Creating a Batch Processing Cluster

TABLE OF CONTENTS

Questions, feedback or corrections? Email us at aws-course-feedback@amazon.com.

OVERVIEW

In this lab, you will use the AWS Management Console to build a basic batch processing cluster. This cluster is a loosely-coupled system that creates a montage from a list of image URLs. During this lab, you will:

1. Use CloudFormation to launch a complete application stack.
2. Use the AWS Management Console to create an SQS queue.
3. Use the AWS Management Console to pass messages to—and read messages from—an SQS queue.
4. Configure CloudWatch alarms and use those alarms with an Auto Scaling group.

ABOUT THE BATCH PROCESSING CLUSTER

The worker nodes in your cluster have a simple job: to convert some number of individual images into a single montage image. A worker node downloads a list of images you provide and stitches them into a composite montage using the ImageMagick tool. While this isn't the most CPU-intensive job, it does require some cycles, and the larger the size and number of images you provide for each job, the more work each node will have to do.

For this lab, you will provide a newline-delimited list of image URLs. For example:

```
http://photos.evandbrown.com/Travel/Oxford-2012/i-MtB8P4d/0/L/20120728-DSC01265-L.jpg

http://photos.evandbrown.com/Travel/Oxford-2012/i-cCQpccd/0/L/20120728-DSC01292-L.jpg

http://photos.evandbrown.com/Travel/Oxford-2012/i-p3nqXxd/0/L/20120728-DSC01267-L.jpg

http://photos.evandbrown.com/Travel/Oxford-2012/i-C9Czwqj/0/L/20120728-DSC01315-L.jpg

http://photos.evandbrown.com/Travel/Oxford-2012/i-gjgxLzs/0/L/20120728-DSC01337-L.jpg
```

The node will download each image and produce an output:
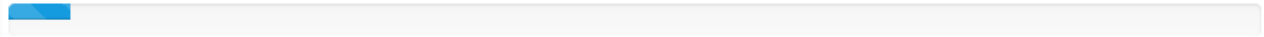
START YOUR *QWIKLAB™*

Here's how to get started with your *qwikLAB™*.

1. Click **Start Lab** to start your lab.
    (If you are prompted for a token, please use one you've been given or have purchased.)

    [Start Lab]

    A progress bar appears, indicating that *qwikLAB™* is preparing your lab environment.

    ❄ *Create in progress...*

2. After your lab is ready, be sure to note:
    a. **Duration -** The time the lab will run for before shutting itself down.
    b. **Setup Time -** The estimated lab creation time on starting the lab.
    c. **AWS Region** - The AWS Region the lab resources are being created in.
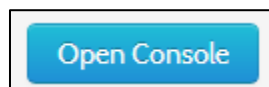
OPEN THE AWS MANAGEMENT CONSOLE

Next, you need to open the AWS Management Console.

1. Copy the Password for the AWS Management Console provided by *qwik*LAB™ for your lab.
    We recommend selecting the value shown and using Ctrl (or Command) + C.

    AWS Management Console

    User Name: awsstudent

    Password   94dL3LCKj7t
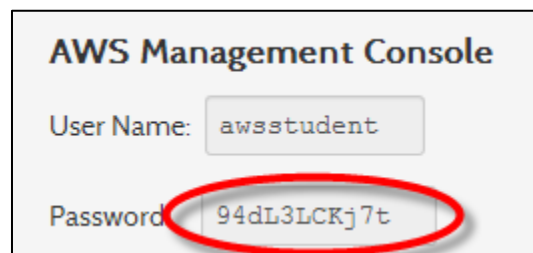
2. Click **Open Console**.

    [Open Console]

3. Login to the AWS Management Console.

4. Type the User Name '**awsstudent**' and paste the password you copied from the lab details in *qwikLAB™* into the **Password** text box.

5. Click **Sign in using our secure server**.

   You've now logged into the AWS Management Console using credentials provisioned via AWS Identity Access Management in an AWS account by *qwikLAB™*.

Amazon Web Services Sign In

Please enter the AWS Identity & Access Management (IAM) User name and password assigned by your system administrator to sign in.

