A Review on AWS for automotive solutions

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ABSTRACT

The study is based on a controlled experiment in which a prototype system was created to assess several edge technology applications. The system comprises of an accelerometer that is attached to a car and a machine learning algorithm that attempts to anticipate the type of road surface the car is travelling on using the accelerometer's data.The amount of businesses moving their operations from traditional computing to cloud computing as internet usage rises, and as a result, the number of users on the cloud is growing, along with the load.This thesis aims to construct an automated pipeline that generates immutable images for Amazon. This was done for a SaaS firm that wanted to use Packer to move a system from a datacenter to the cloud.The International Hellenic University's Msc in Cybersecurity programme required the completion of this dissertation. In recent years, an increasing number of businesses have moved their data and services to the cloud. Because of this, a lot of hostile actors have started to target cloud resources and infrastructure. In this dissertation, we will look at how Suricata Intrusion Detection Software may be used in conjunction with Amazon Web Services capabilities like Traffic Mirroring, VPC, Load Balancing, and Auto-scaling to construct scalable and effective monitoring solutions in terms of security and resource usage.The main 3 commercial cloud services, AWS, Azure, and GCP, are compared in depth here to assist enterprise organisations in selecting the best cloud computing platform.According to Amazon Web Services (AWS), "Containers provide a standard approach to bundle the code, settings, and dependencies of an application into a single object. They are portable, lightweight, and offer an uniform software environment that makes it simple for applications to function and scale anywhere.

INTRODUCTION

Modern cars typically require to interpret the data they collect. Examples include estimating a vehicle's range using battery discharge rates in an electric vehicle or utilising machine learning to examine data from many types of sensors, including video feeds. There are two issues with processing on the cloud. Secondly, latency and bandwidth issues might arise while processing the data elsewhere. Second, there is a monetary charge associated with each network package delivered between the cloud and the automobile.[1]AWS's Sagemaker ecosystem offers a wide range of machine learning templates and solutions. AWS wants to offer a fully managed AutoML system that automatically determines the problem type for a given dataset and returns a high-performing classifier that can even be directly deployed within the AWS ecosystem. AWS is a cloud service provider with a market share greater than the sum of its closest three competitors (Masood, 2021).[2]The SaaS provider suggested a project to transfer their service from a data centre to the cloud. This was accomplished by constructing a pipeline to produce automatic immutable machine images using Amazon, packer, and Ansible.[3]AWS Traffic Mirroring is an Amazon VPC feature. The elastic network interface of an EC2 instance can be used to copy traffic. When used for testing, debugging, and troubleshooting, traffic mirroring can be used to send copies of real traffic from production servers to development servers. Traffic mirroring can be used to replicate traffic and distribute it outside the band, excluding (meaning they do not waste bandwidth from essential resources of an application) for content screening and hazard monitoring, security, and monitoring apparatus.[4]Because to a variety of services including on-demand computing, the Internet of Things, video resources, and machine learning, to mention a few, Amazon Web Services (AWS) is a widely utilised cloud computing platform. Particularly, AWS-hosted ML resources may enable everyone from a novice looking to get a taste of the industry to a skilled ML-level developer or who can quickly implement specific technologies into theirapplication but has limited resources and wantsto modify an ML model.[5]

LITERATURE REVIEW

Packer

The functioning of the Packers is shown in figure 5. Committing the HCL template, which provides instructions for configuring machine images, is the first step. Initializing the required modules for the preparation is the second stage. when Packer began the construction process.[6] Packer produces ssh keys for connecting to the instance that it configures once the prerequisites are in place for build to begin. Packer launches the provisioners listed on the HCL template and runs them to the instance when the instance is generated. [7]The packer initiates the AMI request for registering it when the provisioner has finished making the adjustments. After the authorised packer terminates the instance, the AMI remains on the authorised cloud provider to be used as needed.[8]You may use your own account to connect Packer to AWS if you require credentials. Packer gives the access required to create an image in a YAML configuration file (see Appendix 1). With such rights, the packer is able to construct and delete EC2 instances as well as perform the necessary tasks to produce registered images for the Amazon image registry.[9]Packer creates its own machine images from base images. As packer bases its photos on those already provided by providers, these images are provider-specific.[10]Packer HCL defines a source block to specify the type of instance to utilise during a building phase. Configuring the initial instance created for the packer is where source block configuration begins. The resulting build will be customised based on the underlaying machine image, including its storage capacity and who may access it. [11]The account owner from whence the packer was linked is the only one who may utilise the final packer picture, regardless of the user. A YAML file with prerequisites for the packer to access the AWS environment of your companywas supplied for AWS access control (see Appendix 1)[12].

