SDV-Software Defined Vehicle Auto OTA Solution

Mike SU, Carota Project Manager

We Believe #SoftwareDefinedVehicles

Whole Car ECUs OTA | OTA Testing Equipment | Remote Diagnosis

VSOC Security | OTA Operation Subscription

©2023 Carota Corporation

Question:
How many Cars were Recalled a year in the US?

carota

carota

26.3 Million Vehicles

were Recalled in the US in 2022.

U.S. Market Vehicle Recall Data

FY22

Brand	Recalls	Units (Vehicles)
Ford	67	8,636,265
Volkswagen Group	45	1,040,885
Fiat-Chrysler/Stellantis	38	3,041,431
Mercedes-Benz	33	969,993
General Motors	32	3,371,302
Kia	24	1,458,962
Hyundai	22	1,452,101
Tesla	20	3,769,581
BMW	19	1,000,455
Nissan	15	1,568,385

1H23

Brand	Recalls	Units (Vehicles)
Ford	31	4,146,013
Fiat-Chrysler/Stellantis	26	1,736,164
Forest River, Inc.	18	5,062
BMW	18	154,717
Navistar, Inc.	17	222,487
Nissan	14	1,305,987
Mercedes-Benz	14	330,753
Jaguar Land Rover	13	74,884
Jayco, Inc.	13	7,803
Daimler Truck	13	237,864
Honda	11	2,859,621
Volkswagen Group	11	249,598

Ford Recalls 382K Explorers and Lincoln SUVs over Camera Issue

Ford Explorers, Hyundai SUVs and Subarus among nearly 400,000 vehicles recalled this week

Orlando Mayorquin
USA TODAY

Published 3:00 a.m. ET Jan. 30, 2023

More than 391,000 vehicles made by manufacturers including Ford, BMW and Hyundai were recently put under recall.

Manufacturers reported the recalls to the U.S. National Highway Traffic Safety Administration last week.

If you want to find out more about auto recalls, or see whether your vehicle is being recalled, you can search USA TODAY's automotive recall database or the NHTSA database, where you will need your car's vehicle identification number (VIN), or its year, make and model. You may also contact your vehicle's manufacturer for more recall information.

Here are the latest cars, trucks and SUVs to come under recall.

Ford recalls over 382,000 Explorers and Lincoln SUVs over camera issue

Ford is recalling 382,759 of its Explorer and Lincoln Aviator and Corsair SUVs because a faulty processor inthe back-up camera system causes the video monitor to go blue. Only models with the 360-degree camera are affected, Ford said. Vehicles with the rear view-only camera are not under recall.

Vehicles recalled:

- Ford Explorer (2020-2023): 279,700 vehicles recalled
- Lincoln Aviator (2020-2023): 72,699 vehicles recalled
- Lincoln Corsair (2020-2022): 30,360 vehicles recalled

Ford said it would notify owners between Feb. 20 and Feb. 24. Owners can take their vehicle to a Ford dealership where a free software update that should fix the issue will be performed for free.

BMW EVs Recalled Because They Aren't Loud Enough

BMW EVs recalled because they aren't loud enough

Two BMW electric vehicle models are under recall because they sometimes fail to generate the artificial sound required by the NHTSA to make them more detectable by pedestrians in close proximity.

Over 3,400 vehicles are affected:

- BMW i4 eDrive40, 2022-2023: 1,988 vehicles recalled
- BMW iX xDrive50, 2022-2023: 1,443 vehicles recalled

An external artificial sound generator control unit may fail upon the vehicle's startup, the German automaker told the NHTSA last week.

BMW said it would notify owners on March 17. They can take their cars to an authorized dealer for a free software update on the defective unit.

Reference Source: https://www.usatoday.com/story/money/cars/2023/01/30/ford-hyundai-bmw-kia-subaru-recall/11146063002/

Tesla Recalls 362K Vehicles Over Intersection Safety Concerns

CAROTA

Tesla recalls 362,000 vehicles with self-driving software over intersection safety concerns

Jordan Mendoza
USA TODAY

Published 2:13 p.m. ET Feb. 16, 2023 | Updated 6:52 p.m. ET Feb. 16, 2023

Tesla is issuing a software upgrade to over 362,000 versions of its Model S, Model X, Model 3 and Model Y vehicles because those with its full self-driving beta software may be "unsafe around intersections," according to a National Highway Traffic Safety Administration report.

Tesla said vehicles with the full self-driving beta software or pending installation may allow it to exceed speed limits or travel through intersections in an "unlawful or unpredictable manner," increasing the risk of a crash.

Examples of what vehicles could do include traveling straight through an intersection while in a turn-only lane, entering an intersection with a stop sign without coming to a complete stop or going through an intersection during a steady yellow traffic signal without caution.

Which Tesla vehicles are recalled?

At least 362,758 vehicles equipped with full self-driving beta software or pending installation are affected by the recall. The vehicles included in the recall are:

- 2016-2023 Tesla Model S
- 2016-2023 Tesla Model X
- 2017-2023 Tesla Model 3
- 2020-2023 Tesla Model Y

The NHTSA said Tesla administered the recall voluntarily "out of an abundance of caution." The company is not aware of any injuries or death related to the affected issue.

Nissan: Nissan recalls 405,000 older Titan, Frontier, Pathfinder and other models over airbag issue

Subaru: Subaru recalls select 2023 Solterras for issue that could cause wheels to fall off the cars

What do I do if my Tesla vehicle is part of the recall?

Tesla will be notifying affected owner by mail by April 15. The company will release an over-the-air software update, free of charge, meaning it will be done remotely and vehicles do not need to be taken to dealers.

Fact:
Half of Recalls are
Software-Related Failures.

Half of Recalls are Software-Related Failures

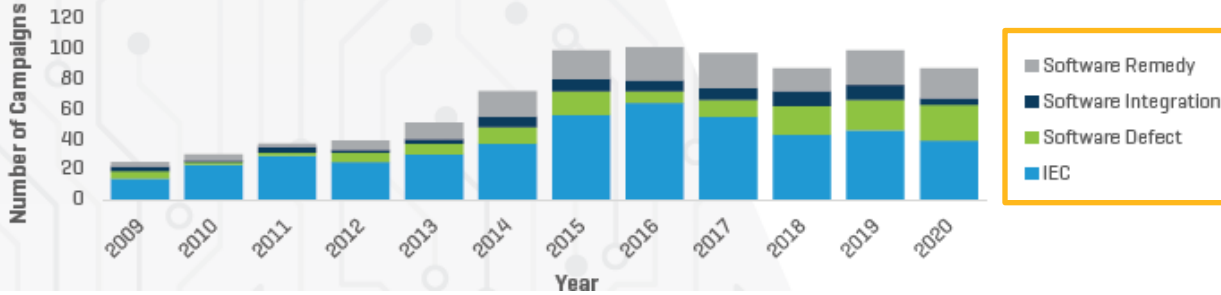**FIGURE 15 / RECALL CAMPAIGNS BY ELECTRONIC COMPONENTS AND YEAR**

Legend: Software Remedy, Software Integration, Software Defect, IEC

FIGURE 16 / PERCENTAGE OF RECALL CAMPAIGNS BY ELECTRONIC COMPONENTS AND YEAR

Legend: Software Remedy, Software Integration, Software Defect, IEC
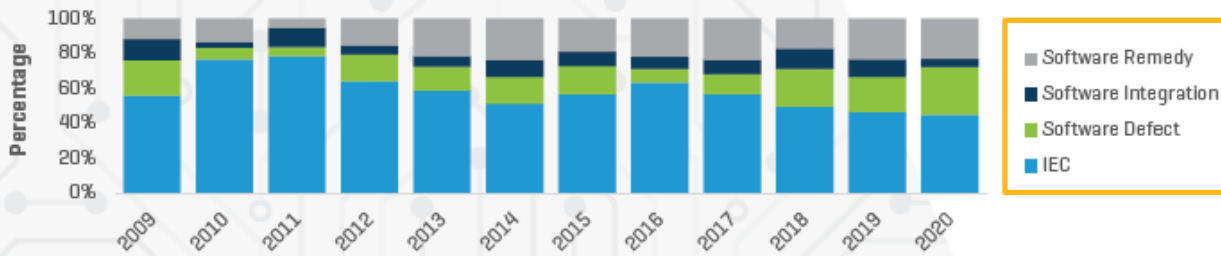
FIGURE 17 / VEHICLES AFFECTED BY ELECTRONIC COMPONENTS AND YEAR

Legend: Software Remedy, Software Integration, Software Defect, IEC
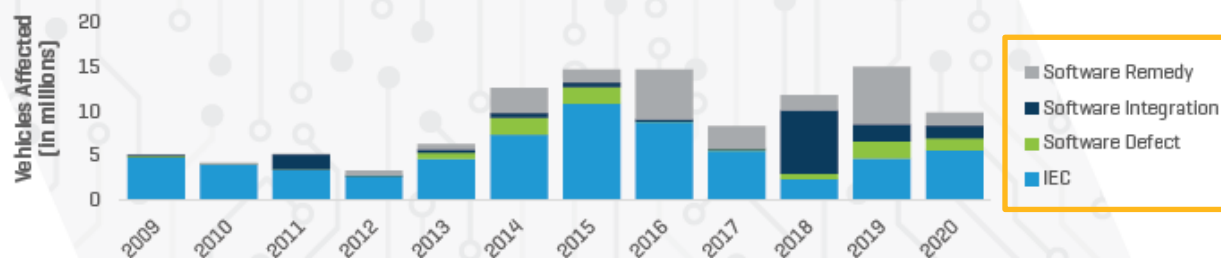
OTA REMEDY	COMPLETION RATE	REMEDY REQUIREMENT
20V-191	95.4% completion in Q3	Requires owner to select Update Now when prompted on radio display
20V-440	79.2% completion in Q2	Must be connected to a Wi-Fi network, requires navigation through menu prompts to identify software update and installation
20V-461	84.7% completion in Q2	Owner required to accepted applicable terms and conditions, vehicle not operable during installation
20V-489	85.1% completion in Q1	Owner required to accepted applicable terms and conditions, vehicle not operable during installation
20V-609	99.8% completion in Q2	Update included in firmware releases with push notifications provided to the vehicle and mobile app; owners can initiate updates from mobile app.

at a Glance

We provide the global one-stop OTA (Over-The-Air) Upgrade, and Remote Diagnostic total solutions.

