

Aperio WebViewer

Programmer's Reference



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ImageServer is intended for use with the SVS file format (the native format for digital slides created by scanning glass slides with the ScanScope scanner). Educators will use Aperio software to view and modify digital slides in Composite WebSlide (CWS) format.

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Contact Information

Headquarters: Aperio Technologies, Inc.
 1430 Vantage Court
 Vista, CA 92081
 United States

European Office: Aperio
 3 The Sanctuary
 Eden Office Park
 Ham Green
 Bristol BS20 0DD, UK

United States of America

Tel: 866-478-4111 (toll free)

Fax: 760-539-1116

Customer Service Tel: 866-478-4111 (toll free)

Technical Support Tel: 866-478-4111 (toll free)

Email: support@aperio.com

Europe

Tel: +44 (0) 1275 375123

Fax: +44(0) 1275 373501

Customer Service Tel: +44 (0) 1275 375123

Technical Support Tel: +44 (0) 1275 375123

Email: europesupport@aperio.com

Aperio WebViewer Programmer's Reference

This document describes the Aperio WebViewer, and how it may be customized and/or linked or embedded into second- or third-party web pages. The WebViewer provides an HTML user interface which enables users with ordinary web browsers to view ScanScope virtual slides. The pages generated by the WebViewer access virtual slides using the Aperio ImageServer.

The WebViewer is integrated into ImageServer and uses the APMML template facility¹. This makes it easy to customize WebViewer pages².

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Installation of WebViewer

WebViewer is provided as a standard InstallShield self-installing executable. Aperio ImageServer is required as a prerequisite for the installation. The installation process creates a directory named **C:\Program Files\ScanScope\ImageServer\apml**, which contains APMML templates, and **C:\Program Files\ScanScope ImageServer\html**, which contains HTML files, images, and a Flash viewer application.

To test the Aperio Web Viewer installation, access the following URL from any web browser:

<http://www.your-server.com/>

In some cases you may have ImageServer configured to use a port number other than 80. In this case access the following URL:

<http://www.your-server.com:port/>

¹ The Aperio Markup Language (APML) is documented separately, in the *Aperio Markup Language (APML) Programmer's Reference*.

² As of Aperio release 6, WebViewer *does not* require an external webserver such as Microsoft IIS and *does not* require Korn shell scripts. Additionally, WebViewer now uses *the same port* as ImageServer, so only one port is required for viewing digital slides on the Internet with a web browser.

This should load the WebViewer, and you should see the “top level” of images from the ImageServer machine.

Customizing WebViewer

The WebViewer makes uses of APMML template files. These are text files which use a simple language for substituting information into HTML pages. A detailed description of APMML template processing is part of the Aperio ImageServer documentation³. This documentation describes the *dictionaries* created by ImageServer which contain information for directories and image files.

The WebViewer consists of the following templates:

view.apml	default viewer for directories and image files
header.apml	generates page header for all pages
headscript.apml	contains inner logic of header.apml
footer.apml	generates page footer for all pages
error.apml	formats page displaying error messages
dir.apml	formats directory display
file.apml	formats file display; contains digital slide viewer
fileinfo.apml	formats file information page
bookmark.apml	displays bookmark link from within file display
is.apml	displays page when SIS link but no ImageScope
is.sis	template to generate SIS files (see below)
rss.xml	template to generate RSS feeds (see below)

Any of these templates may be customized and reformatted. Aperio suggests the original templates be saved for comparison purposes and in case of problems. Page header generation is split between **header.apml** and **headscript.apml** to make it easy to customize **header.apml** and leave the header generation logic of **headscript.apml** as is.

In addition, you may create other templates which may be used to display directory or file information. APMML template processing is initiated from any standard web browser by entering URLs which have the form **directory/template.apml**. For example:

```
http://www.mysite.com/images/view.apml
```

In this example **www.mysite.com** is the domain name of ImageServer, and **/images** is a directory path (relative to the “base” directory for ImageServer, specified by the **-dir** command-line parameter). The dictionary will be filled with information for the **/images** directory and then the template **view.apml** is processed. The generated HTML will be the output of the request.

