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Engineering Company

Kineton is an engineering company that provides services and products.
Kineton assists clients in the creation and development of their products and solutions in some of the major technological domains, such as Media Television, ICT & Telco, Automotive.

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Connection to the Universities

Kineton has relationships with some of the major Italian universities, and maintains a meaningful connection to the academic world. Academic preparation and skills play a key role for Kineton.

The Kineton Academy, fully supported by the company, prepares young resources for the world of business.

kineton ACADEMY

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Numbers

HEADQUARTER

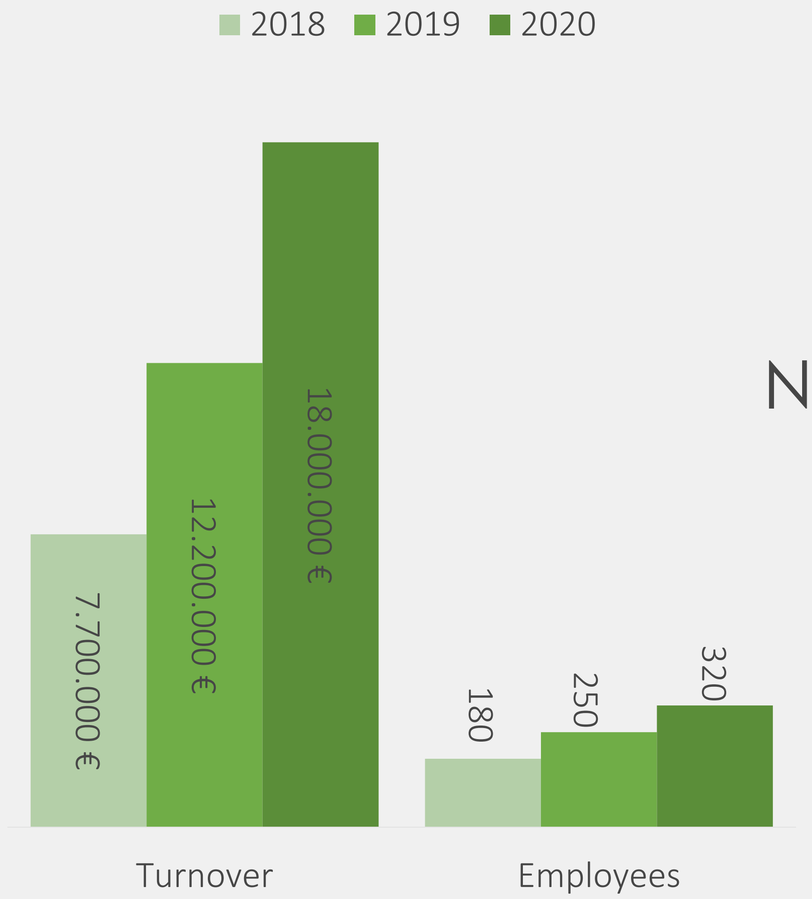
Napoli

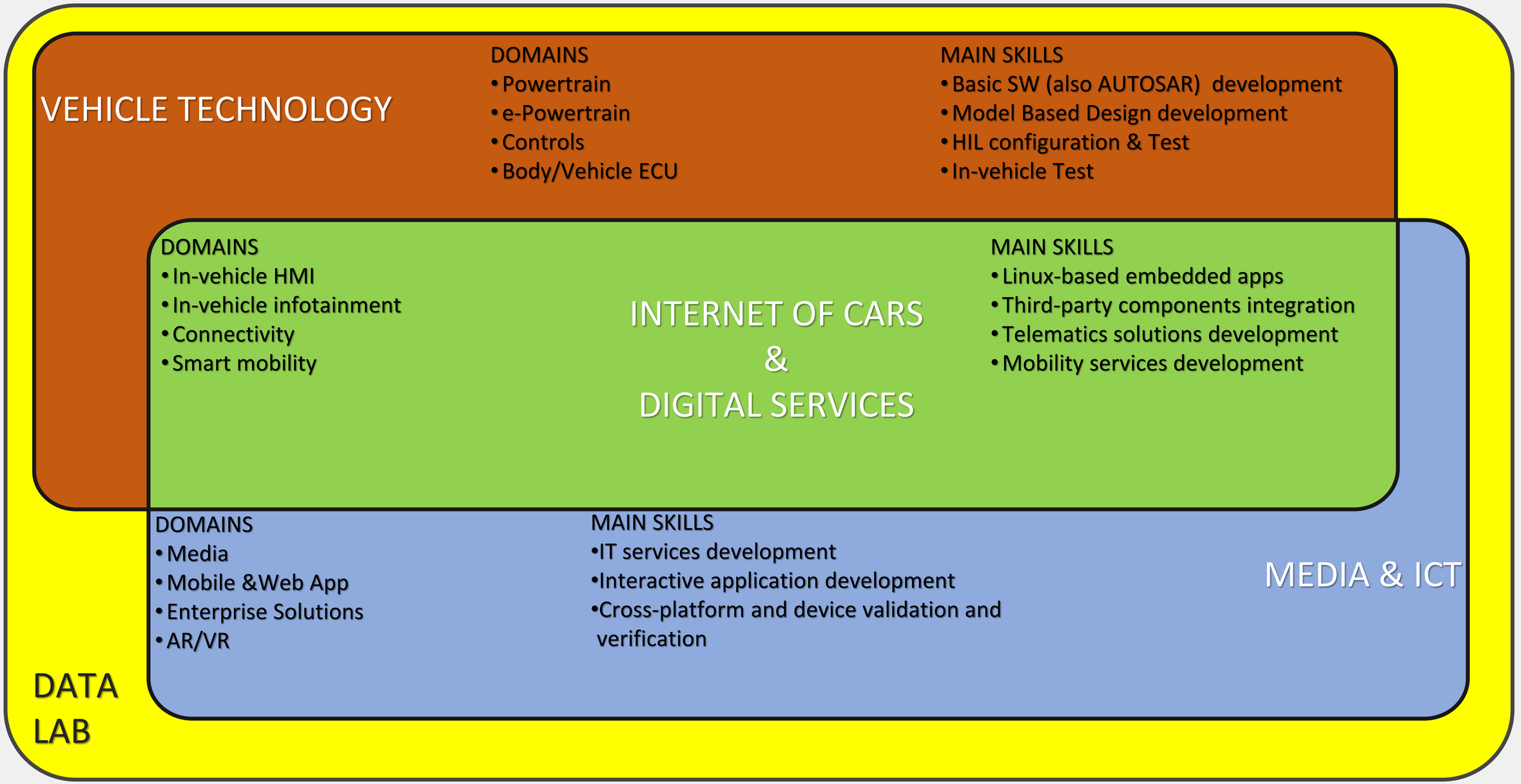
BRANCH

Torino

BRANCH

Milan





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Our main Automotive Partners

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Our main Media Partners

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Automotive SW Architecture

AUTOSAR

Design of an SWC for an On-Board charger

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Automotive SW Architecture

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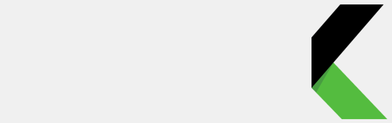
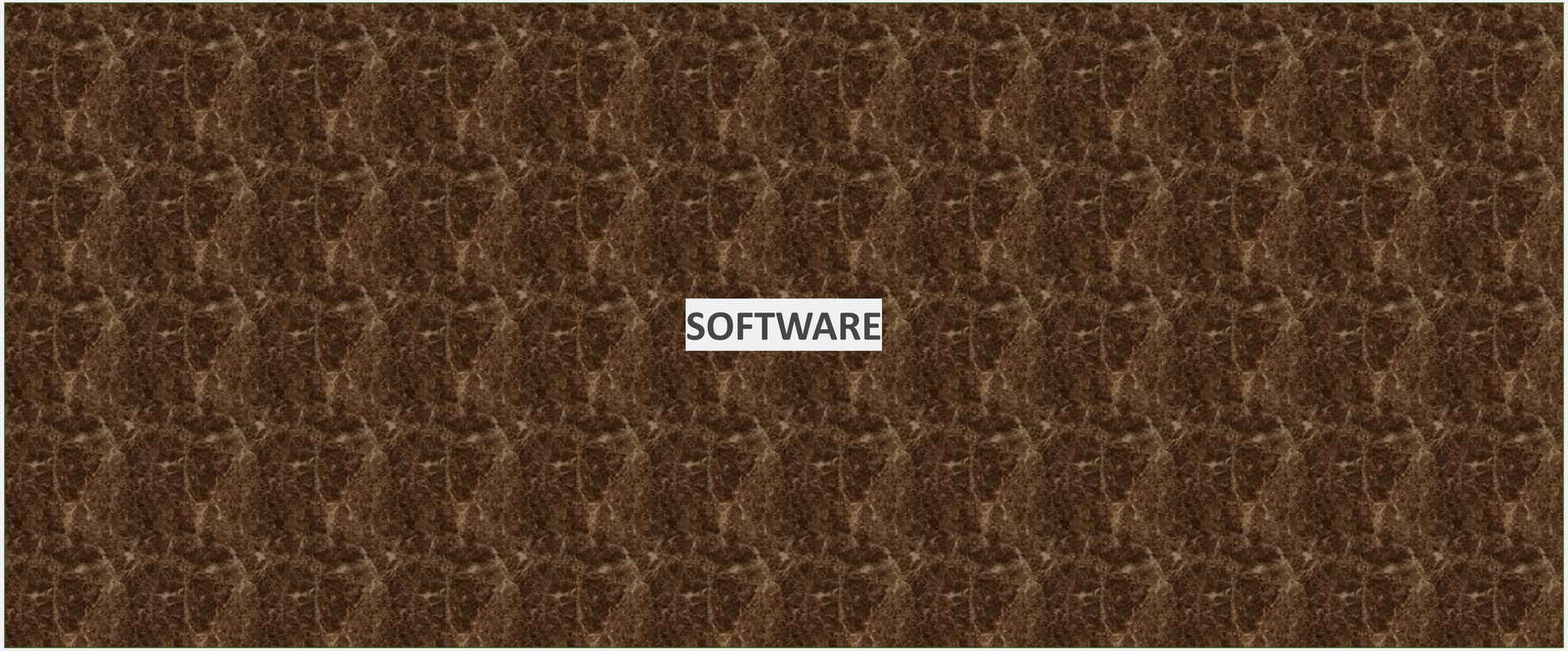


In the beginning was Chaos



HARDWARE

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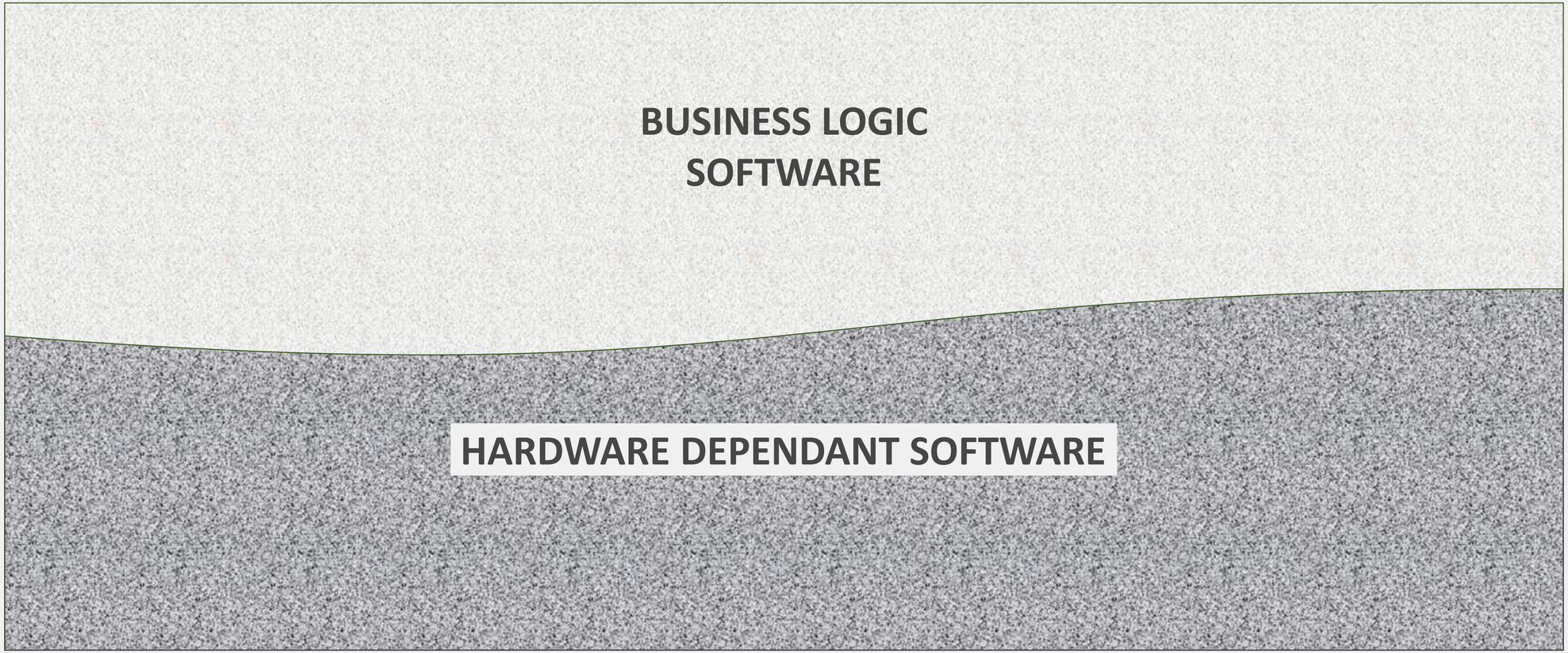
Not clearly defined boundary



