To face the industry paradigm shift …

The Advent of "CASE/ACES"

The software content of modern **Autonomous, Connected, Electrified and Shared vehicles** grows exponentially, making feature-rich & high-performance operating systems necessary.

New E/E in-vehicle architectures

OEMs are moving towards a centralized E/E architecture with **only a few powerful central computers** supplemented by **re-usable and rapidly integrated software components** that are driving standardization of the underlying platform.

## New OS, middleware & cloud technologies

Virtualization and containerization are getting common within todays' OS. With the success of open source, **Linux** is getting traction in the Automotive Industry.

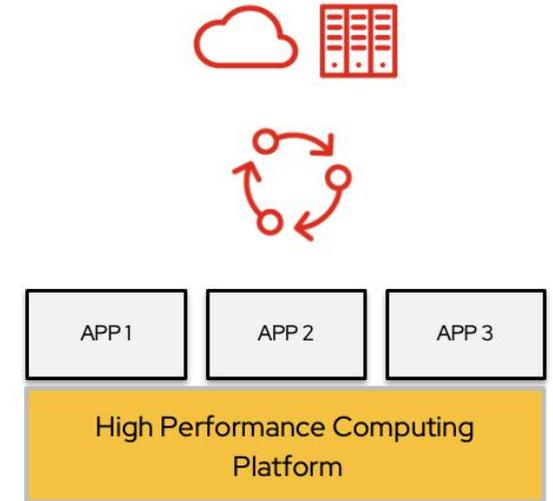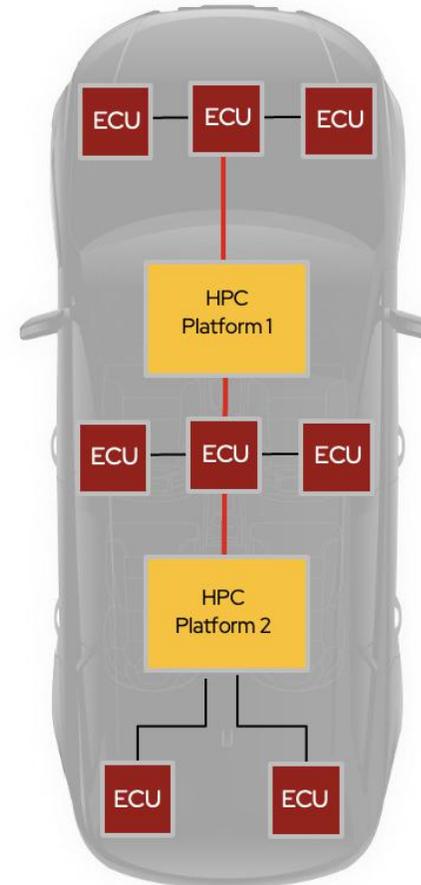## New tech players vs established OEMs

Nowadays, established OEMs are trying to **significantly expand the capabilities of their own vehicle software development**, following the example of new software-driven players like *Tesla*.

From Hardware Centric to Software-Defined & Cloud-Native
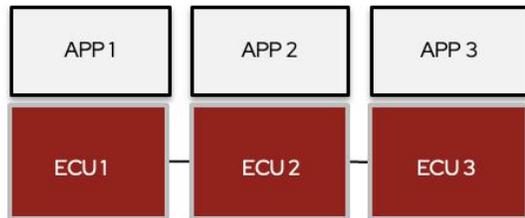
Vertically integrated siloes
Low speed networks
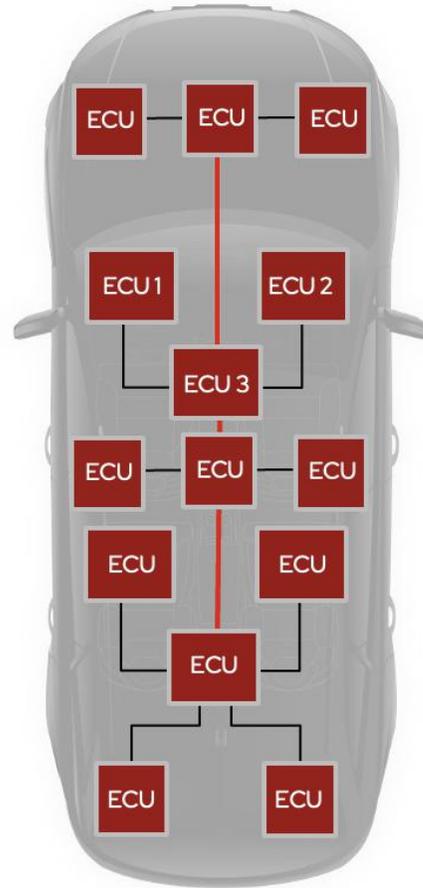
Horizontally scalable platform
High speed interconnects

...open source and open architectures are recommended

GOTC

From **vertically integrated** dedicated point solutions...

