



# SAS<sup>®</sup> MDM 4.3: Administrator's Guide

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**SAS® MDM 4.3: Administrator's Guide**

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## 1

# Overview of SAS MDM

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## About SAS MDM

SAS MDM is a combination of software, templates, documentation, data models, and services that provide the functionality and processes necessary to build and maintain a master entity database. An entity can be a customer, product, patient, site, or any business data object that you define. You can also define attributes for each entity, as well as transformations that support data quality and identity management functionality.

The SAS MDM hub is a set of tables and table relationships that contain entity information and required entity keys and linking information. This hub provides end-users or other applications with a complete view of an entity and its relationships with other entities. In addition, the hub can be used as the single source for creating and maintaining survivor records that can be used in other applications or processes. The original source system IDs, which are important to other enterprise applications or data sources, are also maintained in the hub to facilitate linking activities with other data providers or consumers.

**Note:** SAS MDM is integrated with SAS and DataFlux data management products that are included in the SAS MDM and SAS Data Quality software offerings. Therefore, to use SAS MDM successfully, you must be familiar with these products.

SAS Data Remediation enables users to manage and correct issues triggered by business rules in SAS MDM batch jobs and real-time processes. These issues can also be triggered by external systems that communicate with data remediation through its REST-based web service application programming interface (API). Data remediation allows user- or role-based access to data exceptions, which are categorized by application and subject area. Once data

remediation issues have been reviewed, they can be corrected through the same application, eliminating the need for another user to complete the correction process. All data remediation issues can also be associated with workflow definitions that route the issues to the correct decision maker for approval or instructions for additional action.

SAS MDM includes the following features:

- batch and real-time modes
- capability to register user-defined tools that operate on the data in the hub
- entity matching, de-duplication, and survivor record creation
- entity linking through relationships
- data quality functionality such as address verification, standardization, and parsing
- the ability to search based on fields within the records
- capability of adding, modifying, and retiring SAS MDM entities
- workflow-based data remediation functionality to view and correct SAS MDM data errors
- metadata management for entities, attributes, and transformations
- historical tracking, including changes saved for contributor records and survivor records
- data access, data profiling, data monitoring, data quality, and data enrichment

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## How SAS MDM Works

SAS MDM performs the following functions:

- extracts business information from your data sources
- validates and standardizes the data
- captures data errors through user-defined business rules and sequesters the data for review and correction
- consolidates the information into a single view of the information available from all the data sources

The organizational data that you provide can be customer data, product data, services data, or data for other entity types. SAS MDM applies a rigorous methodology to the problem of integrating disparate enterprise data.

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## Architecture

### Overview

SAS MDM is built on a sophisticated data management platform that provides both development and run-time support for applications.

## Development

During development, you can use DataFlux Data Management Studio (Data Management Studio) and DataFlux Data Management Server (Data Management Server). Data Management Studio provides the ability to design and test processes (batch jobs) and real-time services (data jobs), which can then be deployed and run using the following:

- DataFlux Data Management Server
- DataFlux Data Management Studio
- scripting with a command line interface

The SAS MDM and SAS Data Quality software offerings rely on the Quality Knowledge Base (QKB) for data quality processing. The QKB provides capabilities such as standardization of data and computation of match codes. The QKB is used both during development and at run time.

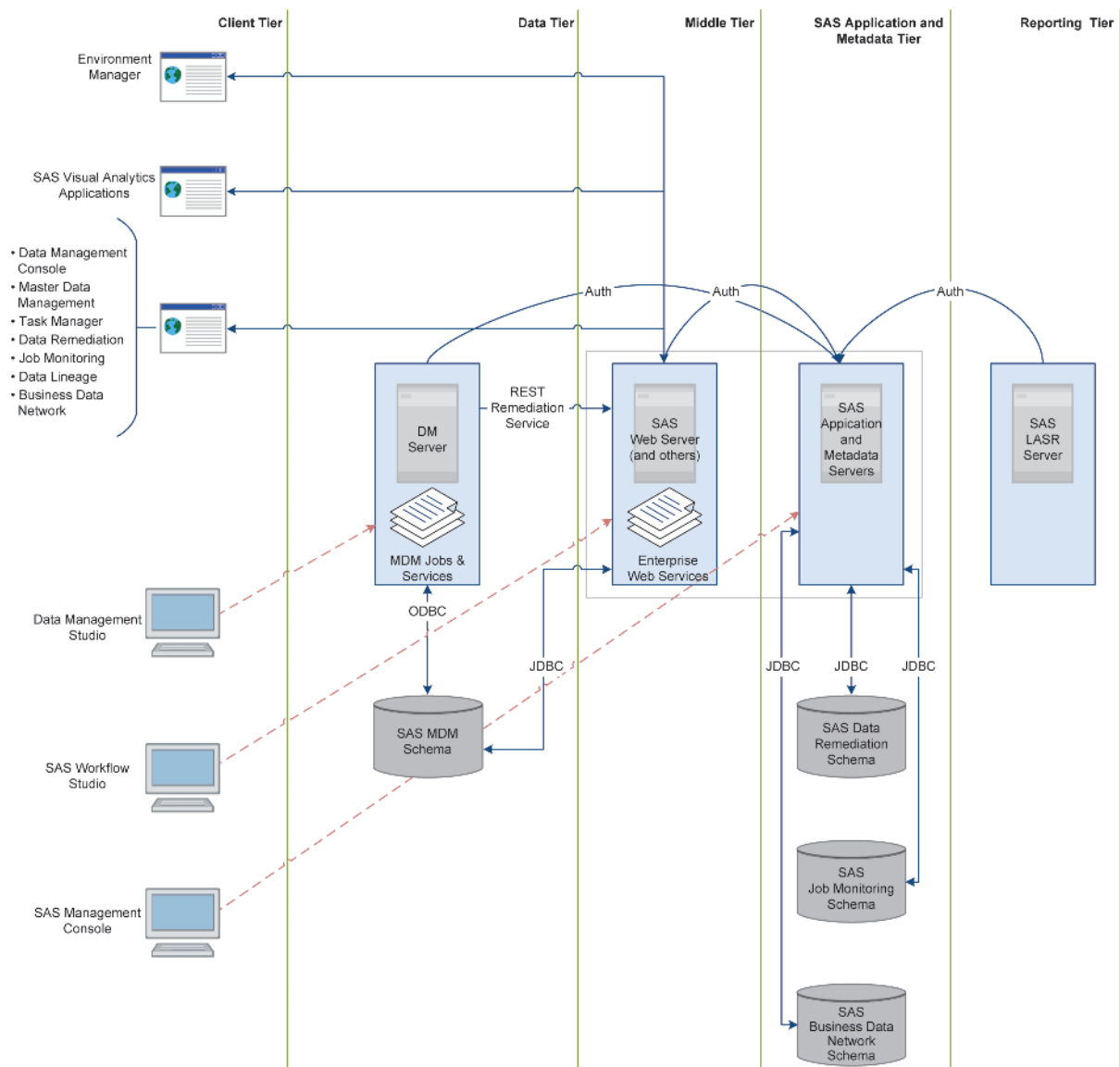
## Run Time

At run time, a multi-tier architecture that consists of presentation, business, and data tiers is used.

- The presentation tier hosts the web interface in a Servlet 2.5-compliant container and includes a Java application server and a browser. Batch interfaces might be available for some operations such as bulk loads and updates.
- The business tier runs on a Data Management Server and is implemented using Data Management Studio processes (batch jobs) and real-time services (data jobs). It implements a Service Oriented Architecture (SOA) that enables any system to use its services through SOAP requests. Common web service standards are used to maintain simplicity when integrating with other systems. Authentication within the business tier runs on a SAS Metadata Server. This server can authorize user permissions for applications, assign roles and security restrictions, and define authentication parameters for accessing other systems, such as the database, for each user or group. The real-time or transactional component of SAS MDM interfaces with other applications through an SOA environment. Specifically, the ability to call business services hosted on Data Management Server is accomplished through web services. Process jobs can also be used as business services that accept data on a record-by-record basis. This enables users to use SAS MDM data and services within an enterprise architecture.
- The data tier hosts the supporting data and metadata for the system, which consists of a relational database such as Oracle or Microsoft SQL Server. The data model is documented and accessible to third-party tools and can also be accessed through Data Management Studio jobs.

The following display shows how the components fit together:

Figure 1.1 Architecture Diagram



## SAS MDM Components

### Data Management Studio

Data Management Studio is a graphical user interface (GUI)-based application that provides access to other tools and services. You can use Data Management Studio for job flow management and customization, to manage data source connections, to manage user accounts through SAS Metadata Server, to deploy and execute jobs on the Data Management Server, and to run batch jobs and data services within a Windows environment.

### DataFlux Process Jobs and Real-time Business Services

A DataFlux process job is a multi-step data management process that can be run from Data Management Studio, from Data Management Server, or from a

command line interface or script. Real-time business services, also called data jobs, are deployed through Data Management Server and are used by the SAS MDM web application to provide data to the application through SOAP calls.

## Quality Knowledge Base

The Quality Knowledge Base (QKB) contains the files, file relationships, and metadata needed to correctly parse, match, standardize, and otherwise process data as required for SAS MDM. The QKB can be customized to meet an organization's needs. The QKB can support different locales to support processing for many different languages.

## Data Management Server

The Data Management Server (labeled as DM Server in [Figure 1.1](#)) enables data management and integration processes to be deployed across an entire IT environment. SAS MDM uses batch jobs and real-time services deployed through Data Management Server to manage the master data hub and to provide data through the web interface and reports. Data Management Server handles all aspects of database connectivity and service availability through SOAP calls.

**Note:** In many instances, you should have at least two Data Management Servers working together through network load balancing or failover hardware or software, to achieve the desired results for performance and meet server uptime goals, particularly for real-time service processing.

## Databases

SAS MDM relies on access to a Database Management System (DBMS, labeled as SAS MDM Schema in [Figure 1.1](#)), such as Oracle or SQL Server, to act as a repository for metadata and data. The Master Data Management component of SAS MDM requires two database schemas for its operation.

## SAS Data Management Console

The SAS Data Management Console is a central, web-based location for all master data management activities. This environment provides a launch location for all associated SAS MDM applications and SAS Visual Analytics reports, as well as other SAS applications.

The SAS MDM applications Master Data Manager, Data Remediation, and Task Manager enable you to perform the following functions:

- Master Data Manager
  - ☐ create and manage a hub
  - ☐ define new entity types and their attributes
  - ☐ search for data within the hub
  - ☐ create and update data within the hub
- Data Remediation
  - ☐ monitor and correct errors in data loaded into SAS MDM
- Task Manager
  - ☐ start, stop, view, and interact with active workflow instances

- Data Lineage (not available in all SAS MDM product bundles)
  - view relationships and perform impact analysis for selected objects stores in SAS metadata
- Business Data Network (not available in all SAS MDM product bundles)
  - define and manage metadata for business terms

Other applications might appear in your SAS Data Management Console depending on the SAS MDM offering.

Several of these web applications use SAS data server repositories to store application data. These are represented in [Figure 1.1](#) as schemas in the SAS Application and Metadata Tier.

### **SAS Workflow Studio**

This application is a drag-and-drop workflow designer. Users can modify existing MDM workflow templates or create new ones for use with other SAS MDM processes. Workflows can also be uploaded and activated in the SAS server environment and can be downloaded for additional editing.

### **SAS Visual Analytics Applications**

If your SAS MDM product bundle includes reporting capabilities, business users and data stewards have several reporting applications available to them to design, view, and share reports for SAS MDM and SAS Data Remediation. See the documentation for SAS Visual Analytics for more information about application capabilities.

### **Environment Manager**

This application enables an administrator to see in one location key operational metrics of all SAS servers and other technologies deployed with SAS MDM. This application also includes server configuration and management capabilities.

### **SAS Web Server**

This server handles web traffic and communication for all SAS web applications running in the mid-tier environment.

### **SAS Application Server**

An application server hosts the SAS Data Management Console and other associated applications. This is installed and configured during the deployment process. No other third-party application servers are supported.

### **SAS Metadata Server**

This server makes important system wide metadata available to SAS clients and other SAS servers. Interaction with this server is accomplished through SAS Management Console.

### **SAS LASR Analytic Server**

If your SAS MDM product bundle includes reporting capabilities, then SAS LASR Analytic Server is present in your SAS MDM environment. You can load SAS

MDM instance data to SAS LASR Analytic Server using SAS/ACCESS engines. This loads the data into memory making it available to SAS Visual Analytics applications.

Normal MDM functionality does not require an access engine. However, if your SAS MDM product bundle includes reporting capabilities delivered through SAS Visual Analytics, you must have the following installed on the computer that hosts SAS LASR Analytic Server:

- for the SAS MDM reports, either SAS/ACCESS to Oracle if your SAS MDM target database is Oracle or SAS/ACCESS to ODBC if your SAS MDM target database is Microsoft SQL Server
- for the SAS Data Remediation reports, SAS/ACCESS to Postgres

### **SAS Management Console**

This application enables users to manage groups, users, and roles on the SAS Metadata Server for all SAS MDM web applications. It also is the location where various web application configuration parameters are set.

---

## **Deployment Models**

The most common type of deployment for SAS MDM is the physical deployment model. This model assumes that all the information necessary to construct a complete survivor record for an entity is stored in the hub. Source system keys are also stored in the hub so that information used to identify and describe entities can be recorded. This supports the ability to link or reference source system data, provides traceability for the contributor records, and describes key relationships with the data as it exists in the hub.

With this approach, uniquely identifying information for entities is stored in the hub, along with other dependent attributes. You can access the survivor record by querying the hub by itself, without the need to refer to the systems of record. This approach simplifies the task of constructing the survivor record, but results in higher storage requirements.

The physical deployment model is the primary implementation, but SAS MDM also works in conjunction with other technologies to provide functionality that supports deployment styles such as hybrid MDM, registry-based MDM, reference-style MDM, and other integration scenarios.

---

## **Integrating Other Applications with SAS MDM**

You can integrate other end-user or enterprise applications, as well as other Extraction, Transformation, and Loading (ETL) software with SAS MDM.

Two methods for integration are as follows:

- direct-database or flat-file access, running batch load, or batch update processes. In this case, the Data Management Server can connect directly to data sources, transform the data, and load it into the hub.

- communicating with the Data Management Server using web services. Any application or process that can make a web service call can send data to the hub through Data Management Server and receive data from the hub in the same manner.

Both methods are typically used to interact with SAS MDM. In some cases it might make sense to communicate directly with Data Management Server from an application integration layer of an enterprise application such as Siebel or SAP. In other cases, using an enterprise messaging mechanism such as TIBCO or webMethods might be more practical if that infrastructure has already been deployed within your organization.

You also have the option of making web service calls directly from a .NET or Java component or application that can use web services. This might be common in circumstances where internally designed and built operational or reporting processes need to interact with the Data Management Server to access customer or service data inside the hub.

## 2

## Installing SAS MDM

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## Installing the Software for the First Time

### Overview

SAS MDM is available through SAS delivery channels. For information about installing this product, see your SAS Software Order Email (SOE).

The following table lists default software locations:

Description	Default Path
Windows installation	<SAS Home Directory> \<product_instance_name>\<version>
UNIX installation	<SAS Home Directory>/ <product_instance_name>/<version>
SAS MDM support files and the associated data management repository on client machines	C:\ProgramData\SAS\DataManagement \FileStorage\SASMDM
SAS mid-tier servers	\SAS\<configuration_name>

**Note:** In the descriptions in this guide, <SAS MDM Install Directory> represents C:\ProgramData\SAS\DataManagement\FileStorage\.

SAS MDM installation and configuration is a multi-step process. Depending on your target host systems, the process might need to be repeated on multiple computers if required by your deployment plan.