Here's another example:

```
http://www.mysite.com:82/images/my_digital_slide.svs/my_viewer.apml
```

³ Aperio ImageServer is documented separately; please see the *Aperio ImageServer Programmer's Reference*.

In this example **www.mysite.com** is the domain name of the machine running ImageServer, and **82** is the port number⁴. The file **my_digital_slide.svs** is a digital slide in the **/my_images** directory. The dictionary is filled with information for the **my_digital_slide.svs** image, and then the template **my_viewer.apml** is processed; the generated HTML is the output of the request.

Note: All APML templates and HTML files are cached by ImageServer for performance. To clear the cache, use the RESET command (e.g. while creating and testing templates).

Linking to WebViewer Slide Views

WebViewer pages may be linked from any other web pages in the usual web fashion, simply by copying the URL of a particular “view” from the Location: in a web browser window and creating a link on another page using that URL.

It may be desirable to link to a *particular* view of a particular virtual slide. There are three parameters which determine a particular view – the X coordinate within the slide (horizontal), the Y coordinate within the slide (vertical), and the zoom level. These parameters may be added to any virtual slide view URL as follows:

`http://www.myserver.com/path/slide.svs/view.apml?X=&Y=&zoom=...`

The **X=** parameter specifies the X coordinate, and the **Y=** parameter specifies the Y coordinate. These values position the *center* of the view relative to the entire virtual slide. The center of the slide is X=0.0, Y=0.0. The upper left corner of the slide is X=0.5, Y=0.5, and the lower right corner of the slide is X=-0.5, Y=-0.5.

The **zoom= parameter** specifies the zoom percentage as a decimal number. Zoom=100.0 sets the view to the full resolution of the slide. Zoom=50.0 is 50% zoomed out, or ½ the resolution. A value of zoom=-1 means set the zoom so the entire virtual slide exactly fits in the view area. The viewer supports zoom levels beyond 100%, e.g., zoom=200.0 zooms in beyond the full resolution of the slide.

⁴ Previous to release 6 the Aperio WebViewer required two port numbers, one for a webserver such as Microsoft IIS, and one for Aperio ImageServer. Customers often used port 82 for ImageServer. As of release 6 Aperio WebViewer uses the APML template facility of ImageServer and only one port is required.

The following parameters may be specified on a WebViewer URL:

X	- X-coordinate of initial view (default = 0.0)
Y	- Y-coordinate of initial view (default = 0.0)
zoom	- zoom level of initial view (as %, default = -1)
toolbar	- 0/1 – whether to display toolbar (default = 1)
navwindow	- 0/1 – whether to display navigation window (default = 1)
slider	- 0/1 – whether to display zoom slider (default = 1)
checkmark	- 0/1 – whether to display check icon in toolbar
checkurl	- URL for page opened when check icon in toolbar clicked
returnurl	- URL for return from display (default = none)
logo	- HTML for display of image logo (default = none)

Creating WebViewer Links Automatically (“Bookmarks”)

The WebViewer can be used to create links to WebViewer slide views automatically. When a digital slide is displayed in the WebViewer, the viewer toolbar includes a checkmark icon. Clicking on the checkmark opens a new window which displays a WebViewer link. This is a link constructed automatically to the exact view (position and zoom level) of the currently displayed slide. The link can be included in web pages, sent via email, etc.

Displaying Image Annotations as Bookmarks

Digital slides may be *annotated* using the ImageScope viewer. (ImageScope is a FREE download from the Aperio website at <http://www.aperio.com/download>). Annotations are organized as one or more *regions* within one or more *layers*. Each annotation layer may be manually authored or may be the output of an algorithm. Regions can be rectangles, polygons (with any number of vertices), ellipses, arrows, or rulers. Annotations are stored in an XML format (see ImageServer documentation for details).

