

---

# **AWS Database Migration Services**

Workshop: Oracle to PostgreSQL Migration

Revised: 2017.10.22

© 2017 Amazon Web Services



This document is © 2017, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Oracle is a registered trademark of Oracle Corporation and/or its affiliates. PostgreSQL is a registered trademark of the PostgreSQL Community Association of Canada.

## Contents

<b>1</b>	<b>Introduction</b>	<b>5</b>
1.1	Objective	5
1.1.1	Lab Setup	5
1.1.2	Lab Steps	5
1.1.3	Lab Teardown	5
1.2	About AWS Database Migration Service (AWS DMS)	6
1.3	About the AWS Schema Conversion Tool (AWS SCT)	7
<b>2</b>	<b>Lab Setup</b>	<b>8</b>
2.1	Setup EC2 Key Pair	8
2.2	Setup AWS CloudFormation Stack	9
2.2.1	AWS CloudFormation Stack Selection	10
2.2.2	AWS CloudFormation Stack Settings	11
2.2.3	AWS CloudFormation Stack Options	13
2.2.4	AWS CloudFormation Stack Review	15
2.2.5	AWS CloudFormation Stack: List All Stacks	15
2.3	Setup JDBC Drivers	16
2.4	Setup AWS Schema Conversion Tool	16
2.4.1	AWS SCT Download	16
2.4.2	Download JDBC Drivers	17
2.4.3	Configure AWS SCT with JDBC Drivers	17
2.4.4	Permit Local Access to Source/Target Databases	18
2.5	Setup SQL database management tools (Optional)	20
<b>3</b>	<b>Lab Steps</b>	<b>21</b>
<b>4</b>	<b>Lab Teardown</b>	<b>22</b>
4.1	Teardown AWS CloudFormation Stack	22

## List of Tables

## List of Figures

1	AWS Schema Conversion Tool: Supported Platforms	7
2	Key Pairs: List All Keys	8
3	Key Pair: Create Dialog	9
4	Key Pair: Created	9

5	<a href="#">AWS CloudFormation Stack Selection: Template</a>	10
6	<a href="#">AWS CloudFormation Stack Selection: Confirmation</a>	10
7	<a href="#">AWS CloudFormation: Settings Overview</a>	11
8	<a href="#">AWS CloudFormation: Stack Name</a>	12
9	<a href="#">AWS CloudFormation: Key Pair</a>	12
10	<a href="#">AWS CloudFormation: Oracle</a>	12
11	<a href="#">AWS CloudFormation: Postgres</a>	13
12	<a href="#">AWS CloudFormation Stack Parameters: Confirmation</a>	13
13	<a href="#">AWS CloudFormation Stack Options: All</a>	14
14	<a href="#">AWS CloudFormation Stack Options: Confirmation</a>	14
15	<a href="#">AWS CloudFormation Stack Review: All</a>	15
16	<a href="#">AWS CloudFormation Stack Review: Creation</a>	15
17	<a href="#">AWS CloudFormation Stack Review: List All Stacks</a>	16
18	<a href="#">AWS Schema Conversion Tool: Initialized</a>	17
19	<a href="#">AWS Schema Conversion Tool: Global Settings</a>	18
20	<a href="#">AWS Schema Conversion Tool: List of Security Groups</a>	19

# 1 Introduction

## 1.1 Objective

In this lab, you will be performing a migration from Oracle to PostgreSQL using the AWS Schema Conversion Tool (AWS SCT) and the AWS Databases Migration Service (AWS DMS).

### 1.1.1 Lab Setup

- Create EC2 Key Pair
- Launch AWS CloudFormation Stack
- Access Amazon AppStream 2.0 Tools
- OPTIONAL: download the JDBC drivers locally
- OPTIONAL: install the AWS Schema Conversion Tool locally
- OPTIONAL: install database management tools locally

### 1.1.2 Lab Steps

- Create AWS Database Migration Instances
- Connect to your environment
- Setup AWS Schema Conversion Tool
- Convert the Oracle schema to PostgreSQL
- Create Source Endpoint in AWS DMS
- Create Target Endpoint in AWS DMS
- Create a Migration Task in AWS DMS
- Start the migration
- Generate transactions on Oracle and see the data being migrated to PostgreSQL - CDC

### 1.1.3 Lab Teardown

- Delete AWS CloudFormation Stack
- Delete EC2 Key Pair

## 1.2 About AWS Database Migration Service (AWS DMS)

The AWS Database Migration Service helps you migrate databases to AWS quickly and securely. The source database remains fully operational during the migration, minimizing downtime to applications that rely on the database. The AWS Database Migration Service can migrate your data to and from most widely used commercial and open-source databases.

