

# **Secure Data Commons**

## **Data Analyst User Guide**

**[www.its.dot.gov/index.htm](http://www.its.dot.gov/index.htm)**  
**Draft Report — January 23, 2020**  
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## Revision History

#	Name	Version	Revision Date	Revision Description
1	REAN Cloud	1.0	08/02/2018	Initial Draft
2	REAN Cloud	2.0	09/13/2018	Added the Export Functionality
3	REAN Cloud	3.0	10/29/2019	Added the Manage Workstations chapter and updated the Guide per feedback comments
4	SDC Team	4.0	01/08/2020	Added Chapter 7 Setting Up SDC with GitLab Repositories, added FMI section to Chapter 4 Sample Queries for SDC Datasets, added commands to the “AWS S3 CLI Commands” section under Chapter 8, added note about printing documents in Chapter 6
5	SDC Team	5.0	01/23/2020	Added instructions for setting up and logging in with Login.gov in Chapter 2

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# Chapter 1. Introduction and Document Overview

The Secure Data Commons (SDC) is a United States Department of Transportation (U.S. DOT) sponsored cloud-based analytical sandbox designed to create wider access to sensitive transportation datasets, with the goal of advancing the state of the art of transportation research and state/local traffic management.

The SDC stores sensitive transportation data made available by participating Data Providers, and grants access to approved researchers to these datasets. The SDC also provides access to open source tools and allows researchers to collaborate and share code with other system users.

The SDC platform is a research environment that allows users to conduct analyses and do development and testing of new tools and software products. It is not intended to be an alternative to any local jurisdiction's traffic management center or local data repository. The current SDC platform provides users with the following data, tools, and features:

- **Data:** The SDC is ingesting several datasets currently. Additional datasets will be added to the environment over time. Users can bring their own data into the environment to use along with the Waze data.
- **Tools:** The environment provides access to open source tools including Python, RStudio, Microsoft R, SQL Workbench, Power BI, Libre Office, and Jupyter Notebook. These tools are available on a virtual machine in the system enabling data analytics in the cloud.
- **Functionality:** Users can access and analyze data within the environment, save their work to a virtual machine, and publish processes and results to share with other SDC users.

The SDC platform supports two major roles:

- **Data Providers** – These are entities that provide data hosted on the SDC platform. The Data Provider establishes the data protection needs and acceptable use terms for the data analysts.
- **Data Analysts** – These are entities that conduct analysis using the datasets hosted within the SDC system. Note that analysts can bring their own data and tools into the SDC system.

This document provides guidance for the **Data Analyst** role. A similar guide will be prepared for the Data Providers. This document is organized as follows:

- Initial Setup and Validation
- Workstation Access
- Sample Queries

- Exporting Data
- Importing and Exporting Code
- Accessing External Data Sources within SDC
- Setting Up GitLab with SDC
- Technical Support and Contact Information
- Frequently Asked Questions

## Prerequisites

Workstation access will not be granted for a Data Analyst user until the user has:

1. Submitted a completed Access Request Form;
2. Received approval for the request;
3. Received an email message with onboarding instructions from the support team; and
4. Received a walkthrough of the system from the support team.

Refer to the [Useful Links](#) section later in the document for further information on technologies relevant to SDC.

# Chapter 2. Initial Setup and Validation

This chapter provides guidance on the initial setup and validation of the user into the SDC system.

## Accessing Secure Data Commons Portal

Users can access the SDC web portal by navigating to <https://portal.securedatacommons.com>.

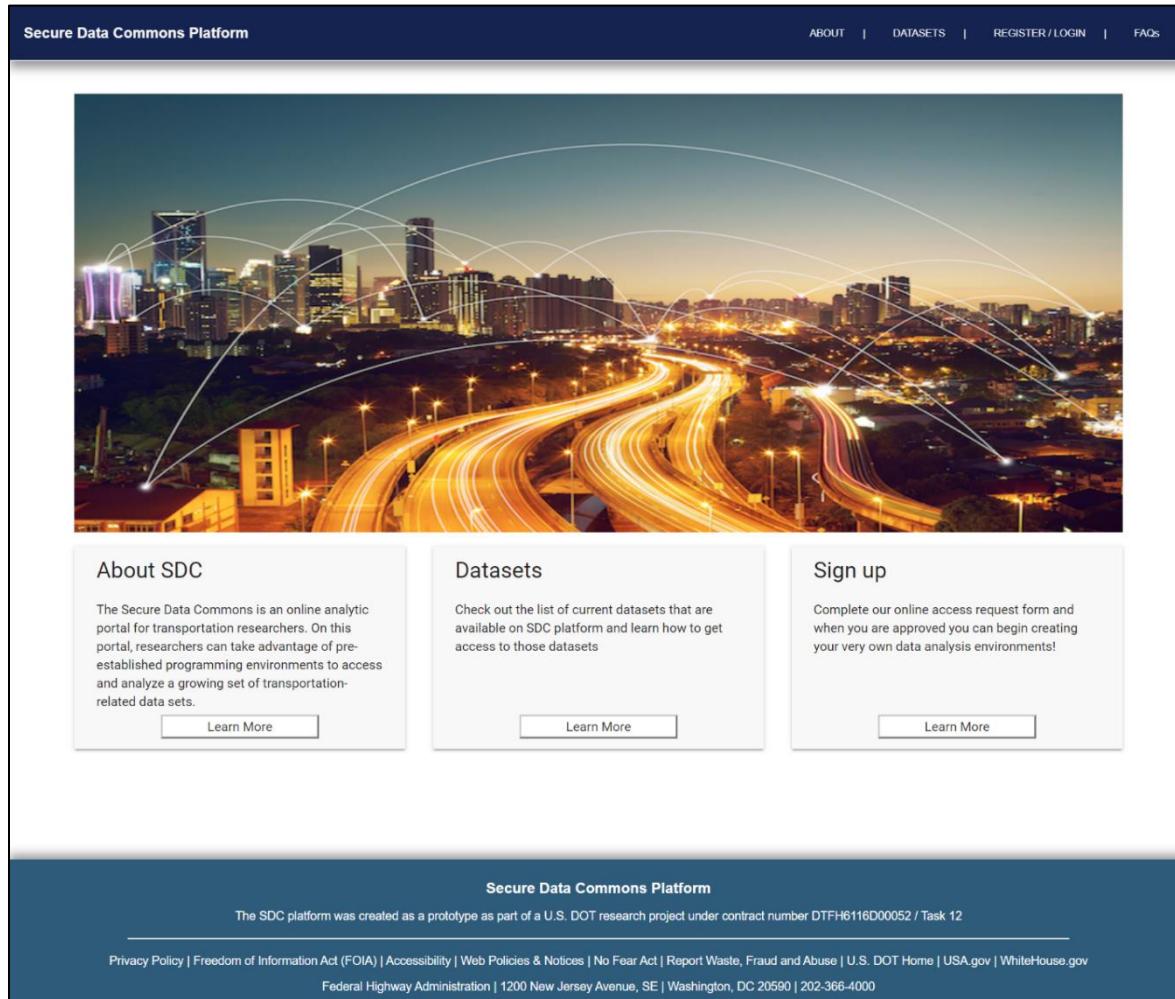


Figure 1: SDC Starting Homepage

## Chapter 2. Initial Setup and Validation

Select Register/Login from the top menu to display the Access Request Form and Privacy Policy links, as well as the email address sign-in prompt. The Access Request Form takes you to a PDF form in which you can provide the support team with contact info, a rationale for your access request, your preferred workstation type, and sign-off for the SDC data use agreements.

If you have a DOT email address (@dot.gov), enter it into Email Address and then select Sign In to access the portal. If you do not have a DOT email address, continue to Page 5.

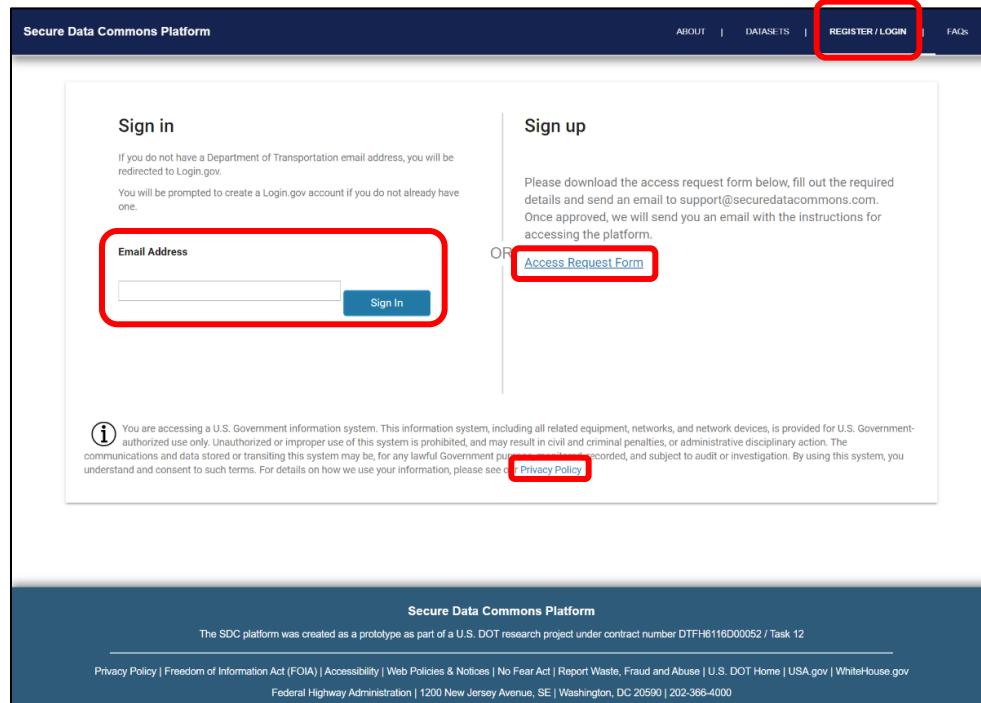


Figure 2: SDC Portal – Register/Login Page

After signing in, you will be redirected to the Secure Data Commons platform login page:

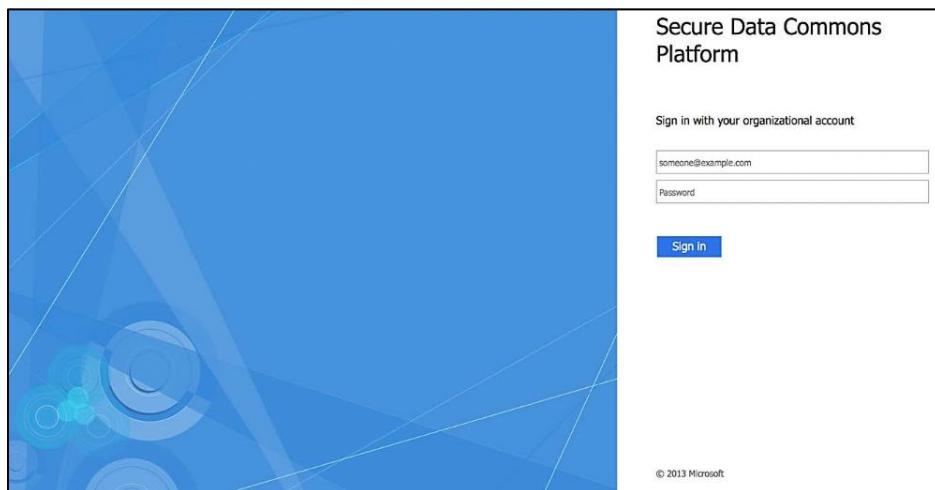


Figure 3: SDC Portal – Login Page

If you do not have a DOT email address, enter the email address you would like to use as your Login.gov account and then select Sign In to be redirected to the Login.gov website, where you can create a new account. If you already have an existing Login.gov account, enter your credentials and then click Sign in (skip to step 6 further below as you will be redirected to the one-time accounts synchronization form). Below is an overview of the account creation process.

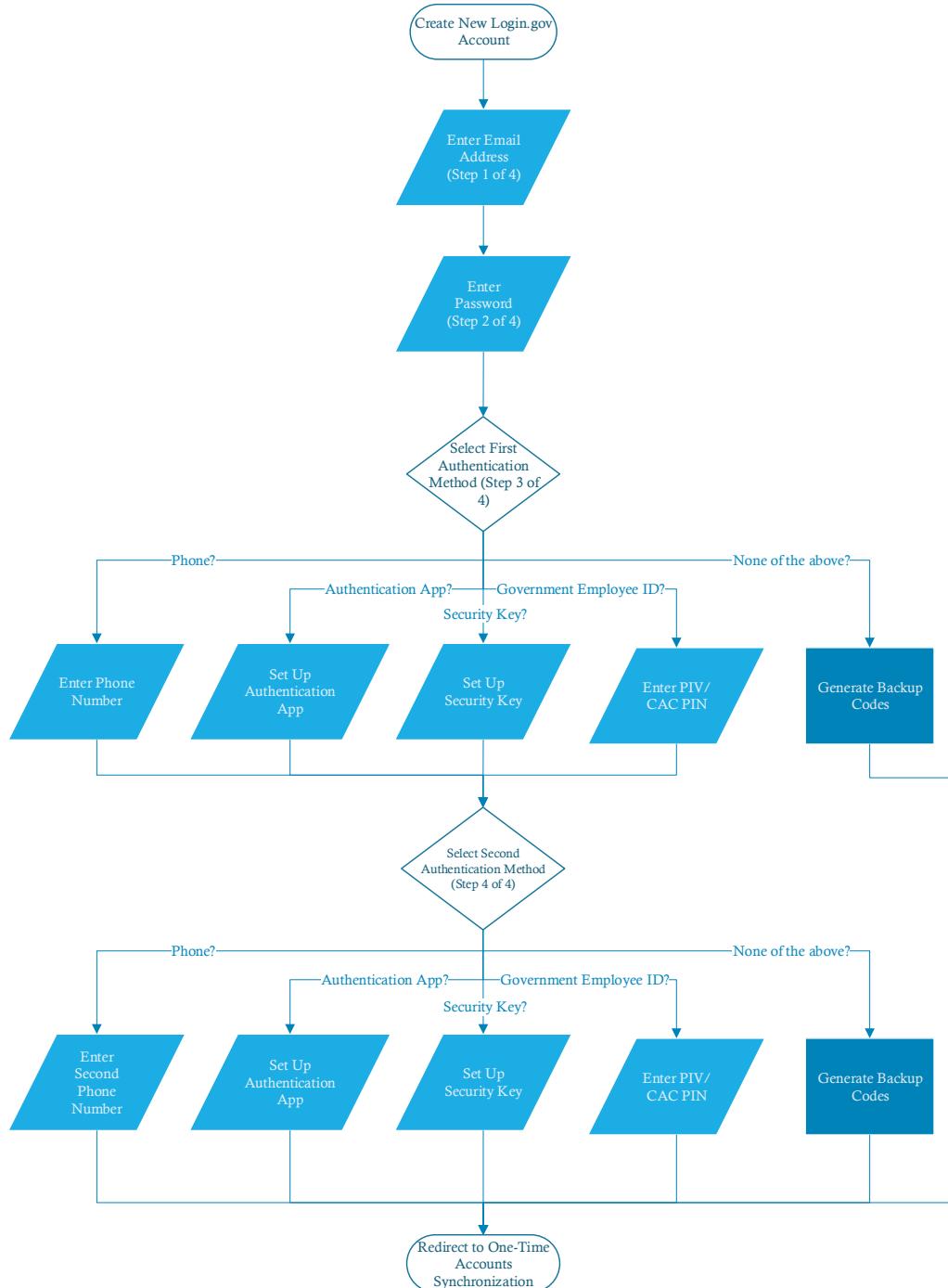


Figure 4: Login.gov – Overview of Login.gov Account Creation

## Chapter 2. Initial Setup and Validation

1. Select the “Create an account” link on the login page to create a new Login.gov account.

The screenshot shows the Login.gov login page. At the top, there is a banner with the text "TEST SITE - Do not use real personal information (demo purposes only) - TEST SITE" and "A DEMO website of the United States government". Below the banner, the LOGIN.GOV logo is displayed. The main content area features a graphic of a person connecting to a computer screen. The text "USDOT's Secure Data Commons is using login.gov to allow you to sign in to your account safely and securely." is displayed. Below this are fields for "Email address" and "Password", a "Sign In" button, and a link "Don't have an account? [Create an account](#)". The "Create an account" link is highlighted with a red rectangle. Below these fields are links for "Sign in with your government employee ID...", "Back to USDOT's Secure Data Co...", "Forgot your password?", and "Security Practices and Privacy Act Statement". At the bottom of the page, there is a footer with links for "U.S. General Services Administration", "Language", "HELP", "CONTACT", and "PRIVACY & SECURITY".

Figure 5: Login.gov – Create New Account

2. For Step 1 of 4, enter the email address you want to use for the Login.gov account and then select Submit.

The screenshot shows the first step of a four-step account creation process. The title "STEP 1 OF 4" is at the top, followed by the instruction "Enter your email address". There is a field labeled "Email address" with a placeholder "Email address" and a "Submit" button below it. At the bottom of the form are links for "Cancel" and "Security Practices and Privacy Act Statement".

