HOW THE FUTURE OF ELECTRIC AND AUTONOMOUS VEHICLES WILL RELY ON DATA CENTRICITY

Bob Leigh
SENIOR MARKET DEVELOPMENT DIRECTOR, COMMERCIAL

Pedro López Estepa
MARKET DEVELOPMENT DIRECTOR, AUTOMOTIVE
200+ RTI Autonomous Vehicle Programs!

- 50+ commercial systems
  - 10+ Passenger vehicles
  - 10+ EV startups
  - 5+ Software platforms
  - 8+ Trucks, mining vehicles, forklifts
  - 2 Flying taxi services
  - 2 Hyperloop & other
  - 2+ Autonomous ships
  - 2+ Underwater robots
- 100+ defense systems (land, sea, air)
- 75+ research programs (companies, universities, etc.)
Mobility Technological Revolution

Major disruptions across the Automotive Industry
Mobility Technological Revolution

From steam power to the affordable car

The Vintage Era
“The first steps towards modern vehicles”

1800

The Post-war Era
“Modern engines and sophisticated bodies”

1920

The Modern Era
“Electronics take over”

1950

The Future
“Connected world, from ADAS to AVs”

1980

2020

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“The auto industry is poised for more change in the next five to ten years than it’s seen in the past 50”

Mary Barra, CEO, General Motors

“Software will account for 90 percent of future innovations in the car”

Herbert Deiss, CEO, VW Group

“Tesla is open to licensing software and supplying powertrains and batteries. We’re just trying to accelerate sustainable energy, not crush competitors!”

Elon Musk, CEO, Tesla
The Future
“Connected world, from ADAS to AVs”

2020

Mobility Technological Revolution Pillars

Software Architecture
"Next Gen EE and Safety"

Telecommunication Infrastructure

Supply Chain & Business Models
The Future of Mobility “Software Architecture”

Architectural Evolution

The Future “Connected world, from ADAS to AVs”

- Distributed Architecture
- Domain Architecture
- Redundant Zonal Architecture
- Central Zone Architecture

- L1-L2 ADAS
- L3-L4 Automated Vehicles
- L5 Autonomous Vehicles

2020 2022 2024 2028 2030+
The Future of Mobility “Next Gen EE”
The Future of Mobility “Connected Infrastructure”

- V2P (DSRC C-V2X)
- V2I (DSRC C-V2X)
- V2P (DSRC C-V2X)
- V2V (DSRC C-V2X)
- C2X (4G-5G)
- Core Network (WAN)
- RSE (Road Side Unit)
- BT (Base Station)
- OEM Cloud
- Asset Management Cloud
- Service Provider Cloud
The Future of Mobility “New Business Models”

- MaaS Mobility as a Service
- Pay to Drive Services
- Driver Health Services
- Driver Health Services
- Operator Related Services
- Car Sharing
- OEM Diagnostic Services
- Vehicle Diagnostic Services
- Infotainment Services
- Multi travel Services
- Pay to Drive Services
- Operator Related Services
- Car Sharing
- Aftermarket Insurances
- OEM Diagnostic Service
- Insurance Services
- Operator Related Services
- Teleoperation
- Health System
- Health Insurance
- IoT Services Suppliers
- IoT Platform Suppliers
- Health Insurance
- Infotainment Services
- Digital Disruption
  Business models and processes
- Ecosystem
  Insurance, Health, IoT, Operators
- Governments
- Insurances
- OEM Services
- Car Sharing
- Multi travel Services
- Digital Disruption
  Business models and processes
- Ecosystem
  Insurance, Health, IoT, Operators
- OEM Differentiation
  Brand creation and differentiation
- OEM Differentiation
  Brand creation and differentiation
- Dealers
- Suppliers
- Digital Disruption
  Business models and processes
- Ecosystem
  Insurance, Health, IoT, Operators
- Health System
- Health Insurance
- Infotainment Services
Future Mobility Challenges

Autonomous vehicle connectivity software is challenging and risky
Challenges on Future Mobility

• Importance of **software** is new
  – Traditional supply chain is still adapting

• **Business models** are changing rapidly
  – Many new revenue streams

• **Competition**
  – Electric cars have drastically lowered the entry barrier
  – MaaS is changing the relationship with the customers
  – Multiple non-traditional players
Challenge #1 “Supply Chain Evolution”

New Architecture Multi-tier Supply Chain

Supply Chain Challenges

- Evolving from a traditional automotive product to a multi-tier collaborative development.
Challenge #1 “Supply Chain Evolution”

New Architecture Multi-tier Supply Chain

Supply Chain Challenges

- Evolving from a traditional automotive product to a multi-tier collaborative development.
- Navigating changes in System and SW integration roles.
Challenge #1 “Supply Chain Evolution”

New Architecture Multi-tier Supply Chain

Supply Chain Challenges

• Evolving from a traditional automotive product to a multi-tier collaborative development.
• Navigating changes in System and SW integration roles.
• Transitioning to an agile development model where changes might occur during development and series production.