The service supports homogenous migrations such as Oracle to Oracle, as well as heterogeneous migrations between different database platforms, such as Oracle to Amazon Aurora or Microsoft SQL Server to MySQL. It also allows you to stream data to Amazon Redshift, Amazon DynamoDB, and Amazon S3 from any of the supported sources including Amazon Aurora, PostgreSQL, MySQL, MariaDB, Oracle, SAP ASE, SQL Server and MongoDB, enabling consolidation and easy analysis of data in the petabyte-scale data warehouse. AWS Database Migration Service can also be used for continuous data replication with high-availability.

To find out more about AWS DMS, see the product page at <https://aws.amazon.com/dms/>

### 1.3 About the AWS Schema Conversion Tool (AWS SCT)

The AWS Schema Conversion Tool makes heterogeneous database migrations predictable by automatically converting the source database schema and a majority of the database code objects, including views, stored procedures, and functions, to a format compatible with the target database. Any objects that cannot be automatically converted are clearly marked so that they can be manually converted to complete the migration. SCT can also scan your application source code for embedded SQL statements and convert them as part of a database schema conversion project. During this process, SCT performs cloud native code optimization by converting legacy Oracle and SQL Server functions to their equivalent AWS service thus helping you modernize the applications at the same time of database migration. Once schema conversion is complete, SCT can help migrate data from a range of data warehouses to Amazon Redshift using built-in data migration agents.

Your source database can be on-premises, or in Amazon RDS or EC2 and the target database can be in either Amazon RDS or EC2. The AWS Schema Conversion Tool supports the following conversions:

Source Database	Target Database on Amazon RDS
Oracle Database	Amazon Aurora, MySQL, PostgreSQL, MariaDB
Oracle Data Warehouse	Amazon Redshift
Microsoft SQL Server	Amazon Aurora, Amazon Redshift, MySQL, PostgreSQL, MariaDB
Teradata	Amazon Redshift
IBM Netezza	Amazon Redshift
Greenplum	Amazon Redshift
HPE Vertica	Amazon Redshift
MySQL and MariaDB	PostgreSQL
PostgreSQL	Amazon Aurora, MySQL, MariaDB
Amazon Aurora	PostgreSQL

Figure 1: AWS Schema Conversion Tool: Supported Platforms

## 2 Lab Setup

### 2.1 Setup EC2 Key Pair

In this step, you will generate an EC2 key pair for use in the Database Migration Workshop labs.

Make sure you are have selected the **Asia Pacific (Tokyo)** region by visiting the following link:

<http://amzn.to/aws-tokyo-keypairs> (=> <https://ap-northeast-1.console.aws.amazon.com/ec2/v2/home?region=ap-northeast-1#KeyPairs:sort=keyName>)

If no EC2 key pairs have been created in this region yet, you will see the following screen:

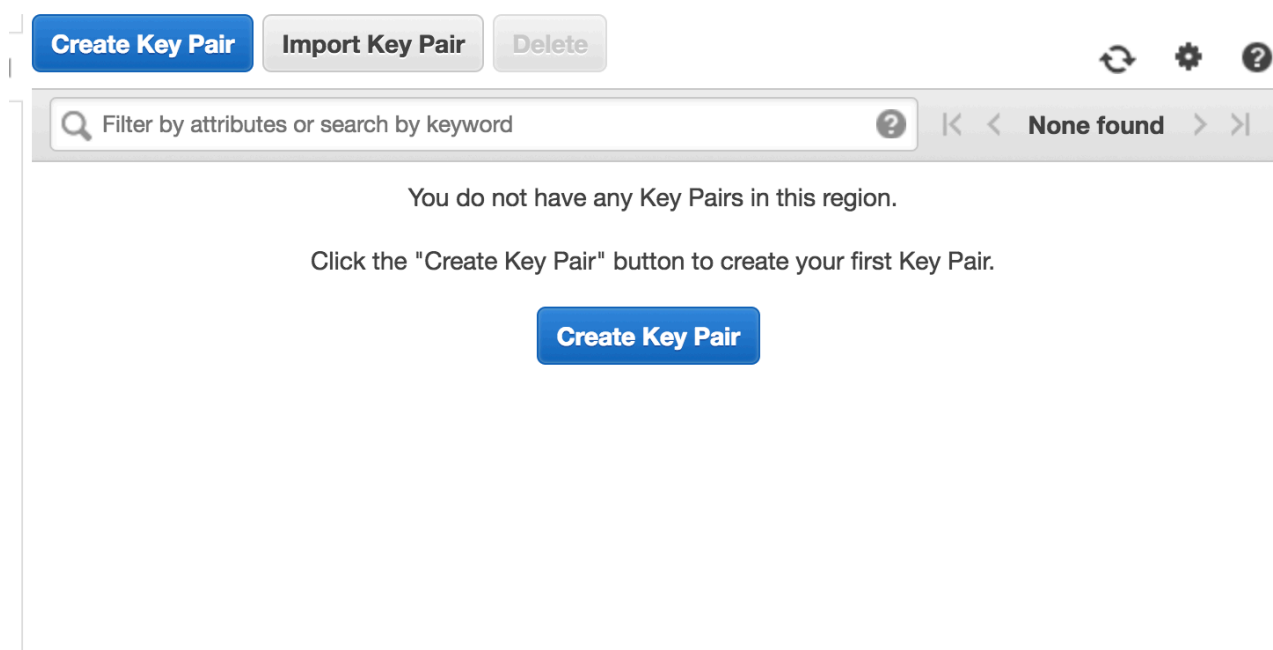


Figure 2: Key Pairs: List All Keys

*For this workshop, we recommend the creation of a new EC2 key pair to be used associated with workshop resources. We will later delete this key pair along with the workshop resources.*

You should click the **Create Key Pair** button and enter **workshop** as the name for the new key pair as shown below, clicking the **Create** button to complete the creation of the new key pair.



