



RTA Application Note Add NvM configuration to Project

RTA-CAR



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1 Introduction

1.1 Scope

This application note describes how to integrate into an existing ISOLAR project the Memory Stack configuration using PIMs. The document contains an explanation step by step of the workflow to follow to obtain a working project able to be executed on a virtual target. A sample project is provided along with this document configured as shown in this application note. The starting project used to create this AN is the one obtained following the AN "Project from scratch".

1.2 Definitions and Abbreviations

BSW: AUTOSAR Basic Software, Hardware independent service layer

RTE: AUTOSAR Real Time Environment

OS: AUTOSAR Operating System

SWC: Software Component

1.3 Conventions

The following typographical conventions are used in this document:

'Choose **File -> Open**' -> Menu commands are shown in boldface

Click **Ok** -> Buttons are shown in boldface

Press -> Keyboard commands are shown in angled brackets

The "Open File" dialog box is displayed -> Names of program windows, dialog boxes, fields, etc. are shown in quotation marks.

Select the file setup.exe -> Text in drop-down lists on the screen, program code, as weel as path- and file names are shown in the Courier font.

1.4 Assumptions

You must have the following ETAS software installed:

- ISOLAR-AB 6.0.1
- RTA-BSW 5.0
- RTA-OS 5.6.4
- RTA-RTE 6.8
- ISOLAR EVE 3.2.2

This application note could be used as a reference for any generic AR based project.

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2 Tool overview

2.1 ISOLAR-AB

ISOLAR-A is the AUTOSAR Authoring Tool that assists users in designing application software to AUTOSAR standards. It provides a graphical interface to generate, import and modify arxml describing the SWC and System design. ISOLAR-A provides also feature to automatically create system configuration importing legacy files (such as DBC and LDF) and support arxml merger. ISOLAR-A output is the set of arxml containing the System Design configuration.

ISOLAR-B is BSW Configuration tool based on a single domain model (ARTOP) architecture, providing a number of advantages when building AUTOSAR system and ECU software. ISOLAR-B output is the set of EcuC Values containing the BSW modules configuration.

2.2 RTA-RTE

RTA-RTE generates the RTE code (*.c and* .h files). The RTE generator takes in input the SWC and System description generated via ISOLAR-A and provides in output the RTE implementation that will be integrated in the software project.

RTA-RTE outputs include:

- OS configuration required to sustain the System configuration (OsNeeds.arxml) to be imported in RTA-OS to maintain automatically aligned System and OS configuration (the OS configuration shall be completed in RTA-OS)
- Measurement and calibration description (McSupportData) that can be imported in a A2L generator supporting AUTOSAR.

2.3 RTA-BSW

RTA-BSW provides the following main features:

- **RTA-BSW ConfGen** uses the System Description and ASW Configuration(s) to create a default BSW Configuration using ECUC Value Collection ARXML. RTA-BSW can automatically generate the configuration for the communication stack (Can and Lin supported) and the Memory stack. The generated EcuC values consist in a complete configuration of the interested module (although it's possible to expand the configuration in a later stage) that allows the user to move to the next step, the code generation.
- **RTA-BSW CodeGen** creates the BSW implementation this includes:
 - Static source code (.c and .h) for the configured modules
 - Dynamic source code for the configured module (configuration dependent)
 - BSW module description, AUTOSAR description of the BSW modules in ARXML format (_BSWMD.arxml and _SWCD.arxml)*
 - Integration code (.c and .h), template files to help the user in the prototyping early stages (no production intent); the user shall modify and adapt integration code as per project requirements.

During RTA-BSW ConfGen phase, RTA-BSW generates also part of the MCAL configuration (ARMXL format) needed to sustain the BSW configuration. This configuration can be imported in the MCAL configuration tool to automatically synchronize the two AUTOSAR layers.

2.4 RTA-OS

RTA-OS provides a graphical interface to configure the AUTOSAR Operating System, and generate the relative source code (or linkable library). The synchronization between OS configuration and System configuration (ISOALR-AB) is implemented sharing a subset of



AUTOSAR description file across the tools. The Operating System has dependency to the Hardware target and the C compiler; ensure your RTA installation is compatible with your embedded set-up.



3 Sample project overview

The final project will be a System composed by 2 ECUs (EcuA and EcuB) where only EcuA will be configured. Besides the 2 starting SWCs a new SWC and the memory stack will be added.

Below a short list of the steps described in Chapter 4:

- configuration in ISOLAR-A of a new application SWC: ports, internal behaviour, runnables, events, data access points, PIMs.
- update of the composition
- ECU extract generation
- in ISOLAR-B creation of an EcuC Value Collection
- confgen using RTA-BSW
- udpate of Rte and Os modules with mapping of ASW SWCs on tasks
- codeGen using RTA-BSW
- mapping of BSW modules on tasks
- ECU Extract regeneration
- RTE regeneration



4 Workflow description

4.1 Part 1 - ASW Configuration

In this first part ISOLAR A is used to configure the ASW layer of the System; a new SWC prototype will be created; it will be executed each 500ms and will take care of reading and writing Non Volatile Memory based on commands received on ports.

NB: ISOLAR A can be accessed by selecting the "AR Explorer" in the Project Explorer view.

4.1.1 Import an existing AUTOSAR Project

Open a new Workspace in ISOLAR-AB 6.0.1.

The first step to execute is to import an existing project, in this case the result of the AN "Project from scratch" will be used. To import a project from the Menu Bar select **File -> Import...** as shown in Figure

	File	Edit Navigate	Search	Project	RTE	RTA-BSW	Run	Role Configuration
		New				Alt+Sh	ift+N⊃	s 🖪 👩 📾
		Open File						
	È,	Open Projects fro	m File Sys	tem				? ? ¬
		Close				C	trl+W	
		Close All				Ctrl+Sh	ift+W	
		Save				(Ctrl+S	
		Save As						
		Save All				Ctrl+S	hift+S	
		Revert						
		Move						
		Rename					F2	
	8	Refresh					F5	
		Convert Line Delir	miters To				;	
	Ð	Print				(Ctrl+P	
	è	Import						
	4	Export						
11								

In the pop-up window "Import" choose "General" and then "Existing Projects into Workspace", then press **Next**.

Add NvM configuration to Project



📰 Import		×
Select Create new projects from an archive file or directory.	 Ľ	1
Select an import wizard:		
type filter text		
 ✓ Seneral ✓ Existing Projects into Workspace △ File System ✓ Import ECU Workunit/Project ✓ Import Folder as AR Project □ Preferences △ Projects from Folder or Archive > ✓ C/C++ > ✓ ECU Development > ✓ Install > ✓ ISOLAR-A > ✓ Plug-in Development > ✓ Run/Debug 		
	Cance	el

A new pop-up window will appear, choose the archive file or the root directory to the existing project to be imported. If valid project files are found, they are displayed in the box below; select the desired project and press **Finish**.

Add NvM configuration to Project



⊞ Import							×
Import Projects Select a directory to sear	ch for existir	ng Eclipse proj	ects.				
 Select root directory: Select archive file: 	C:\Users\P	OV1MI\Deskto	op\Pomp	a\testProje		B <u>r</u> owse B <u>r</u> owse	
Projects:	ch (C:\User	s\POV1MI\Des	:ktop\Pon	npa\testProj	e	<u>S</u> elect / <u>D</u> eselect R <u>e</u> fres	All All h
Options Searc <u>h</u> for nested pro <u>C</u> opy projects into w H <u>i</u> de projects that alr Working sets Add projec <u>t</u> to work W <u>o</u> rking sets:	ijects orkspace eady exist in ing sets	the workspac	e	~		Ne <u>w</u> S <u>e</u> lect	
?	< <u>B</u> ack	<u>N</u> ext >		<u>F</u> inish 🔓		Cance	:I

4.1.2 Create a new SWC

Now you can create a new SWC that will be used for NvM handling. To create the SWC right click on "Software" and select **Software -> Create Component -> Elements | Application Sw Component Type** and place the SWC in the ARPackage named "SWCs".



File	Edit	Navigat	e Se	arch	Project	RTE	RTA	-BSW	Run	Role	Conf	igur	ation	Fil	e I	Build G	enerato	or 1	Wind	low	н	lelp				
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0	AR Exp	lorer 🛛	0	ECU I	Navigator	😧 File	syster	n Nav	igator																	
							Ē	€ 3	æ 👳	#	VP res	С	P	\bigtriangledown												
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		2	Create	Inter	face							>														
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	> 🕞	Bs	Create	Com	position							>	1	Elem	ent	s Com	plex De	evice	e Driv	er Sv	N C	omp	pon	ent Ty	pe	
	> @	Va	Create	Infra	structure							>	#	Elem	ent	s Ecu /	Abstrac	tion	Sw C	Comp	pon	nent	Тур	e		
		TH St:	Create	Adap	otive SW							>	2	Elem	ent	s Nv B	lock Sv	v Co	mpo	nent	Ту	pe				
	5 🛱	Deploym	ent										*	Elem	ent	s Para	meter S	Sw C	omp	onen	nt T	ype				
I													8-7	Elem	ent	s Sens	or Actu	ator	r Sw (Com	por	nent	Тур	e		
													*	Elem	ent	s Servi	ce Prox	cy Sv	v Cor	mpor	nen	nt Ty	pe			
													85	Elem	ents	s Servi	ce Sw (Com	pone	ent Ty	ype	2				
													_					-			-	-	-			

4.1.3 Create a new Port Interface

Ports connecting SWCs must have a reference to a defined Port Interface. To create a new Port interface right click on "Software" and select **Software -> Create Interface -> Create Port Interface -> Elements | Sender Receiver Interface.

