

Web Map Service (WMS) Introduction **for Science On a Sphere®**

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Overview

WMS was created by the Open Geospatial Consortium (OGC) to “provide a simple HTTP interface for requesting geo-registered map images from one or more distributed geospatial databases.” To translate: WMS allows users to type special kind of URL, called a WMS request, into their browser. This request gets sent to a WMS server, which is essentially a computer that stores a lot of maps. The server sends a map back to the user, in the format specified by the request.

WMS Servers For some places to start, take a look at the following WMS servers. This is not a comprehensive list by any means.

- http://nationalatlas.gov/infodocs/wms_intro.html#table1 This site lists several maps that show factors such as population, climate, environment, borders, etc.
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How Does It Work, Exactly?

WMS requests are made up of the address of the server the request is being sent to and a series of parameters. There are two types of request that are required for any WMS request: GetMap and GetCapabilities. Although GetCapabilities is usually the first request sent, it’s simpler than GetMap and not always required, so it’s explained later. A GetMap request is diagrammed below, broken down into its components. (The request has been broken into three lines, but it’s just one request.) GetCapabilities requests can be created by inserting the word “GetCapabilities” in place of “GetMap” in the “REQUEST=” parameter (section 4). (No other parameters need to be specified. For example, <http://neowms.sci.gsfc.nasa.gov/wms/wms?version=1.3.0&service=WMS&REQUEST=GetCapabilities> is a valid GetCapabilities request). Color definitions are as follows:

Server Address (will be provided in every WMS request you find)

Ends the server address. Everything after this is a parameter.

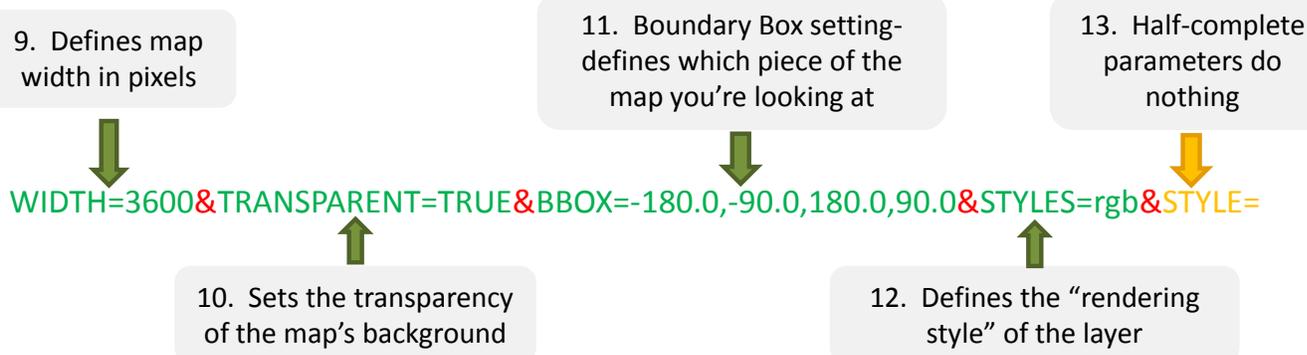
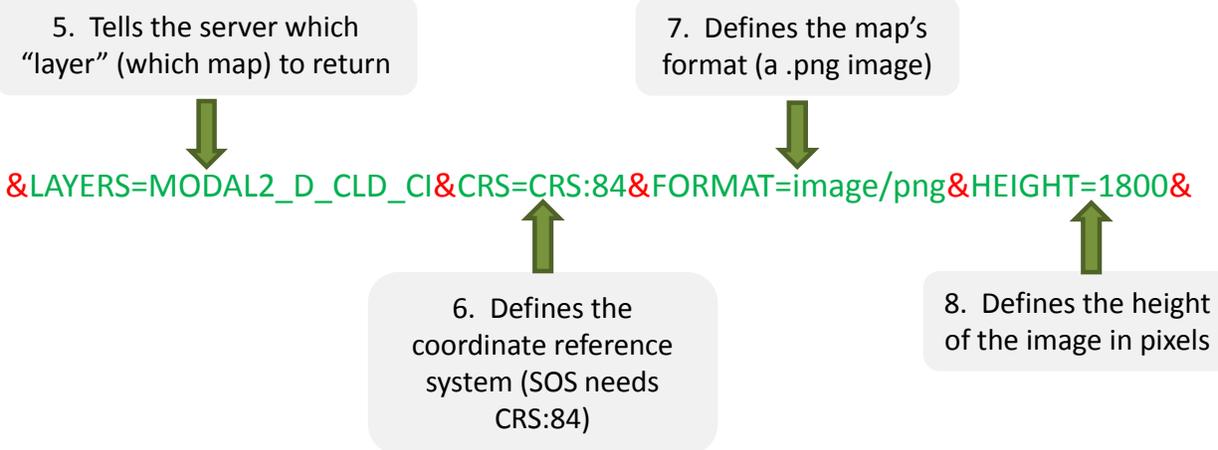
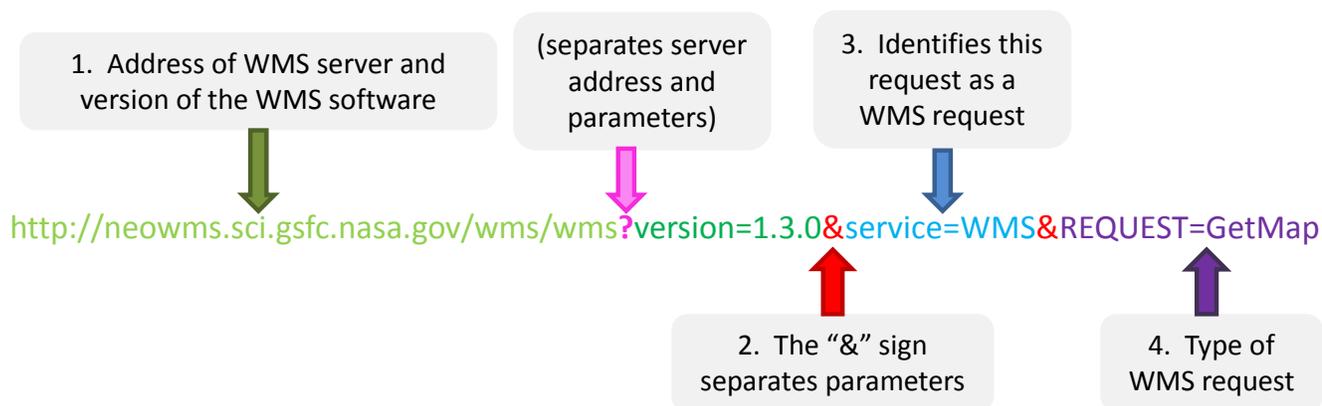
Separates statements/parameters

