## ↑ Jump to Table of Contents → Pop Out Sidebar



# Scalable Vector Graphics (SVG) 2

## W3C Candidate Recommendation 04 October 2018

This version:

https://www.w3.org/TR/2018/CR-SVG2-20181004/

Latest version:

https://www.w3.org/TR/SVG2/

Previous version:

https://www.w3.org/TR/2018/CR-SVG2-20180807/

Editors draft

https://svgwg.org/svg2-draft/

Single page version:

https://svgwg.org/svg2-draft/single-page.html

GitHub repository:

https://github.com/w3c/svgwg/

Public comments:

www-svg@w3.org (archive)

Editors:

Amelia Bellamy-Royds, Invited Expert < <u>amelia.bellamy.royds@gmail.com</u>>

Bogdan Brinza, Microsoft Co. < <a href="mailto:bbrinza@microsoft.com">bbrinza@microsoft.com</a>>

Chris Lilley, W3C <chris@w3.org>

Dirk Schulze, Adobe Systems < <a href="mailto:dschulze@adobe.com">dschulze@adobe.com</a>>

David Storey, Microsoft Co. <a href="mailto:dstorey@microsoft.com">dstorey@microsoft.com</a>>

Eric Willigers, Google

Former Editors:

Nikos Andronikos, Canon, Inc. <nikos.andronikos@cisra.canon.com.au>

Rossen Atanassov, Microsoft Co. <ratan@microsoft.com>

Tavmjong Bah, Invited Expert < tavmjong@free.fr>

Brian Birtles, Mozilla Japan < <a href="mailto:bbirtles@mozilla.com">bbirtles@mozilla.com</a>>

Cyril Concolato, Telecom ParisTech < <a href="mailto:cyril.concolato@telecom-paristech.fr">cyril.concolato@telecom-paristech.fr</a>>

Erik Dahlström, Invited Expert < <a href="mailto:erik@dahlström.net">erik@dahlström.net</a>>

Cameron McCormack, Mozilla Corporation <cam@mcc.id.au>

Doug Schepers, W3C < <a href="mailto:schepers@w3.org">schepers@w3.org</a>>

Richard Schwerdtfeger, IBM <schwer@us.ibm.com>

Satoru Takagi, KDDI Corporation <<u>sa-takagi@kddi.com</u>>

Jonathan Watt, Mozilla Corporation <jwatt@jwatt.org>

<u>Copyright</u> © 2018 <u>W3C</u><sup>®</sup> (<u>MIT, ERCIM, Keio, Beihang</u>). W3C <u>liability, trademark</u> and <u>document use</u> rules apply.

## Abstract

https://www.w3.org/TR/SVG2/

This specification defines the features and syntax for Scalable Vector Graphics (SVG) Version 2. SVG is a language based on XML for describing two-dimensional vector and mixed vector/raster graphics. SVG content is stylable, scalable to different display resolutions, and can be viewed stand-alone, mixed with HTML content, or embedded using XML namespaces within other XML languages. SVG also supports dynamic changes; script can be used to create interactive documents, and animations can be performed using declarative animation features or by using script.

## **Status of This Document**

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the <u>W3C technical reports index</u> at https://www.w3.org/TR/.

This document is the 04 October 2018 **Candidate Recommendation** of SVG 2. This version of SVG builds upon <u>SVG 1.1 Second Edition</u> by improving the usability and precision of the language. The <u>Changes</u> appendix lists all of the changes that have been made since SVG 1.1 Second Edition.

Publication as a Candidate Recommendation does not imply endorsement by the W3C Membership. This is a draft document and may be updated, replaced or obsoleted by other documents at any time. It is inappropriate to cite this document as other than work in progress.

This Candidate Recommendation is expected to advance to Proposed Recommendation no earlier than 04 December 2018.

There is no preliminary implementation report at this time. The SVG Working Group is working on a test suite for SVG2 and expects to produce an implementation report based on those tests.

Comments on this Candidate Recommendation are welcome. Comments can be raised as <u>GitHub issues</u> (preferred), or alternatively be sent to <u>www-svg@w3.org</u>, the public email list for issues related to vector graphics on the Web. This list is <u>archived</u> and senders must agree to have their message publicly archived from their first posting. To subscribe send an email to <u>www-svg-request@w3.org</u> with the word subscribe in the subject line.

