prostep IVIP

Annual Report 2025

DRIVEN BY TECH.
UNITED FOR IMPACT.

Our Vision

We are a unique network driving the next era of digital engineering. Where industry, tech and research unite, we accelerate disruptive ideas and co-create new standards.

Through collaboration, we spark innovation, scale impact and pave the way for the industry of tomorrow.

Our Mission

At the heart of industry collaboration, we are the platform that brings together people, knowledge and experience in a collaborative and trust-based environment.

We turn complexity into clarity – by advancing open standards, enabling cross- industry dialogue and supporting the responsible use of software-driven and emerging technologies.

Through a strong community and shared values, we support industry leaders to innovate, grow and drive progress – SUSTAINABLE AND IMPACTFUL.

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Editorial

Dear Readers,
Dear Members of the prostep ivip Association,

In 2025, prostep ivip turned its strategic goals into tangible results. The direction we set earlier is now clearly shown in our technical work.

At the center of our work was a key question for our industry: How do software-defined product development and artificial intelligence change the way we do engineering, and how should prostep ivip position itself to create lasting value? The SDP Study, created together with members and our global community, gave us a solid foundation. Through projects like FAICE, SDVxMBSE, HAIViSH, CDT, SmartSE, and many other established initiatives in our technical program, including Collaborative SDV, you as members have shown again that working across industries leads to real, valuable results.

I am especially proud of the range and quality of our technical work. We have twenty-five active projects covering the whole development process, from requirements to model-based systems engineering, integration, verification, and validation. This shows that our community is not just talking about change but making it happen. In 2025, we published many new recommendations, guidelines, and position papers to share our knowledge with the wider industry. Our media library now offers a unique collection of valuable recommendations and use cases to speed up virtual product creation. We also launched a new podcast series that presents selected projects to a wide professional audience in a short format and several languages. Creating knowledge is important, but sharing it internationally and before competition is just as vital. We are succeeding at both.

On the international stage, 2025 was one of our best years. Our board visited Seoul, Hiroshima, Tokyo, and Yokohama, meeting with top leaders at Hyundai, Mazda, Honda, Subaru, Panasonic, and JAXA. These meetings took our relationships in Asia to a higher level. The Tokyo Systems Engineering Summit has become our second-largest networking event, drawing over 300 participants. The Berlin Symposium welcomed more than 650 guests and had a fully booked exhibition floor. This shows that meeting in person is still very important for sharing ideas, inspiration, and learning together, even as the world becomes more digital.

With HARMONIQ and euroFMX, we also secured two important funding grants. These grants help us extend our impact beyond our members, reaching both national and European research communities.

In 2026, we are focusing on diversification and growth. Our main skills are well-suited to sectors such as defence, medical technology, and autonomous systems, where long product lifecycles, safety, and secure data exchange are essential. We plan to build new partnerships, leverage our member companies as connectors, and expand into markets such as India and the United States. We are also strengthening our work with key partners, including the Aerospace and Defence Industries Association, BVMed, and JAXA. These organizations share our values and help us reach further. prostep ivip's strength has always been its neutrality and ability to cross industry lines. We will use this strength to support our goals for diversification and international growth.

The upcoming prostep ivip Symposium 2026 in Frankfurt, with the theme "The Next Frontier: Agentic AI and the Rise of Software-Defined Industry," starts this new chapter. I warmly invite you to take an active part in shaping our journey as a co-speaker, thought leader, or critical voice that makes our association stronger.

This annual report shows what we have achieved together. I sincerely thank you, our members, the board, and the whole team. Let's keep moving forward together.

Dr. Alain Pfouga

Managing Director, prostep ivip Association

prostep ivip Association – **Members Worldwide**

3DInteractive GmbH
4Soft GmbH
Abat AG
Accenture GmbH
Adient Ltd. & Co. KG
AI Marketplace GmbH
Airbus Defence & Space GmbH
Airbus Operations GmbH
Altium Europe GmbH
Anark Corporation
ANSYS Germany GmbH
Aptiv Services Deutschland GmbH
Aras Software GmbH
Arorian Technologies GmbH
Asaro Systems Limited
ASCon Systems Holding GmbH
AUCOTEC AG
Audi AG
Autodesk Inc.
AVL List GmbH
BENTELER Business Services GmbH
BETA CAE Systems International AG
BHC GmbH
BMW AG
Bosch Thermotechnik GmbH
Brain of Materials AG
Brose Fahrzeugteile GmbH & Co. KG
CADCAM Design Centar D.O.O.
Cadence Design Systems
Carl Zeiss GOM Metrology GmbH
CEFE, Hochschule Augsburg
CIMPA GmbH
collaboration Factory AG
Configit GmbH
CONTACT Software GmbH
Continental AG
Continental Automotive GmbH
CONWEAVER GmbH
CT CoreTechnologie GmbH
Dassault Systems Deutschland GmbH
Dataciders InMediasP GmbH
Datakit SARL
DENSO Corporation
Dentsu Soken Inc.
DesktopEDA
DIN Solutions GmbH
Dr. Ing. h.c. F. Porsche AG
dSPACE GmbH
Duwe-3d AG
Eberspächer digital solutions GmbH
ECS Engineering Consulting & Solutions GmbH
Elysium Co., Ltd.
:em engineering methods AG
ENX Association
Eugen Forschner GmbH
Eviden Germany GmbH
EXOKNOX GmbH
eXXcellent solutions GmbH
FhG IAO
FhG IESE
FhG IGD
FhG IPK
FhG ITWM
FIWARE Foundation e.V.
Forschungsinstitut für Telekommunikation und Kooperation e.V.
Forschungsvereinigung Smart Engineering e.V.
Gulfstream Aerospace Corporation
Hamburg Analytics GmbH
HCL Technologies Ltd.
Heinz Nixdorf Institut, Universität Paderborn (ASE)
Hochschule Osnabrück (IuI)
Honda R&D Co., Ltd.
HOOD GmbH
HTW Berlin
Hyundai Motor Corporation
IAV Industrie-Automation Vertriebs GmbH

- Industry (Users)
- IT-Companies (System Vendors)
- Universities, Associations

IBM Deutschland GmbH
ILC GmbH
Inensia GmbH
Intelizign Engineering Services GmbH
invenio Virtual Technologies GmbH
IPG Automotive GmbH
ISRA Vision GmbH
JAMA-Japan Automobile Manufacturer Association
John Deere GmbH & Co. KG
Karakun AG
Karlsruher Institut für Technologie (KIT)
KISTERS AG
KOSTAL Automobil Elektrik GmbH & Co. KG
Kubotek USA, Inc.
Küster Holding GmbH
LEONARDO SpA
LieberLieber Software GmbH
Lisa Dräxlmaier GmbH
Mahle International GmbH
MAN Energy Solutions SE
material.one AG
Mazda Motor Corporation
mediatec.net GmbH
Mercedes-Benz AG
MEWS Deutschland GmbH
Microsoft Deutschland GmbH
Mitutoyo CTL Germany GmbH
Modelon AB

Nexans autoeletric GmbH
Nexus R&D
NTT DATA Deutschland SE
OASIS
OMG-Object Management Group, Inc.
Open Design Alliance
Parametric Technology GmbH
PDTec GmbH
Peak Solution GmbH
Porsche Engineering Services GmbH
PROCAD GmbH & Co. KG
PROSTEP AG
PROSTEP Inc.
Q-DAS GmbH
Raiqon GmbH
Raytheon Technologies Corporation
REQUISIS GmbH
RLE International GmbH
Robert Bosch GmbH
Robert Bosch Manufacturing Solutions GmbH
Schaeffler Technologies AG & Co. KG
Secondmind Ltd.
Siemens AG
Siemens Electronic Design Automation GmbH
Siemens Industry Software GmbH
Siemens Industry Software Inc.
smartCable GmbH
SparxSystems Software GmbH
SSC-Services GmbH
Stellantis N.V.
Sumitomo Electric Bordnetze SE

T-Systems International GmbH
TECH SOFT 3D SAS
TECHNIA GmbH
The Boeing Company
Theorem Solutions Ltd.
Threedy GmbH
Toshiba Digital Solutions Corporation
TOYOTA Motor Corporation
Transition Technologies PSC Germany GmbH
TU Berlin
TU Chemnitz (IWP)
TU Darmstadt (plcm)
TU Dortmund (IPS)
TU Hamburg (IFPT)
TU Ilmenau
TU Kaiserslautern (VPE)
TWT GmbH
UNITY AG
Universidad Carlos III de Madrid
University of Twente
VDA – Verband der Automobilindustrie e. V.
VDMA – Verband dt. Masch.-& Anlagenbau e. V.
Vector Informatik GmbH
VIRTUAL VEHICLE Research GmbH
Volkswagen AG
WIGeP e.V.
xPLM Solution GmbH
Yazaki Systems Technologies GmbH
ZF Friedrichshafen AG
Zuken Inc.

Technical Steering Committee (TSC)

The Technical Steering Committee is responsible for steering the Technical Program of the association. It bears overall economic and technical responsibility for the management and coordination of all technically oriented work within the association, and decides on the establishment and termination of projects, their financial support, as well as the exploitation and publication of project results.

The Technical Program of the prostep ivip association set important impulses in 2025 for open, interoperable, and collaborative industrial product development. The focus was particularly on advancing end-to-end data continuity, the practical implementation of cross-company collaboration, and the industrialization of open standards across the entire product lifecycle. Thematically interconnected project clusters addressed key future topics – from Digital Thread and Digital Twins to simulation and AI, through to production, sustainability, and regulatory requirements.

Focus Areas & Concrete Results

A central focus in 2025 was the further development of the Digital Thread and collaborative Digital Twins. Several projects contributed complementarily to this effort, establishing a semantically grounded foundation for cross-company collaboration. The Collaborative Digital Twins (CDT) project reached its conclusion and demonstrated – using an industry-relevant demonstrator – that synchronized, data-driven collaboration is possible without file transfers. The developed User Journeys show how IP protection, data sovereignty, and real-time collaboration can be reconciled, and form the foundation for the follow-on project Live Collaboration in Engineering (LCE), launching in 2026. In parallel, CASCaRA reached a significant milestone with its submission to the international OMG standard. These activities were supported by psiOnt for harmonizing cross-project ontologies, and by LOTAR, which extended its scope to include MBSE and ECAD data, thereby strengthening data continuity across the entire product lifecycle.

Significant progress was also made in the area of simulation and virtual validation. The Smart Systems Engineering (SmartSE) project published Recommendation V4, a comprehensive guideline for simulation-based systems engineering. The enhanced SmartSE V-model, concrete use cases, and recommendations on standards and processes address both user and vendor perspectives. Complementing this, the HAIViSH project continued to advance the virtual homologation of AD/ADAS systems incorporating AI methods, with particular focus on regulatory requirements and their integration into virtual validation processes.

The co-design and industrialization of open standards remained a defining characteristic of the Technical Program. The JT project groups made progress in advancing the JT format, particularly in its interaction with STEP AP242 XML, PMI at assembly level, and kinematics. At the same time, the publication of STEP AP242 Edition 4 marked an important milestone in the MBx-IF environment. Updated Recommended Practices and extensive test rounds underline the high industrial relevance of this work.

The integration of engineering and production was further strengthened as well. The VES/ECAD project groups published VEC Release 2.2, making a significant contribution to the standardization of electrical system development and to DIN 72036. The research project HARMONIQ also initiated work on digital twins for production systems. Simultaneously, sustainability topics moved further into focus, including through the first prostep ivip Sustainability Day.

Furthermore, the Code of PLM Openness (CPO) was advanced as an additional building block for open and trustworthy IT architectures. Work on product-specific CPO certification and the international orientation of the initiative highlight the growing importance of openness, interoperability, and governance for industrial IT landscapes.

Outlook for 2026

Building on the foundations established in 2025, the Technical Program will continue to be developed with clear priorities. Software-defined products and vehicles, AI-assisted engineering, virtual validation, regulatory requirements, and the further internationalization of standards will remain central topics. The goal is to consistently translate methodological concepts into industrially applicable solutions and to continue aligning the Technical Program closely with the strategic needs of its members.

Statement from Project Coordination

"The challenge lies in keeping the Technical Program consistently aligned with current industrial developments and evolving project content in line with actual needs. At the same time, new topics must be identified early and existing priorities reviewed regularly – to sustainably maintain member interest in contributing to the Technical Program, while remaining true to the strategy of the prostep ivip association."

Participants

- Airbus Operations GmbH
- Aptiv Services Deutschland
- AVL List GmbH
- BHC GmbH
- BMW AG
- :em engineering methods AG
- Ford-Werke
- Fraunhofer IPK
- IBM Deutschland GmbH
- John Deere GmbH & Co. KG
- Mercedes-Benz AG
- NTT DATA Deutschland SE
- PROSTEP AG
- Raytheon Technologies Corporation
- RLE INTERNATIONAL
- Robert Bosch GmbH
- Ruhr-Universität Bochum
- Schaeffler Technologies AG & Co. KG
- Siemens AG
- Siemens Industry Software
- smartCable GmbH
- Stellantis N.V.
- The Boeing Company
- T-Systems International GmbH
- TU Darmstadt
- UNITY AG
- Volkswagen AG
- ZF Friedrichshafen AG

Project Leadership

Chair
Bernd Feldvoss, Airbus

prostep ivip Contact
Nora Tazir
+49 178 9509215
nora.tazir@prostep.org

BORDNETZE DIGITAL

Das Digitalisierungsforum für die Bordnetzentwicklung und -fertigung

prostep ivip ARENA2036

Review: Bordnetze Digital 2025
Expertise, Exchange and a Clear View of the Future

On 25 September 2025, more than 110 experts from industry, academia and technology convened at ARENA2036 in Stuttgart to exchange insights on the latest developments in electrical wire harness development and manufacturing. Now firmly established in the industry calendar, the event brought together technical presentations, an exhibition featuring six exhibitors and numerous networking opportunities. Bordnetze Digital 2025 once again proved to be a dynamic platform for knowledge transfer and professional dialogue.

A Vibrant Start

As in the previous year, digitalisation topics took centre stage. Alongside the presentations, the direct exchange between participants and exhibitors was a defining feature of the day. Moderated by Georg Schnauffer (ARENA2036) and Dr. Alain Pfouga (prostep ivip), the second edition of Bordnetze Digital once again demonstrated its strengths: well-founded technical contributions and meaningful personal conversations. Organised by ARENA2036 in cooperation with the prostep ivip association, the congress provides a dedicated platform for industry-wide dialogue.

Topics and Insights from Presentations & Discussions

The presentation programme illustrated the breadth of approaches being pursued in the digitalisation of the industry. Dr. Detlef Zerfowski (ETAS) outlined how the transformation towards the Software-Defined Vehicle is fundamentally reshaping in-vehicle architecture. Mercedes-Benz focused on the consistent use of wire harness data as a means of ensuring quality and reducing rework.

Several presentations placed artificial intelligence at the forefront: smartCable showcased a model-based toolchain for simulation and variant management; the University of Stuttgart and IILS demonstrated the automated generation of wire harnesses; and ISW presented approaches to AI-supported cable manipulation.

A further area of focus was interoperability and standards. Contributions from ARENA2036, msg and 4Soft highlighted how the Asset Administration Shell, VEC and data spaces will enable secure data exchange and end-to-end digital continuity. Complementing these, Daimler Truck, S-IT and Siemens presented solutions for variant validation and the digitalisation of manufacturing processes.

Outlook

The congress made one thing clear: digitalisation, simulation, artificial intelligence and automation are not isolated topics – they are integral parts of a broader, interconnected transformation. The close integration of hardware, software, data models and process innovation lies at the very heart of this change.

The next Bordnetze Digital congress will take place on 24 September 2026 at ARENA2036 in Stuttgart.


