

ATAK - iTAK - WinTAK

ArcGIS To KMZ Tips

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Online at: https://mappingsupport.com/p2/atak/pdf/atak_arcgis_tips.pdf

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1. Introduction

Anyone can display ArcGIS data using ATAK, iTAK and WinTAK. **No plug-in is needed.** The key step is using a 'query' command to download data from the ArcGIS server. There are two ways to make and use an ArcGIS query command. I have produced PDF documentation for each method.

1. Make a query command 'by hand' with various parameters and enter the command into TAK software as a KML link.

https://mappingsupport.com/p2/atak/pdf/atak_arcgis_query.pdf

2. Use a webpage I developed to fill out a form. User Guide:
https://mappingsupport.com/p2/atak/pdf/atak_arcgis_convert.pdf

There is a third PDF (“Tips PDF”) which applies to both methods. That PDF

- Compares the above two methods and points out **unique features and key differences**.
- Explains how to find ArcGIS data and use the webpages that are a table of contents for each server. This is where you will learn about **MaxRecordCount**.
- Shows you how to work with KML/KMZ files including combining KMZ files.
https://mappingsupport.com/p2/atak/pdf/atak_arcgis_tips.pdf
You are reading this PDF.

2. Comparing the two methods

The next page has a table showing the differences between using query commands to display ArcGIS data vs using the webpage method. Here is the biggest difference.

If the ArcGIS data is **FeatureServer** data then you **must use the webpage method**. The query command method cannot be used since FeatureServer data cannot be exported from the ArcGIS server in KMZ format. When you use the webpage method the icons hosted on the ArcGIS server for point are not available for use in TAK.

If the ArcGIS data is **MapServer** data and changes over time and you want to automatically have the TAK software refresh the data on your device, then you **must use the query command method** as an ATAK KML link. Data exported from the ArcGIS server in KMZ format includes the icons for point data.

Tip: If you want to display **MapServer point data** in TAK then it is strongly recommended that you use the **query command method** so the icons hosted on the ArcGIS server show up in TAK. If you want to edit the KML/KMZ (for example by adding a <Region> section) then enter the query command into a browser and save the KMZ file. Later sections of this report show how to de-compress a KMZ file, edit a KML file and make a new KMZ file for use in TAK. By using this method the icons from the ArcGIS server will be used on the TAK map.

In addition to the two methods compared in the following table, ESRI made a TAK plug-in to display ArcGIS data, but (1) you need a government account, (2) it only works in ATAK, (3) has significant problems and will not be further discussed.

	ArcGIS Query command used as ATAK KML link	ArcGIS-to-TAK Web form
Access ArcGIS MapServer data	Yes	Yes
Access ArcGIS FeatureServer data	No	Yes
ATAK can automatically refresh with new data from the ArcGIS server	Yes	No
Data displayed in ATAK uses the icons defined on the ArcGIS server	Yes	No
Restyle line and polygon data	No	Yes
KML file includes a <Region> section so point data stops displaying when you zoom out	No	Yes
File format that is exported from the ArcGIS server	KMZ	GeoJSON

3. ArcGIS for TAK users

This information provided here assumes you have **no prior ArcGIS knowledge**. You do not need a GIS degree in order to display ArcGIS data in TAK software. The sections below will first show you how to find ArcGIS data for your area. Then you will learn that each ArcGIS server has a **table of contents** that is just a series of webpages. For the purpose of displaying ArcGIS data in TAK, the important bits of information in an ArcGIS table of contents will be pointed out.

a. How to find ArcGIS data

A good way to learn about loading ArcGIS data into TAK software is by experimenting with data for your own local area. Maybe there is an ArcGIS server for your city or county with data layers for parks, trails, parcels, traffic cameras, schools, hospitals, hydrants or something else that interests you.

Below is a link to a PDF file that I curate with links to 3,000+ ArcGIS servers at all levels of government in the USA from federal to local. Each week the addresses are scanned by my code and any bad links are either fixed or flagged. An updated list is usually posted each Wednesday.