File	Edit	Navigate	Search	Project	RTE	RTA-BSW	Run	Role C	Configuration	n File	Build Generator	Window	Help	
1	• 8	G 💥	4 👳	B 🔍	?	00	0	R.	R 6 4		○ • 🖗 • 👌	- *> 🔶	• =>	•
•	R Explo	orer 🛛	🧼 ECU I	Navigator	😧 Files	ystem Nav	igator		-					
						🖻 🔄	¢	#	🖫 🔗 🎗					
~ t	🤔 Myl	VewProject	[AR 4.2.2	2]										
	- 🛗	Sof C	reate Data	а Туре			:	·						
	- > (S o	reate Con	npu Metho	bd		:	· 1						
	> +	Sys C	reate Inte	rface			:	•	Create Port	t Interfa	ace	3	-)-	Elements Client Server Interface
		Bsv C	reate Con	nponent			:	*	Create Elen	nents	Port Interface Map	ping Set	+	Elements Mode Switch Interface
	> 🗟	Bsv C	reate Con	nposition			:							Elements Nv Data Interface
		Var Tin C	reate Infra	astructure			:						-	Elements Parameter Interface
	ŝ	Sta C	reate Ada	ptive SW			:						-≫-	Elements Sender Receiver Interface
	s 🖏	Deploymer	t										\$	Elements Trigger Interface
													_	

Place the Port Interface into the ARPackage named "Interfaces".

Double click on the Interface to open it with the "Data Dictionary Editor"; in "Sender Receiver Interface", select the interface from the table and press the **Add VariableData Prototype** button.



★*MyFirstMemInterface		
Interface		
This page helps to configure AUTOSAR Port Inte	erfaces	
Interfaces	orface) Daras	matar Interface) Mada Switch Interface)
Add SR Interface Add VariableDat Filter: RE Se	a Prototype arch: Add Variab	Elete Belete RE ☆ ↓ []
ARPackage		SR ShortName
> H /Interfaces	-»-	My Extended Interface
/Interfaces	-Ď-	MyFirstMemInterface

Set the Data Element name and its Type reference. The result of this step is shown in Figure below.

Interface											
This page helps to configure AUTOSAR Port Interfaces											
Interfaces	Interfaces										
Sender Receiver Interface Client Server Interf	ace Parameter Interface Mode Switch Interface	NvData Interface Trig	gger Interface								
💠 Add SR Interface 🌵 Add VariableData P	rototype 🗙 Delete										
Filter: RE Searc	h: RE 🏠 🤑	🗭 🥅 Rows : 4									
	SP ShortName	SP Is Service	VDP ShortName	VDP Type Ref							
/Interfaces	My Standard Interface	SICIS SERVICE	vor shortvarre	vor type de							
> # /Interfaces	>> ∰ /Interfaces ♦> My_Extended_Interface false										
✓	MyFirstMemInterface										
			DE_MyFirstDataElement	uint16							

Create in the asme way a second interface for the second PIM; the final result of this step is shown below:

Interface				
This page helps to configure AUTOSAR Port I	nterfaces			
Interfaces				
Sender Receiver Interface Client Server	Interface Parameter Interface Mode Switch Interfa	ce NvData Interface Ti	igger Interface	
🐥 Add SR Interface 🔶 Add Variable)ata Prototype 🛛 🗮 Delete			
Filter:	Search: RE 😚 🤑	, 拱 📄 Rows : 6		
ARPackage	SR ShortName	SR Is Service	VDP ShortName	VDP Type Ref
> # /Interfaces	My_Standard_Interface			
> # /Interfaces	My_Extended_Interface	false		
✓	MyFirstMemInterface			
			DE_MyFirstDataElement	uint16
✓	MySecondMemInterface			
			DE_MySecondDataElement	uint32

4.1.4 Create a new Port

SWCs communicate with each other through ports, the Memory SWC prototype has two provided port to eventually communicate datas to other SWCs and two RPorts to receive datas from NvM service module (created after configuation generation). To create a new port, open the SWC with "Component Editor"; in "Main" Tab press the **PPorts...** button. In the pop-up window "Port Creation Dialog", select the desired Interface.

Add NvM configuration to Project



🔚 Port Creation Dia	alog	6			_		×				
Helps to create Po	orts from the se	elected Interface	5								
Select the required i will create the ports	interfaces for whi and assign the ir	ch ports need to be iterface reference t	e created unde o the port.	r the compo	nent. This						
Reference Style	Reference Style										
Filter: RE Search: RE Grand RE Grand RE Grand RE Rews:											
Interface		No. of Entries									
> 🗔 ClientServe	rInterface	7									
✓ ■ SenderRece	eiverInterface	4									
My_Stan	dard_Interface	1									
My_Exter	nded_Interface	1									
✓ MyFirstN	/lemInterface	1									
MySecor	ndMemInterface	1									
> 🔄 ModeSwitc	hInterface	2									
Autosar Splitable	Support										
AR Element path:	/SWCs/Mem_SV	VC									
- Split the ARElema	nt into different a	ovml file									
Evisting ArEila	Split the AKElement into different arxmi file										
Existing Arrie											
ARFile name :	SWCs.arxml						¥				
?				ОК		Cance	I				

The final result of the Ports created is:

ſ	<u>-</u> 1	Mair	J &	Functions 🚿 Events 👿 IRV Others			
]⇒	<u>PP</u>	orts	◆ RPorts 🚯 PRPorts 💥 Delete		Con	figure Runnable
	9	Shov	ving: 2	/2 🖲 C 📎 🧭 Filter :			📄 🚉 🗖 RE
			Туре		Interface	Port Interface	Is Service VP
			Y	Y	Y	N N	Y
		1	►	PPort_FirstPIM	⊸	MyFirstMemInterface	
		2	►	PPort_SecondPIM	-≫	MySecondMemInterface	
L							

4.1.5 Create a new Internal Behaviour

To fill the empty SWC an "Internal Behaviour" container must be created inside which create the entities such as runnables. To create the container, right click on the SWC and select **New Child** -> Internal Behaviours | Swc Internal Behaviour





> 3 BswM > 3 CanCom > 3 ComM > 3 ComM > 4 EcuM ~ 1 Mem_SV	muni	cation_SWC			Physician Deficient Physician Deficient Set
 ↓ P Por P P P Composition > ♥ EcuA_Fla ♥ TopLevel > ♥ TopLevel > ♥ TopLevel > ♥ System > ♥ System Info ♥ System Info ♥ System > ♥ Farmets > ♥ Ecus > ♥ Parameter Defin ♥ Bay Modules 		Ven With Show In Undo Set Short Name Redo Cut Copy Paste Delete Configure Runnable SWC Decompose Copy Variation Points Pdu Trace View	> Alt+Shift+W>		Bilueprint Policies Bilueprint Policy Not Modifiable Bilueprint Policies Bilueprint Policy Single Consistency Needs Ports PPort Prototype Ports PPort Prototype Ports PR Port Prototype Short Name Fragments Short Name Fragment Sw Component Documentations Sw Component Documentation Internal Behaviors Swc Internal Behavior Symbol Props Variation Point Problems Log 👎 WorkFlow 😰 Problems 🖨 Console 😂 🐩 Model API View 🚇 Sci
66° Description View 🦃 Bu An outline is not available.	ø	Find References Rename		to d	lisplay at this time.

Double click on the container to open it and set its properties, in particular set the nam.

4.1.6 Create a new runnable

Now that the Internal Behaviour is created, you can create the runnables entities. To create a runnable, re-open the SWC prototype with the "Component Editor" and switch to the "Functions" Tab. Press the **Runnables** button and edit the runnable name and its Function name in the table.

Name Mem_SWC			🖶 <u>VP</u>	X VP IB Memory_IB
🚰 Main 🐼 Functions 🚿	Events 🚺 IRV Others			
🕂 Runnables 🔀 Delete				Main Properties Data Acces
Showing: 1/1 🗐 C 📎	🧭 Filter :		E C RE	CanBelnvokedConcurrent
Runnable Entity	Function Name	Advance Options VP Short Label	•	MinimumStartInterval
	Y	Y	Y	SwAddrMethod
1 RE_Mem_SWC	RE_Mem_SWC_func			

4.1.7 Create a new Data Access Point

Runnables have access to SWC ports only if a Data Access Point is created; to do so, in "Functions" Tab switch to the "Data Access Points" subtab and press the **Access Points...** button. In the pop-up window "Create DataAccessPoint Dialog" select the "Data Send Points".



Create DataAccessPoint Dialog	_		×				
Select VariableDataPrototype(s) to be set as reference							
Select VariableDataPrototype(s) to be set as reference for the DataAccessPoint(s) to be created							
Reference Style 🗸 🗸							
type filter text							
 > DataWriteAccess ✓ DataSendPoints ✓ PPort_FirstPIM ✓ ♦ DE_MyFirstDataElement ✓ PPort_SecondPIM ✓ ♦ DE_MySecondDataElement 							
Indicates already configured and not possible to edit							
?	(Cance	el				

4.1.8 Create a new Event

Runnables can be executed only if they are connected to an event. The event triggering the runnable is a timing event. To create the event switch to "Events" tab, press the little arrow next to the green plus and select "Timing Event".



