Connected Change: Transforming Wiring Harness Development Through Data Continuity

Bordnetze Digital Kongress, September 24th 2026, Stuttgart

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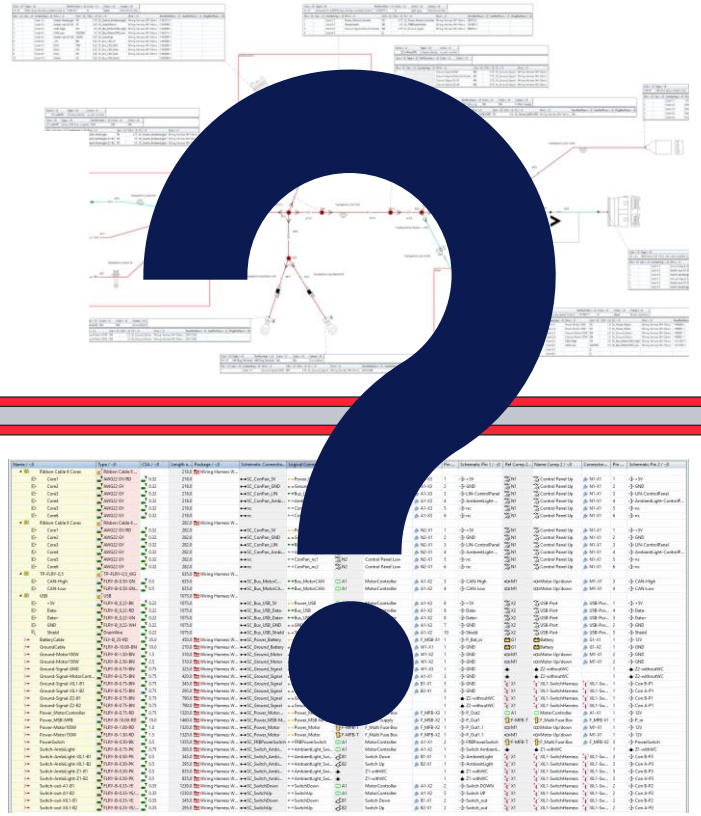
Challenge

Collaboration between OEM and TIER1

Challenge: How to handle 1000 changes per year?



- > Variant Management
- > Connect ECAD and MCAD
- > Data Exchange

- > “Print to Build”
- > Concept and case study
- > Request for Quotation (RFQ)

Single Point Of Truth

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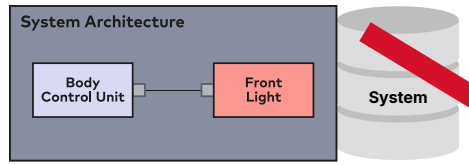
Single Point Of Truth And Model-Based Approach