If you do not see an ArcGIS server for your city or county, then if you let me know I will look for one.

https://mappingsupport.com/p/surf_gis/list-federal-state-county-city-GIS-servers.pdf

One way to see if a specific ArcGIS server has the data you want is to use a **Google advanced search**. This will search one internet address based on keywords. For example, Spokane County in Washington State has an ArcGIS server at

<https://gismo.spokanecounty.org/arcgis/rest/services>

Assume you want data showing the location of trails. Enter the following search into your browser. **There is no space after the colon.** You will see that the first search hit is to a layer of trail data on this server.

site:https://gismo.spokanecounty.org/arcgis/rest/services trail

Another way to look for data on an ArcGIS server is to use your browser to look through an ArcGIS server's table of contents as explained in the next section.

b. How to use an ArcGIS table of contents

The text below is focused on describing ArcGIS server table of contents for the purpose of displaying ArcGIS data in TAK. I also made a video tutorial and that link is show below. However, the video was produced to support the GISsurfer web map (one of my other projects) so some of the information in the video is not relevant to TAK.

<https://youtu.be/cnZfLOQZfX8>

Each ArcGIS server has a table of contents which is just a series of web pages. One webpage is the top of the table of contents. The top webpage always ends in **'rest/services'**. From the top page you can drill down either 2 or 3 more levels.

The following link will open the top page for the table of contents for a Washington D.C. ArcGIS server.

<https://maps2.dcgis.dc.gov/dcgis/rest/services>

When you open the above webpage you will see a clickable list of **folders** and **services**. As you open different pages in the table of contents you may see a screen asking for login credentials. Just close that webpage and then try opening a different part of the table of contents. It is fairly common for an ArcGIS server to have some data layers that are public (i.e. no login required) and other layers where the access is restricted.

If you click on a **folder** then you will see a clickable list of **services**. The top page of some ArcGIS servers will just have a list of services and will not have a folder section.

If you click on a **service** then you will see a clickable list of one or more **layers**.

If you click on a **layer** then you will see **details** for that layer including a value for **MaxRecordCount**.

Use the above link and open the table of contents for the Washington D.C. ArcGIS server. Then under Folders, click the DCGIS_DATA. Next, look down about 10 lines on the DCGIS_DATA page and click the line "DCGIS_DATA/Cultural_and_Society_WebMercator (MapServer)".

You now see a list of layer names and numbers. The layer names are not important. Instead, it is the **layer number** that will help you display the data in ATAK. Next, click layer number 54 and a **detail page for this layer** will open. This layer has data about museums.

Below is the address for layer 54 that is now in your browser bar. Note the layer number at the end. **This is the address to use as part of an ArcGIS query command.**

`https://maps2.dcgis.dc.gov/dcgis/rest/services/DCGIS_DATA/Cultural_and_Society_WebMercator/MapServer/54`

A complete **ArcGIS query command** to display this data in ATAK using import > KML link would be:

`https://maps2.dcgis.dc.gov/dcgis/rest/services/DCGIS_DATA/Cultural_and_Society_WebMercator/MapServer/54/query?where=1=1&outSR=4326&outFields=*&f=kmz`

If you are using the **data conversion webpage** then in the input area labeled "ArcGIS server address" you would enter:

`https://maps2.dcgis.dc.gov/dcgis/rest/services/DCGIS_DATA/Cultural_and_Society_WebMercator/MapServer`

Then in the next input box you would enter the layer number:

54

Now refer back to the ArcGIS table of contents detail page for layer 54 (museums). The **detail page** for an ArcGIS layer has several useful pieces of information. Look for the following headings.

Geometry Type

This tells you if the data is for points, lines or polygons.

Description

Sometimes this will have useful metadata to help you understand what information that layer contains. Some of the NOAA ArcGIS layers do an outstanding job of providing a description. Unfortunately, a useful description seems to be the exception.

MaxRecordCount

This is the maximum number of records you can download from this ArcGIS layer at one time. This limit applies to both ArcGIS query commands and to ArcGIS data you download using the data conversion webpage I made.

Fields (scroll down)

This section lists the **name** of each attribute. If you are going to select a subset of records from the layer based on attribute values then you need to know the name of the attribute(s) you will use to make that selection. Note that attribute names do not have spaces but instead use an underline character. The information after the attribute name shows whether the **value** is a:

string	esriFieldTypeString
integer	esriFieldTypeInteger
decimal number	esriFieldTypeDouble

Tip: Lots of ArcGIS layers include attribute data that is a link which leads to more information. When you display that attribute data with ATAK even if the link does not appear to be clickable you can **touch-and-hold the link** and you should see an option to open the link using Chrome.