С М	em.	_swc 🛛	
Me	m_	SWC	
Na	ame	Mem_SWC	
2	M	ain 🐼 Functions 💉 Events 👿 IRV Of	thers
	. .	▼ X Delete	
ſ	- υ	TimingEvent	
		InitEvent	
-	\$	BackgroundEvent	
4		OperationInvokedEvent	ent Name
		ExternalTriggerOccurredEvent	
		DataReceivedEvent	
-	\$	DataReceiveErrorEvent	
	•	SwcModeManagerErrorEvent	

In the "TimingEvent Creation Dialog" select the desired runnable by a double click on it and press \mathbf{Ok} .



🔚 TimingB	ری vent Creation Dialog			_		×				
Helps to C	Helps to Create Events from the selected Runnables									
Select the F assign the	ent(s) and									
🗌 Display C	onfigured Runnables									
Showing:	1/1 🗐 C 📎 🖉) Filter:			П 🗈 г	RF				
	Runnable	· · · · · · · · · · · · · · · · · · ·	Timing Period(s)							
Y			Y			Y				
1 🗹	RE_Mem_SWC									
Select All										
?			(ОК	Cance	el				

Configure the event's properties such as the the event name and the period, the result of this step is shown in Figure below.



Name	Mem_SWC			💠 <u>1</u>	<u>VP</u> 🗶 🛛	/P., IB Men	nory_IB
🛃 Ma	ain 💫 Functions 💓 Events 👿	IRV Others					
<u>.</u> .	🗸 🔀 Delete						
-							
Sho	owing: 1/1 🗐 C 🥘 🧭 Filter	r:					
Sho	owing: 1/1 🗐 C 🥸 🧭 Filter	r:					
Sho	owing: 1/1 🗐 C 📎 🧭 Filter Rte Event Type	r : Event Name	Star	rt Runnable Enti	ity Tim	ing Period(s)	Activ
Sho	owing: 1/1 🗐 C 🥸 🧭 Filter	r: Event Name	Star	rt Runnable Enti	ity Tim	ing Period(s)	Activ

4.1.9 Crete the PIMs

To create a PIM from the Component Editor swithc to Tab "Others" and select the sub-tab "PerInstanceMemory". Press the button **Create PerInstanceMemory**; a new element will be adde to the table below, edit the Shortname and set the initial value (InitValue column), type and type definition. The final result of the two PIMs needed is shown in the following figure:

🛃 Main	🐼 Functions 🚀	Events 🚺 IRV O	Others				
Parame	terDataPrototy Vari	ableDataPrototyp S	ShortNameFragment	Annotation	ExclusiveArea	ExclusiveAreaNesting	Swcl
+ Sho	Create erinstance	Memory 🗙 De	lete PerinstanceMem	iory			
	ShortName*	InitValue	Туре	TypeDefi		A	
		Y	Y	Y		Y	
1	PIM_02	10	uint32	uint32			
2	PIM_01	1	uint16	uint16			

For each PIM a new software data definition proposal must be created. To do that right click on the PIM and select New Child -> Sw Data Def Props Variants | Sw Data Def Props Conditional

 Components BswM CanComi ComM ComM EcuM Mem_SW Memu 	munication_SWC C ory_IB			
× •	New Child	>	\$	Short Name Fragments Short Name Fragment
	Open With	>	*	Sw Data Def Props Sw Data Def Props Conditional
5.4	Show In	Alt+Shift+W >	\diamond	Variation Point
> 🖕	Undo		Γ	,
> 🕞 Compo: 😂	Redo			
> 🕞 Infrastri 🖋	Cut			

Open the created element and set the **BaseType** parameter to the proper value.

Do the same for all the PIMs configured.



4.1.10 Create NvM Service Needs

Open the SWC containing the PIMs with the service needs Editor; to do that right click on the SWC and select **Open with –> Service Needs Editor**.

 Components BswM CanComn ComM EcuM 	nunication_SWC				
✓ ⁸ Mem_ > Mem_	New Child	>	Ĺ.		
5 🕞 P F	Open With	>	Α	Component Editor	
> 🕞 Composit	Show In	Alt+Shift+W >	0	Generic Editor	
🗸 اnfrastruc 🔍	Undo Set Base Type		鸣	Component Overview	
🗸 🐺 System	Device Dase type		S	Service Needs Editor	
> 🕞 System In 🖓	Kedo		-		
🚽 > 🕞 Signals Ar 🛷	′ Cut				
> 🕞 Pdus 🛛 👔	Сору				
🔉 🕞 Frames 🛛 🚡	Dacto				
> 🕞 Ecus 🛛 💾	1 date				
🔰 🕞 Networks 🎽	Delete				

Switch to Tab **NvM Service Needs** and select **Add NvM Service Needs**; the table below will be filled with a new element named "Srv_NvM_0"; edit the name and the service needs attributes, below an example of how to configure the attributes to have a PIM that is read at each startup and written at each shutdown.

ResistantToChangedSw					
RestoreAtStart					
WriteOnlyOnce	WriteOnlyOnce				
CalcRamBlockCrc					
API	~				
NO-PROTECTION	~				
LOW	~				
0	216				
0	2,16 10,8				
0	2,16 10				
	ResistantToChangedSw RestoreAtStart WriteOnlyOnce CalcRamBlockCrc API NO-PROTECTION LOW 0 0 0 0				

Finally connect the PIM the the Service needs created by adding a data Assignment; press on **Add Data Assignment**; in the po-up window "Add Data Assignment" switch to tab **Used PIM** and select the desired PIM; then press **OK**:

Add NvM configuration to Project



🔛 Add Data Assignment		2	_		\times
To configure role based data	assignment(s)				
Please select the required data a configure role based data assigr	ssignments for the response to the selected se	ective roles given ervice dependenc	below to y.		
UsedParameterElement UsedPIN	UsedDataElement				
6	Role : ramBlock				
type filter text					
✓ ◆ PIM_01 ○ ◆ PIM_02					
Select all					
?		ОК		Cance	el

Do the same steps for all the PIMs; the final result should be as shown here:

Component Name Mem	_SWC	Int	ernal Behavior	Memory_IB		v 🕂 🗙 📲	Add Service Ports	L
DEM Service Needs FIM Se	rvice Needs NvM Sen	vice Needs DCM S	Service Needs E	cuM Service Ne	eds			
To view and configure the	general needs on the o	configuration of the	NvRAM Manag	er (NvM)				
Configure NvM Usecase	e 🕈 Add NvM Servi	ce Needs 🕈 Add F	Port Assignment	🕂 Add Data	Assignment X Dele	te Show NvM Attribut	es	
Filter:	📑 🔐 🗌 RE 🛛 Search		RE 🛛	û 🕂 🖽 🛛	Rows : 4			
Service Dependency	Port Assignment	RBPA Role	RBDA Role	UsedPIM	UsedDataElement	UsedParameterElement	Service Need	Va
✓ ◆ Srv_NvM_0							NvM_Needs_0	
			ramBlock	PIM_01				
✓ ♦ Srv_NvM_1							NvM_Needs_1	
			ramBlock	PIM_02				

4.1.11 Update System Composition

Open the TopLevelComposition and press the little arrow next to the green plus button and select **Component Prototype**.

sition/Top	LevelComposition?type=CompositionSw	Comp	onentType - ISOLAR-A/B 5.0.1							-	٥	×
IN KOIE	onfiguration File Build Generator V	lindow	Helb						_			
6	[1] 🖸 🕶 [2] * 취 * 🏷 🔶 * 🔿	Ŧ							Qui	ck Access	1 🖻	F
💾 TopLev	elComposition 🛛										0	• •
Overvi	ew								Matrix View 🤣	(?) 🖄	- 🕞	к ^
> +	- Fe S 5 🕂 🛪 8	5	Compute Variant	Overwrite Existing								
1	Component Prototype										X	
34	 Delegation Provider Port 										N.	
⇒[Delegation Requester Port											
- 0	Delegation Provider Requester Port	9	Ø Filter:							_ 🗟 🗆] RE	
	Component Prototype	• c	Port	Interface Type	Status	Connected Composition	Connected Port	Connected Port Inte	File Name	VP		
	Y	7	7 Y	r v	' Y	7 V	Y	Y	·	7	S	
	1 🔛 CanCommunication_SWC		C RPort_shutdownTarget	EcuM_Shutdown	.🖶 Open				SWCs.arxml		E	
	2 📶 CanCommunication_SWC		C RPort_shutdownTarget	EcuM_Shutdown	. 🖶 Open				SWCs.arxml	3	Ε	
	3 Terr Concommunication_SWC_E	Эн	🕨 PPort_Extended_TxData	My_Extended_Int	. 🔍 Valid	CPT_CanCommunication_SWC_EcuB	RPort_Extended	My_Extended_Inter	Composition.arxml	a	E	
	4 MCPT_CanCommunication_SWC_E	н	🕨 PPort_Standard_TxData	My_Standard_Int	. 🔍 Valid	CPT_CanCommunication_SWC_EcuB	RPort_Standard	My_Standard_Inter	Composition.arxml	3	Ξ	
	5 M CPT_CanCommunication_SWC_E	ж.	🕨 PPort_Standard_TxData	分 My_Standard_Int	. 🔍 Valid	CPT_CanCommunication_SWC_EcuA	RPort_Standard	My_Standard_Inter	Composition.anml	3	Ε	
	6 M CPT_CanCommunication_SWC_E	Эн	🕨 PPort_Extended_TxData	My_Extended_Int	. 🔍 Valid	CPT_CanCommunication_SWC_EcuA	RPort_Extended	My_Extended_Inter	Composition.arxml	3	E	

In the pop-up window "Create Component Prototype Dialog" select the new ASW SWC and press **Ok**.

