**How to consume COD Services**

Updated 15 November 2021 to add ArcGIS Pro instructions

***Overview***

ITOS is serving map and feature services of OCHA's Common Operational Datasets, specifically, populated places and administrative boundaries. These services are designed to work as base layers in cartographic products and applications. The services focus on providing easy access to names and pcodes.

For those who are familiar with how to consume services, the links in this rest catalogue will allow you to consume the data in your platform of choice:
http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External

The COD services are developed and deployed by country. Each country has:

1. Map Services intended as a simple base map for the country showing administrative units and their name, and populated places and their name symbolized by rank. The map services have ESRI Map, ESRI Feature, KML and WMS endpoints. The country map services have features that turn off an on at different scales. This service is primarily used for consuming basemaps in ESRI, Google Earth (as image overlays), and OGC clients, and for data processing in ESRI clients.
2. Feature Services stream features from the administrative units and populated places COD data to the client. These feature services allow Prousers to manipulate data in their desktop as if it were locally loaded: they can change symbology, perform geoprocessing tasks, and manipulate the base layer maps. Be very careful - the feature and WFS services should not be used for subset or data extraction. For cartographic reasons, the WFS and ESRI feature services have definition queries that restrict some of the data records (removes them from the service). If users want a copy of the data, they can get them from the WAF or the pcode service (using the API to extract features against the mapservice as geoJson), download them from dropbox or HDX. If there is a usecase for needing all datasets via a feature service let ITOS know and they will enable one on a region by region basis.
3. The feature services have ESRI Map, ESRI Feature, KML, and OGC WMS and WFS endpoints. These services are also known as 'pcode' services. The services provide pcode labels intended to be used in conjunction with the country map service described in (1) above. The pcode labels are either off or on, and do not appear and disappear at different scales. This service is primarily used for feature access via WFS,

KMZ (via network overlays), and pcode labels for either OGC or ESRI clients.

There is one map service and one feature service for each language in the country's database, and one pcode service per country. For example, for the Iraqi services, there is one Map Service and one Feature service in English, one Map Service and one Feature service in Arabic, and one MapService (with a WFS endpoint) for pcodes.

- COD_External/COL_pcode (MapServer)
- COD_External/IRQ_AR (FeatureServer)
- COD_External/IRQ_AR (MapServer)
- COD_External/IRQ_EN (FeatureServer)
- COD_External/IRQ_EN (MapServer)
- COD_External/IRQ_pcode (MapServer)
- COD_External/JOR_EN (FeatureServer)

When you use either the ESRI feature service or the WFS, you will get all data for the country, including data that may not be in the base map. For example, in Colombia, we have an urban areas feature class that isn't in the basemap. You have access to it via ESRI Feature and WFS services. This table gives a snapshot of the services and their intended use:

Minimum of 3, and up to 5 services per country (with multiple endpoints).

| **Service Type** | **Examples** | **Endpoints** | **Description** |
|---|---|---|---|
| FeatureServer | COD_External/IRQ_AR (FeatureServer)<br><br>COD_External/IRQ_EN (FeatureServer) | ESRI Map, ESRI Feature | Intended as base map and feature extraction for ESRI clients (available in 1-2 languages). |
| MapServer | COD_External/IRQ_AR (MapServer)<br><br>COD_External/IRQ_EN (MapServer) | ESRI Map, WMS, KML Image overlay (recommended) | Intended as base map for ESRI or OGC clients (available in 1-2 languages). Name labels only |
| MapServer | COD_External/IRQ_pcode (MapServer) | ESRI Map, WMS, WFS, KML Image overlay (not recommended), KML | Intended as a labelling layer for PCODES for all clients, and feature extraction for OGC |

| | | | |
|---|---|---|---|
| | | Network Link (recommended) | clients. All countries get a single pcode service |

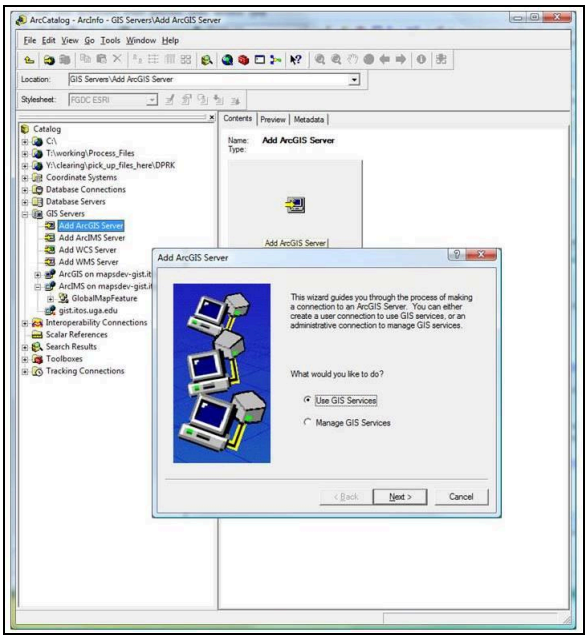
Below are step-by-step instructions on how to consume COD services in various clients.

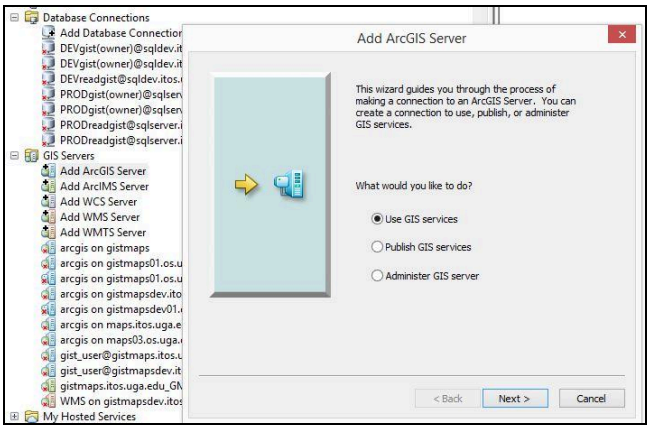
***ESRI Clients***

**ArcGIS Desktop**

**(Steps 1 and 2 are a one-time process that will enable ITOS live services as needed and as they become available. Steps 3 and 4 are required per use in ArcMap.)**

1. Open ArcCatalog, expand the 'GIS Servers' tree and double-click 'Add ArcGIS Server'.

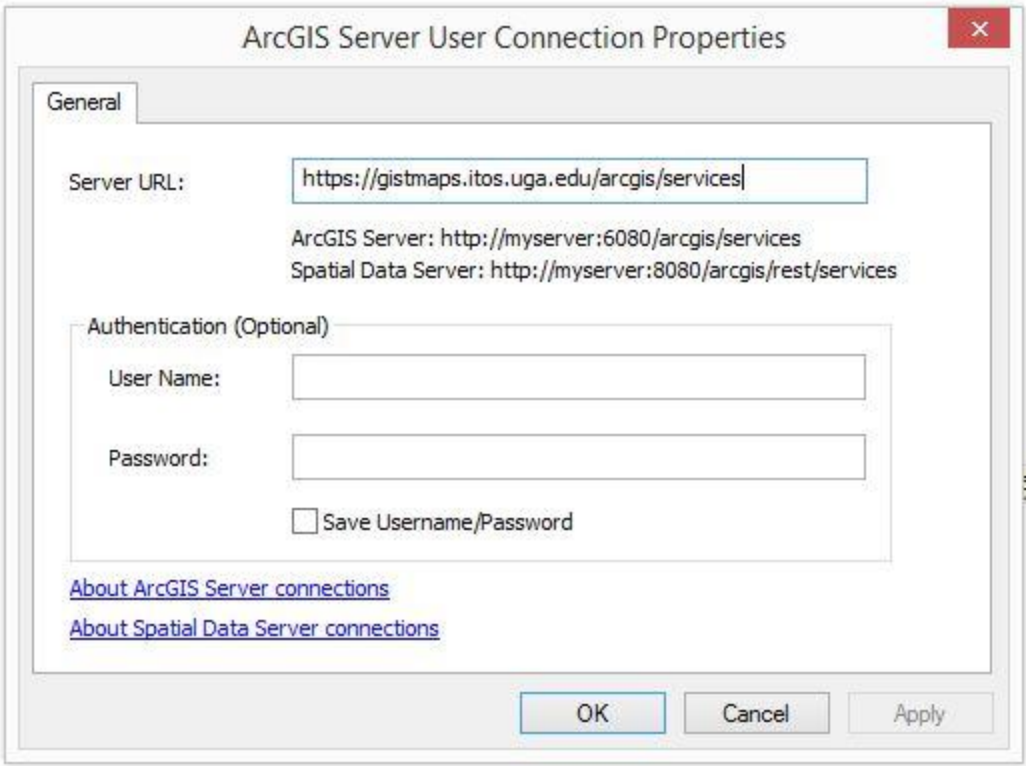


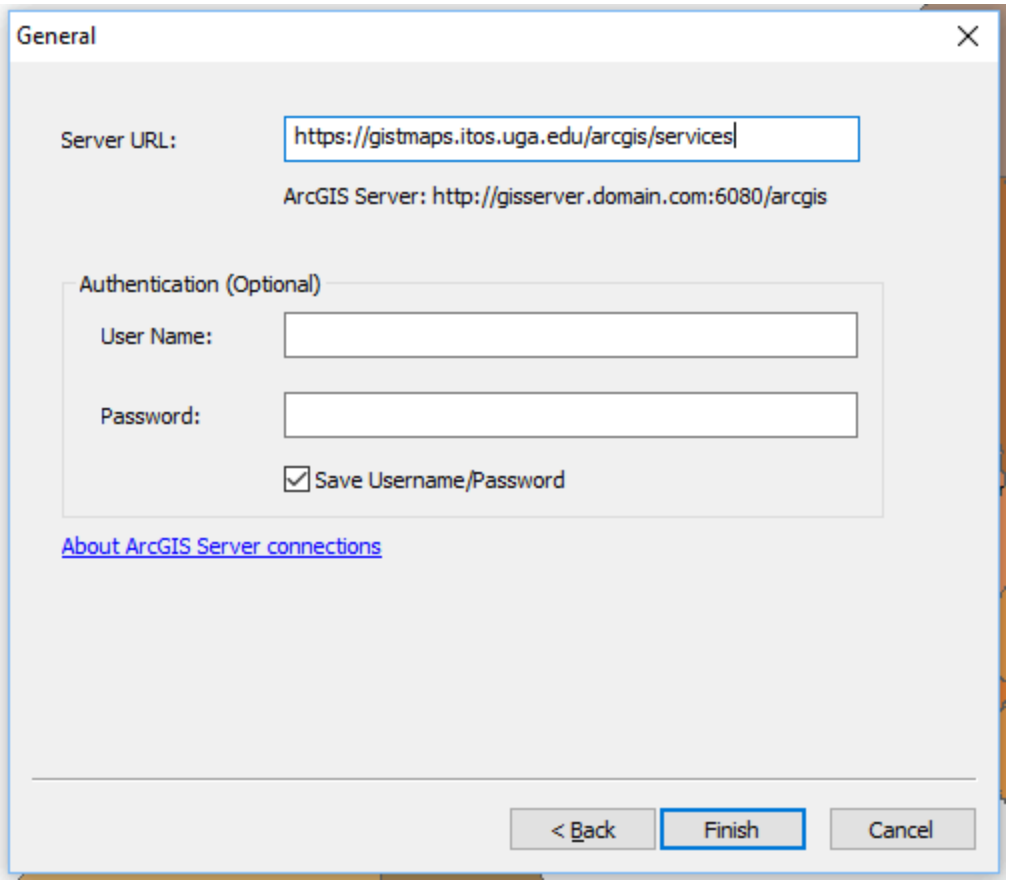

9.X Client Interface 10.X Client Interface

- select 'Use GIS Services' option, and click Next >
- Enter the location of the service: https://gistmaps.itos.uga.edu/arcgis/services. The services are open so you don't need to add Authentication. Click 'OK' (ArcGIS 9.x) / 'Finish'

(ArcGIS 10.x).

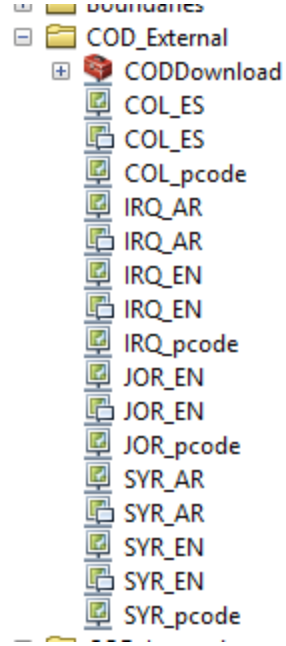



At 10.3 the interface will look like:




**The following steps are needed each time you want to render live services**

3. Navigate to **GIS Servers > arcgis on gistmaps.itos.uga.edu (user)** and expand '**COD External'** for current versions, or **'V00_0'** for previous versions and you will see a list of map and geoprocessing services.




You should see a service for each language in the COD dataset, most commonly English, Spanish, Arabic or French.

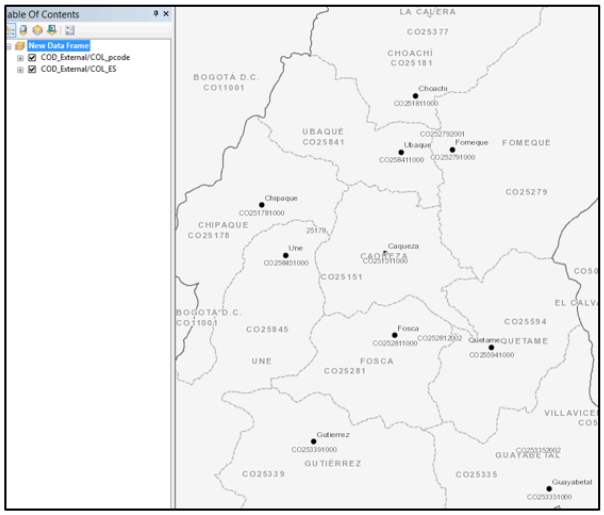
4. Choose a map or feature service and drag it into your ArcMap Table of Contents. 9.x clients do not have the option to use feature services - these are only be available to 10.x clients.