Here is a review of the ArcGIS table of contents webpages described above for the Washington D.C. museum layer.

Top of the table of contents.

<https://maps2.dcgis.dc.gov/dcgis/rest/services>

Display the contents of folder DCGIS_DATA.

https://maps2.dcgis.dc.gov/dcgis/rest/services/DCGIS_DATA

Display the list of layers in the service Cultural_and_Society_WebMercator.

https://maps2.dcgis.dc.gov/dcgis/rest/services/DCGIS_DATA/Cultural_and_Society_WebMercator/MapServer

Display the **details** for layer 54.

https://maps2.dcgis.dc.gov/dcgis/rest/services/DCGIS_DATA/Cultural_and_Society_WebMercator/MapServer/54

Another key thing to know is that there are several different types of ArcGIS data which are identified by terms such as **MapServer**, **FeatureServer** and a few other types. When you look at an ArcGIS table of contents page that shows a list of layers, the type of data for each layer is shown. Note the term “MapServer” in the last two links shown above.

It is critical to identify whether a data layer is MapServer, FeatureServer or some other type. As shown in the comparison table earlier in this report, **only** MapServer data can be streamed directly from the ArcGIS server into ATAK by making an ArcGIS query command and

doing Import > KML link. On the other hand, the data conversion webpage can use **either** MapServer or FeatureServer data.

Sometimes when you look through an ArcGIS server's table of contents you will see that the same data is available as both a MapServer layer and a FeatureServer layer. If you open the following page and run your eye down the list of services, you will see some examples.

<https://tdeconline.tn.gov/arcgis/rest/services>

As you look at addresses for ArcGIS servers you will notice that some of those addresses include a string of **random characters**. All of the data layers on those servers is **FeatureServer** data. The only way to view that data in TAK is to use the data conversion webpage. **ArcGIS servers cannot export FeatureServer data as KMZ** therefore that data cannot be directly streamed from the ArcGIS server into ATAK via Import > KML link. Below is an example of an ArcGIS server address that includes some random characters. If you open this table of contents page and look around you will see that all of the data is **FeatureServer**.

<https://services9.arcgis.com/RHVPKKiFTONKtxq3/ArcGIS/rest/services>

c. A few ArcGIS layers that might be useful

i. Trails

The USGS is building a national trail layer. You can read about this program at

<https://www.usgs.gov/national-digital-trails>

The trail data is layer 0 at:

<https://partnerships.nationalmap.gov/arcgis/rest/services/USGSTrails/MapServer>

ii. Statewide parcel data

About half of the states have a statewide ArcGIS layer of parcel data. The link below is to a text file that has those ArcGIS layer addresses. There is some extra information in this text file that is not relevant to TAK and can be ignored. Also, since there will always be more records in the layer than allowed by **MaxRecordCount** you will need to use a bounding box.

https://mappingsupport.com/p2/parcels/USA_public_private_parcels.txt

Tip: If a data layer is MapServer and the parcels do not have any fill, then the easiest way to display the data is by making an ArcGIS query command.

iii. National map structures

When you open the following ArcGIS table of contents page you will see that the layers are arranged in two parts. The first bunch of layers only have label information. Those layers do not display icons. Look halfway down the list of layers until you find “Features”. The layers after that point will display icons on the map.

<https://carto.nationalmap.gov/arcgis/rest/services/structures/MapServer>

Tip: All these layers are MapServer data. So use an ArcGIS query command in order to have the icons hosted on the ArcGIS server appear on the TAK map. But since there likely will be more records in the layer than allowed by MaxRecordCount, your query command will need to either include a bounding box or a ‘where’ parameter or both.

To see all the national map ArcGIS layers, start at <https://apps.nationalmap.gov/services>

d. GISsurfer can give you a quick look at ArcGIS data

One of my other volunteer projects is developing the **GISsurfer web map**. You can split your screen and on the left side navigate up and down through the table of contents for an ArcGIS server. When you drill down to a layer you can click the box in front of the layer name and that data appears on the screen - assuming you have panned and zoomed the map to an area covered by the data in the layer. The GISsurfer Help page has links to both a video tutorial and PDF tutorial for the ‘Surfing’ feature.

<https://mappingsupport.com/p2/gissurfer-help.html>

4. Working directly with KMZ and KML files

a. How to decompress a KMZ file

A KMZ file is a compressed file. It is the same as a zip file except for the file extension. To uncompress a KMZ file using windows, change the file extension to zip and then right-click the file name and select “Extract all”. A new folder will be created with the KML file. If the KML file is named ‘doc.kml’ then it would be wise to change the name to something more meaningful.