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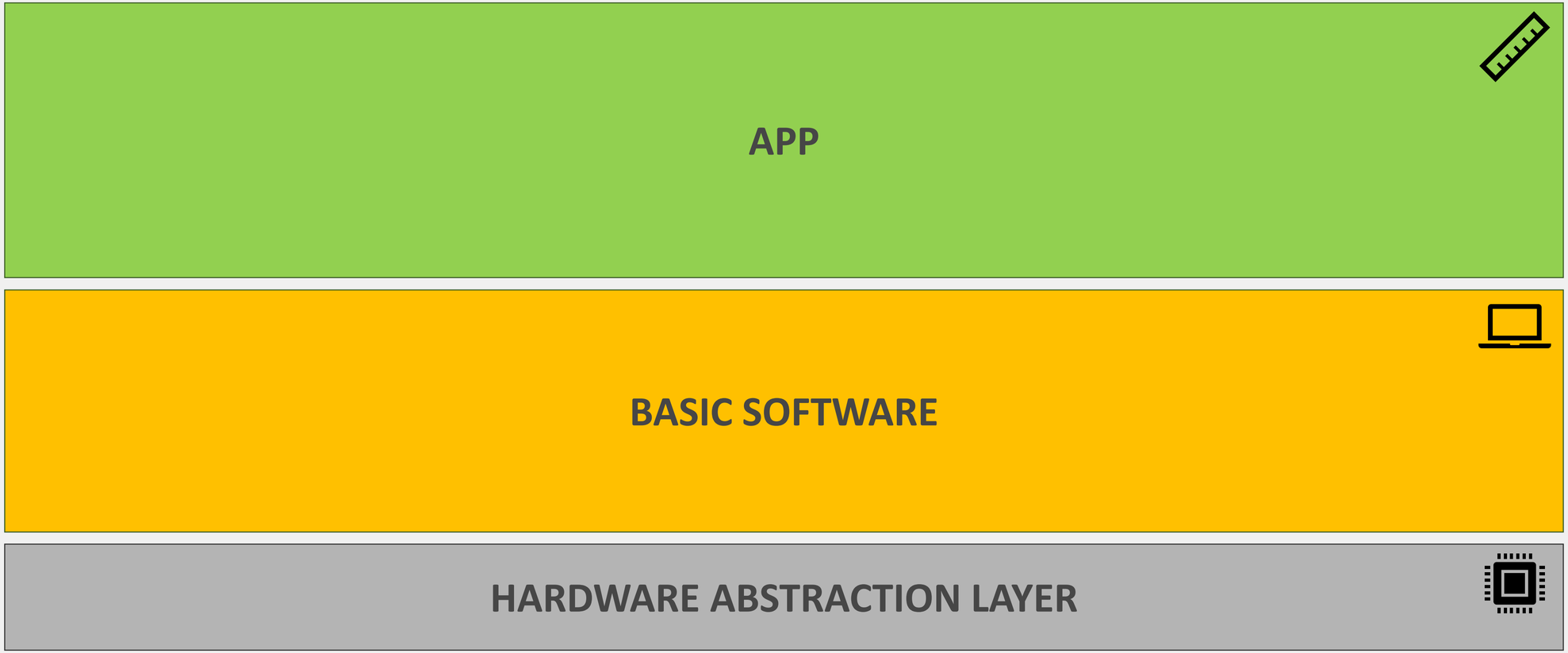
Layered SW architecture



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Standardization

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- In 1993 a consortium of German carmakers defined a first attempt of a standardized SW architecture for automotive application, named OSEK
- In the meanwhile Renault and PSA in France were working on a similiar project named VDX
- In 1994 Renault and PSA joined the OSEk consortium, and the official name of the standard became OSEK/VDX
- The OSEK/VDX specification has been adopted by the **AUTOSAR (AUtomotive Open System ARchitecture)** consoritum, which defined the namesake SW architecture that is currently de de-facto standard for automotive applications

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AUTOSAR Classic

The 284 AUTOSAR Partners

https://www.autosar.org/fileadmin/ABOUT/AUTOSAR_EXP_Introduction.pdf

9 Core Partners

BMW Group
BOSCH
Continental
Ford
DAIMLER
PSA GROUPE
GM
TOYOTA
VOLKSWAGEN AG

2 Strategic Partners

DENSO Crafting the Core
LG Life's Good

55 Premium Partners

ALTRAN
APTIV
APTJ
ASSYSTEM
Autoliv
Baidu 百度
CEA
BlackBerry
DASSAULT SYSTEMES
Deloitte.
dSPACE
EB
Capgemini
ETAS
Fraunhofer FOKUS
Great Wall
Green Hills SOFTWARE
HCL
HELLA
eSOL
HONDA The Power of Dreams
HUAWEI
HYUNDAI MOTOR GROUP
Infineon
itk ENGINEERING
CETC
JTEKT
iav
intel
ixia
KPIT
L&T Technology Services
LEAR
LUXOFT
MathWorks
NEC
NVIDIA
Panasonic
Mentor Graphics
MITSUBISHI ELECTRIC Changes for the Better
RENESAS
SCSK
NISSAN
NXP
SUMITOMO ELECTRIC
RENAULT
TATA CONSULTANCY SERVICES
sodius
TATA MOTORS
TATA
TATA ELXSI
thyssenkrupp
Valeo
VECTOR
VOLVO
WIND
ZF see, think, act.

50 Development Partners

ABUP 艾拉比
avelabs
AVIN Systems
BASELABS
C2A
codeplay
eJad
easycore
Freetech
GAIO TECHNOLOGY
HANECS
HSAE
HINGE MIND
INCHRON
INTREPID
IP Cams
KRONO-SAFE
Z SYSTEM
itemis
ixia
NCES
nordsys
LAUTERBACH
MATRICKZ
REACH
PopcornSAR
pls
OPENSYNERGY
PROA
rti
RTAE
RTst
seneos
softing
SYSGO
Timing Architects
TTTech
VALIDAS
VEROLT
wafer space

146 Associate Partners
22 Attendees

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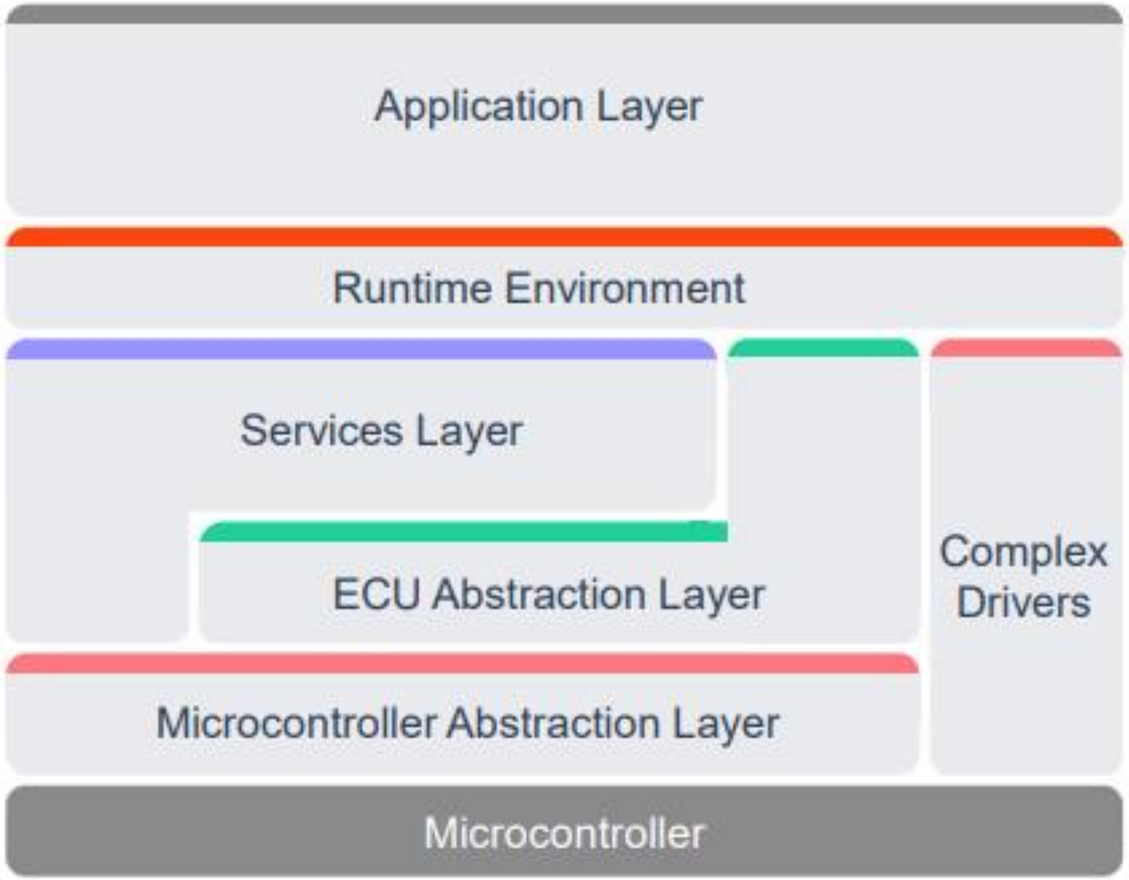
AUTOSAR Classic Platform

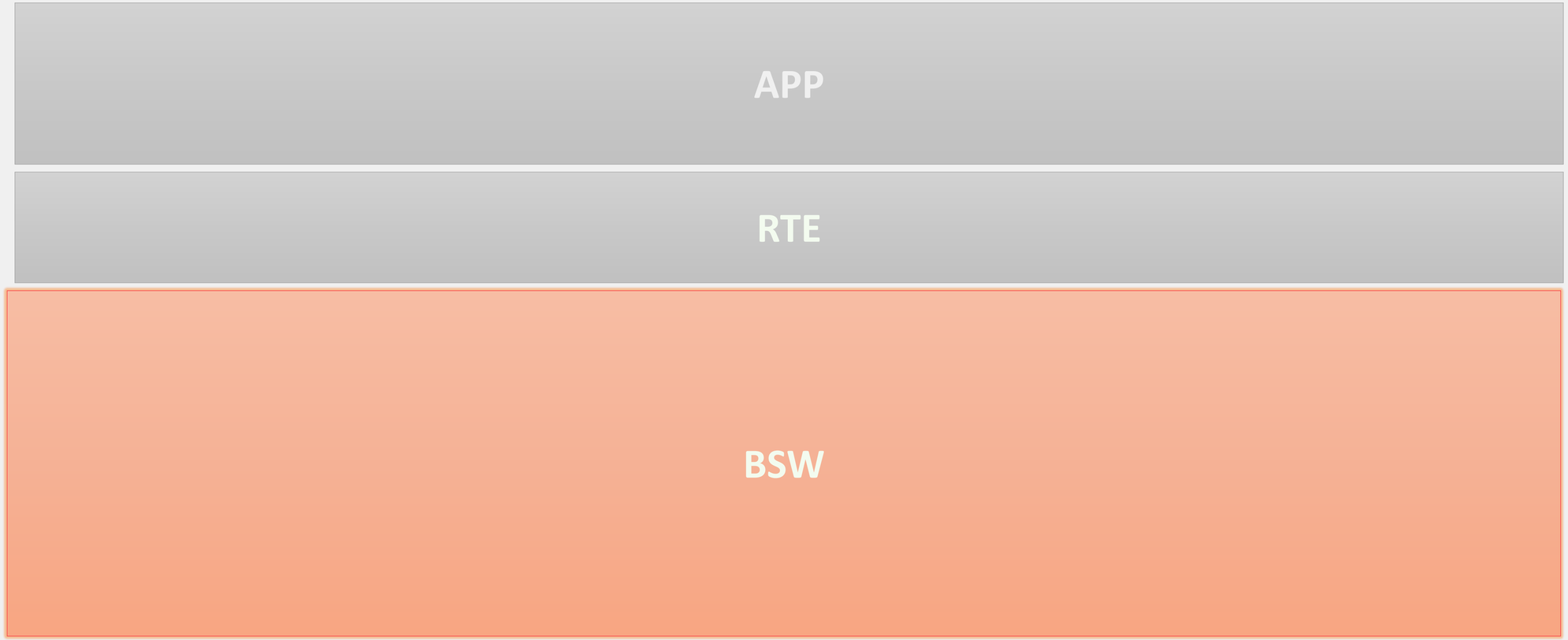
Layered Software Architecture (1/2)



The layered architecture of the classic platform basically supports

- Hardware abstraction
- Scheduling of runnables and tasks (OS)
- Communication between applications on the same hardware and over the network
- Diagnosis and diagnostic services
- Safety- and
- Security Services

Basic Software (BSW)



