

FANS Network Meetings

SAS Cloud Data Exchange

Leverage distributed data with SAS Viya 2023.03+

Ivor Moan

SAS Global Technology Practice

Moving data from on-premises to cloud

Challenges

- Insecure networks & threats
- Hackers want to steal data
- Exposed, Open ports
- Exposed UserIDs and Passwords
- Unencrypted data
- Unencrypted passwords
- Slow networks
- Long data transport times
- Diverse set of data sources
- Different database clients / APIs
- Difficulty to administer access to data
- Difficulty administering access to navigate the various Firewalls

What's needed

- Secure, reliable self-service access to on-premises data
- Using standards for data encryption including TLS, and HTTPS
- Without opening ports
- Without giving users UserIDs and Passwords
- Encrypt data
- Encrypt all communications
- Parallelize data movement
- Centralize management of data sources
- Virtualize on-premises data to cloud users

SAS Cloud Data Exchange: Target Audience



Organizations who want to perform AI and analytics on data managed in on-premises databases



Organizations who have security concerns about conveying data across their firewall



Organizations who operate in the cloud or are consuming data sources in the cloud



Organizations with SAS 9 wishing to transition to SAS Viya, but want to leverage data in place whether it be on-premises or elsewhere

Cloud Data Exchange

Cloud Data Exchange is a **data connection** capability included in all core SAS Viya packages

Cloud Data Exchange can **securely copy and access** a customer's data from their **on-premises** repositories to their **cloud-based** SAS Viya instance for use in SAS Viya applications.



Focus is on **transferring data securely and efficiently from behind a firewall**

Capabilities

SAS Cloud Data Exchange



Local Data Access from Cloud Deployment

Provides the means to expose local data to a community of remote data engineers, data analysts, and data scientists



On Premises Firewall Friendly

Negotiates the on-premises firewall securely and responsibly



Support for High-Volume Data Transfers

Performs high-volume data transfers from on-premises to SAS Viya to support big data



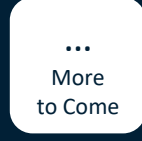
SAS/ACCESS Powered

Leverages many of the SAS/ACCESS data source connectors used by SAS Viya



Connectivity – CDE Data Services

SAS Cloud Data Exchange





SAS Viya



Distributed Data
Resources

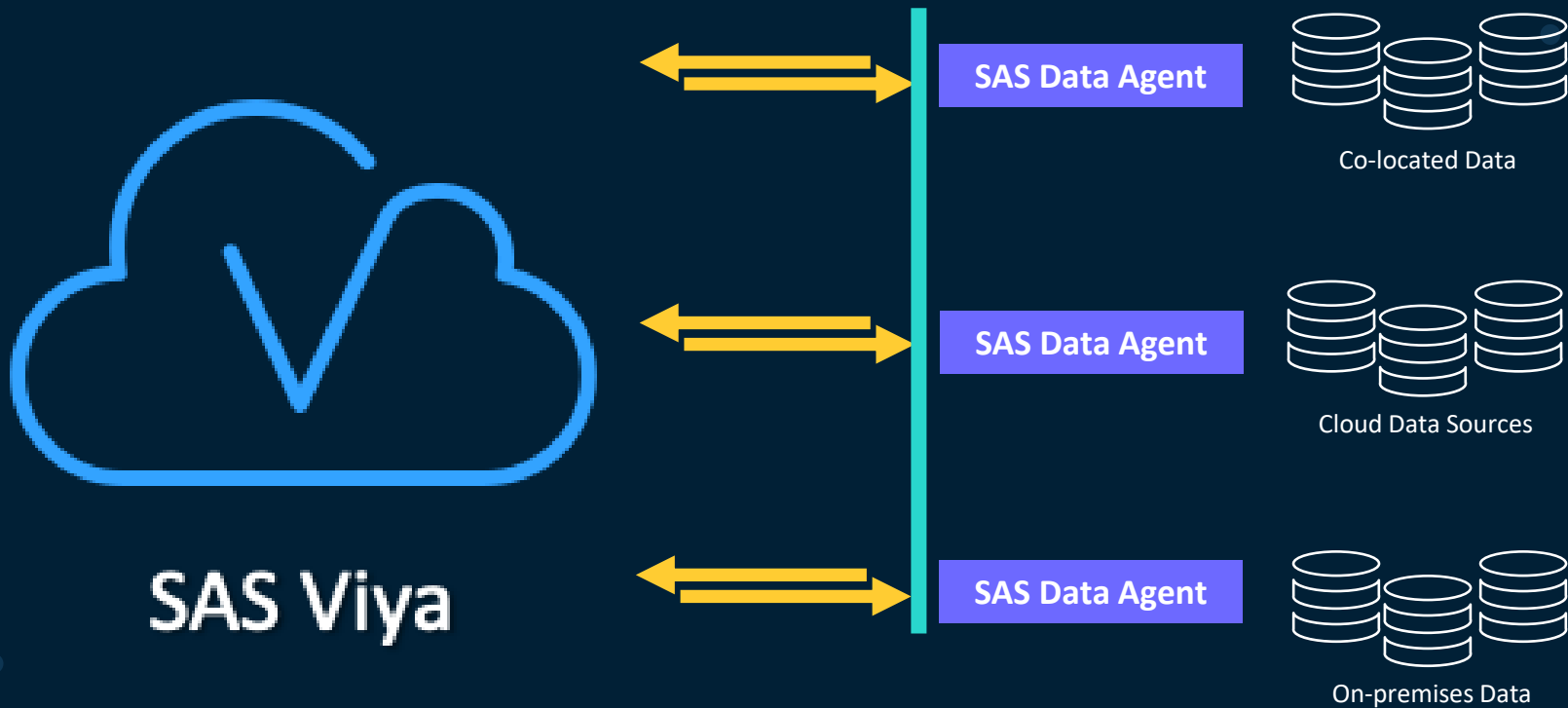
Data Scientists & Data Engineers

- Securely share and collaborate
- Securely access remote data
- Distribute processing
- Optimize data transfer
- Data tiering: Hot, Warm, Cold

Data Owners & Data Administrators

- Leverage all data storage & data centers
- Securely provision data to SAS Viya
- Control and monitor access to data

Securely Access Data, Distribute Processing, & Collaborate



Data Scientists & Data Engineers

What?

- Easily access and leverage remote data in a secure and performant way
- Distribute FedSQL queries to the source data
- Fast data movement across cloud and on-premises data sources
 - For example: on-premises to a SAS Viya environment and back
- Securely share and collaborate with other users

How?

- SAS libname for your SAS jobs on SAS compute
- SAS CASLib for your CAS processing
- SAS FedSQL

Capabilities

- Leverage remote data as if it were local to your SAS compute
- Load data from on-premises directly into CAS memory, and save data back
- Distribute Processing to the data

Data Owners and Data Administrators

What?