Figure 6: Login.gov – Enter Account Email Address

You will receive an email message from Login.gov that contains a link to verify your email address. Select Confirm email address to continue to the Step 2 of 4 form.

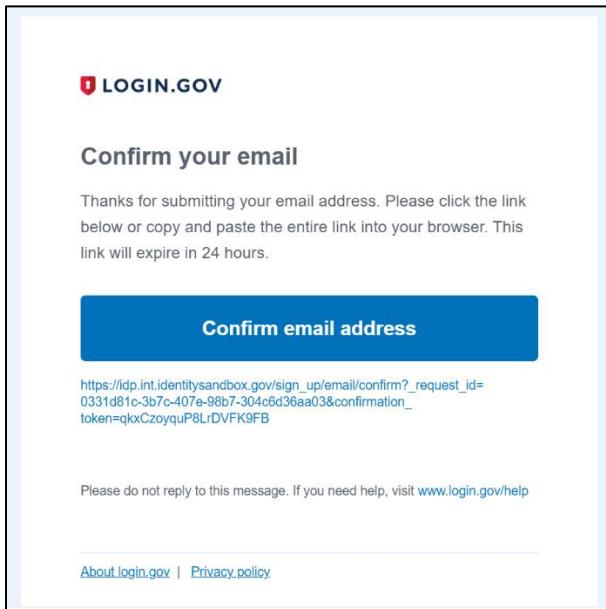


Figure 7: Login.gov – Email Address Confirmation

3. For Step 2 of 4, enter a password made up of at least 12 characters and then select Continue.

The screenshot shows a web page titled "STEP 2 OF 4" and "CREATE A STRONG PASSWORD". It informs the user that the password must be at least 12 characters long and not be a commonly used password. A "Password" input field is shown with a "Show password" link. Below the input field, a progress bar indicates a "Great!" password strength. A "Continue" button is present. At the bottom, there is a "Password safety tips" section with a "+" icon and a link to "Cancel account creation".

Figure 8: Login.gov – Create Account Password

4. For Step 3 of 4, you are prompted to select the first of two authentication methods to be used for securely signing into your account. Select any of the options and then select Continue.

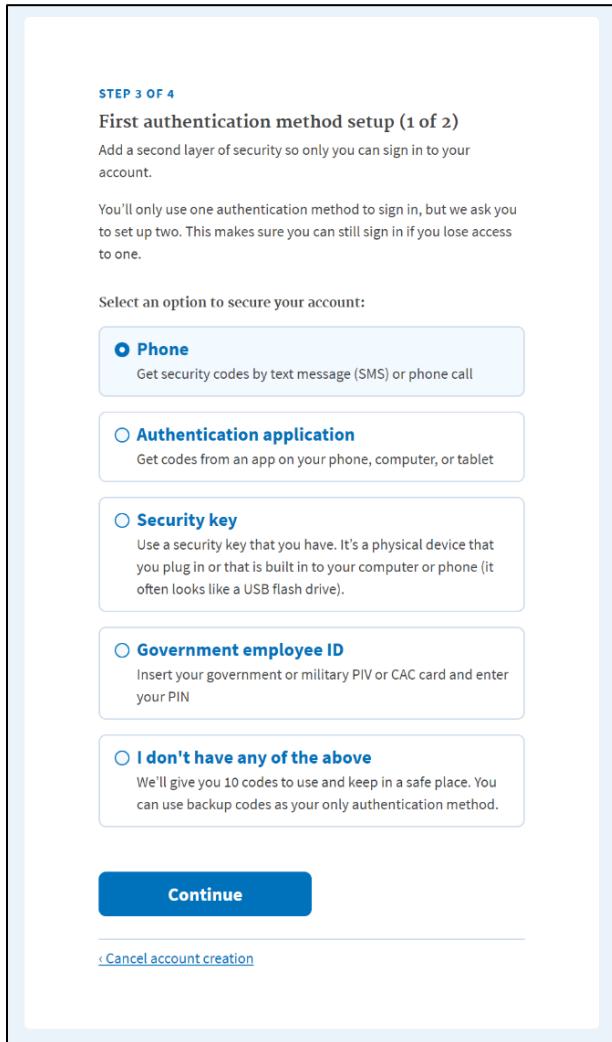


Figure 9: Login.gov – Select First Authentication Method

- a. Select Phone and then Continue to enter a phone number to receive a text message or phone call with an authentication code for signing in. Select Text message or Phone call and then select Send Code to generate a security code to verify the phone as the authentication method.

The screenshot shows a step 3 of 4 process for sending a security code. It features a telephone icon with a green oval containing four asterisks. The text reads: "Send your security code via text message (SMS) or phone call. We'll send you a security code each time you sign in. If you entered a landline, please select "Phone call" below. Message and data rates may apply." Below this, there is a "Phone number" input field with a placeholder "(201) 555-0123" and a dropdown menu showing "US". A section titled "How should we send you a code?" asks if the user can change their selection next time they sign in. It includes two radio button options: "Text message (SMS)" (selected) and "Phone call". A large blue "Send code" button is at the bottom, with a link "Choose another option" below it.

Figure 10: Login.gov – Authentication with Phone

Enter the security code you received over the phone and then select Submit.

The screenshot shows a step 3 of 4 process for entering a security code. It has the heading "Enter your security code" and a note: "We sent a security code to +1. This code will expire in 10 minutes." Below this is a "One-time security code" input field with a "Submit" button to its right. There are also "Get another code" and "Remember this browser" buttons. A note at the bottom says "Entered the wrong phone number? [Use another phone number](#)". A "Choose another option" link is at the very bottom.

Figure 11: Login.gov – Phone Security Code

A success message is shown. Select Continue and proceed to step 5 to set up the second authentication method.

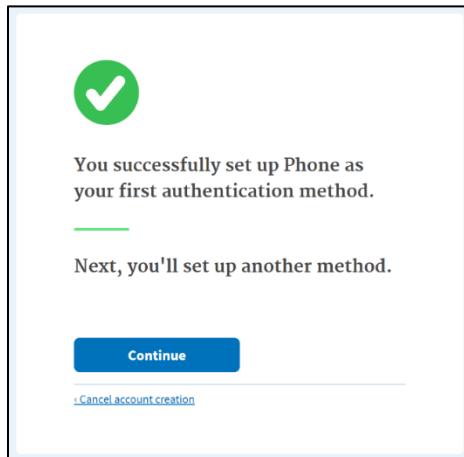


Figure 12: Login.gov – Phone Setup Success

- b. Select Authentication application and then Continue to set up an authentication app on your phone, computer, or tablet that generates authentication codes for sign-in. You can select the “What is an authentication app?” link to view app setup instructions and examples of authentication apps that can be used. You must manually enter the provided key into your app or scan the barcode with your app. Enter the code generated from your app and then select Submit.

A screenshot of a web page titled "STEP 3 OF 4 Add an authentication app". The title is followed by the sub-instruction "Set up an authentication app to sign in using temporary security codes. [What is an authentication app?](#)". The page is divided into four numbered steps:

- 1 Give it a nickname  
If you add more than one app, you'll know which ones which.  
[Input field]
- 2 Open your authentication app
- 3 With your app, enter this key manually or scan the barcode  
[Text input field containing "TJ7D3FBCCWXEOSG"]  
[Copy button]  
OR>  
[Scan code with your mobile device button]
- 4 Enter the temporary code from your app  
[Input field]  
[Submit button]

At the bottom of the form are two links: "[Remember this browser](#)" and "[Choose another option](#)".

Figure 13: Login.gov – Authentication with Phone/Computer/Tablet App

A success message is shown. Select Continue and proceed to step 5 to set up the second authentication method.

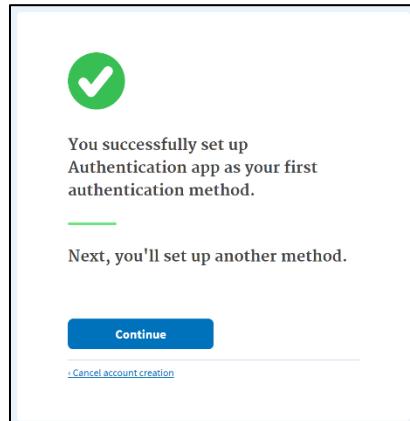


Figure 14: Login.gov – Authentication App Setup Success

- c. Select Security key and then Continue to use a FIDO-compliant physical device you can plug in or that is built into your computer or phone to generate authentication codes for sign-in. Enter a nickname for the security key and then select Continue.

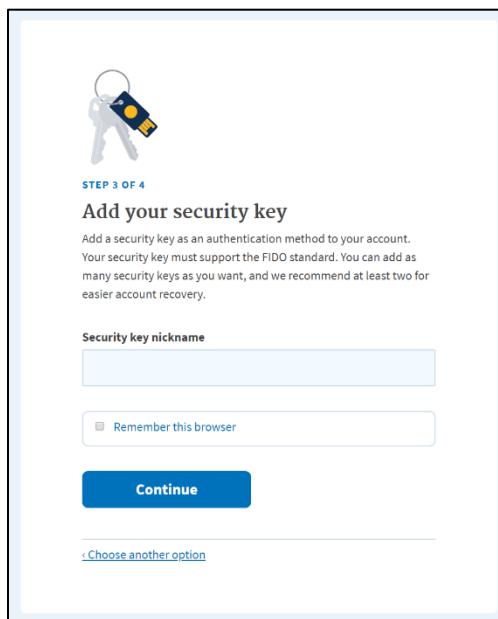


Figure 15: Login.gov – Authentication with Security Keys

Your computer will prompt you to use your security key to proceed with setup. Proceed to step 5 after setting up the security key to set up the second authentication method.

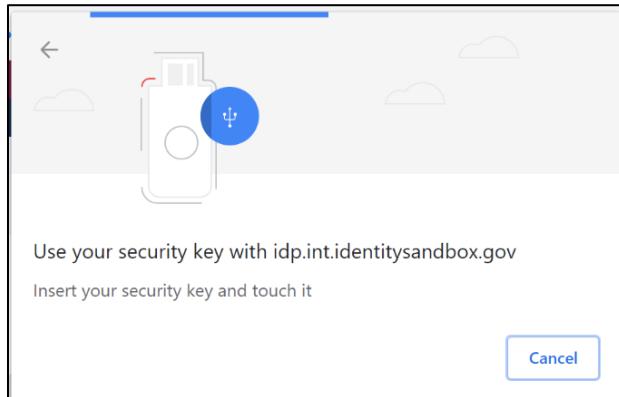


Figure 16: Login.gov – Security Key Setup

- d. Select Government employee ID and then Continue to use your government or military PIV or CAC card as the authentication method. Your card will be set up as the two-factor authentication method for signing in. Insert your PIV/CAC card into your card reader and then select Add PIV/CAC card. Proceed to step 5 after setting up the card.

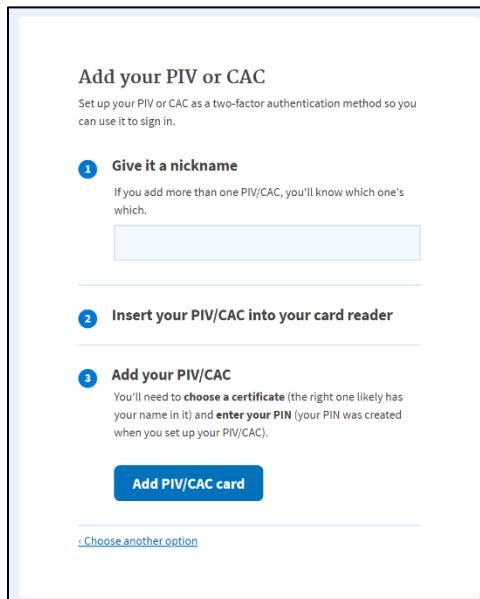


Figure 17: Login.gov – Authentication with Government PIV/CAC Card

- e. Select “I don’t have any of the above” and then Continue to generate 10 backup codes to use as your authentication method. You will not be able to use a backup code after it has been used to sign in; however, 10 new codes will be generated after they have all been used up. A warning message will be shown to indicate that using backup codes are not the most secure authentication method. Select Continue to proceed with generating the backup codes.

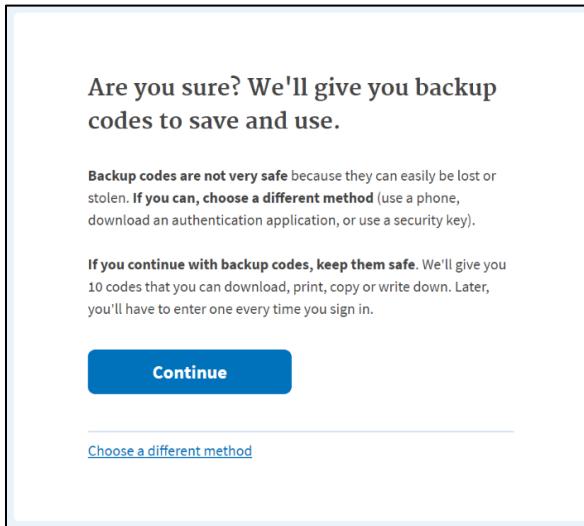


Figure 18: Login.gov – Backup Codes Warning

Your 10 backup codes will be displayed. Select Download, Print, or Copy to create a copy of these backup codes.

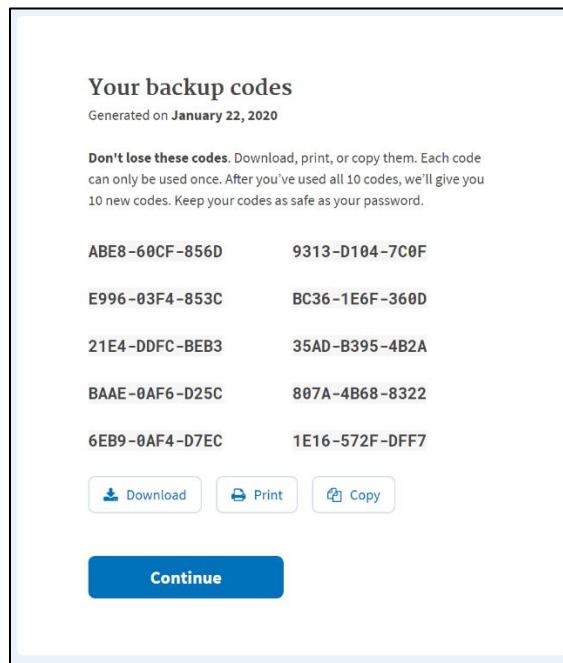


Figure 19: Login.gov – Backup Codes for Authentication

A success message is shown. Select Continue to be redirected to the portal login (skip to step 6 as you will not be asked to provide a second authentication method if backup codes have been selected as the first method).

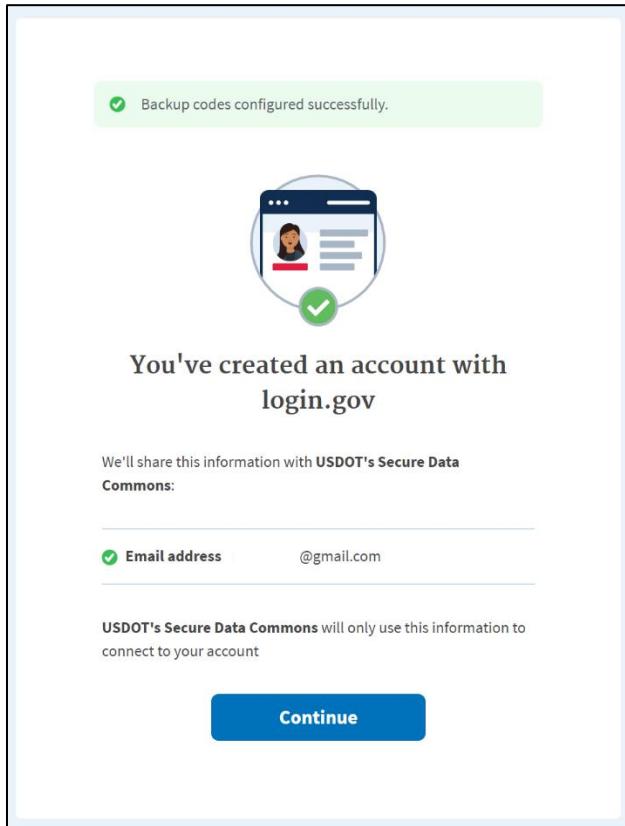


Figure 20: Login.gov – Backup Codes Success

5. After you have set up and verified the first authentication method, you will be prompted to set up a second authentication method on the Step 4 of 4 form. Refer to previous steps 4a-d for instructions on how to set up the second authentication method. Note that if you selected Phone as the first authentication method in step 4, you will not be able to use that same phone number as the second authentication method.

**STEP 4 OF 4**  
Second authentication method setup (2 of 2)  
Adding a second authentication method makes sure you can sign in to your account even if you lose or don't have the other.