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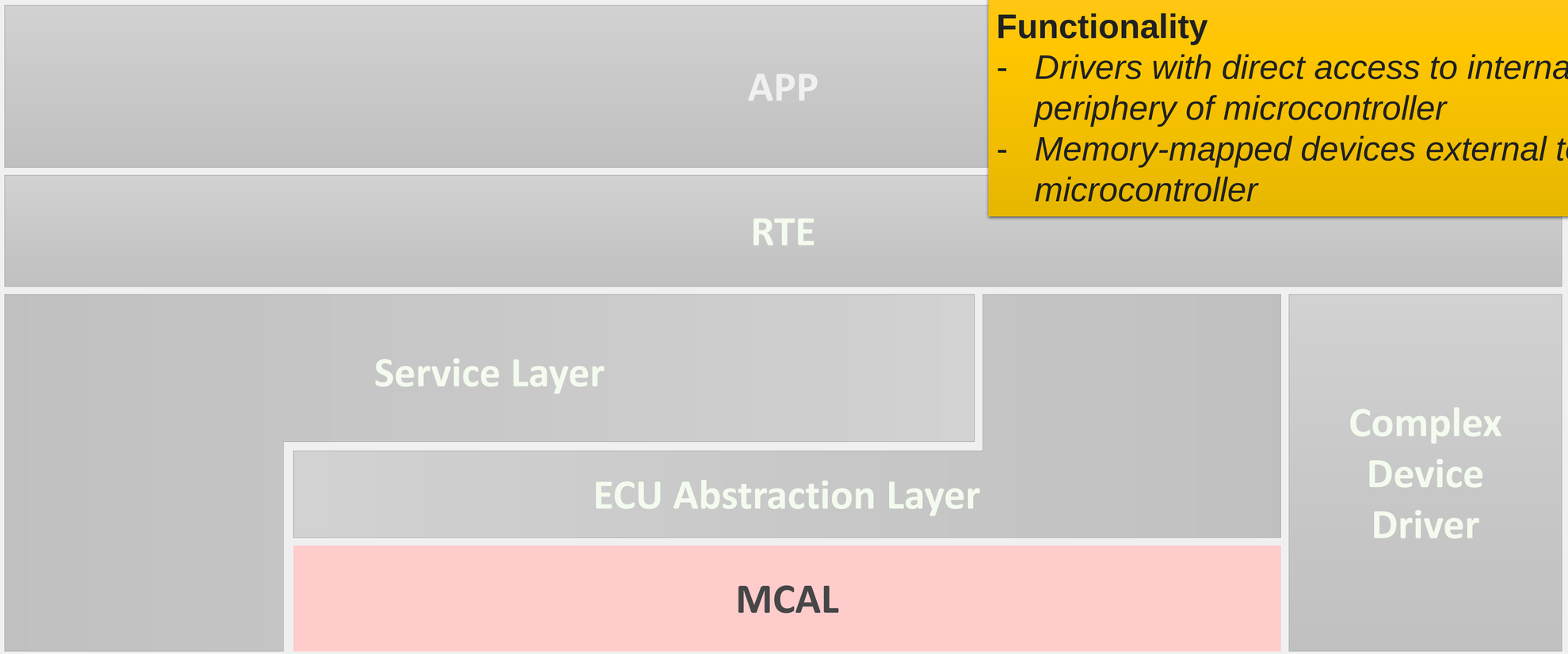
BSW: MicroController Abstraction Layer

Task
- *Make higher layers independent of microcontroller*

Functionality
- *Drivers with direct access to internal periphery of microcontroller*
- *Memory-mapped devices external to microcontroller*



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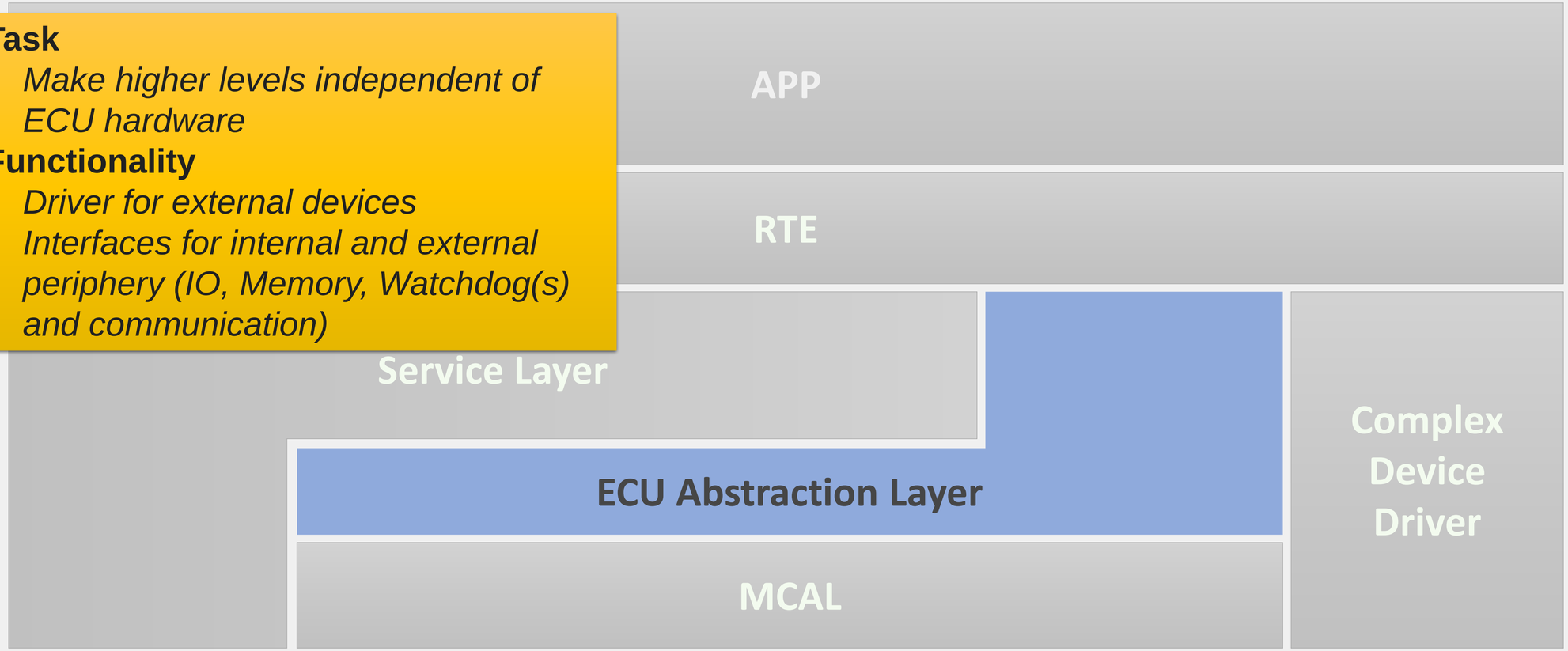
BSW: ECU Abstraction Layer

Task
- *Make higher levels independent of ECU hardware*

Functionality
- *Driver for external devices*
- *Interfaces for internal and external periphery (IO, Memory, Watchdog(s) and communication)*



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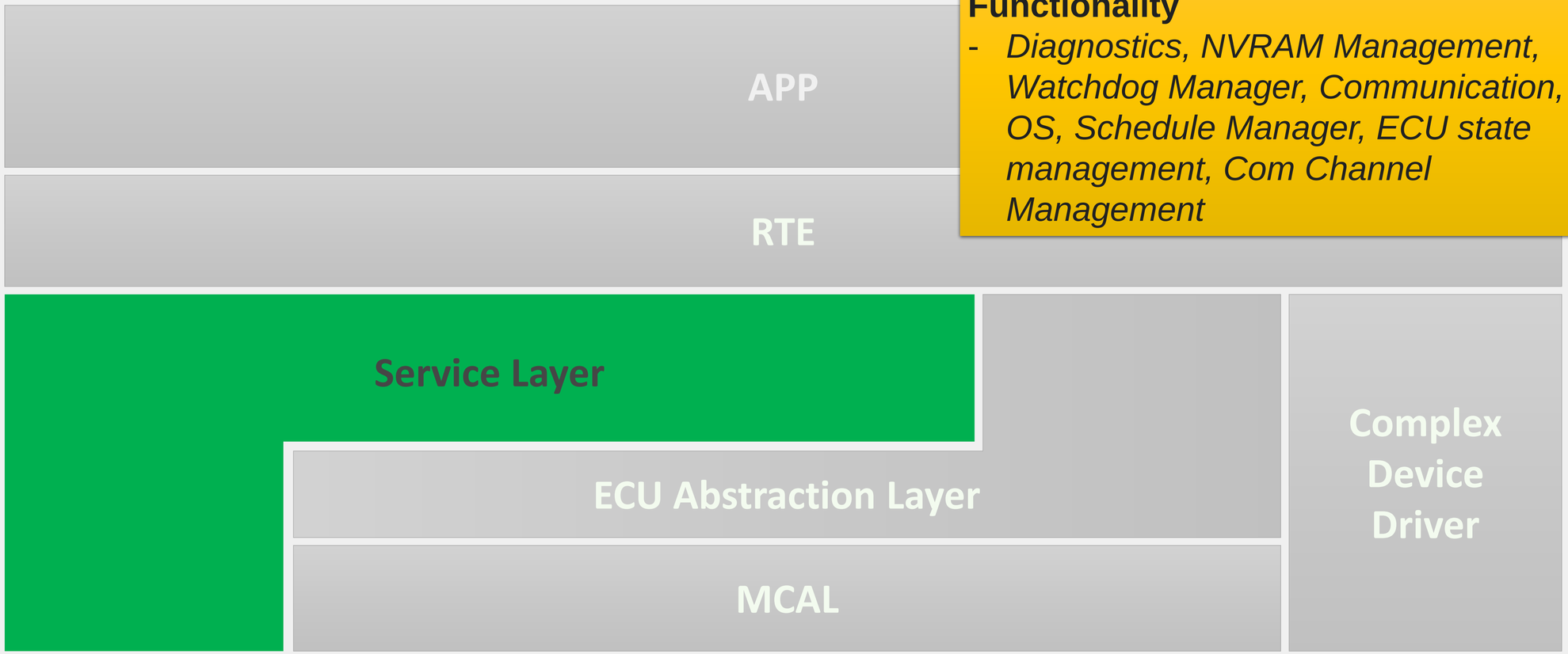
BSW: Service Layer

Task
- *Services for application*

Functionality
- *Diagnostics, NVRAM Management, Watchdog Manager, Communication, OS, Schedule Manager, ECU state management, Com Channel Management*



HARDWARE

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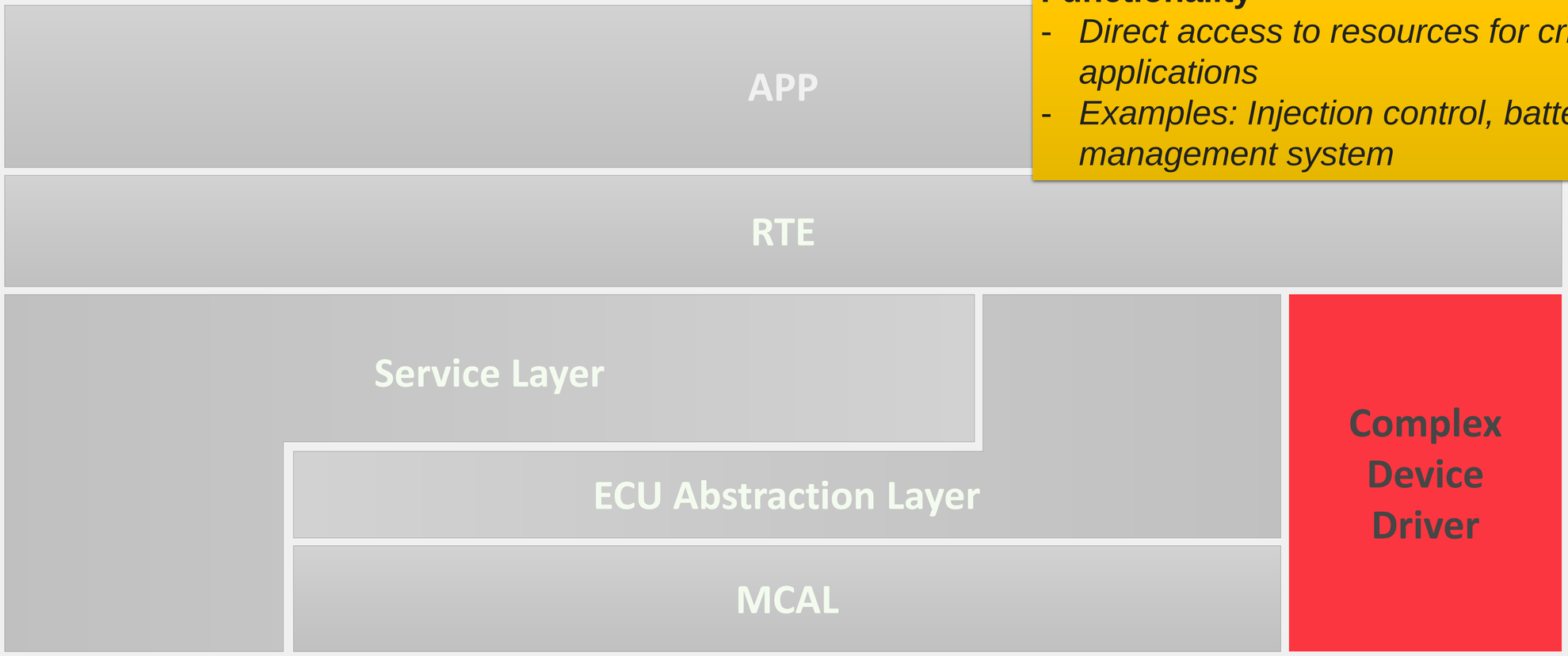
BSW: Complex Device Driver

Task
- *Offer functionality for complex sensors and actuators*

Functionality
- *Direct access to resources for critical applications*
- *Examples: Injection control, battery management system*