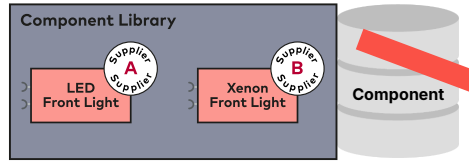
System Responsible

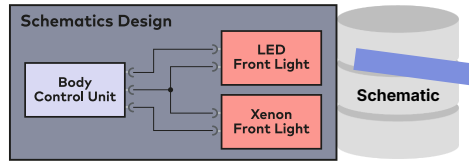
Component Responsible

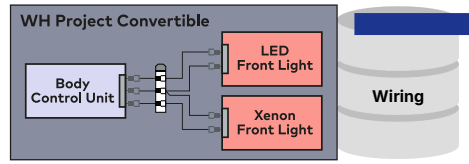
Wiring Harness Architect

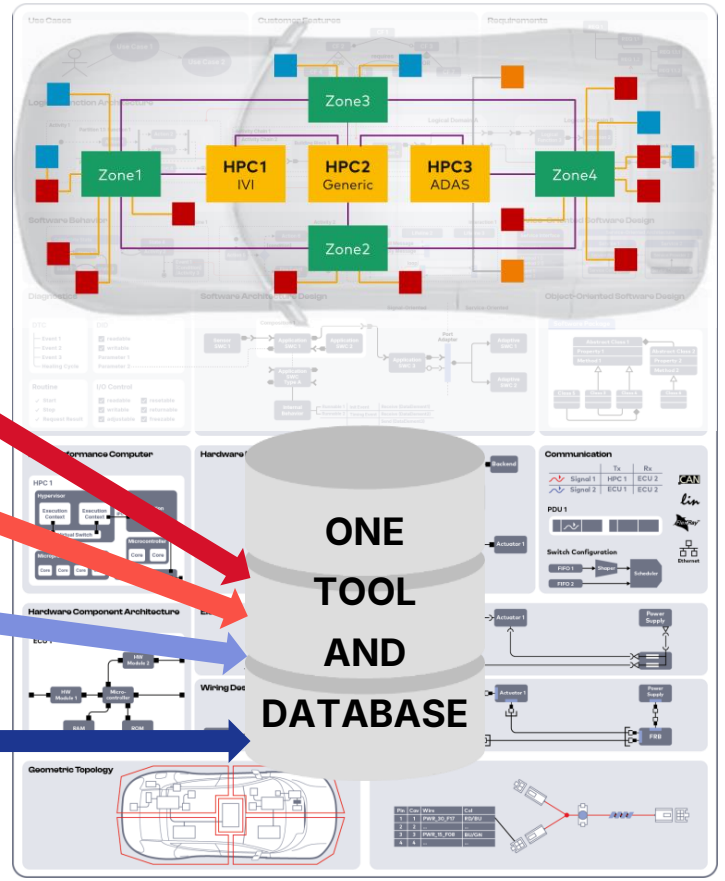
Wiring Harness Designer







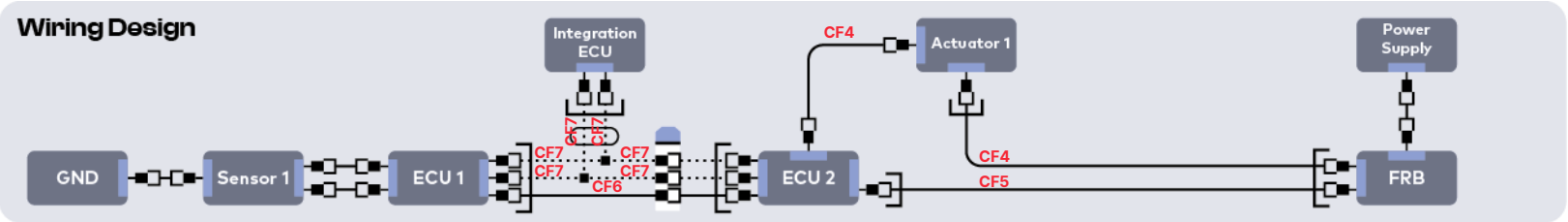




Managing Variation

Variant Management in Wiring Harness today

> Best practice today: option code/expression tagging added manually to all wires on an individual basis



- A lot of manual effort for initial setup and maintenance over time
- Error-prone because of manual process
- Wiring modules defined manually too
- Consistency with other layers not granted
- Predefined variants built on option codes/expressions

Paradigm Shift

Software-Defined Vehicles

> Shift from pre-build hardware to post-build software variants
> Subscription as new business model for customers (software updates)

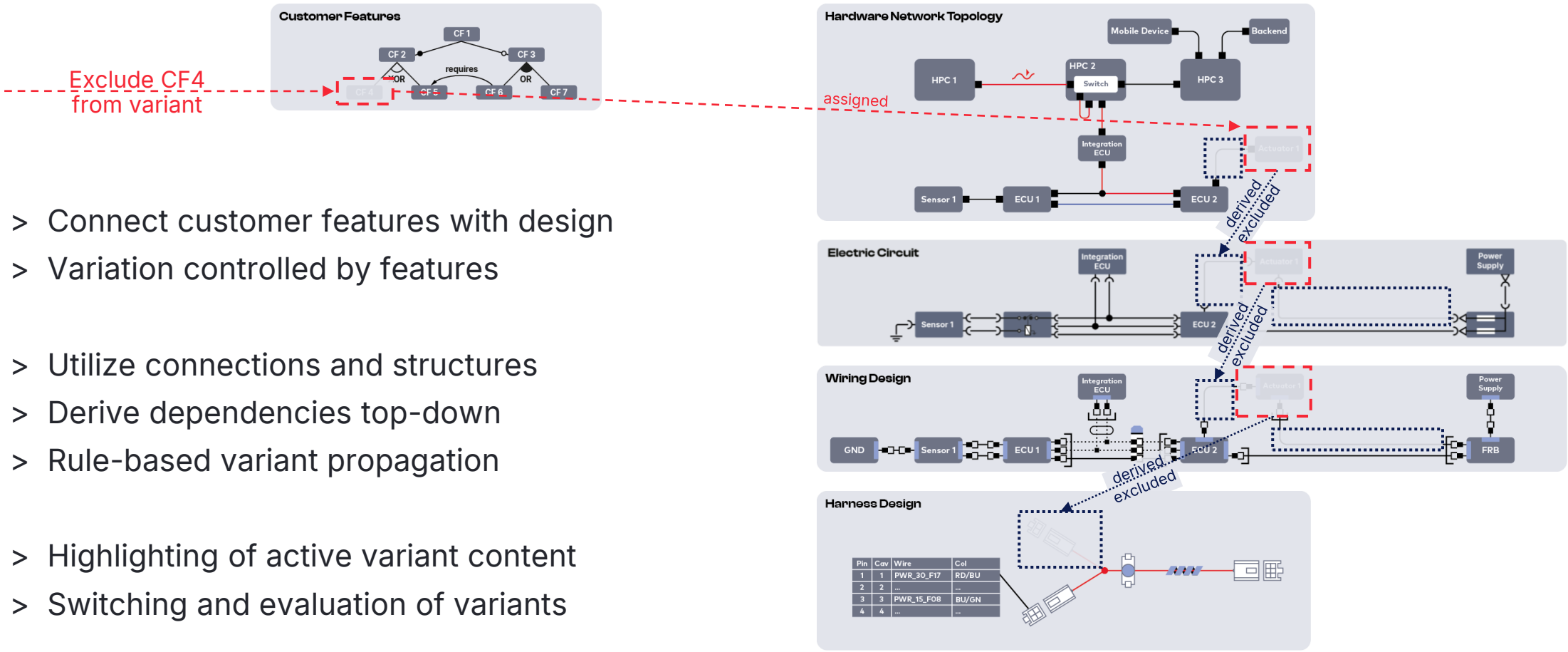
Modular Harnesses

> Trend is moving away from configurable “customer specific harness”
> Developing simplified and reusable sub-harnesses optimized for automated manufacturing

