



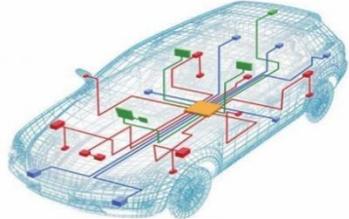
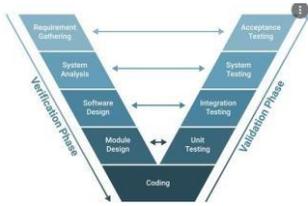
Create, Embed, Empower

Automotive Competencies

Crevavi – Company Overview

A R&D company, founded in 2011

Global footprint

Automotive	EV / Autonomous	SW Functional Safety
		
Automotive ECU software	Inverter, OBC, DCDC BMS	ISO26262 compliance



Company strengths

Number of developers

75+

Lab facilities

3+



Sachin Shivapur
Co-founder and CEO
25 years experience



Ravi Kishore Attili
Co-founder and US Head
25 years experience



Shriram Kathavate
Cofounder and CTO
23 years experience

HW Test benches

3+

Locations

5+

- 250+ Man years of Automotive ECU SW and HW experience
- HV EV ECU – Traction Inverter , DCDC, Battery Management (BMS), OBC
- R&D for Automotive Electronics
- Functional safety (ISO26262)
- Development partners of major silicon vendors
- World-wide presence: India, Germany and USA

Automotive software competencies



Automotive Core competencies



HV Inverter for e-Motor
HV On-Board Charger
Battery Management System
HV DC-DC Converter
Super-Capacitor cell balancing ECU



Immobilizer
Secure boot
Secure Programming
Bootloaders
OEM specific flash loaders



Drive Train ECU
Instrument Cluster
Telematics ECU
Zone/Domain Controller
Chassis and Body Control ECU

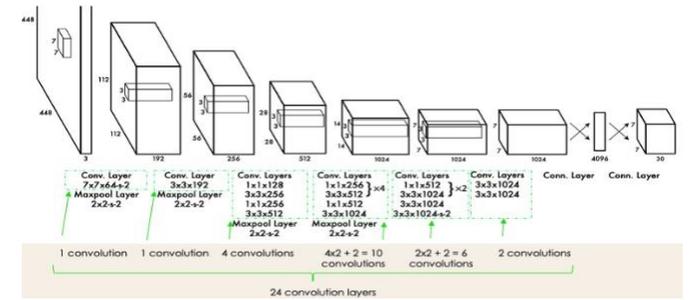


IC Engine ECU
Fuel Injection, ignition
Angle/Time Driver
High-pressure pump control

Key ECU Projects executed

ADAS: Real-time Object detection: using Jetson Nano

- **Project:** Implement Yolo algorithm on Jetson Nano for real-time object detection
- **Project content:**
 - Use the JetPack L4T BSP as base platform
 - create pipeline and capture frames from the MIPI-CSI CSI camera using Gstreamer multimedia framework
 - Integration of Yolo (You Only Look Once) CNN real-time object detection algorithm
 - Integration of Pytorch tensor library for deep learning for Yolo algorithm
 - Use the bounding boxes augmentation for object detection provided by Yolo
 - Use the computing power of CUDA processors to render the image with minimal lag
- **Customer Benefits :**
 - Optimize high compute loads on NVIDIA platforms starting from Nano
 - quad-core 64-bit ARM CPU, a 128-core integrated NVIDIA GPU
 - Validation of algorithms
 - Performance and memory optimization for underlying hardware architecture



SW Defined Vehicle: SOA architecture for Body ECU

- **Project content:** Design SOA architecture for Body ECU components compliant to SOA
- **Details:**
 - Decode system requirements for Body ECU (Immobilizer, Climate, Alarm, Doors)
 - Design **SOA** architecture
 - SOA interaction within Body domain
 - SOA integration with Powertrain, Chassis, Cockpit domains and other Zonal ECUs
 - Arrive at safety goals following ISO26262 standard
 - For crash scenarios
 - Automatic door lock scenarios
 - SOA interaction between Zonal and HPC (high performance computing domains)
 - **S2S (Signal to signal – Adaptive AUTOSAR)** design for communication across ECUs
 - **Ethernet to CAN** gateway interaction for SOA
- **Customer Benefits**
 - Leverage on SDV platform design experience
 - Leverage on SOA architecture definition for Zonal and HPC computing domains for SDV

