

System Wide Information Management (SWIM)

SWIM Cloud Distribution Service (SCDS)

User Guide



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1. Introduction

The System Wide Information Management (SWIM) Program is a National Airspace System (NAS)-wide information system that supports Next Generation Air Transportation System (NextGen) goals. SWIM facilitates the data-sharing requirements for NextGen, providing the digital data-sharing backbone of NextGen. The SWIM Cloud Distribution Service (SCDS) is an FAA cloud-based service that provides publicly available FAA SWIM content to FAA approved consumers. Consumers interface with SCDS via the Java Message Service (JMS) version 1.1. More information on the Solace JMS API can be found on Solace's website at <https://docs.solace.com/Solace-JMS-API/Solace-JMS-Overview.htm>.

2. Overview

SCDS provides a direct internet, non-VPN, connection to SWIM JMS services via the FAA Public Cloud. The intent of SCDS is to reduce the burden and time for SWIM users to request and connect to FAA SWIM data. To accomplish this, a self-service portal is provided to support on-demand requests for new subscriptions and changes. Figure 1 depicts the high-level architecture for SCDS illustrating how SWIM access is provided via a public cloud with direct internet.

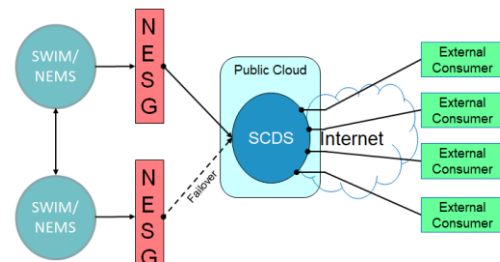


Figure 1 - High-Level SCDS Architecture

3. On-Boarding Process

SCDS provides users with a web management portal to request and manage access to SWIM subscriptions. Figure 2 below illustrates the process for creating an account, requesting access, connecting, and monitoring consumer connections.

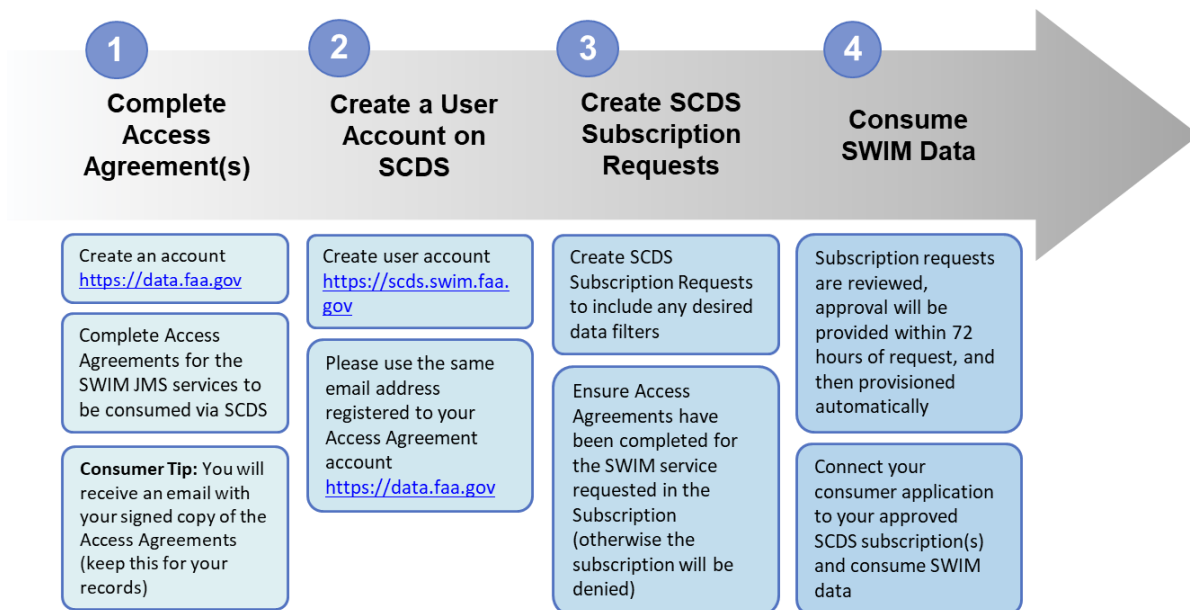

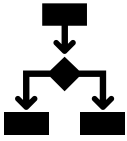


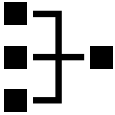



Figure 2 - SCDS On-Boarding Process

4. Services

SCDS aims to improve the SWIM On-Boarding process and has implemented several core features to facilitate improved user experience. The table below provides a summary of these core SCDS features.

Table 1 - SCDS Services

	Self-Service Provisioning	Users are provided with self-service access to create their own subscriptions and submit for approval. Once approved, the user's SWIM Queue is automatically provisioned for use.
	Subscription Management	SCDS provides users with fine-grained message filtering, allowing users to define the SWIM subscription that fits their specific needs.
	Client Metrics	The SCDS Portal provides users with self-service access to real-time client metrics on connections, ingress, egress, and discards, enabling users to monitor their connections, identify, and resolve any issues.
	Secure Connection	All information passed between the SCDS client and server are encrypted via a secure (TLS) connection.
	Managed Failover	SCDS maintains connections to both ACY and OEX SWIM NESG servers performing automatic failover, for network outages, and manual failover, for scheduled maintenance related outages.
	Help Desk Support	SCDS provides users with everything they need to manage their connections and subscriptions but in the event a user needs additional assistance in resolving issues or simply has a question about the data provided via SWIM, a dedicated Help-Desk is provided for users to email or call for support.

4.1 Self-Service Portal

The SCDS Self-Service Portal is a web-enabled service that provides the ability for users to register, view available content products, and set your subscription to a product.

From the Self-Service Portal a user can:

- View the products available
- Register for access to the SCDS
- Create a subscription request to the products available

4.2 Service Status Portal

The SCDS Service Portal is a web-enabled service that provides the ability for users to view current subscriptions, metrics of the current subscriptions, view connection information to be used by their messaging client and download a Jumpstart Kit.

From the Service Status Portal, a user can:

- View active subscriptions
- View subscriptions pending approval
- View metrics of the active subscriptions
- View the messaging connection information
- Download the Jumpstart Kit
- View sample messages
- View account information

5. SCDS Access and Usage

This section will explain how to navigate the SWIM Cloud Distribution Service (SCDS) system from account creation to creating a subscription.

5.1 Landing Page

Upon navigating to the SCDS User Portal, users are presented with the SCDS Landing Page as shown in Figure 3. The Landing Page contains a list of SWIM data products available through SCDS as well as some navigation controls including a “GET STARTED” button, a “SIGN IN” link, and a link to the SCDS “SUPPORT” section that includes Frequently Asked Questions.