4.2 Part 2 - ECU Configuration

In this part ISOLAR B is used to configure the BSW modules of the ECU.

NB: ISOLAR B can be accessed by selecting the "ECU Navigator" in the Project Explorer view.

4.2.1 Map SWC to ECU

The new SWC must be mapped to the ECU "EcuA"; to do that right click on the System element (in the imported project it is called **System**) and select **Open with -> SWC to ECU Mapping Editor**

~		} System I ◆ EcuA 園 EXTF	nfo FlatN CEcuA	Иар			
>	Ċ,	Signals		New Child	>	1	
>	G	Pdus		Open With	>	ECU	RTE Editor
>	-	Frames		Show In	Alt+Shift+W >	E.	System Data Mapping Editor
>		Ecus Network	N	Undo Do Commands		E	SWC To ECU Mapping Editor
~ 🛱	Bs	w	5	Redo		E	EndToEndProtection Configuration Editor
>	۵	Bsw Mo	ot	Cut		8-**	Composition Editor
>	D	Bsw Mo	Ê	Сору		Л	Auto Signal Mapping
> 4	Bs	w Mdt	Ē	Paste		ECU	Align Rte Configuration Editor
	yva)Tir	ming Exte	×	Delete		ECU	Ecu Partition Editor
ŝ	Sta	andardiza				E.	System Editor
> 0	, } De	eploymen	÷.	Pdu Trace View		0	Generic Editor
> 📾	⊳_fv	wd	*	Simplify Variant Condition (Boolean only)		-	
> 🖻	- Co	onfig	B	Find References			

On the right the TopLevelComposition should have in black the mapped SWC and in pink the not mapped ones. Drag and drop the Memory SWC under the EcuA on the left; the final result of this step should be as shown below:

type filter text	◆ <u>Create System Mapping</u> ◆ <u>Create ECU Instance</u> ◆ <u>Create ECU Partition</u> X <u>Remove Mapping</u>								
CPT_CanCommunication_SWC_EcuA	Œ	🖻 Showing: 4/4 🗎 (C 📎 🧭 Filter	:					
EPT_Mem_SWC		System Mapping	·	WC to ECU Mapping	, ·	Components Mapped	•		
		ShortName	ECU Instance	ECU Partition	Variant Point	Target Component Prototype	Context Comp		
		Y	' Y	' ¥	Y	· · · · · · · · · · · · · · · · · · ·	7 Y		
	1	SystemMapping							
	2	4	I EcuA						
	3					CPT_CanCommunication_SWC_EcuA			
	4					CPT_Mem_SWC			



4.2.2 Update ECU Extract

The existing ECU Extract must updated now since a new SWC has been assigned to the ECU; right click on the System and select **Create ECU Extract** in the pop-up window that appears keep selected the "Update existing ECUExtract" option and press **Finish**.

NB: if the previous ECU extract files are not placed in the project root folder, this step will create two new files; replace the old files with these new ones moving them in the desired sub-directory.

4.2.3 Configuration Generation

Now you can update the Configuration of the BSW generating a new one.

Press the ConfGen button or from the Menu bar select **RTA-BSW** -> **Automatically configure BSW from System Description**. This step will update the "Config" directory inside the Project folder with the automatically generated arxml files related to the BSW modules. As a result expanding the Bsw Modules within the "ECU Navigator" menu you can see how a Memory stack has been created with the modules: NvM, MemIf and Fee.

4.2.4 Import configuration

Import from the MCAL the FIs module description files; in this case the following files have been imported:

- Fls_BSWMD.arxml
- Fls_BSWMD_EcucValues.arxml

4.2.5 Code generation

Now you need to generate the BSW code; in this way the BSWMD files will be generated and the NvM service will be recognized and available to be added to the composition. First you need to have a configuration to run. From the Toolbar press the arrow next to **Run Configurations** button and select **Run Configurations...**



In the pop-up window select the correct configuration

Make sure that the RTA-BSW version recognised is the desired one and that the project is correct, check the path where you want to create the folder with the BSW source code. Finally check that



all the BSW modules configured are checked. The result of this step is shown in Figure below.

🔚 Run Configurations	∑a	×
Create, manage, and run configuration	5	
📑 🖬 🗶 🖻 🎝 🗸	Name: ProjectFromScratch	
type filter text	BSW Generation Config	
✓ Second Configuration Second MyNewProject ProjectFromScratch	RTA-BSW RTA-BSW 5.0.0.024213pr	Select
😡 ProjectFromScratch	Project ProjectFromScratch	Select
ProjectFromScratchNvM	Output Path C:/Users/POV1MI/Desktop/Pompa/testProjects/02_ProjectFromScratchE	Browse
 ☑ EASE Script ☑ Eclipse Application ☑ ISOLAR-A External Code Gen ☑ ISOLAR-A RTA-RTE Code Gen ☑ Java Applet ☑ Java Application JJJ JUnit ☑ JUnit Plug-in Test ☑ Launch Group ☑ MWE Workflow Mwe2 Launch OSGi Framework ➢ Perl Local ➢ CFW MyNewProject ➢ CFW ProjectFromScratch ➢ CFW ProjectFromScratch ➢ CFW ProjectFromScratch ➢ CFW ProjectFromScratch ➢ Sphinx Workflow 	Modules: Generate C/H > RTA-ETH Generate ARXMI > RTA-FRAY Generate static E > RTA-HWD(Can) Generate Integra > RTA-HWD(Eth) Delete Existing C > RTA-HWD(Fray) Select All Modul > RTA-HWD(Lin) Select All Modul > RTA-HWD(Lin) Select All Modul > RTA-HWD Select All Modul > RTA-FRM Select All Modul > RTA-SEC RTA-SEC > RTA-SEC V	SW Code tion Code utput Folder es
Filter matched 24 of 24 items	Re <u>v</u> ert	Apply
?	Run	Close

Make sure to add the needed code into Integration files generated since the existing files will be overwritten! (e.g. in Compiler.h fill the INLINE defines)

4.2.6 SWC Ports for NvM

Besides the PPort created previously, the SWC "Mem_SWC" needs to have as many RPorts as are the PIMs; so open the SWC with the Component Editor, switch to tab "Main" and create a new RPort; in the pop-up window select **ClientServerInterface -> NvMService**. Do the same for every PIM created.



Mem_SWC

Name	Mem_	SWC		💠 VP 🗶 VP IB Mer	nory_IB
🛃 Ma	in Z	🕽 Functions 💉 Events 🚺 IRV Others			
]⇒ P Sho	Ports wing: 4	◆ PRPorts ★ Delete	Interface	Co Port Interface	nfigure Runnable
	Y	Y			2
11.1		-			Y Y
1	Þ	- PPort_FirstPIM		MyFirstMemInterface	
1	Þ	PPort_FirstPIM PPort_SecondPIM	-≫ -≫	MyFirstMemInterface MySecondMemInterface	
1 2 3	D	PPort_FirstPIM PPort_SecondPIM RPort_FirstPIM	-≫ -≫ -⊅	MyFirstMemInterface I MySecondMemInterface I NvMService I	

Reopen the SWC with the component editor to add the Server Call Points; switch to "Functions" Tab, on the right switch to sub-tab "Server Call Points" and press the **Server Call Points...** button. In the pop-up window select "SynchronousServerCallPoint"; in this way needed Server Call Points for all the PIMs will be created; see figure below:

📰 Create ServerCallPoint Dialog	_		\times
Select ClientServerOperation(s) to be set as refer Select ClientServerOperation(s) to be set as reference for ServerCallPoint(s) to be created	r ence r the		
Reference Style			
 AsynchronousServerCallPoint SynchronousServerCallPoint C RPort_FirstPIM C RPort_SecondPIM AsynchronousServerCallResultPoint 			
Indicates already configured and not possible to ed	it		
?	<u>Ŗ</u> ĸ	Cance	I



4.2.7 Crc Module creation

By defualt the NvM automatically configured by ConfGen will make use of the CRC; the corresponding BSW module must be configured. To do that from the **ECU Navigator** menu right click on **Bsw Modules** and select **Create Service -> Create Crc**. In the pop-up window choose the module name "Crc" and press **Finish**.