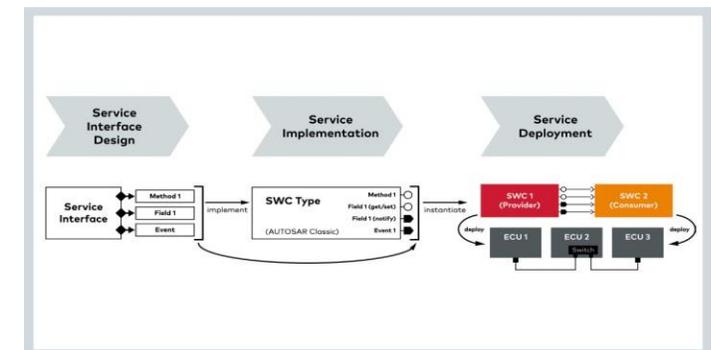
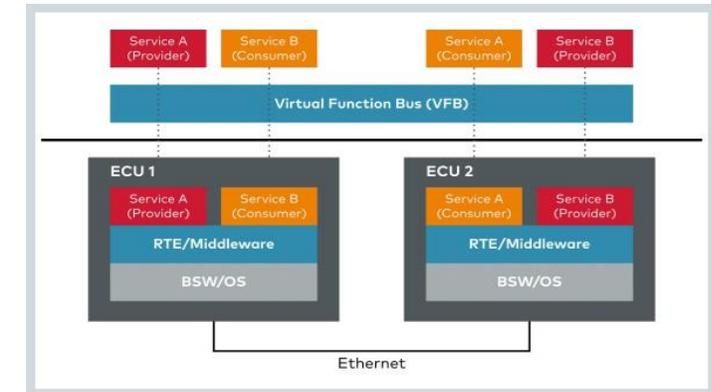
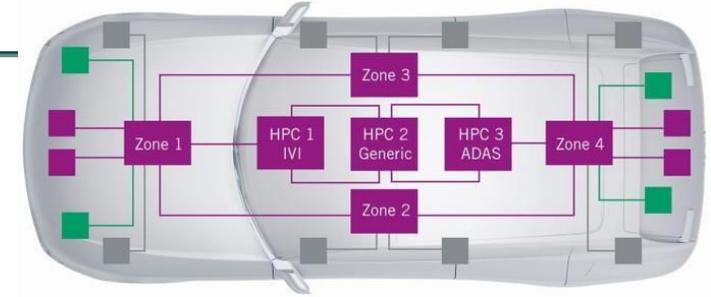
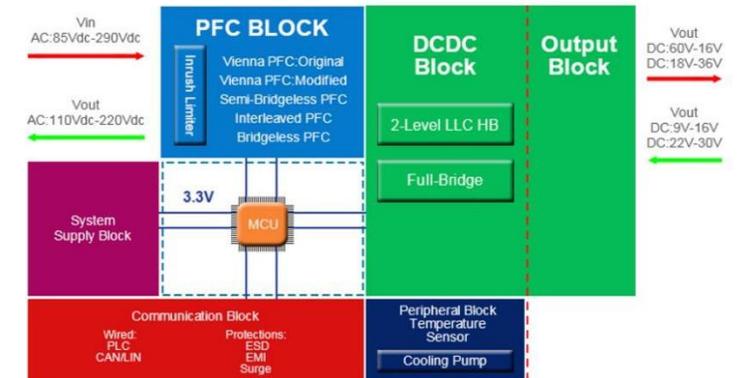


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E-Mobility: SW development for HV On-board Charger ECU

- **Project content:** CPU load reduction for AUTOSAR BSW stack on Multicore, Mixed ASIL ECU
- **Details:**
 - Entire Configuration analysis of **AUTOSAR BSW** and MCAL stack
 - Analysis of high frequency function calls and stacks
 - Profiling of start up, shutdown, communication (CAN-FD, LIN and **Ethernet**), OS Applications, spinlocks, memory and watchdog stacks
 - Validate and measurement of CPU loads reduction and memory optimization
 - Verify NVM(D-Flash), wakeup, **Ethernet**, **SOMEIP** configuration for SOP
 - Write and validate microcontroller functional safety drivers to be compliant with **ISO26262**
 - Achieve **ASIL-D** safety concept
 - FCCU configuration, CRC, Memory error management and reporting of events
 - Validate multi-core, mixed-ASIL functionality
 - Memory and core partitioning
- **ECU HW**
 - **ST SPC58 Chorus** family
 - e200z4 triple core:32-bit Power Architecture technology CPU