Defines this string of letters as a WMS request

Defines the type of WMS request

Additional Parameters

Incomplete Parameter



Additional notes for various sections are organized by the section's number below:

1. To find a WMS server in the first place, simply google “WMS server” or see the list of servers provided in the “WMS Servers” section of this tutorial.
4. This is the parameter that defines the WMS request. There are five types of WMS request, two of which are required for any WMS server: GetCapabilities and GetMap. Usually, a GetCapabilities request is sent first. Instead of returning a map to this request, the server returns a document (which appears in the browser) that contains the details of the maps available. Once those details are known, constructing the GetMap request is easy. The other types of request are described on the Wikipedia page for WMS (http://en.wikipedia.org/wiki/Web_Map_Service#Requests), and are usually not required for creating SOS content.
5. Map layers can be found by using a GetCapabilities request. The “layer” is the version of the map that you want.
8. SOS prefers if users use the keyword <IMAGE_HEIGHT> to define the parameter HEIGHT, like this: “HEIGHT=<IMAGE_HEIGHT>”.
9. SOS prefers if users use the keyword <IMAGE_WIDTH> to define the parameter WIDTH, like this: “WIDTH=<IMAGE_WIDTH>”.
11. A bounding box defines what part of the map you're looking at. It's defined by four coordinates, which have to be in the correct order and must be in degrees. For a world map, the coordinates shown above will show the complete map. However, the SOS team prefers if users use the parameter <BOUNDING_BOX> to define BBOX, like this: “BBOX=<BOUNDING_BOX>”. This will always give the full map.

How to Use an Existing GetMap Request

If you have an existing GetMap request already, chances are you'll have to check a few things and change a few others. The three changes that are required, minimum, are below:

1. After the HEIGHT= parameter, change whatever number is there to <IMAGE_HEIGHT>, spelled and capitalized exactly like that.
2. After the WIDTH= parameter, change the number to <IMAGE_WIDTH>.
3. After the BBOX parameter, change whatever numbers are there to <BOUNDING_BOX>.

These changes are required for the SOS system, but they won't work in a browser, because the keywords such as <IMAGE_HEIGHT> were created by the SOS team, not the designers of WMS.

You should also check a few of the parameters to make sure they're compatible with the SOS format.

1. CRS should equal CRS:84 or EPSG:4326. This parameter can't be changed, so if it isn't correct, you'll need to find a different WMS server **Is that right?**
2. FORMAT should equal image/png, image/jpeg, or another SOS-supported image format.

If these parameters are correct, you're good to go! See the "How to Display WMS Data on the Sphere" section to proceed.

