AWS for Industries

Building a Scalable Standardized Pipeline for Automotive OTA on AWS

by Shrikant Acharya and Luke Harvey | on 09 AUG 2021 | in Amazon API Gateway, Amazon Cognito, Amazon EC2, Amazon Elastic Kubernetes Service, Amazon Elasticsearch Service, Amazon RDS, Automotive, AWS Partner Network, Customer Solutions, Industries, Intermediate (200), Internet of Things | Permalink | Comments | Share

In this blog, we'll describe how Excelfore was able to use AWS Cloud services to deliver a scalable, secure and easy to manage OTA solution for automotive OEM, Maruti Suzuki.

The demand for an intelligent, safer, and smarter vehicle is driving increased offerings from many vendors in the automotive industry. Vehicle intelligence and enhanced functionalities are coming from different entities across the globe and end customer technology expectations have shifted towards demands for a vehicle that is adaptable and upgradable over its lifecycle. Connected vehicles are increasingly enabled to receive remote over-the-air (OTA) software updates and transmit diagnostic and operational data from on-board systems and components. Automakers now can significantly reduce recall expenses, improve cybersecurity response time, increase product quality and operational efficiency, and deliver post-sale vehicle performance and feature enhancements.

The drive for standardization in OTA

Due to the complexity of software function distribution over various Electronic Control Units (ECUs) and vehicle networks, it is becoming imperative to have standardized interfaces to establish communication between components and the cloud. This is important for automotive OEMs for managing warranty recalls and associated costs. Continuous Integration and/or Continuous Delivery (CI/CD) pipelines and validation and verification (V&V) trends are driving the need for standardized remote updates.

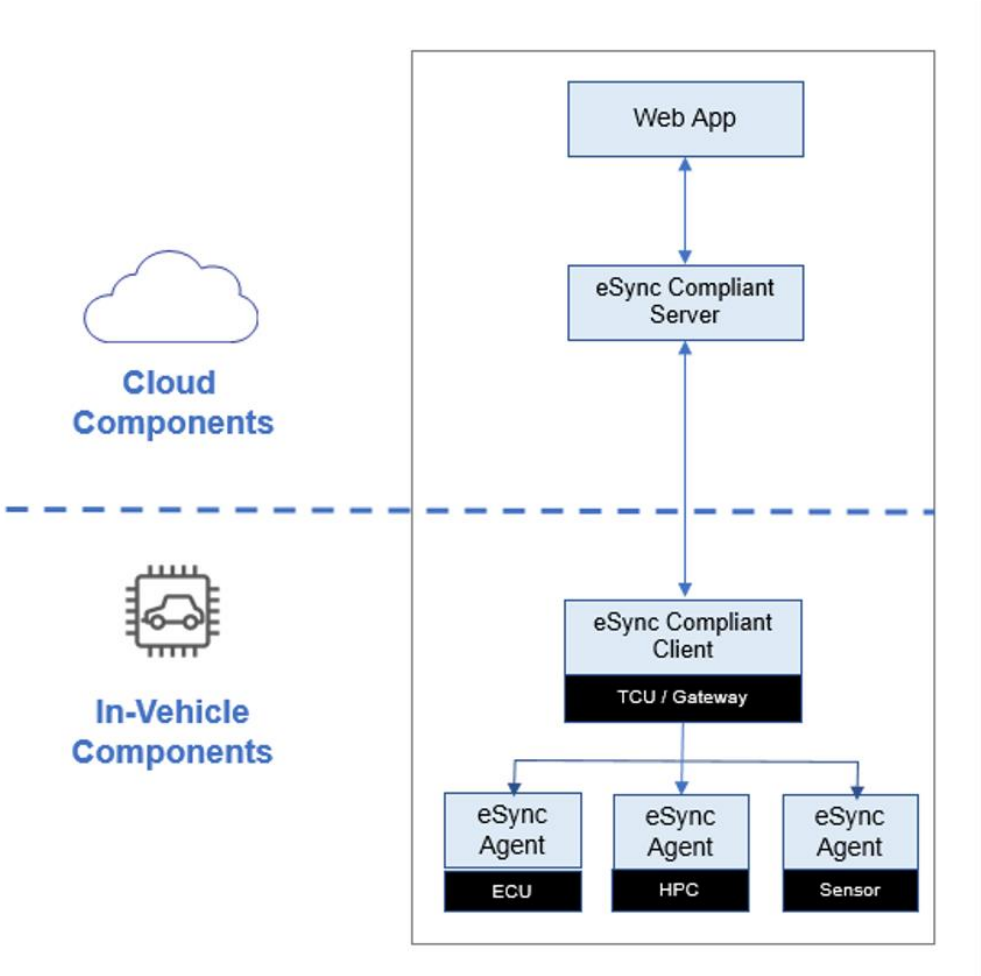
The automotive industry is no stranger to standardization. It's been critical for driving interoperability and providing cost efficiencies that can allow faster proliferation of any automotive technology. Standards allow diverse auto manufacturers, suppliers, and tool developers to establish and maintain commonality and interoperability across systems. Such an approach can drive the outcome of development processes to be delivered within reasonable timeframes and costs. One such example of an industry-wide collaboration is the eSync Alliance, which recently released its V2.0 standard.

