Tutorial 4. Building a Render Scheduler with AWS Thinkbox Deadline

Estimated Time to Complete: 1 hour, 15 minutes

Review of: Tutorial 3: Setting Up an FSx File System and User Accounts

In the last tutorial we created shared storage and set up user profiles for all of the artists in our studio. We also learned how to create Amazon Machine Images and Launch Templates which we will be using again in future tutorials.
Overview of this Tutorial

In this tutorial we are going to set up an instance to manage the renders that get sent to the render farm within our studio. We are also going to install AWS Thinkbox Deadline and configure path mapping.

What is AWS Thinkbox Deadline?

Deadline is a compute management toolkit that leverages the scale of the cloud to run compute intensive jobs. Deadline handles provisioning machines to render on, licensing and path mapping so that your artists can send renders off to the farm and continue working while the jobs complete.

What is the Render Scheduler?

The render scheduler is an instance we use for managing Deadline. The Deadline Repository and Database will reside on this instance, and it is the instance that will provision workers for us when we submit a render.

Allow Render Scheduler to Access Deadline

In order for the render scheduler to talk to your farm workers (which we will create in a later step), we need to open some ports that will allow for Deadline access.

Create Deadline Security Group

- Go to Services → EC2.
- In the left panel click on Security Groups.
- Click Create Security Group.
- Name the security group (e.g., My-Studio-Deadline-SG). Please also enter the name on your cheat sheet.
- Give it a description (e.g., Security Group for Render Scheduler to access Deadline).
- Set the VPC to your studio vpc.
- Click Add Rule.
- Add these rules to the Inbound tab:
<table>
<thead>
<tr>
<th>Protocol</th>
<th>Port Range</th>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom TCP Rule</td>
<td>TCP 4433</td>
<td>10.0.0.0/16</td>
<td>Deadline</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>TCP 17000-17005</td>
<td>10.0.0.0/16</td>
<td>Deadline</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>TCP 8080</td>
<td>10.0.0.0/16</td>
<td>Deadline</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>TCP 8082</td>
<td>10.0.0.0/16</td>
<td>Deadline</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>TCP 27100</td>
<td>10.0.0.0/16</td>
<td>Deadline</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>TCP 443</td>
<td>10.0.0.0/16</td>
<td>Deadline</td>
</tr>
<tr>
<td>Custom UDP Rule</td>
<td>UDP 17001</td>
<td>10.0.0.0/16</td>
<td>Deadline</td>
</tr>
<tr>
<td>Custom UDP Rule</td>
<td>UDP 123</td>
<td>10.0.0.0/16</td>
<td>Deadline</td>
</tr>
</tbody>
</table>

- Click **Create** when done.
- After the security group is created, you will find that it doesn't have a **Name** visible in the list of security groups. Find the one you just created by locating it under **Group Name**, and then add a **Name** by clicking on the little pencil icon under the name column.
- You can also add a Tag for your Studio now in the Tags Tab.

![Add/Edit Tags](image)

- **Now is also a good time to enter the security group’s ID to your cheat sheet. You can find it to the right of the name in the list of security groups. It will look something like: sg-293m3jj3iha2991o4.**
Launch the Render Scheduler Instance

Launch the Instance Using Your Management Launch Template

- Go to Services → EC2.
- Select Launch Templates in the left side panel.
- Select the Management Launch Template (e.g., My-Studio-Management-LT). You can refer to your cheat sheet if you don’t remember the launch template’s name.
- Choose Actions → Launch instance from template.
- Choose the newest version.
- Change the Instance type to m5.2xlarge.

- Increase the storage space for this machine by going to the Storage (volumes) section, clicking the triangle to the left of Volume 1 and changing Size (GiB) to 100.

- Change the Name tag to Render Scheduler in the Instance tags section.
• Then under the **Tag volumes** column, check the box on for each tag.

![Instance tags](image)

• At the bottom of the page, click **Launch instance from template**.

• After the instance has launched, go to your list of running instances.

• Right mouse click on the Render Scheduler and choose **Networking → Change Security Groups**.

• Select your Deadline security group (e.g., My-Studio-Deadline-SG) from the list (keep the Remote Desktop Security Group selected as well). *The name and ID of your Deadline security group can be found on the cheat sheet.*

![Change Security Groups](image)

• Click **Assign Security Groups**.
• Make note the Private IP of your render scheduler and enter it on your cheat sheet. If you have the render scheduler selected in the instance list, you can find the Private IP in the Description tab at the bottom of the page.

Log into the Render Scheduler as Administrator

Now we are going to connect to the render scheduler and start installing Deadline! For this task we are going to log onto the machine as Administrator.

Note: This is different than logging in as mystudio\Admin as we did in Tutorial 3. In that case, we needed admin privileges for our domain when setting up users, etc. In this case, we need admin privileges for the instance itself, hence the need to login as Administrator, the administrator for the instance itself.