## Pre-Installation

Your SAS SOE directs you to the complete pre-installation checklist. Outstanding SAS Notes about installation are available at the following location: <http://support.sas.com/notes/index.html>.

Here is the basic pre-installation information:

- Your plan.xml file and SAS installation data file (SID file) must be in a directory accessible to the SAS Deployment Wizard. Accept the SAS Deployment Wizard default configuration settings unless you are otherwise instructed.
- The SAS Data Management Console can be configured to give you access to SAS Visual Analytics through an application link. If you intend to use this feature, ensure that all prerequisites for the installation of SAS Visual Analytics have been met.

**Note:** The delayed deployment of SAS Visual Analytics Administration and Reporting is supported.

- JDBC drivers must be downloaded from the website of the database vendor before beginning the installation process. The SAS Deployment Wizard prompts you for the correct JDBC driver. The SAS MDM web application requires these files to connect to the SAS MDM target database

During the installation and configuration process, you are asked for information about your target SAS MDM database. The target database is the Oracle or SQL Server database into which your master data is loaded. Data Management Studio and Data Management Server must also connect to the SAS MDM target database. Have the following information available before you start the installation process:

**Table 2.1** Database Parameters

Parameter	Default Values
SAS MDM Database vendor	Oracle or SQL Server
SAS MDM Database DSN	SASMDM
SAS MDM Database name	mdm
SAS MDM Database schema	MDM
SAS MDM Database port	Oracle: 1521 or SQL Server: 1433
SAS MDM Database Oracle SID	mdm
SAS MDM Database password	SASMDMpw1

Parameter	Default Values
SAS MDM Database host	Host where the database is installed

For more information about how to define users, schemas, tablespaces, and other key features required for SAS MDM to deploy correctly, see [Chapter 3, “Configuring Databases,” on page 15](#). At a minimum, you must supply database and user configuration information, or the application does not start successfully.

## Post-Installation

For post-installation configuration instructions, see [Chapter 4, “Configuring SAS MDM,” on page 23](#).

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# SAS MDM Update Process

## Overview

If you already have SAS MDM installed, the installation and configuration process takes steps to upgrade your existing environment. This involves an MDM database schema evolution process, updates to web applications, and the delivery of updated or new MDM jobs in the data management environment. Several manual post-installation steps are described in this guide, the most important of which is the MDM database schema evolution process.

## Prerequisites

Prerequisites for the SAS MDM update process are as follows:

- Back up your SAS MDM database before beginning the update process. After you have run the automated installation process, you must manually upgrade the MDM database schema. See [Chapter 4, “Configuring SAS MDM,” on page 23](#) for details.
- Back up your SAS Data Remediation database before beginning the update process. This database is updated to the latest version.
- The automated installation process makes backups of your data management repository file directories in a predetermined location for both Data Management Studio and Data Management Server. If you prefer to back up these directories to another location, you must copy them manually.
- Have SAS MDM database connection information available when you start the installation process. You might be prompted for DSN, schema, user name, and password information depending on your specific configuration.



\workflows [Example workflow templates]

```
C:\Program Files\SASHome\DataFluxDataManagementServer\2.6\var
  \batch_jobs\sasmdm      [All batch data jobs for SAS MDM]
  \data_services\sasmdm   [All real-time data service jobs for SAS MDM]
  \process_services\sasmdm [All process server jobs for SAS MDM]
  \sasmdm\archive         [Location where artifacts from the data archiving process reside]
    \data                 [Location for temporary data files]
    \logs                 [Location for log files generated by certain SAS MDM processes
                          like bulk loading]
  \samples\data           [Source data files for sample entities]
    \scripts              [Script files associated with sample entities]
  \scripts               [Database creation scripts and other metadata support files]
  \workflows              [Example workflow templates]
```



## 3

## Configuring Databases

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### Metadata and Instance Data

SAS MDM builds a repository of metadata and instance data. This requires, at a minimum, either Oracle 11gR2, 12c, SQL Server 2012, or SQL Server 2014. Ensure that the character set for the database supports your data requirements. For example, not all accented characters (such as the cedilla, umlaut, or circumflex characters) or special-use characters (such as trademark, copyright, or Euro symbols) can be stored in all character sets. SAS recommends using a UTF character set to ensure maximum compatibility between the data and your database. SAS also recommends that databases be configured to ignore accents when performing character comparisons.

---

### Building the SAS MDM Repository

#### Overview

This section explains the process of creating a new SAS MDM repository. You must have access to a relational database system and have read, write, and table creation permissions. This database system can be either local or on a network.

The first steps in creating a repository are as follows:

- 1 Create a user or schema named MDM defining common privileges (for example, table reads) as well as the following:
  - create procedure
  - create sequence
  - create table
  - create view
  - create trigger
- 2 (Optional) Grant extra tablespace to this schema, depending on your database configuration.
- 3 (Optional) Create a temporary user or schema for development activities that can add, modify, and drop database objects as needed in that schema.

**Note:** For Oracle installations, a separate schema must be created to manage encryption. The user name `mdm_secure` and table name `mdm_secure_info` must not be changed. Database limitations for encryption also apply.

## Creating Databases and Tablespaces

### Overview

The creation of databases should use the standards and best practices of your organization. The commands that follow are examples and can be modified to meet your requirements.

### Oracle

For Oracle installations, you create tablespaces to hold data and indexes, modifying values as needed for your system. Note that the file `mdm_oracle_ddl.sql` is hardcoded to use `QMDM_DATA` and `QMDM_INDICES` as tablespace names. If you are not using the same tablespace names, then the file `mdm_oracle_ddl.sql` must be modified to match the tablespace names that you use. For more information, see your database documentation.

As the `sysdba`, execute the following SQL statements after modifying them as required for your installation:

```
-- create new tablespace

create tablespace qmdm_data datafile
'C:\oracle\product\11.2.0\oradata\sas\qmdm_data.dbf'    size
10M autoextend
on extent management local autoallocate;

create tablespace qmdm_indices datafile
'C:\oracle\product\11.2.0\oradata\sas\qmdm_indices.dbf'    size
10M autoextend
on extent management local autoallocate;

-- create mdm user and grant privileges

create user MDM identified by SASMDMpw1 default tablespace
qmdm_data quota unlimited on qmdm_data quota unlimited on qmdm_indices;
```

```
grant connect, resource, create table, create view, create procedure,
create trigger, create session, create sequence to MDM;
```

## SQL Server

For SQL Server installations, create a separate database for SAS MDM. Do not install it in the master database. For more information, see your database documentation.

As the sa user, execute the following SQL statements after modifying them as required for your installation:

```
--Create database and login
create database mdm
create login mdm with password = 'SASMDMpw1',CHECK_POLICY=OFF;
go

-- Create user
use mdm;
create user mdm for login mdm with default_schema=mdm;
grant connect, create table, create view, create procedure, create schema,showplan to mdm;
grant execute on schema::dbo to mdm;
go

--Create schema

create schema mdm authorization mdm;
go
```

## Setting Databases for Encryption

### Overview

SAS MDM provides the ability to encrypt data being stored in the hub. This feature requires additional settings and grants for Oracle and SQL Server. Even if you do not use encryption, you must set your SAS MDM database environment to support it.

### Oracle

For Oracle installations, you must create a separate user to manage encryption. The user name `mdm_secure` and table name `mdm_secure_info` must not be changed. Database limitations for encryption also apply.

To create the separate user, execute the following code:

```
-- create mdm_secure schema

create user mdm_secure identified by SASMDMpw1 default tablespace
qmdm_data quota unlimited on qmdm_data quota unlimited on qmdm_indices;
grant connect, resource, create table to mdm_secure;
grant execute on UTL_RAW to mdm_secure;

-- create secure info table

create table mdm_secure.MDM_SECURE_INFO
```

```

(
MDM_ENCRYPTION_KEY RAW(2000)
)
tablespace QMDM_DATA;

-- Insert key into table

insert into mdm_secure.mdm_secure_info
select utl_raw.cast_to_raw('sasmdm') from dual;

-- Grant privileges to MDM user

grant execute on DBMS_CRYPTO to MDM;
grant execute on UTL_RAW to MDM;
grant select on mdm_secure.mdm_secure_info to MDM;

```

## SQL Server

For SQL Server installations, you must create an encryption key and certificate. The key name qMDMKey and certificate name qMDMCer must not be changed. Database limitations for encryption also apply.

As the sa user, execute the following code

```

use mdm;

-- Create encryption certificate and key

create master key encryption by password='SASMDMpw1';
create certificate qMDMCer with subject='sasmdm';
create symmetric key qMDMKey with algorithm=triple_des encryption
by certificate qMDMCer;
go
grant control on certificate :: [qMDMCer] to [mdm];
grant view definition on symmetric key :: [qMDMKey] to [mdm]; go

```

## Creating a Data Source

SAS MDM accesses DataFlux services on Data Management Server, and those services access the relational database that hosts the SAS MDM database. To access a database with Data Management Studio, an Open Database Connectivity (ODBC) driver for the specified DBMS must be installed, and the database must be configured as an ODBC data source. When this has been completed successfully, the database name appears in the Data Connections folder on the Data Management Studio riser.

The SAS MDM installation and configuration process creates the required data source names (DSNs) for you. DSNs are created using the DataFlux ODBC Wire Protocol drivers for either Oracle or SQL Server with the correct driver options set. These two drivers are the only ones supported for communicating with the SAS MDM target database from the SAS MDM and SAS Data Quality software offerings.

If you enter incorrect information during the installation process for your SAS MDM target database, you can manually create DSNs as needed using the appropriate mechanism as documented in the ODBC Reference documentation that is available in every Data Management Studio installation. In the Data

Management Studio **Search** riser, search for DSN, and then view the topics Adding ODBC Connections and Maintaining Data Connections for the Server.

Remember to use the saved connection functionality in Data Management Server and Data Management Studio once you have added or amended the SAS MDM database DSN settings.

## Creating a Data Source for VA Reports

SAS MDM is installed using SAS provided ODBC drivers, which must be used with SAS MDM. For SAS Visual Analytics reports, the SAS provided ODBC drivers cannot be used when connecting to SQL Server databases containing the SAS MDM data for the reports. You must create a new data source name (DSN) using ODBC drivers supplied by your database vendor to connect to data in SAS MDM from the SAS Visual Analytics environment. For SQL Server, you need a new connection using the vendor-supplied ODBC driver. Use this ODBC connection name as the **DB\_NAME** value when you use the SAS MDM tool for creating SAS Visual Analytics HubOverview report. See DB\_NAME in the [SAS MDM: User's Guide](#) for more information.

## Special Database Driver Considerations

Because SAS MDM uses stored procedures in the target database, you must enable these procedures using ODBC Connection Manager when configuring your database connections. These settings are applied for you during the SAS MDM installation and configuration process and are shown here for reference. For example, if you want to use the Oracle Wire Protocol Driver, you must enable the following settings:

**Table 3.1** Driver Settings

Advanced Settings	Performance Settings
Application Using Threads	Use Current Schema for SQL Procedures
Enable Procedure Returns Results	Catalog Functions Include Synonyms
Enable SQLDescribeParam	Enable Scrollable Cursors
Describe at Prepare	Wire Protocol Mode: 2
Enable N-Char Support	

### Note:

- The DSN must be configured in the `mdm_macros.cfg` file. The SAS MDM installer default DSN is SASMDM, but the DSN can be edited as needed. If you edit the DSN, ensure that the `mdm_macros.cfg` file is updated with the new name (including the copy on the Data Management Server).
- Additional driver settings can be configured for optimum performance. For more information, see your database driver documentation.

---

## DNS Resolution of Host Names

You might encounter slow response time with Domain Name System (DNS) resolution of host names for data sources. Consider using the IP Address in the ODBC DSN configuration to avoid DNS lookups. You can also modify the hosts file for your server to avoid DNS lookups. For Windows platforms, this file is typically `C:\Windows\System32\drivers\etc\hosts`. For UNIX platforms, the file is `etc/hosts`.

---

## Using Database Utilities

Some SAS MDM batch jobs give you the option of using database utilities to improve software interactions with the database. For example, bulk load jobs can be set to use database utilities that might perform the operations more efficiently. Some of these job templates use calls to command-line applications that are specific to either Oracle or SQL Server. SAS MDM requires access to these applications.

Here are the database-specific applications:

- Oracle
  - SQL\*Plus
  - SQL Loader
- SQL Server
  - sqlcmd
  - bcp

You are not typically required to use the database utilities. However, for bulk-loading operations, you might see large performance gains when loading your hub. See your database documentation for more information about the specific calls.

To use Oracle database utilities properly:

- 1 Do one of the following:
  - On Windows, set the path to the Oracle bin directory in your system PATH variable.
  - On UNIX, set the system variable ORACLE\_HOME. Then export \$ORACLE\_HOME to the PATH.
- 2 Enter the database location description in the Oracle tnsnames.ora file. Here is a typical format:

```
ORCL =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP) (HOST =
your_server_name) (PORT = 1521))
    )
  )
```

```
(CONNECT_DATA =  
  (SERVICE_NAME = orcl)  
)  
)
```



## 4

## Configuring SAS MDM

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## Post-Installation Tasks for New Installations

After the SAS Deployment Wizard has finished the installation, you can complete post-installation tasks.

**Note:** On Windows systems, you might need to modify file directory security options to display some of the locations where SAS MDM content is stored.

Here are the post-installation tasks:

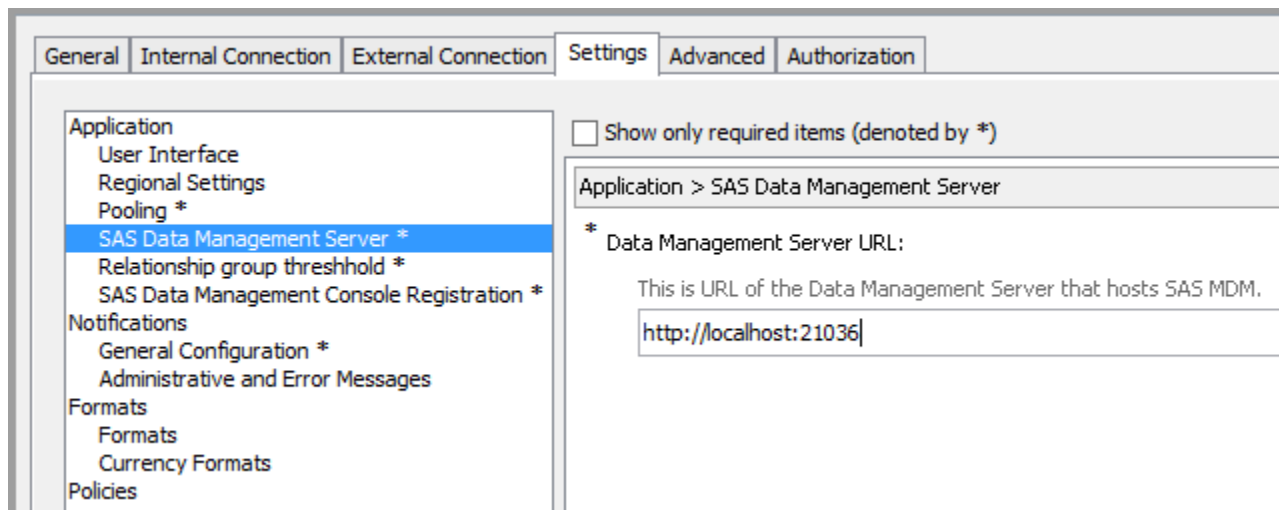
- 1 Verify that DSNs have been created for the SAS MDM target database. By default, these are set to SASMDM.
  - For Data Management Studio, open Data Management Studio and verify through the **Data** riser that you have access to your database. Your data source should be listed under **Data Connections**.