Founded in 2011, starting from software and firmware OTA-centered, Carota gradually expands into spectrum of OTA operation subscription, remote diagnostic, OTA testing products and services, as well as video telematics.

Our commitment is to provide safe, stable, reliable and scalable OTA upgrade and fleet management solutions to OEMs, fleet owner and IoT smart devices manufacturers.

Sunnyvale
Los Angeles
Munich
Wuhu
Liuzhou
Shanghai
Taipei, Kaohsiung
Shenzhen

Uptane   CMMi level 3   ISO 27001   ASPICE 2
UNECE   ISO 26262 Road vehicles – Functional Safety   ISO/SAE 21434 Road vehicles – Cybersecurity Engineering

2011
Founded

300 MM
Devices updated with OTA

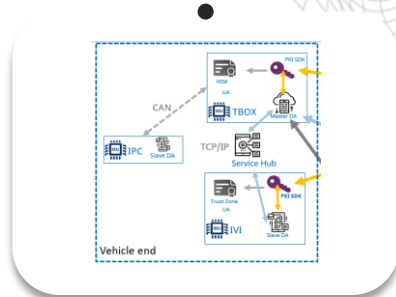**20+**
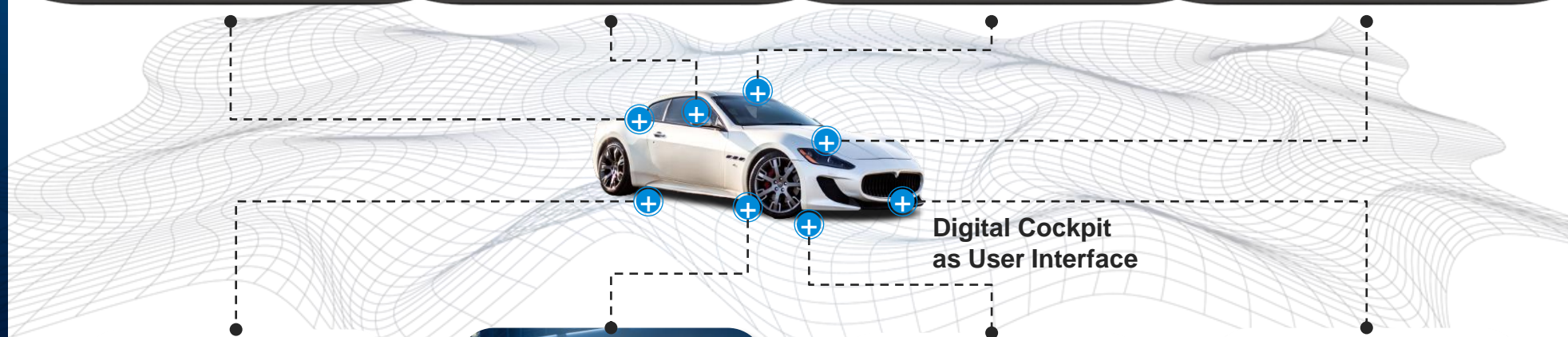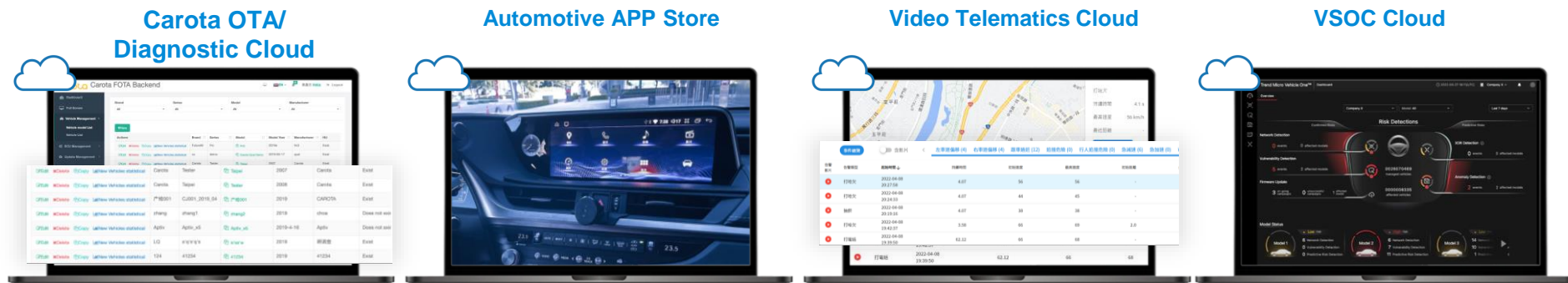Operating countries

300+
Clients

Carota Cloud Operations Center

Connected Operations Cloud

Enrich the digital cockpit experience with Cross ECU Management Capabilities: OTA, Diagnostic, Subscription, and Video Telematics services.

Connected ECU/Devices

Carota OTA/ Diagnostic Cloud

Automotive APP Store

Video Telematics Cloud

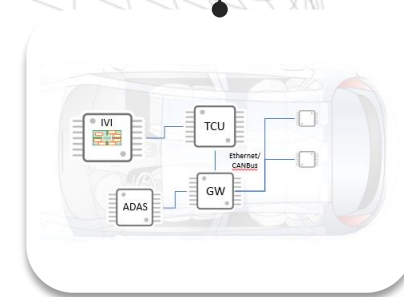**VSOC Cloud**

Digital Cockpit as User Interface

Agents on ECUs MDA/ SDA Framework

Car End License Management Agent

Edge box to integrate all data points

VSOC Agent

Carota Joins NXP® Semiconductors' Partner Program

In response to the growing demand for in-car systems from connected vehicles, Carota's OTA technology extensively supports NXP's existing **i.MX 6, i.MX 8, and S32G processors**.

Integrating with NXP platforms, Carota's OTA creates a holistic connected vehicle solution for customers.
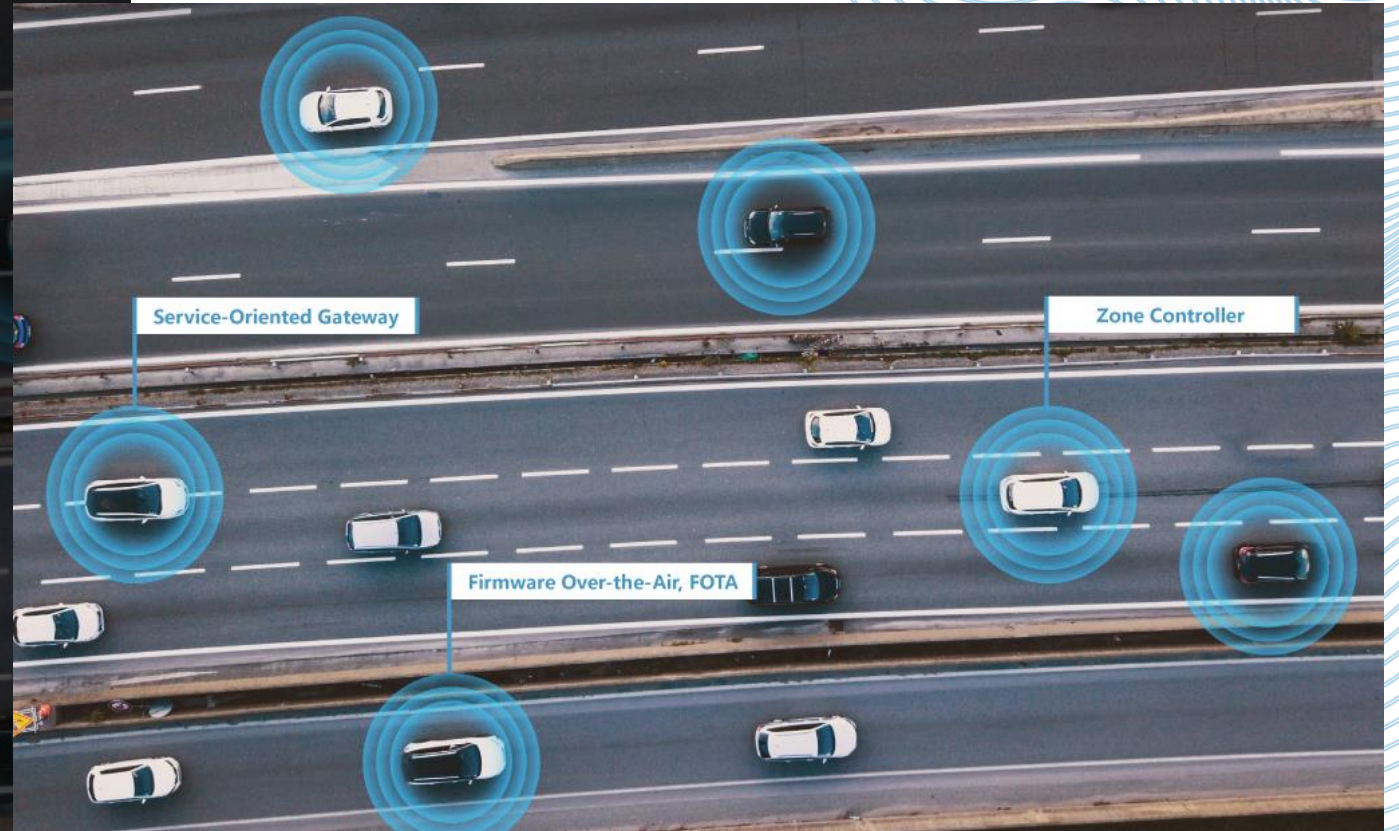
Empowering Connected Vehicles with Carota's OTA Technology