When an image is displayed in the WebViewer which has previously had annotations authored, WebViewer modifies the display of the slide in two ways. First, a column at the right displays a menu of all defined annotations, organized as regions within layers. Second, a table below the slide display gives all *attributes* for the currently selected layer or regions. Clicking on the name of a layer or region in the annotation menu causes the corresponding area of the slide to be displayed in the viewer, and the corresponding attributes to be displayed below it. Buttons at the top of the annotations menu enable users easily to select the next or previous region, or the first or last region. A checkbox at the top of the menu enables the user to HIDE all annotation areas, restoring the whole web page for display of the digital slide. After this is done, a small checkbox at the right edge of the page enables the user to SHOW annotations again.

The combination of annotations and WebViewer easily enables you to construct a “tour” through a digital slide. As users select each [previously annotated] region, corresponding descriptive text can be displayed.

Including WebViewer Slide Views in Web Pages

The WebViewer may easily be included in second- or third-party web pages. The following HTML should be included in a web page:

```
<OBJECT CLASSID='clsid:D27CDB6E-AE6D-11cf-96B8-444553540000'
        CODEBASE='http://download.macromedia.com/pub/shockwave/cabs/flash/swflash.cab#
        version=6,0,40,0'
        WIDTH=&width HEIGHT=&height ID='theMovie'>
<PARAM NAME='FlashVars' VALUE='&parms'>
<PARAM NAME='src' VALUE='/html/awv.swf'>
<EMBED SRC='/html/awv.swf'
        FlashVars=&parms
        PLUGINSFAGE='http://www.macromedia.com/shockwave/download/index.cgi?
        P1_Prod_Version=ShockwaveFlash'
        WIDTH=&width HEIGHT=&height NAME='theMovie'>
</EMBED>
</OBJECT>
```

The following substitutions in the HTML should be made:

- &width - width of the viewing area in pixels
- &height - height of the viewing area in pixels
- &parms - a parameter string containing values passed into the viewer. Each parameter has the form **name=value**, and parameters are separated by an ampersand character.

Here are the valid parameter values:

- awvByteHandlerPath - the path to ImageServer (may be left blank for default)
- awvImagePath - the path to the virtual slide, passed to ImageServer
- awvX - X-coordinate of initial view (default = 0.0)
- awvY - Y-coordinate of initial view (default = 0.0)
- awvZoom - zoom level of initial view (default = 100.0)
- awvToolbar - 0 or 1, whether to display toolbar (default = 1)
- awvSlider - 0 or 1, whether to display slider (default = 1)
- awvNavWindow - 0 or 1, whether to display navigation window (default = 0)
- awvNavX - X-offset of thumbnail window (in pixels, default = 0)
- awvNavY - Y-offset of thumbnail window (in pixels, default = 0)
- awvNavWidth - width of thumbnail window (in pixels)
- awvNavHeight - height of thumbnail window (in pixels)
- awvGetURLBtn - 0 or 1, whether to display checkmark on toolbar
- awvGetURLBtnURL - URL loaded when checkmark on toolbar is clicked

Creating Syndication “Feeds” Using RSS

RSS is a standard way of creating a “table of contents” for a website. (RSS stands for “really simple syndication.”) Programs called RSS readers or [sometimes] feed readers display the table of contents. Some popular web browsers like Firefox have RSS support built in, and there are many free and commercial programs available⁵.

Using RSS enables you to easily tell when a website has changed, and to see the pages or items on the website which are new or modified. WebViewer enables an RSS feed to be created for any directory or image file served by ImageServer. Directories have feeds with an item for each file in the directory. Image files have a single item for the file.

RSS readers allow users to “subscribe” to a particular feed. This gives the user easy access to every item in the feed. It also alerts the user every time the feed has changed. So as new images are added into a directory, they automatically appear in the user's feed reader.

RSS feeds are generated by appending “/rss.xml” to the ImageServer path for a directory or file:

```
http://www.mysite.com/images/rss.xml  
http://www.mysite.com/images/myimage.svs/rss.xml
```

The first example above shows the URL for an RSS feed for the /images directory. The second example shows the URL for an RSS feed for the myimage.svs file located in the /images directory.