If you decompress a KMZ file with **point data** that you downloaded from an ArcGIS server, then the new folder will also have one or more png or jpg files with the **icon images**. Note that the file names for the icon files might be a string of **random characters**. You can view these icon files the same way you view any image file.

b. KML basics

A KML file is a type of text file and can be opened/edited with software that can edit text files. KML files are written using matching tags like so: <opening tag>stuff</closing tag>. Most KML files use coordinates to define points, lines or polygons.

All you usually need at the start of a KML file is the following.

```
<?xml version="1.0" encoding="UTF-8"?>  
<kml xmlns="http://www.opengis.net/kml/2.2">  
<Document.....
```

A KML file typically has one or more <Placemark> sections. Each placemark corresponds to **one record** on the ArcGIS server. Placemarks usually defines points, lines or polygons. Each placemark also refers to a <Style> section that controls various things about how the data appears on the map, such as line color. The styles can either be at the start or the end of the KML file.

After editing a KML file a quick way to test for errors is to try an open the file using **Google Earth Pro**. This is free software than can be installed on Windows, Mac and Linux systems. If there is a syntax error in the KML file then you will see a message telling you what is wrong. How to get Google Earth Pro:

<https://support.google.com/earth/answer/21955?hl=en>

If you are testing a KML file that has point data then you should first make a KMZ file (see later section of this report) **that includes the icon(s)** and then try to open the KMZ file with Google Earth Pro.

There is a KML syntax reference at

<https://developers.google.com/kml/documentation/kmlreference>

If you enter an ArcGIS ‘query’ command into ATAK then the ArcGIS server sends back KMZ data. The following sections will look at examples of point, line and polygon data that ArcGIS servers send in response to a query command and will show how data in the KML file is used to control the size of any icons, determine if labels are displayed and style how lines, polygons and labels appear on the map. You can edit any of that data and make a new KMZ file to use in TAK.

c. Point data

The State of Florida has an ArcGIS MapServer layer showing the location of public access to beaches. If you open the following ArcGIS table of contents page then you will see that **MaxRecordCount** is a generous 6000.

https://ca.dep.state.fl.us/arcgis/rest/services/External_Services/ORP_APP/MapServer/1

The next step is to enter the following query command into a browser to find out the number of records in this layer.

https://ca.dep.state.fl.us/arcgis/rest/services/External_Services/ORP_APP/MapServer/1/query?where=1=1&outSR=4326&outFields=*&f=geojson&returnCountOnly=true

Since the number of records in the layer, 2189, is less than **MaxRecordCount**, you can download all the Florida beach access data as a KMZ file by entering the following query command into a browser.

https://ca.dep.state.fl.us/arcgis/rest/services/External_Services/ORP_APP/MapServer/1/query?where=1=1&outSR=4326&outFields=*&f=kmz

I saved this data on my PC and gave it the name **florida_beach_access.zip**. Then I decompressed this zip file as described above. Now I have the following two files.

39f23633-e150-4806-a7f2-69e681d48e22.png
doc.kml

When you use a query command to download point data from an ArcGIS server as KMZ then you also get any **icon files** used by data in that layer. In this case there is only one png icon file. If you open the png file you will see it is a small triangle. I do not know why the file name has **random characters**. That is just how ArcGIS does things.

Since I am going to change the icon that will appear on the map for this data I deleted the png file. I also renamed the kml file to **florida_beach_access.kml**

Next, open the KML file with an editor and let's look at a some things.

The first few lines above the <Document tag have a lot of stuff you do not need. See the comment on this point in the prior section of this report.

Locate the first **<Placemark** section. Each placemark is a beach access point and corresponds to **one record** on the ArcGIS server.

If labels are turned on (more on that below) then the value in the <Placemark><name> tag will be used for the label text.

The <Placemark><styleUrl> tag points to a <Style> section at the end of the KML file. In this KML file all placemarks use the same style. In other KML files you will notice that different placemarks use different <Style> sections.

Now go to the end of the KML file and find the **<Style** section. Note that the style 'id' matches the styleUrl used by the placemarks.

`<IconStyle><scale>` determines the icon size on the map. Decimal numbers are OK.

