Crevavi

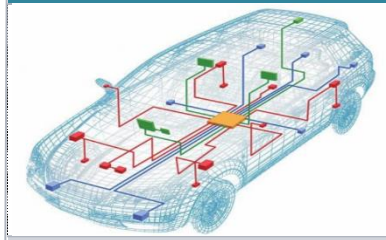
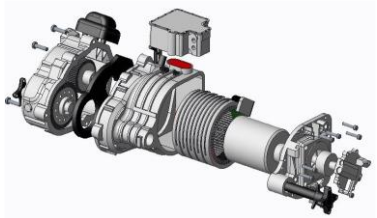
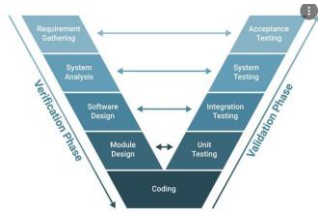
*Create, Embed, Empower*

# Competency Highlights

## Family of ST microcontrollers

# About Crevavi

## An Indian product company, founded in 2011

| Automotive | EV experience | SW Functional Safety |
|---|---|---|
|  |  |   |
| Automotive ECU software | Inverter, OBC, DCDC, BMS | ISO26262 compliance knowhow |

## Global footprint


## Company strengths

- 250+ Man years of Automotive ECU experience
- Expertise in setting up Automotive R&D teams for global clients
- Specialized in EV ECUs
- Research centre for Automotive electronics

- ECU Systems
  - From Concept to Series production
  - HV EV ECU – Inverter , DCDC, Onboard Charger, BMS
  - Body, Chassis, Cockpit and Engine Management systems
  - Product design house and ODM services
- SW Defined Vehicle(SDV)