eSync Alliance

The eSync Alliance is a multi-company initiative established to standardize OTA updates and data collection for connected cars through a global network of cooperating companies including major automotive suppliers such as Aptiv, Alps Alpine, Faurecia, Hella, Molex and ZF.

The eSync Alliance was developed to provide standards for building a software-based data pipeline from edge (such as ECUs in the vehicle) to cloud services (such as virtualized servers). As illustrated below, it defines a common approach for linking together the cloud interactions of any number of edge devices through the distribution of eSync Agents throughout the in-vehicle network. Through this approach, while the cloud may see the car as one entity, it can track and interact, in a secure and consistent method, with dozens of ECUs and smart sensors in the car

The following diagram illustrates the eSync architecture at a high level, showing the various edge and cloud components in the system.



eSync high level architecture

As the automotive ecosystem has a complex supply chain, the following illustration represents how the eSync Alliance has laid out the standard framework for its members to collaborate on the standards while allowing them to compete on implementation.

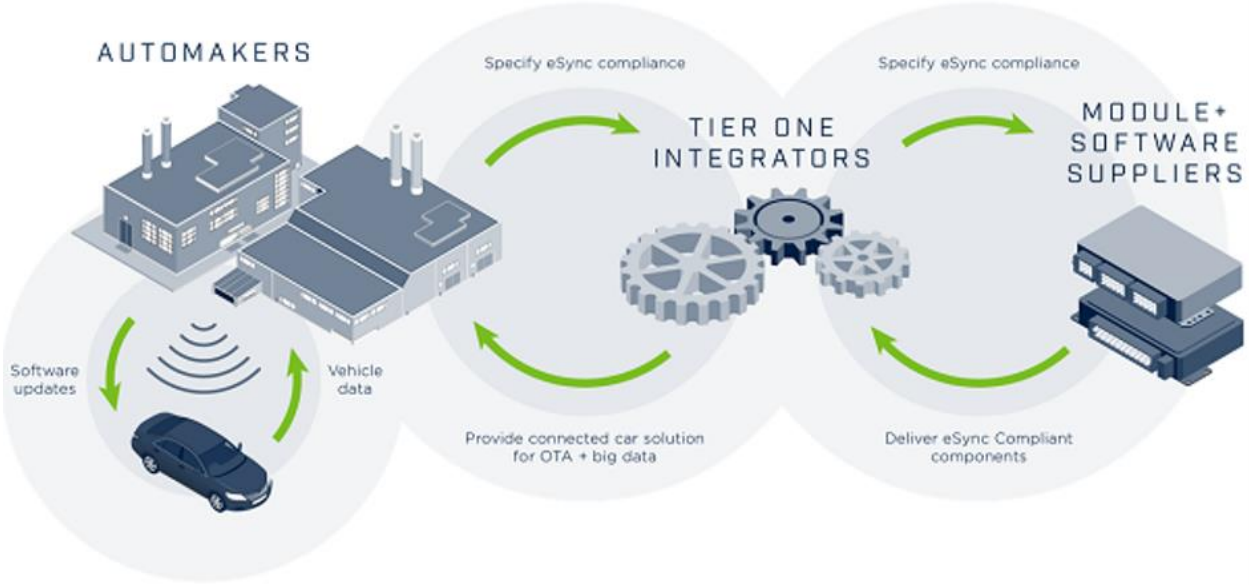


Figure 2: eSync platform

The eSync standard has proven itself scalable for automotive OTA, having deployed with 9 OEMs and 14 car models worldwide with contracts covering 20 million production vehicles and fills the gap for an open standardized approach.

The eSync Alliance v2.0 specifications defines the architecture, behavioral characteristics, and interfaces between each component of the eSync platform. A synopsis of the specifications can be downloaded from the eSync Alliance website.

Excelfore

Excelfore, an AWS APN partner, is focused on unlocking automotive data through innovative platforms for connected cars, electric vehicles, and autonomous vehicles. Excelfore products include protocol stacks for in-vehicle networking, in addition to a full implementation of the eSync™ Alliance standard bidirectional pipeline for OTA updates and data gathering for the automotive industry.