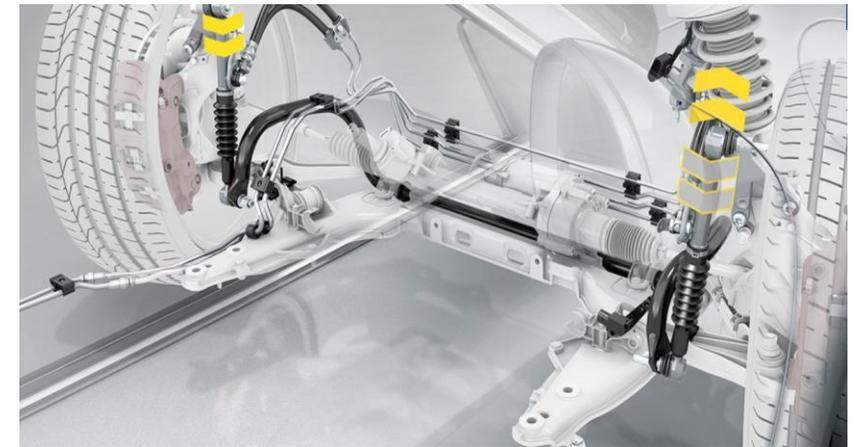


E-Mobility: DCDC and SCAP ECU for Anti-roll ECU

- **Ask from Indian Supplier**
 - Operate in BOT model + Manage project timelines and deliverables
 - Deliver series grade project for a Japanese Tier1 for **HV EV DCDC** and Super-capacitor ECU
 - Handle UK OEM interactions
- **Project: Configure AUTOSAR BSW stack for Anti-roll ECU (DCDC and Super Capacitor ECU)**
- **Project work carried out:**
 - Configuration and integration of Vector AUTOSAR BSW stack and Bootloader
 - Develop **Complex Drivers**
 - **Cell-balancing Complex Driver for Super Capacitors**
 - End-to-end system testing for series production
- **Customer Benefits :**
 - Demonstrated End-to-end systems' competency in HV DCDC converter SW
 - Provided entire ECU SW architecting as a consultancy to Tier1 and OEMs
 - Own entire validation responsibility for series production