The specification includes a number of annotations that the Working Group is using to record links to meeting minutes and resolutions where specific decisions about SVG features have been made. Different coloring is also used to mark the maturity of different sections of the specification:

- a red background indicates a section that is either unchanged since SVG 1.1 (and which therefore still requires review and possible rewriting for SVG 2), or a section that is new but still requires substantial work
- a yellow background indicates a section from SVG 1.1 that has been reviewed and rewritten if necessary, or a new section that is complete and ready for the rest of the Working Group to review
- a white background indicates a section, either from SVG 1.1 or new for SVG 2, that has been reviewed by the Working Group and which is ready for wider review

This document has been produced by the <u>W3C SVG Working Group</u> as part of the <u>Graphics Activity</u> within the <u>W3C Interaction Domain</u>. The goals of the W3C SVG Working Group are discussed in the <u>W3C SVG Charter</u>. The W3C SVG Working Group maintains a public Web page, <a href="https://www.w3.org/Graphics/SVG/">https://www.w3.org/Graphics/SVG/</a>, that contains further background information. The authors of this document are the SVG Working Group participants.

This document was produced by a group operating under the <u>W3C Patent Policy</u>. W3C maintains a <u>public list of any patent disclosures</u> made in connection with the deliverables of the group; that page also includes instructions for disclosing a patent. An individual who has actual knowledge of a patent which the individual believes

contains <u>Essential Claim(s)</u> must disclose the information in accordance with <u>section 6 of the W3C Patent Policy</u>.

A list of current W3C Recommendations and other technical documents can be found at <a href="https://www.w3.org/TR/">https://www.w3.org/TR/</a>. W3C publications may be updated, replaced, or obsoleted by other documents at any time.

This document is governed by the <u>1 February 2018 W3C Process Document</u>.

All features in this specification depend upon implementation in browsers or authoring tools. If a feature is not certain to be implemented, we define that feature as "at risk". At-risk features will be removed from the current specification, and may be included in future versions of the specification. If an at-risk feature is particularly important to authors of SVG, those authors are encouraged to give feedback to implementers regarding its priority. The following features are at risk, and may be dropped during the CR period:

- More than one '<u>title</u>' or '<u>desc</u>' to provide localisation
- 'zoomAndPan'
- Nested links
- 'unknown' elements and the SVGUnknownElement interface.
- <u>vector-effect</u> options other than non-scaling-stroke

## **Table of Contents**

- 1. 1. <u>Introduction</u>
  - 1. 1.1. About SVG
  - 2. 1.2. Compatibility with other standards efforts
  - 3. <u>1.3. Normative Terminology</u>
- 2. 2. Conformance Criteria
  - 1. 2.1. Overview
  - 2. 2.2. Processing modes
    - 1. 2.2.1. Features
    - 2. 2.2.2. Dynamic interactive mode
    - 3. 2.2.3. Animated mode
    - 4. 2.2.4. Secure animated mode
    - 5. 2.2.5. Static mode
    - 6. 2.2.6. Secure static mode
  - 3. 2.3. Processing modes for SVG sub-resource documents
    - 1. 2.3.1. Examples
  - 4. 2.4. Document Conformance Classes
    - 1. 2.4.1. Conforming SVG DOM Subtrees
    - 2. <u>2.4.2. Conforming SVG Markup Fragments</u>
    - 3. 2.4.3. Conforming XML-Compatible SVG Markup Fragments
    - 4. 2.4.4. Conforming XML-Compatible SVG DOM Subtrees
    - 5. 2.4.5. Conforming SVG Stand-Alone Files
    - 6. <u>2.4.6</u>. Error processing
  - 5. 2.5. Software Conformance Classes
    - 1. 2.5.1. Conforming SVG Generators
    - 2. 2.5.2. Conforming SVG Authoring Tools
    - 3. 2.5.3. Conforming SVG Servers
    - 4. 2.5.4. Conforming SVG Interpreters
    - 5. 2.5.5. Conforming SVG Viewers
      - 1. 2.5.5.1. Printing implementation notes
    - 6. 2.5.6. Conforming High-Quality SVG Viewer
- 3. 3. Rendering Model