- Enable secure sharing of data to SAS Viya users
- Take advantage of various tiers of data storage, data centers and platforms

How?

- SAS Data Agents
- SAS FedSQL

Capabilities

- Access to a wide variety of data sources
- Keep all data credentials secret and local to the data
- Define Data Source Names (DSNs)
- Optionally create views to virtualize the data
- Authentication and authorization enforcement
- Audit logging for all data access
- Data masking

Cloud Data Exchange Architecture

Legend

- Cloud Data Exchange components
- Customer provisions

Remote Data Agent per instance

Customer Volumes

- Docker files
Container Manager
- License File
- Postgres data files
- Vault data files
- DBMS clients

(Remote) Data Agent
Command Line Interface

Data Agent Server
Postgres 12.9
(SASDATASVR) Vault
OCI image Container
(cr.sas.com)

On premises Databases

Corporate
Web proxy
Server

FIREWALL (HTTPS)



(Cloud) Data Agent Command Line Interface

Viya microservices

- DataAgentContent / DataAgentManagement
- CASL JobExecution
- SASLogon
- Credentials
- Identities

Data Agent Server (collocated)

SAS Viya

Viya Webapps (ENV MGR, ...)

Viya stateful services (full stack: Consul, Postgres, ...)

- Configuration CLI
- Consul
- Postgres
- SAS Job CLI

CAS

- Caslib of type CLOUDEX
- Data Agent CAS Action

Compute Server

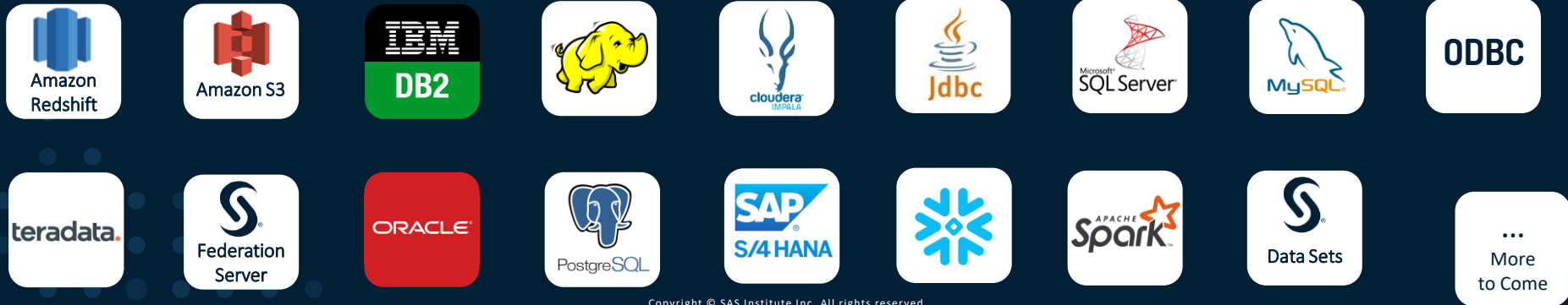
- CDE libname

Cloud Databases





On-Premises or other Cloud



Without SAS Cloud Data Exchange...



FIREWALL (HTTPS)

On-Premises or other Cloud

Without SAS Cloud Data Exchange...

SAS Viya

SAS/ACCESS



FIREWALL (HTTPS)

On-Premises or other Cloud

Without SAS Cloud Data Exchange...

SAS Viya

SAS/ACCESS



MSSQL: Port #1433 Oracle: Port #1521 Teradata: Port #1025

FIREWALL (HTTPS)

UserID: admin

UserID: scott

UserID: tduser

Password: admin1

Password: tiger

Password: 23*324adf

On-Premises or other Cloud



Without SAS Cloud Data Exchange...



SAS Viya

SAS/ACCESS

Oracle DB Client

Teradata TTU Client

Shared File System
with SAS Datasets

MSSQL: Port #1433 Oracle: Port #1521 Teradata: Port #1025

Firewall takes on the appearance of Swiss Cheese

On-Premises or other Cloud

A grid of logos representing various data sources and clients. The logos are arranged in two rows. The first row includes Amazon Redshift, Amazon S3, IBM DB2, Cloudera, Jdbc, Microsoft SQL Server, MySQL, and ODBC. The second row includes Teradata, Federation Server, Oracle, PostgreSQL, SAP S/4 HANA, Apache Spark, Data Sets, and a box with three dots and the text 'More to Come'.

WITH SAS Cloud Data Exchange...



SAS Viya

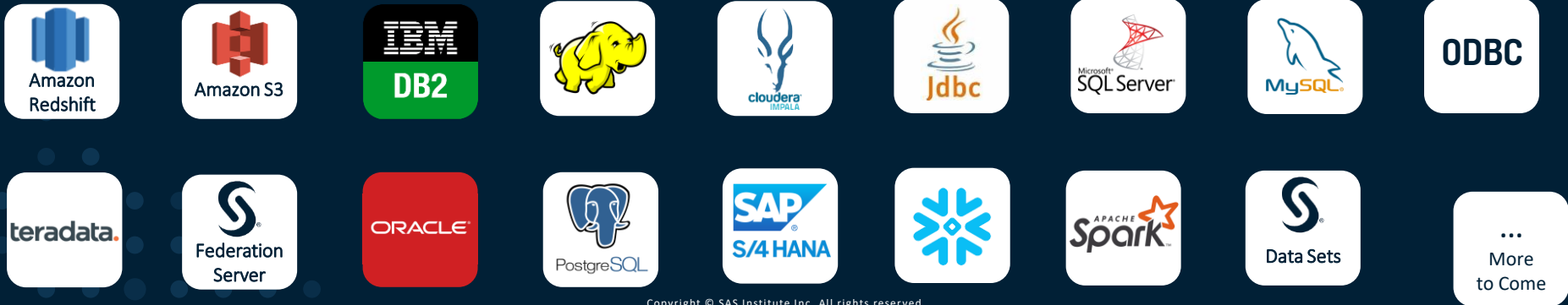
SAS/ACCESS

Parallel Connections
through the same
SINGULAR port opening

FIREWALL (HTTPS)

