

## CHAPTER

# 1

## Using the Metadata LIBNAME Engine

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### What Does the Metadata Engine Do?

The metadata engine enables you to use metadata in order to process and augment data that is identified by the metadata. The metadata engine retrieves information about a target SAS data library from metadata objects in a specified SAS Metadata Repository.

The *metadata* is information about the structure and content of data and the applications that process and manipulate that data. The metadata contains details such as the location of the data and the SAS engine that is used to process the data.

The metadata engine provides a consistent method for accessing many data sources. For example, because SAS provides different engines, with different options, behavior, and tuning requirements, it can be difficult to keep track of how each SAS engine works. By taking advantage of metadata, the necessary information required to access data can be created in one central location so that applications can simply use the metadata engine in order to access different sources of data, without having to understand the differences and details of each SAS engine.

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### Understanding How the Metadata Engine Works

The metadata engine works much like other SAS engines. That is, you execute a LIBNAME statement in order to assign a libref and to specify an engine. You then use that libref throughout the SAS session where a libref is valid.

However, instead of the libref being associated with the physical location of a SAS data library, the metadata libref is associated with a set of metadata objects. The metadata objects identify the SAS engine that provides access to the data and options that are necessary to process the SAS data library and its members.

Here is an example of a LIBNAME statement for the metadata engine and a description of what happens when you execute the statement:

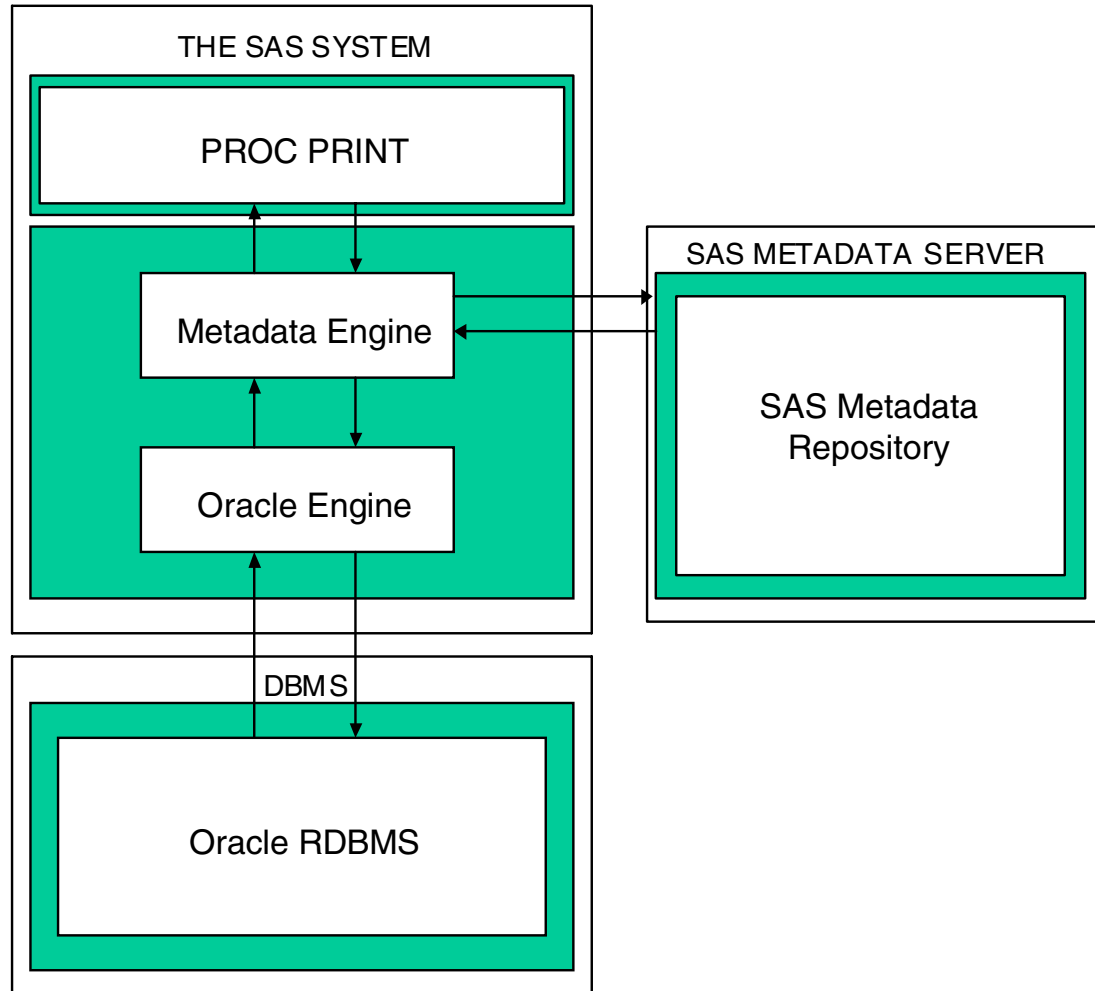
```
libname oralib meta libid=A8000001 repid=AWPKT800
  userid=metaid pw=metapw
  ipaddr=myip.us.org.com port=6401
  protocol=bridge liboptset=myopts;
```

- 1 The metadata engine retrieves information about the target SAS data library from the metadata.
- 2 The metadata engine uses the retrieved information to construct a LIBNAME statement for the engine that is specified in the metadata (referred to as the underlying engine) and assigns it the appropriate options.
- 3 Then, when the metadata engine needs to access data, the metadata engine uses the underlying engine to process the data.