Select an additional method to secure your account:

**Second phone**  
Get security codes by text message (SMS) or phone call to a secondary phone number (one that is not \*\*\*-\*\*\*-6709)

**Authentication application**  
Get codes from an app on your phone, computer, or tablet

**Security key**  
Use a security key that you have. It's a physical device that you plug in or that is built in to your computer or phone (it often looks like a USB flash drive).

**Government employee ID**  
Insert your government or military PIV or CAC card and enter your PIN

**I don't have any of the above**  
We'll give you 10 codes to use and keep in a safe place

**Continue**

[Cancel account creation](#)

Figure 21: Login.gov – Select Second Authentication Method

## Chapter 2. Initial Setup and Validation

6. After you have finished setting up all authentication methods or signed in with an existing Login.gov account, you will be redirected to a one-time sign-in form on the portal. Enter your SDC ADFS credentials and then select Sign in to synchronize your Login.gov account with your SDC credentials. You will be able to log in to the portal using either set of credentials going forward.

The screenshot shows the 'One Time Sign In' page of the Secure Data Commons Platform. At the top, there is a dark blue header bar with the text 'Secure Data Commons Platform' on the left and navigation links 'HOME', 'DATASETS', 'WORKSTATIONS', 'FAQ', and 'LOGOUT' on the right. Below the header, the main content area has a white background. It features a title 'One Time Sign In' at the top center. Below the title are two input fields: 'Username' with the value '@securedatacommons.com' and 'Password' with a masked value. To the right of the password field is a 'Show Password' link. Below these fields is a large blue 'Sign in' button. Underneath the button, there is a note: 'Please sign in using your internal Secure Data Commons credentials. Accounts only need to be linked once.' Below this note are two links: 'If you do not remember your Secure Data Commons credentials, please contact the Support Team.' and 'Don't have an account? Follow the instructions on the Secure Data Commons portal to create one.' At the bottom of the page, there is a dark blue footer bar with the text 'Secure Data Commons Platform' and a small note: 'The SDC platform was created as a prototype as part of a U.S. DOT research project under contract number DTFH6116D00052 / Task 12'. The footer also contains links for 'Privacy Policy', 'Freedom of Information Act (FOIA)', 'Accessibility', 'Web Policies & Notices', 'No Fear Act', 'Report Waste, Fraud and Abuse', 'U.S. DOT Home', 'USA.gov', and 'WhiteHouse.gov'. It also includes the address 'Federal Highway Administration | 1200 New Jersey Avenue, SE | Washington, DC 20590 | 202-366-4000'.

Figure 22: SDC Portal – Synchronize Login.gov Account with SDC

7. You will be redirected to the Secure Data Commons platform login page (refer to previous Figure 3), where you will be prompted for your SDC credentials again.

If the user is accessing the portal for the first time, they will be prompted to change their password after entering the credentials provided in the welcome email.

Upon successfully logging in, the user is redirected to the landing page, which provides an overview of Secure Data Commons and the different actions the user can perform from the web portal:

1. Curated and published datasets
2. Access to workstations with programming tools

## Chapter 2. Initial Setup and Validation

3. Bring your own datasets / algorithms
4. Publish your datasets / algorithms

The screenshot shows the SDC portal landing page. At the top, there is a dark blue header bar with the text "Secure Data Commons Platform" on the left and "HOME | DATASETS | WORKSTATIONS | FAQ | LOGOUT" on the right. Below the header, the main content area has a white background. It starts with a welcome message: "Welcome to the Secure Data Commons Platform (SDC), a sandbox environment in AWS managed by U.S. Department of transportation. The SDC platform provides a collaborative environment for traffic engineers, researchers, data scientists and anyone who is interested in carrying out research and analysis on different datasets related to traffic, weather, crashes etc." followed by a note: "Ready to Get Started? Follow the steps below or directly jump to any of the sections that you wish to access. SDC Users will have the following access in the platform:". Below this, there are four numbered callout boxes arranged in a 2x2 grid:

- 1 Curated and published datasets**  
Check out the list of currently available datasets (curated, published), data dictionaries owned by you and others. [Learn more](#) about what curated and published datasets mean
- 2 Access to workstations with programming tools**  
Access the workstations assigned to you, if you have requested as part of the registration process
- 3 Bring your own datasets / algorithms**  
[Learn more](#) about how you can bring your algorithms and code to the SDC platform
- 4 Publish your datasets / algorithms**  
[Learn more](#) about how you can publish your research analysis and algorithms with other researchers

At the bottom of the page, there is a dark blue footer bar with the text "Secure Data Commons Platform" in the center. Below it, smaller text reads: "The SDC platform was created as a prototype as part of a U.S. DOT research project under contract number DTFH6116D00052 / Task 12". At the very bottom, there are links to "Privacy Policy | Freedom of Information Act (FOIA) | Accessibility | Web Policies & Notices | No Fear Act | Report Waste, Fraud and Abuse | U.S. DOT Home | USA.gov | WhiteHouse.gov" and "Federal Highway Administration | 1200 New Jersey Avenue, SE | Washington, DC 20590 | 202-366-4000".

Figure 23: SDC Portal – Landing Page After Login

## Request Access to Datasets

Users can request access to the datasets that are available within the SDC platform as published / enabled by the SDC team or published by other users.

Once you are logged in, go to Datasets in the top menu.

The screenshot shows the SDC portal homepage. At the top, there is a dark blue header bar with the text "Secure Data Commons Platform" on the left and "HOME | DATASETS | WORKSTATIONS | FAQ | LOGOUT" on the right. The "DATASETS" button is highlighted with a red rounded rectangle. Below the header, there is a large white area containing text and four numbered callout boxes. The text reads: "Welcome to the Secure Data Commons Platform (SDC), a sandbox environment in AWS managed by U.S. Department of transportation. The SDC platform provides a collaborative environment for traffic engineers, researchers, data scientists and anyone who is interested in carrying out research and analysis on different datasets related to traffic, weather, crashes etc. Ready to Get Started? Follow the steps below or directly jump to any of the sections that you wish to access. SDC Users will have the following access in the platform:"

- 1 Curated and published datasets**  
Check out the list of currently available datasets (curated, published), data dictionaries owned by you and others. [Learn more about what curated and published datasets mean](#)
- 2 Access to workstations with programming tools**  
Access the workstations assigned to you, if you have requested as part of the registration process
- 3 Bring your own datasets / algorithms**  
[Learn more](#) about how you can bring your algorithms and code to the SDC platform
- 4 Publish your datasets / algorithms**  
[Learn more](#) about how you can publish your research analysis and algorithms with other researchers

At the bottom of the page, there is a dark blue footer bar with the text "Secure Data Commons Platform" and "The SDC platform was created as a prototype as part of a U.S. DOT research project under contract number DTFH6116D00052 / Task 12". Below this, there is a horizontal line followed by links to "Privacy Policy", "Freedom of Information Act (FOIA)", "Accessibility", "Web Policies & Notices", "No Fear Act", "Report Waste, Fraud and Abuse", "U.S. DOT Home", "USA.gov", and "WhiteHouse.gov". The footer also includes the address "Federal Highway Administration | 1200 New Jersey Avenue, SE | Washington, DC 20590 | 202-366-4000".

Figure 24: SDC Portal – Datasets Option

## Chapter 2. Initial Setup and Validation

Expand the SDC Datasets. You will be able to see all available datasets in the SDC platform. To access a dataset, click on Request.

The screenshot shows the 'SDC Datasets' section of the SDC Portal. It displays a table of datasets with columns for Name, Category, Description, Geographic Scope, Start / End for Data Availability, Owner, and Request Access. The 'Request Access' column contains three blue 'Request' buttons, which are all highlighted with a red box. The datasets listed are WAZE, FSD, and CVP.

Name	Category	Description	Geographic Scope	Start / End for Data Availability	Owner	Request Access
WAZE	Curated	Contains curated waze data	All states in US	March 2017 to Present	SDC platform	<button>Request</button>
FSD	Raw	Contains raw FTA sample data	All states in US	March 2019	SDC platform	<button>Request</button>
CVP	Curated	Contains CVP evaluation datasets	All states in US	March 2017 to Present	SDC platform	<button>Request</button>

Figure 25: SDC Portal – Request Dataset Access

Complete the SDC Data Access Request form that appears. Once completed, click on Send Request.

The screenshot shows the 'SDC Data Access Request Form' on the SDC Portal. The form includes sections for Basis for Access (radio buttons for 'Yes' or 'No'), Geographic Extent of Access (text input field), and a checkbox for accepting terms and conditions. At the bottom, there are 'SEND REQUEST' and 'CANCEL' buttons, with the 'SEND REQUEST' button highlighted with a red box.

Figure 26: SDC Portal – Send Data Access Request

The request will be sent to the support team and access to the requested dataset will be given upon validation and approval of the information in the form.

## Upload User Data to S3 Bucket through Portal

Users can upload their own data to their assigned team/individual buckets through the portal.

1. Click on Datasets from the home page.
2. Click on Upload Files under “My Datasets / Algorithm.”
3. A pop-up window appears prompting you to choose one or more files for upload to the assigned bucket. (The assigned bucket name will be displayed on the upload pop-up window.)

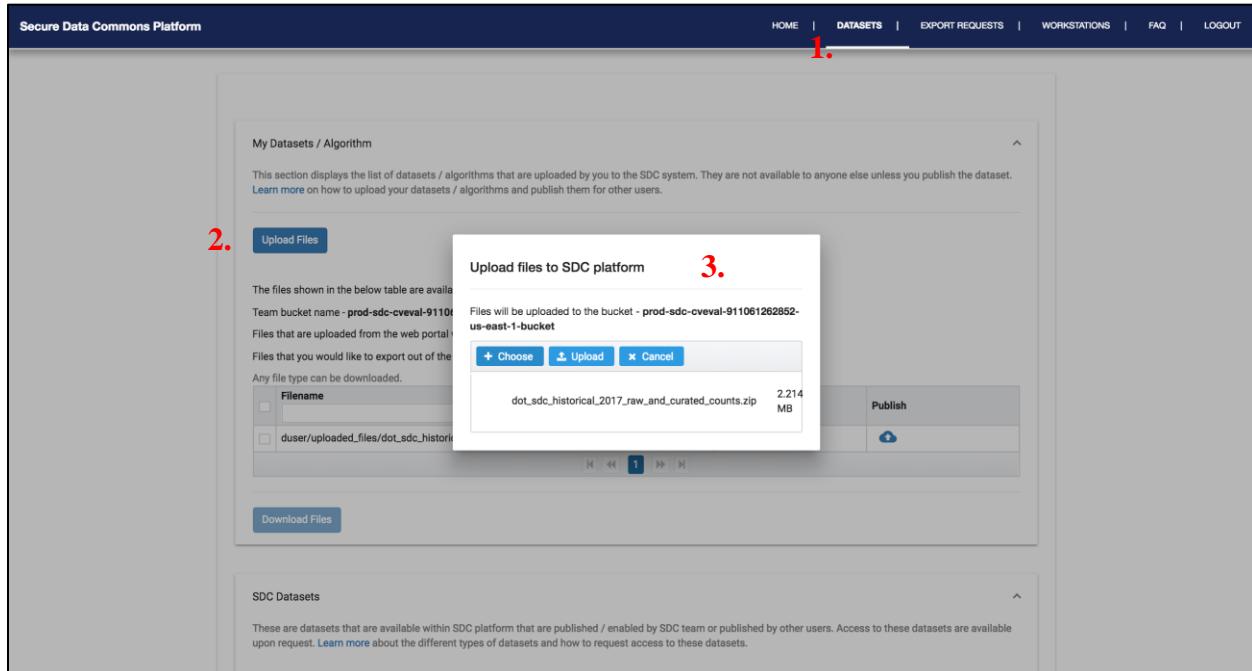


Figure 27: SDC Portal – Upload Files

4. A success message will be displayed upon a successful upload.

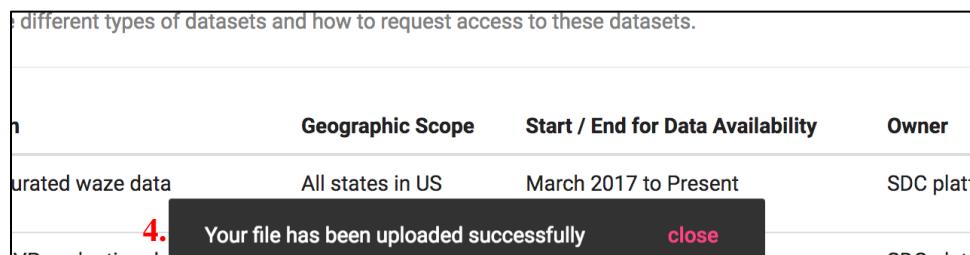


Figure 28: SDC Portal – Upload Success

5. Files that are uploaded from the web portal will be saved in the folder – **username/uploaded\_files**
6. Users would be able to access only the files that are under **uploaded\_files**, **export\_requests** folder.

## Download User Data from S3 Bucket through Portal

Users can download their data from their assigned team/individual buckets through the portal.

1. Click on Datasets from the home page.
2. All the available files under **username/uploaded\_files** in the assigned bucket will be displayed along with the assigned bucket name under My Datasets / Algorithm.
3. Select the files that you want to download and then click on Download Files.
4. Users should go through the export request workflow to download files that are uploaded under **export\_requests** folder. Export requests workflow can be found by clicking [here](#).

The screenshot shows the SDC Portal interface. At the top, there's a navigation bar with links for HOME, DATASETS, EXPORT REQUESTS, WORKSTATIONS, FAQ, and LOGOUT. Below the navigation, it says "My Datasets / Algorithm". A red box labeled "1." highlights the "Upload Files" button. The main content area displays a message: "This section displays the list of datasets / algorithms that are uploaded by you to the SDC system. They are not available to anyone else unless you publish the dataset. Learn more on how to upload your datasets / algorithms and publish them for other users." Below this, there's a table with a red box labeled "2." highlighting the first row. The table has columns for "Filename", "Export", and "Publish". The first row contains the filename "duser/uploaded\_files/dot\_sdc\_historical\_2017\_raw\_and\_curated\_counts.zip", an "Export" button, and a "Publish" button. At the bottom of the table, there are navigation arrows and a page number indicator. A red box labeled "3." highlights the "Download Files" button at the bottom left of the table.

Figure 29: SDC Portal – Selecting Files for Download

### Notes:

- Not all the files are downloaded directly. Files with extensions such as .txt, .png, or .pdf will be opened in a separate tab from where they can be downloaded. All other files with extensions like .csv, .zip, etc. can be downloaded directly.
- Files are downloaded individually.
- The Filename box allows searches for partial filenames. This can be used to download all the contents of a sub-folder in an S3 bucket by searching for the sub-folder name and then clicking the box next to Filename to select all objects.
- Files must be copied to and from S3 buckets using the SDC workstation. Files stored in S3 buckets are not visible through Windows Explorer.
  - o For example: To copy the file shown above in Figure 29 that is hosted in an S3 bucket to your SDC workstation, use the command:  

```
aws s3 cp s3://prod-sdc-cveval-911061262852-us-east-1-
bucket/duser/uploaded_files/dot_sdc_historical_2017_ra
w_and_curated_counts.zip
dot_sdc_historical_2017_raw_and_curated_counts.zip
```

# Chapter 3. Accessing and Launching Workstations

Users are assigned cloud-based workstations to perform analysis on the datasets. This section provides a description of how to launch and use these workstations.

## Launch Workstations

1. Users can see the assigned workstations by clicking on WORKSTATIONS from the top menu. By default, all the workstations are in an inactive state.
2. Click on Start to start the workstation.

The screenshot shows the SDC Portal interface. At the top, there is a navigation bar with links for HOME, DATASETS, EXPORT REQUESTS, WORKSTATIONS (which is the active tab), FAQ, and LOGOUT. Below the navigation bar, the main content area has a title 'My Workstations'. A sub-instruction '1.' is placed above the navigation bar. The content area contains a table with two rows of data. The columns are labeled '#', 'Stack Name', 'Applications', 'Configuration', and 'Action'. The first row corresponds to 'Programming Environment #1' with applications like Microsoft-R, Rstudio, Python, etc., and configuration of CPUs: 2 and Memory(GiB): 4. The second row corresponds to 'Programming Environment #2' with applications like Jupyter Notebook, R Studio Server, and configuration of CPUs: 2 and Memory(GiB): 4. In the 'Action' column, there are three buttons: 'Start', 'Launch', and 'Manage'. The 'Start' button for the first row is highlighted with a red box and labeled '2.'.

#	Stack Name	Applications	Configuration	Action
1	Programming Environment #1	Microsoft-R, Rstudio, Python, Microsoft Power BI, SQL Server Management Studio, SQL Workbench, Open Office, Firefox	CPU: 2 Memory(GiB): 4	<b>Start</b> (highlighted with a red box) Launch Manage
2	Programming Environment #2	Jupyter Notebook, R Studio Server	CPU: 2 Memory(GiB): 4	Start Launch Manage

Figure 30: SDC Portal – Starting Workstations

3. The workstation should become available within five minutes; you may not see any change immediately. A message will appear when the workstation has been successfully started.