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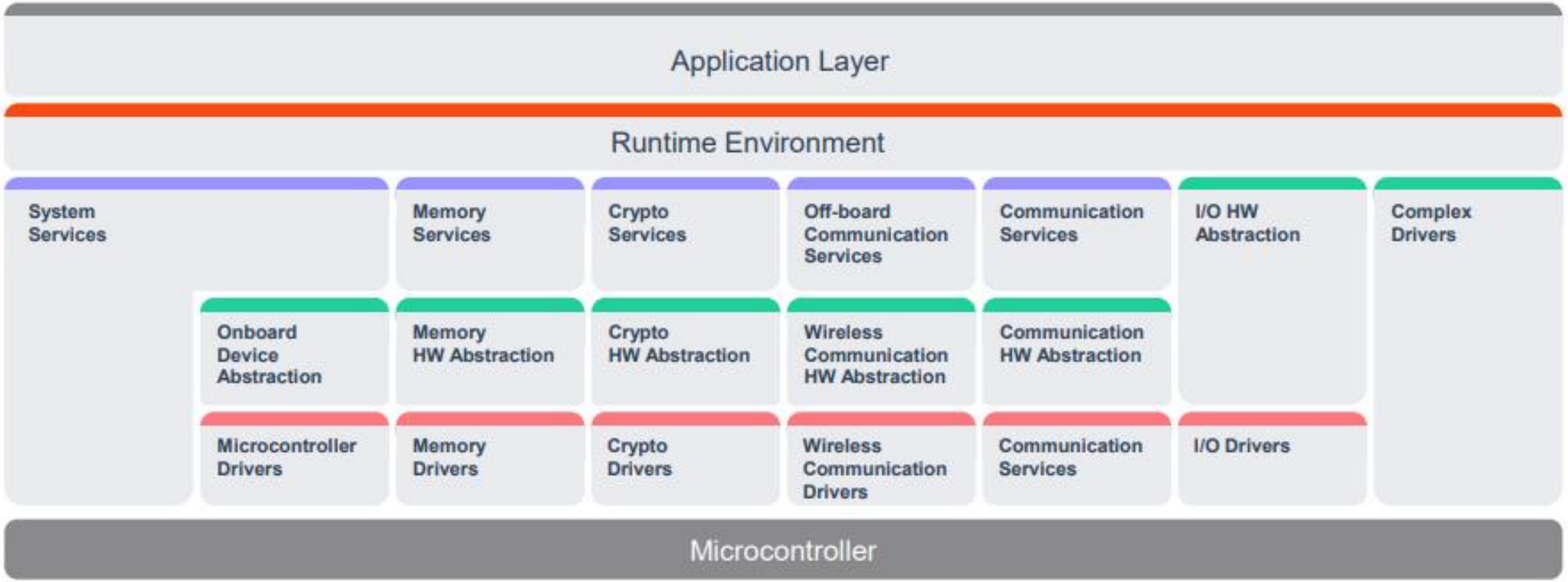
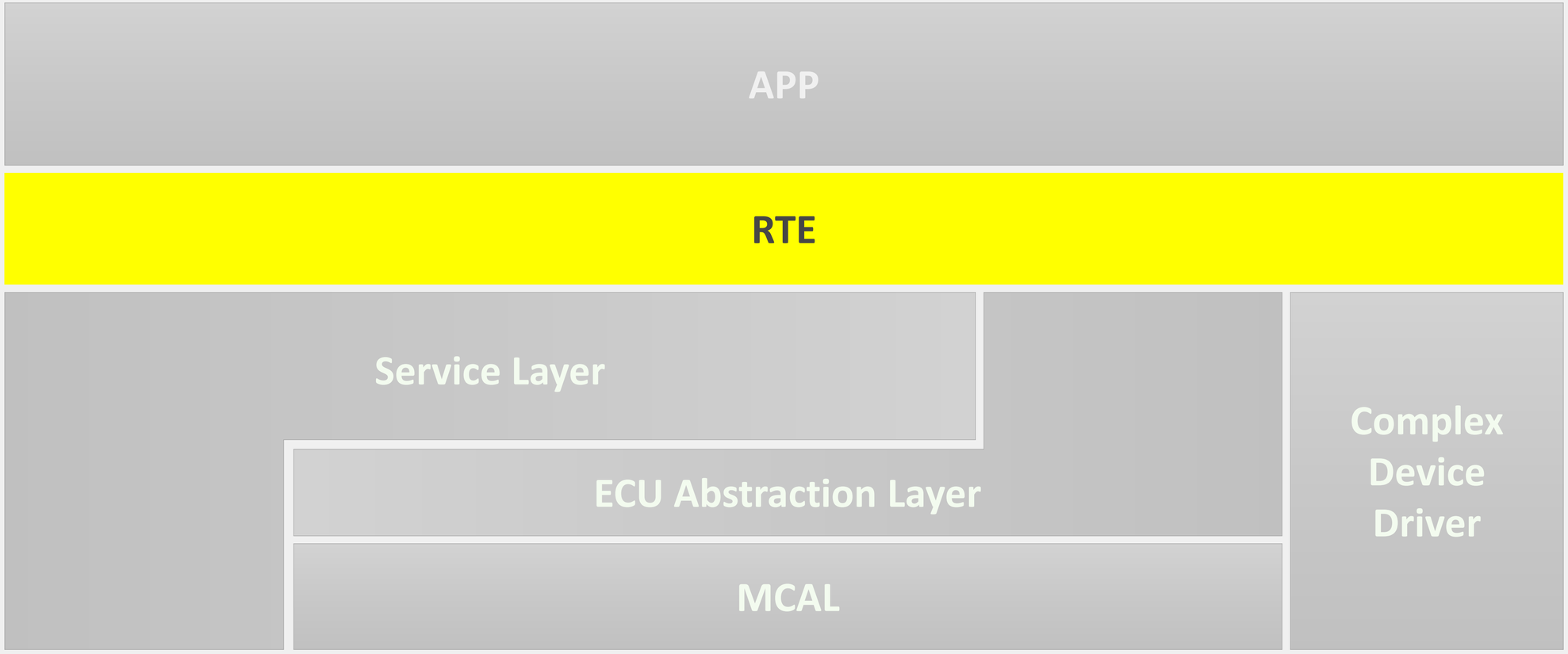
AUTOSAR Classic Platform

Layered Software Architecture (2/2)



Runtime environment (RTE)



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Application Software

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Software Components

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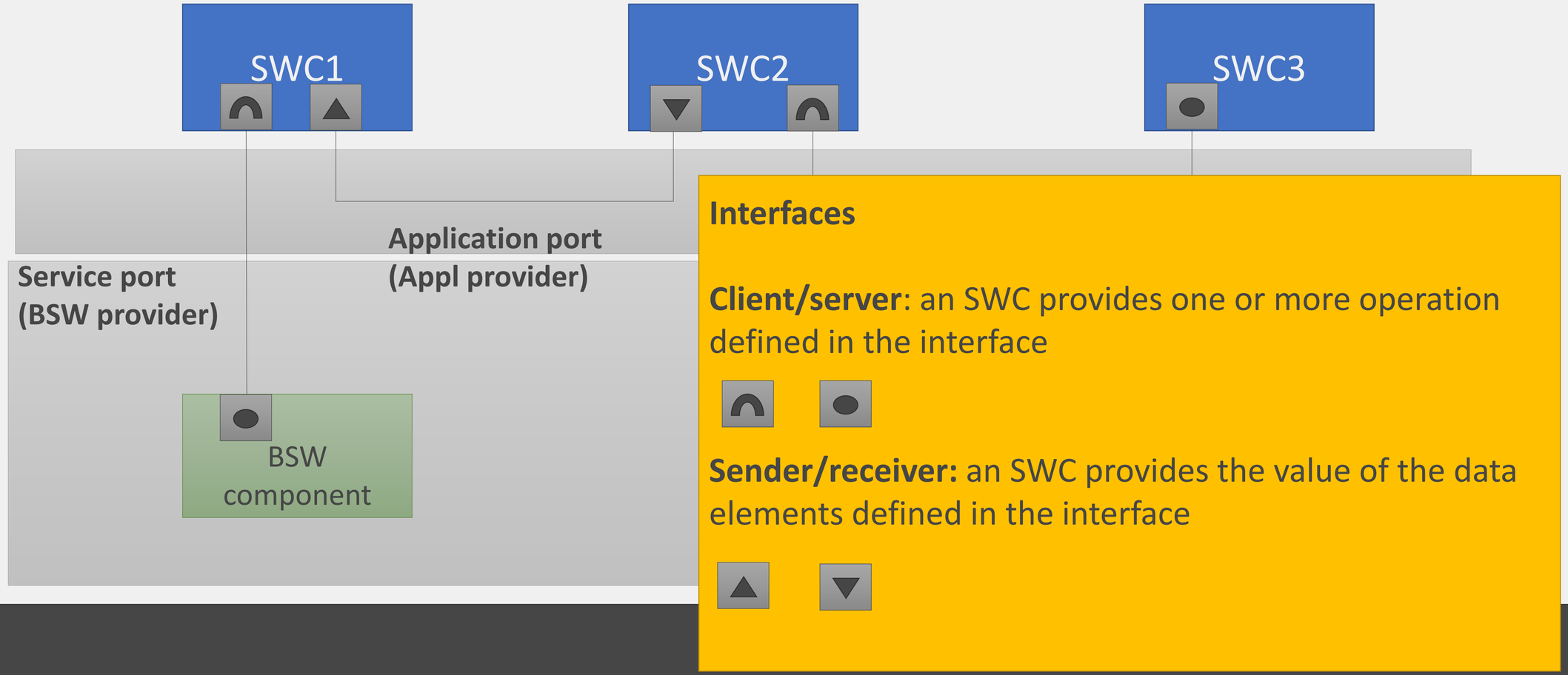
HARDWARE

Software Components



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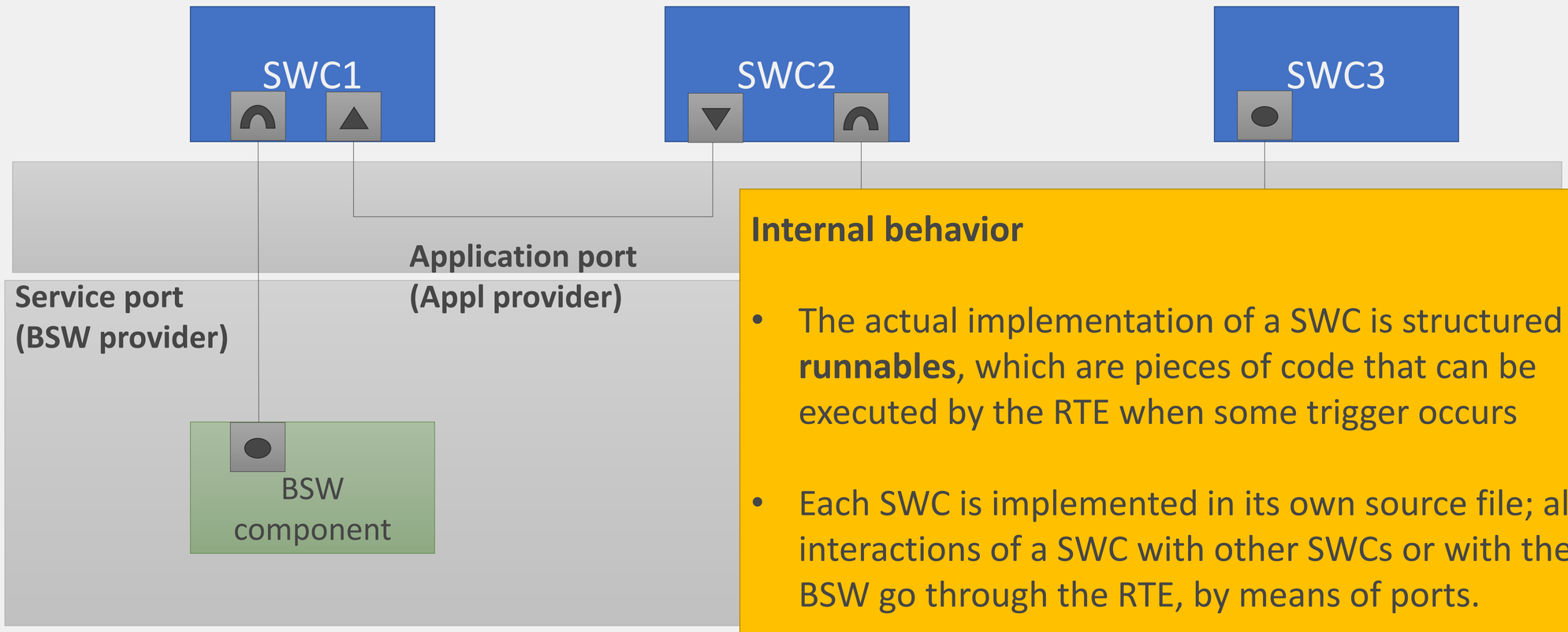
Software Components



Internal behavior

- The actual implementation of a SWC is structured in **runnables**, which are pieces of code that can be executed by the RTE when some trigger occurs
- Each SWC is implemented in its own source file; all interactions of a SWC with other SWCs or with the BSW go through the RTE, by means of ports.

