

LESS IN EMBEDDED AUTOMOTIVE SOFTWARE DEVELOPMENT.

BY THE EXAMPLE OF BMW INSTRUMENT DISPLAY/ CLUSTER INSTRUMENT.

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**BMW
GROUP**



Rolls-Royce
Motor Cars Limited

PRODUCT.



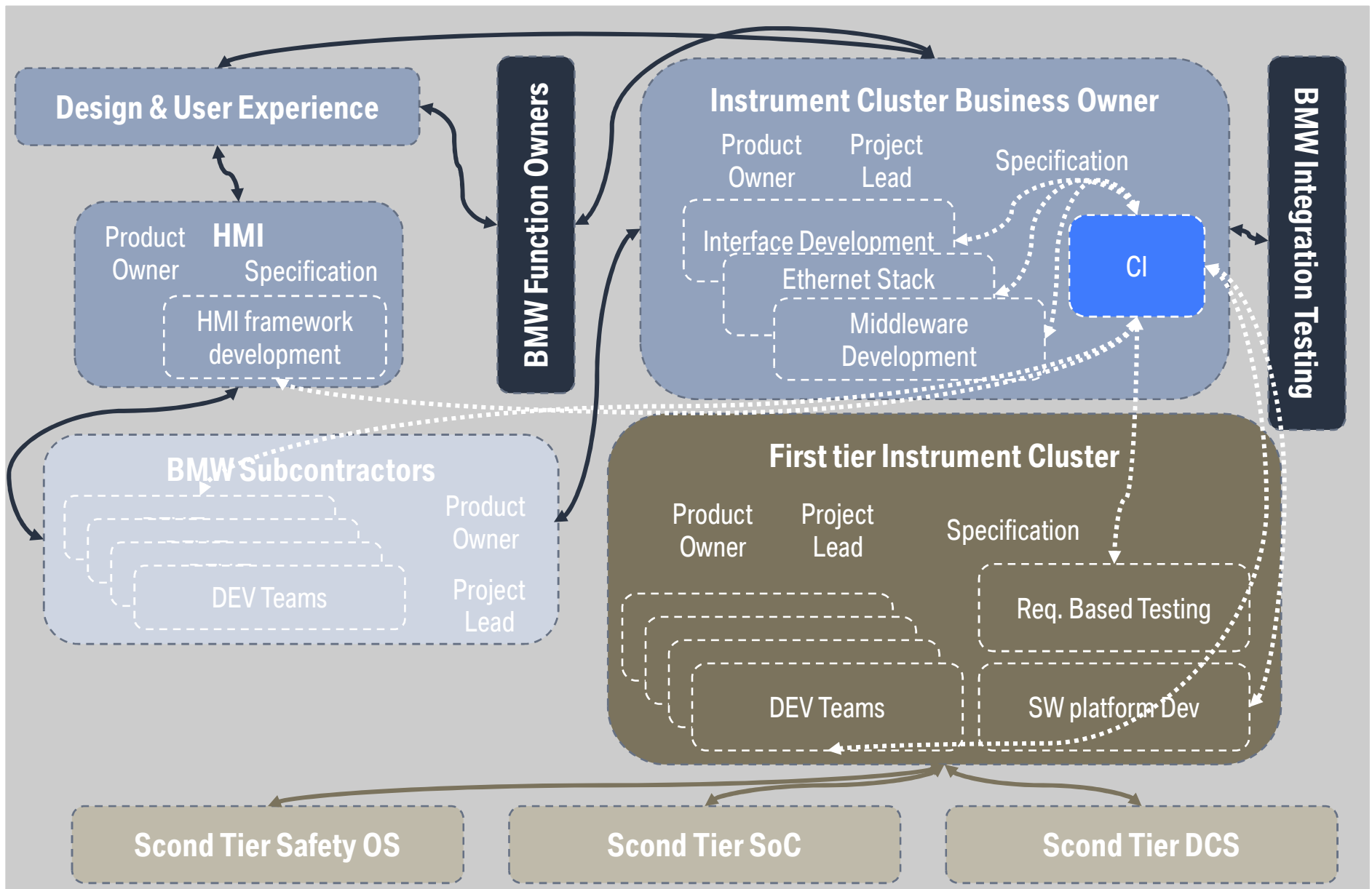
General information:

- Automotive embedded software,
- 80 ECUs connected with CAN and ETH,
- 5 years project from initial phase to production.