 → Common → EcuM → Mem_ST → NvM ← Compositic → EcuA_FT → Compositic → EcuA_FT → TopLeve → TopLeve → System → Parameter Defi 	WC ons atView elComposition tre nitions				
Bsw Mod	Create Child	>			
V 🕞 Memo	Create Other Modules	>			
> 🗔 Fe	Create COM Stack	>			
> 🗆 M(Create IO Stack	>			
> N	Create Memory Stack	>			
> CR Rte Os	Create Mode Mgm	> _			
> 🕞 Other	Create Service	>		Create Watchdog Module >	1
🗸 🕞 Ecuc V	Create Rte OS	>		Create Dcm	
> 🔶 Ec	Create Ecuc Value Collection	>		Create DoIP	
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AC Description V (50 .	Switch to Product	C		Create Det	
oo Description v 🎯	Enable Post Build Loadable Mode	E		Create Dem	
An outline is not avail:	Post Build Loadable Model Export	C		Create Crc	
				Create E2EXf	
				Create FiM	
		Properties		Create Csm	VorkFlow
		0 errors, 2 warni	ings	, 66 others	,

Remember to configure the Crc module according to the project's requirements.

After this step it is necessary to run the code generation again to generate this module's code.

4.2.8 Fls module creation

Create an module "FIs" to have all the reference needed to the MCAL. To create an "FIs" module right click on "Bsw Modules" from the "ECU Navigator" menu and select **Create Memory Stack -> Create FIs**



ECU Configurator		*		
🗸 🏰 ProjectFromScrat	tch [AR 4.2.2]			
> 📅 Software				
> 🛨 System				
🔉 📴 Parameter De	finitions			
V 🖬 Bsw Moduler				
> 🕞 Com	Create Child	>		
> 🕞 Men	Create Other Modules	>		
> 😡 Mod	Create COM Stack	>		
> 🕞 Servi	Create IO Stack	>		
> 🕞 Othe	Create Memory Stack	>		Create NvM
> 🕞 Ecuc	Create Mode Mgm	>		Create Ea
> 🔘 Variant lı	Create Service	>		Create Fee
> 🔐 Bamt	Create Rte OS	>		Create Fls
> 🕞 Ar Metai	Create Ecuc Value Collection	>		Create Memlf
	Open With	>		Create Eep
	Switch to Product			
	Enable Post Build Loadable Mode			
	Post Build Loadable Model Export			
			_	

Configure the module according to you hardware; reported below a sample configuration to be used with virtaul target:

Add NvM configuration to Project



⊞ New AR Element Creation		×
AR Element		
Create a new AR Element		
Fls		
Fls		
Create New AR Packages Use Existing AR Packages		
AR Package Path:		
/RB/UBK/Project/EcucModuleConfigurationValuess		
Auto-update Filename		
File na <u>m</u> e:		
Fls_EcucValues.arxml		
Select the folder:		
type filter text		
> EcuA_FlatView_SWCD.arxml		^
> EcucValues.arxml		
IntegrationCfg Second State		
CanEcucValues McalIntegration.arxml		
Interfaces.arxml		
Solar Sol		
> 📑 MSI_ShutDown.arxml		
> 📑 Os.arxml		
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Add NvM configuration to Project



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 	FISExternalDriver	FlsNumberOfSectors*	6			
Image: Sector FisSector (P) Image: Sector (P) Image: Sector (P) <tr< td=""><td> FlsSectorList "FlsSectorList_0" FlsSectors [1] </td><td>FlsPageSize*</td><td>8</td><td></td><td></td><td></td></tr<>	 FlsSectorList "FlsSectorList_0" FlsSectors [1] 	FlsPageSize*	8			
FIsPublishedinformation FisSectorStartaddress* 0 @ * ** FisConfigSet_0* * * ** FisConcolit* * * ** FisSector 1* * * ** FisSector_* * * * ** FisSector_* * * * * ** FisSector_* * * * * * ** FisSector_* * * * * * * * ** FisSector_* * * * * * * * * *	 FIsSector "FIsSector_0" FIsGeneral "FIsGeneral_0" 	FlsSectorSize*	1024			
*** FIs*TH:** Attributes *** FIs*Tes* FIs*Tes* *** FIs*Tes* 0 *** FIs*Tes* 0 *** FIs*Tes* 0 *** FIs*Tes* 0 **** FIs*Tes** 0 ***** FIs*Tes*** 0 ************************************	FIsPublishedInformation "FIsPublishedInfor	FlsSectorStartaddress*	0			
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FisSector "FisSector.0" FisCancelApi" false v % FisDPublishedInfor FisCompareApi" true v % FisDPublishedInfor FisDowErrorDetect* false v % FisDevErrorDetect* false v % FisBesthankCheckApi* true v % FisRbBlankCheckApi* false v % FisRbLibRamAddr v % % % FisRbSuspendApi v % % % FisRbSuspendApi v %	 FisSectorList FisSectorList_0 FisSectors [1] 	FIsBaseAddress		0		. ⊗ -
FIsPublishedInformation "FIsPublishedInfor FisCompareApi* true v S FIsDevErrorDetect* false v S FIsDevErrorDetect* false v S FIsDevErrorDetect* false v S FIsDevErrorDetect* false v S FIsEdetJobResultApi* true v S FIsEdetJobResultApi* false v S FIsEdetJobResultApi* true v S FIsEdetJobResultApi* false v S FIsEbElankCheckApi* true v S FIsEbLibRamAddr S FIsEbLibRamAddr S FIsEbLibRamAddr S FIsEbLibRamAddr S FIsEbLibRamAdpi v S FIsEbLibSupportOlderDevice v S FIsEbLibSupportOlderDevice v S FIsEbLibRamAdpi S S FIsEbLibRamAdpi false v S FIsEbLibRamAdpi S S FIsEbLibRamAdpi false v S FIsEbLibRamAdpi S S <	FIsSector "FIsSector_0" FIsGeneral "FIsGeneral_0"	FlsCancelApi*		false		• 🛞 •
FisDevErrorDetect* false FisDriverIndex 0 FisDetEvenometer false FisGetJobResultApi* frue FisGetStatusApi* false FisGetStatusApi* false FisRbBlankCheckApi* true FisRbBlankCheckApi* true FisRbDeactivateDeviceApi FisRbHclk FisRbLibRamAddr FisRbDisspontOlderDevice FisRbP1xSupportOlderDevice FisRbSuspendApi FisRbSuspendApi FisRbSuspendApi FisRbSuspendApi FisSetModeApi* false FisUseInterrupts false FisUseInterrupts false FisUseInterrupts false	FIsPublishedInformation "FIsPublishedInfor	FlsCompareApi*		true		• 🙁 •
FisDriverIndex 0 S FisGetJobResultApi* true S FisGetStatusApi* false S FisRbBlankCheckApi* true S FisRbDlackCheckApi* true S FisRbDlackCheckApi* true S FisRbDlackCheckApi* S S FisRbDlackCheckApi* S S FisRbDlackTivateDeviceApi S S FisRbHclk S S FisRbDlackTivateDeviceApi S S FisRbDlackIneType MCU_R8_PC S FisRbP1xSupportOlderDevice S S FisRbStuspendApi S S FisTotalSize 6144 S FisUseInterrupts false S FisVersionInfoApi* true S		FlsDevErrorDetect*		false		• 🙁 •
FIsGetJobResultApi* true FIsGetStatusApi* false FIsRbBlankCheckApi* true FIsRbDeactivateDeviceApi FIsRbLick FIsRbLibRamAddr FIsRbLibRamAddr FIsRbLibRamAddr FIsRbDisspendApi FIsRbP1xSupportOlderDevice FIsRbSuspendApi FIsRbSuspendApi FIsRbSuspendApi FIsRbSuspendApi FIsTotalSize FIsUseInterrupts FIsUseInterrupts FIsUseInterrupts FIsUseInterrupts FIsUseInterrupts FIsUseInterrupts FIsUseInterrupts FIsUseInterrupts FIsUseInterrupts FIsU		FIsDriverIndex		0		_ ⊗ -
FisGetStatusApi* false FisRbBlankCheckApi* true FisRbDeactivateDeviceApi FisRbHclk FisRbLibRamAddr FisRbDactivateDevice FisRbPixSupportOlderDevice FisRbPixSupportOlderDevice FisSetModeApi* false FisTotalSize 6144 FisUseInterrupts false		FlsGetJobResultApi*		true		• 🛞 •
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FIsRbDeactivateDeviceApi FIsRbHclk FIsRbLibRamAddr FIsRbMachineType MCU_RB_PC FIsRbP1xSupportOlderDevice FIsRbSuspendApi FIsSetModeApi* false FIsTotalSize 6144 FIsUseInterrupts false FIsUseInterrupts false		FlsRbBlankCheckApi*		true		• 🛞 •
FisRbHclk (*) FisRbLibRamAddr (*) FisRbDachineType MCU_RB_PC (*) FisRbP1xSupportOlderDevice (*) FisRbSuspendApi (*) (*) FisRbSuspendApi (*) (*) FisTotalSize 6144 (*) FisUseInterrupts false (*)		FIsRbDeactivateDeviceAp	i			• 🙁 •
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FisUseInterrupts false v 🛞		FlsTotalSize		6144		
FkVersionInfoAni* true u		FIsUseInterrupts		false		• 🙁 •
isterationintorph		FlsVersionInfoApi*		true		 ✓ (※) -

4.2.9 Edit BswM module

Memory stack needs to be initialized at startup and deinitialized at shutdown, for this reason the BswM module needs to be modified in the following way:

1. Add a new Mode request port with request processing of type **BSWM_IMMEDIATE**



 Set the MRP source right clicking on the source and selecting New Child -> BswMNvMJobModeIndication; then set the BswMNvmService to "NvmReadAll".

