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Racing with Deep Reinforcement Learning

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AWS DeepRacer Origin



How can we put
Reinforcement Learning
in the hands of all
developers? *literally*

AWS DeepRacer Car Specifications

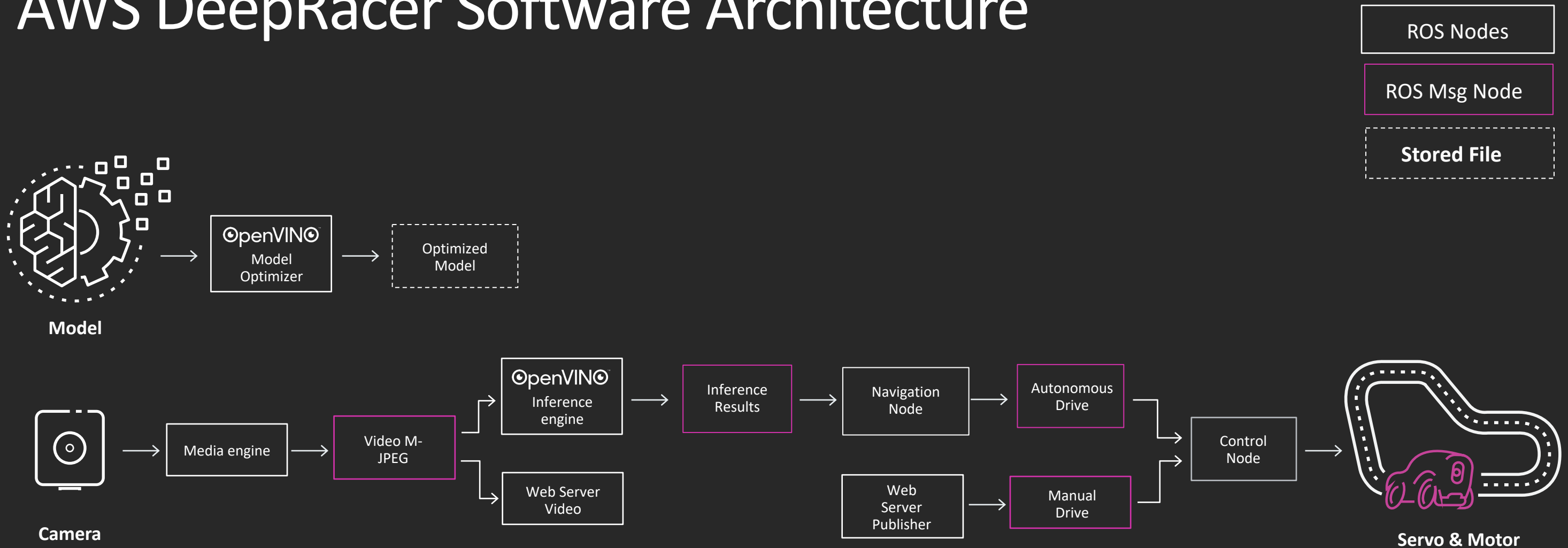


CAR	18th scale 4WD with monster truck chassis
CPU	Intel Atom™ Processor
MEMORY	4GB RAM
STORAGE	32GB (expandable)
WI-FI	802.11ac
CAMERA	4 MP camera with MJPEG
DRIVE BATTERY	7.4V/1100mAh lithium polymer
COMPUTE BATTERY	13600mAh USB-C PD
SENSORS	Integrated accelerometer and gyroscope
PORTS	4x USB-A, 1x USB-C, 1x Micro-USB, 1x HDMI
SOFTWARE	Ubuntu OS 16.04.3 LTS, Intel® OpenVINO™ toolkit, ROS Kinetic

