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# **SAS<sup>®</sup> Customer Link Analytics 5.5**

## Administrator's Guide

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**SAS® Customer Link Analytics 5.5: Administrator's Guide**

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# Using This Book

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## Audience

This guide is written for administrators who want to install and configure SAS Customer Link Analytics. The administrator must be able to install, configure, administer, and use SAS Intelligence Platform, which SAS Customer Link Analytics uses. For details, see <http://support.sas.com/documentation/onlinedoc/intellplatform>.

The system administrator should have the skills to perform the following types of installation, configuration, and administration tasks:

- use SAS Download Manager to download SAS Software Depot to each machine where the installation will be performed.
- install and configure SAS Intelligence Platform and the solution. The system administrator should install and configure the required SAS Enterprise Intelligence Platform software on the required operating system.
- administer solution metadata. The system administrator must use SAS Management Console to maintain the metadata for servers, users, and other global resources that are required by the solution.

A thorough understanding of the target network configuration is critical, especially when setting up the grid software.

---

## SAS Customer Link Analytics Requirements

Review the system requirements documentation before you install SAS Customer Link Analytics to ensure that your system meets the appropriate requirements. For details, see <http://support.sas.com/documentation/installcenter/en/iksocnfluatofrsr/67428/HTML/default/index.html>.

---

## Document Conventions

The following table lists the conventions that are used in this document:

*Document Conventions*

<b>Convention</b>	<b>Description</b>
<code>&lt;SAS Home&gt;</code>	Represents the path to the folder where SAS is installed. For example, on a Windows computer, this can be <code>C:/Program Files/SASHome</code> .
<code>&lt;SAS configuration directory&gt;</code>	Represents the path to the folder where SAS configuration data is stored. For example, on a Windows computer, this can be <code>C:/SAS/Config</code> .



## Recommended Reading

SAS Customer Link Analytics is supported by the following documents:

- *SAS Customer Link Analytics: User's Guide* is written for users who want to create projects in SAS Customer Link Analytics and run workflow steps.
- *SAS Customer Link Analytics: Data Reference Guide* is written for users who want to understand the details about application data and business data tables.

Other relevant documents include the following:

- *SAS Intelligence Platform: Installation and Configuration Guide* is for system administrators who need to install and configure SAS products that use the metadata server.
- *SAS High-Performance Analytics Infrastructure: Installation and Configuration Guide* is for system administrators who need to install and configure SAS High-Performance Analytics Infrastructure.

For a complete list of SAS books, go to [support.sas.com/bookstore](http://support.sas.com/bookstore). If you have questions about which titles you need, please contact a SAS Book Sales Representative:

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# Part 1

## Installation and Configuration

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## 1

# Introduction to SAS Customer Link Analytics

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## Overview of SAS Customer Link Analytics

In recent years, customers have become more sophisticated and well-informed in their buying decisions than ever before. They rely on and seek advice from their network of friends, family, and acquaintances. As a result, there is an explosive growth in the number of subscriptions on the communications service provider's network. Also, with the increasing penetration of people subscribing to communications services, the traditional methods of campaigning, such as telemarketing and advertising, are no longer necessarily applicable. Therefore, it is imperative for marketers to develop marketing strategies based on meaningful insights that are gained from network or transactional data analysis. This data captures interactions in the subscriber base, such as how much they talk, with whom they talk, and so on. The strength of relationships within their network subscriptions and outside their network can reveal more information than such static attributes as the demographics of their subscriptions. Marketers can then use these insights to target their customers more accurately and effectively.

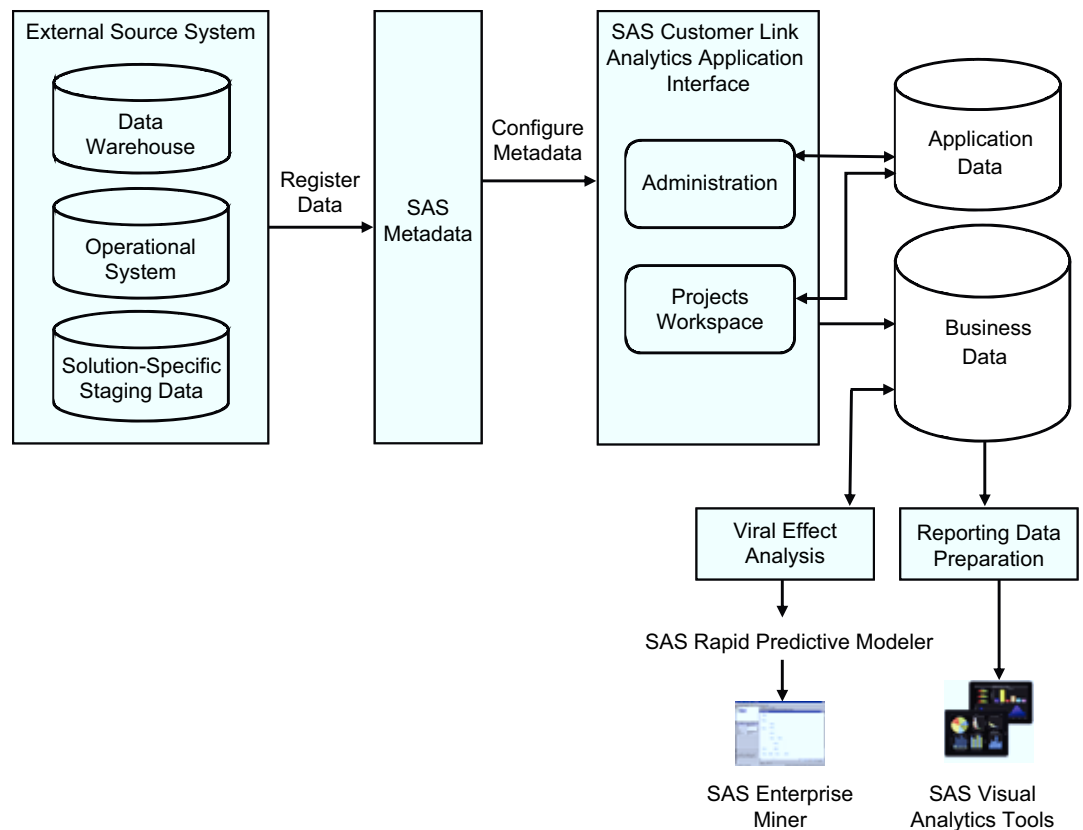
SAS Customer Link Analytics is a comprehensive solution for analyzing and controlling network data processing. It enables marketers to analyze network data, identify communities within the network, and quantify the relative importance of nodes within a community or network from various aspects. In addition, it enables marketing analysts to identify the role that each node plays within its community.

## How SAS Customer Link Analytics Works

### Overview

SAS Customer Link Analytics is a comprehensive solution that interacts with an external source system to extract and process subscription network data.

Figure 1.1 Solution Flow Diagram



The solution comprises the following components:

#### External source system

the system with which SAS Customer Link Analytics interfaces to extract transactional data and other information such as node and link attributes. SAS Customer Link Analytics uses this data to build communities. The external source system can be a data warehouse, an operational system, or staging data that is specific to SAS Customer Link Analytics.

#### SAS metadata

the data from the external source system has to be registered in SAS metadata. This data can then be imported into SAS Customer Link Analytics and used by the application.

#### SAS Customer Link Analytics interface

workflow-based application to configure metadata, define projects, configure and run workflow steps, and view reports.

**Application data**

stores project-specific data and configuration details of source data. Also, stores the summary of results that the SAS Customer Link Analytics solution produces when each workflow step is run. These results include information about communities, roles, and centrality measures.

**Business data**

stores the intermediate tables that SAS Customer Link Analytics creates when the workflow steps are run. The business data also contains the final output that SAS Customer Link Analytics produces when all the workflow steps of a project are run. This output contains node-level information such as role ID, community ID, and centrality values. In addition, business data contains reporting data that SAS Customer Link Analytics can produce in a format that can be further exploited by reporting tools such as SAS Visual Analytics to build insightful reports.

**SAS Visual Analytics tools**

reporting tools for business analysts to explore, view, and analyze data and create and view reports that help them make business decisions.

**Viral effect analysis**

analysis of the output of SAS Customer Link Analytics, construction of an analytical model using SAS Rapid Predictive Modeler, and generation of analytical scores for viral effect analysis. The analytical model can be further explored in SAS Enterprise Miner and the scores can be used by marketing automation tools.

## Solution Flow

The SAS Customer Link Analytics solution flow includes the following steps:

**TIP** For details about each step, see *SAS Customer Link Analytics: User's Guide*.

- 1 Register data from the external source system in SAS metadata. This step is not within the scope of this document.
- 2 Log on to SAS Customer Link Analytics as an administrator and perform the following tasks:
  - a Import tables that are registered in SAS metadata, configure them, and then refresh transactional tables.
  - b Define source data profiles.
- 3 Log on to SAS Customer Link Analytics as a network analyst and define a project.
- 4 Complete these workflow steps:
  - a Select the nodes and links whose data you want to analyze and extract summarized transaction data.
  - b Filter the links based on specific parameters and assign weights to the links.
  - c Build communities by selecting the appropriate analytical approach.

- d Select the centrality measures that you want to compute and provide input parameters to compute these measures.
  - e Assign a role to each node of the communities.
- 5 (Optional) Promote a project to batch mode.
  - 6 (Optional) View and explore output produced by SAS Customer Link Analytics.
  - 7 (Optional) Perform viral effect analysis.

---

## Distributed versus Non-Distributed Deployments

SAS Customer Link Analytics can run on a computer grid or on a single computer system with multiple CPUs. Running on a computer grid is referred to as a *distributed mode* of processing. Running on a single computer system with multiple CPUs is referred to as a *non-distributed mode* of processing. For details, see [“Modes of Processing” on page 33](#).

---

## Overview of SAS Customer Link Analytics Architecture

The SAS Customer Link Analytics architecture is designed to efficiently process large volumes of network data and produce results such as communities and roles. The architecture enables the solution to use this data to support user-driven workflows through the application user interface (UI). SAS Customer Link Analytics has a multi-tier architecture that separates the workflow-related activities from data-intensive process routines and distributes functionality across computer resources that are most suitable for these tasks. SAS Customer Link Analytics uses the capability of SAS High-Performance Analytics to maximize performance. You can scale the architecture to meet the demands of your workload. For a large organization, the tiers can be installed across many machines with different operating systems. For tasks such as developing prototypes and presenting demonstrations, all the tiers can be installed on a single machine. Similarly, if you are implementing SAS Customer Link Analytics for small enterprises, then you can install all the tiers on a single machine.

The SAS Customer Link Analytics architecture consists of the following four tiers:

### Data Tier

The data tier stores application data (also called *configuration data*) and business data (also called *transactional data*). The application data is stored in a PostgreSQL database. However, business data can reside either in a SAS or Teradata database based on the deployment setup at your implementation site. Access to the data is granted by using pre-assigned SAS libraries.



**Server Tier**

The server tier of SAS Customer Link Analytics consists of data routines and SAS servers that process your enterprise data based on requests from client programs (through middle-tier services) and other programs. If SAS Customer Link Analytics operates with high-performance capabilities, then SAS High-Performance Analytics procedures are used to process the data. As a result, there is comparatively greater improvement in performance. Customers who have high volumes of data and a tight service-level agreement (SLA) should consider this version of SAS Customer Link Analytics.

**Middle Tier**

The middle tier of SAS Customer Link Analytics provides an environment in which the SAS Customer Link Analytics client, along with other business intelligence web applications can execute in an integrated environment. These applications run in a web application server and communicate with the user by sending and receiving data from the user's web browser. The middle-tier applications depend on the servers that are deployed on the server tier to process, query, and analyze data.

**Client Tier**

Clients in SAS Customer Link Analytics include web-based and desktop UI content and applications. These clients provide access to content, appropriate query and reporting interfaces, and business intelligence functionality, including advanced design and analysis tasks for all information consumers in your enterprise.