Carota's OTA solution has been verified to support NXP's automotive devices, meeting the automotive industry's demand for connected vehicles.
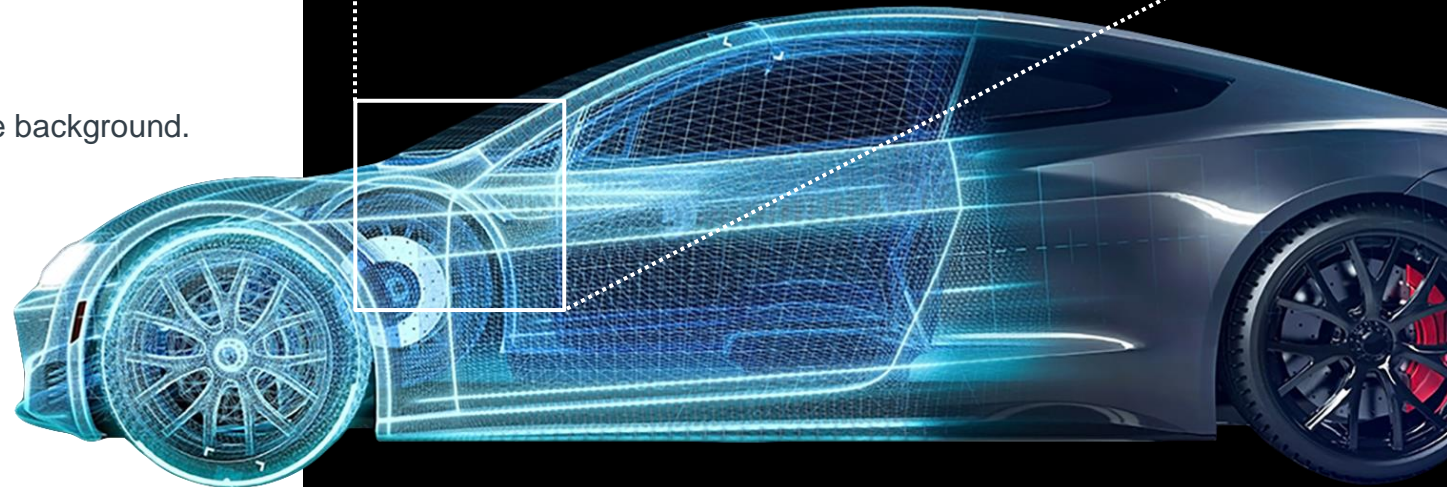
Firmware Over-The-Air (FOTA)
Update securely and seamlessly the vehicle ECU firmware in the background.

Zonal Controllers
Hub for power distribution and data connection to actuators and sensors within a physical area.

Service-Oriented Gateway
High-performance and real-time processing, networking and bandwidth for handling in-vehicle services.

Connectivity Domain Controller

Zone Controller		Zonal Controller
ADAS	Vehicle Computer	IVI
Zonal Controller	Network	Zonal Controller
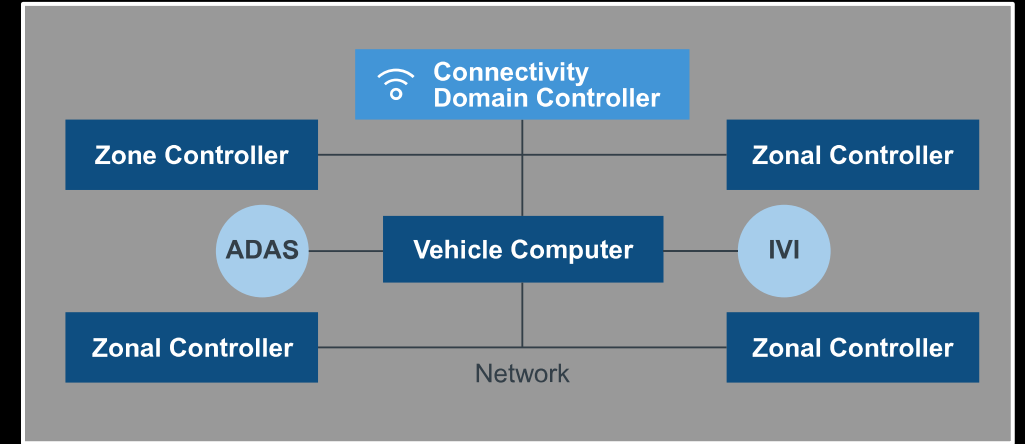
Whole Car ECUs OTA

Cross-ECU update system with industry-leading delta technology and sequence setting cloud service

Numerous ECUs in Car
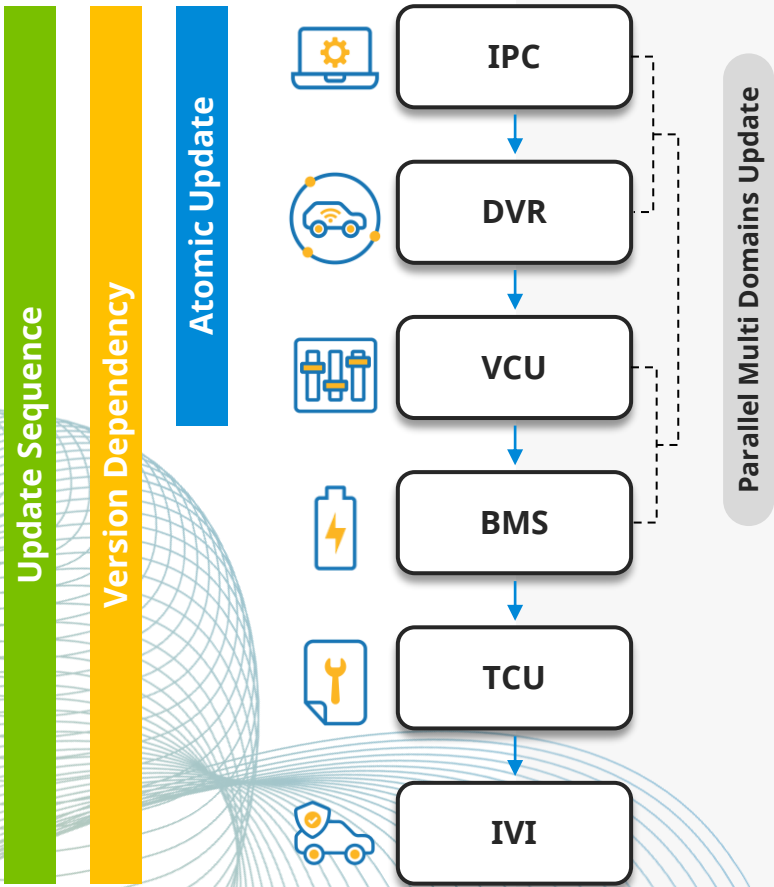

Source: flexautomotive.net

Multi-ECUs Update Strategies

Pre-conditions	Pre-action
Speed, Gear, Voltage...	Lock, Handbrake...