`<IconStyle><Icon><href>` only has the file name for the icon. You saw this file name when you decompressed the KMZ file.

Note: You can use a full https link to an icon here. However, if you do that then you may run into problems if you try to use the KMZ file offline.

Here are steps I am using to change the icon.

Find a new icon and save it in the **same folder** with the KML file. Google has a bunch of icons you can download and use. <http://kml4earth.appspot.com/icons.html>

You can also use the following website to convert an emoji into a png file. I searched this website on 'beach' and saved a png file called **beach_with_umbrella.png**

<https://emoji.aranja.com/>

I edited the KML so it has:

```
<IconStyle>
  <scale>2.0</scale>
  <Icon><href>beach_with_umbrella.png</href></Icon>
</IconStyle>
```

I used a scale setting to increase the size of the icon since I am going to turn on labels for this point data and I know that ATAK will display the labels **on top of the icons**. At least a bit of the icon will peek out from under the label.

Later in this report you will see how to manage labels, add a KML `<Region>` section and make a new KMZ file you can use in TAK.

d. Line data

The city of Portland Oregon has an ArcGIS MapServer layer showing the location of recreational trails. If you open the following ArcGIS table of contents page you will see that **MaxRecordCount** is 4000.

https://www.portlandmaps.com/arcgis/rest/services/Public/BDS_Boundary/MapServer/26

The next step is to enter the following query command into a browser to find out the number of records in this layer.

https://www.portlandmaps.com/arcgis/rest/services/Public/BDS_Boundary/MapServer/26/query?where=1=1&outSR=4326&outFields=*&f=geojson&returnCountOnly=true

Since the number of records in the layer, 698, is less than **MaxRecordCount**, you can download all of this trail data as a KMZ file by entering the following query command into a browser.

https://www.portlandmaps.com/arcgis/rest/services/Public/BDS_Boundary/MapServer/26/query?where=1=1&outSR=4326&outFields=*&f=kmz

I saved this trail data on my PC with the name **portland_trail.zip**. Then I decompressed this file as described above. This gave me the following two files. I do not need the xls file so I will delete it.

14B38F8821C0400682C9893604B1909D.xls
doc.kml

I changed the name of the KML file to **portland_trail.kml** and opened that file in an editor. Now go to the end of the KML file and note there is only a single <Style section. The <LineStyle> section controls how line data appears on the map. The effect of the <width> setting is obvious but the <color> setting needs some explaining.

The <color> tag can be used in a KML file to as part of the style for

- Line data
- Polygon outlines
- Polygon fill
- Label text

KML color is specified in four parts as aabbggrr where

- aa = alpha (controls transparency)
- bb = blue
- gg = green
- rr = red

Allowable values for each part are 0 to 255 but expressed in hexadecimal, i.e. 00 to ff. Here is a webpage that can convert decimal numbers to hex.

<https://www.rapidtables.com/convert/number/decimal-to-hex.html>

An alpha value of 00 means the color is completely transparent. In other words, using an alpha of 00 is one way to turn the color off. An alpha of ff means the color is completely solid. Here are the codes for some prominent colors.

- black ff000000
- white ffffffff
- red ff0000ff
- green ff00ff00
- blue ffff0000
- yellow ff00ffff
- orange ff00a5ff
- violet ffee82ee

I am going to edit the portland_trail.kml file so it has:

```
<LineStyle>
  <color>ff0000ff</color>
  <width>2</width>
```

This styling will make the trail data solid red and easy to see on any basemap.

A later section in this report shows how to use this edited KML file to make a new KMZ file.

e. Polygon data

The National Interagency Coordination Center has several ArcGIS MapServer layers with predictive outlook information for wildland fires. For background on this data see

<https://www.nifc.gov/nicc/predictive-services/outlooks>

If you open the following ArcGIS table of contents page you will see that **MaxRecordCount** is 2000. This layer shows the wildfire risk for the **current month**.

https://fsapps.nwcg.gov/psp/arcgis/rest/services/npsg/Outlooks_Monthly_Extended/MapServer/0

The next step is to enter the following query command into a browser to find out the number of records in this layer.

https://fsapps.nwcg.gov/psp/arcgis/rest/services/npsg/Outlooks_Monthly_Extended/MapServer/0/query?where=1=1&outSR=4326&outFields=*&f=geojson&returnCountOnly=true