- 1. 3.1. Introduction
- 2. <u>3.2</u>. The rendering tree
  - 1. 3.2.1. Definitions
  - 2. 3.2.2. Rendered versus non-rendered elements
  - 3. 3.2.3. Controlling visibility: the effect of the 'display' and 'visibility' properties
  - 4. 3.2.4. Re-used graphics
- 3. 3.3. The painters model
- 4. 3.4. Rendering order
  - 1. <u>3.4.1. Establishing a stacking context in SVG</u>
- 5. 3.5. How elements are rendered
- 6. 3.6. How groups are rendered
  - 1. 3.6.1. Object and group opacity: the effect of the 'opacity' property
- 7. <u>3.7. Types of graphics elements</u>
  - 1. 3.7.1. Painting shapes and text
  - 2. 3.7.2. Painting raster images
- 8. 3.8. Filtering painted regions
- 9. 3.9. Clipping and masking
- 10. 3.10. Parent compositing
- 11. 3.11. The effect of the 'overflow' property
- 4. 4. <u>Basic Data Types and Interfaces</u>
  - 1. 4.1. Definitions
  - 2. <u>4.2</u>. Attribute syntax
    - 1. <u>4.2.1. Real number precision</u>
    - 2. <u>4.2.2. Clamping values which are restricted to a particular range</u>
  - 3. <u>4.3. SVG DOM overview</u>
    - 1. 4.3.1. Dependencies for SVG DOM support
    - 2. <u>4.3.2. Naming conventions</u>
    - 3. 4.3.3. Elements in the SVG DOM
    - 4. 4.3.4. Reflecting content attributes in the DOM
    - 5. 4.3.5. Synchronizing reflected values
    - 6. 4.3.6. Reflecting an empty initial value
    - 7. <u>4.3.7</u>. <u>Invali</u>d values
  - 4. 4.4. DOM interfaces for SVG elements
    - 1. 4.4.1. Interface SVGElement
    - 2. 4.4.2. Interface SVGGraphicsElement
    - 3. 4.4.3. Interface SVGGeometryElement
  - 5. 4.5. DOM interfaces for basic data types
    - 1. 4.5.1. Interface SVGNumber
    - 2. 4.5.2. Interface SVGLength
    - 3. 4.5.3. Interface SVGAngle
    - 4. 4.5.4. List interfaces
    - 5. 4.5.5. Interface SVGNumberList
    - 6. 4.5.6. Interface SVGLengthList
    - 7. 4.5.7. Interface SVGStringList
  - 6. 4.6. DOM interfaces for reflecting animatable SVG attributes
    - 1. 4.6.1. Interface SVGAnimatedBoolean
    - 2. 4.6.2. Interface SVGAnimatedEnumeration
    - 3. 4.6.3. Interface SVGAnimatedInteger
    - 4. 4.6.4. Interface SVGAnimatedNumber
    - 5. 4.6.5. Interface SVGAnimatedLength
    - 6. 4.6.6. Interface SVGAnimatedAngle
    - 7. 4.6.7. Interface SVGAnimatedString
    - 8. 4.6.8. Interface SVGAnimatedRect
    - 9. <u>4.6.9. Interface SVGAnimatedNumberList</u>

#### 10. 4.6.10. Interface SVGAnimatedLengthList

## 7. 4.7. Other DOM interfaces

- 1. <u>4.7.1. Interface SVGUnitTypes</u>
- 2. 4.7.2. Mixin SVGTests
- 3. 4.7.3. Mixin SVGFitToViewBox
- 4. 4.7.4. Mixin SVGZoomAndPan
- 5. 4.7.5. Mixin SVGURIReference

## 5. 5. <u>Document Structure</u>

- 1. 5.1. Defining an SVG document fragment: the 'svg' element
  - 1. <u>5.1.1</u>. Overview
  - 2. <u>5.1.2</u>. Namespace
  - 3. <u>5.1.3. Definitions</u>
  - 4. <u>5.1.4</u>. The 'svg' element
- 2. <u>5.2. Grouping: the 'g' element</u>
  - 1. <u>5.2.1</u>. Overview
  - 2. <u>5.2.2</u>. The 'g' element
- 3. 5.3. Unknown elements
- 4. 5.4. Defining content for reuse, and the 'defs' element
  - 1. 5.4.1. Overview
  - 2. <u>5.4.2</u>. The 'defs' element
- 5. 5.5. The 'symbol' element
  - 1. 5.5.1. Attributes
  - 2. <u>5.5.2</u>. Notes on symbols
- 6. 5.6. The 'use' element
  - 1. 5.6.1. The use-element shadow tree
  - 2. <u>5.6.2</u>. <u>Layout of re-used graphics</u>
  - 3. <u>5.6.3</u>. Style Scoping and Inheritance
  - 4. 5.6.4. Multimedia in use-element shadow trees
  - 5. 5.6.5. Animations in use-element shadow trees
  - 6. 5.6.6. Event handling in use-element shadow trees
- 7. 5.7. Conditional processing
  - 1. 5.7.1. Conditional processing overview
  - 2. 5.7.2. Definitions
  - 3. 5.7.3. The 'switch' element
  - 4. <u>5.7.4</u>. The 'requiredExtensions' attribute
  - 5. 5.7.5. The 'systemLanguage' attribute
- 8. 5.8. The 'desc' and 'title' elements
  - 1. 5.8.1. Definition
- 9. 5.9. The 'metadata' element
- 10. 5.10. HTML metadata elements
- 11. 5.11. Foreign namespaces and private data
- 12. 5.12. Common attributes
  - 1. <u>5.12.1</u>. <u>Definitions</u>
  - 2. 5.12.2. Attributes common to all elements: 'id'
  - 3. 5.12.3. The 'lang' and 'xml:lang' attributes
  - 4. <u>5.12.4</u>. The 'xml:space' attribute
  - 5. 5.12.5. The 'tabindex' attribute
  - 6. 5.12.6. The 'data-\*' attributes
- 13. 5.13. WAI-ARIA attributes
  - 1. 5.13.1. Definitions
  - 2. 5.13.2. Role attribute
  - 3. 5.13.3. State and property attributes (all aria- attributes)
  - 4. 5.13.4. Implicit and Allowed ARIA Semantics
- 14. 5.14. DOM interfaces