BswMModeConditions [9] BswMModeRequestPorts [5] BswMModeRequestPort "BswM	MRI MRI MRI MRI	?_BswM_MDG" ^_ApplicationRequestPort" P_ComM_Can0" ?_SwcModeRequest" _NvmReadAllComplete"		
BswMModeRequestSource '		New Child	>	RowMRowModeNotification
> 💼 BswMRules [7]		Show In		RouMCanSMIndication
BswMDataTypeMappingSets "BswMDa BswMDataTypeMappingSets "BswMDa		Show in	/	BruthComMindication
BswMModeControl "BswMModeControl BswMGeneral"	\checkmark	Undo setting reference	Ctrl+Z	BswiviCommindication
- Bawwoenerar Bawwoenerar	5	Redo	Ctrl+Y	BswiviComivinitiateReset
	ď	Cut	Ctrl+X	BswMComMPncRequest
	Ē	Сору	Ctrl+C	BswMDcmApplicationUpdatedIndication
	Ê.	Paste	Ctrl+V	BswMDcmComModeRequest
		D L +		BswMEcuMindication
	*	Delete	Delete	BswMEcuMRUNRequestIndication
	Ŷ	Move Up	Ctrl+Up	BswMEcuMWakeupSource
	Ŷ	Move Down	Ctrl+Down	BswMEthIfPortGroupLinkStateChg
		Fill BswMModeRequestSource with Default values		BswMEthSMIndication
		PDU Trace View		BswMFrSMIndication
		Export Module		BswMGenericRequest
	B	Find References		BswMJ1939DcmBroadcastStatus
	÷	Split File		BswMJ1939NmIndication
	Ť	Configure Post Build Variants		BswMLinSMIndication
ties 📳 Problems 🛛 🏼 🍪 Problems Log		Configure Variation Point		BswMLinScheduleIndication
warnings, 66 others		Remove Variation Point		BswMLinTpModeRequest
on .	_			BswMNmlfCarWakeUpIndication
arnings (2 items)				BswMNvMJobModeIndication
tos (bb items)				BswMNvMRequest
Attributes 😡				
ShortName*		BswMNvMJobModeIndication_()	
BswMNvmService		NvmReadAll		✓ (※ ▼

3. Create a new Mode Condition to check the NvM reading at startup at set its parameters as below:

DRIVING EMBEDDED EXCELLENCE



type filter text BswM "BswM" BswMConfig "BswMConfig" BswMArbitration "BswMArbitration" BswMLogicalExpressions [7] BswMModeCondition BswMModeCondition BswMModeConc Show In BswMModeConc Create BswMModeCondition	Create Bsw Showing: 9/9	vMMod 🗐 BswM		
> BswMModeConc Cut	Ctrl+Z Ctrl+Y Ctrl+X	Bsi Bsi Bsi Bsi Bsi		
ShortName* BswM_MC_BswModules_ReadAllComplete BswMConditionType* BSWM_EQUALS_NOT Image: Complete instance References Image: Complete instance Image: Complete instance				
BswMCononMode* BswMMRP_NvmReadAllComplete	✓ ⊗ ▼	_		
Finally set the BswMConditionValue to:		r.		

Characteria at	Dev MDev Manda	
ShortName"	BswiviBswiviode	
BswMBswRequestedMode		. ⊗ -

4. Edit the Logical Expression "BswM_LE_InitBlockReadAllComplete" to add the created MC. The final configuration of this Logical Expression must be as shown below:

Attributes		
ShortName*	BswM_LE_InitBlockReadAllComplete	
BswMLogicalOperator	BSWM_AND	✓ ⊗ ▼
References		
<u>BswMArgumentRef</u>	BswM_MC_BswM_StartupTwo BswM_MC_BswModules_ReadAllComplete	↓ × ⊗ ▼

What has been done in steps 1 to 4 for the startup reading, must be done for the writing at the shutdown. Elements must be added or edited, see the figures below as reference:

Add NvM configuration to Project



Attributes	
ShortName*	BswMMRP_NvmWriteAllComplete
BswMkequestProcessing'	BSWM_IMMEDIATE
Attributes 💫	
ShortName*	BswMNvMJobModeIndication
BswMNvmService	NymWriteAll 🗸 🗙 🗸
Attributes	
ShortName*	BswM_MC_BswModules_WriteAllComplete
BswMConditionType*	BSWM_EQUALS_NOT V 😵 🕶
References	
<u>BswMCononMode*</u>	BswMMRP_NvmWriteAllComplete V 🛞 🗸
Attributes	
ShortName*	BswMBswMode
BswMBswRequestedMode	
Attributes	
ShortName*	BswM_LE_GoDown
BswMLogicalOperator	BSWM_AND 🗸 😵 🗸
References	
<u>BswMArgumentRef</u>	BswM_MC_BswM_PrepShutdown BswM_MC_BswModules_WriteAllComplete

5. Add the Memory stack modules initialization functions to the Actions; in the following pictures an example on configuration:



BswMData IypeMap Comparison BswMModeControl BswMActionList	pingSets "BswMI "BswMModeCor s [7]	Jata IypeMappingSets" htrol"		BswMActio
✓	21		1	📋 BswM_
> 🧰 BswMA	Show In		>	BswM_
> 🛅 BswMA	Create BswMAc	tion		📋 BswM_
> BswMA		1-	01.7	BswM_
> 📑 BswMA 💝	Undo Do Comn	hands	Ctri+2	BswM
> 📑 BswMA 🖒	Redo		Ctrl+Y	BswM
> BswMA	Cut		Ctrl+X	BswM
> BswMA ~	Cont		Cut C	D RowM
> BswMA	Сору		Ctri+C	DSWIVI_
> BswMA	Paste		Ctrl+V	BSWIVI_
> BSWMA	Delete		Delete	BswM_
> BSWIMA	Delete		belete	BswM_
BswMA	Move Up		Ctrl+Up	BswM_
	Move Down		Ctrl+Down	BswM_
> BswMAction "BswM_AI_EcuMShutdown"	^	Attributes		
BswMAction "BswM_AI_FIsInit" BswMAvailableActions "BswMAvailable	eActions"	ShortName*	BswMUserCallout	
BswMComMAllowCom		BswMUserCalloutFunction*	Fls_Init(NULL_PTR)	
BswMComMModeLimitation		Attributes		
> BswMAction "BswM_Al_BswMSwitchPrepShutdow > BswMAction "BswM_Al_BswMSwitchPostRun"	'n" ^	Attributes		7
> bswMAction "BswM_AI_EcuMShutdown"		ShortName*	BswMUserCallout	
BswMAction "BswM_AI_HsInit" BswMAction "BswM_AI_Fee\tit"		BswMUserCalloutFunction*	Fee_Init(NULL_PTR)	_ ⊗ ▼
V BswMAvailableActions				
> BswMAction "BswM_Al_BswMSwitchPostRun"	^	Attributes		
> BswMAction "BswM_AI_EcuMShutdown" > BswMAction "BswM AI_Elcloit"		ShortName*	BswMUserCallout	
BswMAction "BswM_AI_FeeInit"		BswMUserCalloutFunction*	NvM_Init()	- (*) •
 BswMAction "BswM_Al_NvMInit" BswMAvailableActions "BswMAvailableAction 	ıs"			
BswMComMAllowCom	-			
> BswMAction "BswM_Al_EcuMShutdown"	^	Attributes		
> bswMAction "BswM_AI_FIsInit" > BswMAction "BswM AI FeeInit"		ShortName*	BswMUserCallout	
> BswMAction "BswM_AI_NvMInit"		BswMUserCalloutFunction*	Fee_Rb_EndInit()	⊗ -
BswMAction "BswM_AL_FeeRb" SwMAvailableActions				
BswMComMAllowCom				

6. Add the Actions for reading and writing of NvM:

> in BswMAction "BswM_AI_FeeInit"	Attributes		
BswMAction "BswM_AI_NvMInit" BswMAction "BswM_AI_FeeRbEndInit" BswMAction "BswM_AI_FeeRbEndInit" BswMAction "BswM_AI_NvMReadAII" BswMAvailableActions "BswMAvailableActions"	ShortName* BswMUserCalloutFunction*	BswMUserCallout EcuM_User_NvM_ReadAll()	
BswMComMAllowCom BswMComMModeLimitation BswMComMModeSwitch BswMComMModeSwitch	Attributes		
BowMAction "BowM_AI_VedInit" BowMAction "BowM_AI_NvMInit" BowMAction "BowM_AI_FeeRbEndInit" BowMAction "BowM_AI_NvMReadAll" BowMAction "BowM_AI_NvMWriteAll"	ShortName* BswMUserCalloutFunction*	BswMUserCallout NvM_WriteAll() &) •
✓			