Since the number of records in the layer is less than **MaxRecordCount**, you can download all of this polygon data as a KMZ file by entering the following query command into a browser.

https://fsapps.nwcg.gov/psp/arcgis/rest/services/npsg/Outlooks_Monthly_Extended/MapServer/0/query?where=1=1&outSR=4326&outFields=*&f=kmz

I saved this data on my PC with the name **fire_outlook_current_month.zip**. This data is for **December 2024**. Then I decompressed this file as described above. This gave me an XLS file and a KML file. I deleted the XLS file and renamed the KML file to **fire_outlook_current_month.kml**

Now go to the end of the KML file and note there are **two <Style sections**. Some polygons use the first style and other polygons use the second style.

<PolyStyle><color> controls the color of any **fill** inside the polygon

<PolyStyle><outline> controls whether a **border** will be displayed along the edge of each polygon. A value of 1 means borders will be displayed using the current <LineStyle>. A value

of 0 will cause the polygon borders to not be displayed. To **turn off** polygon outlines, set this value to 0.

The **first <Style section** has a <PolyStyle><color> of ff0000ff which is solid red. I am changing the fill to be semi-transparent by picking a decimal value of 80 (the range is 0-255) and then converting that number to hex. <PolyStyle><color> is now 500000ff.

Also in the first <Style section I am going to make the polygon outlines solid red and wider.

```
<LineStyle>
  <color>ff0000ff</color>
  <width>1.5</width>
```

The **second <Style section** has a <PolyStyle><color> of 00000000 which means the polygon fill is completely transparent since the alpha value is 00.

Tip: When the color for polygon fill has a alpha value of **00** then ATAK will not display anything when you tap inside the polygon. However if you change the alpha value so the polygon fill color is **01**000000 then since the polygons technically have fill (which is not visible on the map) you can tap inside a polygon and ATAK will display the circle with options. I made this change to the polygon fill color.

Also in the second <Style section I am going to make the polygon outlines solid green and wider.

```
<LineStyle>
  <color>ff00ff00</color>
  <width>1.5</width>
```

Tip: Another way to turn off polygon outlines is to set both color and width to all zero.

```
<LineStyle>
  <color>00000000</color>
  <width>0</width>
```

A later section in this report shows how to use this edited KML file to make a new KMZ file.

f. How to manage labels for KML data

i. Point data

In the file **florida_beach_access.kml** part of the <Style section currently is:

```
<LabelStyle>
  <color>00000000</color>
  <scale>0.000000</scale>
```

The <color> setting controls the color of the font used for the label. The <scale> setting determines the size of the font. The default scale setting is 1. To turn **labels off** for point data the settings shown above are recommended.

When point data is exported from an ArcGIS server as KMZ, labels are always turned off via the <LabelStyle> settings shown above. When ATAK sees these settings it does not display labels for point data.

I am going to edit the KML to turn labels on with a yellow font and a bit larger font size.

```
<LabelStyle>
  <color>ff00ffff</color>
  <scale>1.5</scale>
```

The text for each label will come from each <Placemark><name> tag. If there is no content in <Placemark><name> then ATAK will look higher in the KML for content in a <Folder><name> tag and then look higher again for content in a <Document><name> tag. If either of this content is used for the label text then the label will also have a sequential number starting with 1 for each <Placemark> in the KML.

Tip: To only display labels on the map and no icon, make an invisible icon. This could be a one pixel png file with a transparent background and no other content in the png. Put that png in the same folder with the KML file. Then make a KML file with point data and in the <Style> section specify that png file name as the icon. The text for each label goes in <Placemark><name> and you can set the text color and size for the label with <LabelStyle>. Make a KMZ file that includes both the KML file and the PNG file.

ii. Line data

ATAK does not display labels for KML/KMZ line data. This seems to be true for KML parsers in general since Google Earth Pro also does not display labels for line data.

iii. Polygon data

Typically, KML parsers do not display labels for polygon data. However, ATAK has some special code that does so. If the <Polygon><name> tags have content then ATAK will add a red dot to each polygon and then display the <Polygon><name> as a label by each dot. These labels ignore any <Style> information in the KML file.