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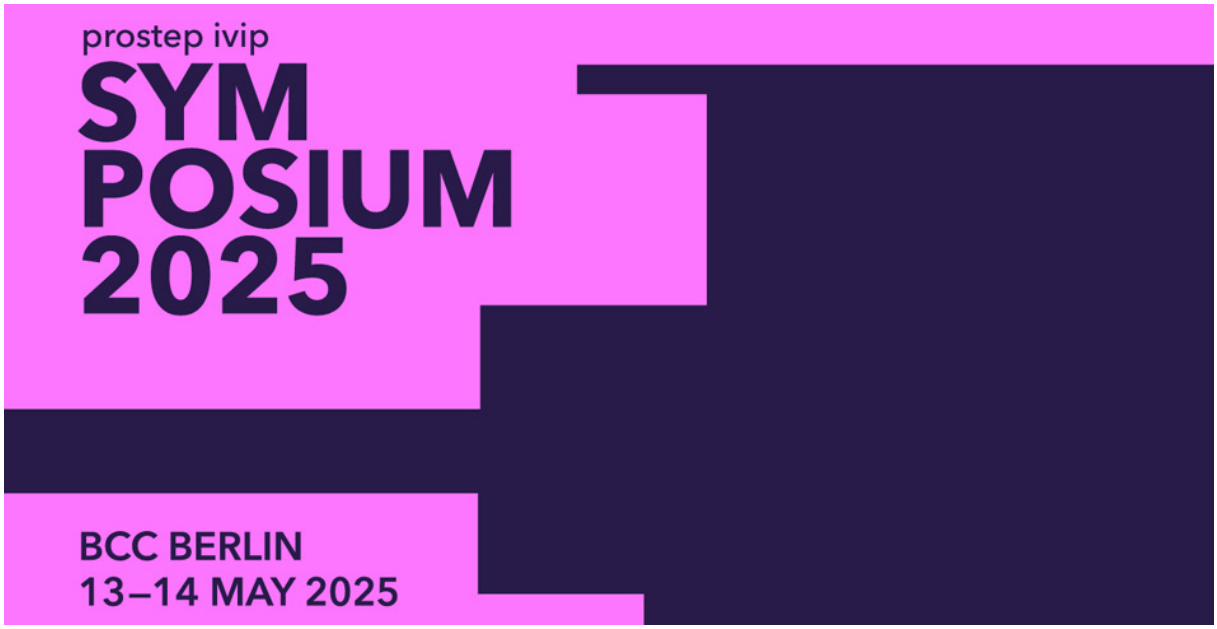
prostep ivip Symposium 2025: The Revolutionary Power of Digital Twins and AI

The prostep ivip Symposium 2025 took place on 13 and 14 May at the bcc Berlin Congress Center, right in the heart of the city at Alexanderplatz. Despite widespread travel restrictions across many organisations, the two-day event drew an impressive 650 attendees – 90 of whom travelled from abroad, primarily from Japan, South Korea, and the United States. The strong presence of younger participants was a clear signal: the next generation is finding its place in what has long been considered the PLM industry's annual family reunion.

Under the theme "Revolutionizing Industries With Digital Twins and AI", the prostep ivip Association simultaneously underscored its commitment to strategic realignment. "We must change if we want to continue fulfilling our role of serving our members in their digital transformation journey," stated Board Speaker Henrik Weimer during the strategy update that opened the event. This year's agenda – featuring four keynotes, more than 60 parallel sessions, and numerous workshops – illustrated just how far this transformation has already progressed. Topics such as Software Defined Vehicle, Virtual Homologation, Digital Twin, and Artificial Intelligence commanded a presence that rivalled, if not matched, the classic PLM and standardisation themes on which the Association was built.

Premium sponsors this year were Volkswagen and Dassault Systèmes. In a joint keynote, Thomas Kamla – CTO ID.1 and responsible for Cooperation Projects, MQB Classic, and Digitalisation at VW – alongside Antje von Specht, Head of Virtual Vehicle, outlined how the group is positioning itself for the future. Volkswagen has embarked on a departure from the global car concept, shifting towards more regionally tailored vehicle development – supported by Dassault Systèmes' 3DEXPERIENCE platform and a significantly expanded use of simulation and virtual testing. "The goal is to shorten the product development process by up to six months and reduce costs by up to 200 million euros," said Kamla.

"Virtual worlds will improve the real world" – with this bold vision, Sabine Scheunert, Managing Director Eurocentral at Dassault Systèmes, set the tone for her keynote. The AI deeply embedded within the 3DEXPERIENCE platform is set to become a game-changer, helping European manufacturers reclaim a competitive edge. The prerequisite, however, is breaking down the data silos that persist between development and production. Scheunert also emphasised the importance of digital sovereignty for Europe. Closing out the first day, Dr. Reinhold Achatz, Chairman of the International Data Spaces Association (IDSA), shed light on the role of trusted data ecosystems in enabling data-driven value creation – explaining how federated data storage in Data Spaces allows information to be shared selectively and purposefully.



The accompanying exhibition, spread across two floors of the bcc, was nearly fully booked with 36 software vendors and service providers. Guided tours through the event's key topics ensured every exhibitor received well-deserved attention, generating a lively atmosphere throughout the floor – a format that resonated strongly with both visitors and exhibitors alike.

The Start-up Pitch Award once again attracted considerable interest. Four young companies each had 180 seconds to make their case to the audience. The €2,500 prize went to Michael Pfennig of Elevanting Patterns GmbH, whose federated backbone solution for the Digital Thread – built on a graph database and deployable in the cloud – impressed both jury and audience.

The evening event, with its sweeping view of Alexanderplatz, provided the fitting backdrop for the prostep ivip Scientific Awards. The €1,000 prize for the best Master's thesis was awarded to Paul Göcker for developing an automated calculation and evaluation method for structural analysis. The €4,000 prize for the best doctoral dissertation went to Dr.-Ing. Constantin Mandel, who – under the supervision of Prof. Albert Albers at the Karlsruhe Institute of Technology – developed an MBSE-based methodology for the continuous validation of product development. The evening concluded with the Association honouring its former Chairman Armin Hoffacker with honorary membership, recognising his outstanding contribution to strengthening the Association's ties with the VDA.

The next prostep ivip Symposium will take place on 14 and 15 April 2026 at Kap Europa, the congress centre of Messe Frankfurt – with CONTACT Software, Stackit, and AVL as Premium Partners.

www.symposium.de

Review JT Day Express 2025

The 9th JT Day Express, held on 22 October 2025, demonstrated convincingly that format and impact are not mutually dependent: despite being held online, the event attracted an exceptionally high level of participation, reaffirming the JT Day Express as a cornerstone platform for the international JT community. Under the theme "JT for the Digital Future", professionals from a broad range of industries convened to discuss the latest developments surrounding JT as both a national and international standard format. The decision to move to an online format reflected the travel restrictions and budget constraints facing the user industry, while leaving the event's high professional standards fully intact.

The event was opened by the project managers of the JT Workflow Forum, Thomas Ott from Aumovio and Bernd Watzal from Mercedes-Benz, followed by five presentations from distinguished international speakers.

Takao Senko from Honda led off with a contribution on semantic PMI, covering their definition, distinction from graphical PMI, integration within the MBE maturity model, and the advantages they offer for digital measurement processes. Bernd Watzal from Mercedes-Benz then addressed the validation of JT integration based on attributes calculated from source systems, also providing an outlook on forthcoming developments in this area. Johannes Lehnen from :em AG demonstrated how the "Digital Data Package" semantically represents geometry-related technical information – spanning materials, mechanical properties, coatings, heat treatment, joining techniques and bending specifications – and aligns this data with the Digital Thread and 3D visualisation through the newly introduced JT External Element References (EER). Dan Ganser from Gulfstream outlined the evolution of "Build to Model" processes in aircraft manufacturing over the past two decades and the drivers that ultimately necessitated the introduction of a technical data package.

The programme concluded with a joint presentation by Bernd Feldfoss from Airbus, Jochen Boy from prostep and Bernd Watzal from Mercedes-Benz, providing an update on current standardisation activities. The speakers reported on progress in establishing JT 10.5 as ISO 14306 Ed. 3, the recently published ISO 10303-242 Ed. 4 (STEP AP242 XML) – which provides the technical foundation for the External Element References discussed in earlier presentations – and the planned transition of the national JT standardisation from DIN SPEC 91383 to a new DIN standard.

A post-event survey recorded exclusively positive feedback, with all presentations rated as either excellent or good by attendees. The slide decks from all presentations are available for download at:

www.prostep.org/fileadmin/events/jtday2025/JT-Day_Express_2025_presentations_final.zip

Review STEP AP242 Day 2025: Driving Digital Continuity Across Industry

On October 14, 2025, the STEP AP242 Day brought together leading industrial stakeholders in Paris for a full-day event dedicated to advancing interoperability through the STEP AP242 standard. Organized by AFNeT and prostep ivip, the conference focused on operational use cases, long-term data strategies, and the development roadmap for Edition 5 of the standard.

Jean-Pierre Souzy opened the event with a keynote emphasizing the strategic role of STEP in the aeronautics industry. With over 75% of aircraft components sourced from suppliers, the airframer's task is not only to produce the remaining quarter but to orchestrate the integration of the entire aircraft. Standardized data exchange formats like STEP are essential for this coordination, especially in the context of paperless certification and increasingly complex data types such as PMIs, electric harnesses, and composite structures.

Safran Helicopter Engines, represented by Guillaume Valentin, showcased a field-proven approach to long-term archiving using the LOTAR standard and STEP AP242 Edition 1. With legacy engines like the Alouette still in service after nearly 70 years, Safran's archival strategy ensures regulatory compliance and product support over decades. The next step is transitioning from graphical to semantic PMI, enabling machine-readable annotations and enhancing digital continuity.

Fumiki Ohtani, speaking for the Japan Automobile Manufacturers Association (JAMA), addressed interoperability challenges in Japan's automotive sector. Low adoption of 3D standard formats and inconsistent design practices among OEMs have led to issues such as excessive annotations – the so-called "hedgehog problem." JAMA is responding with initiatives including sample data publication, CAD best practices, and direct collaboration with vendors and ISO committees to ease supplier burden and foster a unified digital foundation.

Several software vendors presented their contributions to STEP implementation. Elysium reaffirmed its commitment to open interoperability through active participation in CAx-IF and user-driven updates. CoreTechnologie and Dassault Systèmes emphasized the embedded role of STEP AP242 in their conversion and visualization tools. Datakit demonstrated support for Edition 4 via its CrossCADWare SDK, while Open Cascade highlighted its free and open-source STEP kernel, already powering tools like FreeCAD and KiCad.

User companies also shared compelling use cases. MBDA illustrated how export control metadata embedded in STEP files enables compliant data sharing across international programs. Mercedes-Benz Vans and T-Systems introduced a semantic twin approach, transforming STEP data into knowledge graphs for automated validation and traceability. Airbus, a key contributor to the LOTAR project, presented strategies for ensuring data survivability beyond software lifecycles – a critical need in aerospace, where products may remain in service for half a century.

Jean Brangé (AFNeT Services) presented the roadmap for STEP AP242 Edition 5, currently under ISO development. Key priorities include improved traceability, expanded semantic PMI support, and enhanced coverage for composites, electrical systems, and classified data. The new edition aims to maintain backward compatibility while streamlining modular architecture, with publication targeted for 2026.

Further contributions from Threedy, T-Systems, Open Design Alliance, Kubotek Kosmos, and PROSTEP AG demonstrated STEP's evolving role in enabling real-time collaboration, secure data exchange, and lifecycle connectivity. The event concluded with Alain Pfouga (prostep ivip) reaffirming STEP AP242 as the foundation of digital continuity across the extended enterprise – a standard shaped by industry, for industry.

Tokyo Systems Engineering Summit 2025: International Knowledge Transfer as a Catalyst for Innovation

The Tokyo Systems Engineering Summit, held on 14 November 2025 at Marunouchi Hall, recorded over 300 registrations – a new high that confirms its standing as a leading conference for the systems engineering community in Asia. The event has established itself as a central platform where experts from Japan, South Korea and international markets engage in structured professional exchange.

Partnership as a Foundation

The success of the event is built on a long-standing institutional partnership: Tomohiko Adachi, board member of the prostep ivip Association and Mazda Motor Corporation, together with NTT Data, which has supported the event from the very beginning, play a key role in shaping its strategic direction and operational delivery. Premium sponsors NTT Data, HCLTech and PTC made free participation possible for all attendees – a significant contribution to the event's accessibility and reach.

„The unique value of this event lies in connecting different continents and enabling genuine knowledge transfer across borders," said Dr. Alain Pfouga, Managing Director of the prostep ivip Association.

Program:
Industry and Academia in Dialogue

The speaker program brought together perspectives from industry, research and academia. The thematic focus centered on the potential of artificial intelligence in systems development and the ongoing transition to software-defined vehicle architectures.

Jens Poggenburg from AVL opened the program with a keynote on the role of Agentic AI in vehicle development. Dr. Henrik Weimer from Airbus examined the application of AI methods to improve efficiency in the aerospace industry. Professor Seiko Shirasaka from Keio University broadened the perspective, drawing connections between systems engineering and broader societal transformation processes. Takao Sugai from Toyota Motor Corporation presented practical use cases from current development practice.

The afternoon case study sessions provided concrete insights into the digital transformation of leading organizations: representatives from Mazda, Olympus, Toyota, Denso, Volkswagen and the Technical University of Berlin presented current approaches covering topics such as application lifecycle management, model-based systems integration, test methodologies and virtual engineering.

Premium partners PTC, HCLTech and NTT Data complemented the program with technically substantive contributions on product lifecycle management, the integration of MBSE with ALM and PLM, and the deployment of Agentic AI in SDV development.

Exhibition and Networking

Twelve solution providers – including Accenture, Dassault Systèmes, Keysight, Contact Software and Zuken – showcased their latest developments in an accompanying exhibition. Exhibitor pitch sessions offered a concise overview of the participating companies' portfolios. An evening social event provided space for in-depth conversations and informal exchange within the community.

Outlook 2026

The significantly increased demand presents the organizing team with the challenge of balancing growth with quality. The prostep ivip Association is currently evaluating concepts that would accommodate a larger number of participants without compromising the collaborative character of the event.

The Tokyo Systems Engineering Summit reflects the prostep ivip Association's commitment to actively connecting international professional communities and advancing cross-border knowledge transfer as a meaningful contribution to the continued development of the discipline.

Highlights Technical Program

The Technical Program of the prostep ivip Association delivered decisive impulses in 2025 toward open, interoperable, and collaborative industrial product development. Organized in thematically interconnected project clusters, the program addressed key future topics – spanning the Digital Thread and Digital Twins, simulation, AI, and MBSE through to standardization, production, sustainability, and regulatory requirements.

The focus was firmly placed on the industrialization of standards, practical implementability within real-world toolchains, and cross-company collaboration among user companies, software vendors, research institutions, and industry associations.

Digital Thread & Collaborative Digital Twins

A central highlight of 2025 was the further concretization of the Digital Thread concept within the prostep ivip ecosystem. Several projects made complementary contributions, collectively forming a continuous, semantically grounded foundation for cross-company Digital Twins.

The Collaborative Digital Twins (CDT) project reached its conclusion in 2025, demonstrating through an industry-oriented demonstrator that synchronized, data-driven collaboration without file transfer is achievable. The developed user journeys illustrated how IP protection, data sovereignty, and real-time collaboration can be reconciled – forming the foundation for the successor project Live Collaboration in Engineering (LCE) from 2026 onwards.

In parallel, CASCaRA achieved a significant milestone with the submission for the international OMG standard. These activities were further supported by psiOnt for cross-project ontology harmonization, and by LOTAR, which further expanded its scope to encompass MBSE and ECAD data, thereby strengthening data continuity across the product lifecycle.

Simulation, Virtual Validation & AI

Simulation and virtual validation firmly established themselves in 2025 as key enablers of efficiency, quality assurance, and regulatory conformance. The Smart Systems Engineering (SmartSE) project published Recommendation V4 – a comprehensive guideline for simulation-driven systems engineering. The extended SmartSE V-model, concrete use cases, and clear recommendations on standards and processes address both user and vendor requirements.

With HAIViSH, the virtual homologation of AD/ADAS systems was advanced, incorporating AI-based methods. The focus was on the interpretation of regulatory requirements and their integration into end-to-end virtual validation workflows.

Standards, Interoperability & International Normalization

Strong engagement in international standardization activities remained a defining characteristic of the Technical Program in 2025. The JT project groups achieved significant progress in the standardization and industrialization of the JT format – particularly in its interplay with STEP AP242 XML, assembly-level PMI, and kinematics. The JT Day and close alignment with DIN and ISO underlined the active role of prostep ivip in shaping the standards landscape.

In the MBx-IF / STEP AP242 domain, the publication of AP242 Edition 4 marked a major milestone, enabling a wide range of new use cases. A large number of updated Recommended Practices and extensive test rounds demonstrated the high industrial relevance of this work.

LOTAR also continued its successful trajectory, further evolving into a key enabler for lifecycle-spanning data strategies.

Production, Electrical Systems & Sustainability

With a view to the integration of engineering and manufacturing, several projects addressed central implementation challenges. The VES/ECAD project groups published VEC Release 2.2 in 2025, making a significant contribution to the standardization of vehicle electrical system development and to DIN 72036. The Congress "Bordnetze Digital" reinforced the industrial relevance of these results.

The newly launched research project HARMONIQ is developing content in the area of digital twins for production systems. The topic of sustainability was additionally brought into focus through the first prostep ivip Sustainability Day, driven by the SSB.