Map services are intended as base maps. You can zoom in and out, query layers and overlay other datasets. Labels will turn on and off at different scales. The pcode service provides pcode labels for populated places and administrative boundaries and are intended to be used in conjunction with the country base map services. While the base map services have features that turn off and on at different scales the pcode labels are either off or on. To use them, you should pan and zoom to your area of interest, then turn them on. To see this, load the COL_ES and COL_pcode ESRI ***map*** services:

Load Colombia Base Map Service

Zoom to see basemap features and labels


Add and enable PCODE label service



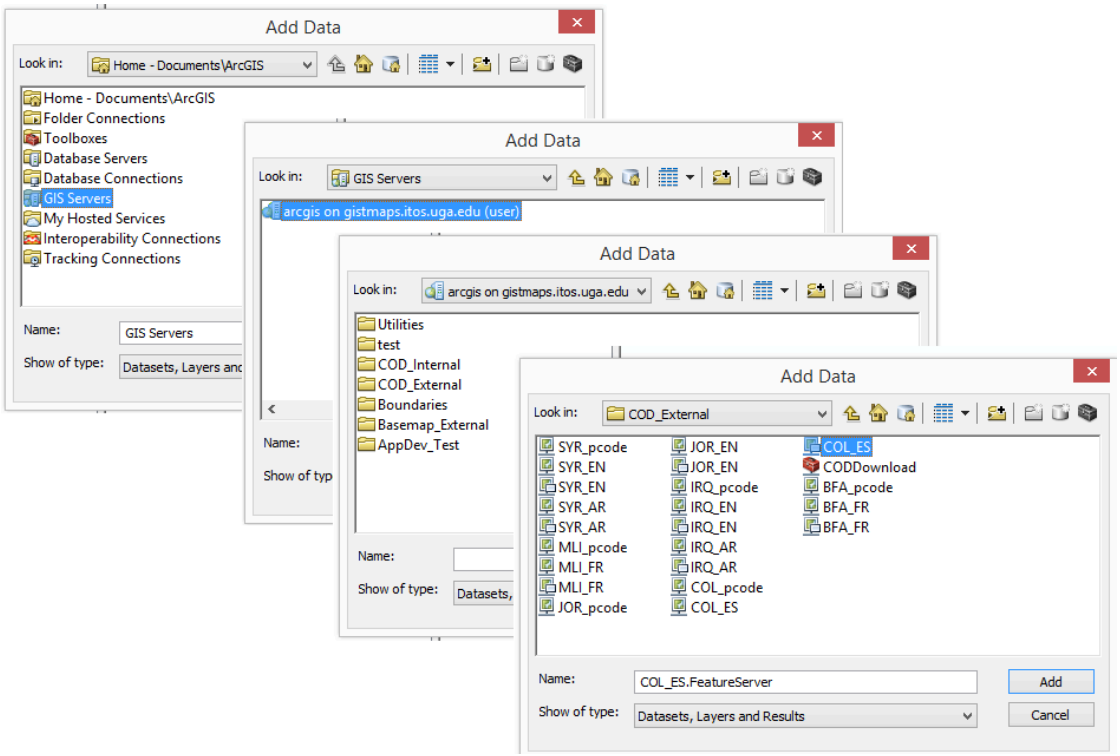

You'll notice that the labels for the pcodes are the same font as the name of the feature they are labelling (pcode labels for admin1 boundaries look the same as name labels for admin1 boundaries; pcode labels for populated places look the same as name labels for populated places, etc). Pcode labels for populated places are always placed below the point they are labeling, while the names usually appear in to the upper right of the point.

Feature services are very similar to old ArcIMS services. They are bandwidth heavy because the features are streamed automatically to your desktop, allowing users to have very similar types of control that they would have with data hosted on a local machine. Specifically, users have:

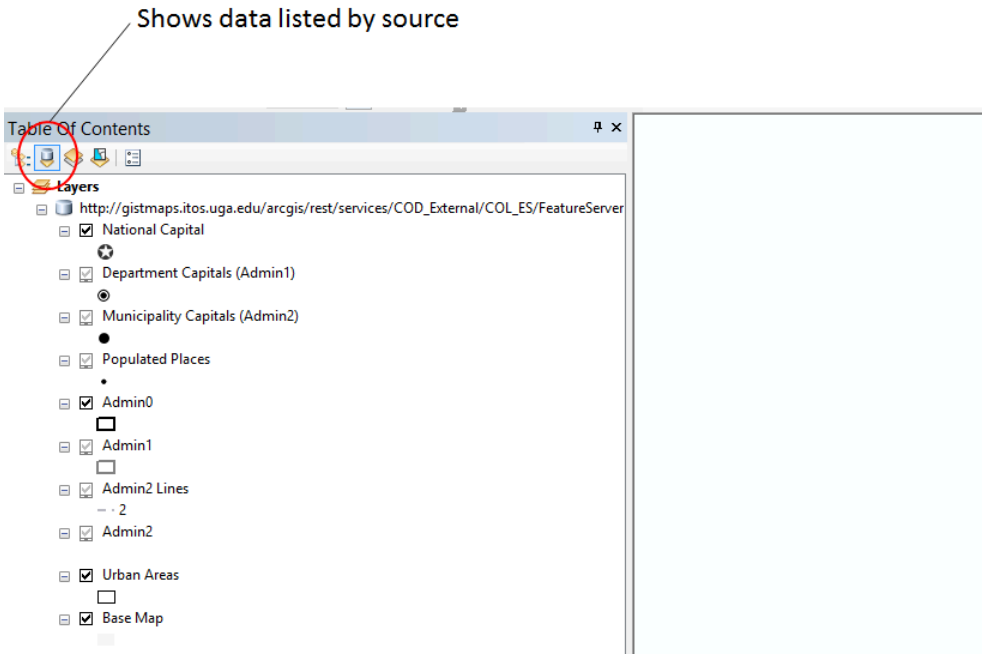
1. control over the order of feature layers in the Table of Contents and can set scale ranges for drawing and labeling
2. full featured symbology control
3. properties control, for example users may set definition queries
4. attribute table control: opening, viewing, manipulation. They don't have to identify/find on single feature but can query the entire database, create complex selections (select from set, remove from set) and zoom to selected features
5. the ability to convert features to graphics
6. simple geoprocessing functionality like buffering. One small bug with buffering– in theory you should be able to buffer only selected features but it appears to buffer all features. To work around this you can either buffer on a layer with a

definition query or download the data and then buffer.  To download: right click on data layer and choose Data->export data.

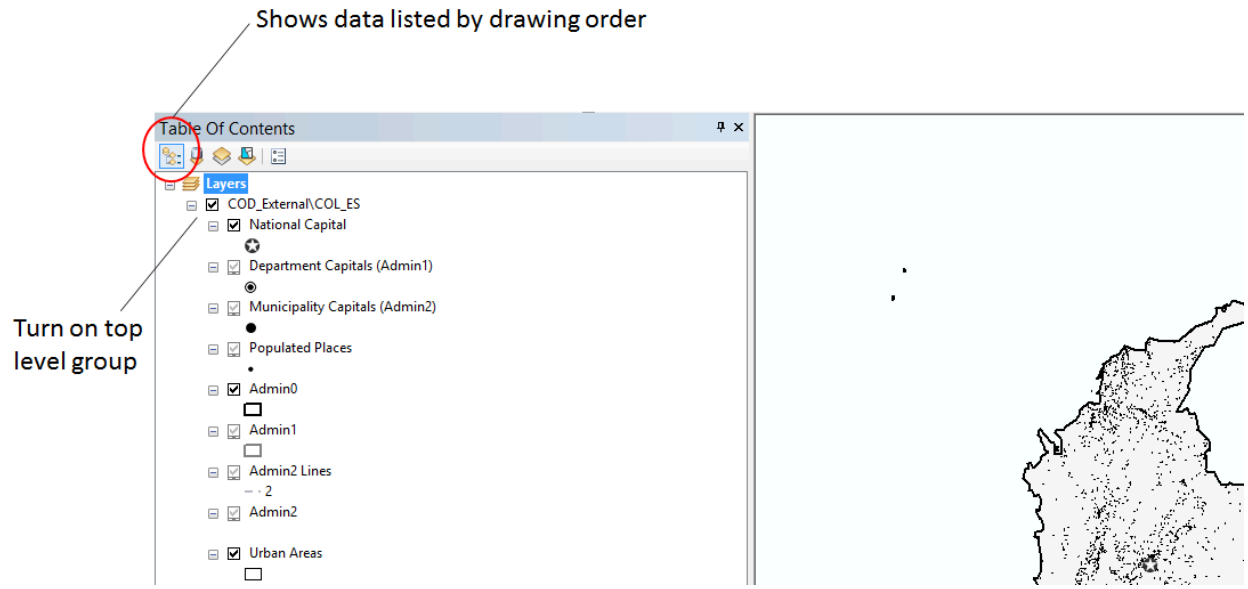
To use these services in ArcGIS 10.x desktop clients, after creating a connection, load one of the ESRI feature services:




You should see a list of data layers like:

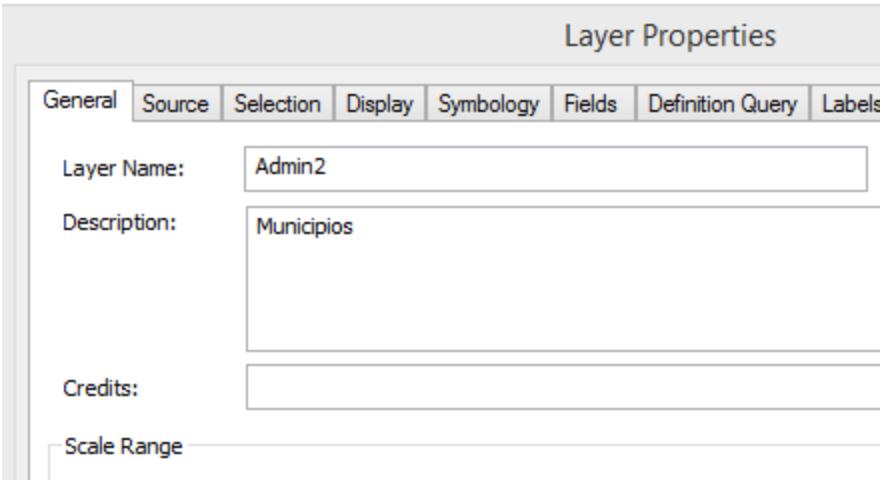



If you have your desktop configured to automatically turn off data when you load it, you may have to switch your table of contents from the “source” listing to the “drawing order” listing and turn on the features at the top level:




Use the data as you would any locally loaded database.

If you are viewing the ESRI map or ESRI feature services in ArcGIS Desktop the admin titles are listed in the General tab of the Layer Properties dialog box.




**ArcGIS Pro**

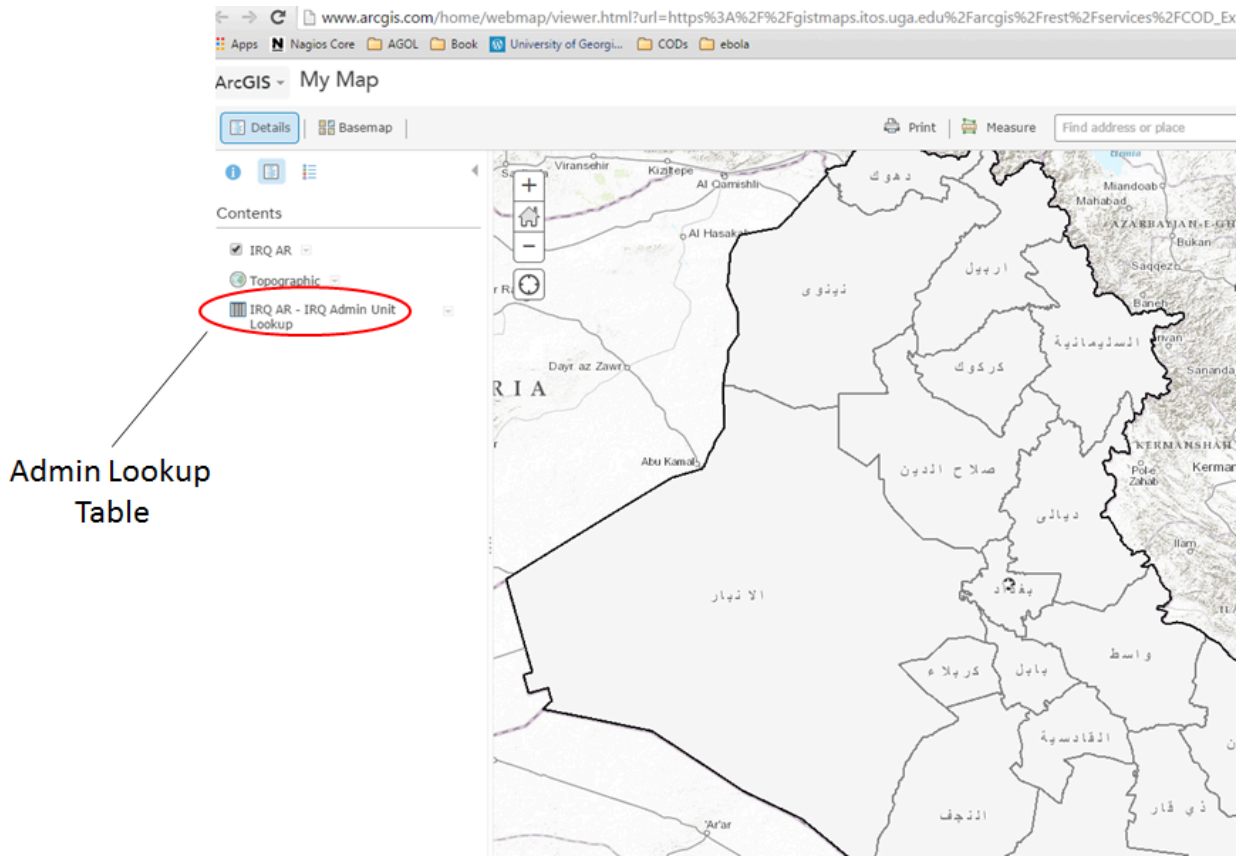
General help is available on the ESRI site here - and specifically, the “Connect to an ArcGIS Server site” section.

Enter this service location: https://codgis.itos.uga.edu/arcgis/rest/services/COD_External. The services are open so you don’t need to add Authentication.

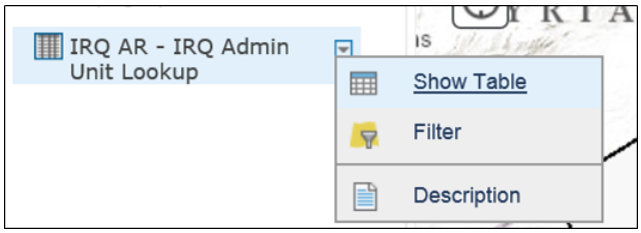
**ArcGIS Online**

If you want to consume the map service in ArcGIS Online, the easiest way is to use the link provided in rest catalog above. Point your browser to https://codgis.itos.uga.edu/arcgis/rest/services/COD_External. and choose a service. Click on the link: View In: ArcGIS.com Map


Alternatively, you can go directly to
http://www.arcgis.com/home/webmap/viewer.html?url=https%3A%2F%2Fgistmaps.itos.uga.edu%2Farcgis%2Frest%2Fservices%2FCOD_External%2FIRQ_AR%2FMapServer&source=sd
to see the service.




When you consume the ESRI map service in ArcGIS online, you'll see an additional lookup table in the table of contents of the service; use the toggle button to Show/Hide the table. This table can come in handy when you need to know what the admin units are called (district, quartier, municipos, barangay etc).




**IRQ AR - IRQ Admin Unit Lookup (2 features, 0 selected)**

| adminUnitLevelNumber | adminUnitLevelTitle | adminUnitLocalTitle |
|---|---|---|
| 1 | Governorate | Muhafadhah |
| 2 | District | Qadha |

If you are already in ArcGIS Online and want to add a COD base map:

1. Select "Modify Map" (or "New Map") and then click "Add," and choose "Add layer from Web"

2. You can add either ArcGIS Server or WMS OGC Web Service. In this case an ESRI service will perform better

3. The url should be: gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/IRQ_AR/MapServer

Note, ArcGIS Onlne will append http:// to the address for you, you only need to type in the address after http://.