Figure 1.2 SAS Customer Link Analytics Architecture: Non-Distributed Mode

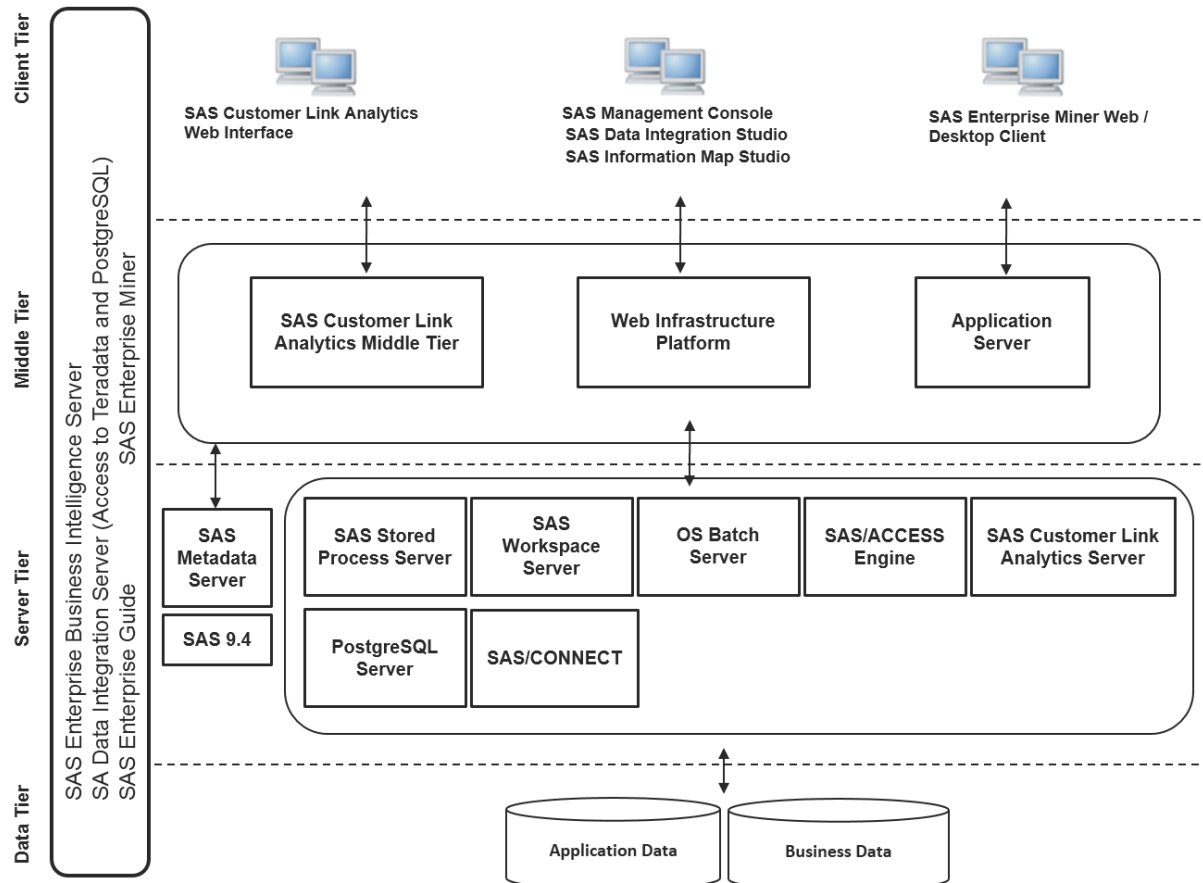
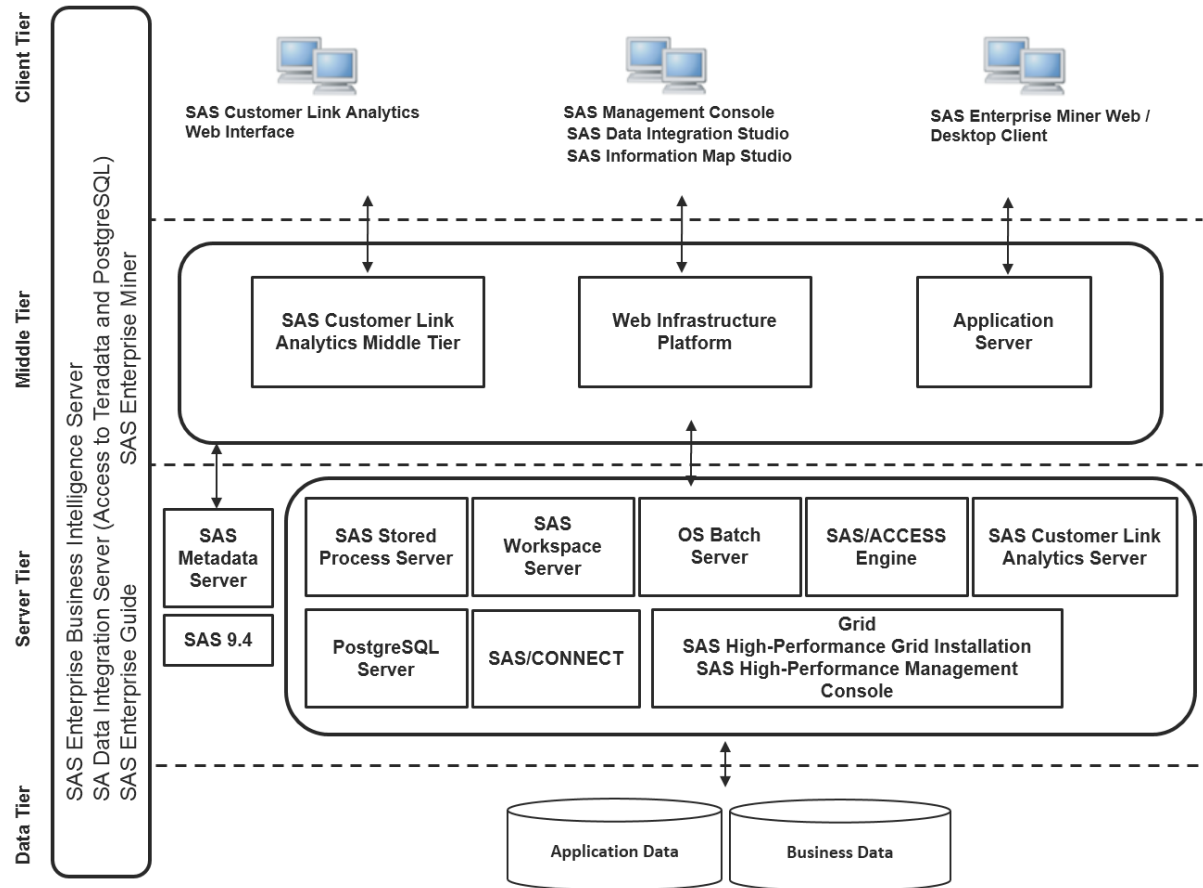


Figure 1.3 SAS Customer Link Analytics Architecture: Distributed Mode



## 2

## Pre-Installation Instructions

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### Verify System Requirements

Review the system requirements documentation to ensure that your system meets the appropriate requirements. For more information, see *System Requirements for SAS Customer Link Analytics*. You can access this document from <http://support.sas.com/documentation/installcenter/en/iksocnfluatofrsr/67428/HTML/default/index.html>.

---

### Obtain a Deployment Plan

Before you can install SAS Customer Link Analytics, you must obtain a deployment plan. The *deployment plan* is a summary of the software that is installed and configured during your installation. A deployment plan file, named `plan.xml`, contains information about what software should be installed and configured on each machine in your environment. This plan serves as input to the SAS installation and configuration tools. SAS includes a standard deployment plan. You can use this standard plan or create your own plan. For more information, see “About Deployment Plans” in *SAS Intelligence Platform*:

*Installation and Configuration Guide*, which is located at <http://support.sas.com/documentation/onlinedoc/intellplatform>.

---

## Create a SAS Software Depot

Download the software that is listed in your SAS software order with SAS Download Manager. A SAS Software Depot is created, which includes the SAS installation data (SID) file. The SID file is used by SAS to install and license SAS software. It is a control file that contains license information that is required to install SAS. After you have downloaded SAS Software Depot, you can then use SAS Deployment Wizard to install your software. Verify that Base SAS is listed as a selected product. Then, select additional products specific to your environment. For more information, see “Creating a SAS Software Depot” in *SAS Intelligence Platform: Installation and Configuration Guide* at <http://support.sas.com/documentation/onlinedoc/intellplatform>.

---

## Install and Configure the SAS High-Performance Analytics Environment

In distributed mode, you need to use the SAS High-Performance Analytics environment component of the SAS High-Performance Analytics infrastructure to install and configure components on machines in the grid network. For deployment instructions, see *SAS High-Performance Analytics Infrastructure: Installation and Configuration Guide*, which is available at the following location: <http://support.sas.com/documentation/solutions/hpainfrastructure/>.

---

## Set UNIX Directory Permissions

**Note:** This is a new permissions requirement that is introduced in SAS 9.4.

To deploy SAS Customer Link Analytics in UNIX environments, you must create and grant WRITE permissions on the `/etc/opt/vmware/vfabric` directory. Refer to the SAS Pre-Installation Checklist that is included with your deployment plan for instructions about how to set up this directory.

---

## Creating and Verifying SSH Keys

You must create Secure Shell (SSH) keys if you are working with SAS Customer Link Analytics in a distributed computing environment. You do not need SSH keys if you are working with SAS Customer Link Analytics in a non-distributed computing environment.

SAS Customer Link Analytics uses passwordless SSH for access to the machines in the grid network and to the server tier.

Each SAS Customer Link Analytics user requires an SSH key pair for authentication with the grid network. SSH keys must be established for any user who will be running SAS jobs on the grid. For example, users who will be logging on to the server and running SAS code to create and run their projects require SSH keys.

You can use one of two methods to set up SSH keys for these users:

- Create a separate account and SSH key pair for each SAS Customer Link Analytics user. Each user can create SAS Customer Link Analytics projects on the grid. Users can also create and execute projects using the UI.

This method requires that you set up SSH keys for all SAS Customer Link Analytics users on each grid node. Each user's SSH credentials are used for authentication with the grid nodes in order to provide traceability of user sessions to individual user accounts. This method is the safest and is recommended, though it is more difficult to implement.

- Create SSH keys and one generic account for the user associated with the account. This dedicated or generic user must be registered with the SAS Customer Link Analytics workspace server. All jobs on the grid use this account after the user has successfully been authenticated to the UI by using the credentials in the metadata server. This method is less secure than creating a separate account for each user, but it is simpler to implement.

**Note:** You can use the SAS High-Performance Management Console that is available as a component of the SAS High-Performance Analytics infrastructure to create new users and set up SSH key authentication for the users.

---

## Prerequisite Setup for Teradata

### Install the Teradata Client

If the business data that you import into SAS Customer Link Analytics is stored in Teradata, make sure that you install and configure the Teradata client on a machine on which the SAS Customer Link Analytics Server Tier will be installed and configured. Contact your database administrator to set up the client software. Also, make sure that the required databases are created on the Teradata server.

### Create a Super User

Create a user on the Teradata server. This user is a super user who will perform all the operations that are relevant for SAS Customer Link Analytics. In addition, this user will own all the databases that you will create.

### Create Databases for Business Data

Create appropriate databases on the Teradata server. For example, you can create the following databases:

**Table 2.1** Teradata Databases for Business Data

Libref	Metadata Library Name	Schema Name
Sia_bdop	Sia_bdm_output	Sia_bdop
Sia_bdim	Sia_bdm_intmdt	Sia_bdim
Sia_anop	Sia_analytics_output	Sia_anop
Sia_ani	Sia_analytics_inmdt	Sia_ani

During SAS Deployment Wizard installation, you are prompted to specify a schema name for each of these libraries. Default values are provided for these prompts as mentioned in this table. However, you can change these values according to your planned database setup.

## Grant Privileges to the Super User

By using the Teradata client, you grant the following permissions to the super user. Contact your database administrator for assistance.

```
GRANT ALL ON <Database name> to <Super user name>
```

In this command, replace *<Database name>* with the schema name that is mentioned in [Table 2.1 on page 12](#). Also, replace *<Super user name>* with the appropriate user name that you created earlier. For details, see [“Create a Super User” on page 11](#).

For example, for the Sia\_bdop schema and the clouser super user, enter the following command:

```
GRANT ALL ON Sia_bdop to clouser;
```

**Note:** Make sure that you grant all permissions to the super user for each database that is listed in [Table 2.1 on page 12](#).

## Export Environment Variables

Export environment variables for the Teradata client according to your platform.

**Table 2.2** Environment Variables

Platform	Environment Variables
Linux for Intel Architecture, Linux for x64, and Solaris for x64	LD_LIBRARY_PATH=TPT-API-LIBRARY-LOCATION NLSPATH=TPT-API-MESSAGE-CATALOG-LOCATION

## Specifying Library Names

Various Teradata libraries are created during SAS Deployment Wizard installation. You are prompted to specify a database name for each of these libraries. Default values are provided for these prompts as mentioned in this table. However, you can change these values according to your planned database setup.

**Note:** It is not mandatory that these databases be available during SAS Deployment Wizard installation.

---

## Default File Locations

SAS Deployment Wizard installs and configures your SAS software. The application installation files are installed in a default location referred to as <SAS Home>. For example, on a Windows machine, <SAS Home> is `C:/Program Files/SASHome`.

The following table lists the default locations of the installation and configuration files for SAS Customer Link Analytics.

*Table 2.3 Default File Locations*

Location Name	Windows Path	UNIX Path
<SAS Home>	<code>C:/Program Files/SASHome</code>	<code>/usr/local/SASHome</code>
<SAS configuration directory>	<code>C:/SAS/Config</code>	<code>/usr/local/config</code>





## 3

## Installation Instructions

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---

### Overview of Installing SAS Customer Link Analytics

There are several concepts to understand and components to manage when you install SAS Customer Link Analytics, including the following:

- understanding distributed deployments versus non-distributed deployments
- the SAS High-Performance Analytics environment

General information about using SAS Deployment Wizard to install SAS software components that are specified in your deployment plan is documented in *SAS Intelligence Platform: Installation and Configuration Guide*, which is available at the following location: <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>. Review this information before you install SAS Customer Link Analytics.

---

### Installing SAS Customer Link Analytics

Follow the instructions in the SAS Intelligence Platform documentation to install SAS Customer Link Analytics. Many prompts of SAS Deployment Wizard are specific to SAS Intelligence Platform and other SAS solutions, and information about these prompts is beyond the scope of this guide. For instructions about installing SAS Intelligence Platform, see “Installing and Configuring Your SAS Software” in *SAS Intelligence Platform: Installation and Configuration Guide*. You should be aware that you will encounter prompts that are specific to SAS

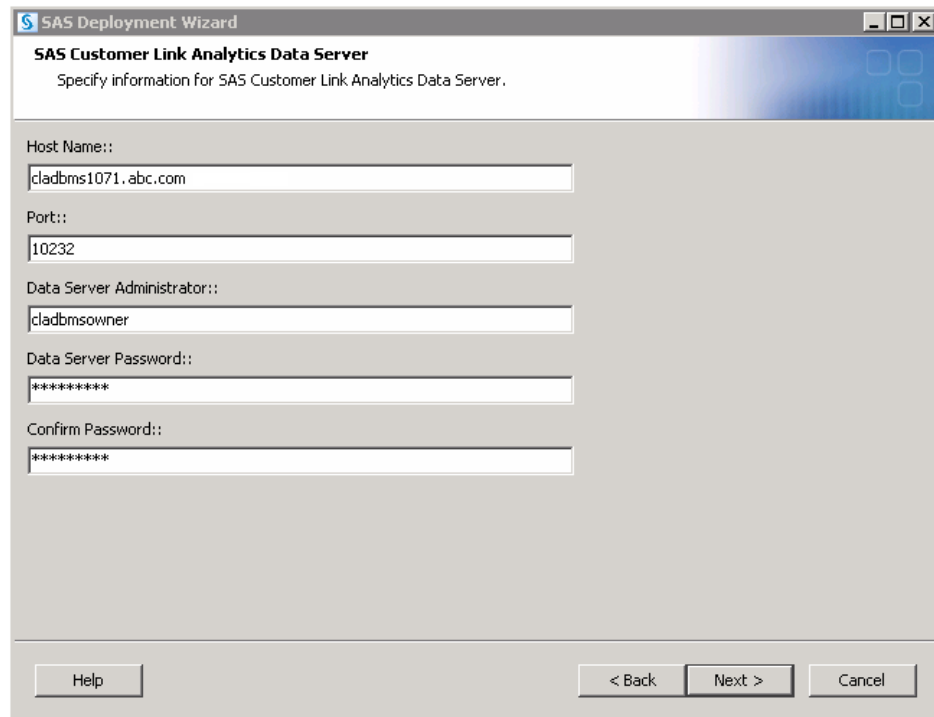
Customer Link Analytics during the deployment. The following section describes the prompts that are specific to SAS Customer Link Analytics.

---

## SAS Deployment Wizard Prompts That Are Specific to SAS Customer Link Analytics

### Application Data: Database Server Details:

*Display 3.1 Application Data: Server Details*



The screenshot shows a window titled "SAS Deployment Wizard" with a sub-header "SAS Customer Link Analytics Data Server". Below the sub-header is the instruction "Specify information for SAS Customer Link Analytics Data Server." The form contains five input fields: "Host Name:" with the value "cladbms1071.abc.com", "Port:" with the value "10232", "Data Server Administrator:" with the value "cladbmsowner", "Data Server Password:" with masked characters "\*\*\*\*\*", and "Confirm Password:" with masked characters "\*\*\*\*\*". At the bottom of the window are four buttons: "Help", "< Back", "Next >", and "Cancel".

Enter the host name and the port number of the database server on which the application data will be stored. SAS Deployment Wizard installs PostgreSQL on this server. Typically, the host name is usually the name of the compute tier. For example, the host name can be **compute.orion.com**. Also, the port that SAS Customer Link Analytics defaults to is 10232.

