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SVG

Creating Vector Graphics in the Web

Telerik Software Academy
Learning & Development
http://academy.telerik.com

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SVG Overview

What is SVG?

SVG Overview

- SVG is a technology for describing two dimensional vector graphics
  - Uses an extension of XML
- SVG stands for Scalable Vector Graphics
- SVG is platform independent
  - Understood by most browsers

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Vector Graphics Overview

- Vector graphics are based on mathematical expressions
  - The same on any resolution and zoom level and are not pixelated
- Consist of geometrical primitives such as:
  - Points
  - Lines and curves
  - Shapes or polygons
- Represent images in computer graphics
- Vectors are locations in a dimensional space

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Using SVG in a web page

- To use SVG you need to simply open the <svg> element and to start defining your shapes using XML notation

```
<svg width="300" height="450">
  <rect x="50" y="50"
        width="150" height="150"
        fill="lightblue" />
  <circle cx="125" cy="125"
          r="60" stroke="none"
          fill="darkblue" />
</svg>
```

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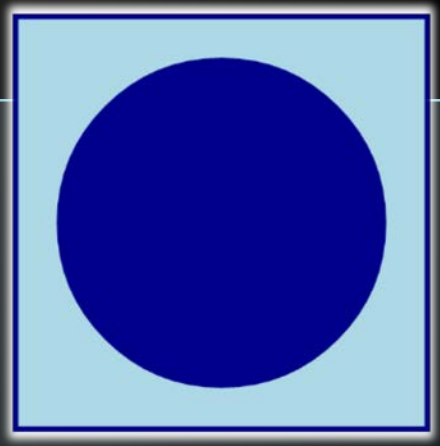
```



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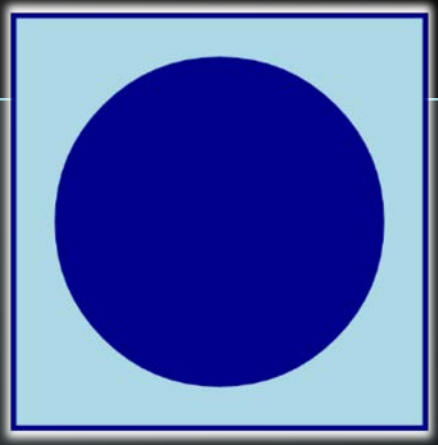

SVG uses a coordinate system for the sizes and positions

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Simple SVG

Live Demo

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SVG Shapes

What has SVG to offer?

SVG Shapes

- As mentioned, vector graphics are built from graphic primitives
  - Points
  - Lines and curves
  - Shapes: rectangular, circle, etc…
- SVG supports most of the basic shapes
  - More complex shapes can be created using the basic ones

SVG Shapes: Line

- `<line>` is the most basic shape in SVG
  - Creates a line between two points

```
<line x1="0" y1="0"
      x2="300" y2="450" stroke="black" />
<line x1="300" y1="0"
      x2="0" y2="450" stroke="black" />
<line x1="0" y1="150"
      x2="300" y2="150" stroke="black" />
<line x1="0" y1="300"
      x2="300" y2="300" stroke="black" />
<line x1="0" y1="150"
      x2="300" y2="300" stroke="black" />
<line x1="0" y1="300"
      x2="300" y2="150" stroke="black" />
```

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      x2="300" y2="150" stroke="black" />
<line x1="0" y1="300"
      x2="300" y2="300" stroke="black" />
<line x1="0" y1="150"
      x2="300" y2="300" stroke="black" />
<line x1="0" y1="300"
      x2="300" y2="150" stroke="black" />
```