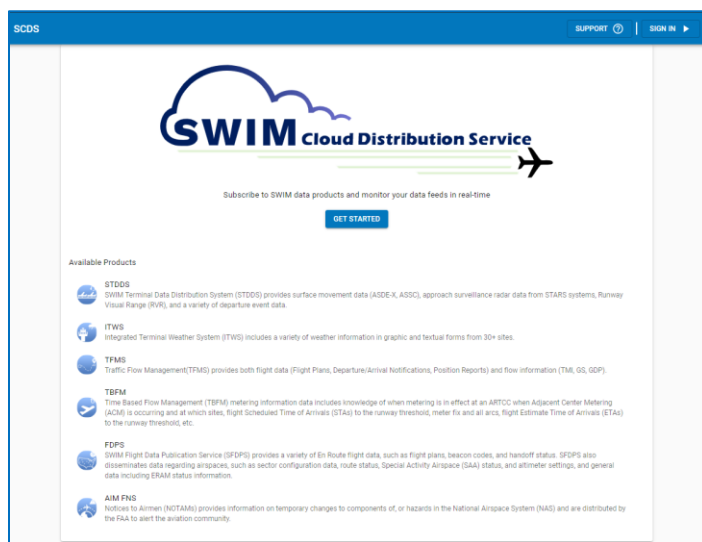


Figure 3 - Landing Page



Figure 4 - Account Creation Page

5.2 Account Creation

To request an account with SCDS, click on the “GET STARTED” button on the Landing Page. The account request form will be presented as shown above in Figure 4.

5.3 Account Creation Form

Fill out the form, (passwords must be a minimum of 12 characters, contain at least one number, one lowercase letter, one uppercase letter, and one special character) and check the “I’m not a robot” checkbox in the reCAPTCHA area and then click the “SUBMIT” button to get to the Update Account Information page. The Update Account Information page will ask for your Company Name and Phone Number. Once filled out, click the “SUBMIT” button to get to the Email Verification Page shown below in Figure 5.

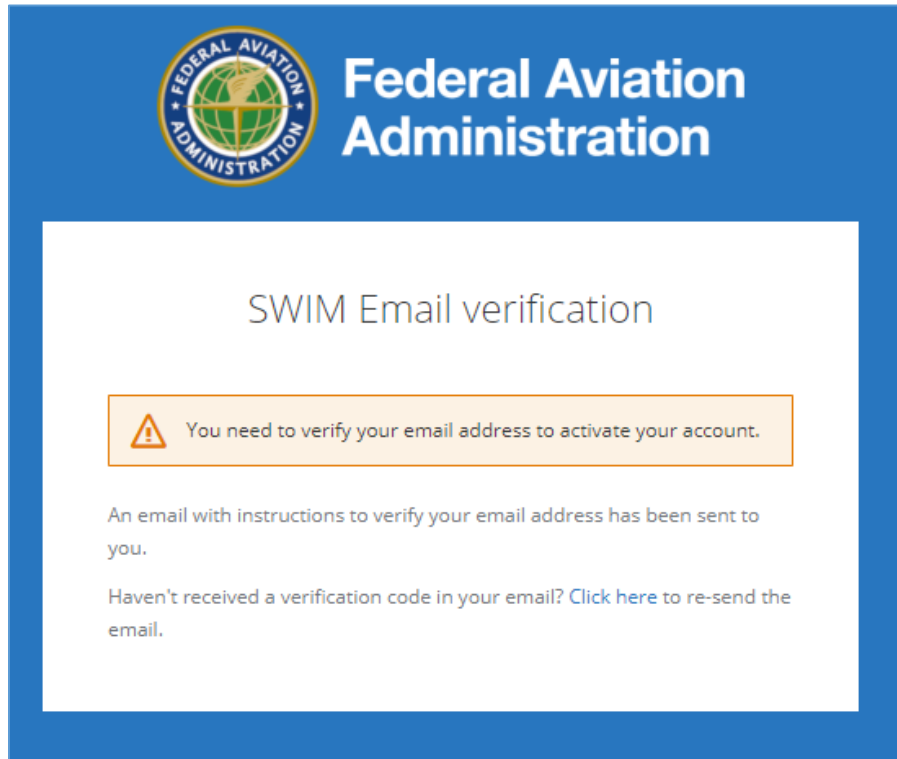


Figure 5 - Email Verification Page

5.4 Email Verification Page

An email will be sent to your email address to verify your account. If you do not validate the email address within 5 minutes of receipt, the link will expire. Click on the “SIGN IN” button on the Landing Page to once again prompt the SCDS system to send another email verification. Once you click on the link in the email, your account will be validated, and you can click on “Click here to proceed” on the Email Confirmation Page. You will be directed to a page that will notify you that your email has been verified. Click on the “Back to Application” link to get the Login Page. After you log in, the Subscriptions Page will be shown. Click “GET STARTED” to begin requesting data.

5.5 SCDS Request SWIM Data Subscription

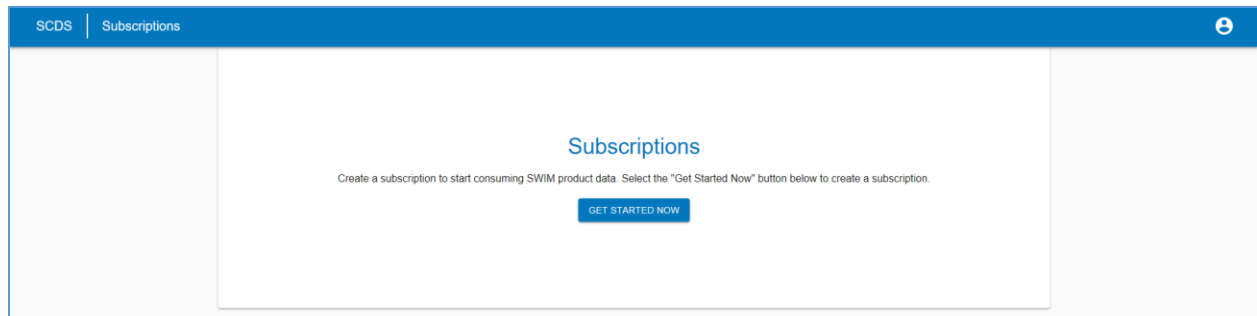


Figure 6 - SCDS Subscriptions Page

To request a SWIM data product, click on the “GET STARTED NOW” button on the Subscriptions Page, shown in Figure 6. You are directed to the New Subscription wizard shown below in Figure 7.

