NTT DATA

Software process assessment: key in the Automotive Domain but Why not so in the Space Domain

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FUTURE AT HEART

Introduction

Wide consensus that the quality of the processes eventually helps to get higher quality products, to detect defects earlier, to leave less systematic faults in the product, etc.

CMM/CMMI and SPICE were the initial process assessment models used to assess the quality of the software life cycle processes, **focusing on the life cycle processes of software within a system**, and measuring **capability levels** as their quality characteristic.

Different industry sectors found these models useful, and often defined their own sector specific process assessment models, most of them based on the ISO SPICE initial model:

- ECSS-Q-80-HB-02 for the European space domain,
- AutomotiveSPICE for the automotive domain,
- MediSPICE for medical devices
- CMMI, etc

Now, other process assessment models exist for the assessment of other processes: HW, Mechanical, Agile, Data Management, Cybersecurity, Business, Very Small Entities, etc. processes respectively.

Nevertheless, **not all those models are very much used,** mainly because of the lack of recognition of their added value (by many SW suppliers and customers).

Their use is often successful when the customers require certain process quality level for allowing SW suppliers to sign in any contract.

AND THIS IS WHAT IS MAINLY HAPPENING IN THE AUTOMOTIVE SECTOR

Introduction

In the automotive sector, customers require their suppliers to reach capability levels (**CL2 and only sometimes even CL3 – as being an internal investment**) by their processes before delivery or sometimes even before the contract is signed off for a project.

One of the main reasons is to reduce project risks, feared very high today by the main manufacturers due to the tremendous SW revolution, challenging current development and operational software paradigms. Today, InCar SW is incorporating completely different and new technologies, new architectures and with many different new features to add to the vehicle control, e.g. :

- more and more features to implement such as infotainment functionalities for passengers, not anymore only for vehicle control;
- the main forces disrupting the automotive industry today —known collectively as ACES (autonomous driving (AD), connected vehicles, the electrification of the powertrain, and shared mobility);
- sensor, camera's and LiDAR signal processing;
- increased need for safety/dependability and cybersecurity;
- different technology: SW with AI, SW in the Cloud, Data management, SW as a Service / On demand SW, etc.
- New HW architecture: the more than 200 microcontrollers (ECUs) in the vehicle today are becoming now to be two or three big CPUs (DCU – so-called Domain Control Unit) with very complex SW products (one SW product in today's microcontroller can have more than 1.5 Million LOC – the size of the SW in one of the new CPUs may be of 10 Million?);
- Etc.

New ECSS-Q-HB-80-02 – PRM

S4S is existing in the European space sector, but it is not much used.

It will be updated to be in line with the latest ISO/IEC 33061 standard (the SPICE PAM) plus cybersecurity processes might also be added (taken from the ASPICE model from the Automotive domain).