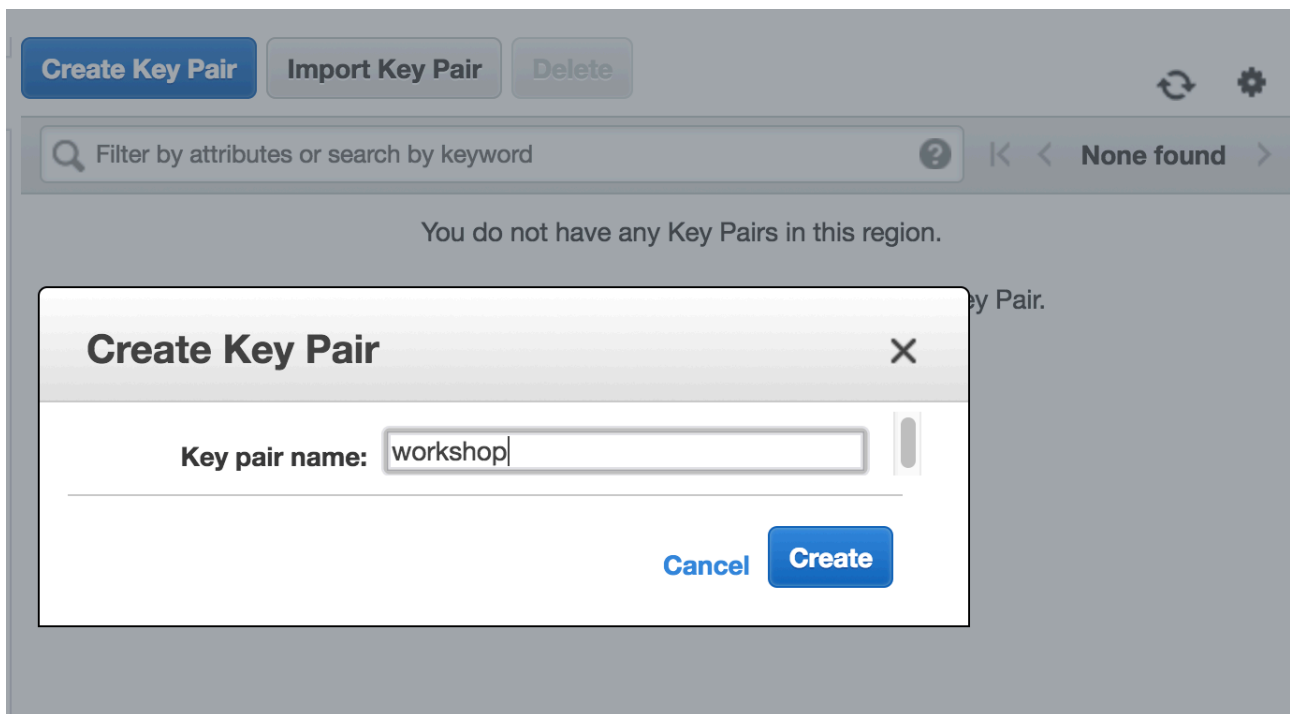


Figure 3: Key Pair: Create Dialog

You should now see a new EC2 key pair labeled **workshop**:

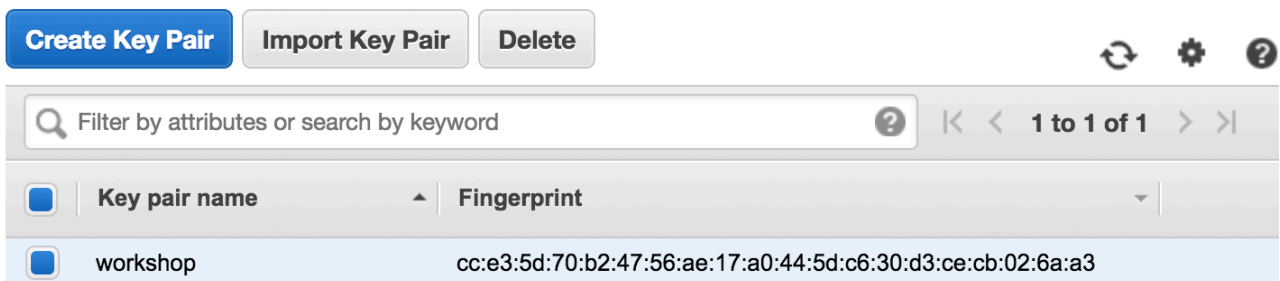


Figure 4: Key Pair: Created

The private key for this EC2 key pair will have automatically downloaded to your browser's default directory, and this file will be called **workshop.pem**.

## 2.2 Setup AWS CloudFormation Stack

In this step, you will launch a AWS CloudFormation template that will setup the following resources needed for this lab:

- Source Database: Amazon RDS Oracle (this database will be pre-populated with sample database installed from <https://github.com/awslabs/aws-database-migration-samples>)
- Target Database: Amazon RDS PostgreSQL

**CAUTION:** The resources that you will be spinning up will continue to run until the CloudFormation stack is deleted or the individual resources are shutdown -- the steps for teardown are located in this document at [Teardown: AWS Cloudformation Stack](#)

To launch this template, use the following link:

<http://amzn.to/aws-dms-workshop-lab-1> (=> <https://ap-northeast-1.console.aws.amazon.com/cloudformation/home?region=ap-northeast-1#/stacks/new?stackName=workshop&templateURL=https://s3-ap-northeast-1.amazonaws.com/aws-dms-workshop/workshop-lab-1.yaml>)

### 2.2.1 AWS CloudFormation Stack Selection

You should now see the following:

#### Create stack

The screenshot shows the 'Create stack' wizard in the AWS Management Console, specifically the 'Select Template' step. On the left, a sidebar lists the steps: 'Select Template' (highlighted), 'Specify Details', 'Options', and 'Review'. The main content area is titled 'Select Template' and includes a description: 'Select the template that describes the stack that you want to create. A stack is a group of related resources that you manage as a single unit.' Below this, there are two main options: 'Design a template' and 'Choose a template'. 'Design a template' has a 'Design template' button. 'Choose a template' has three radio button options: 'Select a sample template' (selected), 'Upload a template to Amazon S3', and 'Specify an Amazon S3 template URL'. The 'Specify an Amazon S3 template URL' option is currently selected, and a text box contains the URL 'https://s3-ap-northeast-1.amazonaws.com/aws-dms-works'. To the right of the text box is a link 'View/Edit template in Designer'. At the bottom right of the main content area are 'Cancel' and 'Next' buttons.

Figure 5: AWS CloudFormation Stack Selection: Template

**The default settings are recommended, and no changes are required to this page.** Click the **Next** button on the bottom of the page to continue.

The screenshot shows the 'Confirmation' step of the 'Create stack' wizard. It features a light gray background with three buttons at the bottom right: 'Cancel' (blue text), 'Previous' (gray button), and 'Next' (blue button).

Figure 6: AWS CloudFormation Stack Selection: Confirmation

### 2.2.2 AWS CloudFormation Stack Settings

This page displays the settings and parameters for the CloudFormation stack. **The default settings are recommended, and no changes are required to this page.**

#### Create stack

[Select Template](#)**Specify Details**[Options](#)[Review](#)

#### Specify Details

Specify a stack name and parameter values. You can use or change the default parameter values, which are defined in the AWS CloudFormation template. [Learn more.](#)

Stack name

#### Parameters

##### Key Pair

KeyName    
Name of an existing EC2 KeyPair to enable SSH access to the instance

##### Source Oracle Database Configuration

OracleDBName  Enter Oracle Database name

OracleDBPassword  Enter password for the oracle admin user: dbmaster

OracleDBStorage  Enter storage for Oracle DB in GB

OracleInstanceType  Oracle DB instance type

##### Target PostgreSQL Database Configuration

PostgresDBName  Enter PostgreSQL Database name

PostgresDBUsername  Enter database Admin username for RDS PostgreSQL

PostgresDBPassword  Enter password for RDS PostgreSQL Admin user

PostgresInstanceType  RDS PostgreSQL DB instance type

PostgresDBStorage  Enter storage for PostgreSQL DB in GB

[Cancel](#)[Previous](#)[Next](#)

Figure 7: AWS CloudFormation: Settings Overview

### Specify Details

Specify a stack name and parameter values. You can use or change the default parameter values, which are defined in the AWS CloudFormation template. [Learn more.](#)

Stack name

workshop

Figure 8: AWS CloudFormation: Stack Name

### Parameters

#### Key Pair

KeyName

workshop

Name of an existing EC2 KeyPair to enable SSH access to the instance

Figure 9: AWS CloudFormation: Key Pair

### Parameters

#### Source Oracle Database Configuration

OracleDBName

ORCL

Enter Oracle Database name

OracleDBPassword

.....

Enter password for the oracle admin user: dbmaster

OracleDBStorage

100

Enter storage for Oracle DB in GB

OracleInstanceType

db.t2.medium

Oracle DB instance type

Figure 10: AWS CloudFormation: Oracle

## Target PostgreSQL Database Configuration

<b>PostgresDBName</b>	<input type="text" value="postgres"/>	Enter PostgreSQL Database name
<b>PostgresDBUsername</b>	<input type="text" value="postadmin"/>	Enter database Admin username for RDS PostgreSQL
<b>PostgresDBPassword</b>	<input type="password" value="....."/>	Enter password for RDS PostgreSQL Admin user
<b>PostgresInstanceType</b>	<input type="text" value="db.t2.medium"/>	RDS PostgreSQL DB instance type
<b>PostgresDBStorage</b>	<input type="text" value="100"/>	Enter storage for PostgreSQL DB in GB

Figure 11: AWS CloudFormation: Postgres

Once you have confirmed the settings, click the **Next** button on the bottom of the page to continue.

