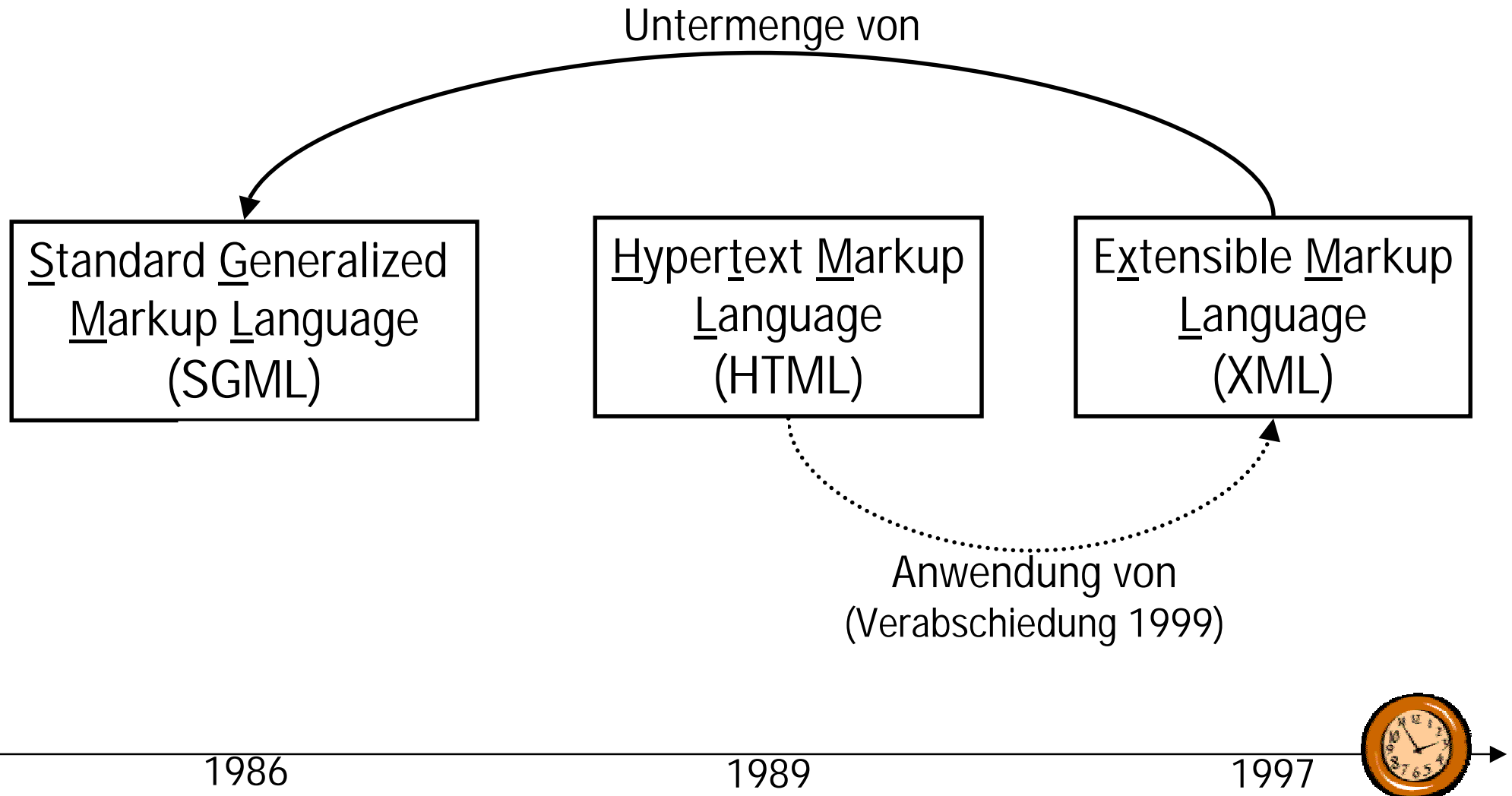
Gebäude
Finanzamt

See
Lehnitzsee

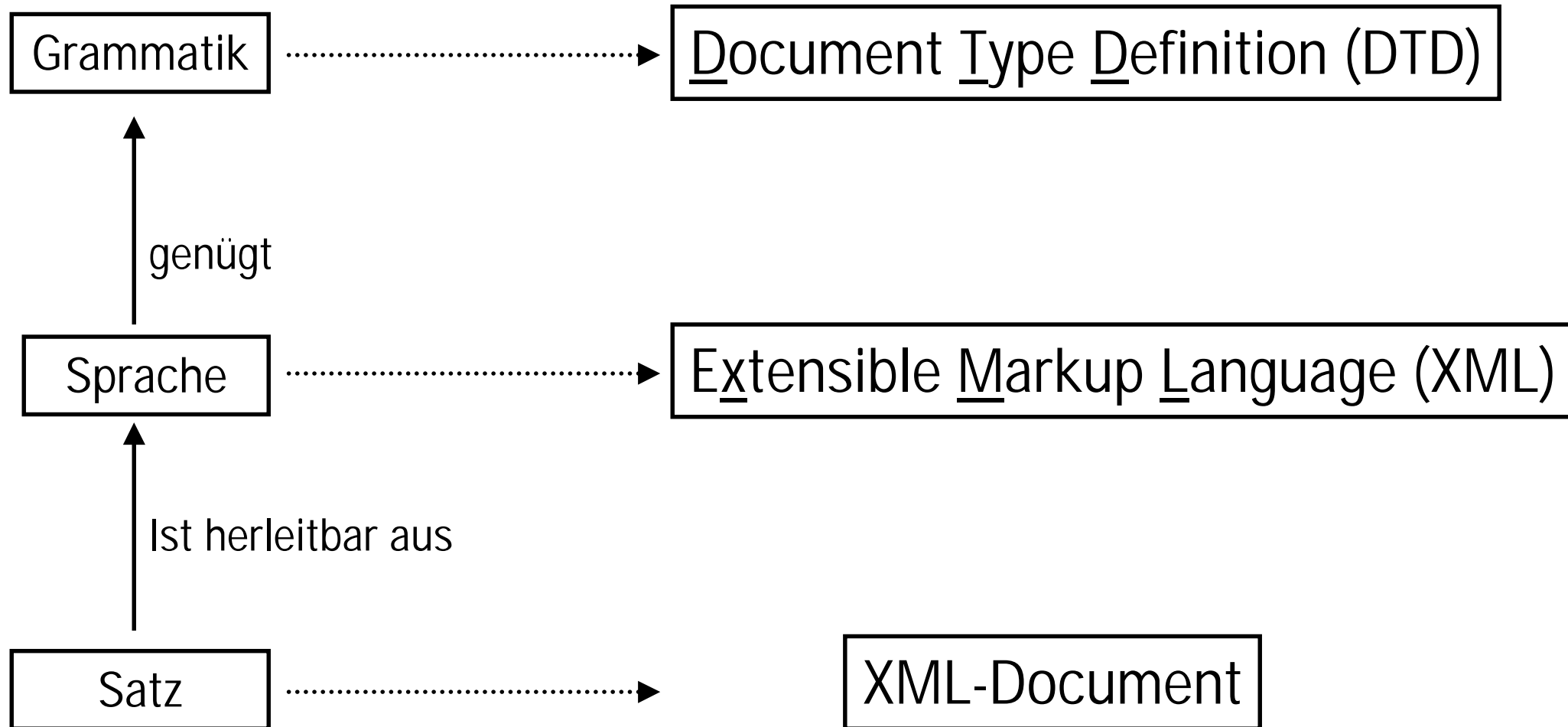
Straße
Heidelberger Str.

Aufteilung der Information in Struktur und Inhalt

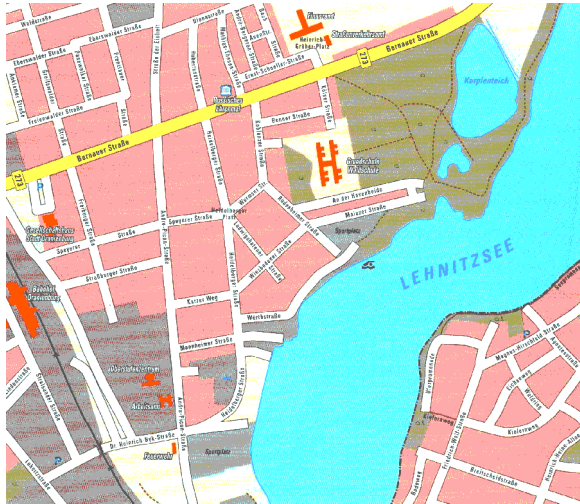
Entstehung der Extensible Markup Language (XML)



Extensible Markup Language (XML) im Überblick



Baumartige Datenstruktur



Stadtplan

Titel

Straße

Gebäude

Name

Abschnitt

Darstellung

Typ

...