4. Choose to add as basemap or as an overlay. This map is intended to be a basemap but you can also change the transparency to overlay on top of other datasets.

5. Add layer

6. Similar to the desktop, you can zoom in and out, query and overlay other datasets

7. you can add single layers from the map services and have greater functionality in AGOL. Use the rest catalogue to get the layer number and append it to the url when you add layer from the web. For example:

http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/BFA_FR/MapServer/5 will add admin1 from the BFA map service to your AGOL map.

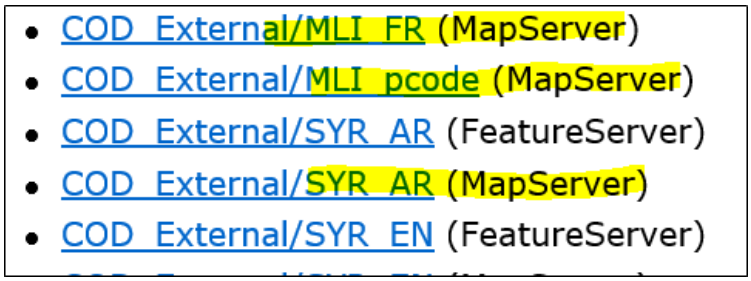
**Google Earth**

There are 2 options for consuming COD services in Google Earth

1. Consuming KML ground overlays (data as image)
2. Creating network link (data as vector)

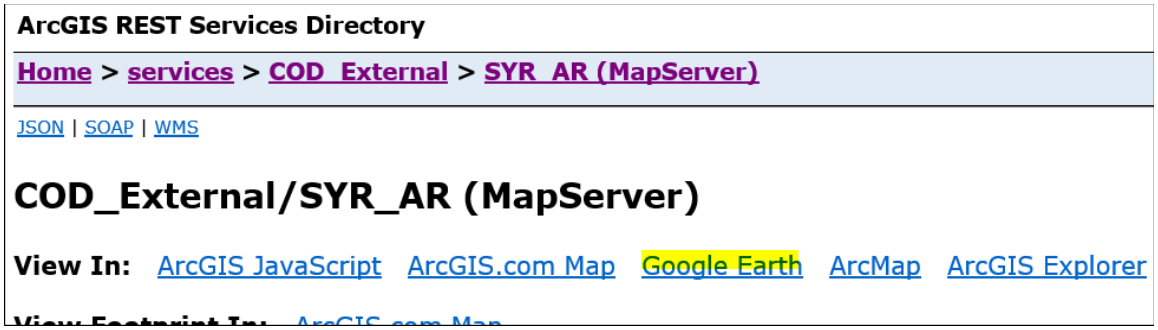
1. **KML Ground Overlay / Image Overlay**

Both the country basemap and pcode map services have KML endpoints; you get to them through the map service links on the rest catalog: https://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External

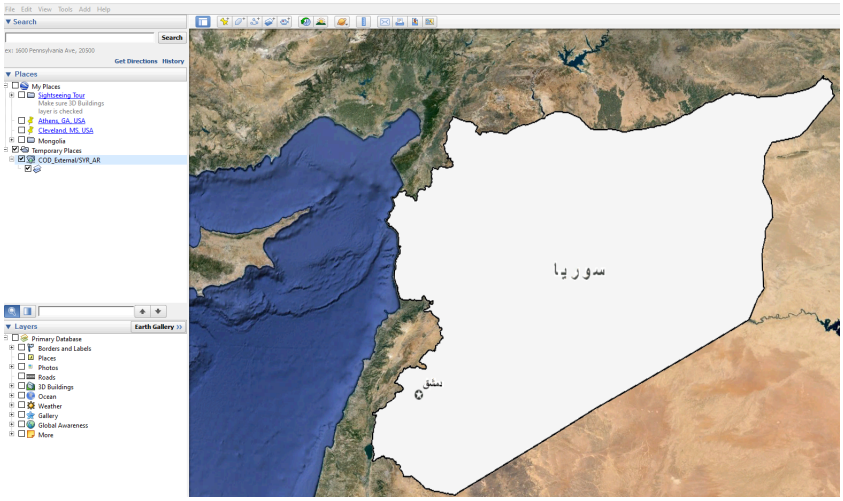



Choose any of the MapServer options and you will see a link to open the service in Google Earth. For image overlays, we strongly recommend you use the non-pcode

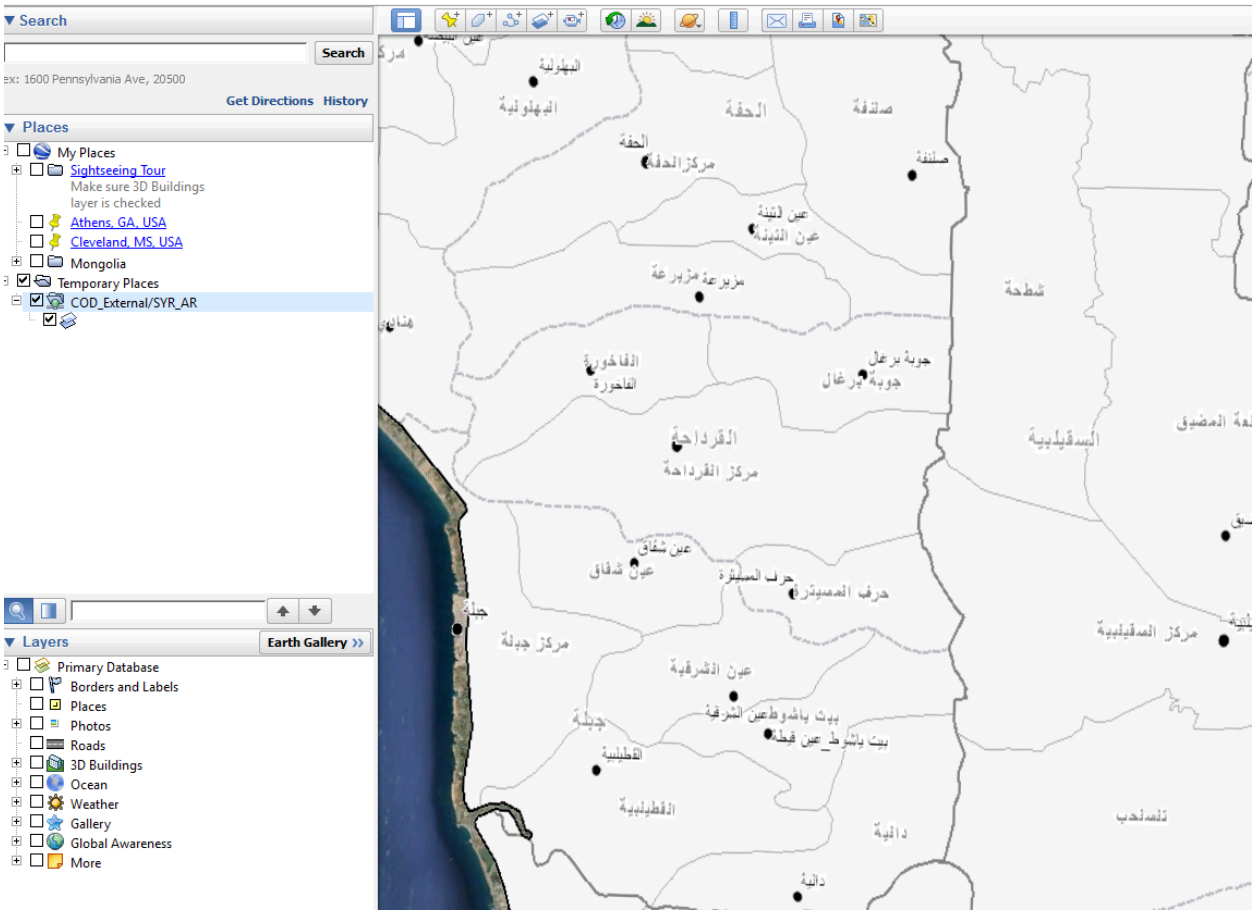
services; in other words, use the MLI_FR or SYR_AR services instead of the MLI_pcode service.



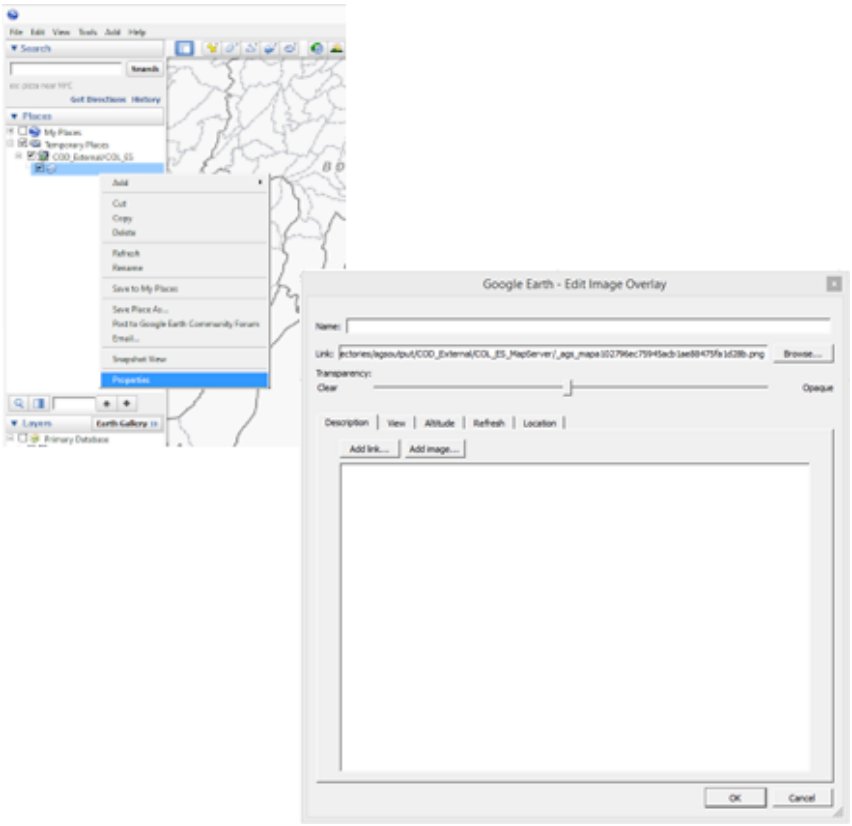

You can open or download this link. If you open it, GE opens the basemap as ground overlay. The KMLServer creates a PNG image and drapes it on the ground on top of the satellite imagery. Double click on the name of the service in the table of contents to zoom to the service extent:




As you zoom and pan through the service, the overlay will automatically obey feature class visibility, including scale dependencies, and symbology. As you zoom and pan, the service will send all of the map information available at that scale, but it does not support any queries and the underlying imagery is obscured.



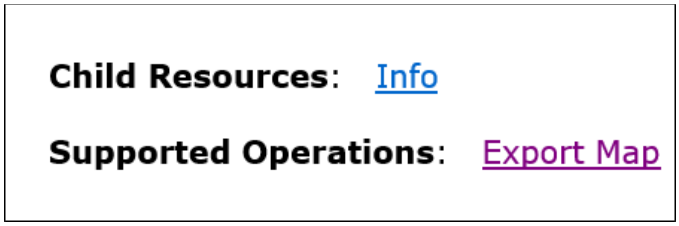

You can change the transparency of the overlay layers so that you can see the underlying imagery.  To do this, in the table of contents, right click on the folder underneath the service name, choose Properties > and use the Transparency slider to choose how clear or opaque you want the overlay to be:



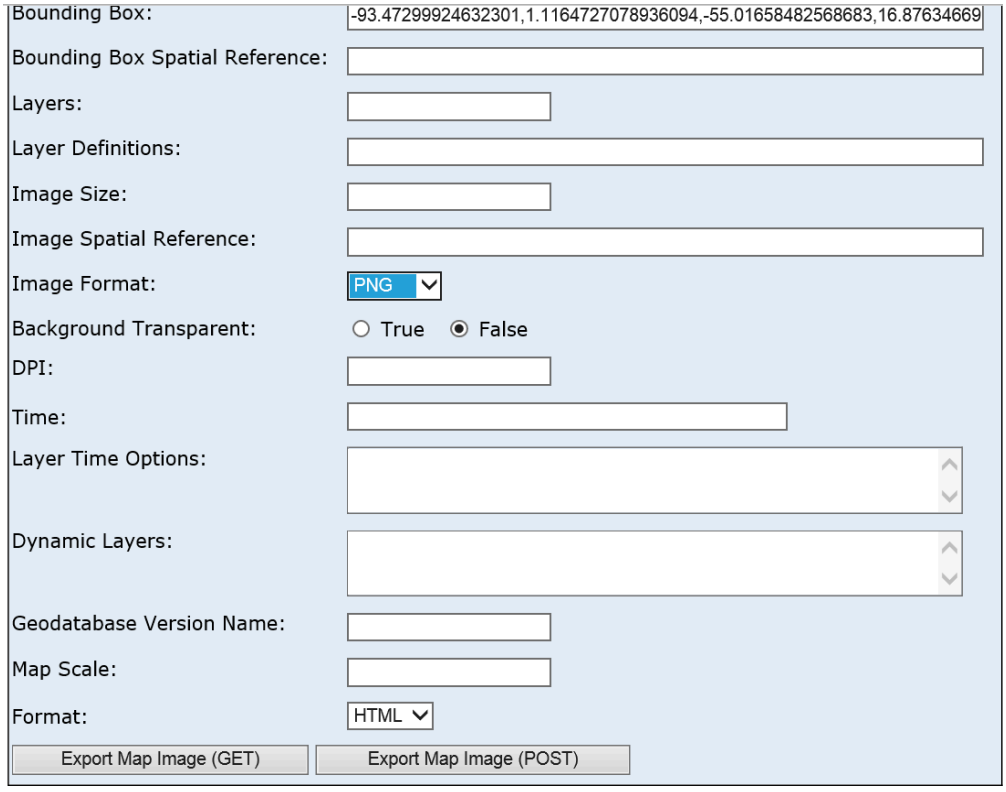

Warning: if you make the image overlay more or less opaque (less or more transparent), then try to pan or zoom, the layer may revert back to 100% opaque. You may also get an error message “The feature editing has been destroyed.” To avoid this, you will either need to zoom to your area of interest and reset the opacity, or use vector layers, described below.

You can also export the image to use in other applications like PowerPoint. To do this, you can either use the “Save Image” tool in Google earth:


or export an image from the map service. To export a non-georeferenced image from the map service, go to the rest catalog, scroll to the bottom of the page and choose Export Map




You have the option to export the basemap as an image (PNG, PNG8, PNG24, PNG32, JPG, PDF, BMP, GIF, or SVG). You can choose which layers and what extents to export.