SAS Data Agent

On-Premises or other Cloud





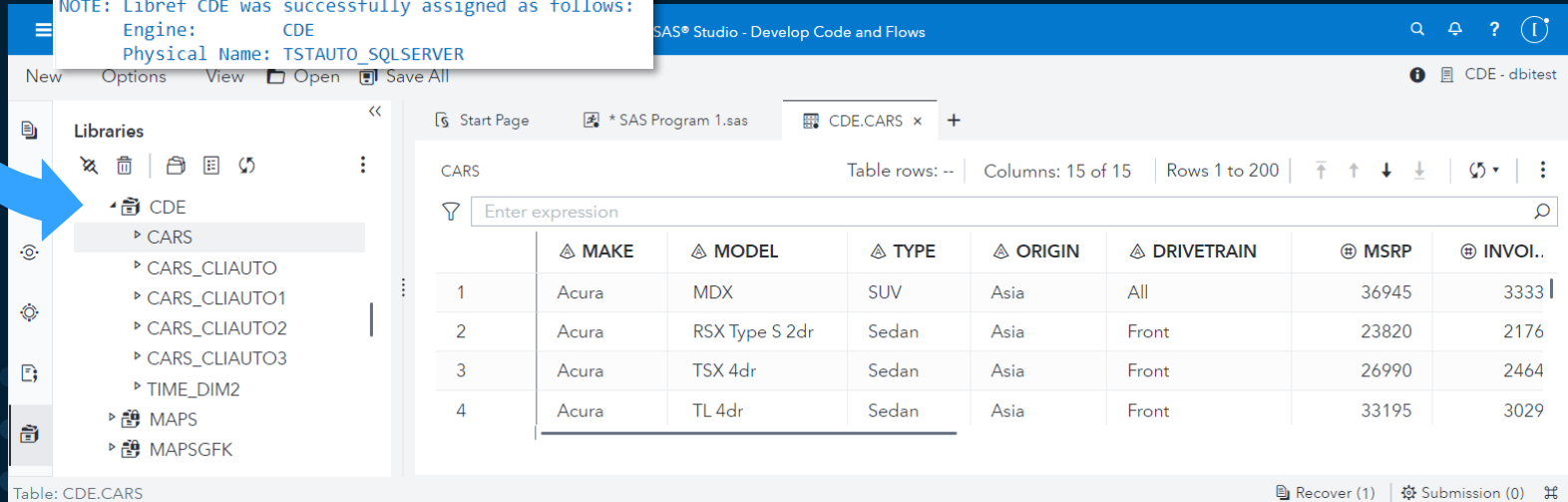
Using SAS Cloud Data Exchange



Load Data Into SAS Compute Through CDE

- The SAS Compute Server can connect to the Data Agent and read/write data
- The CDE library will behave like any other SAS/ACCESS library and deliver access to tables to the user regardless of where the data lives

```
1 /* region: Generated preamble */
79
80 /* Create a library to an on-premises location */
libname cde cde
82 dataagentname="sas-data-agent-server"
83 uid=dbitest pwd=XXXXXXX
84 dsn=TSTAUTO_SQLSERVER
85 preserve_tab_names=yes;
NOTE: Libref CDE was successfully assigned as follows:
Engine: CDE
Physical Name: TSTAUTO_SQLSERVER
```



The screenshot shows the SAS Studio interface. On the left, the 'Libraries' pane displays a tree view with the 'CDE' library expanded, showing sub-libraries like 'CARS', 'CARS_CLIAUTO', etc. A blue arrow points from the code block above to the 'CDE' library in the Libraries pane. The main window shows a data table named 'CARS' with 15 columns and 200 rows. The table is displayed in a grid view with the following columns: MAKE, MODEL, TYPE, ORIGIN, DRIVETRAIN, MSRP, and INVOI.. The data rows are as follows:

	MAKE	MODEL	TYPE	ORIGIN	DRIVETRAIN	MSRP	INVOI..
1	Acura	MDX	SUV	Asia	All	36945	3333
2	Acura	RSX Type S 2dr	Sedan	Asia	Front	23820	2176
3	Acura	TSX 4dr	Sedan	Asia	Front	26990	2464
4	Acura	TL 4dr	Sedan	Asia	Front	33195	3029

Create a Caslib SAS Environment Manager

Name: * CDE_Oracle

Type: Other

Persist this connection beyond the current session

Settings Advanced

Path:

Description: CDE Connection to on-pre

Include subdirectories

Data transfer mode: Default

Number of read nodes: 1

Number of write nodes: 1

Additional Parameters ⓘ

Name:	dataagentname
Value:	mwf-cdetest-rda
Name:	uid
Value:	uid

...
Add Parameter

Connection Settings

Connection : uid

Value: dbitest

Name: pwd

Value: [REDACTED]

Name: conopts

Value: dsn=TSTAUTO_ORACLE

The connection was successful. x

Name: * CDE_Oracle **Server:** cas-shared-default

Type: Other **Source type:** * ⓘ CLOUDEX

Persist this connection beyond the current session ⓘ

Settings Advanced

Value: mwf-cdetest-rda

Name: uid

Value: ...

Test Connection Save Cancel

Manage Data

The screenshot displays the SAS Data Studio interface. On the left, the 'Data' pane shows a tree view of data sources under 'cas-shared-de'. The 'CARS' dataset is highlighted, with a blue arrow pointing to its details view in the center. The 'CARS' details view shows a table with 12 columns: #, Name, Label, Type, Ra..., and Fo... The table contains 12 rows of data. On the right, a metadata panel provides information about the dataset, including the number of columns (16) and rows (--), the size (not available), and the location (cas-shared-default/CDE_Oracle).

Data

Available Data Sources Import

Filter

cas-shared-de

CDE_Oracle

BLOBAUTO20201019469823F

BLTEST

BOOKS_20201019469823F

BRIANVIEW1

Cl@#\$\$%^~&(_+{,}[]()=;B4KO

CAKEAPPEND

CARS

CARS_DMTEST

CARS

Details Sample Data

Filter

#	Name	Label	Type	Ra...	Fo...
1	MAKE		varchar	52	52
2	MODEL		varchar	160	160
3	TYPE		varchar	32	32
4	ORIGIN		varchar	24	24
5	DRIVETRAIN		varchar	20	20
6	MSRP		double	8	12
7	INVOICE		double	8	12
8	ENGINESIZE		double	8	12
9	CYLINDERS		double	8	12
10	HORSEPOWER		double	8	12
11	MPG_CITY		double	8	12
12	MPG_HIGHWAY		double	8	12

View the latest profile and analysis in SAS Information Catalog.

Columns: 16, Rows: --

Size: -- (not available)