Enter the user ID and password of the super user who will own the SAS Customer Link Analytics Database Server instance on which the application data will be stored.

Click **Next**.

**Display 3.2** Application Data: Administrative User

**SAS Deployment Wizard**

**SAS Customer Link Analytics Server Configuration**

Specify the connection information for the Application Data Mart Database JDBC connection (SAS Customer Link Analytics Data Server).

Database Name:

User ID::

Password::

Confirm Password::

Help      < Back      Next >      Cancel

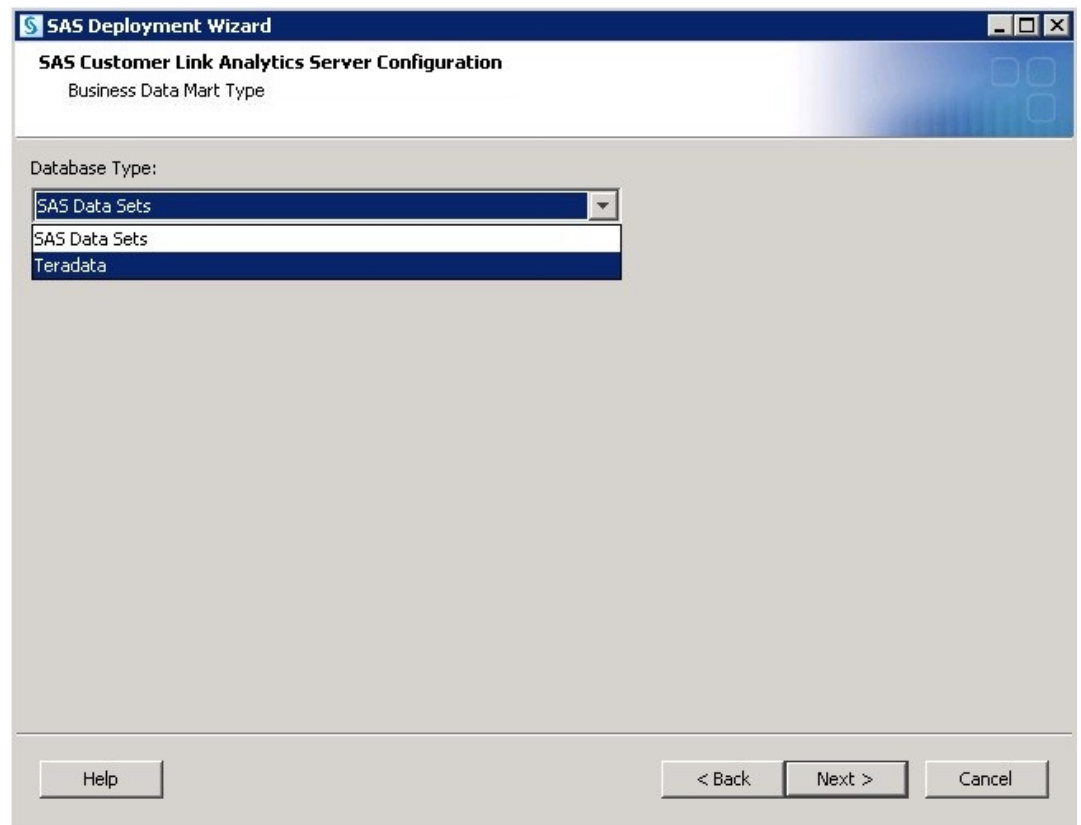
Enter the name of the database in which the application data will be stored.

Enter the user ID and the password of the user who has administrative privileges on the SAS Customer Link Analytics Database Server instance on which the application data will be stored.

Click **Next**.

## Business Data: Database Server Details

Display 3.3 Business Data Mart Type



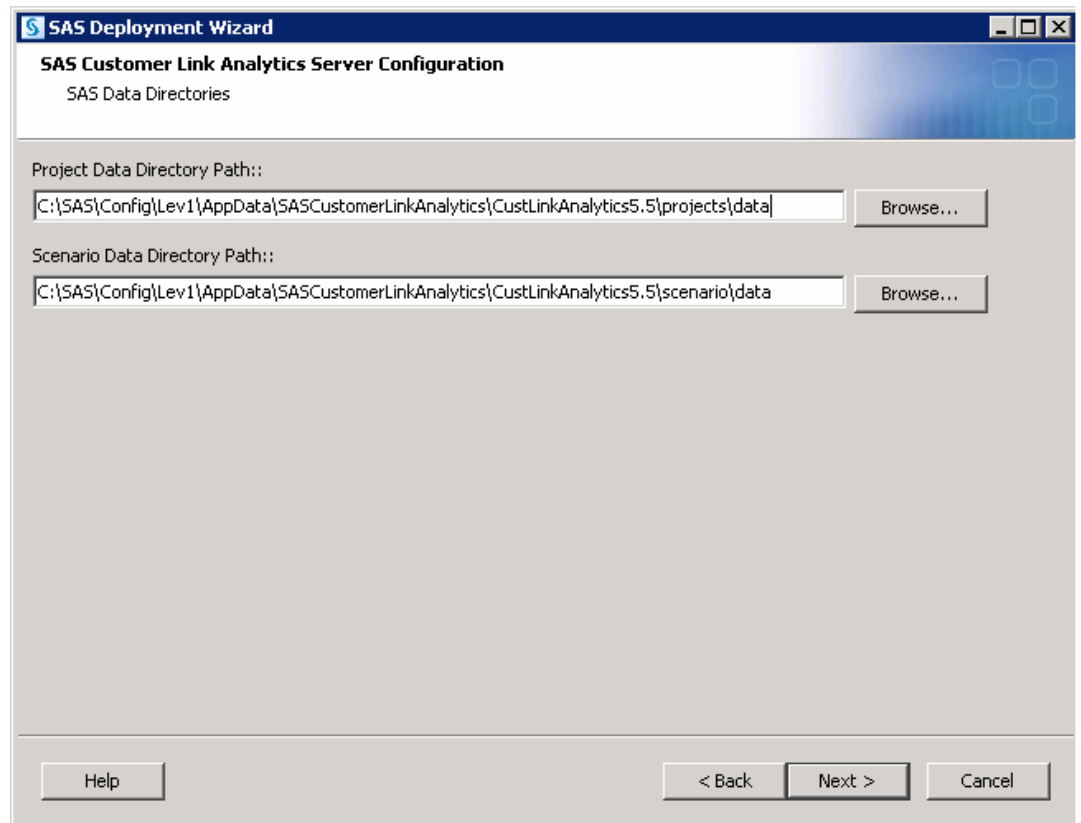
Select the database that will be used to store the business data. The available options are **Teradata** and **SAS Data Sets**.

Click **Next**.

**Note:** Specify details depending on whether you chose **SAS Data Sets** or **Teradata** as the database type.

## Database Type: SAS Data Sets

Display 3.4 SAS Data Directories



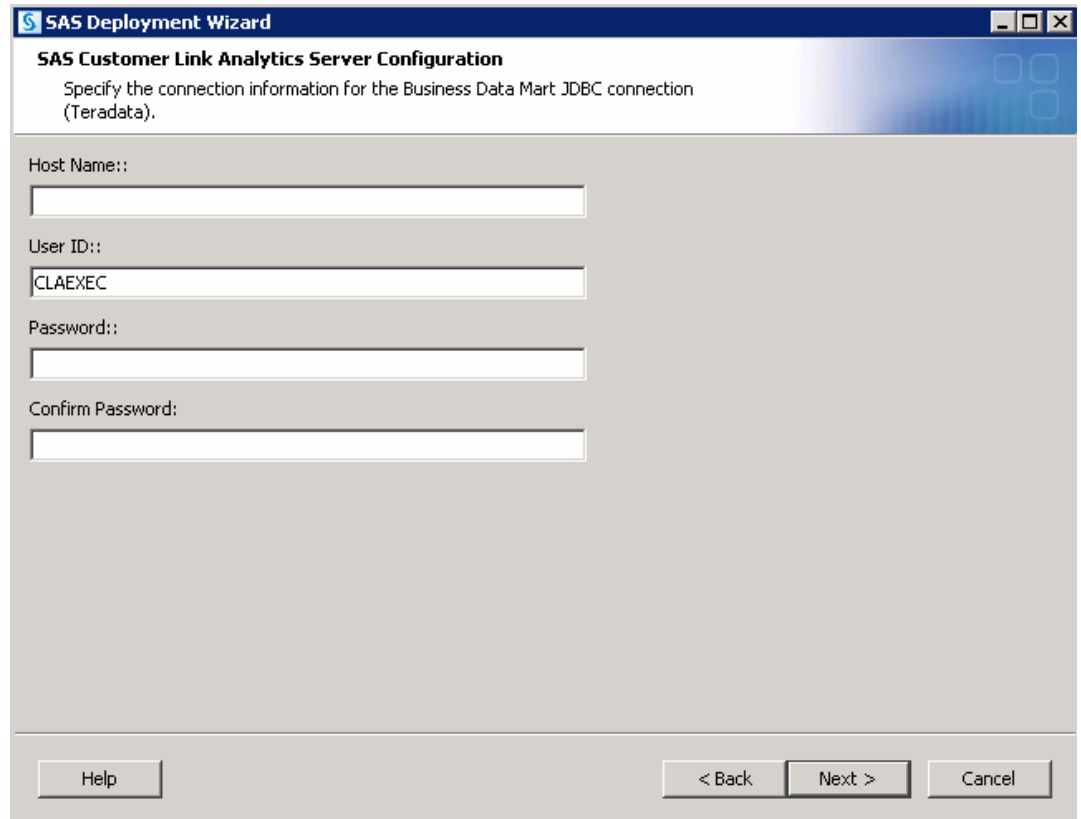
The screenshot shows a window titled "SAS Deployment Wizard" with the subtitle "SAS Customer Link Analytics Server Configuration" and "SAS Data Directories". It contains two text input fields and two "Browse..." buttons. The first field is labeled "Project Data Directory Path::" and contains the path "C:\SAS\Config\Lev1\AppData\SASCustomerLinkAnalytics\CustLinkAnalytics5.5\projects\data". The second field is labeled "Scenario Data Directory Path::" and contains the path "C:\SAS\Config\Lev1\AppData\SASCustomerLinkAnalytics\CustLinkAnalytics5.5\scenario\data". At the bottom, there are buttons for "Help", "< Back", "Next >", and "Cancel".

Specify the locations in which the business data will be stored, and then click **Next**.

## Database Type: Teradata

### Database Configuration Details

Display 3.5 Teradata Database Configuration



The screenshot shows a window titled "SAS Deployment Wizard" with a sub-header "SAS Customer Link Analytics Server Configuration". Below the sub-header is the instruction: "Specify the connection information for the Business Data Mart JDBC connection (Teradata)." The form contains four input fields: "Host Name:" (empty), "User ID:" (containing "CLAEXEC"), "Password:" (empty), and "Confirm Password:" (empty). At the bottom, there are three buttons: "Help", "< Back", and "Next >", and a "Cancel" button on the far right.

Enter the name of the machine on which the Teradata server is running.

Enter the user ID and password of the user who has administrative privileges on the Teradata server.

Click **Next**.

**Display 3.6** Teradata Schemas

**SAS Deployment Wizard**

**SAS Customer Link Analytics Server Configuration**  
Business Data Mart (Teradata) Schemas

Business Data Output Schema Name::  
sia\_bdop

Business Data Intermediate Schema Name::  
sia\_bdim

Analytics Data Output Schema Name::  
sia\_anop

Analytics Data Intermediate Schema Name::  
sia\_ani

Help < Back Next > Cancel

Enter the schema name for each of the following schemas, and then click **Next**.

**Note:** The default value is displayed for each schema name. Make sure that you enter the schema name according to the schema that you have created in the pre-installation instructions. For details, see [“Create Databases for Business Data” on page 11](#).

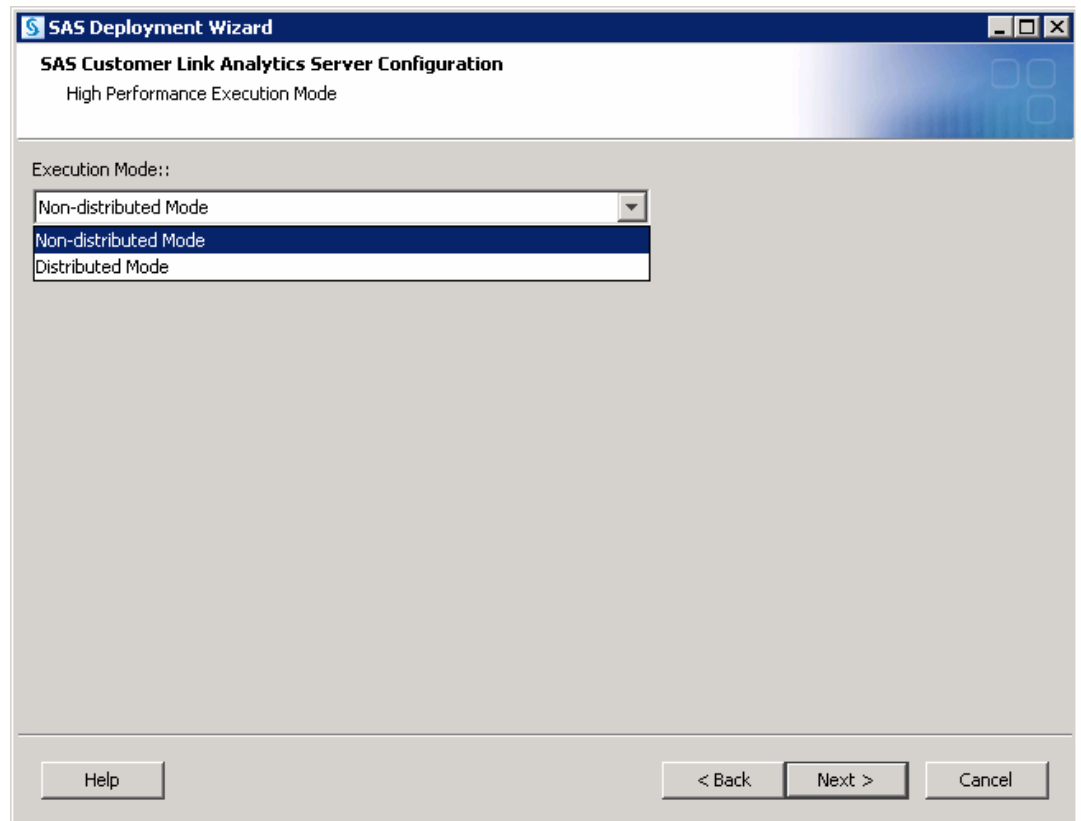
**Table 3.1** Teradata Schemas

Schema Name	Default Value
Business Data Output Schema Name	sia_bdop
Business Data Intermediate Schema Name	sia_bdim
Analytics Data Output Schema Name	sia_anop
Analytics Data Intermediate Schema Name	sia_ani

Click **Next**.