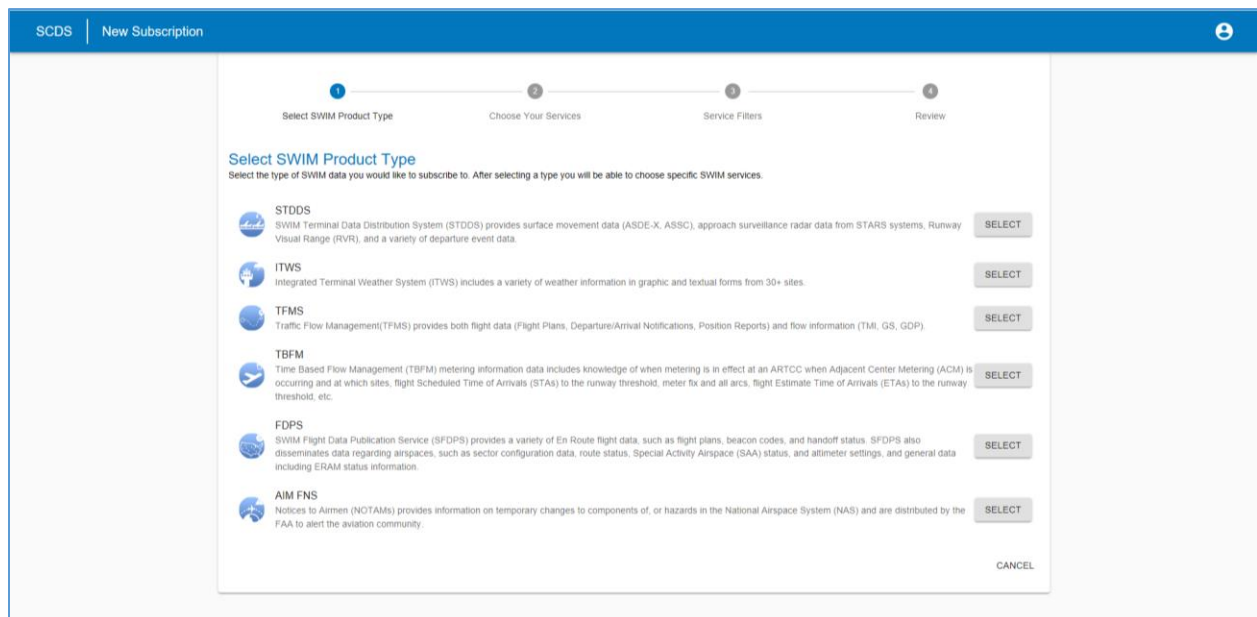


Figure 7 - SCDS New Subscription Wizard Step 1

The New Subscription Wizard will guide you through the subscription process in four simple steps. In Step 1, you can select a SWIM Product Type, which includes the following product types: STDDS, ITWS, TFMS, TBFM, FDPS, and AIM FNS. Select a product type by clicking on the “SELECT” button next to the desired SWIM Product Type. Step 2 presents you with the individual SWIM services contained within the selected SWIM Product. Figure 8 shows the services

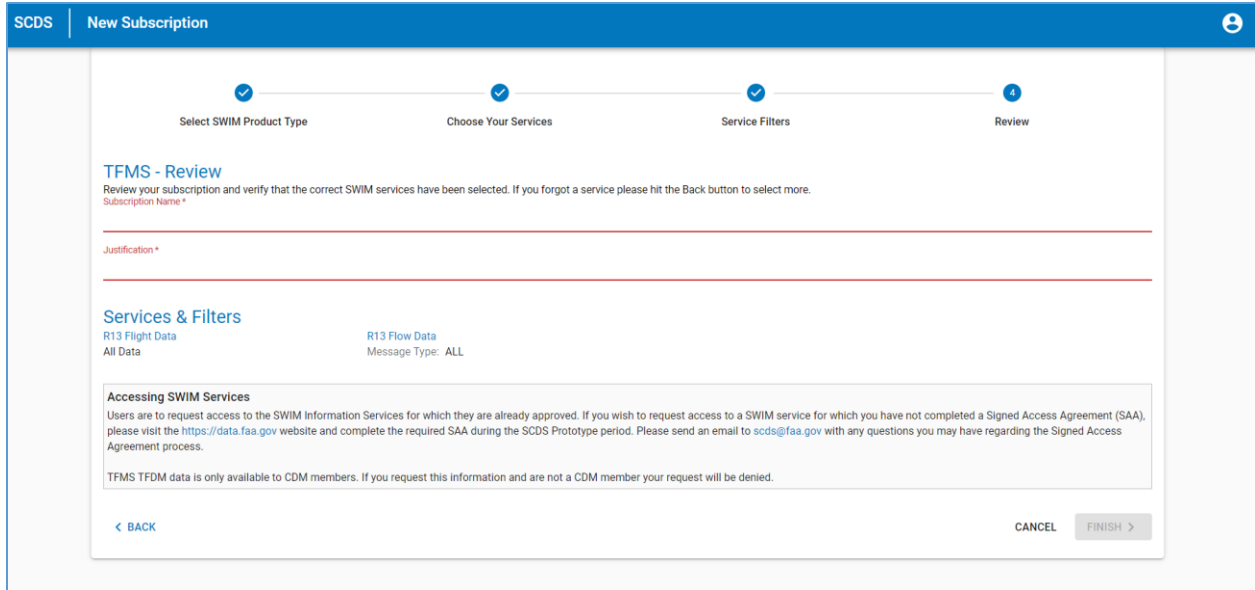
contained within the STDDS Product. Select the desired service(s) and click on the “NEXT: FILTERS” button.

Figure 8 - SCDS New Subscription Wizard Step 2

Step 3 allows you to select which filters are applied to your selected data service. Select the desired filters and then select the “NEXT:REVIEW” to move onto the next step. Figure 9 below shows the service filter selection page.

Figure 9 - SCDS New Subscription Wizard Step 3

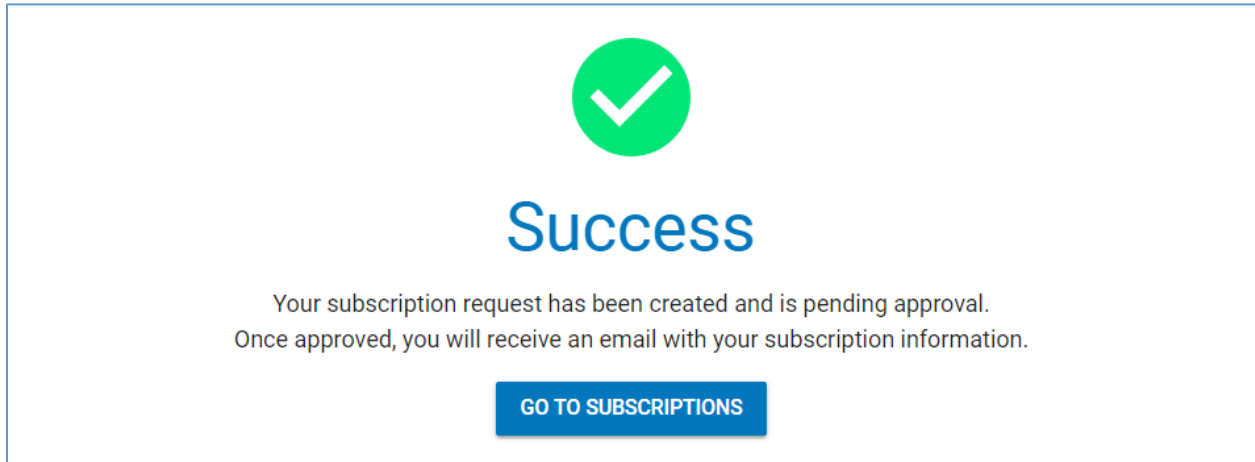
Step 4 provides a review of the selected service and allows you to provide a name for the subscription and justification for the requested service. Once you fill out a name and justification, you will want to review the Terms & Conditions and then check the box to validate that you have read and agree to the Terms & Conditions. Once you complete these items, select the “FINISH” button to submit your request for approval. Figure 10 below shows the review page.