Toolchain

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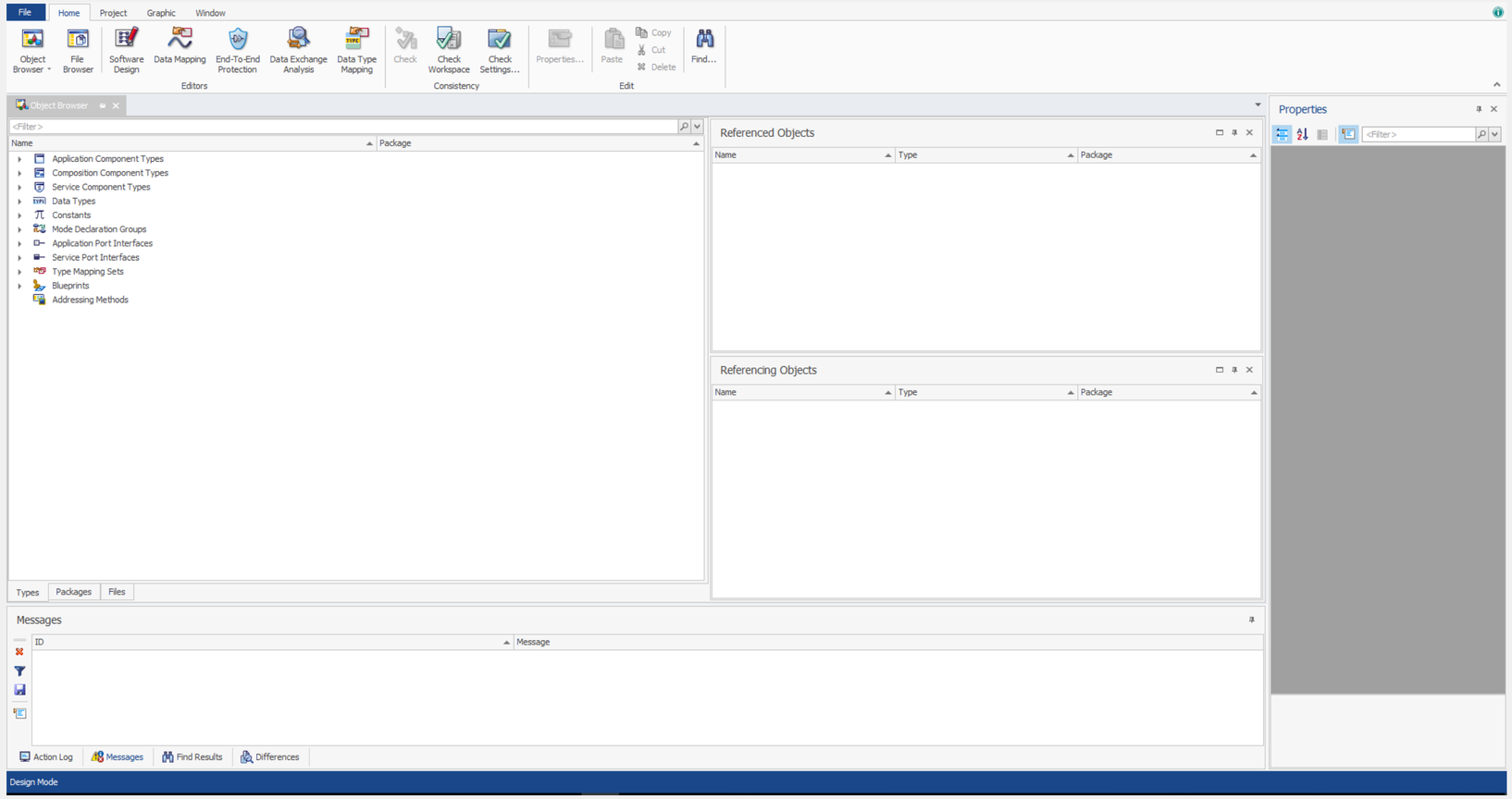
The minimum set of tools needed to develop a piece of software in an AUTOSAR framework contains the following:

- **Application design tool:** A tool that allows the developer to define the architecture of all SWCs in a project, defining all of their interfaces and internal behaviors (e.g. **Vector DaVinci Developer**)

- **BSW configurator:** According to the AUTOSAR specification, all BSW modules should be highly configurable, in order to be easily adaptable to different projects; a tool that allows to easily configure BSW modules for a project specific needs is a necessary part of the AUTOSAR development workflow (e.g. **Vector DaVinci Configurator**)

- **RTE generator:** For each ECU the developers have to create a specific RTE instance; this is done via automaticgenerators, usually embedded in either the BSW configurator or in the application design tool (Vector DaVinci configurator includes an RTE generator)

DaVinci Developer



- SWC modeling
- Architecture design
- Import/Export SWCs
- Validate architecture
- Map ports to network

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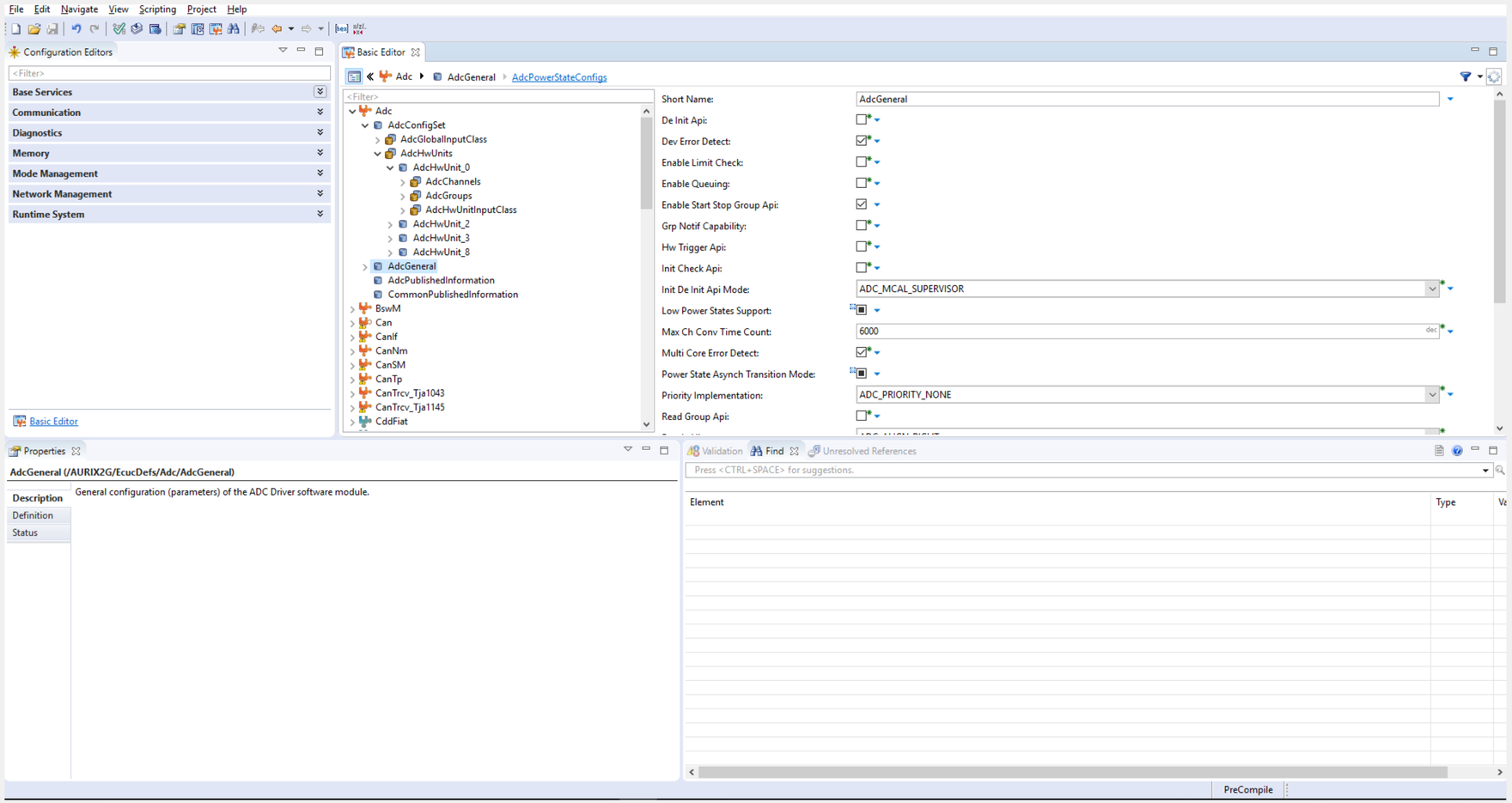
DaVinci Configurator



- BSW configuration
- RTE generation
- Validate configuration
- Generate SWC templates
- Map AUTOSAR services

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AUTOSAR Adaptive

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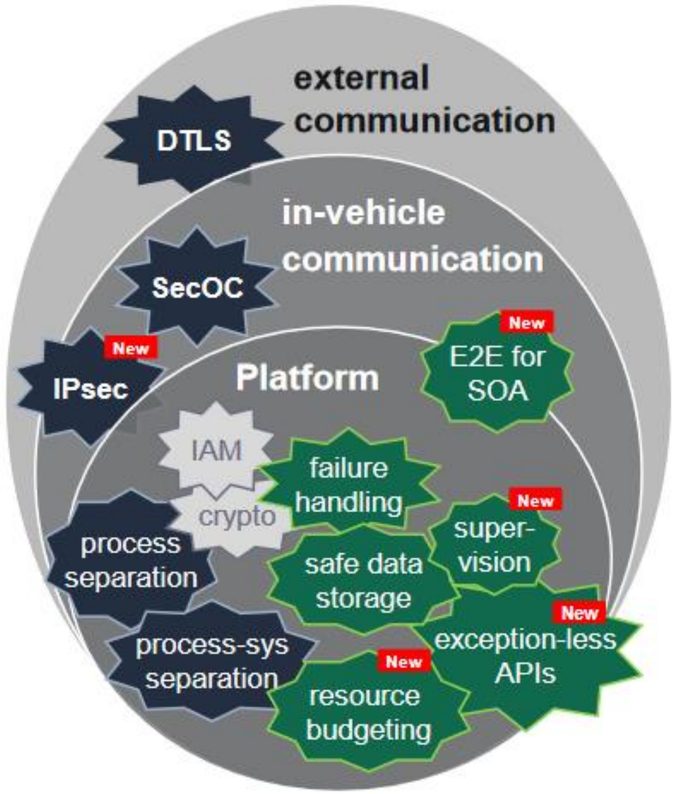
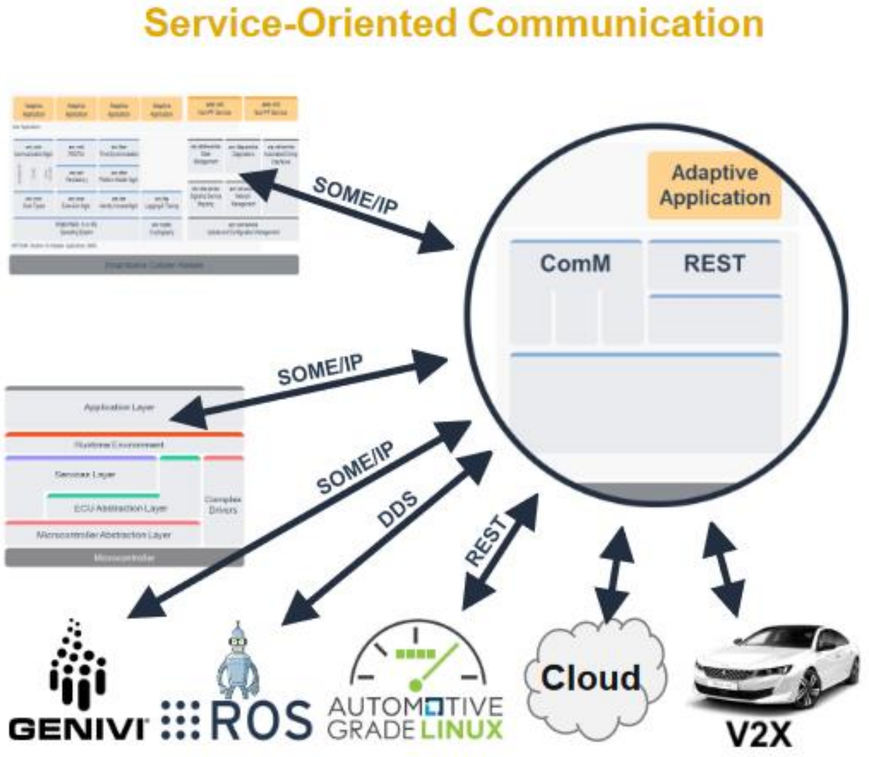
AUTOSAR Adaptive Platform

The 3 Pillars of the Adaptive Platform …

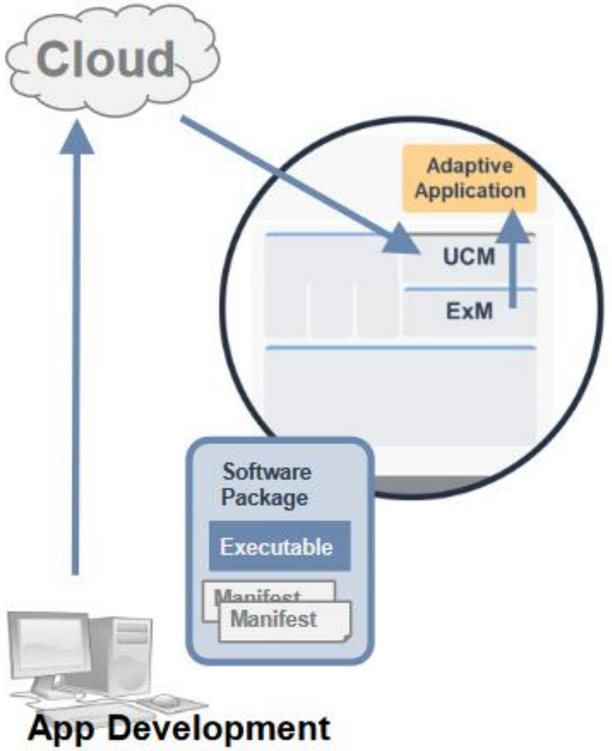
I – Safe & Secure



II – Connected



III – Dynamic & Updateable



… are the prerequisite for ADAS applications

AUTOSAR Classic	AUTOSAR Adaptive
CAN communication	Ethernet communication
Single Core processor	Multi core processor
Low computing power	High computing power
C implementation	C++ implementation
Layered architecture	Service-oriented architecture (SOA)
Rare SW updates	Frequent SW update
OSEK OS	POSIX OS

