

ArcIMS Technical Paper: Strategies for using feature limits

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ArcIMS Technical Paper: Strategies for using feature limits

ArcIMS services, by design, have no limits on the number of features that can be selected or queried. Users can inadvertently or maliciously request unlimited numbers of features. Feature queries do not have scale dependencies. This means that all features for a layer can be requested even if the layer is not displayed on the map for a given scale. Some common ways a user can request many or all records for a layer are:

- Request all cities with a population greater than 0.
- Send an empty *where* statement (*where=""*)
- Send a statement that is always true (*where="1=1"*).
- Select all features in a layer using an application's select tool.

Fortunately, ArcIMS has several built in ways to set limits to the number of requested features when making GET_FEATURES requests.

- Setting a global feature limit.
- Setting feature limits in a map configuration file.
- Requesting a specified number of features.

Setting a global feature limit

A global feature limit can be set in the Spatial Server configuration files limiting the number of requested features from all layers in all services. By default, the feature limit is 2000 for queries made to Image and ArcMap Image Services. No upper limit is set for Feature Services (denoted as -1 in the configuration file). For ArcMap Image Services, this is the only place on the server to limit the number of requested features.

You can change the feature limit by setting the *featurelimit* parameter in the Spatial Server configuration files.

- **aimsqs.cfg** for Image Services
- **aimsamsrv.cfg** for ArcMap Image Services
- **aimsfs.cfg** for Feature Services.

Spatial Server configuration files are stored in the following locations.

For Windows:

<ArcIMS Installation Directory>\ArcIMS\Server\etc directory

For UNIX and Linux:

\$AIMSHOME/etc directory

Change the *featurelimit* value to a new feature limit.

```
<PARAMETER name="featurelimit" value="2000" />
```

Higher values can lead to slower performance. More importantly, When many large queries are executed they may block and prevent shorter queries from executing until completion of the excessively long queries.. In addition, large responses can hang a client viewer.

When you change any setting in a .cfg file, you must restart the Monitor and Application Server. The changes you make affect only the Spatial Server(s) on the machine where you edited the .cfg files. So, if your site configuration includes multiple machines for Spatial Servers, you must change the configuration files on each machine, and then restart the Monitor on each machine plus the Application Server.

Setting feature limits in a map configuration file

If you do not wish to set a global limit on the number of features returned, or you want to refine the feature limit, it is possible to set limits on a layer by layer basis for Image and Feature Services. A feature limit cannot be set in the map document for ArcMap Image Services.

Setting a feature limit in a configuration file is implemented via the SPATIALQUERY element. This is advanced functionality and not available through the Author interface and so will require a manual edit of the map configuration file.

1. Open the map configuration file in a text or XML editor and look for the LAYER element.

```
<LAYER type="featureclass" name="Countries" visible="true"
id="1">
  <DATASET name="CNTRY94" type="polygon" workspace="shp_ws-0" />
  .
  .
  .
</LAYER>
```

2. After the DATASET element add SPATIALQUERY. The placement of this element is not critical as long as it is between the opening and closing LAYER elements.

```
<LAYER type="featureclass" name="Countries" visible="true"
id="1">
  <DATASET name="Countries" type="polygon" workspace="shp_ws-0" />
  <SPATIALQUERY featurelimit="25" />
  <COORDSYS id="4326" />
  <SIMPLERENDERER>
    <SIMPLEPOLYGONSYPHOL fillcolor="255,255,153" />
  </SIMPLERENDERER>
</LAYER>
```

In this example, the number of returned features can never exceed 25 for the Countries layer. You can set a feature limit for each layer, and this value does not need to be the same from layer to layer.

Additional information about SPATIALQUERY and editing map configuration files is available in the [ArcXML Programmer's Reference Guide](#).

Requesting a specified number of features

The third way in which the number of features can be limited is to set a feature limit when requesting attribute data using a GET_FEATURES request. In many cases, you may want to limit the number of returned features to something manageable. For example, you may want to return only 10 records at a time and allow users to page for the next or previous 10 records.