Location: cas-shared-default/CDE_Oracle

Date created: --

Date modified: --

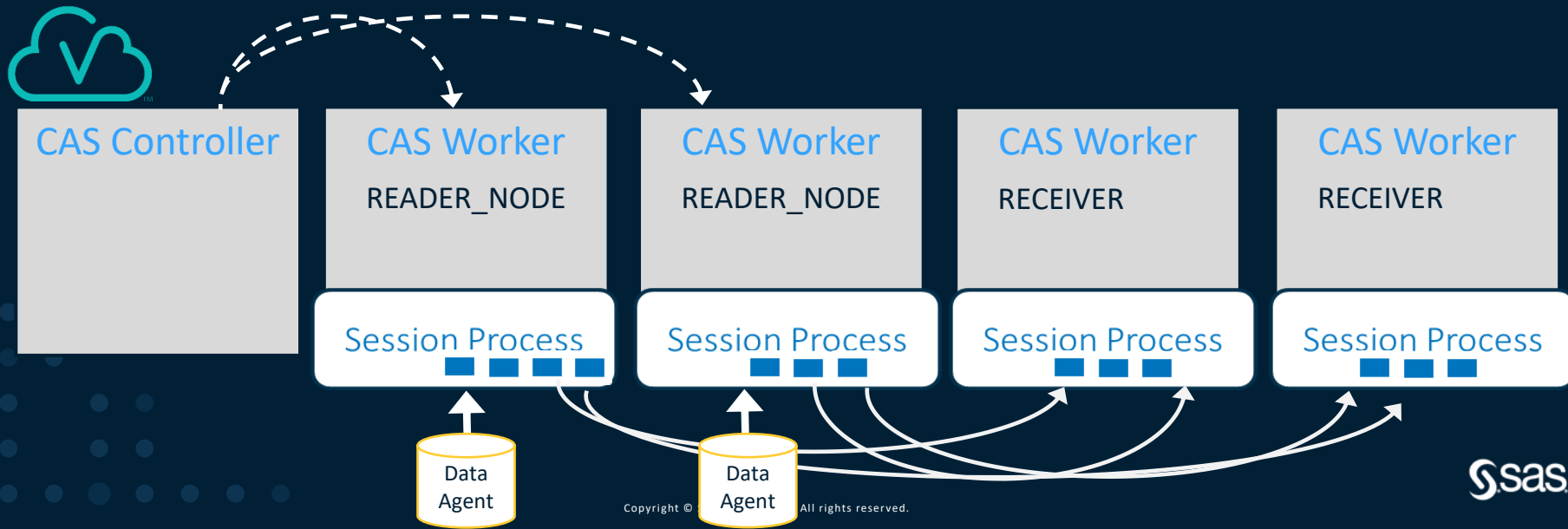
Encoding: (not available)

Tags (0):

Load Data Into CAS Through CDE

Parallel Loading Data to CAS

- Multiple CAS Worker nodes can connect to the Data Agent and fetch data concurrently when **numReadNodes** is greater than 1
- Data will be distributed to all CAS Worker nodes when **dataOnReaderNodesOnly** is set to be FALSE (by default)
- Example of 4 Worker nodes with **numReadNodes=2**





CDE Command Line Interface



Command Line Interface - Download

The screenshot shows the SAS Support website interface. At the top left is the SAS logo and the word 'SUPPORT'. To the right are navigation icons for 'All SAS', search, globe, mail, grid, and user profile. Below the header is a navigation bar with 'SUPPORT / DOWNLOADS & HOT FIXES'. A left sidebar lists various support categories, with 'Downloads & Hot Fixes' selected. The main content area is titled 'All Downloads' and 'Downloads SAS Viya CLI'. It contains a description of the package, a paragraph explaining the CLI's purpose and usage, a link to 'SAS Viya: Using the Command-Line Interface', and a 'Requirements' section with two bullet points. At the bottom is a table titled 'SAS Viya CLI' with columns for Description, Request Download, Size, Release Date, and ReadME. The table lists three download options for Linux, OSX, and Windows, each with a 3.1 MB size and a 2023-02 release date.

SUPPORT / DOWNLOADS & HOT FIXES

SUPPORT

- Manage Tracks
- SAS Administrators
- Security Bulletins
- License Assistance
- Manage My Software Account
- Downloads & Hot Fixes
 - › SAS System Software
 - › SAS DataFlux Software
 - › JMP Software
 - › Mobile Device Software
 - › Third Party Software
 - › Additional Products
 - › Hot Fixes
- Knowledge Base

All Downloads

Downloads

SAS Viya CLI

This package provides the sas-viya binary which is intended to be used with the sas-viya CLI plug-ins.

The SAS Viya Command-Line Interface (CLI) allows you to perform tasks like changing the configuration or updating security rules at the command line. **It can only be used with SAS Viya.** The SAS Viya CLI can run on Linux, Windows or OSX.

[SAS Viya: Using the Command-Line Interface](#)

Requirements

- The CLI requires access to your SAS Viya system.
- The CLI requires that the machine running the tool has access to the internet.

SAS Viya CLI				
Description	Request Download	Size	Release Date	ReadME
sas-viya for Linux	sas-viya-cli-1.21.6-linux-amd64.tgz	3.1 MB	2023-02	txt
sas-viya for OSX	sas-viya-cli-1.21.6-osx.zip	3.1 MB	2023-02	txt
sas-viya for Windows	sas-viya-cli-1.21.6-windows.zip	3.1 MB	2023-02	txt

Command Line Interface - Usage

```
Command Prompt
C:\SAS CDE Data Agent>sas-viya.exe
NAME:
  sas-viya - SAS Viya Command Line Interface

USAGE:
  sas-viya.exe [global options] command [command options] [arguments...]

VERSION:
  1.21.6

COMMANDS:
  authenticate, auth, authn    Handles authentication to the target environment.
  help, h                      Shows a list of commands or help for one command.
  plugins                     Manages plugins.
  profile, prof               Shows and updates options.

GLOBAL OPTIONS:
  --colors-enabled            Enables or disables ANSI colored output. [$SAS_CLI_COLOR]
  --help, -h                 Shows help.
  --insecure, -k             Allows connections to TLS sites without validating the server certificates.
  --locale "en"              Specifies a locale to use. [$LC_ALL, $LANG]
  --log-file                  Specifies the file to write log events to. [$SAS_LOG_FILE]
  --output                    Specifies output format - text, json, fulljson. [$SAS_OUTPUT]
  --profile, -p "Default"    Specifies a named profile to use. [$SAS_CLI_PROFILE]
  --quiet, -q                Quiets spurious output, data only.
  --sas-endpoint              Sets the URL to the SAS services. [$SAS_SERVICES_ENDPOINT]
  --verbose                   Shows detailed processing information and output.
  --version, -v              Prints the version.
  --yes-to-all, -y         Suppresses all confirmation prompts by defaulting to 'yes'.

COPYRIGHT:
  (c) 2016-2023 SAS Institute Inc. All Rights Reserved.
```

Command Line Interface - Usage

Adding ALL plugins
including dagentsrv plugin

C:\ Command Prompt

```
C:\SAS CDE Data Agent>sas-viya plugins install --repo SAS all
Installing all plugins from the SAS repository.
Retrieving source file from the SAS repository...
2907244 bytes downloaded.
Saving audit plugin to C:\Users\eurigm\.sas\viya-plugins\sas-audit-cli-1.19.18-20230217.1676592000.exe...
Plugin audit successfully installed.

2907348 bytes downloaded.
Saving authorization plugin to C:\Users\eurigm\.sas\viya-plugins\sas-authorization-cli-1.20.4-20230302.1677715200.exe...
Plugin authorization successfully installed.

3126072 bytes downloaded.
Saving workload-orchestrator plugin to C:\Users\eurigm\.sas\viya-plugins\sas-workload-orchestrator-cli-1.5.19-20230309.1678320000.exe...
Plugin workload-orchestrator successfully installed.

All plugins from the SAS repository were installed.

C:\SAS CDE Data Agent>
```