- 1. 5.14.1. Extensions to the Document interface
- 2. 5.14.2. Interface SVGSVGElement
- 3. 5.14.3. Interface SVGGElement
- 4. 5.14.4. Interface SVGUnknownElement
- 5. 5.14.5. Interface SVGDefsElement
- 6. <u>5.14.6. Interface SVGDescElement</u>
- 7. <u>5.14.7</u>. Interface SVGMetadataElement
- 8. <u>5.14.8. Interface SVGTitleElement</u>
- 9. <u>5.14.9</u>. <u>Interface SVGSymbolElement</u>
- 10. 5.14.10. Interface SVGUseElement
- 11. <u>5.14.11</u>. Interface SVGUseElementShadowRoot
- 12. 5.14.12. Mixin SVGElementInstance
- 13. 5.14.13. Interface ShadowAnimation
- 14. 5.14.14. Interface SVGSwitchElement
- 15. 5.14.15. Mixin GetSVGDocument

## 6. 6. Styling

- 1. <u>6.1. Styling SVG content using CSS</u>
- 2. 6.2. Inline style sheets: the 'style' element
- 3. 6.3. External style sheets: the effect of the HTML 'link' element
- 4. <u>6.4. Style sheets in HTML documents</u>
- 5. 6.5. Element-specific styling: the 'class' and 'style' attributes
- 6. <u>6.6. Presentation attributes</u>
- 7. <u>6.7. Required properties</u>
- 8. <u>6.8. User agent style sheet</u>
- 9. 6.9. Required CSS features
- 10. 6.10. DOM interfaces
  - 1. <u>6.10.1</u>. Interface SVGStyleElement

#### 7. 7. Geometry Properties

- 1. 7.1. Horizontal center coordinate: The 'cx' property
- 2. 7.2. Vertical center coordinate: The 'cy' property
- 3. 7.3. Radius: The 'r' property
- 4. 7.4. Horizontal radius: The 'rx' property
- 5. 7.5. Vertical radius: The 'ry' property
- 6. 7.6. Horizontal coordinate: The 'x' property
- 7. 7.7. Vertical coordinate: The 'y' property
- 8. 7.8. Sizing properties: the effect of the 'width' and 'height' properties
- 8. 8. Coordinate Systems, Transformations and Units
  - 1. 8.1. Introduction
  - 2. 8.2. Computing the equivalent transform of an SVG viewport
  - 3. 8.3. The initial viewport
  - 4. 8.4. The initial coordinate system
  - 5. <u>8.5. The 'transform' property</u>
  - 6. 8.6. The 'viewBox' attribute
  - 7. <u>8.7. The 'preserveAspectRatio' attribute</u>
  - 8. <u>8.8. Establishing a new SVG viewport</u>
  - 9. <u>8.9. Units</u>
  - 10. 8.10. Bounding boxes
  - 11. 8.11. Object bounding box units
  - 12. 8.12. Intrinsic sizing properties of SVG content
  - 13. 8.13. Vector effects
    - 1. <u>8.13.1</u>. Computing the vector effects
    - 2. 8.13.2. Computing the vector effects for nested viewport coordinate systems
    - 3. <u>8.13.3. Examples of vector effects</u>
  - 14. 8.14. DOM interfaces

- 1. 8.14.1. Interface SVGTransform
- 2. <u>8.14.2. Interface SVGTransformList</u>
- 3. <u>8.14.3. Interface SVGAnimatedTransformList</u>
- 4. <u>8.14.4. Interface SVGPreserveAspectRatio</u>
- 5. 8.14.5. Interface SVGAnimatedPreserveAspectRatio