AWS Account: 832809622232

User Name: awsstudent

Password: ••••••••••••

Sign in using our secure server ▶

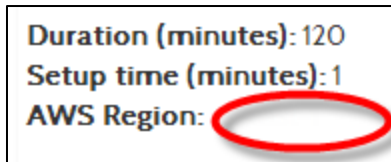Please contact your system administrator if you have forgotten your user credentials.

Sign in using AWS Account credentials

CONFIRM YOUR AWS REGION

Some labs require a specific region to function correctly. Here's how to check the region for your lab.

1. Note the AWS Region set for your lab in *qwikLAB™*.

2. Select or confirm that the same AWS Region is already set in the AWS Management Console.
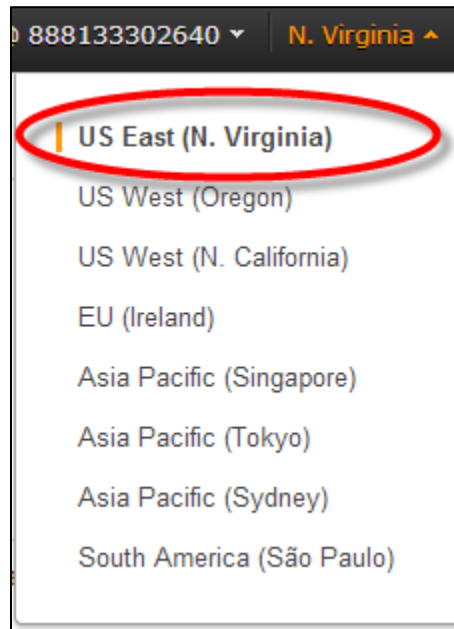
LAUNCH CLUSTER WITH CLOUDFORMATION

To get started, you'll launch a cluster using a CloudFormation stack. This stack creates the EC2 instance that forms the batch processing cluster.

1. Download the CloudFormation template.
2. From the **Services** menu in the Management Console, select **CloudFormation**.
3. Click **Create New Stack**.
4. Select the **Upload Template File** option.

5. In the **Name** text box, type a name for the stack.
6. Click **Choose File** and select the template you downloaded, then click **Continue**.
7. In the **KeyName** text box, type the name of the KeyPair you created. You do not need to add the extension.
8. Check **I acknowledge that this template may create IAM resources** and click **Continue**.
9. Click **Continue** again.
10. A final confirmation screen appears. Click **Continue** to launch the stack.

After a few minutes, the stack will be ready. This stack will have the appropriate SQS queues, EC2 instances, and other resources you need for the rest of the lab.

DISPATCH WORK AND VIEW RESULTS

Use the SQS Management Console to put a message in your SQS task input queue. Remember, your background nodes are expecting a newline-delimited list of URLs pointing to images.

1. Create a list of image URLs. For example:

    ```
    http://photos.evandbrown.com/Travel/Oxford-2012/i-MtB8P4d/0/L/20120728-DSC01265-L.jpg

    http://photos.evandbrown.com/Travel/Oxford-2012/i-cCQpccd/0/L/20120728-DSC01292-L.jpg

    http://photos.evandbrown.com/Travel/Oxford-2012/i-p3nqXxd/0/L/20120728-DSC01267-L.jpg

    http://photos.evandbrown.com/Travel/Oxford-2012/i-C9Czwqj/0/L/20120728-DSC01315-L.jpg

    http://photos.evandbrown.com/Travel/Oxford-2012/i-gjgxLzs/0/L/20120728-DSC01337-L.jpg
    ```

2. Navigate to the SQS Management Console.
3. Right-click your Input queue and click **Send a Message.**
4. Input your list of image URLs and click **Send Message**.
5. Click **Refresh** and observe the *Messages Available* and *Messages in Flight* columns for each queue. Refresh periodically until you see 0 messages in your input queue and 1 message in your output queue.

After your first job has been processed, view the output and open the resulting link in a browser:

1. Right-click your output queue and click **View/Delete Messages.**
2. Click **Start Polling for Messages**.
3. Find your message and click **More Details** to view the message body. Open the link in your browser to view the montage image.

Now that you've run one job, try using your input queue to schedule 30 or more jobs. You can re-use the same list of URLS that you used in your initial test if you want.