Start

Ende

Breite

Farbe

Bundesstr.

Koordinate

Koordinate

Autobahn

Horizontal

Vertikal

Horizontal

Vertikal

Landstr.

Eine Dokumenteninstanz

```
<Stadtplan Titel="Berlin">
```

```
<Straße>
```

```
<Name> Heidelberger Str. </Name>
```

```
<Darstellung>
```

```
<Breite>2</Breite>
```

```
<Farbe>Weiß</Farbe>
```

```
</Darstellung>
```

```
<Abschnitt>
```

```
<Start> <Horizontal>10</Horizontal> <Vertikal>12</Vertikal> </Start>
```

```
<Ende> <Horizontal>14</Horizontal> <Vertikal>17</Vertikal> </Ende>
```

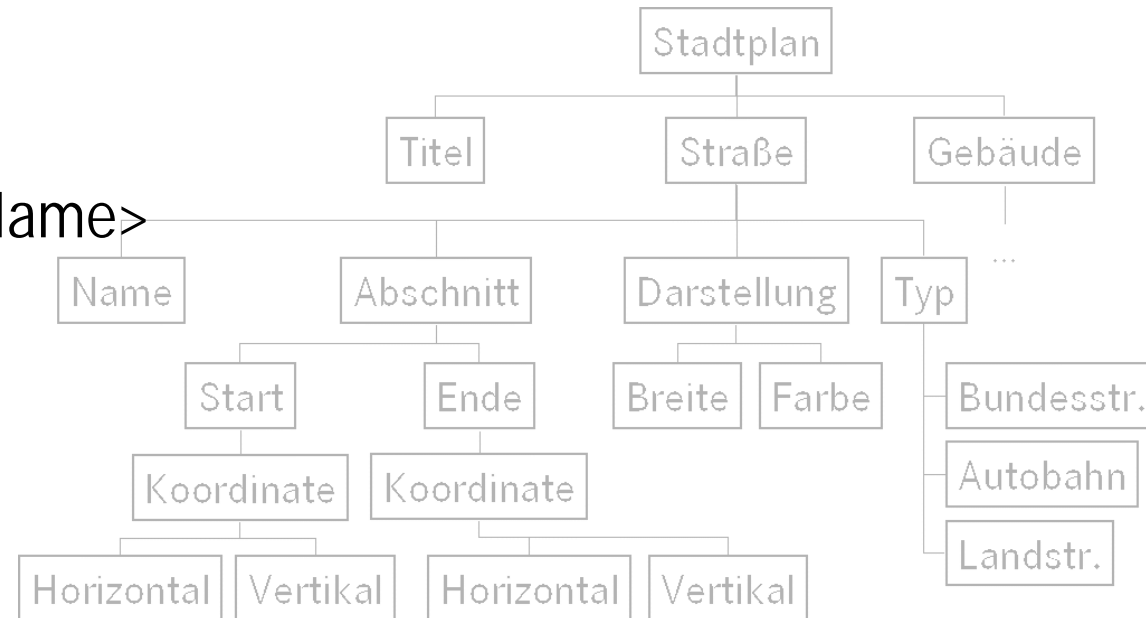
```
<Start> <Horizontal>14</Horizontal> <Vertikal>17</Vertikal> </Start>
```

```
<Ende> <Horizontal>18</Horizontal> <Vertikal>24</Vertikal> </Ende>
```

```
</Abschnitt>
```

```
</Straße>
```

```
</Stadtplan>
```



Die Document Type Definition (DTD)

```
<!ELEMENT Stadtplan (Straße*, Gebäude*)>
```

```
<!ATTLIST Stadtplan
```

```
  Titel CDATA #REQUIRED>
```

```
<!ELEMENT Abschnitt (Start, Ende)>
```

```
<!ELEMENT Start (Koordinate)>
```

```
<!ELEMENT Ende (Koordinate)>
```

```
<!ELEMENT Koordinate (Horizontal, Vertikal)>
```

```
<!ELEMENT Straße (Name, Darstellung, Abschnitt+)>
```

```
<!ATTLIST Straße
```

```
  Typ (Bundesstr. | Autobahn | Landstr. | Verbind.str.) Verbind.str>
```

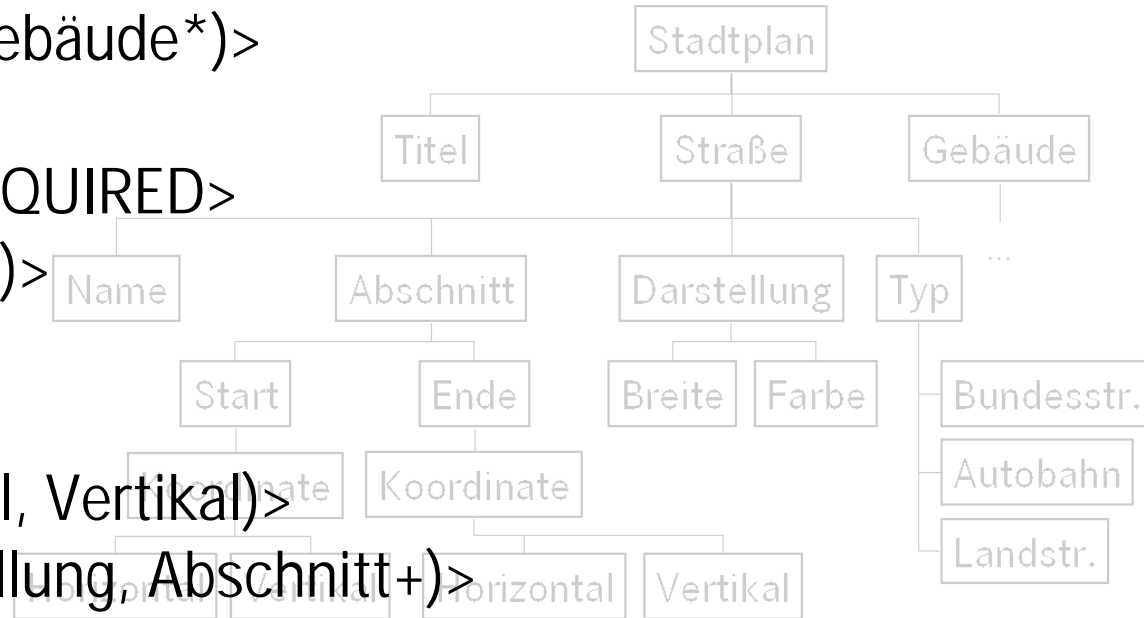
```
<!ELEMENT Darstellung (Breite, Farbe)>
```

```
<!ELEMENT Name (#CDATA)>
```

```
<!ELEMENT Horizontal (#CDATA)>
```

```
<!ELEMENT Vertikal (#CDATA)>
```

```
<!ELEMENT Breite (#CDATA)>
```



Vektorformate

Vektorformate enthalten eine mathematische Beschreibung einzelner Objekte eines Bildes (z.B. Linien, Kreise, Polygone). Im einfachsten Fall kann z.B. eine Linie beschrieben werden durch den Startpunkt, eine Richtung sowie die Länge.

Vorteile:

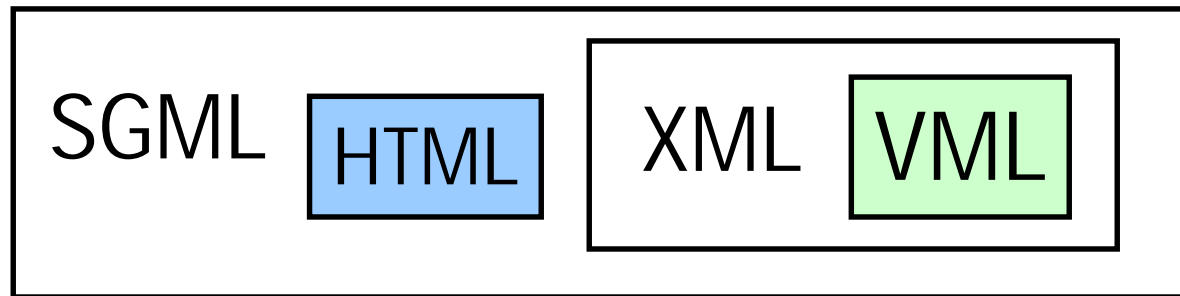
- Ideal zur Speicherung von linienbasierten Bildern
- Leicht skalierbar und manipulierbar
- Meist einfach in andere Vektor- oder Rasterformate wandelbar.

