

# SVG animation

**Animation of Scalable Vector Graphics**, an open [XML](#)-based standard [vector graphics](#) format, is possible through various means:

- **Scripting:** [ECMAScript](#) is a primary means of creating animations and interactive user interfaces within SVG.
- **Styling:** Since 2008, the development of [CSS Animations](#) as a feature in [WebKit](#) has made possible stylesheet-driven implicit animation of SVG files from within the [Document Object Model](#) (DOM).
- **SMIL:** Synchronized Multimedia Integration Language, a recommended means<sup>[1][2][3]</sup> of animating SVG-based hypermedia, supported by the [Amaya](#) (2003)<sup>[4]</sup> [Opera](#) (2006),<sup>[5]</sup> [Mozilla Firefox](#) (2011),<sup>[6]</sup> [Google Chrome](#) (2016) and [Safari](#) (2017) [web browsers](#),<sup>[7]</sup> and any browser that aims to pass the [Acid3](#) web standards test of 2008 (i.e. before the test's "simplification" in 2011) as this requires SMIL support for tests 75 and 76.

## Scalable Vector Graphics

- [sXBL](#)
- [SVG Working Group](#)
- [SVG filter effects](#)
- [Precision Graphics Markup Language](#)
- [Vector Markup Language](#)
- [XHTML+MathML+SVG](#)
- [SVG animation](#)
- [Comparison of layout engines \(SVG\)](#)

[Libraries](#) have also been written as a [shim](#) to give current SVG-enabled browsers SMIL support.<sup>[8]</sup> This method is also known as SVG+Time.

Because SVG supports [Portable Network Graphics](#) (PNG) and [JPEG](#) raster images, it can be used to animate such images as an alternative to [APNG](#) and [Multiple-image Network Graphics](#) (MNG).

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## History

SVG animation elements were developed in collaboration with the [World Wide Web Consortium](#) (W3C) Synchronized Multimedia Working Group, developers of the [Synchronized Multimedia Integration Language](#), the first version of which was published in 1999. SVG 1.0 became a [W3C Recommendation](#) on 4 September

2001. Certain web browsers added support for SVG animation during the 2000s, including Amaya as early as 2003, but SVG animation was only supported by widely used browsers beginning in the 2010s, notably by Firefox 4 (2011). Internet Explorer supports ECMAScript animation, and its successor Microsoft Edge supports ECMAScript and CSS animations as of version 42.17134.

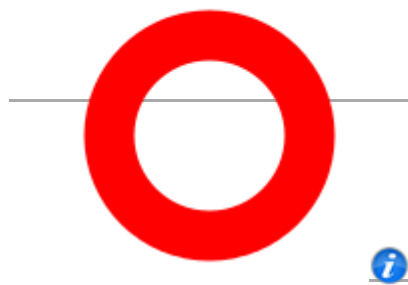
The SYMM Working Group, in collaboration with the SVG Working Group, has authored the SMIL Animation specification, which represents a general-purpose XML animation feature set. SVG incorporates the animation features defined in the SMIL Animation specification and provides some SVG-specific extensions.

## Examples

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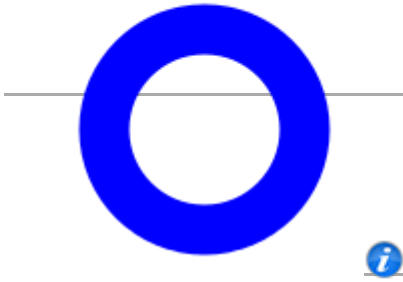
The following code snippets demonstrate three techniques to create animated SVG images on compatible browsers. The relevant parts are highlighted in yellow. Click the images' thumbnails to see their animated versions.

### SVG animation using SMIL



```
1 <!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"
  "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
2 <svg version="1.1" xmlns="http://www.w3.org/2000/svg"
  xmlns:xlink="http://www.w3.org/1999/xlink"
3   width="100%" height="100%" viewBox="-4 -4 8 8">
4   <title>SVG animation using SMIL</title>
5   <circle cx="0" cy="1" r="2" stroke="red" fill="none">
6     <animateTransform
7       attributeName="transform"
8       attributeType="XML"
9       type="rotate"
10      from="0"
11      to="360"
12      begin="0s"
13      dur="1s"
14      repeatCount="indefinite"/>
15 </circle>
16 </svg>
```