# Leadership Team & Bangalore office premises

**Ravikishore Attili**
- Co-founder, CMO
- 22 yrs. of exp: Wipro, IBM
- SME: IoT, Cloud, Java

**Sachin Shivapur**
- Co-founder, CEO
- 23 yrs. of exp: Wipro, Siemens, Bosch, Intel
- SME: Automotive, IoT

**Shriram Kathavate**
- Co-founder: CTO
- 20 yrs. Of exp: Siemens
- SME : Automotive

**Sujata Sahu**
- COO: Operations Head
- 22 yrs.of exp: Printronix
- SME: Program management

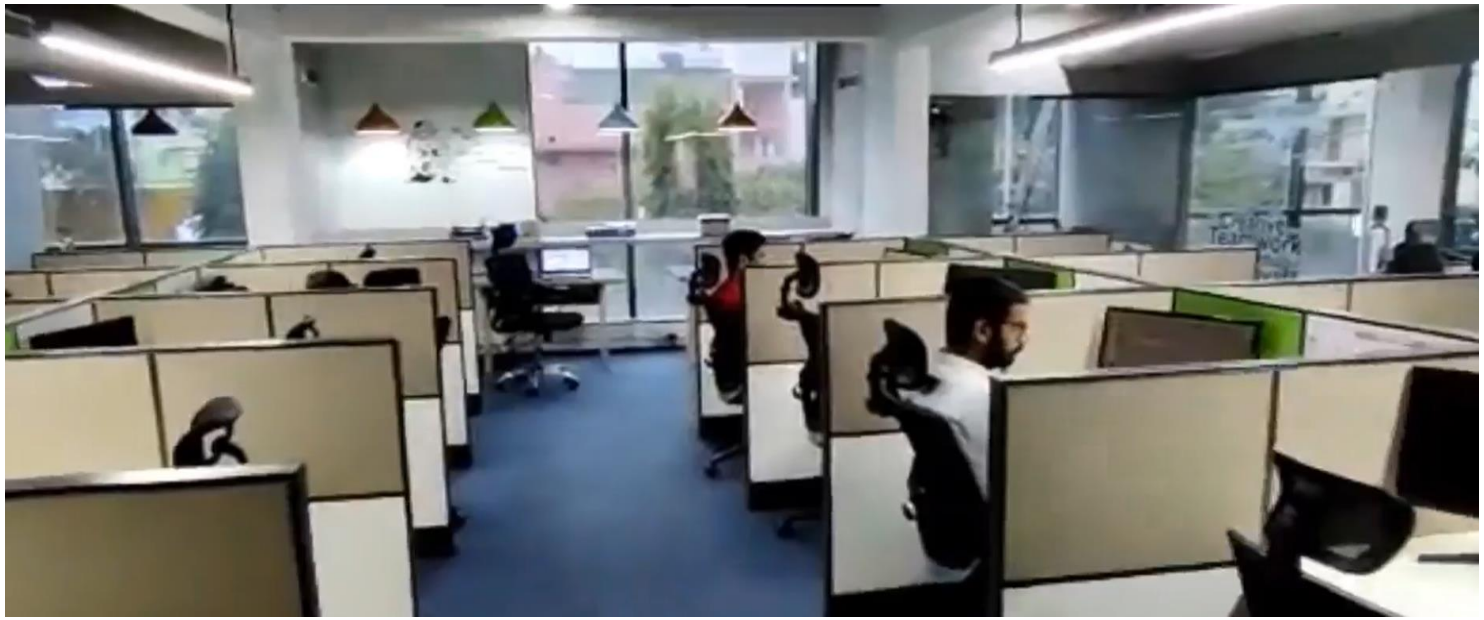
Number of developers
60+

Lab facilities
3+

Test benches
3+

Locations
5+

- ODM capabilities for bespoke product development
- Contract manufacturing compliant to demanding standards
- BSP development for microcontroller platforms
- Low-level device drivers, complex drivers, AUTOSAR BSW development and integration







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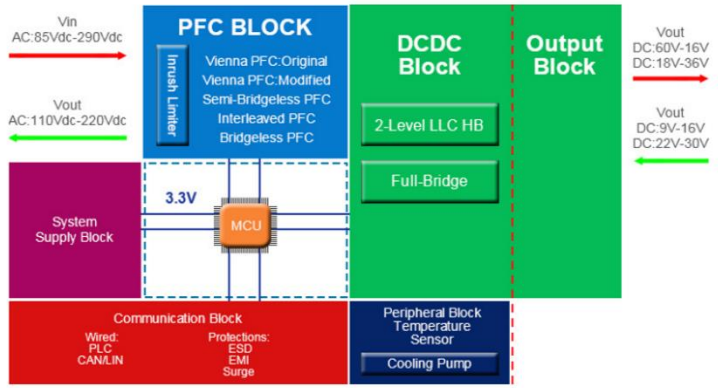
# E-Mobility: SW development for HV On-board Charger ECU

- **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 partioning




- **ECU HW**
  - **ST SPC58 Chorus** family
  - e200z4 triple core:32-bit Power Architecture technology CPU

