



汽車嵌入式軟體應用開發 - Capital VSTAR, Polarion - 軟體創新執行的單一協作平臺

Siemens Digital Industries Software (Taiwan)
Global Sales and Customer Success

Agenda

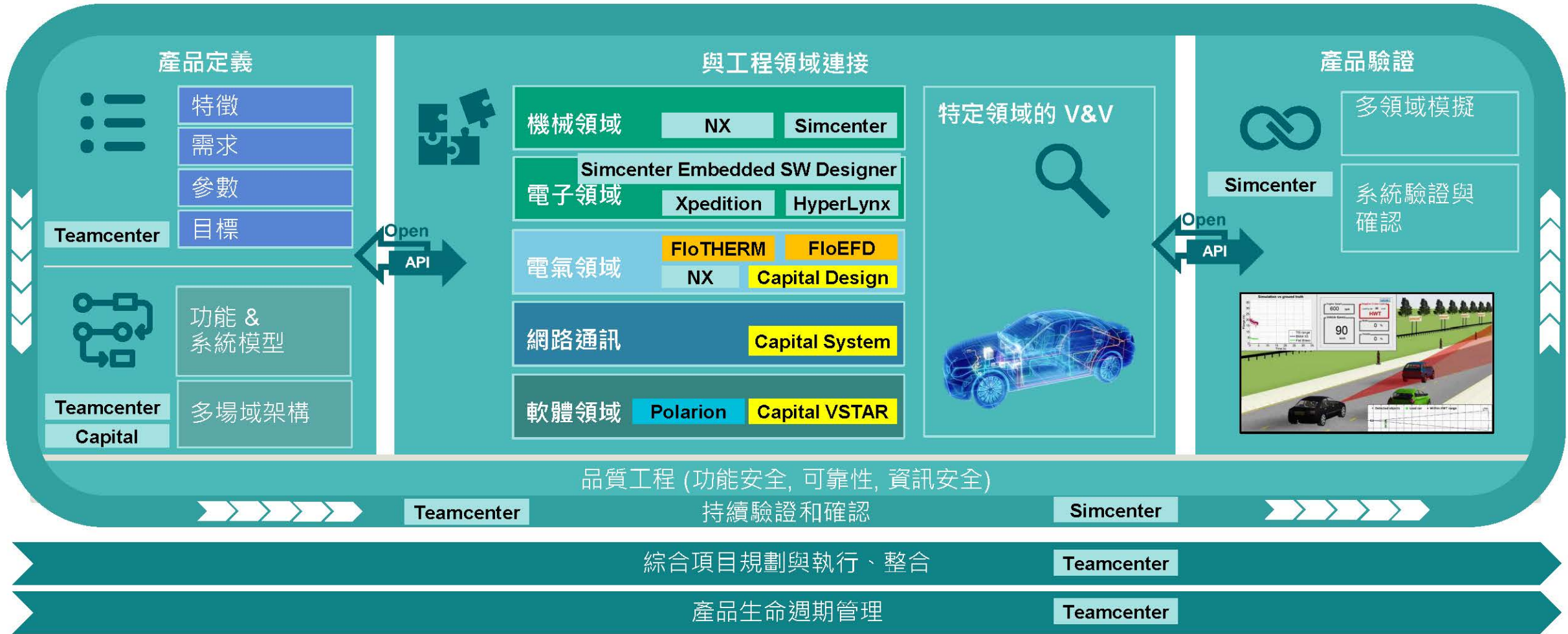
- 汽車電子產品帶有嵌入式軟體的法規要求
- **SIEMENS' IES Segment Product in MBSE**
- 嵌入式軟體開發 w/ Capital VSTAR (符合汽車電器/電子架構開發的行業標準 - AUTOSAR)
- 汽車嵌入式軟體應用開發 w/ Polarion 協作平臺 (符合 ISO-26262 道路車輛功能安全國際標準)
- **Customer Success**

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SIEMENS' IES Segment Product Portfolio in MBSE

Start Integrated Electrical Systems, stay integrated



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- **Customer Success**

Electronic Control Unit (ECU) 開發不是一個孤立的活動 是系統的一部分與高效和正確性才是關鍵



嵌入式軟體開發目的；管理車輛系統狀態與減少能耗。

應用領域；安全系統、

車身系統

車電系統

馬達動力

電池系統

充電系統

自動駕駛

整車系統

娛樂系統

Microcontroller

基於多核心運用、低功耗模式，經過驗證的可靠和符合網路安全要求的 software component.

E/E 系統開發 驅動軟體和網路發展的系統

ALM : 協作、可追溯性、工作流

- 需求管理
- 測試與品質管理
- 敏捷和混合項目管理

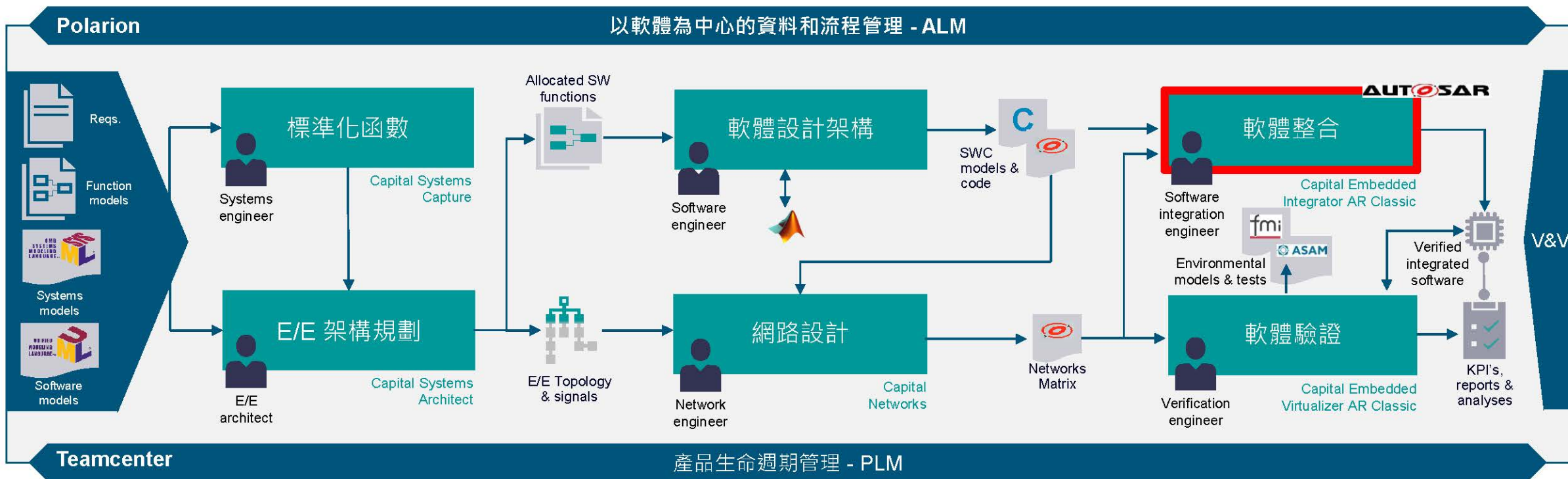
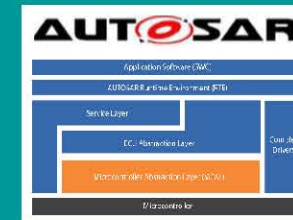
有保證的品質和合規性