Dedicated point solutions

...to continuous **open source & interoperable** innovation.

Continuous open source innovation

#1 Enterprise Linux Distribution
75%

#1 Enterprise Container Platform
48%

#1 Cloud Automation Software
41%

#2 Private Cloud Stack
35%

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OPEN SDV

Red Hat

Automotive Value Chain

Strategy and business development

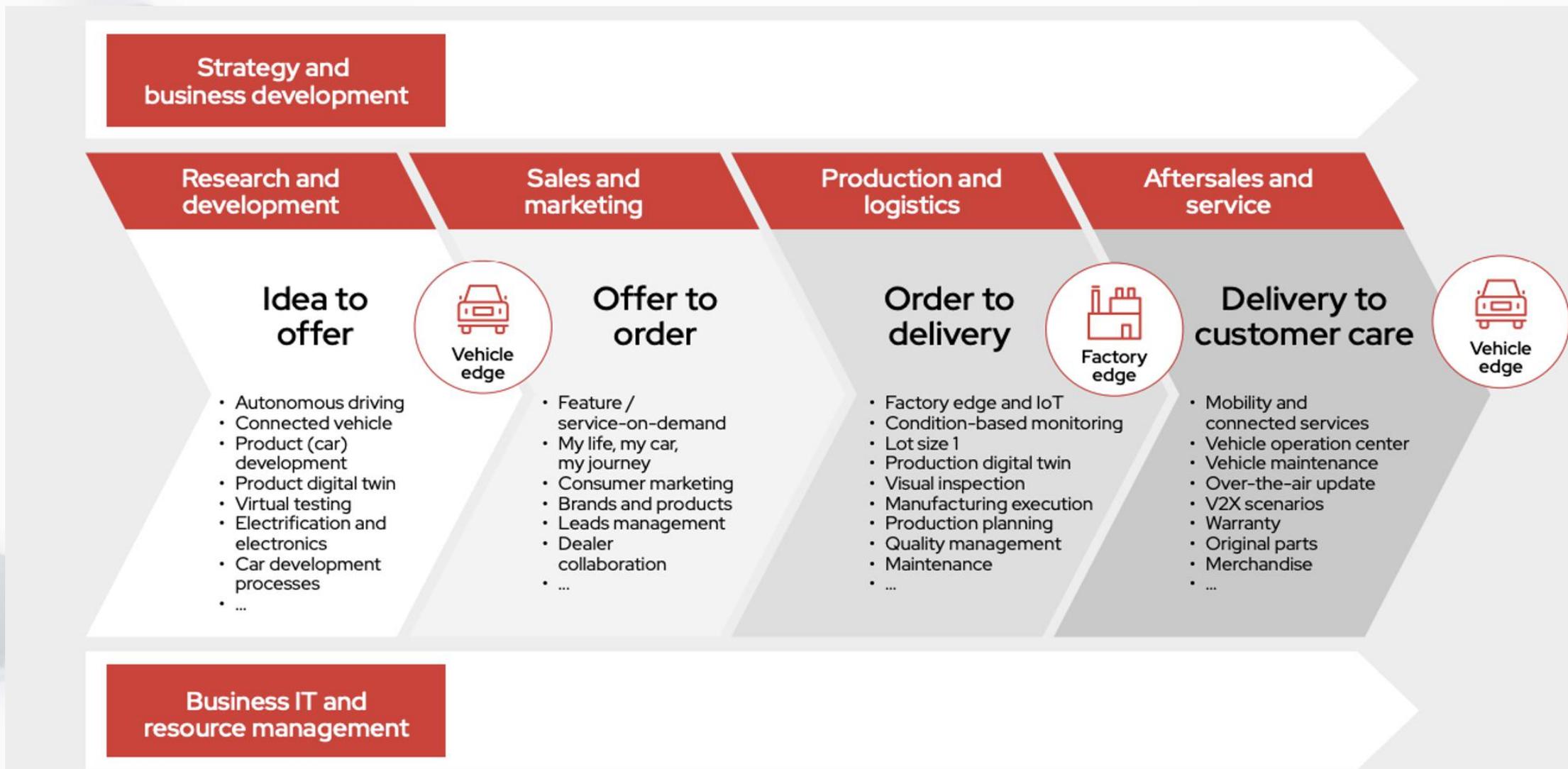| Research and development	Sales and marketing	Production and logistics	Aftersales and service
Idea to offer	**Offer to order**	**Order to delivery**	**Delivery to customer care**
Vehicle edge		Factory edge	Vehicle edge
• Autonomous driving • Connected vehicle • Product (car) development • Product digital twin • Virtual testing • Electrification and electronics • Car development processes • …	• Feature / service-on-demand • My life, my car, my journey • Consumer marketing • Brands and products • Leads management • Dealer collaboration • …	• Factory edge and IoT • Condition-based monitoring • Lot size 1 • Production digital twin • Visual inspection • Manufacturing execution • Production planning • Quality management • Maintenance • …	• Mobility and connected services • Vehicle operation center • Vehicle maintenance • Over-the-air update • V2X scenarios • Warranty • Original parts • Merchandise • …