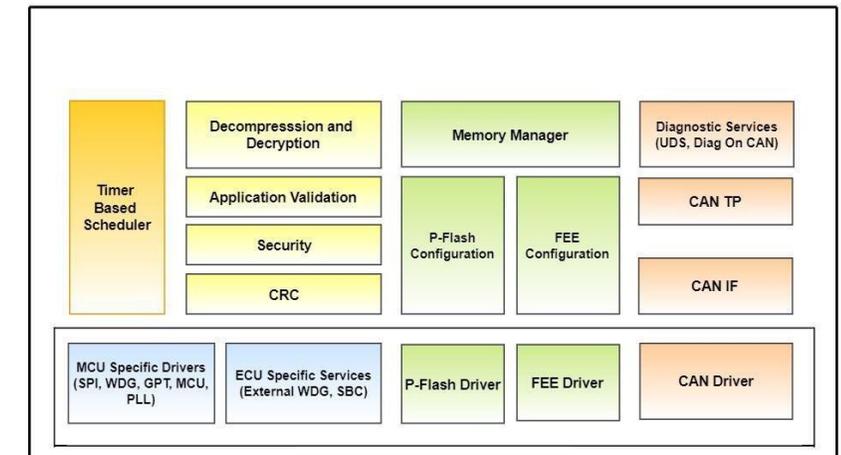
Super Capacitors on the ECU



Anti-roll System

Migrate TCU platform from NXP to Infineon AURIX for American Tier1

- **Ask from German Supplier (Partner)**
 - Bid for the TCU (Transmission control Unit) project and win against competitors
 - Own end-to-end execution of project
 - Handle Japanese OEM interactions on behalf of American Tier1
- **Project: Develop Generic Bootloaders for Transmission control system ECUs**
- **Project work carried out:**
 - Integration of legacy SW, middle-ware, AUTOSAR select layers and MCAL(IO)
 - Development of Generic bootloader
 - Development of state-of-the-art security algorithms
 - Handle OEM interactions
- **Customer Benefits :**
 - Develop robust platform ECU for scalability
 - Upto 50% reduction in TTM and TCC (total cost of ownership)
 - Offload Tier1s with OEM interactions
 - Meet stringent SOP requirements of global OEMs(Japanese, European and US)

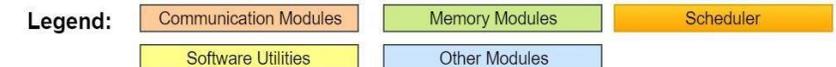
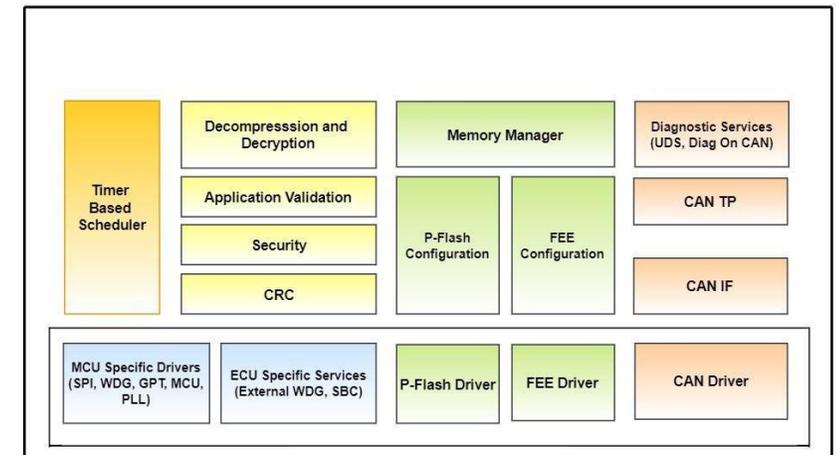


Flash Bootloaders (FBL) for Aurix TC2XX

- **Project: Develop Generic Bootloaders for Transmission control system ECUs**
 - End-to-end responsibility from concept to production
 - MCAL stack using EB Tresos
 - Vector CAN Stack (CAN Driver, CANIF, CANSMB) using DAVINCI Configurator tool
 - Compliance to ISO 14229-1 and ISO 15765-2 (UDS on CAN)
 - Develop flashing using XCP protocol
 - Support for ODX flash specifications



- **Customer Benefits :**
 - Develop platform for scalability
 - Pragmatic implementation of 3rd party IP to save royalty costs
 - Upto 50% reduction in TTM
 - Upto 50% reduction in total cost of ownership



Telematics and ADAS platform with Intel

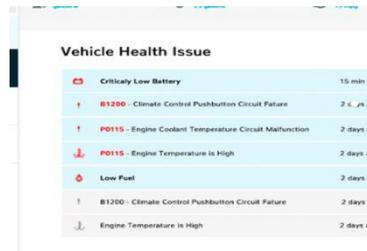
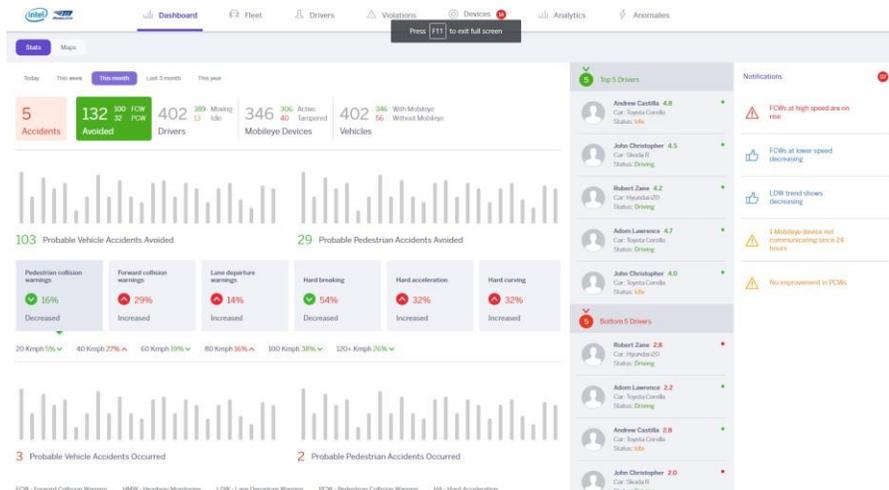