Polygon labels can be toggled on/off by going to ATAK Settings > Tool preferences > Specific tool preferences > File overlay preferences > Display shape label.

g. KML multigeometry surprise

When you make an ArcGIS query command that uses a bounding box you might get more data than you expect - sometimes a lot more data. The following query command includes a bounding box around the island of Oahu Hawaii. The data in this ArcGIS layer is a generalized depiction of state lines. However, if you open this data in ATAK (Import > KML link) then you will see a polygon outline around every Hawaiian Island even though most of them are outside of the bounding box.

https://gis.ncdc.noaa.gov/arcgis/rest/services/geo/references/MapServer/6/query?where=1=1&geometry=-158.365173,21.184679,-157.587891,21.772358&geometryType=esriGeometryEnvelope&inSR=4326&outSR=4326&outFields=*&f=kmz

“Multigeometry” in this context means that one ArcGIS record has many polygons (or many lines). If **any** polygons (even just one) are inside the bounding box then **all data for the record** (i.e. all polygons or all lines) will be sent by the ArcGIS server to ATAK.

This ArcGIS layer has boundary data for all the states. So it makes sense that there is only one record for Hawaii. You can see the multiple polygon data in geojson format by entering the following query command into your browser. Find the word “coordinates”. Each of the next lower divisions is a polygon with its own coordinate data.

https://gis.ncdc.noaa.gov/arcgis/rest/services/geo/references/MapServer/6/query?where=1=1&geometry=-158.365173,21.184679,-157.587891,21.772358&geometryType=esriGeometryEnvelope&inSR=4326&outSR=4326&outFields=*&f=geojson

h. KML region

The tags that are in a KML <Region> section can prevent your screen from being solid mess of KML data when you zoom out. For example, here is a KMZ file hosted on my server that shows a marker at each fire station for the District of Columbia. As you zoom out there is a <Region> section in the KML that causes the point data to be removed from the map.

https://mappingsupport.com/p2/atak/pdf_example/DC_fire_stations_region.kmz

If you use **ArcGIS query commands** as Import > KML link in ATAK then the KMZ data produced by the ArcGIS server does not include a <Region> section. Therefore as you zoom out all ArcGIS query data remains displayed on your screen.

If you use the **data conversion webpage** to access point data then the resulting KML/KMZ file will contain a <Region> section.

The information below shows how to manually edit a KML file to add a <Region> section. Be aware that there is no perfect <Region> settings. The settings that work well on a cell phone screen might not work well on a bigger screen. There are a number of factors including:

- Amount of ground area covered by the data

- Amount of data

- Size of the icon (for point data)

- Whether labels are displayed

- Size of the user’s screen in pixels

There is some documentation from Google about the <Region> tag at:

<https://developers.google.com/kml/documentation/regions>

But note that ‘nested’ regions are not currently supported by ATAK. This would be a useful feature since as the user zooms out and the KML data disappears, a box could remain on the screen alerting the user that data will appear in that area if they zoom in.

If you want to experiment with a KML <Region> then below is an example of the only tags you likely need in your KML. Make a bounding box that holds all or most of the data in the KML and then for <minLodPixels> try values in the 1000 to 40000 range. Larger bounding boxes require larger values for <minLodPixels>. Remember to include the **minus sign** if needed for any of the latitude longitude values.

```
<Region>
  <LatLonAltBox>
    <west>_____</west>
    <south>_____</south>
    <east>_____</east>
    <north>_____</north>
  </LatLonAltBox>
  <Lod>
    <minLodPixels>_____</minLodPixels>
  </Lod>
</Region>
```

Tip: The following site has bounding boxes for each state and each county. When you open this link you will first see some code.

<https://observablehq.com/@rdmurphy/u-s-state-bounding-boxes>

I used the above link and got the bounding box data for Florida. That data is presented in the order: west, south, east, north. I truncated each value to 6 decimal places and made the following KML <Region>. I know from experience that when data covers a fairly large state that a good starting value for <minLodPixels> is 40000.

```
<Region>
  <LatLonAltBox>
    <west>-87.634700</west>
    <south>24.514908</south>
    <east>-80.032575</east>
    <north>31.000809</north>
  </LatLonAltBox>
  <Lod>
    <minLodPixels>40000</minLodPixels>
  </Lod>
</Region>
```

Next I opened the florida_beach_access.kml file (described earlier in this report) and just after the style section near the end of that file, I add the above <Region>. Then I made a new KMZ

file that includes both the KML file and the png icon file. Both the KML and KMZ file are on my server.