## High-Performance Execution Mode

Display 3.7 High-Performance Execution Mode



Select the execution mode in which you want SAS Customer Link Analytics to operate. The available options are **Distributed** and **Non-distributed**.

Click **Next**.



## High-Performance Analytics Grid Server

Display 3.8 Grid Server Options

The screenshot shows a window titled "SAS Deployment Wizard" with a sub-header "SAS Customer Link Analytics Server Configuration" and "High Performance Analytics Grid Server". The window contains the following fields and controls:

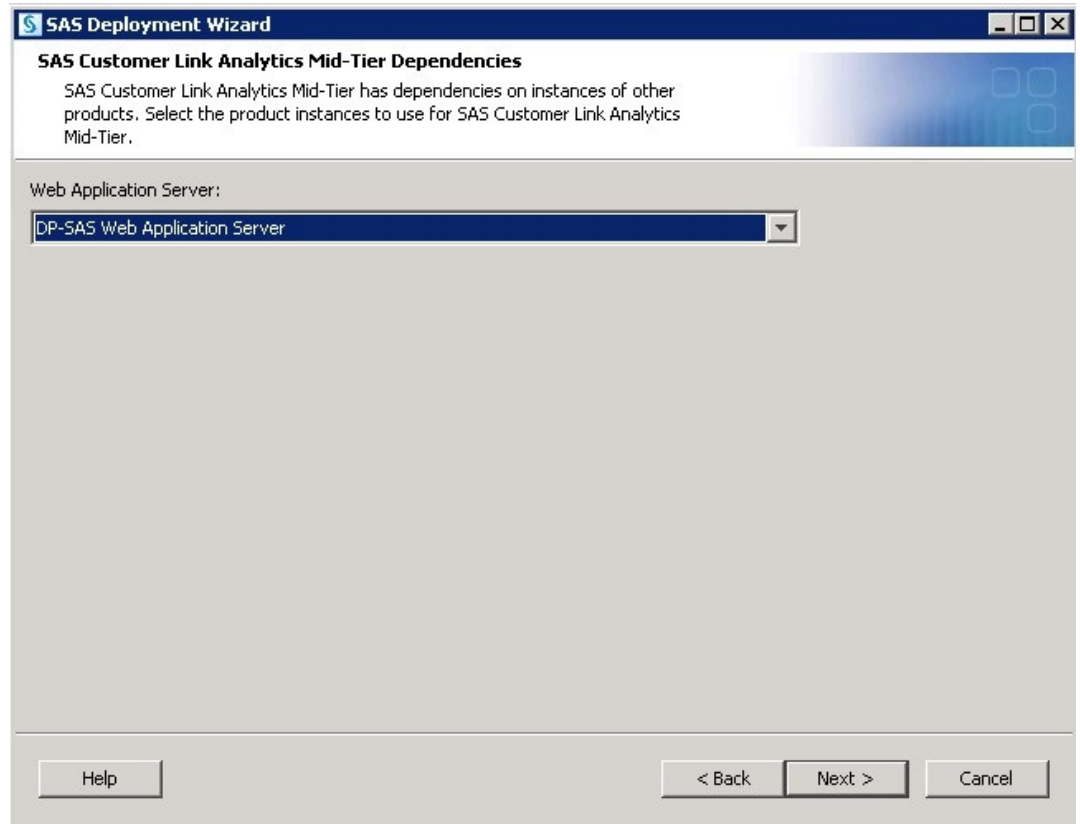
- Host Name::**: An empty text input field.
- Installation Location::**: A text input field containing the path "/opt/v94m1/INSTALL/TKGrid".
- Grid Mode::**: A dropdown menu with "Symmetric" selected. The dropdown list shows "Symmetric" and "Asymmetric".
- Buttons**: "Help", "< Back", "Next >", and "Cancel" are located at the bottom of the dialog.

The High-Performance Analytics Grid Server page is displayed if you select the **Distributed** mode. Enter the host name of the grid server and specify the location in which the grid server is installed. Also, select whether the grid configuration is **Symmetric** or **Asymmetric**.

Click **Next**.

## Middle-Tier Server

Display 3.9 Web Application Server



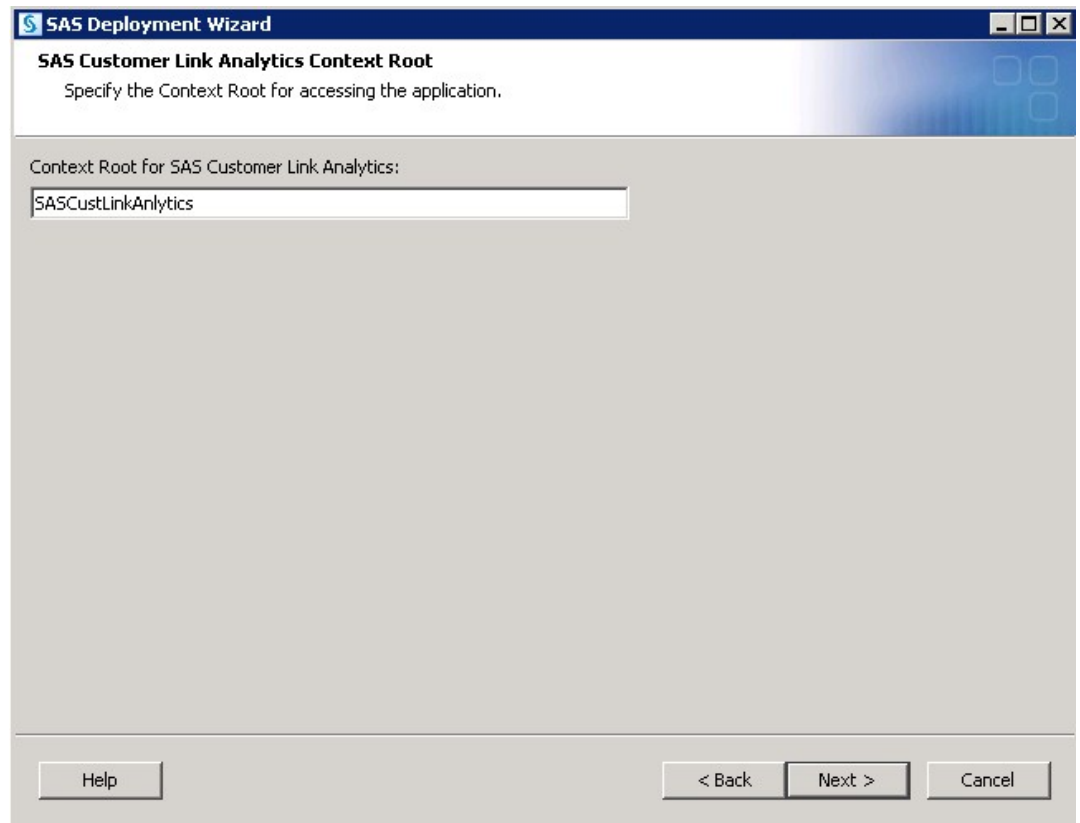
**Note:** This page is displayed only if you select the **Custom** option on the Select Configuration Prompting Level page.

SAS Customer Link Analytics middle tier depends on a configured instance of a web application server in order to successfully complete its configuration. Select the configured instance of a web application server on which you want to base the configuration of SAS Customer Link Analytics middle tier.

Click **Next**.

## Context Root

Display 3.10 Context Root



The screenshot shows a dialog box titled "SAS Deployment Wizard" with a sub-title "SAS Customer Link Analytics Context Root". The instruction reads: "Specify the Context Root for accessing the application." Below this, there is a text input field labeled "Context Root for SAS Customer Link Analytics:" containing the text "SASCustLinkAnalytics". At the bottom of the dialog, there are three buttons: "Help", "< Back", and "Next >", and a "Cancel" button on the far right.

**Note:** This page is displayed only if you select the **Custom** option on the Select Configuration Prompting Level page.

Enter the context root for SAS Customer Link Analytics. The value that you enter here is used as part of the URL that you will use to access the SAS Customer Link Analytics interface. For example, if you enter the context root as *SASCustLinkAnalytics*, then the URL of the application can be `http://server01.abc.com/SASCustLinkAnalytics`.

Click **Next**.



## 4

## Post-Installation Instructions

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---

### Overview of Post-Installation Tasks

At the end of the installation process, SAS Deployment Wizard produces an HTML file, named Instructions.html. To complete your installation, you need the information that is provided in Instructions.html. In addition, you need the information that is specific to SAS Customer Link Analytics, which is documented in this chapter.

This chapter provides details about how to complete the SAS Customer Link Analytics post-installation tasks.

---

### Create User Groups and the Metadata User in SAS Management Console

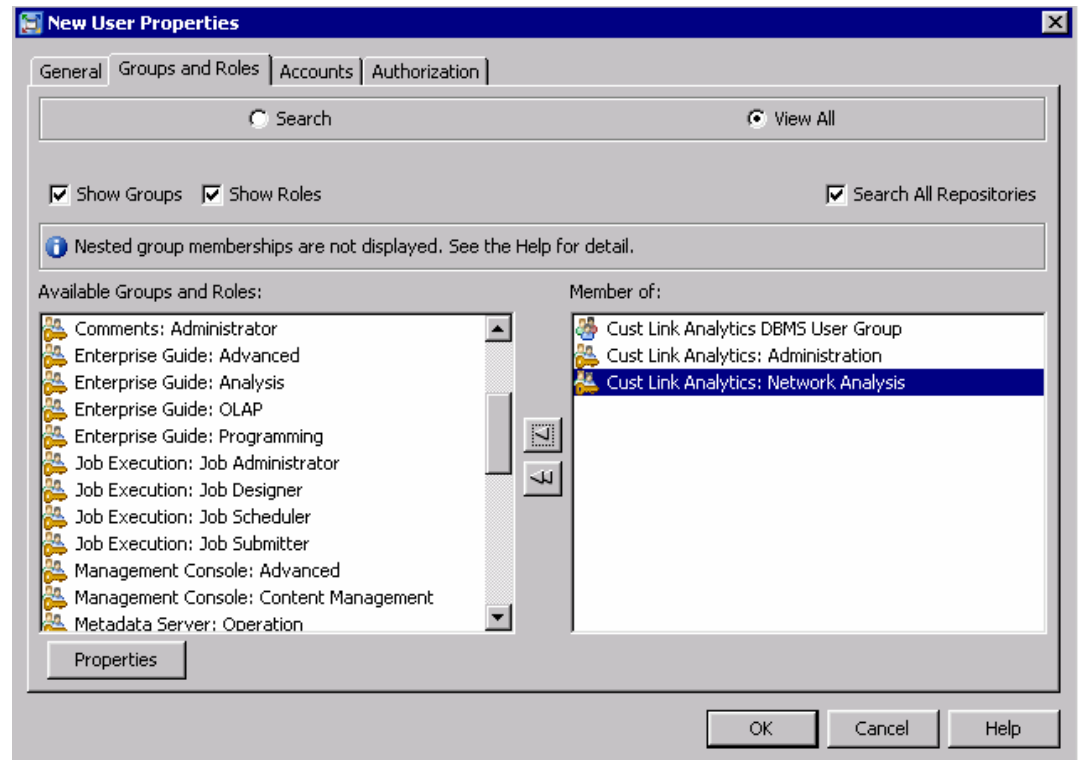
You need to create a single user who can access the business data and the application data and log on to SAS Customer Link Analytics. To do so, you have to create a user who is a member of the default group and the default roles that SAS Deployment Wizard creates.

To configure a SAS Customer Link Analytics metadata user account:

- 1 Start SAS Management Console and connect as a SAS administrator (for example, sasadm@saspw).
- 2 Select the **Plug-ins** tab.
- 3 Right-click the **User Manager** plug-in, and then select **New** ► **User** from the pop-up menu. The New User Properties dialog box appears.

- 4 On the **General** tab, enter the user name. For example, you can enter the name as **CLAUSER**.
- 5 On the **Group and Roles** tab, add the following group and roles:
  - Cust Link Analytics DBMS User Group
  - Cust Link Analytics: Administration
  - Cust Link Analytics: Network Analysis

*Display 4.1 New User Properties*



- 6 Click **OK**.
- 7 Close SAS Management Console.

## Verifying Values of **WORK**, **MEMSIZE**, and **SORTSIZE** Options

If you want to work with SAS Customer Link Analytics in non-distributed mode, you must verify the value of certain SAS system options. To do so, open the `sasv9.cfg` file, which is available in the following location: `<SAS Home>/SASFoundation/9.4/n1s/en`. Make sure that you specify an appropriate value for the following options:

### **WORK**

specify an appropriate value to ensure that enough space is available for the current SAS session.

**MEMSIZE**

specify an appropriate value for this option depending on the size of the data that a SAS Customer Link Analytics project will be processing.

**SORTSIZE**

specify an appropriate value for this option depending on the size of the data that a SAS Customer Link Analytics project will be processing.

If you do not specify appropriate values for these options, the Community Detection workflow step or the Centrality Measures Computation workflow step might fail to execute because of insufficient memory.

---

## Unconfiguring SAS Customer Link Analytics

### Prerequisite Tasks

Before you unconfigure SAS Customer Link Analytics, complete the following tasks:

- 1 Create a backup of the following folders:
  - `<SAS configuration directory>/Levl/AppData/SASCustomerLinkAnalytics`
  - `<SAS configuration directory>/Levl/SASCustomerLinkAnalyticsDataServer`
- 2 Create a backup of the data that is stored in the application data tables (sia\_apdm).
- 3 Create a backup of the application metadata if you have made any customizations that you want to save for later use. To do so, complete the following steps:
  - a Start SAS Management Console, and then open the appropriate connection profile to connect to the desired metadata server.
  - b On the **Folders** tab, select **SAS Folders** ► **Products**.
  - c Create a backup of the following folder: **SAS Customer Link Analytics**.
  - d Close SAS Management Console.

### Remove SAS Customer Analytics for Communications

Use SAS Deployment Manager to remove the following software components of SAS Customer Link Analytics:

- **Cust Link Analytics 5.5**
- **Cust Link Analytics Svr Cfg 5.5**
- **SAS Customer Link Analytics Data Server 5.5**

## Post-Unconfiguration Tasks

After you remove the software components of SAS Customer Link Analytics, delete the application metadata.

To delete the application metadata, complete the following tasks:

- 1 Start SAS Management Console, and then open the appropriate connection profile to connect to the desired metadata server.
- 2 On the **Folders** tab, select **SAS Folders** ► **Products**.
- 3 Delete the **SAS Customer Link Analytics** folder.
- 4 Close SAS Management Console.
- 5 Delete the following folders:
  - `<SAS configuration directory>/Lev1/AppData/SASCustomerLinkAnalytics`
  - `<SAS configuration directory>/Lev1/SASCustomerLinkAnalyticsDataServer`
- 6 If you want to reconfigure SAS Customer Link Analytics, perform the following tasks:
  - Drop the Customer Link Analytics Data Server database (claapdm). You might also want to back up your data and restore it after the configuration is complete.
  - Drop the Customer Link Analytics Data Server login role (claadmin user).
  - Drop the Customer Link Analytics Data Server group role (claapdm\_admin).