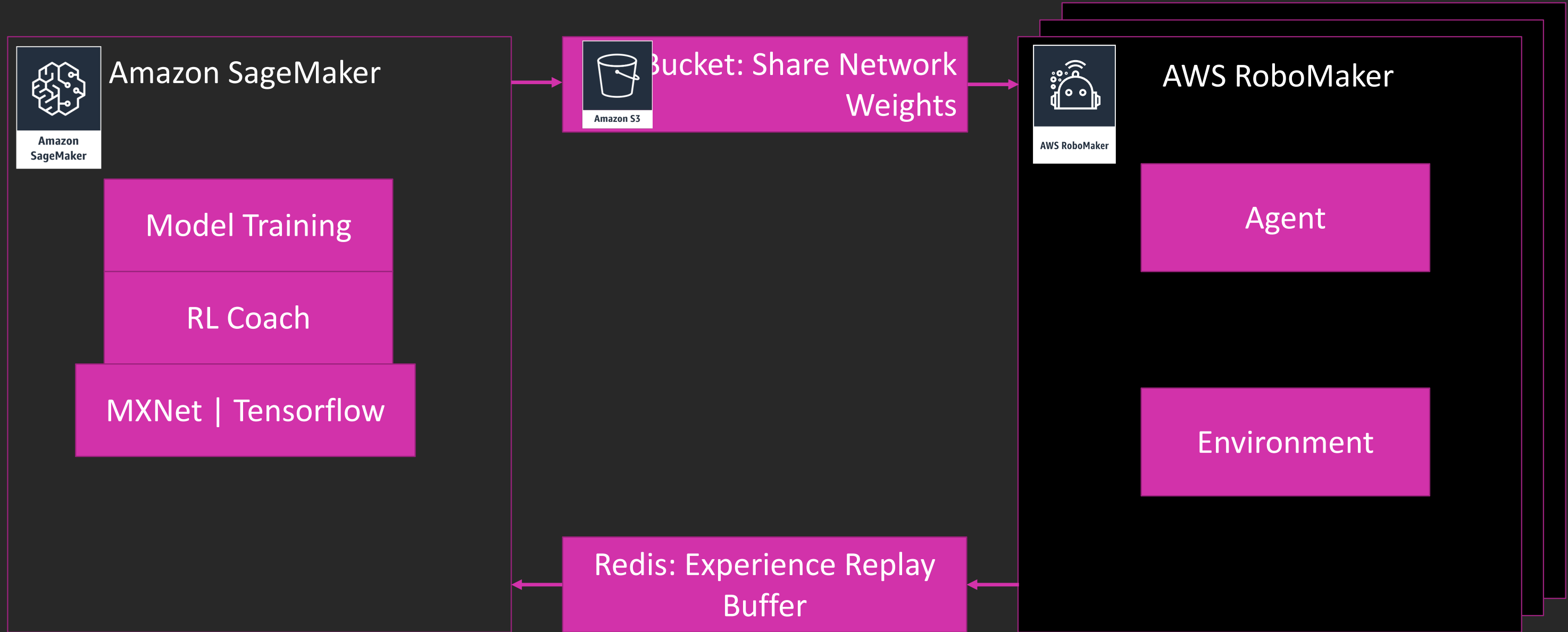


OpenVINO

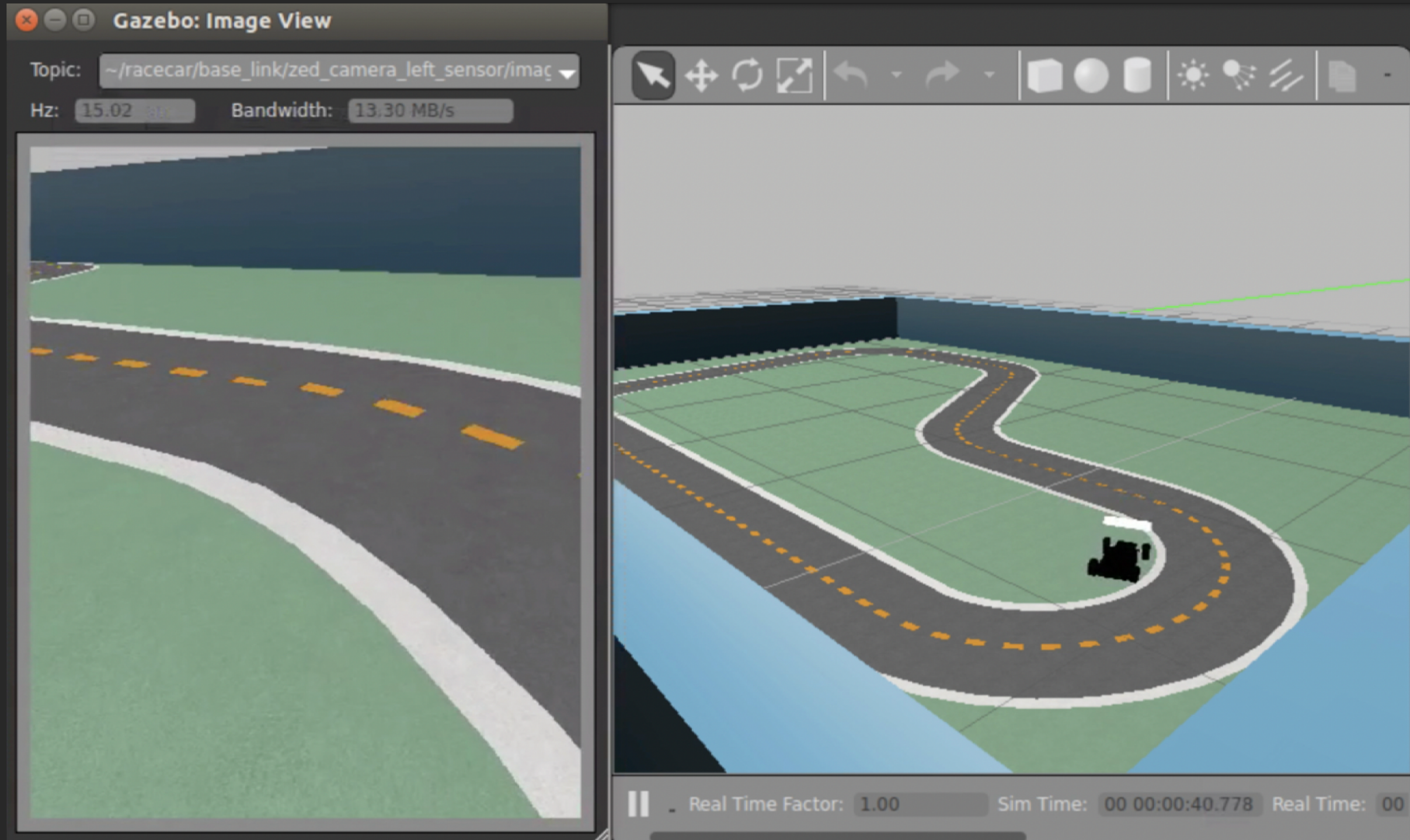
AWS DeepRacer Software Architecture



Distributed RL (Clipped PPO)