The screenshot shows the 'New Subscription' wizard in the SCDS application, specifically the 'Review' step. The header bar is blue with 'SCDS' and 'New Subscription' on the left, and a user icon on the right. A progress bar at the top indicates four steps: 'Select SWIM Product Type', 'Choose Your Services', 'Service Filters', and 'Review' (the current step, marked with a '4' in a blue circle). Below the progress bar, the title 'TFMS - Review' is displayed. A sub-header reads: 'Review your subscription and verify that the correct SWIM services have been selected. If you forgot a service please hit the Back button to select more.' There are two input fields: 'Subscription Name *' and 'Justification *', both with red borders. Below these is a section titled 'Services & Filters' showing 'R13 Flight Data' and 'All Data' on the left, and 'R13 Flow Data' and 'Message Type: ALL' on the right. A box titled 'Accessing SWIM Services' contains text about requesting access to SWIM Information Services and a link to <https://data.faa.gov>. At the bottom, there is a '< BACK' button on the left and 'CANCEL' and 'FINISH >' buttons on the right.

Figure 10 - SCDS New Subscription Wizard Step 4

Upon submittal of the request, you will receive confirmation that your subscription request has been created and is pending approval as shown below in Figure 11.



The screenshot shows a confirmation page with a large green circle containing a white checkmark at the top center. Below the checkmark, the word 'Success' is written in a large, blue, sans-serif font. Underneath, a message states: 'Your subscription request has been created and is pending approval. Once approved, you will receive an email with your subscription information.' At the bottom center, there is a blue button with the text 'GO TO SUBSCRIPTIONS' in white, uppercase letters.

Figure 11 - SCDS Subscription Request Confirmation

An email will be sent to the email associated with the SCDS account indicating receipt of the subscription request. Figure 12 shows an example of what this email looks like.

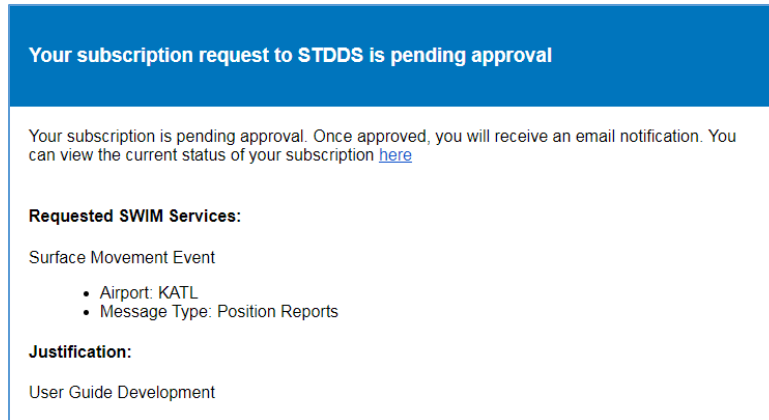


Figure 12 - SCDS Subscription Request Email

Once your subscription request has been approved you will receive an email indicating that your subscription has been approved and the connection details will be contained within the email. Figure 13 below highlights an example of the approval email.

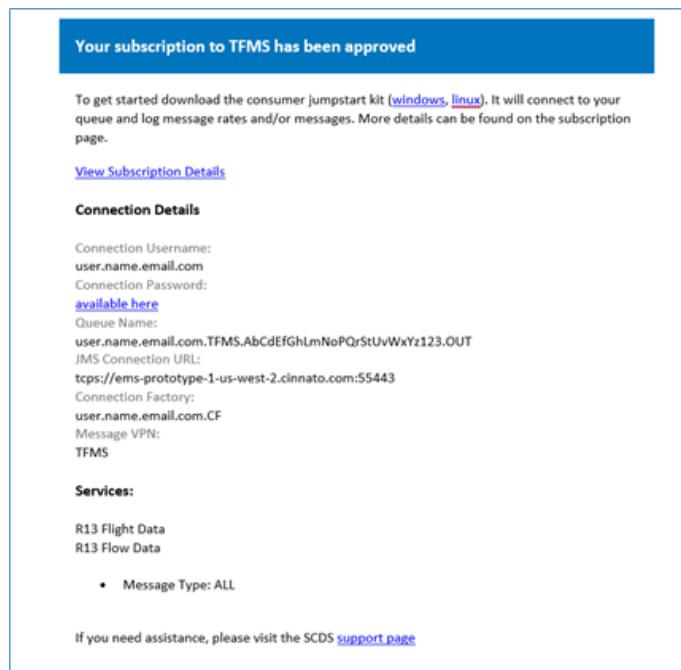


Figure 13 - SCDS Subscription Approved Email

5.6 Service Status Portal Access and Usage

This section describes how a user can view their content subscription requests pending, subscription approvals, connection details, content consumption metrics, as well as download a Jumpstart Kit, use the message data viewer, and review their user account information.

5.6.1 Service Status Display

SCDS provides several status indicators that help users understand if there are any issues with the SCDS messaging system and/or the data flowing into the system from the NESG SWIM Nodes. Figure 14 shows the SCDS status display that is available at the top of the SCDS portal once logged into the system.



Figure 14 - SCDS Status Display

5.6.2 Subscriptions Page

From the SCDS Subscription Request Confirmation shown in Figure 14, you can select the “GO TO SUBSCRIPTIONS” button to navigate back to your subscriptions page. If you have any pending or approved subscriptions, you will see them listed as shown in Figure 15 and Figure 16.