在平臺環境中開發軟體，並於前端加載流程

- 建立基於合同的、預驗證的軟體架構
- 網路通信系統的早期驗證
- 使用 AUTOSAR 方法進行軟體整合

將每個設計步驟附加到 ALM 驅動的軟體過程



E/E 系統開發

透過模擬或物理硬體上整合 ECU 分配的軟體

挑戰：隨著成本和時間壓力，車輛系統的複雜性不斷增加

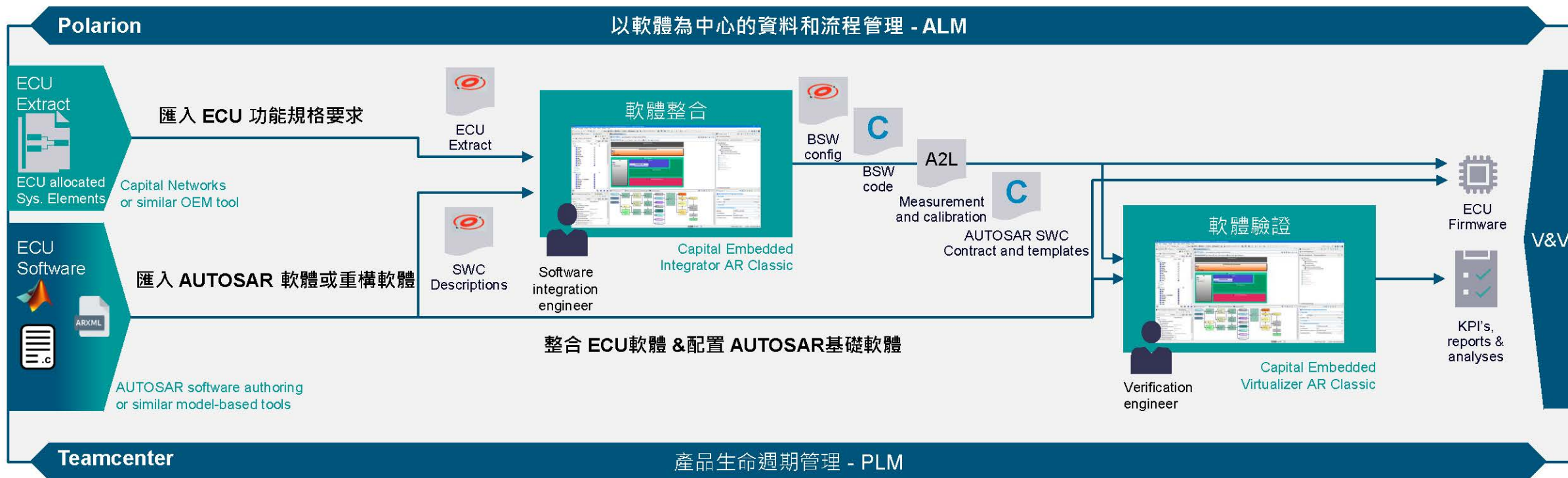
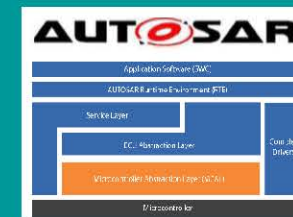
- 應用功能的複用與整合
- 整合過程和測試中錯誤與延遲檢測

必須滿足不斷增長的 SW 安全/安保和監管需求

高度合規的 AUTOSAR 實施和工具

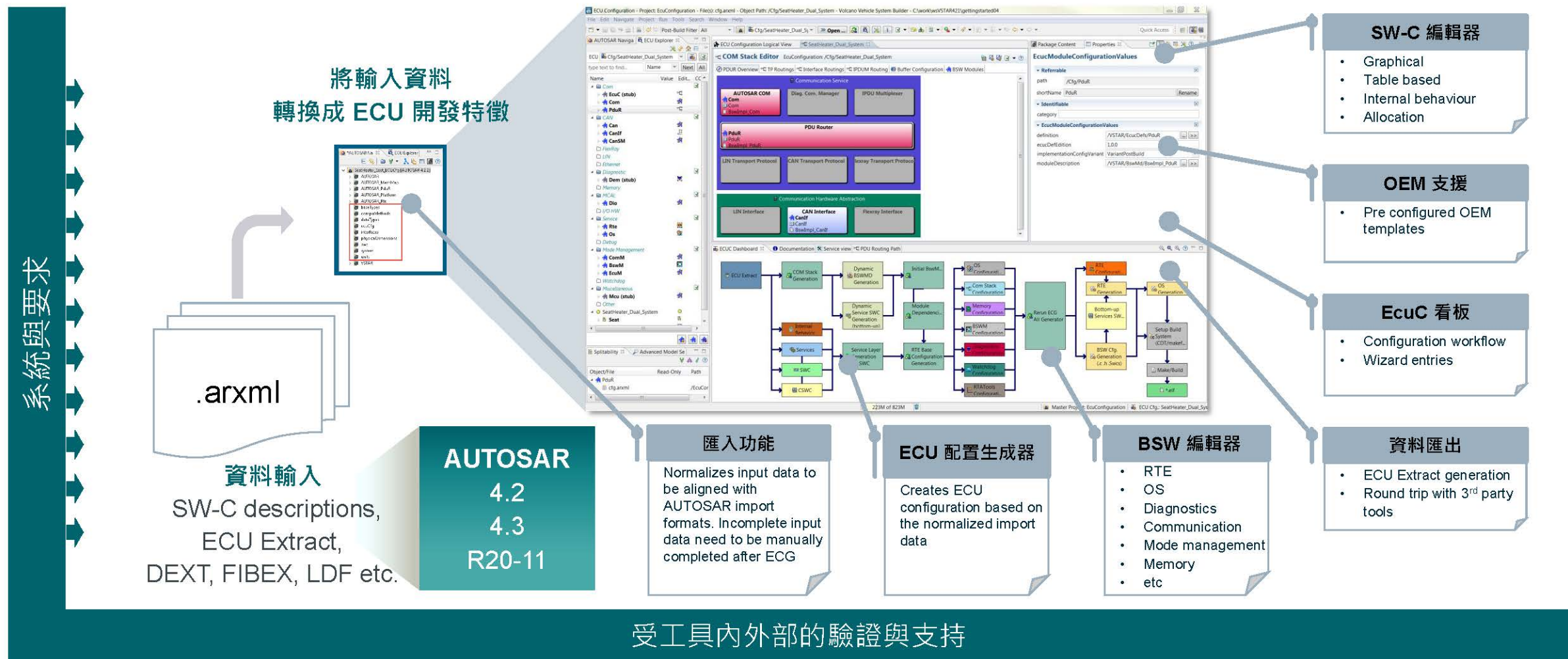
- 通過引導式用戶界面簡化 ECU 整合
- 由生成開發流程管理的複雜配置
- 使用 AUTOSAR 方法自動化進行軟體整合