You have the option to create an export as either HTML, JSON, Image (in the format selected in the 'image format') or KMZ. If you select HTML, JSON or KMZ you will get a text file with a ground overlay or pointer to the basemap image. The KML looks like

<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns:atom="http://www.w3.org/2005/Atom"
xmlns="http://www.opengis.net/kml/2.2">
<GroundOverlay>
<Icon>
<href>https://gistmaps.itos.uga.edu/arcgis/rest/directories/agsoutput/COD_External/COL_ES_MapServer/_ags_mapf9cc25e071664372a357028ed918b583.png</href>
</Icon>
<LatLonBox>
<north>28.224616910817538</north>
<south>-10.231797509818648</south>
<east>-55.01658482568684</east>
<west>-93.47299924632303</west>
</LatLonBox>
</GroundOverlay>
</kml>

If you open that KMZ file in GE, or if you export as any image option, it will point to a single image stored on ITOS servers; a snapshot of the extent you choose when you created the file. It will not be dynamically linked to the live data service and will not show greater details or other layers as you zoom and pan.

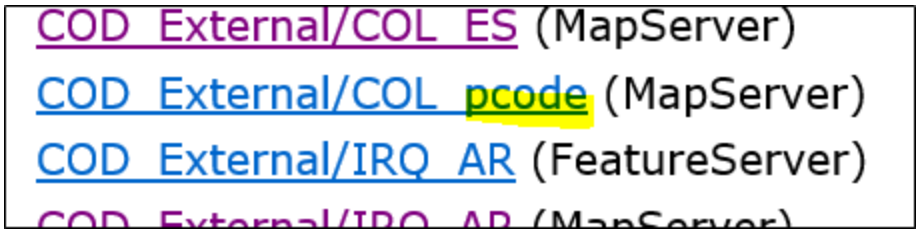
**2. Network link**

All of the COD data is also available as KML Network Links. KML Network Links have the advantage of allowing the user to control symbology because it streams the features, rather than a pre-rendered image, to the user's desktop. The services include all layers that are present in the basemap, and may include additional layers that are present but not visible in the basemap resource. For example, in Colombia, the base map service has populated places and administrative boundaries, but an additional layer, polygons of urban areas is also present but not visible in the basemap. This layer can be streamed in the Network Overlay. The service has a folder structure, and each feature in the service is separately available to be symbolized. The service also supports popup windows detailing the feature attributes.

The disadvantage is that the service is bandwidth heavy, because there is a higher data load. There is also a limit to the number of features the service will return. If a large polygon with many vertices is requested, the limit (the number of vertices) may be reached before the entire object encoding is retrieved. In this case only part of the polygon would be available to the user in Google Earth. We have set the number of features in the COD Network Link services to be very high; you may retrieve a large number of features but the service may be slow. Therefore, we recommend using text based data streaming protocols (KMZ network links and WFS) only if image based services do not provide the functionality you require, and/or if you are working outside of the ESRI ecosystem and cannot consume ESRI's binary based Feature Service.

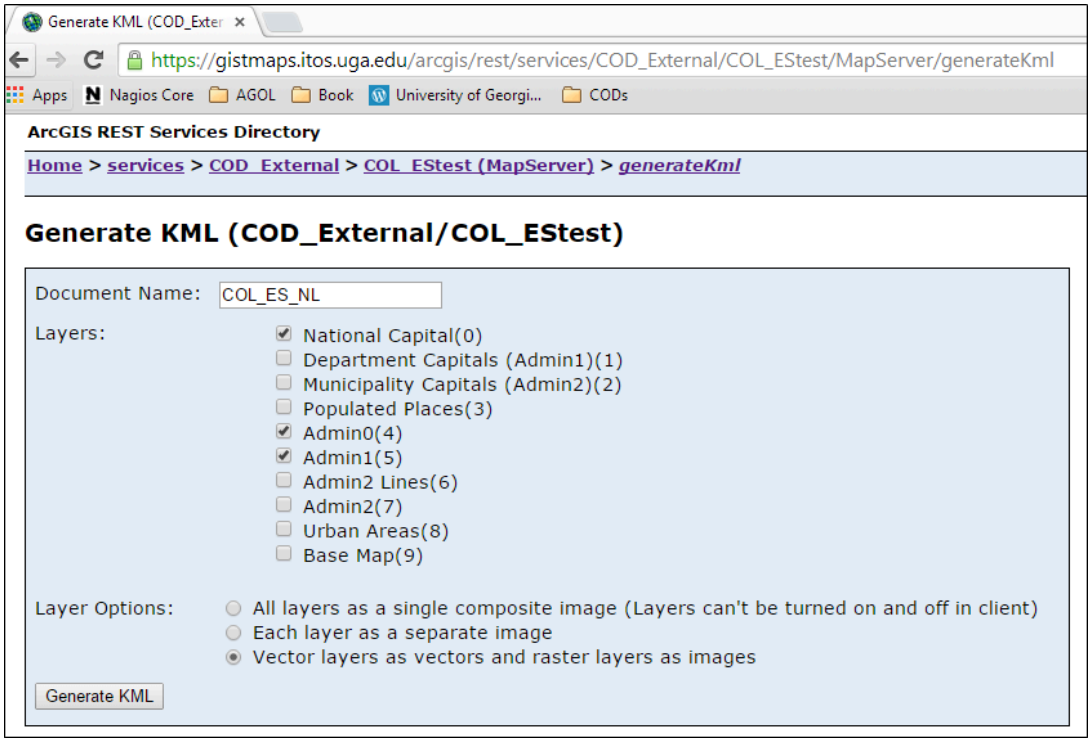
To help with performance, users will create their own network link, allowing them to choose which datasets they would like to stream. The process of creating a network link will create a URL that will pull features from the COD datastore; the actual geometry of the features.

As above, the user navigates their browser to the rest catalog and chooses a map service: https://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External. To create a network link, we strongly recommend you use the "PCODE" services. Choose any MapServer link that has the word "pcode" in the service name. There is one pcode service per country.




Scroll to the bottom of the page and click on the link to "Generate KML."


Choose a name for the KML document, and select the feature classes you wish to stream. Choose "Vector layers as vectors, and raster layers as images," then generate the KML. The more layers you choose, the heavier the service will be.

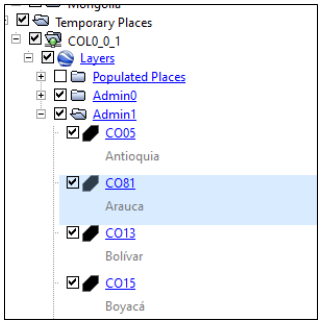


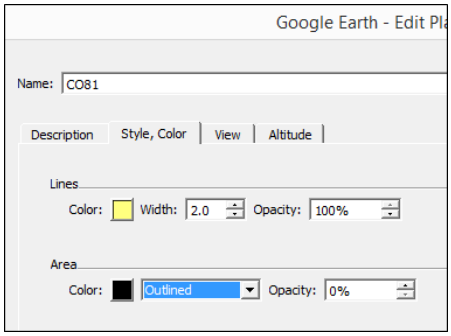

The service will create a KMZ file, a zipped KML, and download it to your machine. If your browser doesn't automatically open the file, find the downloaded KMZ file on your local machine (it will probably be in a local folder like c:\<users>\<user name>\Downloads\<Document Name>. Double click on the file to open the KMZ in GE. You will want to give the application time to load all of the features before you start interacting with the service by panning, zooming or querying the data.

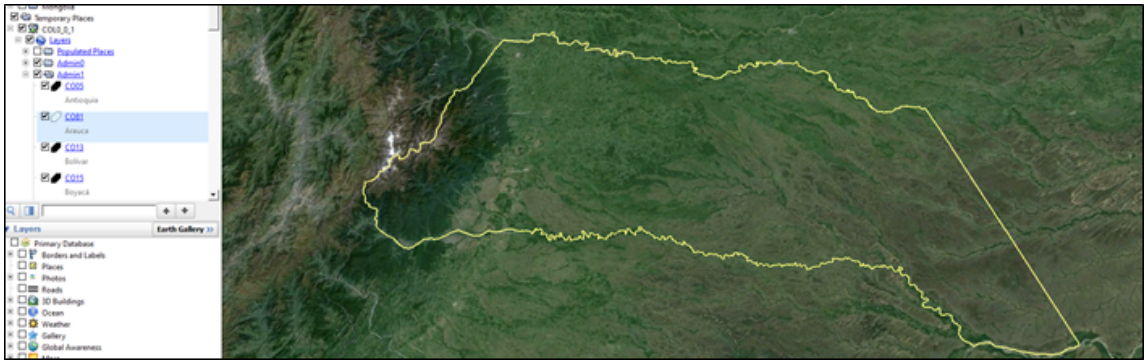
The service will appear turned off in the "Temporary Places" folder of your table of contents. Double click on the service name to zoom to the extent of the service.

The features should be available at all scales. As you pan and zoom into the service you may need to refresh the service to see more or fewer features. Do this by right clicking on the network link in the table of contents and choosing "Refresh." Doing so will cause the service to redraw and default to the original symbol set; you will need to re-symbolize your features if you do not want to use the original color pallet.

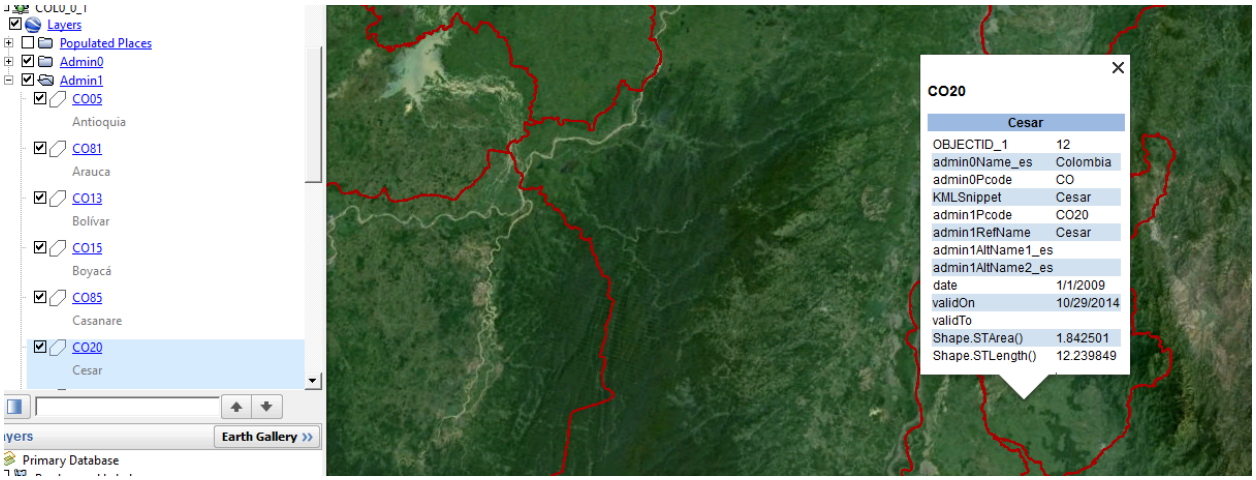
Right click on the layer name and choose 'properties' to change the symbology for the entire layer, or open the folder to see each feature listed separately, and right click on the properties to change the symbology for a single feature.



If you click on either a location in the view, or a feature in the table of contents, a popup window will display all the attributes for that feature and highlight the feature in the table of contents.




If the feature you are trying to symbolize participates in multi-part geometry, that is, if multiple features are contained in a single record, then you will only be able to symbolize the first feature of the multipart in a Network Link. For example, the admin0 country boundary for Colombia is a multipart feature consisting of both of the islands on the NW coast of Colombia, plus the mainland national boundary. If you were to try and symbolize the Admin0 layer for Colombia, you would be able to change the symbology of the islands, but not the mainland. If you wanted to symbolize the mainland, you would either need to symbolize a lower admin unit, or manually edit a locally loaded KML file that contains all of the geometry. Symbolizing populated places markers from the pcode service can also be problematic because the original symbol size is so small, they are rendered as fuzzy circles in GE. Instructions for downloading geometry rich KML data from COD services are provided next.

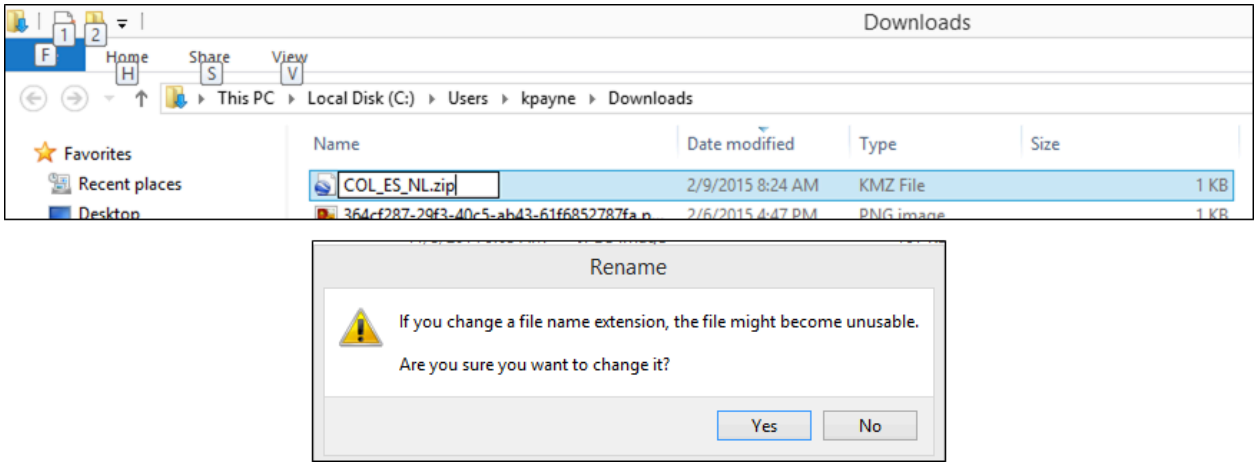
If you want a file that contains the actual KML geometry (not just a link to the server), you can either

1. save the visible features from the GE application,
2. request the GML through the Network Link you generated above.
3. Request the features from the rest API either through the KMLserver or the MapServer

To save the file from the GE application:

1. Right click on the layer in the TOC and choose “Save Place As…” This will write a KMZ file to your local machine.
2. Find the downloaded KMZ file

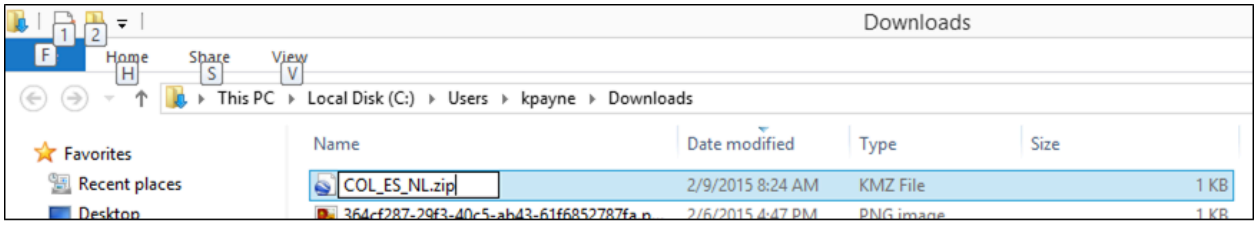
3. Rename the file extension from KMZ to .zip. You will get a warning message about the usability of the file; choose yes to go ahead and rename the file.