Openness, Governance & Trust

The Code of PLM Openness (CPO) was further developed in 2025 as an important building block for trustworthy, future-ready IT architectures. Work on a product-related CPO certification, combined with the initiative's growing international orientation, demonstrates that openness, interoperability, and governance are increasingly recognized as strategic success factors.

Outlook

The Technical Program 2025 exemplifies how prostep ivip functions as a platform for collaboration, standardization, and innovation. The close integration of strategy, technology, and industrial implementation provides a solid foundation for actively shaping the challenges ahead – particularly in the context of software-defined products, AI, regulatory compliance, and global supply chains.

Our YouTube Channel – Knowledge in Motion

Complex topics made accessible, practical insights into our project work and forward-thinking perspectives from the world of Product Lifecycle Management: our YouTube channel brings prostep ivip to life – and it keeps growing.

New: Our Data Space Film

One highlight of the past year is our latest film on the topic of Data Spaces – concise, clear and straight to the point. It explores how interconnected data ecosystems are fundamentally transforming industrial collaboration and why this topic is pivotal to the future of the digital product lifecycle.

Push to Future – Visionary, Substantive, Essential Viewing

Equally recommended: our Push to Future series. It takes a sharp look at the industry's most pressing future topics – closely aligned with the developments shaping our community, and always with an eye firmly on what lies ahead.

prostep ivip Symposium 2026 April 14-15 Frankfurt
Meet industry leaders in automotive, aerospace

Bordnetze Digital 2025 Review
ARENA2036

Browse through our films, get inspired – and discover how prostep ivip brings knowledge to life.

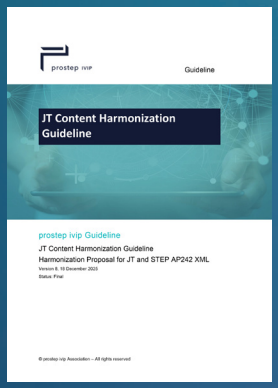
▶ **Explore now on YouTube**

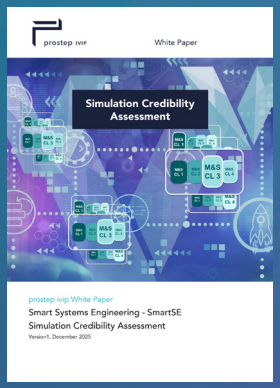
Our Media Library – Knowledge That Grows

Years of project work, international expert exchange and continuously new results from our working groups: our media library brings together the best of both worlds – a well-established repository of proven expertise and the latest publications reflecting the current state of collaboration within our community.

Recently Published – Fresh Insights Straight from the Project Groups

The past year has been a productive one: a number of new publications are now available for download. Whether updated implementation guidelines, revised recommendations or practice-oriented white papers – the latest releases deliver tangible value for day-to-day project work and are clearly highlighted within the media library.





Access for Members and Interested Parties

prostep ivip members enjoy unrestricted access to all publications – current and historical – free of charge and available at any time. Non-members may browse selected content; however, full access remains exclusively available to our members.

Please log in to the members' area to download all documents.

Member Login **Registration**

Editorial ProductDataJournal 1-2025

Editorial

4

From Hardware-Driven to Customer-Defined:

The Race for Development Speed

Check out PDJ 1-2025

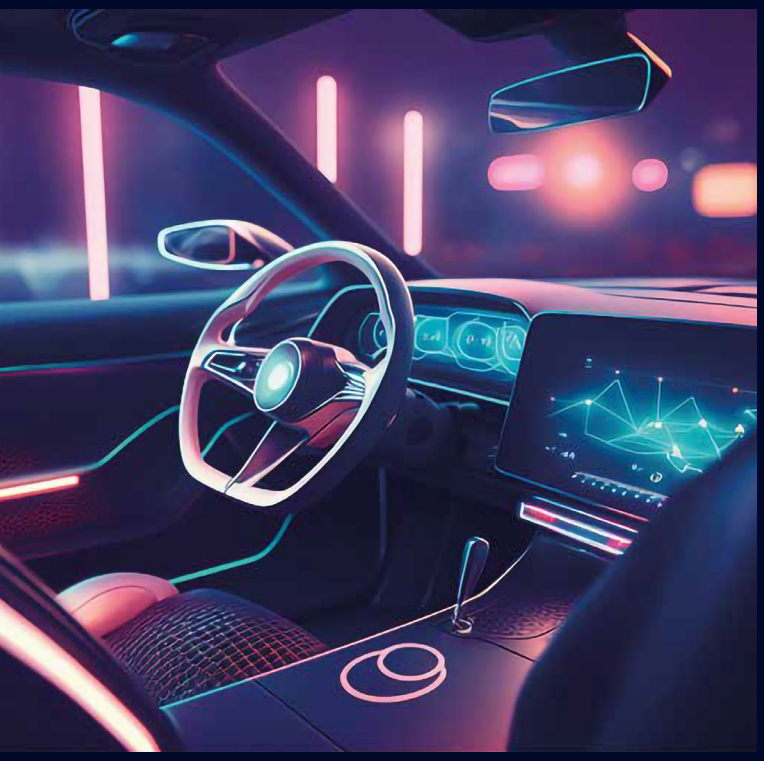
Dear prostep ivip Members,

The European automotive industry faces enormous challenges, and navigating these complexities becomes even more demanding amid ongoing geopolitical crises. As a global corporation, we at Volkswagen are particularly affected by these dynamics. If we want to shape the future of mobility with the same impact we've had on its past, we must transform our vision and take the offensive. We've spent recent years laying the necessary groundwork for this transformation.

The new normal in mobility is defined by software controlling all relevant functions. We already view the vehicle as part of the user ecosystem today. Users interact with our products, and their requirements vary significantly from region to region. This is why at Volkswagen, we no longer speak merely of a Software Defined Vehicle, but rather of a Customer Defined Vehicle. We've established various user journeys to meet the expectations of different target groups. This simultaneously provides us with a clearer understanding of how customer requirements can be realised through software, backend, and vehicle system architecture.

A crucial consequence of this new reality is our departure from the "world car" concept, as it no longer meets the requirements of all local markets. Instead, we're expanding the capabilities of our global R&D network to strengthen product localisation and develop products specifically for regional markets. Wolfsburg remains the innovation engine for the core brands of Brand Group Core, but we aim to increase our development

Editorial ProductDataJournal 2-2025



Text published in the German-Language magazine D1G1TAL AGENDA 4/2025 and translated by prostep ivip

The New Formula for Product Development

Software-defined products (SdPs), artificial intelligence (AI), and digital twins have the potential to transform industrial manufacturing fundamentally. However, this breakthrough can only be made a reality through jointly developed standards and intensive exchange through pre-competitive collaboration.

52 months or 120 weeks? That's the difference in development times between the European and Chinese automotive industries. This discrepancy is striking, but it's only a momentary snapshot in the race for market share. Those who will stay ahead in the future are those who know how to leverage new technologies based on approaches such as software-defined products or agentic AI. They will also critically examine and refine the way they collaborate with partners.

The prostep ivip association, based in Darmstadt, organizes precisely this type of pre-competitive collaboration. The organization brings together leading industrial companies, IT system providers, and research institutions to develop methods and process designs for future product platforms. The board includes globally active companies such as Volkswagen, Airbus, AVL, Mazda, and Unity, as well as the Technical University Berlin, one of Germany's universities of excellence. This underscores the relevance and international impact of the recommendations.

New Realities

The focus of product development has shifted significantly in recent years. The notion of a product whose value contributions come largely from hardware and electrical or electronic components has given way to a more holistic view of products as systems and parts of larger systems (Systems of Systems, or SoS).

Products are now capable of communicating with their operating environment independently. This has led to the need to rethink current product system architectures, particularly in terms of sustainability and new business opportunities.

Platform Approaches

From a technological perspective, a key strategy for implementing SoS products is the platform approach. However, this refers to at least two strategies:

- A combined hardware and electronics (E/E) platform for the development of mechanical components, systems-on-a-chip, sensors, and controllers.
- A software platform for providing middleware and product operating systems.

Development and deployment of features should be cloud-based in order to enable scenarios such as the use of operational data and over-the-air (OTA) feature updates, and to open up new business opportunities. This also calls for a dedicated cloud strategy.

“In an environment where Chinese OEMs develop vehicles in 120 weeks while it takes us in Europe 52 months, we can no longer afford to work in isolation. At prostep ivip, we collaborate on methods and standards that help all members become faster and more efficient. This pre-competitive collaboration is the key to remaining internationally competitive.“

Jens Poggenburg AVL,
Spokesperson for the prostep ivip e.V. board

Platform strategies are based on the idea of providing a unified technological foundation for multiple product groups or modules (in large-scale plant engineering: skids). For example, in the automotive industry, each vehicle type currently uses a hundred or more control units. Each of these units has its own embedded software, application programming interfaces (APIs), and, in some cases, different communication protocols. Therefore, attempting to install an update on a vehicle inevitably becomes risky. A unified platform, such as those introduced by the „new players,“ provides a solution.

The automotive industry has seen remarkable progress in modularization, particularly with regard to chassis, powertrain, and infotainment. The Volkswagen Group, for example, relies on the following platforms for its vehicles: The MQB (Modular Transverse Matrix) is used for vehicles with transversely mounted engines; the MLB (Modular Longitudinal Matrix) for vehicles with longitudinally mounted engines; the SSP (Scalable Systems Platform) for vehicles with either transversely or longitudinally mounted engines; the MEB (Modular Electric Drive Matrix) for electric vehicles, and the PPE (Premium Platform Electric) for premium-class electric vehicles from Porsche and Audi. BMW uses CLAR (Cluster Architecture) for internal combustion, hybrid, and electric powertrains, while Mercedes-Benz uses MRA (Modular Rear Architecture) for rear-wheel drive or all-wheel drive vehicles. Asian manufacturers such as Hyundai (K-platform) and Toyota (TNGA, or oyota New Global Architecture) are also pursuing similar strategies (1).

"The Volkswagen Group's modular strategy, from MQB to MEB to SSP, can only succeed if collaboration with our partners works smoothly. Prostep ivip provides this foundation with shared standards and processes that help us streamline partner engineering services and significantly shorten our time to market."

Thomas Kamla, Volkswagen

The cross-product use of modules promises significant cost savings, especially when scale effects can be achieved through standardization and mass production. At the same time, this strategy has the potential to improve quality.

However, things can go wrong. The Stellantis Group is currently experiencing this firsthand. A technical defect affecting a wide range of vehicle models has necessitated an extensive recall (2).

In any case, it is important that the various components can be flexibly combined, and that the platform is open to the integration of further technical innovations. There is an immense drive for improvement, especially in the field of advanced driver-assistance systems (ADAS). This has implications for the development methodology.

Speaking of ADAS: Due to automation and AI-based assistance, products are becoming more „intelligent," and their „perceptual capabilities" are constantly improving. Therefore, it is no surprise that the market for advanced driver assistance systems is growing rapidly. Analysts at Market and Markets estimate that this segment will reach 360 million units this year and forecast nearly 9 percent annual growth. They expect sales to exceed 650 million units by 2032. This success is fueled by advancements in machine learning, AI algorithms, and sensor fusion. ADAS software is becoming more sophisticated and affordable, thereby reducing reliance on expensive sensors, such as radar and LiDAR. Tesla, for instance, exclusively uses cost-effective, camera-based systems (3).

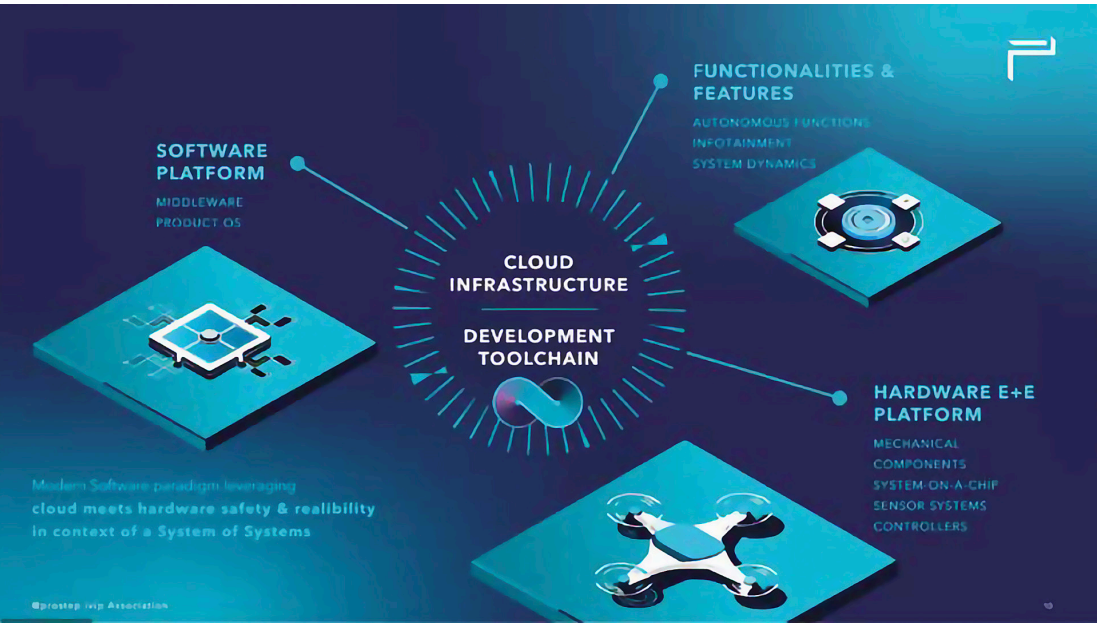
Amid all the hype surrounding smart products, autonomous systems, and end-to-end process design, cybersecurity must not be overlooked. Furthermore, many companies, particularly those in the mechanical and plant engineering sector and Tier 2 and Tier 3 suppliers, lack knowledge of modern software development and product architecture design („systems engineering"). They must absolutely catch up.

„Software makes the World (Products) go round"

Although platform strategies are gaining ground, a tense calm still surrounds the implementation of SdP scenarios (the calm before the storm?) Fortunately, the prostep ivip association has presented an industry-ready strategy that focuses on the fusion of Model-Based Systems Engineering (MBSE) and SdP. This is important for aligning the various technology platforms more closely with one another.

Regardless of the industry - machines, systems, vehicles, and aircraft are increasingly designed and modified using software. Ideally, software development is completely decoupled from hardware. This allows products to be kept up to date, adapted, and improved throughout their entire lifecycle via "over-the-air" (OTA) updates. Products would quickly become outdated if features were hard-coded into physical hardware. SdP reduces costs and allows companies to maintain customer engagement with innovations for a much longer period of time.

How do MBSE and the SdP approach fit together? The term "Model-Based Systems Engineering" first appeared in the book of the same name by A. Wayne Wymore, published in 1993. Model-based systems engineering (MBSE) uses pre-formalized representations of systems in the form of models. It is often compared to document-



Software and hardware platforms must be intelligently integrated. (Source: prostep ivip 2025)

"The digital thread forms the digital backbone of modern product development. Only by thoroughly documenting every step of the development process and ensuring it is traceable can we reliably perform over-the-air updates and meet regulatory requirements. It is the digital twin that makes this traceability possible in the first place."

Professor Rainer Stark,
Technical University Berlin

based approaches, where system information is stored in a variety of documents in different, non-standardized formats. MBSE consolidates SE artifacts. These system models are expressed using a standardized modeling language, such as the Systems Modeling Language (SysML).

The V-model is an integral part of systems engineering. It was developed to ensure the seamless integration of requirements management, design, and testing through a sequential process, and emphasizes the importance of verification, validation, and traceability of design decisions at every stage of development. Unlike other approaches, such as the Waterfall or Agile models, the V-Model provides a clear, visual representation of the development process, linking each phase to its corresponding testing phase. This structured methodology ensures comprehensive coverage of the requirements lifecycle, reduces risks, and improves outcomes for complex systems engineering projects (5).

Dematerialization of Product Development

Unlike MBSE as a method (the "how" approach), SdP (the "what" approach) strictly follows the so-called software-first strategy: The core functions of the product and the product architecture are all defined in the form of software. Added to this is hardware abstraction: "layers" are built into the product operating system that isolate the software from the hardware and enable the software to be deployed on various hardware platforms. This turns a car into a computer on wheels – though with additional requirements, including safety standards. It reduces reliance on specialized hardware designs and opens up the possibility of running products on

“The prostep ivip Symposium 2026 is the must-attend event for anyone who wants to be at the forefront of industrial digital transformation. With ‚Agentic AI and the Rise of Software-Defined Industry,‘ we have deliberately chosen a topic that will define the future of our industry.“

Philipp Wibbing, UNITY

standardized hardware. This naturally requires hardware providers, such as ADAS providers, to rethink their business models. SdP uses agile project management methods, which enable iterative development and improved synchronization with hardware development. The products are consistently designed to be updated remotely with new features, bug fixes, and performance improvements via OTA software updates.