• To log into the Render Scheduler as Administrator:
  o Go to Services → EC2 and click on Running Instances.
  o Look for the Render Scheduler instance in the list and verify that the Status Checks column says “2/2 checks passed” before continuing.
  o Select the Render Scheduler instance and click the Connect button.
  o In the pop-up window, click Get Password to get the Administrator password
  o Click Choose File and find the key pair file (e.g., mystudio-keypair.pem). You can refer to the Tutorial 1 section of your cheat sheet if you don’t remember the key pair file name.
  o Click Decrypt Password, and notice this time that the password is set to your Active Directory Admin password. This is because of the special Sysprep shutdown procedure we did in Tutorial 3, where we specified the Administrator password. Now instead of having to decrypt the password, you can just type in your Admin password.
  o Click Download the Remote Desktop File.
  o Open Remote Desktop and connect to your instance.
  o The username should already be set to Administrator. Type in your Active Directory Admin password and click OK.

• Once logged in as Administrator, you can begin the installation process for your applications! But, first...

Connect Shared Storage to Render Scheduler

• Open a File Explorer window.
• From the navigation pane, open the context (right-click) menu for Network and choose Map Network Drive.
• Choose a drive letter of your choice for Drive (e.g., Z:).
• Enter the full CNAME Alias for your file share that you noted above for Folder.
  o e.g., \studio.mystudio.com\share\name
• Confirm that Reconnect at sign-in is selected and then click Finish.
• It will ask for your Active Directory login credentials. For example:
  o Admin
  o Use the password you set up.
  o Toggle on Remember my credentials.

• Create a new folder on your shared drive called installers.
• Create a folder in the installers folder called `firefox` and one called `thinkbox`. 
Turn Off Firewall Settings

In order for Deadline to work correctly we need to turn off some of the default Windows firewall settings. This is OK because the AWS security groups we are setting up will handle security for our instances.

- Go to the **Start Menu** and type **firewall**.
- Choose **Windows Defender Firewall**.
- On the left click **Turn Windows Defender Firewall on or off**.
- Under **Domain network settings** turn off Windows defender firewall.
- Under **Private network settings** turn off Windows defender firewall.
• Leave **Public network settings** firewall on.
• Click **OK**.

**Install Firefox**

The first thing we are going to install is a web browser that will allow us to download the Deadline installers. In this case we are going to use **Firefox**.

**Copy Firefox Installer onto Render Scheduler Instance**

• On your local computer navigate to the [Firefox installation page](#).
• Click on the small white text that says **Advanced install options & other platforms**.
• Download the **Windows 64-bit MSI**.
• **Copy** the MSI file from your local downloads folder and **paste** it onto the render scheduler instance in *Z:\installers\firefox*.
  - This will upload the file to the remote instance.
• Double click on the installer and click **Run** in the popup window.
• When it’s done running you will be able to launch Firefox.
Install Deadline

Download the Installers and Run!

- In Firefox on the remote instance, go to the AWS Thinkbox downloads page and login with your Amazon.com login credentials (not your AWS account info).

- Click the download icon on Deadline

- Download the latest version of the Deadline installers for Windows and Linux (we will need the Linux installers later). At the time of writing, this was Deadline-10.1.1.3-windows-installers.zip and Deadline-10.1.1.3-linux-installers.tar, but the version you see may be higher.

- Cut and paste both installers from the Downloads folder into the Z:\installers\thinkbox folder.

- Unzip the Windows file by right mouse clicking and choosing Extract all.
Install the Deadline Repository

- In Z:\installers\thinkbox\Deadline-10.1.1.3-windows-installers, double-click on Deadline Repository installer.
- Click Run.
- Click Next.
- Accept the license agreement and click Next.
- Leave the Repository Directory at the default (we’re going to install the repository on the C: \ drive) and click Next.
- Choose Install a new MongoDB database on this machine and click Next.
- Keep option Download Mongo DB (requires internet connection) selected and click Next.
- Choose I accept the agreement to accept the MongoDB license agreement and click Next.
- Leave MongoDB Directory, MongoDB Hostname and MongoDB Port at the default and click Next.
- Using File Explorer, create a new folder in C: \ called DeadlineCertificates and choose it as the Certificate Directory.
- Turn off Use client certificate for DB user authentication.
- Click Next then click Next again.
  o Wait a few minutes for the installation to complete.
- Click Finish.

Install the Deadline Client

- When the install for the Repository is finished, install the Deadline Client.
- Go to Z:\installers\thinkbox\Deadline-10.1.1.3-windows-installers.
- Double-click on Deadline Client installer.
- Click Run.
- Click Next.
- Accept the license agreement and click Next.
- Leave the Installation Directory as default and click Next.
- Select Remote Connection Server and click Next.
- Leave Connection Type as Repository and click Next.
- Leave the Repository Directory as default and click Next.
- In the field next to Database SSL Certificate, navigate to C:\DeadlineCertificates\Deadline10Client.pfx and click Open.
• You do not need to input a **SSL Certificate Password** since we didn’t specify one before. Click **Next**.