- For Data Management Server:
  - 1 Add a server under the **Data Management Servers** riser.
  - 2 Open the server and locate the **Data Connections** tab.
  - 3 Open the **Manage ODBC Connections** dialog box. Your data source should be listed.
- 2 For Data Management Studio, determine the host and port values for your metadata server. Then set the Host and Port values for the **Metadata Server** in **Options**.
- 3 Ensure that the connections in Data Management Studio are saved for both Data Management Studio and for Data Management Server.
- 4 Verify that the `mdm_macros.cfg` file for Data Management Studio and for Data Management Server contains the correct information for the following macros: `MDM_HUB_DB`, `MDM_DSN`, `MDM_SCHEMA`, and `MDM_PACKAGE`. See “[Setting SAS MDM Macros](#)” on page 31 for details.
- 5 Because a SAS Quality Knowledge Base (QKB) was installed by the SAS Deployment Wizard, you must take the following actions:
  - a Verify that the `mdm_macros.cfg` file for Data Management Studio and for Data Management Server contains the correct QKB location information for the `MDM_QKB` macro. This was set during installation.
  - b If you do not want to use the latest QKB supplied by the SAS MDM installation process, you must manually change the `MDM_QKB` macros for Data Management Studio and Data Management Server and point to your original QKB location.
  - c If you edit the `mdm_macros.cfg` file, you must restart Data Management Server.

If you need to download another version of the QKB, see this web page: <http://support.sas.com/qkbbdownload>.
- 6 To use Data Remediation functionality for Data Management Studio and for Data Management Server, review the `mdm_macros.cfg` file and `mdm_remediation_macros.cfg` macro files. Ensure that the correct information has been set by the installation process for the following macros: `MDM_REMEDIATION_URL`, and `MDM_REMEDIATION_LIBS`.  
See “[Macro Descriptions](#)” on page 31 for more information about macros.
- 7 (Optional) Download and install address verification data from <http://support.sas.com/downloads/browse.htm?fil=3&cat=16>.
- 8 Start the Data Management Server service or process from the machine on which it was installed.
- 9 Add an administrative user to the SAS Administrators group and add users to the default Data Management groups in the SAS Management Console. For setup and configuration, ensure that the user identity for administrative and configuration tasks is a member of the SAS Administrators and Data Management Administrators groups. See “[Security Considerations for SAS MDM](#)” on page 34 for complete information.

- 10 Log on to Data Management Server from Data Management Studio as a member of the SAS Administrators group. Assign access privileges to other groups that need to access the Master Data Management application. See [“Security Considerations for SAS MDM” on page 34](#) for complete information.
- 11 (Optional) Configure Workflow as follows:
  - a As a system administrator, add the Data Management Administrators group to the ROLE\_WORKFLOW\_ADMINISTRATOR role using the SAS Web Administration Console. The default URL is `http://<host>:<port>/SASAdmin`. The default port for Windows systems is 80. The default port for UNIX systems is 7980.
  - b Open SAS Workflow Studio and connect to the default SAS environment.
  - c Log on to the server as a member of the Data Management Administrators group and upload MDM Tag and MDM Lifecycle workflows to the SAS Workflow server. Ensure that you activate the workflows. The workflow template files are located in the repository (`<SAS MDM Install Directory>/workflows`) created during installation.
  - d Enable email notifications through Preferences found on the top right side in the SAS Web Administration Console.
- 12 If the SAS Deployment Wizard was not able to determine the location of the Data Management Server instance that supports SAS MDM, you must set it in SAS Management Console. Navigate to **Application Management** ► **Configuration Manager** ► **SAS Application Infrastructure** and right-click **MDM**. Select **Properties** ► **Settings** ► **Application** ► **SAS Data Management Server** and enter the correct information.

Figure 4.1 SAS Management Console



**Note:** You might need to restart your application server for this change to take effect. If you have trouble getting the SAS MDM web application to connect to Data Management Server, verify that Data Management Server is accessible via the network. See [“Data Management Server Communication” on page 30](#) for more information.

- 13 Verify the default connection information in the Data Management Studio `install_schema.djf` job and modify it if necessary.

- a Open this job with Data Management Studio. The **Inputs** tab for the Echo node contains the defaults.
- b Follow the instructions in install\_schema.djf to make the necessary changes for Oracle and SQL Server. Other values, such as the database DSN and schema information, are taken from the appropriate, previously defined macro variables. See [“Setting SAS MDM Macros” on page 31](#) for more information.
- c After verifying the information, execute install\_schema.djf to install the schema.
- d If the scripts do not run, you might need to edit the command line used to call the database. Open install\_schema.djf in Data Management Studio and follow the instructions in the Expression nodes for your specific database.
- e If your Data Management Studio installation does not have access to SQL\*Plus or sqlcmd, you must install the schema without using Data Management Studio. You can use a database management tool such as PL/SQL Developer or SQL Developer. For example, if you are using an Oracle database, you can use SQL\*Plus to execute the DDL for your database. If you do not have the correct database command-line access from your environment, an administrator using the correct user name or schema defined for SAS MDM must run the following scripts:

Table 4.1 Scripts

Database	Scripts
Oracle	mdm_oracle_ddl.sql mdm_oracle_procs.sql
SQL Server	mdm_sql_server_procs.sql mdm_sql_server_ddl.sql

- 14 Run the add\_default\_meta.djf job to install the metadata. This job is located in the <SAS MDM Install Directory>\batch\_jobs\sasmdm directory.
- 15 (Optional) Run the add\_ui\_language\_meta\_<locale>.djf job to install the translatable metadata. For example, to load the English metadata, use add\_ui\_language\_meta\_enusa.djf. These jobs are located in the <SAS MDM Install Directory>\batch\_jobs\sasmdm directory.
- 16 (Optional) If you want to load sample entities and data into your SAS MDM database, run the add\_sample\_meta.djf job. These jobs are located in the <SAS MDM Install Directory>\batch\_jobs\sasmdm directory.
- 17 (Optional) To load translatable metadata for the sample entity types, run the add\_ui\_language\_sample\_<locale>.djf job. For example, to load the English sample metadata, use add\_ui\_language\_sample\_enusa.djf. These jobs are located in the <SAS MDM Install Directory>\batch\_jobs\sasmdm directory.
- 18 To access SAS MDM and associated applications, open the SAS Data Management Console at http://<host>:<port>/SASDataManagement. The

default port for Windows systems is 80. The default port for UNIX systems is 7980.

- 19** (Optional) To generate jobs that you can use to load and interact with sample data, perform the following tasks:

**Note:** See the *SAS MDM: User's Guide* for instructions about using the SAS MDM user interface.

- a** Open SAS Data Management Console.
  - b** Click **Data Model**.
  - c** On the **Data Model** tab, select the sample entity types into which you want to load data.
  - d** Generate the associated jobs and services. Omit the generation of the `_stnd` jobs and `mdm_extract_individual.ddf` and `mdm_push_individual.ddf` jobs as they exist already and contain pre-defined data quality transformations necessary to support the sample entities.
  - e** On the **Data Model** tab, select all the relationship types.
  - f** Generate the associated jobs and services.
  - g** From the SAS Data Management Console, click **Source Systems**.
  - h** On the **Source Systems** tab, expand a source system, select an entity, and then invoke the **Add/Update** tool for that entity.
- 20** For multi-machine deployments to use SAS Data Remediation in conjunction with SAS MDM, you must copy several configuration files from your Data Management Studio client computer to your Data Management Server computer. These files enable SAS MDM to SAS Data Remediation communication.

**Table 4.2** File Locations

Files to be Copied	Destination Location
<code>DMSTUDIOHOME\etc\macros \mdm_remediation_macros.cfg</code>	<code>DMSERVERHOME\etc\macros \mdm_remediation_macros.cfg</code>
<code>DMSTUDIOHOME\lib\mdm \sas.dm.mdm.dataremediation.xml</code>	<code>DMSERVERHOME\lib\mdm \sas.dm.mdm.dataremediation.xml</code>
<code>DMSTUDIOHOME\lib\mdm \sas.dm.mdm.migrateremediation. xml</code>	<code>DMSERVERHOME\lib\mdm \sas.dm.mdm.migrateremediation. xml</code>

- 21** (Optional) Add links to the SAS Data Management Console Home Page.

- a** Log on to SAS Management Console as an administrator.
- b** Expand the following folders on the **Plugins** tab: **Application Management** ⇒ **Configuration Manager** ⇒ **Data Management Cnsle Home Page**.

- c Right-click **Data Management Console Home Page** and select **Properties**.
- d Click the **Settings** tab.
- e Select **Home Page Settings** in the panel on the left.
- f Use the **Home Page Settings** panel to add the URL for the desired web page.
- g Click **OK** to save your changes.
- h Restart the SAS Web Application Server in order for the new URL to show up on the home page for SAS Data Management Console.

---

## Post-Update Tasks for SAS MDM

### 1 Evolve the database schema

Determine which release you are starting from, and evolve the schema for each intervening release. For instance, if you are starting from 4.1, you must run the `evolve_schema` batch jobs for SAS MDM 4.1, 4.1m1, and 4.2; see the table below for more information. Be sure to check the logs for the schema evolution scripts between each step to ensure that no errors occurred. If there are errors, correct them before continuing. Run these batch jobs to schema-evolve the previous SAS MDM schema. These jobs appear in the `batch_jobs/sasmdm` folder. Modify the `echo` node at the top of the job according to the instructions in the job.

If you are starting from	then you must run these jobs
SAS MDM 4.1	<code>evolve_schema_41.djf</code> , <code>evolve_schema_41m1.djf</code> , and <code>evolve_schema_42.djf</code>
SAS MDM 4.1m1	<code>evolve_schema_41m1.djf</code> , and <code>evolve_schema_42.djf</code>
SAS MDM 4.2	<code>evolve_schema_42.djf</code>

**Note:** Because of the addition of relationship type attributes, values in the `MDM_REL_TYPE` table must be sized to 23 characters or less to run the schema evolve process successfully. If you have values in the `MDM_REL_TYPE` table larger than 23, change the column size before attempting to run the schema evolve script. Only the underscore special character is allowed. Remove any other special characters in the `MDM_REL_TYPE` table before attempting to execute the schema evolve script.

### 2 Republish all entity types.

You must manually publish all of the entity types to incorporate a new clustering rule for this release in the database tables.

### 3 Regenerate all jobs.

You must manually move modifications that you have made to the standard generated output to the newly generated jobs. If the Remediation node is active in other SAS MDM jobs because of customizations, those jobs must be manually modified as well. If the Remediation node is used, you must modify these jobs through the Advanced Properties settings of the Remediation node.

**4** Regenerate entity-specific jobs using the Data Model component.

MDM system-level jobs are updated in your Data Management Studio and Data Management Server MDM repositories. Backup directories were created for you when you ran the automated installation process. Entity-specific MDM jobs are not automatically updated. Previous customizations must be manually migrated to the newly generated jobs.

**5** (Optional) When migrating to SAS MDM 4.3, the sample data needs to be loaded into the database. If you have already loaded the sample entity types by running the `add_sample_meta.djf` batch job, then you do not want to run that job again (loading the sample entity types again will result in errors).

To load only the sample data into the database, run the final two nodes of the `add_sample_meta.djf` batch job. To run the node, right click on the node and select Run Node.

**6** Manually upload modified workflow templates to the workflow server using SAS Workflow Studio.

Modifications to the workflow templates used by SAS MDM support the pass-through of URL data from SAS MDM. See post-installation [Step 11 on page 25](#) for more information about how to do this. If you made customizations to your workflow templates and have them in production, review the new MDM workflow templates to see whether you must manually edit your customized workflows to perform correctly with the newer SAS MDM functionality.

**7** (Optional) If you are upgrading to a newer QKB, you might need to increase the column lengths for standardize and match code columns in the hub. Review the documentation for both your current and the new QKB to see whether the definitions that you are using with your SAS MDM entity have changed. If the definitions have changed, perform the following steps:

- a** Modify the column lengths for standardize and match code columns in your entity tables.
- b** Update the columns length metadata for the affected entities in the Data Model component.

**Note:** After the installation is upgraded, all users of the Data Management Console must clear their browser caches.

---

## Remediation Data Migration

**Note:** If you are migrating from SAS MDM 4.2, it is not necessary to complete the following steps.

The mechanism for maintaining records for remediation has changed from a filebased method to a database method. If you want to maintain your existing

remediation items after SAS MDM installation, any existing remediation data must be migrated into the database. SAS MDM provides a Java program to perform this migration. To use it, your classpath environment variable must include all of the JAR files in the directory identified by the MDM\_REMEDIATION\_LIBS macro.

The program uses a configuration file to connect to the SAS Data Remediation database. The file, `sas.dm.mdm.migrateremediation.xml`, appears in the same directory as the required JAR files.

```
java -Dmigrateremediation.config=your_path\sas.dm.mdm.migrateremediation.xml
com.sas.dm.mdm.dataremediation.MigrateRemediationFiles
```

You see the following changes after the program completes successfully:

- `Sas_rem_items` for file-based remediation tasks contain an `app_key` if the record had values for both the source system ID and the source system record ID.
- `Sas_rem_items` contain updated keys for file-based remediation tasks. These appear as `record:///id` from `mdm_remediation_data`.
- `Mdm_remediation_data` contains an entry for each of the records that has been migrated.

After verifying that the content has migrated successfully, you can remove the files for the remediation records.

---

## Migration Tasks for SAS MDM

Beginning with SAS MDM 4.3, you can migrate from SAS MDM 4.1 or later. You can also elect to migrate to a different SAS MDM configuration. For example, from a one machine installation to a multiple machine installation or from a single machine to a larger, faster machine.

Once you have migrated, you must run each of the evolve schema batch jobs. See [“Post-Update Tasks for SAS MDM” on page 28](#).

---

## Data Management Server Communication

Here are some additional considerations for setting the address value that allows communication with Data Management Server:

- If your environment contains a host name that is associated with a single IP address, then host name and IP address can be used interchangeably on a client/server connection. You can use either for the Data Management Server setting in SAS Management Console.
- If your environment contains multiple IP addresses (at least one IPv4 and one IPv6) that are associated with a host name, then a host name on one end of the connection might not resolve to the correct IP address at the other end of a connection. In these cases, you must set the following value in `dmserver.cfg` to a blank value: `dmserver/soap/listen_host =`.

## Setting SAS MDM Macros

### Overview

SAS MDM jobs and services require certain values in the `mdm_macros.cfg` file on all clients and on the server. These values are automatically added during the SAS MDM installation. If you need to make changes to your `mdm_macros.cfg` file after the SAS MDM installation and configuration process, you can edit the `mdm_macros.cfg` file on your client computer using Data Management Studio. Some of the paths used as values for the keys in this file must be modified for UNIX.

After making changes to the `mdm_macros.cfg` file, follow these steps:

- 1 If you change macro values through the Data Management Studio interface, an `mdm_macros.cfg` file is also created in `\Users\<Your_User_ID>\AppData\Roaming\<Studio Install Directory>\<version>\etc\macros`. You must combine those values with the values in the `mdm_macros.cfg` file in `\Program Files\<Studio Install Directory>\<version>\etc\macros` without duplicating key names.
- 2 After making these changes, you must copy the combined file to the macros directory on Data Management Server. If your Data Management Server system runs on another platform, ensure that the path delimiters are appropriate for the platform.
- 3 If you run SAS MDM services on a Data Management Server as web services, you must ensure that Data Management Server has access to the `mdm_macros.cfg` file.

For more information about the configured macros and their use, see the `mdm_macros.cfg` file.

### Database Values

The SAS MDM installation process updates database connection values in your SAS MDM macro files. If you need to modify these after the installation process is completed, the values that you use for your database must be reflected in the `mdm_macros.cfg` file or files for your installation. For Oracle, the schema name must be in uppercase letters.