A Mentor for Faster Product Development

prostep ivip is strongly committed to integrating Model-Based Systems Engineering (MBSE) and Systems of Products (SdP). According to a recent SdP study, the association has launched six initiatives to this end:

1. Active shaping of the regulatory framework. This includes creating a framework that facilitates the implementation of digital traceability and the safety and security of software-defined products.
2. Improving collaboration across different ecosystems. The goal is to promote effective collaboration across different core competencies (software/hardware DNA) and to overcome IP restrictions in the development of software-defined functions.
3. Promoting cross-domain standardization and harmonization. This includes, among other things, supporting the standardization of data formats in software-defined products.
4. Improving processes, methods, and tools. This includes virtualization technologies, interoperability, and long-term archiving of digital twins.
5. Managing complexity in SdPs by promoting digital homologation.
6. Educating future talent and developing skills. This includes, for example, holding regular SdP developer conferences.

One goal is to make collaboration so efficient that, in addition to the 30 percent of engineering work performed in-house by automotive OEMs, the remaining 70 percent – which is currently carried out by partners - will significantly reduce time to market. Of course, the proportion of in-house work varies considerably within different industries.

As mentioned above, the need for action is enormous. In Europe, the average development time in the automotive industry, from concept to start of production (SOP), is 52 months. However, Chinese automotive OEMs complete new vehicle development within 120 weeks or less (6).

European Speed

Various approaches are being taken to speed up product development. For instance, BYD Auto Company is on track to achieve nearly 100 percent integration depth, as even the batteries for its electric vehicle portfolio are manufactured in-house. With its multitude of brands and century-long history, the Volkswagen Group stands in stark contrast to the Chinese automaker, which was founded as recently as 2003.

The key question is how decision-making can be significantly accelerated within development networks, especially since other platform providers such as Google and Nvidia will need to be integrated even more deeply. There are also challenges to be overcome in cloud-to-cloud communication (e.g. ALM/PLM with ERP) (7).

The fact is that some automotive OEMs are already capable of offering Level 4 driving functions, yet they do not. We can only speculate about the reasons, but it seems likely that the digital thread has not yet been established across all domains within these companies. The industry is very cautious and for good reason; they

Results of a Study on Software-Defined Products Commissioned by the prostep ivip Association (Source: prostep ivip 2025)

want to prevent any unforeseen incidents. Suppose you are driving a luxury vehicle and receive a prompt asking if you want to install a new software update for your operating system: you agree, and then an accident happens. At the very least, legislators will expect to see proof that no errors occurred during the update's integration, according to the current technological standard. This involves, for example, the requirement to fully document the test scenarios for the update and, consequently, the existence of a digital thread.

Vision: A Common Cause

The prostep ivip Association fosters collaboration between industry, startups, and research to develop methods and process designs for future product platforms. Together, its members develop practical standards and templates that accelerate disruptive innovation and sustainably strengthen and expand the competitiveness of the entire manufacturing industry. In a sense, this is the guiding star that all of the association's working groups use to orient themselves. To do this, one must step outside one's own „walls" and establish connections with other expert partners. prostep ivip offers effective collaboration processes for this, so join in! You know the African proverb: "If you want to go fast, go alone. If you want to go far, go together." (bv)

"Agentic AI is fundamentally changing the way complex systems are developed and operated. At the prostep ivip Symposium, we will discuss both theoretical concepts and concrete implementation strategies. For example, how can we safely integrate autonomous AI agents into processes? How can we ensure traceability and compliance? These questions can only be answered together."

Henrik Weimer, Airbus

"The software-first strategy is changing the way we think: the car is becoming a computer on wheels. At Mazda, we are working to completely decoupling functions from hardware in order to continuously provide our customers with new features and improvements throughout the entire product lifecycle. However, this requires new development methods and standards, and this is precisely where prostep ivip comes in, by integrating MBSE and SdP."

Tomohiko Adachi, Mazda Motor

The editorial team is grateful for the constructive discussions with Alain Pfouga of prostep ivip

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PROJECTS IN THE **TECHNICAL PROGRAM 2025**

ONTOLOGIES

OPENNESS

Code of PLM Openness
prostep ivip Ontologies
Standardization Strategy Board

REQUIREMENTS & SYSTEM DESIGN

- Requirements Specification
- System Architecture

INTERNATIONAL STANDARDIZATION

ISO 10303 (STEP AP242)
ISO 14306 (JT)
OMG ReqIF
OMG CASCaRA
DIN SPEC CPO
DIN SPEC JT

IMPLEMENTATION & DEVELOPMENT

- CAx/PDM Interoperability
- Electric/Electronic Systems
- ECAD/MCAD Integration
- Model-Based Systems Engineering
- Functional Data Exchange
- SDVxMBSE Integration


CROSS-CUTTING ENABLERS
TRACEABILITY
ARTIFICIAL INTELLIGENCE
DIGITAL TWIN
PRODUCTION ENGINEERING
Production Collaboration
INTEGRATION & VALIDATION
Virtual Certification/Homologation
Virtual Validation of Software & Hardware
Smart Systems Engineering
LONG TERM ARCHIVING

Collaborative Artifact, Specification, Context and Resource Access (CASCaRA)

Digital Engineering (DE) brings unique collaboration opportunities across companies. Properly implemented DE collaboration is essential as it streamlines certification and product delivery, enables development assurance for critical systems, and reduces development and production costs.

The current challenge is the fragmentation caused by many different tools and data formats involved in cross-domain DE. Companies are often developing custom and proprietary ways of interconnection models internally into the so-called "Digital Thread". To effectively extend this thread into the supplier and customer base, the industry requires an agreed-upon, holistic, cross-domain Digital Thread interface. This interface must consist of Digital System Models that are (1) semantically connected at the model entity level and (2) enriched with context metadata, independent of the model domain and provenance.

Technical Data Packages (TDP) are often no more than file or model bundles, this limits the traceability and visibility of the data as it moves from the OEM to the supplier environment; CASCaRA (CASCaDE) is the evolution; it defines an interconnected data set, or Digital Data Package (DDP) that gets shared between companies, enabling synchronous digital collaboration, minimizing iterations and enabling more efficient development assurance and certification.

Juan C Mendo, CASCaDE

CASCaDE provides the solution for this interface, forming the basis for extending the Digital Thread across the entire supply chain. The project – a collaboration between prostep ivip, GfSE, and VDA – is based on an open, standardized ontology that leverages the findings from DDP, SpecIF, MoSSEC AP243, and LOTAR. For some legal reason CASCaDE needed to be renamed in CASCaRA end of 2025.

Priorities & Concrete Results 2025

The year 2025 was entirely focused on the standardization of the CASCaRA (CASCaDE) model within the OMG, to create the foundation for broad industrial acceptance:

- Standardization Milestones: The OMG Q3 TC Meeting in Leeds (September 2025) established the RDF-based Graph Metamodel. The Initial Submission for official review was successfully prepared for the OMG Q4 TC Meeting in December 2025.
- Technical Foundation: The ontologies of DDP and GfSE SepcIF were successfully merged into a unified CASCaDE Ontology. The model now defines 92 classed and 60 Relationships.
- Interoperability: Broad compatibility with standards such as LOTAR, MoSSEC, and SPDX was ensured. The transformation logic was extended and now actively supports data exchange from ReqIF, SysML v1, and STEP AP242.

Organizational/Technical Challenges 2025

The tight schedule of standardization required the postponement of submission deadlines (e.g., Initial submission from August to November 10, 2025). Furthermore, the harmonization of the ontology with existing standards (such as AASX) and the coordination with external committees (such as the INCOSE DEIX WG) represented an ongoing challenge.

What is Planned for 2026

2026 is the decisive year for the finalization of the standard within the OMG:

- Conclusion of Standardization: The Revised Submission is expected for the OMG Q1 TC Meeting (March 2026) and the Final Submission for the Q2 TC Meeting 2026 (June 2026).
- Adoption by OMG: The official Adoption by the OMG Board of Directors (BoD) and thus the recognition as an international standard is planned for the end of 2026.
- Community and Dissemination: The work of the Open Source Community for implementation is actively supported. Furthermore, presentations are planned at the PSI Symposium and the JT/STEP Day.

Project Coordination Statement

"We achieve all goals which were only made possible through the personal commitment and dedication of many contributors."

Stakeholders

- GfSE
- prostep ivip
- VDA
- PDES.INC

Participants

- Airbus
- Boeing Company
- :em engineering methods AG
- GfSE
- OMG-Vertreter
- PDES.Inc
- PROSTEP
- prostep ivip
- SAIC
- Schaeffler Technologies AG & Co. KG
- Collins Aerospace
- Safran
- University Carlos III Madrid

Project Chair

Juan Carlos Mendo, Boeing

prostep ivip Contact

(Coordination)
Torsten Schmied
PROSTEP Group
+49 221 179188156
torsten.schmied@prostep.com

Technical Leadership

Michael Kirsch
+49 6151 7376401
michael.kirsch@em.ag

Collaborative Digital Twins (CDT)

The project group aims to consolidate the association's activities in the field of model-based engineering collaboration.

1
Specifications / Publication

78 Project Partners
26 Companies

Supported formats / standards
Collaborative Systems Engineering Standards

Launched in 2023, CDT aims to shape the future of cross-company collaboration. A key focus is the joint development of digital twins as a foundation for seamless, data-driven cooperation.

Particular emphasis is placed on defining and advancing the content, interactions, and use cases of cross-company and cross-disciplinary digital twins, along with th e supporting IT architectures required to enable them.

The Collaborative Digital Twins (CDT) project group is a joint initiative of prostep ivip and the German Association of the Automotive Industry (VDA), founded in 2022. Its purpose is to develop a clear definition and conceptual framework for collaboratively created, cross-company Digital Twins, and to consolidate related activities within the association. Despite the high relevance and visibility of Digital Twins in publications and the broader community, prostep ivip previously lacked a clear positioning on the topic. Moreover, several existing project groups were working on subjects related to Digital Twins or producing results applicable to their development. CDT brings together and consolidates these discussions within prostep ivip – covering methodological, technical, and legal perspectives – enabling member companies to pursue their path toward collaborative Digital Twins.

With the CDT Proof of Concept, we reached a true milestone: instead of sending complete files back and forth, we can now collaborate directly on the actual data and individual values. This reduces complexity, eliminates interface losses, and avoids unnecessary data overload. To me, this is a quantum leap in collaboration – efficient, transparent, and forward-looking.

Dr. Sebastian Handschuh, Mercedes-Benz AG

The results of the Implementors Lab demonstrated how quickly and how far we can advance cross-company digital collaboration within CDT and prostep ivip. What used to take days or weeks now happens in seconds – across different IT environments. This is not just a technological achievement; it opens up entirely new possibilities for agile, networked development. We must now turn these tangible opportunities into reality.

Peter Gerber, Schaeffler Technologies AG & Co. KG

Key Focus Areas & Concrete Results 2025 - User Perspective

From a user perspective, practical workflows for collaborative engineering were developed. Five User Journeys cover typical scenarios ranging from requirements definition through system design and simulation to integration and testing. Collaborative requirements management was demonstrated in a proof-of-concept implementation, showing how real-time data exchange can function without file transfer while preserving IP protection and data sovereignty. This results in fewer iteration loops, greater transparency, and improved traceability. All developed results and approaches are compatible with existing initiatives such as Catena-X and ReqIF.

Key Focus Areas & Concrete Results 2025 - Vendor Perspective

In 2025, the Implementors Laboratory was successfully conducted and a demonstrator implemented. It confirmed that CDT principles and the developed IT architecture are viable in near-industrial environments. The implementation encompassed the integration of various engineering tools and the harmonization of data models for synchronous, data-driven cross-company exchange. All results were validated in close coordination with relevant organizations and project groups to ensure compatibility with established standards.

Key Focus Areas & Concrete Results 2025 - Information Modeling

In 2025, the Core Ontology and initial domain ontologies were completed and published as the foundation for semantic interoperability. The Implementors Laboratory saw the implementation of User Journeys for collaborative requirements management within the CDT demonstrator. In total, six journeys were published from the CDT project. With the formal project closure, the final CDT Recommendation was adopted and made available to industry.

Organizational & Technical Challenges 2025

Sourcing near-industrial data for the Implementors Laboratory proved difficult. As an alternative, data from a Mars rover demonstrator was used to implement the planned scenarios. The CDT demonstrator also required mapping the APIs of various engineering tools onto a unified data model to enable cross-company exchange. In addition, continuous feedback from the user perspective on intermediate and final results had to be gathered and incorporated throughout the project.

Outlook 2026

The CDT project concluded at the end of 2025. Its results form the foundation for the successor project Live Collaboration in Engineering (LCE), launching in 2026. LCE addresses synchronized, cross-company real-time collaboration along the V-model. Planned activities include the standardization of real-world use cases in the area of Software-defined Products, as well as the further development of outcomes from the CDT Implementors Laboratory.

What the Project Coordinator says

„2025 was the year of implementation: with the CDT demonstrator, using requirements engineering as an example, we showed how Digital Twins can be developed collaboratively across company boundaries – based on our User Journeys and the IT architecture we developed. The foundation for the next level – Live Collaboration in Engineering – has been laid."

Participants

- :em engineering methods AG
- Accenture Deutschland Service
- AVL List GmbH
- Configit GmbH
- CONWEAVER GmbH
- Dassault Systèmes SE
- Fraunhofer IESE
- Fraunhofer IPK
- Heinz Nixdorf Institute
- University of Paderborn
- Mercedes-Benz AG
- Mews Deutschland GmbH
- PROSTEP AG
- Robert Bosch GmbH
- RPTU Kaiserslautern
- Schaeffler Technologies AG & Co. KG
- SSC-Services GmbH
- The Boeing Company
- Threedy GmbH
- Toyota Motor Corporation
- TU Berlin
- TU Darmstadt
- TU Dortmund
- TU Ilmenau
- TUHH
- UNITY AG
- ZF Friedrichshafen AG

Project Leadership

Dr. Sebastian Handschuh,
Mercedes-Benz

Peter Gerber,
Schaeffler AG

prostep ivip Contact

(Coordination)
Dr. Sebastian Schweigert-Recksiek
+49 6151 7376-100
sebastian.schweigert-recksiek@em.ag

Code of PLM Openness (CPO)

The CPO is an initiative of the prostep ivip association aimed at promoting open PLM architectures.

Code of PLM openness
& Specifications
/ Publication

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Project Partners

DIN SPEC 91372
& Collaborative Systems Engineering Standards

To assess the openness of vendor solutions, the project group has defined measurable criteria across key categories such as interoperability, extensibility, interfaces, standards, and architectures.

In close alignment with the Standardization Strategy Board, the initiative is now establishing the foundation for CPO certification of software products.

The trend toward modular, composable PLM architectures places high demands on the openness of individual software components. Enforcing this openness – and thereby simplifying the integration of IT applications into corporate networks and IoT environments – is the core purpose of the Code of PLM Openness. The CPO is a prostep ivip initiative operating under the patronage of the German Federal Ministry for Economic Affairs and Climate Action (BMWK).

The CPO links user requirements with technical requirements for IT solutions, enabling companies to assess the openness of software vendors and their products. The criteria catalog covers measurable criteria across categories such as interoperability, infrastructure, extensibility, interfaces, standards, architectures, and partner relationships. In cooperation with the German Accreditation Body (DAkkS), prostep ivip is developing a certification program that will also formally attest to the openness of software solutions.

Especially with regard to software assessment, we need more input from user companies. That is why we plan to further intensify our collaboration with the SSB this year.

Andrea Denger, AVL List GmbH

Key Focus Areas & Concrete Results 2025

In 2025, the CPO project team focused primarily on two workstreams: in collaboration with DAkkS, making the existing organization-centric CPO certification more efficient and establishing it as an international standard; and, in coordination with the prostep ivip Standardization Strategy Board (SSB), laying the groundwork for a product-level CPO certification for software solutions. To incorporate openness requirements from additional industries, the CPO project team is set to be gradually expanded to include user companies and software vendors from those sectors.

Progress was achieved across all three areas. A revised version of the organizational CPO certification was developed and approved by DAkkS. The project team worked intensively on a potential assessment framework for software products, resulting in a significantly expanded CPO Self Assessment for vendors covering their relevant products. Products are differentiated by supported application domains – aligned with the outcomes of the SSB working group on standards and application areas. The current draft will be completed by vendors for the first time in 2026.