Nachteile:

- Ungeeignet zur Speicherung komplexer Graphiken
- Spezielle Ausgabegeräte (Plotter) notwendig

Anwendung von XML in GIS

Vector Markup Language (VML)



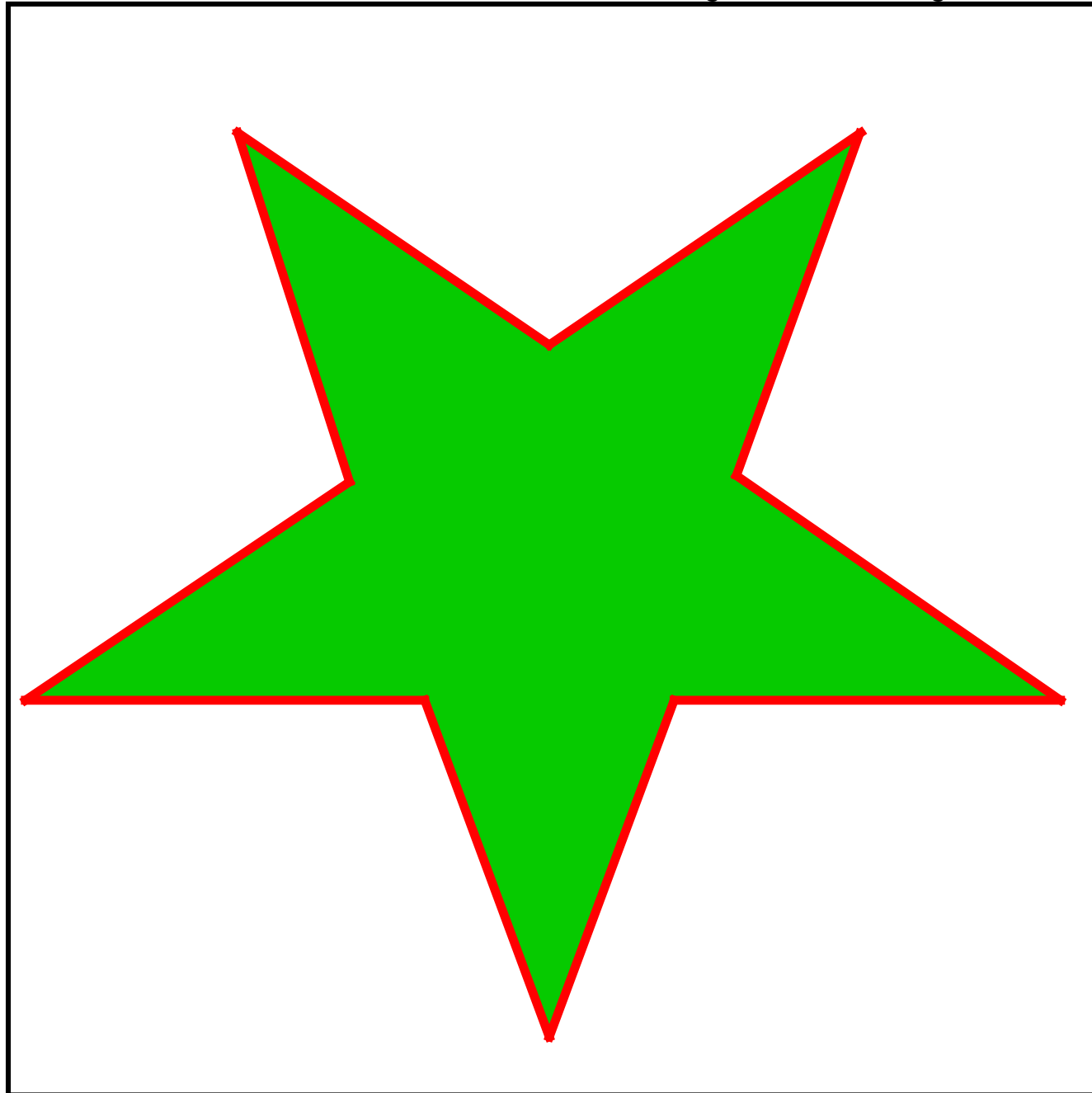
Grundelemente:

- *Shape* := Sichtbares graphisches Vektor-Element
- *Path-Definition* := Sequenz von Vektoren

Design Ziele der VML:

- Informationserhalt für spätere Editierung
- Erweiterbarkeit
- Investitionsschutz durch Abwärtskompatibilität

```
<v:shape style='top: 0; left: 0;
width: 175; height: 175
stroke="true" strokecolor="red"
strokeweight="2" fill="true"
fillcolor="green"
coordorigin="0 0"
coordsize="175 175">
<v:path v="m 8,65
l 72,65,92,11,112,65,174,65,
122,100,142,155,92,121,
42,155,60,100 x e"/>
</v:shape>
```



```
<v:shape style='top: 0; left: 0;  
width: 175; height: 175
```

```
coordorigin="0 0"  
coordsize="175 175">
```

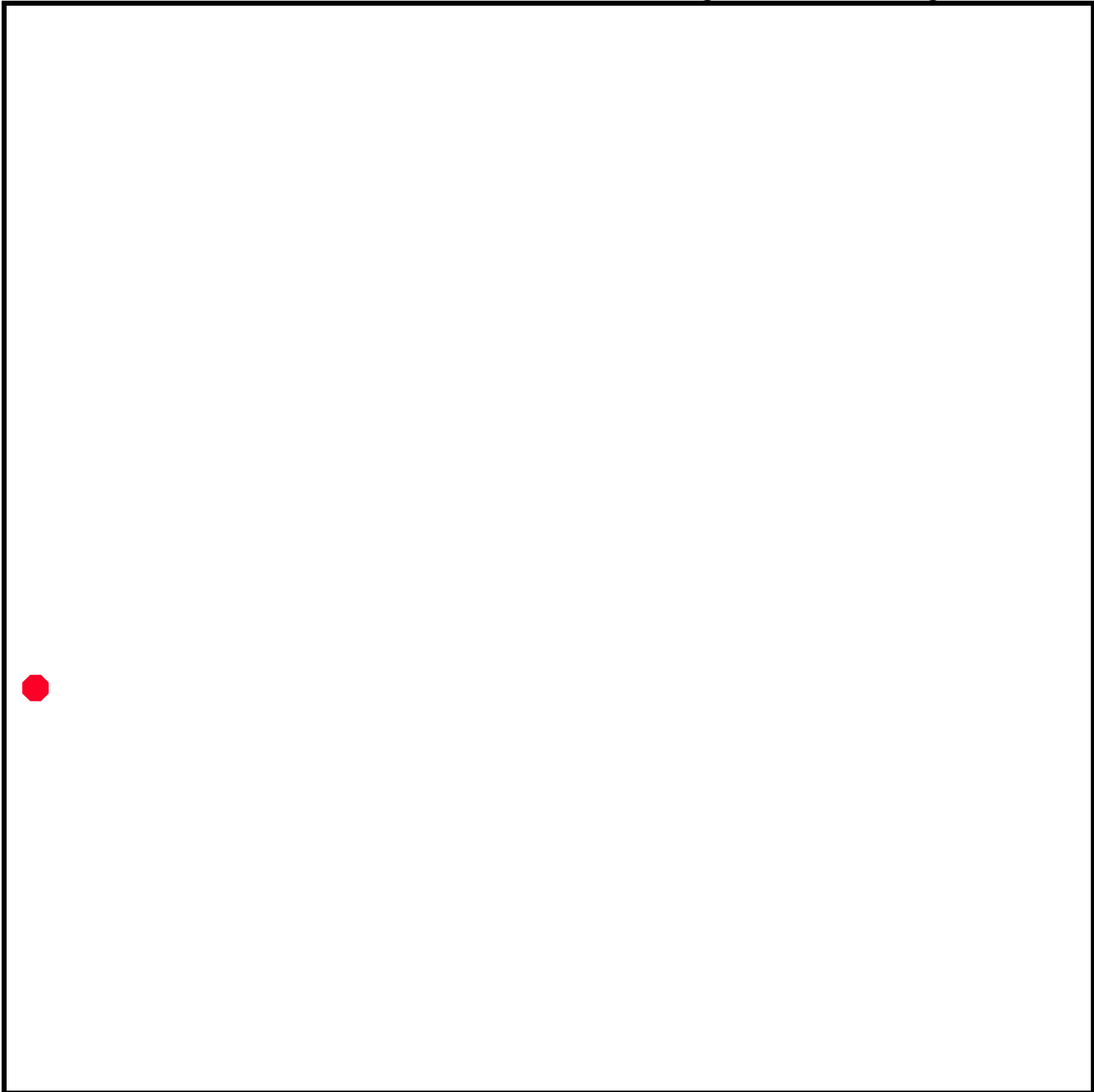
```
</v:shape>
```

```
<v:shape style='top: 0; left: 0;  
width: 175; height: 175
```

```
coordorigin="0 0"  
coordsize="175 175">
```

```
<v:path v="m 8,65
```

```
</v:shape>
```