Sagemaker Autopilot

Within the Sagemaker ecosystem, Amazon offers a wide range of machine learning tools and templates. AWS wants to offer a fully managed system for AutoML, which

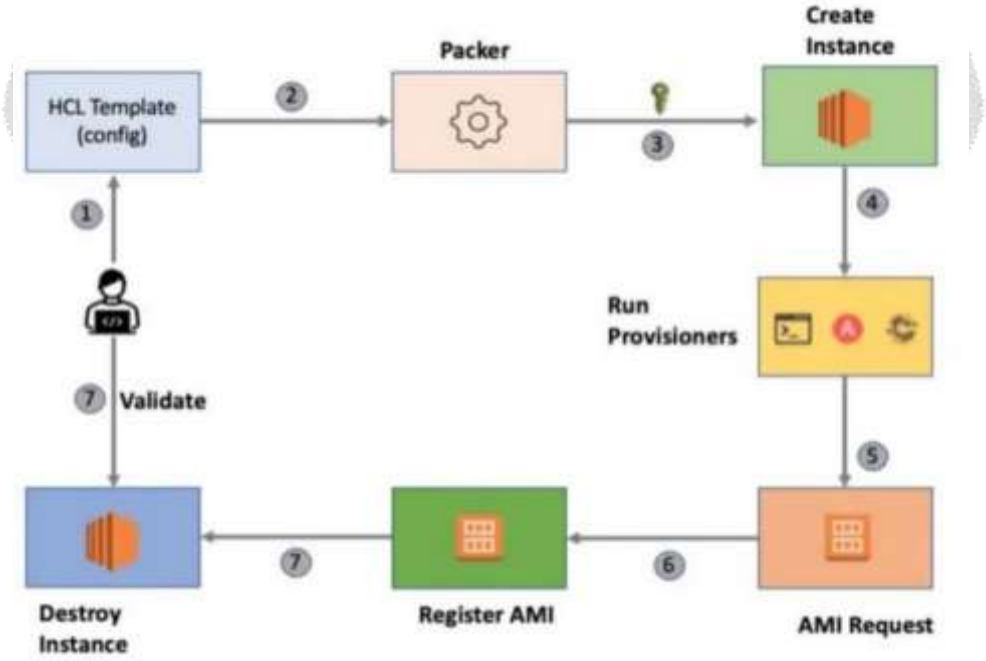

Fig1.1

automatically identifies the problem type for a given dataset and returns a well-performing classifier that can even be directly deployed within the AWS ecosystem.[13] AWS is a cloud service provider with a market share greater than the sum of its closest three competitors (Masood, 2021). [14]The least amount of human input and machine learning expertise will be required for this work, and there will be the option to change the goals, such as choosing between a model's accuracy and latency. For experienced users to further optimise from that base model on, the preprocessing and training code is provided on top of that (Das et al., 2020).[15]The service is being maintained, with the most recent upgrade occurring in October 2021 (at the time of writing). Only as a web service, Autopilot may be utilised through a GUI, a Jupyter notebook hosted on Amazon servers, a REST API, or a Python SDK. Scikit-Learn and a Sagemaker- Scikit-Learn-extension are the ML libraries that were used.[16] Implemented ML tasks include regression, binary classification, multiclass classification, and data preprocessing (Das et al., 2020). XGBoost, Linear Learner, and Deep Learning Neural Network are supported machine learning algorithms (AWS, 2021).[17]Candidate creation and candidate exploration are the two main stages of autopilot. The dataset is automatically divided into a train and validation set during candidate creation, the target column's problem type is determined (if not by the user), and Jupyter notebooks are created for data preparation (such PCA or binning) and data description. These pipelines are used in the candidate discovery phase to undertake automatic hyperparameter tweaking, assess models, and prepare them for rapid deployment (Das et al., 2020); deployment wasnot tested here.[18]