Command Line Interface - Overview

- The command-line interface (CLI) is an executable that operates on Windows 64-bit systems, Linux, and Apple macOS systems
 - Written for administrators and provides a shell interface for communicating with a SAS Data Agent driver
- The CLI uses a REST infrastructure to communicate with SAS Data Agent
- It supports commands to create, list, and delete data services. It also provides the capability to view definitions for data sources, catalogs, and schemas.

sas-viya profile init

Initializing
the profile

```
C:\SAS CDE Data Agent> sas-viya profile init
Enter configuration options:

Service Endpoint> https://mwf.ingress-nginx.cde-test-m1.dmmdev.sashq-d.openstack.sas.com:443

Output type (text|json|fulljson)> text

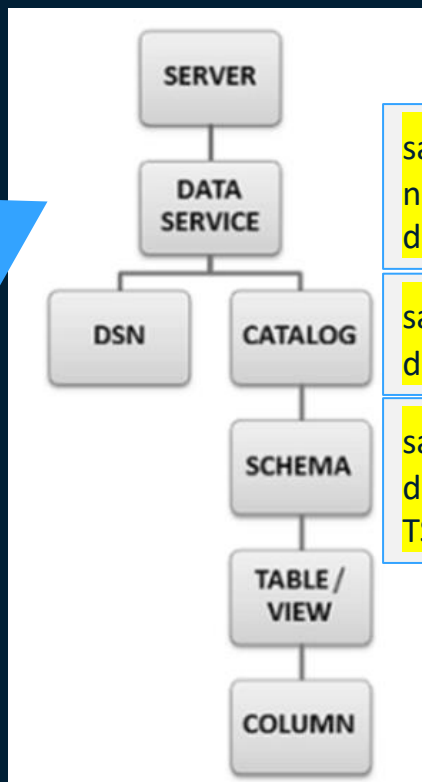
Enable ANSI colored output (y/n)?> y
Saved 'Default' profile to C:\Users\eurigm\.sas\config.json.
```

Point to the
CDE Service
Endpoint

Command Line Interface - Overview

We need to use the Command Line Interface to create/manage the following:

- Data Services
- Data Source Names
- Catalogs
- Schemas



```
sas-viya dagentsrv services create oracle --  
name MY_ORACLE_SERVICE --path tktsora --  
domain TSTAUTO_ORACLE
```

```
sas-viya dagentsrv data-sources catalogs list --  
data-source TSTAUTO_ORACLE
```

```
sas-viya dagentsrv data-sources schemas list --  
data-source TSTAUTO_ORACLE --catalog  
TSTAUTO_ORACLE_RDA
```

Load Data Into SAS via the Cloud Data Exchange

```
1 /* region: Generated preamble */
79
80 libname CDE_ORA cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=XXXXXXX dsn=TSTAUTO_ORACLE preserve_tab_names=yes;
NOTE: Libref CDE_ORA was successfully assigned as follows:
      Engine:          CDE
      Physical Name:  TSTAUTO_ORACLE
81
82 data cars;
83     set CDE_ORA.cars;
84 run;
NOTE: There were 428 observations read from the data set CDE_ORA.cars.
NOTE: The data set WORK.CARS has 428 observations and 15 variables.
NOTE: DATA statement used (Total process time):
      real time          0.29 seconds
      cpu time           0.08 seconds
85
86 /* region: Generated postamble */
97
```

Create a library
pointing to a Cloud
Data Exchange DSN

Demo

The End User perspective

Write a SAS Dataset to an on-premises location

The screenshot displays the SAS Studio interface. The top blue header contains the text "SAS® Studio - Develop Code and Flows" and navigation icons. Below the header is a menu bar with "New", "Options", "View", "Open", and "Save All". The left sidebar, titled "Explorer", shows a tree view of folders including "My Favorites", "Folder Shortcuts", "SAS Server", and "SAS Content". The main area is titled "Start Page" and is divided into three sections: "GET STARTED" with links for "Program in SAS", "Build a flow", "Import data", and "Query data"; "LEARN" with links for "Explore new features in SAS Studio" (marked with a "NEW" badge), "Learn SAS Studio - videos, tutorials, and training", and "Learn SAS programming"; and "STAY CONNECTED" with links for "Join the community" and "Request a feature". On the right, a "RECENTS" section lists four datasets: "MYCARS CDATABASE" (May 10, 2023), "SAVETABLE910 CDATABASE" (Oct 14, 2022), "DATA_SMALL CDATABASE" (Oct 14, 2022), and "CARS CDATABASE" (Sep 6, 2022). The bottom status bar shows "Start Page" on the left and "Submission (0)" on the right.

SAS® Studio - Develop Code and Flows

New Options View Open Save All

Explorer

- My Favorites
- Folder Shortcuts
 - Shortcut to My Folder
- SAS Server
- SAS Content
 - Conversational Flows
 - Decision Repository
 - ESP Projects
 - Model Repositories
 - Products
 - Public
 - Users

Start Page

GET STARTED

- Program in SAS
- Build a flow
- Import data
- Query data

NEW Explore new features in SAS Studio

LEARN

- Learn SAS Studio - videos, tutorials, and training
- Learn SAS programming

STAY CONNECTED

- Join the community
- Request a feature

RECENTS

MYCARS CDATABASE	May 10, 2023, 4:42:02 PM
SAVETABLE910 CDATABASE	Oct 14, 2022, 4:00:36 AM
DATA_SMALL CDATABASE	Oct 14, 2022, 3:59:30 AM
CARS CDATABASE	Sep 6, 2022, 10:16:13 AM

Start Page Submission (0)

CDE Library and table read from Snowflake

The screenshot displays the SAS Studio interface. At the top, a blue header bar contains the text "SAS® Studio - Develop Code and Flows" and navigation icons. Below this is a menu bar with "New", "Options", "View", "Open", and "Save All". On the left, an "Explorer" pane lists various project folders such as "My Favorites", "Folder Shortcuts", "SAS Server", and "SAS Content". The main workspace is titled "Start Page" and features a "GET STARTED" section with links for "Program in SAS", "Build a flow", "Import data", and "Query data". A "LEARN" section offers resources for learning SAS Studio and programming. A "STAY CONNECTED" section includes links to join the community and request features. The right side of the page contains a "Welcome to SAS STUDIO" message, describing it as a rich environment for developing code and design flows. Below this, there are sections for "Programs", "Flows", "Tasks", "Data Access", and "Data Preparation", each with a brief description. A diagram on the right illustrates a flow or task sequence with colored boxes and arrows.