Recommendation

> Reducing hardware variation wherever possible and useful
> Maintaining part numbers/variations create cost factor over time
> Defining variation instead of single variants

Defining Feature-Based Variation - New



- Connect customer features with design
- Variation controlled by features

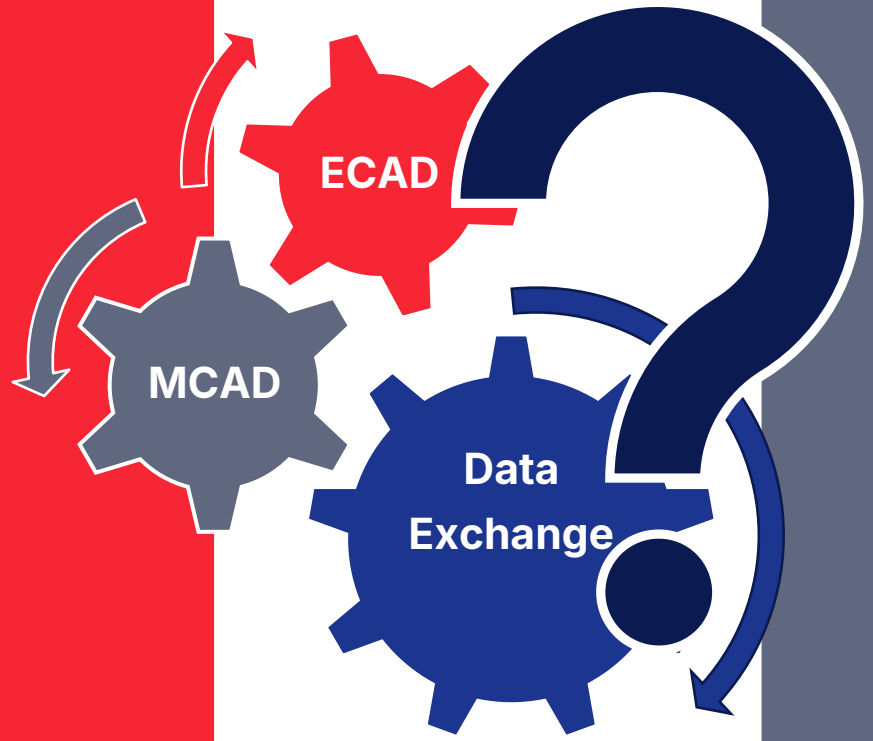
- Utilize connections and structures
- Derive dependencies top-down
- Rule-based variant propagation

- Highlighting of active variant content
- Switching and evaluation of variants

Integrating Data

Connecting ECAD and MCAD

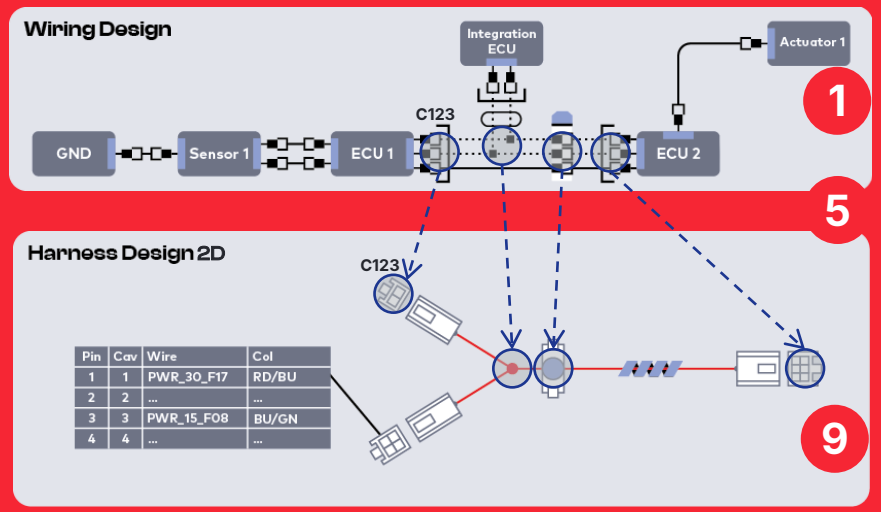
Electronic Computer-Aided Design (ECAD) PREEvision