### SVG animation using CSS

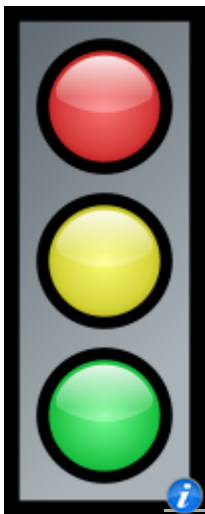


```

1 <!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"
  "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
2 <svg version="1.1" xmlns="http://www.w3.org/2000/svg"
  xmlns:xlink="http://www.w3.org/1999/xlink"
3   width="100%" height="100%" viewBox="-4 -4 8 8">
4   <title>SVG animation using CSS</title>
5   <style type="text/css">
6     @keyframes rot_kf {
7       from { transform: rotate(0deg); }
8       to   { transform: rotate(360deg); }
9     }
10    .rot { animation: rot_kf 1s linear infinite; }
11  </style>
12  <circle class="rot"
13    cx="0" cy="1" r="2" stroke="blue" fill="none"/>
14 </svg>

```

## SVG animation using ECMAScript



```

1 <!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"
  "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
2 <svg version="1.1" xmlns="http://www.w3.org/2000/svg"
  xmlns:xlink="http://www.w3.org/1999/xlink" width="100%" height="100%" viewBox="-4 -4 8 8"
3   onload="rotate(evt)">
4   <title>SVG animation using ECMAScript</title>
5   <script type="text/ecmascript">
6     function rotate(evt) {
7       var object = evt.target.ownerDocument.getElementById('rot');
8       setInterval(function () {
9         var now          = new Date();
10        var milliseconds = now.getTime() % 1000;
11        var degrees      = milliseconds * 0.36; // 360 degrees in 1000 ms
12        object.setAttribute('transform', 'rotate(' + degrees + ')');
13      }, 20);
14    }
15  </script>

```

```
16 <circle id="rot"  
17   cx="0" cy="1" r="2" stroke="green" fill="none"/>  
18 </svg>
```

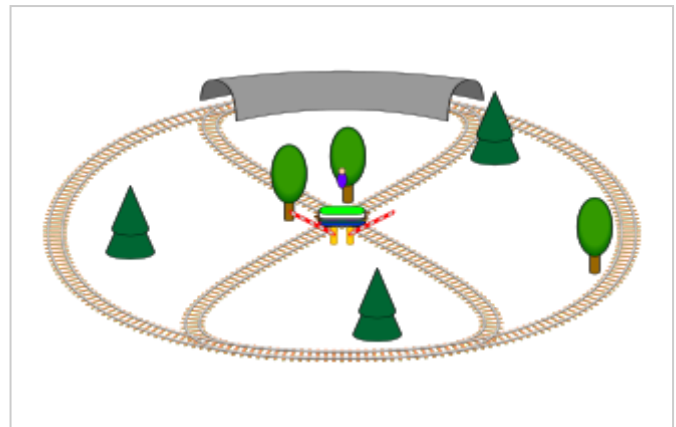
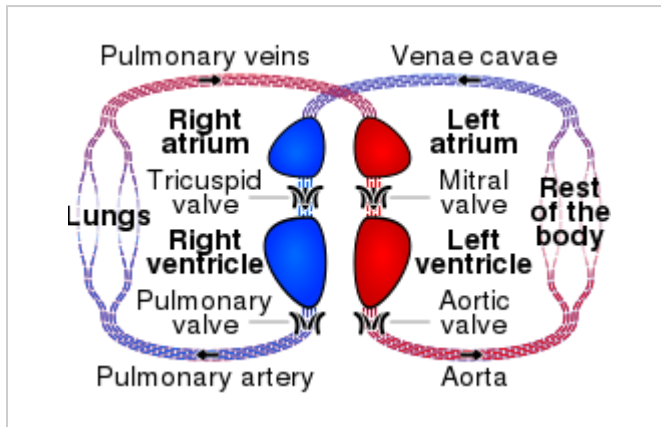
Though the example above works, it is not the optimal implementation; the animation is limited to 50 frames per second (FPS). Using `requestAnimationFrame` provides better performance and can reach 60 FPS:

```
1 <!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"  
  "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">  
2 <svg version="1.1" xmlns="http://www.w3.org/2000/svg"  
  xmlns:xlink="http://www.w3.org/1999/xlink" width="100%" height="100%" viewBox="-4 -4 8 8"  
3   onload="init()">  
4   <title>SVG animation using requestAnimationFrame()</title>  
5   <script>  
6     var object;  
7  
8     function init() {  
9       object = document.getElementById('rot');  
10      window.requestAnimationFrame(rotate);  
11    }  
12  
13    function rotate(timestamp) {  
14      var milliseconds = timestamp % 1000;  
15      var degrees      = milliseconds * 0.36; // 360 degrees in 1000 ms  
16      object.setAttribute('transform', 'rotate(' + degrees + ')');  
17      window.requestAnimationFrame(rotate);  
18    }  
19  </script>  
20  <circle id="rot" cx="0" cy="1" r="2" stroke="green" fill="none"/>  
21 </svg>
```

## SMIL attributes to identify the target attribute

The following are the animation attribute which identify the target attribute for the given target element whose value changes over time. `attributeName` = "`<attributeName>`" specifies the name of the target attribute. An XMLNS prefix may be used to indicate the XML namespace for the attribute. The prefix will be interpreted in the scope of the current animation element.