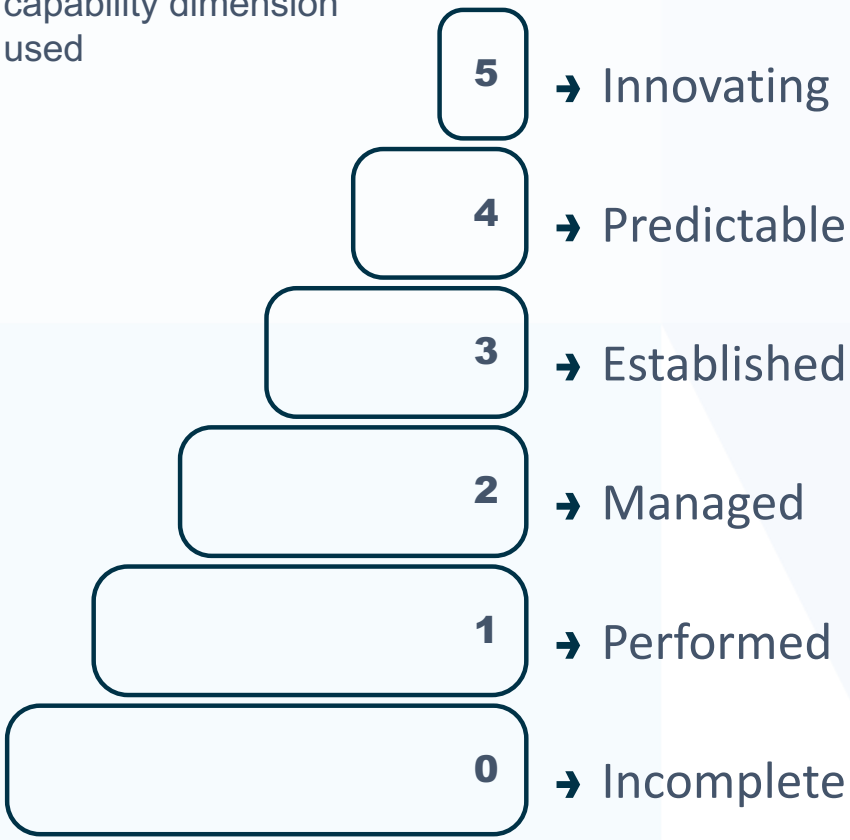
Process dimension

Group	Process		
Agreement processes (AGR)	AGR.1 Acquisition AGR.2 Supply AGR.3 Cybersecurity Supplier Request and Selection		
Organizational project-enabling processes (ORG)	ORG.1 Life cycle model management ORG.2 Infrastructure management ORG.3 Portfolio management	ORG.4 Human resource management ORG.5 Quality management ORG.6 Knowledge management	
Technical management processes (MAN)	MAN.1 Project planning MAN.2 Project assessment and control MAN.3 Decision management MAN.4 Risk management	MAN.5 Configuration management MAN.6 Information management MAN.7 Measurement MAN.8 Quality assurance	MAN.9 Safety and dependability MAN.10 Independent Software Verification and Validation MAN.11 Cybersecurity Risk Management
Technical processes (TEC)	TEC.1 Business or mission analysis TEC.2 Stakeholder needs and requirements definition TEC.3 System/ software requirements definition TEC.4 Architecture definition TEC.5 Design definition	TEC.6 System analysis TEC.7 Implementation TEC.8 Integration TEC.9 Verification TEC.10 Transition	TEC.11 Validation TEC.12 Operation TEC.13 Maintenance TEC.14 Disposal
Security engineering processes (SEC)	SEC.1 Cybersecurity Requirements Elicitation SEC.2 Cybersecurity Implementation SEC.3 Risk Treatment Verification	SEC.4 Risk Treatment Validation SEC.5 Cybersecurity in Operations	