可擴展、安全可靠的高性能嵌入式平臺軟體



Capital Embedded Integrator Classic - 功能和特點

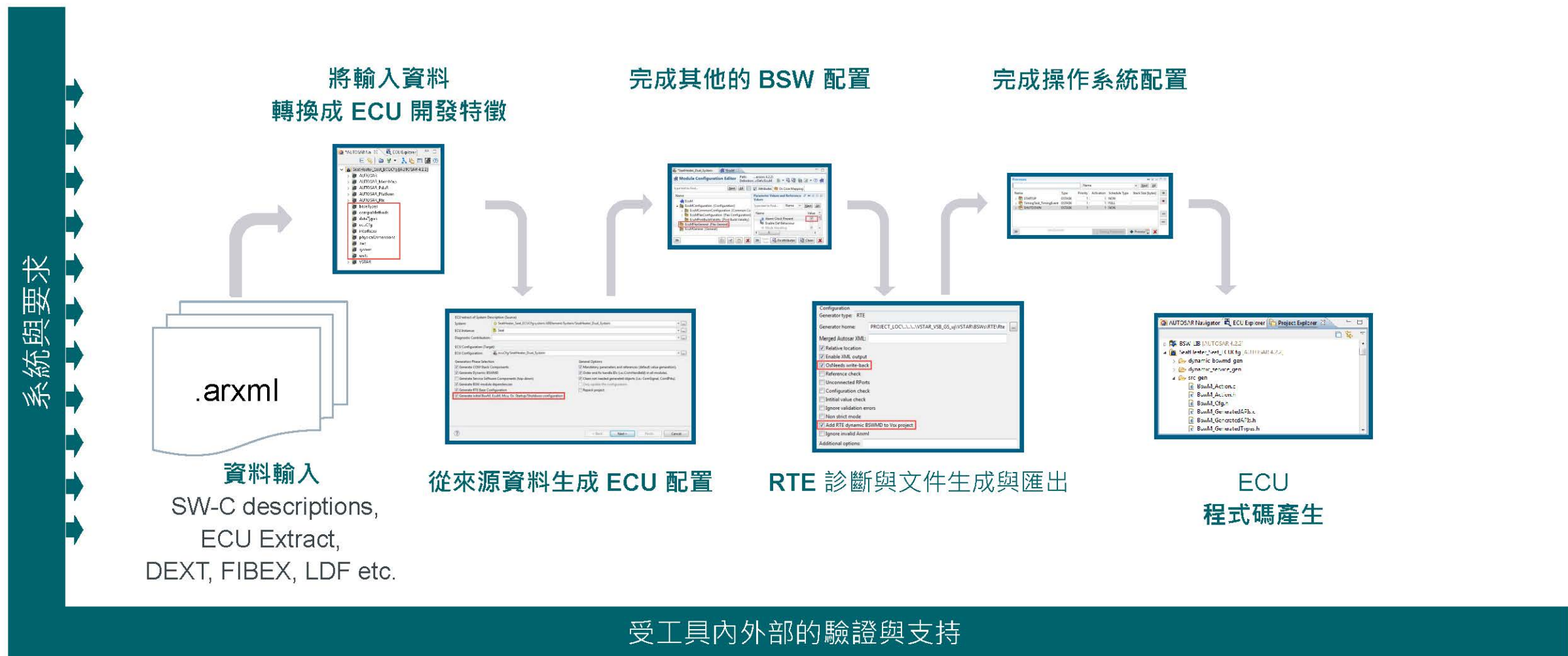
匯入上游資料並設定 Capital Embedded Classic 執行模式



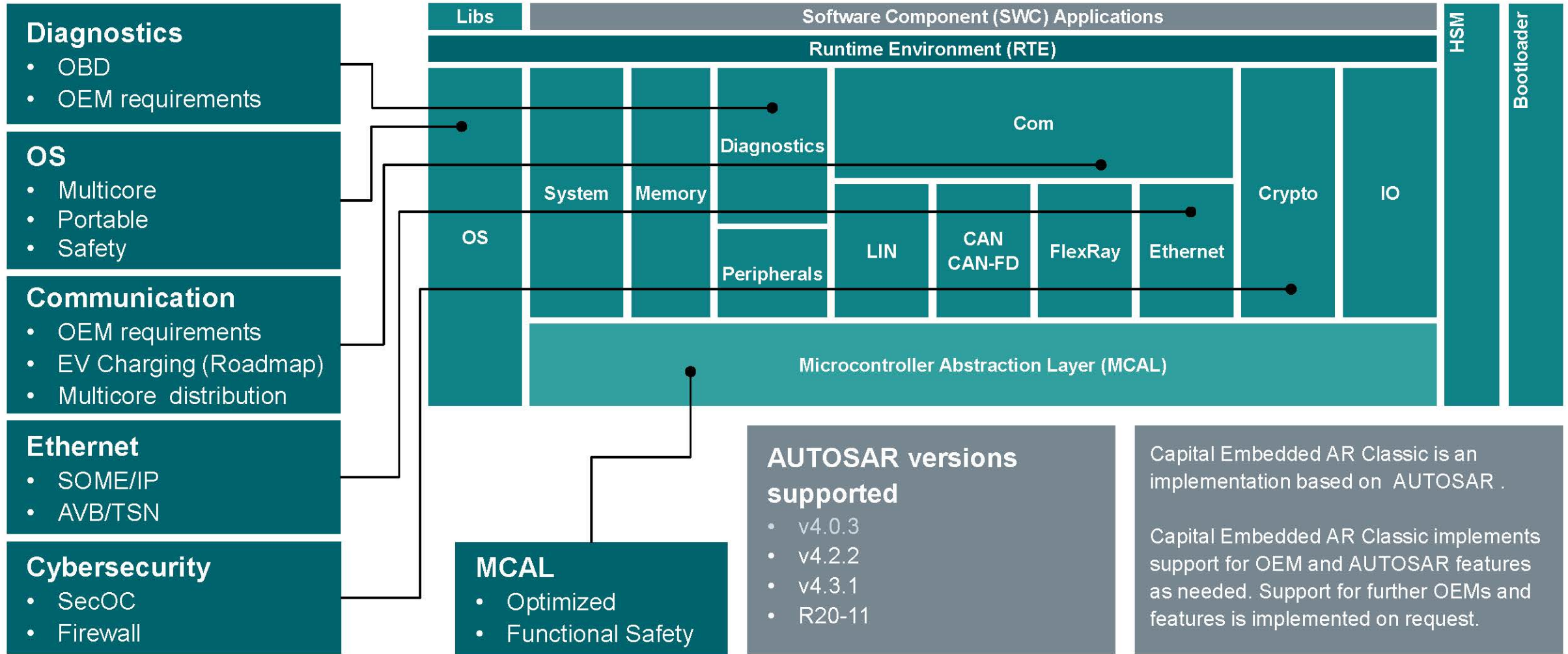
受工具內外部的驗證與支持

Capital Embedded Integrator Classic - 開發流程

支持高效的 ECU 工程



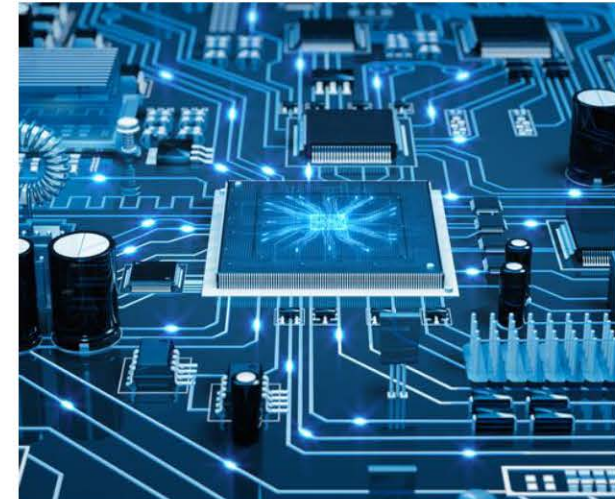
Capital Embedded Integrator Classic - 嵌入式軟體 AUTOSAR 基礎軟體 (BSW)



具有重點和優先級的預定義平臺

Micro	Features	Target ECU's
1 NXP S32K	ARM based, safe and secure microcontroller	Body, zone control and electrification
2 Infineon AURIX TC3(9/8/7)x	Scalable Tricore multicore MCU with safety and security	Powertrain, gateway, electrification, ADAS
3 Renesas RH850 U2A	Multicore processing, cross domain, safety and security	Body, chassis control domain and gateway
4 Renesas RH850 F1K/E2M	Balanced performance, low power, single/multicore	Body F1K, powertrain – E2M
5 NXP MPC57xx	PPC based platform, multi-core processing	Body, powertrain, ADAS and gateway
6 TI J7 (R5F cores)	High-capacity ADAS and gateway processor	ADAS ECUs for cameras, radars, lidars etc.
7 iMX8QM (M4F core)	High-capacity application processor	Application processor for infotainment, clusters and audio

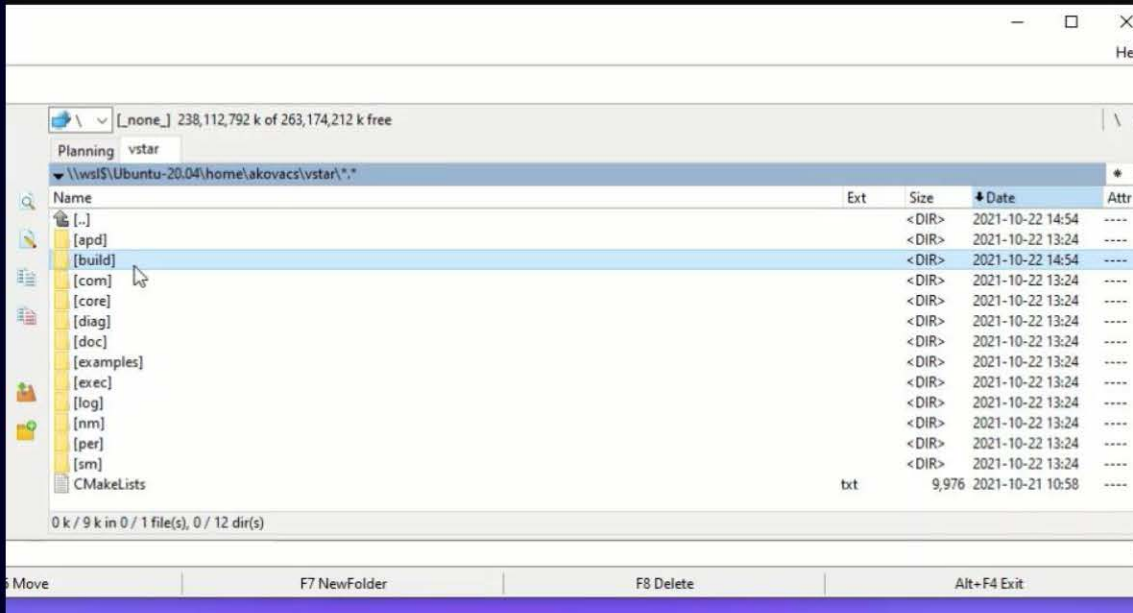
Micro	Features	Target ECU's
PC-executable generic MCU implementation	Platform for Capital Embedded Virtualizer AR Classic	Functional Digital Twin platform



```

akovacs@HUB-AKOVACS2-10: ~/vstar
-- option ARA_ENABLE_MEMCHECK=OFF (depends on ARA_ENABLE_TESTS)
-- option ARA_ENABLE_COVERAGE=
-- Found PkgConfig: /usr/bin/pkg-config (found version "0.29.1")
-- Found Boost: /usr/local/boost-1.60.0/include (found version "1.60.0")
-- Checking for one of the modules 'RapidJSON'
-- Configuring done
-- Generating done
-- Build files have been written to: /home/akovacs/vstar/build/cmake/apd_manifestreader-prefix/src/apd_m
anifestreader-build
[ 22%] Performing build step for 'apd_manifestreader'
make[3]: Entering directory '/home/akovacs/vstar/build/cmake/apd_manifestreader-prefix/src/apd_manifestr
eader-build'
make[4]: Entering directory '/home/akovacs/vstar/build/cmake/apd_manifestreader-prefix/src/apd_manifestr
eader-build'
make[5]: Entering directory '/home/akovacs/vstar/build/cmake/apd_manifestreader-prefix/src/apd_manifestr
eader-build'
Scanning dependencies of target manifestreader
make[5]: Leaving directory '/home/akovacs/vstar/build/cmake/apd_manifestreader-prefix/src/apd_manifestr
eader-build'
make[5]: Entering directory '/home/akovacs/vstar/build/cmake/apd_manifestreader-prefix/src/apd_manifestr
eader-build'
[ 33%] Building CXX object src/CMakeFiles/manifestreader.dir/manifest_node.cpp.o

```



Building and installing the Functional Clusters

After the content of the release package is extracted and the third-parties are installed, the top-level CMake file can be used to build all Functional Clusters of the package.