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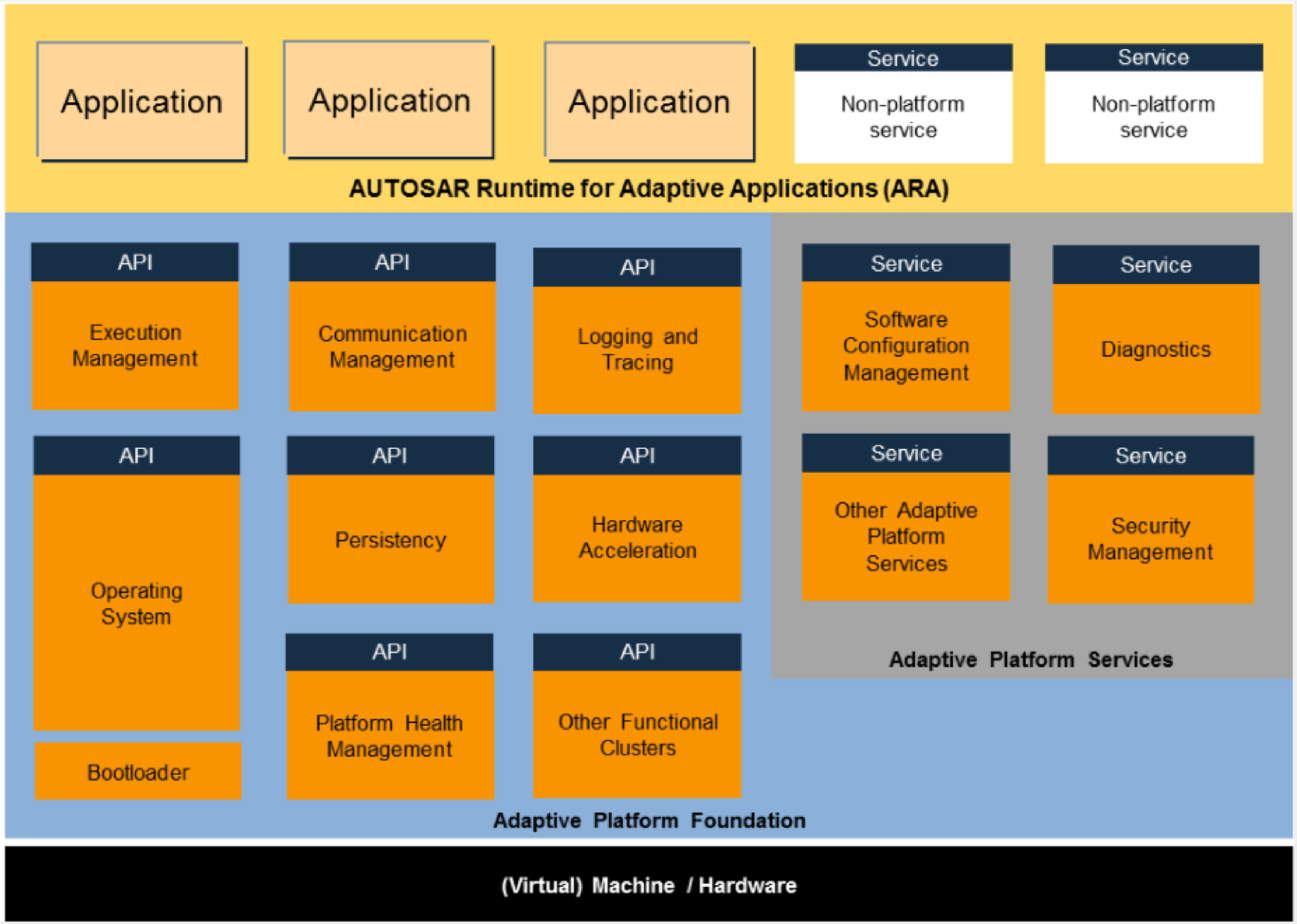

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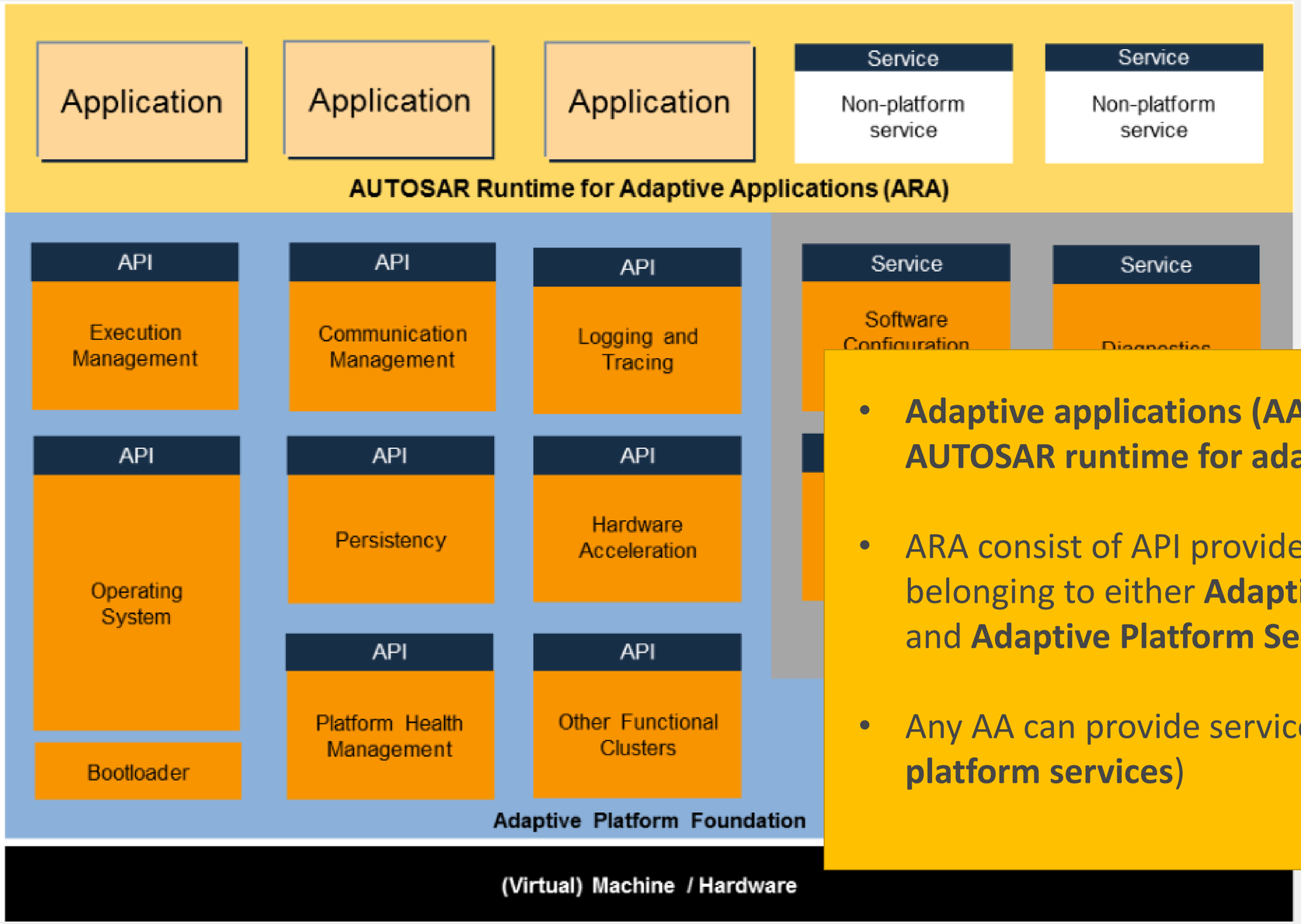

- **Adaptive applications (AA)** run on top of the **AUTOSAR runtime for adaptive application (ARA)**
- ARA consist of API provided by functional clusters, belonging to either **Adaptive Platform Foundation** and **Adaptive Platform Services**
- Any AA can provide services to other AA (**Non-platform services**)

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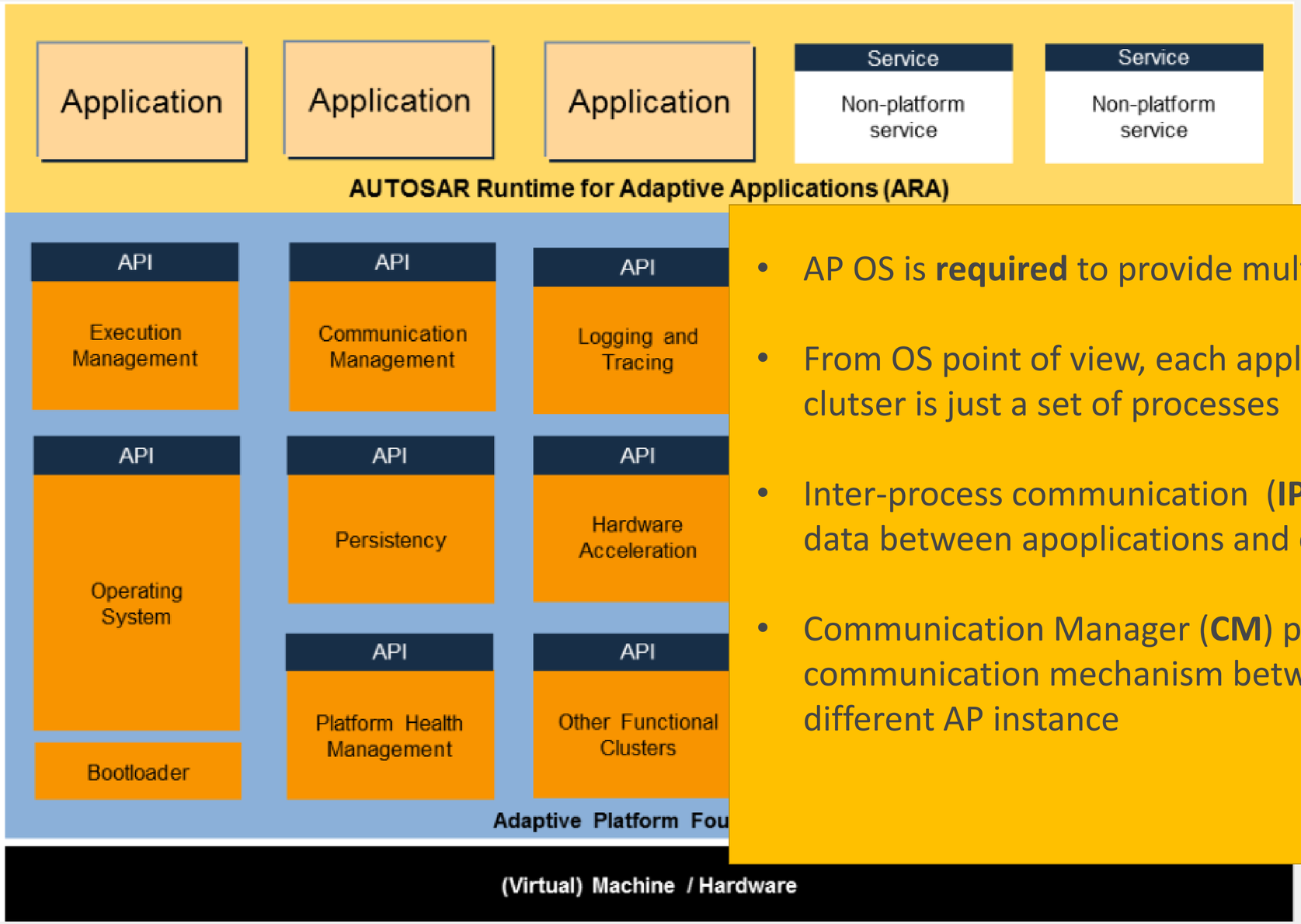

- AP OS is **required** to provide multi-process POSIX OS capability
- From OS point of view, each application and each functional clutser is just a set of processes
- Inter-process communication (**IPC**) is required to exchange data between apoplications and clusters
- Communication Manager (**CM**) provides transparent communication mechanism between applications locaterd on different AP instance

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Design of an SWC for an On-Board charger

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On board charger

- The On-board charger (OBC) is a key ECU in electric and hybrid veichles
- The OBC controls the current and voltage for charging the veichle battery
- Furthermore the OBC is responsible of managing the communication with the charging station (EVSE – Electric Vehicle Supply Equipment)

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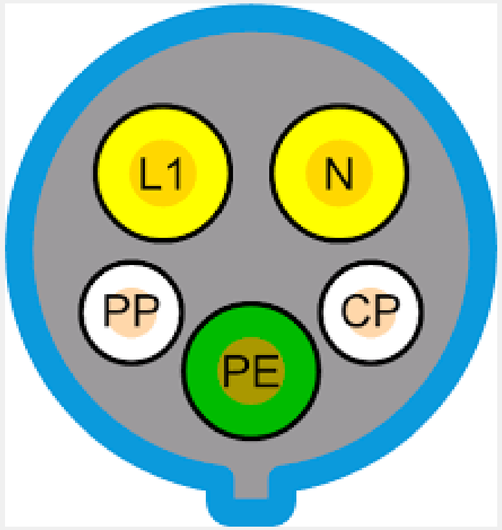
Basic communication with the EVSE