Update Sequence

Version Dependency

Atomic Update

Parallel Multi Domains Update

IPC

DVR

VCU

BMS

TCU

IVI

Supplier A: v1.1.2, v1.1.3, v2.1.0 → v3.0.0   Supplier B: v5.0, v6.1 → v7.6

Supplier C: any version → v1.8.0
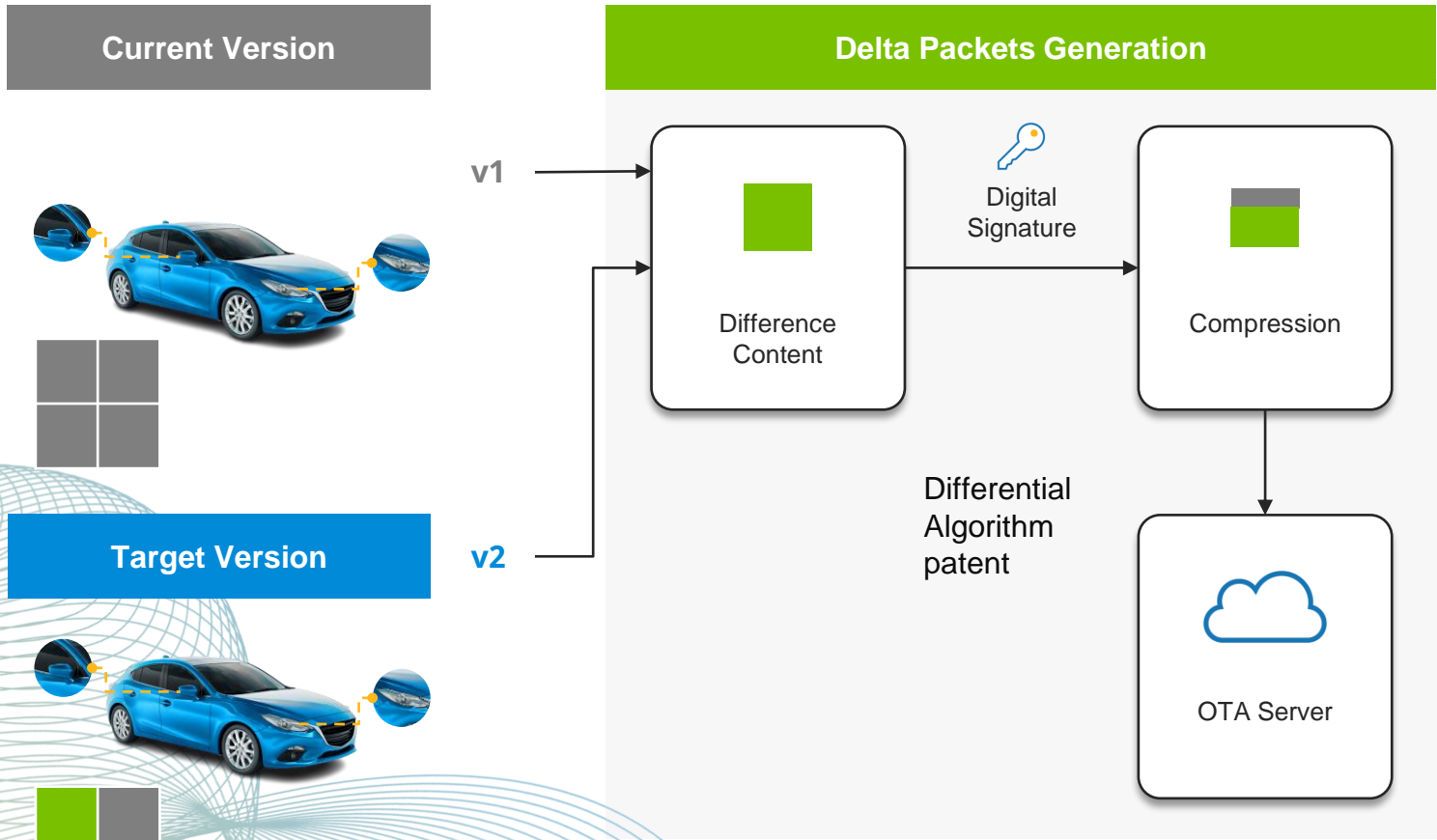
Supplier D: v1.0, v2.0, v3.1 → v4.2

Supplier E: any version → v2.2

Supplier F: v0.1, v1.1, v1.2, v1.3, v2.1, v2.5, v3.1 → v3.6   Supplier G:v1.0, v2.1 → v3.2

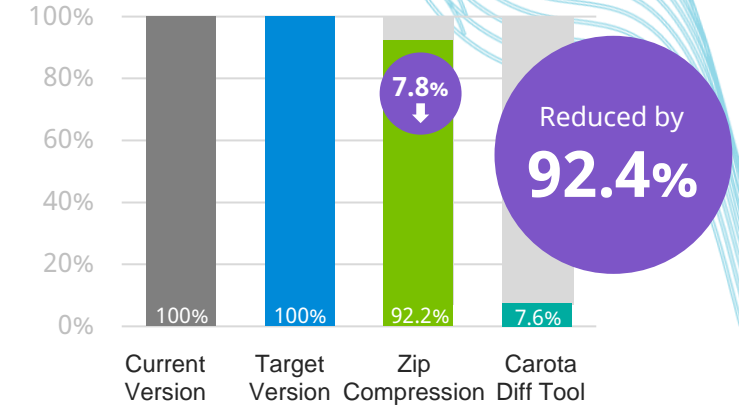Supplier H: v1.0.1, v2.1.1, v2.2.3, v3.1.0, v3.1.1 → v3.9.1

16

Patented Differential Algorithm

Firmware size compression with Carota Patented Delta Tools

Case 1: Vivotek camera firmware

Case 2: Lexus TCU TBox firmware

Current Version

v1

Target Version

v2

Delta Packets Generation

Difference Content

Digital Signature

Compression

Differential Algorithm patent

OTA Server

17
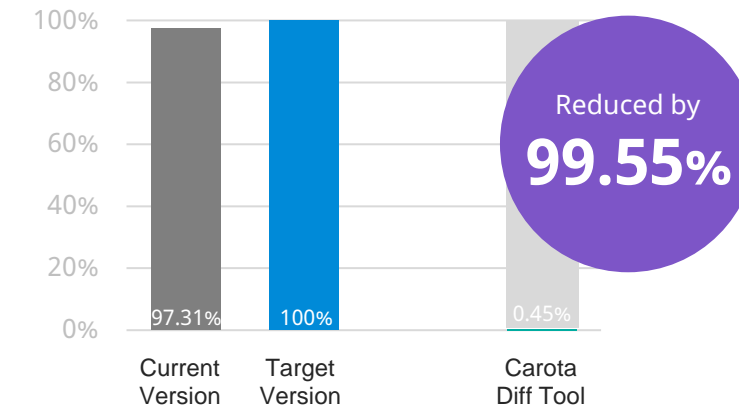
Carota Patented Delta Tool Test for V2

Project Name: V2 │ **Date: Jan 12, 2021**

Item	Name	Firmware size (bytes)	%	Gap %
Current Version	lnx_releas8.bin	78,481,804	23%	-77.4%
Target Version	lnx_release7.bin	347,562,948	100%	0.0%
Zip Compression	7.zip	90,468,734	26.0%	-74.0%
Carota Diff Tool	new_delta	41,379,173	11.9%	-88.1%
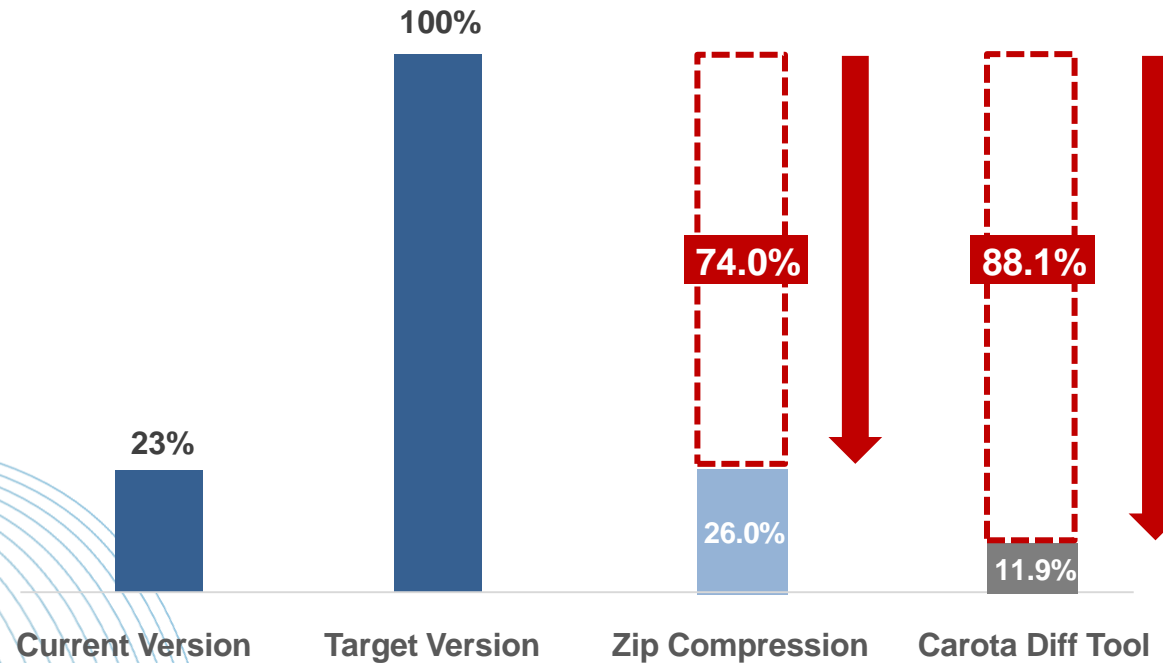
Carota Patented Delta Tool Test for DT