For example, if you have an Oracle data library defined in metadata and you reference the library with the LIBNAME statement for the metadata engine, the metadata engine constructs a LIBNAME statement that assigns the Oracle SAS/ACCESS engine. When the metadata engine needs to process a member of the library, such as with the PRINT procedure, the metadata engine issues a request to the metadata repository for the metadata that is associated with that member and uses the Oracle engine. The metadata includes PhysicalTable, Column, and Property objects.

The following diagram illustrates the metadata engine process.

Figure 1.1 Metadata Engine Process



## Advantages of Using the Metadata Engine

Using the metadata engine provides the following advantages:

- The metadata engine provides a single point of access to many heterogeneous data sources. You do not have to be aware of any of the engine-specific details.
- The metadata engine, in conjunction with the SAS Open Metadata Architecture Authorization facility, enables an administrator to control what data users are allowed to access in three ways:
  - The administrator can associate authorization metadata to any metadata resource in a repository using the SAS Open Metadata Architecture Authorization Facility. The metadata engine enforces the decision returned by the authorization facility for libraries and tables.
  - The administrator can include only those libraries, tables, and columns that users are allowed to access in the metadata. In this way, only those libraries, tables, and columns can be accessed by the metadata engine. For example, if a data source has five tables but only two are defined in the repository, the metadata engine provides access to only those two tables. In another situation, if a table has 20 columns but only five columns are defined in the

repository, the metadata engine provides access to only those five columns. In this context, the metadata engine acts as a filter, providing member- and column-level security.

- An administrator can associate authorization metadata to a metadata resource that prevents the user from accessing the resource in the data source. For example, if a library has 20 tables and all 20 tables are defined in the repository, then the administrator can associate authorization metadata with five tables, which prevents the user from accessing those tables. Therefore, the user will have access to only 15 tables. Again, the metadata engine acts as a filter, providing member-level security.

An advantage of this behavior is that an administrator can use the metadata engine as a means to provide library and table security. See Chapter 7, “Metadata Requirements for Using the SAS Open Metadata Architecture Authorization Facility to Control Data Access,” on page 45.

- The SAS Open Metadata Architecture, which is a general-purpose metadata management facility that provides common metadata services to SAS applications, provides a permanent storage location to maintain column formats, informats, labels, and other information that cannot currently be saved with some data sources.
- Changing the type of data source you use does not require changing SAS code or other applications. SAS Open Metadata Architecture provides a centralized location for storing information about your data environment. Because the metadata engine uses this environment to access your data, you are insulated from these changes. It does not matter if your data changes from Oracle to DB2 to SAS; the SAS code remains the same.

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## What Is Supported?

The metadata engine supports the following:

- The metadata engine accesses metadata in a SAS Metadata Repository in order to process data that the metadata identifies. Using the metadata engine and SAS code, you can
  - read data from a data source table (input processing).
  - create a new table (SAS data set or database management system (DBMS) table) in a data source and create its associated metadata in a repository (output processing).
  - delete a table in a data source and delete its associated metadata in the repository.
  - update data in a data source table (update processing). However, the metadata engine does not support creating indexes.

*Note:* The metadata engine supports only tables (SAS data sets and DBMS tables). The metadata engine does not support other SAS files such as catalogs or views. △

See Chapter 3, “Examples of Using the Metadata Engine,” on page 11.

- The metadata engine in conjunction with the SAS Open Metadata Architecture Authorization facility enables an administrator to control what data users are allowed to access.
- The metadata engine can augment your data. For example, if you execute the DATASETS procedure in order to get a listing of all the members in a library, the metadata engine sends a request to the metadata repository for this information.

The metadata engine does not use the underlying engine. You get a listing of only those members that have been populated in the repository. When you execute the CONTENTS procedure, the table and column attributes that are returned are from the repository, not a result of the underlying engine processing the data. Any formats, informats, or labels that are stored in the metadata are applied to the underlying data. Any columns that are not populated in metadata are not available to the user.

- The metadata engine does not support LIBNAME statement options or data set options that are for the underlying engine. All of the LIBNAME statement options that are needed by the underlying engine must be defined in the Property objects that are associated with the specified SASLibrary object and SASClientConnection object. Likewise, any data set options that are needed for a member of the library must be defined in Property objects that are associated with the PhysicalTable objects that represent the members of the library. For example, you cannot specify SAS/ACCESS engine options in the LIBNAME statement for the metadata engine. The SAS/ACCESS engine options must be defined in the metadata.
- The metadata engine does not support the concatenation of libraries in SAS Open Metadata Architecture.
- The metadata must be consistent with the identified data source. For example, it is invalid to have metadata for a SAS data set where a variable is defined as numeric data, but the actual data source defines it as character data.

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## Performance Considerations

Because the metadata engine uses the underlying engine to process data, performance is no better than directly using the underlying engine. The metadata engine requests metadata, interprets metadata, applies metadata, and drives the engine to access the data (not necessarily in that order). All of these functions add overhead to the data access process.

The most significant overhead is in additional network requests. When requesting metadata, a query must be sent to the repository indicating which metadata is needed. Typically, the repository will be on a different network node. Therefore, each time a request is made for metadata, additional network overhead is incurred.

Each of the following situations requires one metadata request:

- assigning the libref.
- accessing a data member.
- acquiring index information.
- acquiring repository names. This occurs only when the REPID= value is not specified in the LIBNAME statement for the metadata engine. The metadata engine must query the metadata server for all available repositories in order to find the one that matches the REPNAME= value.
- acquiring a list of the members in a library.

Fortunately, most of the extra processing overhead incurred by the metadata engine is front loaded. The same number of metadata requests that are made for large tables are made for small tables. So the larger the table, the less significance the network overhead will have on the total processing time. For small tables, the opposite is true.