#### 9. 9. Paths

- 1. 9.1. Introduction
- 2. 9.2. The 'path' element
- 3. 9.3. Path data
  - 1. 9.3.1. General information about path data
  - 2. 9.3.2. Specifying path data: the 'd' property
  - 3. 9.3.3. The "moveto" commands
  - 4. 9.3.4. The "closepath" command
    - 1. <u>9.3.4.1. Segment-completing close path operation</u>
  - 5. 9.3.5. The "**lineto**" commands
  - 6. <u>9.3.6.</u> The cubic Bézier curve commands
  - 7. <u>9.3.7. The quadratic Bézier curve commands</u>
  - 8. 9.3.8. The elliptical arc curve commands
  - 9. 9.3.9. The grammar for path data
- 4. <u>9.4. Path directionality</u>
- 5. 9.5. Implementation notes
  - 1. 9.5.1. Out-of-range elliptical arc parameters
  - 2. 9.5.2. Reflected control points
  - 3. 9.5.3. Zero-length path segments
  - 4. 9.5.4. Error handling in path data
- 6. 9.6. Distance along a path
  - 1. 9.6.1. The 'pathLength' attribute
- 7. 9.7. DOM interfaces
  - 1. 9.7.1. Interface SVGPathElement

## 10. 10. Basic Shapes

- 1. 10.1. Introduction and definitions
- 2. 10.2. The 'rect' element
- 3. 10.3. The 'circle' element
- 4. 10.4. The 'ellipse' element
- 5. 10.5. The 'line' element
- 6. 10.6. The 'polyline' element
- 7. <u>10.7</u>. The 'polygon' element
- 8. 10.8. DOM interfaces
  - 1. 10.8.1. Interface SVGRectElement
  - 2. 10.8.2. Interface SVGCircleElement
  - 3. 10.8.3. Interface SVGEllipseElement
  - 4. <u>10.8.4. Interface SVGLineElement</u>
  - 5. 10.8.5. Mixin SVGAnimatedPoints
  - 6. 10.8.6. Interface SVGPointList
  - 7. 10.8.7. Interface SVGPolylineElement
  - 8. <u>10.8.8</u>. <u>Interface SVGPolygonElement</u>

#### 11. 11. Text

- 1. 11.1. Introduction
  - 1. <u>11.1.1</u>. Definitions
  - 2. 11.1.2. Fonts and glyphs
  - 3. 11.1.3. Glyph metrics and layout
- 2. 11.2. The 'text' and 'tspan' elements
  - 1. 11.2.1. Attributes
  - 2. <u>11.2.2</u>. Notes on 'x', 'y', 'dx', 'dy' and 'rotate'

- 3. <u>11.3. Text layout Introduction</u>
- 4. <u>11.4. Text layout Content Area</u>
  - 1. <u>11.4.1</u>. The 'inline-size' property
  - 2. 11.4.2. The 'shape-inside' property
  - 3. 11.4.3. The 'shape-subtract' property
  - 4. 11.4.4. The 'shape-image-threshold' property
  - 5. <u>11.4.5. The 'shape-margin' property</u>
  - 6. 11.4.6. The 'shape-padding' property
- 5. <u>11.5. Text layout Algorithm</u>
- 6. 11.6. Pre-formatted text
  - 1. 11.6.1. Multi-line text via 'white-space'
  - 2. 11.6.2. Repositioning Glyphs
- 7. 11.7. Auto-wrapped text
  - 1. 11.7.1. Notes on Text Wrapping
    - 1. 11.7.1.1. First Line Positioning
    - 2. <u>11.7.1.2</u>. <u>Broken Lines</u>
- 8. <u>11.8</u>. Text on a path
  - 1. 11.8.1. The 'textPath' element
  - 2. <u>11.8.2</u>. Attributes
  - 3. <u>11.8.3</u>. Text on a path layout rules
- 9. 11.9. Text rendering order
- 10. <u>11.10</u>. <u>Properties and pseudo-elements</u>
  - 1. <u>11.10.1</u>. <u>SVG properties</u>
    - 1. 11.10.1.1. Text alignment, the 'text-anchor' property
    - 2. <u>11.10.1.2</u>. The 'glyph-orientation-horizontal' property
    - 3. <u>11.10.1.3</u>. The 'glyph-orientation-vertical' property
    - 4. <u>11.10.1.4</u>. The 'kerning' property
  - 2. 11.10.2. SVG adaptions
    - 1. 11.10.2.1. The 'font-variant' property
    - 2. 11.10.2.2. The 'line-height' property
    - 3. 11.10.2.3. The 'writing-mode' property
    - 4. 11.10.2.4. The 'direction' property
    - 5. 11.10.2.5. The 'dominant-baseline' property
    - 6. 11.10.2.6. The 'alignment-baseline' property
    - 7. 11.10.2.7. The 'baseline-shift' property
    - 8. <u>11.10.2.8</u>. The 'letter-spacing' property
    - 9. 11.10.2.9. The 'word-spacing' property
    - 10. 11.10.2.10. The 'text-overflow' property
  - 3. 11.10.3. White space
    - 1. 11.10.3.1. SVG 2 Preferred white space handling, the 'white-space' property
    - 2. 11.10.3.2. Legacy white-space handling, the 'xml:space' property
    - 3. 11.10.3.3. Duplicate white-space directives
- 11. <u>11.11</u>. <u>Text deco</u>ration
  - 1. 11.11.1. The 'text-decoration-fill' and 'text-decoration-stroke' properties
- 12. <u>11.12</u>. Text selection and clipboard operations
  - 1. 11.12.1. Text selection implementation notes
- 13. 11.13. DOM interfaces
  - 1. 11.13.1. Interface SVGTextContentElement
  - 2. 11.13.2. Interface SVGTextPositioningElement
  - 3. 11.13.3. Interface SVGTextElement
  - 4. 11.13.4. Interface SVGTSpanElement
  - 5. 11.13.5. Interface SVGTextPathElement
- 12. 12. Embedded Content
  - 1. <u>12.1. Overview</u>