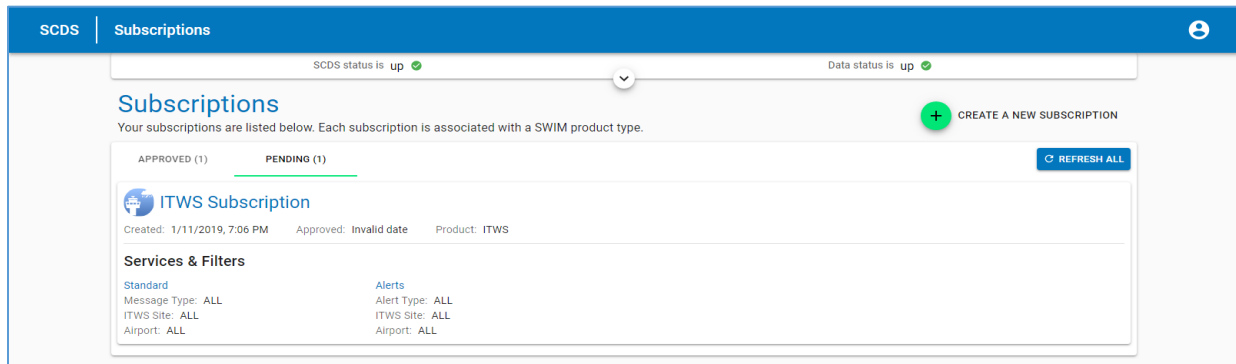


Figure 15 - SCDS Subscriptions Page – Pending

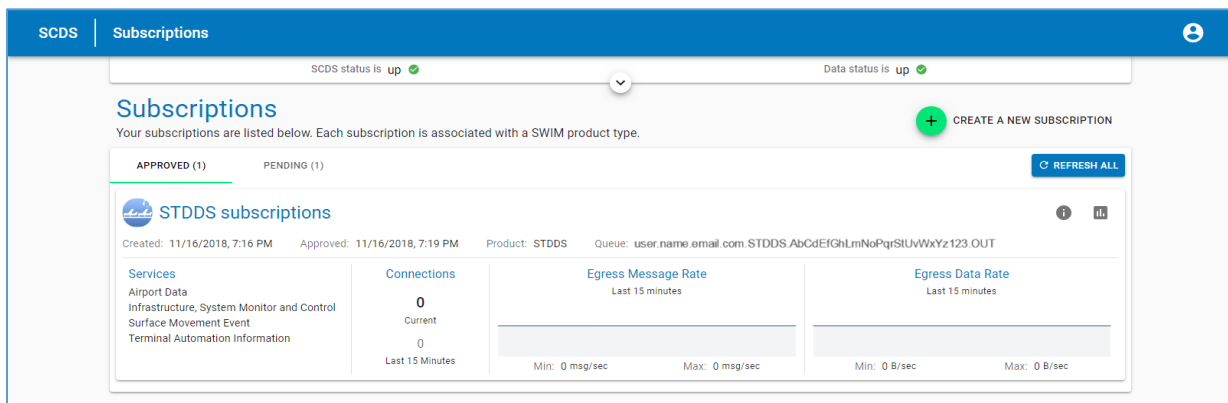


Figure 16 - SCDS Subscriptions Page – Approved

From the Subscriptions Page you can add additional subscriptions by clicking on the “CREATE A NEW SUBSCRIPTION” button in the top right area of the Subscriptions Page.

Located just under the “CREATE A NEW SUBSCRIPTION” button is a “REFRESH ALL” button that will refresh your list of subscriptions. Just under the “REFRESH ALL” button are the subscription details button and subscription metrics button Figure 17. shows the subscription details button and subscription metrics button.



Figure 17 - SCDS Subscription Controls

There are four tabs within the Subscription Details Page including a tab for connection details, subscription metric, Jumpstart Kit download, and a message viewer. The connection details button takes you to the connection details tab within the subscription details page. Figure 18 shows the connection details tab which include all information required to configure a JMS client to connect to the SCDS Queue. The subscription name can also be changed by clicking the “EDIT” button or the entire subscription can be deleted by clicking the “REMOVE” button. Currently, it is not possible to change a subscription once submitted. If a new subscription is needed, it will have to be requested and the old one removed.

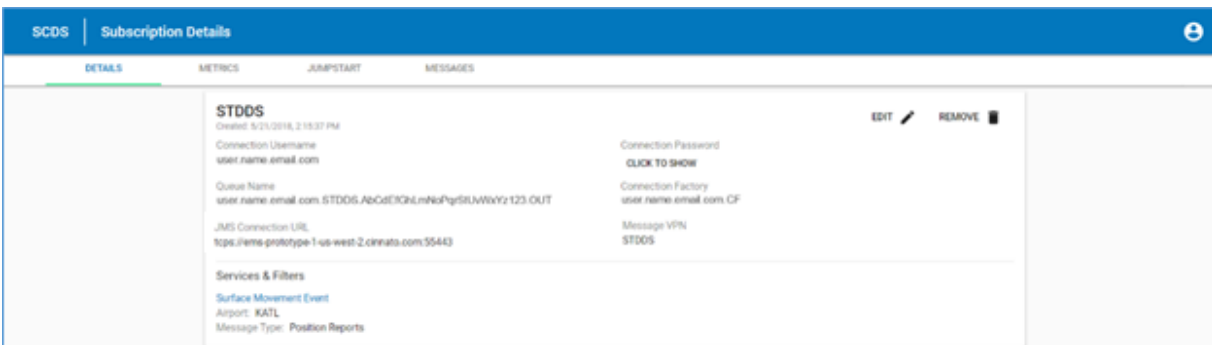


Figure 18 - SCDS Connection Details Tab

The Subscription Metrics Tab shows statistics associated with each subscription. Available metrics are provided in Table 1.

Table 2 - SCDS Queue Metrics

Metric	Description
Connection Count	The number of consumer connections bound to the queue.
Expired Message Count	The number of messages where the JMSEExpiration time has been exceeded resulting in being discarded from the queue and are no longer available for consumption.
Ingress Message Rate	The rate of messages flowing into the queue per minute
Ingress Data Rate	The data rate, bytes per second, flowing into the queue
Egress Message Rate	The rate of messages flowing out of the queue per minute
Egress Data Rate	The data rate, bytes per second, flowing out of the queue

Each of these are presented in temporal graphs that are adjustable with the following settings: Last 15 minutes, Last 30 minutes, Last hour, Last 6 hours, Last 12 hours, Last day, Last 2 days, Last 7 days, and Last 30 days. Figure 19 shows the subscription metrics tab within the subscription details page.

