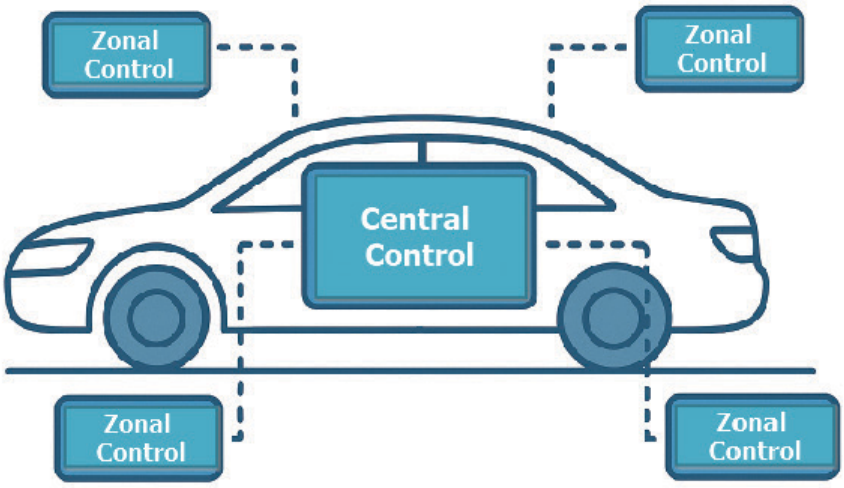
NXP S32G2 Based Zonal Gateway Solution

TESSOLVE
A HERO ELECTRONIX VENTURE



Silicon Partner

Cloud Partner

OTA Partner

DESCRIPTION

Zonal Architecture in Software-Defined Vehicles (SDVs)

Zonal architecture reorganizes vehicle electronics based on physical location instead of function. Instead of relying on dozens of individual Electronic Control Units (ECUs), the system uses a small number of high-performance zonal controllers connected to a centralized computing unit.

This approach delivers several benefits:

- **Reduced wiring complexity -** lighter harness, easier assembly, and lower cost.
- **Improved processing efficiency -** centralized compute optimizes resource allocation.
- **OTA readiness -** seamless software updates and diagnostics over the cloud.
- **Future scalability -** enables SDV features like feature-on-demand and AI-driven services.

Architecture Overview

1. Central Vehicle Gateway
- Connects vehicle to the cloud.
- Distributes compute and control tasks to zonal controllers.
- Interfaces with the OBD-II port for diagnostics and regulatory compliance.

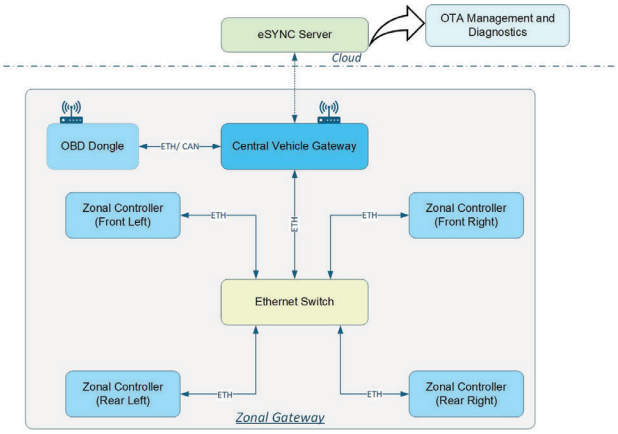
2. Zonal Controllers (4x)
- Front Left, Front Right, Rear Left, Rear Right.
- Act as aggregation nodes for local ECUs (via CAN / LIN / FlexRay).
- Offload simple control tasks, while routing high-level functions to the central gateway.

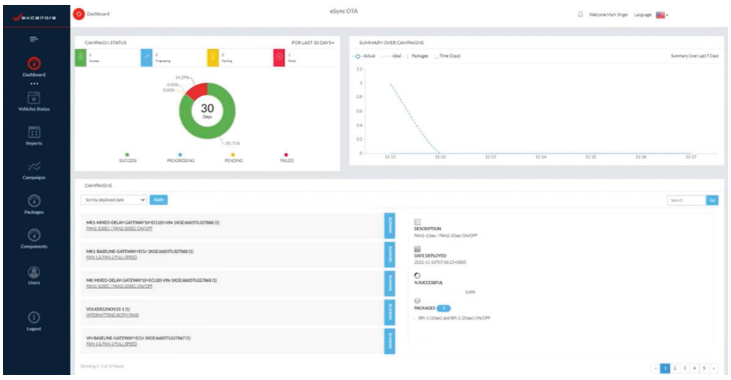
3. Automotive Ethernet Backbone
- High-speed, automotive-grade Ethernet interconnect.
- Provides scalable bandwidth for real-time data exchange.

4. OBD Dongle
- Used by service engineers for direct diagnostics.
- Enables field debugging and engineering access.

5. Cloud / Server Infrastructure
- eSync Server manages OTA software updates, diagnostics, and analytics and provides vehicle lifecycle management.

FEATURES





Use-Cases of Zonal Architecture:

1. OTA Updates for Zonal, Central, and Connected ECUs:
- Enables seamless over-the-air software updates across zonal controllers, central gateway, and legacy ECUs.
- Reduces service downtime and supports new feature rollouts remotely.

2. Predictive Maintenance and Edge Analytics:
- Zonal controllers collect and process sensor data locally.
- Early anomaly detection reduces breakdown risk and improves vehicle uptime.

3. 5G V2X and Vehicle-to-Cloud Integration:
- Supports real-time communication with infrastructure, other vehicles, and the cloud.
- Enables use cases like cooperative driving, traffic optimization, and safety alerts.

4. Dynamic Resource Management:
- Central compute dynamically allocates processing power and bandwidth to zones based on demand.
- Optimizes performance for ADAS, infotainment, and powertrain functions.

5. Over-the-Air Microservices Deployment:
- New services (e.g., navigation, diagnostics, AI models) can be deployed as containerized microservices.
- Allows feature-on-demand and subscription-based business models.

6. Domain Separation and Cybersecurity:
- Clear isolation between safety-critical, infotainment, and telematics domains.
- Strengthens cybersecurity posture with zonal firewalls and secure gateways.



TERA Gateway

With the TERA box, customers can utilize vast amounts of vehicle data to enable predictive and prescriptive maintenance, vehicle usage analysis, and more. Powered by the NXP S32G2 processor, TERA bridges vehicle data and the cloud, providing valuable insights into vehicle analytics – enhancing data-driven decisions for the future of mobility.

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