- 2. 12.2. Placement of the embedded content
- 3. 12.3. The 'image' element
- 4. 12.4. HTML elements in SVG subtrees
- 5. 12.5. The 'foreignObject' element
- 6. 12.6. DOM interfaces
  - 1. 12.6.1. Interface SVGImageElement
  - 2. <u>12.6.2</u>. <u>Interface SVGForeignObjectElement</u>
- 13. 13. Painting: Filling, Stroking and Marker Symbols
  - 1. 13.1. Introduction
    - 1. 13.1.1. Definitions
  - 2. <u>13.2</u>. Specifying paint
  - 3. <u>13.3</u>. The effect of the 'color' property
  - 4. <u>13.4. Fill properties</u>
    - 1. <u>13.4.1. Specifying fill paint: the 'fill' property</u>
    - 2. <u>13.4.2</u>. Winding rule: the 'fill-rule' property
    - 3. 13.4.3. Fill paint opacity: the 'fill-opacity' property
  - 5. <u>13.5. Stroke properties</u>
    - 1. 13.5.1. Specifying stroke paint: the 'stroke' property
    - 2. <u>13.5.2</u>. Stroke paint opacity: the 'stroke-opacity' property
    - 3. <u>13.5.3</u>. Stroke width: the 'stroke-width' property
    - 4. 13.5.4. Drawing caps at the ends of strokes: the 'stroke-linecap' property
    - 5. <u>13.5.5.</u> Controlling line joins: the 'stroke-linejoin' and 'stroke-miterlimit' properties
    - 6. <u>13.5.6.</u> Dashing strokes: the 'stroke-dasharray' and 'stroke-dashoffset' properties
    - 7. 13.5.7. Computing the shape of the stroke
    - 8. 13.5.8. Computing the circles for the arcs 'stroke-linejoin'
    - 9. <u>13.5.9</u>. <u>Adjusting the circles for the arcs 'stroke-linejoin' when the initial circles do not intersect</u>
  - 6. 13.6. Vector effects
  - 7. 13.7. Markers
    - 1. 13.7.1. The 'marker' element
    - 2. 13.7.2. Vertex markers: the 'marker-start', 'marker-mid' and 'marker-end' properties
    - 3. 13.7.3. Marker shorthand: the 'marker' property
    - 4. 13.7.4. Rendering markers
  - **8.** 13.8. Controlling paint operation order: the 'paint-order' property
  - 9. 13.9. Color space for interpolation: the 'color-interpolation' property
  - 10. 13.10. Rendering hints
    - 1. 13.10.1. The 'color-rendering' property
    - 2. 13.10.2. The 'shape-rendering' property
    - 3. 13.10.3. The 'text-rendering' property
    - 4. <u>13.10.4</u>. The 'image-rendering' property
  - 11. 13.11. The effect of the 'will-change' property
  - 12. 13.12. DOM interfaces
    - 1. 13.12.1. Interface SVGMarkerElement
- 14. 14. Paint Servers: Gradients and Patterns
  - 1. 14.1. Introduction
    - 1. 14.1.1. Using paint servers as templates
  - 2. 14.2. Gradients
    - 1. 14.2.1. Definitions
    - 2. 14.2.2. Linear gradients
      - 1. 14.2.2.1. Attributes
      - 2. 14.2.2.2. Notes on linear gradients
    - 3. 14.2.3. Radial gradients
      - 1. <u>14.2.3.1</u>. Attributes
      - 2. 14.2.3.2. Notes on radial gradients