Regarding the expansion into additional industries, the international Aerospace & Defense PLM Action Group was successfully brought on board in 2025.

Organizational & Technical Challenges 2025

The topics addressed are technically highly complex and require intensive consensus-building between users and vendors. The CPO project group has therefore been looking beyond its immediate scope and engaging with the more user-oriented SSB working group – an alignment effort that requires coordination mechanisms not previously foreseen, comparable to those of a workflow group or implementor forum.

Outlook 2026

In the current year, the CPO project group aims to put the new CPO Self Assessment template into practice and deploy it across multiple vendors and software solutions. Significant effort will also be dedicated to exploring how the CPO relates to other initiatives such as GAIA-X, CATENA-X, and data spaces, as well as topics such as the Asset Administration Shell and the Product Passport – and how potential collaboration could be structured. To adequately reflect user-side requirements, the group will intensify its collaboration with the SSB, which represents a broad base of user companies.

In addition, the first joint activities with the international Aerospace & Defense PLM Action Group are planned.

What the Project Coordinator says

"Cohesion and collaboration within the CPO project group were excellent, allowing us to make real progress – particularly on the CPO Self Assessment. The shift to fully virtual meetings had no negative impact on our work."

Participants

- AVL List GmbH
- CONTACT Software GmbH
- CONWEAVER GmbH
- Dassault Systemes SE
- EVIDEN Germany GmbH
- PTC Inc.
- Robert Bosch GmbH
- Siemens Digital Industries Software Inc.
- T-Systems International GmbH
- XPLM Solutions GmbH

Project Leadership

Chair WF, IF, BM
Andrea Denger, AVL List GmbH

prostep ivip Contact
(Coordination)
Dr. Mario Leber
+49 151 20435228
mario.leber@prostep.com

Digital Data Package (DDP)

The development of successful products today relies more than ever on the seamless interaction of the disciplines of mechanics, electrical engineering/electronics, and software, as well as upstream and downstream process steps in product creation. In light of increasing complexity and cross-company collaboration, establishing a continuous, model-based Digital Thread is the central challenge for Digital Twins and AI applications. To achieve this, it is not sufficient to consider only the metadata of overall models. Rather, individual content items – such as requirements, functions, effective geometries, tolerances, or test results – must be accessible and usable by all stakeholders across system and organizational boundaries.

The successful CASCaRA activities have confirmed the global relevance of DDP – our focus now turns to the next step: industrialization. In 2026, we will support user companies and software vendors through concrete end-to-end demonstrations and the finalization of our use cases (MBSE, Joining, Sustainability). The close, trust-based collaboration with partner working groups such as LCE remains the decisive success factor in this endeavor.

Oliver Klaar, ZF Friedrichshafen AG

The prostep ivip / VDA working group DDP (Digital Data Package) addresses this challenge by developing and maintaining a semantically interconnected, logical structure for data exchange. It is important to emphasize that a Digital Data Package is not necessarily a bundle of individual files, but a coherent, semantic construct of information and references that comprehensively supports model-based, collaborative development. In 2025, the group successfully elevated its work to the international level through the CASCaRA standardization initiative at the OMG, thereby laying the foundation for broad industrial acceptance.

Priorities & Concrete Results 2025

This year, the focus shifted toward deepening use cases and expanding the information model in alignment with Digital Thread requirements.

Key results of the year include:

- Expansion of Application Scope: New, strategic use cases – including Joining Technology, Sustainability, and the handover to Digital Twins (AASX) – were integrated into the roadmap. Through the onboarding of new members from the BlueHarvest consortium, coverage of MBSE/architecture data exchange and Collaborative Requirements Engineering was strengthened.
- Technical Model Deepening: The information model was significantly extended in 2025 and now covers critical manufacturing details beyond pure geometry, such as fluids, painting & coating, marketing & labeling, heat treatment, and bending specification. This is essential for digital continuity in the Digital Thread toward manufacturing.
- Validation & Dissemination: Digital availability and human readability across formats such as (3D)PDF and HTML were investigated. Furthermore, at the JT Day 2025, it was demonstrated how DDP represents geometry-related information semantically – in particular through the use of JT External Element References.

Organizational & Technical Challenges 2025

The most significant challenges lay in strategic positioning and ensuring technical consistency:

- Agile Collaboration and Trust: Unlike other association working groups, the DDP project team operates as a single, agile project group uniting user companies and software vendors. This requires a high degree of mutual trust and commitment from all participants.
- Strategic Positioning within the Standards Ecosystem: It was necessary to sharpen the unique value proposition of DDP vis-à-vis parallel initiatives such as AASX, and to consistently emphasize the semantic focus in order to clearly articulate the standard's relevance and differentiating characteristics.
- Intensive Working Group Coordination: To maximize synergies and avoid duplication of effort, continuous close alignment with prostep ivip working groups – such as CDT (Collaborative Digital Twins) – was essential throughout the year.
- Industrialization and Adoption: The dominant PLM vendors need to be more actively engaged in collaboration in order to accelerate the transfer of project results into industrial practice and to increase adoption among user companies.

Plans for 2026

The planning for 2026 is aimed at consolidation, documentation, and broad industrialization:

- Documentation and Visualization: The DDP Recommendation will be updated. In addition, clear representations of the ontology stack will be developed to illustrate the inherent complexity while presenting application areas in an accessible and structured manner.
- Focus Use Cases: Work on the specific use cases DDP for MBSE & System Simulation, DDP for Joining, and DDP for Sustainability will be continued.
- Demonstration and Methods: Specific methods, reference examples, and demos covering the full DDP lifecycle will be developed and presented.

Project Coordination Statement

"The DDP project group fully achieved its objectives in 2025 and delivered outstanding results. In addition, the working group continued to make a decisive contribution to the standardization activities at the Object Management Group (OMG) under the name CASCaRA. As planned, the Initial Submission represented a critical milestone in this regard. The standardization activities also significantly raised the project's external visibility and attracted new members. We would like to express our sincere appreciation for the outstanding commitment of our members – in particular our Technical Project Lead Michael Kirsch and the project coordination team."

Participants

- :em engineering methods AG
- Anark Corporation
- AVL List GmbH
- Elysium Co., Ltd.
- Inomic
- Jaxa
- Mercedes-Benz AG
- MTU
- PROSTEP AG
- RTX (Collins Aerospace, Pratt & Whitney, Raytheon)
- Robert Bosch GmbH
- SodiusWillert
- The Boeing Company
- VDA – Verband der Automobilindustrie e.V.
- Volkswagen AG
- ZF Friedrichshafen AG

Project Leadership

WF

Oliver Klaar, ZF Friedrichshafen AG
Daniel Krems, AVL List GmbH

prostep ivip Contact

(Coordination)
Torsten Schmied
+49 221 179188-156
torsten.schmied@prostep.com

Technical Project Lead
Michael Kirsch
+49 6151 7376401
michael.kirsch@em.ag

ECAD/MCAD Collaboration Implementor Forum

Current electro-mechanical designs have many challenges that can significantly increase design effort and the time-to-market. Typically, these challenges are separated into two groups (1) collision and connectivity design challenges and (2) synchronization issues. Component and mechanical clearances must be accounted for in both the electrical and mechanical designs in order to ensure that no physical violations occur when the PCB is placed within the enclosure and/or entire system. Tight synchronization between the electrical and mechanical flows is required to ensure that both designs are correctly aligned for fabrication.

With the introduction of the Prostep ivip Incremental Data Exchange (IDX) communication protocol developed by the ECAD/MCAD IF project group, designers are now able to fully synchronize their data between both ECAD and MCAD and more effectively collaborate on critical design items between domains ensuring that the design intent is interpreted correctly. This helps designers collaborate and spot problems quickly, leading to stronger designs that reach the market sooner.

Organizational/Technical Challenges 2025

In 2025, work continued towards updating the implementation guidelines and releasing the Schema for IDXV6.0. Regular monthly meetings were held, during which preparations for the Face To Face meeting agenda were systematically developed. The Face-to-Face meeting was held in Munich at Siemens headquarters in September. In addition to finalizing details of IDX V6.0 schema release, new initiatives are to create a presence on Linked in and to develop an eBook on IDX implementation. Also, it was decided that the standard should support cloud implementations.

The IDX V6 Schema was completed and released in December 2025.

Planning for the Current Year 2026

For 2026, the ECAD MCAD Collaboration IF group will build on the decisions made at the 2025 Face to Face meeting.
This includes:

- New IDX version every second year
- Hold some functions planned for V6 to V7 pending further development – e.g. Splines, 3D Keep-outs, Chamfered Board Edge
- Regular posts on Linked In
- Work on Cloud support as a priority
- Allocate chapters of the IDX eBook for various members to create

Participants

- CadCam Design Centar
- Cadence, Dassault Systèmes
- Desktop EDA
- PROSTEP AG
- PTC Inc.
- Siemens PLM
- ZUKEN Inc.
- xPLM Solution GmbH

Pending Participants

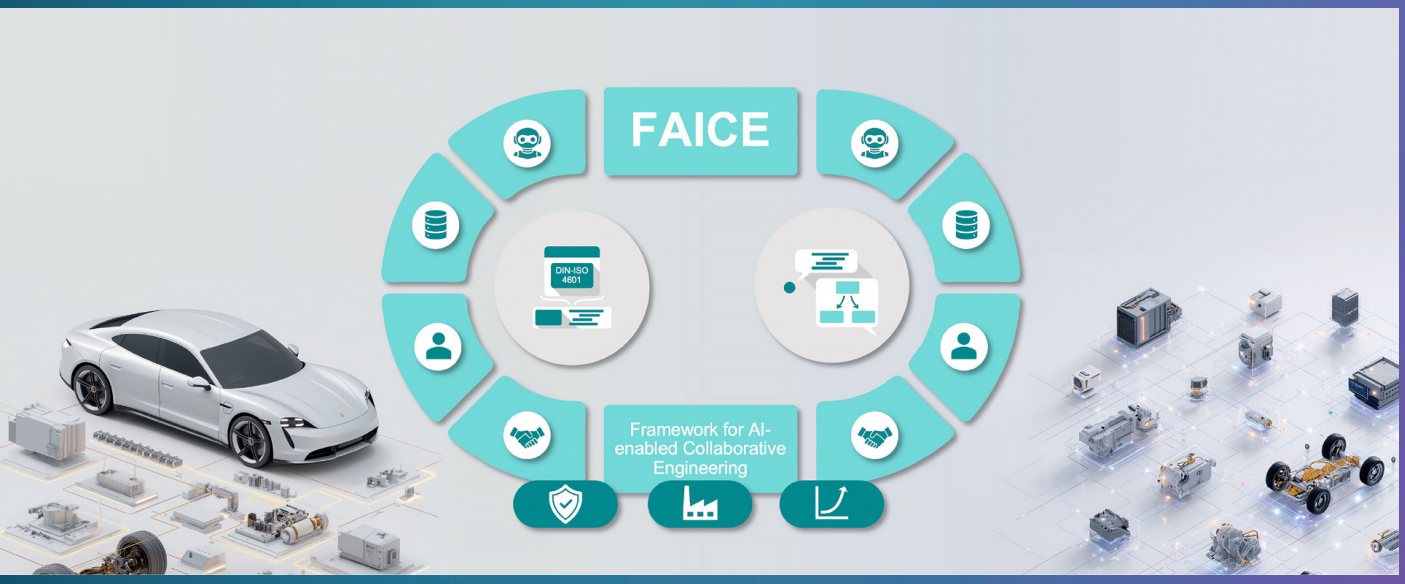
- AutoDesk

Project management

Chair WF, IF, BM
Alex Grange, Siemens
alex.grange@siemens.com

prostep ivip Contact
(Coordination)
Brian Watson, DesktopEDA
brian@desktop-eda.com.au

Framework for AI in Collaborative Engineering (FAICE)



FAICE addresses the integration of generative AI into collaborative engineering workflows. The initiative focuses on two primary use cases: a SysML Assistant embedded in CATIA Magic for MBSE® and a Standards Chatbot for retrieving licensed standards content.

FAICE aims to overcome systemic obstacles rooted in established models of data access, control, and licensing. The project ensures that AI responses are trustworthy and grounded in verifiable source material.

With FAICE, we were able to put our finger on the sore spot. The experiences we gathered reveal that there is still a long way to go to enable collaboration without deliberate obstacles. Openness often means changing everything we were used to doing and were willing to share.

Markus Franke, Schaeffler Technologies AG & Co. KG

AI is set to transform the way engineering is done. Through the findings of this project, the vision for applying AI within a heterogeneous MBSE environment is becoming reality – we are shaping that future. FAICE offers a glimpse into how engineers will benefit from AI and lays the foundation for organizations to prepare for the workplace of tomorrow.

Michael Maletz, AVL

FAICE demonstrates how AI can simplify MBSE and bridge gaps in collaborative engineering. By transforming natural language into structured models and seamlessly integrating work across organizations, formats, and SysML versions, FAICE frees engineers to focus on true architecture and innovation rather than tool complexity. This marks a major step toward a future where AI becomes an integral partner in engineering workflows

Michael Haller, ZF

For the SysML Assistant, the goal is to support modeling tasks inside an industrial tool environment and facilitate collaboration between partners. For the Standards Chatbot, the focus is on enabling secure, legally compliant, and granular access to sensitive or licensed data across corporate boundaries.

Added Value

FAICE offers practical approaches for the secure and trustworthy use of generative AI in engineering across company boundaries.

Objectives

The project aims to improve collaboration by establishing a secure and industry-compliant framework.

Interim Assessment

The project has successfully demonstrated a tangible, working prototype for both the SysML Assistant and the Standards Chatbot. Findings indicate that core technical components are mature, data sovereignty can be maintained, but adoption depends on the evolution of commercial and operational landscapes.

Priorities and Concrete Results 2025 User Perspective

The project delivered a working SysML Assistant that converts natural language into SysML models. Users reported efficiency gains in early modeling tasks, such as creating structure and behavior diagrams. Key user requirements identified include persistent context across sessions and dialog-based clarification to prevent errors.

For the Standards Chatbot, users can now interact with a virtual assistant to retrieve specific content from standards based on individual licenses. The system successfully enforces granular permissions, ensuring users only see information they are authorized to access.

Priorities and Concrete Results 2025 Vendor Perspective

For service providers, the Standards Use Case defined the role of an AI Orchestrator acting as a neutral intermediary. The architecture is based on a "zero-knowledge" principle where the orchestrator routes queries without retaining sensitive data. FAICE identified the Catena-X data space as a potentially suitable ecosystem for deployment, enabling policy enforcement. This allows providers to offer "Standards-as-a-Service" where data is accessed via secure Interfaces (APIs/A2A/MCP) rather than static document downloads.

Priorities and Concrete Results 2025 BM (Business Models)

FAICE has determined that conventional licensing models (per user/per document) must be critically reviewed before the use of AI agents that paraphrase and quote, for example. The project recommends a transition to "AI-first" business models. These include Pay-per-API call/Pay-per-Token models and Project-based subscriptions that grant partners access to specific standards for a project's duration. A "Freemium" model was proposed to make metadata freely discoverable by AI agents, driving transactions for full content access.

Organizational/Technical Challenges 2025

Technical: A major challenge was "data readiness," as many standards (PDF, ReqIF, SysML) are designed for exchange between organizations and tools. However, this does not imply that AI models can also work sufficiently well with these data formats. This is exacerbated by the fact that, in some cases, metamodels allow for individual interpretations of the standards, and, for example, in cross-company collaboration, SysML profile dialects and incompatibilities of abstraction levels are a further challenge.

Organizational: The primary barrier for the Standards Chatbot is the "Data and Licensing Bottleneck". Existing licensing models do not support the granular, on-demand access required by AI agents.

For the SysML Assistant, access to experienced SysML practioners remains critical for the goal to address real-world collaboration scenarios.

What is Planned in 2026

In 2026, FAICE will focus on "Technical Extensions of the SysML Assistant" to address real-world collaboration challenges.

- Cross-enterprise model exchange: The assistant will detect deviations in company specific profiles and suggest or perform automated repairs.
- Support for multiple versions: Addressing differences in SysML versions (1.x/2) between partners.
- Integration of additional modalities: Practical application of „Smart Standards" (IDiS) and ReqIF to improve the assistant's efficiency and reliability.

The release of SysMLv2 offers an opportunity to investigate the Assistant capabilities to support v1x-to-v2 translations.

Project Coordination Statement

"The project successfully built working prototypes, proving the viability of secure, compliant frameworks addressing real day-to-day issues in the industry. These findings are published in 2 whitepapers, a recommendation and a webinar.