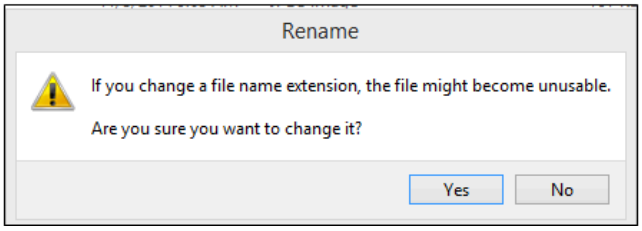



3. Unzip and extract the embedded KML file; it will probably be called “doc.kml.”
4. Open the KML in a text editor to see the geometry data. The file will only contain data for the layer you saved.

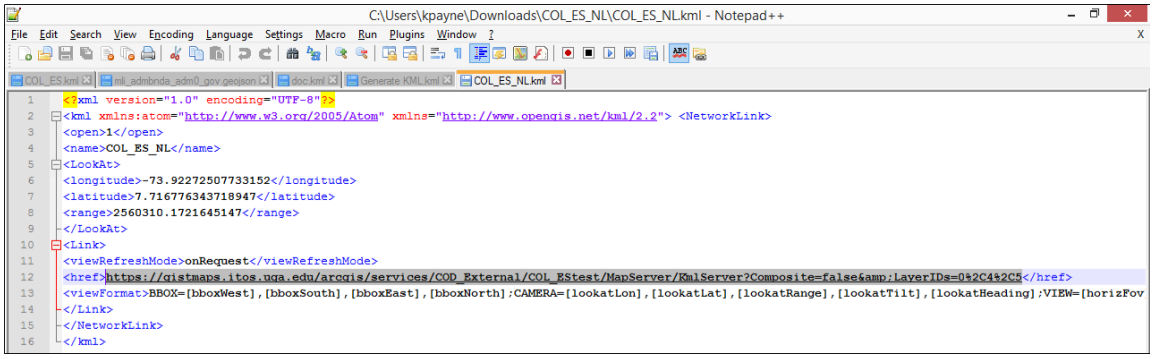

To request the GML through the Network Link you generated above:

1. Find the downloaded Network Link you generated, probably in your ‘Downloads’ folder
2. Rename the file extension from KMZ to .zip. You will get a warning message about the usability of the file; choose yes to go ahead and rename the file.



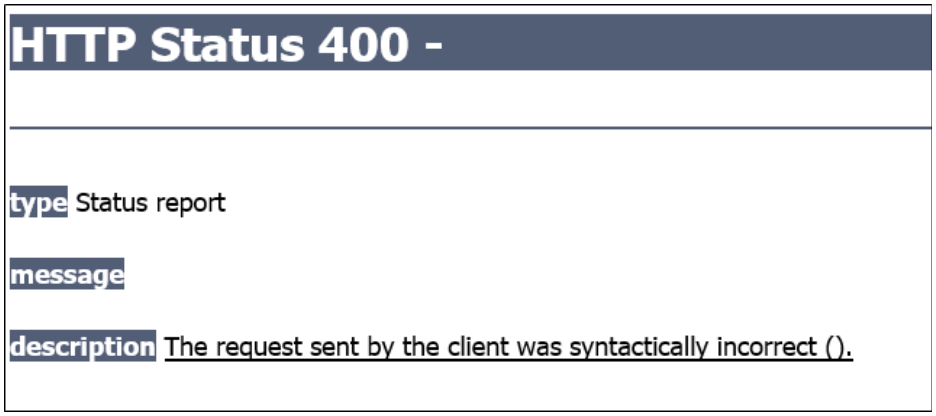




3. Unzip and extract the embedded KML file; open in a text editor to see the URL that calls the service




4. Copy and paste the URL into your browser. this may take a few moments but the browser will ask to save a .kmz file. Save the file, rename it as a zip file, and open the embeded kml in a text editor and you will see all of the data. In this case, even if you request a single layer from the service, all of the available data layers will be included in the KMZ file.


If you see this error:




Notify ITOS - it is possible that either the service is timing out because:

1. Too many features were requested and ITOS needs to up the number of features that the service can be return in a given request
2. The server is taking longer to respond and the service needs to be given longer before it times out
3. You need to clear your browser cache

If you want a local KMZ file that contains all of the geometry and attribution (not tied to the server) you can request a KMZ file containing all the features from the rest API either through the KMLserver or the MapServer. In the first case, use the rest catalog to generate your own NL request using the following pattern:

http://gistmaps.itos.uga.edu/arcgis/services/COD_External/MLI_pcode/MapServer/KmlServer?Composite=false&LayerIDs=0%2C1%2C2%2C3%2C4%2C5

Break down:

*http://gistmaps.itos.uga.edu/arcgis/services/COD_External/* - location of the server and subfolder where public COD services are deployed

*MLI_pcode/* - the name of the service, by convention a 3 letter country iso code followed by "_pcode"

*MapServer/KmlServer?* - the type of service (a KML service endpoint); the "?" indicates that what follows is a query; the request to the server to return

*Composite=false&* - not a composite image composed of

*LayerIDs=0%2C1%2C2%2C3%2C4%2C5* - the layer names as listed in the rest catalog:

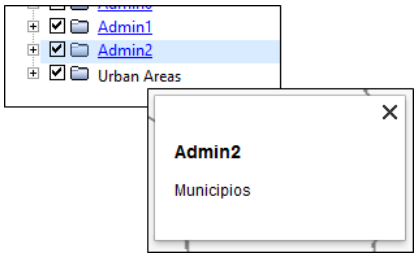
**Layers:**

- Populated Places (0)
- Admin0 (1)
- Admin1 (2)
- Admin2 (3)
- Admin3 (4)
- Admin4 (5)
- AdminLines (6)

In this case “0” refers to Populated Places, “1” refers to Admin0 etc

All parts of the server request are delivered through the URL that is encoded to be ASCII-safe; that’s what all of the “%2C” portions of the strings are about. Specifically, “%2C” is a hexadecimal encoding that is mapped to a comma (,) and used when parameters are separated by a comma.

When viewing services as a network link in Google Earth, the administrative titles are listed as descriptions for each layer. You can see the descriptions in a popup window by clicking on the hyperlink for the layer in the table of contents.




Alternatively, you can get a full copy of the kmz directly from the map server via the rest api. This example will create a kmz file with all feature attributes and geometry for the Admin2 layer in the Mali Pcode service:

http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/MLI_pcode/MapServer/3/query?where=OBJECTID+%3E%3D+0+&geometryType=esriGeometryPolygon&outFields=*&f=kmz

Break down:

*http://gistmaps.itos.uga.edu/arcgis/services/COD_External/* - location of the server and subfolder where public COD services are deployed

*MLI_pcode/* - the name of the service, by convention a 3 letter country iso code followed by "_pcode"

*MapServer/3/* - the type of service and the layer within the service. Recall that in the rest catalog the Admin2 layer had the layer id of 3.

**Layers:**

- Populated Places (0)
- Admin0 (1)
- Admin1 (2)
- Admin2 (3)
- Admin3 (4)
- Admin4 (5)
- AdminLines (6)

*query?* - the "query?" indicates that what follows is a query request to the server to return information.

*where=OBJECTID+%3E%3D+0+* - requesting all object ids or all records in the layer (literally this translates into "when object ID is greater than or equal to 0").

*&geometryType=esriGeometryPolygon* - return polygon information

*&outFields=** - return attribution for all fields (the * is a wildcard character)

*&f=kmz* - create output data in kmz format (downloaded directly to your machine)

**Browsers**

If you select "ArcGIS JavaScript" you can view COD services in your browser. Some layers will not be visible until you zoom into the image using the zoom buttons in the upper left hand corner of the screen. If you select "ArcMap," a copy of the service will open in a new ArcMap desktop instance.

WMS requests can be issued through HTTP, and the responses or exceptions are returned through the browser.  GetCapabilities, GetMap, GetFeatureInfo, GetStyles, and GetLegendGraphic. Through URL parameters, a client can use these operations to obtain metadata, maps, feature information, symbologies, and legend symbols from the WMS service.

**Open Source Clients**
**How to find WFS and WMS endpoints**

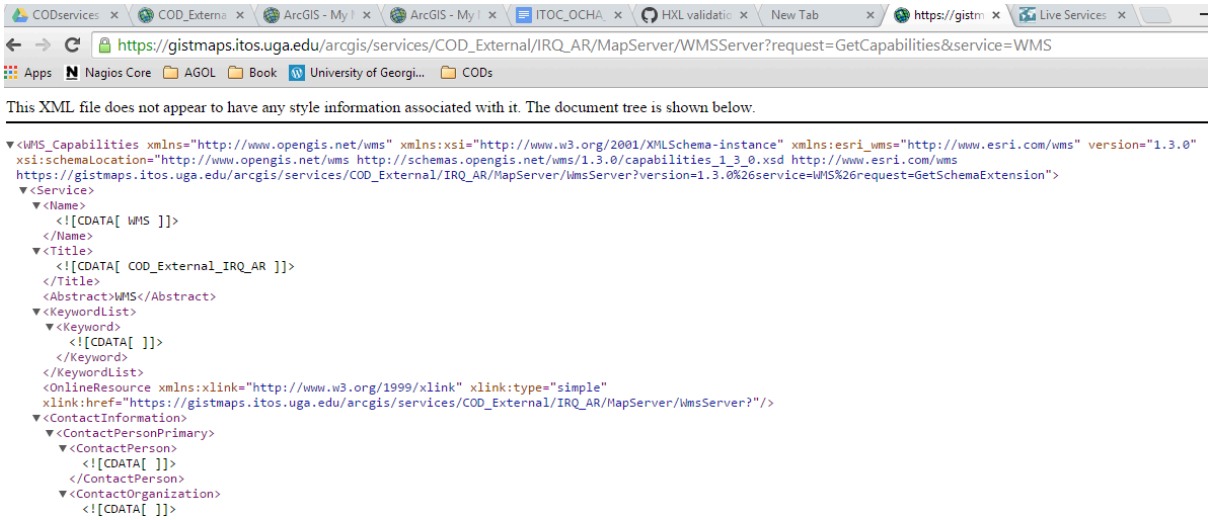
Open Source clients won't consume ESRI Services, so you will use either WFS or WMS layers instead. Some clients will require you to know the Layer names for each layer in the WMS service. Layer names can be found in the capabilities document of the service. To see the capabilities for the WMS:

1. go to the rest catalogue: https://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External
2. choose a map service like: https://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/IRQ_AR/MapServer
3. and choose the WMS link

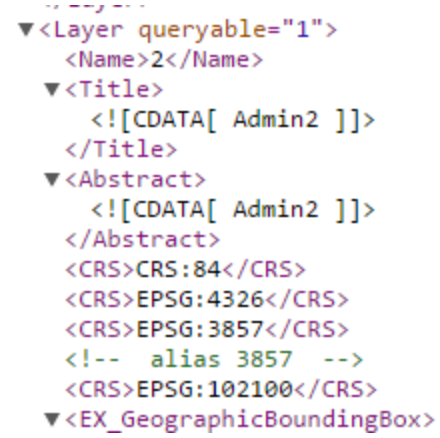

4. or go directly to the capabilities document

https://gistmaps.itos.uga.edu/arcgis/services/COD_External/IRQ_AR/MapServer/WMSServer?request=GetCapabilities&service=WMS

You will see an xml document with all of the information about the service that looks like:




Each layer is described within the capabilities document. To see the layer names for each data set represented in the map, scroll down to any section that begins with <Name> and you will see the Layer name and the descriptive title of the layer. So in this example, the Iraq Admin 2 Layer has the name 2.

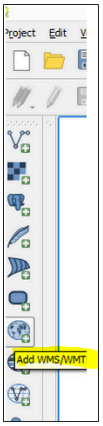


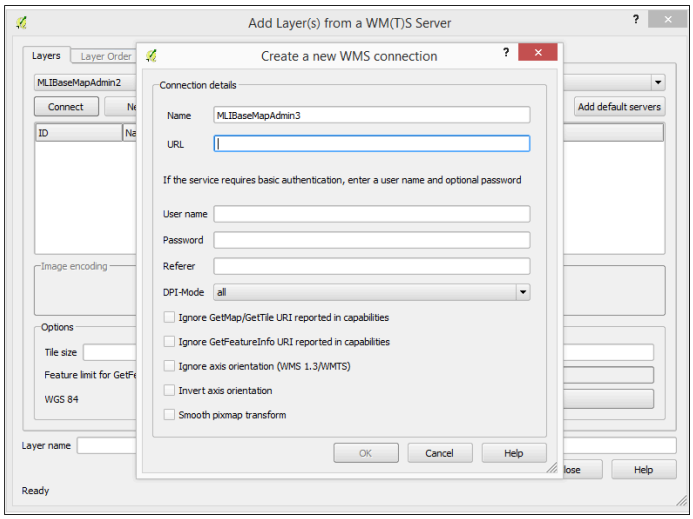

**QGIS (Screenshots from 2.2.0 Valmiera)**

***Consuming WMS***

1. Start QGIS
2. In the toolbar, Click on the Icon to add WMS/WMTS

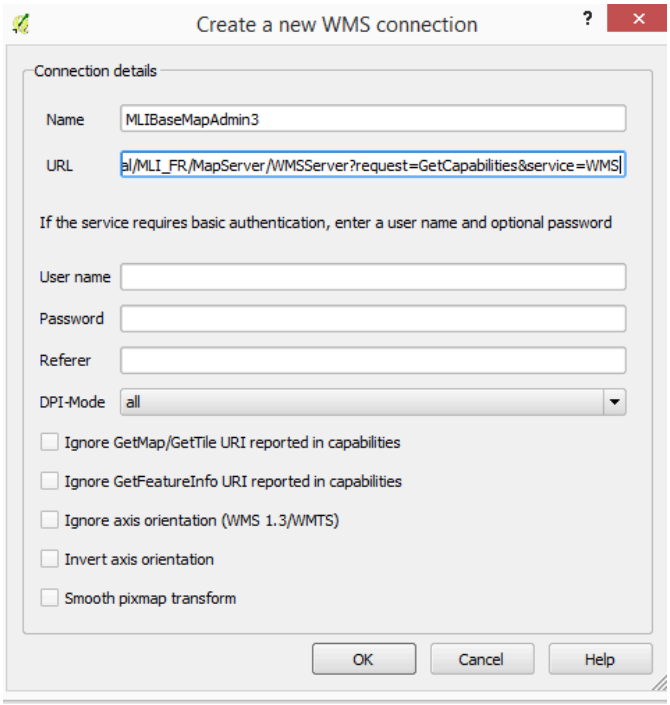
In this example, we will consume the COD basemap, and overlay the pcode service on top, both as WMS.