SAS® Studio - Develop Code and Flows

New Options View Open Save All

Explorer

- My Favorites
- Folder Shortcuts
 - Shortcut to My Folder
- SAS Server
- SAS Content
 - Conversational Flows
 - Decision Repository
 - ESP Projects
 - Model Repositories
 - Products
 - Public
 - Users

Start Page

GET STARTED

- Program in SAS
- Build a flow
- Import data
- Query data

NEW Explore new features in SAS Studio

LEARN

- Learn SAS Studio - videos, tutorials, and training
- Learn SAS programming

STAY CONNECTED

- Join the community
- Request a feature

Welcome to
SAS STUDIO

A rich environment to develop code and design flows.

Programs
Write programs using the robust SAS language.

Flows
Simplify and model repeatable steps.

Tasks
Analyze data and create reports via point-and-click wizards.

Data Access
Import and access data seamlessly.

Data Preparation
Join, filter, sort, and transform data via a robust query.

Recover (4) | Submission (0)

CDE Library and Proc Freq against a DB2 on-premises table

The screenshot displays the SAS Studio interface. The top navigation bar includes a menu icon, the title "SAS® Studio - Develop Code and Flows", and utility icons for search, refresh, help, and user profile. Below the navigation bar is a menu with "New", "Options", "View", "Open", and "Save All".

The left sidebar, titled "Explorer", contains a tree view of the project structure:

- My Favorites
- Folder Shortcuts
 - Shortcut to My Folder
- SAS Server
- SAS Content
 - Conversational Flows
 - Decision Repository
 - ESP Projects
 - Model Repositories
 - Products
 - Public
 - Users

The main workspace shows the "Start Page" with the following content:

GET STARTED

- Program in SAS
- Build a flow
- Import data
- Query data

NEW Explore new features in SAS Studio

LEARN

- Learn SAS Studio - videos, tutorials, and training
- Learn SAS programming

STAY CONNECTED

- Join the community
- Request a feature

The right side of the page features a "Welcome to SAS STUDIO" message, describing it as a rich environment for developing code and design flows. It lists several capabilities:

- Programs:** Write programs using the robust SAS language.
- Flows:** Simplify and model repeatable steps.
- Tasks:** Analyze data and create reports via point-and-click wizards.
- Data Access:** Import and access data seamlessly.
- Data Preparation:** Join, filter, sort, and transform data via a robust query.

An illustration on the right shows a flow diagram with nodes and arrows, representing a data process.

At the bottom of the interface, the status bar shows "Start Page" on the left and "Recover (2) | Submission (0)" on the right.

CDE Libraries against Cloud and On-premises sources

SAS® Studio - Develop Code and Flows

New Options View Open Save All

May 15, 2023, 1:12:42 PM

Explorer

- My Favorites
- Folder Shortcuts
 - Shortcut to My Folder
- SAS Server
- SAS Content
 - Conversational Flows
 - Decision Repository
 - ESP Projects
 - Model Repositories
 - Products
 - Public
 - Users

Code Log Results

```
1 /* Cloud Data Exchange - Libraries
2 Accessing Data on remote customer site via a Remote Data Agent
3 Configuration of the Data Sources are done via a CLI, leaving database credentials on site */
4
5
6 libname CDE_BASE cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=BASE preserve_tab_names=yes;
7 libname CDE_ORA cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_DATAAGENT_ORACLE preserve_tab_names=yes;
8 libname CDE_DBRC cde dataagentname="sas-data-agent-server-colocated" uid=dbitest pwd=&pw dsn=TSTAUTO_DATABRICKS preserve_tab_names=yes;
9 libname CDE_DB2 cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_DB2 preserve_tab_names=yes;
10 libname CDE_FED cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_FEDSVR_ADMIN preserve_tab_names=yes;
11 libname CDE_NFS cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_FT_NFS preserve_tab_names=yes;
12 libname CDE_S3 cde dataagentname="sas-data-agent-server-colocated" uid=dbitest pwd=&pw dsn=TSTAUTO_FT_S3 preserve_tab_names=yes;
13 libname CDE_HDP cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_HADOOP preserve_tab_names=yes;
14 libname CDE_IMP cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_IMPALA preserve_tab_names=yes;
15 libname CDEODATA cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_JDBC_ODATA_NWIND preserve_tab_names=yes;
16 libname CDE_JDBC cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_JDBC_POSTGRES preserve_tab_names=yes;
17 libname CDE_MSQL cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_MYSQL preserve_tab_names=yes;
18 libname CDE_ODBC cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_ODBC_ORACLE preserve_tab_names=yes;
19 libname CDE_ORA2 cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_ORACLE preserve_tab_names=yes;
20 libname CDE_PGR cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_POSTGRES preserve_tab_names=yes;
21 libname CDE_REDS cde dataagentname="sas-data-agent-server-colocated" uid=dbitest pwd=&pw dsn=TSTAUTO_REDSHIFT preserve_tab_names=yes;
22 libname CDE_HANA cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_SAPHANA preserve_tab_names=yes;
23 libname CDE_SNOW cde dataagentname="sas-data-agent-server-colocated" uid=dbitest pwd=&pw dsn=TSTAUTO_SNOWFLAKE preserve_tab_names=yes;
24 libname CDE_SPRK cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_SPARK preserve_tab_names=yes;
25 libname CDE_SQLS cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_SQLSERVER preserve_tab_names=yes;
26 libname CDE_TERA cde dataagentname="mwf-cdetest-rda" uid=dbitest pwd=&pw dsn=TSTAUTO_TERADATA preserve_tab_names=yes;
```

SAS Program.sas [temp]

Recover (3) Submission (0)

CDE Data source usage with Visual Analytics

The screenshot displays the SAS Visual Analytics interface. The top navigation bar is blue and contains the text "SAS® Visual Analytics - Explore and Visualize" along with search, notification, and help icons. Below the navigation bar, the main header reads "Explore and Visualize" and "Explore data, apply predictive analytics, and build interactive reports with SAS Visual Analytics." To the right of the header are two buttons: "New Report" and "Start with Data".

On the left side, there is a sidebar with a search bar and a list of navigation options: "Recent", "My Favorites", "My Folder", "Shared with Me", "All Reports", and "Recommended". The "Recent" section is currently selected. Below the sidebar, a large graphic of a plus sign inside a square is displayed with the text "No items were recently opened." To the right of this graphic is a "Sort by:" dropdown menu set to "Last opened" and a view toggle icon.

The main content area on the right shows a report titled "Regional Revenue". The report includes a map of a region with data points, a bar chart, and a table. The table has the following data:

Product Line	Revenue
Product Line 1	1.7K
Product Line 2	5.4K
Product Line 3	1.7K

Additional elements in the interface include a "Manage templates" link and a vertical sidebar on the far right with icons for "Options", "Roles", "Actions", "Rules", "Filters", and "Ranks".