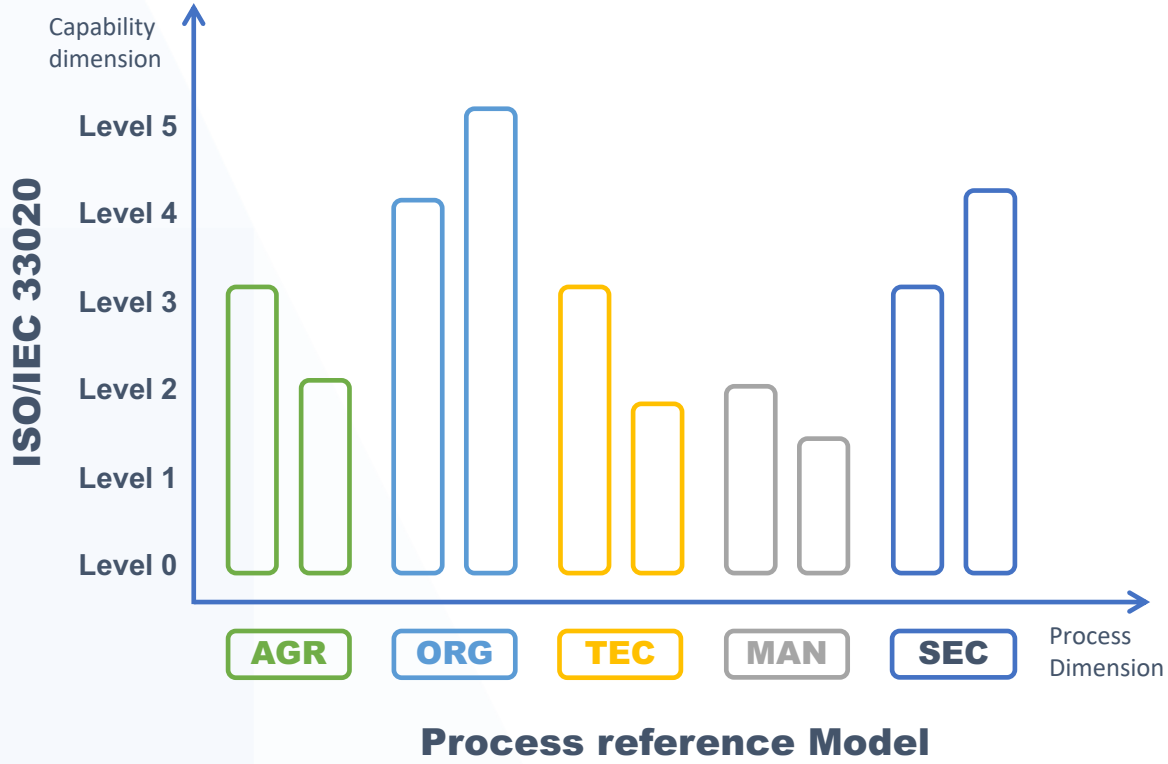
Key: ASPICE Cybersecurity processes · ECSS processes · Added for operations

Capability dimension

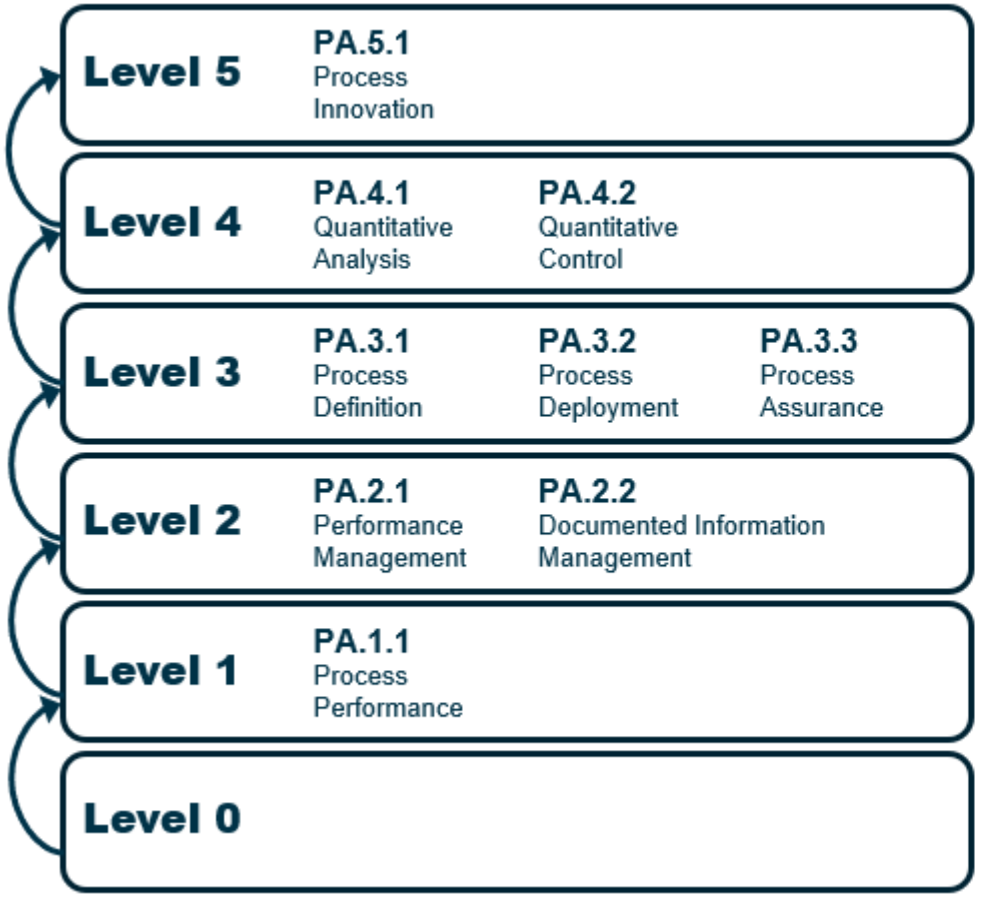
ISO/IEC 33020 is the capability dimension used