Use-Case: Maruti Suzuki

One great example of the value eSync brings is how innovative automotive manufacturer Maruti Suzuki leverages eSync OTA for updating Suzuki vehicles on AWS platform in India. Suzuki is a leading automotive brand in India with more than 50% share of the market in 2020. The cars are built in India by Suzuki Subsidiary Maruti Suzuki India Ltd.

Their deployment is a fully hosted cloud server solution on AWS managed by Excelfore. Excelfore uses the AWS Cloud to serve content, deploy updates, and keep the telematics software in multiple lines of vehicles up to date.

The Ficosa Telematics Unit inside the vehicle serves as the OTA gateway for the system, which can then manage software deployment to all its connected components in the vehicle. eSync OTA addresses software recalls and security fixes using the software and firmware over-the-air (OTA) update solution. The flexibility of the implementation is what led Maruti Suzuki to choose the eSync based solution.

"We chose the eSync OTA platform because it provides a robust, secure vehicle-to-cloud data pipeline that is compatible with multiple operating systems and in-vehicle networks. This gives us the flexibility and scalability to adapt and grow the solution over future years, and to add OTA updating for more components."

– **Joan Palacin**, Advanced Communications Business Unit Director at Ficosa

How AWS helped Excelfore to achieve scalability, agility, and efficiency

The eSync compliant server was developed at the Excelfore offices in California and Germany, demonstrated on a Ficosa TCU (Telecommunications Unit) in Barcelona and deployed into Suzuki vehicles in India using the Asia Pacific Region in Mumbai. This global DevOps environment leveraged the global infrastructure of AWS to develop and deploy.

Excelfore was able to create staging servers and production servers in these geographies on AWS platforms. The eSync Server and Application are hosted using AWS managed services. This allows the customer to meet their performance and uptime objectives without the undifferentiated heavy lifting of managing the underlying infrastructure. The following diagram shows the various services being used for the server application.