Data Masking with Cloud Data Exchange

Using FedSQL Views

Command Line Interface – FedSQL Views

```
sas-viya dagentsrv views --help
```

```
C:\SAS CDE Data Agent>sas-viya dagentsrv views --help
NAME:
  sas-dagentsrv-cli views - Manage views.

USAGE:
  sas-dagentsrv-cli views command [command options]

VERSION:
  2.1.16

COMMANDS:
  create      Create a view.
  delete      Delete a view.
  help, h     Shows a list of commands or help for one command.
  show       Show the definition of an existing view.

OPTIONS:
  --help, -h  Shows help.
```

The root command to
create/delete a FedSQL view

Command Line Interface – FedSQL Views

```
sas-viya dagentsrv views create --dsn BASE --name CarsView  
--sql "SELECT * FROM TSTAUTO_BASE_CAT1_CDA.MYCARS"
```

The command to
create a FedSQL view

```
C:\SAS CDE Data Agent> sas-viya dagentsrv views create --dsn BASE --name CarsView --sql  
"SELECT * FROM TSTAUTO_BASE_CAT1_CDA.MYCARS"  
View successfully created.
```

```
sas-viya dagentsrv views delete --dsn BASE --name CarsView
```

The command to
delete a FedSQL view

```
C:\SAS CDE Data Agent> sas-viya dagentsrv views delete --dsn BASE --name CarsView  
View successfully deleted.
```

```
1 /* region: Generated preamble */  
79  
80 data test; set cdatabase.carsview; run;  
NOTE: There were 428 observations read from the data set CDATABASE.carsview.  
NOTE: The data set WORK.TEST has 428 observations and 15 variables.  
NOTE: DATA statement used (Total process time):  
    real time          1.92 seconds  
    cpu time           0.19 seconds
```

Using the FedSQL
View in a Datastep

Command Line Interface – FedSQL Views

```
sas-viya dagentsrv views create --dsn BASE --name CarsView2 --sql  
"SELECT MAKE,MODEL,TYPE FROM TSTAUTO_BASE_CAT1_CDA.MYCARS"
```

The command to
create a FedSQL view

```
C:\SAS CDE Data Agent> sas-viya dagentsrv views create --dsn BASE --name CarsView2 --sql  
"SELECT MAKE,MODEL,TYPE FROM TSTAUTO_BASE_CAT1_CDA.MYCARS"  
View successfully created.
```

CARSVIEW2 Table rows: -- | Columns: 3 of 3 | Rows 1 to 200

Enter expression

	MAKE	MODEL	TYPE
1	Acura	MDX	SUV
2	Acura	RSX Type S 2dr	Sedan
3	Acura	TSX 4dr	Sedan
4	Acura	TL 4dr	Sedan
5	Acura	3.5 RL 4dr	Sedan
6	Acura	3.5 RL w/Navigation 4dr	Sedan

Opening the FedSQL
View in the Table
Viewer

Command Line Interface – FedSQL Views

```
sas-viya dagentsrv views create --dsn BASE --name CarsView3 --sql "SELECT MAKE,MODEL,TYPE,SYSCAT.DM.MASK('HASH','INVOICE','alg','MD5','KEY','Abcd1234') AS INVOICE_HASH FROM TSTAUTO_BASE_CAT1_CDA.MYCARS"
```

The command to create a FedSQL view with Hashing

```
C:\SAS CDE Data Agent> sas-viya dagentsrv views create --dsn BASE --name CarsView3 --sql "SELECT MAKE,MODEL,TYPE,SYSCAT.DM.MASK('HASH','INVOICE','alg','MD5','KEY','Abcd1234') AS INVOICE_HASH FROM TSTAUTO_BASE_CAT1_CDA.MYCARS"
View successfully created.
```

```
sas-viya dagentsrv views create --dsn BASE --name CarsView4 --sql "SELECT MAKE,MODEL,TYPE,SYSCAT.DM.MASK('ENCRYPT',PUT('INVOICE',8.),'alg','AES') AS INVOICE_MASK FROM TSTAUTO_BASE_CAT1_CDA.MYCARS"
```

The command to create a FedSQL view with Encryption

```
C:\SAS CDE Data Agent> sas-viya dagentsrv views create --dsn BASE --name CarsView4 --sql "SELECT MAKE,MODEL,TYPE,SYSCAT.DM.MASK('ENCRYPT',PUT('INVOICE',8.),'alg','AES') AS INVOICE_MASK FROM TSTAUTO_BASE_CAT1_CDA.MYCARS"
View successfully created.
```

CARSVIEW4				
Table rows: -- Columns: 4 of 4 Rows 1 to 200				
	MAKE	MODEL	TYPE	INVOICE_MASK
1	Acura	MDX	SUV	BDC621239A4D2A45DE86EE340CAB1C1E33FA
2	Acura	RSX Type S 2dr	Sedan	DFE1DEF8FD2004387CB79D44E46FBF2285AA
3	Acura	TSX 4dr	Sedan	F9F8F5E678A3AF626ABE1D680A3B5BC682B2
4	Acura	TL 4dr	Sedan	410F00887EER2B3306C3E555C584661B7CER

Cloud Data Exchange

What's New in Viya 4

Included across all main Viya 4 packages

- E.g. SAS Viya, SAS Viya Advanced, SAS Viya Enterprise...

It supports both Libname connection to CDE and CASLIB

Remote Data Agent delivered as a OCI image container

- E.g.  The Container can easily be deployed in Docker using Container Manager



New connectors

- Snowflake, Amazon Redshift, Amazon S3, etc.

Cloud Data Exchange

Part of a wider data connectivity layer Vision

- Connections to data sources
 - Simplification, Drivers, Discovery, Extend support, RT Data, Versioning, remote/local
- Virtualisation
 - Views, Caching, Security, Logging
- Security
 - Simplify, SSO, Row/Column, Attribute based, Auto-mask data
- Logging
 - Reporting, Defining
- Publishing data
 - API, Marketplace
- Data movement/transformation
 - Batch, Conversion/Transformation, Synchronization
- SQL query layer
 - Simple SQL interface to view/update data, Interactive, code explanation
- Query optimization
 - Pushdown, joins, statistics, analyze
- In-Database processing
 - SQL, DS2, DS, other languages
- Data retention
 - How Long, last updated, rules and actions (archive/delete)

Data Connectivity Layer Vision

CDE delivers some elements

- **Connections to data sources**
 - Simplification, Drivers, Discovery, Extend support, RT Data, Versioning, **remote/local**
- **Virtualisation**
 - **Views**, Caching, **Security**, **Logging**
- Security
 - Simplify, SSO, Row/Column, Attribute based, Auto-mask data
- **Logging**
 - Reporting, **Defining**
- Publishing data
 - API, Marketplace
- **Data movement/transformation**
 - **Batch**, Conversion/Transformation, Synchronization
- SQL query layer
 - Simple SQL interface to view/update data, Interactive, code explanation
- Query optimization
 - **Pushdown**, joins, statistics, analyze
- In-Database processing
 - **SQL**, DS2, DS, other languages
- Data retention
 - How Long, last updated, rules and actions (archive/delete)