7. Edit the Action List "BswM_AL_BswModules_InitListTwo" to add the modules initialization and the read all action:

Add NvM configuration to Project



text				
BswMRule "BswM_AR_StartCom"	^	Attributes		\$
BswMRule "BswM_AR_PostRun"		ShortName*	BswM ALL ElsInit	
BswMRule "BswM_AR_Shutdown"		Shortwane	DSWIM_ALI_ITSIIIL	
BswMRule "BswM_AR_WriteAllComplete"		BswMAbortOnFail*	false	✓ (※) ▼
BSWIVIKUIE BSWIVI_AR_SWCIVIOdEREquest		BswMActionListItemIndex*	0	(
BswMModeControl "BswMModecontrol"		Diswinited Distreminiter	0	
V 🛅 BswMActionLists [7]		References		*
✓ Image: www.sectionList "BswM_AL_BswModules_InitListTwo"			b MALEL S	
 BswMActionListItems [2] 		BswMActionListItemRef*	BswM_AI_FISINIT	✓ (※) ▼
BswMActionListItem "BswM_ALI_BswMStartupTwo"				
BswMActionList "BswM AL BswModules InitListReadAll"				
BswMRule "BswM AR StartCom"	•	Attributes		
BswMRule "BswM AR PostRun"				1
BswMRule "BswM_AR_Shutdown"		ShortName*	BswM_ALI_FeeInit	
BswMRule "BswM_AR_WriteAllComplete"		BswMAbortOnFail*	false	v 🛞 🕶
💼 BswMRule BswM_AR_SwcModeRequest"				
BswMDataTypeMappingSets "BswMDataTypeMappingSets"		BswMActionListItemIndex*	1	🙁 👻 🔻
BswMModeControl "BswMModeControl"				
BSWMACTIONLISTS [7]		References		
BswMActionList Bswm_AL_BswModules_InitElstrive		BswMActionListItemRef*	BswM_AI_FeeInit	v 🛞 🔻
BswMActionListItem "BswM ALI BswMStartupTwo"				
BswMActionListItem "BswM_ALI_FIsInit"				
BswMActionListItem "BswM_ALI_FeeInit"				
BswMRule "BswM AR StartCom"	^	Attributes		\$
BswMRule "BswM_AR_PostRun"		<u> </u>		
BswMRule "BswM_4]_Shutdown"		ShortName*	BswM_ALI_FeeRbEndInit	
BswMRule "BswM_AR_WriteAllComplete"		BswMAbortOnFail*	false	v 🛞 🕶
BswMRule "BswM_AR_SwcModeRequest"				
sswMDataTypeMappingSets "BswMDataTypeMappingSets"		BswMActionListItemIndex*	2	• 🛞
BswMAction ists [7]		References		\$
BswMActionList "BswM AL BswModules InitListTwo"		References		~
✓		BswMActionListItemRef*	BswM_AI_FeeRbEndInit	v 🙁 🕶
💼 BswMActionListItem "BswM_ALI_BswMStartupTwo"	- 11 6			
BswMActionListItem "BswM_ALI_FIsInit"				
BswMActionListItem "BswM_ALI_FeeInit"				
		Au 1		<u>^</u>
ki 💼 BswMRule "BswM_AR_StartCom"	^	Attributes		^
BswMRule "BswM_AR_PostRun"		ShortName*	BswM_ALI_NvMInit	
BSWMRule "BSWM_AK_Shutdown" BSwMRule "BSwM_AK_Shutdown" BSwMRule "BSwM_AK_Shutdown"			falsa	
BswMRule "BswM AR SwcModeRequest"		BswMAbortOnFail*	laise	▼ (※) ▼
BswMDataTypeMappingSets "BswMDataTypeMappingSets"		BswMActionListItemIndex*	3	💌 🕶
BswMModeControl "BswMModeControl"			L	
BswMActionLists [7]		References		*
BswMActionList "BswM_AL_BswModules_InitListTwo"		RoyMActionLictItomPof*	BswM AL NymInit	
BSWMActionListitems [0]		DSWMACtionListteminer		• • •
BswMActionListitem "BswM_ALI_ElswivistantupTwo				
BswMActionListItem "BswM_ALI_FeeInit"				
BswMActionListItem "BswM_ALI_FeeRbEndInit"				
BswMActionListItem "BswM_ALI_NvMInit"				
BowMRule "BowM AR StartCom"	*	Attributes		\$
BswMRule "BswM_AR_PostRun"				
BswMRule "BswM_AR_Shutdown"		ShortName*	BswM_ALI_NvMReadAll	
BswMRule "BswM_AR_WriteAllComplete"		BswMAbortOnFail*	false	v 🙁 🕶
BswMRule "BswM_AR_SwcModeRequest"		Devild and a little in the second	<u>د</u>	
bswiviData iyperviappingSets "BswMData lypeMappingSets" SwMMadeControl "BswMMadeControl"		BSWMActionListItemIndex*	3	• 🙁
BswMActionLists [7]		References		\$
BswMActionList "BswM_AL_BswModules_InitListTwo"			· · · · · · · · · · · · · · · · · · ·	~
✓		BswMActionListItemRef*	BswM_AI_NvMReadAll	 ✓ (𝔅)
BswMActionListItem "BswM_ALI_BswMStartupTwo"				
BswMActionListItem "BswM_ALI_FIsInit"				
BSWMACTIONLISTITEM "BSWM_ALL_FEEINIT" BSWMActionListItem "BswM_ALL_FEEREDUIT"				
BswMActionListItem "BswM ALI NvMInit"				
BswMActionListItem "BswM ALI NvMReadAll"				

NB: the action InitBlockTwo must have an index such that it is executed after the memory stack modules initialization and before the read all function!

8. Edit the Action List "BswM_AL_Shutdown" to add the writing of NvM action:

Add NvM configuration to Project



Atributes			*
ShortName*	BswM_ALI_NvMWriteAll		
BswMAbortOnFail*	false	v 🛞 🕶	
BswMActionListItemIndex*	3		
References			*
BswMActionListItemRef*	BswM_AI_NvMWriteAll	v 🛞 •	

NB: The writing action must be executed ater stopping the RTE, deinitializing the other modules and while the ECU is in PREP_SHUTDOWN state

9. Edit the "BswMGeneral" container parameters to enable the NvM:

✓ ■ BswM "BswM"	BswMEthIfEnabled*	false	• 🛞 🕶
> BswMConfig "BswMConfig"	BswMEthSMEnabled*	false	• 🛞 🕶
BswMRbGenericReqUser SswMUserIncludeFiles	BswMFrSMEnabled*	false	• 🛞 🕶
	BswMGenericRequestEnabled*	true	• 🛞 🕶
	BswMJ1939DcmEnabled*	false	• 🛞 🕶
	BswMJ1939NmEnabled*	false	• 🛞 🕶
	BswMLinSMEnabled*	false	• 💌 •
	BswMLinTPEnabled*	false	• 💌 •
	BswMMainFunctionPeriod	0.01	• 🛞
	PauMNmEnabled*	false	• 🛞 🕶
	BswMNvMEnabled*	true	• 🛞 🕶
	BswMRbDebugEnable	false	• 🛞 🕶
	BswMRbIntrptQueueMaxSize	5	
	BswMRbMaxNumOfRules	255	
			-

4.2.10 Composition Update

Now that the NvM service has been created you can add it to the Composition; open it with the Composition Editor, click on the little arrow next to the green plus button and select **Component Prototype**. In the pop-up window select the NvM component and press **Ok**

Add NvM configuration to Project



🖫 Create Component Prototype Dia	llog	_		×
Heins to Create Component Proj	totypes			
helps to create component rio	iotypes			
Creates component prototypes of se	elected Component Type			
Reference Style		~	# Y	' 🔁
Filter out already available instance	es of a component			
Filter:	E Search:	🗆 RE 😚 🕂 🕀 📻 🥅 Rows:	7	
Component Type	Generated Shortname	ARFile		
TopLevelComposition	CPT_TopLevelComposition	EcuA_FlatView_SWCD.arxml		
CanCommunication_SWC	CPT_CanCommunication_SWC	EcuA_FlatView_SWCD.arxml		
Mem_SWC	CPT_Mem_SWC_0	EcuA_FlatView_SWCD.arxml		
BswM	CPT_BswM_0	EcuA_FlatView_SWCD.arxml		
EcuM	CPT_EcuM_0	EcuA_FlatView_SWCD.arxml		
ComM	CPT_ComM_0	EcuA_FlatView_SWCD.arxml		
NvM	CPT_NvM	EcuA_FlatView_SWCD.arxml		
	:	: 		
?		∧ ок	Canc	el
		<u> </u>	-	

4.2.11 Create connections between SWC and NvM module

Now that the the NvM has been added to the ECU configuration, you must connect its ports to the SWC created previously. To do that open composition and switch to tab "Manual Connection Editor". On the left select the NvM module and select the port "NvM_NativeBlock_2"; it must be connected to the SWC so on the right chhose the memory SWC and select the corresponding port. Do the same for the other Nvm Block. The final result of this connection step il shown below:

Sho	wing: 2/4 [One Direction]	С	😻 🧭 Filter :] 🕞 🗆 RE
	Component Prototype		Connector Name	Port	Interface Type	Status	Connected Composition	Connected Port	Connected Port Inte	File Name	VP	
		Y	9	/ Y	Y	Y	Y	Y	Y	Y		Y
1	CPT_NVM		H ASC_CPT_NvM_NvM_NativeB.	NvM_Native	• NvMService	Valid	CPT_Mem_SWC	C RPort_FirstPIM	• NvMService	EcuA_FlatView_SWCD		
2	CPT_NVM		J-E ASC_CPT_NvM_NvM_NativeB.	NvM_Native	• NvMService	Valid	CPT_Mem_SWC	C RPort_Secon	• NvMService	EcuA_FlatView_SWCD		

4.2.12 Update ECU Extract

Update the ECU Extract since a new module has been added. Right lcick on the System and select **Create ECU Extract** as done before.