During the build, the installation path of the third-party components must be provided by setting CMAKE_PREFIX_PATH variable. As an example, if Genivi VSOMEIP is installed into the "/usr/local/vsomeip/" directory, this path must be appended to the CMAKE_PREFIX_PATH.

The following snippet shows how CMake should be invoked:

```

cmake -S /home/user/vstar -B /home/user/vstar/build/cmake
-DCMAKE_INSTALL_PREFIX=/home/user/vstar/build/install
-DAPD_APP_INSTALL_PREFIX=/home/user/vstar/build/install/opt
-DCMAKE_PREFIX_PATH="/usr/local/jansson;/usr/local/dlt;
/usr/local/rapidjson;/usr/local/boost-1.60.0;/usr/local/vsomeip"
-DNO_REFERENCE_CHECKING=1

make -C /home/user/vstar/build/cmake all install

```

Please note that `make all` will build all the functional clusters regardless of the configuration.

After running these commands, the libraries and the executables of the Functional Clusters will be installed into the directory defined by CMAKE_INSTALL_PREFIX (in the example it is set to "/home/user/vstar/build/install").

In the script above the following assumptions are made:

- The package is extracted into the "/home/user/vstar" directory
- The necessary third parties are installed to "/usr/local" directory

Building a specific Functional Cluster is also possible. After invoking the CMake (see above), the following targets can be used to build the Functional Clusters individually:

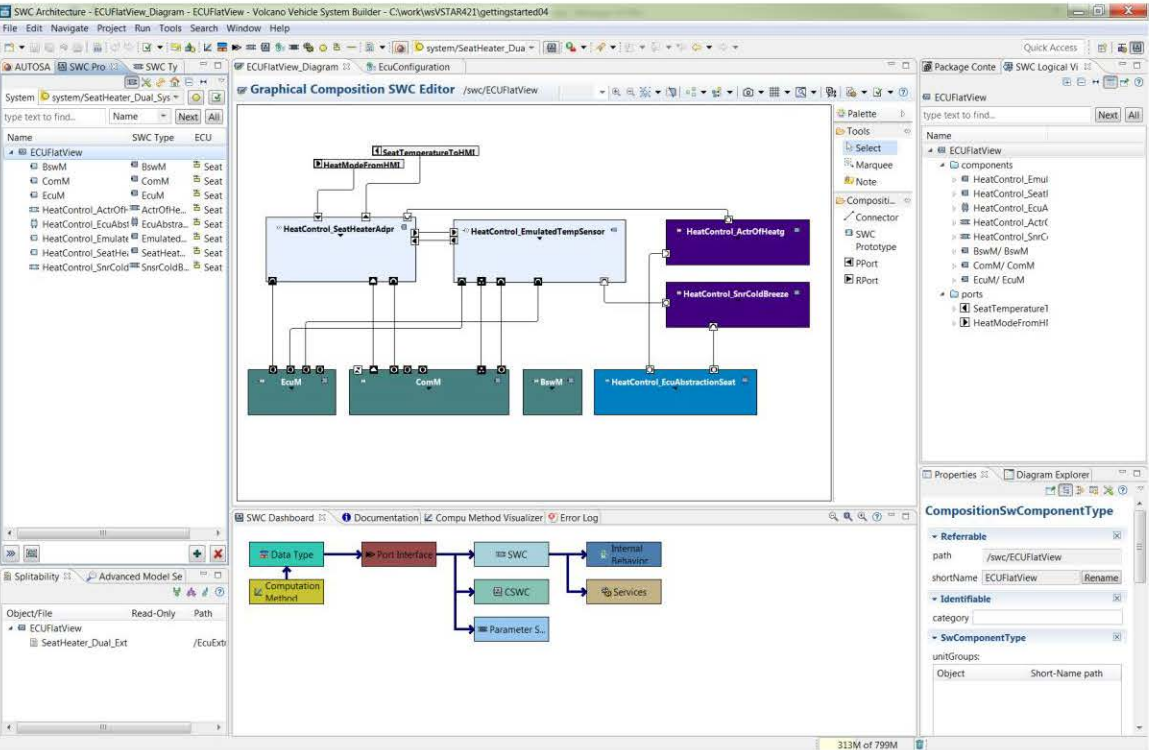
- ara_core_types (Common types of Core Functional Cluster)
- ara_core_core (Core functionality of the Adaptive Platform)
- ara_log

VSTAR_ADAPTIVE_User_Guide_BUILD SYSTEM, Release 2110-Beta
October 21, 2021 6 of 7

Capital Embedded Classic - 西門子 AUTOSAR Classic 平臺

全面的 ECU 設計解決方案

Tool



Embedded runtime

Software Component (SWC) Applications

Runtime Environment (RTE)

Basic Software (BSW)

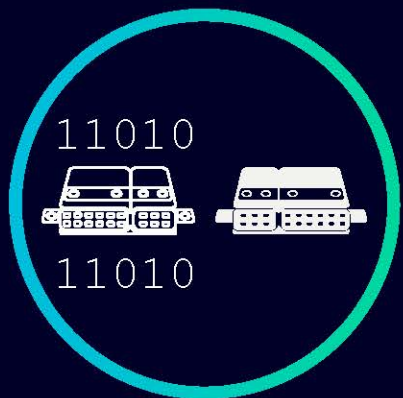
Microcontroller Abstraction Layer (MCAL)