# Part 2

## Application Management

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## 5

## Modes of Execution

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---

## Modes of Processing

### Overview

SAS Customer Link Analytics operates in distributed and non-distributed modes. In distributed mode, SAS Customer Link Analytics runs on a computer grid. However, in non-distributed mode, SAS Customer Link Analytics runs on a single computer system with multiple CPUs.

### Non-Distributed Mode

In non-distributed mode, multiple processors share hardware resources such as disks and memory. They are controlled by a single operating system. The workload for a parallel job is distributed across the processors in the system.

In non-distributed mode, SAS Customer Link Analytics runs multiple concurrent threads on a multicore machine in order to take advantage of parallel execution on multiple processing units.

### Distributed Mode

In distributed mode, many computers are physically housed in the same chassis. In a distributed environment, performance is improved because no resources must be shared among physical computers. However, a file system is commonly shared across the network. This configuration allows program files to be shared instead of installed on individual nodes in the system.

The analytical processes on the appliance are separate from the database processes. Therefore, the technique is referred to as *alongside-the-database* execution, in contrast to *in-database* execution, where the analytic code executes within the database process.

## Data Flow for Distributed and Non-Distributed Modes

### Data Flow Diagram

The following diagram indicates how data flows in distributed and non-distributed modes.

Figure 5.1 Data Flow

Process / Workflow Step	Project Creation and Data Extraction	Link and Node Filtering	Link Weight Computation	Copy Data	Community Building	Centrality Measures Computation	Copy Data	Role Assignment
Operating System	UNIX or Windows							
Business Data: In Teradata								
Distributed Mode (Symmetric / Asymmetric)	Teradata	Teradata	Teradata	-	Alongside-the-Database	Alongside-the-Database	-	Teradata
Non-distributed Mode	Teradata	Teradata	Teradata	Copy to SAS	SAS	SAS	Copy to Teradata	Teradata
Business Data: In SAS								
	SAS	SAS	SAS	-	SAS	SAS	-	SAS

## Distributed Processing with Teradata as the Data Store

In distributed mode, SAS Customer Link Analytics runs only with Teradata as a data store. In this mode, SAS Customer Link Analytics optimally leverages the features of the SAS High-Performance Analytics architecture and distributed processing.

If the source data is in Teradata and the library definition of the source library is in accordance with the SAS In-Database processing rules, then the Data Extraction workflow step runs as an in-database process. As a result, data is not extracted from Teradata to SAS.

The Link and Node Processing workflow step also runs as an in-database process. However, the Community Detection and Centrality Measure Computation workflow steps use the SAS High-Performance Analytics architecture and run in alongside-the-database mode based on whether the SAS High-Performance Analytics grid configuration is symmetric or asymmetric. In this case, data movement between the SAS grid and Teradata is minimal and analytical procedures use the full potential of distributed computing.

The Role Assignment workflow step processes the data using the SAS In-Database techniques and, therefore, there is no data movement between SAS and Teradata.

## Non-Distributed Processing with Teradata as Data Store

SAS Customer Link Analytics is configured to run with Teradata as a data store without using SAS High-Performance Analytics. In this case, SAS Customer Link Analytics processes data using in-database processing wherever possible. However, the analytical procedures are executed in symmetric multiprocessing (SMP) mode.

If the source data is in Teradata and the library definition of the source library is in accordance with the SAS In-Database processing rules, then the Data Extraction workflow step runs as an in-database process. Data is not extracted from Teradata to SAS.

The Link and Node Processing workflow step always runs as an in-database process in this configuration.

The Community Detection and Centrality Measure Computation workflow steps execute in the SAS server using SMP mode. In this case, data is extracted from Teradata only once at the beginning of the Community Detection workflow step. After all the analytical processes are complete, data is loaded back into Teradata.

The Role Assignment workflow step again processes the data using the SAS In-Database techniques and there is no data movement between SAS and Teradata.

## Non-Distributed Processing with SAS as the Data Store

SAS Customer Link Analytics can be configured to run with SAS as a data store. In this case, SAS Customer Link Analytics executes both data processes and analytical procedures in SMP mode.

## Graph Size Limitations for Non-Distributed Mode

In non-distributed mode, the maximum data (nodes or links) that SAS Customer Link Analytics can process is 2,147,483,647. If the graph contains entities beyond this value, then the processing fails. Therefore, it is recommended that you choose the distributed mode SAS Customer Link Analytics if you need to process high volumes of data.

---

## Data Flow for Viral Effect Analysis

In SAS Customer Link Analytics, the viral effect analysis functionality is provided through a set of stored processes. The data flow of viral effect analysis includes the following steps:



## 6

## Configuring the Application

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## Log File Locations

### Installation Log File

When you complete the installation, the `sia_apdm_config_wrapper.log` file is created in the following location: `<SAS configuration directory>/Lev1/Appdata/SASCustomerLinkAnalytics/CustLinkAnalytics5.5/logs`. This file contains the logs of configuration for the application data tables. As a verification task, you can read this log file and make sure that it does not contain any errors.

### Workflow Steps Log Files

When a process is run through the SAS Customer Link Analytics UI or a project is run in batch mode, various log files are created in different locations. The table here lists the locations in which the log files are created and the process for which the log files are created.

Table 6.1 Log File Locations

Process or Task	Path
Tasks completed in the Administration workspace of the SAS Customer Link Analytics UI.	<SAS configuration directory>/ Lev1/Appdata/ SASCustomerLinkAnalytics/ CustLinkAnalytics5.5/admin/logs
Tasks completed in the Projects workspace of the SAS Customer Link Analytics UI and execution of projects in batch mode.	<SAS configuration directory>/ Lev1/Appdata/ SASCustomerLinkAnalytics/ CustLinkAnalytics5.5/projects/ logs
Scenario-related tasks that are processed using SAS Stored Process Web Application and execution of scenarios in batch mode.	<SAS configuration directory>/ Lev1/Appdata/ SASCustomerLinkAnalytics/ CustLinkAnalytics5.5/scenario/ logs

The `sia_appl_debug_flg` parameter determines the level of details that are logged in the log files. This parameter is defined in the `PARAM_VALUE` application data table. If the value of this parameter is set to Y, then a detailed log is generated. However, if it is set to N, then minimal information is logged.

## Middle-Tier Log File

The logs of the middle-tier component are maintained in the `SASCustLinkAnalytics5.5.log` file. This file is available in the following default location: `<SAS configuration directory>/Lev1/Web/Logs/<SASServer11_1>`. For example, on a Windows machine, by default, the log file is available in the following location: `<SAS configuration directory>/Lev1/Web/Logs/SASServer11_1`. However, if you perform a custom installation, the folder name that indicates the SAS server might change depending on the SAS server that you configure.

## Working with Software Component Properties

### Overview

SAS Customer Link Analytics has software component properties that are defined for the following components:

- SAS Customer Link Analytics Server
- SAS Customer Link Analytics Middle Tier

It is recommended that you do not modify the default values of these component properties. However, if you modify the values, you must re-deploy SAS Customer Link Analytics on your web application server in order to reflect the changes that you made.



## View or Modify Software Component Properties

To view or modify software component properties, complete the following steps:

- 1 Open SAS Management Console, and connect to the appropriate metadata server.
- 2 On the **Plug-ins** tab, select **Application Management** ► **Configuration Manager**.
  - To access the SAS Customer Link Analytics Server component properties:
    - 1 Right-click **Cust Link Analytics Svr Cfg 5.5** and select **Properties**.
    - 2 Select the **Advanced** tab and view the properties. For details, see [Table 6.2 on page 40](#).
  - To access the SAS Customer Link Analytics Middle-Tier component properties:
    - 1 Expand **SAS Application Infrastructure**.
    - 2 Right-click **Cust Link Analytics 5.5** and select **Properties**.
    - 3 Select the **Advanced** tab and view the properties. For details, see [Table 6.3 on page 42](#).
- 3 (Optional) Change the default value of the properties, if required, and save the changes.
- 4 Close SAS Management Console.

## SAS Customer Link Analytics Server Component Properties

The value of some of the software component properties is populated depending on the value that you specify for the corresponding SAS Deployment Wizard prompt. For details, see “[SAS Deployment Wizard Prompts That Are Specific to SAS Customer Link Analytics](#)” on page 16.

Table 6.2 Server Properties

Property Name	Sample Value	Description
clasvrc.analytics.inter.libref	sia_ani	<p>Displays the library reference that you specify for the <b>Analytics Data Intermediate Schema Name</b> prompt when you install SAS Customer Link Analytics. SAS Customer Link Analytics uses this reference to access the analytics intermediate library.</p> <p>If you change this value, make sure that you specify the reference of a pre-assigned library. Also, the reference that you specify must be the same as it is declared in the metadata.</p>
clasvrc.analytics.output.libref	sia_anop	<p>Displays the library reference that you specify for the <b>Analytics Data Output Schema Name</b> prompt when you install SAS Customer Link Analytics. SAS Customer Link Analytics uses this reference to access the analytics output library.</p> <p>If you change this value, make sure that you specify the reference of a pre-assigned library. Also, the reference that you specify must be the same as it is declared in the metadata.</p>
clasvrc.apdm.libref	sia_apdm	<p>Displays the library reference that you specify for the application data when you install SAS Customer Link Analytics. SAS Customer Link Analytics uses this reference to access the library that stores the application data tables.</p> <p>If you change this value, you must specify the reference of a pre-assigned PostgreSQL library. Also, the reference that you specify must be the same as it is declared in the metadata.</p>
clasvrc.bdm.intermediate.libref	sia_bdim	<p>Displays the library reference that you specify for the <b>Business Data Intermediate Schema Name</b> prompt when you install SAS Customer Link Analytics. SAS Customer Link Analytics uses this reference to access the intermediate library that stores the business data tables.</p> <p>If you change this value, make sure that you specify the reference of a pre-assigned library. Also, the reference that you specify must be the same as it is declared in the metadata.</p>

Property Name	Sample Value	Description
clasvrc.bdm.output.libref	sia_bdop	<p>Displays the library reference that you specify for the <b>Business Data Output Schema Name</b> prompt when you install SAS Customer Link Analytics. SAS Customer Link Analytics uses this reference to access the output library that stores the business data tables.</p> <p>If you change this value, make sure that you specify the reference of a pre-assigned library. Also, the reference that you specify must be the same as it is declared in the metadata.</p>
clasvrc.cla.bdm.dbms.type	SAS or Teradata	<p>Indicates whether SAS Customer Link Analytics uses a SAS or Teradata database to store business data. By default, the value that you specify during installation is displayed.</p> <p>If you change the value of this property, make sure that you maintain consistency between the relevant library references in the software component properties and the actual configuration.</p>
clasvrc.cla.execution.mode	NONDISTRIBUTED or DISTRIBUTED	<p>Displays the mode of execution that you select when you install SAS Customer Link Analytics.</p> <p>If you configure SAS Customer Link Analytics for Teradata, then you can select the execution mode as distributed or non-distributed. However, for the SAS database, the execution mode can only be non-distributed.</p>
clasvrc.cla.grid.installloc	/opt/v940m1/INSTALL/TKGRID	<p>Applicable for distributed mode. The value of this property indicates the location in which the grid is installed and configured. By default, the value that you specify when you install SAS Customer Link Analytics is displayed. SAS Customer Link Analytics uses this location to set up certain execution parameters. The SAS Deployment Wizard deploys the relevant code in this location.</p>

Property Name	Sample Value	Description
clasvrc.cla.grid.server	Teradbm	Applicable for distributed mode. The host name of the grid server that you specify when you install SAS Customer Link Analytics is displayed as the value of this property. SAS Customer Link Analytics uses this value to set up certain parameters that are required to execute the code.
clasvrc.cla.servercontext	SASApp	Displays the server context.
clasvrc.config.dir	C:\SAS\Config\Lev1	Displays the physical path of the SAS configuration directory. SAS Customer Link Analytics uses this path as a relative path to define other paths such as log locations.
clasvrc.hpa.grid.mode	sym or asym	Applicable for distributed mode. The value of this property is sym (Symmetric) or asym (Asymmetric) depending on the value that you specify for the type of grid server configuration.
clasvrc.metadata.server.name	<Metadata server name>.com	Displays the name of the metadata server.
clasvrc.metadata.server.port	8561	Displays the port of the metadata server.
clasvrc.repository.name	Foundation	Displays the repository name of the metadata server.
clasvrc.version	5.5	Displays the version of SAS Customer Link Analytics.

## SAS Customer Link Analytics Middle Tier Component Properties

Table 6.3 Middle-Tier Properties

Property Name	Value	Description
clamid.EXECUTION_MODE	NONDISTRIBUTED or DISTRIBUTED	Displays the mode of execution that you select when you install SAS Customer Link Analytics.
clamid.STP_FOLDER_PATH	/System/Applications/SAS Customer Link Analytics/Cust Link Analytics 5.5/Application Stored Process/	Displays the location in which the stored processes are stored.

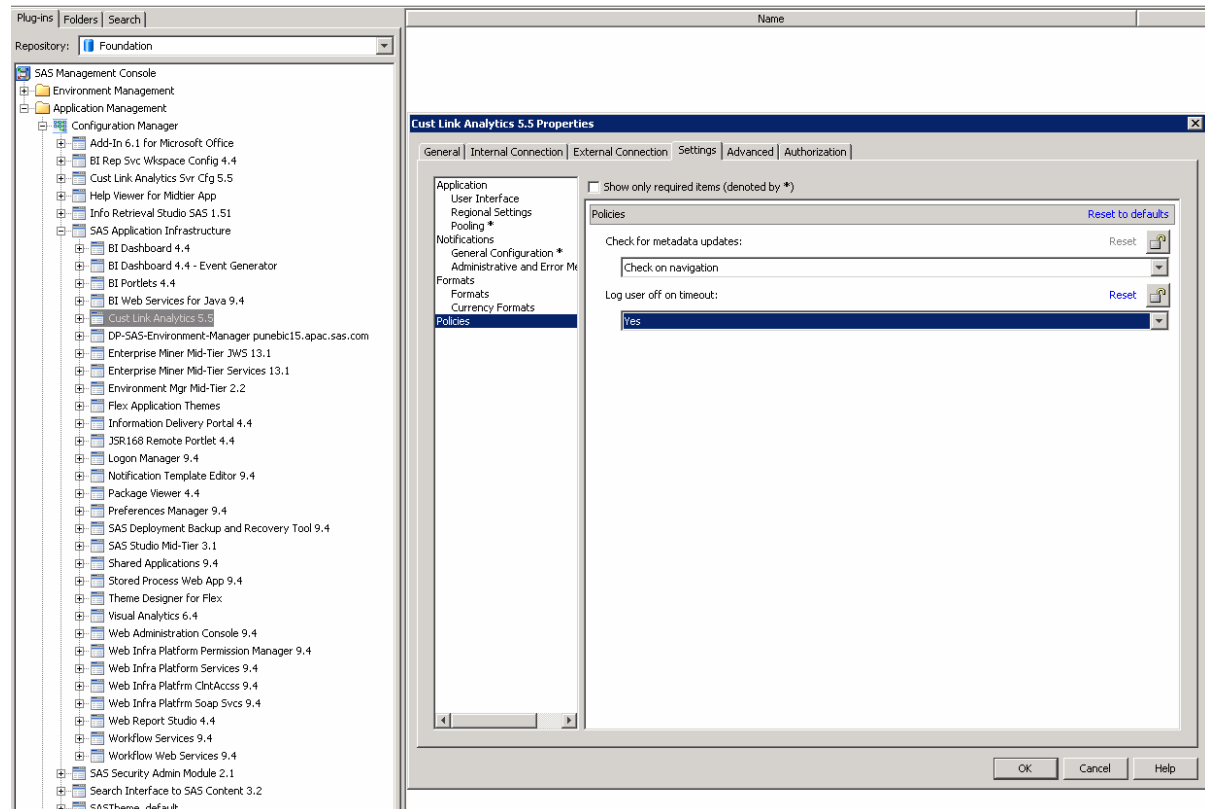
## Change the Policy Settings for Session Time-out

You might have logged on to SAS Customer Link Analytics. However, if your session is idle due to inactivity, then the session time-out page appears. On this page, you can either select **LogOff** or **Return to Application**. By default, when you click **Return to Application**, your session is reloaded and the main page appears. In this case, you are not prompted for your password. However, if you want to require users to enter their password before returning to the application, you can change the appropriate policy setting in SAS Management Console.