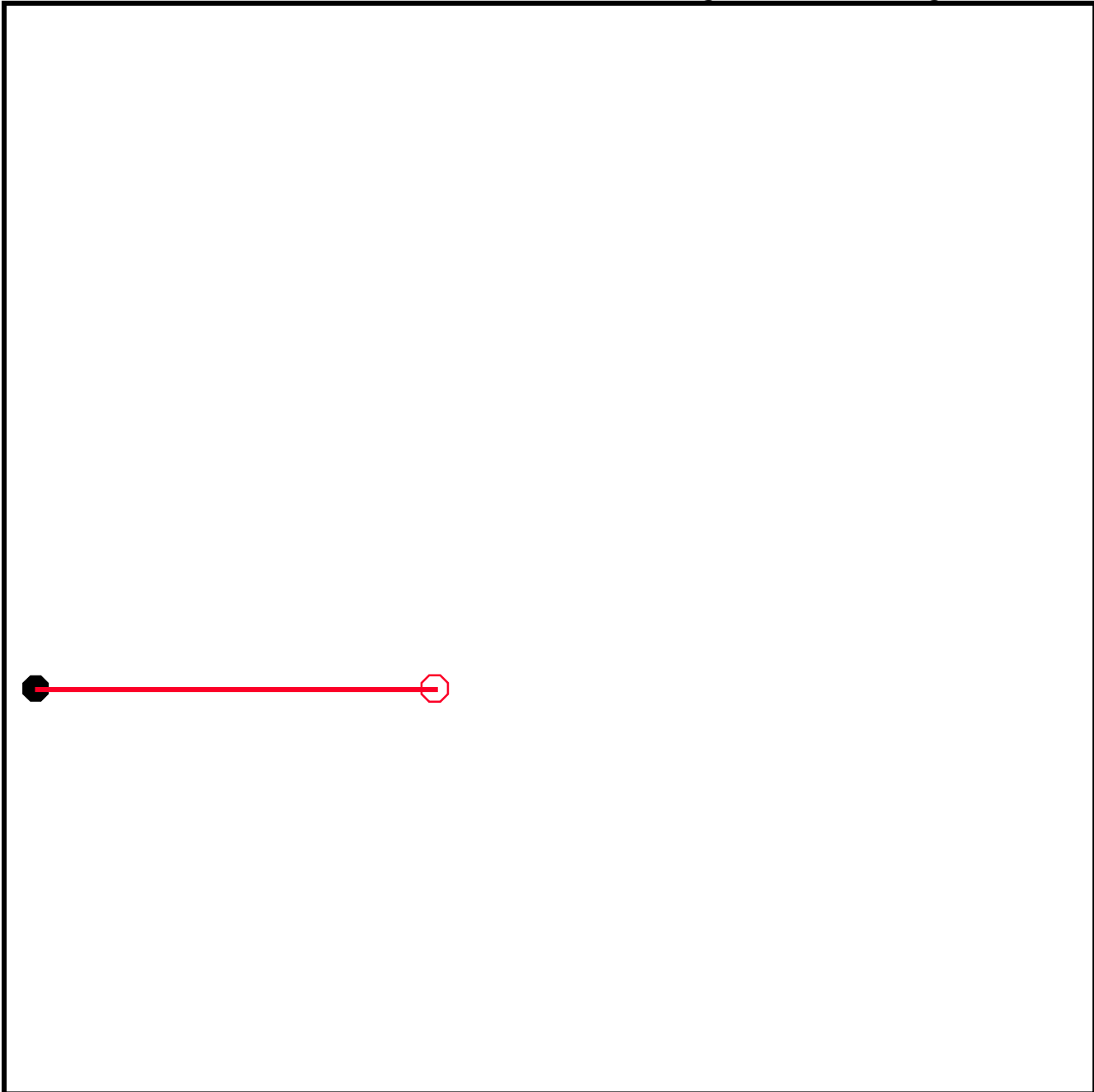
```
<v:shape style='top: 0; left: 0;  
width: 175; height: 175
```

```
coordorigin="0 0"  
coordsize="175 175">
```

```
<v:path v="m 8,65
```

172,65

```
</v:shape>
```

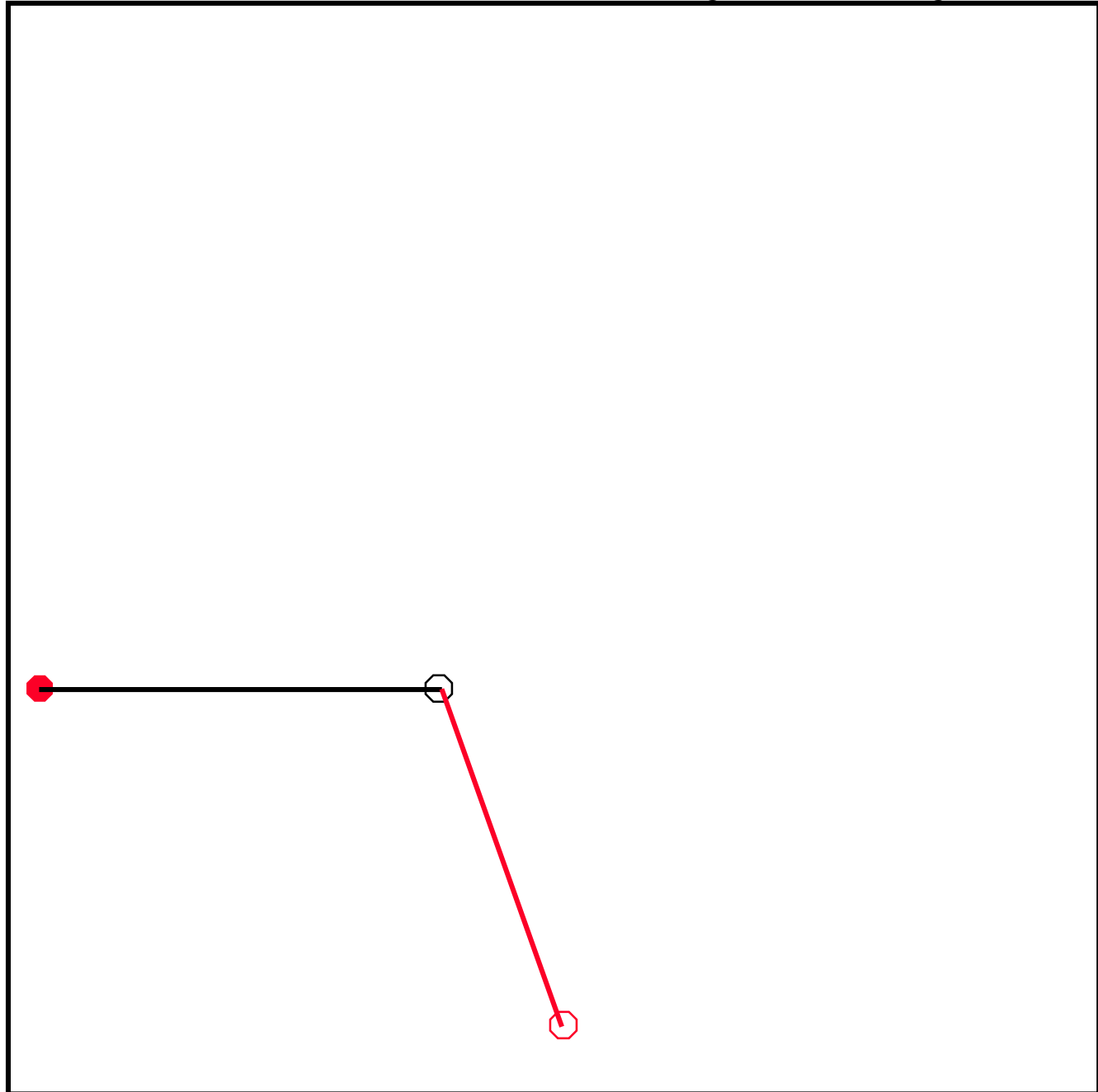


```
<v:shape style='top: 0; left: 0;  
width: 175; height: 175
```

```
coordorigin="0 0"  
coordsize="175 175">
```

```
<v:path v="m 8,65  
l 72,65,92,11
```

```
</v:shape>
```

