Batteries For Buildings (B4B), a system of systems development based on MBSE processes

In the coming years, hundred of thousands of batteries from actual on road electrical vehicles will not fulfill automotive requirements anymore. Their second life management is at stake.

Second life is requiring additional knowledge for automotive industry and is leading to collaboration

First life

Mobility usage in Vehicles

Second Life Concept

Renewable energy storage in buildings, districts…

RENAULT NISSAN

BOUYGUES ENERGIES & SERVICES

arKItect SEA, a Systems Engineering (SE) modeler has been used by Renault and Bouygues Energies & Services to manage SE processes of a Batteries for Buildings (B4B) system. B4B is a concept reusing batteries of electric vehicles (second life), as a storage facility for energy management and renewables integration. The project started in 2012, was completely new from many viewpoints: new partnership with actors using different processes; innovative product and service offer connected and scalable including safety concerns.
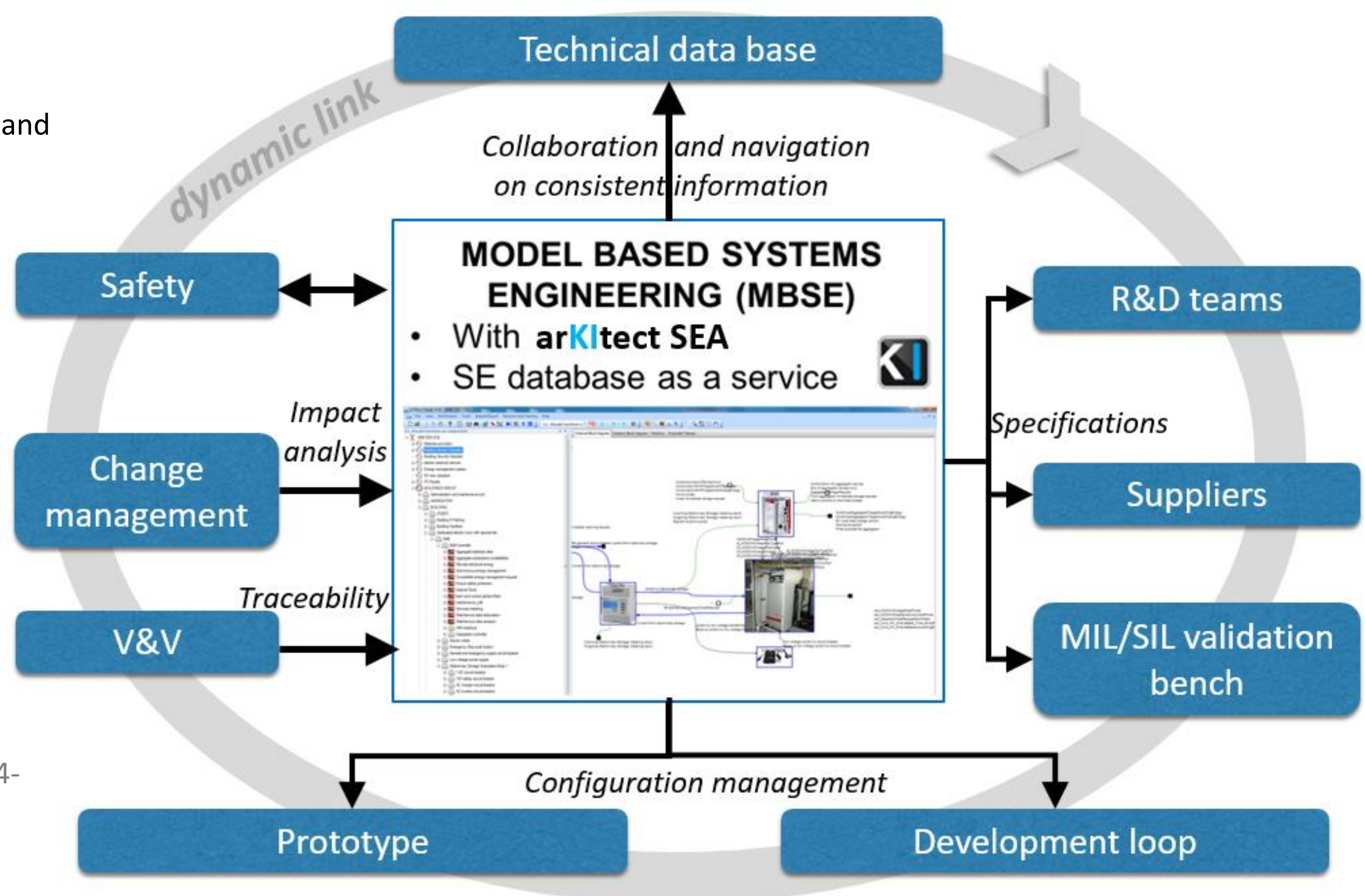
In order to overcome these challenges, a common SE model addressing the SE process has been established: managing all SE data in a modeler, managing data consistency (requirements allocations, functional and system architecture), generating all specification documents toward developers and suppliers, enabling safety analysis faithfully with SE model.

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arKItect SEA supports is a MBSE modeler ensuring a comprehensive and coherent handling of Systems Engineering processes:
- Operational Analysis
- Requirements Management
- Functional architecture
- Physical architecture
- Safety Analysis
- Verification & Validation

"MBSE is about making system-descriptive and analytical models explicit, coherent, and consistent."

David Long (INCOSE President 2014-2015)

dynamic link

Technical data base

Collaboration and navigation on consistent information

Safety

MODEL BASED SYSTEMS ENGINEERING (MBSE)
- With **arKItect SEA**
- SE database as a service

Impact analysis

Change management

Traceability

V&V

R&D teams

Specifications

Suppliers

MIL/SIL validation bench

Configuration management

Prototype

Development loop

Systems Engineering Data managed for B4B

500 requirements
(performances, constraints…)

430 functions

56 components

65 interfaces

1000 flows

Several thousands of links between these objects

Requirements allocated to functions
Requirements allocated to components
Functions allocated to components
Flows linked as input and output of functions
Interfaces linked to components
And other links related to tests, safety…

Key Benefits

- Ability to study all architecture alternatives in a System Of Systems context including technical and economical dimensions: **diversity** management
- Allow new unexpected collaborations between different engineering methods and processes: **collaborative** and **structured** environment
- Allow usage data integration in conception cycle to ensure a continuous development: **traceability** and **scalability**
- Support complete technical data transmission to other teams through specifications descriptions: **documents generation**

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