SQL Server does not use packages for stored procedures, nor does it necessarily separate logon information from schemas. Modify the `mdm_macros.cfg` file or files with the following values:

```
MDM_HUB_DB=SQL SERVER
MDM_SCHEMA=mdm42
MDM_PACKAGE=
```

### Macro Descriptions

The following table lists the macros for the `mdm_macros.cfg` file along with their default values and descriptions. When editing this file, do not set the macros

MDM\_CLUSTER\_MEM, MDM\_BRANCH\_MEM, MDM\_SORT\_MEM, and MDM\_SURVIVE\_MEM to values lower than 4 MB or 4,194,304 bytes. In some cases, doing so can cause the various processes to stop and return memory-related errors.

Here are the macro default values and descriptions:

**Table 4.3** MDM Macros

Macro with Default	Description
MDM_DEF_TIMESTAMP_FORMAT MM/DD/YYYY hh:mm:ss	Default timestamp format for the SAS MDM repository.
MDM_DEF_DATE_FORMAT MM/DD/YYYY	Default date format for the SAS MDM repository.
MDM_BRANCH_MEM 4194304	Branch memory limit.
MDM_SORT_MEM 16777216	Sort memory limit.
MDM_CLUSTER_MEM 16777216	Cluster memory limit.
MDM_SURVIVE_MEM 16	Survivorship memory limit (MB).
MDM_MAX_ROWS 0	File input limit (primarily bulk jobs). This macro is deprecated.
MDM_SORT_THREADS 8	Sort thread limit.
MDM_MAX_CLUSTERS 1000	Maximum number of entries returned by entity search.
MDM_MAX_CLUSTER_RECORDS 1000	Maximum number of entries returned by cluster search.
MDM_QKB	The fully qualified path to the QKB.
MDM_ARCHIVE C:\ProgramData\SAS\DataManagement\FileStorage\SASMDM\archive\	Output path from the archival job.
MDM_DATA C:\ProgramData\SAS\DataManagement\FileStorage\SASMDM\data\	Output path for bulk jobs.

Macro with Default	Description
MDM_LOGS C:\ProgramData\SAS\DataManagement\FileStorage \SASMDM\logs\	Output path for log files.
MDM_SCRIPTS C:\ProgramData\SAS\DataManagement\FileStorage \SASMDM\scripts\	Path to the scripts and metadata directory.
MDM_SAMPLE_DATA C:\ProgramData\SAS\DataManagement\FileStorage \SASMDM\samples\data\	The sample data directory.
MDM_SAMPLE_SCRIPTS C:\ProgramData\SAS\DataManagement\FileStorage \SASMDM\samples\scripts\	The sample scripts directory.
MDM_HUB_DB ORACLE	The database type: ORACLE or SQL SERVER.
MDM_DSN DSN=SASMDM	The name of the DSN for the SAS MDM repository.
MDM_SCHEMA MDM	The schema to use within the SAS MDM repository. This value should be all uppercase for Oracle.
MDM_PACKAGE MD.	The package for the stored procedure. Leave this blank for SQL Server.
MDM_OS_DELIMITER ;	OS-specific delimiter. Use ; for Windows and : for UNIX platforms.
MDM_REMEDIATION_LIBS C:\Program Files\SASHome \DataFluxDataManagementStudio\2.7\lib\mdm\	The location of the data remediation Java application.

The following table lists the macro for the `mdm_remediation_macros.cfg` file along with its default value and description

**Table 4.4** Remediation Macros

Macro with Default	Description
MDM_REMEDIATION_URL http://localhost:80/SASDataRemediation/rest/groups	The location of the SAS Data Remediation REST web service application.

---

## Security Considerations for SAS MDM

### Overview

SAS MDM requires that security be enabled on Data Management Server. The SAS MDM installation creates the following system settings for you:

```
dmserver/secure = yes
dmserver/secure/grp_admin = SASAdministrators
```

The installation process also defines the following Data Management user groups:

- Data Management Administrators
- Data Management Stewards
- Data Management Business Users
- Data Management Business Approvers
- Data Management Power Users
- Data Management Executives

Use SAS Management Console to add users and groups to these groups or to define new ones for use with SAS MDM. Because SAS Administrators is set as the default group for grp\_admin, you must assign at least one of your users to SAS Administrators so that the assigned user can modify Access Control Lists and other permissions for your SAS MDM users.

Permissions consist of Group and User permissions and Access Control Lists (ACLs). Group and User permissions determine the actions that users are allowed to take on the server. ACLs control which users are allowed to access jobs on the servers. If Group permissions and ACLs are not configured, Data Management Server provides defaults. Data Management Studio is used to create permissions and ACLs for the groups, jobs, and services that are deployed on the Data Management Server. The permissions that are used for the jobs depend on the roles and the groups that you have defined and on the needs of your business.

**Note:** Security checks are made by Data Management Server when a SOAP request is received. When a job calls another job directly, Data Management Server is not involved. When a job sends Data Management Server a SOAP request to run another job using the real-time service node, the security check is made only at the top-level service.

For more information about setting up security parameters for users and groups, see the *Data Management Server: Administrator's Guide*.

### Setting Permissions

#### Group Permissions

On the **Data Management Servers** riser in Data Management Studio, select the server to be configured. Use the **Security** tab to add groups to the server configuration, and modify the permissions appropriately.

Here are some initial recommendations that can be changed as required for your installation:

**Table 4.5** *Group Permissions*

Group	Permissions
Data Management Administrators	All
Data Management Stewards	All
Data Management Business Users	All execute and list
Data Management Business Approvers	All execute and list
Data Management Power Users	All execute and list
Data Management Executives	All execute and list

### Access Control Lists

ACLs can be set up for each job or service to give access rights to individuals or groups. For example, assume that only a certain individual, or group of individuals in an organization, is allowed to change records within SAS MDM. The user name or associated group can be given special access rights through an ACL. For sensitive services, an administrator might want to deny everyone access using the ACL and then explicitly allow some users or a group to access or run the job or service. For more information about setting up permission levels, see the *Data Management Server: Administrator's Guide*.

### Batch Job Permissions

On the **Data Management Servers** riser in Data Management Studio, select the server to be configured. Expand the Batch Jobs folder and establish the following ACLs in the SAS MDM folder.

**Table 4.6** *Batch Job Permissions*

Group	Permissions
Data Management Administrators	All
Data Management Stewards	All
Data Management Business Users	None
Data Management Business Approvers	None
Data Management Power Users	None
Data Management Executives	None

## Data Services Permissions

On the **Data Management Servers** riser in Data Management Studio, select the server to be configured. Expand the Real-Time Data Services folder and establish the following ACLs in the SAS MDM folder.

*Table 4.7 Data Services Permissions*

Group	Permissions
Data Management Administrators	All
Data Management Stewards	All
Data Management Business Users	All
Data Management Business Approvers	All
Data Management Power Users	All
Data Management Executives	All

**Note:** You might want to make Data Management Stewards the owner of all SAS MDM jobs and services to facilitate maintenance activities.

## Enabling IP Address-Based Security

SAS MDM must have access to Data Management Server in order to function. Requests from users using SAS MDM to run jobs seem to originate from the application server, not from the computers of the users. Configuring Data Management Server IP address-based security does not secure your system against web users. Instead, you can use request filters to block IP addresses from accessing your application server. For more information, see the *Data Management Server: Administrator's Guide* and your application server documentation.

---

## SAS MDM Logging

### Installation Log

A log of the modifications made to your computer during installation is written to `<SAS Home Directory>\InstallMisc\InstallLogs`.

### Database Script Logs

The database scripts that install or modify the schema generate log files in `<SAS MDM Install Directory>\sasmdm\logs`, as defined by the MDM\_LOGS macro. These log files can be useful in determining problems during the initial configuration of the repository.

## Data Management Server and Studio Application Logs

Log messages that document Data Management Server activity or job statistics while running jobs and services locally through Data Management Studio or dfwproc are recorded in log files specific to the software that you are running.

For more information about Data Management Server and Data Management Studio logging, see the *Data Management Studio: User's Guide* and the *Data Management Server: Administrator's Guide*.

## SAS MDM Logs

Logs for SAS MDM can be found on the application server that hosts them. They are typically found in a location similar to the following:

### SAS MDM

```
..\Config\Lev1\Web\Logs\SASServer13_1\SASMDM.log
```

### SAS Data Management Console

```
..\Config\Lev1\Web\Logs\SASServer13_1\SASDataManagement.log
```

Other logs that might be useful for troubleshooting might not be on the same system as SAS MDM. Examples are as follows:

### SAS Workflow

```
..\Config\Lev1\Web\Logs
\SASServer1_1\SASWorkflowServicesx.x.log
```

### SAS Metadata Server

```
..\Config\Lev1\SASMeta\MetadataServer\Logs
```



## 5

## Localization Configuration

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### Enabling QKB Support for Other Locales

Each of the following services contains an embedded reference to the standardization job:

- mrm\_add\_<entity\_type>.ddf
- add\_update\_<entity\_type>.ddf
- mdm\_query\_survivor\_<entity\_type>.ddf
- mdm\_query\_relationship\_<entity\_type>.ddf

By default, the job supports ENUSA. To change to a single locale (for example, DEDEU), replace the references to the ENUSA locale with DEDEU. To support multiple locales simultaneously, add branches to the job for each locale. Ensure that the locales that you need are supported by the QKB and that the respective QKB licenses are correct. For more information, see the “Enabling Data Quality” section of the *SAS MDM User's Guide*.

### Bulk Loading Data for Other Locales

If you load data for other locales into your hub using database bulk-load utilities, ensure that the encoding in the add\_update\_<entity\_type>.ddf jobs matches the codepage for your database. If these values do not match, some of the data might be translated into the database's codepage incorrectly.

The add\_update\_<entity\_type>.ddf jobs interact with the DBMS bulk-load utilities by writing a data file representing your entities, and then invoking the bulk-load utilities with that data file as input. To change the encoding of the data file, open the **Properties** dialog box for the Write to Staging File node at the bottom of the job, and set the Encoding to a value that matches your database.

In addition to setting the output file encoding, you might find it necessary to change the control files used by the database utilities, which guide the interpretation of the file contents.

**Table 5.1** Database Control Files

Database	Relevant Files
Oracle	Look for the <code>character<del>s</del>et</code> parameter in .ctl files.
SQL Server	bcp files have a column collation field.

For more information, see your database documentation.

## 6

## Administrative Considerations

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### Managing Database Growth

As records are created and updated within SAS MDM, the database continues to grow. Much of the growth is due to retired records, information that has been retained in the hub for historical purposes only. Depending on the needs of your organization, the retired records can be removed by transferring the data to offline storage or deleted entirely.

SAS MDM provides a sample job named `mdm_archive_<entity_type>.djf` that is suitable for customization. This job is not accessible through SAS MDM. You must run it manually. It is used to generate archive files for a specific entity type. The job finds expired records (including audit and entity records), generates files with those records, and removes them from the hub.

**Note:** Archiving data can result in extensive changes in the hub and might cause performance issues for other users. If possible, restrict archival activity to periods when the hub can be taken offline for maintenance. Alternatively, run archiving frequently enough that the overall operation is quick, or modify the archival jobs to process subsets of the hub.

---

## Oracle Considerations

### Specifying MDM\_SCHEMA

For Oracle databases, the value of the MDM\_SCHEMA macro must be specified with uppercase characters. Failure to specify MDM\_SCHEMA in uppercase can cause some data to be inaccessible through Data Management Studio, Data Management Server, and SAS MDM.

### Performance

With Oracle 11g databases, you might experience poor performance during bulk loads, which can be improved by altering the operation of the optimizer.

To alter optimizer operation:

- 1 Log on as sys on your database.
- 2 Run: `ALTER SYSTEM SET OPTIMIZER_FEATURES_ENABLE = '10.2.0.1';`
- 3 Restart the database.

### Oracle 12c

If you want to use a pluggable database under Oracle 12c, you must use a service name instead of an SID when configuring database connections. This includes DSNs, server.xml for the application server, and the jobs that use database utilities such as sqlplus and sqlldr.

You must also edit the sqlnet.ora file used by the database. This file is typically located in the following directory: `$ORACLE_BASE/product/version_number/$ORACLE_HOME/NETWORK/ADMIN`.

Edit the file as follows:

```
SQLNET.ALLOWED_LOGON_VERSION=8
SQLNET.ALLOWED_LOGON_VERSION_SERVER=8
SQLNET.ALLOWED_LOGON_VERSION_CLIENT=8
```

---

## SQL Server Considerations

By default, SQL Server searching is not case-sensitive. If you need to enable case-sensitive search capabilities, ensure that your database is initialized accordingly. For more details, see your database documentation.

---

## Role Design Considerations

For some operations, the SAS MDM UI has to provide information about the assigned roles of a user to a database query. The number of groups and roles assigned to a user can undergo truncation issues if the size of all the role names (including commas to separate them) exceeds 450 characters.

---

## Diagnosing Problems

### Overview

The following sections provide answers to common questions that arise concerning SAS MDM installations.

### Server Connection

*Table 6.1 Server Connection Issues*

Symptom	Resolution
On a 64-bit Windows system, the DSN has been set up, and the connection has been saved. The connection is accessible in Data Management Studio, but not in Data Management Server.	The 64-bit credentials must be saved explicitly for 64-bit systems. The connection must be replicated in a 64-bit ODBC connection, either by using the ODBC Administrative Tool in the Control Panel or by using the <code>odbcad32.exe</code> executable in <code>%systemdrive%\Windows\System32</code> .

---

## Bulk Loads

**Table 6.2** Bulk Load Issues

Symptom	Resolution
A bulk load using a database utility (for example, sqldr or bcp) does not work.	<p>Check the log files for the run in &lt;SAS MDM Install Directory&gt;\data. Look at the timestamps to determine which logs might be relevant.</p> <p>If the logs do not appear, or if they indicate errors running the database utility, try the following:</p> <ul style="list-style-type: none"> <li>■ Ensure that the database utility is installed and can be run. Try running it from the command line.</li> <li>■ Look at the entity_stage_bulk_loader.ddf job. If necessary, use alternative syntaxes to reference the database.</li> <li>■ Check the Echo node at the top of the add_update_&lt;entity_type&gt;.djf job, and ensure that the values are correct.</li> </ul>

## SAS MDM Logon

**Table 6.3** Logon Issues

Symptom	Resolution
Logging on to SAS MDM generates a message about the wrong number of types or arguments in a call to a stored procedure.	<p>Ensure that your ODBC settings are configured correctly. The Procedure Return Results setting might not have been set properly. If you are running a 64-bit system, ensure that both the 32-bit driver used by Data Management Studio, and the 64-bit driver used by Data Management Server have the same settings.</p>
Logging on to SAS MDM generates a message about not being able to load the model.	<p>Check your application server and ensure that the data source has been configured correctly. For tcServer, check the configuration in the context.xml file and the availability of the JDBC drivers in the application server classpath. The application server uses context.xml to configure the resources required by the web application. The resource is a data source that provides connection information to the database for the workflow engine, which uses a JDBC connection pool instead of an ODBC DSN.</p> <p>Confirm that the Data Management Server service has been started. Depending on your system configuration, it might have not started automatically.</p> <p>Review <a href="#">“Data Management Server Communication” on page 30</a> and ensure that you have defined your connection to Data Management Server correctly.</p>

Symptom	Resolution
Not all areas of the SAS Data Management Console web application are visible.	The suggested minimum browser screen size for SAS MDM web components is 1024 x 768, but larger sizes are preferred. Smaller sizes might obscure parts of the application.
You cannot log on and the error log states that <code>context initialization failed</code> or that it is <code>unable to find [jdbc]</code> .	If the source directory used to specify the JDBC driver classpath during the SAS MDM installation contained any additional JAR files, you might have introduced extra JAR files into your web server environment. To correct the problem, remove the incorrect JAR files from the web application server <code>lib</code> directory (for example, <code>..\SAS\mdmadv_1machine\Lev1\Web\WebAppServer\SASServer13_1\lib</code> ) and restart the web server. When setting the JDBC driver classpath, the only file in the source directory should be the JDBC driver JAR file that matches your SAS MDM target database system.