Capital Embedded Classic - 簡化 ECU 軟體開發 涵蓋工具與車載軟體的全面 AUTOSAR 解決方案



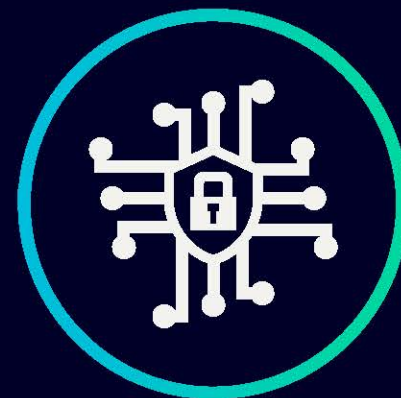
可擴展性



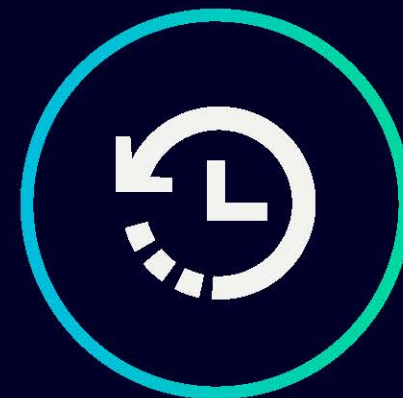
模擬驗證



功能安全



網路安全

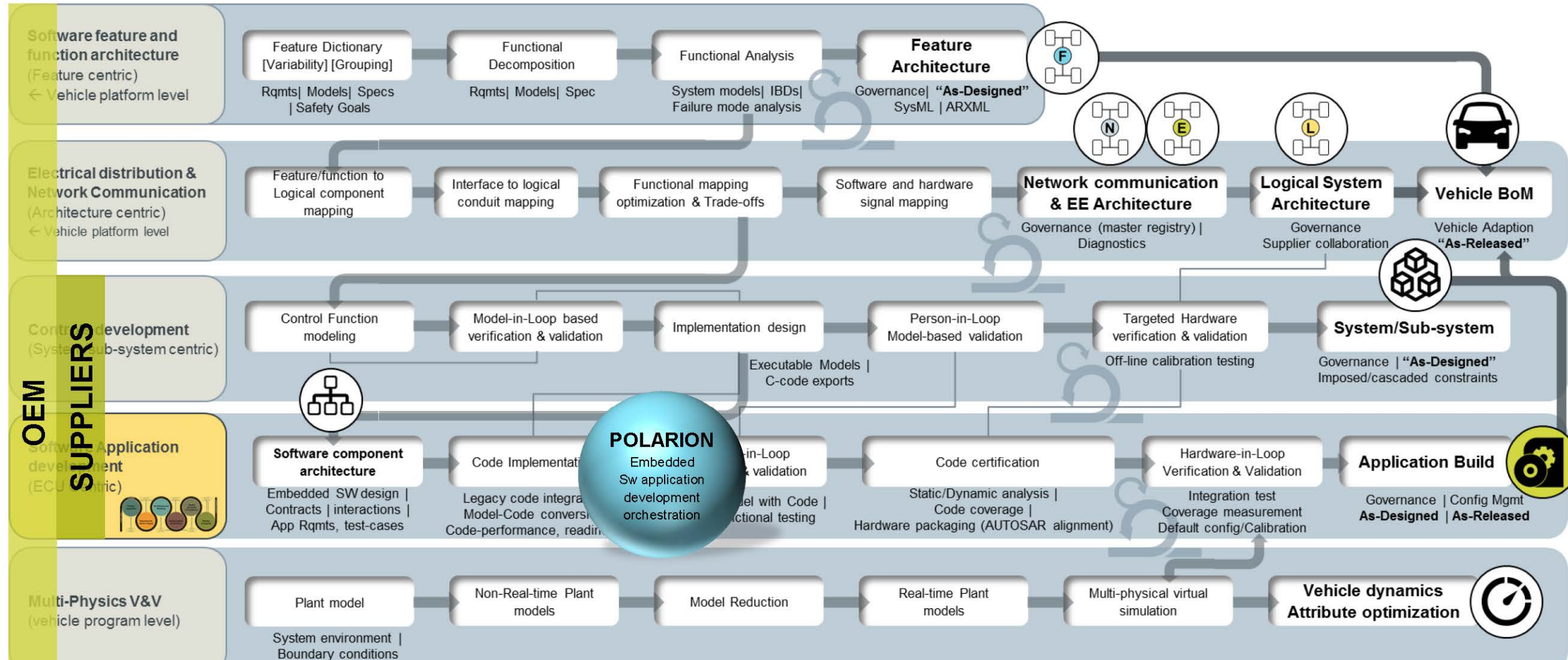


快速部署

Agenda

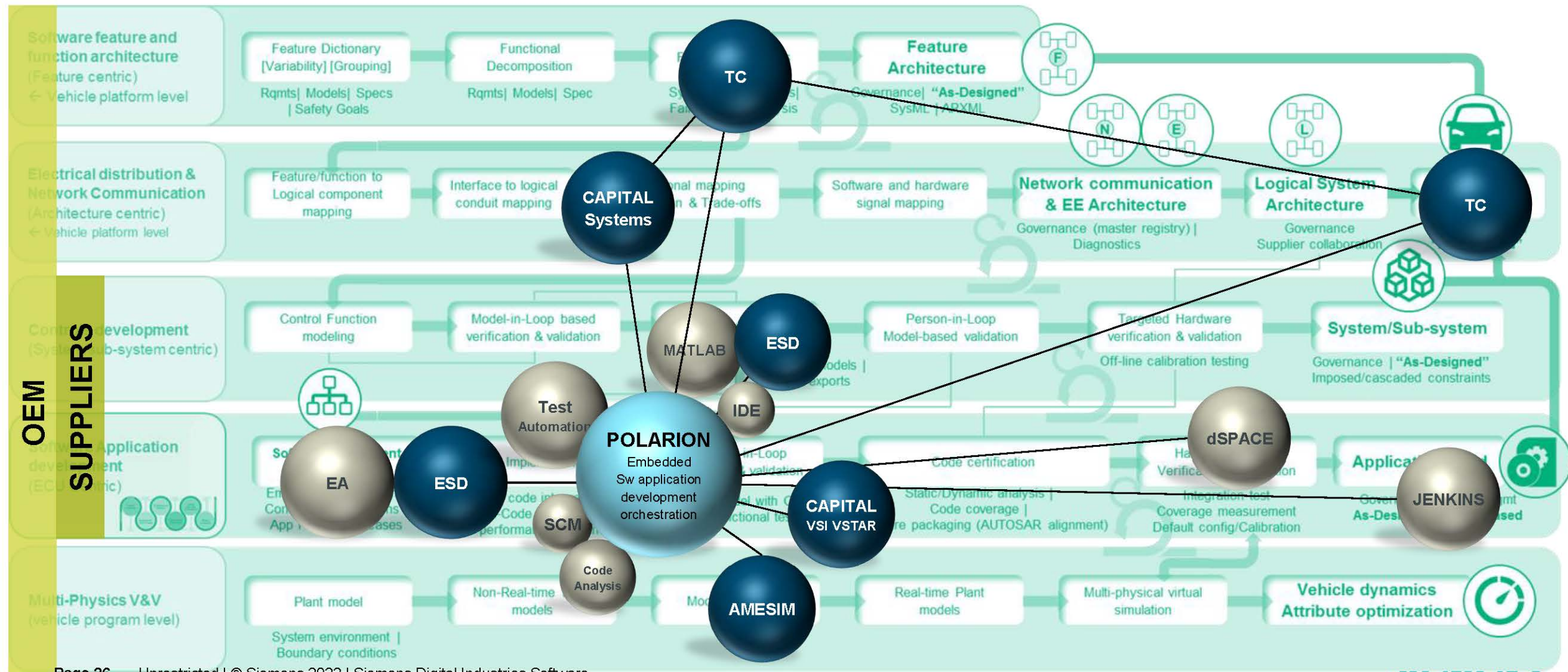
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- **Customer Success**