4.2.13 Map the SWC runnables on Os Tasks

Open the existing Ecuc value collection and switch to the "Entity to Task Mapping" Tab and drag and drop the present runnables (SWC runnables, MemIf Main function runnable, NvM Main function runnable and FIs Main function runnable) on the right under the Os task on the left. The result of this step is shown in Figure below.

Add NvM configuration to Project



Mapped Entities

🔲 🔻 🔕 🔤 🗱 💥

	Os Task/Event Mappin	ig 📢	Compon	ent Instance Properties
	OsTask	OsPriority	Entities	ComponentInstance
	Y	Y	Y	
1	ECU_StartupTask	4		
2	🔺 🔊 OsTask_ASW	1		
3			₹ RE_Tx	CPT_CanCommunication_SWC
4				CPT_CanCommunication_SWC
5			RE_Mem_SWC	CPT_Mem_SWC
6	🔺 🔊 OsTask_BSW	2		
7			BSWSE_MainFunction	♦ CanSM
8			BSWSE_MainFunctionRx	♦ Com
9			BSWSE_MainFunction_BusOff	BSWIMPL_Can
10			BSWSE_MainFunctionTx	♦ Com
11			BSWSE_MainFunction_Mode	BSWIMPL_Can
12			SE_BswM_MainFunction	BSWIMPL_BswM
13			Memlf_Rb_MainFunction	Memlf
14			BSWSE_MainFunction_Read	BSWIMPL_Can
15			BSWSE_MainFunction_Write	BSWIMPL_Can
16			BSWSE_MainFunction_ComMCh	♦ ComM
17			SE_MainFunction	♦ NvM
18			SE_MainFunction	♦ EcuM
19			Fls_MainFunction	♦ Fls

4.2.14 Code generation

Redo the code generation step to update the code with the current configuration.

4.3 Part 4 - RTE

4.3.1 RTE generation

You can now generate the RTE code. To do this, use the RTA-RTE plug-in, press the **RTE** button in the menu bar and select **RTE Generate Phase Wizard** from the drop down menu.

⊞ WS_5.0.1_3.2_ProjectFromScratch - ISOLAR-A	B 5.0.1
<u>File Edit Navigate Search Project</u>	RTA-BSW Run Role Configuration File Build Generator Window Help
📑 🕶 🗐 🐚 🎇 🞺 😓 📵 🍳 🧿 🖻	RTE Contract Phase - Multiple Components in Project/File/ArPackage
🔿 AR Explorer 🗇 ECU Navigator 🖾 📢	RTE Generate Phase Wizard
	□ \$
🔶 Favorites	*
Security ECU Configurator	*
V 🍄 MyNewProject [AR 4.2.2]	A
✓ Into Software	
📕 🗸 🕞 Data Types	

In the pop-up window make sure to select the correct paths to the RTA-RTE tool and to the output folders. In the Additional commands always add the command

(--os-define-osenv=RTA0S40) to create the necessary define for the AUTOSAR release used. If there is any port of BSW unconnected and you want to generate the RTE leaving them as they are, use the additional command (--strict-unconnected-rport-check=warn).

Add NvM configuration to Project



Code Generation Dialog This dialog allows the user to invoke RTE in Generate phase (for an ECU Instance) and in Contract Phase (for a Component). Enter or select the parent folder:	Code Generation Wizar	rd			×
Code Generation Dialog This dialog allows the user to invoke RTE in Generate phase (for an ECU Instance) and in Contract Phase (for a Component). Enter or select the parent folder: Image: Standard Image: Standard					
Enter or select the parent folder:	ode Generation Dialog	g er to invoke RTE in Generate phase (for an ECU Instance) and in Contract Phase (for a Component).			
Add > Standard > Seperator For > Seperator For Output Dir Path < Tool> C\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte > Browse. Output Dir Path <output> C\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte > Browse. Select required RTE Phase O Generate C Outract ECU Instance REF<ecu> / DBC_SysDesc_Can_Network/Pkg_Ecu/EcuA > Select RTE Command @ ETAS RTA-RTE O External Additional Commands</ecu></output>	Enter or select the paren	it folder:			
> @ integration	☆ ↔				
Standard mcal EVE import Filter Seperator For <input/> RTE Tool Path <tool> C:\ETAS\RTA-RTE_6.8\bin\RTEGen.exe Output Dir Path <output> C:\Users\POV1Ml\Desktop\tests\02_Project\newPrj\src\rte RTE Log File C:\Users\POV1Ml\Desktop\tests\02_Project\newPrj\src\rte Select required RTE Phase Generate Contract ECU Instance REF<ecu> /DBC_SysDesc_Can_Network/Pkg_Ecu/EcuA Eternal Additional Commands Eternal </ecu></output></tool>		→ integration	^	<u>A</u> dd	
 mcal model EVE model system_config Seperator For <input/> RTE Tool Path <tool> C:\ETAS\RTA-RTE_6.8\bin\RTEGen.exe Output Dir Path <output> C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte RTE Log File C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte Browse Select required RTE Phase Generate Contract ECU Instance REF<ecu> /DBC_SysDesc_Can_Network/Pkg_Ecu/EcuA Select RTE Command External Additional Commands External </ecu></output></tool>	> 🗹 🦢 S	itandard		Remov	2
Import net Import net <td>✓ ☐ > mcal</td> <td></td> <td></td> <td>-</td> <td>tor</td>	✓ ☐ > mcal			-	tor
>		VE		Import in	
Seperator For <input/> RTE Tool Path <tool> C:\ETAS\RTA-RTE_6.8\bin\RTEGen.exe Output Dir Path <output> C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte RTE Log File C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte Select require I RTE Phase © Generate Output Dir SysDesc_Can_Network/Pkg_Ecu/EcuA Select RTE Command © ETAS RTA-RTE External Additional Commands</output></tool>	> 🗹 🗁 rte				
Seperator For <input/> RTE Tool Path <tool> C:\ETAS\RTA-RTE_6.8\bin\RTEGen.exe Output Dir Path <output> C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte RTE Log File C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte.log Select required RTE Phase Ocontract © Generate O Contract ECU Instance REF<ecu> /DBC_SysDesc_Can_Network/Pkg_Ecu/EcuA Select RTE Command External Additional Commands v</ecu></output></tool>	V 🖉 🧽 system_o	config	¥		
Seperator For <input/> RTE Tool Path <tool> C:\ETAS\RTA-RTE_6.8\bin\RTEGen.exe Output Dir Path <output> C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte RTE Log File C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte.log Select required RTE Phase</output></tool>					
RTE Tool Path < Tool> C:\ETAS\RTA-RTE_6.8\bin\RTEGen.exe Browse. Output Dir Path < Output> C:\Users\POV1Ml\Desktop\tests\02_Project\newPrj\src\rte Isrowse. RTE Log File C:\Users\POV1Ml\Desktop\tests\02_Project\newPrj\src\rte\rte.log Select required RTE Phase Generate Contract ECU Instance REF <ecu> /DBC_SysDesc_Can_Network/Pkg_Ecu/EcuA Select RTE Command External Additional Commands </ecu>	Seperator For <input/>				
Output Dir Path < Output> C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte	RTE Tool Path <tool></tool>	C:\ETAS\RTA-RTE_6.8\bin\RTEGen.exe		✓ Brow	se
RTE Log File C:\Users\POV1Ml\Desktop\tests\02_Project\newPrj\src\rte\rte.log	Output Dir Path <output< td=""><td>> C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte</td><td></td><td>✓ Brow</td><td>se</td></output<>	> C:\Users\POV1MI\Desktop\tests\02_Project\newPrj\src\rte		✓ Brow	se
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NB: if the virtual target is used and the mcal configuration files are inside the project folder, make sure to deselect them in the RTE generation dialog window.

4.4 Part 5 - MCAL update

Remeber to update the MCAL. This step is target dependent; in this AN the virtual target is used so the MCAL is regenerated using the mcalgen.exe tool. In particular go to the project directory "ecu_config->mcal" and edit the batch file to add the memory configuration file (Fls EcucValues.arxml)

4.5 Part 6 - ASW

Do not forget to edit the SWC file adding the necessary code to run the test on the NvM; it means having variables to put read NvM values into and other variables to use as source to write Nvm.

4.6 Part 7 - Build

Finally build the whole system code and test the application.

4.7 Part 8 - Additional Notes

Before building the whole system maje sure you have added all the needed integration code (e.g. Compiler.h INLINE defines).



4.8 Part 9 - Test with ISOLAR EVE

Debug the project with ISOLAR EVE; during the execution of the debug session a binary file will be created; at the end of the test the file will be updated with the new data.



5 Contact, Support and Problem Reporting

For details of your local sales office as well as your local technical support team and product hotlines, take a look at the ETAS website:

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