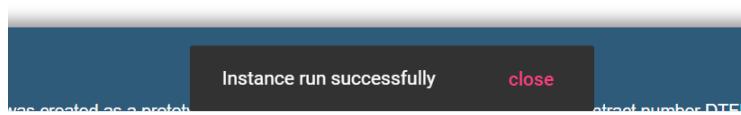


Figure 31: SDC Portal – Run Instance Success

4. Now click Launch for the workstation.

#	Stack Name	Applications	Configuration	Action
1	Programming Environment #1	Microsoft-R, Rstudio, Python, Microsoft Power BI, SQL Server Management Studio, SQL Workbench, Open Office, Firefox	CPU: 2 Memory(GiB): 4	<button>Start</button> <button>Launch</button> <button>Manage</button>
2	Programming Environment #2	Jupyter Notebook, R Studio Server	CPU: 2 Memory(GiB): 4	<button>Start</button> <button>Launch</button> <button>Manage</button>

Figure 32: SDC Portal – Launch Workstations

5. This will provide a user access to their workstation within the browser. The workstation may take a few minutes to initialize. When complete, a login screen will appear. User is prompted to re-enter a valid username and password.

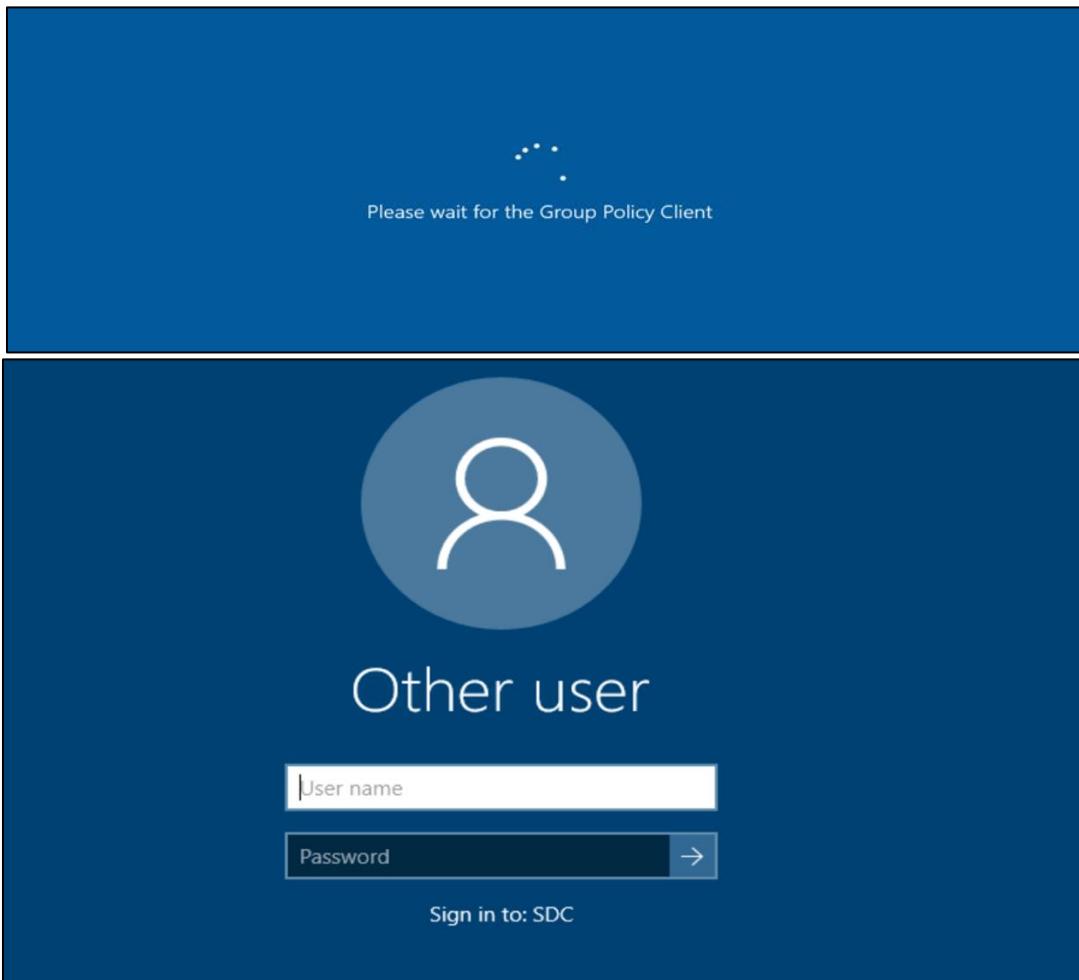


Figure 33: SDC Workstation – Initialization and Login Screens

## Software Validation

By default, users will have the following installed on their workstations:

- Java
- Python
- R, RStudio
- SQL Workbench
- Power BI
- AWS CLI
- Adobe
- Libre Office
- Visual Studio
- PuTTY
- Firefox

To test Python connectivity to the data warehouse, open the IDLE python editor and execute:

```
from impala.dbapi import connect
conn = connect(
    host='172.18.1.20',
    port=10000,
    auth_mechanism='PLAIN',
    user='<your_username>', password='<your_password>')
cursor = conn.cursor()
cursor.execute('SHOW TABLES')
print cursor.fetchall()
```

This should result in an array of tables displayed to the user.

## Connecting to the Data Warehouse

The following sections illustrate how the user can connect to the data stores available to the SDC.

### Connecting to Waze Data in Redshift

Launch SQL Workbench by double-clicking the SQL Workbench shortcut on the desktop.

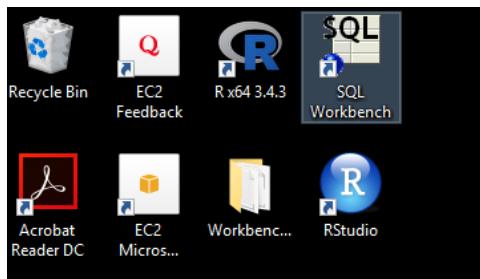


Figure 34: SDC Workstation – SQL Workbench Icon

Create a Redshift connection profile to connect to Waze data:

1. Create a new connection profile by selecting the top left corner icon on the “Select Connection Profile” window.
2. Select “Amazon Redshift Driver” from the Driver drop-down.
3. Update the URL section with the Redshift URL provided in the email from the support desk detailing Redshift login credentials.
4. Provide your username and password received in the welcome email.
5. Click on the Test button at the bottom to test the connection. A pop-up dialog will appear confirming a successful or failed connection.

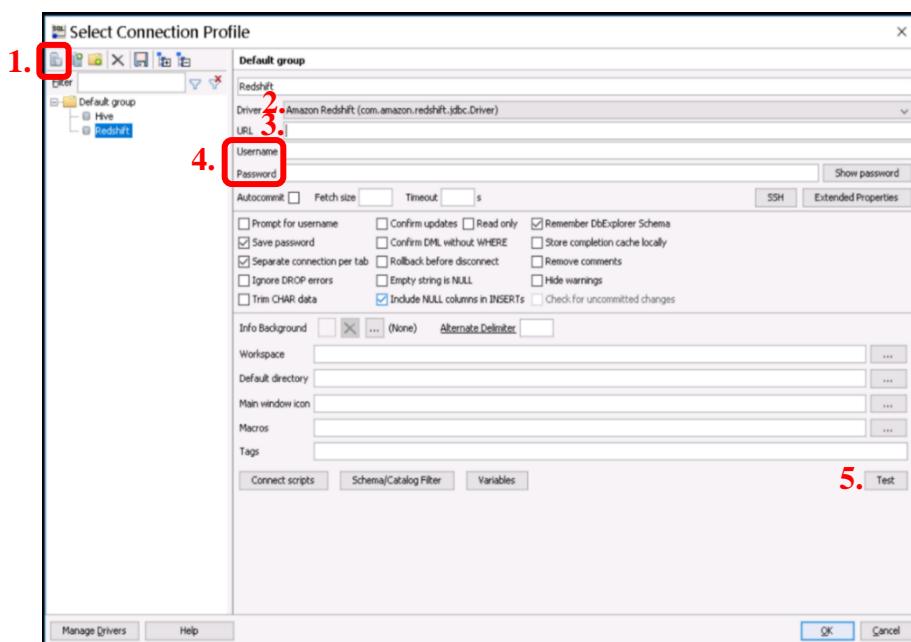


Figure 35: SQL Workbench – Create Redshift Connection Profile

## Connecting to CVP and FMI Data in Hive Metastore

Launch SQL Workbench by double-clicking on the SQL Workbench shortcut on the desktop:

1. Create a new connection profile by selecting the top left corner icon on the “Select Connection Profile” window.
2. Select “Hive JDBC” from the Driver drop-down.
3. Update URL section with the Hive URL.
4. Provide your username and password received in the welcome email.
5. Click on the Test button at the bottom to validate your connection. A pop-up dialog will appear confirming a successful or failed connection. If you continue running into a failed connection, contact the [SDC support desk](#) for assistance.

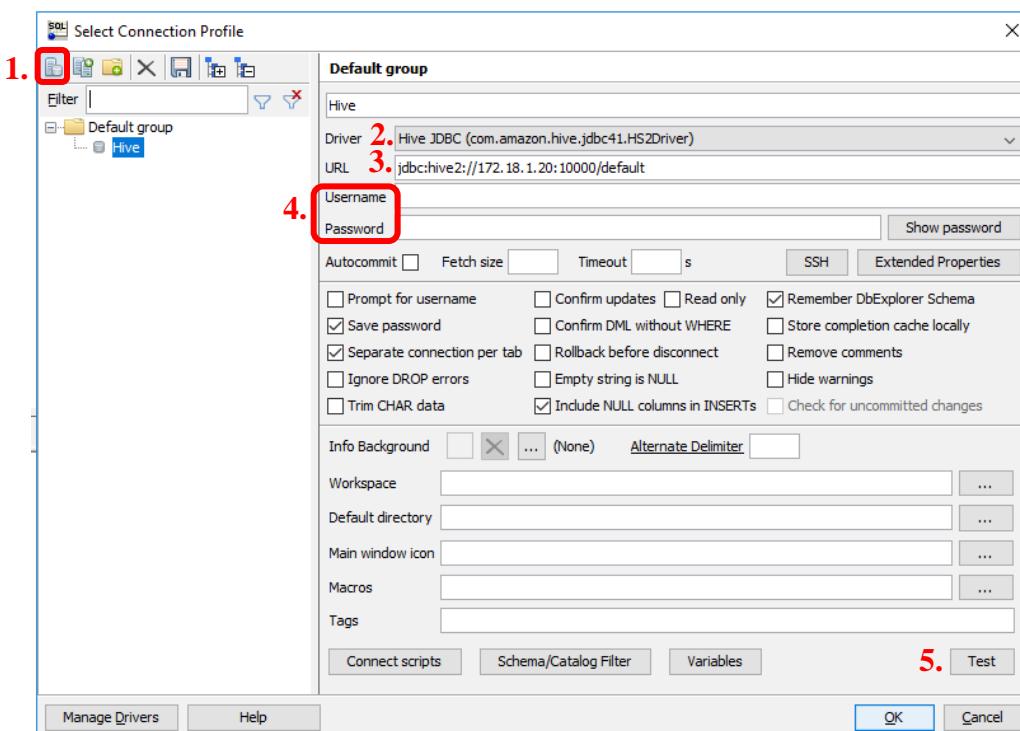


Figure 36: SQL Workbench – Hive Connection Settings

## Update Data Formatting Settings in SQL Workbench

Once the connection has been established, navigate to Tools | Options | Data formatting and update the Decimal digits value to 0.



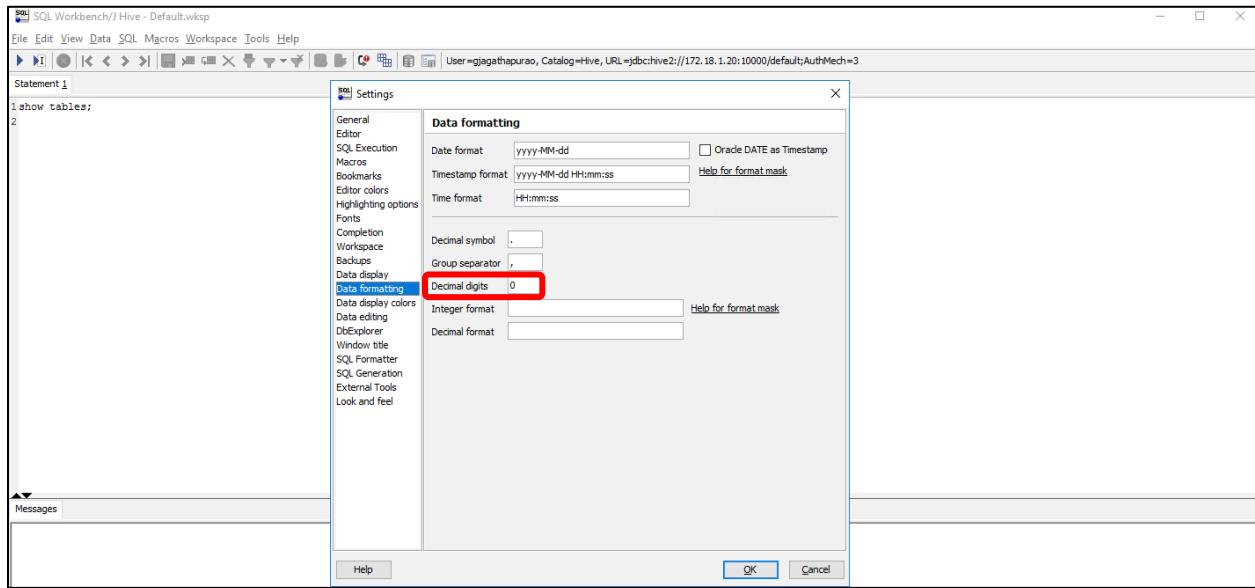


Figure 37: SQL Workbench – Tools → Options → Data formatting

## Connecting to Redshift from Linux Environments

Credentials to access the Waze Redshift database are communicated from the SDC Administrator ([support@securedatacommons.com](mailto:support@securedatacommons.com)).

- In R, it is possible to connect to Redshift using multiple packages. The RPostgreSQL package provides a simple method. This package requires the PostgreSQL library to be installed at the system level; if it is not installed, it would be necessary to install as root in the terminal:  
`$ sudo yum install postgresql-devel`
- In R, you may need to `install.packages("RPostgreSQL", dep=T)` if you do not already have the package installed.
- Connect to Redshift using the following code as a guide:

```
library(RPostgres)
# Specify username and password manually, once:
if(Sys.getenv("sdc_waze_username")==""){
  cat("Please enter SDC Waze username and password
manually, in the console, the first time accessing the
Redshift database, using: \n Sys.setenv('sdc_waze_username'
= <see email from SDC Administrator>) \n
Sys.setenv('sdc_waze_password' = <see email from SDC
Administrator>")
}

redshift_host <- "(details provided by SDC Support to
registered SDC Redshift Users)"
redshift_port <- "5439"
```

```

redshift_user <- Sys.getenv("sdc_waze_username")
redshift_password <- Sys.getenv("sdc_waze_password")
redshift_db <- "dot_sdc_redshift_db"

#drv <- dbDriver("PostgreSQL")
conn <- dbConnect(
  RPostgres::Postgres(),
  host=redshift_host,
  port=redshift_port,
  user=redshift_user,
  password=redshift_password,
  dbname=redshift_db)

```

- A database can then be queried using the dbGetQuery() function.

## Accessing Jupyter Notebook and RStudio Server

Linux users can access their Jupyter Notebook and RStudio Server using the Firefox web browser through windows workstation using below URLs.

- RStudio – <http://<username>-workspace.securedatacommons.internal:8787>
- Jupyter Notebook – <http://<username>-workspace.securedatacommons.internal:8888>



Windows users can click on the “RStudio” shortcut icon present on the desktop to open RStudio console.

## Manage Workstations

After launching their workstations, users can manage resizing CPU/RAM and scheduling uptime for a workstation by clicking on its Manage button as shown below.