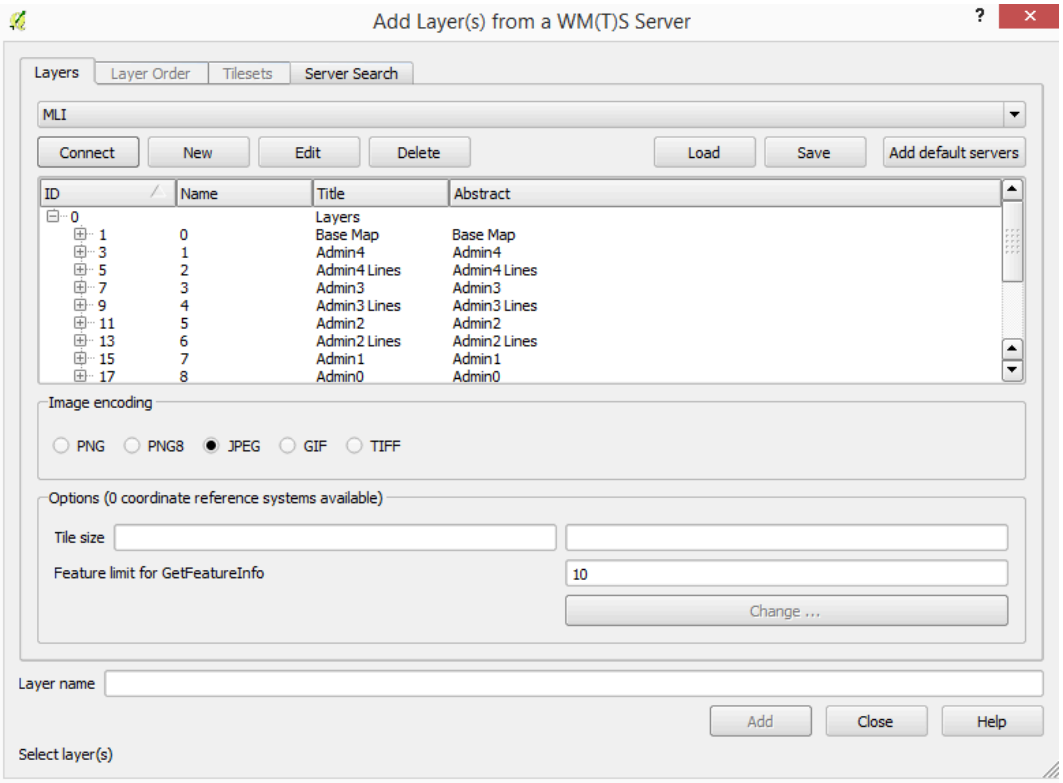




3. Create a new connection; in this case we will add a single layer from the basemap service, and a single layer from the pcode service.
    a. Name the connection
    b. Add the WMS link from the rest catalog of services by choosing the country and language of the basemap you are interested in
        - COD_External/MLI_FR (FeatureServer)
        - COD_External/MLI_FR (MapServer)
        - COD_External/MLI_pcode (MapServer)
    c. Right click and copy the link to the WMS endpoint

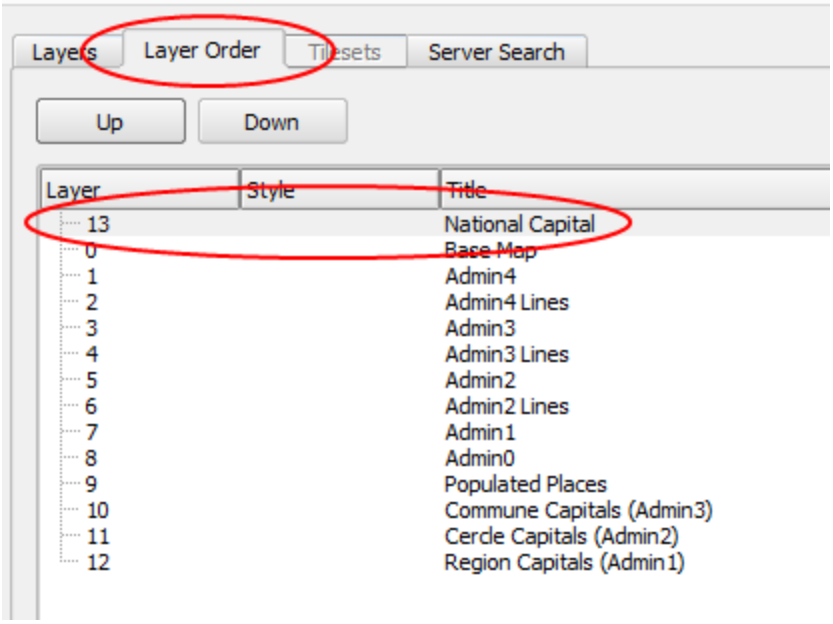

paste the url in the WMS connection dialog box and click ok




4. Click ‘Connect’ to see all available layers and their IDs in the basemap service.

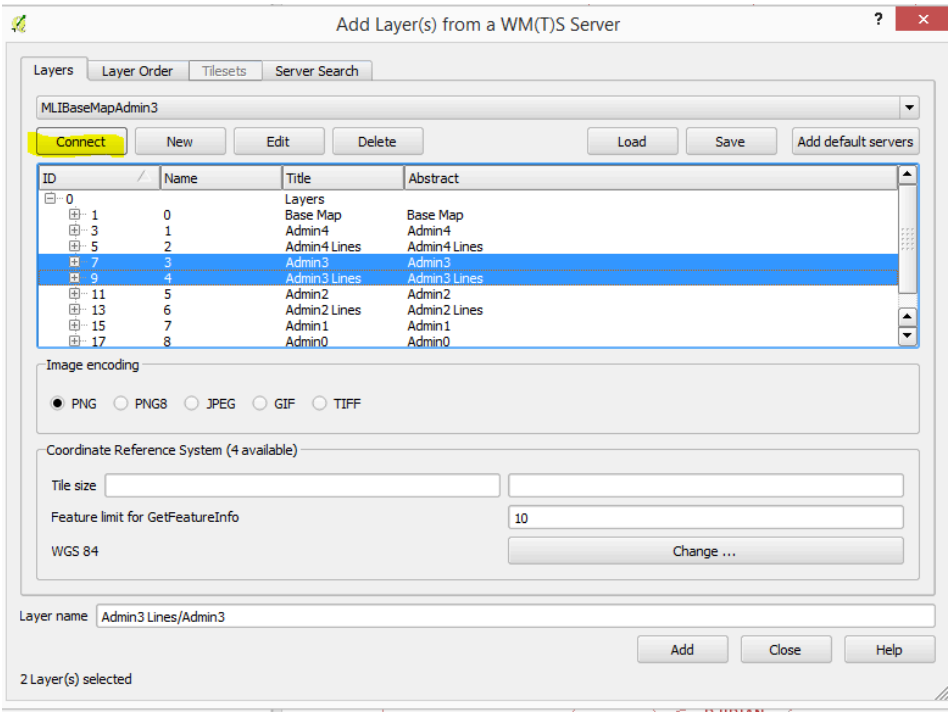



5. If you choose ID 0 you will load all of the map layers at once and you will see all of the Layer names listed in the dialog box. If you want to load all the layers, before you choose “add,” you may want to go to the “Layer Order” tab and move the layers in the order you want them to draw. For example, you may move the National Capital (13) to the top of the drawing order list by selecting it and choosing “Up” until it is at the top of the order



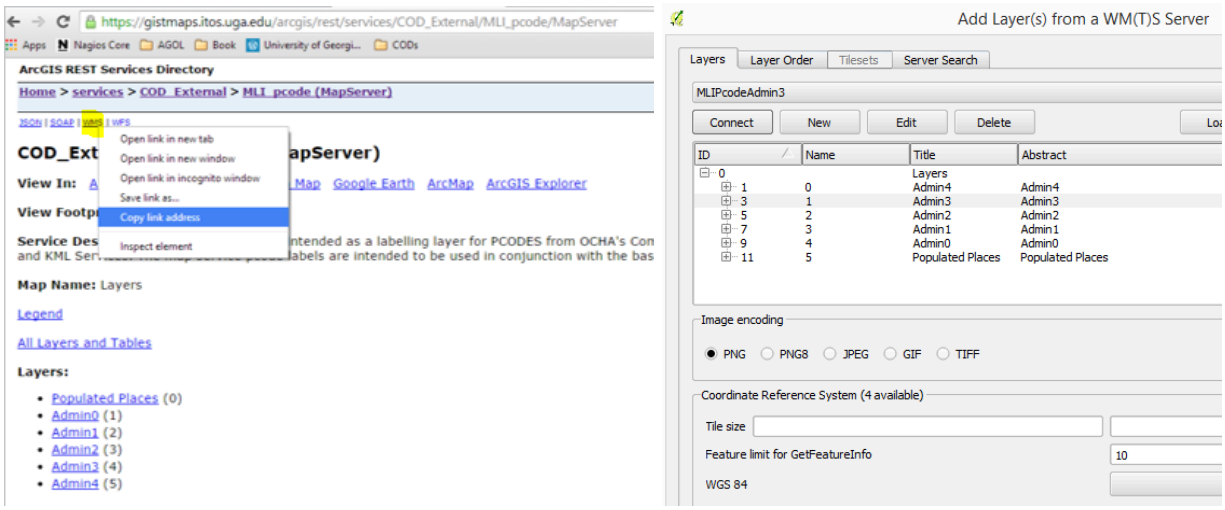
The disadvantage of adding all of the layers at once is that you don't have control over the layer order after they are added to the viewer. If you want to be able to change the view order in the main QGIS application you will have to add each layer one at at time. To do this, when adding the wms, expand the list by clicking on the symbol and select a layer you want to use, then click "Add" without closing the dialog box. Repeat for all layers you want to work with.

6. In this case we will choose the admin3 polygon layer and the admin3 line layer from the WMS to display. This is because the names for the admin 3 units are held in the admin3 polygon layer, but the line layer looks better in cartographic products, so we will use the polygon layer to label the feature names, and the line layer to show their geometry.

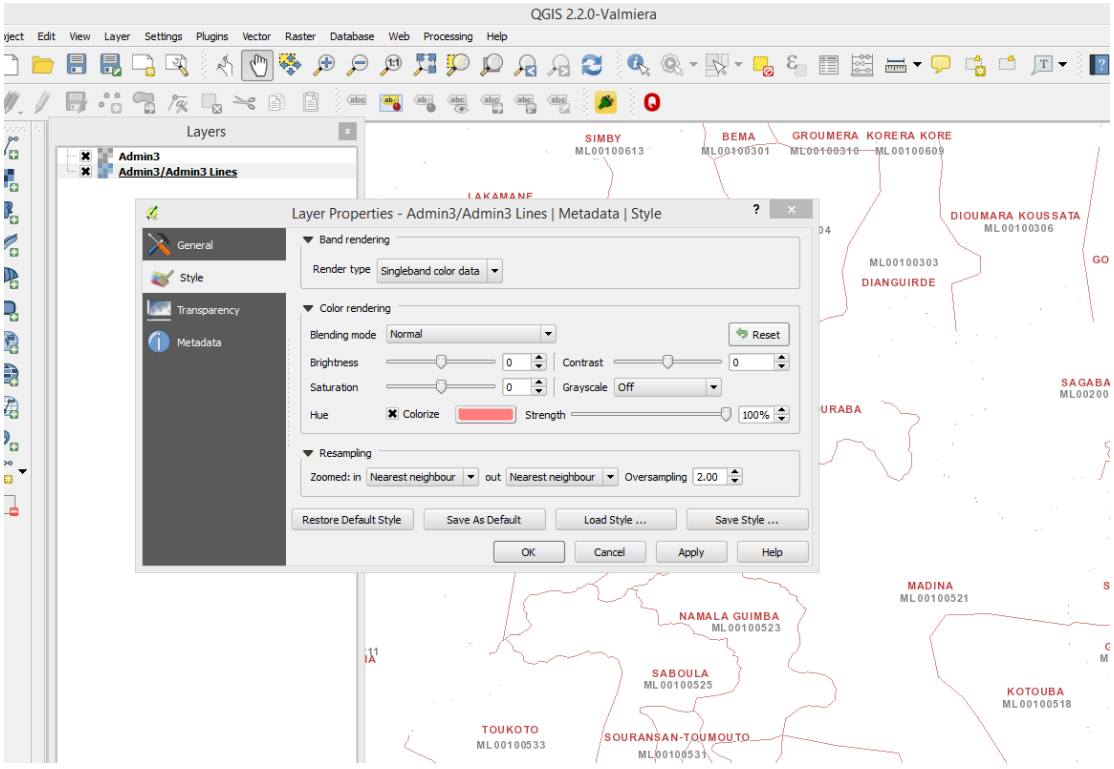



Beginning at 2.x the default parameter for the image format is set to JPEG. This setup will obscure other data in your table of contents. When you consume multiple WMS layers, the top WMS layer will block any data layers underneath it. To avoid this, choose the image encoding as PNG (the PNG encoding allows for transparency across multiple layers) and click 'Add.'

3. Repeat the steps above to create a new connection, this time to the pcode WMS service




4. Zoom to your area of interest and you will see the pcode and unit name labels on top of the admin boundaries. You can right click and change the layer properties to render the WMS in a different color

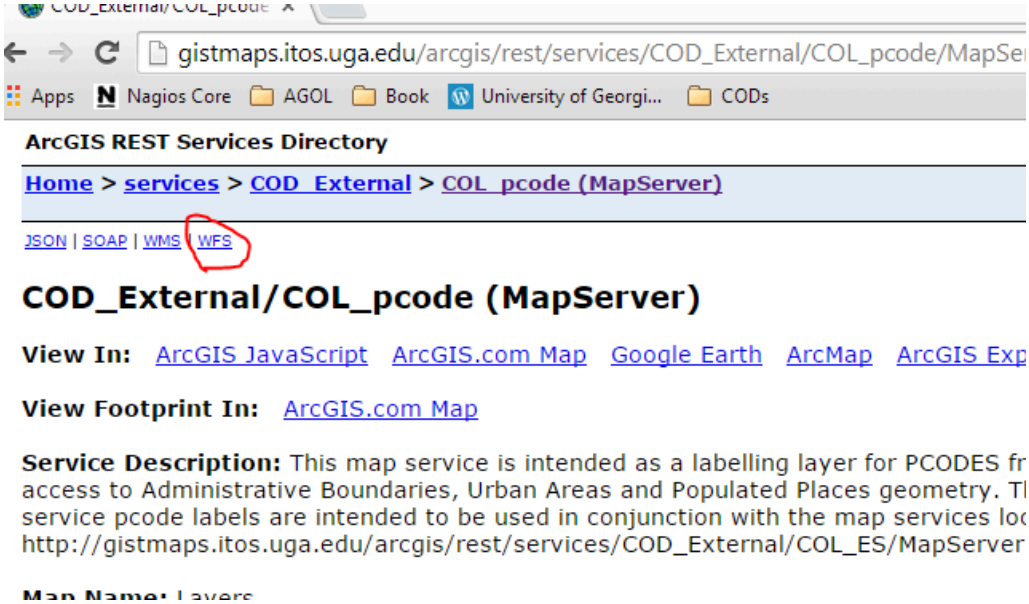



You can add multiple layers at once but be careful. Adding multiple layers does not give you as much flexibility in their order in the table of contents.