A DIN/DKE Project ("IDiS") uses the results already in progressing international discussions to push for machine-digestible standards and norms."

Participants

- AI Marketplace GmbH
- AVL List GmbH
- DIN Solutions GmbH
- KI Marktplatz
- RLE
- Schaeffler Technologies AG & Co. KG
- TU Berlin
- TU Darmstadt
- ZF Friedrichshafen AG

Project Leadership

Project Chair

2024/2025:
Markus Franke, Schaeffler

2026:
Michael Maletz, AVL
Michael Haller, ZF

prostep ivip Contact

(Coordination)
Uwe Kloss
AI-Marketplace GmbH
uwe.kloss@ki-marktplatz.com

Automated Functional Data Exchange Forum (FDX)

Vehicle development is a complex process in which functional development is increasingly carried out digitally. Virtual product development (simulation) and systems engineering are the defining disciplines in this space. At the heart of functional development lies functional data – technical and physical property data of mechatronic components, assemblies, and systems. The parameterization of simulation models, for instance, requires large volumes of functional data depending on the simulation discipline involved. This applies particularly to multi-body simulation (MBS) of complete vehicles. Given the sheer volume of data required, the dynamic lifecycle of functional data, and the fact that functional data is exchanged between vehicle manufacturers and their suppliers in the form of functional requirements and deliverables, there is a clear need for a well-defined, high-performance functional data format. This need led to the establishment of the FDX project group several years ago.

FDX has proven its value in productive use throughout 2025. The provision of standardized functional data makes it possible to unlock efficiencies and significantly increase productivity in the development process. This year, we are focusing on establishing the standard more broadly by attracting new members – and on making additional application areas visible through our AI showcase.

Martin Hagedorn, Mercedes-Benz AG

The fundamental concept of FDX is to define semantic component data models. The data model of a chassis damper, for example, differs fundamentally from that of an electric motor in terms of its payload data. In the former case, force-velocity characteristics are specified to represent energy dissipation behavior; in the latter, the efficiency map is of primary interest. FDX mandates comprehensive documentation of payload data through metadata, enabling a wide range of data consumers to assess whether the payload data is suitable for their specific application.

A further focus of FDX lies on data flow traceability and long-term archivability.

The primary benefit of the semantic data model approach is that it enables highly automated downstream processing of functional data. Automated quality checks and the automated preparation of FDX data to feed subsequent process steps – such as the automated parameterization of complex simulation models – become possible for the first time. Time-consuming manual data quality verification steps can be eliminated, relieving both suppliers and vehicle manufacturers of significant effort.

The FDX project group of the prostep ivip Association defines the component data models and a data exchange format for functional data. The component data models reflect the current state of the art for the respective component or mechatronic system. For further development, vehicle manufacturers and their suppliers can bilaterally agree on extensions to the data model, which are intended to be incorporated back into the standard once they represent a new state of the art.

Key Focus Areas & Concrete Results 2025 – OEM Perspective

In the first half of 2025, the project group focused on extending the FDX specification by developing additional component models, with an emphasis on chassis components. The following components were elaborated in detail and prepared for publication: torsion bar, torsion bar linkage joint, torsion bar linkage bearing, compression buffer, spring/damper strut (as an integrated system, distinct from the individual damper), top mount, and engine/transmission mount.

In the second half of the year, the focus shifted to marketing activities for both the working group and the FDX data format. It is a stated objective of the working group to increase its membership and, within this expanded framework, to align and define the direction of future standardization activities.

In addition to documentation work, the exchange with other project groups within the association – particularly SmartSE and DDP – represents an important area of activity. An intensive dialogue with the SmartSE project has been ongoing for several years, with the goal of integrating FDX as a Credible Parametrization Process (CPP) within the Credible Simulation Process (CSP). Towards the end of the year, an exchange with DDP was initiated based on identified synergies. To underscore the international ambition of the standard and facilitate cross-border knowledge sharing, contacts with Japanese partner organization JAMBE were further deepened.

Key Focus Areas & Concrete Results 2025 – Vendor Perspective

The FDX standard leverages the established standards openMDM and ASAM ODS as its technological foundation – both of which are widely adopted across the automotive industry. This is intended to lower the barrier to entry for implementing FDX interfaces. Initial productive exchanges of FDX data between OEMs and suppliers are now imminent. Early trials conducted at the end of 2025 have already demonstrated that the self-describing nature of FDX delivers significant advantages in lifecycle management of component-specific standardizations. System discontinuities and potential data model incompatibilities arising between FDX applications of two data-exchanging organizations can thereby be effectively overcome.

Organizational & Technical Challenges 2025

The project group is currently experiencing a shift in priorities – both on the OEM and supplier side – towards activities outside the FDX scope. As a result, membership numbers declined in 2025. This is occurring at a time when the project group is increasingly able to realize and demonstrate the efficiency gains that FDX is designed to deliver. The project group is confident that these gains will prove attractive to a broad range of companies, and that membership will grow again in the coming years.

Planned Activities for 2026

The primary focus for 2026 will be on marketing initiatives for FDX, with the goal of significantly increasing project group membership. A further priority is the development of an AI showcase, as the semantic FDX data model is particularly well-suited for the application of AI-based methods.

Collaboration with the SmartSE and DDP project groups will be intensified, with the aim of integrating FDX into the respective data flows of each group.

Project Coordination Commentary

„Over the past year, we have made significant progress in demonstrating the capabilities of the FDX approach. The fact that FDX is now being used for the first time within productive development processes represents an important milestone – and a compelling message in our efforts to attract new members to the project group."

Participants

- EXOKNOX GmbH
- Fraunhofer IESE
- Mercedes-Benz AG
- VDA

Project Leadership

Chair
Martin Hagedorn
Mercedes-Benz AG
+49 176 309 673 63
martin.hagedorn@mercedes-benz.com

prostep ivip Contact
Michael Baumann
EXOKNOX GmbH
+49 151 52806218
michael.baumann@karakun.de

Handling of AI-based Virtual Systems for Homologation of AD/ADAS (HAIViSH)

With its implementing regulation (EU) 2022/1426 the European Union provides a basis for Level 4 (L4) Automated Driving (AD) homologation, but it lacks the necessary specificity for OEMs, Tier X suppliers and other industry stakeholders to effectively implement system homologation. In addition, the industry moves towards virtual validation and the respective homologation to enable a deep and broad scaling of simulations for diverse and dynamic driving environments.

Regulation "act" by its proverbial definition means "do something".

Jürgen Pannek

Consequently, regulatory discussions were conducted to clarify and specify requirements. A basic understanding of the scope of the regulations in the European framework, the integration of the regulations into the overall virtual validation workflow, as well as the derivation of checklists for every section and highlighting of critical aspects was possible.

Subsequently, HAIViSH is developing a virtual validation methodology that integrates advanced system simulations and AI technologies to address the level of detail and potential gaps for the evaluation of AD/ADAS systems based on functional equivalence.

Priorities & Concrete Results 2025 User Perspective

Establishing a comprehensive and consistent understanding of the regulation is essential for creating standards and methodologies that end users can rely on in the long term. Accordingly, based on the integration in the overall workflow of virtual validation as well as the highlighted checklists and critical points, overarching and well-founded discussions can follow. The objective is to establish confidence in the vendors applications and, over time, in autonomous vehicles as well.

Priorities & Concrete Results 2025 Vendor Perspective

Understanding the regulation and integrating this into the overall virtual validation workflow, highlighting the necessary actions and requirements in respective pipelines, enables vendors to implement pipelines and assign regulation responsibilities to subgroups. Therefore, a possible agile workflow to be aligned with the regulation and virtual validation was presented.

Building on this, the derived requirements were categorized and summarized. Key outcomes include checklists for each section, as well as the identification and highlighting of critical aspects. Consequently, vendors are able to assess their current processes and focus on critical aspects.

Organizational/Technical Challenges 2025

A persistent challenge lies in comprehending the repercussions of regulatory formulations on technical solutions. Consequently, we put increased effort to discuss questions and open points in interactive workshops. This addresses the second challenge of establishing contact with industrial partners. A common understanding depends on the incorporation of industrial partners, which was conservative at first but improved along the workshops. Current efforts aim to showcase first implementations as result of WP4 to increase understanding and visualize first outcomes.

What is Planned in 2026

To facilitate practice-based discussions, a radar sensor model will be developed and validated using measurement data. In case of deviation between model and reality, a structured method for handling imperfectly matching models will be established.

The potential of AI methods in virtual validation will be analyzed by categorizing application areas and highlight explainability. We will provide recommendations regarding these methodologies.

Finally, we will prepare next steps for integration of AI approaches in virtual validation to further address 2022/1426 in development

Project Coordination Statement

"Due to its integration within the prostep framework, implementing and launching HAIViSH presented certain challenges. However, we were able to reach an operational level quickly. Building on this foundation, we have established, refined, and optimized the project's strategic direction and roadmap for 2025, with the objective to attract and integrate industrial partners in continuing discussions and workshops in 2026. In particular with regards to known AI applications, we are confident that HAIViSH will showcase their integration potential and capture interdisciplinary feedback and discourse with industrial partners."

Participants

Working-Level Participants

- IAV GmbH
- Toshiba Digital Solutions
- TU Braunschweig, Institute for Intermodal Transport and Logistic Systems

Interested Participants

- Ansys
- AVL List GmbH
- BHC GmbH
- BIPROGY Inc.
- IPG Automotive GmbH
- Nissan Motor Corporation
- NTT DATA Deutschland SE
- PonoSHIP Co.,Ltd.
- PROSTEP AG
- Sony Semiconductor Solutions Corporation
- TIER IV, Inc.
- Toshiba Digital Solutions
- Toshiba Europe Ltd
- TU Berlin (IIT)
- University of Applied Sciences Düsseldorf

Project Leadership

Project Chairs

Prof. Dr. Reza Rezaei, IAV GmbH
Dr. Dai Araki, Toshiba Digital Solution Co., Japan

prostep ivip Contact

(Coordination)
Prof. Dr. Jürgen Pannek
TU Braunschweig
+49 176 21507108
j.pannek@tu-braunschweig.de

New Research Project:

Harmonizing Equipment Behaviour Representation Enabling Digital Twins of Production Systems (HARMONIQ)

Basic Idea HARMONIQ aims to enable flexible, automated, and interconnected production systems through a comprehensive, standardized description of production equipment and its components. The initiative places particular emphasis on the behavior and status of assets as the foundation for digital twins of production systems. This harmonized description provides the basis for holistic data acquisition, real-time control of production processes, and their flexible adaptability.

In addition to the further development and harmonization of relevant standards – such as the Equipment Behaviour Catalogue (EBC) and the Asset Administration Shell (AAS) – a central component of HARMONIQ will be the transfer of these standards into industrial practice. The project focuses specifically on the capture, prioritization, and analysis of industrial use cases in order to align standardization efforts consistently with real-world operational requirements.

HARMONIQ is funded over a 24-month project term under the WIPANO program (Knowledge Transfer through Patents and Standardization) by the German Federal Ministry for Economic Affairs (BMWE).

Priorities 2025

The project was launched in November 2025. During 2025, the focus was on establishing the consortium and completing the formal project initiation. Building on this foundation, detailed project planning was carried out and the overall approach was aligned, including the further specification of work packages. In addition, an initial stakeholder analysis was conducted to identify the relevant actors for the upcoming project phases.

Outlook 2026

In 2026, the HARMONIQ project group will concentrate on the substantive deepening and implementation of the work packages. A central element of the work ahead will be the preparation and launch of an accompanying, industry-driven project group as part of the Technical Program of the prostep ivip Association. Within this framework, industrial use cases will be captured, prioritized, and analyzed in detail, serving as a reference for the further development and harmonization of standards such as EBC and AAS. In addition, the development of an AAS Submodel Template (SMT) for the EBC will be advanced during the coming year.

Through the close interlinking of research, standardization, and industrial practice – combined with the active involvement of the prostep ivip community – a sustainable and broadly applicable foundation for the utilization of project results will be established.

Participants

- CAIQ GmbH
- TU Dortmund IPS (Institut für Produktionssysteme)
- prostep ivip e.V.
- RIF Engineering & Consulting GmbH

Project Leadership

Consortium Lead
RIF Engineering & Consulting GmbH

prostep ivip Contact
(Coordination)
Rachel Bauer
+49 151 14085968
rachel.bauer@prostep.org

JT Project Groups (JT WF, JT IF, JT Standardization)

Basic Idea The JT Workflow Forum (JT-WF) is a joint project of the prostep ivip Association and VDA. Its mandate is to support the further development and industrialization of the JT format through the definition of industry-wide, coordinated use cases. In addition, it actively drives the standardization and normalization of JT as a DIN/ISO standard.

The vendors represented in the JT Implementor Forum (JT-IF) implement the use cases defined and prioritized by the JT-WF in their software. Their responsibilities include the development of CAx-JT interfaces based on the current DIN SPEC 91383:2024 and STEP AP242 XML, the implementation of new functionalities based on user requirements, and the alignment on common implementation approaches. The overarching goal is to strengthen user confidence in JT through the provision of interoperable software.

The JT Workflow Forum continues to actively drive standardization within ISO 14306 Ed3 and a new DIN standard derived from DIN SPEC 91383:2024 – the JT Industrial Application Package (JTIAP).

My three highlights in 2025: We had a well-prepared and smooth change of co-chair from Rudolf Dotzauer to Thomas Ott, which I am very grateful for! I am also pleased that the JT Day online event, which was born out of necessity, was so well received. In October, we had the kick-off meeting of the DIN AK ‚JT Standardization for Industry', combined with the task of transferring DIN SPEC 91383 into a DIN standard. As Co-Chair, it is important to me that we continuously align our activities in the WF, IF and the subgroups with the needs of the industry. We did this successfully.

Bernd Watzal, Mercedes-Benz AG

Priorities & Concrete Results 2025 – User Perspective

In 2025, the JT-WF focused on the exchange of kinematics models using JT and STEP AP242 XML, as well as on the application and validation of manufacturing-relevant semantic information (Product & Manufacturing Information, PMI) in JT files. The increasing interlinking of data across format and domain boundaries led to intensified exchange and collaboration with other project groups, including the MBx-IF and the DDP project group dedicated to the development of AutomationML.

The project group revised the Content Harmonization Guideline, which defines methods for how specific information should be represented in JT and STEP AP242. The updated version is publicly available on the prostep ivip Association website.

Version 8 of the Content Harmonization Guideline introduces a recommendation for unique entity identifiers (Moniker IDs) for body edges in the context of external links to JT elements, enabling consistent use of the External Element References (EER) introduced with STEP AP242 XML Ed. 4. In coordination with the JT-IF, standardized attributes for identifying the CAD source as well as the converter used – including tool name and version – were also recommended.

The group continued to accompany the standardization process for the JT format at ISO level and initiated the process of transitioning DIN SPEC 91383 (JTIAP) into a formal DIN standard.

A highlight of the year for the entire JT community was the 9th JT Day, which was held exceptionally in an online-only format under the title JT Day Express. Approximately 70 participants were welcomed by the two project leads Bernd Watzal and Thomas Ott. The program featured engaging presentations on day-to-day work with JT and the future of the standard, under the event motto "JT for the Digital Future."

Priorities & Concrete Results 2025 – Vendor Perspective

2025 was a year of particular significance for the JT Implementor Forum (JT-IF). A central milestone was the publication of STEP AP242 Edition 4 in late summer, which introduced essential new functionalities. Of particular note is the support for External Element References, enabling references from AP242 XML files to individual elements within JT files – a critical foundation for kinematics and assembly PMI. In parallel, the JT-IF supported the comprehensive update of the implementation guidelines for AP242 Edition 4.

In the area of kinematics, the successful cooperation with the CAx-IF was continued. Following the full support of common joint types, the focus has now shifted to more complex mechanisms. Material data integration in accordance with VDA 231-300 emerged as a new topic. Initial tests for the transfer of material and surface properties were successful, with broader support and improved attribute representation anticipated in the coming year.

Progress was also made in the area of Product and Manufacturing Information (PMI): the transfer of PMI in assemblies was initiated. Various approaches – purely JT-based or in combination with AP242 – are currently being evaluated and incrementally implemented. Each of the two test rounds held during the year saw the participation of eleven systems, with over 160 JT files exchanged in total. With these results and numerous new topics on the agenda, the JT-IF looks back on an exceptionally successful year.

Priorities & Concrete Results 2025 – Standardization

Together with DIN representatives, the JT-WF initiated the process of transitioning DIN SPEC 91383 into a new DIN standard. Following several preceding coordination rounds, the official application was submitted on February 28, setting the formal approval process in motion. On October 30, the DIN working group "JT Standardization for the Industry" convened for a kick-off meeting, with a first working session held on November 27 and further meetings planned, including one scheduled for mid-January 2026.