整合車載軟體開發流程 嵌入式應用程序開發於單一平臺執行



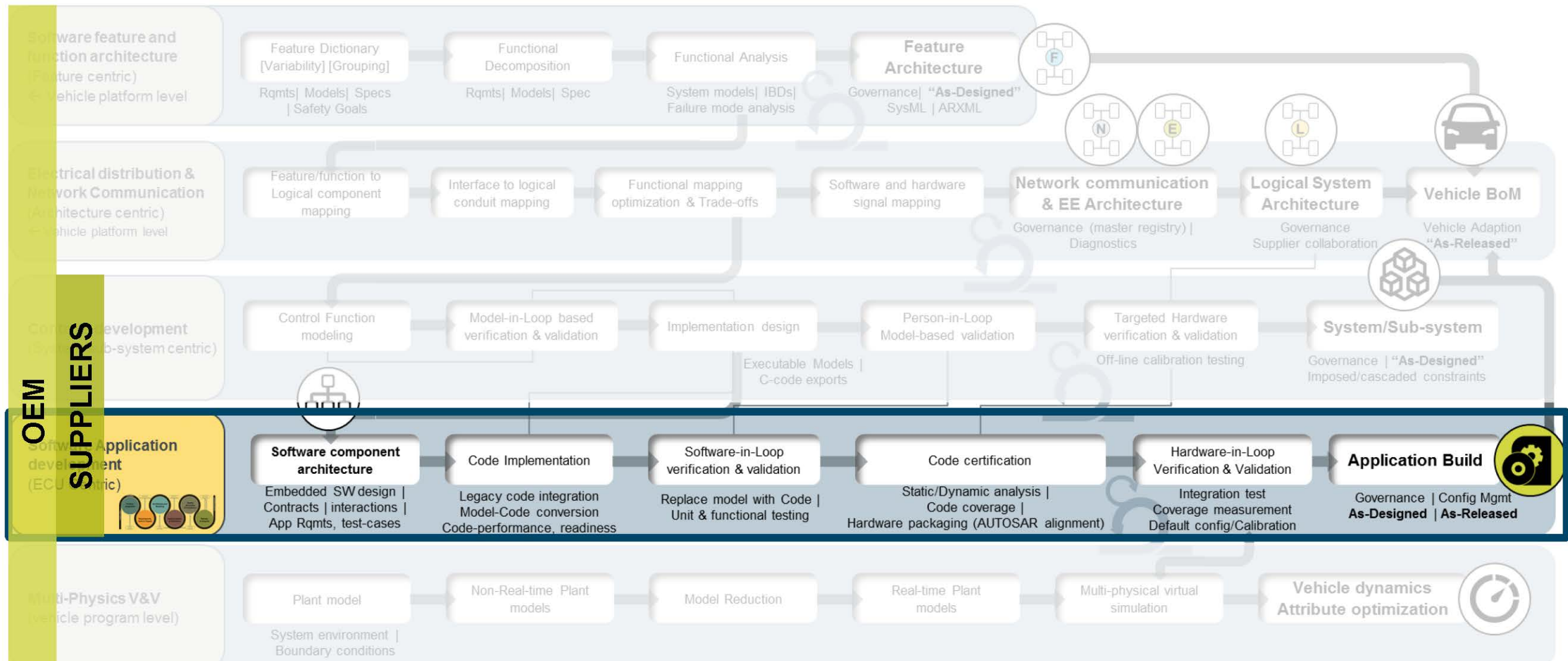
整合車載軟體開發流程

由單一平臺執行編排 - 由下而上的檢視維度



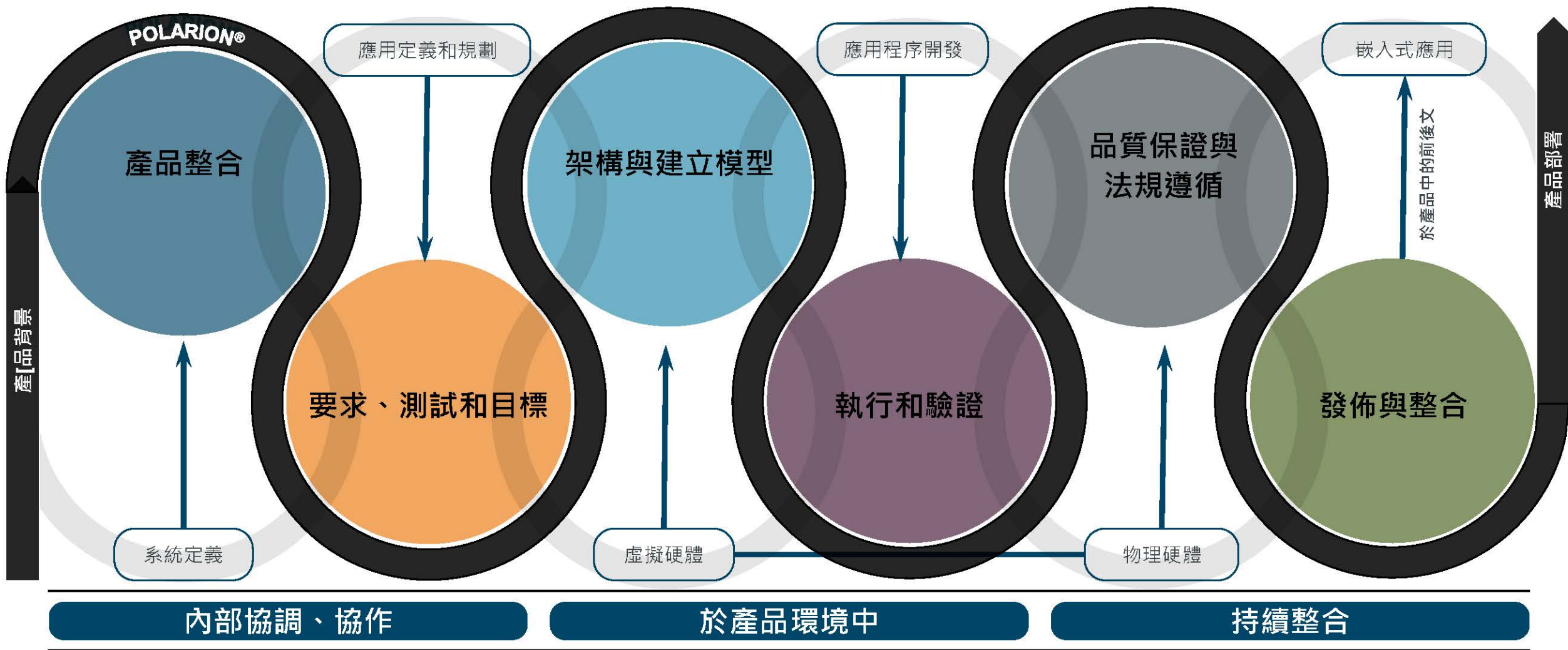
整合車載軟體的開發

重點: 嵌入式應程序的開發編排



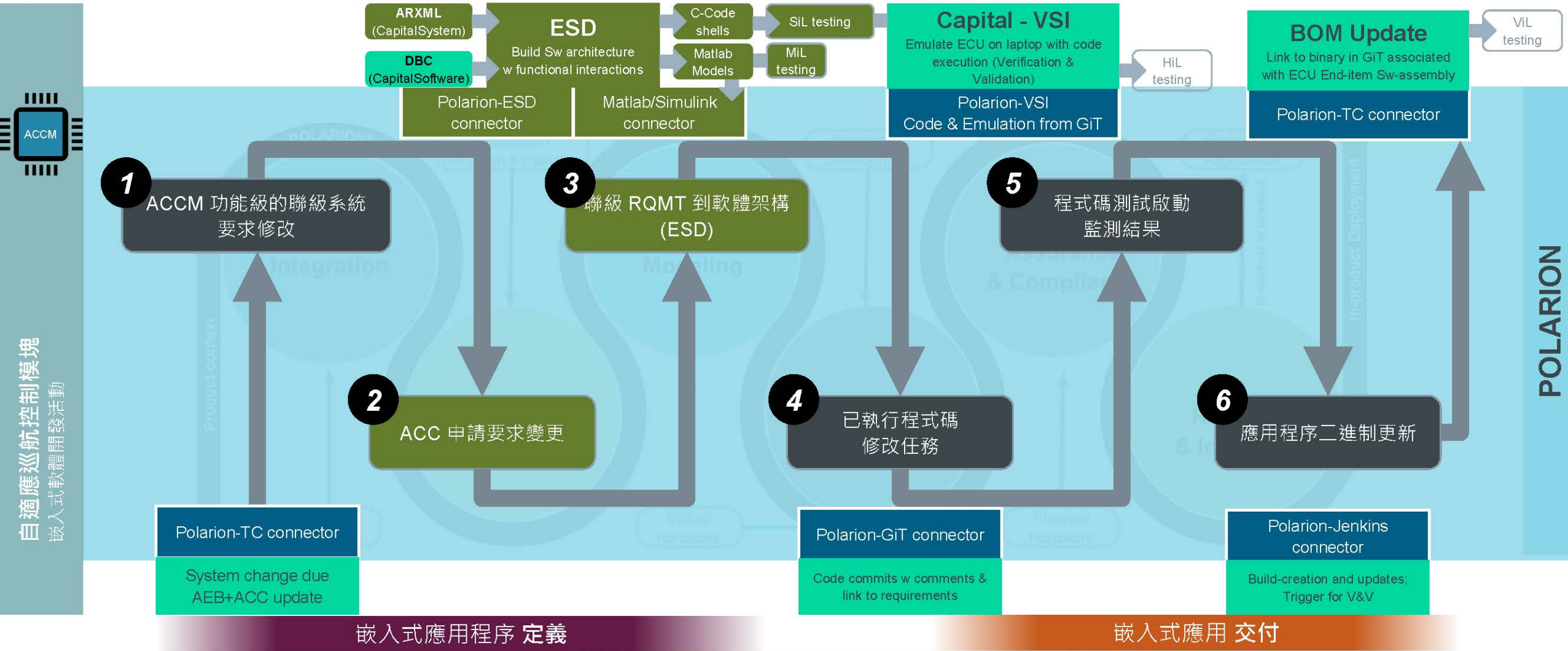
汽車嵌入式軟體應用開發

Polarion – 一個統一的 ALM 平臺協調相關所有活動



案例背景 – 嵌入式軟體應用程序開發

ACCM - Adaptive Cruise Control Module (自主巡航控制模組)



汽車嵌入式軟體應用開發 產品背景下的應用定義和規劃 - 生態系統痛點

嵌入式應用
定義與規劃



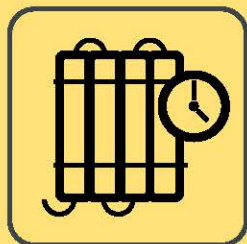
產品環境和系統約束不斷變化

嵌入式應用
開發和質量保證




多領域依賴、跨組織交互變得難以管理


嵌入式應用
交付和監控




清晰的需求、孤立的軟體建模、造成下游延遲和代價高昂的返工




ACCM


 Stephen Crescenti
 My Polarion

- Home
- Dashboard
- Requirements
- Design
- Risks
- Planning
- Development
- Testing
- Maintenance
- Work Items
- Documents & Pages

 ACC Systems
  Driver Braking
 Created: 2019-06-11 00:19, Updated: 2019-06-11 00:27

ACCM-529 - Integrate ACC and AEB

Type: <input checked="" type="checkbox"/> Task	Assignee(s): Stephen Crescenti	Initial Estimate:
Severity:  Normal	Priority:  High [70.0]	Time Spent:
Author: Stephen Crescenti	Status:  Open	Remaining Estimate:
Project: ACCM	Resolution:	

Categories:

Description

Integration of the ACC and AEB features will be necessary for the next generation of our vehicle. Please see supporting information in Teamcenter via the parent tracea

Comments

 Create Comment

 View:
 Show resolved comments

Work Records

Approvals

汽車嵌入式軟體應用開發

產品背景下的應用定義和規劃 - 解決方案的好處

嵌入式應用
定義與規劃



積極配合產品方向和系統約束

嵌入式應用
開發和質量保證

嵌入式應用
交付和監控

汽車嵌入式軟體應用開發 應用程序開發和品質保證 - 生態系統痛點

嵌入式應用
定義與規劃



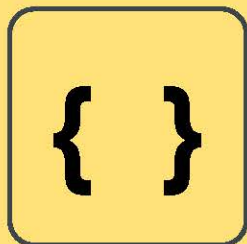
基於里程碑的產品開發和基於敏捷的軟體開發

嵌入式應用
開發和質量保證



知道要測試什麼，什麼時候測試，最重要的是為什麼要測試

嵌入式應用
交付和監控



程式碼來源的複雜性以及產品和系統複雜性的變化

Sourcery Analyzer - Analyzer - Run_FSL_e200z0h/Session 1/Session.Timeline.swd - Volcano Vehicle System Integrator

File Edit Navigate Project Run Search Tools Window Help

Sourcery Analyzer AUTOSAR Debug

Analysis Sessions

Session 1

Timeline

Function Calls

Os_CounterIncrementTicks
Os_CounterAddAction
Os_CounterInsertEP
Os_GetFreeEP
Os_CounterConstructEP
Os_GetFreeAction
Os_CounterConstructAction
Os_CounterFindEP
Os_CounterRegisterIndication
Os_CounterRel2Abs
Os_Core_Idle