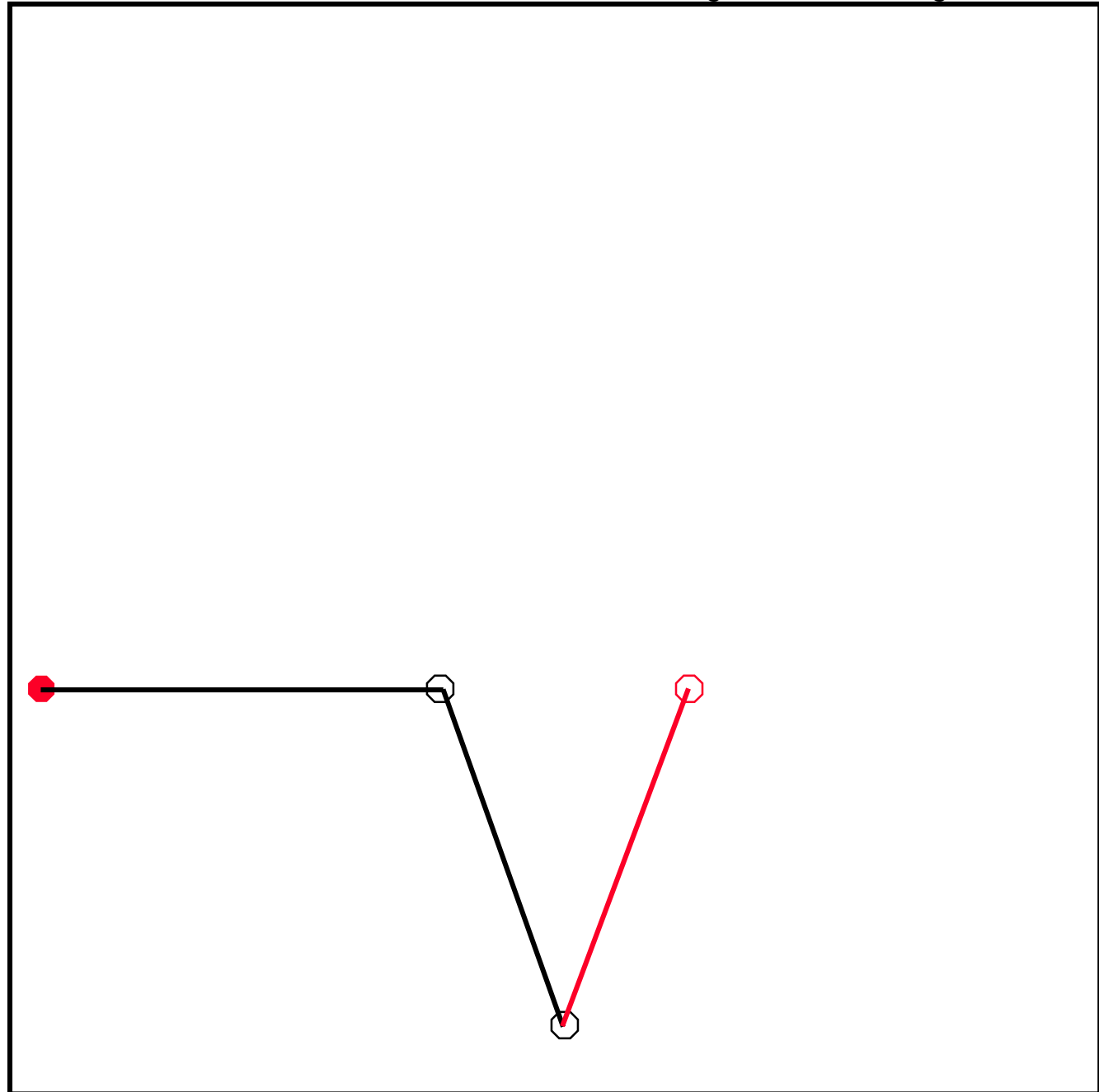


```
<v:shape style='top: 0; left: 0;  
width: 175; height: 175
```

```
coordorigin="0 0"  
coordsize="175 175">
```

```
<v:path v="m 8,65  
l 72,65,92,11,112,65
```

```
</v:shape>
```

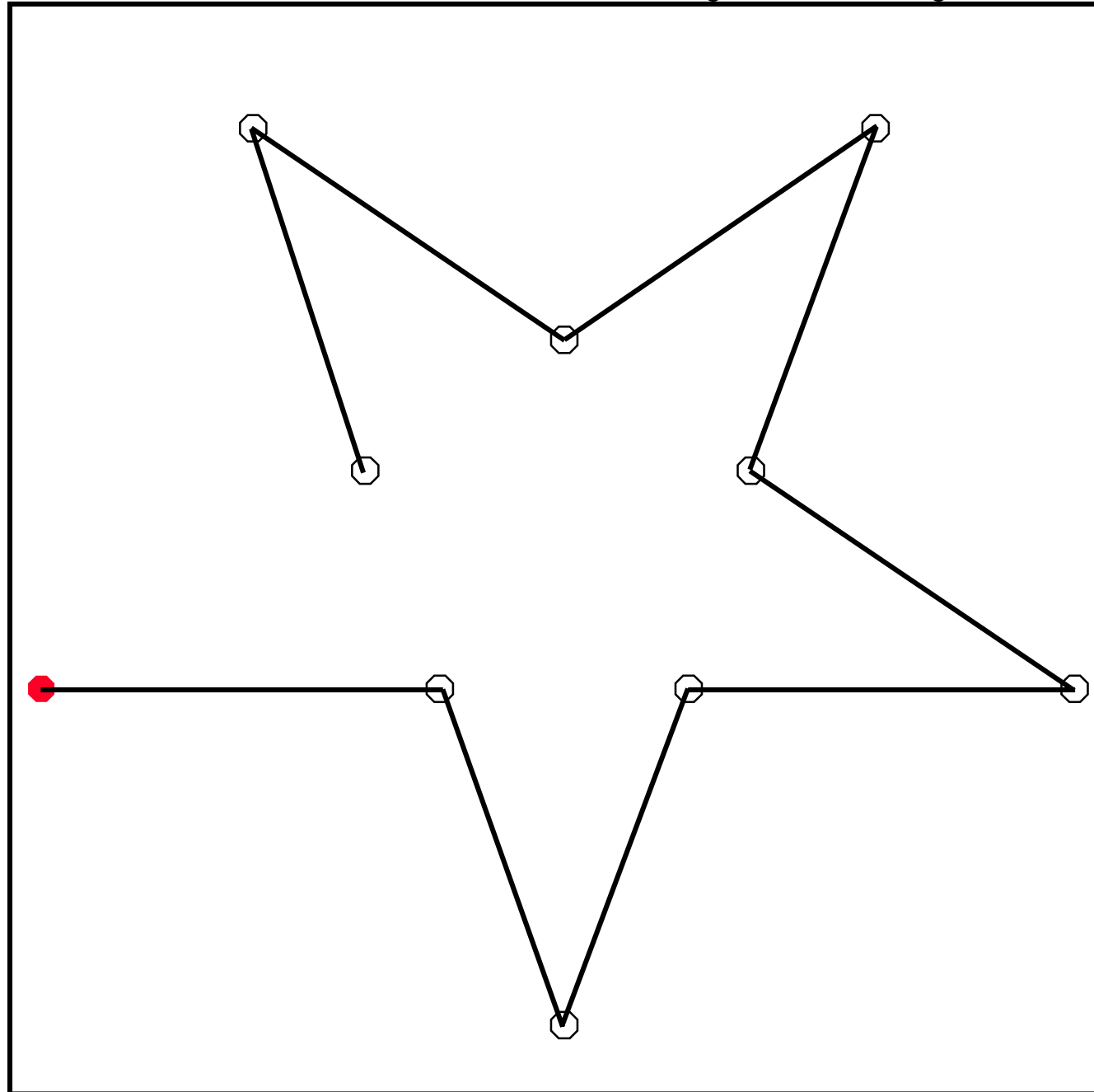



```
<v:shape style='top: 0; left: 0;
width: 175; height: 175
```

```
coordorigin="0 0"
coordsize="175 175">
```

```
<v:path v="m 8,65
172,65,92,11,112,65,174,65,
122,100,142,155,92,121,
42,155,60,100
```

```
</v:shape>
```