My Workstations				
#	Stack Name	Applications	Configuration	Action
1	Programming Environment #1	Microsoft-R, Rstudio, Python, Microsoft Power BI, SQL Server Management Studio, SQL Workbench, Open Office, Firefox	CPU: 2 Memory(GiB): 4	<button>Start</button> <button>Launch</button> <button>Manage</button>
2	Programming Environment #2	Jupyter Notebook, R Studio Server	CPU: 2 Memory(GiB): 4	<button>Start</button> <button>Launch</button> <button>Manage</button>

Figure 38: SDC Portal – Manage Workstation

A dialogue window appears with two checkbox options:

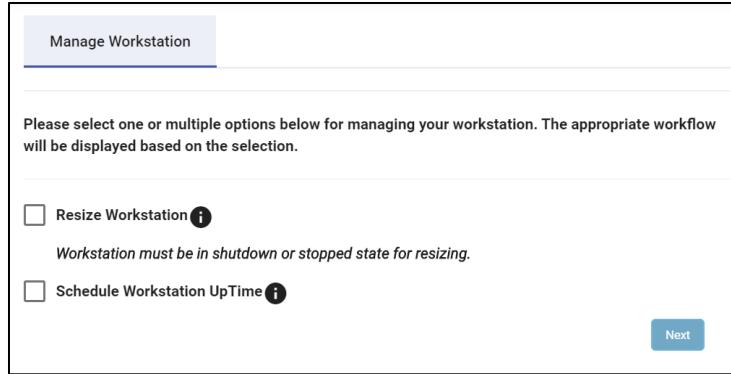


Figure 39: SDC Portal – Manage Workstation Options

Selecting each option renders the appropriate tabs in the dialogue window. The ⓘ icon shown next to each option provides an informational tooltip on their functions.

### Resize Workstation

1. To resize the workstation, select the checkbox for Resize Workstation and then Next to continue.

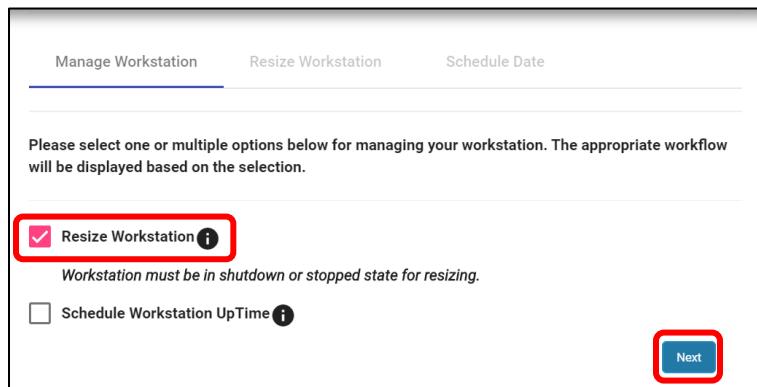


Figure 40: SDC Portal – Resize Workstation Option

2. A message is shown at the bottom of the screen indicating that the workstation will be stopped before applying the resize.



Figure 41: SDC Portal – Workstation Stopped for Resize Changes

3. The Resize Workstation tab allows users to select desired CPU/RAM for their workstation. Current configurations will be grayed out and unavailable. Users can also explore pricing details using the link provided under “click here.”
4. Select the “Please start my workstation after resizing to the new configuration” checkbox to automatically start the workstation with the new configuration after saving changes.
5. Select Submit after all details are entered.
6. A Recommended List of instances will appear. Select the desired instance and then the Next button.

The screenshot shows the 'Resize Workstation' interface. At the top, there are three tabs: 'Manage Workstation', 'Resize Workstation' (which is active and highlighted in blue), and 'Schedule Date'. Below the tabs, a message states: 'Your current workstation configuration is 2 CPU and 4 GB RAM'. It instructs users to 'Please choose the appropriate instance type by selecting the desired CPU and RAM' and provides a link for 'pricing related details'. A note cautions users about stopping the workstation during resize. The 'Select desired CPU / Memory' section shows 'CPU' set to '4' and 'RAM' set to '8 GB'. A red box labeled '4.' highlights the checked checkbox for 'Please start my workstation after resizing to the new configuration'. A red box labeled '5.' highlights the 'Submit' button. Below this, a 'Recommended list' section shows a table with one row:

Instance Name	CPU	Memory	COST
6. c5.xlarge	4	8 GB	\$0.35 per hour

A red box labeled '6.' highlights the 'c5.xlarge' instance in the list. At the bottom right are 'Cancel' and 'Next' buttons.

Figure 42: SDC Portal – Resizing Options

7. On the Schedule Date tab, users are prompted to enter a date range for how long the resize should last for the workstation instance. Enter the From and To dates and then select Submit.

The screenshot shows the 'Select schedule' page with the 'Schedule Date' tab selected. It includes instructions to select a schedule between specific dates and receive an email notification upon completion. A red box highlights the 'From date' and 'To date' input fields, which are set to 10/5/2019 and 10/11/2019 respectively. Another red box highlights the 'Submit' button at the bottom right.

Figure 43: SDC Portal – Schedule Resize

8. Users will be returned to the Workstations tab with updated CPU and memory information. They will also receive a success email message from the system confirming the resize expiration date.

### Schedule/Extend Uptime

1. By default, all workstations are shut down at 11 pm EST. If you want to schedule your workstations to be up for a longer period to accommodate analysis runs, select the checkbox for Schedule Workstation Uptime and then Next to continue.

The screenshot shows the 'Schedule Workstation UpTime' page. It displays a note about selecting options for managing workstations. Two checkboxes are present: 'Resize Workstation' (unchecked) and 'Schedule Workstation UpTime' (checked). A red box highlights the checked 'Schedule Workstation UpTime' checkbox. Another red box highlights the 'Next' button at the bottom right.

Figure 44: SDC Portal – Schedule Workstation Uptime Option

- The Schedule Workstation Uptime tab allows users to enter a date range for how long the workstation uptime should last to skip shutdown. Enter the From and To dates and then select Submit.

Figure 45: SDC Portal – Schedule Uptime

- To extend any currently scheduled uptime for the workstation, select the Workstations tab and then select Manage again for the workstation. A new tooltip is now shown for the Schedule Workstation Uptime checkbox on mouse hover that indicates previously scheduled uptime.



Figure 46: SDC Portal – Tooltip with Existing Scheduled Uptime

- Repeat steps 1-2. For step 2, the From date will already include the date from the previously scheduled uptime. Add a new To date later in the calendar and then submit the update. The previously scheduled uptime goes inactive while the new one becomes active.
- After selecting Submit, return to the Workstations tab and then select Manage for the workstation. The tooltip shown on hover for the Schedule Workstation Uptime checkbox now displays the extended uptime.

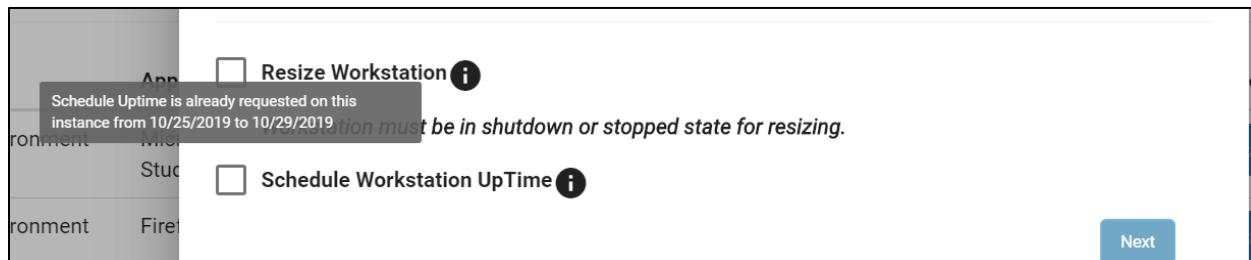
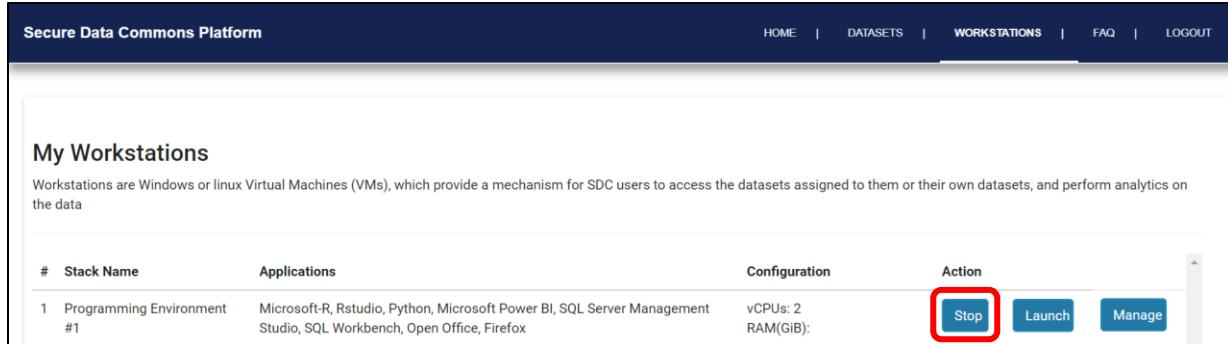


Figure 47: SDC Portal – New Tooltip with Extended Uptime Schedule

## Stop Workstations

Users can see the assigned workstations by clicking on the workstations tab on the top right corner of the page. By default, all the workstations are scheduled to stop every day at 11 PM EST. Users can stop the workstations manually by clicking on the Stop button as shown below. A message will appear when the instance is successfully stopped.



The screenshot shows the 'My Workstations' section of the SDC Portal. At the top, there is a navigation bar with links for HOME, DATASETS, WORKSTATIONS (which is the active tab), FAQ, and LOGOUT. Below the navigation bar, the title 'My Workstations' is displayed, followed by a brief description of what workstations are. A table lists the workstations, with one entry visible:

#	Stack Name	Applications	Configuration	Action
1	Programming Environment #1	Microsoft-R, Rstudio, Python, Microsoft Power BI, SQL Server Management Studio, SQL Workbench, Open Office, Firefox	vCPUs: 2 RAM(GiB):	<a href="#">Stop</a> <a href="#">Launch</a> <a href="#">Manage</a>

The 'Stop' button for the first workstation is highlighted with a red box.

Figure 48: SDC Portal – Stop Workstation

# Chapter 4. Sample Queries for SDC Datasets

The following section provides some sample queries for anchor datasets hosted by the SDC. Three datasets which are currently available in the SDC system:

- Data from USDOT-sponsored Connected Vehicle Pilot (CVP) program, provided by the following pilot sites:
  - Tampa Hillsborough Expressway Authority (THEA)
  - Wyoming Department of Transportation (WYDOT)
- Data provided by Waze on traffic jams and alerts
- Data from the American Transportation Research Institute's (ATRI) Freight Mobility Initiative (FMI)

Sample queries are provided for each of the three datasets.

## Connected Vehicle Data Overview

The CVP Data Warehouse is built on top of a Hadoop's HDFS cluster and utilizes Hive with a HiveQL querying language as a front-end querying package. Information about the HiveQL language and the language manual can be found online:

- Wikipedia info on Apache Hive: [https://en.wikipedia.org/wiki/Apache\\_Hive](https://en.wikipedia.org/wiki/Apache_Hive)
- Language manual: <https://cwiki.apache.org/confluence/display/Hive/LanguageManual>

Key components of the CVP dataset are the basic safety messages (BSM) and Traveler Information Messages (TIM). Both THEA and WYDOT data include BSM and TIM.

## WYDOT

### **Basic Safety Message (BSM) Relational Tables**

WYDOT BSM data are stored in the following set of relational tables.

```
wydot_bsm_core
wydot_bsm_partii
wydot_bsm_partii_crumbdata
```

The following figure illustrates the foreign key relationship of WYDOT BSM tables.

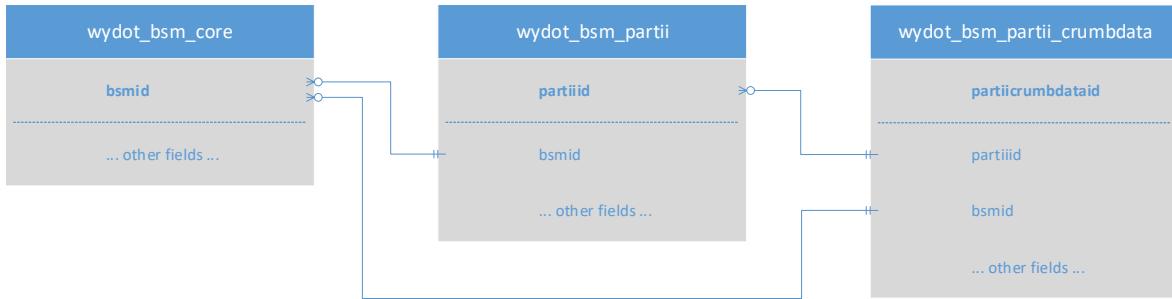


Figure 49: WYDOT BSM Tables

#### Sample queries using WYDOT BSM tables.

These queries can be run using the SQL Workbench which is configured to connect to the data warehouse. Note: running the last three queries will take longer, because they are joining multiple tables.

```

select * from wydot_bsm_core limit 5;
select * from wydot_bsm_partii limit 5;
select * from wydot_bsm_partii_crumbdata limit 5;

select coredatalatitude, coredatalongitude from
wydot_bsm_core limit 5;

select * from wydot_bsm_core join wydot_bsm_partii where
wydot_bsm_core.bsmid = wydot_bsm_partii.bsmid limit 5;

select * from wydot_bsm_partii join
wydot_bsm_partii_crumbdata where wydot_bsm_partii.partiid =
wydot_bsm_partii_crumbdata.partiid limit 5;

select * from wydot_bsm_core join wydot_bsm_partii join
wydot_bsm_partii_crumbdata where wydot_bsm_core.bsmid =
wydot_bsm_partii.bsmid and wydot_bsm_partii.partiid =
wydot_bsm_partii_crumbdata.partiid limit 10;
  
```

### **WYDOT BSM and TIM Metadata RECORDGENERATEDAT vs ODERECEIVEDAT**

WYDOT BSM and TIM messages include a metadata section, appended by the Operational Data Environment (ODE) component. Among others, there are two timestamps of interest are presented in this section:

**recordGeneratedAt:** Closest time to which the record was created by a Vehicle.

**odeReceivedAt:** Time ODE received the data in UTC format. This time is the closest to which the CV PEP system received the record.

- Based on real-life conditions, odeReceivedAt may be days or even weeks after the recordGeneratedAt timestamp.

- The following queries result in distribution of recordGeneratedAt by odeReceivedAt times:

- WYDOT BSM messages:

```
select SUBSTR(metadataarecordgeneratedat, 0, 10) as  
RECORDGENERATEDAT  
, SUBSTR(metadataodereceivedat, 0, 10) as ODERECEIVEDAT  
, count(SUBSTR(metadataodereceivedat, 0, 10)) as CNT  
from wydot_bsm_core  
group by SUBSTR(metadataodereceivedat, 0, 10)  
, SUBSTR(metadataarecordgeneratedat, 0, 10)  
order by RECORDGENERATEDAT limit 10000;
```

- WYDOT TIM messages:

```
select SUBSTR(metadataarecordgeneratedat, 0, 10) as  
RECORDGENERATEDAT  
, SUBSTR(metadataodereceivedat, 0, 10) as ODERECEIVEDAT  
, count(SUBSTR(metadataodereceivedat, 0, 10)) as CNT  
from wydot_tim  
group by SUBSTR(metadataodereceivedat, 0, 10)  
, SUBSTR(metadataarecordgeneratedat, 0, 10)  
order by RECORDGENERATEDAT limit 10000;
```

### **WYDOT Speed Data**

There are two WYDOT speed datasets in the CV PEP Data Warehouse:

wydot\_speed\_unprocessed and wydot\_speed\_processed. The following sample query displays average vehicle speed distribution by lane and it will work against either of the tables:

```
select lane, avg(speedmph) as speed_average  
from wydot_speed_unprocessed  
group by lane  
order by lane;
```

### **THEA**

#### **THEA Basic Safety Message (BSM) Relational Tables**

THEA BSM data are stored in the following set of relational tables.

THEA BSM Relational Tables
thea_bsm_core
thea_bsm_partii
thea_bsm_partii_crumbdata

Sample queries using THEA BSM tables.

These queries can be run using the SQL Workbench which is configured to connect to the data warehouse. Note: running the last three queries will take longer, because they are joining multiple tables.

```
select * from thea_bsm_core limit 5;  
  
select * from thea_bsm_partii limit 5;  
  
select * from thea_bsm_partii_crumbdata limit 5;  
  
select coredatalat, coredatalong from thea_bsm_core limit 5;  
  
select * from thea_bsm_core join thea_bsm_partii where  
thea_bsm_core.bsmid = thea_bsm_partii.bsmid limit 5;  
  
select * from thea_bsm_partii join  
thea_bsm_partii_crumbdata where thea_bsm_partii.partiid =  
thea_bsm_partii_crumbdata.partiid limit 5;  
  
select * from thea_bsm_core join thea_bsm_partii join  
thea_bsm_partii_crumbdata where thea_bsm_core.bsmid =  
thea_bsm_partii.bsmid and thea_bsm_partii.partiid =  
thea_bsm_partii_crumbdata.partiid limit 10;
```

## Geospatial Queries

- The Data Warehouse has geospatial querying capabilities. Functions such as ST\_Point, ST\_Polygon, ST\_Contains and others can be used in queries. For the full list of supported functions see: <https://github.com/Esri/spatial-framework-for-hadoop/wiki/UDF-Documentation>
- As an example, here is a sample query to retrieve a count of messages generated by vehicles between latitudes 40 and 41 and longitudes between -106 and -105.

```
select count(*) from wydot_bsm_core where  
ST_Contains(ST_Polygon(40, -105, 41, -105, 41, -106, 40, -  
106),  
ST_Point(coredatalatitude, coredatalongitude));
```

## Waze Data

### Overview

The SDC platform ingests and curates Waze data for all 50 states of United States of America using the Waze API. Users have access only to Waze data pertaining to the specific geographic region specified in their data access policies.