Mechanical Computer-Aided Design (MCAD) 3D Tool

Connecting ECAD and MCAD

Electronic Computer-Aided Design (ECAD) PREEvision



1 Wiring Design

5 2D Flattening, Mapping and Wire Routing

9 Adjust Routing

KBL/VEC Interface

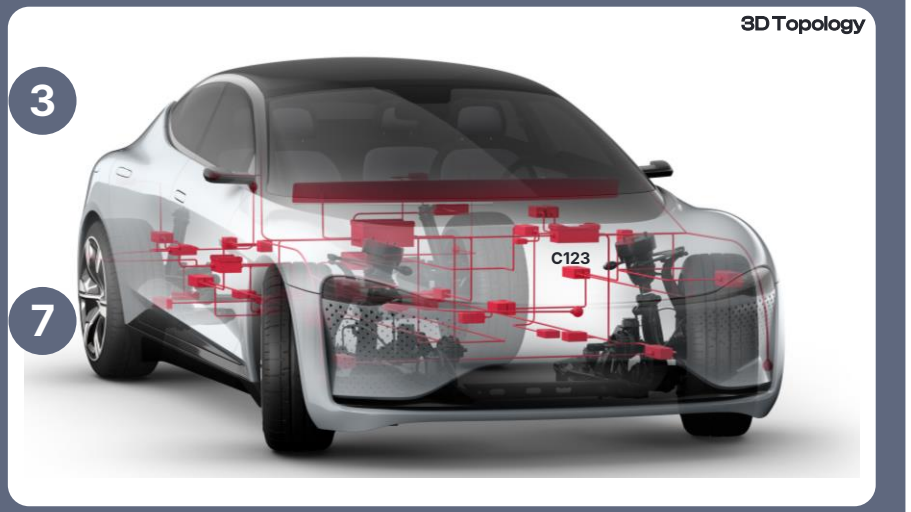
2 From-To-Connections

4 3D Topology with Names

6 Wiring and 2D Harness

8 Feedback on sizing conflicts

Mechanical Computer-Aided Design (MCAD) 3D Tool

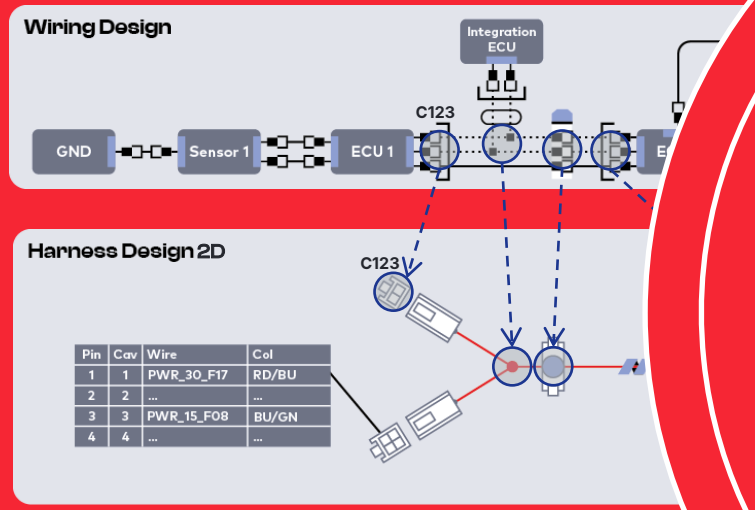


3 Bundle Routing and Wiring Connector Names

7 Synchronize 3D Topology

Connecting ECAD and MCAD

Electronic Computer-Aided Design (ECAD) PREEvision



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KBL/VEC Interface

ECAD **MCAD**

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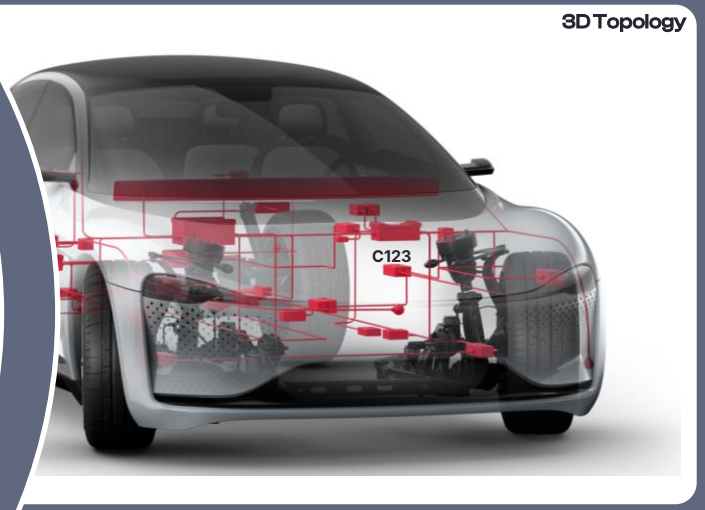
Mechanical Computer-Aided Design (MCAD) 3D Tool