To change the policy setting:

- 1 Open SAS Management Console and connect to an appropriate profile.
- 2 On the **Plug-ins** tab, select **Application Management** ► **Configuration Manager** ► **SAS Application Infrastructure**.
- 3 Right-click **Cust Link Analytics 5.5** and select **Properties**. The Cust Link Analytics 5.5 Properties window appears.
- 4 On the **Settings** tab, select the **Policies** page.
- 5 From the **Log user off on timeout** list, select **Yes**.

Display 6.1 Policy Setting



- 6 Click **OK**.

- 7 Close SAS Management Console.

---

## Using the Lockdown Path List

### Overview of the LOCKDOWN Statement

The LOCKDOWN statement secures a SAS Foundation server by restricting access from within a server process to the host operating environment. It enables you to limit access to the back-end file system and to specific SAS features for a SAS session executing in a server or batch processing mode. This restriction prevents back-end SAS servers such as the SAS Workspace Server or the SAS Stored Process Server from accessing file system paths that are not defined in the lockdown path list (also called a *whitelist*). The lockdown path list specifies the files and directories that a SAS session can access when it is locked down. All the subdirectories of the directory that is specified in the path list can be accessed. However, attempts made to access paths outside of the path list are denied.

A SAS server that is locked down is constrained as mentioned here:

- The server can access only the host directories and files that are specified in the lockdown path list.
- The server cannot run the DATA step javaobj methods.
- The server cannot run the GROOVY procedure.
- The server cannot run the JAVAINFO procedure.
- The server cannot invoke the following functions: MODULE, ADDR, ADDRLONG, PEEK, PEEKLONG, PEEKC, PEEKCLONG, POKE, and POKELONG.

### Adding the Lockdown Path

To ensure that the lockdown feature functions appropriately for SAS Customer Link Analytics, you have to update the lockdown path list in certain files.

To update the lockdown path in the appropriate files:

- 1 Search for the autoexec\_usermods.sas file. Make sure that the search retrieves the files in the following folders:
  - `<SAS configuration directory>/Lev1/SASApp/ConnectServer`
  - `<SAS configuration directory>/Lev1/SASApp/WorkspaceServer`
  - `<SAS configuration directory>/Lev1/SASApp/StoredProcessServer`
  - `<SAS configuration directory>/Lev1/SASApp/PooledWorkspaceServer`
  - `<SAS configuration directory>/Lev1/SASApp/OLAPServer`
  - `<SAS configuration directory>/Lev1/SASApp/BatchServer`

- <SAS configuration directory>/Lev1/SASApp/SchedulingServer
- <SAS configuration directory>/Lev1/SASApp
- <SAS configuration directory>/Lev1/SASMeta

**2** In each of the file that is retrieved in the locations listed here, add the following lines:

```
LOCKDOWN PATH = '<SAS configuration directory>/Lev1/AppData/SASCustomerLinkAnalytics';
LOCKDOWN PATH = '<SAS configuration directory>/Lev1/Applications
/SASCustomerLinkAnalytics';
```

**Note:**

- In the lockdown path statement, replace <SAS configuration directory> with the actual path, such as C:/SAS/Config.
- If the SAS Enterprise Miner project location that you specify while executing a scenario is different from the paths that are listed here, then you have to also add this path in each of the files. For example, assume that the project location on a Windows machine is C:/modeling/em\_projects. In this case, add the following lockdown path: LOCKDOWN PATH = 'C:/modeling/em\_projects';.

**3** Save the file.

**4** In SAS Data Integration Studio, run the following command: %siainit;. Make sure that it does not result in any errors.

**5** Log on to SAS Customer Link Analytics. Make sure that you can run a project in batch and design mode without any errors. Also, make sure that you can successfully perform scenario analysis.





## 7

## Batch Processing

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---

### Overview of Batch Processing

When you successfully run all the workflow steps of a project that you create in the Projects workspace, the project completes one run in design mode. You can then push this project to batch mode. Also, when a project is in batch mode, you can generate report data for it. Similarly, when you publish a scenario that you have defined for a project that is in batch mode, you can run that scenario in batch mode. All these tasks involve batch processing. For details about pushing a project to batch mode, publishing a scenario, and generating report data for a project in batch mode, see *SAS Customer Link Analytics: User's Guide*.

For batch mode, a separate code file is created for each project or scenario in a predefined location. You have to manually execute this code or schedule it to run at a predefined frequency. If you schedule the batch code, the batch process runs seamless without any manual intervention.

---

### Running a Project in Batch Mode

When you push a project to batch mode, a batch code file (sia\_batch\_exe\_<Project name>\_<Project ID>.sas) is created for this project in the following folder: <SAS configuration directory>/Lev1/AppData/SASCustomerLinkAnalytics/CustLinkAnalytcs5.5/projects/batchcode. For more information, see *SAS Customer Link Analytics: User's Guide*. You can run this code in the SAS environment or schedule it to run at regular intervals. To run the batch code, you must have access to the application data tables and business data tables. Also, you can define the frequency at which you want to schedule the batch run according to your business needs.

You can control the way you want to execute the next batch run if any of the workflow steps fail to execute in the current run. To do so, you can set the value of the `Rerunvl` parameter that is defined in the batch code. The default value of this parameter is `N`. This value indicates that if a project fails to execute in a batch run, then the next batch run starts from the workflow step that failed to execute. However, if you want all the workflow steps to execute again, set the value of this parameter to `Y`.

---

## Running a Scenario in Batch Mode

### Overview

*Batch execution* is the process of applying an analytical model to new data in order to compute outputs. When you publish a scenario to batch mode, a batch code file (`sia_scenario_scoring_job_<scenario_name>_<scenario_pk>`) is generated for this scenario in the following folder: `<SAS configuration directory>/Lev1/AppData/SASCustomerLinkAnalytics/CustLinkAnalytics5.5/scenario/batchcode`. For details, see *SAS Customer Link Analytics: User's Guide*. You can run this code in the SAS environment or schedule it to run at regular intervals. You can define the frequency at which you want to schedule the batch run according to your business requirements. However, it is recommended that you schedule the batch run of a scenario with the batch run of the project that is associated with the scenario. This ensures that the scores of the latest network are produced. Also, a batch run of a scenario can be scheduled more frequently compared to the batch run of the project. The frequency with which you want to schedule the batch run of the project depends on the frequency with which the data in the node attribute table is updated.

In the batch run of a scenario, the modeling process is called if the following conditions are satisfied:

- If the current run is the first run of the scenario.
- If the project with which the scenario is associated executes to create a new community and change the network data.

In other cases, the batch run executes the scoring process only. The scoring process includes scoring ABT creation, score code application, and score writeback.

### The Scoring Job

When you publish a scenario, a batch code file (also called, a *scoring job*) is created. SAS Customer Link Analytics does not provide the framework to run or schedule this job. As an administrator, you must manually schedule this job (through an external scheduler). Typically, the scoring job is scheduled to run more frequently than the batch execution of a project.

**Note:** This job uses certain pre-assigned libraries such as the `sia_apdm` library that are defined in the SAS Metadata Server. Therefore, make sure that these pre-assigned libraries are available to the session in which this job is run.

The scoring job, `scoring_run_job_exec_scoring_template_ID.sas`, contains code that is similar to the code included here:

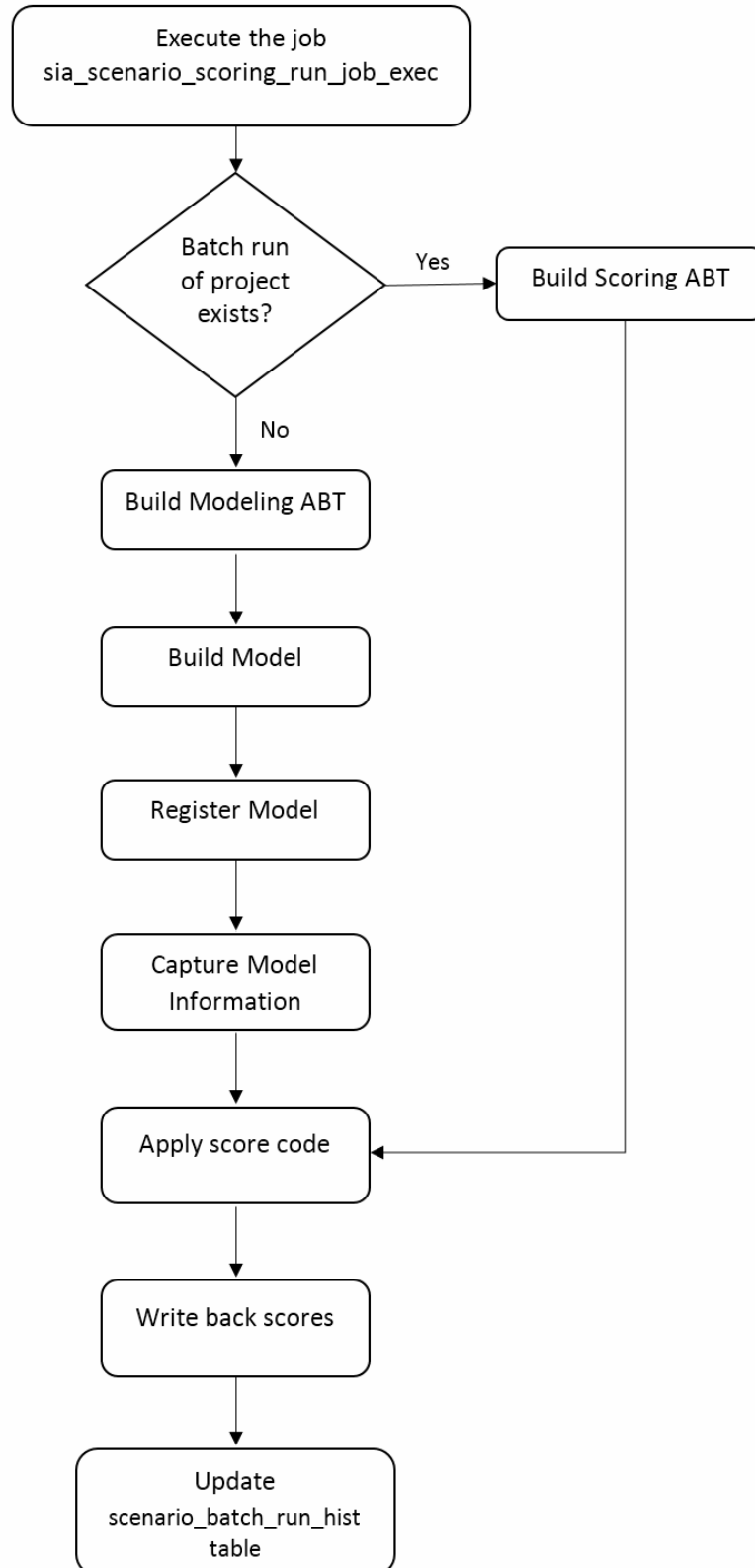
```
%macro sia_scenario_scoring;  
%siainit;  
%let sia_smd_err_key = E_00000;  
%if &sia_rc.= 0 %then %do;  
%sia_scenario_scoring_job(sia_scenario_pk=);  
%end;  
%mend sia_scenario_scoring;  
%sia_scenario_scoring;
```

In this code, `sia_scenario_pk` is the unique key that is assigned to the scenario when it is created.

## High-Level Flow of Scenario Batch Execution

### Flow Diagram

Figure 7.1 Flow Diagram for Scenario Batch Execution



## Project Run Verification

Execution of any scenario batch or modeling run assumes that the project for which the scenario is defined is in batch mode. It also assumes that at least one successful batch run is complete for that project. The `scenario_batch_run_hist` application data table stores information about all the design and batch runs of a scenario and the associated project batch run number. For each modeling run of a scenario, a new record is inserted in this table. This table also stores the association between the scenario and the project batch run number. When the scoring job is executed, the project batch run number is retrieved from the `project_batch_run_hist` application data table. Assume that it is called `batch_prj_run`. Similarly, the `project_run_num` is retrieved from the `scenario_batch_run_hist` application data table. Assume that it is called `scenario_prj_run`.

If `batch_prj_run` is greater than `scenario_prj_run`, then the next batch run of the project for which the scenario is defined has successfully executed. Hence, a new modeling run of the scenario will be executed.

If `batch_prj_run` is equal to `scenario_prj_run`, then no new batch is executed for the project for which the scenario is defined. Hence, a new scoring run for the scenario will be executed.

## Scoring Run

In the scoring run, the following steps occur:

### 1 Create scoring ABT.

When no new batch runs of a project for which the scenario is defined are executed, the scoring job calls the scoring wrapper. During the execution of a scenario, a new record with a new `scenario_run_num` is inserted in the `scenario_batch_run_hist` application data table. This record is updated in the subsequent steps according to the execution status of those steps. This scoring wrapper first builds the scoring ABT. During the scoring run, the source data that is required for batch executions of the project does not change. Only the event information changes. Hence, only event-related link variables are created with the latest event information and then merged with existing modeling ABT. The resulting data set is the scoring ABT.

### 2 Apply score code.

After the scoring ABT is created, the next step is applying the score code that is generated as a part of the modeling run of the scenario. The score code of the successfully built model for the given scenario is available in the following location: `<SAS configuration directory>/Lev1/AppData/SASCustomerLinkAnalytics/CustLinkAnalytics5.5/scenario/modelscorecode`.