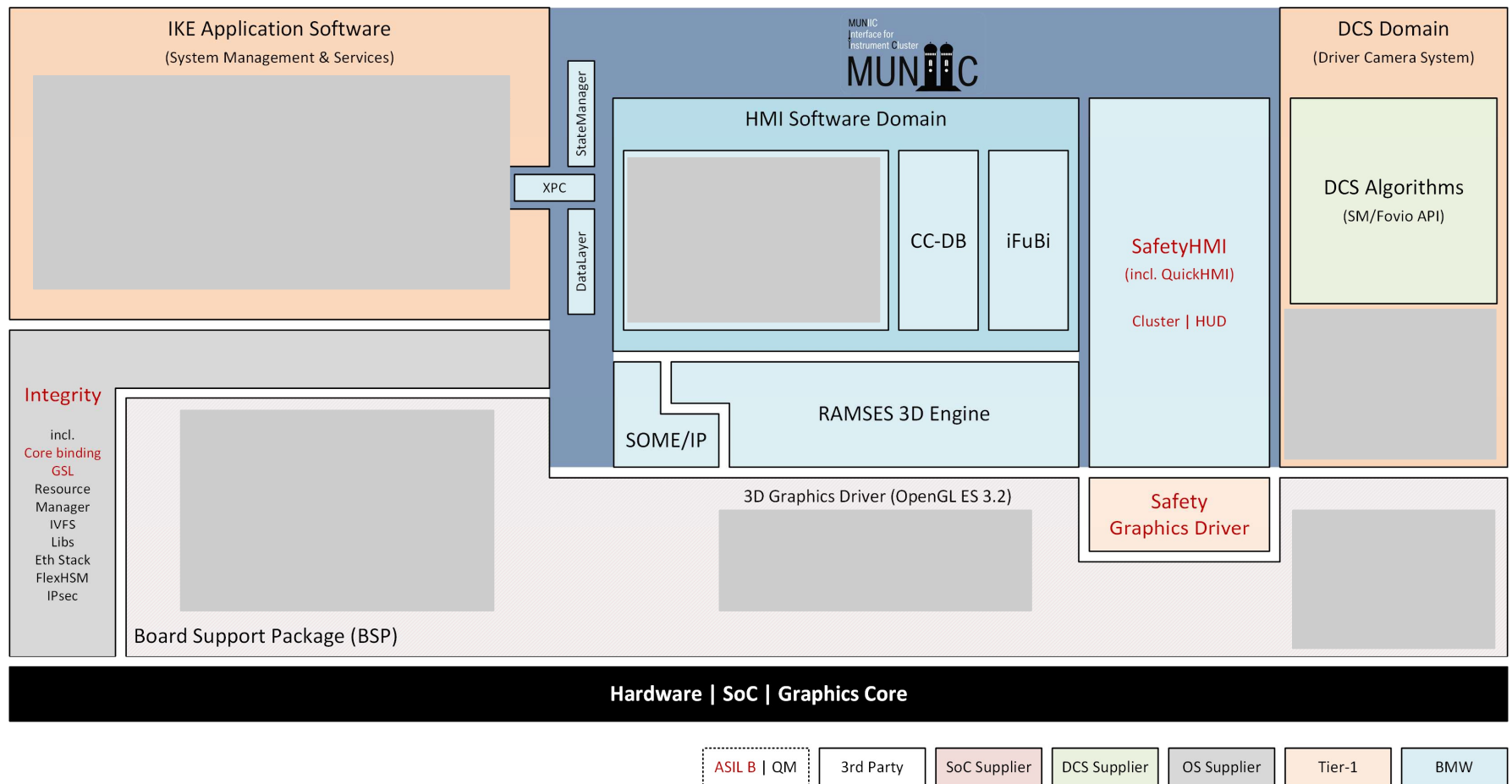
Instrument Cluster:

- low, mid & high variants,
- Design elements,
- HW+SW stack,
- Safety requirements,
- Fully digital display,
- ~ 300 HMI features.

ORGANISATION OF SOFTWARE SUPPLY CHAIN.



ARCHITECTURAL OVERVIEW.



MOTIVATION FOR CHANGE.

- Faster reaction to a changing market,
- Not another task force,
- Quality,
- Efficiency.



COMPANY/ DEPARTMENT CULTURE.

- People have energy to improve and change, but the system is stiff,
- People respect knowledge and competence,
- People are skilled within their specialisation and role,
- Getting things done,
- Others decide, others do; others design, others implement & others test; ...
- Heroic effort at last moment saves the world (task force)...