Linking to Aperio ImageScope – SIS Files

Aperio has two ways to view Virtual Slides—the WebViewer, which is Flash-based and integrates into web pages, or ImageScope, which is a FREE Windows desktop program (downloadable from www.aperio.com/download). Each way has advantages. The WebViewer is cross-platform, and users can view slides without any downloads or installations. ImageScope is faster and has many features which WebViewer does not have, including annotation authoring, the ability to view multiple slides at once, image color/gamma adjustment, etc. However ImageScope does require that users download and install software.

When you visit a gallery of slides online, such as Aperio's slide gallery or the galleries at <http://www.scanscope.com>, you will notice images are displayed with a dark green link labeled **(open with ImageScope)**. Clicking these links causes ImageScope to be launched on your desktop to view the associated slide.

⁵ There are many online resources which explain what RSS is and how it can be used. Just enter “what is RSS” into your favorite search engine.

In case you're wondering how this works, here's the magic. ImageScope supports a kind of file—a .SIS file—which is a text file that lists one or more images to be opened. This file functions like a pointer. If you open ImageScope with a SIS file it simply opens each of the files listed in the file. (SIS stands for "ScanScope Image Set.")

There are [at least] two use cases for SIS files. The first is they make it easy to create web links for ImageScope. To link to a Virtual Slide, you create a SIS file that contains the Virtual Slide's path and link that on your website. When someone clicks the link it causes the SIS file to be downloaded, Windows opens the application associated with the file (ImageScope), and then ImageScope opens the image. This works nicely because SIS files are so small.

It is possible to link directly to Virtual Slides—the SVS files—but this causes the entire file to be downloaded into a local directory, and then ImageScope is launched. It will work on a local network—although not well!—however it won't work on a wide-area network at all.

The same "indirect file" technique used by ImageScope with SIS files is used by Windows MediaPlayer and RealPlayer to point to streaming movies.

The other use case for SIS files is when there are multiple images associated with a case. Each case can have a single SIS file associated with it that lists all the virtual slides for the case. Opening the SIS file causes ImageScope to open all the virtual slides for the case at once.

Creating SIS File Links Automatically ("Bookmarks")

The WebViewer can be used to create links to ImageScope slide views automatically. When a digital slide is displayed in the WebViewer, the viewer toolbar includes a checkmark icon. Clicking on the checkmark opens a new window which displays an ImageScope link. This is a link constructed automatically to the exact view (position and zoom level) of the currently displayed slide. The link can be included in web pages, sent via email, etc.

SIS File Format

SIS files are small XML files. They have the following format:

```
<SIS version="1.0">
  <Image>
    <URL>path</URL>
    <X>initial X offset</X>
    <Y>initial Y offset</Y>
    <Zoom>initial zoom value</Zoom>
  </Image>
  <Image>
    ... another image, if desired ...
  </Image>
</SIS>
```

There can be one or multiple **<Image>** tags in a file, in which case multiple images are specified. Each image's **<URL>** may be specified as one of the following:

```
C:/directory_path/file.ext
    - Windows file (only useful locally)
\\server\directory_path\file.ext
    - path to file on Windows network share (backward slashes)
//domain/directory_path/file.ext
    - path to file on remote ImageServer (forward slashes)
```

The last format is the one typically used on a website.

The **<X>**, **<Y>**, and **<Zoom>** parameters are optional; if not specified, the image will be centered and opened with ImageScope's default zoom value. The *initial X offset* and *initial Y offset* specify the coordinates of the *center* of the image, and are relative to the upper left corner of the image, with X running across and Y running down. These offsets are given in pixels relative to the base zoom level of the image. The *initial zoom value* specifies the magnification of the image, a value of 1.0 means 100% (full resolution), a value of .25 means 25% (1/16th resolution). It is possible to specify values greater than 1.0 to zoom in "beyond" full resolution.

One final note—it isn't always necessary to actually create the SIS files; the SIS data can also be generated programmatically. For example, the WebViewer generates the SIS data dynamically with an APMML template named **is.sis**. This enables ImageScope to be launched for any file served by ImageServer with a URL of the form:

```
http://www.mysite.com/path/image.svs/is.sis
```


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