- When the connector is plugged in the electric vehicle (EV), a basic communication mechanism between the veichle and the EVSE is started
- The communciation runs on one of the wires of the connector, the so called **control pilot (CP)**
- The EVSE can generate a PWM signal on the CP line, the duty cycle of this signal is used to provide some information to the veichle
- The EV can indicate to the EVSE if the veichle is ready to charge or not by closing a switch on its side of the CP circuit (**S2 swicth**)



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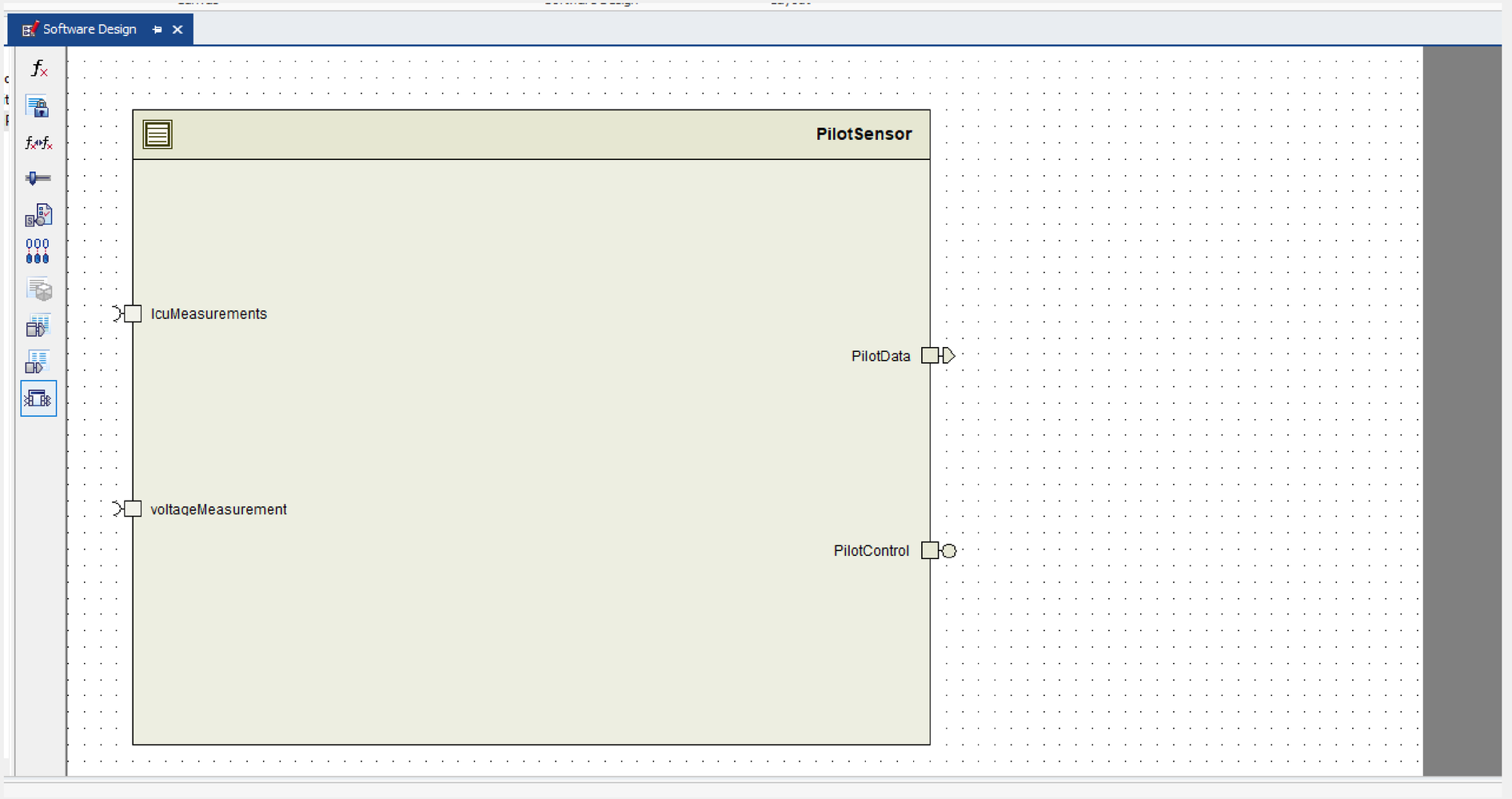
SWC Design: PilotSensor - Overview



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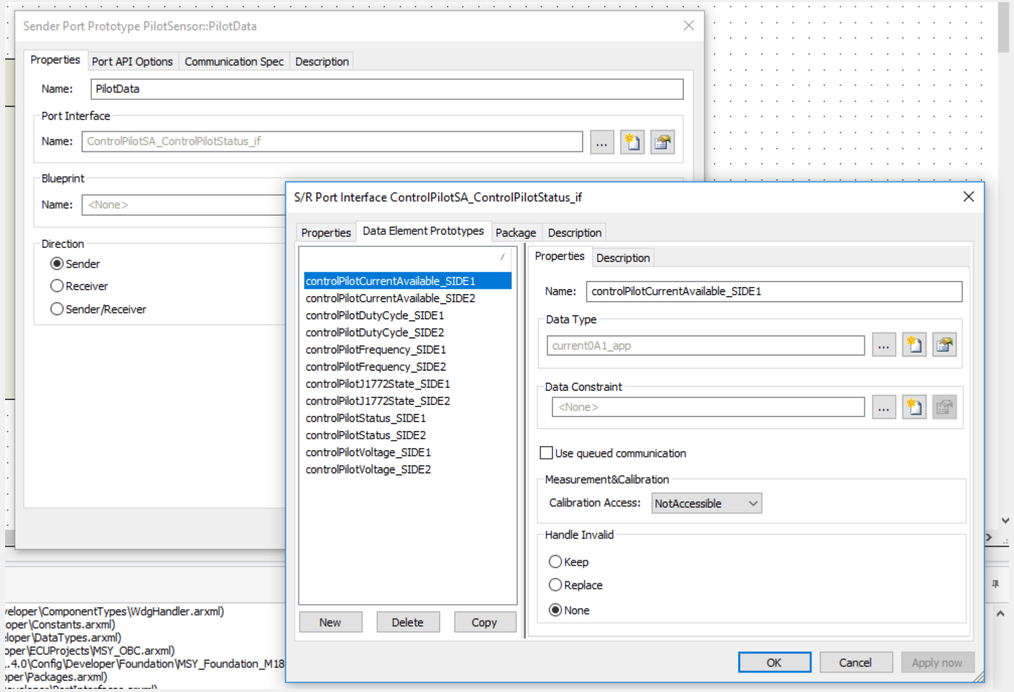
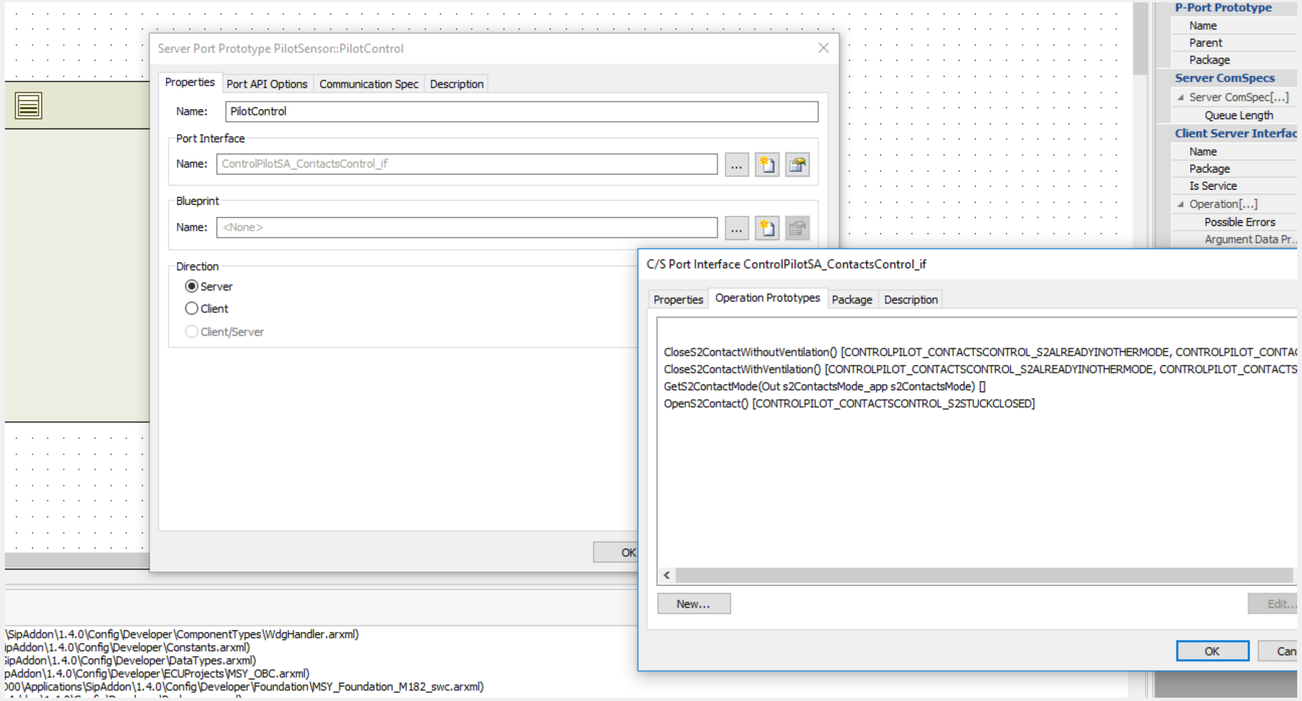
SWC Design: PilotSensor - Ports





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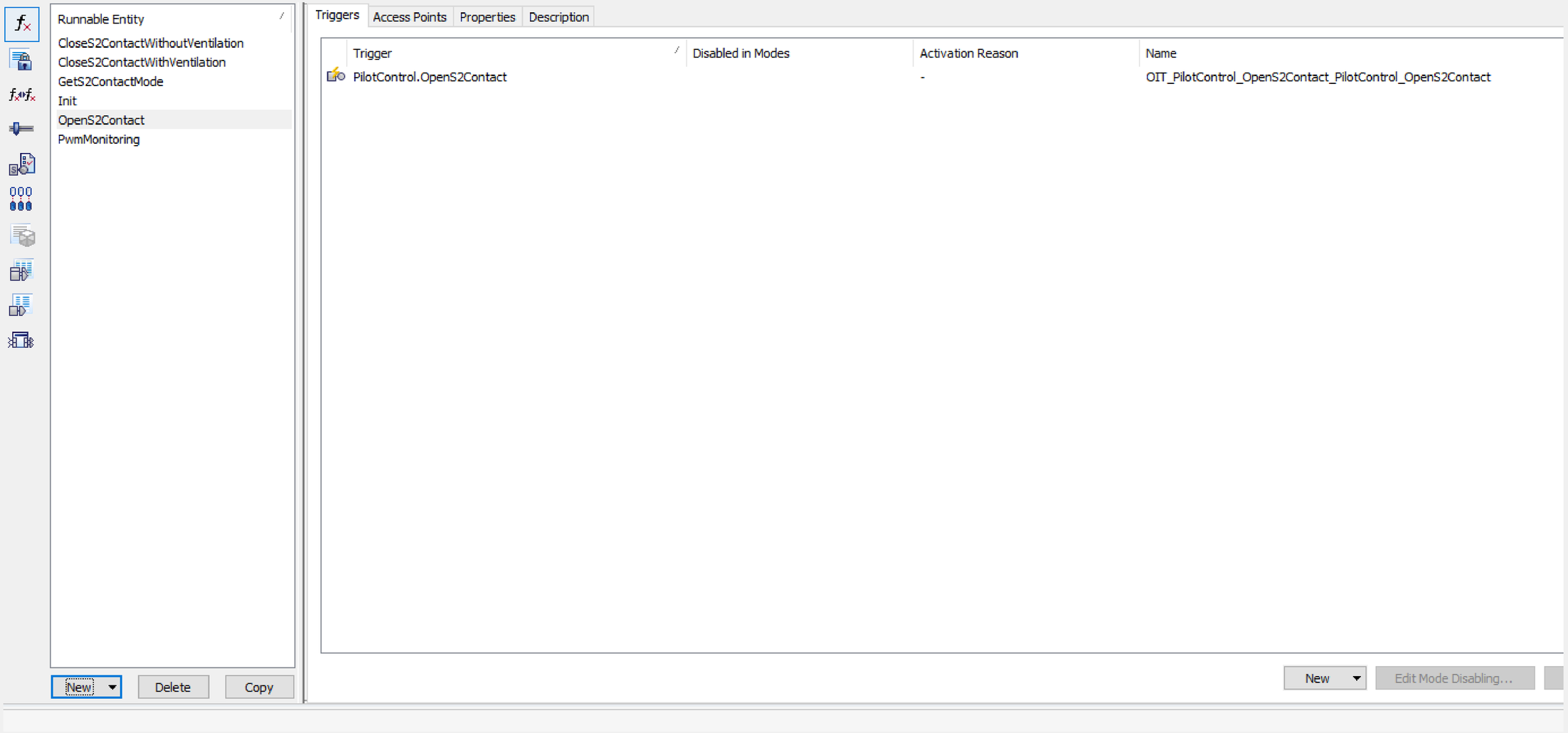
SWC Design: PilotSensor - Runnables