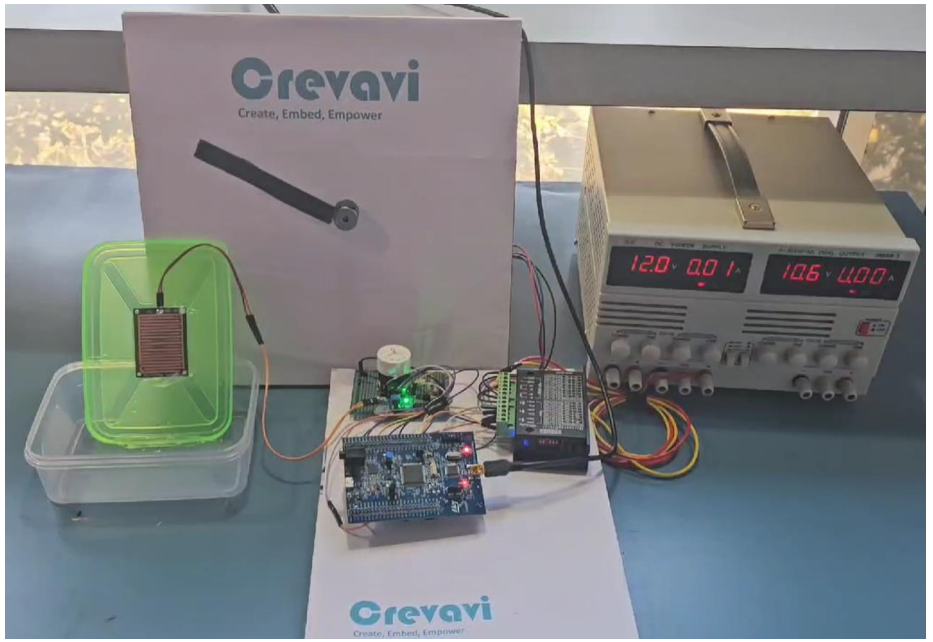
# Automatic Rain sensing wiper ECU: Demonstrator

**Content**

- The timer module and ADC module are configured to control the motor based on input from an IR sensor.
- A state machine for switching between manual and automatic control modes
- Closed loop control algorithm to process ADC inputs and drive motor
- in automatic mode, the motor speed is adjusted based on the analog input from rain sensor
- In manual mode the user can select the motor speed using switches

- System Details
  - Hardware:
    - STM32F4 DISCOVERY Kit
      - 32-bit Arm Cortex-M4 with FPU core
      - 16Mhz / 1-Mbyte Flash / 192-Kbyte
    - Stepper Motor: 3.3 V, DC 1 amps,
    - Rain detecting IR sensor
    - Rotary switch and glass module to represent windshield.

  - Software:
    - Application and Device drivers in C Language
    - Platform: STM32CubeIDE




**Link to demonstrator video:**
https://mobility.crevavi.com/automatic-rain-sensing-windshield-wiper/

# Robotic Arm: Demonstrator Project

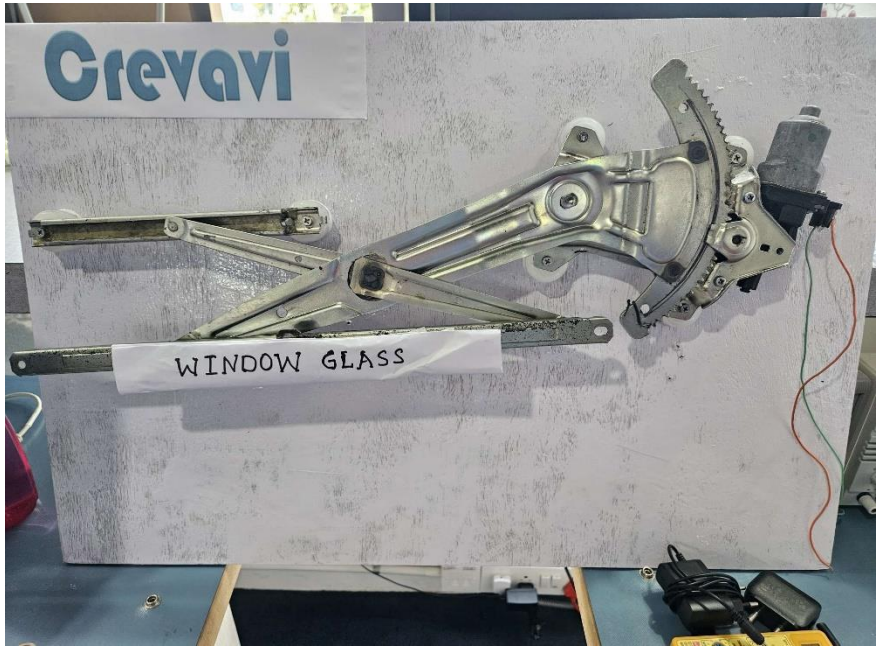
- **Content**:
  - Lift and drop a payload of 4 kg object at a distance of 1.5 meters
  - Drive  Maxon motor
    - renowned for its exceptional torque-to-weight ratio, particularly suitable for space applications.
- Drive a H-bridge with PWM
- Perform precise duty cycle calculations to regulate motor speed and torque
- ensuring accurate lifting and dropping movements using STM32 MCU.
- Use Ultrasonic sensor integrated to accurately measure distances, providing crucial feedback for positioning tasks.
- Display lift and drop distance parameters in an LCD