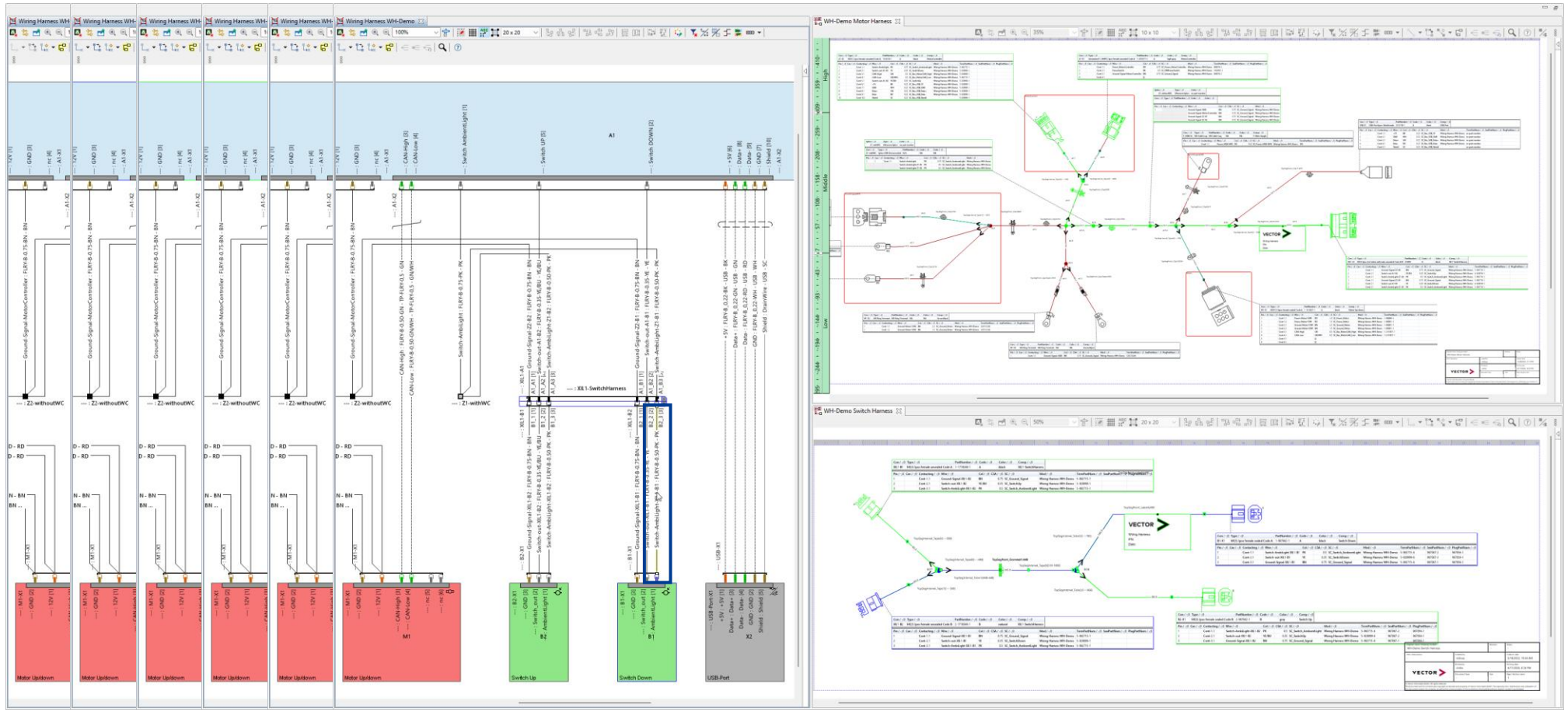


3 Bu Routing and Wiring Connector Names

ynchronize 3D Topology

Highlighting

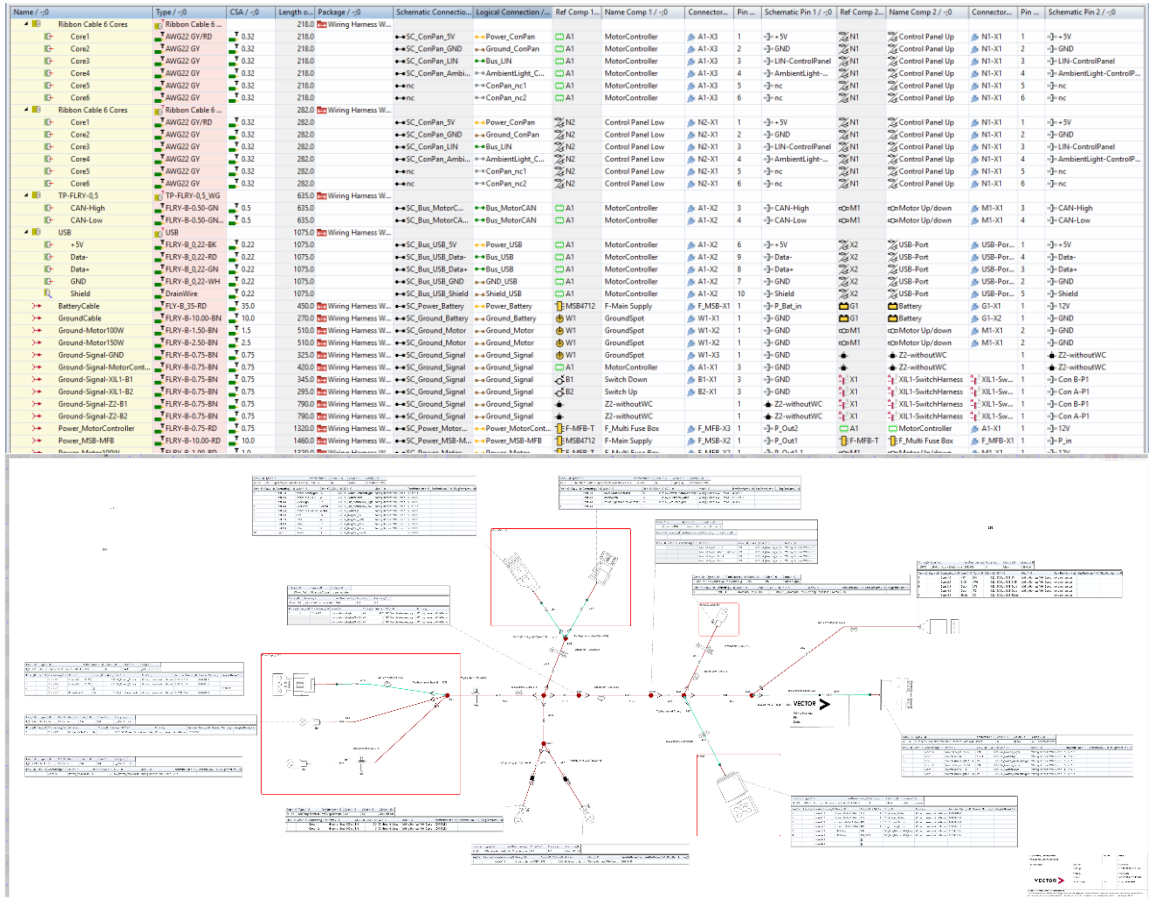
Traceability Highlighting



Managing Data Exchange

Still Present: Document-Based Data Exchange

- Different tables
  - Wire Cut List
  - Table of Content
  - Bill of Material
- Distributed drawings
  - Wiring drawing focused on one sub-system only
  - 2D Harness drawing focused on one harness only
- No proper change management in documents
  - Worst case: identifying changes between drawings running a comparison on pixel-by-pixel level