VP Current Function

Os_Platform_Idle Rte_Mempcy R... R

Function Nesting Depth

Stackdepth

Time (s)

Virtual Platforms

Virtual Platform Installers

- ARM_cortex_r4f/win_vp_cortex.exe
- FSL_e200z0h/win_vp_e200z0h.exe

Installed Virtual Platforms

- ARM_cortex_r4f
- FSL_e200z0h
 - Documentation
 - Run_FSL_e200z0h
 - C/C++ Applications
 - FREESCALE_MPC56xx_DIAB_001.elf
 - trace_sample.tcl
 - parameters_system_mpc5607b_bridge.txt
 - parameters.txt

Analysis Agents

Quick Search (Ctrl+Shift+F)

Filter

- Event Filter...
One or more graphs plotting data for all events of a specified type.
- Advanced Event Filter...
One graph plotting data for events found using complex search

AUTOSAR

- Exclusive Area
When an exclusive area in an AUTOSAR system is used.
- Port Activity
Shows information about port activity.
- Runnable Execution Time
Shows the execution time values for runnables.
- Runnable Execution Time Statistics
Runtime statistics of runnables in an AUTOSAR system.
- Runnable State
When a runnable in an AUTOSAR system is active.
- Task Execution Time
Runtime of tasks in an AUTOSAR system.
- Task Execution Time Statistics

Select an agent from the list.

Properties Console

```
Run_FSL_e200z0h [Virtual Platform] G:\VSx_projects\VSI_elf_processing2\FSL_e200z0h\run.exe
In file: v:\papoulis\src\mb\sysc\warnings.cpp:55
In process: bd.ecul.cpu.PV.core.thread @ 4109762575 ns
```

Progress

- Creating new folder... OK
- Creating new folder... OK

Virtual ECU testing

275M of 410M Running Virtual Platform

汽車嵌入式軟體應用開發 產品背景下的應用程序開發和品質保證

嵌入式應用
定義與規劃



積極配合產品方向和系統約束

嵌入式應用
開發和質量保證

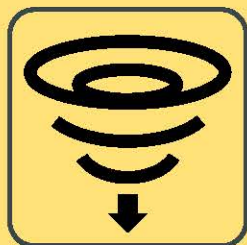


管理風險減少偏差、降低不合格品和返工的數量

嵌入式應用
交付和監控

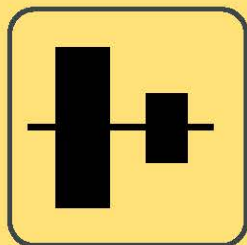
汽車嵌入式軟體應用開發 應用交付和監控 - 生態系統痛點

嵌入式應用
定義與規劃



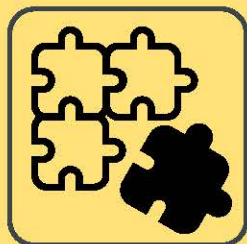
控制後期變更和範圍蔓延

嵌入式應用
開發和質量保證



為軟體驗證與確認硬體調整和系統設定約束

嵌入式應用
交付和監控



確保和管理軟體與產品差異的兼容性

Software Requirement Software Test Case Coverage



ACCM

Search



Stephen Crescenti
My Polarion



Home



Dashboard



Requirements



Design



Index



Software Requirement
Software Test Case
Coverage



Software Requirement
Specification



Software Requirement
Specification Approval
Status



Software Requirement
Statistics



Software Test Case
Specification



System Requirement
Software Requirement
Coverage

Software Requirement	Software Test Case(s)	Issue(s)	Details
✓ ACCM-547 - The ACC System must only activate the Flux Capacitor on a straight road sub-comp...			▼ 1 Software Test Case Found
	ACCM-549 - Test: The ACC System must only activate the Flux Capacitor on a straight road sub-comp...		
✓ ACCM-546 - The ACC System must have a driver_decision sub-component			▼ 1 Software Test Case Found
	ACCM-548 - Test: The ACC System must have a driver_decision sub-component	ACCM-568 - Failure in power cycle ▶	
✗ ACCM-544 - The ACC System must have a TIS_2_straight_road sub-component			No Software Test Case(s) Found.
✓ ACCM-543 - The ACC System must have a sensor_data_merge sub-component			▼ 1 Software Test Case Found
	ACCM-550 - Test: The ACC System must have a sensor_data_merge sub-component	ACCM-567 - Fault in module ▶	
✓ ACCM-542 - The ACC System must have a TIS_1_straight_road sub-component			▼ 1 Software Test Case Found
	ACCM-551 - Test: The ACC System must have a TIS_1_straight_road sub-component		
✗ ACCM-541 - The ACC System must have a output_limitation sub-component			No Software Test Case(s) Found.
✓ ACCM-540 - The ACC System must have a TIS_2_action sub-component			▼ 1 Software Test Case Found

Target Version

-- not selected --

Requirement Query

Filter Linked Items By Coverage

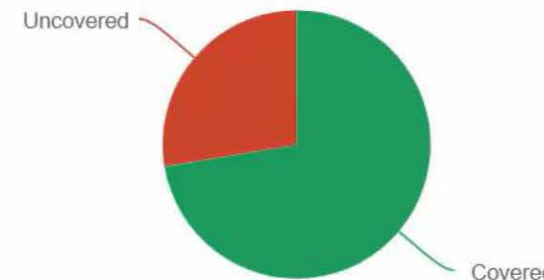
-- not selected --

Collapse from number of Test Cases

5

Apply

[Save as Default](#)



