



SAS® Mobile BI and Offline Mode

Version 1.0 April 14, 2016

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What Is Offline Mode?

On a mobile device, when SAS® Mobile BI cannot connect to the server, any report that you view on that device is in offline mode. Typically, offline mode occurs because the device does not have a network connection. However, it can also occur because security is preventing access to an internal network or server. When SAS Mobile BI cannot communicate with the server, certain app functionality is modified because the app can use only the data that is already downloaded to the mobile device.

Note: Reports that are in offline mode are not the same as reports that use remote data for security purposes. (You might see this feature called tethering or live connection.) Remote data refers to a security setting that requires that your device maintain a connection to the server in order to view data in a report. This feature is controlled by the Purge Mobile Report Data capability. Users with this capability cannot access reports in offline mode.

The Report and Its Data

The Report Package

When you download a report, the app receives the report package. The *report package* is a set of files that is required to view and use the report. The report package includes the following elements:

- the report XML file
- images
- CSS files
- all of the data package files

The Data Package

Each report object in the report has its own data package. The *data package* contains the data required to render the initial view of the report object. The *initial view* is the view of the report object when the report is first opened. When a report object provides some type of interactivity, the data package contains additional data to support interactions while in offline mode. Here are some examples:

- The data package for a typical report object contains data required to render the object in its initial view.
- The data package for a report object with a hierarchy also contains the data for a specific number of levels in the hierarchy. This data supports drilling and expanding the hierarchy while in offline mode.
Note: If a report object has more than one hierarchy, the data package contains the data for a specific number of levels in *each* hierarchy.
- The data package for a report object that is the target of a filter or brush interaction contains additional data to support all filter and brush selections. For example, if a report object can be filtered by date, the data package includes the data for all of the dates.

The size of each data package varies depending on the type of report object, its data source, and whether the report object provides any interactive functionality, such as data drilling or filtering. The contents of the data package can also be affected by data limits.

Data Limits

SAS Mobile BI uses several data limits. Some data limits restrict the amount of data that can be downloaded. Others affect the amount of data that is processed by the middle-tier server.

If a data package exceeds a data limit, the data package default is to include only the slice of data that is required to support the initial view of the affected report object. If the user of the report changes a view, such as making a filter selection, SAS Mobile BI must query the server for additional data. In these cases, the interaction cannot be supported while the device is in offline mode.

Notes:

- Data limits are enforced on a per data package basis. Because of this, it is possible for one report object in a report to support offline interactivity while others do not.

- It is possible to exceed a data limit when retrieving only the data required for the initial view. In some cases, SAS Mobile BI returns an error. In other cases, the data is truncated and a warning is displayed for the affected report object.

Data Limit Adjustments

A data package can exceed one or more limits. SAS® Visual Analytics provides settings and properties that you can use to adjust data limits. Although you might adjust one limit, a data package might continue to exceed another limit. Whether data packages are downloaded without exceeding data limits affects how much of the report works as designed while in offline mode. Before you change any of these settings and properties, consider the balance between the goal of offline mode functionality and the desire for report responsiveness.

If you increase the data limit, then any additional data will increase the processing required when downloading the report. But, if the interactions in a report can be supported with the data downloaded in the initial package and do not require another query to the server, the report will typically be generated faster.

However, if it is a big report with many report objects, and each report object requires a lot of interactive data, it could take longer to initially generate and download the report. Report users might also encounter device capacity limits that cause the report to slow down or close unexpectedly while rendering. For example, a list box report object with thousands of values can quickly consume all of the storage on a mobile device. This situation can cause SAS Mobile BI to close unexpectedly.

Also, be aware that when you adjust any of these settings and properties, the change can impact any or all of the following resources:

- Middle tier resource usage
- Resource use by any of the following client applications:
 - SAS Mobile BI
 - SAS Visual Analytics Viewer (Modern version only)
 - SAS® Enterprise Guide® and SAS® Add-In for Microsoft Office

This white paper describes some of the key data limits, their impact on the data package and report functionality, and their associated settings and properties. For more information about other limits, see “High-Cardinality Thresholds for Report Objects” in *SAS® Visual Analytics: User’s Guide*.