# Appendix 1

## Data Model

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## Database Tables and Columns

### Overview

This section includes a listing of database tables and a description of the columns for each table.

**Note:** The following data types are for an Oracle hub. Equivalent data types are used for a SQL Server hub.

### Database Tables

*Table A1.1 Database Tables*

Table	Description
MDM_ATTRS	Contains a complete list of all attribute metadata for each entity type.
MDM_ATTR_DATATYPES	Specifies the available attribute data types.
MDM_ATTR_ACCESS	Specifies the access control for attributes.
MDM_ATTR_DISPLAY	Contains display parameters for combinations of entity type and attribute type.
MDM_ATTR_PROFILES	Contains a list of localized attribute profile names.
MDM_CLUSTER_CONDITIONS	Maintains a list of cluster conditions for each entity type.

Table	Description
MDM_CLUSTER_CRITERIA	Maintains a list of attributes for each cluster condition.
MDM_CLUSTER_MAPPING	Maintains cluster collapse information.
MDM_CLUSTER_MEMBER_HISTORY	Maintains a history of cluster members for move and collapse scenarios.
MDM_ENTITY_CLUSTERS	Identifies clusters uniquely and the names by which they are known.
MDM_ENTITY_REL	Maintains authored relationships between clusters.
MDM_ENTITY_REL_CONDITIONS	Contains a list of conditions for entity type relationships.
MDM_ENTITY_REL_TYPES	Contains a list of relationships between entity types.
MDM_ENTITY_TYPES	Specifies the entity types that are covered in the hub, such as COMPANY or PART.
MDM_ENTITY_TYPE_ACCESS	Specifies the access control for entity types.
MDM_ENTITY_TYPE_INDICES	Contains list of indices to be maintained on entity type specific tables such as MDM_<entity_type>_TT, MDM_<entity_type>_ST, MDM_<entity_type>_CC.
MDM_ENTITY_TYPE_SRC	Contains list of entity type and source system associations.
MDM_ENTITY_TYPE_TOOLS	Contains list of tools by entity type.
MDM_ERROR_LOG	Contains data about errors that occur within the stored procedures used by Master Data Management.
MDM_EXTRACT_TOKEN	Maintains list of last token values extracted for each entity type – source system association.
MDM_FORCED_CLUSTERS	Maintains a list of records that are moved from one cluster to another.
MDM_HIERARCHY_LEVELS	Contains hierarchy level details for hierarchy types.
MDM_HIERARCHY_TYPES	Contains hierarchy type associations with entity types.
MDM_NAMED_HIERARCHIES	Contains list of named hierarchies added by user.
MDM_LANGUAGES	Specifies the list of configured languages.
MDM_PROCESS_CONTROL	Maintains process control tracks for load-update processes in the hub.
MDM_REL_ATTRS	Contains attribute list for relationship types.
MDM_REL_ATTR_PROFILES	Contains list of localized relationship attribute profiles
MDM_REMEDIATION_ATTRS	Contains a list of remediation attributes for each entity type.

Table	Description
<a href="#">MDM_SRC_SYS</a>	Specifies list of all source systems that feed the hub.
<a href="#">MDM_SRC_SYS_TOOLS</a>	Contains a list of tools available for each entity type-source system association.
<a href="#">MDM_SRC_SYS_TOOL_ACCESS</a>	Specifies access control for source system tools.
<a href="#">MDM_STAGING</a>	Stages non-user attribute data before making it live in the hub.
<a href="#">MDM_TOOL_ACCESS</a>	Specifies access control for entity type tools.

## MDM\_ATTRS Columns

The MDM\_ATTRS table contains a complete list of all attribute metadata for each entity type.

The information in the attribute definition is used to construct a column of the same name, with the data type, length (if any), and constraints as indicated by the metadata. In order for the entity type to be published successfully, the attribute name must be compatible with any restrictions imposed by the underlying database.

If you loaded localized metadata, the MDM\_ATTRS table includes additional columns for the labels that appear in SAS MDM (MDM\_DEF\_ATTR\_LABEL and MDM\_ATTR\_DESC). These column names are postfixed with the locale name. For example, if you loaded the French metadata, the table includes MDM\_DEF\_ATTR\_LABEL\_FRFRA and MDM\_ATTR\_DESC\_FRFRA columns.

**Table A1.2** MDM\_ATTRS Columns

Name	Data Type	Null Option	Description
MDM_ATTR_ID	INTEGER	NOT NULL	Unique attribute identifier. Automatically generated by SAS MDM.
MDM_OPSEQ	INTEGER	NULL	Sequence for optimistic locking.
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Attribute entity type identifier. Constrained by MDM_ENTITY_TYPES table.
MDM_ATTR_NAME	VARCHAR2(30)	NOT NULL	Descriptive attribute name.
MDM_ATTR_PROFILE_ID	INTEGER	NULL	Unique profile identifier. Constrained by MDM_ATTR_PROFILE S table.

Name	Data Type	Null Option	Description
MDM_ATTR_DATATYPE_ID	INTEGER	NOT NULL	Attribute data type identifier. Constrained by MDM_ATTR_PROFILE S table.
MDM_ATTR_LENGTH	INTEGER	NULL	Maximum size of the attribute. A nonzero value is required for string and list data types.
MDM_ATTR_CONSTRAINT	VARCHAR2(200)	NULL	Lists or regex strings used for validation of Master Data Management input fields used to populate the attribute. Can be blank.
MDM_REQUIRED	CHAR(1)	NOT NULL	Indicates whether the attribute is required for the entity type with which it is associated. Enter Y to specify that the attribute is required.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NOT NULL	Date and time at which the attribute is published for the first time. Automatically generated by SAS MDM.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NOT NULL	Date and time at which the attribute is retired. Automatically generated by Master Data Management.
MDM_READONLY_FLAG	CHAR(1)	NOT NULL	Indicates whether the attribute can be modified from Master Data Management. Enter Y to specify that the attribute cannot be modified.
MDM_PARENT_ATTR_ID	INTEGER	NULL	Indicates parent ID for attribute relationships.
MDM_ENCRYPT_FLAG	CHAR(1)	NOT NULL	Indicates whether the attribute should be encrypted in the transpose table.

## MDM\_ATTR\_ACCESS Columns

The MDM\_ATTR\_ACCESS table is an access control table for attributes.

**Table A1.3** MDM\_ATTR\_ACCESS Columns

Name	Data Type	Null Option	Description
MDM_ATTR_GROUP_ID	INTEGER	NOT NULL	Unique identifier for attribute group.
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Unique entity type identifier. Constrained by MDM_ENTITY_TYPES table.
MDM_ATTR_ID	INTEGER	NOT NULL	Unique attribute identifier. Constrained by MDM_ATTRS table.
MDM_GROUP	NVARCHAR	NULL	Name of the access group.
MDM_ACTIVE	CHAR(1)	NOT NULL	

## MDM\_ATTR\_DATATYPES Columns

The MDM\_ATTR\_DATATYPES table is a constraining table for the available attribute data types.

**Table A1.4** MDM\_ATTR\_DATATYPES Columns

Name	Data Type	Null Option	Description
MDM_ATTR_DATATYPE_ID	INTEGER	NOT NULL	Unique attribute data type identifier.
MDM_ATTR_DATATYPE	VARCHAR2(50)	NOT NULL	Name of the data type.
MDM_ATTR_DATATYPE_LABEL	NVARCHAR2(50)	NULL	Human-readable name of the data type.

Name	Data Type	Null Option	Description
MDM_DB_DATATYPE	VARCHAR2(50)	NOT NULL	DBMS-specific data type for the data type. For example, string attributes are created as VARCHAR columns in SQL Server, but are created as VARCHAR2 columns in Oracle.

## MDM\_ATTR\_DISPLAY Columns

The MDM\_ATTR\_DISPLAY table contains display parameters for combinations of entity type and attribute type.

**Table A1.5** MDM\_ATTR\_DISPLAY Columns

Name	Data Type	Null Option	Description
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Attribute entity type identifier. Constrained by MDM_ENTITY_TYPES table.
MDM_ATTR_ID	INTEGER	NOT NULL	Attribute identifier. Constrained by MDM_ATTRS table.
MDM_SEARCH_DISPLAY_ORDER	INTEGER	NULL	Display order of the attribute in the search form on the <b>Master Data Management</b> tab. Enter 0 (zero) to hide the attribute in the <b>Master Data Management</b> tab.
MDM_TABLE_DISPLAY_ORDER	INTEGER	NULL	Attribute order for displaying search results.
MDM_CLUSTER_DISPLAY_ORDER	INTEGER	NULL	Display order of the attribute on the <b>Cluster Members</b> tab of the Master Data Management entity editor.
MDM_FORM_DISPLAY_ORDER	INTEGER	NULL	Display order of the attribute in the Master Data Management entity editor.
MDM_PREVIEW_DISPLAY_ORDER	INTEGER	NULL	Display order of the attribute in the Master Data Management Details panels.

## MDM\_ATTR\_PROFILES Columns

The MDM\_ATTR\_PROFILES table contains a list of localized attribute profile names.

If you have loaded localized metadata, the MDM\_ATTR\_PROFILES table includes additional columns for the labels that appear in SAS MDM (MDM\_ATTR\_PROFILE\_NAME). These column names are postfixed with the locale name. For example, if you have loaded the French metadata, the table includes an MDM\_ATTR\_PROFILE\_NAME\_FRFRA column.

**Table A1.6** MDM\_ATTR\_PROFILES Columns

Name	Data Type	Null Option	Description
MDM_ATTR_PROFILE_ID	INTEGER	NOT NULL	Unique profile identifier. Automatically generated by SAS MDM.

## MDM\_CLUSTER\_CONDITIONS Columns

The MDM\_CLUSTER\_CONDITIONS table maintains a list of cluster conditions for each entity type.

**Table A1.7** MDM\_CLUSTER\_CONDITIONS Columns

Name	Data Type	Null Option	Description
MDM_CLUSTER_CONDITION_ID	INTEGER	NOT NULL	Unique cluster condition identifier.
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Cluster condition entity type identifier. Constrained by MDM_ENTITY_TYPES table.
MDM_SORT_ORDER	INTEGER	NOT NULL	Sort order of cluster condition for an entity type.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NULL	Start of validity for cluster condition.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NULL	End of validity for cluster condition.

## MDM\_CLUSTER\_CRITERIA Columns

The MDM\_CLUSTER\_CRITERIA table maintains a list of attributes for each cluster condition.

**Table A1.8** *MDM\_CLUSTER\_CRITERIA Columns*

Name	Data Type	Null Option	Description
MDM_CLUSTER_CONDITION_ID	INTEGER	NOT NULL	Unique cluster condition identifier. Constrained by MDM_CLUSTER_CONDITIONS table.
MDM_ATTR_ID	INTEGER	NOT NULL	Cluster condition attribute identifier. Constrained by MDM_ATTRS table.

## MDM\_CLUSTER\_MAPPING Columns

The MDM\_CLUSTER\_MAPPING table maintains cluster collapse information.

**Table A1.9** *MDM\_CLUSTER\_MAPPING Columns*

Name	Data Type	Null Option	Description
ORIGINAL_CLUSTER_ID	INTEGER	NOT NULL	Unique cluster identifier that is retired in the process of collapse.
CURRENT_CLUSTER_ID	INTEGER	NOT NULL	Unique cluster identifier into which the records are collapsed.

## MDM\_CLUSTER\_MEMBER\_HISTORY Columns

The MDM\_CLUSTER\_MEMBER\_HISTORY table maintains a history of cluster members for move and collapse scenarios.

**Table A1.10** *MDM\_CLUSTER\_MEMBER\_HISTORY Columns*

Name	Data Type	Null Option	Description
MDM_ENTITY_CLUSTER_ID	INTEGER	NOT NULL	Unique cluster identifier to which the entity ID belonged.
MDM_ENTITY_ID	INTEGER	NOT NULL	Unique entity identifier.
MDM_COMMENT	NVARCHAR2(200)	NULL	Comment on the history of the record.
MDM_REASON	CHAR(1)	NOT NULL	Reason code: C for cluster collapse, or M for moved records.

Name	Data Type	Null Option	Description
MDM_MODIFIED_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NOT NULL	Date and time of modification for the record.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NULL	End of validity.

## MDM\_ENTITY\_CLUSTERS Columns

The MDM\_ENTITY\_CLUSTERS table uniquely identifies clusters and the names by which they are known.

*Table A1.11 MDM\_ENTITY\_CLUSTERS Columns*

Name	Data Type	Null Option	Description
MDM_ENTITY_CLUSTER_ID	INTEGER	NOT NULL	Unique entity cluster identifier.
MDM_ENTITY_CLUSTER_NAME	NVARCHAR2(100)	NOT NULL	Entity cluster name.
MDM_CLUSTER_TYPE	CHAR(1)	NOT NULL	Cluster type: natural or forced. Natural clusters are constructed solely by the clustering rules expressed in the jobs. Forced clusters are generated by users moving records into the cluster.

## MDM\_ENTITY\_REL Columns

The MDM\_ENTITY\_REL table maintains authored relationships between clusters.

*Table A1.12 MDM\_ENTITY\_REL Columns*

Name	Data Type	Null Option	Description
MDM_ENTITY_REL_TYPE_ID	INTEGER	NOT NULL	Entity type relationship identifier. Constrained by MDM_ENTITY_REL_TYPES table.
MDM_FROM_CLUSTER_ID	INTEGER	NOT NULL	Unique cluster identifier. Constrained by MDM_ENTITY_CLUSTERS table.

Name	Data Type	Null Option	Description
MDM_TO_CLUSTER_ID	INTEGER	NOT NULL	Unique cluster identifier. Constrained by MDM_ENTITY_CLUSTERS table.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NOT NULL	Start of validity for relationship.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NOT NULL	End of validity for relationship.

## MDM\_ENTITY\_REL\_CONDITIONS Columns

The MDM\_ENTITY\_REL\_CONDITIONS table contains a list of conditions for entity type relationships.

*Table A1.13 MDM\_ENTITY\_REL\_CONDITIONS Columns*

Name	Data Type	Null Option	Description
MDM_ENTITY_REL_TYPE_ID	INTEGER	NOT NULL	Entity type relationship identifier. Constrained by MDM_ENTITY_REL_TYPES table.
MDM_ENTITY_REL_CONDITION_ID	INTEGER	NOT NULL	Unique entity relationship condition identifier.
MDM_FROM_ATTR_ID	INTEGER	NOT NULL	Unique attribute identifier. Constrained by MDM_ATTRS table.
MDM_TO_ATTR_ID	INTEGER	NOT NULL	Unique attribute identifier. Constrained by MDM_ATTRS table.

## MDM\_ENTITY\_REL\_TYPES Columns

The MDM\_ENTITY\_REL\_TYPES table contains a list of relationships between entity types.

If you have loaded localized metadata (see [Chapter 5, “Localization Configuration,” on page 39](#)), the MDM\_ENTITY\_REL\_TYPES table includes additional columns for the labels that appear in SAS MDM (MDM\_REL\_TYPE\_DESC, MDM\_REL\_TYPE\_LABEL, and MDM\_INV\_REL\_TYPE\_LABEL). These column names are postfixed with the locale name of the localized metadata. For example, if you have loaded the French metadata, the table includes MDM\_REL\_TYPE\_DESC\_FRFRA, MDM\_REL\_TYPE\_LABEL\_FRFRA, and MDM\_INV\_RELTYPE\_LABEL\_FRFRA columns.