Business IT and resource management

Automotive Value Chain with Success Stories

Our focus edge use cases

Enterprise Edge
Extend cloud/data center approaches to new contexts / distributed locations / OT

- Enterprise, provider & operator edge
- Standardize distributed operations
- Modernize application environments (OT and IT)
- Modernize network infrastructure

Operations Edge
Leverage edge/AI/serverless to transform OT environments

- Automation/integration of monitoring & control processes
- Predictive analytics
- Production optimization
- Supply chain optimization

Provider Edge
Network and compute specifically to support remote/mobile use cases

- Aggregation, access and far edge
- Manages a network for others
  - Telecommunications Service Providers
  - Creates reliable, low latency networks

Product Edge (customer-facing)
Create new offerings or customer/ partner engagement models

- Vehicle edge (onboard & offboard)
  - In-vehicle OS
  - Autonomous driving, Infotainment up to ASIL-B
  - Quality management
  - V2x

Enterprise Edge
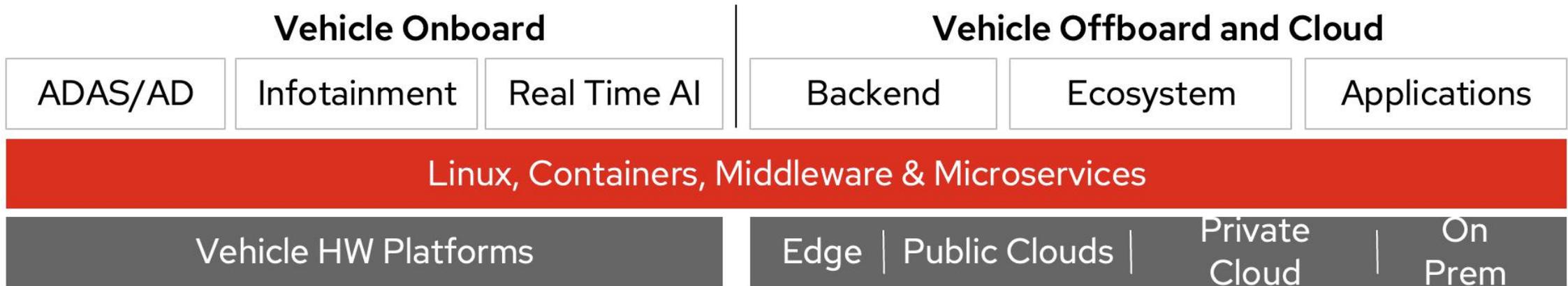Factory Edge
Provider Edge
Vehicle Edge

Red Hat

We start with the customer-centric Connected Car Vision

GOTC

*"An **enterprise-hardened open source layer** to run workloads spanning from offboard to onboard, by using a **light container management solution on a CarOS**."*

Vehicle Onboard			**Vehicle Offboard and Cloud**		
ADAS/AD	Infotainment	Real Time AI	Backend	Ecosystem	Applications

Linux, Containers, Middleware & Microservices

Vehicle HW Platforms		Edge	Public Clouds	Private Cloud	On Prem

BUILD ONCE. DEPLOY ANYWHERE.

onboard or cloud related application enables **new kind of services** and their **scalability** across any **workload** – any **footprint** – any **location** - any **provider.**

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What we bring to Automotive

Technology

Security, stability, reliability

160+ invested resources in Automotive

1.300+ SW engineers working on Linux

Decades of experience supporting mission critical applications

Assurance

Enterprise-grade certainty

Experienced in certifications like **Common Criteria** (ISO/IEC 15408)

Information Security (ISO 27001)