Item	Name	Firmware size (bytes)	%	Gap %
Current Version	DCU_01.tgz	1,294,558	99.99%	-0.01%
Target Version	DCU_02.tgz	1,294,725	100.00%	0.00%
Carota Diff Tool	new_delta	65,901	5.09%	-94.91%
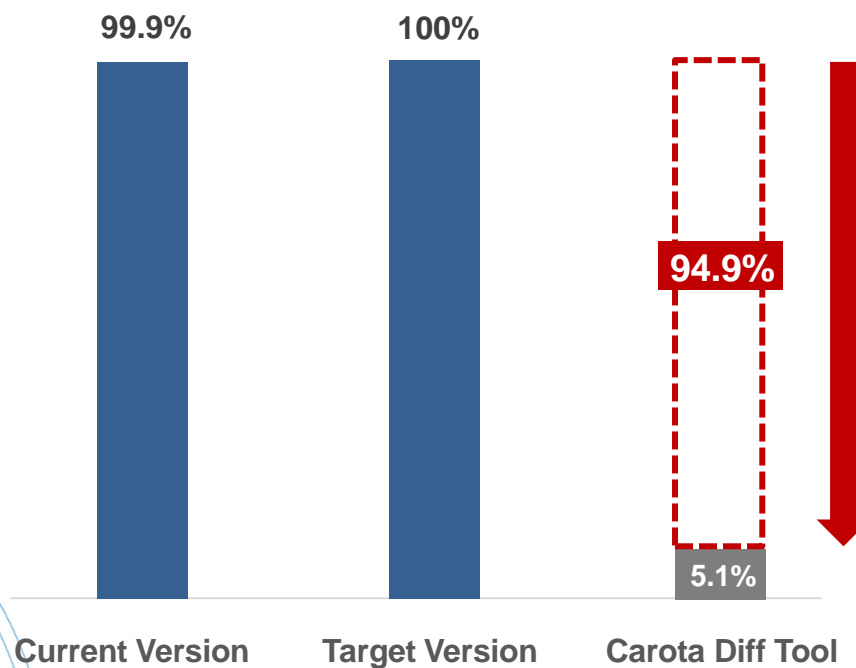
Carota Patented Delta Tool Test for FR

Project Name: FR | **Date: May 07, 2021** | **Large size file (Over 10GB)**

Item	Name	Firmware size (bytes)	%	Gap %
Current Version	FR_0.0.1.tar	10,607,222,272	98.58%	-1.42%
Target Version	FR_0.0.2.tar	10,759,918,080	100.00%	0.00%
Carota Diff Tool	new_delta	65,901	5.09%	-94.91%

98.9%   100%   87.3%   12.8%

Current Version   **Target Version**   **Carota Diff Tool**

OTA Architecture

Products	Software tool	Cloud Platform	Device Part	
	Delta Generator Software	**Carota OTA Server Platform**	**Download Agent Software**	**Update Agent Software**
Function	Compare current version and target version difference, make the incremental package	Web Interface, login to management device 、 update package file、 create update task and update result statistic	Connect to Carota OTA Server to check the OTA task and download the update package file	Patch the delta file to current version to generator the target update file and update the system
Format	Software tool (run on PC or Cloud)	Cloud Platform (can use Carota cloud or deploy to Client assign cloud)	Application / Library	Application / Library

OTA Architecture (Smart Watch / Band / E-bike)

Products	Software tool	Cloud Platform	Device Part	
	Delta Generator Software	**Carota OTA Server Platform**	**Download Agent Software**	**Update Agent Software**
Function	Compare current version and target version difference, make the incremental package	Web Interface, login to management device 、 update package file、 create update task and update result statistic	Connect to Carota OTA Server to check the OTA task and download the update package file	update the system and report the update result
Format	Software tool (run on PC or Cloud)	Cloud Platform (can use Carota cloud or deploy to Client assign cloud)	Android / iOS Library or API Doc.	Application / Library

OTA System Architecture
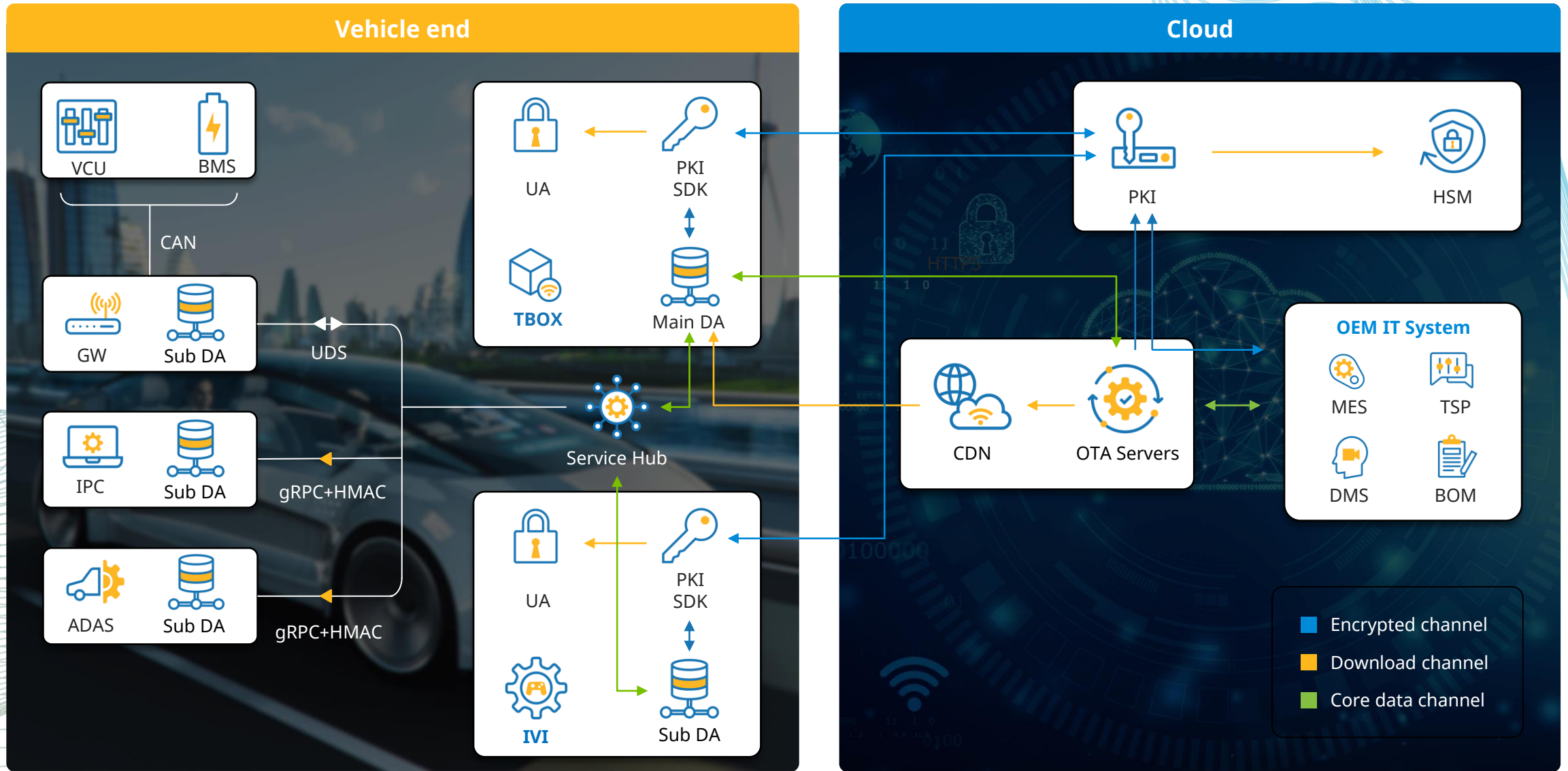
Carota Generic FOTA Backend Fleet Analytics and Statistics

Fleet Management and Analytics
Vehicle Status Log

Schedules name	USID	VIN	action	Receive time	Appointment setup information	Source
HIL-GP01-T2	63fe1dad86b59c3de8bfc9f0	HILGP010000000001	PowerState = PWR_ON; GearState = PARKING; ChargeState = CHG_OFF; Speed = 0; BatteryVoltage = 17000; BatteryPower = 85; Handbrake = HANDBRAKE_ON; PowerReady = READY_OFF; Diagnose = DIAGNOSE_OFF; TelDiagnose = TEL_DIAGNOSE_READ; VehicleMode = NORMAL	2023-02-28 23:29:26	PowerState = PWR_ON; GearState = PARKING; ChargeState = CHG_OFF; Speed = 0; BatteryVoltage = 17000; BatteryPower = 85; Handbrake = HANDBRAKE_ON; PowerReady = READY_OFF; Diagnose = DIAGNOSE_OFF; TelDiagnose = TEL_DIAGNOSE_READ; VehicleMode = NORMAL	vehicle
HIL-GP01-T2	63fe1dad86b59c3de8bfc9f0	HILGP010000000001	PowerState = PWR_ON; GearState = PARKING; ChargeState = CHG_OFF; Speed = 0; BatteryVoltage = 17000; BatteryPower = 85; Handbrake = HANDBRAKE_ON; PowerReady = READY_OFF; Diagnose = DIAGNOSE_OFF; TelDiagnose = TEL_DIAGNOSE_READ; VehicleMode = NORMAL	2023-02-28 23:29:23	PowerState = PWR_ON; GearState = PARKING; ChargeState = CHG_OFF; Speed = 0; BatteryVoltage = 17000; BatteryPower = 85; Handbrake = HANDBRAKE_ON; PowerReady = READY_OFF; Diagnose = DIAGNOSE_OFF; TelDiagnose = TEL_DIAGNOSE_READ; VehicleMode = NORMAL	vehicle