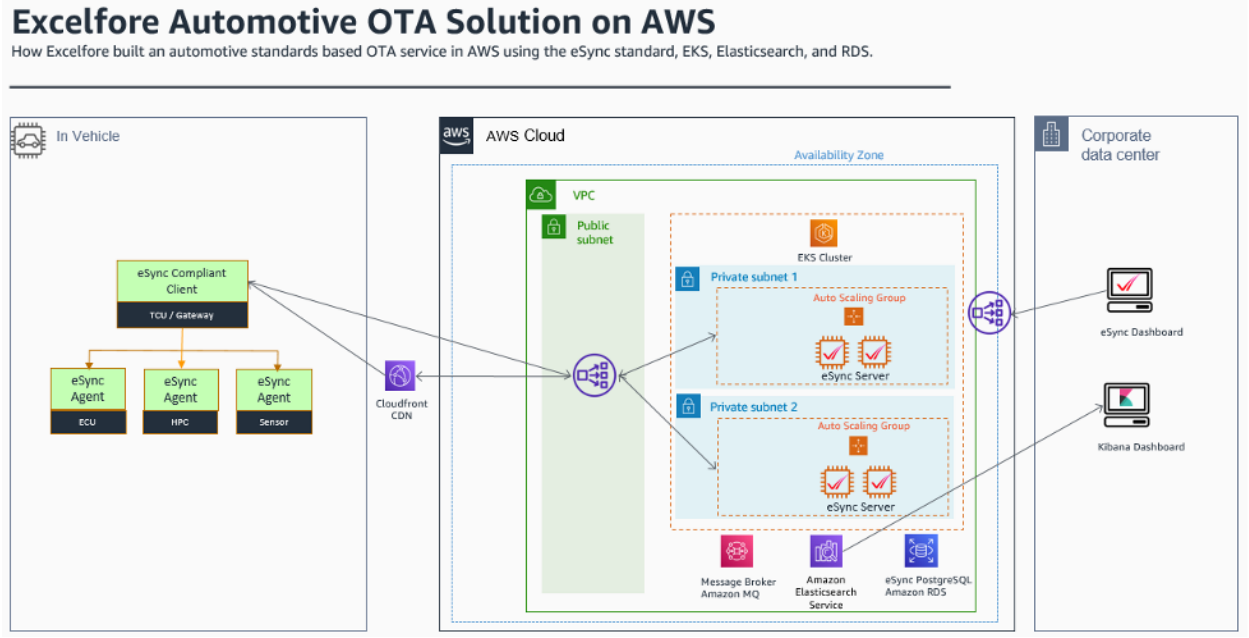


Figure 3: Excelfore Automotive OTA Solution on AWS

AWS managed services currently utilized are:

- Amazon EKS – Fully hosted scalable Kubernetes control plane
- Amazon RDS – Postgres engine for OTA payload and status database
- Amazon MQ – Messaging broker service
- Amazon Elasticsearch – Indexing of data for searching and logging with Kibana dashboard
- Amazon CloudFront – CDN (Content Delivery Network) service for distributing vehicle update packages to the edge

eSync containers run and scale automatically within the EKS cluster and interacts with the AWS services (ActiveMQ, RDS, ELK stack) preceding in a virtual private network. eSync uses the CloudFront CDN to ensure efficient package delivery to vehicles from the CDN edge nodes. Load balancer endpoints are available to the public network for interfacing with vehicles and eSync dashboard users.

By leveraging AWS, Excelfore is able to dynamically scale, test, and efficiently deploy software updates to vehicles around the globe, improving driver experiences and saving OEMs large service costs.

How to get started

The Excelfore eSync Agent SDK facilitates and accelerates the development of customized eSync Agents, to allow edge device integration into the eSync OTA pipeline.

The SDK provides a fully working OTA AWS data pipeline based on the eSync standard. Users provide their own computer (PC or Raspberry Pi) to host the eSync software, and their own edge device (typically an ECU, or an ECU development platform) with an Ethernet or CAN bus interface.