• Leave **License Mode** to **Standard** and click **Next**.

• If you have a license server that you’re going to be connecting to add the port and hostname/IP address, otherwise leave blank.

• Leave **Launch Worker When Launcher Starts** checked and click **Next**.

• Set **Windows User/Group Name** as **Everyone** (from Active Directory).

• Leave the rest of the Remote Connection Server Setup as default and click **Next**.

• Leave **Generate New Certificates** selected and click **Next**.

• Change the **Output Directory** for the certificates in the HTTPS Server Settings to **C:\DeadlineCertificates**.

• No passwords needed.

• Click **Next** and **Next** again.
  - Again, wait a few minutes for the installation to complete.

• Click **Finish**.

**Copy the Deadline Submitter Installers to the FSx File Share**

The Deadline submission installers will allow you to install plugins for the digital content creation applications that you are going to be working in so you can launch renders directly from the app.

• Navigate to the Deadline Repository folder:
  - **C:\DeadlineRepository10**

• Copy the entire **submission** folder to the FSx share (the Z:\ drive) in this location:
  - **Z:\installers\thinkbox**

  - **Note**: If you get an error that a file could not be copied and a message from Windows Defender Antivirus, you may have to temporarily disable it in order for all the files to copy.

    - Go to the **Start Menu** and type **windows defender**
    - Select **Windows Defender settings**
Select Virus & threat protection
- Under Virus & threat protection settings click on Manage settings
- Under Real-time protection click the slider to turn it to Off

- Retry the copy of the submissions folder. Once the copy has completed, you can turn real-time protection back on.
Copy the Deadline Certificates to a Shared Space

In order for the workers to connect, they need access to the Deadline Certificates you created in the C:\ drive. However, those need to be copied to the Z:\ drive so they are accessible on the network.

We will start by creating a folder on the Z:\ drive called app_env (short for application_environment). You can use this drive to put any application specific scripts, environment settings, etc. For now, we'll just use it for Deadline.

- Create a folder called Z:\app_env.

![Folder structure](image)

Next, we will create the folder for the Deadline specific files, and copy the certificates there.

- Create a folder called thinkbox in Z:\app_env.
- Copy the folder C:\DeadlineCertificates to Z:\app_env\thinkbox.
- You may need to change permissions to allow for Domain Users to have access to Deadline10RemoteClient.
  - Navigate into Z:\app_env\thinkbox\DeadlineCertificates and RMB on Deadline10RemoteClient and choose Properties.
  - On the Security tab, click Edit... to change permissions.
  - Click Add... 
    - You may need to log in as your studio administrator (e.g., mystudio\Admin).
  - Then under "Enter the object names to select" type in Everyone.
- Click **Check Names**.
- Once Everyone is underlined, click **OK**.
- Then click the **Full Control** checkbox under **Allow** to add all permissions possible for Everyone.

- Click **OK** and **OK** again.

**Run Remote Connection Server (RCS)**

- Go to `C:\Program Files\Thinkbox\Deadline10\bin`.
- Scroll down to **deadlinercs**.
• Double click on deadlinercs and a new window will open up (you might need to wait a minute for it to start).

• Minimize the window to leave it running in the background.

Setup Deadline Monitor

Launch Monitor

• From the Start Menu choose Thinkbox→Deadline Monitor 10.

• It will take a minute to come up. Once it does, it will create a new account for you called administrator.
• After clicking OK in the window above, you should now see the Deadline Monitor window open.

• The **Deadline Worker** app will have also automatically launched. The worker window may be behind the monitor window and looks like this:
• The worker is the application that actually does the job of rendering on whatever computer it is running on. In exercises later in this tutorial and the next, we’ll be using this worker to test our Deadline setup. Without this running worker, our render tests will not get picked up.

• Like deadlinercs, make sure that you leave the worker running, but you can minimize the window.

• Back in the Deadline Monitor window, you will see this single worker listed in the bottom panel of the monitor. That is the worker running on your Render Scheduler.
  
  o If the Deadline Worker didn’t start, you can start it manually by going to C:\Program Files\Thinkbox\Deadline10\bin\ and double-clicking on deadlineworker.exe.

**Set Mapped Paths**

Because we will be using Linux workers for rendering, we need to create some mapped pathing to make sure our file paths convert from Windows to Linux correctly. For example, a file located at Z:\project\myshow\shot_01.ma on your Windows machine will need to be mapped to /mnt/studio/project/myshow/shot_01.ma. Deadline can do this automatically when it’s set up correctly.