- **4.** 14.2.4. Gradient stops
  - 1. 14.2.4.1. Attributes
  - 2. <u>14.2.4.2</u>. Properties
  - 3. 14.2.4.3. Notes on gradient stops
- 3. 14.3. Patterns
  - 1. <u>14.3.1</u>. Attributes
  - 2. <u>14.3.2</u>. Notes on patterns
- 4. 14.4. DOM interfaces
  - 1. 14.4.1. Interface SVGGradientElement
  - 2. 14.4.2. Interface SVGLinearGradientElement
  - 3. 14.4.3. Interface SVGRadialGradientElement
  - 4. 14.4.4. Interface SVGStopElement
  - 5. 14.4.5. Interface SVGPatternElement
- 15. 15. <u>Scripting and Interactivity</u>
  - 1. 15.1. Introduction
  - 2. <u>15.2</u>. Supported events
    - 1. 15.2.1. Relationship with UI Events
  - 3. 15.3. User interface events
  - 4. 15.4. Pointer events
  - 5. <u>15.5. Hit-testing and processing order for user interface events</u>
    - 1. 15.5.1. Hit-testing
    - 2. 15.5.2. Event processing
  - 6. <u>15.6</u>. The 'pointer-events' property
  - 7. 15.7. Magnification and panning
  - 8. 15.8. Focus
  - 9. 15.9. Event attributes
    - 1. 15.9.1. Animation event attributes
  - 10. 15.10. The 'script' element
  - 11. 15.11. DOM interfaces
    - 1. 15.11.1. Interface SVGScriptElement
- 16. 16. Linking
  - 1. 16.1. References
    - 1. 16.1.1. Overview
    - 2. 16.1.2. Definitions
    - 3. <u>16.1.3</u>. URLs and URIs
    - 4. 16,1.4. Syntactic forms: URL and <url>
    - 5. <u>16.1.5. URL reference attributes</u>
    - 6. 16.1.6. Deprecated XLink URL reference attributes
    - 7. 16.1.7. Processing of URL references
      - 1. 16.1.7.1. Generating the absolute URL
      - 2. 16.1.7.2. Fetching the document
      - 3. 16.1.7.3. Processing the subresource document
      - 4. 16.1.7.4. Identifying the target element
      - 5. <u>16.1.7.5</u>. Valid URL targets
  - 2. 16.2. Links out of SVG content: the 'a' element
  - 3. 16.3. Linking into SVG content: URL fragments and SVG views
    - 1. 16.3.1. SVG fragment identifiers
    - 2. 16.3.2. SVG fragment identifiers definitions
    - 3. 16.3.3. Predefined views: the 'view' element
  - 4. 16.4. DOM interfaces
    - 1. 16.4.1. Interface SVGAElement
    - 2. 16.4.2. Interface SVGViewElement
- 17. Appendix A: IDL Definitions
- 18. Appendix B: Implementation Notes

