Group 1 - AUTOSAR: The Universal Language of Automotive Software

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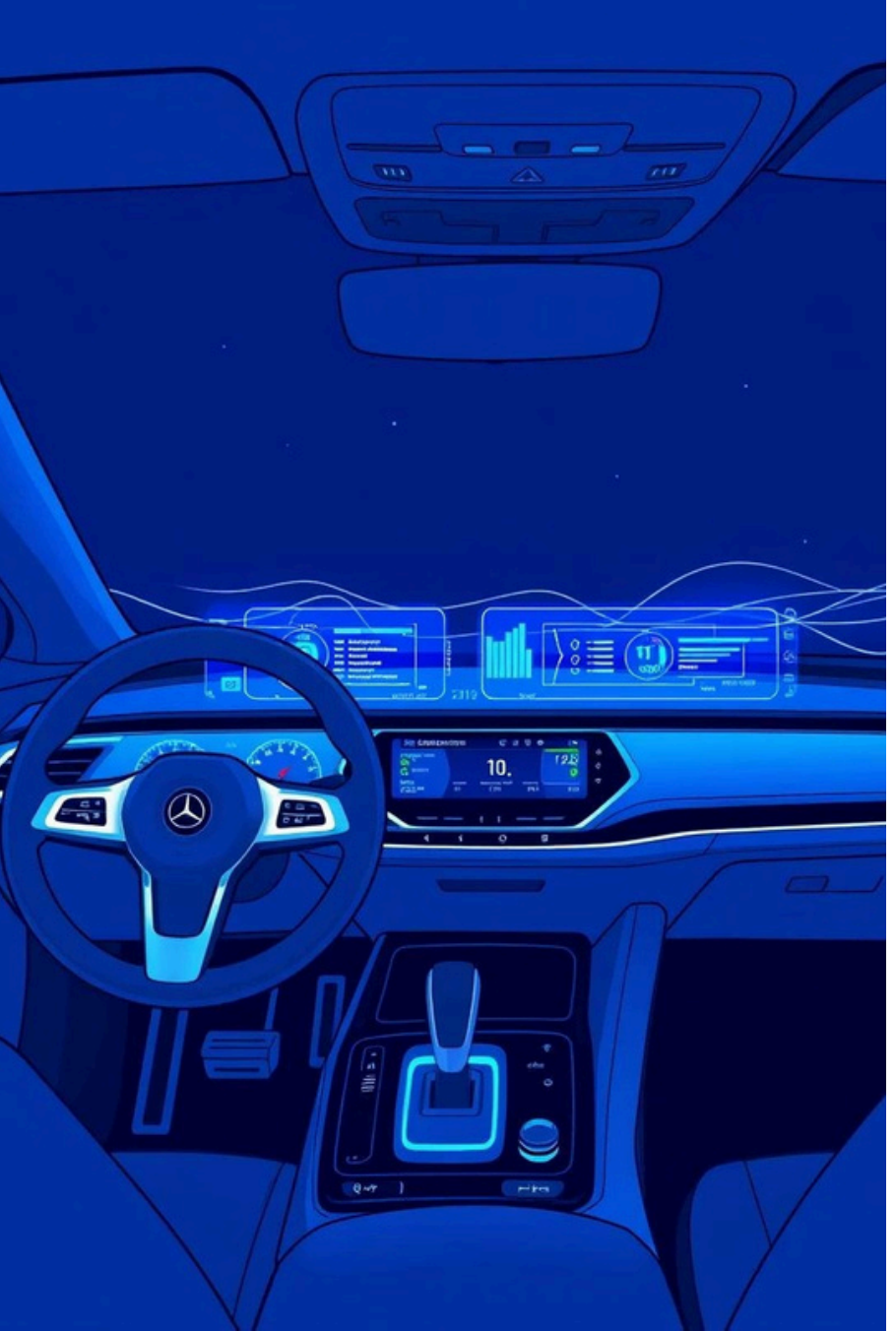
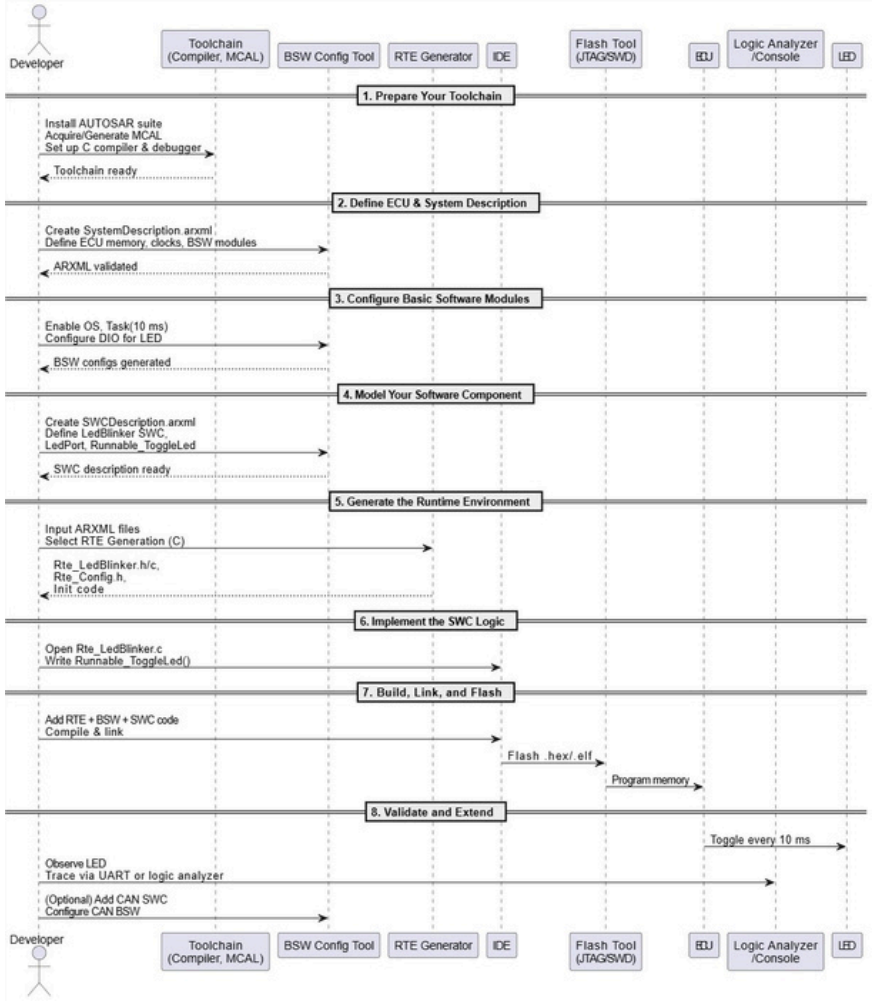