Project Content:

- Linux based platform co-developed with Intel
- OBDII, GSM communication on Intel Atom
- Fleet Management System (FMS) on cloud
- Interface with ADAS processor for ADAS event recognition
- Connects to cloud via cellular modem
- Integrated GNSS for tag and trace
- OBDII connection using UDS protocol

Customer Benefits :

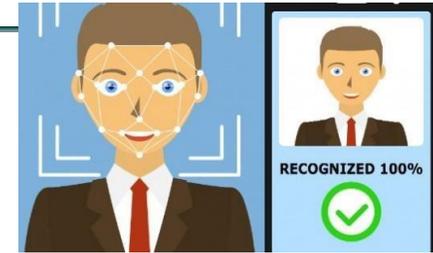
- Ready platform for FMS, Telematics and ADAS
- Retrofit and factory fit option



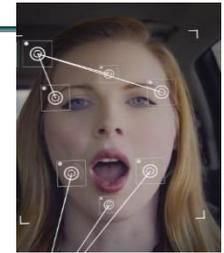
Predictive Vehicle health



ADAS Events



Driver Authentication



Driver Monitoring



Driver monitoring & Authentication & Event recording



Mobileye CAS



Car Dashcam with event Recording



Rear Parking Camera



Centralized Processing Unit

1. Multiple Camera inputs
2. GPS & Accelerometer
3. 3G/4G/WIFI
4. CAS Events
5. Vehicle OBD



Immobilizer ECU for Indian Tier1

- **Ask from an Indian Supplier**
 - Bag the project from the European OEM. Win the bid against competitors
 - Deliver a generic platform immobilizer ECU
- **Project:** Develop the entire ECU SW for a renowned European sports bikes manufacturer
- **Project content:**
 - Develop bootloader and UDS diagnostics stack
 - Key authentication with key transponder, Pairing with Immobilizer and Engine ECU
 - State-of-the-art encryption and decryption algorithms as defined by German supplier
- **Customer Benefits :**
 - Leverage on Immobilizer domain knowhow
 - Meet demanding TTM timelines
 - Bootloader with state-of-the-art security algorithms



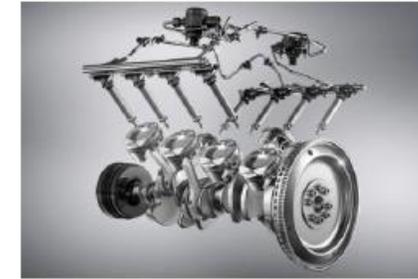
Instrument Cluster ECU

- **Project:** Develop IO drivers for Renesas RH850 controller
- **Challenge:** Deliver ECU software in 5 months from scratch using newly launched controller
- **Project content:**
 - Develop AUTOSAR like ADC, PWM, I2C, RTC, WDT, SOUND, DMA drivers
 - Compliance to SW layered architecture of AUTOSAR
 - Portable across Renesas RH850 family
- **Customer Benefits :**
 - RH850 controller know-how to meet demanding TTM targets
 - Instrument cluster domain know
 - Platform development for scalability



Powertrain ECU software

- **20 years of automotive powertrain ECU software development**
 - TPU and PCP co-processor programming for time critical applications like injection and ignition
 - End power-stage control and diagnosis of actuators
 - CAN, UDS, KWP, LIN communication protocols development
 - Layered SW architecture development on the lines of AUTOSAR standards
- **Quality process\methodology**
 - ASPICE process compliance
 - FMEA and 8D analysis
 - ISO26262 compliance
 - DevOPs / CICD
- **Customer Benefits**
 - SW development for highest ASIL ISO2626 applications
 - Multicore Mixed ASIL
 - Time critical applications requiring complex timing waveform generation



Thank You for your time

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