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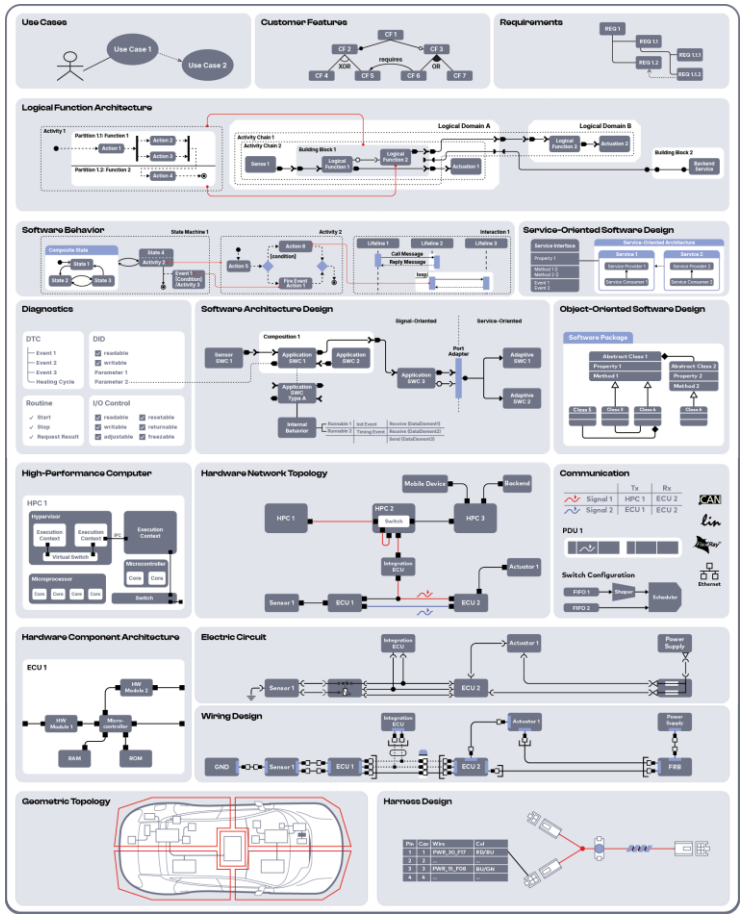
Data Exchange and Digital Twin



PREEvision

- All KBL- and VEC-based data plus
  - Requirements and Features
  - Software Design
  - Communication Design
  - Diagnostics

VEC (Vehicle Electric Container)

- All KBL-based data plus
  - Network Architecture
  - Schematics Design
  - EE Components

KBL (Kabelbaumliste)

- Wiring Design
- Harness Design
- 3D or 2D Topology

Digital Twin Use Cases

- Authoring and Design
- Evaluation and Validation
- Data Marketplace
- Production
- Aftersales and Service