In an assessment, each process gets a capability level

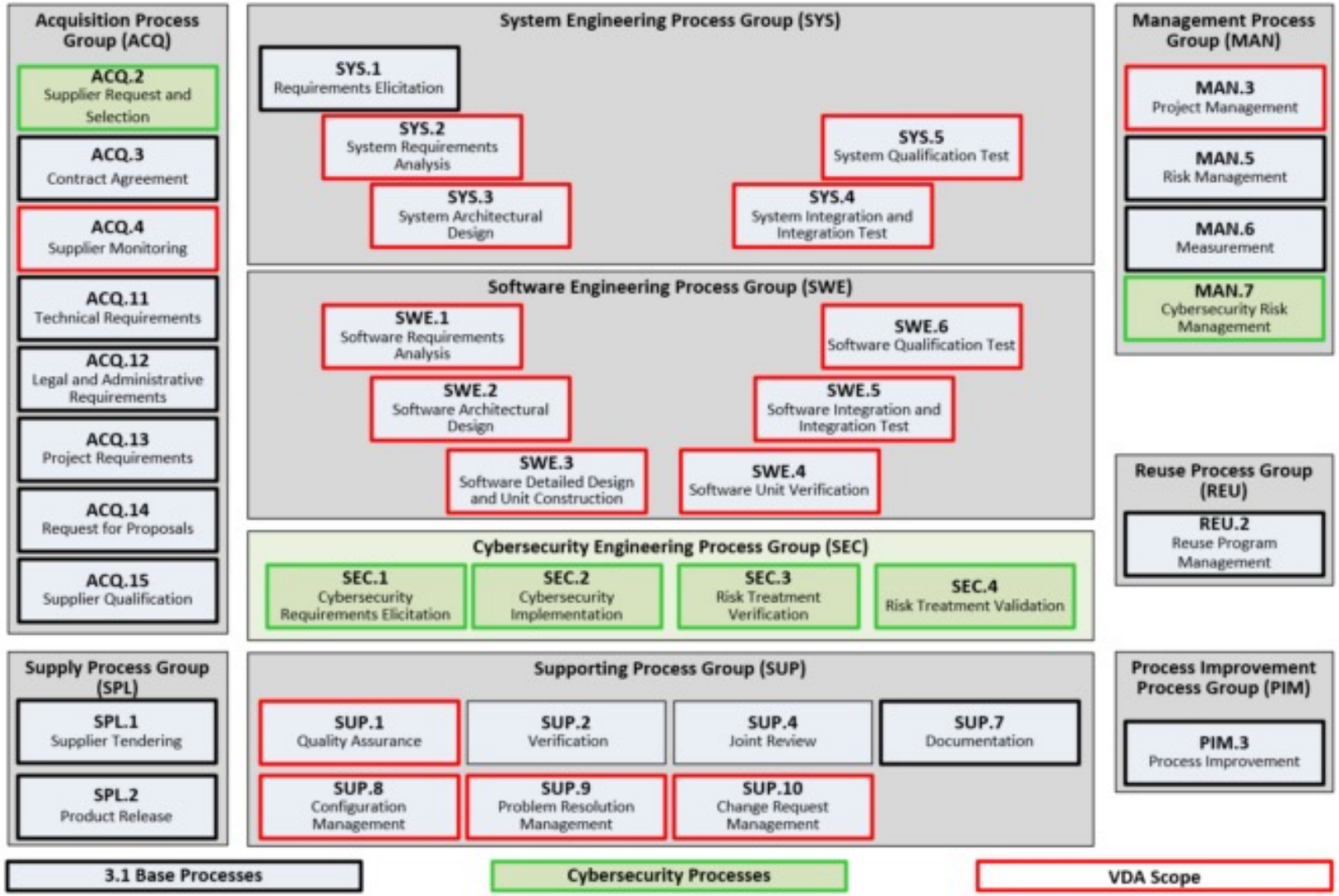


TN3 Part 2 – Measurement framework
(as in the latest ISO/IEC 33020:2019)