**Table A1.14** MDM\_ENTITY\_REL\_TYPES Columns

Name	Data Type	Null Option	Description
MDM_REL_TYPE_ID	INTEGER	NOT NULL	Entity type relationship identifier.
MDM_REL_TYPE	VARCHAR2(50)	NOT NULL	Entity type relationship name.
MDM_SORT_ORDER	INTEGER	NULL	Sort order of relationship type.
MDM_INVERSE_SORT_ORDER	INTEGER	NULL	Inverse sort order of relationship type.
MDM_FROM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Unique entity type identifier. Constrained by MDM_ENTITY_TYPES table.
MDM_TO_ENTITY_TYPE_ID	INTEGER	NOT NULL	Unique entity type identifier. Constrained by MDM_ENTITY_TYPES table.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Start of validity for relationship type.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	End of validity for relationship type.

## MDM\_ENTITY\_TYPES Columns

The MDM\_ENTITY\_TYPES table is a constraining table for the entity types that are covered in the hub, such as COMPANY or PART.

If you have loaded localized metadata (see [Chapter 5, “Localization Configuration,” on page 39](#)), the MDM\_ENTITY\_TYPES table includes additional columns for the labels that appear in SAS MDM (MDM\_ENTITY\_TYPE\_LABEL and MDM\_ENTITY\_TYPE\_DESC). These column names are postfixed with the locale name. For example, if you have loaded the French metadata, the table includes MDM\_ENTITY\_TYPE\_LABEL\_FRFRA and MDM\_ENTITY\_TYPE\_DESC\_FRFRA columns.

**Table A1.15** MDM\_ENTITY\_TYPES Columns

Name	Data Type	Null Option	Description
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Unique entity type identifier. Automatically generated by Master Data Management.
MDM_QPSEQ	INTEGER	NULL	Sequence for optimistic locking.

Name	Data Type	Null Option	Description
MDM_ENTITY_TYPE	VARCHAR2(23)	NOT NULL	Entity type name (for example, COMPANY or PART).
MDM_ENTITY_TYPE_SORT_ORDER	INTEGER	NOT NULL	Controls the entity type's sort order in Master Data Management selection lists. Enter zero (0) to hide the entity type in the Master Data Management.
MDM_LAST_MOD_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Date and time at which the entity type was last modified. Automatically generated by Master Data Management. Use this attribute in combination with MDM_GOLIVE_DTTM to determine whether the metadata has changes that have not been applied to the hub.
MDM_GOLIVE_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Date and time at which entity type is made live. Automatically generated by Master Data Management.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Date and time at which entity type is first published. Automatically generated by Master Data Management.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Date and time at which entity type is retired. Automatically generated by Master Data Management.
MDM_PARENT_ID	INTEGER	NULL	Unique tree identifier of the parent. Constrained by MDM_ENTITY_TYPES table.
MDM_ABSTRACT	CHAR(1)	NOT NULL	Flag indicating if the entity type is abstract or not.
MDM_LABEL_ATTR_ID	NUMBER	No value	Identifier of the label attribute for this entity type.

## MDM\_ENTITY\_TYPE\_ACCESS Columns

The MDM\_ENTITY\_TYPE\_ACCESS table contains access control list for entity types.

**Table A1.16** MDM\_ENTITY\_TYPE\_ACCESS

Name	Data Type	Null Option	Description
MDM_ENTITY_GROUP_ID	INTEGER	NOT NULL	Entity type group identifier.
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Entity type identifier. Constrained by MDM_ENTITY_TYPES table.
MDM_GROUP	NVARCHAR	NULL	Group name.
MDM_ACTIVE	CHAR(1)	NOT NULL	Entity type access active indicator.

## MDM\_ENTITY\_TYPE\_INDICES Columns

The MDM\_ENTITY\_TYPE\_INDICES table contains the list of custom indices created on ST, TT, and CC tables.

**Table A1.17** MDM\_ENTITY\_TYPE\_INDICES

Name	Data Type	Null Option	Description
MDM_ENTITY_TYPE	VARCHAR2(23)	NOT NULL	Entity type name.
MDM_ATTR_NAME	VARCHAR2(30)	NOT NULL	Attribute name.
MDM_INDEX_ID	INTEGER	NOT NULL	Index identifier for entity type.
MDM_INDEX_COLUMN_ORDER	INTEGER	NOT NULL	Order of column in the index.

## MDM\_ENTITY\_TYPE\_SRC Columns

The MDM\_ENTITY\_TYPE\_SRC table contains list of entity types contributed by source systems.

**Table A1.18** MDM\_ENTITY\_TYPE\_SRC Columns

Name	Data Type	Null Option	Description
ENTITY_TYPE_SRC_ID	INTEGER	NOT NULL	Entity type source identifier.

Name	Data Type	Null Option	Description
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Entity type identifier, constrained by MDM_ENTITY_TYPE S table.
MDM_SRC_SYS_ID	INTEGER	NOT NULL	Source system identifier, constrained by MDM_SRC_SYS table.
MDM_ACTIVE	CHAR(1)	NOT NULL	Entity type source active indicator.
PULL_OPTION	CHAR(1)	NOT NULL	Pull option indicator.
PUSH_OPTION	CHAR(1)	NOT NULL	Push option indicator.

## MDM\_ENTITY\_TYPE\_TOOLS Columns

The MDM\_ENTITY\_TYPE\_TOOLS table contains the list of tools for each entity type.

**Table A1.19** MDM\_ENTITY\_TYPE\_TOOLS

Name	Data Type	Null Option	Description
TOOL_ID	INTEGER	NOT NULL	Tool identifier.
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Entity type identifier.
TOOL	VARCHAR2(260)	NOT NULL	Tool name.
TOOL_SORT_ORDER	INTEGER	NOT NULL	Sort order for tool.
TOOLTYPE	CHAR(1)	NOT NULL	Type identifier for the tool. <b>D</b> for data job, <b>P</b> for process job, and <b>B</b> for batch job.
CARDINALITY	CHAR(1)	NOT NULL	Expected input cardinality (S-M-L).
RESULTTYPE	CHAR(1)	NOT NULL	Type of result being returned. Valid result types are Status (S), Batch status (B), URL (U), Table (T), and Attribute value (A).
CONTACT	NVARCHAR2(513)	NULL	Contact for the tool.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Start of validity for the tool.

Name	Data Type	Null Option	Description
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	End of validity for the tool.

## MDM\_ERROR\_LOG Columns

The MDM\_ERROR\_LOG table contains data about errors that occur within the stored procedures used by Master Data Management.

*Table A1.20 MDM\_ERROR\_LOG Columns*

Name	Data Type	Null Option	Description
MDM_ERROR_LOG_ID	INTEGER	NOT NULL	Unique error log record identifier.
TABLE_NAME	VARCHAR2(50)	NULL	Name of table in which error occurred.
SERVICE_NAME	VARCHAR2(50)	NULL	Name of service in which error occurred.
RECORD_ID	INTEGER	NOT NULL	Identifier of record in which error occurred.
RECORD_ID_FROM	VARCHAR2(30)	NULL	Identifier of record from which error was generated.
ERROR_SOURCE	VARCHAR2(100)	NOT NULL	Name of source (service, stored procedure, window) where error originated.
ERROR_CODE	VARCHAR(10)	NOT NULL	Database-generated error code.
ERROR_MESSAGE	VARCHAR2(1000)	NULL	Database-generated error message.
ERROR_DATE	TIMESTAMP WITH LOCAL TIMEZONE	NOT NULL	Date when error log record was added.

## MDM\_EXTRACT\_TOKEN Columns

The MDM\_EXTRACT\_TOKEN table maintains token value for extracting entity type data from a source system used to support incremental data load.

*Table A1.21 MDM\_EXTRACT\_TOKEN Columns*

Name	Data Type	Null Option	Description
MDM_EXTRACT_TOKEN_ID	INTEGER	NOT NULL	Unique extract token identifier.

Name	Data Type	Null Option	Description
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Entity type identifier.
MDM_SRC_SYS_ID	INTEGER	NOT NULL	Source system identifier.
EXTRACT_TOKEN_FIELD	NVARCHAR2(50)	NULL	Field to use as the extract token.
EXTRACT_TOKEN_TYPE	NVARCHAR2(30)	NULL	Type of extract token.
LAST_TOKEN_VALUE	NVARCHAR2(100)	NULL	Value of last token.

### MDM\_FORCED\_CLUSTERS Columns

The MDM\_FORCED\_CLUSTERS table maintains list of records that are moved from one cluster to another.

*Table A1.22 MDM\_FORCED\_CLUSTERS Columns*

Name	Data Type	Null Option	Description
ORIGINAL_CLUSTER_ID	INTEGER	NOT NULL	Unique cluster identifier. Constrained by MDM_ENTITY_CLUSTERS table.
SRC_SYS_ID	INTEGER	NOT NULL	Unique source system identifier.
SRC_SYS_REC_ID	VARCHAR2(200)	NOT NULL	Source system record identifier.
ENTITY_TYPE_ID	INTEGER	NOT NULL	Unique entity type identifier. Constrained by MDM_ENTITY_TYPES table.
CURRENT_CLUSTER_ID	INTEGER	NOT NULL	Unique cluster identifier. Constrained by MDM_ENTITY_CLUSTERS table.

### MDM\_HIERARCHY\_LEVELS Columns

The MDM\_HIERARCHY\_LEVELS table contains the list of levels for each hierarchy type.

*Table A1.23 MDM\_HIERARCHY\_LEVELS Columns*

Name	Data type	Null Option	Description
MDM_HIERARCHY_LEVEL_ID	INTEGER	NOT NULL	Hierarchy level identifier.

Name	Data type	Null Option	Description
MDM_HIERARCHY_TYPE_ID	INTEGER	NOT NULL	Hierarchy type identifier. Constrained by MDM_HIERARCHY_TYPES table.
MDM_REL_TYPE_ID	INTEGER	NOT NULL	Relationship type identifier. Constrained by MDM_ENTITY_REL_TYPES table.
MDM_REVERSE_REL_DIRECTION	CHAR(1)	NULL	Flag to reverse relationship direction.
MDM_PARENT_LEVEL_ID	INTEGER	NULL	Parent hierarchy level identifier.

## MDM\_HIERARCHY\_TYPES Columns

The MDM\_HIERARCHY\_TYPES table is a constraining table denoting specific hierarchy types.

If you have loaded localized metadata (see [Chapter 5, “Localization Configuration,” on page 39](#)), the MDM\_HIERARCHY\_TYPES table includes additional columns for the labels that appear in SAS MDM (MDM\_HIER\_TYPE\_LABEL and MDM\_HIER\_TYPE\_DESC). These column names are postfixed with the locale name of the localized metadata. For example, if you have loaded the French metadata, the table includes MDM\_HIER\_TYPE\_LABEL\_FRFRA, and MDM\_HIER\_TYPE\_DESC\_FRFRA columns.

**Table A1.24** MDM\_HIERARCHY\_TYPES Columns

Name	Data Type	Null Option	Description
MDM_HIERARCHY_TYPE_ID	INTEGER	NOT NULL	Unique hierarchy type identifier.
MDM_OPSEQ	INTEGER	NULL	Sequence for optimistic locking.
MDM_HIERARCHY_TYPE	VARCHAR2(50)	NOT NULL	Hierarchy type designation.
MDM_VALID_FROM_DTTM	DATE	NULL	Start of validity for hierarchy type.
MDM_VALID_TO_DTTM	DATE	NULL	End of validity for hierarchy type.

## MDM\_NAMED\_HIERARCHIES Columns

The MDM\_NAMED\_HIERARCHIES table contains the list of named hierarchies added by users.

**Table A1.25** *MDM\_NAMED\_HIERARCHIES Columns*

Name	Data Type	Null Option	Description
MDM_HIERARCHY_TYPE_ID	INTEGER	NOT NULL	Hierarchy type identifier. Constrained by MDM_HIERARCHY_TYPES table.
MDM_ENTITY_CLUSTER_ID	INTEGER	NULL	Cluster identifier. Constrained by MDM_ENTITY_CLUSTERS table.
MDM_HIERARCHY_NAME	NVARCHAR2(50)	NOT NULL	Hierarchy name.
MDM_HIERARCHY_DESC	NVARCHAR2(50)	NULL	Hierarchy name description.

## MDM\_LANGUAGES Columns

The MDM\_LANGUAGES table is a constraining table for the list of configured languages.

**Table A1.26** *MDM\_LANGUAGES Columns*

Name	Data Type	Null Option	Description
MDM_LANGUAGE_ID	INTEGER	NOT NULL	Unique country code identifier.
MDM_OPSEQ	INTEGER	NULL	Sequence for optimistic locking.
MDM_LANGUAGE_NAME	NVARCHAR2(50)	NULL	Language name.
MDM_QKB_LOCALE	VARCHAR2(5)	NOT NULL	QKB locale associated with language.
MDM_ISO_LOCALE	VARCHAR2(5)	NOT NULL	ISO locale associated with language.
MDM_IS_DEFAULT	CHAR(1)	NOT NULL	Flag to indicate default language.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Start of validity for country code.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	End of validity for country code.

## MDM\_PROCESS\_CONTROL Columns

The MDM\_PROCESS\_CONTROL table is a control table to track load-update processes in the hub.

**Table A1.27** *MDM\_PROCESS\_CONTROL Columns*

Name	Data Type	Null Option	Description
PROCESS_ID	INTEGER	NOT NULL	Unique process identifier.
MDM_STAGING_ID	INTEGER	NULL	Unique staging identifier.
PROCESS_NAME	VARCHAR2(50)	NOT NULL	Process name.
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Unique entity type identifier. Constrained by MDM_ENTITY_TYPES table.
PROCESS_RUNNING	CHAR(1)	NOT NULL	Flag to indicate whether process is currently running.
PROCESS_SUCCESS	CHAR(1)	NULL	Flag to indicate success or failure of process.
PROCESS_USER	NVARCHAR2(50)	NULL	User who initiated process.
PROCESS_START_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NOT NULL	Start date and time of process.
PROCESS_END_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	End date and time of process.

## MDM\_REL\_ATTRS Columns

The MDM\_REL\_ATTRS table contains an attribute list for relationship types.

**Table A1.28** *MDM\_REL\_ATTRS Columns*

Name	Data Type	Null Option	Description
MDM_ATTR_ID	INTEGER	NOT NULL	Attribute identifier.
MDM_OPSEQ	INTEGER	NOT NULL	Sequence for optimistic locking.
MDM_REL_TYPE_ID	INTEGER	NOT NULL	Relationship type identifier.
MDM_ATTR_NAME	VARCHAR2(30)	NOT NULL	Attribute name.
MDM_ATTR_PROFILE_ID	INTEGER	NOT NULL	Unique relationship profile identifier, constrained by MDM_REL_ATTR_PROFILES table.

Name	Data Type	Null Option	Description
MDM_ATTR_DATATYPE_ID	INTEGER	NULL	Attribute data type identifier, constrained by MDM_ATTR_DATATYPE S table.
MDM_ATTR_LENGTH	INTEGER	NULL	Maximum size of the attribute.
MDM_ATTR_CONSTRAINT	VARCHAR2(200)	NOT NULL	Lists of regex strings used for validation of Master Data Management input fields used to populate the attribute. Can be blank.
MDM_FORM_DISPLAY_ORDER	INTEGER	NULL	Display order of the attribute in the Master Data Management entity editor.
MDM_PREVIEW_DISPLAY_ORDER	INTEGER	NULL	Display order of the attribute in the Master Data Management Details panels.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Start of validity for relationship attribute.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	End of validity for relationship attribute.
MDM_READONLY_FLAG	CHAR(1)	NULL	Indicates whether the attribute can be modified from Master Data Management. Set to default N. Enter Y to specify that the attribute cannot be modified.
MDM_ENCRYPT_FLAG	CHAR(1)	NULL	Indicates that the attribute should be encrypted in the RT tables. Set to default N.