[Cancel](#)

Figure 12: AWS CloudFormation Stack Parameters: Confirmation

### 2.2.3 AWS CloudFormation Stack Options

You will now see the Options for this CloudFormation template. **The default settings are recommended, and no changes are required to this page.**

## Create stack

[Select Template](#)[Specify Details](#)**Options**[Review](#)

## Options

## Tags

You can specify tags (key-value pairs) for resources in your stack. You can add up to 50 unique key-value pairs for each stack. [Learn more.](#)

	Key (127 characters maximum)	Value (255 characters maximum)	
1	<input type="text"/>	<input type="text"/>	<input data-bbox="1393 499 1425 521" type="button" value="+"/>

## Permissions

You can choose an IAM role that CloudFormation uses to create, modify, or delete resources in the stack. If you don't choose a role, CloudFormation uses the permissions defined in your account. [Learn more.](#)

**IAM Role**

Enter role arn

## ► Advanced

You can set additional options for your stack, like notification options and a stack policy. [Learn more.](#)

[Cancel](#)

Figure 13: AWS CloudFormation Stack Options: All

Click the **Next** button on the bottom of the page to continue.

[Cancel](#)

Figure 14: AWS CloudFormation Stack Options: Confirmation

## 2.2.4 AWS CloudFormation Stack Review

### Create stack

[Select Template](#)[Specify Details](#)**Options**[Review](#)

#### Options

##### Tags

You can specify tags (key-value pairs) for resources in your stack. You can add up to 50 unique key-value pairs for each stack. [Learn more.](#)

	Key (127 characters maximum)	Value (255 characters maximum)	
1	<input type="text"/>	<input type="text"/>	<input data-bbox="1396 582 1428 604" type="button" value="+"/>

##### Permissions

You can choose an IAM role that CloudFormation uses to create, modify, or delete resources in the stack. If you don't choose a role, CloudFormation uses the permissions defined in your account. [Learn more.](#)

**IAM Role**

Enter role arn

##### ► Advanced

You can set additional options for your stack, like notification options and a stack policy. [Learn more.](#)

[Cancel](#)

Figure 15: AWS CloudFormation Stack Review: All

Click the **Create** button on the bottom of the page to continue.

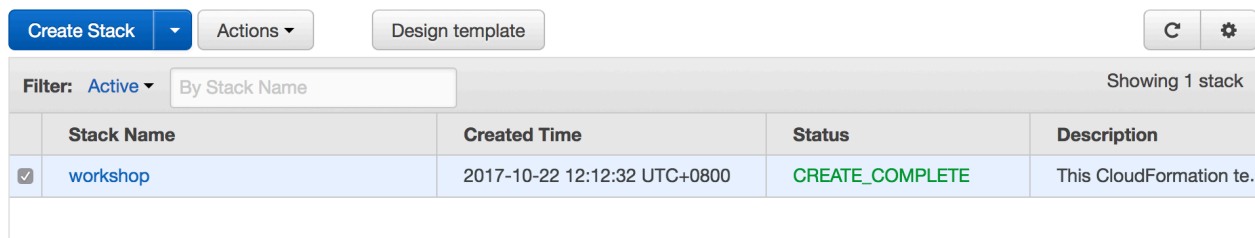
[Cancel](#)

Figure 16: AWS CloudFormation Stack Review: Creation

**All AWS resources associated with this workshop lab will now be created immediately, and billing will proceed until this CloudFormation stack is deleted or those resources are individually stopped/terminated -- the steps for teardown are located in this document at [Teardown: AWS Cloudformation Stack](#)**

## 2.2.5 AWS CloudFormation Stack: List All Stacks

You should now see a list of any existing CloudFormation templates for this region in your account, and the new CloudFormation stack called **workshop** should now appear in your console.



Create Stack	Actions	Design template	C	⚙
Filter: Active	By Stack Name	Showing 1 stack		
	Stack Name	Created Time	Status	Description
<input checked="" type="checkbox"/>	workshop	2017-10-22 12:12:32 UTC+0800	CREATE_COMPLETE	This CloudFormation te.

Figure 17: AWS CloudFormation Stack Review: List All Stacks

If the stack does not immediately appear, you may need to click the **Refresh** button above the list panel.