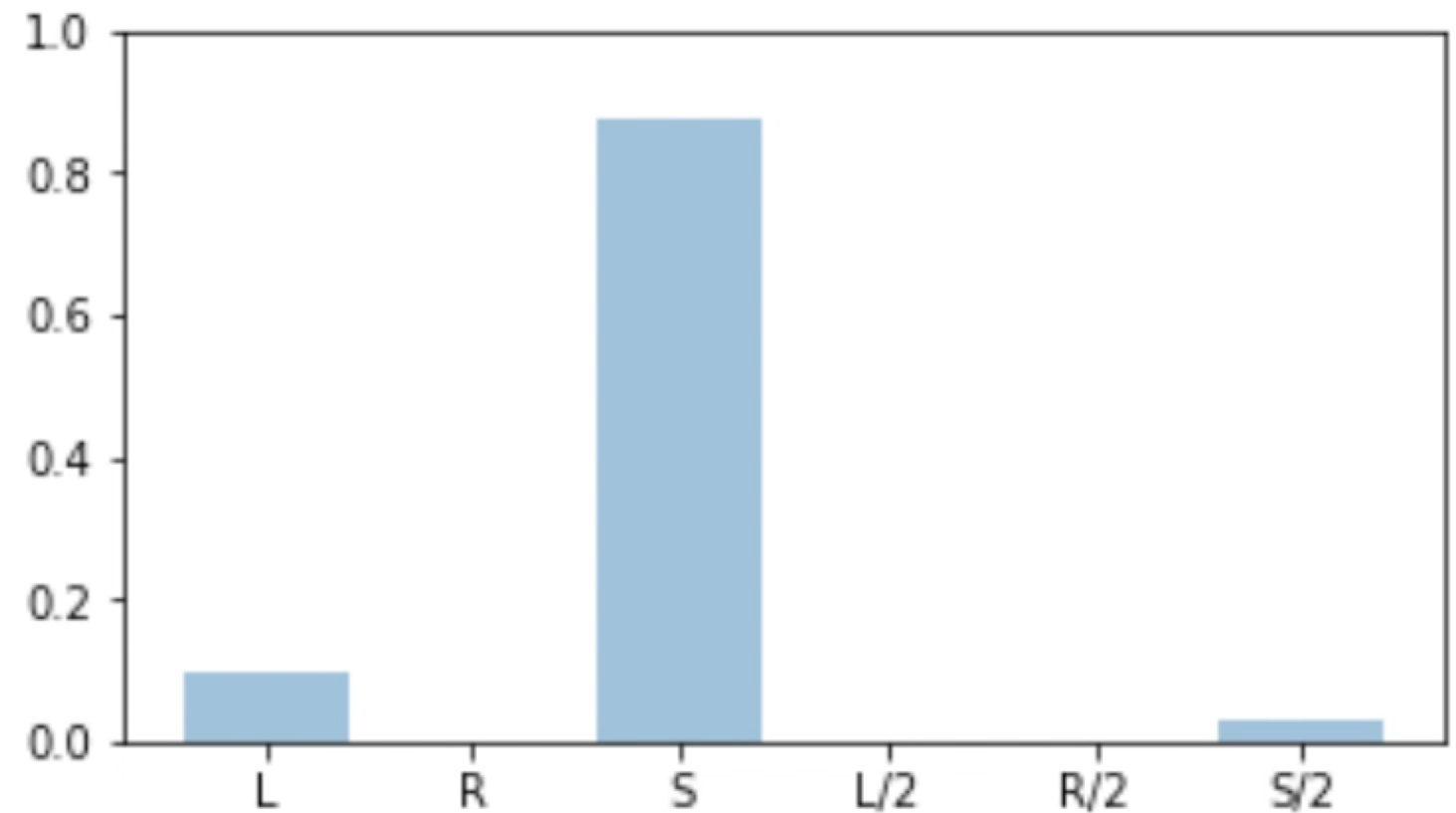
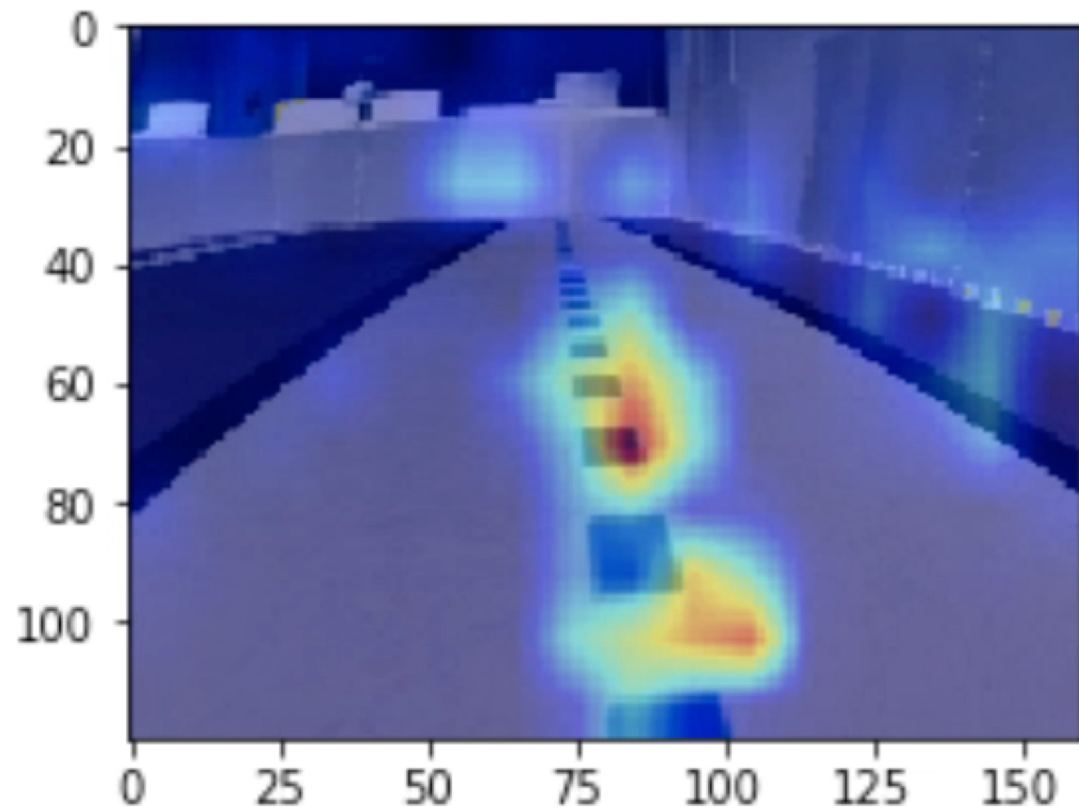