- **System Details**
  - Hardware:
    - STM32F4 DISCOVERY Kit
      - 32-bit Arm Cortex-M4 with FPU core
      - 16Mhz / 1-Mbyte Flash / 192-Kbyte
  - Software:
    - Application and Device drivers in C Language
    - Platform: STM32CubeIDE

# Anti-Pinch : Demonstrator ECU project

Content:

- **Develop anti-pinch ECU demonstrator project**
    - Detect spike current in window motor
    - Configure ADC to read current sensor input
    - Drive window motor based on the threshold values during obstacle detection
    - Drive full window motor for normal operations.
- **System Requirement**
- **Hardware**:
    - STM32F4 DISCOVERY Kit
        - 32-bit Arm Cortex-M4 with FPU core
        - 16Mhz/1-Mbyte Flash memory/192-Kbyte RAM
    - ACS712 Current sensor
        - Supply Voltage: 4.5V ~ 5.5V DC,
        - Measure Current Range: -5A ~ 5A
- Software
    - Application and Device drivers in C Language




**Project Demo:**
https://mobility.crevavi.com/anti-pinch-mechanism-for-power-windows/



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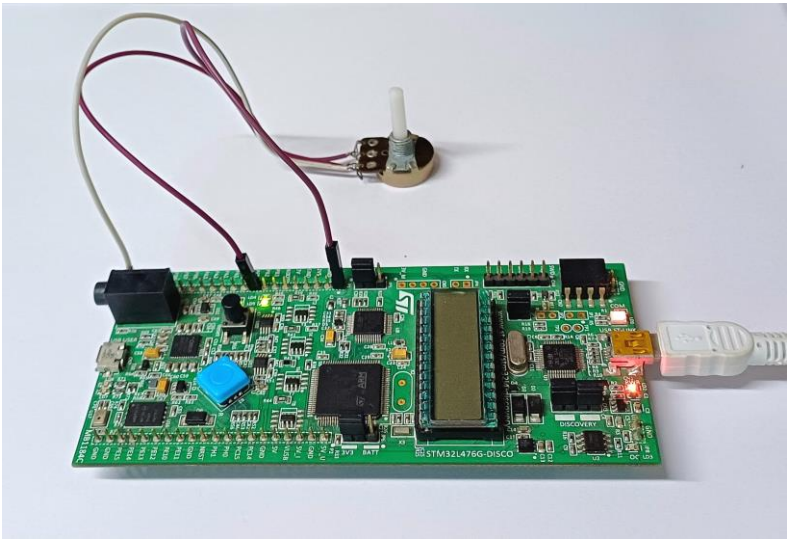
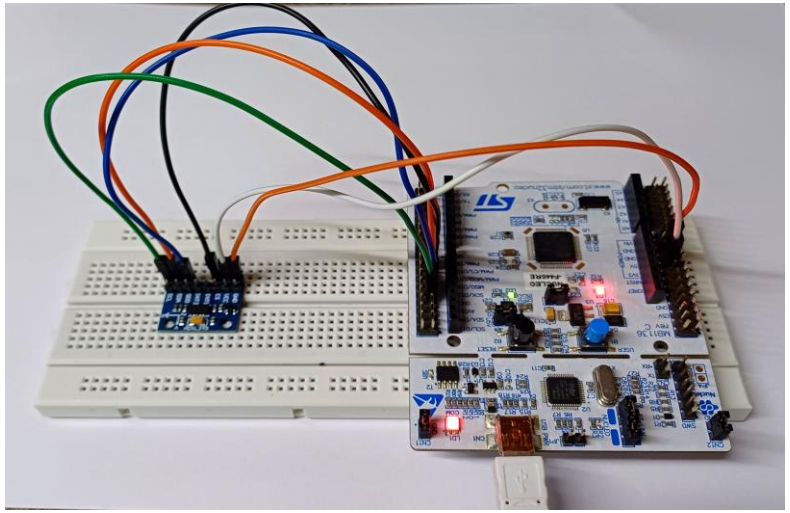
# Platform driver development : ADC, PWM, SPI and UART drivers