## MDM\_REL\_ATTR\_PROFILES Columns

The MDM\_REL\_ATTR\_PROFILES table contains a list of localized relationship attribute profile names.

If you have loaded localized metadata, the MDM\_REL\_ATTR\_PROFILES table includes additional columns for the labels that appear in SAS MDM (MDM\_ATTR\_PROFILE\_NAME). These column names are postfixed with the locale name. For example, if you have loaded French metadata, the table includes an MDM\_ATTR\_PROFILE\_NAME\_FRFRA column.

Table A1.29 MDM\_REL\_ATTR\_PROFILES Columns

Name	Data Type	Null Option	Description
PROCESS_ID	INTEGER	NOT NULL	Unique profile identifier automatically generated by SAS MDM.

## MDM\_REMEDIATION\_ATTRS Columns

The MDM\_REMEDIATION\_ATTRS table contains a list of remediation attributes for each entity type

Table A1.30 MDM\_REMEDIATION\_ATTRS Columns

Name	Data Type	Null Option	Description
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Entity type identifier, constrained by MDM_ENTITY_TYPES table.
MDM_ATTR1	INTEGER	NULL	Attribute identifier, constrained by MDM_ATTRS table.
MDM_ATTR2	INTEGER	NULL	Attribute identifier, constrained by MDM_ATTRS table.
MDM_ATTR3	INTEGER	NULL	Attribute identifier, constrained by MDM_ATTRS table.

## MDM\_SRC\_SYS Columns

The MDM\_SRC\_SYS table is a registry table for all source systems that feed the hub.

Table A1.31 MDM\_SRC\_SYS Columns

Name	Data Type	Null Option	Description
MDM_SRC_SYS_ID	INTEGER	NOT NULL	Unique identifier of source system.
MDM_OPSEQ	INTEGER	NULL	Sequence for optimistic locking.
MDM_SRC_SYS_NAME	NVARCHAR2(50)	NOT NULL	Name of source system.
MDM_SRC_SYS_DESC	NVARCHAR2(100)	NULL	Description of source system.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Start of validity for source system.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	End of validity for source system.

Name	Data Type	Null Option	Description
MDM_SRC_SYS_PATH	VARCHAR(500)	NULL	Identifies the original source system in a hub. For source systems that were not imported from a hub, this value is not populated.

## MDM\_SRC\_SYS\_TOOLS Columns

The MDM\_SRC\_SYS\_TOOLS table contains list of tools available for each entity type-source system association.

**Table A1.32** MDM\_SRC\_SYS\_TOOLS Columns

Name	Data Type	Null Option	Description
SRC_SYS_TOOL_ID	INTEGER	NOT NULL	Source system tool identifier.
ENTITY_TYPE_SRC_ID	INTEGER	NOT NULL	Entity type of source system identifier.
TOOL	VARCHAR2(260)	NOT NULL	Tool name.
SORT_ORDER	INTEGER	NOT NULL	Sort order for tool.
TOOLTYPE	CHAR(1)	NOT NULL	Job type identifier for the tool. D for data job, P for process job, and B for batch job.
TOOLCODE	CHAR(1)	NOT NULL	Code identifier for the tool. A for Add/Update tool, S for Standardize tool, E for Extract too, U for Unknown, and O for Others.
RESULTTYPE	CHAR(1)	NOT NULL	Type of result being returned. Valid result types are Status (S), Batch status (B), URL (U), Table (T), and Embedded (E).
CONTACT	VARCHAR2(513)	NULL	Contact for the tool.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	Start of validity for the tool.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIMEZONE	NULL	End of validity for the tool.

## MDM\_SRC\_SYS\_TOOL\_ACCESS Columns

The MDM\_SRC\_SYS\_TOOL\_ACCESS table contains access control list for source system tools.

**Table A1.33** *MDM\_SRC\_SYS\_TOOL\_ACCESS Columns*

Name	Data Type	Null Option	Description
SRC_SYS_TOOL_GROUP_ID	INTEGER	NOT NULL	Source system tool group identifier.
SRC_SYS_TOOL_ID	INTEGER	NOT NULL	Source system tool identifier. Constrained by MDM_SRC_SYS_TOOLS table.
MDM_GROUP	NVARCHAR	NOT NULL	Group name.
MDM_ACTIVE	CHAR(1)	NOT NULL	Source system tool access active indicator.

## MDM\_STAGING Columns

The MDM\_STAGING table stages non-user attribute data before making it live in the hub.

**Table A1.34** *MDM\_STAGING Columns*

Name	Data Type	Null Option	Description
MDM_STAGING_ID	INTEGER	NOT NULL	Unique staging identifier.
MDM_ENTITY_ID	INTEGER	NOT NULL	Unique record identifier.
MDM_ENTITY_CLUSTER_ID	INTEGER	NULL	Unique cluster identifier.
MDM_ENTITY_CLUSTER_NAME	NVARCHAR2(100)	NULL	Cluster name.
MATCH_TYPE	INTEGER	NULL	Match type of the incoming record.
OLD_CLUSTER_ID	INTEGER	NULL	Old CLUSTER ID if the record is migrating to a new cluster.
ROW_PROCESSED	CHAR(1)	NOT NULL	Flag indicating whether the record is processed.

## MDM\_TOOL\_ACCESS Columns

The MDM\_TOOL\_ACCESS table specifies access control for entity type tools.

Table A1.35 MDM\_TOOL\_ACCESS Columns

Name	Data Type	Null Option	Description
MDM_TOOL_GROUP_ID	INTEGER	NOT NULL	Entity type tool group identifier.
MDM_ENTITY_TYPE_ID	INTEGER	NOT NULL	Entity type identifier. Constrained by MDM_ENTITY_TYPES table.
MDM_TOOL_ID	INTEGER	NOT NULL	Entity type tool identifier. Constrained by MDM_ENTITY_TYPE_TOOLS.
MDM_GROUP	NVARCHAR	NOT NULL	Group name.
MDM_ACTIVE	CHAR(1)	NOT NULL	Entity type tool access active indicator.

## Entity Tables

### Overview

The following tables are generated from the metadata for the specific entity type. As attributes for an entity type are defined, columns are added to the tables. The tables that are created are not automatically removed as entity types are retired.

### Sample Entity Tables

Table A1.36 Sample Entity Tables

Name	Naming Convention	Description
Staging Table	MDM_<entity_type>_ST	Table used to prepare data before updating the hub.
Transpose Table	MDM_<entity_type>_TT	Table used to maintain record data for particular entity types.
Cluster Conditions Table	MDM_<entity_type>_CC	Table used to pre-load cluster condition data columns during a data load.
Audit Log Table	MDM_<entity_type>_AL	Table to maintain audit trail of changes to hub data.

The following columns are common to all the staging tables and transpose tables. These tables are further populated with columns representing the attributes defined for the entity type.

## MDM\_<Entity\_Type>\_ST Columns

The staging tables are schema-evolved to include columns for the attributes defined by the related entity type.

**Table A1.37** MDM\_<Entity\_Type>\_ST Columns

Name	Data Type	Null Option	Description
MDM_STAGING_ID	INTEGER	NOT NULL	Unique staging identifier.
ROW_ID	INTEGER	NOT NULL	Identifier for row within each staging ID.
MDM_ENTITY_CLUSTER_ID	INTEGER	NULL	Unique cluster identifier.
MDM_ENTITY_CLUSTER_NAME	NVARCHAR2(100)	NOT NULL	Cluster name.
MDM_SURVIVOR	CHAR(1)	NOT NULL	Flag indicating if the record is a survivor record.
MATCH_TYPE	INTEGER	NOT NULL	Match type of the incoming record.
CID	INTEGER	NOT NULL	Intermittent cluster ID.
ROW_PROCESSED	CHAR(1)	NOT NULL	Flag indicating if the record is processed or not.
MDM_SRC_SYS_ID	INTEGER	NOT NULL	Unique source system identifier.
MDM__SRC_SYS_REC_ID	NVARCHAR2(200)	NULL	Source system record identifier.
MDM_LANGUAGE_ID	INTEGER	NOT NULL	Unique language identifier.

## MDM\_<Entity\_Type>\_TT Columns

The transpose tables are schema-evolved to include columns for the attributes defined by the related entity type.

**Table A1.38** MDM\_<Entity\_Type>\_TT Columns

Name	Data Type	Null Option	Description
MDM_STAGING_ID	INTEGER	NOT NULL	Unique staging identifier.
MDM_ENTITY_ID	INTEGER	NOT NULL	Unique entity identifier.
MDM_SRC_SYS_ID	INTEGER	NOT NULL	Unique source system identifier.
MDM_SRC_SYS_REC_ID	NVARCHAR2(200)	NULL	Source system record identifier.
MDM_LANGUAGE_ID	INTEGER	NOT NULL	Unique language identifier.
MDM_ENTITY_CLUSTER_ID	INTEGER	NOT NULL	Unique cluster identifier.
MDM_SURVIVOR	CHAR(1)	NOT NULL	Flag indicating if the record is a survivor record.
MDM_VALID_FROM_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NULL	Start of validity for entity.
MDM_VALID_TO_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NULL	End of validity for entity.

## MDM\_<Entity\_Type>\_CC Columns

The cluster conditions tables are schema-evolved to include columns for the attributes defined by the related entity type.

**Table A1.39** MDM\_<Entity\_Type>\_CC Columns

Name	Data Type	Null Option	Description
MDM_STAGING_ID	INTEGER	NOT NULL	Unique staging identifier.
ROW_ID	INTEGER	NOT NULL	Unique row identifier.

## MDM\_<Entity\_Type>\_AL Columns

**Table A1.40** MDM\_<Entity\_Type>\_AL Columns

Name	Data Type	Null Option	Description
MDM_AUDIT_LOG_ID	INTEGER	NOT NULL	Unique audit log identifier.
TABLE_NAME	VARCHAR2(50)	NOT NULL	Name of the table in which the auditable action was made.
RECORD_ID	INTEGER	NOT NULL	Identifier of the record for which the auditable action was made.
USER_ACTION	VARCHAR2(10)	NOT NULL	Type of action.
MDM_MODIFIED_BY	NVARCHAR2(513)	NOT NULL	ID of the user who performed the auditable action.
MODIFIED_DTTM	TIMESTAMP WITH LOCAL TIME ZONE	NOT NULL	Date and time at which the auditable action occurred.

## Relationship Tables

### Overview

The following tables are generated from the metadata for the specific relationship type. As attributes for a relationship type are defined, columns are added to the tables. The tables that are created are not automatically removed as relationship types are retired.

### Sample Relationship Tables

**Table A1.41** Sample Relationship Tables

Name	Naming Convention	Description
Relationship Type Table	MDM_<entity_type>_RT	Table used to maintain attribute values for a particular relationship type..

The following columns are common to all the staging tables and transpose tables. These tables are further populated with columns representing the attributes defined for the entity type.

## MDM\_<Entity\_Type>\_RT Columns

The relationship tables are schema-evolved to include columns for the attributes defined by the related relationship type.

*Table A1.42 MDM\_<Entity\_Type>\_RT Columns*

Name	Data Type	Null Option	Description
MDM_ENTITY_REL_ID	INTEGER	NOT NULL	Unique entity relationship identifier.

## Bulk Load Tables

### Overview

The following tables are generated while running bulk load jobs to stage data during the load. They are generated from metadata for the specific entity type. As attributes for an entity type are defined, columns are added to the tables. The tables are automatically deleted at the end of a successful load. If the load fails for any reason, the tables are not deleted and can be used for debugging purposes.

### Sample Bulk Load Tables

*Table A1.43 Sample Bulk Load Tables*

Name	Naming Convention	Description
Cluster Conditions Table	MDM_BULK_CC_<staging_id>	Table used to pre-load cluster condition data columns during a data load.
Entity Staging Table	MDM_BULK_ST_<staging_id>	Table used to stage data before updating the hub.
Staging Table	MDM_STAGING_<staging_id>	Table used to stage data before updating the hub.

The following columns are common to all the staging tables and transpose tables. These tables are further populated with columns representing the attributes defined for the entity type.

### MDM\_BULK\_CC\_<Staging\_ID> Columns

These tables have the same structure as the MDM\_<entity\_type>\_CC table for the entity type associated with staging ID of the particular load.

## MDM\_BULK\_ST\_<Staging\_ID> Columns

These tables have the same structure as the MDM\_<entity\_type>\_ST table for the entity type associated with staging ID of the particular load.

## MDM\_STAGING\_<Staging\_ID> Columns

These tables have the same structure as the MDM\_STAGING table.

---

## Sample Views

The following tables contain available SAS MDM views.

**Table A1.44** Sample Bulk Load Tables

View	Naming Convention	Description
Match View	MDM_<entity_type>_MA	Transpose view with only contributor records. Primarily used by clustering jobs to find matched entity rows or records prior to clustering.
Cluster View	MDM_<entity_type>_CV	View used in clustering operations.
Search View	MDM_<entity_type>_SV	Search view for a given entity type. Primarily used to incorporate entity type inheritance into searches.

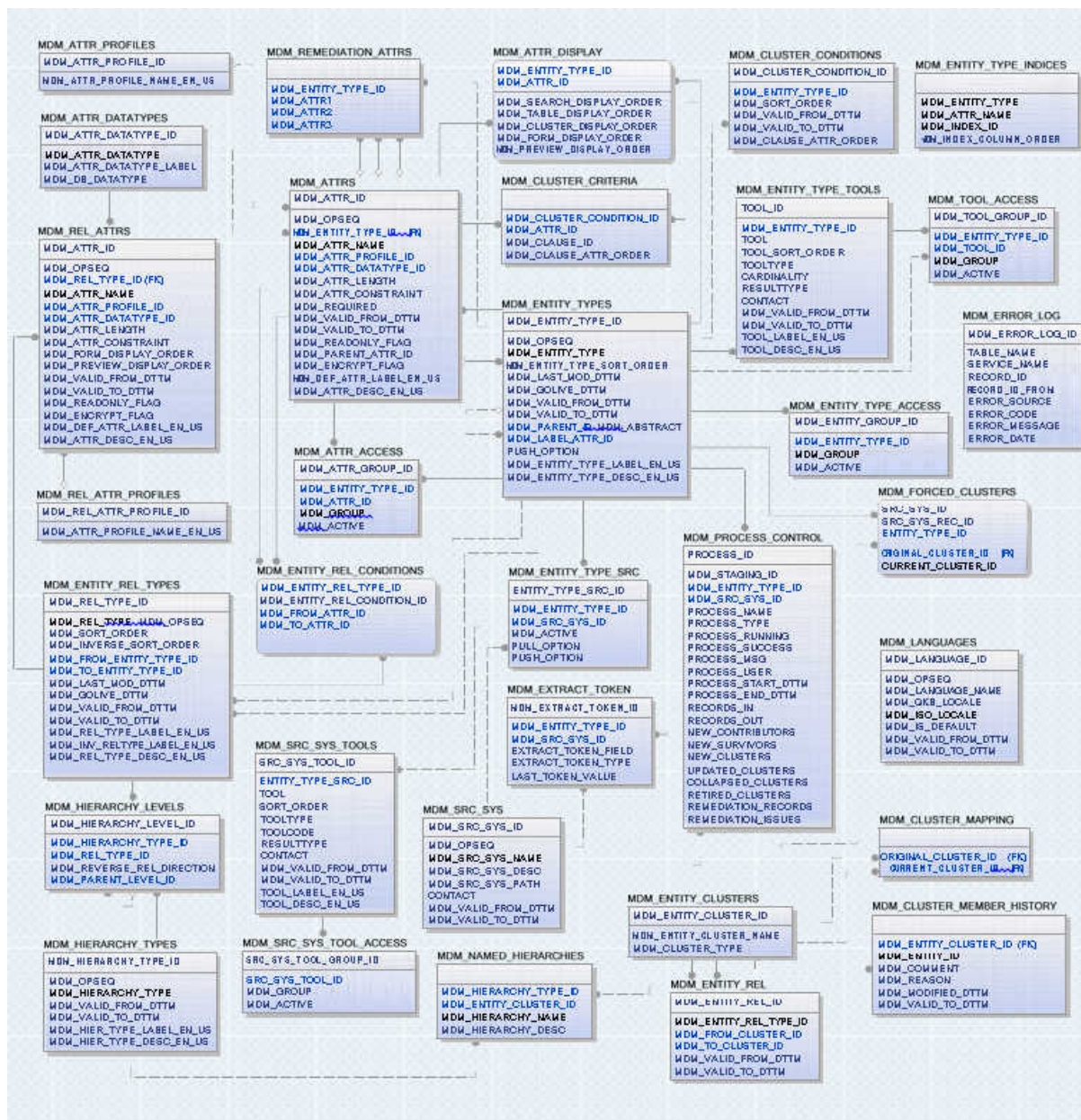
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## Data Model Diagrams

### Core Data Model Diagram

The following diagram illustrates the core tables in the SAS MDM data model. These tables are not dependent on the entity types defined in the hub.