AWS Greengrass

Amazon Web Services' edge computing platform is called AWS Greengrass. A device may be set up to run the AWS Greengrass Core software when utilising Amazon's AWS Greengrass, turning it into a "Greengrass core device."[19]The Greengrass core device can then receive many components. These parts can do a broad range of tasks, from basic logging tools to SSL setups, but they can also include Amazon Lambda functions that can be executed locally on the device.[20] This effectively transforms the Greengrass core device into a local implementation of an AWS cloud server by enabling the same code configured in the same way to be run both in the cloud and on a local Greengrass device.[21]The Greengrass core software enables for simple distribution of modifications to a big number of Greengrass devices at once in addition to merely performing the functions. Moreover, Greengrass has native support for the Amazon MQTT broker, enabling any Greengrass core device to instantly connect to its environment. messages sent over MQTT to the Amazon IoT hub.[22] A "cold start" danger can be eliminated by Greengrass devices' ability to conduct long-lived tasks [23]. Figure 2.2 depicts an instance of communication between Amazon Greengrass software and AWS centralservers.[24]

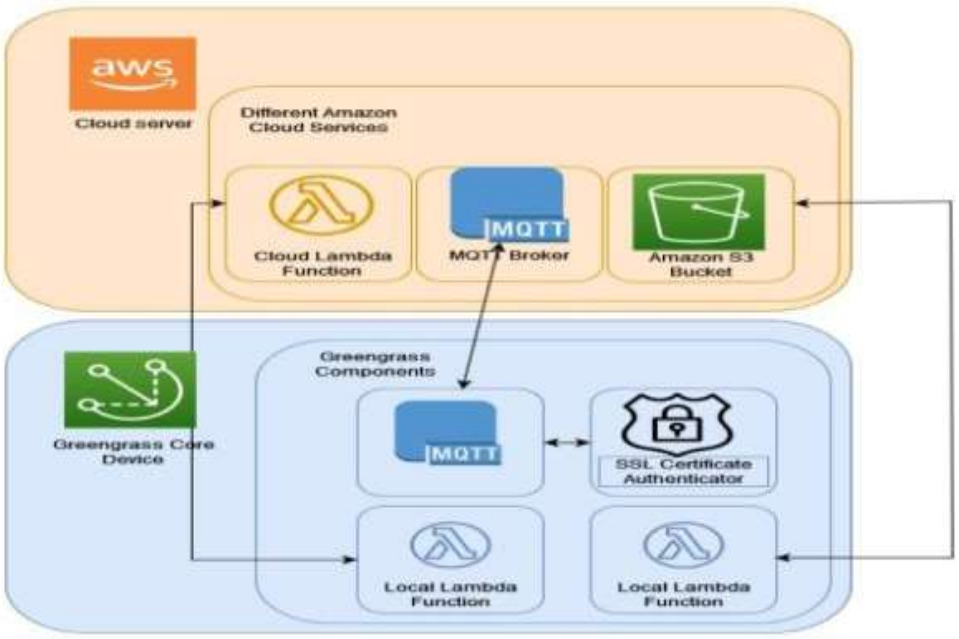

Fig 1.2

CONCLUSION

The load balancing method, cloud computing, and method utilised for load balancing are the main topics of this paper.[25] Several techniques are utilised, including auto-scaling, job-based synchronisation, and the ant colony approach. Three systems were put into place utilising Amazon Lambda and AWS Greengrass to address our study questions from Section 1.2.[26] Around 4200 queries were made in order to test the latency between these systems and the cloud, and the latency for each one was logged. We anticipated that Amazon Sagemaker Autopilot, which provides all the necessary parameters to establish an experiment as planned to execute, would provide an easily accessible and simple to use AutoML service.[27] However, there is a barrier if there is no prior understanding of the AWS environment and some fundamental variables, such as hardware or time limits, are not present .[28] The goal of this project was to develop a packer for a migration from a data centre to the AWS cloud.[29] This investigation led to the migration's effective creation. But, since my assignment was to create the cloud pipeline, I did not witness the finished product being utilised in production. According to this report, there are several approaches to help businesses become more cloud-friendly.[30]

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