While Part 3 of ISO 14306 – covering JT version 9.5 – was published in June 2025, the release of Part 4, which relates to JT version 10.5, has unfortunately been delayed. However, the eight-week FDIS Ballot on the final draft of the standard commenced on November 24.

Organizational and Technical Challenges 2025

The international composition of the working group – with participants from Europe, Asia, and the United States – enriches the project with diverse perspectives. At the same time, this global setup requires particularly careful and forward-looking coordination of time slots for online meetings across working groups and sub-groups.

Travel restrictions, partly driven by the broader economic environment, continued to complicate in-person meetings. Against this backdrop, the JT Day was successfully held in the JT Day Express online format, receiving very positive feedback from all participants. While the direct exchange with vendors about their products was not possible in the same way as at in-person events, the new format generated valuable experience. In 2026, the JT Day will therefore return as an in-person event – and for the first time, it will be held jointly with the STEP AP242 Day at the same location and time, in order to leverage additional synergies to the fullest.

Participants

JT WF Participants:

- Aumovio
- Audi AG
- Denso Corporation
- :em engineering methods AG
- Fraunhofer IPK
- Gulfstream Aerospace Corporation
- Honda R&D Co., Ltd.
- Mercedes-Benz AG
- Robert Bosch GmbH
- SSC Services GmbH
- TU Darmstadt
- Volkswagen AG
- BENTELER Business Services GmbH
- MTU
- ZF Friedrichshafen AG

JT IF Participants:

- Autodesk
- BETA CAE
- CT CoreTechnologie GmbH
- Elysium Co., Ltd.
- Kisters AG
- Open Design Alliance (ODA)
- PROSTEP
- Siemens Digital Industry Software
- T-Systems International GmbH
- Technia GmbH
- Threedy GmbH

Plans for 2026

The work of the subgroups within the JT-WF will continue in 2026. For Content Harmonization, the search for new topics is still ongoing, and practical experience gained from applying the newly defined recommendations will be fed back into future revisions.

Both JT-WF and JT-IF will continue to focus in 2026 on the transfer of PMI in assemblies via AP242 XML and on references to JT geometry elements (External Element References, EER) – a concept that will also gain increasing relevance in the kinematics domain. The further development and consolidation of single-part PMI and kinematics – both including Validation Properties – remains on the agenda.
The publication of the third edition of the JT standard ISO 14306 is expected in the first quarter of 2026. The group's main focus in 2026 will be on advancing and finalizing the transition of DIN SPEC 91383:2024 into a new DIN standard.

From the JT-IF perspective:

- Key priorities include the continuation of topics newly initiated in 2025 – material data and assembly PMI – along with further expansion of kinematics support, and a comprehensive update of all JT-IF implementation guidelines, covering extensions to Validation Properties and the implementation of Content Harmonization requirements.
- A major milestone will be the Engineering Interoperability Day on October 1, 2026, near Frankfurt, which will bring together both the JT Day and the STEP AP242 Day under one roof, uniting the two communities for the first time.

Comment on Project Coordination

"The economically challenging situation facing many project members – both on the user and software vendor side – has had a tangible impact on project work, manifesting in travel restrictions and shifting priorities. Nevertheless, significant progress was achieved, delivering meaningful added value to all project members."

"For ODA, participation in the prostep ivip Association is a strategic advantage. The JT-IF and CAx-IF meetings provide valuable networking and insight into the requirements of major industry players. Furthermore, early access to upcoming changes in open standards ensures our solutions remain at the forefront of innovation for our members." – Neil Peterson, President, Open Design Alliance (ODA)

Quotes from the Project Leads

Thomas Ott (Aumovio): „As the new project lead in the JT-WF, I am impressed by the strength of collaboration within this community. It has been an exciting start. The results of this year demonstrate the enormous potential that lies in the cooperation between users and vendors. For 2026, I want to harness this momentum and, together with all stakeholders, continue to advance JT as a key technology for seamless, end-to-end digital processes."

Project Leadership

WF, IF, BM
Thomas Ott, Aumovio
Bernd Watzal, Mercedes Benz

prostep ivip Contact
(Coordination)
JT WF:
Lars-Christian Bütow
+49 6151 7676-100
lars-christian.buetow@em.ag

JT IF:
Jochen Boy
+49 6151 9287-382
jochen.boy@prostep.com

Long-term Archiving and Retrieval (LOTAR)

Aircraft have very long lifecycles. There can be 80 years between the initial design for a new program and the end of life of the last one delivered. Throughout the product lifecycle, the data defined for archiving and retrieval must be provided in a standardized format that can be read and reused regardless of changes to the original IT environment. Ensuring this is the goal of LOTAR.

LOTAR is a project under the joint auspices of the aerospace industry association AIA and ASD, as well as PDES, Inc. and prostep ivip. It aims to develop, implement, test, pilot, publish, and maintain standards for long-term archiving and retrieval of digital product and technical information. This includes CAD and PDM data, composites, wire harnesses, MBSE artifacts, and CAE simulation data. The multi-part standard describes both the information content and the processes for recording, storing, managing, and accessing information. The documents are published as parts of the EN/NAS-9300 series of standards.

It is encouraging to see the progress the project team has made over the past year, as is evident by the recently published standard documents. The growing interest in LOTAR from industries other than Aerospace, as well as in archiving data in domains not yet in scope of the project, opens up a lot of possibilities for the future. It will be great to see the project grow.

Jochen Boy, PROSTEP

Focal Points & Concrete Results 2025

Basic & Common (B&C) Process Parts:

The B&C Workgroup published the LOTAR Overview Data Flow (Part 010) and LOTAR Fundamentals and Concepts (Part 003) which incorporated Description Methods (Part 004). LOTAR Requirements (Part 002) is available through ASD-STAN as a preliminary DIN EN9300-002 while NAS and EN versions go through AIA and ASD-STAN balloting. The working group has nearly finished resolving comments from internal ballot for the new standard for LOTAR Metadata (Part 021).

3D Mechanical CAD with PMI:

The team continued the systematic review of its domain-specific documents. The new edition of Part 110 (3D Geometry) is ready for publication ballot, and Part 120 (Graphic PMI) has been reviewed and confirmed as-is. Part 115 (Assembly Structure) is in review to extend the scope to geometry at assembly level. The 3rd pilot project for Assembly Product Manufacturing Information demonstrated the usage of STEP AP242 Edition 4 Domain Model XML. The work group contributes to the identification of requirements for STEP AP242 Edition 5.

PLM:

The PLM Workgroup made significant headway on the LOTAR standard for product data in the "as planned" stage (Part 230), particularly regarding aligning PLM concepts with the STEP standard. The Product Structure Validation Property standard (Part 205) is now on external publication ballot stage and a prototype has been tested and presented last year. The definition of common use cases with the PDM Interoperability Forum was continued. The LOTAR standard for product data in "as designed" (Part 210) is published and available via the LOTAR website.

Composites:

The Composites WG provided support for enhancements to the composite data model for AP242 Edition 4, which included the addition of limited length and application indicators (LLAI) and updates to the Composite Material Recommended Practices. The team supported a joint project with WG15 (STEP-NC/AP238) for the use of AP242 composite data in downstream manufacturing and NC processes for automated layup. Part 300 (Fundamentals and concept for Long Term Archiving & Retrieval of Composite Information) is now in internal ballot for publication in 2026.

Electrical Wire Harness:

The Electrical Workgroup's objective is to identify and maintain the data necessary for defining a wiring harness. The design and analysis processes must encompass both electrical (ECAD) and mechanical (MCAD) data. The team's primary focus was on the Electrical Harness contents of the AP242 Domain Model. The team actively contributes to and supports the activities of the Interoperability Forum for Electrical Wiring Interconnection Systems (EWIS-IF), with a particular emphasis on advancing interoperability, updating technical documentation, and developing new test cases based on real-world use cases. Key areas of focus include mating capabilities, signal management, conductive protections, and the handling of complex cable assemblies.

MBSE:

The year began with active participation at the INCOSE IW in Seville, supporting the transition to SysML v2 and standardized digital engineering. Key milestones included the "Stratoliner" demonstrator, MIC-core integration with the LOTAR manifest, and continued development of a validation tool for archive packages. The team contributed to global outreach through publications and collaboration with INCOSE initiatives, including MBSE-DE Integration Forum and utilizing ISO 42010 (Architecture Description Frameworks). Guidelines for Engineering Design Integration were drafted to align with OMG CASCARA. Reviews for Part 500 (MBSE Fundamentals and Concepts) advanced to public comment.

Organizational / Technical Challenges

The boundary conditions in the Aerospace industry remain challenging and limit the LOTAR project's ability to progress on a number of topics, specifically the validation of new concepts in pilot projects. These tests are an important building block for the LOTAR standard in that they ensure the published requirements are implementable and supported in commercial tools. In addition, limited availability of domain experts is a hindrance across all areas.

On the plus side, the project has updated its infrastructure to support collaborative work on document drafts more efficiently and is supporting the combination of several meetings into a single overarching event to boost on-site participation.

What is Planned for 2026

Despite the challenges, the project team aims at maintaining its high momentum while continuing to recruit new team members. The Basic & Common parts team plans on publishing Part 021 for Metadata, revising Part 005 for Authentication and Verification, and starting an update for Part 007 (Terms and References). The 3D Mechanical WG will review existing documents and create two new standard parts for Semantic PMI at assembly level, and structural joins.

The PLM team's objective is to revisit the LOTAR standard part Fundamentals and Concepts (Part 200) and to send an edition 2 for internal ballot, as well as to complete the ballot for Part 230 (product data in the "as planned" stage) and publish it. In the Composites area, the domain's Fundamentals and Concepts document (Part 300) will be published. Working with the CAx-IF for testing new Composite functionalities will continue.

The Electrical team will shift toward finalizing and expanding the scope of ongoing activities. The test case plan includes the definition of mating, updating older test cases, and developing scenarios for multiple harnesses hooked together. There will be a particular emphasis on hierarchical assembly joints as well as signal and signal harness management. The team will also explore the relationship with MBSE, ensuring that developments align with broader systems engineering practices.

The MBSE group itself will continue its close collaboration with INCOSE, starting with supporting the MBSE Integration Forum at the International Workshop in Torrance, CA, USA. Concerning the LOTAR Standard, internal drafts for Part 515 (Validation and Verification requirements) and Part 520 (Analytical models described by specifications or executable code and equations) will be created.

Project Chairs' Statement:

"2025 was a very productive year for LOTAR as we published several new LOTAR parts and revisions to existing parts, with more to come soon. We started a discussion on how to "re-brand" LOTAR to emphasize the relevance to operational business needs (not just preservation) and encourage industry to participate and work with the vendors through the forums to implement capabilities to meet those needs. Last but not least, we started thinking about extending the scope of LOTAR domain activity through restarting Modeling & Simulation, and initiating Electronics and Software working groups."

Participants

Europe:

- Airbus Commercial Aircraft
- Leonardo SpA

Americas:

- The Boeing Company
- Embraer
- GE
- Gulfstream Aerospace Corporation
- Lockheed Martin Aerospace
- Raytheon Technologies Corporation

Project Leadership

Chair

Europe:
Bernd Feldvoss, Airbus
bernd.feldvoss@airbus.com

Americas:
Jeff Klein, The Boeing Company
jeff.r.klein@boeing.com

prostep ivip Contact

(Coordination)

Europe:
Jochen Boy
PROSTEP AG
jochen.boy@prostep.com

Americas:
Jeff Holmlund
Lockheed Martin
jeffrey.a.holmlund@lmco.com

Psi Ontology (psiOnt)

Interdisciplinary collaboration across the product lifecycle is becoming increasingly important. One of the key topics is data-driven collaboration in engineering – an area addressed by several project groups within the prostep ivip association. To enable these groups to work more closely together and jointly tackle cross-cutting topics, a consistent approach to knowledge and information management is essential. For this reason, the Technical Steering Committee launched the Psi Ontology (psiOnt) initiative.

Collaboration between the project partners and the involved project groups has worked very well. Supporting the adoption and use of ontologies remains an ongoing priority.

Stefan Just, PROSTEP AG

The goal of psiOnt is to create a cross-project-group information model that identifies commonalities and interdependencies as well as gaps between individual project groups, and makes the resulting insights actionable. The use of a Top-Level Ontology (TLO) is intended to increase efficiency across project groups. In addition, the insights gained through this initiative on the use of web technologies and ontologies are designed to provide association members with valuable guidance for addressing the challenges of information interconnectivity.

Key Focus Areas & Concrete Results

The documentation, provision, and accessibility of ontologies have been standardized across prostep ivip. Accordingly, information and ontologies from VEC, CDT, and the Top-Level Ontology are now available via the association's GitHub repository. The DDP ontology is currently undergoing the OMG standardization process as part of the CASCaDE project. As an additional domain model, the VEC ontology has been assessed for its relevance to the top-level and its coverage by TLO elements.

Organizational & Technical Challenges

The initiative faces the ongoing challenge of aligning the semantics of ontologies from various project groups and integrating them into a shared overarching ontology. A particular challenge is obtaining feedback from the practical application of these ontologies in order to continuously refine and further develop the models.

Outlook 2026

The next step is to pilot the TLO in line with the CDT vision, in conjunction with a Core Ontology and domain ontologies. Insights gained will feed back into further development. As in previous years, regular exchange and collaboration with all interested prostep ivip project groups will continue.

What the Project Lead Says

„The ontology landscape within the association has evolved significantly in recent years. The TLO is an integral part of this landscape – which is why we will continue to seek close collaboration with the project groups in the coming year."

Participants

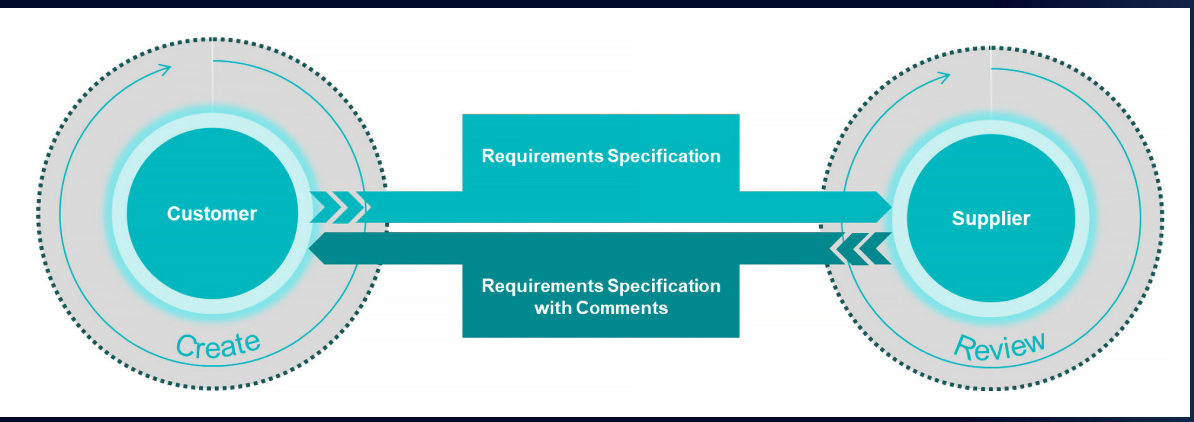
- AVL List GmbH
- PROSTEP AG

Project Leadership

Chair
Andrea Denger, AVL List GmbH

prostep ivip Contact
(Coordination)

Stefan Just, PROSTEP AG
stefan.just@prostep.com



Clients and contractors frequently manage requirements using different Requirements Management (RM) systems, which complicates alignment processes in distributed product development. The Requirements Interchange Format (ReqIF) enables the exchange of requirements between different tools on the basis of an XML file. The objective of the ReqIF Implementor Forum (ReqIF IF) is to ensure the interoperability of tools for ReqIF-based exchange. Within this project group, vendors collaborate to agree on conventions that go beyond the standard, conduct interoperability tests, discuss insights from practical application, and prepare benchmarks.

The prostep ivip Association's activities in the field of requirements management are complemented by the ReqIF Workflow Forum (ReqIF WF), in which user companies examine common exchange processes and scenarios. The objective of this project group is to promote the wider adoption and industrial implementation of the standard. Since 2018, the efforts of both forums have been accompanied by a regular benchmark that enables the assessment of ReqIF usage in requirements exchange and improvements in RM system interoperability.

The results of Benchmark 2025 demonstrate that tool vendors are continuously improving their software, with significantly fewer errors occurring compared to the previous benchmark.