## 2.3 Setup JDBC Drivers

If you have chosen to locally install the AWS Schema Conversion Tool and your preferred database management tool, you will also need to download the database-specific JDBC drivers to connect to the database resources in this workshop. These JDBC drivers can be found at the following links:

- <http://bit.ly/postgres-jdbc>
- <http://bit.ly/oracle-jdbc>

*The Oracle JDBC requires that you accept the associated license agreement before downloading -- the actual file required from the linked page is called **ojdbc7.jar***

You will need to download both drivers to your local hard drive for later use by both the AWS Schema Conversion Tool and your preferred database management tool.

## 2.4 Setup AWS Schema Conversion Tool

In this step, you will install the AWS Schema Conversion Tool locally.

*For those participants not wishing to install the AWS Schema Conversion Tool locally, you can use the Schema Conversion Tool via Amazon AppStream 2.0 resources that will have been temporarily provisioned for your use during this lab. See [Setup: Accessing Amazon AppStream 2.0 Tools](#)*

### 2.4.1 AWS SCT Download

Download the latest version of AWS Schema Conversion Tool (SCT) from the following link:

<http://amzn.to/aws-sct> (=> [http://docs.aws.amazon.com/SchemaConversionTool/latest/userguide/CHAP\\_SchemaConversionTool.Installing.html](http://docs.aws.amazon.com/SchemaConversionTool/latest/userguide/CHAP_SchemaConversionTool.Installing.html))

*If you already have SCT installed, we recommend that you download and install the latest version*



### 2.4.2 Download JDBC Drivers

For connecting to your source database (Oracle) and target database (PostgreSQL), you will need the appropriate JDBC drivers for both databases. If you have not already done so, download the [JDBC Drivers](#) before moving forward.

### 2.4.3 Configure AWS SCT with JDBC Drivers

Once downloaded, launch AWS Schema Conversion Tool. On first launch, you will be presented with a terms and conditions statement, click **Agree** if you agree to the terms and conditions specified.

Next, you should see the following page:



Figure 18: AWS Schema Conversion Tool: Initialized

Click on **Settings > Global Settings**

Now you should see the following Global Settings dialog:

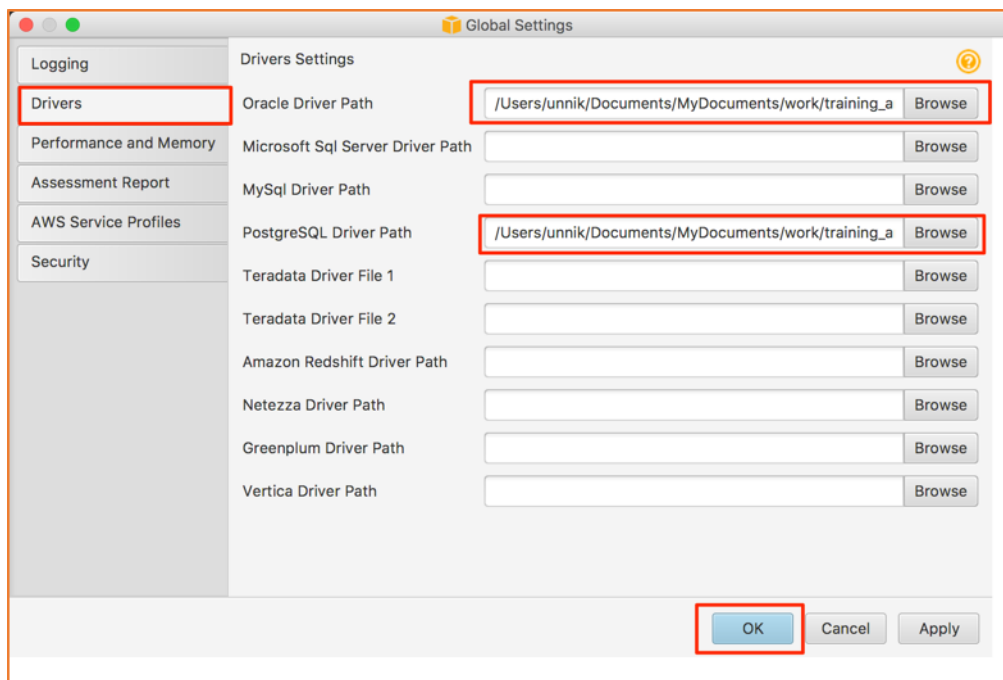


Figure 19: AWS Schema Conversion Tool: Global Settings

Make the following changes to the Global Settings:

- Select **Drivers** on the left-side panel
- For the **Oracle Driver Path**, select the location of your local Oracle jar file
- For the **PostgreSQL Driver Path**, select the location of your local PostgreSQL jar file
- Click **OK** to Proceed

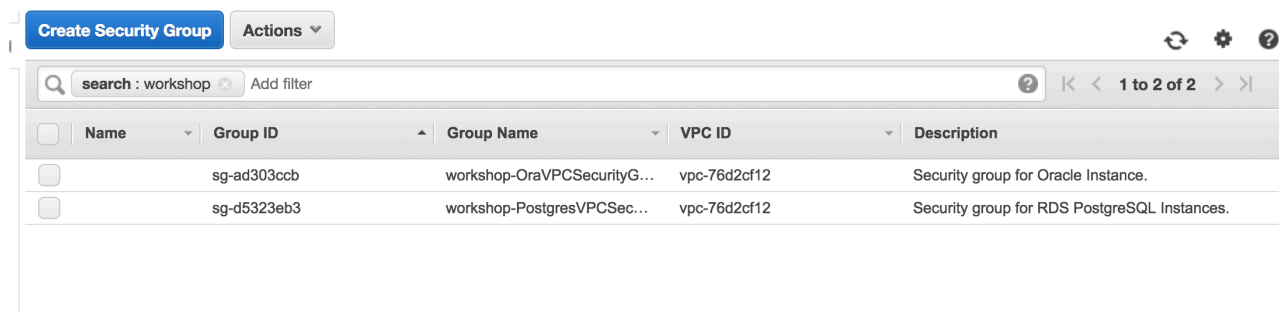
#### 2.4.4 Permit Local Access to Source/Target Databases

You will now modify both Source and Target database permissions so that you can connect to those databases with the AWS SCT locally.

To do so, you will modify the Security Groups attached to the databases. The following link will provide you access to the list of Security Groups in the region, filtered by the default CloudFormation stack name of **workshop**:

<http://amzn.to/aws-tokyo-sg-workshop> (=> <https://ap-northeast-1.console.aws.amazon.com/ec2/v2/home?region=ap-northeast-1#SecurityGroups:search=workshop;sort=groupId>)

The list should look similar to the following, with two different SGs created by the earlier CloudFormation template, one for Oracle and the other for PostgreSQL:



	Name	Group ID	Group Name	VPC ID	Description
<input type="checkbox"/>		sg-ad303ccb	workshop-OraVPCSecurityG...	vpc-76d2cf12	Security group for Oracle Instance.
<input type="checkbox"/>		sg-d5323eb3	workshop-PostgresVPCSec...	vpc-76d2cf12	Security group for RDS PostgreSQL Instances.

Figure 20: AWS Schema Conversion Tool: List of Security Groups

Open the following ports to provide access from your current IP address.

- Modify **workshop-oracle-sg** Security Group as follows:
  - Add rule Oracle Port – 1521 > Open to 'My IP'
- Modify **workshop-postgres-sg** Security Group as follows:
  - Add rule Postgres Port – 5432 > Open to 'My IP'

## 2.5 Setup SQL database management tools (Optional)

In this step, we will install a database management tool of your choice locally.

*For those participants not wishing to install a database management tool locally, you can use the DBeaver tool via Amazon AppStream 2.0 resources that will have been provisioned for you temporarily. See [Setup: Accessing Amazon AppStream 2.0 Tools](#)*

Some popular and free tools include:

- SQL WorkbenchJ: <http://www.sql-workbench.net/downloads.html>
- DBeaver: <http://dbeaver.jkiss.org/>
- Squirrel: <http://squirrel-sql.sourceforge.net/>

In this lab, we will be using SQL WorkbenchJ screenshots to demonstrate the lab activities.

### **3 Lab Steps**

## **4 Lab Teardown**

### **4.1 Teardown AWS CloudFormation Stack**