Fleet Management and Analytics
Vehicle Update History

| Usid	License Number	Vin	Last Schedule	Last Update State	Last Update Time	History Schedules
62ecc155d4b04c6f0f065e48	XTT-0148	XTTDRV3UAT0000148	(5AANC)2.38 - > 2.37(delta)	Running	2022-08-05 15:05:59	Detail
62ecbe2ad4b04c6f0f06512d	XTT-0148	XTTDRV3UAT0000148	(5AANC)2.37 - > 2.38(delta)	Success	2022-08-05 15:05:38	Detail
62ecbf7ed4b04c6f0f0656ae	XTT-5142	XTTDRV3UAT0005142	(5AANC)side + mcu logo test	Success	2022-08-05 15:04:35	Detail
62ecc028d4b04c6f0f06597f	BFQ-5811	JTMY23FV80D056729	0727降DA0706、EB0707差分测试	Running	2022-08-05 15:01:40	Detail
62ecba80d4b04c6f0f0643ac	BFQ-5811	JTMY23FV80D056729	DA+EB差分升级测试 DA:0706，EB:0707升0727	Success	2022-08-05 15:00:30	Detail
62ecbfbed4b04c6f0f065801	BGM-7060	MR0BA3CD000120954	(SDC) 1.40 升级 1.41	Running	2022-08-05 14:59:10	Detail
62ecba66d4b04c6f0f064347	XTT-5142	XTTDRV3UAT0005142	(5AANC)side + mcu logo test	Success	2022-08-05 14:53:42	Detail
62ecbc2fd4b04c6f0f0649dc	XTT-0148	XTTDRV3UAT0000148	(5AANC)2.37 - > 2.38(delta)	Success	2022-08-05 14:52:29	Detail
62ecbde7d4b04c6f0f065057	BGM-7060	MR0BA3CD000120954	(SDC) 1.40 升级 1.41	Running	2022-08-05 14:51:19	Detail
62ecb967d4b04c6f0f063f67	XTT-0148	XTTDRV3UAT0000148	(5AANC)2.38 - > 2.37(delta)	Success	2022-08-05 14:43:58	Detail

Show 10 Items

Previous 1 2 3 4 5 ... 4114 Next

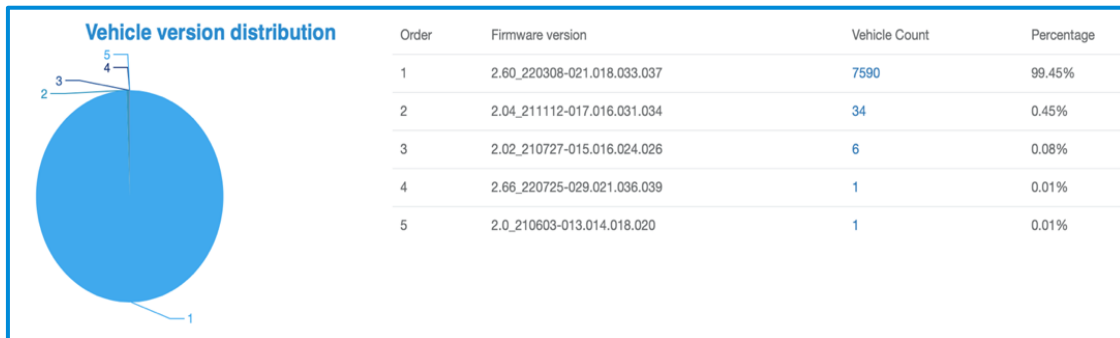# Carota Generic FOTA Backend Fleet Analytics and Statistics
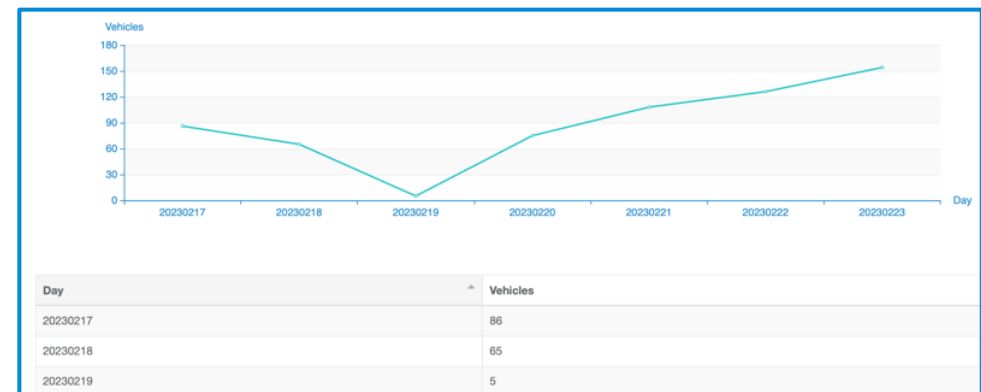
Fleet Management and Analytics
Campaign Progress

Fleet Management and Analytics
Campaign Status
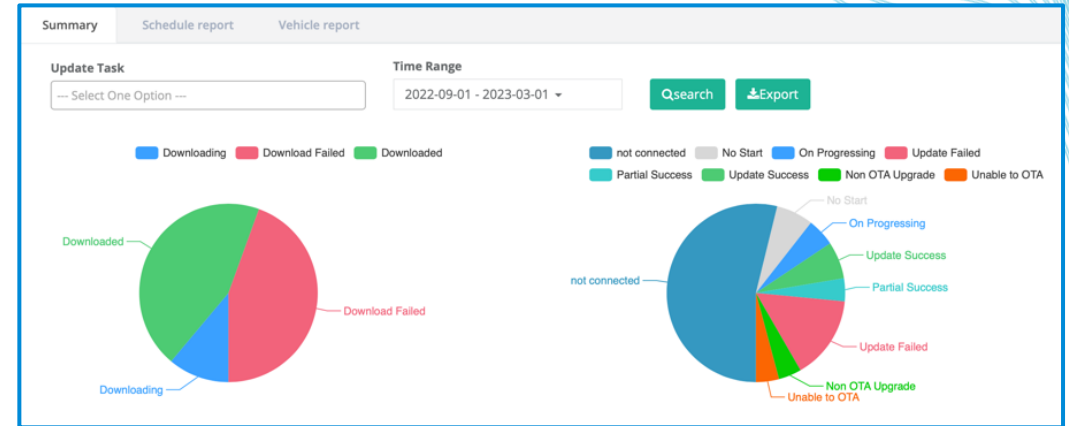
Fleet Management and Analytics
Version Distribution