KML: https://mappingsupport.com/p2/atak/pdf_example/florida_beach_access.kml

KMZ: https://mappingsupport.com/p2/atak/pdf_example/florida_beach_access.kmz

When I opened the KMZ in ATAK 5.3.0.1 (Import > KML link)

the icons are large

the labels display with larger font

the region makes the data disappear when I zoom out

but the label font is not yellow. I seem to recall this worked in an earlier version of ATAK. This KMZ does display yellow font in Google Earth Pro.

i. How to combine KML data into one file

If there are more records in an ArcGIS layer than **MaxRecordCount** then you need to send more than one request to the ArcGIS server in order to download all the data. With a bit of work you can combine that data into a single KMZ file.

1. Decompress each KMZ file that you downloaded from the ArcGIS server.
2. Open the first KML file in an editor and go to the last </Placemark> tag.
3. Open the next KML and copy only all the placemark data.
4. Paste the placemark data after the last </Placemark> tag in the first KML file.
5. Repeat steps 3 and 4 until all the placemark data is in the first KML file
6. Make a new KMZ file as shown in the next section of this report.

j. How to compress KML into a new KMZ file

These instructions are for a windows computer.

For **point data** you need to have both the KML file and the icon file(s) in the **same folder**.

1. Make a selection that includes the kml file and each icon file.
2. Right-click in the selection.
3. Send to > Compressed (zipped) folder.
4. Change the file extension from zip to kmz.

Links to the **Florida beach access** KML and KMZ files are provided above.

For line and polygon data the instructions are the same except you do not have any icon files. Instead, you only have a KML file that will be compressed.

Finished files for the **Portland trail** line data are at:

KML: https://mappingsupport.com/p2/atak/pdf_example/portland_trail.kml

KMZ: https://mappingsupport.com/p2/atak/pdf_example/portland_trail.kmz

Finished files for the **fire outlook** polygon data are at:

KML: https://mappingsupport.com/p2/atak/pdf_example/fire_outlook_current_month.kml

KMZ: https://mappingsupport.com/p2/atak/pdf_example/fire_outlook_current_month.kmz

The fire outlook polygons cover the USA and it is a lot of data. When I opened the KMZ using ATAK 5.3.0.1 a red dot displayed on each polygon but the labels did not display. If you look at the attribute data for the two type of polygons you will see that the ones that appear to have no fill have FirePotent = Normal. The red ones have FirePotent = Above. In the KML, one style or the other is assigned to each placemark polygon based on the value of this attribute.

k. KML <NetworkLink> tag

The KML syntax includes a feature that lets you make a small KML file that displays data from multiple KML/KMZ files. You do this by making a KML file that has one or more <NetworkLink> sections. Each of those sections displays the data from one KML or KMZ file.

Caution! The address for each file with data to display must end in either **kml** or **kmz**. In other words, the target of a KML <NetworkLink> cannot be a file on Google Drive and cannot be an ArcGIS query command.

Here is a link to a small KML file on my server that has three <NetworkLink> sections. Each section points to a KMZ file on my server. You can download this KML file and copy the syntax for your own needs.

If you do Import > KML Link using this KML address then the map will display police stations, fire stations and hospitals for King County, Washington State. **This requires ATAK 5.3.0.1 or later.**

https://mappingsupport.com/p2/atak/pdf_example/king_county_networklink.kml

Since KML files with <NetworkLink> sections tend to be small files there is no real benefit in compressing the KML file into a KMZ file.

5. How to host files for free on Google Drive

If you have a gmail address then you have a Google account which includes **Google Drive** with lots of free storage. **Google Cloud** is something different. KML and KMZ files that are hosted

on Google Drive can be used in ATAK when you do Import > KML link. After uploading a file to Google Drive, set the 'share' permission to anyone with the link. Copy the 'share' link and paste it into this website:

<https://sites.google.com/site/gdocs2direct/>

Copy the 'direct' link. That is the link that can be used in ATAK for Import > KML link.

Example 'share' link.

https://drive.google.com/file/d/1vLyvtI2-twadBIOW7QZyUz_u7AzqZzxi/view?usp=drive_link

Example 'direct' link.

https://drive.google.com/uc?export=download&id=1vLyvtI2-twadBIOW7QZyUz_u7AzqZzxi

Unless you know that a KML/KMZ file hosted on Google drive is being updated, you should assume the file is static. When a file is not being updated there is no reason to set an Auto Refresh rate in ATAK.