Hands-on Exercise 3: Distributed AWS DeepRacer RL Training using Amazon SageMaker and AWS RoboMaker

Overview

In this exercise, you will train your AWS DeepRacer using reinforcement learning (RL), Amazon SageMaker RL, and the AWS RoboMaker 3D driving simulator. AWS DeepRacer uses Amazon SageMaker to build and train its reinforcement learning models and AWS RoboMaker to create the virtual simulator that serves as the environment the car interacts with.

Unlike the first two exercises, where you used the AWS DeepRacer console UI to build, train, and evaluate models, in this exercise, you'll interact directly with Amazon SageMaker and AWS RoboMaker. In doing so, you will gain more control over the process of model training, tuning, and simulation.

*Note: This exercise is designed to be completed in your AWS account. AWS DeepRacer is part of AWS Free Tier, so you can get started with the service at no cost. For the first month after sign-up, you are offered a monthly free tier of 10 hours of Amazon SageMaker training, and 60 simulation units of Amazon RoboMaker (enough to cover 10 hours of training). If you go beyond those free tier limits, you will accrue additional costs. For more information see the AWS DeepRacer Pricing page.

Learning Objectives

By the end of this exercise, you will be able to:

1. Configure an Amazon SageMaker environment and install the appropriate packages for use with AWS DeepRacer
2. Use Amazon SageMaker to build, train, and evaluate a reinforcement learning model for AWS DeepRacer
3. Create, launch, and visualize a simulated environment in AWS RoboMaker

Technical Prerequisites

- Experience using AWS technologies, including Amazon SageMaker
- Basic understanding of machine learning concepts, particularly RL and how it applies to AWS DeepRacer

- Experience building and training models in the AWS DeepRacer console

---

Task 1: Create an Amazon SageMaker notebook instance

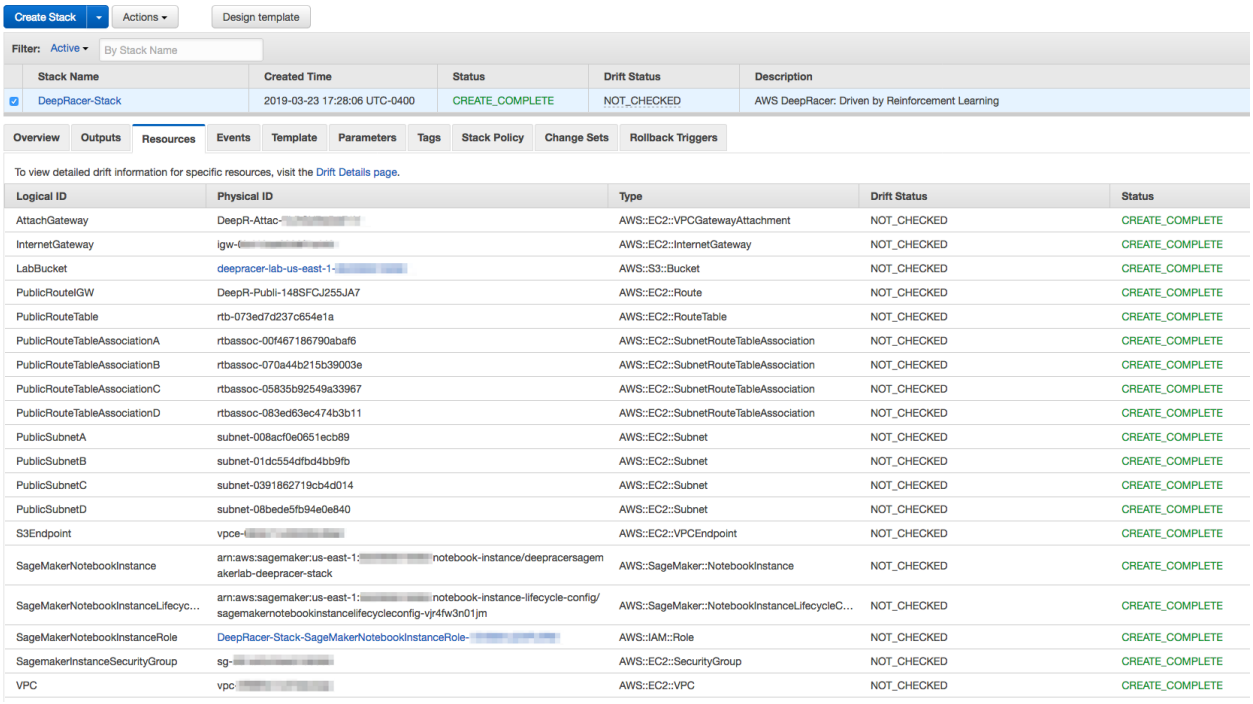
Before you can start building and training your reinforcement learning model with Amazon SageMaker, you need to create an Amazon SageMaker notebook instance. This includes launching an AWS CloudFormation template that will provision the services you need for this exercise. To do that, follow the steps below.