汽車嵌入式軟體應用開發 產品上下文中的應用程序交付和監控

嵌入式應用
定義與規劃



積極配合產品方向和系統約束

嵌入式應用
開發和質量保證



管理風險減少偏差、降低不合格品和返工的數量

嵌入式應用
交付和監控



在硬體和系統設定限制下，部署經過全面驗證的
嵌入式軟體

汽車嵌入式軟體應用開發

產品上下文中的應用程序定義、開發和交付

嵌入式應用
定義與規劃



積極配合產品方向和系統約束

嵌入式應用
開發和質量保證



管理風險減少偏差、降低不合格品和返工的數量

嵌入式應用
交付和監控

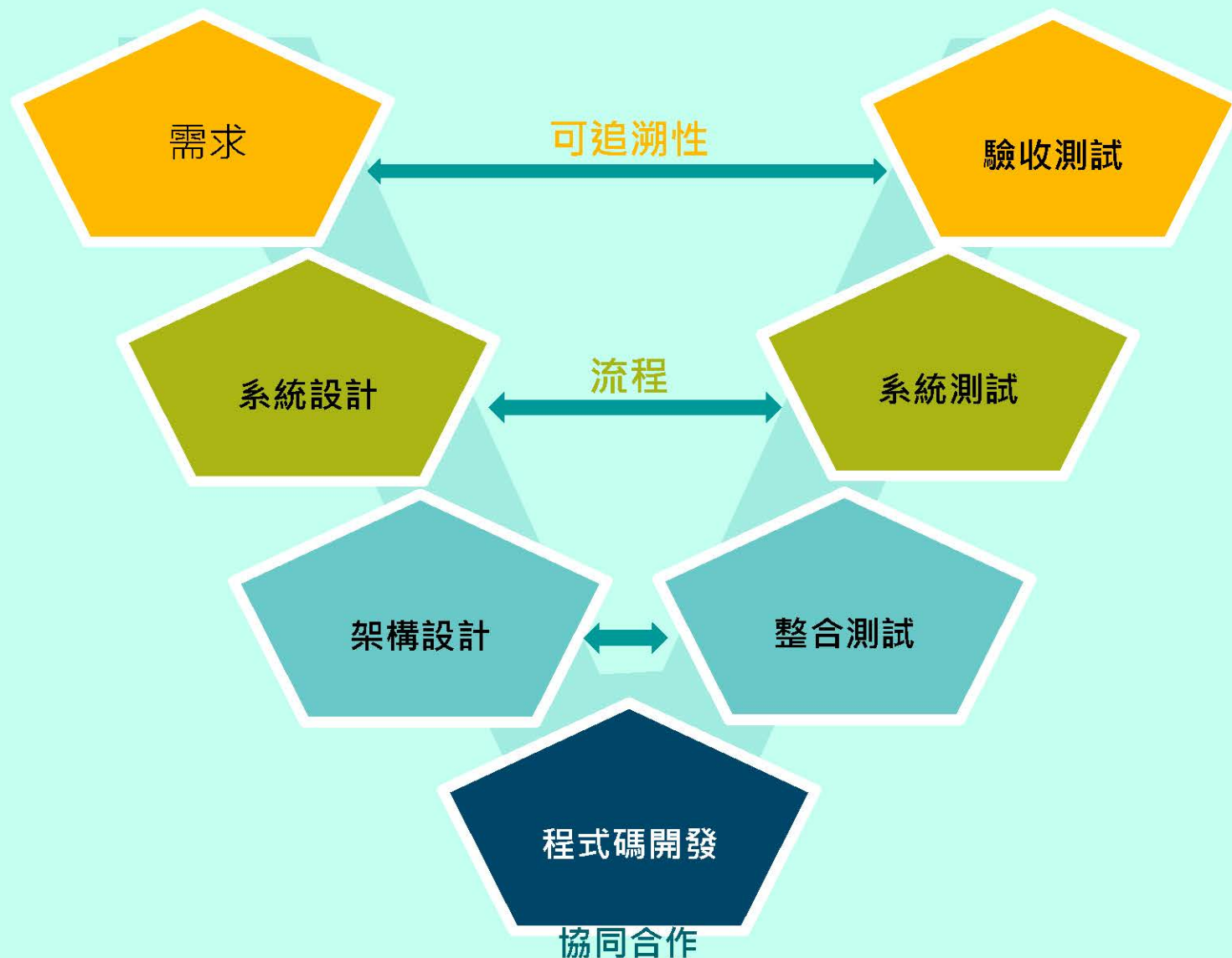


在硬體和系統設定限制下，部署經過全面驗證的
嵌入式軟體



關鍵整合舉措

需求測試用例覆蓋了完整可追溯性以確保更好的品質交付

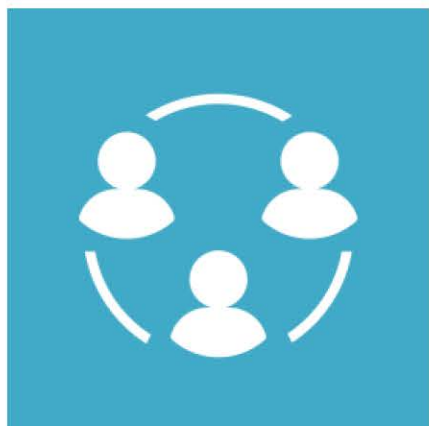


汽車嵌入式軟體應用開發

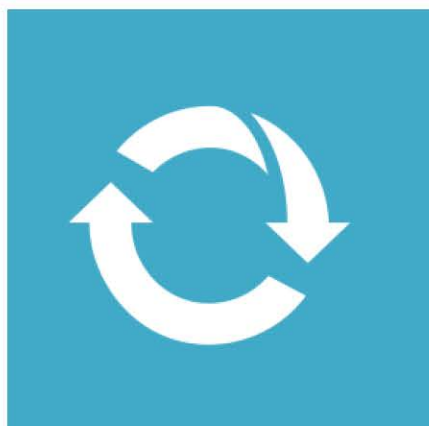
小結 以一個統一的 ALM 平臺來協調所有相關活動

投資回報

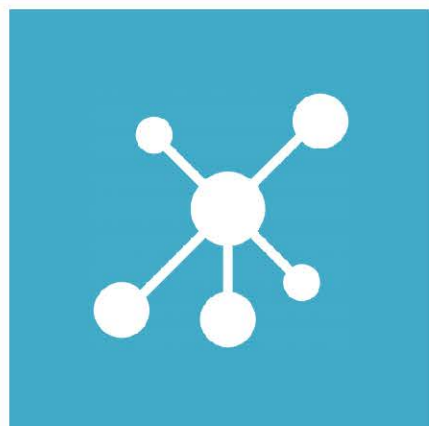
節省時間



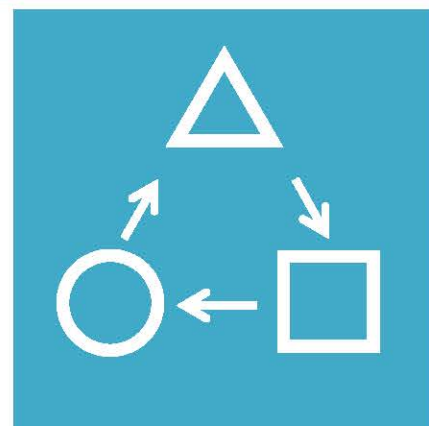
協作便利與快速



重用



可追溯性

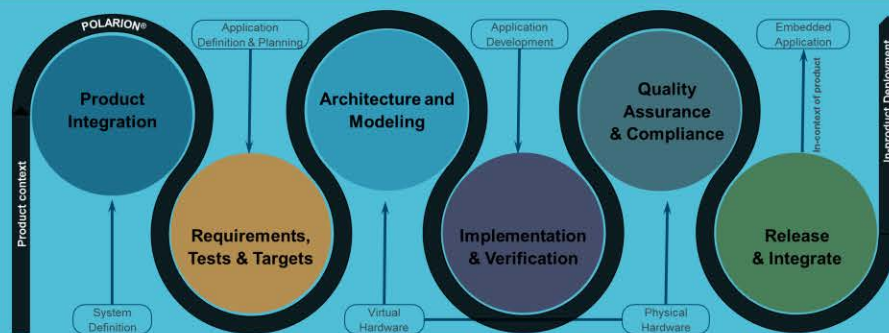


互通性



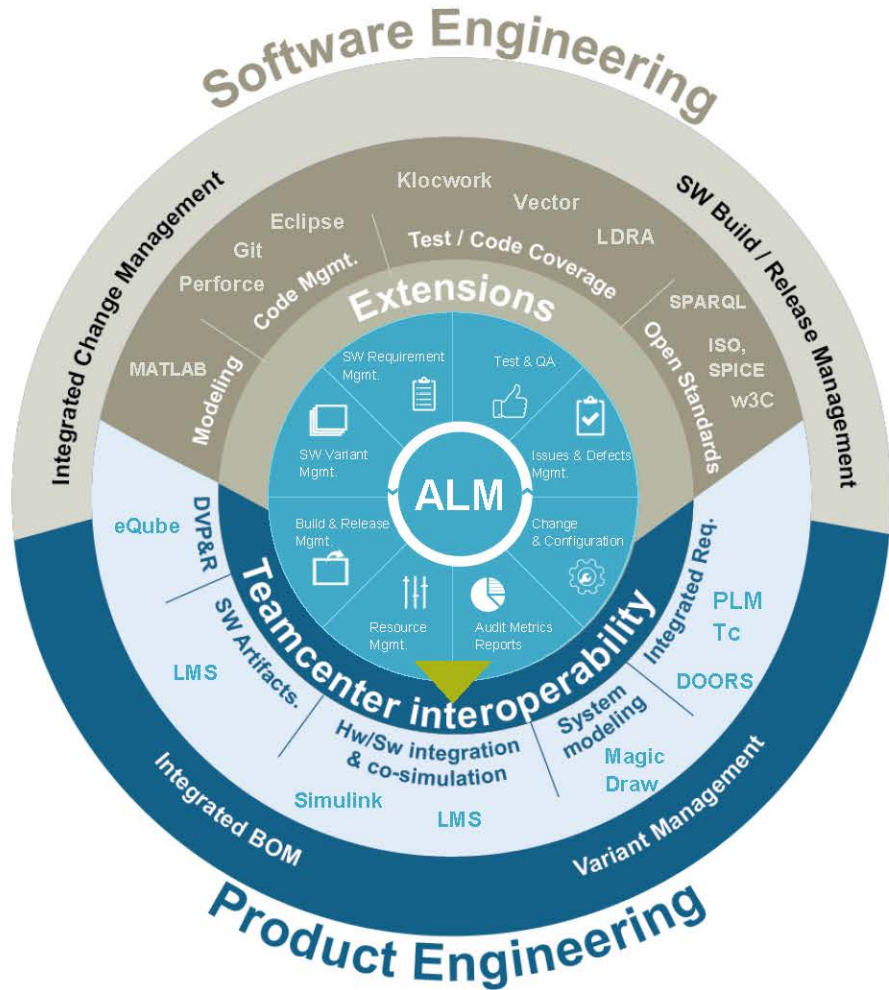
遵循/符合法規要求

Enterprise AGILE
SAFe
ISO 26262
A-SPICE



CMMI
DevOps
Scrum

Polarion 獲得TÜV Nord 可靠工具認證符合 ISO 26262 標準 Functional Safety Management – ISO 26262



功能安全
跨產品與軟體開發

危害分析與風險評估
(ISO 26262 Part 3)

軟體級別的產品開發
(ISO 26262 Part 6)

TÜV Nord “可靠工具認證
對於軟體工程流程支援
(ISO 26262 Part 8)



功能安全可在產品工程中提供全面的
軟體生命週期支援

Pre-Defined Solution

Agenda

- 汽車電子產品帶有嵌入式軟體的法規要求
- **SIEMENS' IES Segment Product in MBSE**
- 嵌入式軟體開發 w/ Capital VSTAR (符合汽車電器/電子架構開發的行業標準 - AUTOSAR)
- 汽車嵌入式軟體應用開發 w/ Polarion 協作平臺 (符合 ISO-26262 道路車輛功能安全國際標準)
- **Customer Success**

Our customers are world leaders



Automotive



Mil/Aero



Computers & Telecom



Consumer



Contract Manufacturers



Thank you

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