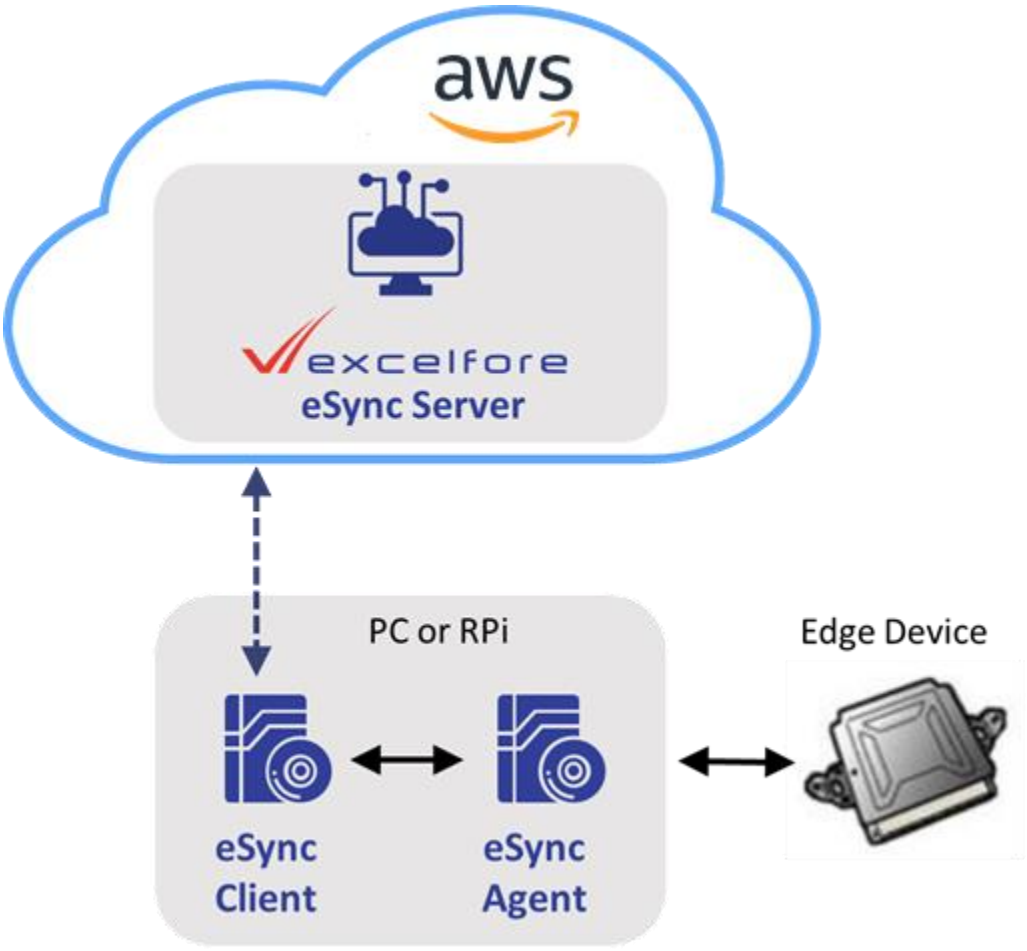


Figure 4: eSync Agent SDK

The eSync Agent SDK includes two software components for installation into a user's system, the eSync Client, which manages interaction with the eSync server as well as orchestrates the update and eSync Agent, which updates end devices. An authorized login to the eSync Server hosted on the Amazon Web Services cloud by Excelfore is also provided. Users will build and install an eSync Client, and use a template format to configure, build and install an eSync Agent for the user's edge device.

For more information on getting started with the eSync Agent SDK you can download the Product Brief here.

We invite you to discover more about the eSync Alliance by visiting the Alliance website.

Shrikant Acharya

Shrikant Acharya is CTO and co-founder of Excelfore, where he drives the company's technology roadmap & partnerships. He is a serial entrepreneur, and also serves on the board the eSync Alliance. In addition to his work in cloud-to-device communications he has been an early advocate for Ethernet AVB/TSN, achieving the first AVnu-certified AVB talker & listener stacks in 2017. He is a frequent speaker at industry technical conferences and forums. He holds over a dozen patents.

Luke Harvey

Luke Harvey is a Principal Partner Solution Architect at Amazon Web Services. He is responsible for AWS's global automotive partner strategy and enables partners to build, market, and sell their state-of-the-art solutions leveraging the cloud. He has over a decade of automotive leadership experience in autonomous and connected vehicle technology. When not building things on AWS, he spends time beekeeping with his family in Michigan.