Cloud Data Exchange

What's Next – Still under discussion



- Additional Data Source Support
- Additional Cloud Storage Support – ADLS, GCS
- UI rather than CLI to improve admin user experience
- File Transfer to include transform e.g. SAS7BDAT on site to Parquet in S3
- Use CDE as way of providing third party tools access to SAS Data, via JDBC/ODBC like that provided in SAS Federation Server
- Use CDE as method of querying data without need to start Compute/CAS session

Useful Resources

- https://go.documentation.sas.com/doc/en/dataagentcdc/v_001/dataagentwlcw/home.htm

The screenshot shows the SAS Help Center interface. At the top, there is a navigation bar with the SAS logo, 'SAS® Help Center', 'Customer Support', and 'SAS Documentation'. Below this is a secondary navigation bar with a hamburger menu, 'Cloud Data Exchange for the SAS® Viya® Platform | 2023.03 - 2023.04', a search icon, and links for 'PDF', 'EPUB', and 'Feedback'. The main content area is titled 'Welcome' and features a large heading: 'Welcome to Cloud Data Exchange for the SAS Viya Platform'. Below the heading, there is a section for 'SAS Viya Platform' with two columns of links. The left column is titled 'Administrator's Guide' and includes links for 'Roadmap for Getting Started', 'About Cloud Data Exchange', 'SAS Data Agent and Security Concepts', 'Data and the Command Line Interface', and 'Configure Cloud Data Exchange for CAS'. The right column is titled 'Remote SAS Data Agent: Deployment Guide' and includes links for 'Quick Start', 'Frequently Asked Questions', 'Configure Remote SAS Data Agent', 'Configure Data Sources', and 'Migrate Data'. At the bottom of the page, there is a footer with 'English', 'Privacy Statement', 'Terms of Use', and 'Copyright © SAS Institute Inc. All Rights Reserved'.

SAS® Help Center Customer Support | SAS Documentation

Cloud Data Exchange for the SAS® Viya® Platform | 2023.03 - 2023.04

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Welcome

Welcome to Cloud Data Exchange for the SAS Viya Platform

SAS Viya Platform

Administrator's Guide

- Roadmap for Getting Started
- About Cloud Data Exchange
- SAS Data Agent and Security Concepts
- Data and the Command Line Interface
- Configure Cloud Data Exchange for CAS

Remote SAS Data Agent: Deployment Guide

- Quick Start
- Frequently Asked Questions
- Configure Remote SAS Data Agent
- Configure Data Sources
- Migrate Data

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Useful Resources

- https://go.documentation.sas.com/doc/en/dataagentcdc/v_001/dplydagent0ctr/p0c9masik486odn1kb6p17pfs8tt.htm

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Cloud Data Exchange for the SAS® Viya® Platform | 2023.03 - 2023.04 Q PDF EPUB Feedback ⋮

Welcome ◀ ▶

- ▶ Administrator's Guide
- ▶ **Remote SAS Data Agent: Deployment Guide**
 - Quick Start**
 - Frequently Asked Questions
 - Requirements
 - ▶ Configuration
 - ▶ Software Updates
 - Migrate Data
 - ▶ Reference Topics
- ▶ Other Resources

Remote SAS Data Agent: Deployment Guide

Quick Start for Remote SAS Data Agent

- How to Use the Quick Start
- First Steps
 - Configure Connectivity to the SAS Viya Platform
 - Run the Container
 - Download the dagentsrv plug-in to the sas-viya CLI and Sign In
 - Register Remote SAS Data Agent with the SAS Viya Platform
 - Example: Test Remote SAS Data Agent
- Next Steps

How to Use the Quick Start

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Useful Resources

Supported Data Service types

- https://go.documentation.sas.com/doc/en/dataagentcdc/v_001/dataagentag/p0h7sl2w1qypz3n1dl78v23hyx1h.htm?fromDefault=

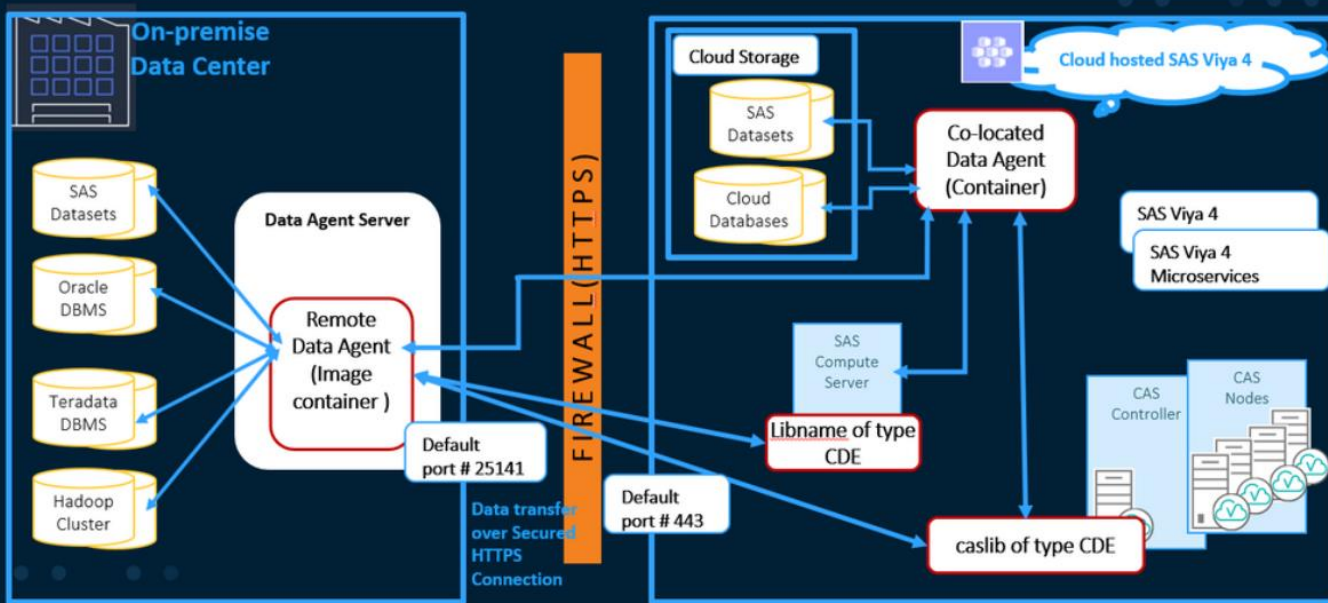
Command Line Interface (CLI)

https://go.documentation.sas.com/doc/en/dataagentcdc/v_001/dataagentag/n1k7qsb4adtpcyn1m7vofq4b0ada.htm

Useful Resources

- <https://communities.sas.com/t5/SAS-Communities-Library/SAS-Cloud-Data-Exchange-for-the-SAS-Viya-Platform/ta-p/873764>

SAS Viya Cloud Data Exchange (CDE)



Questions ?