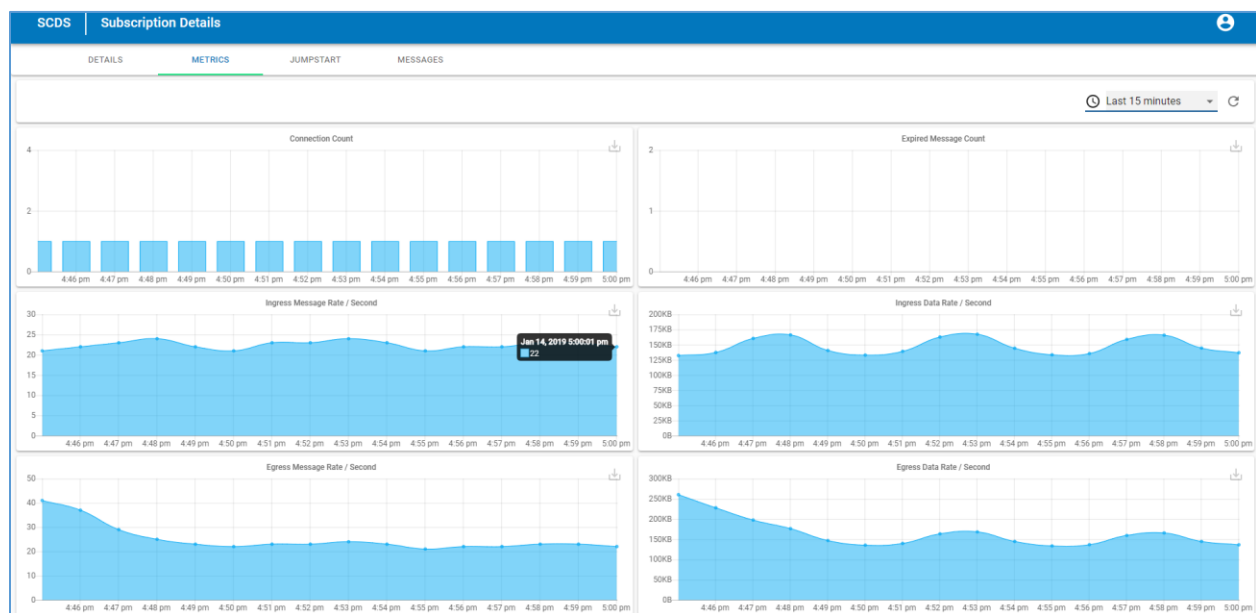


Figure 19 - SCDS Subscription Metrics Tab

The Jumpstart Tab provides a download button to retrieve the Jumpstart Kit for SCDS. First you select which operating system you plan to use, either Windows or Linux, and then click the “DOWNLOAD” button to get the Jumpstart Kit. Figure 20 shows the jumpstart kit tab within the subscription details page.

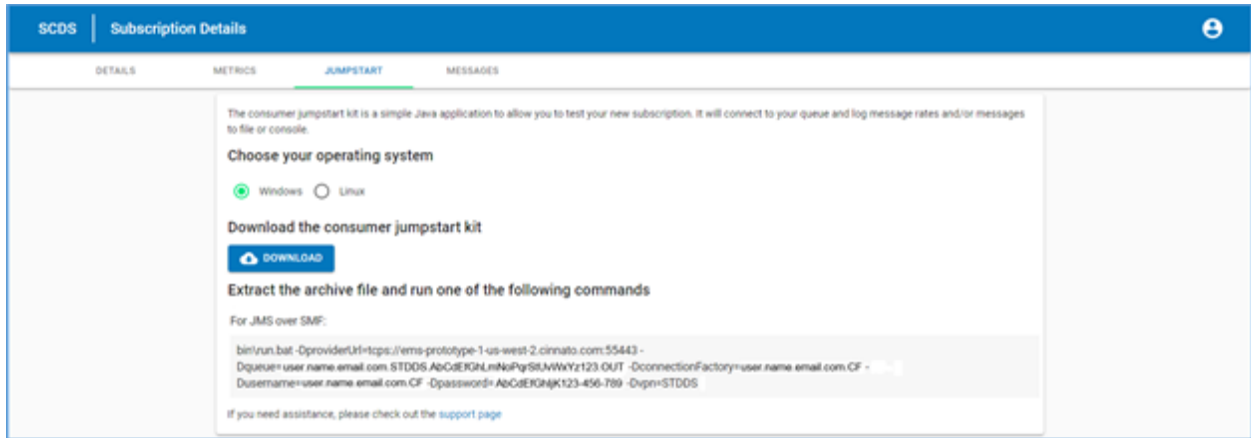


Figure 20 - SCDS Jumpstart Kit Tab

The Messages Tab enables users to be able to view messages as they arrive in their JMS queues. To load the latest message, press the “LOAD MESSAGE” button located at the top center of the page. Figure 21 shows the message viewer.

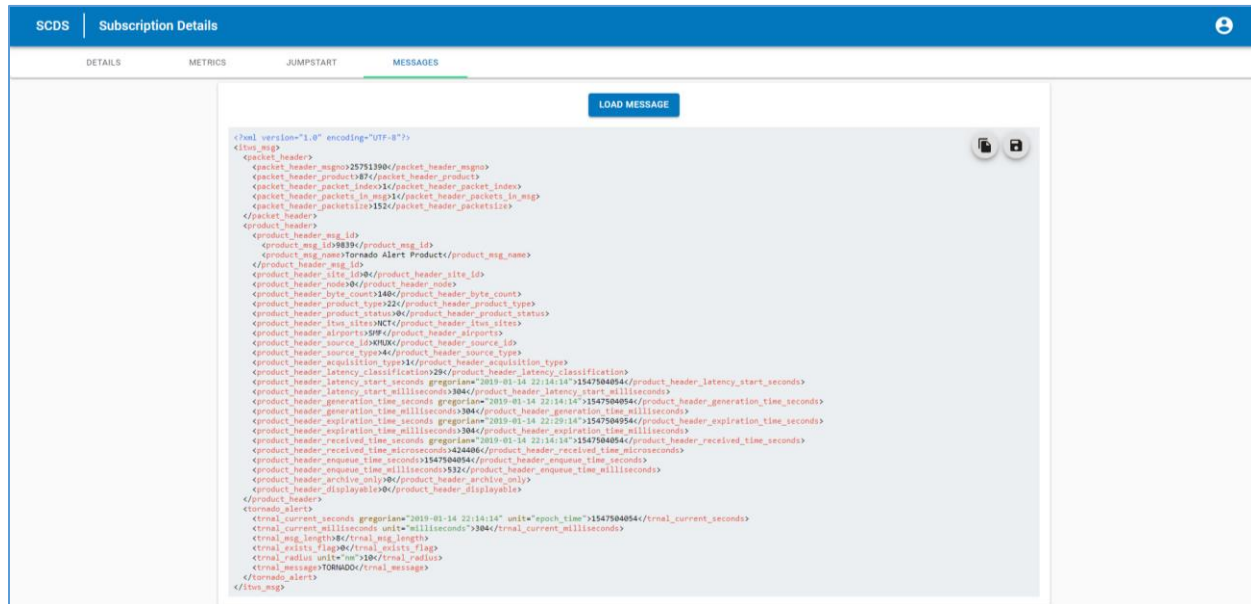


Figure 21 - SCDS Message Viewer Tab

5.6.3 Account Details

To view details associated with your account, click on the user profile icon in the top right corner and you will be presented with an option to view your account or sign out of the SCDS portal. Figure 22 shows the user profile menu options.