Managing Changes and Versions

Change Request

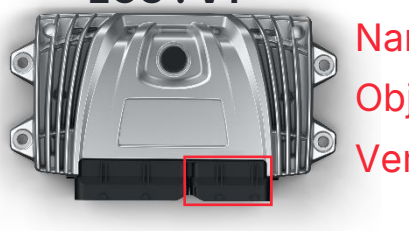
> Add 2nd header connector to ECU

ECU : V0

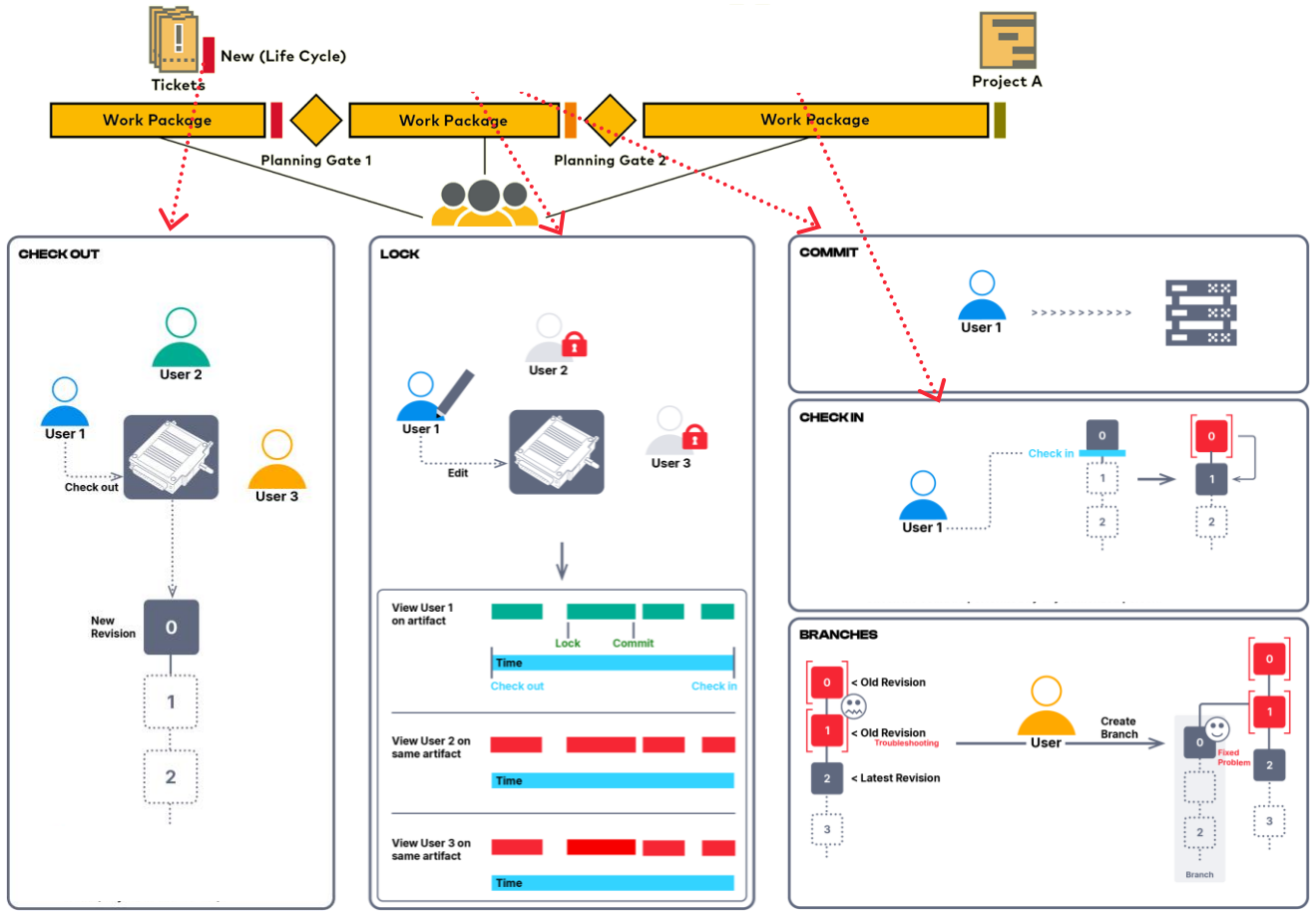
Name: ECU
Object ID: 12345
Version ID: **76543**

New Version 1

ECU : V1



Name: ECU
Object ID: 12345
Version ID: **76544**



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Change Management and Data Exchange

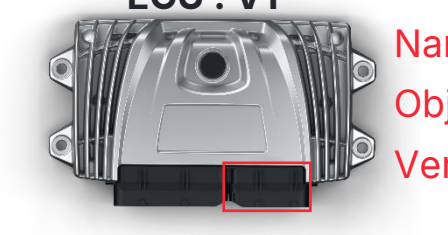
- **VEC:** Object ID and Version ID can be used explicitly to indicate the change
- **KBL:** Object ID and Version ID can be used implicitly in KBL per process definition

ECU : V0

Name: ECU
Object ID: 12345
Version ID: **76543**

New Version 1

ECU : V1



Name: ECU
Object ID: 12345
Version ID: **76544**

PREEvision

- Authoring & Lifecycle
- Fine-grained versioning (artifacts, attributes)
- Change history, baselines, branching
- Active change management during development

VEC (Vehicle Electric Container)

- Standardized exchange model enables digital thread
- Explicit object and document versions
- Stable object identity across versions
- Lifecycle-aware data exchange

KBL (Kabelbaumliste)

- Standardized snapshot for manufacturing
- File-based versioning (New file = new state)
- No built-in change or lifecycle semantics

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Lifecycle Management and Data Exchange

KBL

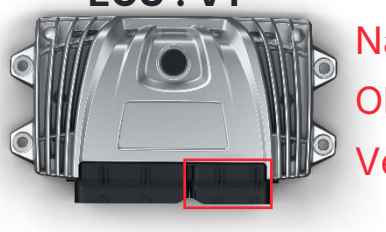
No built-in change or lifecycle semantics

ECU : V0

Name: ECU
Object ID: 12345
Version ID: **76543**

New Version 1

ECU : V1



Name: ECU
Object ID: 12345
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VEC