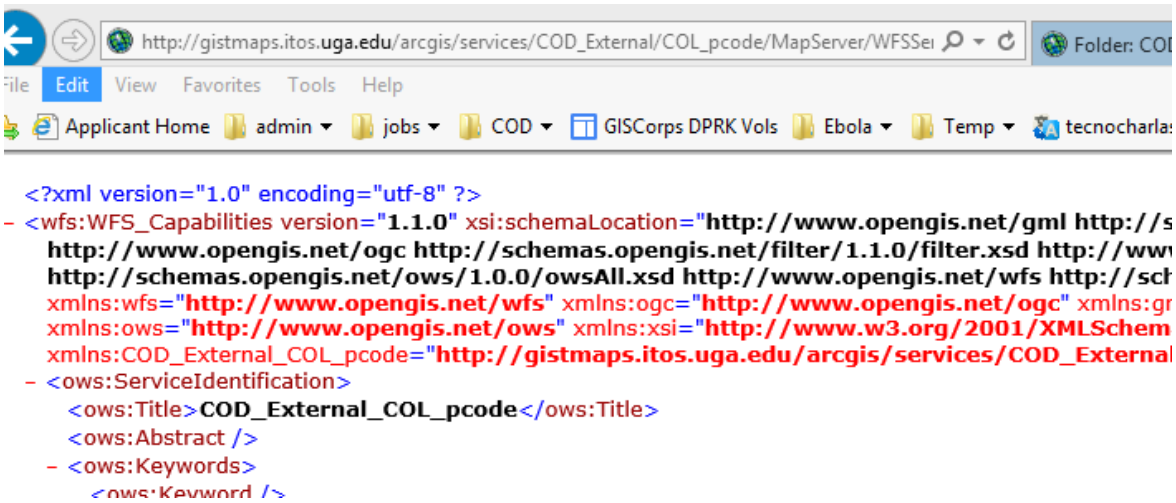
***Consuming WFS***

If you want more control over the data, you can consume WFS services. In the toolbar, Click on the Icon to add WFS layer

1. Select “New” in the the “Add WFS Layer from a Server” dialog box; name the service.
2. In your browser, go to the rest catalog of services, select a pcode service and click on WFS to get the WFS endpoint from the URL:

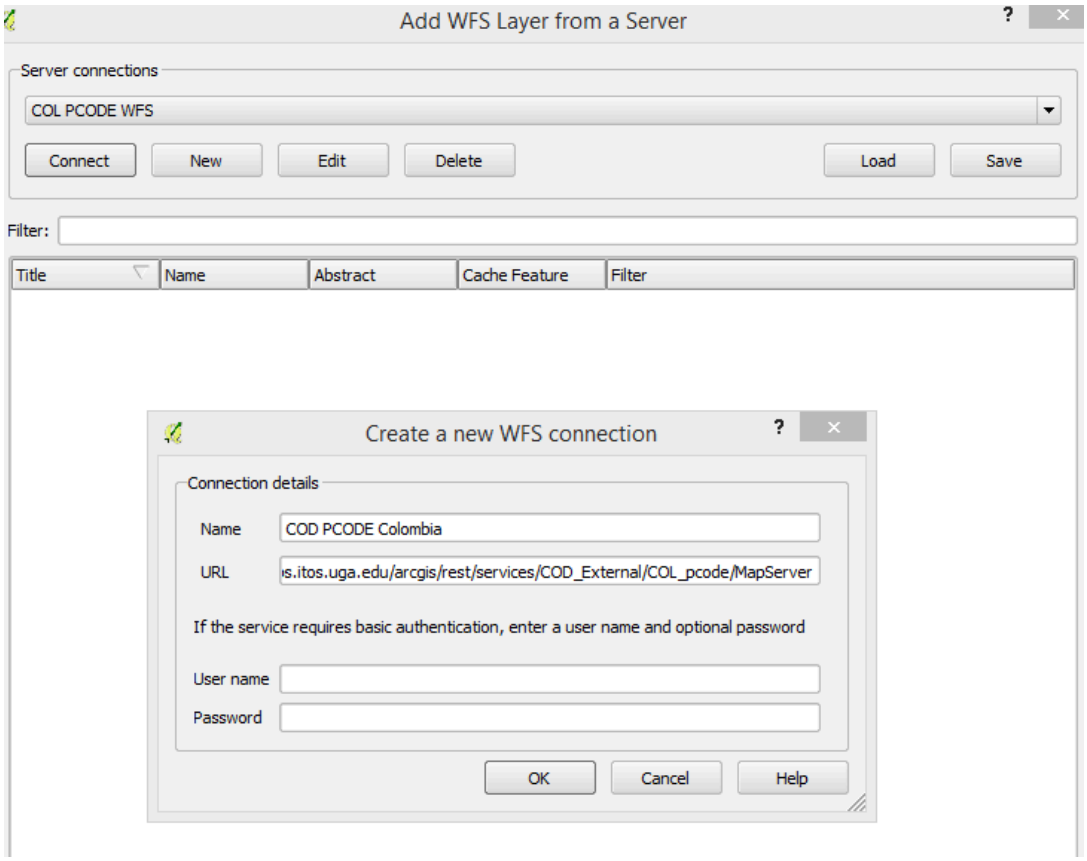



Or if you want more information about the service, click on the “WFS” link

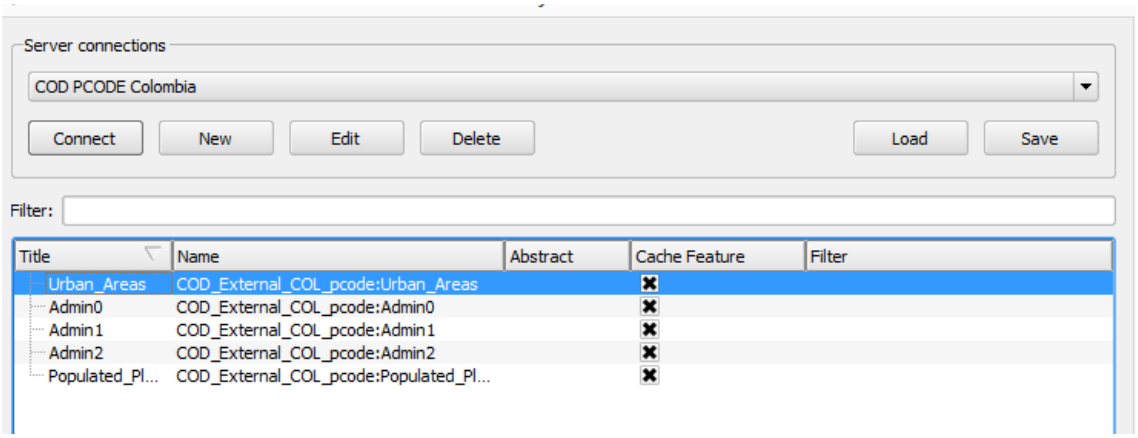



The WFS endpoint will look like:
http://gistmaps.itos.uga.edu/arcgis/services/COD_External/COL_pcode/MapServer/WFSServer?request=GetCapabilities&service=WFS

3. Copy and paste the URL from the WFS endpoint into the “Create a new WFS connection” from a Server” dialog box

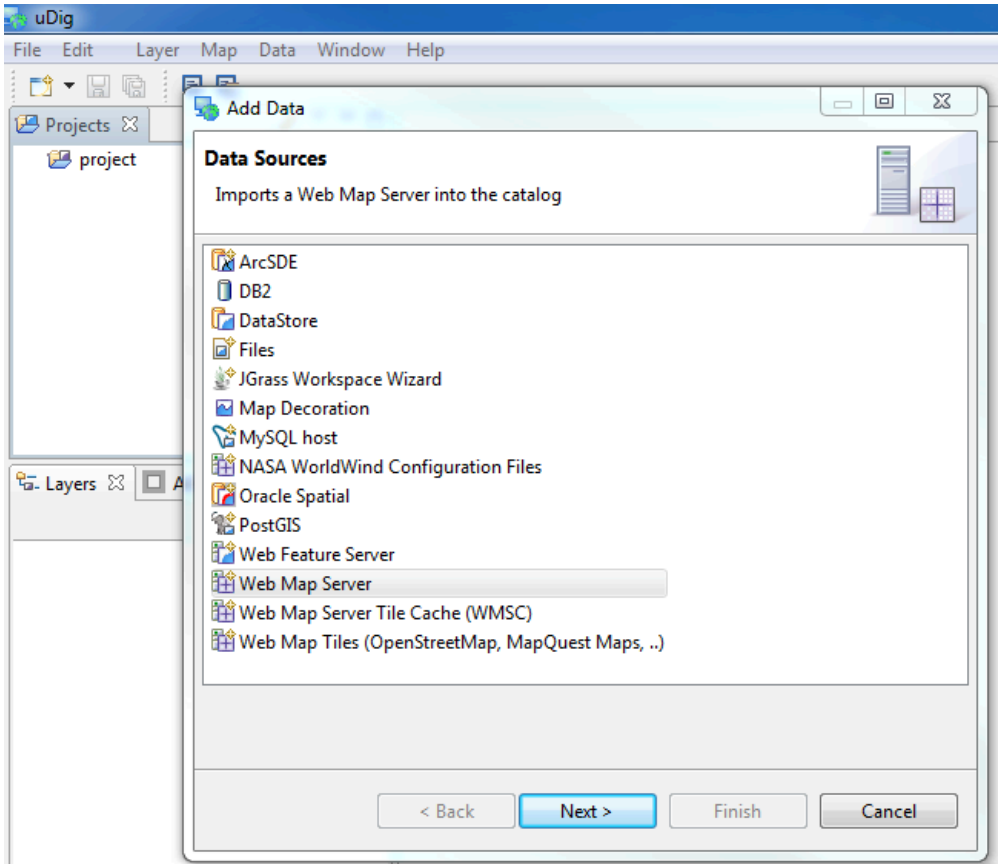


4. Click OK, and Connect
You should see a list of data layers you can Add to your viewer.



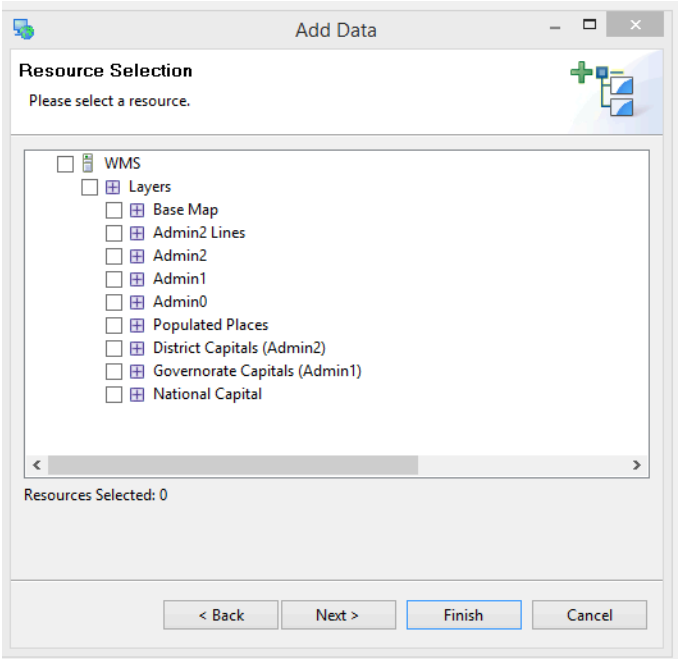

**UDig** (screen shots from Version: 1.4.0b)

1. Open UDig and choose Add from the Layer Menu, choose Web Map Server

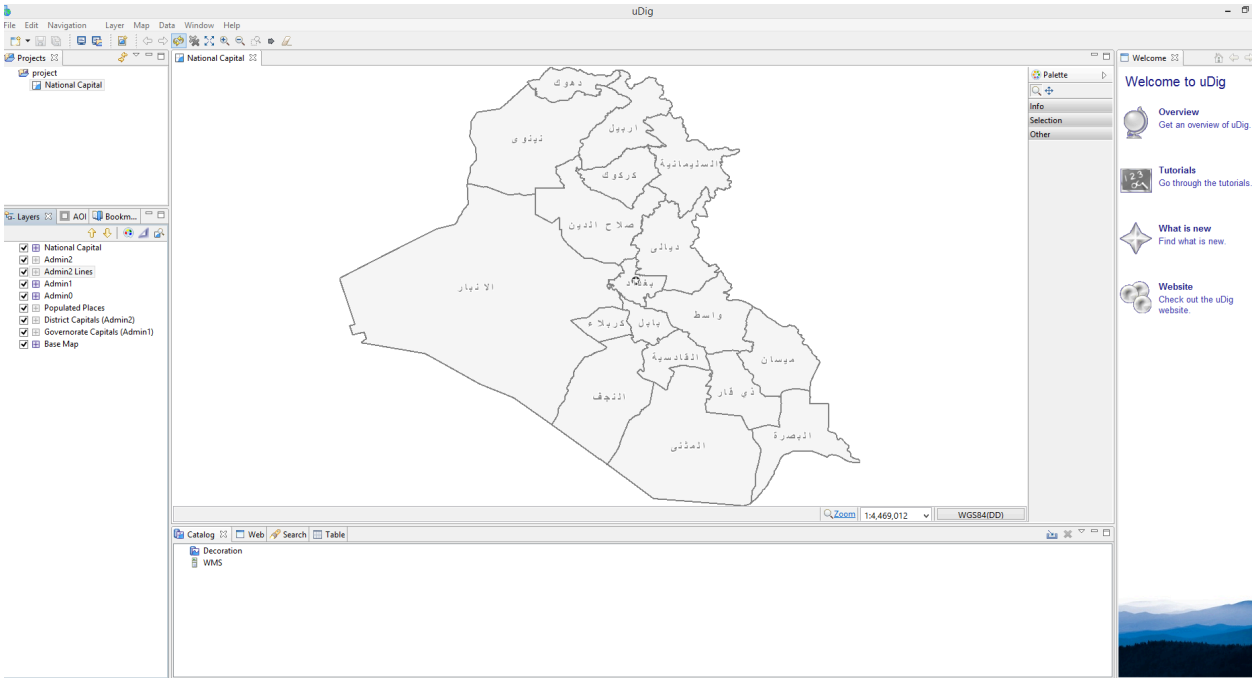



2. When prompted for the url of the capabilities document use this address:

https://gistmaps.itos.uga.edu/arcgis/services/COD_External/IRQ_AR/MapServer/WMSServer?request=GetCapabilities&service=WMS




3. Select the layers you want to add – or select the top level to add all of the layers. You may have to zoom to a layer in the table of contents before the data appears. You can re-order the data in the table of contents.



**Tableau**

Mapping Data with WMS

Use WMS Servers

*First tests with free version tableau desktop 9.0*

*-Tableau intends the WMS to be **just** a backdrop*

*-You may not be able to see the WMS service unless you having overlay data in the worksheet (you can't display the backdrop alone)*

*-I don't think Tableau allows you to load single layers*

*-The data layers in the map services are scale dependent. Even if you turn them on, you won't see them unless you zoom in.*

*-Even when you turn on a polygon admin (like admin3) in the map service, and zoom in you won't see it because our higher level polygons are not symbolized in the map service. We use the line layers to symbolize (they look cleaner). So you will have to enable admin3 Lines and zoom in to see the boundaries.*

*-Tableau doesn't allow you to change the symbology on WMS layers*

*-Tableau does not allow users to re-order the layers*

*-Tableau doesn't consume WFS*

**Does anyone use OpenJump?**

**Ushahidi?**

**Consuming WMS in Google Earth**

Although not advisable, you also have the option of consuming the COD services as WMS in Google Earth. This will look and feel similar, but perform worse than the KML image overlay. To view the data in Google Earth as a WMS service, point your browser to https://gistmaps.itos.uga.edu/ArcGIS/rest/services/ and, as above, choose one of the open MapServer services, in this case we'll look at http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/MLI/MapSe.... Google Earth will consume open source services (but at this time not ESRI services) so at the top of the page choose the WMS link and copy the url in the web page that displays the WMS link found there - it will look like: https://gistmaps.itos.uga.edu/arcgis/services/COD_External/IRQ_AR/MapServer/WMSServer?request=GetCapabilities&service=WMS

Open Google Earth. Go to Add/Image Overlay and click on the "Refresh" tab then select the "WMS Parameters" button. Select "Add" and paste the URL from the services link

above into the dialog box, but WAIT It is important to realize that WMS clients can vary according to the link they need. In this case Google Earth can only recognize the services if the first portion of the url, up to and including the query marker (?) is presented. So remove all text after the "?" and click OK.  It will look like this https://gistmaps.itos.uga.edu/arcgis/services/COD_External/IRQ_AR/MapServer/WMSServer?