CONTRACTING.

As before, specify perfectly, suppliers implement. What is new:

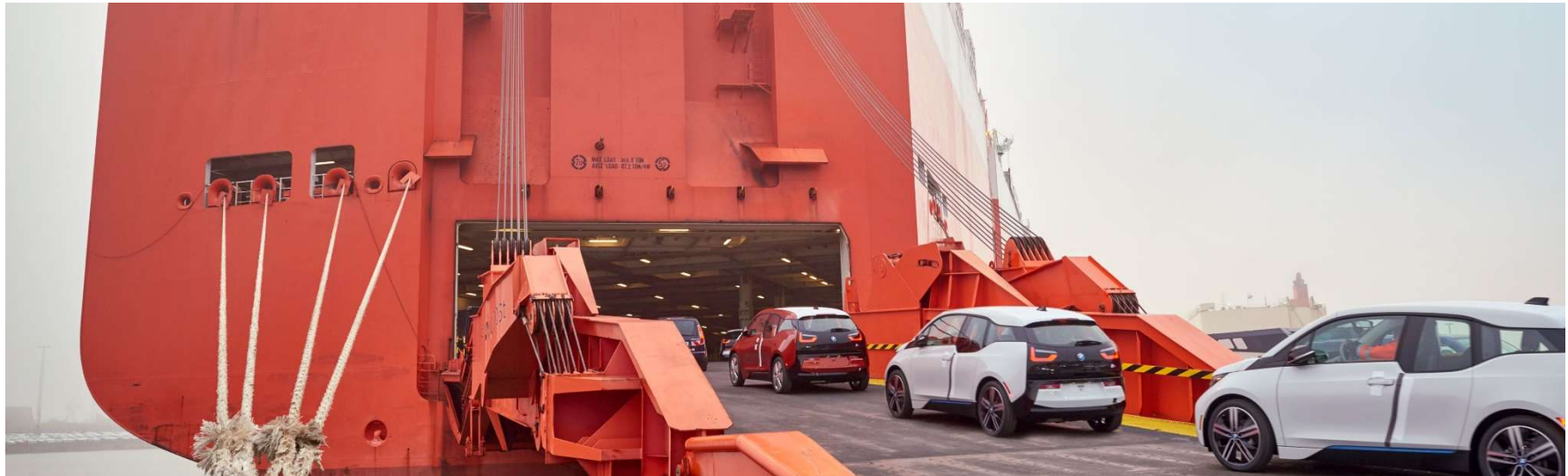
- Source code in customer's Continuous Integration (CI) system,
- Working in customer's wiki & ticket tool,
- NDAs across all parties,
- Agile development (whatever it means),
- Iterative development (Sprints).



CONTINUOUS INTEGRATION.

Has happened: Integration manager picking random packages to be integrated. What is new:

- Very skilled driver of CI: experience about CI in ECU projects since 2011,
- Git process, with multiple levels of integrating source code. Many repositories because of project complexity and history,
- Practical problems because suppliers have their CI systems and platform components,
- CI driver was coaching supplier teams 30 min every day for a couple of months,
- Funny story: Managers need confirmation, that continuous integration really means continuous. And that actually is possible. And that we are doing it. No integration dates...