Lifecycle State

> Version + Approval + Change

Practical Mapping

Draft:
Version + no approval

Review:
Version + approval ongoing

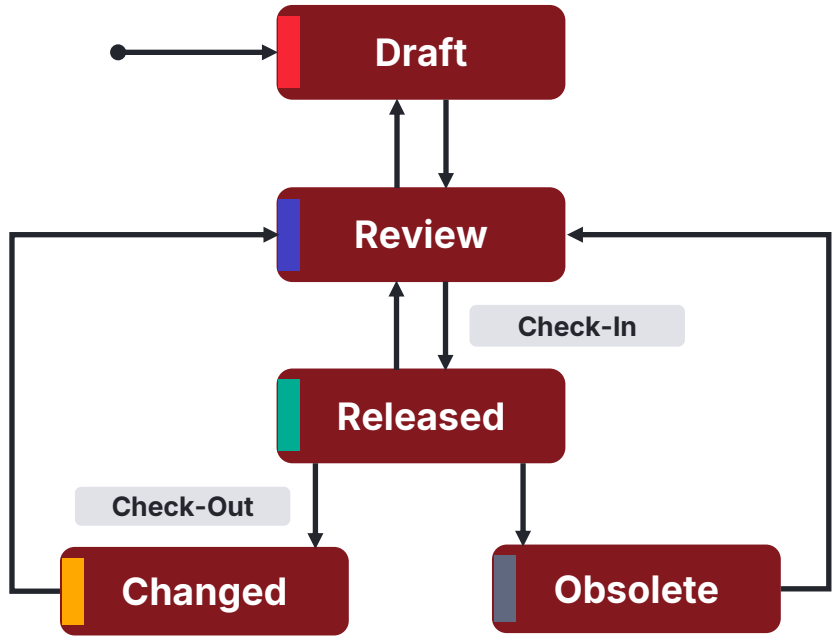
Released:
Version + approval assigned

Changed:
New version + change description

Obsolete:
New version + process rule

PREEvision

Lifecycle process definition by OEM/TIER1



Conclusion

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Seamless Data Continuity

Solution: Digital Twin enabling Digital Thread

PREEvision

Single Point Of Truth

Success Stories

- BMW
- Cognizant Mobility
- Daimler Buses
- EDAG
- HOLON Mover
- Lucid Motors
- McLaren
- Mercedes Benz Cars
- Versigent (Aptiv)

Customer Benefits

- Faster and future-proof engineering
- Full design workflow in one tool
- Multiuser collaborative environment
- Traceability and change management
- Feature-based variant management
- Consistent data and standardization
- Highly customizable to process needs
- Digital Wiring Harness Twin
- Zero-Defect Production

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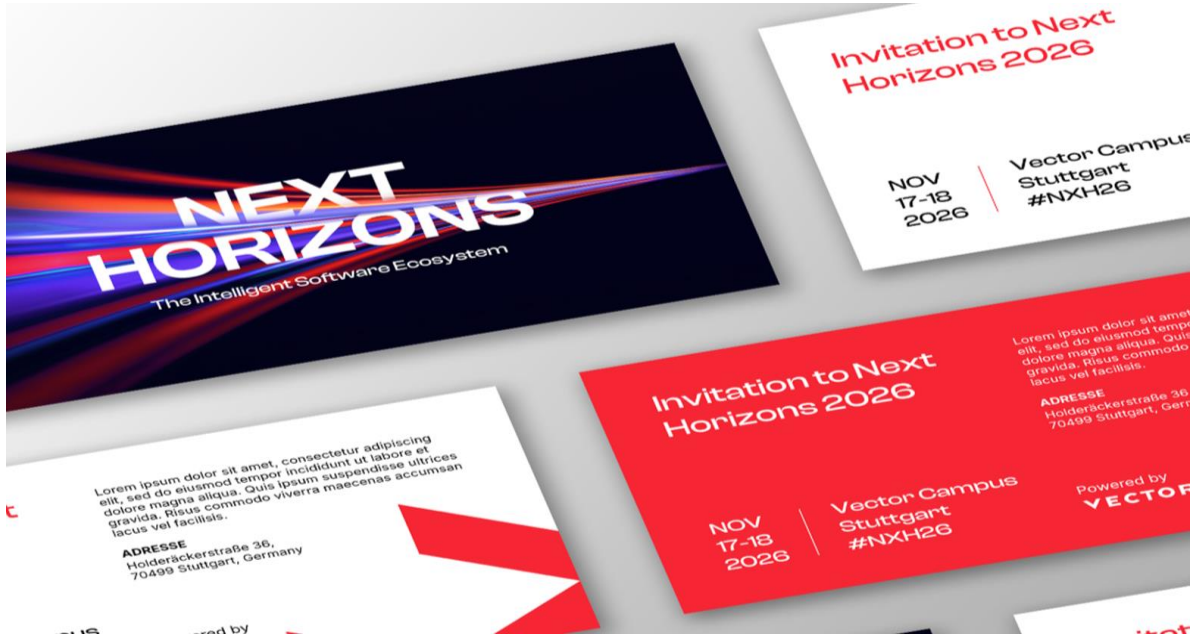
NEXT HORIZONS 2026 in a Nutshell

New cross-industry technology event dedicated to the intelligent software ecosystem.

Date: November 17–18, 2026
Location: Vector Campus, Stuttgart
www.nexthorizons.com



500+Participants
Decision-makers
Engineers & architects
Partners, journalists & tech influencer

6 Keynotes
On AI, economics, future trends & key markets

4 Tech Tracks
Four critical challenges. Each explored through keynotes, real-world success stories, and hands-on workshops. Choose your level of depth.

Thank you for your attention.

Dr. Harald Bucher | Lars Wunderlich
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