The Data Cell Limit

Data Cells

The *data cell limit* is the maximum number of data cells that can be delivered to SAS Mobile BI for a single data query. The default is 250,000 data cells.

What to Consider Before Increasing the Number of Data Cells

The data cell limit is configurable. However, when you increase the number of data cells, you also increase the likelihood that the data package will exceed one of the other data limits. In this situation, SAS Mobile BI might take a longer period of time attempting to retrieve the interactive data before ultimately failing. When it fails, the data package includes only the data that is required to support the initial view of the affected report object.

Configure the Limit

The number of data cells that are available offline is set by the SAS Visual Analytics administrator.

To configure this number, the administrator uses the Transport Service `viewerservices.default.max.cells.produced` property:

1. Log on to SAS® Management Console.
2. On the **Plug-ins** tab, select **Application Management > Configuration Manager > SAS Application Infrastructure > Visual Analytics *version* > Visual Analytics Services *version* > Visual Analytics Transport Services *version***, where *version* indicates the installed version of SAS Visual Analytics.
3. Right-click **Visual Analytics Transport Service *version*** and select **Properties**.
4. Click the **Advanced** tab.
5. Specify the `viewerservices.default.max.cells.produced` property and the number of data cells.
Note: The default is 250, 000.
6. Click **OK** to close the Visual Analytics Transport Service Version Properties window.
7. To enable this property to take effect, restart the SAS® Web Application Server.

For more information about this property, see *SAS® 9.4 Intelligence Platform: Middle-Tier Administration Guide* or *SAS® Visual Analytics: Administration Guide*.

Hierarchy Data Drill Levels

The Data Package

When the app downloads a report, the report includes a *data package*. A downloaded report that contains a hierarchy includes the following data package:

- The default drill state. This state is the level to which the hierarchy was drilled when the report was saved on the server.
- By default, three levels of data *downward* in the hierarchy.
Note: The number of levels is configurable by using SAS Management Console. See “Configure the Number of Offline Drill Levels.”

It is this data package that is available when a report is in offline mode.

Note: If a cross tabulation table (crosstab) has a hierarchy that is expanded beyond the default number of levels, the data package does include the additional expanded levels as well. Doing so ensures that the crosstab can display data in all of its visible cells. However, in this case, the data package does not include any additional drill levels beyond the expanded state.

Drill-Level Availability Affected by Other Offline Data Considerations

The specified number of drill levels is available offline only if the report object is not affected by other offline data considerations. For example, maps require a network connection. If the hierarchy is on a map, the data package does not include the additional drill levels and you cannot drill upward or downward while in offline mode.

The same interdependency can occur when a report object includes any functionality that requires data requests to the server, such as rank, aggregate filters, or aggregate measures. For more information, see “Report Features That Require a Server Connection.”

Similarly, the specified number of drill levels is not available offline if, while gathering the data for those drill levels, any other data limit is exceeded. When a data limit is exceeded, the data package default is to include only the slice of data that is required to support the initial view.

Hierarchy Data That Is Retrieved When Online

When SAS Mobile BI is connected to a network (online), the app queries the server for additional data when the user takes either of the following actions:

- drills above the default drill state
- drills down into the hierarchy beyond the initially downloaded levels

The server returns only the individual data slice that the user requested.

For example, a user views a regional hierarchy that contains the following levels:

1. Continent
2. Country
3. State

4. City
5. ZIP code
6. Neighborhood

The default drill state is the top of the hierarchy. Therefore, the data package contains Continent (the default drill state), Country, State, and City. When the user taps on a City and drills down to view ZIP codes, a data request is required because the ZIP code data is not part of the data package. The server returns the ZIP codes for the selected City only. If the user drills upward or downward, the ZIP code data slice is discarded.