CSR: Continuous Software Release
Challenge #1 “Supply Chain Evolution”

New Architecture Multi-tier Supply Chain

Supply Chain Challenges

- Evolving from a traditional automotive product to a multi-tier collaborative development.
- Navigating changes in System and SW integration roles.
- Transitioning to an agile development model where changes might occur during development and series production.
- Determining who will own IP, and be responsible for liabilities, warranty and reliability.
Challenge #2 “Future Proof”
Challenge #3 “Path to Safety”

- **Cost efficient** safety strategy while maintaining the highest standards.
- **Flexibility** to evolve safety platforms through the platform lifetime.
- Enable **unknown** safety requirements.
- **Easy path to integrate** in certified environments.
- **Isolate** safety data communication from non-safety, while allowing connectivity.
- Trusted software for **critical systems**.
Challenge #4 “New Business Model”

Innovation Challenges

- **Rapid Innovation**
  Even at production or during development phase

- **Cost Pressure**
  Low contributions in an unknown market

- **Features**
  Prioritization of costly and risky features

- **Evolution**
  Future updates including over the air

- **Customization**
  Mobility as a Service, Individual configuration

- **Brand Position**
  Differentiation and Positioning

Business Model Challenges

- **Rapid Innovation**
  BM to address liabilities and cost associated to them

- **Features**
  Traditional OEM BM

- **Cost Pressure**
  Software BM

- **Evolution**
  Buy or build

- **Vehicle upgrade BM**
  Data transfer BM

- **Customization**
  Mobility as a Service Aftermarket BM

- **Brand Position**
  Premium vs. Mass

  Fleet vs. Personal

  Ownership vs. Sharing
Connext Drive®

The First Complete Automotive-Grade Connectivity Solution for AV Development
CONNEXT DRIVE
The First Complete Automotive-Grade Connectivity Solution for AV Development

• Simple solution for Automotive customers
• Designed for the Automotive Market
• Complete ECU to Cloud Framework
• Only proven-in-use framework that will meet all Autonomous use cases
• Future Proof, data-centric architecture that will support industry evolution

www.rti.com/drive
Connext Drive Framework

- Teleoperations
- Autonomous Vehicles
- Next Gen Architectures
- ROS2 Application
- Adaptive Application
- Classic Application

- Connext Drive APIs
- ROS2
- AUTOSAR Adaptive
- AUTOSAR Classic

- Connext 6
- QM
- Safety (ISO 26262)

- Ecosystem Interfaces with Connext

CONNEXT DATABUS

Infrastructure Serv.  Platforms  Transports  Tools

CONNEXT DRIVE

A foundation for autonomous vehicle development
Why Connext Drive?

Supply Chain & Business Models

Challenge #1 “Supply Chain Evolution”

- Maintenance
- Availability
- Fleet Management Databus
- HMI
- V2X Databus
- GATEWAY
- Traffic Management
- Road Management
- Municipal Cloud Databus
- Telematics
- Sensors
- Situation Awareness
- Planning
- Sensor Fusion
- Data Recording
- CAN AUTOSAR
- GPS
- Camera
- LiDAR
- Vehicle Control (Safety Critical)

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Why Connext Drive?

Supply Chain & Business Models

Challenge #4 “New Business Model”

Rapid Innovation
Reduce time to development and implementation

Cost Pressure
Accurate Automotive Business Model

Customization
Enable plug-in applications

Features
Capabilities to deliver on Autonomy

Evolution
Flexibility to adapt to both legacy and new technologies

Brand Position
Easy architecture configuration to address branding challenges
Why Connext Drive?

Challenge #2 “Future Proof”

Future Proof, data-centric architecture will support industry evolution.
Why Connext Drive?

Software Architecture "Next Gen EE and Safety"

Connext Drive Platform

Connext Drive SEooC

Challenge #3 “Path to Safety”

Customer Safety Platform

Connext Drive SEooC

Connext Drive SEooC Product

Safety Manual

Safety Analysis

Safety Certificate

SEooC: Safety Element out of Context
Why Connext Drive?

Challenge #2 “Future Proof”

Telecommunication Infrastructure

Connext Drive Databus

Home Wi-Fi

Cellular

Public Wi-Fi

IP Mobility capabilities facilitate seemingly seamless connection to a vehicle as it travels.
CONNEXT DRIVE
The First Complete Automotive-Grade Connectivity Solution for AV Development

**Summary**

Proven in-use

- Single framework for all subsystems
- Reduced maintainability

Low risk and future proof

- Easy integration of subsystems
- Compatible with Automotive Ecosystem

Easy design and customization

- Support for large range of data
- Reuse design and code across teams

Expertise and know-how

- 200x years of accumulated expertise
- Safety-critical project experience

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