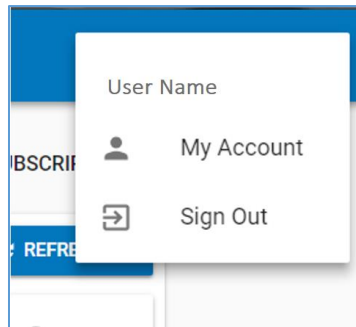


Figure 22 - SCDS User Profile Menu

If you click on the “My Account” option, you are taken to the Account Details Page. From this menu you are able to edit your account settings, change your portal password, set up your account for two-factor authentication (for enhanced protection of your account, not required to consume SWIM data) and see some general information on active portal sessions (active logons to the SCDS Portal) and past SCDS Portal activity. Press the “SAVE” button to make sure any changes are saved within the system. To return to your subscriptions page, select the “BACK TO SCDS” button or you can select the “SIGN OUT” button to log off from the SCDS Portal.

Appendix A: JMS 1.1

JMS is a Java API to support messaging. It is an open standard to allow Java applications to create, send, receive, and read messages. A client application must use a vendor-specific JMS client library and its dependent libraries to interoperate with a vendor's JMS broker. A JMS application using another vendor's JMS client library cannot connect to Solace, but if the client is generically written, it should be able to swap the client libraries to go from using one JMS broker to another. The Solace JMS client libraries will be provided in a Jumpstart Kit through the SCDS Self-Service Portal. More information on the Jumpstart Kit will be discussed in the Self-Service Portal Access and Usage section.

JMS allows for the use of the Java Naming and Directory Interface (JNDI) that can be used to lookup Connection Factory and Queue objects. After a JMS client performs a JNDI lookup, it can create a local JMS object from the information returned.

One difference between a client connection to another JMS broker versus the Solace broker, is the need to specify the Message Virtual Private Network (VPN) name. The Message VPNs are managed objects on Solace routers that allow for the segregation of topic space and clients.

There are a couple of ways to set the Message VPN name on the client.

1. It can be set as a Java system property when running the Java program using the -D command line option.

```
"java -DSolace_JMS_VPN=myVPN ..."
```

2. It can be set as Initial Context environment property in the Java code.

```
Hashtable<String,Object> environment = new Hashtable<String,Object>();
environment.put(InitialContext.INITIAL_CONTEXT_FACTORY, "com.solacesystems.jndi.SolJNDIInitialContextFactory");
environment.put(InitialContext.PROVIDER_URL, "smf://192.168.1.1:5555");
environment.put(Context.SECURITY_PRINCIPAL, "userName");
environment.put(Context.SECURITY_CREDENTIALS, "userPassword");
environment.put(SupportedProperty.SOLACE_JMS_VPN, "mvVPN");
InitialContext = new InitialContext(environment);
ConnectionFactory cf = (ConnectionFactory)initialContext.lookup("connectionFactoryName");
```

3. It can be placed in a jndi.properties file that is in the class path of the Java application.

```
Solace_JMS_VPN=myVPN
```

Appendix B: Consumer Application Connection Steps and Design Guidance

If a consumer client loses their connection or receives an exception, it is recommended as best practice to write the client software to perform a reconnect. Any processing, parsing, or writing to disk of the messages after they are received should be done in a separate thread than the process thread that is consuming the messages. If parsing and writing to disk is done in the same thread as the message consumer thread, a slow consumer situation may occur and result in missed messages.

Using the Self-Service Portal Metrics Page, a user should be able to determine if their egress message rate matches their ingress messages rate. If the ingress message rate is much higher than the egress message rates and the expired message rate is not zero, then likely the client is not able to consume the messages fast enough. Possible solutions could include using a multi-threaded client or multiple clients to consume from a single queue to keep up with the message rate. Other possible issues could be limited bandwidth on the user's network or performance limitations on the user's server.

Appendix C: SCDS Jumpstart Kit

The SCDS Jumpstart Kit contains a simple JMS consumer that allows for testing connections to SCDS; it is not intended for real world applications. This section provides an overview of the SCDS Jumpstart Kit. It will cover contents of the Jumpstart Kit as well as describe how to use the Kit to consume SWIM services. There are two versions of the Jumpstart Kit available for download from the Subscription Details Page under the Jumpstart Tab depending from which operating system you will be consuming SWIM data. SCDS supports the Solace proprietary SMF protocol. To download the Jumpstart Kit, navigate to the Subscription's Details Page and the Jumpstart Tab. Select which version of the jumpstart kit you need, either Windows or Linux. Figure 23 shows the Jumpstart Kit Download Page.

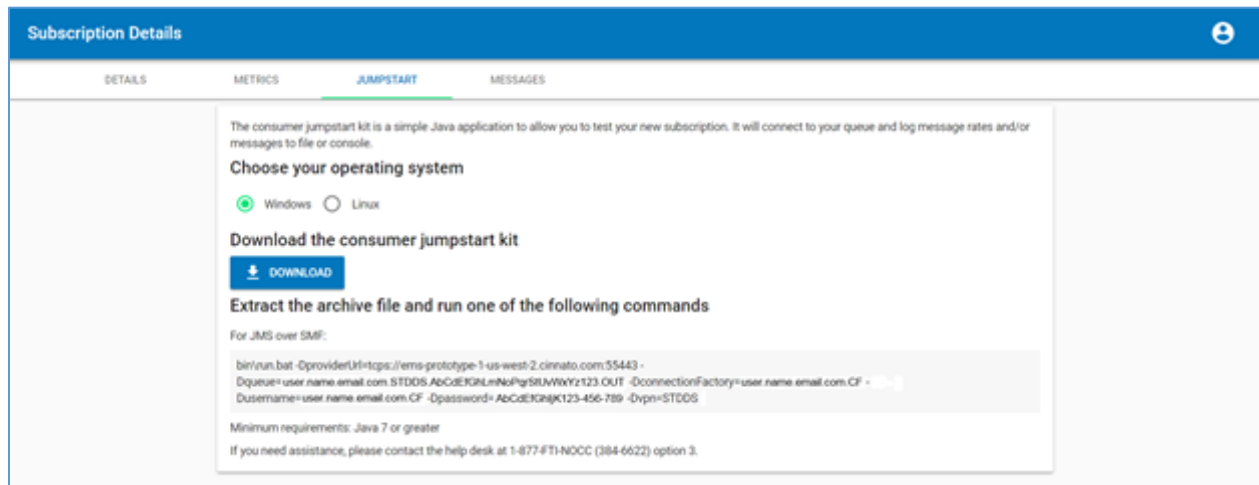


Figure 23 - SCDS Jumpstart Kit Download

Jumpstart Contents

Figure 24 below shows the top-level contents of the Windows Jumpstart Kit. The README file provides details on the available configuration options for using the Jumpstart Kit as well as instructions on how to start the consumer.