**Content**:

- **Bare metal programing**
- **ADC driver**
  - Convert analog input voltage/current to digital Configuring ADC registers to set sampling rate, resolution, reference voltage, etc.
- **PWM driver**
  - Generate PWM signal
    - 1Khz frequency with 50% duty cycle
  - Base clock, timer and prescalar configuration
- **UART driver**
  - Communicate with PC using UART
  - Configure UART peripheral - baud rate, frame bits, stop bits, and parity
    - Polling and interrupt mode
- **SPI Driver**
  - Configure SPI driver to communicate with accelerometer sensor
  - Clock polarity, clock phase, and baud rate
  - full-duplex communication with the accelerometer sensor
  - Receive accelerometer data for each axis
  - Perform calibration to get physical values (e.g., m/s^2 or g)



STM32L476 Discovery Board







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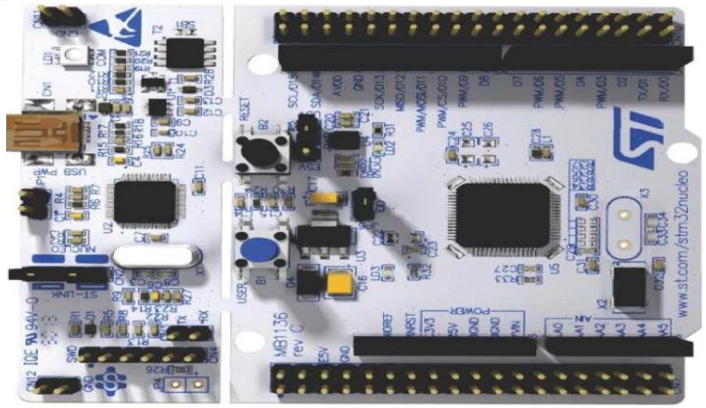
# CAN Driver development

**Content**:

- Bare metal **CAN driver** development
  - Validate CAN protocol with CAN bus analyzer
  - Configure CAN peripheral
  - baud rate, message format (standard or extended), message filters
  - CAN message format
    - identifier, data length, data payload
- Configure the CAN bus analyzer software
  - to capture and analyze the received CAN messages,
  - Displaying message identifiers, data payload, and timestamps.
- **Hardware**:
  - STM32F4 DISCOVERY Kit
    - 32-bit Arm Cortex-M4 with FPU core
- **Software**
  - Application and Device drivers in C Language




CAN BUS Analyzer

File View Tools Setup Help

Rolling Trace

| TRACE | ID | DLC | DATA 0 | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA 6 | DATA 7 | TIME STAMP (sec) | TIME DELTA (sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9349 | 0.001 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9340 | 0.000 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9339 | 0.011 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9229 | 0.001 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9220 | 0.000 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9220 | 0.000 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9219 | 0.000 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9219 | 4294.967 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9220 | 0.001 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9210 | 0.000 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9209 | 0.000 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9209 | 0.000 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9209 | 0.001 |
| RX | 0x11 | 7 | 0x43 | 0x52 | 0x45 | 0x56 | 0x41 | 0x56 | 0x49 | | 1529.9200 | 0.000 |





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# Thank You for your time!!


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