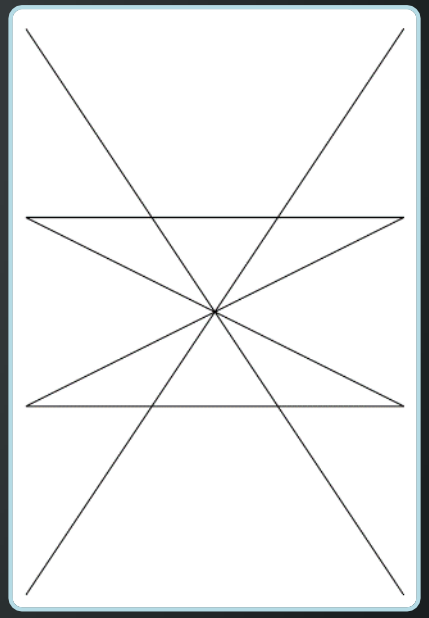

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      x2="300" y2="300" stroke="black" />
<line x1="0" y1="150"
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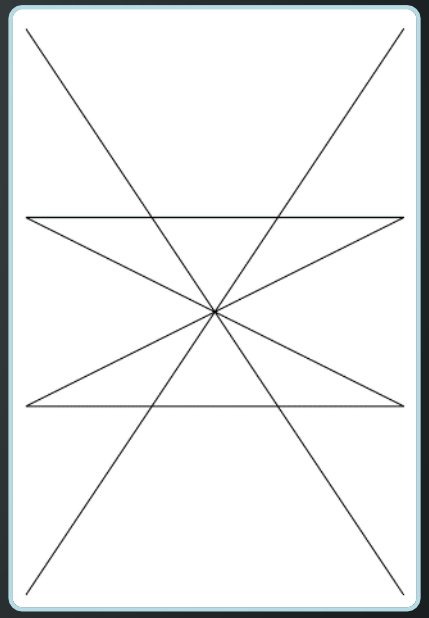
<line x1="0" y1="300"
      x2="300" y2="150" stroke="black" />
```



Stroke sets the color of the line

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Defining Lines with SVG

Live Demo

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SVG Shapes: Rects and Circles

- `<rect>` creates a rectangular with a top-left position, width and height
- `<circle>` creates a circle with center and radius

```
<rect x="10" y="10" width="280" height="280"
fill="#222"/>
<circle cx="150" cy="150" r="135" fill="#333"/>
<rect x="55" y="55" width="190" height="190"
fill="#444"/>
<circle cx="150" cy="150" r="95" fill="#555"/>
<rect x="85" y="85" width="130" height="130"
fill="#666"/>
<circle cx="150" cy="150" r="65" fill="#777"/>
<rect x="105" y="105" width="90" height="90"
fill="#888"/>
<circle cx="150" cy="150" r="45" fill="#999"/>
```

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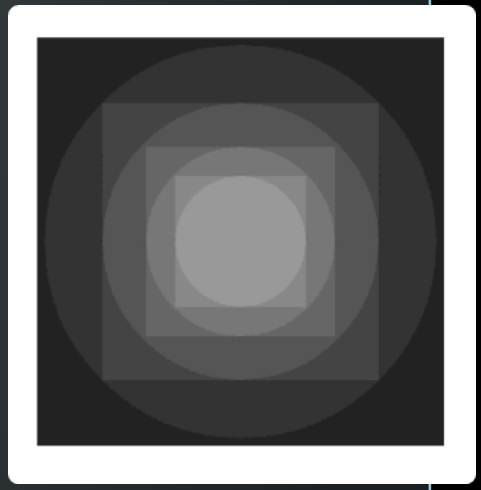

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Circles and Rectangles

Live Demo

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SVG Paths

SVG Paths

- SVG can define more complex shapes using the path
  - Create straight line from a point to other point
  - Create a curve between two points
  - Used with the element <path>
    - Add giving commands and points for the lines using the "d" attribute

```
<path d="M 50 50 L 175 310 H210" ></path>
```

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SVG Paths: Commands

- The path commands are as follows:
  - `M x y` or `m x y`
    - Moves the path marker to position (x, y)
  - `L x y` or `l x y`
    - Creates a straight line between the marker point and point (x, y)
  - (`H x` or `h x`) and (`V y` or `v y`)
    - Creates a horizontal/vertical line from the marker point to the given point
  - `Z` or `z`
    - Closes the path, connects the first and last points

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SVG Paths: Line Commands

- Paths example
  - Drawing the letters "R" and "E"

```
<path stroke="yellowgreen" fill="none"
      d="M 375 50 H 450 M 375 50 V 150
         H 450 M 375 100 H 430" />
```

```
<path stroke="yellowgreen" fill="none"
      d="M 475 50 V 150 M 475 50 H 525
         L 550 75 V 100 H 475 L 550 150" />
```

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SVG Paths: Line Commands

- Paths example
  - Drawing the letters "R" and "E"

```
<path stroke="yellowgreen" fill="none"
      d="M 375 50 H 450 M 375 50 V 150
         H 450 M 375 100 H 430" />
```

```
<path stroke="yellowgreen" fill="none"
      d="M 475 50 V 150 M 475 50 H 525
         L 550 75 V 100 H 475 L 550 150" />
```

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SVG Paths: Line Commands

Live Demo

SVG Paths: Curves

- C x1 y1 x2 y2 x y
  - Cubic Bezier curve
  - Two control points: (x1, y1) and (x2, y2)
  - Ending point at (x, y)
  - S x2 y2 x y continues the curve
- Q x1 y1 x y
  - Quadratic Bezier curve
  - One control point: (x1, y1)
  - Ending point at (x, y)
  - T x y continues the curve

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SVG Paths: Curves Example

- Drawing quadratic and cubic Bezier curves:

```
<path d="M50 200
         C60 450 145 300 200 200
         S225 50 300 200" />
```

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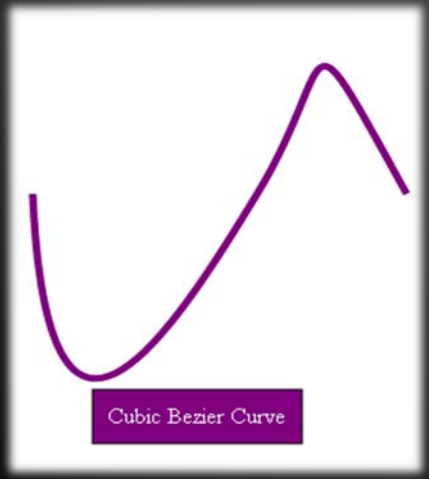
SVG Paths: Curves Example

- Drawing quadratic and cubic Bezier curves:

```
<path d="M50 200
         C60 450 145 300 200 200
         S225 50 300 200" />
```



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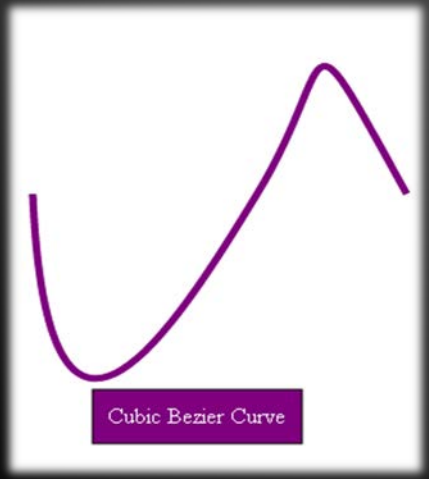
SVG Paths: Curves Example

- Drawing quadratic and cubic Bezier curves:

```
<path d="M50 200
         C60 450 145 300 200 200
         S225 50 300 200" />
```




```
<path d="M350 200
         Q360 450 400 200
         T525 200" />
```

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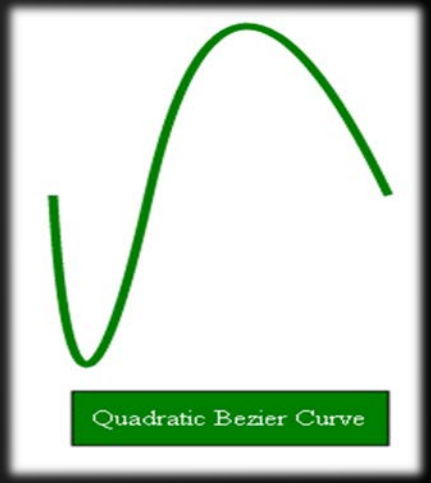
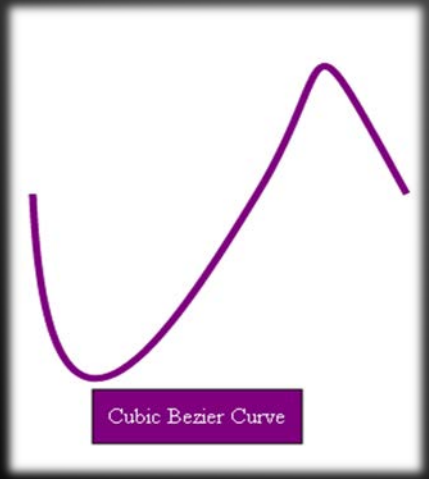
SVG Paths: Curves Example

- Drawing quadratic and cubic Bezier curves:

```
<path d="M50 200
         C60 450 145 300 200 200
         S225 50 300 200" />
```






```
<path d="M350 200
         Q360 450 400 200
         T525 200" />
```

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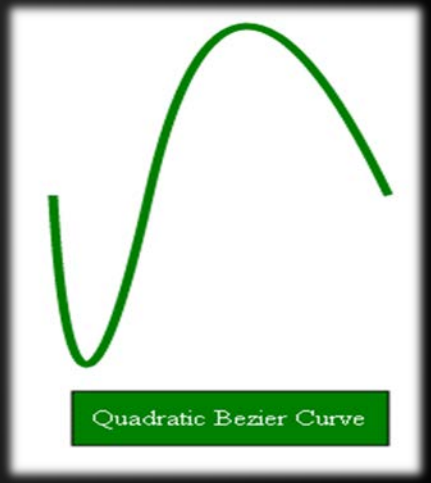
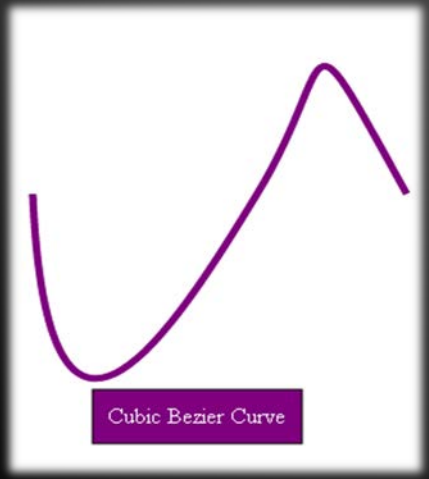
SVG Paths: Curves Example

- Drawing quadratic and cubic Bezier curves:

```
<path d="M50 200
         C60 450 145 300 200 200
         S225 50 300 200" />
```



The path points must be on the same line!

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<path d="M350 200
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```

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SVG Paths: Curves

Live Demo

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SVG DOM API

Using SVG with JavaScript

SVG DOM API

- SVG is XML
  - SVG elements can be selected just as DOM elements
    - getElementsByXXX(…) and querySelector(…)
  - SVG elements can be created dynamically
    - document.createElement('rect')

```
var svgNS = 'http://www.w3.org/2000/svg';
var rect = document.createElementNS(svgNs, 'rect');
rect.setAttribute('x', x);
rect.setAttribute('y', y);
rect.setAttribute('width', width);
rect.setAttribute('height', height);
document.getElementById('the-svg').appendChild(rect);
```

SVG Styles

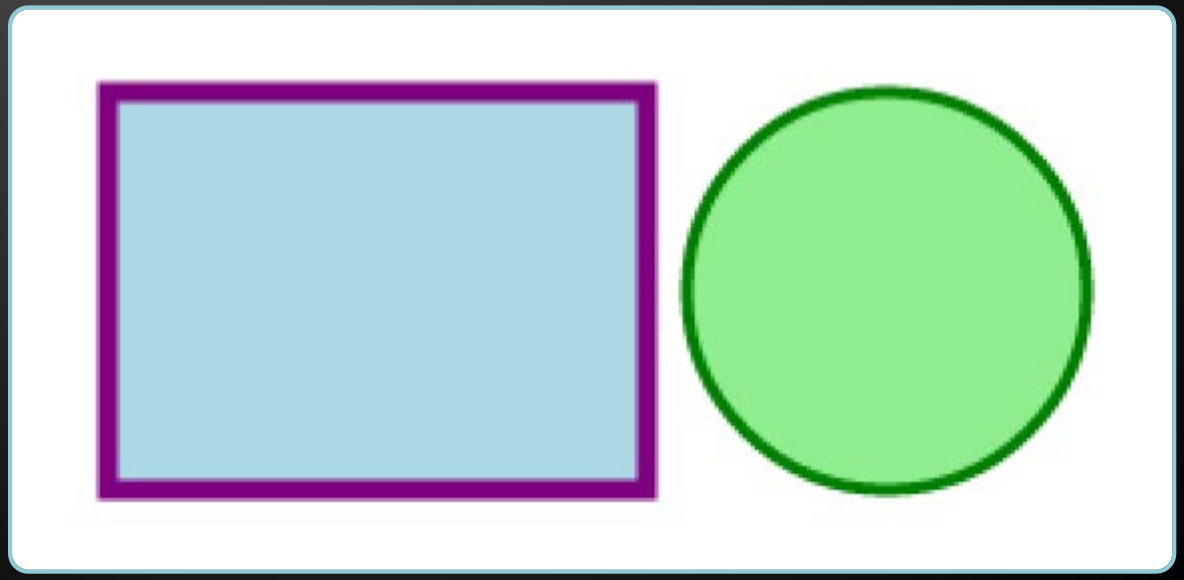
- SVG elements can also be styled with CSS:

SVG:

```
<svg id='the-svg' …>
  <rect … />
  </rect>
  <circle … />
</svg>
```

CSS:

```
#the-svg rect{
  fill: 'white'
  stroke: 'purple'
  stroke-width: '5'
}
```



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SVG DOM and Styles

Live Demo

Questions?

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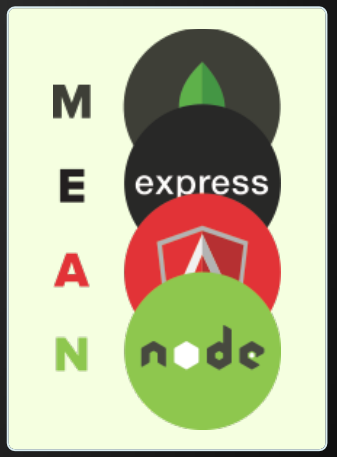
Homework

1. Implement the image (MEAN) with SVG
   - Use both circles and paths
2. Implement the Windows 8 start screen with SVG



3. *Implement the first two tasks using the SVG DOM API and JavaScript