### **Waze Alert Data**

An alert is a User Generated Incident (UGI) reported by a Waze user or group of users, as defined by Waze. In SQL Workbench, the following query can be used to test access to the *alert* table.

```
select distinct alert_uuid from alert where
alert_type='<alert_type>' and pub_utc_timestamp between
<start_time_stamp> and <end_time_stamp> and state
=<state_name>;

select distinct alert_uuid from alert where
alert_type='ACCIDENT' and pub_utc_timestamp between '2018-
01-01 04:59:43.00' and '2018-01-30 04:59:43.00' and state
='CA';
```

### **Waze Jam Data**

Waze provides information of traffic jams and events that affect road conditions either from wazers or external sources. A traffic jam maybe associated with an alert.

```
select top 10 * from jam;
select top 10 * from jam_point_sequence;
```

### **Waze Irregularity Data**

Irregularities are similar to Jams, where Waze derives these events based on unusual traffic patterns. These could also be a result of an alert or a jam.

```
select top 10 * from irregularity;
select top 10 * from irregularity_point_sequence;
select top 10 * from irregularity_alert;
select top 10 * from irregularity_jam;
```

## **FMI Data**

### **Overview**

The American Transportation Research Institute's (ATRI) Freight Mobility Initiative (FMI) project within the SDC brings together data from ATRI that leverages GPS on trucks with spatial statisticians from the Bureau of Transportation Statistics (BTS) to develop new approaches to analyze and visualize freight performance and network use. FMI data are stored in a Hive data warehouse, which you can connect to using SQL Workbench.

The main table for the FMI ATRI data is the FMI\_ATRI\_TRUCK\_GPS\_CORE. This table combines the data from fmi\_atri\_truck\_gps\_v1 and fmi\_atri\_truck\_gps\_v2. All the columns are string except for the speed column which is integer.

***Sample Queries Using FMI\_ATRI\_TRUCK\_GPS\_CORE Table***

```
SELECT * FROM fmi_atri_truck_gps_core limit 20;

SELECT * FROM fmi_atri_truck_gps_core WHERE rdate = '2019-03-01'
AND truckid = '"b9f45e9e634d44d5b1accb1c7f9711"';
SELECT * FROM fmi_atri_truck_gps_core WHERE rdate = '2019-03-01'
AND ST_Contains(ST_Polygon(30.10,-95.53,30.13,-94.49,29.18,-
94.46,29.14,-95.50),ST_Point(y,x)) limit 20;

SELECT * FROM fmi_atri_truck_gps_core WHERE rdate like '2019-
03%' limit 20;
```

# Chapter 6. Exporting Datasets from the SDC

Data Analysts should be able to export the data of the system based on the compliance and data usage policies set forth by a Data Provider.

There are two different types of analysts:

1. **General Analyst:** This type of analyst must provide justification to the Data Provider for each data product that they want to export out of the SDC system. The intent is to ensure that the Data Provider has oversight of the exported data. This type of analyst can also request trusted status from the Data Provider while filling out the approval form.
2. **Trusted Analyst:** This type of analyst already has a trusted status which is provided by the Data Providers. The intent is to reduce the effort for exporting data products of analyses out of the SDC system. A trusted user has a pre-existing and approved relationship with the Data Provider.

Once the Data Analyst completes creating derived datasets, either working on the SDC datasets or combining with other datasets that they import into the system, they can export the derived datasets or share the datasets with other team members.

The following are the steps that the Data Analyst needs to follow to export the data of their analysis from the SDC system to support their research:

1. Each Data Analyst is part of a team bucket which is displayed in the Datasets section. When ready to export, Data Analysts can select the file (or files) that they want to export out of the SDC system and place them in a separate staging folder (i.e., **export\_requests**) in their team bucket. Data Analysts can request for exporting a file in this folder by clicking on the export symbol for the file they want to export out of the SDC system. Please note that if Data Analysts want to print out a hard copy of a document, they will need to export it from the SDC workstation to their local machine.

Filename	Export	Publish
export_requests/test3.zip	<input type="checkbox"/>	<input type="checkbox"/>
export_requests/s3cmd2.zip	<input type="checkbox"/>	<input type="checkbox"/>
export_requests/t.zip	<input type="checkbox"/>	<input type="checkbox"/>
export_requests/demo9.zip	<input type="checkbox"/>	<input type="checkbox"/>
s3pata/uploaded_files/architecture.png	<input type="checkbox"/>	<input type="checkbox"/>
export_requests/s3cmd1.zip	<input type="checkbox"/>	<input type="checkbox"/>
export_requests/wazeAnalysis.zip	<input checked="" type="checkbox"/>	<input type="checkbox"/>
export_requests/dynamodbanalysis.zip	<input type="checkbox"/>	<input type="checkbox"/>

Figure 50: SDC Portal – Request Export

2. Once the export button is selected, a dialog box for requesting the export data will be displayed. The analyst will then need to provide the details of the Project, Data Provider, and Data Type that he has used to create his own dataset and click on the NEXT button once finished.

## Request to Export Data

Select Project      Approval Form      Trusted Status

**Please select the Project, Data Provider, and the primary Sub-Dataset/Data Type, that you have used to create your derived dataset. This will help us to route your request to the appropriate Data Provider for approval.**

*Note - If your derived Dataset is created using multiple Sub-Datasets/Data Types, that are available within SDC or external Datasets/Data Sources that you have uploaded into the system, you will be provided an option to list all such Datasets/Data Types in the next section of the workflow.*

Project/Dataset  
WAZE

Data Provider  
WAZE

Sub-Dataset/Data Type  
JAM

CANCEL      NEXT

Figure 51: SDC Portal – Request Export Form

3. The additional information regarding the request for exporting the data must be filled out in the approval form below. These details are shared with the Data Providers, which helps them to accept or reject the request made by the Data Analysts.

Select Project	Approval Form	Trusted Status
<p><b>Please provide additional information pertaining to your request for exporting data, by filling out the fields below. These details will be shared with the Data Provider to help them review your request and provide their decision.</b></p>		
<p><b>* All fields are mandatory</b></p>		
Name or short description of your derived dataset *		
waze derived dataset		
Anchor dataset of interest or data provider *		
WAZE		
Specific sub-datasets or data types used *		
JAM		
Additional datasources *		
datasources		
High level description of derived dataset *		
high level desc		
Detailed description of the derived dataset *		
detailed desc		
Tags		
tags		
Justification of Export *		
Justification		

Figure 52: SDC Portal – Approval Form Fields

4. If the user is not a trusted user, he/she will be prompted with the option for requesting the trusted status from the Data Provider. This will allow the analyst to export the data immediately, as opposed to waiting for review and approval from the Data Provider. The user must accept the Acceptable Usage policy for the request to go through to the Data Provider. The form will not be submitted if the user declines.

Select Project	Approval Form	Trusted Status
<p><b>Trusted Status is a mechanism for analysts to obtain a passport from a data provider. Obtaining this passport allows analyst to export their data immediately (for subsequent similar requests), as opposed to waiting for the review and approval of a data provider.</b></p> <p><b>This status is acquired per Project + Data Provider + Sub-Dataset/Data Type.</b></p> <p>Note - Based on the dataset and datatype selection, you currently do not have a Trusted Status from this Data Provider. We will notify the Data Provider about your request and send it for approval. Your request will be processed based on the decision from the Data Provider.</p> <p><b>Do you wish to request Trusted Status from the Data Provider?</b></p> <p><input type="radio"/> Yes      <input checked="" type="radio"/> No</p> <p><b>Acceptable Use Policy</b></p> <p>The WAZE DOT is providing ongoing access to data generated by the Connected Vehicle Pilot deployment to support performance measurement and evaluation activities to a select group of explicitly approved individuals. The CV Pilot is an ongoing research activity and includes access to rapidly evolving data sets and products. WAZE DOT makes no claims, promises or guarantees about the accuracy, completeness, or adequacy of the contents of data and expressly disclaims liability for errors and omissions in the data.</p> <p>Conducting research activities on WAZE DOT CV pilot data and resources is restricted to authorized individuals for the purpose for which access was granted. Further uses of the WAZE CV Pilot data</p> <p><input type="radio"/> Accept      <input type="radio"/> Decline</p>		

Figure 53: SDC Portal – Acceptable Use Policy

5. Upon successful submission, the request will be sent to appropriate Data Providers. Data Providers will be responsible for accepting or rejecting the export requests.
6. Once Data Providers approve the request, Data Analysts will be able to download the dataset out of SDC through portal.

# Chapter 7. Setting Up SDC with GitLab Repositories

The following sections provide instructions for SDC users on setting up GitLab repositories for committing and sharing their code and any other documents.

GitLab provides an organizational structure of users and repositories managed respectively via “groups” and “projects” to promote collaboration among teams of SDC users. Groups contain members with different access levels to their project repositories based on the assigned roles:

*Table 1: GitLab Access Rights by Role*

Role	Read-Only Access	Read/Write Access
Guest	✓	
Reporter	✓	
Developer		✓
Maintainer		✓

## GitLab Features:

- Share code among a wide range of users and provide comments to improve each other’s code
- Simplified collaboration with shared read/write access
- Support for multiple repositories to be kept in a logical structure that separates them from each other and groups by organization.
- Version control and source code management including:
  - File locking to help prevent conflicts
  - Users can work from their local copy of the code
  - Users can branch code to make changes and then quickly merge it after approval

## Log In to GitLab

1. Open a web browser, then navigate to <http://scm.securedatacommons.internal/>, which is the URL of the SDC internal GitLab implementation.

2. In the Sign in page, the LDAP login option is selected by default. Enter your SDC credentials as the LDAP username and password, then click Sign in (in the LDAP Username field, do not enter the “@securedatacommons.com” portion of your SDC username).

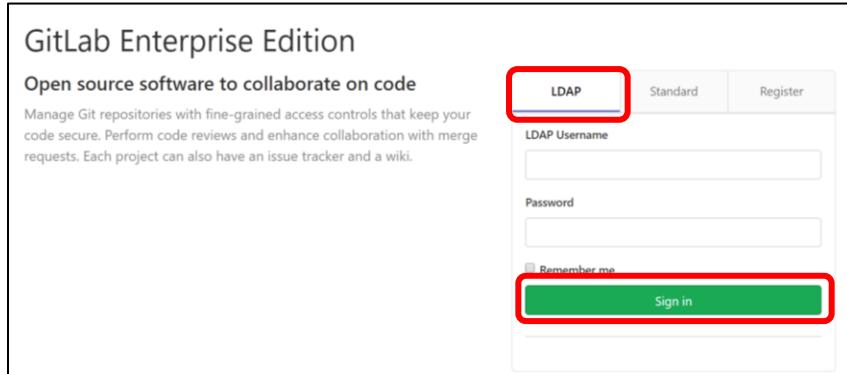


Figure 54: GitLab Login Prompt - LDAP

3. The Welcome to GitLab web page is displayed.

## Create a Group

1. In the Welcome to GitLab web page, select Create a group.

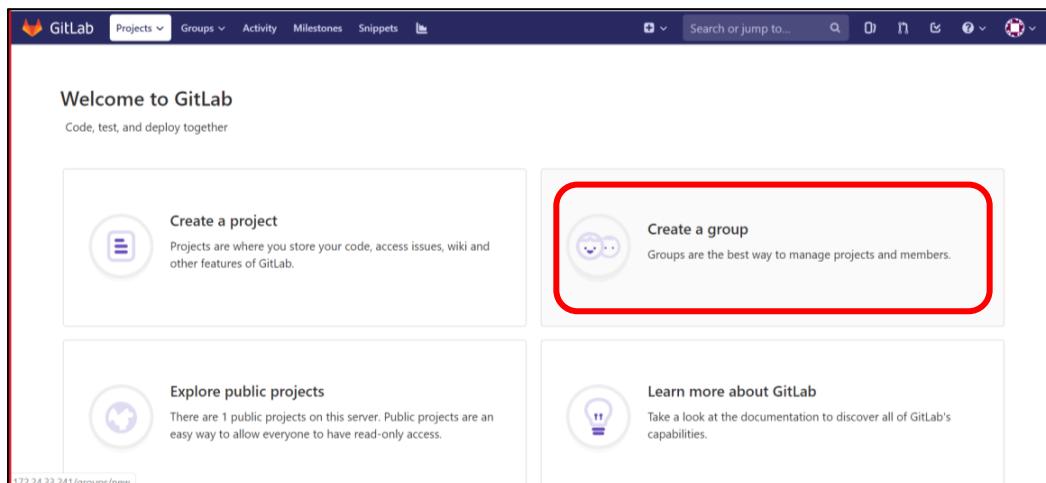


Figure 55: GitLab – Create a Group Option

## Chapter 7. Setting Up SDC with GitLab Repositories

2. The New group form appears. Enter the name for the new group.
3. Select the Private option under Visibility level to only allow members in the group to see the group and its projects.
4. Select Create group.

The screenshot shows the 'New group' creation interface in GitLab. The 'Group name' field is filled with 'SDC test group' and is highlighted by a red box labeled '4.'. The 'Visibility level' section is also highlighted by a red box labeled '5.', showing the 'Private' radio button selected. The 'Create group' button at the bottom is highlighted by a red box labeled '6.'

Figure 56: GitLab – New Group Form

5. A success message appears indicating that the group was created. You are now ready to add members to the group.

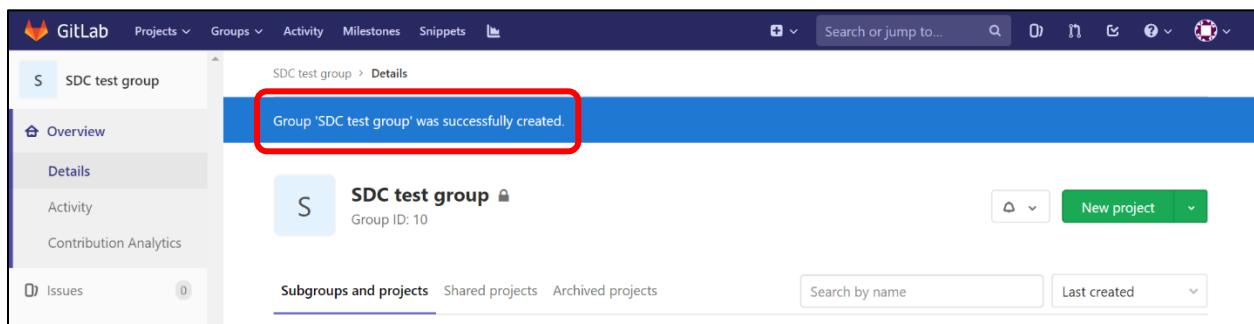


Figure 57: GitLab – Group Creation Success

## Add Group Members

Users assigned with the “Developer” or “Maintainer” role can add other GitLab members in the SDC to their groups.

**NOTE:** SDC users are listed as a GitLab member in the Members panel only after they have logged into GitLab. If you do not see your SDC colleague listed, please ask them to log in to GitLab.

1. In the newly created project web page, click Members from the left navigation menu.

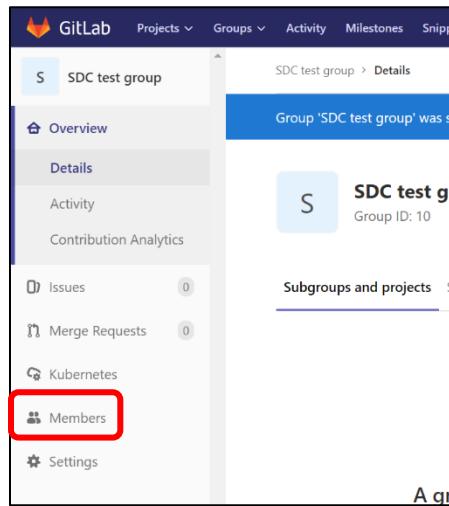


Figure 58: GitLab – Members Left Navigation Menu

2. In the “Search for members” text box, start entering the name of the SDC user you want to add; then select the member’s name from the autocomplete list.
3. Select a role from the next drop-down menu. You can select the “Read more” link to view a comprehensive list of the different available permission levels and their access rights. A summary of the roles’ access types is also shown in Table 1 at the beginning of this chapter.
4. Select Add to group.