GetCapabilities Requests

A GetCapabilities request will return an XML (Extensible Markup Language) document. If you aren't familiar with markup languages, you can find more information on them here: http://en.wikipedia.org/wiki/Markup_language. However, all you really need to know is that markup languages organize information by enclosing it with tags that describe what type of information it is. For example, to designate a title, an XML document will have the Title tags enclosing the actual title, like this: <TITLE> Title of Map </TITLE>. Tags have an opening tag and a closing tag- the closing tag has a backslash in front of the word, inside the brackets.

How to Find Relevant Information in a GetCapabilities Request

The information you need from a GetCapabilities request is the name of the map layer, the CRS, and the formats available. To find the layer, you need to look for the <Layer> tag, followed by a <Name> tag instead of a <Title> tag. Layers don't always contain maps; sometimes they contain metadata about the map instead. Usually, layers with maps will have the <Name> tag directly following the <Layer> tag, like this:

```
<Layer>  
  <Name> MOD14A1_E_FIRE </Name>
```

You might not be able to determine which layer you want at first sight, just by looking at the tags containing information about the layer- in that case, simply try them out until you find one. See the next section for an explanation of how to do so. Similarly, to find the CRS, look for the tag <CRS>, and to find the format of a particular server, search for <Format>. As long as there is a format tag that contains the words image/jpg or image/png, SOS can use the map. However, the CRS must be CRS:84. You can do a simple word search in Windows by pressing Ctrl+F, which will bring up a little search box. Type in the tag you're looking for, then use the up and down arrow keys to find multiple occurrences of your search term.

How to Create a GetMap Request

Once you've found the necessary information in the GetCapabilities page, you can start constructing your GetMap request. You'll want to test your request in your browser before trying to put it onto the sphere, but some formats will have to be changed, as explained later. To make the request, keep everything up to the word GetCapabilities in your previous GetCapabilities request, then replace the word GetCapabilities with GetMap. This will change the request type. If you don't already have parameters after your request, you'll need to create them now, or modify them if you do have them. The parameters you need to create an SOS-ready WMS request are below. If SOS requires a particular value, it has been filled in— however, not all of SOS's requirements can be used in a browser. The keywords <IMAGE_HEIGHT>, <IMAGE_WIDTH>, and <BOUNDING_BOX> are in brackets not because they are XML tags, but because the SOS team (who

created them) gave them that format to distinguish them from ordinary WMS parameters. The SOS software is the only thing that recognizes them. If you use them in a browser, you'll get an error. Instead, fill in 1800 for HEIGHT and 3600 for WIDTH, and "-180, -90, 180, 90" for BBOX if you're testing your map in a browser.

1. LAYERS equals the layer name you found using GetCapabilities
2. CRS=CRS:84
3. FORMAT=image/png or FORMAT=image/jpg
4. HEIGHT=<IMAGE_HEIGHT>*
5. WIDTH=<IMAGE_WIDTH>*
6. TRANSPARENT can equal TRUE or FALSE
7. BBOX=<BOUNDING_BOX>*
8. STYLES usually equals "rgb."

Separate the parameters with "&" signs. Please note that spelling and capitalization have to be exactly as shown here. When you're done, your request should look something like this for a browser:

http://neowms.sci.gsfc.nasa.gov/wms/wms?version=1.3.0&service=WMS&REQUEST=GetMap&LAYERS=MODAL2_D_CLD_CI&CRS=CRS:84&FORMAT=image/png&HEIGHT=1800&WIDTH=3600&TRANSPARENT=TRUE&BBOX=-180.0,-90.0,180.0,90.0&STYLES=rgb

And something like this for SOS:

http://neowms.sci.gsfc.nasa.gov/wms/wms?version=1.3.0&service=WMS&REQUEST=GetMap&LAYERS=MODAL2_D_CLD_CI&CRS=CRS:84&FORMAT=image/png&HEIGHT=<IMAGE_HEIGHT>&WIDTH=<IMAGE_WIDTH>&TRANSPARENT=TRUE&BBOX=<BOUNDING_BOX>&STYLES=rgb

Note how HEIGHT, WIDTH, and BBOX have been changed.

How to Display WMS Data on the Sphere

Displaying WMS data is the same as displaying anything else- you'll need to create a playlist.sos file (instructions may be found here:

www.sos.noaa.gov/Docs/SOSContentGuidelines.pdf). Use the layerdata tag to

specify your WMS request. To tell the SOS software that the URL you're giving it is a WMS request, add "//WMS//" right before the request, without spaces. Your tag should look like this:

```
layerdata="//WMS//http://neowms.sci.gsfc.nasa.gov/wms/wms?version=1.3.0&service=WMS&REQUEST=GetMap&LAYERS=MODAL2_D_CLD_CI&CRS=CRS:84&FORMAT=image/png&HEIGHT=<IMAGE_HEIGHT>&WIDTH=<IMAGE_WIDTH>&TRANSPARENT=TRUE&BBOX=<BOUNDING_BOX>&STYLES=rgb
```

Make sure the rest of your playlist.sos file is in order, and you should be good to go.