Partnership with **Exida** and ELISA chair **for functional safety**
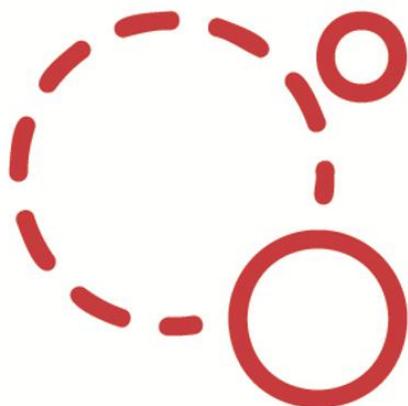
Expertise

Experience you can trust

Track record of **aligning and leading open source communities**
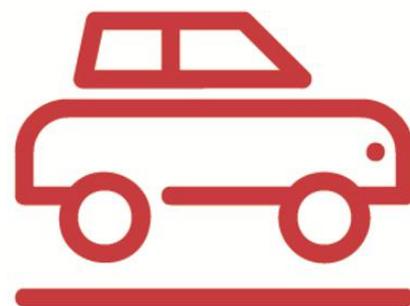
Long term **ongoing** support

Strong partner ecosystem approach

Red Hat In-Vehicle Operating System

Delivering a Linux-based foundation for the **Software Defined Vehicle**, enabling cloud-native development, functional safety, and long-term relevancy.
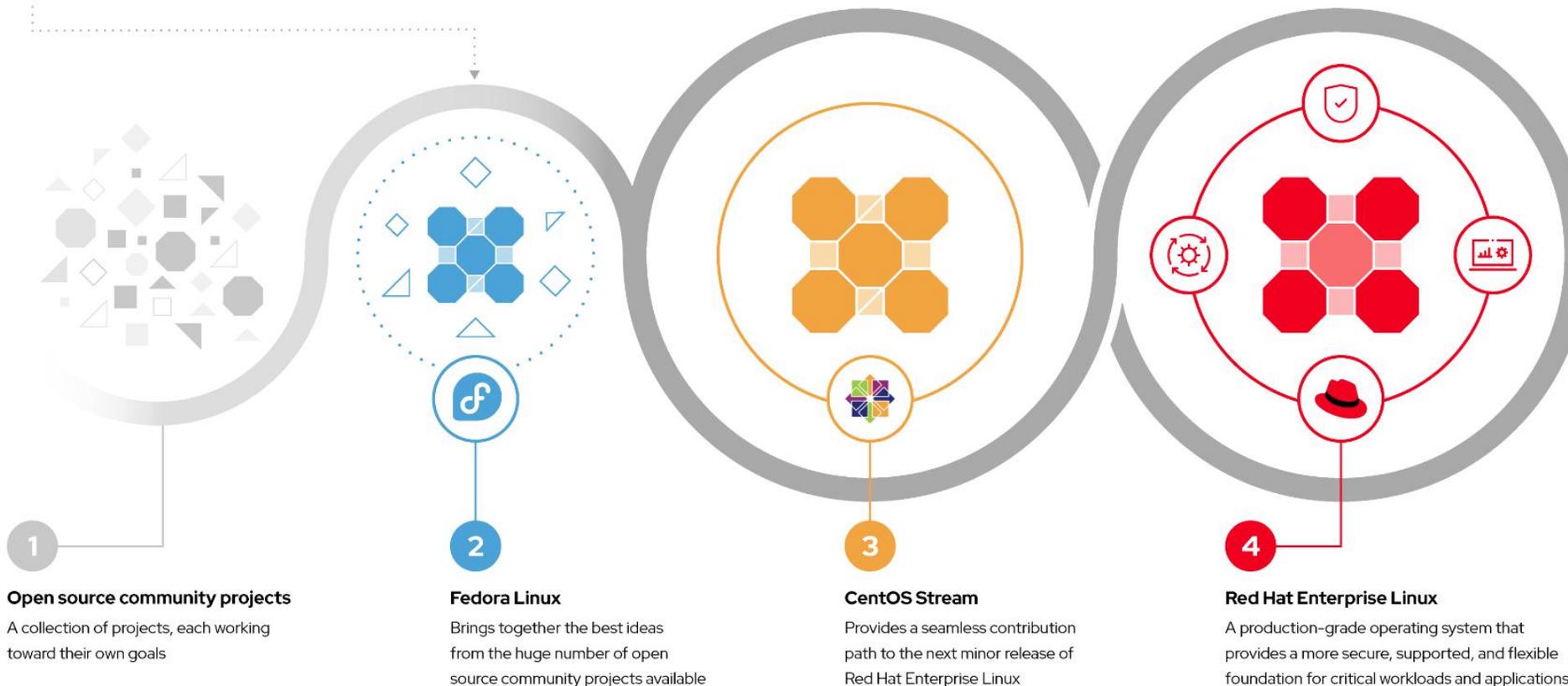

Open

Safe

Secure

In-vehicle OS community approach

Contributions flow among all elements of the ecosystem; however, there is a stronger connection between CentOS Stream and Red Hat® Enterprise Linux®. They each contribute to the other while also ensuring that new code is submitted as far upstream as possible; and, ideally, directly into the relevant open source community projects.