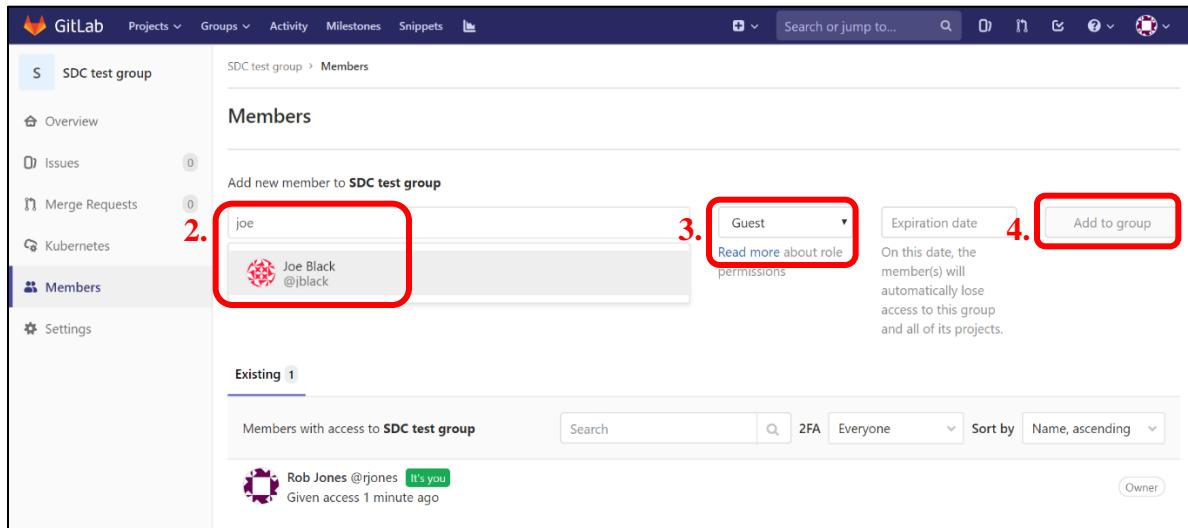


Figure 59: GitLab – Add a New Group Member

## Create a Project

1. Select the GitLab icon on the upper left to return to the home page.
2. Select Create a project.

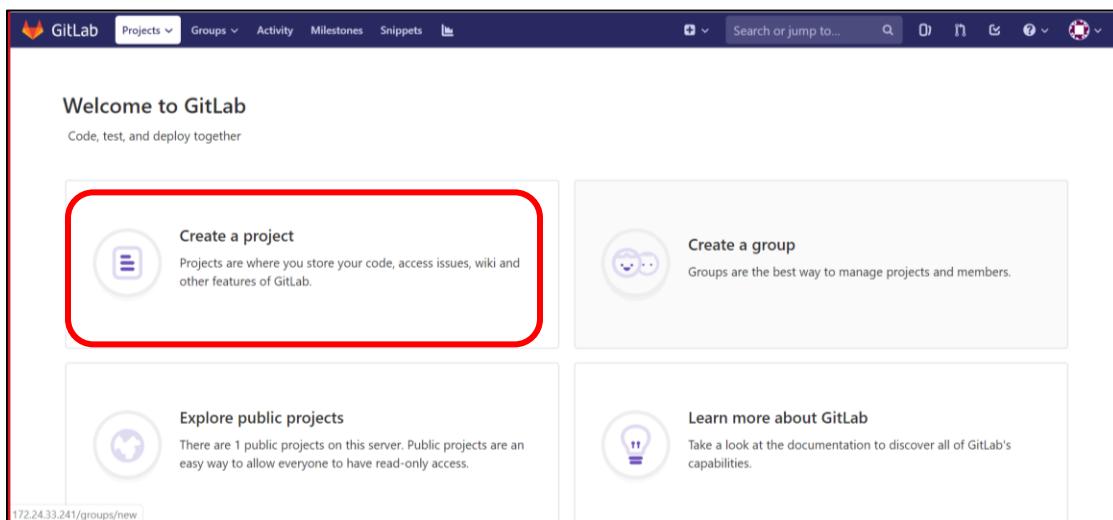


Figure 60: GitLab – Create a Project

3. The New project form appears. Enter a name for the project.
4. Select the Private option under Visibility level, so that the project is only visible to users who are granted explicit access to the project.
5. Select the Initialize repository with README checkbox to automatically generate a readme file that contains the project's repository details.
6. Select Create project.

The screenshot shows the 'New project' form in GitLab. Step 3 highlights the 'Project name' field with the value 'My awesome project'. Step 4 highlights the 'Visibility Level' section where 'Private' is selected. Step 5 highlights the 'Initialize repository with a README' checkbox. Step 6 highlights the 'Create project' button at the bottom.

Figure 61: GitLab – New Project Form

7. A success message appears indicating that the project repository was created. You are now ready to add members to the project.

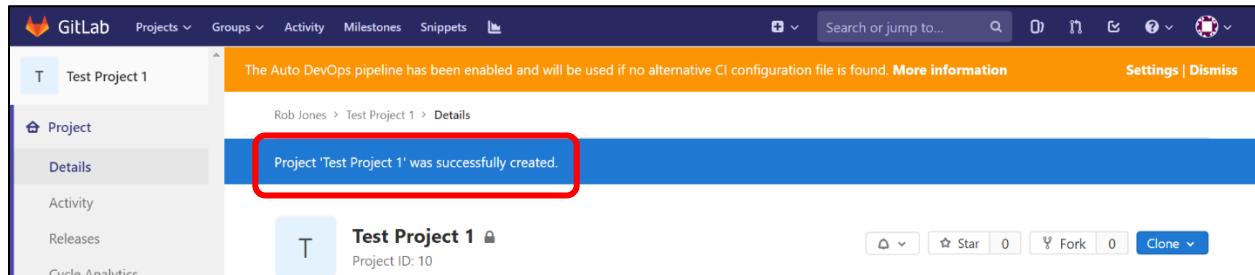
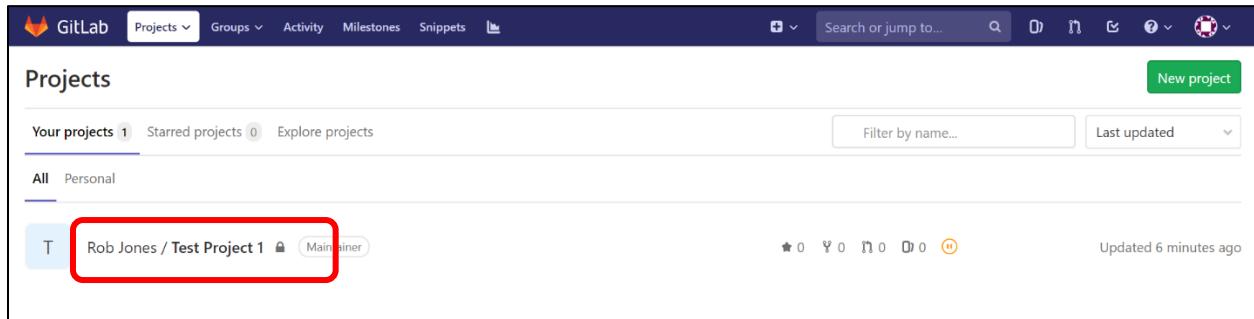


Figure 62: GitLab – Project Creation Success

## Add Members or Groups to a Project

1. Select the GitLab icon on the upper left to return to the home page.

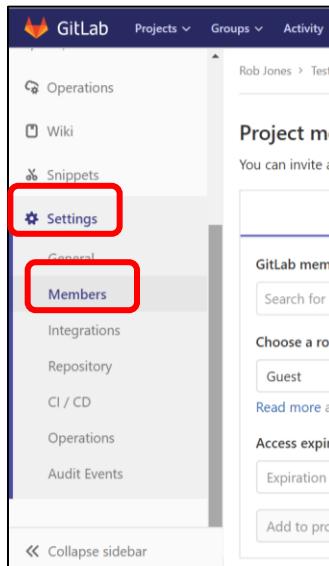
2. A list of your projects appears. Select the name of the project you want to add members /groups to.



The screenshot shows the GitLab interface with the 'Projects' tab selected. At the top, there are navigation links for Projects, Groups, Activity, Milestones, Snippets, and a search bar. Below the header, a 'Projects' section displays a list of projects. The first project in the list, 'Rob Jones / Test Project 1', is highlighted with a red box. This project has a status of 'Maintainer'. To the right of the project list, there are statistics: 0 stars, 0 forks, 0 issues, 0 merge requests, and 0 pipelines. The text 'Updated 6 minutes ago' is also visible.

Figure 63: GitLab – Select Project to Add Members

3. Click on Settings and then Members from the left navigation menu.



The screenshot shows the GitLab interface with the 'Settings' sidebar open. The sidebar includes options like Operations, Wiki, Snippets, Settings (which is highlighted with a red box), General, and Members (also highlighted with a red box). The main content area shows a 'Project members' section where a new member can be invited. The 'Members' section includes fields for 'Search for name', 'Choose a role' (Guest selected), 'Access expires', and 'Add to project'.

Figure 64: GitLab – Settings, Members Left Navigation Menu

4. You can add individual users or entire groups to the project.
  - a. Select the Invite member tab to add members individually to the project.
    - i. Start entering the project member's name or email address into GitLab member or Email address to select from the autocomplete list.
    - ii. Select a role for the project member from the drop-down menu under Choose a role permission.
    - iii. Click Add to project.

The screenshot shows the 'Members' page for 'Test Project 1' in GitLab. The left sidebar has 'Members' selected. The main area shows the 'Project members' section with a 'GitLab member or Email address' search input field and a 'Choose a role permission' dropdown set to 'Guest'. The 'Add to project' button at the bottom left of the main form is highlighted with a red box labeled 'iii.'.

Figure 65: GitLab – Add Member to Project

- b. Select the Invite group tab to add an entire group to the project.
  - i. Start entering the group's name into Select a group to invite to select from the autocomplete list.
  - ii. Select a role to apply for the group from the drop-down menu under Max access level.
  - iii. Select Invite to grant the group access to the project repository.

The screenshot shows the 'Members' page for a project named 'Test Project 1'. The sidebar on the left is titled 'Settings' and has a 'Members' section selected. The main area is titled 'Project members' and contains fields for 'Select a group to invite' (with a search bar), 'Max access level' (set to 'Developer'), and an 'Invite' button. A red box highlights the 'Invite group' button. Step numbers i., ii., and iii. are overlaid on the interface to indicate specific actions: i. highlights the 'Select a group to invite' search field; ii. highlights the 'Max access level' dropdown; iii. highlights the 'Invite' button.

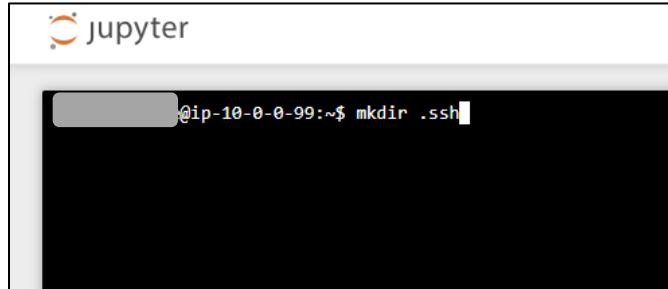
Figure 66: GitLab – Add Group to Project

## Generate SSH Key

To set up git integration, you need to have an SSH key on your SDC workstation. This key authenticates your identification to GitLab so that you can push commits to the project repository.

**NOTE:** For Windows users, perform the following commands in Git Bash. If Git Bash is not installed on your Windows workstation, please copy the Git Bash installer, **Git-2.19.1-64-bit.exe**, from the Z:\software-distribution folder and then install it.

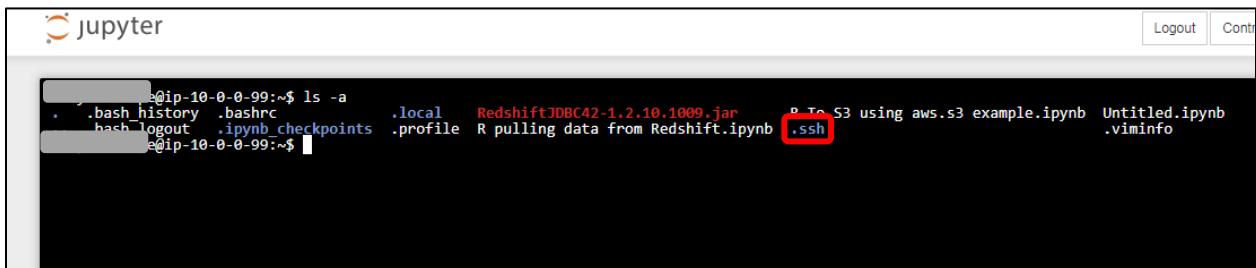
1. To store your authentication credentials for git, use a hidden folder called “.ssh.” First, check to see if the folder exists with `ls -a`. If not, create it using the command `mkdir .ssh`:



```
jupyter
[...]
@ip-10-0-0-99:~$ mkdir .ssh
```

Figure 67: GitLab – Create Folder for Credentials

2. Confirm this works by entering `ls -a` to see all objects in the current directory; you should see the .ssh listed:



```
jupyter
[...]
@ip-10-0-0-99:~$ ls -a
. .bash_history .bashrc .local RedshiftJDBC42-1.2.10.1009.jar R_to_S3_using_aws.s3 example.ipynb Untitled.ipynb
.. .bash_logout .ipynb_checkpoints .profile R_pulling_data_from_Redshift.ipynb .ssh .viminfo
@ip-10-0-0-99:~$
```

Figure 68: GitLab – View Directory Objects

3. Generate a new key to store in this location by typing the following command and then hitting the Enter key:

```
ssh-keygen -t rsa -b 4096 -C "SDCusername@securedatacommons.com"
```

4. It will output the following message: “*Generating public/private rsa key pair.*”
5. It will ask you where to save the file and to enter a passphrase with the following three prompts. Hit the Enter key each time (no need to enter anything else) to accept the defaults.
  - “*Enter file in which to save the key:*”
  - “*Enter passphrase (empty for no passphrase):*”
  - “*Enter same passphrase again:*”
6. After the following confirmation messages, the new SSH key is now stored in the .ssh folder.
  - “*Your identification has been saved in /c/Users/SDCusername/.ssh/id\_rsa.*”
  - “*Your public key has been saved in /c/Users/SDCusername/.ssh/id\_rsa.pub.*”

The default key file name is **id\_rsa** and is saved under the .ssh folder (e.g., C:/Users/[SDCUsername]/.ssh/ in Windows; \$HOME/.ssh/id\_rsa in Linux)

7. You now need to provide the public part of this key to GitLab by copying the “.pub” part of the key. Here are the different options for copying the public SSH key.

Option 1:

On Windows, open the id\_rsa.pub file (under the C:/Users/[SDCUsername]/.ssh folder) in a text editor (Notepad) and copy the entire key by using Select All then Copy. Be careful not to accidentally change anything!

Option 2:

Copy your public SSH key to the clipboard by using one of the commands below depending on your Operating System:

**Git Bash on Windows:**

```
cat ~/.ssh/id_rsa.pub | clip
```

**WSL/GNU/Linux (requires the xclip package):**

```
xclip -sel clip < ~/.ssh/id_rsa.pub
```

If using Jupyter, use the **head** command. Right-click on the output and click **copy**:

```
head ~/.ssh/id_rsa.pub
```

8. From the GitLab home page, add your public SSH key to your GitLab account:
  - a. In the upper-right corner, click on your avatar image and then click Settings.
  - b. From the left navigation menu, click SSH Keys.
  - c. In the Key field, paste your public SSH key.
  - d. The Title field will be automatically populated with [SDCUsername@securedatacommons.com](mailto:SDCUsername@securedatacommons.com).
  - e. Click the Add key button.
9. To test whether your SSH key was added correctly, run the following command in your terminal:

```
ssh -T git@scm.securedatacommons.internal
```

10. The first time you connect to GitLab via SSH, you will be asked to verify the authenticity of the GitLab host you are connecting to. Type “yes” to add the SDC internal GitLab to the list of trusted hosts.
11. You should see the “*Welcome to GitLab, @username!*” message.

**NOTE:** Once added to the list of known hosts, you will not be asked to validate the authenticity of SDC internal GitLab's host again. Run the above command once more, and you should only receive a “*Welcome to GitLab, @username!*” message.

If the Welcome message does not appear, run SSH in verbose mode by replacing `-T` with `-vvvT` to debug the error:

```
ssh -vvvT git@scm.securedatacommons.internal
```

# Chapter 8. Technical Documentation and Contact Information

The following sections provide technical resources for SDC users.