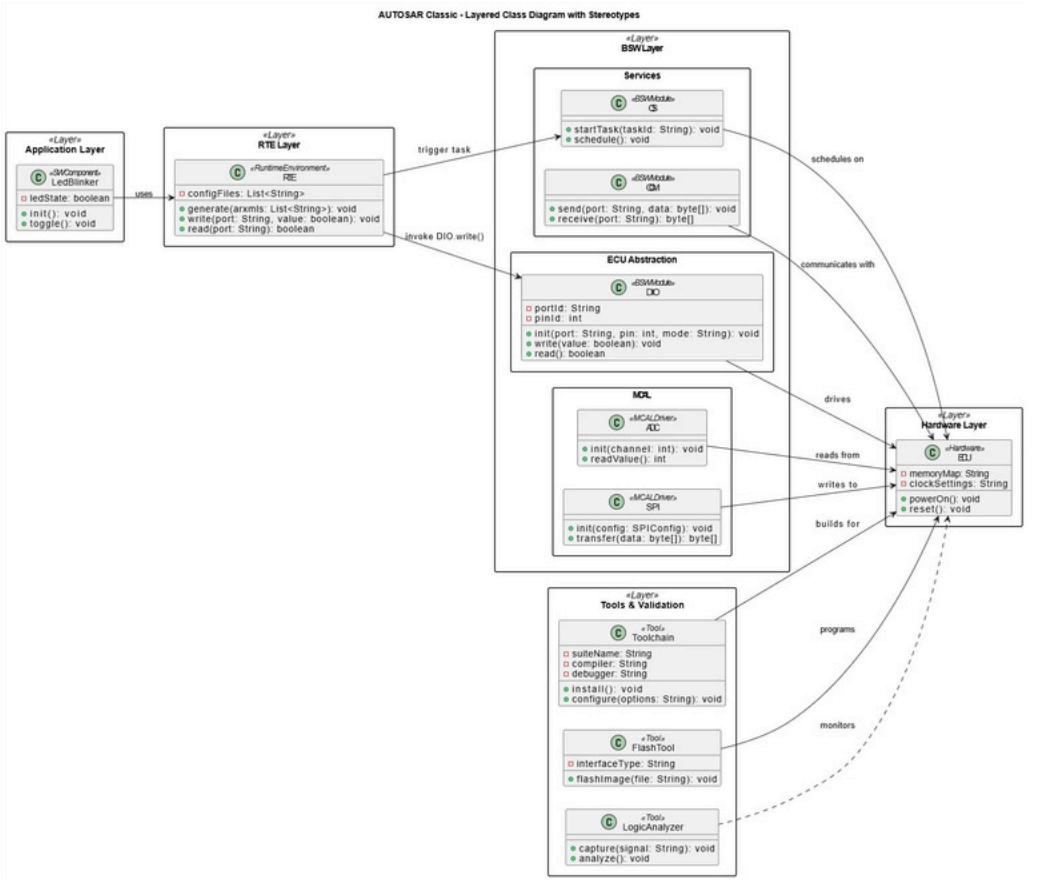
UML Diagram / Flow Chart

Sequence Diagram

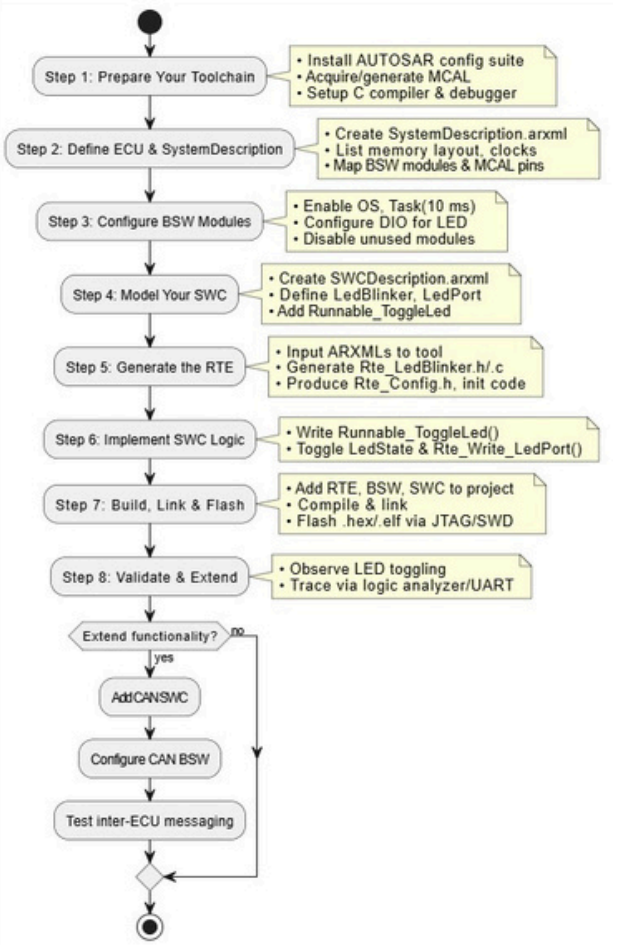


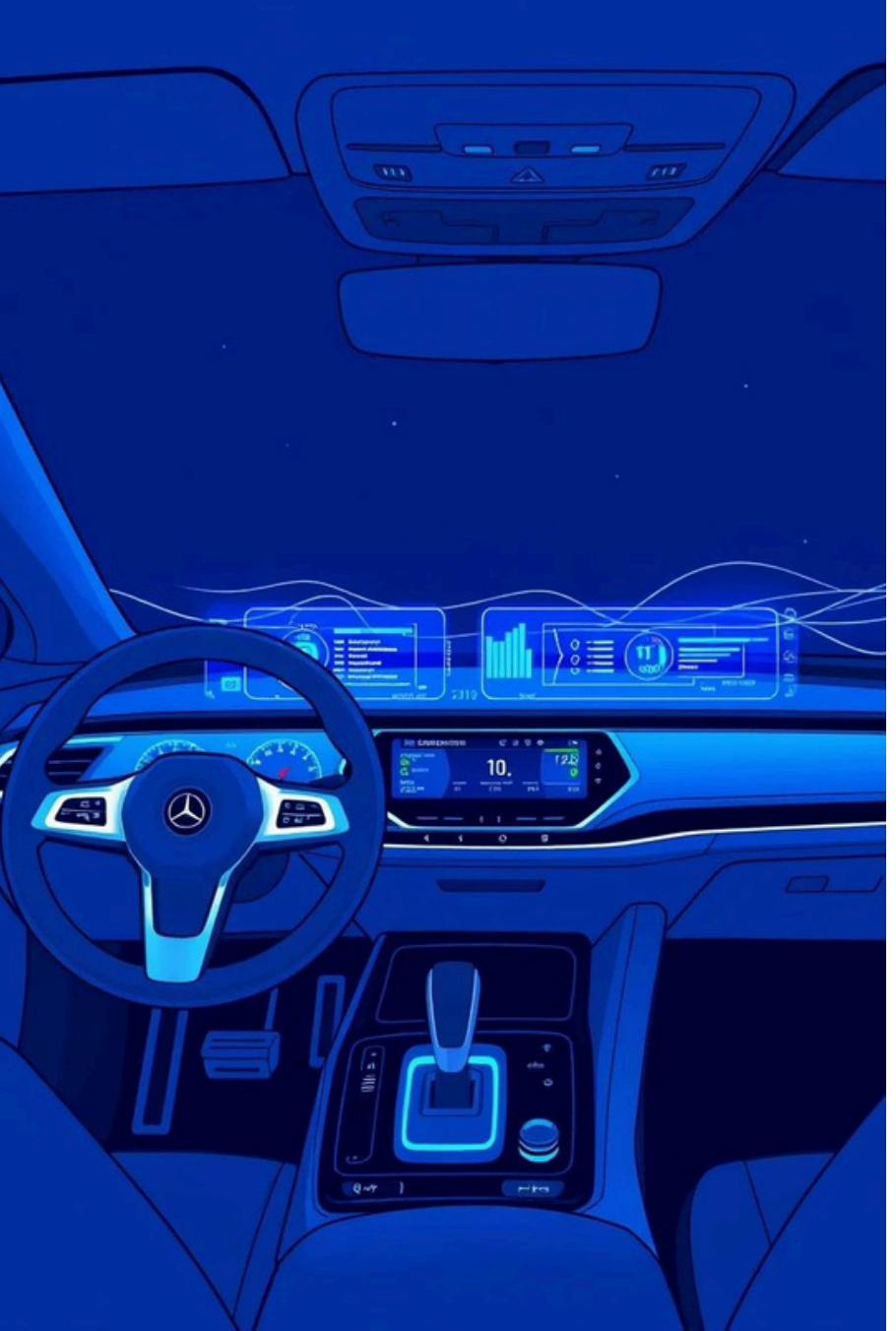
UML Diagram / Flow Chart

Class Diagram



Activity Diagram





AUTOSAR: The Universal Language of Automotive Software

Explore how AUTOSAR standardizes automotive software development.

It enabling seamless integration and innovation in modern vehicles.

UNDERSTANDING THE CORE

What is AUTOSAR?

AUTOSAR(AUTomotiveOpen SystemARchitecture) is a global development partnership establishing a standardized software architecture for the automotive industry. It creates a common set of rules, interfaces, and a shared language for building in-car software.

Standardization

A commonframework for software components from diverse suppliers to interact.

Interoperability

Ensuresall disparate software components can "speak the same language" and work together.