1

Open source community projects

A collection of projects, each working toward their own goals

2

Fedora Linux

Brings together the best ideas from the huge number of open source community projects available

3

CentOS Stream

Provides a seamless contribution path to the next minor release of Red Hat Enterprise Linux

4

Red Hat Enterprise Linux

A production-grade operating system that provides a more secure, supported, and flexible foundation for critical workloads and applications

Our approach for In-vehicle OS

GOTC

Solution Blueprints : Simplifying the creation of edge stacks

Enterprise-hardened Open Source Product

In-vehicle OS based on Linux flagship Red Hat Enterprise Linux

From POC to production

Ensure your teams are ready to operate at scale

Red Hat In-vehicle OS

Open collaboration and standardized

Aligned with standardization initiatives so that you can scale out your deployments with consistency

ELISA
ENABLING LINUX IN SAFETY APPLICATIONS

Automotive SIG

Continuous certification

Anyone can suggest improvements and contribute to it

exida

PRESS RELEASE

Red Hat Sets Sights on Delivering the First Continuously Certified Linux Platform for Road Vehicles

Open source leader to add predictable Linux platform with ongoing certifications for a variety of in-vehicle, safety-related applications, from infotainment to driver operations

Press Release 27th April: link

Dimensions of the Red Hat Vehicle OS

Business Model and Go-To Market

Definition of Product Offering	Ecosystem & Partners	Legal & Liability	Pricing	Business Case & Marketing

Enablement Technical / Base System

- Platform Standards (Linux Kernel, Glibc, ...)
- Smaller Footprint, Realtime, faster boot time, ...
- Hardware Support (ARM, x86, ...)
- Container Usage (lightweight approaches)
- ...

Qualification (incl. certification)

- Functional Safety ASIL-B, ISO 26262
- Cybersecurity / ISO 21434
- ASPICE / Process Qualification
- Certification Bodies
- ...

Tooling & Process for Safety App Dev

- Joint agile development / DevOps sprint cycles
- Open Source Software [OSS] Governance
- Release Management Process & Traceability
- Establish Test Framework
- Integration/Handling of existing tools (e.g. Yocto)

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Red Hat

Open source in the driver's seat

Red Hat and GM are collaborating to advance automotive technology at the edge with software-defined vehicles that run on the Red Hat In-Vehicle Operating System.

See what's next for the auto industry →

Bringing Red Hat In-Vehicle Operating System to the transportation industry better equips automakers to adopt rapid, open source innovation in the present and in the future.

Scott Miller
Vice President, Software Defined Vehicle and Operating System,
General Motors

Partnership & solution

GM and Red Hat intend to make these complex vehicle updates simpler and more frequent by implementing continuous functional-safety certification into Ultifi, GM's vehicle software platform, with Red Hat In-Vehicle Operating System pioneering the continuous certification approach.

Expectations

- Reduced costs from consolidation and reuse of software across a common platform
- An improved development cycle for faster time-to-market with new customer features and software improvements
- A continuous functional safety certification for systems related to safety applications
- Creation of new services, business models and revenue streams

Red Hat Automotive Community Engagements - Q2 2022

ECLIPSE FOUNDATION

Eclipse SDV Edge WG

Industry consortium to develop a scalable architecture for software-defined vehicles

Founding member

SOAFEE

Arm SOAFEE SIG

Industry consortium to develop a scalable open architecture for cloud-native in-vehicle computing

Founding member

CentOS

CentOS Automotive SIG

CentOS Special Interest Group for collaborative distro-based automotive Linux development

Founding member

AUTOMOTIVE GRADE LINUX

Automotive Grade Linux

Collaborative embedded-based automotive Linux development

ELISA
ENABLING LINUX IN SAFETY APPLICATIONS

ELISA

Enabling functional safety within the Linux kernel and ecosystem

Board chairship

ISO

CUNA / ISO-PAS

Standards process within ISO to update ISO 26262 for Linux in automotive safety applications

Initiative leader

Linaro

Linaro LEDGE & Automotive

Arm-based edge platform, automotive special interest group

Board chairship

AUTOSEMO
CHINA AUTOMOTIVE BASIC SOFTWARE ECOSYSTEM COMMITTEE

AUTOSEMO

Major Chinese automotive business consortium consisting of OEMs and suppliers in China

THANKS