MONITORING THE CLUSTER

Next, let's use the AWS Management Console to monitor the CPU performance of your worker node.

1. Navigate to the EC2 Management Console.
2. Select your worker node from the list.
3. In the details panel at the bottom of the screen, select the Monitoring tab.
4. Observe the available metrics, then click the Avg CPU Utilization Metric to view more detail.
5. Change the Time Range filter to view the previous 6 hours of data.

QUESTIONS

1. What is the average CPU utilization of your instance?
2. If the utilization is below 100%, what does that indicate?

CREATE AN ALARM

CloudWatch alarms allow you to receive notifications when metrics are at a threshold you define. Create an alarm that will alert you if your worker node's CPU is being overutilized.

1. From the Monitoring tab of your instance, click **Create Alarm**.
2. Add your email address to the **With these recipients** text box.
3. Configure the alarm to fire when average CPU utilization is >= 90% for 1 period of 5 minutes
   Hint: Adjust the value for CPU utilization and observe the graph to see how this alarm might work given your current metric.
4. Name the topic *BatchProcessingNotifications* and add your e-mail address as a recipient.
5. Click **Create Alarm**.
6. Check your e-mail and click the link to opt-in to the notification subscription.

TRACK JOBS USING SQS

Now that you understand the CPU utilization of your worker node, monitor the status of your outstanding jobs in SQS.

1. Navigate to the SQS Management Console.
2. Locate your input queue in the list.

CREATE AN SQS ALARM

Next, let's create an SQS alarm to track the number of messages in the queue.

1. Navigate to the CloudWatch section of the Management Console.
2. Click the Alarms link in the left column.
3. Create an alarm to receive an e-mail when the number of messages in your queue is > 10 for (1) 5-minute period.
   Hint: The metric is named ApproximateNumberOfMessagesVisible, and the statistic you should use is Sum, not Average.

If your messages are not being processed quickly enough, that's a good indicator that you should add more nodes to your cluster. In the next lab, you'll create an Auto Scaling group to scale out automatically when the SQS Alarm you just created is fired.

TEST YOUR POLICY

Add enough messages to your input queue to force your alarm to fire. Observe as your instances are scaled out and the number of messages in your queue begin to be processed more quickly.

CONCLUSION

Congratulations! You now have successfully:

- Use CloudFormation to launch a complete application stack.
- Use the AWS Management Console to create an SQS queue.
- Use the AWS Management Console to pass messages to—and read messages from—an SQS queue.
- Configure CloudWatch alarms and use those alarms with an Auto Scaling group.

For feedback, suggestions and corrections to this lab, please email aws-course-feedback@amazon.com.

APPENDIX A: CONNECTING TO EC2 INSTANCES

If you're unfamiliar with how to connect to EC2 instances, here are some instructions that will help.

### CONNECT TO YOUR EC2 INSTANCE VIA SSH (WINDOWS)

DOWNLOAD PUTTY

To start, check to see if you have PuTTY installed on your machine. If you don't, you can download it from here:

http://the.earth.li/~sgtatham/putty/latest/x86/putty.exe

DOWNLOAD YOUR EC2 KEY PAIR PRIVATE KEY FILE

1. Go back to your lab in *qwikLAB™*.
2. Download the *qwikLAB™* provided EC2 Key Pair private key file in the PuTTY compatible PPK format by clicking on the Download PPK option in the "Download PEM/PPK" drop-down.
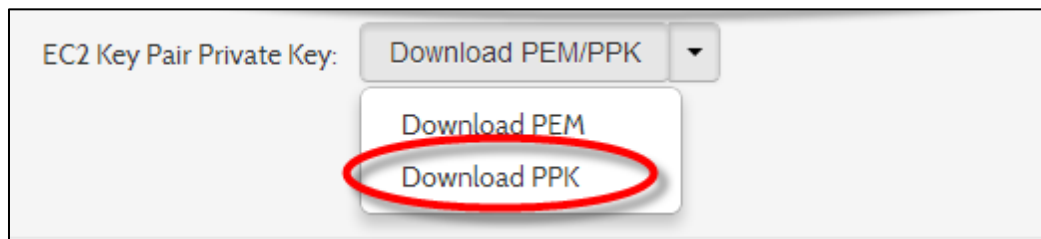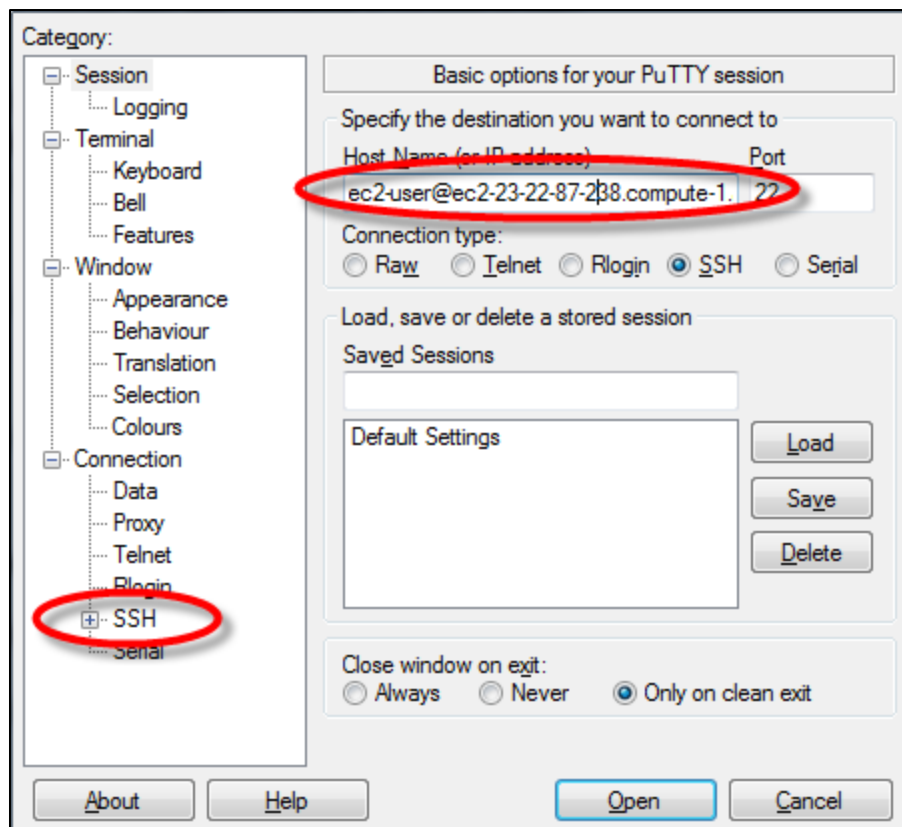

3. Save the file to your Downloads directory (or some other directory of your choice).

CONNECT TO THE EC2 INSTANCE USING SSH AND PUTTY.

1. Open the putty.exe you downloaded or already had.
2. Enter ec2-user@<your EC2 hostname> into the Host Name input in Putty (Ctrl+v).
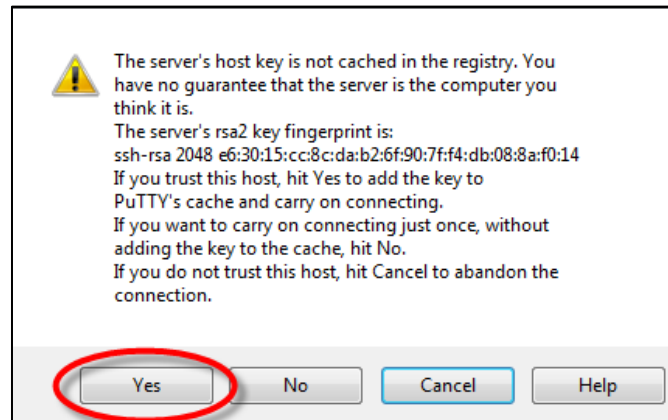3. Expand the SSH category by clicking on it.