`attributeType` = "`CSS | XML | auto`" specifies the namespace in which the target attribute and its associated values are defined. CSS specifies that the value of 'attributeName' is the name of a CSS property defined as animatable in this specification. XML specifies that the value of 'attributeName' is the name of an XML attribute defined in the default XML namespace for the target element. The attribute must be defined as animatable in this specification. `auto` The default value is 'auto'. The implementation should match the 'attribute Name' to an attribute for the target element. The implementation must first search through the list of CSS properties for a matching property name, and if none is found, search the default XML namespace for the element.



SMIL animation demonstrating change in transformation (scale) and CSS attributes (opacity and dash offset)

SMIL animation demonstrating motion along a path and simulation of 3D



SMIL animation demonstrating morphing of shapes (paths)

CSS3 animation demonstrating changes in transformation (rotation, scale and translation) and simulation of 3D

The [MediaWiki](#) wiki software automatically generates static, non-animated thumbnails of SVG images. Viewing the actual .svg image from each respective description page will show its animation in a compatible browser.

## Libraries

There are several JavaScript libraries for working with SVG animation. An advantage to the use of such libraries is that these libraries often solve incompatibility issues in browsers through [abstraction](#). Examples of libraries include [Raphaël](#) and [Velocity.js](#)

## See also

- [CSS animations](#)
- [D3.js](#)
- [Flash animation](#)
- [GIF animation](#)

## References

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1. "Scalable Vector Graphics (SVG) 1.1 Specification" (<http://www.w3.org/TR/SVG11/animate.html#Animation.classExample>). World Wide Web Consortium. January 2003 – April 2009. Retrieved 4 February 2010.
2. Festa, Paul (9 January 2003). "W3C releases scripting standard, caveat" (<http://news.cnet.com/2100-1023-979976.html>). CNet. Retrieved 24 February 2010.
3. Bulterman, D.C.A.; Lloyd Rutledge (November 2008). *SMIL 3.0: Interactive Multimedia for the Web, Mobile Devices and Daisy Talking Books*. X.media.publishing (<https://www.springer.com/computer/database+management+%26+information+retrieval/book/978-3-540-78546-0>) (2nd ed.). New York: NY: Springer. p. 508. ISBN 978-3-540-78546-0.
4. "SVG Animation support in Amaya" (<http://www.w3.org/2003/03/amayasvganim.html>). World Wide Web Consortium. 15 April 2003. Retrieved 4 February 2010.
5. McCathieNeville, Charles (31 October 2006). "Animating Your SVG" (<https://web.archive.org/web/20100307035302/http://dev.opera.com/articles/view/animating-your-svg/>). *Opera Developer Community*. Opera Software. Archived from the original (<http://dev.opera.com/articles/view/animating-your-svg/>) on 7 March 2010. Retrieved 24 February 2010.
6. "SVG animation with SMIL" ([https://developer.mozilla.org/en/SVG/SVG\\_animation\\_with\\_SMIL](https://developer.mozilla.org/en/SVG/SVG_animation_with_SMIL)). 29 March 2011.
7. "When can I use SVG SMIL animation?" (<http://caniuse.com/svg-smil>).
8. Dahlström, Erik (August 2008). "Tricks of javascript, SVG and SMIL" ([http://svgopen.org/2008/presentations/70-Tricks\\_of\\_Javascript\\_and\\_declarative\\_animation/index.html](http://svgopen.org/2008/presentations/70-Tricks_of_Javascript_and_declarative_animation/index.html)). Opera Software at SVG Open. Retrieved 24 February 2010.

## External links

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- [SVG 1.1 Specification – Animation](http://www.w3.org/TR/SVG/animate.html) (<http://www.w3.org/TR/SVG/animate.html>)
- [SVG Animation and other SVG Tutorials](https://web.archive.org/web/20110926012937/http://www.learnsvg.com/tutorials/tutorialScripting/anime.svg) (<https://web.archive.org/web/20110926012937/http://www.learnsvg.com/tutorials/tutorialScripting/anime.svg>)
- [SMIL animations embedded in SVG – Chapter from SVG Primer \(W3C\)](http://www.w3.org/Graphics/SVG/IG/resources/svgprimer.html#SMIL_animations) ([http://www.w3.org/Graphics/SVG/IG/resources/svgprimer.html#SMIL\\_animations](http://www.w3.org/Graphics/SVG/IG/resources/svgprimer.html#SMIL_animations))
- [SVG Animation Examples](https://templatefor.net/svg-animation-examples-inspiration/) (<https://templatefor.net/svg-animation-examples-inspiration/>)
- [SVG Animation Tool](https://svgator.com/) (<https://svgator.com/>)

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