A list of layers will show up on the left hand side of the dialog box. Select the layers you want to view, add them to the right hand side of the screen and click ok to display in the viewer (you can adjust the transparency in the properties window as above).

**Developers**

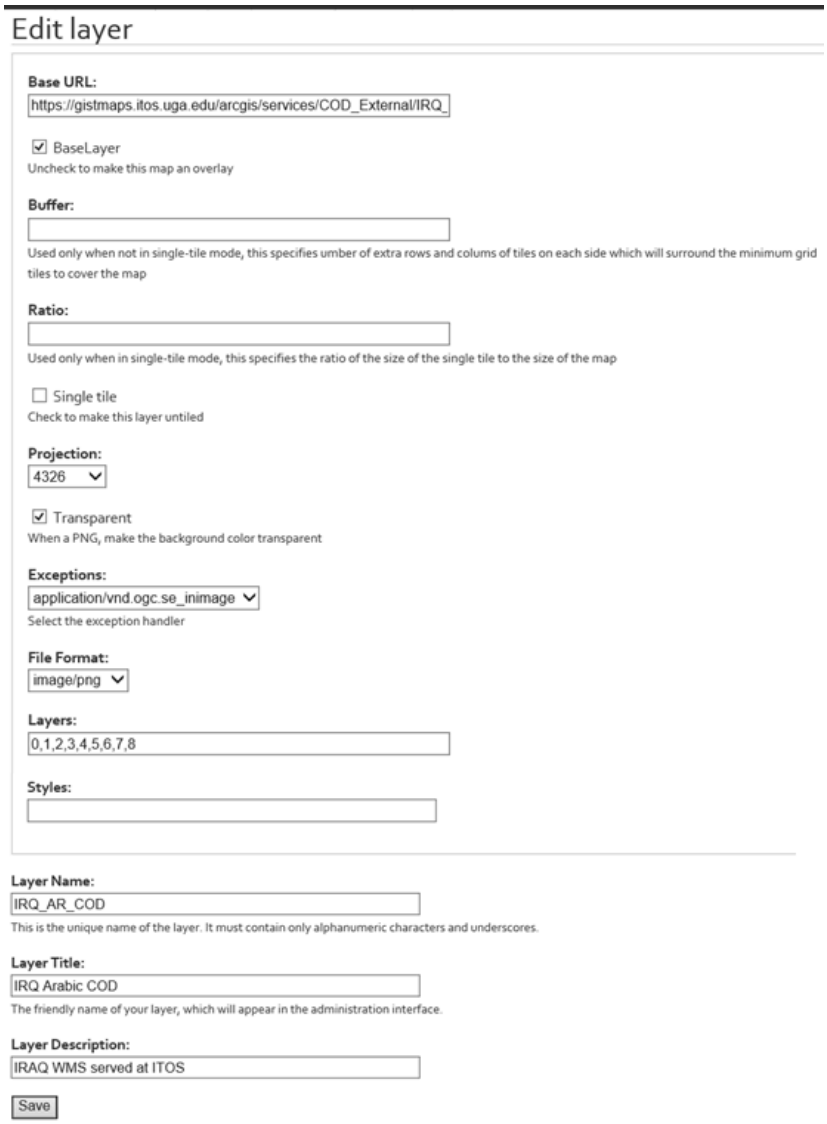
**The Rest Catalog and ESRI API**

**SOAP side?**

***Open Source Clients***

**Openlayers and Drupal** (screen shots from Drupal 6 and OpenLayers 6.x-2.0)
*UPDATE: openlayers is no longer supported in D6*
The Openlayers module in Drupal allows users to create views to show base maps from different providers (Google maps, Open Street Map, etc.) as well as geographic data from other sources. For example, you can display Well Known Text (WKT) that is stored as part of a node or piece of content in the Drupal database, or you can overlay other map services, like WMS. I won't go through all of the steps here, but as a general set of guidelines, when you create a layer to be displayed, these are the parameters you should know:
Base url:
https://gistmaps.itos.uga.edu/arcgis/services/COD_External/IRQ_AR/MapServer/WMSServer

Layers:
Assuming you want to add all of the WMS layers for Iraq into your OpenLayers view you will specify the Layer names in this order:
0,1,2,3,4,5,6,7,8



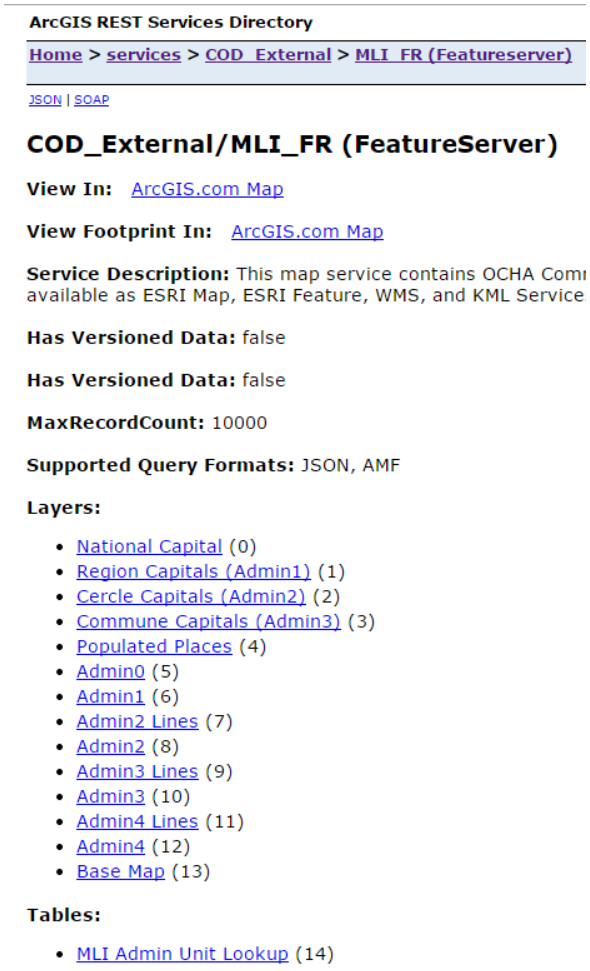

If you add the layer as a base layer it will not be queryable. If you don't add the layer as a base layer, and have installed the WMS Getfeatureinfo module, you can query the WMS. [See this discussion if you are having trouble getting the WMS Getfeatureinfo module to work with WMS services served from an ESRI Server].

**CKAN**

**(esri)JSON**

For developers who want to get geometry from the CODs in json, working with the feature service will allow them to query a feature for the layerIDs, then query the layerIDs for featureIDs, and request the geometry for the features.

For example, looking at the rest catalog for the Mali feature service:
http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/MLI_FR/Featureserver
You can query the feature service to get a list of layers and their id.
http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/MLI_FR/FeatureServer?f=pjson
returns



ArcGIS REST Services Directory

Home > services > COD_External > MLI_FR (Featureserver)

JSON | SOAP

**COD_External/MLI_FR (FeatureServer)**

**View In:** ArcGIS.com Map

**View Footprint In:** ArcGIS.com Map

**Service Description:** This map service contains OCHA Comı
available as ESRI Map, ESRI Feature, WMS, and KML Service

**Has Versioned Data:** false

**Has Versioned Data:** false

**MaxRecordCount:** 10000

**Supported Query Formats:** JSON, AMF

**Layers:**

- National Capital (0)
- Region Capitals (Admin1) (1)
- Cercle Capitals (Admin2) (2)
- Commune Capitals (Admin3) (3)
- Populated Places (4)
- Admin0 (5)
- Admin1 (6)
- Admin2 Lines (7)
- Admin2 (8)
- Admin3 Lines (9)
- Admin3 (10)
- Admin4 Lines (11)
- Admin4 (12)
- Base Map (13)

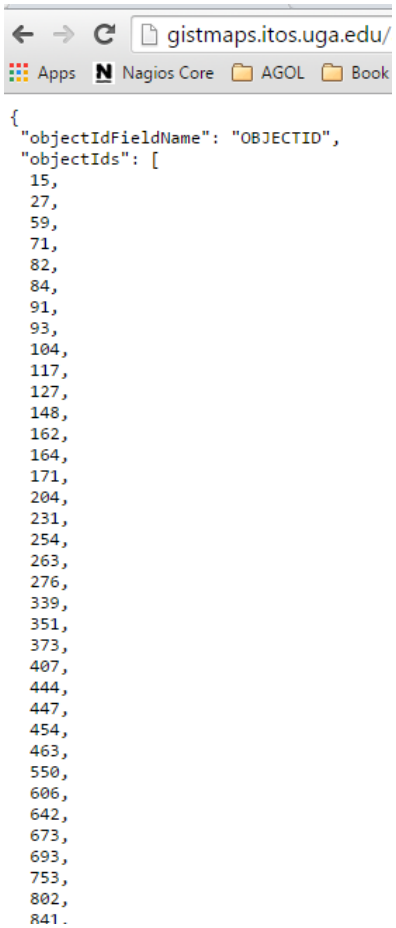
**Tables:**

- MLI Admin Unit Lookup (14)

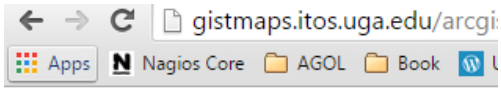
From this list of layers and their ids, you can query one of the layers, for example admin3 capitals, which has layer id 3, to get the feature ids:

http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/MLI_FR/FeatureServer/3/query?returnIdsOnly=true&f=pjson

returns



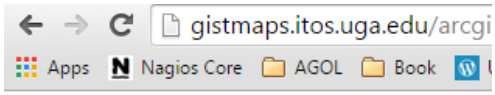

To get the geometry, pass the feature ids to the service to query. There are two syntaxes that will return geometry. Choosing one of the points from our feature id query like:
http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/MLI_FR/FeatureServer/3/642/?f=pjson
returns the xy coordinates and all the attributes





```
{
 "feature": {
  "geometry": {
   "x": -10.162449399999957,
   "y": 14.20357572000006
  },
  "attributes": {
   "OBJECTID": 642,
   "featureName_fr": "Dialan",
   "pcode": "MLI00100204000",
   "featureRefName": null,
   "featureAltName1_fr": null,
   "featureAltName2_fr": null,
   "popPlaceClassNumber": null,
   "popPlaceClassTitle": "Admin3 Capital",
   "admin0Name_fr": "Mali",
   "admin0Pcode": "MLI",
   "admin1Name_fr": "KAYES",
   "admin1Pcode": "MLI001",
   "admin2Name_fr": "BAFOULABE",
   "admin2Pcode": "MLI001002",
   "admin3Name_fr": "DIALLAN",
   "admin3Pcode": "MLI00100204",
   "date": 1422835200000,
   "validOn": null,
   "validTo": null
  }
 }
}
```


Alternatively you can pass a list of object ids and get geomtery and attribution:
http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/MLI_FR/FeatureServer/3/query?f=pjson&objectIds=642,17327
returns





```
{
 "objectIdFieldName": "OBJECTID",
 "globalIdFieldName": "",
 "geometryType": "esriGeometryPoint",
 "spatialReference": {
  "wkid": 4326,
  "latestWkid": 4326
 },
 "fields": [
  {
   "name": "featureName_fr",
   "alias": "featureName_fr",
   "type": "esriFieldTypeString",
   "length": 50
  }
 ],
 "features": [
  {
   "geometry": {
    "x": -10.162449399999957,
    "y": 14.20357572000006
   },
   "attributes": {
    "featureName_fr": "Dialan"
   }
  },
  {
   "geometry": {
    "x": -3.5972920229999659,
    "y": 16.422015850000037
   },
   "attributes": {
    "featureName_fr": "Kanèye"
   }
  }
 ]
}
```

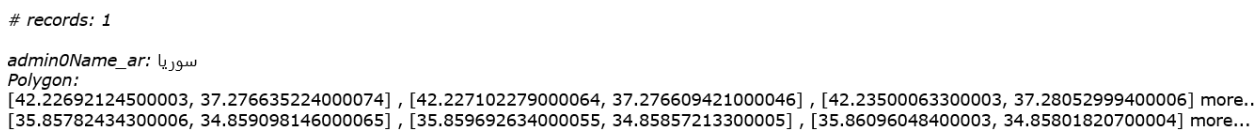

If you have any trouble getting a response, you may have to specify an envelope for the data, for example: http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/SYR_AR/FeatureServer/5/query?geometryType=esriGeometryEnvelope&geometry=-180,-90,180,90&returnGeometry=true&f=json

You can also get a response by making the query ‘dirty’ with a true clause. For example, adding the clause ‘where 1=1’: http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/SYR_AR/FeatureServer/5/query?where=1%3D1&returnGeometry=true&f=json

Note: Esri's JSON objects don't follow the GeoJSON standards. You can convert on the fly using OGR library.

sampleserver3.arcgisonline.com/ArcGIS/rest/services/Hydrography/Watershed173811/FeatureServer/0/query?where=objectid+%3D+objectid&outfields=*&f=json"
OGRGeoJSON
There is also a free web service that will convert files to GeoJson:
http://ogre.adc4gis.com/

**HTML**
Similar to the JSON queries, you can also request the results as HTML:
http://gistmaps.itos.uga.edu/arcgis/rest/services/COD_External/SYR_AR/FeatureServer/5/query?where=1%3D1&returnGeometry=true&f=html
returns




**Leaflet**
**Shapley**
**Mapbox (JavaScript)**

Info here on how to use the gdal library in qgis to convert data from ESRI services to other formats:
https://hub.qgis.org/wiki/17/Arcgis_rest
http://www.northrivergeographic.com/qgis-adding-an-arcgis-rest-service

***Future Services***
Need another set of tests for tile services.

Work is in progress on the services listed below, which can be consumed by various clients.

- WMTS (tiled WMS)

**Use cases:**

AGOL user - loads (a) as esri map service ; wants pcodes so adds (b)

ESRI desktop - loads (a) as esri feature, downloads data
OS data client - wants wfs so adds (b) and saves local copy
OS map client - loads (a) or (b) as WMS over other data

Downloadable static files
Files are available in the following packages and formats (each country has 24 packages):

a. By theme: Admin or PP
b. By Format:
    i. CSV (attribute only)
    ii. XLS (attribute only)
    iii. WKT (CSV+WKT)
    iv. WKB (CSV+WKB)
    v. fGDB 9.2
    vi. fGDB 9.3
    vii. fGDB 10.1
    viii. fGDB 10.2
    ix. SHP
    x. geoJson
    xi. GML
    xii. KMZ