- 1. B.1. Introduction
- 2. B.2. Elliptical arc parameter conversion
  - 1. B.2.1. Elliptical arc endpoint syntax
  - 2. B.2.2. Parameterization alternatives
  - 3. B.2.3. Conversion from center to endpoint parameterization
  - 4. B.2.4. Conversion from endpoint to center parameterization
  - 5. B.2.5. Correction of out-of-range radii
- 3. B.3. Notes on generating high-precision geometry
- 19. Appendix C: Accessibility Support
  - 1. <u>C.1. SVG Accessibility Features</u>
  - 2. C.2. Supporting SVG Accessibility Specifications and Guidelines
- 20. Appendix D: Animating SVG Documents
- 21. Appendix E: References
  - 1. E.1. Normative references
  - 2. E.2. Informative references
- 22. <u>Appendix F: Element Index</u>
- 23. Appendix G: Attribute Index
  - 1. G.1. Regular attributes
  - 2. G.2. Presentation attributes
- 24. <u>Appendix H: Property Index</u>
- 25. Appendix I: IDL Index
- 26. Appendix J: Media Type Registration for image/svg+xml
  - 1. J.1. Introduction
  - 2. J.2. Registration of media type image/svg+xml
- 27. Appendix K: Changes from SVG 1.1
  - 1. K.1. Editorial changes
  - 2. K.2. Substantial changes
    - 1. K.2.1. Across the whole document
    - 2. K.2.2. Concepts chapter (SVG 1.1 only)
    - 3. K.2.3. Conformance Criteria chapter (Appendix in SVG 1.1)
    - 4. K.2.4. Rendering Model chapter
    - 5. K.2.5. Basic Data Types and Interfaces chapter
    - 6. K.2.6. Document Structure chapter
    - 7. K.2.7. Styling chapter
    - 8. K.2.8. Geometry Properties chapter (SVG 2 only)
    - 9. K.2.9. Coordinate Systems, Transformations and Units chapter
    - 10. K.2.10. Paths chapter
    - 11. K.2.11. Basic Shapes chapter
    - 12. K.2.12. Text chapter
    - 13. K.2.13. Embedded Content chapter (SVG 2 only)
    - 14. K.2.14. Painting chapter
    - 15. K.2.15. Color chapter (SVG 1.1 only)
    - 16. K.2.16. Paint Servers chapter (called Gradients and Patterns in SVG 1.1)
    - 17. K.2.17. Clipping, Masking and Compositing chapter (SVG 1.1 only)
    - 18. K.2.18. Filter Effects chapter (SVG 1.1 only)
    - 19. K.2.19. Scripting and Interactivity chapter (separate chapters in SVG 1.1)
    - 20. K.2.20. Linking chapter
    - 21. K.2.21. Scripting chapter (in SVG 1.1)
    - 22. K.2.22. Animation chapter (SVG 1.1 only)
    - 23. K.2.23. Fonts chapter (SVG 1.1 only)
    - 24. K.2.24. Metadata chapter (SVG 1.1 only)
    - 25. K.2.25. Backwards Compatibility chapter (SVG 1.1 only)
    - 26. K.2.26. Extensibility chapter (SVG 1.1 only)
    - 27. K.2.27. Document Type Definition appendix (SVG 1.1 only)

- 28. K.2.28. SVG Document Object Model (DOM)(SVG 1.1 Only)
- 29. K.2.29. IDL Definitions appendix
- 30. K.2.30. Java Language Binding appendix (SVG 1.1 only)
- 31. K.2.31. ECMAScript Language Binding appendix (SVG 1.1 only)
- 32. K.2.32. Implementation Notes appendix (was Implementation Requirements in SVG 1.1)
- 33. K.2.33. Accessibility Support appendix
- 34. K.2.34. Internationalization Support appendix (SVG 1.1 only)
- 35. K.2.35. Minimizing SVG File Sizes appendix (SVG 1.1 only)
- 36. K.2.36. Animating SVG Documents appendix (SVG 2 only)
- 37. <u>K.2.37. References appendix</u>
- 38. K.2.38. Elmenent, Attribute, and Property index appendices
- 39. K.2.39. IDL Index appendix (SVG 2 only)
- 40. K.2.40. Feature Strings (SVG 1.1 only)

# Acknowledgments

The SVG Working Group would like to thank the following people for contributing to this specification with patches or by participating in discussions that resulted in changes to the document: David Dailey, Eric Eastwood, Jarek Foksa, Daniel Holbert, Paul LeBeau, Robert Longson, Henri Manson, Ms2ger, Kari Pihkala, Philip Rogers, David Zbarsky.

In addition, the SVG Working Group would like to acknowledge the contributions of the editors and authors of the previous versions of SVG – as much of the text in this document derives from these earlier specifications – including:

- Patrick Dengler, Microsoft Corporation (Version 1.1 Second Edition)
- Jon Ferraiolo, ex Adobe Systems (Versions 1.0 and 1.1 First Edition; until 10 May 2006)
- Anthony Grasso, ex Canon Inc. (Version 1.1 Second Edition)
- Dean Jackson, ex W3C (Version 1.1 First Edition; until February 2007)
- 藤沢 淳 (FUJISAWA Jun), Canon Inc. (Version 1.1 First Edition)

Finally, the SVG Working Group would like to acknowledge the great many people outside of the SVG Working Group who help with the process of developing the SVG specifications. These people are too numerous to list individually. They include but are not limited to the early implementers of the SVG 1.0 and 1.1 languages (including viewers, authoring tools, and server-side transcoders), developers of SVG content, people who have contributed on the www-svg@w3.org and svg-developers@yahoogroups.com email lists, other Working Groups at the W3C, and the W3C Team. SVG 1.1 is truly a cooperative effort between the SVG Working Group, the rest of the W3C, and the public and benefits greatly from the pioneering work of early implementers and content developers, feedback from the public, and help from the W3C team.