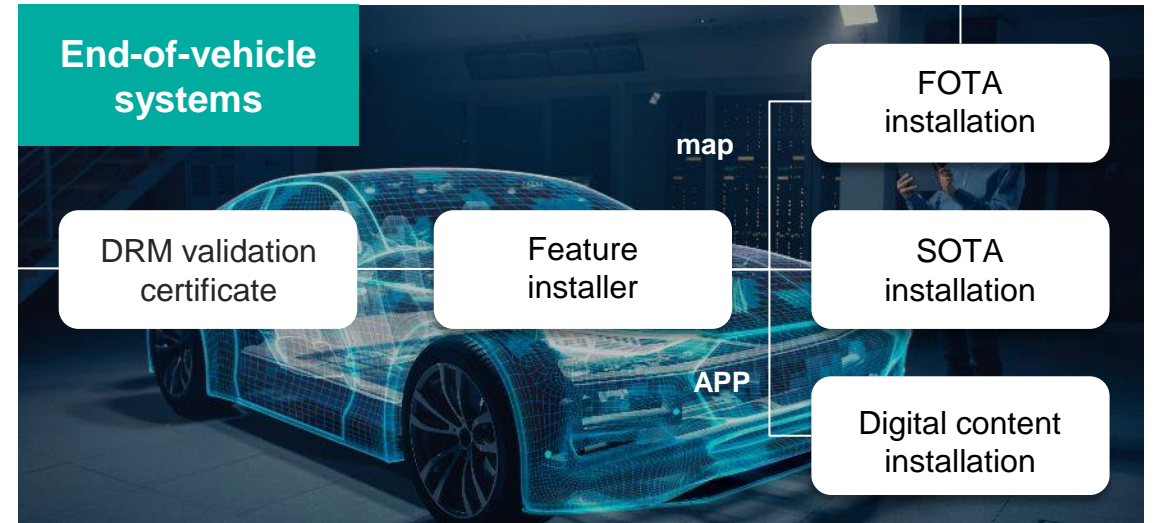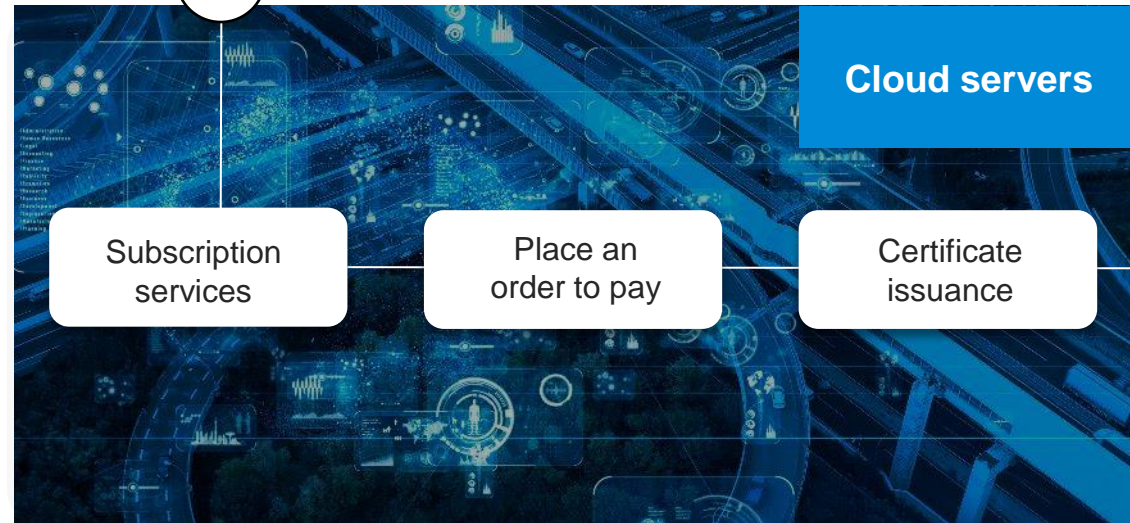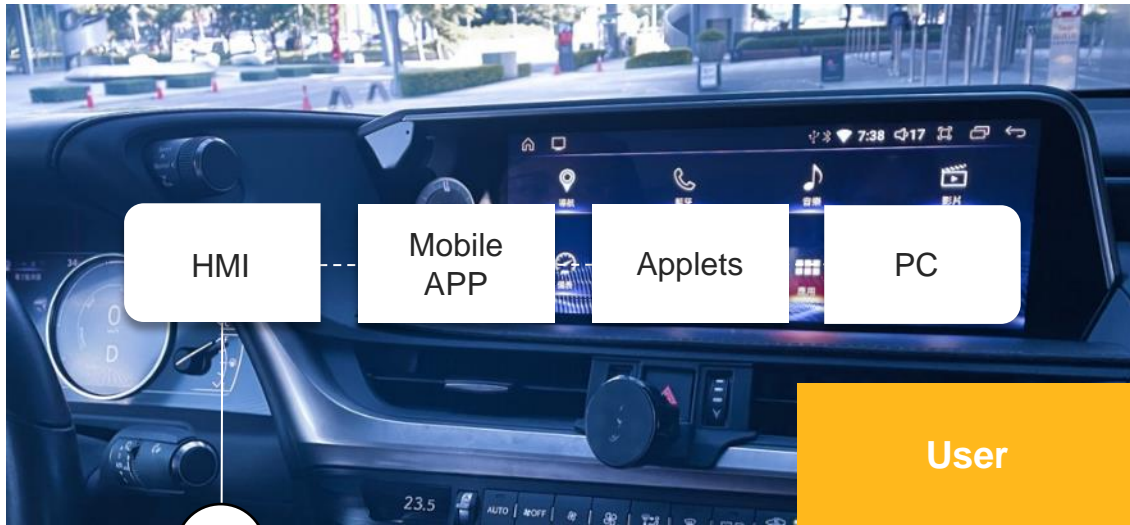Fleet Management and Analytics
New Vehicle Onboarding

On-Demand Service
Marketplace

Subscription - Implementation Plan

User

| HMI | Mobile APP | Applets | PC |

Vehicle

Use the feature

Cloud servers

| Subscription services | Place an order to pay | Certificate issuance |

End-of-vehicle systems

DRM validation certificate	Feature installer	FOTA installation
		SOTA installation
		Digital content installation

map

APP

Coming up Next

OTA Testing Platform and Equipment

Test Coverage

Testing Platform System

In-Depth Compliant Testing System for OTA function testing,

stress testing, security testing, etc.

Coverage

01 Function Test

Functional testing covering requirements, carrying out end-to-end functional compliance testing, packaging and differentiation of upgrade packages, testing packages, generating tasks, and then simulating upgrades.

02 Stress Test

Cloud parallel test, multi-vehicle terminal request, upgrade task download, through simulation tool; single-point and multi-point cycle test (durability) compatibility and stability, backup disaster tolerance, etc.; vehicle-end main process stress test, multi-ECU combination stress test.

03 Information Security Test

Simulate hacker attack test, check the upgrade service platform security, communication channel security, upgrade package signature, upgrade package encryption, vehicle identity authentication, and vehicle-end upgrade security.

04 Performance Test

For refreshing large data volume performance tests, upgrading execution efficiency, improving user experience, system stability, response time, compression ratio, storage space and other tests.

Helping users understand the health status and performance limits of the system, find and locate performance bottlenecks. Provide technical support for the stable operation of the system.

05 Sanity Test

Build and simulate different scenarios for testing to verify the integrity of the OTA system, such as network delays, interruptions, bus exceptions, errors, data loss, etc., to verify the correctness and effectiveness, improve the stability of system operation, and reduce the impact of abnormalities in the system.

OTA function test

1 Test platform to create functional test tasks

2 OTA task of OTA cloud management platform configuration test

3 The test tool executes the test of the OTA function according to the test script

4 Feedback test results to the test platform

5 Generate a test report after the test is completed
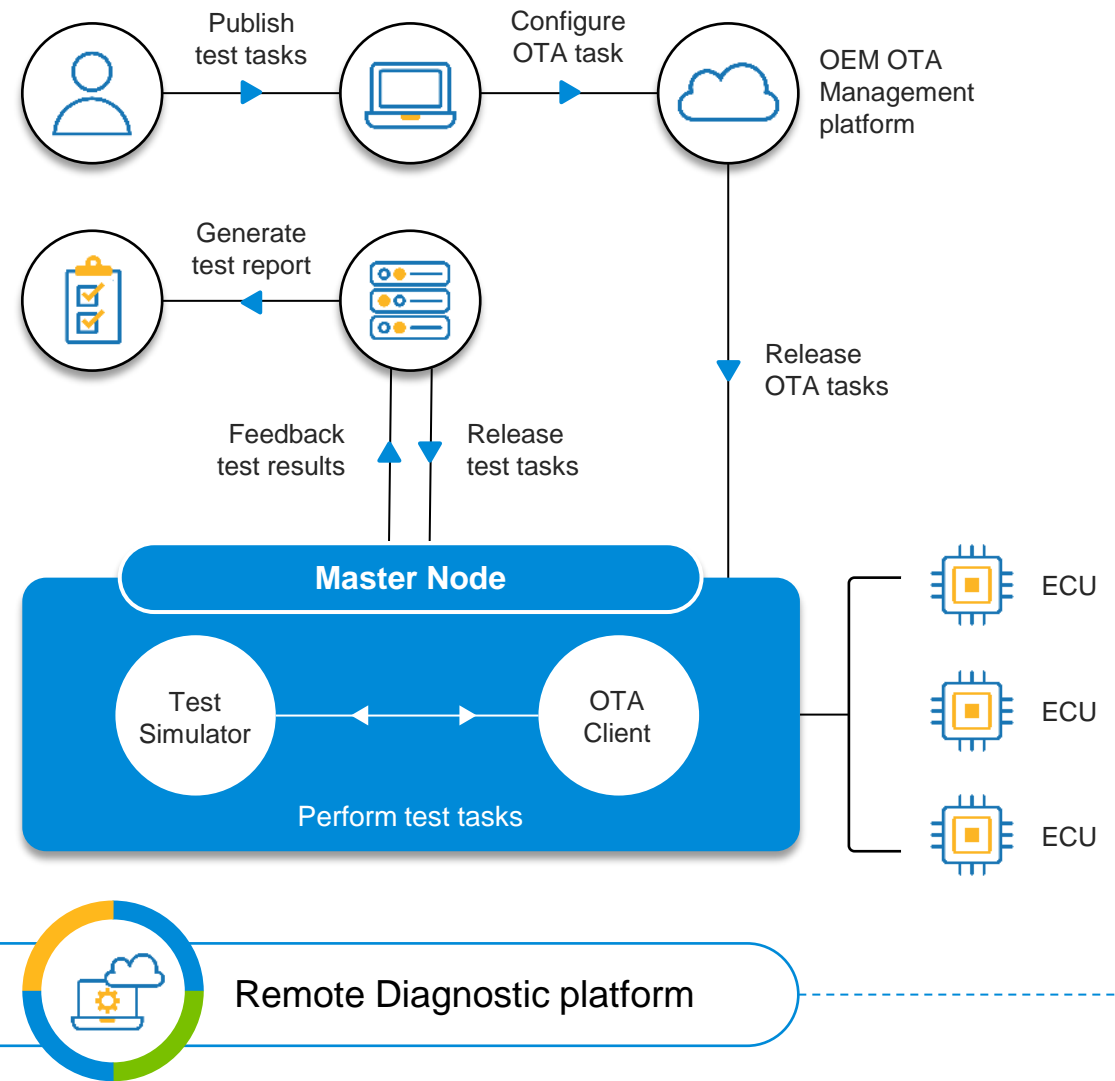
Remote Diagnosis

ECU monitoring system
Digital cockpit fault detection

Diagnostic with OTA
A fast and efficient repair tool for ECUs

Solve malfunctions and reduce maintenance costs with ECU software upgrades. With OTA technology, the Carota Cloud Diagnosis platform seamlessly deliver fixed ECU software and online updates to the vehicles.