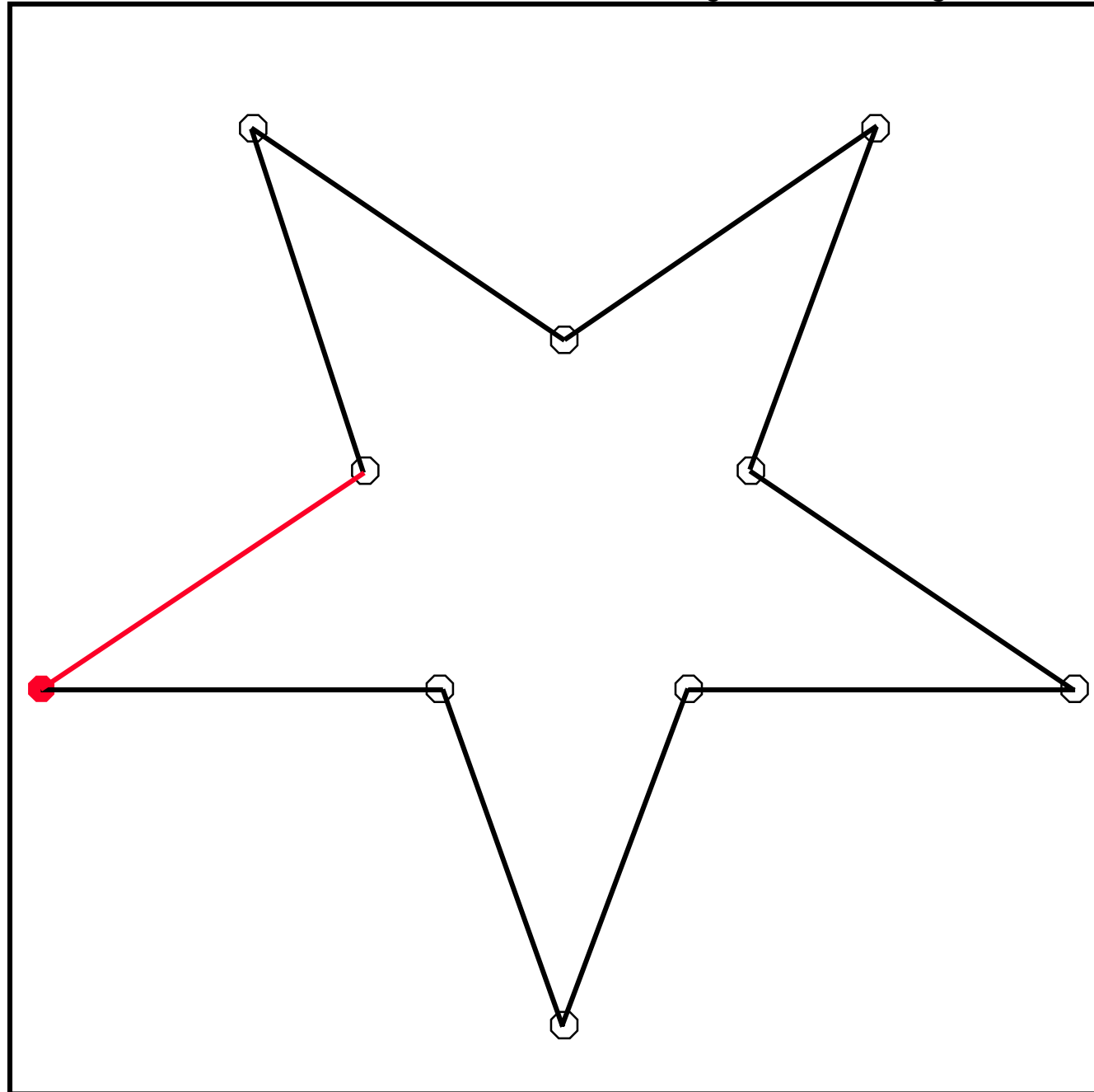


```
<v:shape style='top: 0; left: 0;
width: 175; height: 175
```

```
coordorigin="0 0"
coordsize="175 175">
```

```
<v:path v="m 8,65
l 72,65,92,11,112,65,174,65,
122,100,142,155,92,121,
42,155,60,100 x e"/>
```

```
</v:shape>
```



```
<v:shape style='top: 0; left: 0;  
width: 175; height: 175
```

```
fillcolor="green"
```

```
coordorigin="0 0"
```

```
coordsize="175 175">
```

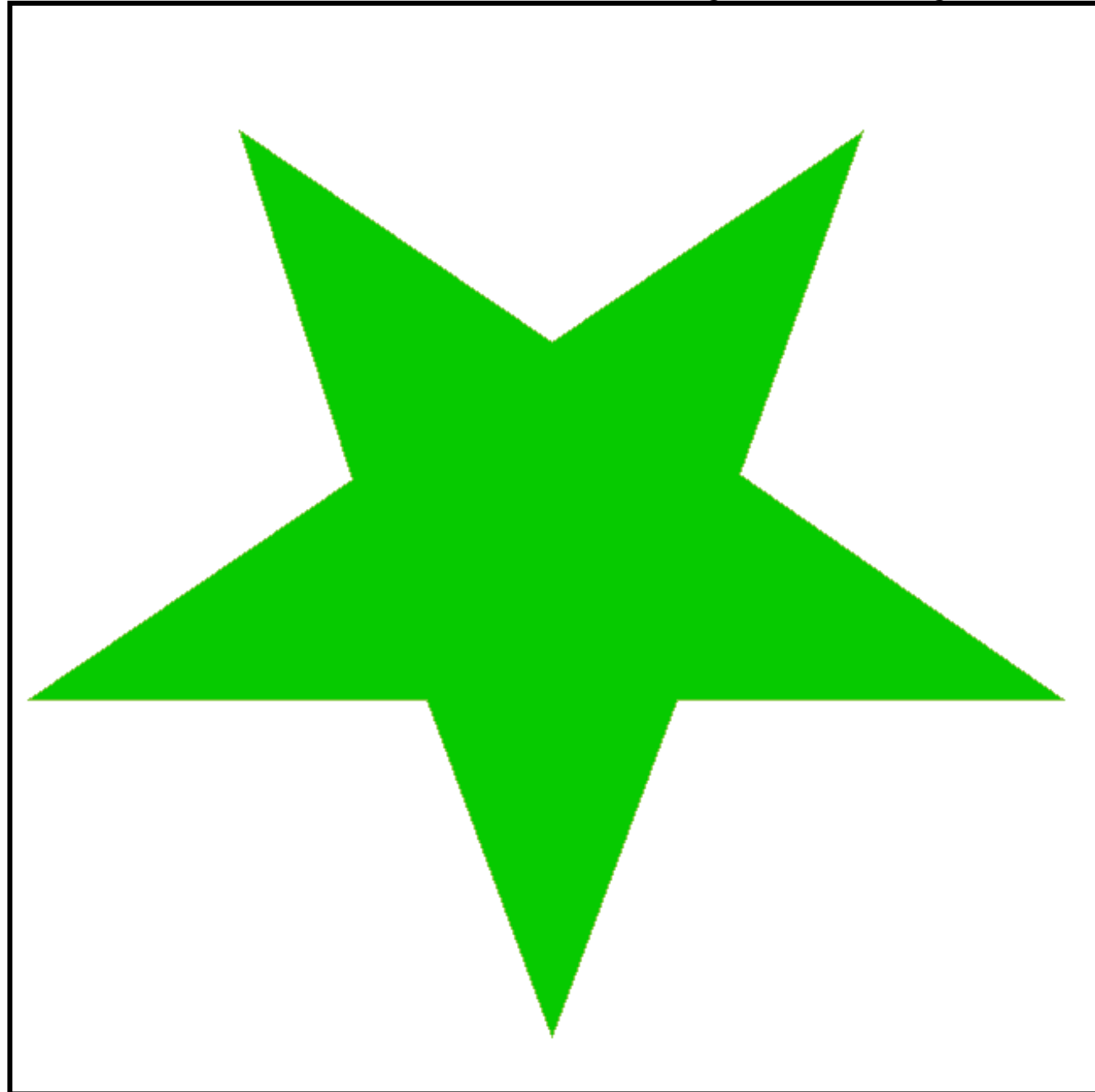
```
<v:path v="m 8,65
```

```
l 72,65,92,11,112,65,174,65,
```