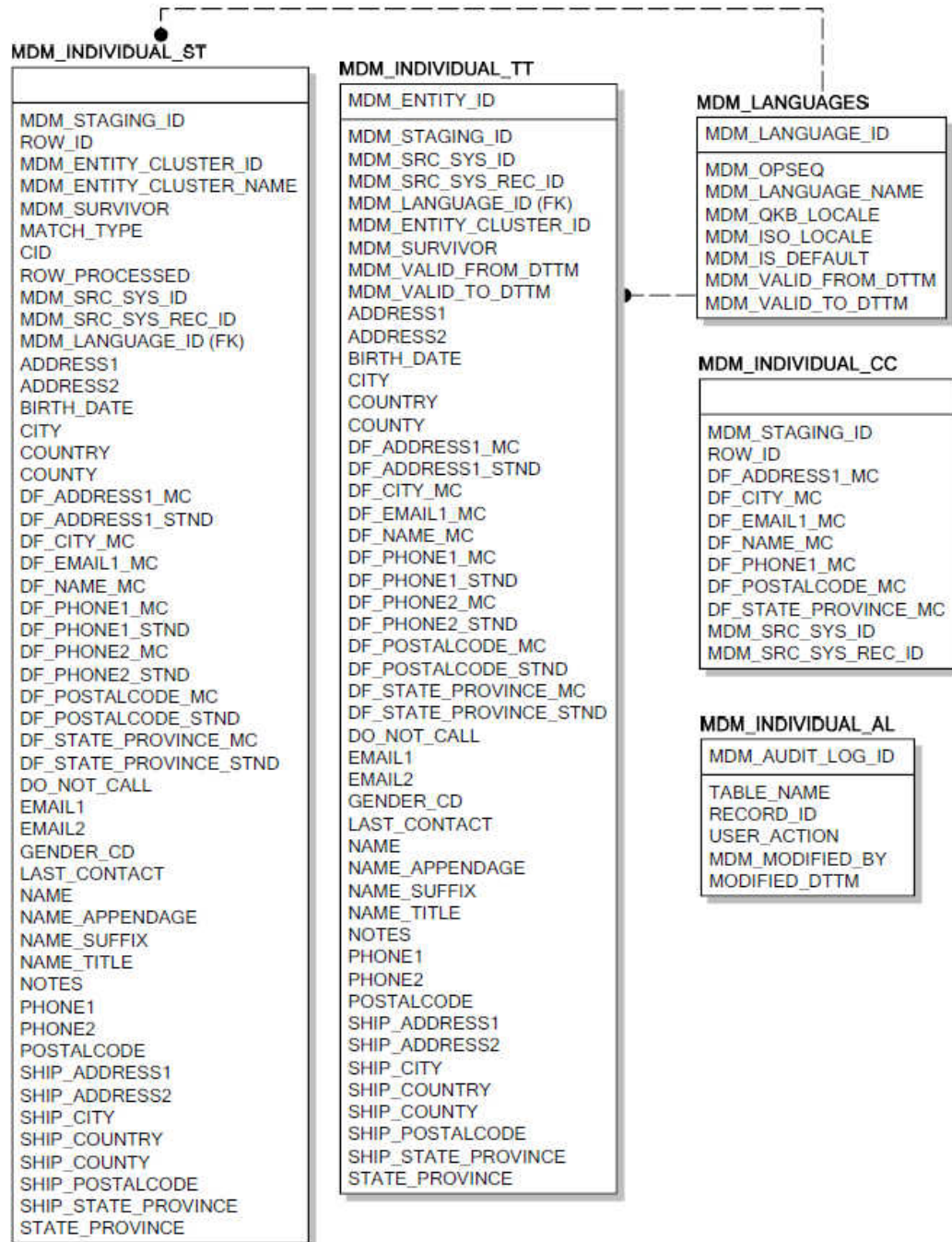
**Figure A1.1** Core Data Model



## Entity Domain Data Model Diagram

The following diagram shows the tables generated for the Individual sample entity type. Similar tables are created for the other samples or any other entity type that is defined in the hub. Most of the columns in these tables are represented by the attributes defined for the entity type.

Figure A1.2 Entity Domain Model



# Appendix 2

## Service Descriptions

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## Required Services

### Overview

The services listed in this section are used for internal functions and are not meant to be modified. Any modification might lead to problems in other associated or integrated areas of SAS MDM.

### Core SAS MDM Services

The following core SAS MDM services handle complex tasks, such as adding entities. The mrm prefix indicates that the job expects a single row input.

**Table A2.1** Core SAS MDM Services

Name	Description
mdm_add_relationships.ddf	Adds entity relationships.
mdm_get_archival_count.ddf	Gets an archival count. Called from mdm_archive_<entity_type>.djf.
mdm_archive.ddf	Archives rows for a given entity type. Called from mdm_archive_<entity_type>.djf. <b>Note:</b> Relationship attributes are not archived by this job

Name	Description
mdm_start_process_control.ddf	Starts the bulk job load process.
mdm_get_process_control.ddf	Returns process control data.
mdm_get_staging_id.ddf	Returns the next sequence value for staging ID.
mdm_prep_forced_cluster_processing.ddf	Prepares add-update rows for forced cluster processing. Called from add_update_<entity_type>.ddf and mrm_add_<entity_type>.ddf.
mdm_match_type_processing.ddf	Applies match type logic to add-update rows for forced cluster processing. Called from add_update_<entity_type>.ddf and mrm_add_<entity_type>.ddf.
mdm_forced_cluster_processing.ddf	Applies forced cluster logic to add-update rows. Called from add_update_<entity_type>.ddf and mrm_add_<entity_type>.ddf.
mdm_end_process_control.ddf	Ends a running process.
mdm_retire_entity.ddf	Retires entities (called by other services).
mdm_check_process_completion.ddf	Checks whether the bulk job load process is complete.
mdm_make_staged_records_live.ddf	Makes staged records live in the hub.
entity_stage_bulk_loader.ddf	Sets the max bulk load and runs the max bulk-loading process until complete. Embedded job used with all the add_update_<entity_type>.ddf bulk jobs.
mdm_retire_relationships.ddf	Retires entity relationships.
mdm_query_hierarchies.ddf	Retrieves a list of hierarchies for the current entity.
mdm_rename_hierarchies.ddf	Adds or modifies name and description fields for a hierarchy.
mrm_retire_entityType.ddf	Retires an entity type.
mrm_query_edit.ddf	Loads records from the server for Master Data Management. Because attributes for the entity are returned as name-value pairs, the service can work with any entity type.
mrm_get_clusterhistory.ddf	Gets cluster history from the hub.
mrm_goLive_entityType.ddf	Makes an entity type go live from staging to production.

## Core Metadata Services

The following core metadata services handle language metadata, schema evolution, data migration, and default metadata.

**Table A2.2** Core Metadata Services

Name	Description
add_default_meta.djf	Adds default metadata.
add_ui_language_meta_de.djf	Adds UI language metadata for German.
add_ui_language_meta_en_us.djf	Adds UI language metadata for English.
add_ui_language_meta_fr.djf	Adds UI language metadata for French.
entitytype_golive.ddf	Takes the name of the entity type and publish it.
install_schema.djf	Installs the SAS MDM schema.
migrate_mdf_meta.djf	Imports the source systems and language defined in a Master Data Management Foundation hub.
add_attributetypereationships.ddf	Adds the relationship between flux attributes and their base attribute.
add_attributetypes.ddf	Adds attribute types to the database.
add_clusterconditions.ddf	Adds cluster conditions to the database.
add_entitytype_source.ddf	Adds entity type-source system associations.
add_entitytypeindices.ddf	Adds entity type indices to the database.
add_entitytypes.ddf	Adds entity types to the database.
add_entitytypetoolpermissions.ddf	Adds entity type tools access control list.
add_entitytypetools.ddf	Adds entity type tools to the database.
add_groupassociations.ddf	Adds group associations to the database.
add_hierarchylevels.ddf	Adds hierarchy levels to the database.
add_hierarchytypes.ddf	Adds hierarchy types to the database.
add_i18n_attributeprofiles.ddf	Adds attribute profile translations to the database.
add_i18n_attributetypes.ddf	Adds attribute type translations to the database.
add_i18n_entitytypes.ddf	Adds entity type translations to the database.
add_i18n_profilerelationships.ddf	Adds profile relationships to attribute types.
add_i18n_relationshiptypes.ddf	Adds relationship type translations to the database.
add_languages.ddf	Adds languages to the database.

Name	Description
add_relationshiptypematches.ddf	Adds match conditions to a relationship type in the database.
add_relationshiptypes.ddf	Adds relationship types to the database.
add_relattributetypes.ddf	Adds relation type attributes to the database.
add_remediationattributes.ddf	Adds remediation attributes to the database.
add_sourcesystems.ddf	Adds source systems to the database.
update_entitytypes.ddf	Updates label attributes for entity types.
mdm_reltype_goLive.ddf	Makes a relationship type live from staging to production.

## Sample Tool Services

The following services support the SAS MDM sample tools.

**Table A2.3** Sample Tools Services

Name	Description
tool_entity_errors.ddf	Show entries from the SAS MDM error log.
tool_party_map.ddf	Show the party address in Google Maps.
tool_party_us_addver.ddf	Run address verification for party records.
tool_company_search.ddf	Search Google based on the company name.
tool_individual_multi_update.ddf	Adds multiple individual records to hub.
tool_individual_query_gender.ddf	Search the hub for individuals with Gender='U'.
tool_part_email_attachment.djf	Emails the list of parts from hub.
tool_src_remainingrecords.ddf	Shows number of records left in source to be extracted.
push_mdm_data_to_reports.djf	Pushes SAS MDM data to SAS LASR Analytic Server.
push_remediation_data_to_reports.djf	Pushes remediation data to SAS LASR Analytic Server.

## Sample Services

### Overview

These jobs and services are specific to sample entity types provided with SAS MDM and must be modified if you are not using the standard definition of entity types provided with SAS MDM. They can be customized for other entity types by following the notes inside each job.

### Sample MDM Services

The following service provides support for the sample entity types. For a list of the generated jobs for an entity type, see the *SAS MDM User's Guide*.

**Table A2.4** Sample MDM Services

Name	Description
mdm_extract_individual.ddf	Demonstrates changes required to be made to prepare incoming rows for remediation and workflow. The Check for required fields node in this job includes use cases.
mdm_push_individual.ddf	Demonstrates the use case to push surviving records back to source system.

### Sample Metadata Services

The following services load metadata into the SAS MDM hub.

**Table A2.5** Sample Metadata Services

Name	Description
add_indices.djf	Loads entity type indices.
add_sample_meta.djf	Loads sample entity types.
add_ui_language_sample_de.djf	Loads German sample UI metadata.
add_ui_language_sample_enusa.djf	Loads English sample UI metadata.
add_ui_language_sample_fr.djf	Loads French sample UI metadata.

---

## Schema Evolution Service

Schema evolution is a service for running schema evolution scripts.

**Table A2.6** *Schema Evolution Service*

Name	Description
evolve_schema_41.djf	Runs the schema evolution scripts to upgrade the database from the SAS MDM 4.1 service level to the SAS MDM 4.1 first maintenance release service level.
evolve_schema_41m1.djf	Runs the schema evolution scripts to upgrade the database from the SAS MDM 4.1 first maintenance release service level to the SAS MDM 4.2 service level.
evolve_schema_42.djf	Runs the schema evolution scripts to upgrade the database from the SAS MDM 4.2 service level to the SAS MDM 4.3 service level.

## Recommended Reading

- *DataFlux Data Management Studio Installation and Configuration Guide*
- *DataFlux Data Management Studio User's Guide*
- *DataFlux Data Management Server Administrator's Guide*
- *DataFlux Data Management Server User's Guide*
- *SAS Workflow Studio User's Guide*
- *SAS Intelligence Platform Middle-Tier Administration Guide*
- *SAS Management Console User's Guide*
- *SAS MDM User's Guide*

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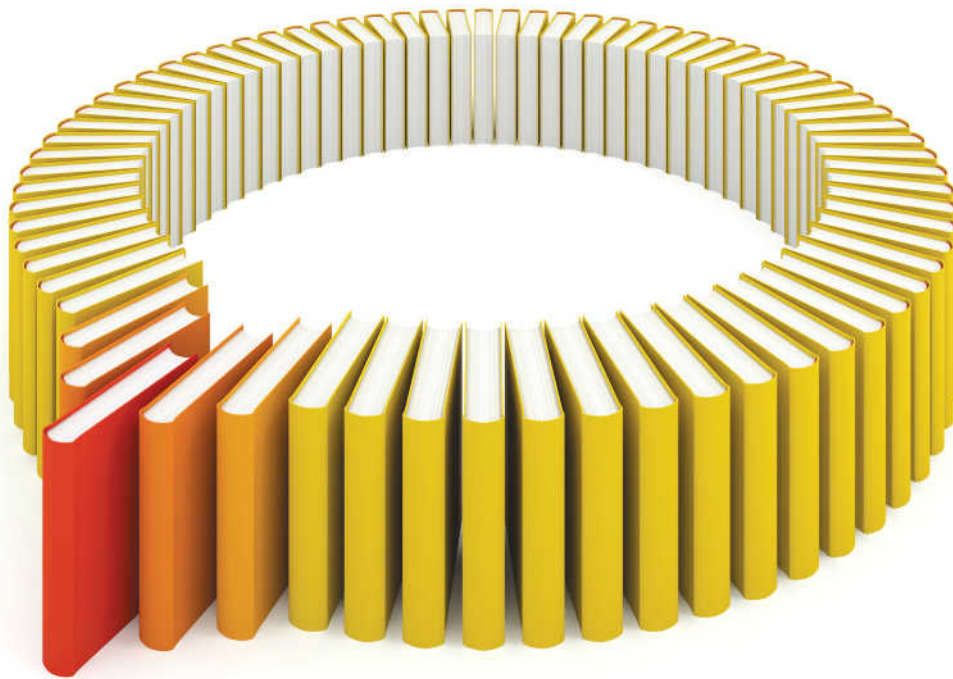
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