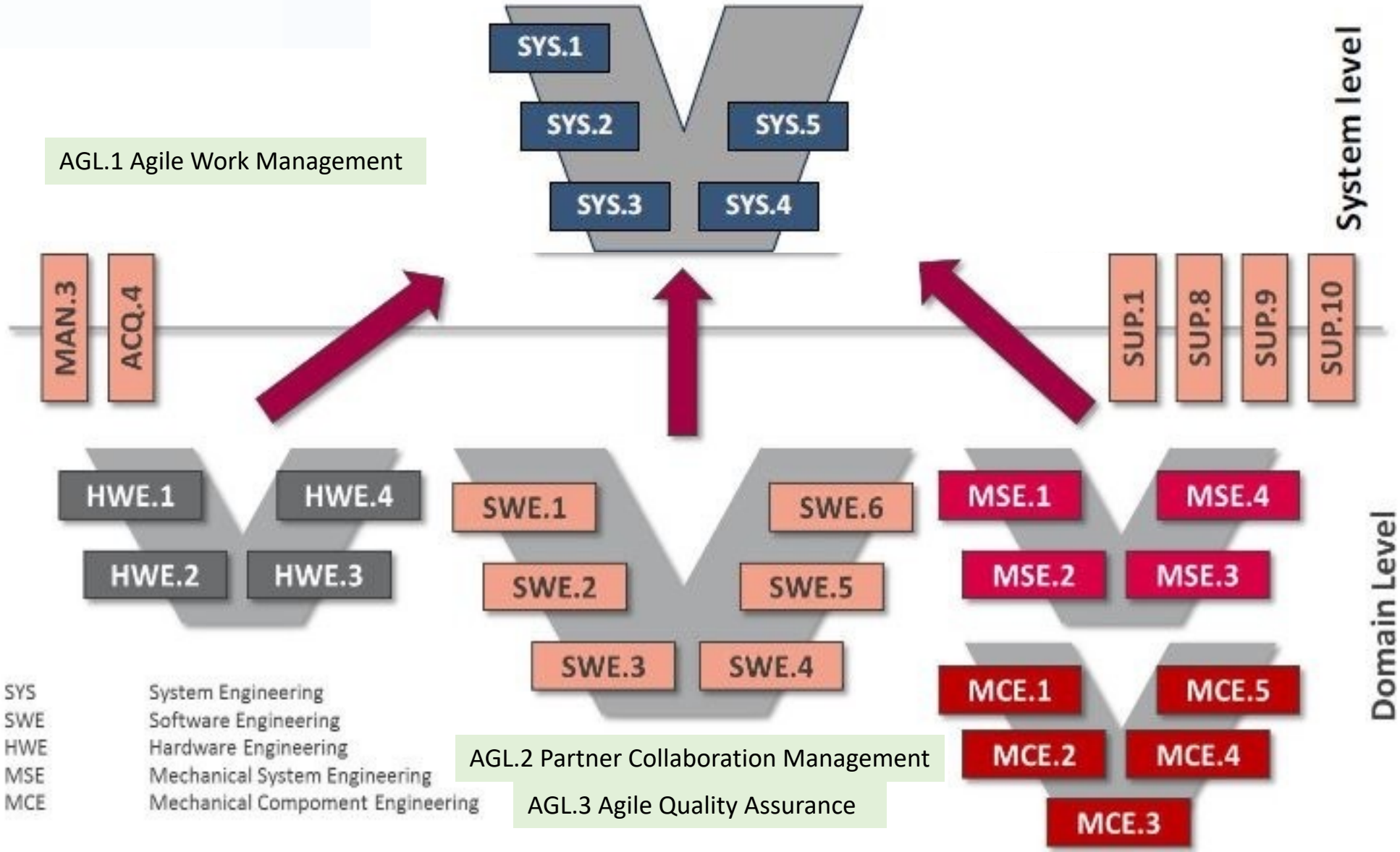


→ **Innovating**	The previously described Predictable process is now continuously improved to respond to change aligned with organizational goals.
→ **Predictable**	The previously described Established process now operates predictably within defined limits to achieve its process outcomes.
→ **Established**	The previously described Managed process is now implemented using a defined process that is capable of achieving its process outcomes.