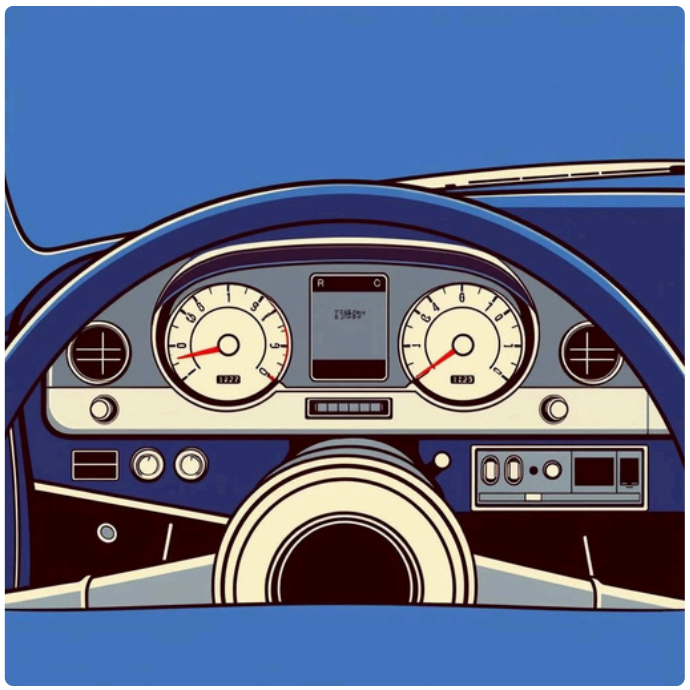
Efficiency

Streamlines development, integration, and maintenance of complex automotive software.

EVOLUTION OF AUTOMOTIVE SOFTWARE

Past vs. Present: The Software Shift

In the Past: Bespoke Development



ModernCars:Software-Defined Vehicles

Aspect	In the Past	Modern Cars (with AUTOSAR)
Software Development	Custom-built from scratch for each new feature	Modular, reusable software components
Integration	Complex and time-consuming	Easier and faster with standardized interfaces
Efficiency	Low, due to repeated efforts	High, due to software reuse and sharing
Feature Examples	Basic functionalities (e.g., lights, wipers)	Advanced features like ADAS, self-driving, voice control
Update Mechanism	Manual updates at service centers	Over-the-air (OTA) updates possible
Development Cost & Time	Higher due to duplication of work	Lower due to modularity and reuse
Analogy	Building a house with custom parts for each component	Using standardized building blocks like bricks and windows

AUTOSAR IN ACTION

Real-World Applications

AUTOSAR's standardized approach is critical for many cutting-edge automotive technologies, ensuring seamless communication and functionality across diverse systems.

ADAS
Advanced Driver Assistance Systems

EVs
Electric Vehicles

OTA
Over-the-Air Updates

V2X
Vehicle-to-Everything

Centralized Computing

Vehicle Brain

APPLICATION SPOTLIGHT

ADAS: Enhancing Driver Safety

What it is: Safetyfeatures likeautomaticemergency braking, lane-keeping assist, and adaptivecruise control,designed to assist drivers andprevent accidents.

How AUTOSAR helps: ADAS involves various software components from different suppliers (e.g., camera, radar, steering, braking). AUTOSAR acts as a "traffic controller" for data, ensuring real-time, coordinated communication from sensors to control systems. This is crucial for preventing accidents and ensuring the reliability of these life-saving systems.

APPLICATION SPOTLIGHT

Electric Vehicles: Powering the Future

What it is: Cars poweredby electricity,with complex software managing

How AUTOSAR helps: EVs require intricate interactions between components (e.g., battery management system, motor control unit, charger, dashboard display). AUTOSAR provides the standardized communication channels that allow these critical components to communicate seamlessly and safely. This ensures efficient power delivery, prevents overcharging, and keeps the driver informed about critical EV parameters.

APPLICATION SPOTLIGHT

Over-the-Air Updates: Seamless Enhancements

What it is:

Wirelessly updating a car's software—similar to smartphone app updates—to introduce new features and enhance existing ones.

Secure Isolation

AUTOSAR'smodular architecture ensures updates for non-safety-critical features (e.g., infotainment) do not interfere with essential safety systems (brakes, airbags).

Efficient Delivery

TheAdaptive AUTOSAR platform supports differential updates, applying only specific application blocks or patches for more efficient and secure delivery.

Future-Proofing

Thiscapability ensures cars remain up-to-date with the latest technology and security patches throughout their lifecycle.