AWS DeepRacer Training Environment





Using Gradient Visualization for Policy Debugging



Gzclient - sim-2f14rzth0386

<https://us-west-2.console.aws.amazon.com/robomaker/viewer?region=us-west-2#sim-2f14rzth0386/8443/gzcli...>

AWS RoboMaker sim-2f14rzth0386 **Action**

World Insert Layers

- GUI
- Scene
- Spherical Coordinates
- Physics
- Models
- Lights

Property Value

This screenshot shows a 3D simulation environment. A small red and white car is positioned on a track with white and yellow lane markings. The environment is viewed from a perspective angle. The interface includes a top toolbar with navigation and camera controls, and a left sidebar with a scene tree and a property panel.

Gzclient - sim-6rntd5wxtc2l

<https://us-west-2.console.aws.amazon.com/robomaker/viewer?region=us-west-2#sim-6rntd5wxtc2l/8443/gzcli...>

AWS RoboMaker sim-6rntd5wxtc2l **Action**

File Edit Camera View Window Help

World Insert Layers

- GUI
- Scene
- Spherical Coordinates
- Physics
- Models
- Lights

Property Value

This screenshot shows a 3D simulation environment with a different track layout. A small red and white car is on a track with white and yellow lane markings. The interface includes a top toolbar with navigation and camera controls, and a left sidebar with a scene tree and a property panel.

Gzclient - sim-jsl5n83fd5dk

<https://us-west-2.console.aws.amazon.com/robomaker/viewer?region=us-west-2#sim-jsl5n83fd5dk/8443/gzcli...>

AWS RoboMaker sim-jsl5n83fd5dk **Action**

File Edit Camera View Window Help

World Insert Layers

- GUI
- Scene
- Spherical Coordinates
- Physics
- Models
- Lights

Property Value

Property	Value
name	Light 1
pose	
diffuse	[229, 229, 22...]
specular	[25, 25, 25] (...)
range	50.00
attenuation	

This screenshot shows a 3D simulation environment with a track on a green field. A small red and white car is on the track. The interface includes a top toolbar with navigation and camera controls, and a left sidebar with a scene tree and a property panel. The property panel shows settings for a light object.

Gzclient - sim-9jd6fvrq8zvm

<https://us-west-2.console.aws.amazon.com/robomaker/viewer?region=us-west-2#sim-9jd6fvrq8zvm/8443/gzcli...>

AWS RoboMaker sim-9jd6fvrq8zvm **Action**

File Edit Camera View Window Help

World Insert Layers

- GUI
- Scene
- Spherical Coordinates
- Physics
- Models
- Lights
 - sun
 - Light 1

Property Value

Property	Value
name	Light 1
pose	
diffuse	[50, 40, 229] ...
Red	50
Green	40
Blue	229
Alpha	255
specular	[25, 25, 25] (...)
range	50.00
attenuation	

This screenshot shows a 3D simulation environment with a track on a blue field. A small red and white car is on the track. The interface includes a top toolbar with navigation and camera controls, and a left sidebar with a scene tree and a property panel. The property panel shows settings for a light object.





Announcing AWS DeepRacer: An exciting way for developers to get hands-on experience with reinforcement learning



Robotic autonomous
race car



Virtual simulator, to train
and experiment



Racing League

Thank you!

DeepRacer RL Code

https://github.com/aws-labs/amazon-sagemaker-examples/tree/master/reinforcement_learning/rl_deepracer_robotmaker_coach_gazebo

(or) <https://bit.ly/2TfjIO1>

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