When a user drills upward in the hierarchy above the default drill state, the server sends a data slice in the same way. For example, if we use the same hierarchy, but set the default drill state to State (that is, the report is saved at the point when the user has drilled into North America -> United States), the data package contains State, City, ZIP code, and Neighborhood. If the user drills upward to the Country level of the hierarchy, a data request is required because Country data is not part of the data package. A new query is sent to the server. The server returns the data slice for North America. The data slice includes all of the countries in North America, but does not include countries from other continents. If the user drills upward or downward again, the Country data slice is discarded. The only data that is never discarded in the report is the data package that was originally downloaded with the report to the device's storage. When you close the report and reopen it, the original data package is loaded into memory again. These are the hierarchy levels that are available when in offline mode.

What to Consider Before Increasing the Number of Offline Drill Levels

The number of offline drill levels is configurable. However, when you increase the number of offline drill levels, you also increase the likelihood that the data package will exceed one of the other data limits. For example, when a data package contains a large set of unique data (high-cardinality data), the added drill levels can cause the data package to exceed the maximum data cell limit or one of the other limits. When this happens, the data package includes only the data that is required to support the initial view of the report object. Therefore, by increasing the number of offline drill levels, you can potentially end up with only one level.

Increases to other data limits might be required to accommodate the additional drill levels. For more information, see "Data Limit Adjustments."

Configure the Number of Offline Drill Levels

The number of hierarchy levels that are available offline is set by the SAS Visual Analytics administrator.

To configure this number, the administrator uses the Transport Service `viewerservices.data.default.interactive.drill.depth` property:

1. Log on to SAS Management Console.
2. On the **Plug-ins** tab, select **Application Management > Configuration Manager > SAS Application Infrastructure > Visual Analytics *version* > Visual Analytics Services *version* > Visual Analytics Transport Services *version***, where *version* indicates the installed version of SAS Visual Analytics.
3. Right-click **Visual Analytics Transport Service *version*** and select **Properties**.

4. Click the **Advanced** tab.
5. Specify the `viewerservices.data.default.interactive.drill.depth` property and the number of levels.
Note: The default is 3 (users can drill down three levels).
6. Click **OK** to close the Visual Analytics Transport Service Version Properties window.
7. To enable this property to take effect, restart SAS Web Application Server.

For more information about this property, see *SAS® 9.4 Intelligence Platform: Middle-Tier Administration Guide* or *SAS® Visual Analytics: Administration Guide*.

Report Features That Require a Server Connection

Overview

Some report objects and features require an active server connection. Depending on how a report is designed, a report object might include functionality that requires additional queries to the server. If the mobile device is in offline mode, these queries cannot occur and functionality might be modified.

Report Objects That Require a Server Connection

Stored processes and geo maps always require a server connection:

- When a report with a stored process is opened, it calls the SAS Stored Process Web Application (in SAS® Stored Processes) to execute the stored process in real time.
- In order for a report to render a geo map, the report must communicate with an OpenStreetMap or ESRI Server to retrieve map tiles.

Types of Interactions That Require a Server Connection

Some types of interactions require a server connection. A *detail interaction* is evaluated against the detail data. An *aggregate interaction* is evaluated against the aggregated totals. For example, you have a data source that contains transaction-level sales data, and there is a report that uses that data source to render a table showing the total sales by date. If the report has a range slider filtering the table, the range slider can be configured in either of the following ways:

- to filter data at the transaction level before the data aggregation. This is a detail interaction.
- to filter data based on the aggregated, daily totals. This is an aggregate interaction.

The following interactions can be either detail or aggregate:

- filter
- brush (also called highlighting)

Detail interactions are available in SAS Visual Analytics 6.1 and later. Aggregate interactions are available in SAS Visual Analytics 7.1 and later.

All aggregate interactions require a live data query, regardless of the type of report object they target. Some detail interactions are supported in offline mode. The support varies, depending on the type and features of the target report object.