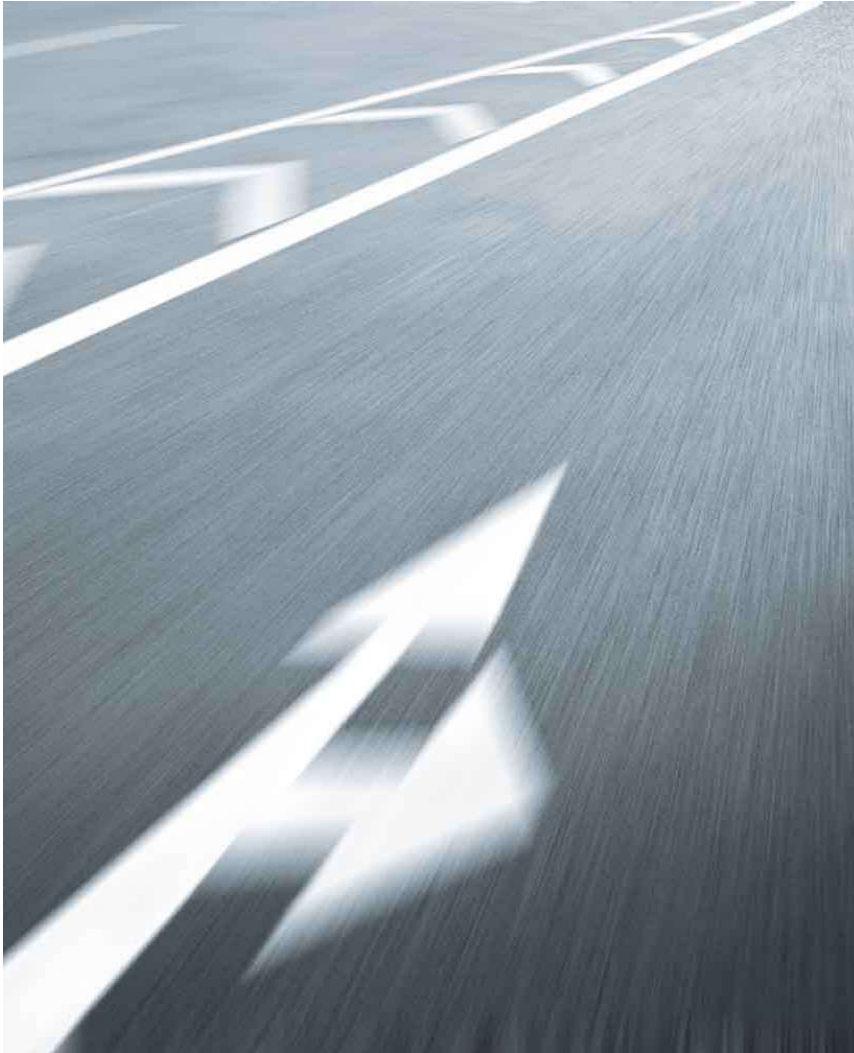


COMMUNICATION & COLLABORATION.



- Development reality is hidden behind escalation structures: Immediate intervention if something does not work,
- Go & see the development teams,
- Bi-weekly business meeting with all important companies,
- Remote bi-weekly retrospectives over company boundaries did not work,
- Continuous Improvement proved difficult,
- Brainstorming pain is easy – problem solving is difficult,
- Improvement is part of the POs' /project managers' work...

PROJECT MANAGEMENT.



- Tradition of heavy up-front planning and ticket followup,
- Tradition of fixed milestones – (Integration Steps are actually an incremental development process)
- Searching for the balance of supplier's autonomy, and the granularity of the customer's backlog,
- How to do backlog refinement and release planning?
- Overall project management plans prove to be necessary and meaningful,
- Difficult to find the „real PO“ and one backlog in the complex organization,
- The „real“ Workflow, how requirements become code is scattered, thus difficult to manage.

TRAININGS.



Invest in training early and constantly: preferably short term and more often than once and longer:

- Agile leadership training – there is no process to implement, people need to understand,
- Change workshops – wake-up call,
- Agile FuSi – challenging old assumptions.

TEST AUTOMATION.



- Impressive amount of testing, but in islands of test phases,
- Unit tests, supplier functional tests, customer integration tests, in-car testing...
- Proprietary tools at all companies with e.g. thousands of acceptance tests,
- Testing on target is included in CI,
- Implementation of test automation strategy, that is focusing in working tested end product,
- Difficulties because of organizational boundaries,
- Safety is challenging.

AUTOMOTIVE SPICE.



- Background in CMMI & Spice: Following detailed (waterfall) process ensures quality,
- Made as a standard process between OEMs and suppliers,
- Typical maturity model assessments, including also a checklist based on previous projects,
- New approach: improvement workshops at development sites,
- Go & see developers reality, bypassing escalation chains,
- “In A-SPICE assessment we hide problems, here we talk about problems”,
- Fight the bureaucracy: “Developers just silently suffer the bureaucratic waste”,
- Support the Agility of tier 1 & 2 suppliers.

KEY LEARNINGS: KEEP IT SIMPLE AND REAL.

- Keep It Simple: Iterations, Continuous Integration & Test Automation,
- Improve collaboration: Go and See,
- Use existing strengths: Technical knowledge, Customer's power, ...
- Act early with big or difficult things e.g. selecting people, trainings, communication,
- Antipattern: Heavy up-front planning when the development is not yet happening. Instead choose the right things to start early: CI, test automation, technical education, communication structures, training people.