→ **Managed**	The previously described Performed process is now implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained.
→ **Performed**	The implemented process achieves its process purpose.
→ **Incomplete**	The process is not implemented, or fails to achieve its process purpose.

ASPICE models



Other ASPICE models



ASPICE v4.0 coming

New processes and removed processes (SPL.1, ACQ.x, SUP.x)

Same capability dimensión

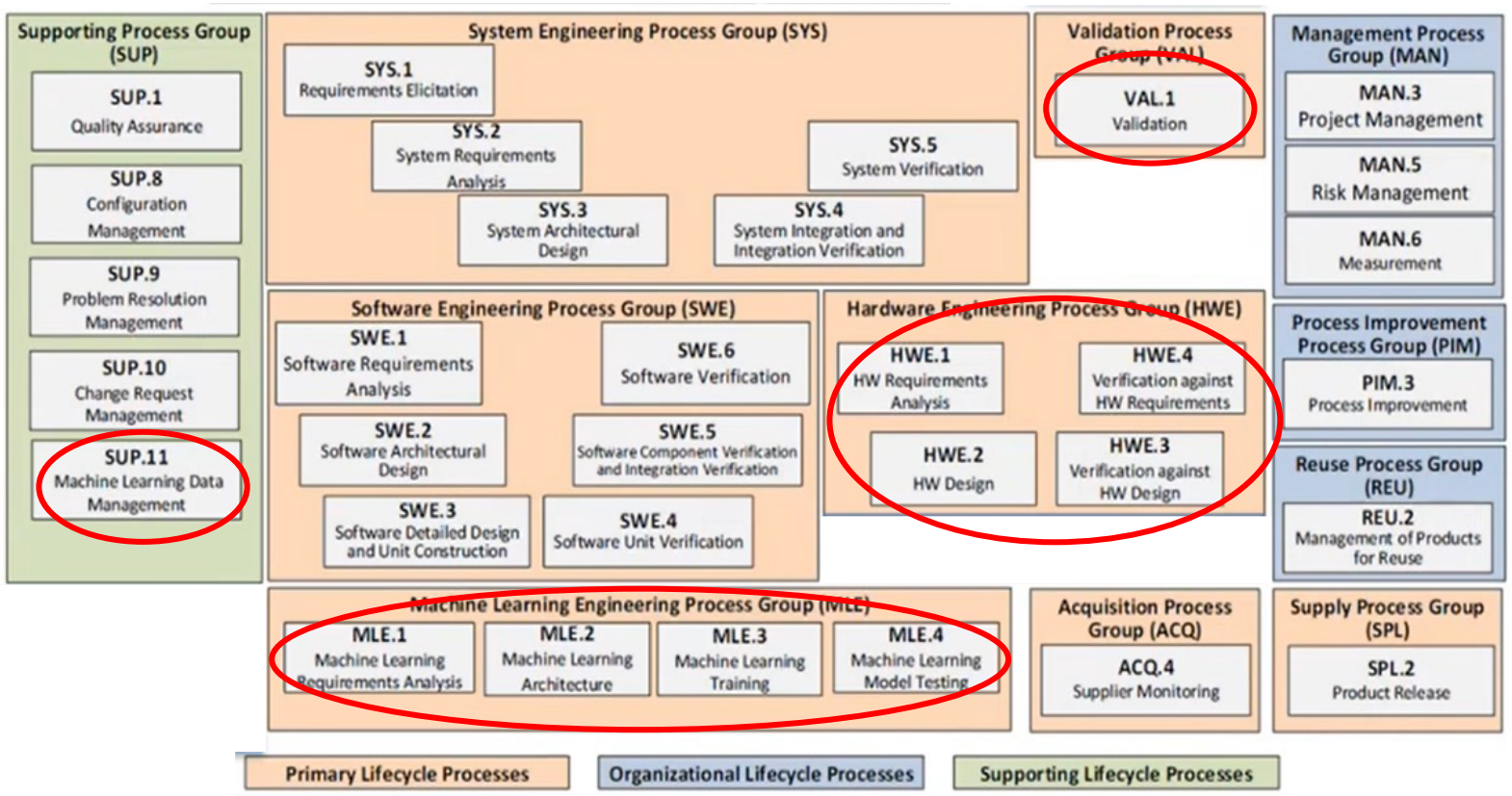
Different base practices (now traceability with ensure consistency) not just to single requirements, elements…