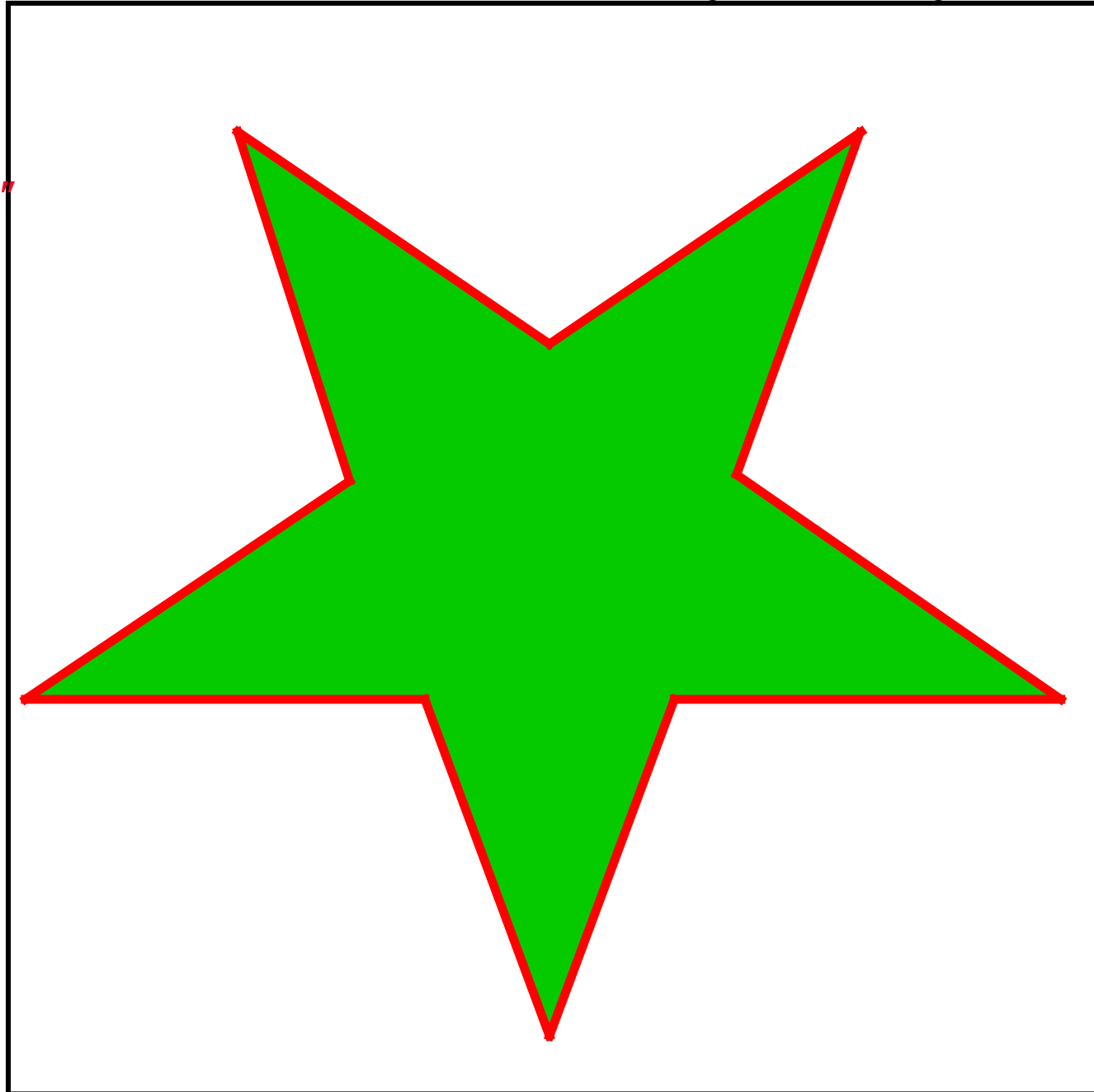
```
122,100,142,155,92,121,
```

```
42,155,60,100 x e"/>
```

```
</v:shape>
```

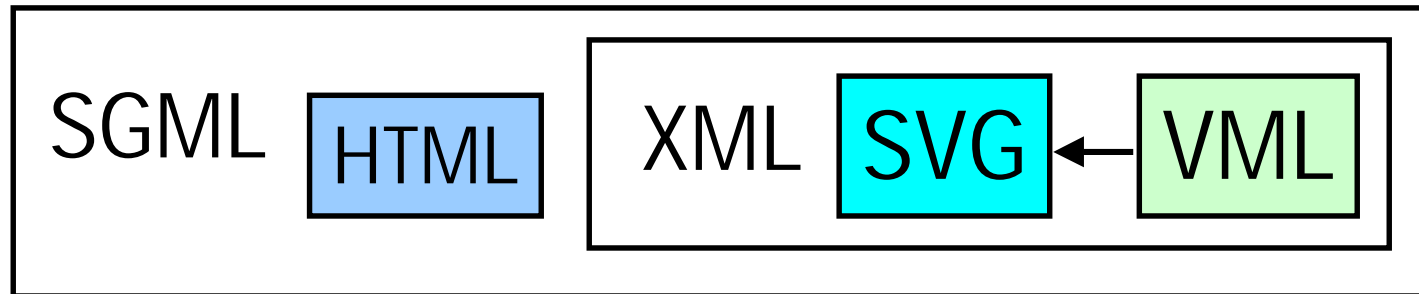


```
<v:shape style='top: 0; left: 0;
width: 175; height: 175
stroke="true" strokecolor="red"
strokeweight="2" fill="true"
fillcolor="green"
coordorigin="0 0"
coordsize="175 175">
<v:path v="m 8,65
172,65,92,11,112,65,174,65,
122,100,142,155,92,121,
42,155,60,100 x e"/>
</v:shape>
```



Anwendung von XML in GIS

Scalable Vector Graphics (SVG)



Kennzeichen

- implizite Erweiterung der VML
- Unterstützung der neuen W3C-Standards

Namespaces, CSS L2, DOM L1

- noch unreifer Stand (*working draft 12. März 1999*)
- Unterstützung in nächster Browsergeneration

MS IE v6, Netscape Navigator v6

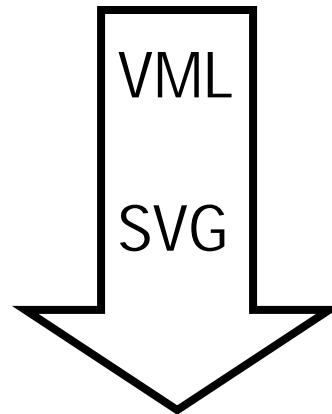
Struktur eines SVG Dokuments

```
<?xml version="1.0" standalone="no"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG April 1999//EN "
"http://www.w3.org/Graphics/SVG/svg-19990412.dtd">
<svg width="4in" height="3in">
  <desc>
    <!-- put a description here -->
  </desc>
  <g>
    <!-- your graphic here -->
  </g>
</svg>
```

Anwendung von XML in GIS

Scalable Vector Graphics (SVG)

```
<v:shape style='top: 0; left: 0; width: 250; height: 250'
  stroke="true" strokecolor="red" strokeweight="2" fill="true"
  fillcolor="green" coordorigin="0 0" coordsize="175 175">
  <v:path v="m 8,65
    l 72,65,92,11,112,65,174,65,122,100,142,155,92,121,42,155,60,100
    x e"/>
</v:shape>
```



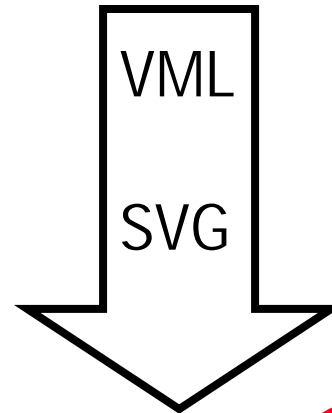
```
<SVG:polygon style="fill: green; stroke: red; path d="M 8 65 H 72 L 92 11 L 112 95 H 174
  L 122 100 L142 155 L 92 121 L 42 155 L 60 100 z"/>
```

[...]