The process reads the score code from this location and applies it on the scoring ABT. As a result, the scores are generated. The scored ABT is stored under the `sia_anop` library.

### 3 Write back scores.

After the scored ABT is generated, the newly generated scores are written back to the designated area. The `scenario_score_writeback` table stores the scores for all the runs of the scenario. It also stores information such as the model for which scoring is performed and the date on which scoring is performed.

#### 4 Update the scenario\_batch\_run\_hist table.

If the scores writeback process completes successfully, a record from the scenario\_batch\_run\_hist application data table is updated with the execution status for the given run number of the scenario. At any stage of the scoring wrapper execution, if the execution fails with errors, this record is updated with the corresponding status.

### Modeling Run

The following steps occur in a modeling run:

#### 1 Build a modeling ABT.

When the batch run of the associated project is complete, the basis for creating input variables changes. This change triggers the need to rebuild the input variables and, hence, the models. With the latest available event information, the modeling ABT is created. The modeling ABT contains node-level variables, community-level variables, different role-level link variables, event-specific link variables, node attributes, and the target variable. Before building the modeling ABT, a new record is inserted into the scenario\_batch\_run\_hist application data table. This record stores information about the new run of the scenario.

#### 2 Build a model.

After the modeling ABT is built, a predictive model is built using this ABT and SAS Rapid Predictive Modeler. The model type that you have configured while updating the scenario parameters is read from the scenario\_param application data table and the corresponding model is built.

#### 3 Register the model in metadata.

After successful model creation, the model is registered in metadata. The registered model serves as a registry and a common placeholder for all the models that are built through viral effect analysis.

#### 4 Capture model information.

The information about the newly registered model is extracted from the metadata. This information is in the form of a metadata identifier of the model and the score code of the model. The score code is stored in the following location: `<SAS configuration directory>/Lev1/AppData/SASCustomerLinkAnalytics/CustLinkAnalytics5.5/scenario/modelscorecode`. The code is used for the subsequent scoring runs.

#### 5 Model time scoring.

The modeling ABT creation requires the event information for two windows: the events that occurred in the observation window and the events that occurred in the performance window. The events that occurred in the performance window are treated as an impact of the events that occurred in the observation window. Similarly, to study the impact of events that occurred in the performance window on the subsequent time period, model time scoring is performed. In this step, the target variable that is computed for the performance window is considered as a basis for computing churn-level link variables. All the other variables are retained. The merged data set that contains the retained variables and the newly computed churn-level link variables is the scoring ABT for model time scoring. After the ABT is built, the

score code captured in step 4 is applied on this ABT and the scored ABT is generated.

**6** Write back scores.

After the scored ABT is generated, the newly generated scores are written back to the designated area. The `scenario_score_writeback` table stores the scores for all the scenario runs. It also stores information such as the model for which scoring is performed and the date on which scoring is performed.

**7** Update the `scenario_batch_run_hist` table.

If the scores writeback process completes successfully, a record from the `scenario_batch_run_hist` application data table is updated with the execution status of the given run number of the scenario. At any stage of scoring wrapper execution, if the execution fails with errors, this record is updated with the corresponding status.

The `scenario_batch_run_hist` application data table stores information on all the modeling and scoring runs. The record contains information such as the scenario PK, scenario run number, project run number, model PK, and event history end date. The following table shows the `scenario_batch_run_hist` table with sample records.

**Table 7.1** `scenario_batch_run_hist` Table

scenario_pk	scenario_run_num	project_run_num	scenario_model_pk	scenario_abt_history_end_date	scenario_execution_start_dttm	scenario_execution_end_dttm	scenario_status_cd
3	2	2	.	30MAY2013:00:00:00	30JAN2014:08:08:41	.	ENBL
3	3	2	5	26APR2013:00:00:00	30JAN2014:08:11:07	30JAN2014:08:21:53	EXCSCS
3	4	2	5	26APR2013:00:00:00	30JAN2014:08:23:19	.	EXERR
3	5	2	5	26APR2013:00:00:00	30JAN2014:08:33:39	.	EXERR
3	6	2	5	26APR2013:00:00:00	30JAN2014:08:36:37	.	EXERR
3	7	2	5	26APR2013:00:00:00	30JAN2014:08:40:58	30JAN2014:08:41:04	EXCSCS
3	8	3	6	30MAY2013:00:00:00	30JAN2014:08:44:46	.	EXERR

## Generating Report Data in Batch Run

When you run the stored process to generate report data for a project that is in batch mode, a batch code file (`sia_rpt_data_exe_<Project name>_<Project`

*ID>.sas*) is created in the following folder: `<SAS configuration directory>/AppData/SASCustomerLinkAnalytics/CustLinkAnalytics5.5/projects/batchcode`. For more information, see *SAS Customer Link Analytics: User's Guide*.

You can run this file in the SAS environment or schedule it to run at regular intervals. You can decide the scheduling frequency according to your business needs. However, when deciding the scheduling frequency, you can consider the following recommendations:

- Make sure that the batch run that is scheduled for the corresponding project completes its execution before the batch run of report data generation that you intend to schedule.
- You can synchronize the scheduling frequency so that it matches the frequency at which the data is refreshed in the external source system.

When the batch code is run, the following tasks are performed:

- An output table named `RPT_DATA_<Project ID>` is created in the `sia_ani` library and registered in the specified metadata path.
- A log file named `sia_create_rpt_data_batch_<Project ID>` is created in the following location: `<SAS configuration directory>/AppData/Lev1/SASCustomerLinkAnalytics/CustLinkAnalytics5.5/projects/logs`.



# Part 3

## Appendixes

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# Appendix 1

## Troubleshooting

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### Troubleshooting Error Messages in the Log File

The following table lists the errors that you might encounter when you run the Community Building and Centrality Measures Computation workflow steps in distributed mode. You can review the probable reason that is mentioned and take appropriate action to resolve the problem. These errors are logged in a log file. For details, see [“Workflow Steps Log Files”](#) on page 37.

*Table A1.1 Error Messages*

Error Message in Log File	Probable Reason
bash: /opt/v940m1/laxno/TKGrid1/ tkmpirsh.sh: No such file or directory time- out waiting for grid connection.	The SAS High-Performance Analytics grid installation location is not specified correctly.
ERROR: Failed to enumerate available compute nodes in the distributed computing environment.	
ERROR: Failed to open TKGrid library.	
ERROR: The bridge for SAS High- Performance Analytics encountered an internal error.	

Error Message in Log File	Probable Reason
<p>Unable to open connection: Cannot resolve address.</p> <p>Time-out waiting for grid connection.</p> <p>ERROR: Failed to enumerate available compute nodes in the distributed computing environment.</p> <p>ERROR: Failed to open TKGrid library.</p> <p>ERROR: The bridge for SAS High-Performance Analytics encountered an internal error.</p>	<p>The SAS High-Performance Analytics grid server name is not specified correctly.</p>
<p>ERROR: Connect to HPA failed, connect_rc = -1 ip = 127.0.0.1 port = -26755. Double check your GRIDMODE setting.</p> <p>ERROR: GRIDdata BulkOperations error_rc = -1 ip = 127.0.0.1 port = -26755. Double check your GRIDMODE setting.</p> <p>ERROR: Unable to add rows to table.rt_rc = -1 ip = 127.0.0.1 port = -26755. Double check your GRIDMODE setting.</p>	<p>The SAS High-Performance Analytics grid mode is not set up correctly.</p>
<p>Unable to use key file "&lt;user home directory&gt;/ssh/id_rsa" (unable to open file)</p> <p>Time-out waiting for grid connection.</p> <p>ERROR: Failed to enumerate available compute nodes in the distributed computing environment.</p> <p>ERROR: Failed to open TKGrid library.</p> <p>ERROR: The bridge for SAS High-Performance Analytics encountered an internal error.</p>	<p>The .SSH key is not set up correctly.</p>

## Troubleshooting the Performance of the Data Extraction Workflow Step

### Problem statement

The source transactional data is located in the same Teradata database in which the data that is extracted in the Data Extraction workflow step is stored. However, the workflow step execution takes a longer time.

### Solution

This problem might occur if the Data Extraction workflow step is not running as an in-database process.

Perform the following steps to resolve the problem:

- 1 Check the properties of the external library that you have created for the source data.
- 2 Confirm that these properties are the same as the properties of the sia\_bdop and sia\_bdim libraries. If they are not, change the properties of the external library as required.
- 3 Confirm that the Data Extraction workflow step runs as an in-database process and its execution time shows a performance gain.

---

## Tuning Recommendation for Using PostgreSQL

If you have opted for a middle-tier cluster for deployments that have multiple cluster nodes, then you need to configure the connection tuning parameter for PostgreSQL. To implement this recommendation for a large database, in the default postgresql.conf file, change the value of the max\_connections parameter to 512. The postgresql.conf file is available in the following location: `<SAS configuration directory>/Lev1/WebInfrastructurePlatformDataServer/data`. A restart is required after you change this value.

---

## Troubleshooting the Problem of Insufficient Memory

### Problem statement

While operating in non-distributed mode, the Community Detection or the Centrality Measures Computation workflow step might fail because insufficient memory was logged in the log file.

### Solution

To resolve this out-of-memory problem, open the sasv9.cfg file, which is available in the following location: `<SAS Home>/SASFoundation/9.4/nls/en`. Verify the values that you have specified for the following SAS system options:

- WORK
- MEMSIZE
- SORTSIZE

Change the value of each of these system options depending on the size of the data that is being processed.



# Appendix 2

## Global Parameters

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### Project-Specific Parameters

The project-specific parameters are stored in the PARAM\_MSTR table and their values are stored in the PARAM\_VALUE table. Both these tables are application data tables. For more information about these tables, see *SAS Customer Link Analytics: Data Reference Guide*.

**Table A2.1** Parameter Details

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
log_clear	Specifies whether a new log file is created or log messages are appended in the existing log file.	N	new	
sia_appl_debug_flg	Specifies whether a detailed log message is printed in SAS log files.	Y	Y	N
sia_appl_debug_options	Controls printing of detailed log messages in SAS log files.	Y	mprint mlogic symbolgen	
sia_by_cluster_community	Specifies that centrality measures are computed at community level.	N	COMMUNITY	
sia_by_cluster_network	Specifies that centrality measures are computed at network level.	N	NETWORK	
sia_chk_box_no	Stores the value N for check boxes.	N	N	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_chk_box_yes	Stores the value Y for check boxes.	N	Y	
sia_cm_cd_auth	Stores the code that is assigned for the Authority centrality measure.	N	AUTHORITY	
sia_cm_cd_between	Stores the code that is assigned for the Betweenness centrality measure.	N	BETWEEN	
sia_cm_cd_close	Stores the code that is assigned for the Closeness centrality measure.	N	CLOSE	
sia_cm_cd_close_in	Stores the code that is assigned for the In-closeness centrality measure.	N	CLOSEIN	
sia_cm_cd_close_out	Stores the code that is assigned for the Out-closeness centrality measure.	N	CLOSEOUT	
sia_cm_cd_clust_coef	Stores the code that is assigned for the Clustering coefficient centrality measure.	N	CLUSTCOEF	
sia_cm_cd_dg	Stores the code that is assigned for the Degree centrality measure.	N	DEGREE	
sia_cm_cd_dg_in	Stores the code that is assigned for the In-degree centrality measure.	N	DEGREEIN	
sia_cm_cd_dg_out	Stores the code that is assigned for the Out-degree centrality measure.	N	DEGREEOUT	
sia_cm_cd_eigen	Stores the code that is assigned for the Eigenvector centrality measure.	N	EIGEN	
sia_cm_cd_hub	Stores the code that is assigned for the Hub centrality measure.	N	HUB	



Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_cm_cd_inflnce1	Stores the code that is assigned for the Influence 1 centrality measure.	N	INFLUENCE1	
sia_cm_cd_inflnce2	Stores the code that is assigned for the Influence 2 centrality measure.	N	INFLUENCE2	
sia_cm_round_precision	Stores the value for round precision of decimal point numbers.	Y	0.1	
sia_comm_links_ds_flag	Stores the flag value for creating a community link data set in the Community Building workflow step. This data set describes the links between communities.	Y	N	Y
sia_comm_overlap_ds_flag	Stores the flag value for creating a community overlap data set in the Community Building workflow step. This data set describes the intensity of each node that belongs to multiple communities.	Y	N	Y
sia_comm_size_param_id	Stores the parameter ID for the community size used in the Community Building workflow step.	N	VALCOMMSIZE	
sia_default_role_nm	Stores the name of the default role.	Y	Default	
sia_dt_align_day	Specifies the date alignment for extracting the date in the number of days.	N	SAMEDAY	
sia_dt_align_month	Specifies date alignment for extracting the date in the number of months.	N	BEGIN	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_err_cd	Stores the error code value for an executed process.	N		
sia_flag_no	Stores N as the flag value.	N	N	
sia_flag_yes	Stores Y as the flag value.	N	Y	
sia_in_degree_clmn_nm	Stores the column name of the In-degree centrality.	N	IN_DEGREE	
sia_in_degree_clmn_pk	Stores the primary key (PK) value of the In-degree column.	N	1	
sia_lnk_wt_exp_param_id	Stores the parameter ID for the link weight expression.	N	LNKWTEXP	
sia_lnknde_msr_max_up_lmt	Stores the maximum value for the upper limit that is defined in the Link and Node Processing workflow step.	N	1000000000	
sia_lnknde_msr_min_low_lmt	Stores the minimum value for the lower limit that is defined in the Link and Node Processing workflow step.	N	0	
sia_navl	Stores the parameter ID for a null value.	N	#NAME?	
sia_out_degree_clmn_nm	Stores the value of the column name of the Out-degree column.	N	OUT_DEGREE	
sia_out_degree_clmn_pk	Stores the PK value of the Out-degree column.	N	2	
sia_param_id_btwn_normtyp	Stores the parameter ID for the approach that is used for computing betweenness.	N	BTWNNORMTYP	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_param_id_chkauth	Stores the parameter ID this is used for the <b>Authority</b> check box displayed in the UI of the Centrality Measures Computation workflow step.	N	CHKAUTH	
sia_param_id_chkbtwn	Stores the parameter ID that is used for the <b>Betweenness</b> check box displayed in the UI of the Centrality Measures Computation workflow step.	N	CHKBTWN	
sia_param_id_chkclscoeff	Stores the parameter ID that is used for the <b>Clustering coefficient</b> check box displayed in the UI of the Centrality Measures Computation workflow step.	N	CHKCLSCOEFF	
sia_param_id_chkclsln	Stores the parameter ID that is used for the <b>Closeness</b> check box that is displayed in the UI of the Centrality Measures Computation workflow step.	N	CHKCLSN	
sia_param_id_chkcommsize	Stores the parameter ID that is used for checking community size in the Community Building workflow step.	N	CHKCOMMSIZE	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_param_id_chkdeg	Stores the parameter ID that is used for the <b>Degree</b> check box that is displayed in the UI of the Centrality Measures Computation workflow step.	N	CHKDEG	
sia_param_id_chkdiam	Stores the parameter ID that is used for checking the diameter in the Community Building workflow step.	N	CHKDIAM	
sia_param_id_chkeigen	Stores the parameter ID that is used for the <b>Eigenvector</b> check box that is displayed in the UI of the Centrality Measures Computation workflow step.	N	CHKEIGEN	
sia_param_id_chkhub	Stores the parameter ID that is used for the <b>Hub</b> check box that is displayed in the UI of the Centrality Measures Computation workflow step.	N	CHKHUB	
sia_param_id_chkinfl	Stores the parameter ID that is used for the <b>Influence</b> check box that is displayed in the UI of the Centrality Measures Computation workflow step.	N	CHKINFL	
sia_param_id_clsnnopathyp	Stores the parameter ID for the approach that is used for computing closeness of disconnected nodes.	N	CLSNNOPATHYP	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_param_id_commbldaprch	Stores the parameter ID for the approach that is used for the community-building process.	N	COMMBLDAPRCH	
sia_param_id_commdiambwght	Stores the parameter ID for the approach that is used for computing community diameter in the summary report of the Community Building workflow step.	N	COMMDIAMBYWGHT	
sia_param_id_commsizediamrel	Stores the parameter ID for defining the relationship between community size and diameter in the Community Building workflow step.	N	COMMSIZEDIAMREL	
sia_param_id_complvltyp	Stores the parameter ID of another parameter that specifies whether centrality is computed by community or by network.	N	COMPLVLTYTYP	
sia_param_id_datahst	Stores the parameter ID for data history for data extraction from the source event detail records (xDR) table.	N	DATAHST	
sia_param_id_datatodt	Stores the parameter ID for the To Date column for data extraction from the source xDR table.	N	DATATODT	
sia_param_id_degtyp	Stores the parameter ID for the <b>Degree</b> check box that is displayed in the UI.	N	DEGTYP	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_param_id_eigenalgotyp	Stores the parameter ID for the algorithm that is used for computing the Eigenvector centrality.	N	EIGENALGOTYP	
sia_param_id_graphdirtytyp	Stores the parameter ID of another parameter that specifies the graph direction type of the source data.	N	GRAPHDIRTYP	
sia_param_id_inclst	Stores the parameter ID for the inclusion list.	N	INCLST	
sia_param_id_lnkrmvratio	Stores the parameter ID for the link removal ratio in the community-building process.	N	LNKRMVRATIO	
sia_param_id_resvalentered	Stores the parameter ID for values entered for resolution lists in the Community Building workflow step.	N	RESVALENTERED	
sia_param_id_resvalselected	Stores the parameter ID for selected values of resolutions in the Community Building workflow step.	N	RESVALSELECTED	
sia_param_id_showcommblresult	Stores the parameter ID for showing the result in the Community Building workflow step.	N	SHOWCOMMBLDRESULT	
sia_param_id_valcommsize	Stores the parameter ID for the value of the community size used in the Community Building workflow step.	N	VALCOMMSIZE	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_param_id_valdiam	Stores the parameter ID for the value of the diameter used in the Community Building workflow step.	N	VALDIAM	
sia_param_val_cd_commbld_bua	Stores the parameter ID for the bottom-up approach used in the Community Building workflow step.	N	BUA	
sia_param_val_cd_commbld_tda	Stores the parameter ID for the top-down approach used in the Community Building workflow step.	N	TDA	
sia_po_cd_algo	Stores the name of the community-building algorithm.	Y	PARALLEL_LABEL_PROP	
sia_po_graph_int_fmt	Specifies the internal graph format of the source data to be used by the OPTGRAPH procedure algorithms.	Y	THIN	FULL
sia_po_loglevel	Controls the amount of information that is displayed in the SAS log as a result of calling the OPTGRAPH procedure.	Y	1	0 2 3
sia_po_max_iter	Specifies the maximum number of iterations that are permissible in the algorithm of the community-building process.	Y	100	
sia_po_nthreads	Specifies the number of threads that the procedure can use.	Y	8	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_prm_val_grph_drctd	Stores the parameter ID for the directed graph data.	N	DIRECTED	
sia_prm_val_grph_undrctd	Stores the parameter ID for the undirected graph data.	N	UNDIRECTED	
sia_prm_val_xctn_md_dstrbtd	Stores the parameter ID for the distributed mode of execution.	N	DISTRIBUTED	
sia_prm_val_xctn_md_nndstrbtd	Stores the parameter ID for the non-distributed mode of execution.	N	NONDISTRIBUTED	
sia_rptvar_id_avgdenscomm	Stores the parameter ID for the community reporting variable, Average density of communities.	N	AVGDENSCOMM	
sia_rptvar_id_avgdiamcomm	Stores the parameter ID for the community reporting variable, Average diameter of communities.	N	AVGDIAMCOMM	
sia_rptvar_id_avgnumnodcomm	Stores the parameter ID for the community reporting variable, Average number of nodes in communities.	N	AVGNUMNODCOMM	
sia_rptvar_id_linkrmvd	Stores the parameter ID of the link and node processing reporting variable, Number of links removed.	N	LINKRMVD	
sia_rptvar_id_maxdenscomm	Stores the parameter ID for the community reporting variable, Maximum density of communities.	N	MAXDENSCOMM	



Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_rptvar_id_maxdiamcomm	Stores the parameter ID for the community reporting variable, Maximum diameter of communities.	N	MAXDIAMCOMM	
sia_rptvar_id_maxnumnodcomm	Stores the parameter ID for the community reporting variable, Maximum number of nodes in communities.	N	MAXNUMNODCOMM	
sia_rptvar_id_mindenscomm	Stores the parameter ID for the community reporting variable, Minimum density of communities.	N	MINDENSCOMM	
sia_rptvar_id_mindiamcomm	Stores the parameter ID for the community reporting variable, Minimum diameter of communities.	N	MINDIAMCOMM	
sia_rptvar_id_minnumnodcomm	Stores the parameter ID for the community reporting variable, Minimum number of nodes in communities.	N	MINNUMNODCOMM	
sia_rptvar_id_modnet	Stores the parameter ID for the community reporting variable, Modularity.	N	MODNET	
sia_rptvar_id_nodermvd	Stores the parameter ID of the link and node processing reporting variable, Number of nodes removed.	N	NODERMVD	
sia_rptvar_id_numcommnet	Stores the parameter ID for the community reporting variable, Number of communities in network.	N	NUMCOMMNET	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_rptvar_id_numlink	Stores the parameter ID of the link and node processing reporting variable, Number of links.	N	NUMLINK	
sia_rptvar_id_numnode	Stores the parameter ID of the link and node processing reporting variable, Number of nodes.	N	NUMNODE	
sia_smd_err_key	Stores the error code value that is defined in the sia_smd_error_tbl table.	N		
sia_smd_error_tbl	Stores the name of the table that contains the error message details.	N	sia_smd_error	
sia_sql_ip_trace_flag	Specifies whether SQL trace messages are printed in the SAS log files.	Y	Y	N
sia_text_separator	Separates the texts in the strings.	N	:	
sia_wrkflw_status_disable	Stores the code for the Disabled state of a workflow step.	N	DSBL	
sia_wrkflw_status_edit	Stores the code for the Edited state of a workflow step.	N	EDT	
sia_wrkflw_status_enable	Stores the code for the Enabled state of a workflow step.	N	ENBL	
sia_wrkflw_status_error	Stores the code for the Error occurred state of a workflow step.	N	EXERR	
sia_wrkflw_status_executed	Stores the code for the Successfully executed state of a workflow step.	N	EXCSCS	
sia_wrkflw_status_inprgs	Stores the code for the In progress state of a workflow step.	N	INPRGS	

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_wrkflw_step_id_cmblid	Stores the code for the Community Building workflow step.	N	CMBLD	
sia_wrkflw_step_id_cntrmsr	Stores the code for the Centrality Measures Computation workflow step.	N	CNTRMSR	
sia_wrkflw_step_id_dxtr	Stores the code for the Data Extraction workflow step.	N	DXTR	
sia_wrkflw_step_id_lnkndpr	Stores the code for the Link and Node Processing workflow step.	N	LNKNDPR	
sia_wrkflw_step_id_rlass	Stores the code for the Role Assignment workflow step.	N	RCLASS	
sia_xDR_aggr_type_day	Stores the aggregation type code for the daily aggregated source xDR table.	N	DY	
sia_xDR_aggr_type_fll	Stores the parameter ID for the fully aggregated source xDR table.	N	FLL	
sia_xDR_aggr_type_mth	Stores the aggregation type code for the monthly aggregated source xDR table.	N	MTH	
sia_xDR_aggr_type_wk	Stores the aggregation type code for the weekly aggregated source xDR table.	N	WEEK	
sia_xDR_dt_dtime_cd	Stores the parameter ID for the data type of the datetime variable in the source xDR table.	N	DATETIME	
sqlrc	Stores the return code of an SQL operation.	N		

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
tbl_clmn_type_cd_dgin	Stores the column code for the In-degree column.	N	DGIN	
tbl_clmn_type_cd_dgout	Stores the column code for the Out-degree column.	N	DGOUT	
tbl_clmn_type_cd_frm	Stores the column type code for the From column in source xDR table.	N	FRM	
tbl_clmn_type_cd_msr	Stores the column type code for the Measure column in the source xDR table.	N	MSR	
tbl_clmn_type_cd_to	Stores the column type code for the To column in the source xDR table.	N	TO	
tbl_clmn_type_cd_trndt	Stores the column type code for the Transaction date column in the source xDR table.	N	TRNDT	
tbl_type_cd_lnkinclist	Stores the table type code for the link inclusion list table.	N	LNKINCLLST	
tbl_type_cd_ndinclist	Stores the table type code for the node inclusion list table.	N	NDINCLLST	
tbl_type_cd_trn	Stores the table type code for the transaction xDR table.	N	TRN	

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## Parameters for Viral Effect Analysis

The parameters that are required for viral effect analysis are stored in the SCENARIO\_PARAM\_MSTR table and their values are stored in the SCENARIO\_PARAM\_VALUE table. The parameters that you configure are stored in the SCENARIO\_PARAM table. All these tables are application data tables. For more information about these tables, see *SAS Customer Link Analytics: Data Reference Guide*.

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_mod_abt_nm	Name of the modeling ABT that is built when the stored process for building an ABT is executed.	Y		user-specified
sia_project_location	Location on the physical file system in which the SAS Enterprise Miner project workspace that is created for each model created by SAS Rapid Predictive Modeler is stored.	Y		user-specified
sia_id_var_nm	Column that identifies a unique row of the node attribute table.	Y	NODE_ID	user-specified
sia_model_type	Type of model that is built for a given scenario using SAS Rapid Predictive Modeler. You can build basic, intermediate, or advanced types of models for a given scenario.	Y	Intermediate	Basic Advanced
sia_node_attr_tbl_nm	Name of the node attribute table that is used for a given scenario. This table name is stored in the form of libname.tablename. This table stores information about each node and its event date.	Y		user-specified
sia_event_date_col_nm	Name of the column from the node attribute table that stores the event date.	Y		user-specified

Parameter ID	Description	Is Editable	Default Value	Other Possible Values
sia_perf_window_length	Length of the performance window in days. This length identifies whether a particular event occurred for the given node. For example, in this time period, the churn behavior of the nodes is observed.	Y	0	user-specified
sia_obs_window_length	Length of the performance window in days. This length identifies whether a particular event occurred for the given node. For example, in this time period, the impact of nodes (that have churned in the observation window) on the remaining nodes is observed. The impact is studied in this window. Also, the impact is considered in terms whether the remaining nodes churned in the performance window.	Y	0	user-specified
sia_em_project_nm	Name of the SAS Enterprise Miner project that is built for the current scenario. This name is generated automatically and you must not change it.	N		

## Glossary

**ABT variable**

See analytical base table variable

**analytical base table**

a highly denormalized data structure that is designed to build an analytical model or to generate scores based on an analytical model.

**analytical base table variable**

a column in an analytical base table that is used to build a statistical model to predict defaults.

**analytical model**

a statistical model that is designed to perform a specific task or to predict the probability of a specific event.

**box plot**

a graphical display of five statistics (the minimum, lower quartile, median, upper quartile, and maximum) that summarize the distribution of a set of data. The lower quartile (25th percentile) is represented by the lower edge of the box, and the upper quartile (75th percentile) is represented by the upper edge of the box. The median (50th percentile) is represented by a central line that divides the box into sections. The extreme values are represented by whiskers that extend out from the edges of the box.

**centrality measure**

in graph theory and network analysis, a factor that indicates the relative importance of a vertex within a graph. A few examples of centrality measures are Degree, Closeness, Betweenness, and Eigenvector.

**community**

a group of nodes in a network that are more densely connected internally than with the rest of the network. A network can contain one or more communities.

**data store**

a table, view, or file that is registered in a data warehouse environment. Data stores can contain either individual data items or summary data that is derived from the data in a database.

**geodesic**

the shortest distance between a pair of nodes.

**grid**

a collection of networked computers that are coordinated to provide load balancing of multiple SAS jobs, accelerated processing of parallel jobs, and scheduling of SAS workflows.

**grid host**

the machine to which the SAS client makes an initial connection in a SAS High-Performance Analytics application.

**link**

in a network diagram, a line that represents a relationship between two nodes.

**locked-down server**

a SAS server that is configured with the LOCKDOWN system option, so that the server can access only designated host resources.

**model scoring**

the process of applying a model to new data in order to compute outputs.

**network**

a collection of one or more communities.

**node**

in a network diagram, a dot or point that represents an individual actor within the network.

**outlier**

a data point that differs from the general trend of the data by more than is expected by chance alone. An outlier might be an erroneous data point or one that is not from the same sampling model as the rest of the data.

**project**

the named collection of activities and reports to implement a business strategy for addressing a business pain. For example, a project can be created for reducing churn of highly profitable customers in the North region.

**quartile**

any of the three points that divide the values of a variable into four groups of equal frequency, or any of those groups. The quartiles correspond to the 25th percentile, the 50th percentile (or median), and the 75th percentile.

**scoring**

See model scoring

**SMP**

See symmetric multiprocessing

**symmetric community**

a community in which each central node is symmetrically linked to other nodes of the community.

**symmetric multiprocessing**

a hardware and software architecture that can improve the speed of I/O and processing. An SMP machine has multiple CPUs and a thread-enabled operating system. An SMP machine is usually configured with multiple controllers and with multiple disk drives per controller.



**transactional data**

timestamped data collected over time at no particular frequency. Some examples of transactional data are point-of-sale data, inventory data, call center data, and trading data.

**whisker**

a vertical line on a box plot that represents values larger than the third quartile or smaller than the first quartile but within 1.5 interquartile ranges of the box.

**workflow**

a series of tasks, together with the participants and the logic that is required to execute the tasks. A workflow includes policies, status values, and data objects.

**workflow diagram**

a diagram that indicates the order in which activities of a project are to be performed.

**workflow step**

each individual activity of a project that is depicted in a workflow diagram.