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SWC Design: PilotSensor –PilotSensor.c template

```
FUNC(Std_ReturnType, PilotSensor_CODE) CloseS2ContactWithVentilation(void) /* PRQA S 0624, 3206 */ /* MD_Rte_0624, MD_Rte_320
{
/**********************************************************************************************************************
 * DO NOT CHANGE THIS COMMENT!          << Start of runnable implementation >>            DO NOT CHANGE THIS COMMENT!
 * Symbol: CloseS2ContactWithVentilation (returns application error)
 *********************************************************************************************************************/

  return RTE_E_OK;

/**********************************************************************************************************************
 * DO NOT CHANGE THIS COMMENT!          << End of runnable implementation >>              DO NOT CHANGE THIS COMMENT!
 *********************************************************************************************************************/
}
```

```
/**********************************************************************************************************************
 *
 * Runnable Entity Name: CloseS2ContactWithVentilation
 *
 *---------------------------------------------------------------------------------------------------------------------
 *
 * Executed if at least one of the following trigger conditions occurred:
 *   - triggered by server invocation for OperationPrototype <CloseS2ContactWithVentilation> of PortPrototype <PilotContr
 *
 *********************************************************************************************************************
 *
 * Client/Server Interfaces:
 * =========================
 *   Server Invocation:
 *   ------------------
 *   Std_ReturnType Rte_Call_S2Ventilation_Write_IoHwAb_Dio_SetHigh(void)
 *     Synchronous Server Invocation. Timeout: None
 *
 *********************************************************************************************************************
 *
 * Runnable prototype:
 * ===================
 *   Std_ReturnType CloseS2ContactWithVentilation(void)
 *
 *********************************************************************************************************************
 *
 * Available Application Errors:
 * =============================
 *   RTE_E_ControlPilotSA_ContactsControl_if_CONTROLPILOT_CONTACTSCONTROL_S2ALREADYINOTHERMODE
 *   RTE_E_ControlPilotSA_ContactsControl_if_CONTROLPILOT_CONTACTSCONTROL_S2STUCKOPEN
 *
 *********************************************************************************************************************/
```

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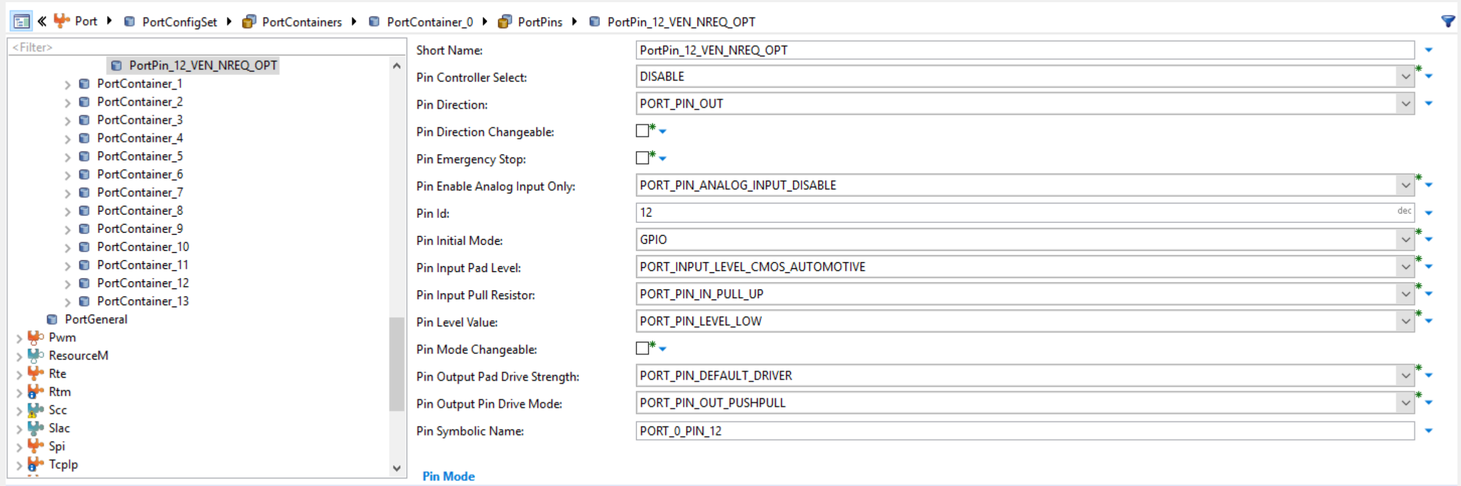
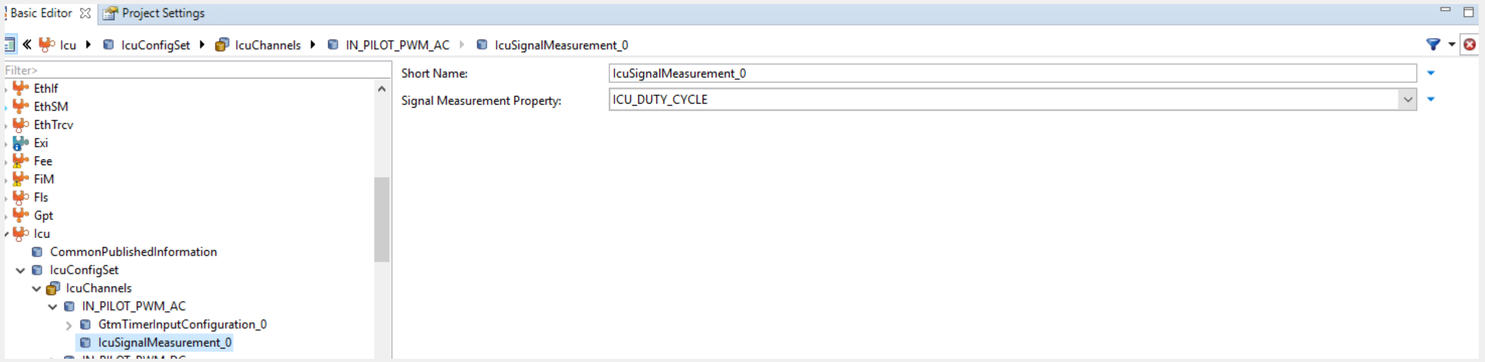
SWC Design: PilotSensor – BSW configuration





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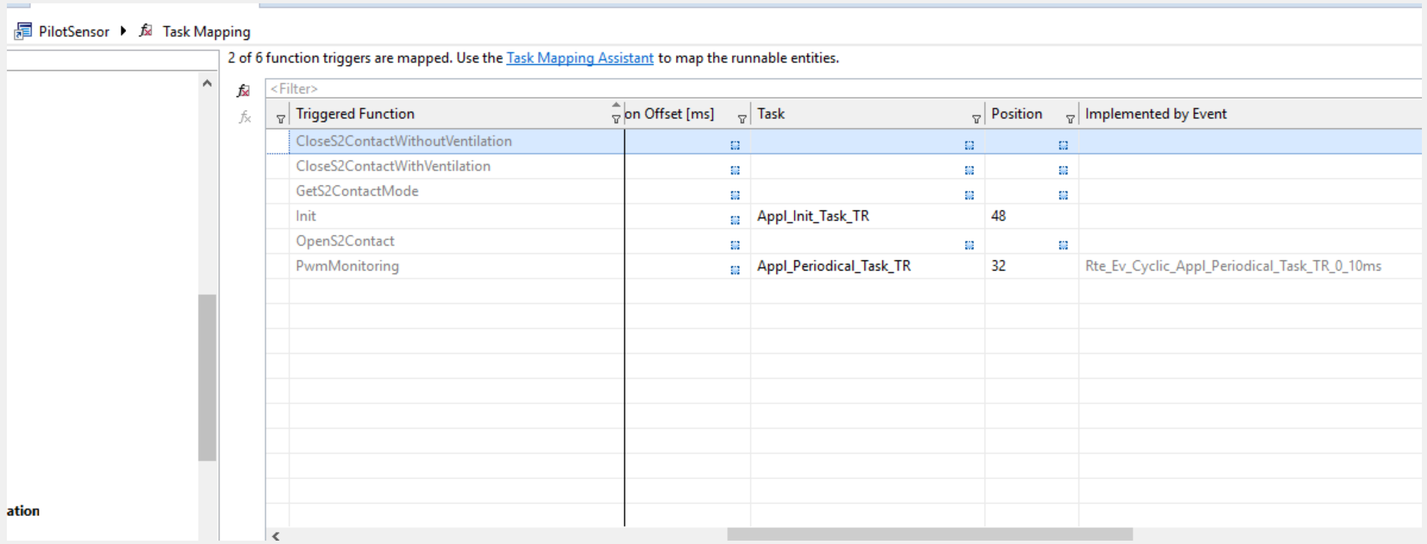
SWC Design: PilotSensor – BSW configuration



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SWC Design: PilotSensor – To summarize

- We created a new SWC named PilotSensor, responsible of managing everything relating to the CP line
- We added ports to our SWC in order to provide/access data and operations to/from other SWCs
- We created a set of runnable entities, defining triggers and access points for each of them
- We generated a SWC template, providing us empty function stubs for each runnable
- We configured BSW modules that are involved in CP functionalities (Port, Icu, etc…)
- We mapped the runnables to appropriate OS tasks
- At this point we would continue by implementing all the runnables in our SWC; our PilotSensor will then be ready to use and easy to export to a different OBC project if needed

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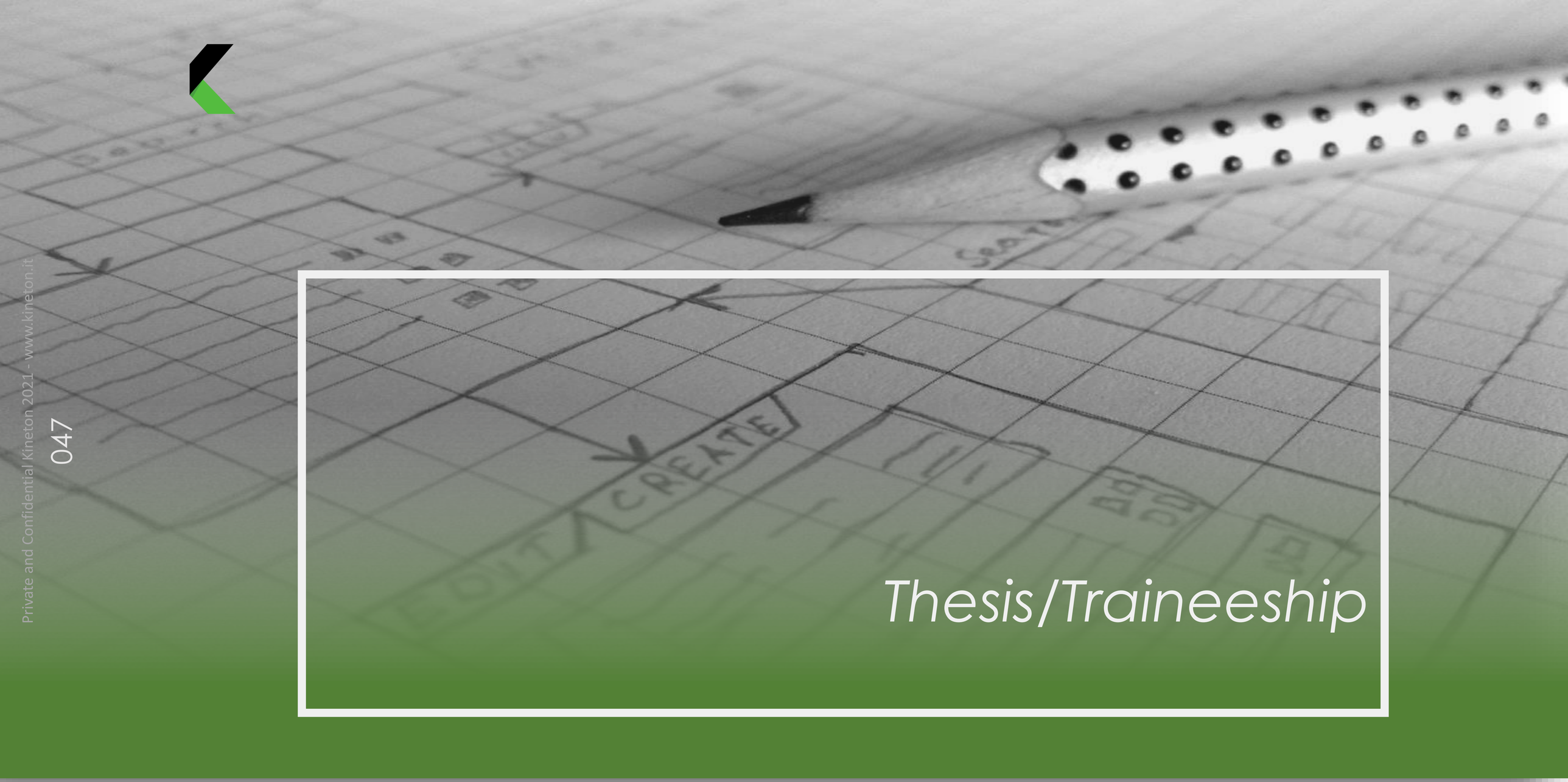

Thesis/Traineeship

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- Diagnostica remota DoIP
  https://www.linkedin.com/posts/kinetonsrl_tesi-doip-activity-6769591026064642048-9mpF

- SW per l'analisi della messaggistica CAN
  https://www.linkedin.com/posts/kinetonsrl_can-analyzer-activity-6767044654769741824-Yfi_

- Cybersecurity applicata alle ECU
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- Architettura SW con standard AUTOSAR
  https://www.linkedin.com/posts/kinetonsrl_tesi-autosar-dev-activity-6761978789439307776-TAHD

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