The attributes *beginrecord* and *featurelimit* are used together to limit the number of features returned. *Beginrecord* is used to start the retrieval at a specified record. *Featurelimit* sets the number of features. For example, if 25 features should be returned, *featurelimit* is set to "25". For the first retrieval, *beginrecord* starts at "0" (the default). For the second retrieval, *beginrecord* should start at "25". To determine whether more than 25 features were extracted, the attribute *hasmore* in the FEATURES response will be set to "true" (more records) or "false" (no more records).

Feature limit hierarchy

The hierarchy for all the feature limit settings are as follows:

1. The feature limit in the Spatial Server configuration files is the maximum that can ever be returned in one request. If you have ever wondered why you never get more than 2000 records, it is because of this *featurelimit*.
2. SPATIALQUERY *featurelimit* in a map configuration file overrides the value in #1 if it is smaller.
3. GET_FEATURES *featurelimit* overrides the values in #1 and #2 if it is smaller.
4. In a GET_FEATURES request, SPATIALQUERY *featurelimit* overrides GET_FEATURES *featurelimit*. In both elements, the feature limit must be smaller than #1 or #2, or it is ignored.

HTML Viewer behavior with feature limits

The HTML Viewer has several safeguards in place to protect against bad queries or queries that return too many features. First, a layer must be turned on and must be visible for the given scale before any features can be queried. Second, although all features may be selected on a map, a request returns records for only 25 features at a time.

These constraints have been placed at the application level. Other applications or users who understand how to send requests to an ArcIMS Servlet Connector can bypass these HTML Viewer safeguards. Therefore, although you may not run into too many problems with requests from an HTML Viewer, you need to protect your site from these other users and applications.

ArcMap as a client

A good example of another client that uses the same Servlet Connector as the HTML Viewer is ArcMap. Unlike the HTML Viewer, ArcMap does not limit the number of

returned features. In addition, the layer does not need to be visible or within scale range for features to be selected.

In ArcMap, selected features can be saved locally. Some strategies for preventing users from selecting all the features of a layer are covered in the technical paper *How to Manage the Data Sharing Capabilities of an ArcIMS Service* (<http://support.esri.com/index.cfm?fa=knowledgebase.whitepapers.viewPaper&PID=16&MetaID=308>)

If you want ArcMap users to be able to identify small groups of features but not select all of them at once, you can limit the number of selected features using `featurelimit`. The benefit is that users can use identify and select small groups of features. The downside is that if a user selects many features, only some of those features will highlight. Since there is no feedback about why all the features weren't selected, a user may assume that ArcMap is not functioning properly. Also, a determined user could make many selections and eventually save all the data for a layer.

How to select appropriate feature limits

You now know the different ways to set feature limits and how feature limits affect two popular viewers – the HTML Viewer and ArcMap. Choosing the appropriate feature limit depends on the service type, performance considerations, and data sensitivity among other factors.

- **Service type:** Feature limits for ArcMap Image Services can be set only in the Spatial Server configuration file. The `featurelimit` value applies to all layers in all services. Therefore, you must pick a value that does not interfere with potential queries you would expect users to make. If you expect users to only use the identify tool, you can set the value very low. If you expect users to analyze data using queries and buffers, you will need to set the value higher so that all records are returned for an appropriate query.

Image and Feature services have more flexibility for setting feature limits. In addition to setting a global feature limit, you can set feature limits on each layer in a map configuration file. Thus, you can set the global feature limit to a fairly large number. You can set the feature limit on each layer depending on the expected use of the layer.

- **Performance considerations:** You should consider performance when setting a feature limit value. The more features requested, the slower the response. If too many features are requested, your ArcIMS site may stop responding altogether. Large responses to a client application such as the HTML Viewer may time out or freeze the application.
- **Data sensitivity:** Data is a valuable resource. If you want users to be able to identify or select features, you open the possibility that they will save the geometry and attributes. To limit how much data can be selected for each query, you can set the feature limit very low.

Resources

- SPATIALQUERY and GET_FEATURES in the [ArcXML Programmer's Reference Guide](#).
- Advanced Topics | Work with Spatial Server configuration files in the ArcIMS Help