Report Objects That Require Interactive Data Queries

Some report objects require computations and analysis that can be performed only by the server. In these cases, the data package includes only the data required to render the initial view. The mobile device must query the server to gather additional data in response to interactions. Therefore, these report objects do not support interactivity while in offline mode. Here are some examples of the affected interactions:

- navigating through hierarchies
- responding to parameter changes
- applying interactive filters or brushes

The following table lists the affected report objects.

Note:

- A gray cell indicates that the report object is not supported in that version.
- A blank cell indicates that the report object is supported in offline mode.
- An X indicates the versions of SAS Visual Analytics in which the report object requires a server connection to support the functionality in the list above.

Report Object Type	Version of SAS Visual Analytics						
	6.1	6.2	6.3	6.4	7.1	7.2	7.3
Geo maps	X	X	X	X	X	X	X
Time series	X	X	X	X	X	X	X
Tables with sparklines	X	X	X	X	X	X	X
Any report object with an aggregate measure		X	X	X	X	X	X
Any report object with an aggregate filter defined					X	X	X
Any report object with a rank defined		X	X	X	X	X	X
Any report object that references a parameter (1)					X	X	X
Any report object that is the target of a range slider	X(2)						
Any report object that includes data items that use the COUNT(distinct x) function as a means of aggregation	X	X	X	X	X	X	X
Any report object that includes data items that use functions as a means of aggregation other than the following functions: sum, average, count, min, max, frequency, and frequency percent					X	X	X

- (1) The parameter could be referenced by a calculated item, aggregate measure, filter, or rank. A data query is required to refresh the data when a referenced parameter value is changed. When the report is downloaded, the data query uses the default value for the parameter. The result of this query is included in the initial data package.
- (2) In version 6.1, data queries were required to satisfy interactions when the source of the interaction was a range slider. Versions 6.2 and later provide offline mode support for these interactions, provided the affected report object does not meet one of the other conditions that requires a server connection.

Report Links

What Is a Report Link?

A report object can be designed to link to any of the following resources:

- another section in a report
- an info window
- another report
- a web address

Note: A web address might be for a stored process. See “Report Objects That Require a Server Connection.”

Note: Report links to another section in the report or to a web address are available in SAS Visual Analytics 6.2 and later. Report links to another report are available in SAS Visual Analytics 6.3 and later. Report links to an info window are available in SAS Visual Analytics 7.1 and later. For more information about report links, see *SAS® Visual Analytics: User’s Guide*.

Links That Require a Server Connection

When a link opens another report, SAS Mobile BI must have a connection to the SAS Visual Analytics server to retrieve data for the new report. Therefore, linking to another report is unavailable when the device is in offline mode or SAS Mobile BI does not have a connection to the server.

Links That Might Require a Server Connection

The following link types *might* require a server connection:

- links to another section in a report
- links to an info window

These link types are similar to filter interactions. When the report is downloaded, the data required for the link is gathered into the initial data package for the report. However, it is possible for this data to be affected by other offline data considerations, specifically data cell limits and report objects that require a server connection. If the link is affected, the report must send a data query to the server and a server connection is required. In this situation, these two link types might be unavailable when the device is in offline mode or SAS Mobile BI does not have a connection to the server.

For more information, see “The Data Cell Limit” and “Report Features That Require a Server Connection.”

Links That Require a Network Connection

When a link opens a web address, the web browser must have a network connection in order to load the web page. Therefore, linking to a web address is unavailable when a device is in offline mode.

References

SAS® 9.4 Intelligence Platform: Middle-Tier Administration Guide, Third Edition. Available at: <http://support.sas.com/documentation/cdl/en/bimtag/66823/PDF/default/bimtag.pdf>

Help for SAS® Mobile BI. Available in the app.

SAS® Visual Analytics: Administration Guide. Available at: <http://support.sas.com/documentation/onlinedoc/va/>. A user name and password is required to access this document. Contact SAS® Technical Support.

SAS® Visual Analytics: User's Guide. Available at: <http://support.sas.com/documentation/onlinedoc/va/>. A user name and password is required to access this document. Contact SAS® Technical Support.