1. In your AWS account, go to the AWS Management Console.
2. At the top right corner, in the **Regions** dropdown menu, choose `us-east-1`.
3. From the console, click **Services**, enter **CloudFormation** in the search box, and select **AWS CloudFormation**.

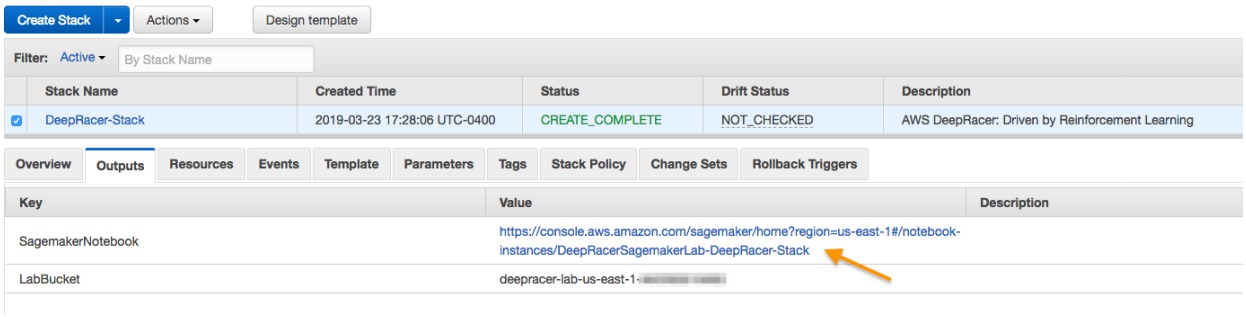
   Note: The following instructions are based off of the current default version of the AWS CloudFormation console. If you opt to use the new version of the service console, please note that the following instructions will not align perfectly to the console UI.
4. In the AWS CloudFormation console, select **Create Stack**.
5. On the **Select Template** page, in the **Choose a Template** section, select the **Upload a template to Amazon S3** option. Click **Browse**, navigate to your local drive, and choose **SageMakerForDeepRacerSetup.yaml**. Then click **Next**.

   Note: Locate the **SageMakerForDeepRacerSetup.yaml** CloudFormation template file which you downloaded as part of the **resource-pack.zip** in chapter 2.
6. Enter a name for the stack (for example, SageMaker-For-DeepRacer-Stack), keep the default settings and click **Next.**

   Note: If this is the second stack you're creating, make sure to choose the option **False** under **CreateS3Bucket.** If this is the first stack you're creating, you can disregard this note.
7. Accept the default settings on **Options** screen and click **Next**.
8. Check the box next to "I acknowledge..." and click **Create**.
9. Wait 4 to 5 minutes for your stack to be created. When it completes, you will see the status as "CREATE_COMPLETE" in green, as shown in the **Resources** tab below.



10. Next, open the **Outputs** tab and click the link next to **SagemakerNotebook**. This will open up an Amazon SageMaker notebook instance.



Note: You can also open a notebook instance using the Amazon SageMaker console. To open a notebook instance this way, navigate to **Services**. From the console, open **Amazon SageMaker**. In the left navigation pane, click **Notebook instances**. Look for a running instance with a name like **DeepRacerSageMakerLabs-$stackname$**.

11. Once inside the Amazon SageMaker notebook instance, click **Open Jupyter**. This will open the Jupyter dashboard. Make sure that you see the notebook files **rl_deepracer_robomaker_coach.ipynb** and **rl_deepracer_robomaker_coach.zip**.

Task 2: Initialize and complete the Amazon SageMaker notebook instance for model building and training

The rest of this exercise will take place within the notebook file. Within the notebook file, you will first import the required libraries and configure a VPC so that Amazon SageMaker and AWS RoboMaker can interact with each other. You will then use Amazon SageMaker to complete the build and train process, before launching and visualizing a simulator environment in AWS RoboMaker.

1. From the Jupyter dashboard, open the **rl_deepracer_robomaker_coach.ipynb** notebook file.
2. Move through the notebook file step by step.

Conclusion

Congratulations! You now have successfully:

1. Configured an Amazon SageMaker environment and installed the appropriate packages for use with AWS DeepRacer
2. Used Amazon SageMaker to build, train, and evaluate a reinforcement learning model for AWS DeepRacer
3. Created, launched, and visualized a simulated environment in AWS RoboMaker

---

Additional Resources

- For more information about AWS DeepRacer, see https://aws.amazon.com/deepracer/.
- For more information about AWS Training and Certification, see https://aws.amazon.com/training/.
- To troubleshoot and collaborate on AWS DeepRacer, see https://forums.aws.amazon.com/forum.jspa?forumID=318.

For feedback, suggestions, or corrections, email us at aws-course-feedback@amazon.com.