• In the Deadline Monitor, click on Tools.
• Choose **Tools → Super User Mode.**

![Deadline Monitor - C:\DeadlineRepository10](image1)

• Choose **Tools → Configure Repository Options.**
• Click on **Mapped Paths.**
• Under **Global Rules** click **Add.**
  o For **Replace Path**, enter **Z:**
  o For **Windows Path**, enter **Z:**
  o For **Linux Path**, enter **/mnt/studio**

![Configure Repository Options](image2)
• Click OK.
• Click OK again to close the window.

Set up Render Groups
Now we want to create a render group. You can create multiple groups if you want, but for our case a single one will be fine.

• Go Tools → Manage Groups...
• Click New.
• For Group name enter: linux_worker
• Click OK.

• Click OK again.

Note: We will use this in a later tutorial...for now we’re just setting up the group.

Run Deadline Pulse
Pulse is a mini server application that performs maintenance operations on your farm, and manages some advanced features.

• Go to the Start Menu and select Thinkbox→Deadline Pulse 10 and leave it running.
Minimize Pulse so you don’t have to see the window all the time.

Test Your Setup
To test and make sure that jobs are able to run, you can create a very simple test that just outputs information to the render logs. This won’t be how you normally run jobs on the farm, but it will let submit a job through the Deadline Monitor, and have the current machine pick it up and execute it.
Create a Test Batch File

First, we'll create a batch file that can execute a simple command. Then, we'll submit this command with Deadline.

- On your Render Scheduler, open Notepad by going to the Start Menu and typing Notepad.
- Enter the following code:

```batch
@echo off
echo ======================
echo Testing Deadline Submission
echo Frame %1
echo ======================
```

- Save the file on the Desktop as testDeadline.bat (C:\Users\Administrator\Desktop\testDeadline.bat).

**testDeadline** – Note: <shift>+click on the image to open the text in a new tab.
Check the Deadline Worker

Before you submit your render, you should check that the Deadline Worker is running. It should have automatically started when you launched the Deadline Monitor above, but it's good to check just in case. If the worker is running, you should see the Deadline Worker icon in the task bar and also see one worker in the list of workers at the bottom of the Deadline Monitor window.

Submit the Test

Now you'll submit the test to Deadline. If everything works as expected, you will run a series of jobs on the current machine. Inside the logs of those jobs, you should see the statements above echoed out.

- In the Deadline Monitor go Submit → Miscellaneous → Command Line.
- Set the Job Name to Test Deadline.
- Leave Group set to none. Note: We won’t be using the “linux_worker” group until a later tutorial.
- Set the Frame List to 1-10.
  - This will run the command for 10 frames.
- Set the Executable to the location of your testDeadline.bat file (C:\Users\Administrator\Desktop\testDeadline.bat).
- In Arguments enter <STARTFRAME>
  - You can do this by just clicking the Start Frame Tag button.
  - This will replace the %1 in the batch file with the current frame.
• Click **Submit**.

• Close the Submission dialog.
Review Your Submission

- Now that the job is submitted, you should see it listed under **Jobs** in the upper left panel of Deadline.
- Select the **Test Deadline** job, and you will see a list of **Tasks** in the upper right panel of Deadline.

![Deadline Monitor](image)

- **Double-Click** on one of the **Completed tasks** to see the logs.
- Select the log and then scroll down until you can see the code we entered.

![Logs](image)

- Congratulations! You’ve now manually submitted a task and can see Deadline working.

Restart Your Render Scheduler

In order to make sure the Render Scheduler can be connected to via other instances, you’ll need to restart the machine.
In the AWS EC2 Console, select the Render Scheduler instance and choose **Actions → Instance State → Reboot.**

Once it’s been restarted, you can connect again by clicking **Connect**

Log in as **Administrator.**

Then start up the **Deadline Monitor, deadlinercs, and Deadline Pulse**

Note: If you have trouble when launching any of the Deadline apps above, run **Start → Task Manager** and double-check that they aren’t already running. Sometimes you need to force quit them and launch again for them to start correctly.

**Your VPC So Far**
**Shut Down Notes**

If you are going to continue to the next tutorial right away then leave your Render Scheduler running. If it is running, you can stop your User Management instance for now. You won’t need it until you onboard more artists into your studio. If you are going to continue at another time you can **Stop** your Render Scheduler and restart it when you continue this series.

- In the AWS Console go to the list of running instances.
- Select your **User Management** and/or **Render Scheduler** instance from the list
- Click on the **Actions** button, then select **Instance State → Stop**

Link to next tutorial: [Tutorial 5: Installing Applications and Creating a Workstation AMI](#)
Appendix

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Links to AWS Documentation

- Deadline Repository Installation
- Deadline Client Installation

Downloads

- Important Information Cheat Sheet