Remote Diagnostic platform

→ Detect ECU Issue →

OEM

→ Test Report →

OTA Platform

→ OTA Update →

ECU Issue report   Failure snapshot

→

Supplier

→

New firmware
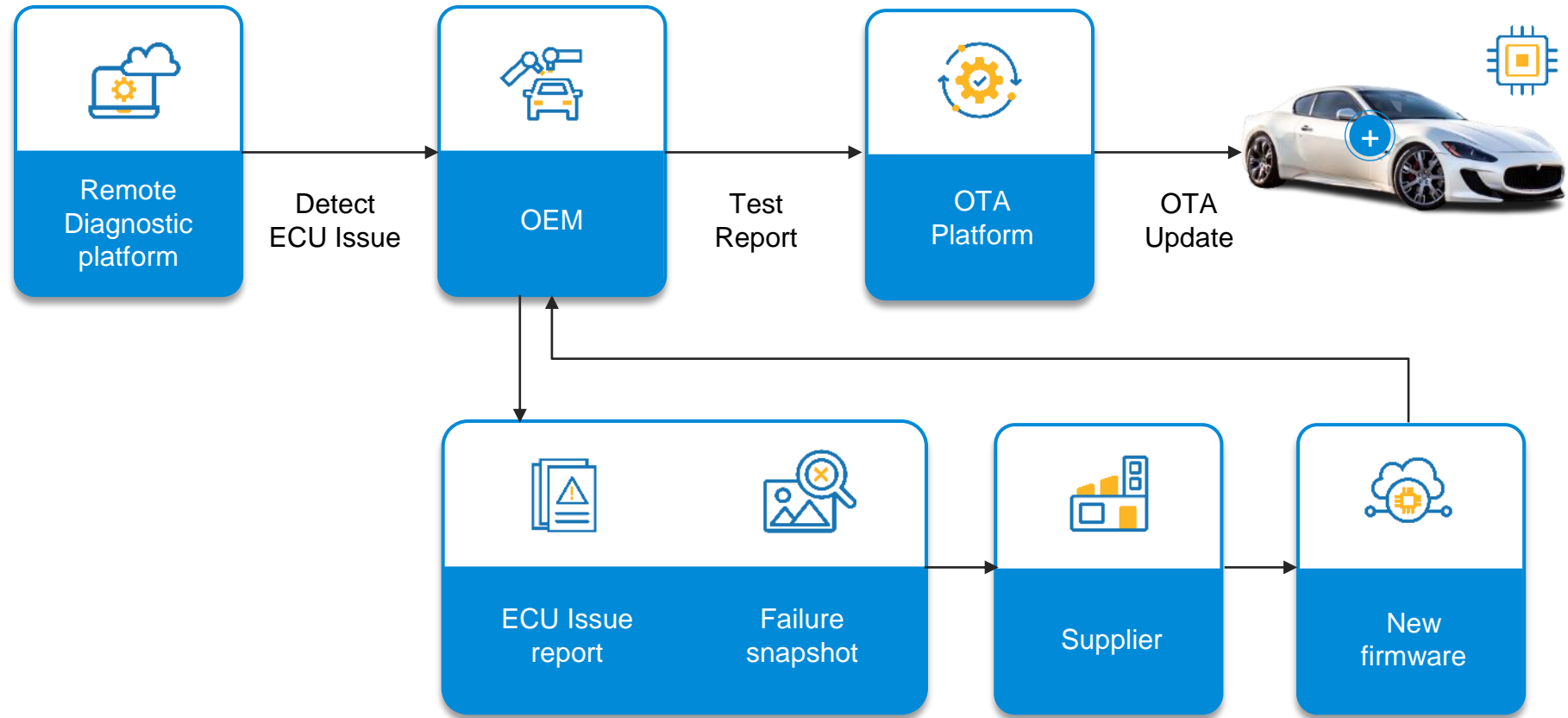
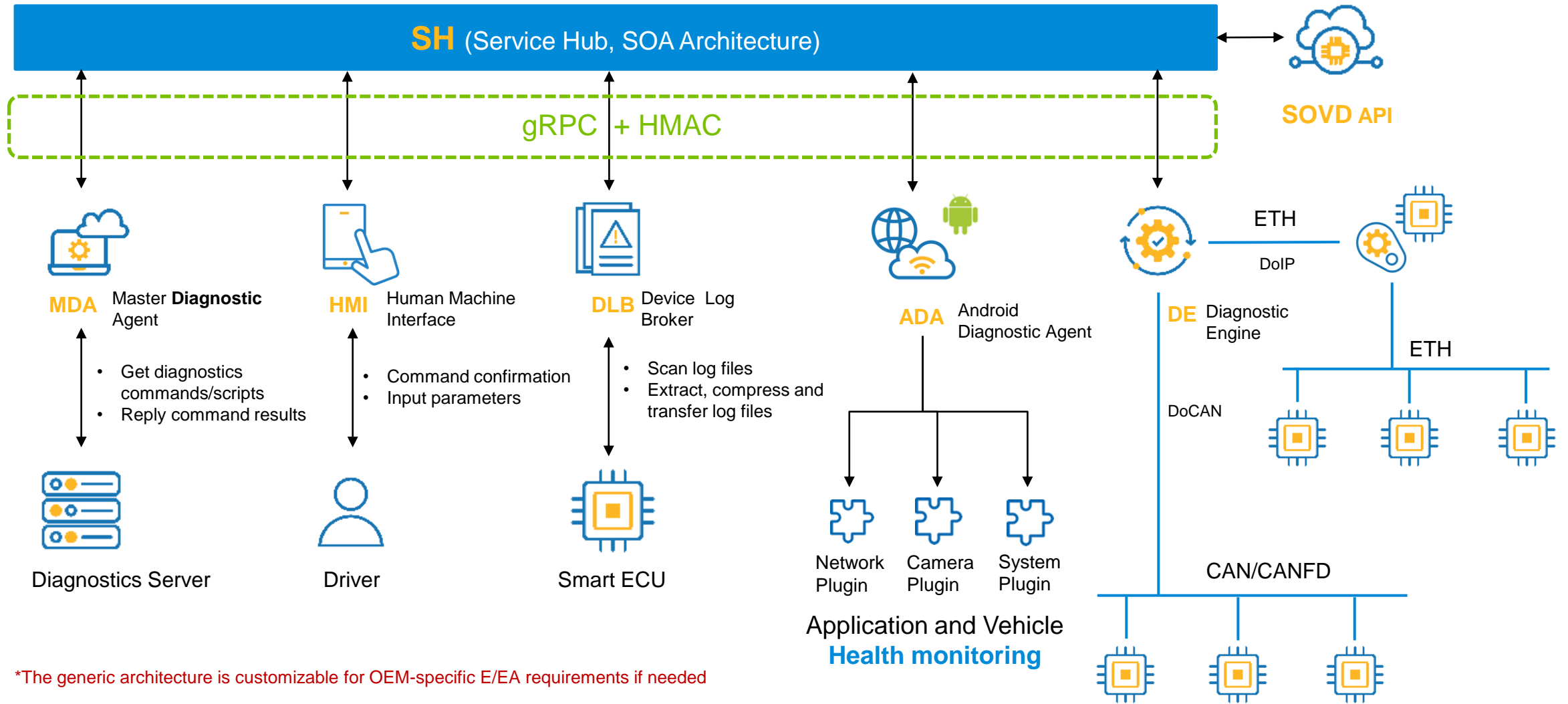# Carota Generic Remote Diagnostics Architecture

One API for All Use Cases

SH (Service Hub, SOA Architecture)

gRPC + HMAC

SOVD API

ETH
DoIP

MDA Master **Diagnostic** Agent

HMI Human Machine Interface

DLB Device Log Broker

ADA Android Diagnostic Agent

DE Diagnostic Engine

ETH

- Get diagnostics commands/scripts
- Reply command results

- Command confirmation
- Input parameters

- Scan log files
- Extract, compress and transfer log files

DoCAN

Diagnostics Server

Driver

Smart ECU

Network Plugin

Camera Plugin

System Plugin

CAN/CANFD

Application and Vehicle **Health monitoring**

*The generic architecture is customizable for OEM-specific E/EA requirements if needed

33

We Believe Software Defined Vehicles

Thank you for your attention.

Stay connected with us on

or, Contact sales@carota.ai to learn more.