4. Select the Auth category by clicking on it (not the + symbol next to it).
5. Click Browse and locate the PPK file (ending in .ppk) in your Downloads directory or whatever other location you chose.
6. Click Open.
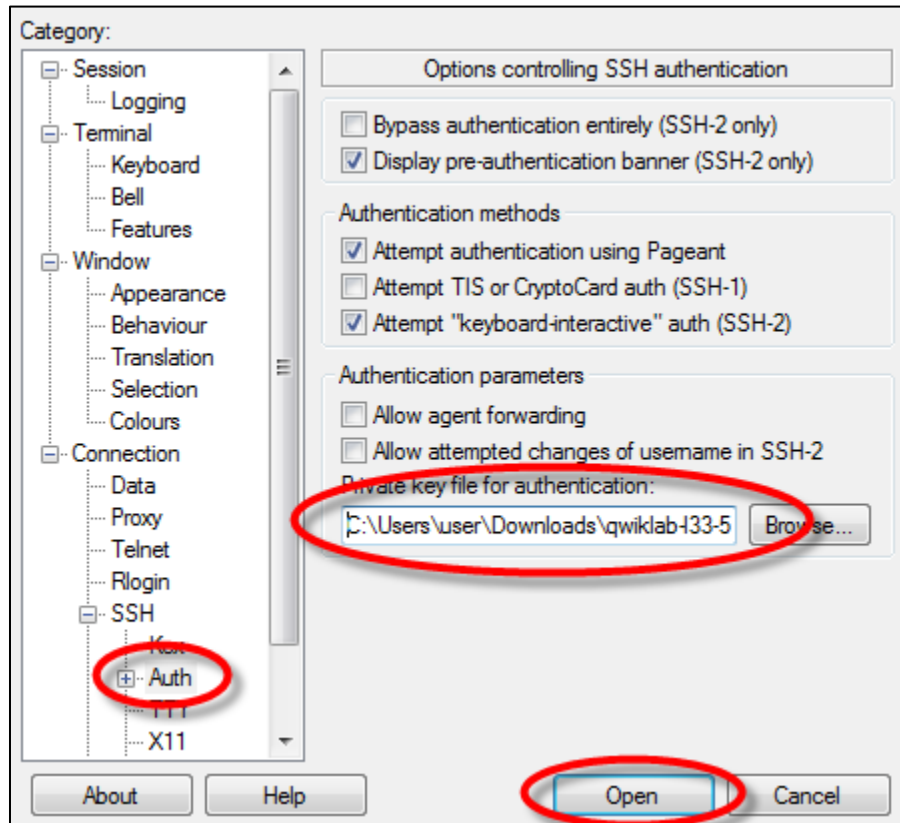
7. Click **Yes** when prompted to allow a first connection to this remote SSH server.

CONNECT TO YOUR EC2 INSTANCE VIA SSH (OS X AND LINUX)

DOWNLOAD YOUR EC2 KEY PAIR PRIVATE KEY FILE

1. Go back to your lab in *qwikLAB™*.
2. Download the *qwikLAB™* provided EC2 Key Pair private key file in the PEM format by clicking on the Download PEM option in the Download PEM/PPK drop-down.
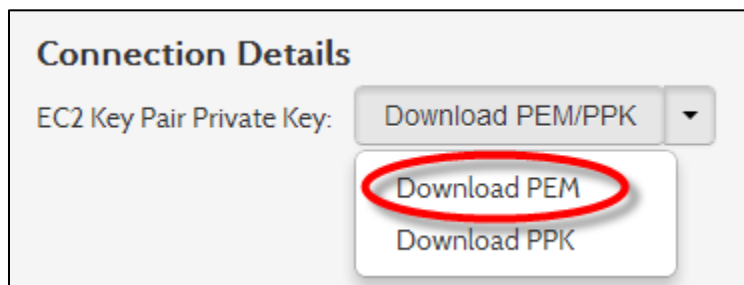
3. Save the file to your Downloads directory (or some other directory of your choice.)

CONNECT TO THE EC2 INSTANCE USING THE OPENSSH CLI CLIENT

1. Open the Terminal application.
2. Enter the below commands substituting the path/filename for the .pem file you downloaded from *qiwkLAB™* and pasting ec2-user@<your EC2 hostname> to substitute the example below.

```
chmod 600 ~/Downloads/qwiklab-l33-5018.pem
ssh –i ~/Downloads/qwiklab-l33-5018.pem ec2-user@ec2-23-22-
87-238.compute-1.amazonaws.com
```