Anwendung von XML in GIS

Scalable Vector Graphics (SVG)

```
<v:shape style='top: 0; left: 0; width: 250; height: 250'
  stroke="true" strokecolor="red" strokeweight="2" fill="true"
  fillcolor="green" coordorigin="0 0" coordsize="175 175">
  <v:path v="m 8,65
    l 72,65,92,11,112,65,174,65,122,100,142,155,92,121,42,155,60,100
    x e"/>
</v:shape>
```



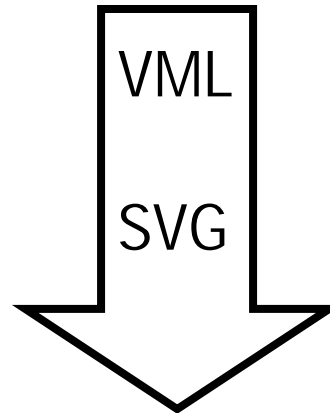
```
<SVG:polygon style="fill: green; stroke: red; path d="M 8 65 H 72 L 92 11 L 112 95 H 174
  L 122 100 L142 155 L 92 121 L 42 155 L 60 100 z"/>
```

[...]

Anwendung von XML in GIS

Scalable Vector Graphics (SVG)

```
<v:shape style='top: 0; left: 0; width: 250; height: 250'
  stroke="true" strokecolor="red" strokeweight="2" fill="true"
  fillcolor="green" coordorigin="0 0" coordsize="175 175">
  <v:path v="m 8,65
    1 72,65,92,11,112,65,174,65,122,100,142,155,92,121,42,155,60,100
    x e"/>
</v:shape>
```



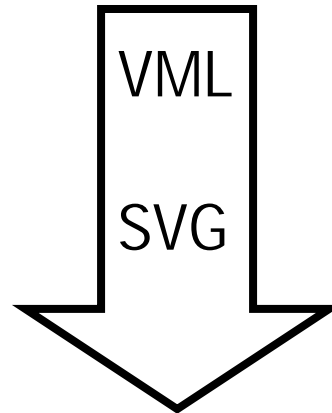
```
<SVG:polygon style="fill: green; stroke: red; path d="M 8 65 H 72 L 92 11 L 112 95 H 174
  L 122 100 L142 155 L 92 121 L 42 155 L 60 100 z"/>
```

[...]

Anwendung von XML in GIS

Scalable Vector Graphics (SVG)

```
<v:shape style='top: 0; left: 0; width: 250; height: 250'
  stroke="true" strokecolor="red" strokeweight="2" fill="true"
  fillcolor="green" coordorigin="0 0" coordsize="175 175">
  <v:path v="m 8,65
    l 72,65,92,11,112,65,174,65,122,100,142,155,92,121,42,155,60,100
    x e"/>
</v:shape>
```

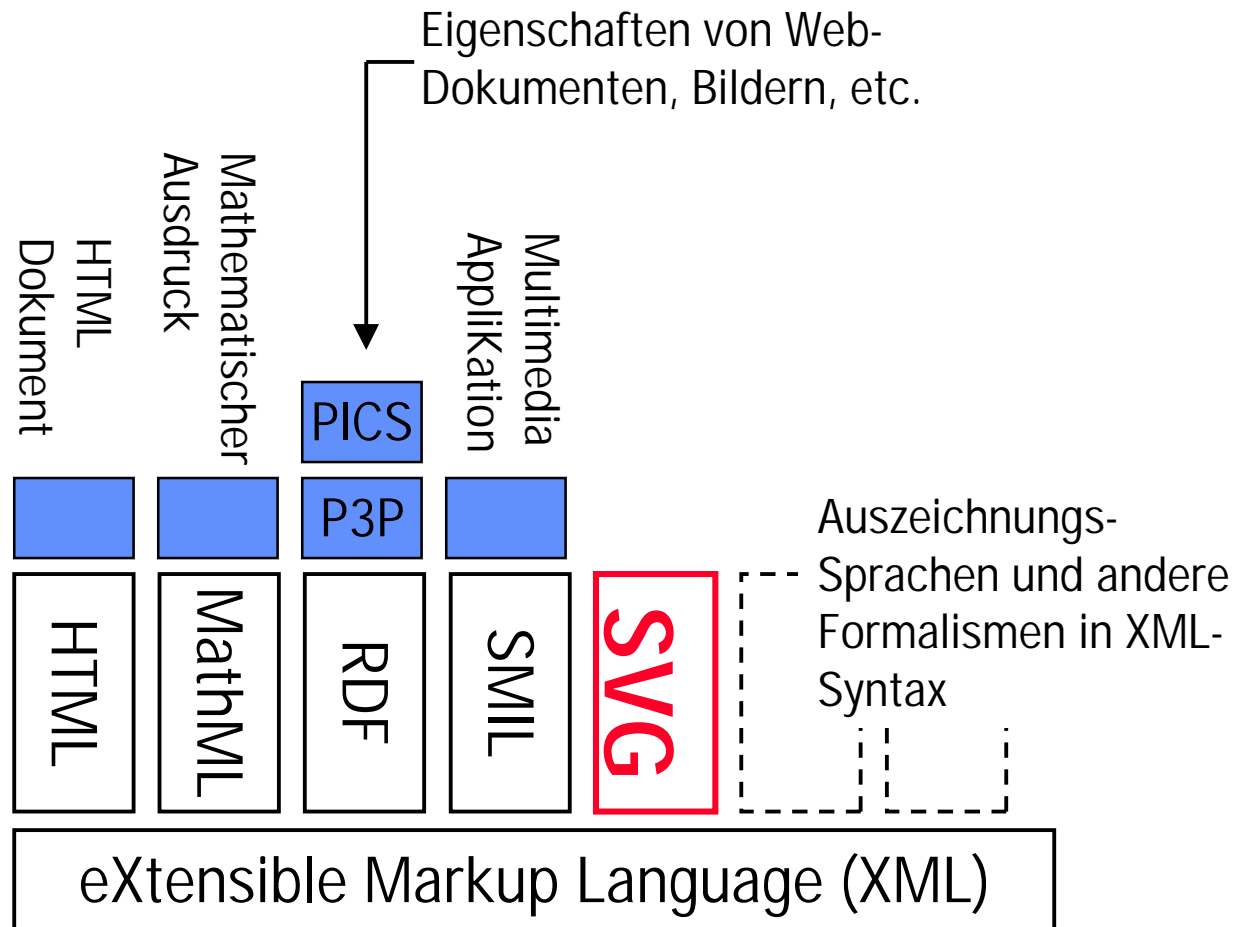


```
<SVG:polygon style="fill: green; stroke: red; path d="M 8 65 H 72 L 92 11 L 112 65 H 174
  L 122 100 L142 155 L 92 121 L 42 155 L 60 100 z"/>
```

[...]

Anwendung von XML in GIS

Zusammenfassung und Ausblick



Anwendung von XML in GIS

Zusammenfassung und Ausblick

Extensible Markup Language

- Standardformat zur Sprachdefinition für Web-Formate (HTML, SMIF/XMI, ...)
- (logische) Weiterentwicklung von HTML
„Zukunft des Web“
- Breite Industrieunterstützung
- Tool-Unterstützung
 - DTD-Generatoren
 - Dokument-Editoren
- Hinreichend expressiv für Spezialbelange
- Programmiersprachen- und Datenbankbindung durch Document Object Model (DOM)

Weitere Informationen

Bücher:

- Oliver Pott, Gunter Wielage: *XML - Praxis und Referenz*, Verlag Markt&Technik
- Henning Behme, Stefan Mintert: *XML in der Praxis*, Addison-Wesley

Internet:

- (XML)
 - www.w3.org/XML
 - www.xml.com
- (VML): www.w3.org/VML
- (SVG): www.w3.org/TR/WD-SVG

- www.krumbach.de/home/jeckle