Traceability allowing tracing to cluster requirements, elements…)

Many strategies are not anymore at level 1

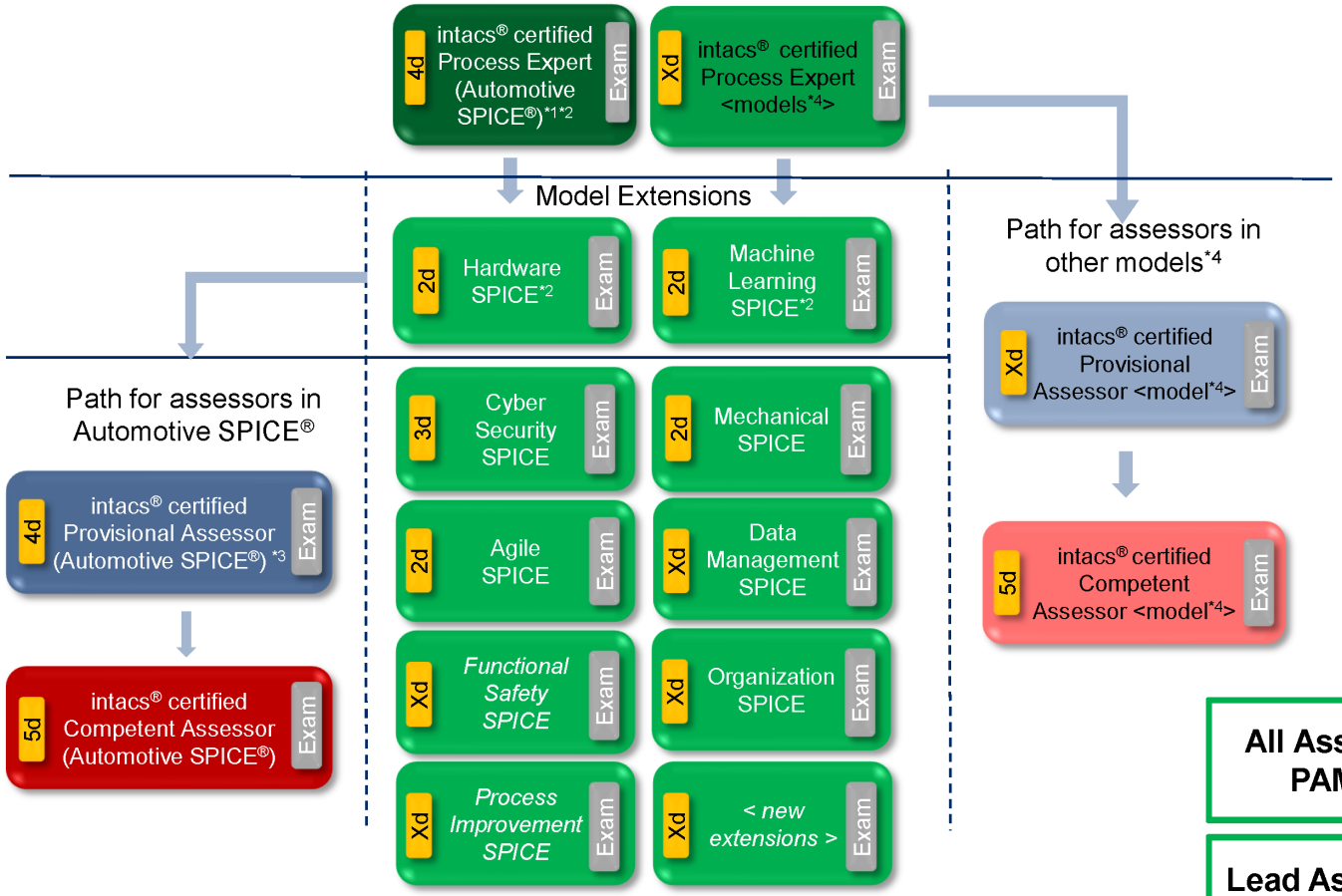
Generic practices at level 2 different

…



ASPICE new training schema coming

Future intacs® Training Architecture



*1 includes all PAM 4.0 processes without HWE and MLE, emphasizes Process Improvement

*2 includes all Guideline aspects regarding content

*3 includes all Guideline aspects regarding rating

*4 Other models, e.g.
- Medical SPICE
- SPICE for IT Services
- Organizational SPICE
- Improvement SPICE
- Test SPICE
- ISO/IEC TS 33061 (SW Life Cycle)
- …

All Assessors need a training and certification for a **Core PAM** to perform official assessments with this PAM.

Lead Assessors need a certification for a **model extension** to perform official assessments with this extension.

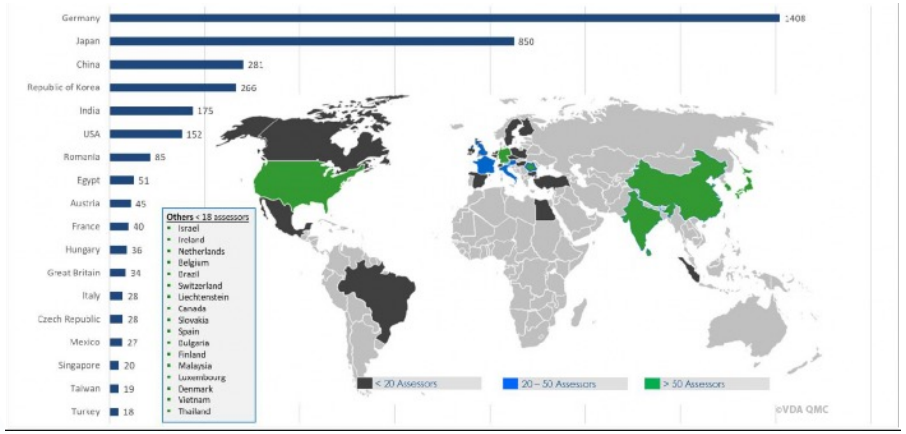
intacs.info
International Assessor Certification Scheme

Use of ASPICE

CL2 required in almost ALL InCar development projects, mainly at the second development year after many releases already delivered to the Customer.

Manufacturers are developing SW too, therefore requiring ASPICE CL2 to all their projects, therefore ASPICE assessments are exponentially required in the Automotive domain, at all hierarchical contractual levels.

6403	50	5
Automotive SPICE® Assessors	Countries	Available languages



What about the Use of S4S

Despite of the GEO return constraints in ESA projects, Why not so spread in the Space Domain?

S4S not exactly containing all Project requirements.

S4S assessment requests could be increased in ESA projects to

- support ensuring better quality of SW in general in the space domain
- only to CL2 not higher
- to be also used as a set of requirements for the projects and suppliers
- the experience of using ASPICE for different projects in the auto domain has the consequence of standardising the processes and the culture of the teams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Thank you!
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AT HEART