Name	Date modified	Type	Size
bin	5/22/2018 11:06 A...	File folder	
lib	5/22/2018 11:06 A...	File folder	
src	5/22/2018 11:06 A...	File folder	
licenses	5/22/2018 11:06 A...	Text Document	2 KB
licenses-all	5/22/2018 11:06 A...	Text Document	4 KB
pom	5/22/2018 11:06 A...	XML Document	9 KB
README.md	5/22/2018 11:06 A...	MD File	3 KB

Figure 24 - SCDS Windows Jumpstart Kit Contents

Figure 25 below shows the contents of the Linux version of the Jumpstart Kit. The README file provides details on the available configuration options for using the Jumpstart Kit as well as instructions on how to start the consumer.

```
lib/jumpstart-jar-with-dependencies.jar
licenses.txt
licenses-all.txt
README.md
pom.xml
bin/
bin/run
bin/run.bat
src/
src/main/
src/main/assembly/
src/main/java/
src/main/java/com/
src/main/java/com/harris/
src/main/java/com/harris/cinnato/
src/main/java/com/harris/cinnato/outputs/
src/main/java/com/harris/cinnato/solace/
src/main/scripts/
src/main/resources/
src/main/assembly/distribution.xml
src/main/java/com/harris/cinnato/outputs/MessageFileOutput.java
src/main/java/com/harris/cinnato/outputs/Output.java
src/main/java/com/harris/cinnato/outputs/FileOutput.java
src/main/java/com/harris/cinnato/outputs/NoopOutput.java
src/main/java/com/harris/cinnato/outputs/StdoutOutput.java
src/main/java/com/harris/cinnato/Consumer.java
src/main/java/com/harris/cinnato/solace/SolaceConsumer.java
src/main/java/com/harris/cinnato/solace/SolaceInitialContext.java
src/main/java/com/harris/cinnato/solace/AMQPConsumer.java
src/main/java/com/harris/cinnato/solace/JMSConsumer.java
src/main/scripts/run
src/main/scripts/run.bat
src/main/resources/cacerts
src/main/resources/log4j.properties
src/main/resources/reference.conf
```

Figure 25 - SCDS Linux Jumpstart Kit Contents

Jumpstart Configuration

There are two methods to configure the Jumpstart Kit, one using command line options and the other by creating a configuration file. To use the command line, use the following command and fill in the parameters associated with the wire level protocol being used and your subscription:

- Linux: `./bin/run -DproviderUrl=<url> -Dqueue=<queue> -DconnectionFactory=<factory> -Dusername=<user> -Dpassword=<pass> -Dvpn=<vpn>`
or

- Windows: `.\bin\run.bat -DproviderUrl=<url> -Dqueue=<queue> -DconnectionFactory=<factory> -Dusername=<user> -Dpassword=<pass> -Dvpn=<vpn>` To use the jumpstart kit with a configuration file, you will need to create a configuration file and pass the configuration file name as an argument when starting the consumer. The following parameters are required in the configuration file:

- `providerUrl:<url>`
- `queue:<queue>`
- `connectionFactory:<factory>`
- `username:<user>`
- `password:<pass>`
- `vpn:<vpn>`
- `metrics:false`
- `output:com.harris.cinnato.outputs.FileOutput`
- `json:true`

To run the Jumpstart Kit using the configuration file, run the following command:

- Linux: `./bin/run -Dconfig.file=<path/to/config-file>`
or
- Windows: `.\bin\run.bat -Dconfig.file=<path\to\config-file>`

These values for the Jumpstart parameters can be obtained from the Connection Details Tab within the Subscription Details Page of the SCDS User Portal.

Appendix D: NESG Client Migration Guide

With the removal of the IPSec VPN, TLS is being used to encrypt user credentials when connecting to the Solace servers. This change requires the setting of Solace specific client properties that will enable the use of the TLS/SSL interface. There are three properties that a user needs to be aware of and set accordingly:

1. SSL Trust Store

- The file path of the trust store that the Solace JMS Client should use. This property is mandatory if the SSL Certificate Validation property is set to true. A DST Root CA X3 certificate is required and is included in the default Java trust store located in the Java directory under lib/security/cacerts (JDK 7u111+ and JDK 8u101+; earlier version require it to be imported).
- Format is a URL or path of the trust store file
 - If JAVA_HOME is set, you can use the default Java trust store by setting the path to `String defaultTrustStore = System.getenv("JAVA_HOME") + "/jre/lib/security/cacerts"`
- Can be set using:
 - Client code under the Initial Context variable using JNDI name;
`env.put("Solace_JMS_SSL_TrustStore", defaultTrustStore)`
 - Integration software setting for additional JNDI properties;
`name="Solace_JMS_SSL_TrustStore" value="mytruststore.jks"`
 - Java System Property; `-Djavax.net.ssl.trustStore=mytruststore.jks`

2. SSL Trust Store Format

- Indicates the format used by the trust store provided for the SSL Trust Store property.
- Acceptable formats are “jks” or “pkcs12”
- Can be set using:
 - Client code under the Initial Context variable using JNDI name;
`env.put("Solace_JMS_SSL_TrustStoreFormat", "jks")`
 - Integration software setting for additional JNDI properties;
`name="Solace_JMS_SSL_TrustStoreFormat" value="jks"`
 - Java System Property; `-Djavax.net.ssl.trustStoreType=jks`

3. SSL Trust Password

- The trust store password that should be used for to access the trust store file provided in step 1. If using the default Java trust store, this property does not need to be set.
- Can be set using:

- Client code under the Initial Context variable using JNDI name;
env.put("Solace_JMS_SSL_TrustStorePassword", "mypass")
- Integration software setting for additional JNDI properties;
name="Solace_JMS_SSL_TrustStorePassword" value="mypass"
- Java System Property; -Djavax.net.ssl.trustStorePassword=mypass

More information on Solace JNDI properties can be found on their website at:

<https://docs.solace.com/Solace-JMS-API/JNDI-Connection-Properti.htm>

Migrating an ActiveMQ/WebLogic Client to SCDS Solace

For those users who need to migrate from ActiveMQ or WebLogic, an additional property Solace property is required to be set. This is the Message VPN for the connection. Unlike ActiveMQ or WebLogic, Solace implements a concept called Message VPNs. A Message VPN is simply a virtually segregated environment for messages. SWIM uses these Message VPNs to separate the different systems that provide data via Solace; AIM FNS, FDPS, ITWS, STDDS, TBFM, and TFMS.

The Message VPN can be set in two ways:

1. Through appending the username with @ and the Message VPN name (e.g. user@FDPS) or
2. Through setting the Solace_JMS_VPN property
 - a. Client code under the Initial Context variable env.put("Solace_JMS_VPN", "FDPS") or
 - b. Integration software setting for additional properties name="Solace_JMS_VPN" value="FDPS"