APPLICATION SPOTLIGHT

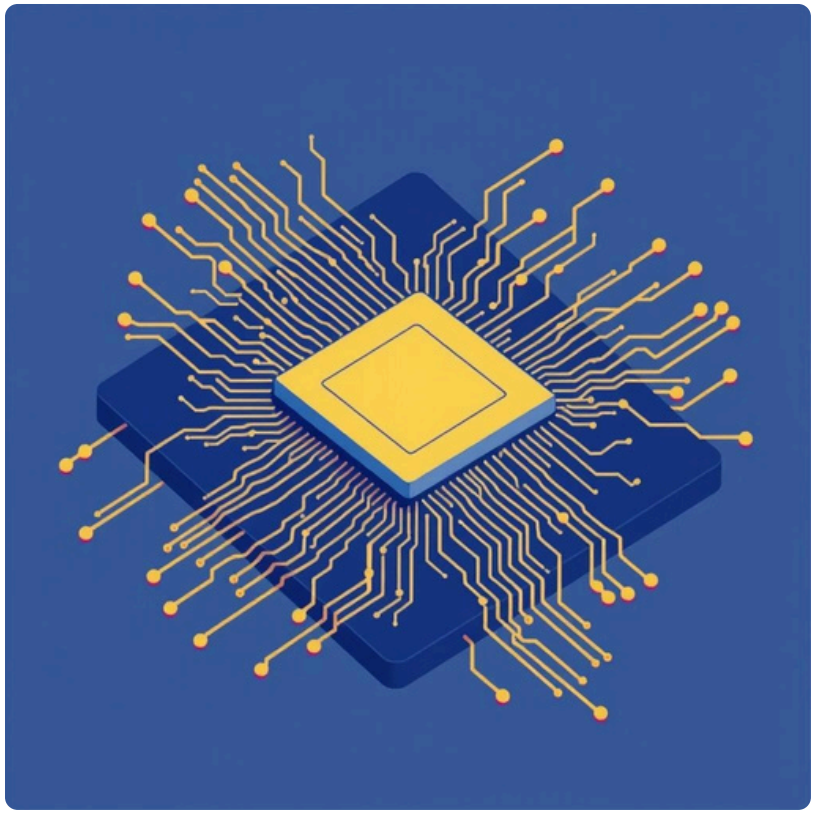
V2X Communication: The Connected Car

What it is: Cars "talking" to other vehicles (V2V), traffic infrastructure (V2I), or the cloud (V2C) for information and decision-making.

How AUTOSAR helps: V2X communication demands extremely fast, real-time, and secure data exchange. If a car receives a warning about black ice, it needs to process that information in milliseconds. AUTOSAR provides the framework for secure, real-time data exchange, enabling cars to reliably share vital information. This allows for features like collision warnings, optimized traffic flow, and enhanced road safety

APPLICATION SPOTLIGHT

Centralized Computing: The Vehicle Brain



What itis: The trend towards powerful central computers managing many
car functions, moving away fromnumerous separate Electronic Control Units (ECUs).

How AUTOSAR helps: With a central "brain," diverse software applications need to run concurrently without interference. AUTOSAR provides the "operating system" rules and framework for independent development, ensuring smooth, safe, and efficient operation on shared central computers, crucial for complex systems and autonomous driving.

Key Takeaways & Future Outlook

AUTOSAR is more than just a technical standard—it's the universal language that enables the complex software within modern vehicles to work seamlessly together.

1 Foundational Framework

It provides a common framework for building safe, reliable, and innovative automotive software.

2 Enabling Innovation

From ADAS to EVs, OTA updates, and V2X communication, AUTOSAR underpins the advanced features of connected and smart cars.

3 Ready for Tomorrow

AUTOSAR ensures cars are prepared for continuous innovation, including highly automated and autonomous driving functionalities.

Conclusion

- Establishing a precise toolchain up front guarantees compatibility across AUTOSAR tools, MCAL, compiler, and debugger.

- Defining the ECU and System Description in ARXML provides a single source of truth for memory, clocks, and BSW mappings.

- Enabling only the OS and DIO modules (and disabling unused BSW) keeps the build lean and maintainable.
- Modeling the Led Blinker SWC in its own ARXML cleanly separates application logic from underlying platform code.

- Generating the RTE automates all interfacing code (Rte_*.h/.c), ensuring consistency between BSW and SWC.
- Implementing the Runnable in C and toggling the LED validates core functionality before full integration.
- Building, flashing, and on-target validation closes the loop, confirming the end-to-end workflow works as intended.

- This eight-step process scales naturally—add CAN SWCs, multi-ECU setups, or more complex Runnables by repeating these modular phases.

Thankyou !!