## Architecture Diagram

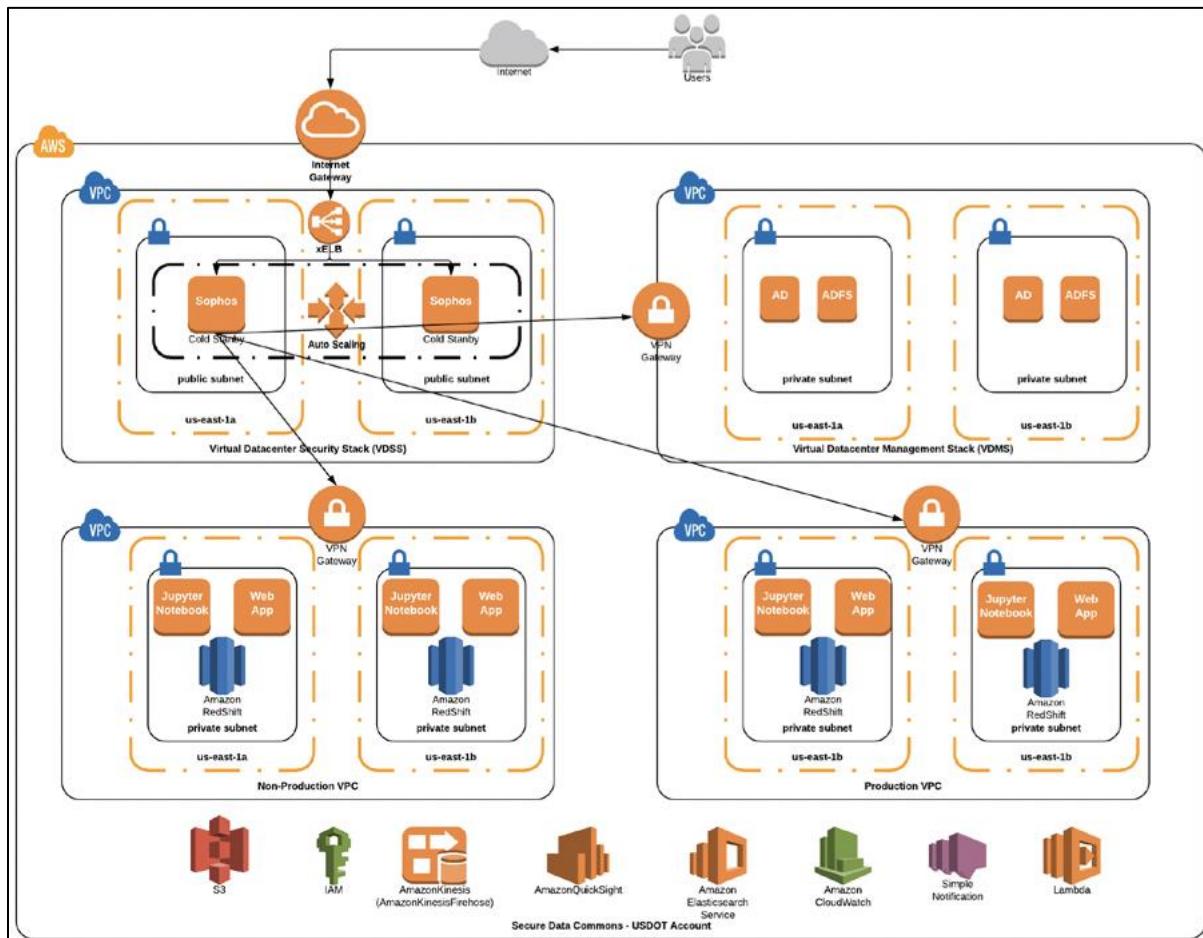


Figure 69: SDC Architecture Overview

## Workstation Details

Table 2: Default Workstation Details

Workstation Type	Type
Linux Workstation	t2.medium
Windows Workstation	t2.medium

**Note:** Workstation size and type can be increased upon user request. Please refer to the [Resize Workstation](#) section under Chapter 3 for instructions.

## Tools and Versions

*Table 3: List of Tools Used and Their Versions*

Tool Name	Version	Workstation
Java	1.8.0_162	Linux, Windows
Python	2.7.14	Linux, Windows
SQLWorkbench/J	Build 125	Windows
R	3.4.3	Linux, Windows
RStudio	1.1.423.0	Linux, Windows
Libre Office	5.3.6.1	Windows
Visual Studio	1.20.1.0	Windows
AWS CLI	1.14.46	Windows
7Zip	18.01	Windows
PuTTY	0.70	Windows
Firefox	59.0.2.0	Windows

## Contact Information

The SDC support team can be reached at [support@securedatacommons.com](mailto:support@securedatacommons.com).

## Useful Links

[S3:](#) Amazon Simple Storage Service, a place to store data.

[Jupyter:](#) An interactive, browser-based programming environment, mostly used for Python scripts but can also run R or other languages and can weave formatted text in with code and results of code into one ‘notebook’ file.

[Redshift:](#) A database system, which can be queried with SQL.

[Hive:](#) The Apache Hive™ data warehouse software facilitates reading, writing, and managing large datasets residing in distributed storage and queried using SQL syntax.

## AWS S3 CLI Commands

The following are a list of helpful commands to work with S3 from the terminal. The AWS\_S3\_CLI\_Cheat\_Sheet.pdf file is also available on the desktop of all workstations with useful commands.

In these commands, ‘local’ refers to the user’s SDC workstation (EC2 instance). The listed commands can only be used from within the user’s workstation environment.

- **List objects in a bucket** - If there are any files at the bucket level, then this command will return the list of files. If there are only folders/prefixes under the bucket, then it will return the top level folder/prefix names of that bucket.  
`aws s3 ls s3://<bucketName>`

- **List objects under a folder/prefix** - This command will list all the objects/files under that folder or prefix.  
`aws s3 ls s3://<bucketName>/<prefix>/`

- **Copy a local file to S3** - This command will copy a local file (test.txt) from your workstation over to an S3 bucket:

```
aws s3 cp test.txt s3://<bucketName>/test.txt
```

- **Copy an S3 object to a local file** - The below command copies an S3 object to your workstation.

```
aws s3 cp s3://<bucketName>/test.txt test.txt
```

# Chapter 9. Frequently Asked Questions

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## ***How can I get access to the SDC Datasets?***

These are datasets that are available within SDC platform that are published / enabled by the SDC team or published by other users. Access to these datasets are available upon request. Once you are logged in, go to ‘Datasets’ in the top menu.

The screenshot shows the 'SDC Datasets' page. At the top, there is a header bar with links for HOME, DATASETS, WORKSTATIONS, FAQ, and LOGOUT. Below the header, a section titled 'SDC Datasets' contains a brief description: 'These are datasets that are available within SDC platform that are published / enabled by SDC team or published by other users. Access to these datasets are available upon request. Learn more about the different types of datasets and how to request access to these datasets.' Below this description is a table listing datasets:

Name	Category	Description	Geographic Scope	Start / End for Data Availability	Owner	Request Access
WAZE	Curated	Contains curated waze data	All states in US	March 2017 to Present	SDC platform	<a href="#">Request</a>
CVP	Curated	Contains CVP evaluation datasets	All states in US	March 2017 to Present	SDC platform	<a href="#">Request</a>

Figure 70: SDC Portal – Datasets Tab

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All the available datasets are listed under the ‘SDC Datasets’. To request access to a dataset, click on the ‘Request’ button. A form will pop up. Fill out the form and click on ‘Send Request’ button.

The screenshot shows the Secure Data Commons Platform interface. At the top, there's a navigation bar with links for HOME, DATASETS (which is currently selected), WORKSTATIONS, FAQ's, and LOGOUT. Below the navigation, there's a section titled 'My Datasets / Algorithm' which displays a list of datasets uploaded by the user. One dataset, 'federationmetadata.xml', is highlighted. A modal window titled 'SDC Datasets Access Request' is open over this list. It contains fields for 'Enter the list of state\*' and 'Provide comma separated state name (e.g. KN, VI)'. At the bottom of this modal are two buttons: 'SEND REQUEST' (highlighted with a red box) and 'CANCEL'. In the background, there's another section titled 'SDC Datasets' with a table. The table has columns for Name, Type, Description, Programming tools / language, Geographic Scope, Start / End for Data Availability, and Request Access. A single row is shown for 'WAZE', which is a 'Dataset(Curated)' containing curated waze data. The 'Request Access' column for this row contains a blue button labeled 'Request' (also highlighted with a red box).

Figure 71: SDC Portal – Dataset Access Request

The request will be sent to the SDC support team and access to the requested dataset will be given upon approval.

### ***How will I understand what a particular dataset consists of?***

Click on Name of Dataset, you can see README of that particular dataset below it.

### ***How can I launch a workstation?***

Click on ‘Workstations’ and click on the ‘Launch’ button of any workstation you want to access.

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The screenshot shows the 'My Workstations' section of the SDC Portal. At the top, there's a header with links for HOME, DATASETS, WORKSTATIONS (which is underlined), FAQ, and LOGOUT. Below the header, a sub-header says 'My Workstations'. A brief description follows: 'Workstations are Windows or linux Virtual Machines (VMs), which provide a mechanism for SDC users to access the datasets assigned to them or their own datasets, and perform analytics on the data'. A table lists two workstations:

#	Stack Name	Applications	Action
1	Programming Environment #1	Microsoft R, RStudio, Python, Microsoft Power BI, SQL Server Management Studio, SQL Workbench, Open Office, Firefox	<button>Stop</button> <button>Launch</button>
2	Programming Environment (AppStream)	Firefox, Jupyter Notebook, RStudio	<button>Stop</button> <button>Launch</button>

Figure 72: SDC Portal – Workstations Tab

For Programming Environment #1, you will be prompted with username and password to log in to the Windows workstation.

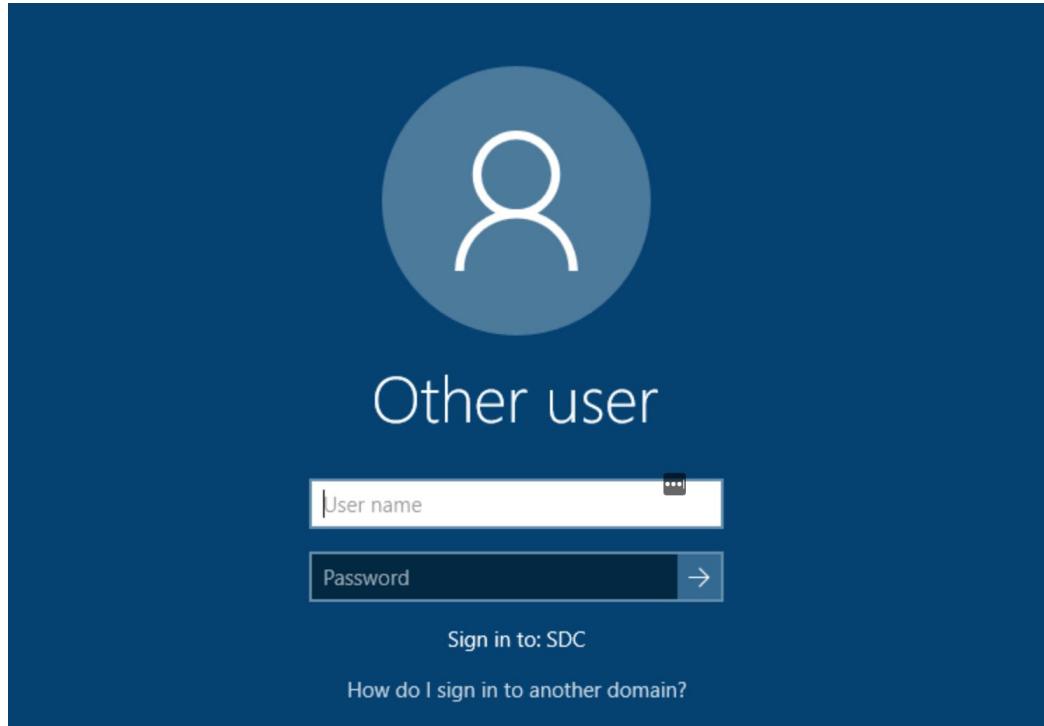


Figure 73: SDC Workstation – Login

### Where do I store my data?

You can store your data in your team/individual bucket. Please refer to [Upload User Data to S3 Bucket Through Portal](#)

## ***How can I bring my own datasets/algorithm to my workstation?***

Please refer to [Upload User Data to S3 Bucket Through Portal](#) to bring your own datasets/algorithm to workstation.

## ***How can I publish my dataset/algorithm?***

Follow the below steps to publish your datasets / algorithms and share with other SDC Users.

1. Navigate to the Datasets page.
2. Click on the Publish button for the dataset/algorithm you wish to publish.

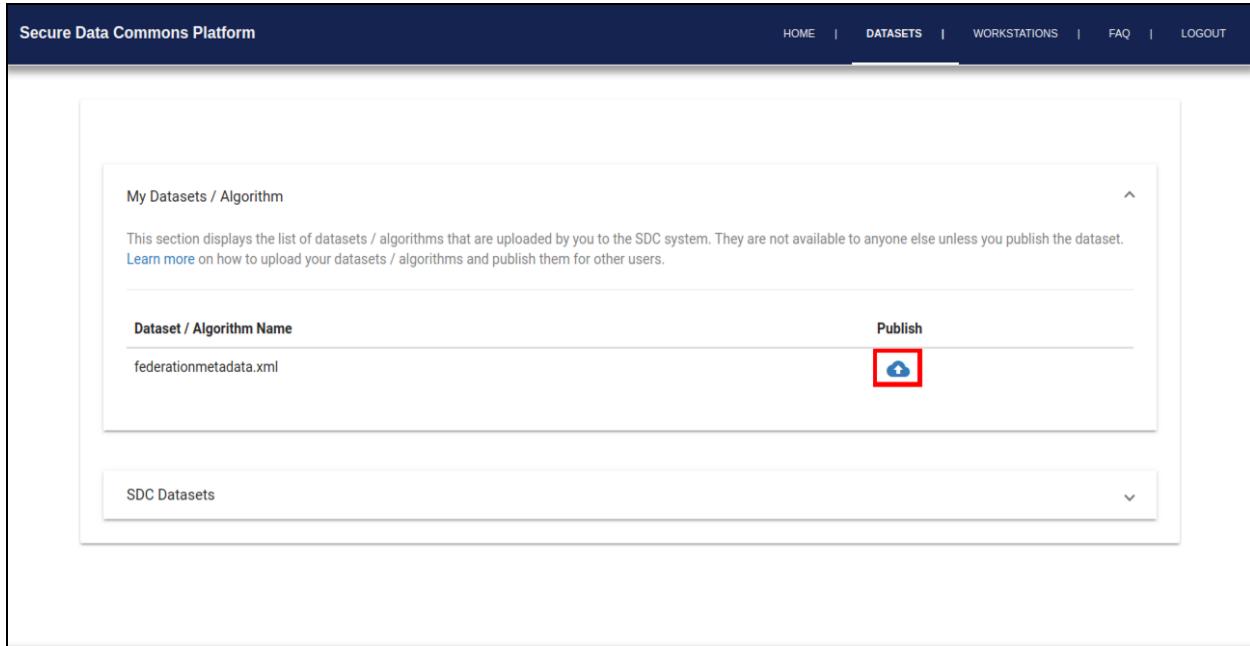


Figure 74: SDC Portal – Publish Button

3. In the pop-up window, there are two options for the Type: either a **Dataset** or **Algorithm**.
  - a. From the Type drop-down menu, select **Dataset**:

The screenshot shows a web-based form titled "Publish Dataset / Algorithm Request". The form fields are as follows:

- Type: Dataset
- Name \*: appstream.py
- Description \*
- File/folder name \*
- Readme / Data dictionary file name \*
- Geographic Scope \*
- Start/End Date for Data Availability \*

At the bottom of the form are two buttons: "SEND REQUEST" and "CANCEL".

Figure 75: SDC Portal – Publish Dataset Request Form

- i. Name - Name of the dataset, which you wish to call it. Users will see your dataset with this name under SDC Datasets section.
- ii. Description - Provide a short description so users can get an idea about your dataset.
- iii. File/folder name - Name of the file or folder where your dataset resides in your S3 Bucket. We need this information, so the support team can publish this dataset and make it available to other users.
- iv. Readme / Data dictionary file name - This file should provide detailed instructions about your dataset, how it was created or any relevant information that helps user to understand and use the dataset. Save this file in your home folder relative to the dataset file/folder name.

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- v. Geographic scope - Indicate the geographic scope for your dataset whether it belongs to a specific state, region, country etc.
  - vi. Start/End Date for data availability - Provide the start and end dates of the data that belongs in your dataset. For example, your dataset may contain data from March 2017 to August 2017.
- b. From the Type drop-down menu, select **Algorithm**.

The screenshot shows a 'Publish Dataset / Algorithm Request' form. The 'Type' field is set to 'Algorithm'. The 'Name \*' field contains 'appstream.py'. There are four empty text input fields for 'Description', 'File/folder name \*', 'Readme / Data dictionary file name \*', and 'Programming Tools/language \*'. At the bottom are 'SEND REQUEST' and 'CANCEL' buttons.

Figure 76: SDC Portal – Publish Algorithm Request Form

- i. Name - Enter the name for your algorithm. Users will see your algorithm with this name under SDC Datasets section
- ii. Description - Provide a short description about your algorithm
- iii. File/Folder name - Name of the file or folder where your algorithm resides in your S3 bucket. We need this information, so SDC support team can publish this algorithm and make it available to other users
- iv. Readme / Data dictionary file name - This file should provide detailed instructions about your algorithm, how it was created or any relevant information that helps user to understand and use the algorithm. Save this file in your home folder relative to the algorithm file/folder name

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- v. Programming Tools/language - Provide the details of programming tools and/or languages that were used to create this algorithm, so users can leverage the same to run your program.

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