Bertil Muth, HOOD GmbH

Priorities & Concrete Results 2025 – All Groups

The ReqIF IF and WF jointly track and address use cases and issues related to the handling of the standard format. Potential changes to the ReqIF standard for version 1.3 were discussed in depth. Among other topics, the handling of tables was examined extensively, with a detailed analysis of the concrete implications for interoperability, ultimately leading to a decision for ReqIF 1.3. As a result, issues for ReqIF 1.3 were submitted and revised at the OMG, and ballots were conducted accordingly.

Both forums collaborated continuously and jointly prepared the ReqIF Benchmark. Two joint workshops were held during the past year to improve collaboration with the benchmark team. In these workshops, participants clarified the objectives of the benchmark and presented the results.

In 2025, the seventh benchmark for the independent assessment of data exchange between RM systems via ReqIF was completed. The evaluation included, among other criteria, the import of an OEM-modified requirements package into the RM system of a supplier. Requirements and test cases were defined by the WF, which also managed the benchmark, while the vendors in the IF provided the software to be tested. The benchmark results are publicly available in a summary version; a detailed report is available to members of the prostep ivip Association and VDA.

Organizational & Technical Challenges 2025

The coordination and execution of this year's benchmark – encompassing a total of 12 system combinations and 588 evaluation criteria – was both a demanding and rewarding undertaking. Continuous and close collaboration with the vendors was essential for the successful completion of the benchmark and made a significant contribution to the optimization of ReqIF-based data exchange.

Plans for 2026

In 2026, the ReqIF Workflow Forum and the ReqIF Implementor Forum will be merged into a unified ReqIF Interoperability Forum. The primary objective is the publication of the ReqIF 1.3 standard.

Project Coordination Statement

"The coordination of the three project groups – ReqIF WF, IF, and BM – functioned exceptionally well, particularly when short-notice issues arose. The joint workshops deserve special mention, as they led to a significant improvement in collaboration and faster decision-making."

Participants

- Asaro Systems Limited
- Continental Automotive GmbH
- DIN Solutions GmbH
- :em engineering methods AG
- HOOD GmbH
- Mercedes-Benz AG
- PROSTEP AG
- REQUISIS GmbH
- Robert Bosch GmbH
- Siemens Industry Software GmbH
- Vector Informatik GmbH
- Volkswagen AG
- ZF Friedrichshafen AG

Project Leadership

Chair
Bertil Muth
HOOD GmbH

prostep ivip Contact
(Coordination)
WF:
Marc Lieberenz, PROSTEP AG
Tel. +49 151 5843-5817
marc.lieberenz@prostep.com

IF:
Bertil Muth, HOOD GmbH
Tel. +49 176 16611600
bertil.muth@hood-group.com

BM:
Christian Gentili, PROSTEP Group
Tel. +49 151 23420349
christian.gentili@prostep.com

Smart Systems Engineering (SmartSE)

The development of complex mechatronic systems, such as those in the automotive or aerospace industries, is increasingly under pressure to be faster, more efficient, and cost-effective. A key lever for achieving this is the use of Systems Engineering methods in combination with virtual validation through simulation. Since these development processes are typically distributed across multiple levels of the supply chain, there is an urgent need for standardized simulation processes and interoperable data formats to enable efficient exchange and reuse of models and relevant information among partners.

SmartSE creates the ideal connection between OEMs and tool vendors: pragmatic, fast, and solution-oriented. Together, we develop, align, and implement short-term approaches – for maximum efficiency and tangible results.

Hans-Martin Heinkel, Robert Bosch GmbH

Against this backdrop, the Smart Systems Engineering (SmartSE) project group of the prostep ivip Association has set itself the goal of developing application-oriented concepts for cross-company collaboration in simulation-based Systems Engineering.

Priorities and Concrete Results 2025 User Perspective

In May 2025, SmartSE published Recommendation V4. This comprehensive guideline forms the foundation for the strategic advancement of simulation-based methods in Systems Engineering. It includes, among other things:

- the SmartSE V-Model for the structured development of connected mechatronic systems,
- concrete use cases and interaction scenarios,
- requirements for simulation models in collaborative scenarios,
- as well as recommendations on processes, standards, and organizational frameworks.

A concise Executive Summary provides an overview of the contents. In addition, there is a podcast available in German, English, and Japanese, praised for its clear structure and the ability to listen to key topics "on the go." Ideal for decision-makers and professionals.

Priorities and Concrete Results 2025 Vendor Perspective

The developed SSP Layered Standard is already being actively implemented within SmartSE by several leading tool vendors. This standardization enables a consistent description of system structures, parameters, and extensions, thereby laying the foundation for seamless interoperability between different simulation and engineering tools.

A major milestone was this year's Modelica Conference, where SmartSE presented the requirements for further tool development in several technical sessions. These requirements address, among other things, support for complex co-simulation scenarios, integration into model-based development processes, and the extension with collaborative functions. In doing so, SmartSE is setting clear impulses for the future tool landscape and strengthening the role of open standards in Systems Engineering.

Participants

- AVL List GmbH
- BHC GmbH
- Dassault Systèmes SE
- DENSO Corporation
- dSPACE GmbH
- :em engineering methods AG
- eXXcellent Solutions GmbH
- Fraunhofer IESE
- IPG Automotive GmbH
- Nexus R&D
- PMSF
- PDTec
- PonoSHIP Co. Ltd.
- Raytheon Technologies Corporation
- Robert Bosch GmbH
- Siemens AG
- Siemens Industry Software GmbH
- Stellantis
- Toshiba Digital Solutions Corporation
- Toyota Motor Europe
- UNITY AG
- Volkswagen AG
- ZF Friedrichshafen AG

Organizational/Technical Challenges 2025

The year 2025 brought several challenges for SmartSE. The biggest was the enormous diversity of topics within the initiative – ranging from standards and processes to tool integration. To manage this complexity, use-case clusters were established as structuring elements, focusing on practical application examples. In parallel, demonstrators are being developed to make the implementation of concepts tangible.

Another important step was the stronger networking of work packages (WPs). The topics increasingly overlap, which led to the introduction of the cross-WP approach. This enables closer collaboration between teams and fosters synergies to advance the development of simulation-based methods more efficiently and consistently.

What is Planned in 2026

In the coming year, SmartSE will continue to consistently develop the initiated use-case clusters and demonstrators to make the practical application of simulation-based methods even more tangible.

In addition, a new White Paper titled "Simulation Credibility Assessment" will be published. This document addresses the central question of how the trustworthiness of simulation results can be evaluated and ensured—a crucial step for the acceptance and use of simulations in safety-critical and complex systems.

Project Coordination Statement

"2025 has shown: The diversity of topics has brought companies closer together. Through use-case clusters, demonstrators, and cross-WP approaches, companies are now more actively involved and jointly driving further development."

Project Leadership

Chair WF, IF, BM
Hans-Martin Heinkel,
Robert Bosch GmbH

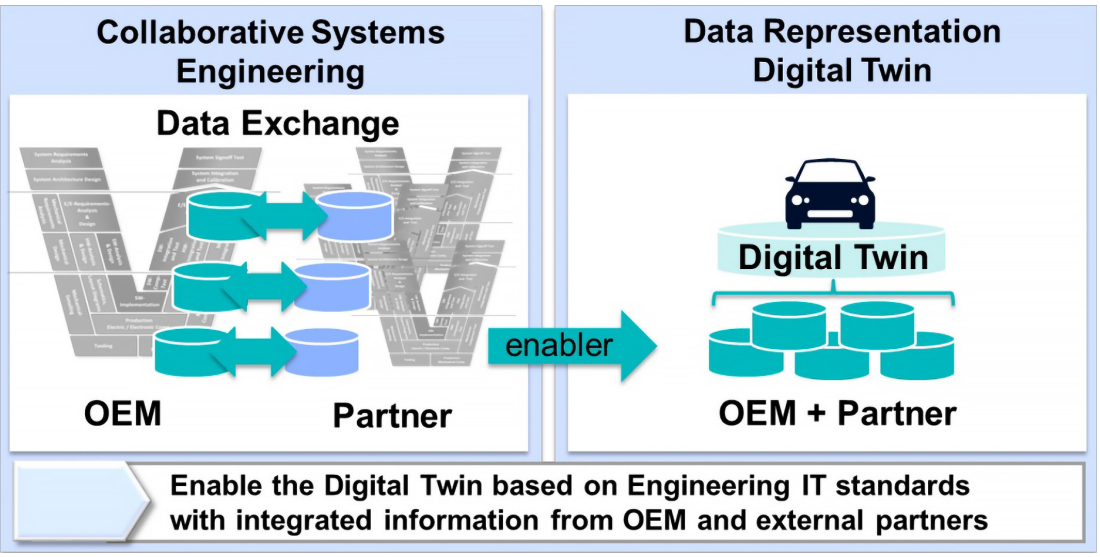
prostep ivip Contact
(Coordination)
Philipp Thorwarth
+49 176 36351846
philipp.thorwarth@b-h-c.de

Standardization Strategy Board (SSB)

IT standards are indispensable for cross-company systems engineering – but which ones are best suited for this purpose? This is the central question addressed by the Standardization Strategy Board (SSB), a joint project of the prostep ivip association and the German Association of the Automotive Industry (VDA). The project group was founded in 2016 with the vision of enabling cross-company Collaborative Systems Engineering (CSE) on the basis of engineering IT standards.

We look forward to seeing the results from the Collaborative Digital Twins project group this year and are curious about the requirements for future collaboration that will emerge at the technical, functional, and organizational levels. We will of course continue and expand our close collaboration with other prostep ivip projects such as the CPO, as well as our engagement with IT vendors. Our clear goal is to further advance the adoption of data standards – both on the user side and among software vendors.

Dr. Sebastian Handschuh, Mercedes-Benz AG



The project group continuously analyzes, prioritizes, and assesses the maturity of IT standards relevant to systems engineering, deriving shared strategies and actionable recommendations for their implementation and application. The goal is to achieve end-to-end coverage of the business objects and interfaces required in the CSE process through appropriate standards – ultimately realizing the vision of the Digital Twin. In addition, the SSB identifies forward-looking trends in product development and the cross-company challenges they generate, feeding these into the relevant committees and working groups.

Key Focus Areas & Concrete Results

In 2025, the SSB's work was significantly shaped by two themes: sustainability and the requirements arising from the development of increasingly software-defined products. From the SSB's perspective, both aspects are exerting growing influence on the entire product lifecycle – not just product development – as well as on PLM IT architectures. This evolution is far from complete; on the contrary, this trend will continue to define the coming years for the foreseeable future.

In the first half of the year, the SSB designed and conducted a survey on the penetration and implementation of regulatory sustainability requirements. The aim was to assess how member companies perceive the importance, awareness, and practical implementation of sustainability topics, and to gauge their views on the relevance of specific regulations and standards in industrial practice.

As a follow-up and complement to this work, the prostep ivip Sustainability Day was held on December 3, 2025, featuring contributions from sustainability officers and speakers with demonstrated expertise in handling these topics in industrial practice. The survey results and insights from the Sustainability Day will be published in a white paper in the first half of 2026.

The topic of software development and its significance for cross-domain PLM processes has been on the SSB's agenda for several years. A dedicated workshop on this subject was held again at the prostep ivip Symposium 2025.

As in previous years, additional Fact Sheets were produced in 2025. The Release Package Fact Sheet was published on the prostep ivip Confluence platform, and the list of available Fact Sheets on the prostep ivip website was updated and expanded accordingly.

Organizational & Technical Challenges

A central challenge was the design, execution, and evaluation of the sustainability survey. The primary difficulty was drawing valid and meaningful conclusions despite significantly lower participation compared to earlier SSB surveys.

Outlook 2026

In 2026, the SSB will bring its work on sustainability to an initial close with the publication of a white paper. The topic of "Standards and Processes for Software-Defined Product Development" will be continued. Two new focus areas will be added: "Meta Data Management in Synchronous Collaborations and Dataspaces" and "Strategy for Lean Digital Engineering Transformation." The creation, maintenance, and publication of Fact Sheets will also continue throughout 2026.

What the Project Coordinator says

"The SSB has established itself as a body with a stable membership and highly engaged participants. We are pleased that we were also able to initiate collaboration with IT vendors, taking further steps toward the implementation of standards in software products."

Participants

- Airbus Operations GmbH
- AUDI AG
- AVL LIST GmbH
- BMW AG
- Continental AG
- Dr. Ing. h.c.F. Porsche AG
- :em engineering methods AG
- Mercedes-Benz AG
- PROSTEP AG
- Robert Bosch GmbH
- Schaeffler Technologies AG & Co. KG
- Siemens AG
- Stellantis N.V.
- Volkswagen AG
- ZF Friedrichshafen AG

Project Leadership

Chair WF, IF, BM
Dr. Sebastian Handschuh,
Mercedes-Benz AG

Olaf Kramer,
Robert Bosch GmbH

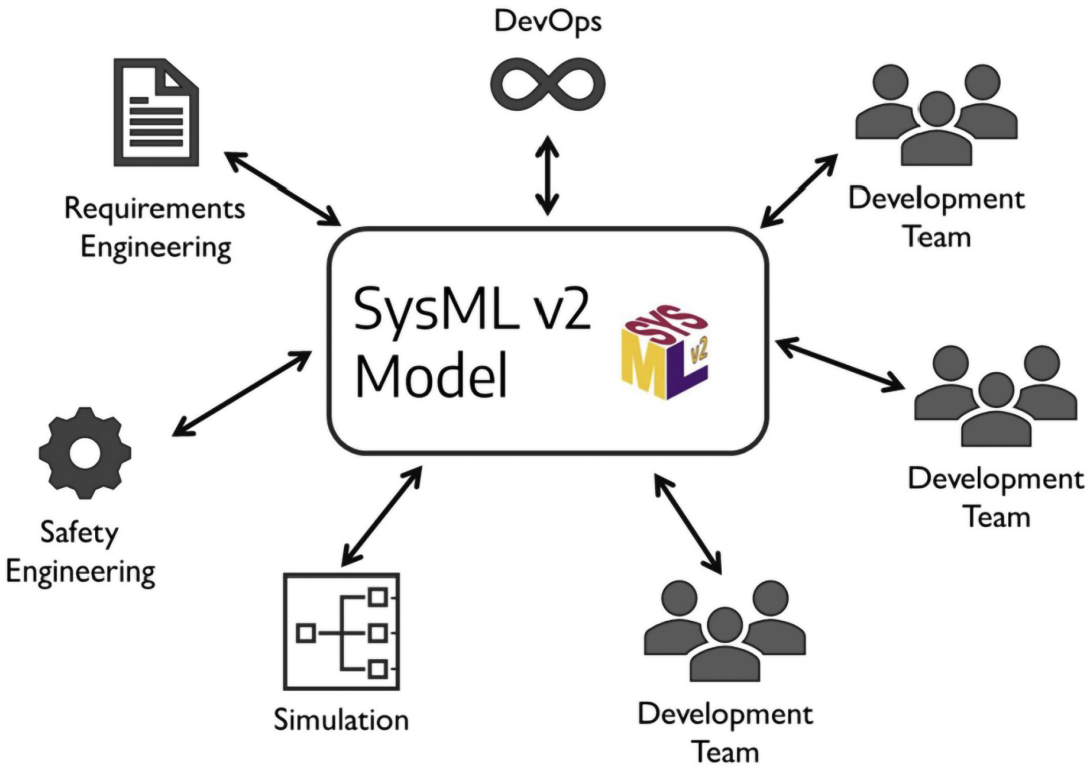
prostep ivip Contact
(Coordination)
Dr. Marcus Krastel
+49 6151 7376-100
marcus.krastel@em.ag

SysML V2 – The New Standard for MBSE

The increasing complexity of cyber-physical products and their development involving interdisciplinary and distributed teams, raises the importance of modelbased processes, methods, and tools. In Model-Based Systems Engineering (MBSE), the system model serves as the single-point-of-truth for the product description across all engineering domains.

SysML v2 tackles the challenges of system complexity of cyber-physical and software-defined products.

Sven Kleiner, :em AG



Industry has adopted formal modeling languages such as SysML (Systems Modeling Language) to create system models in MBSE. However, this leads to challenges when it comes to connecting authoring tools seamlessly with neighboring disciplines like Requirements Management (RM) or Product Lifecycle Management (PLM) systems. Additionally, access to the model content is difficult for stakeholders from engineering domains as well as management due to the need of an authoring tool.

SysML v2, the next generation of the Systems Modeling Language, is designed to support the evolving practice of model-based systems engineering (MBSE) and to address the challenges posed by increasing system complexity and technological changes.

Priorities & Concrete Results 2025

Participating organizations dealing with Systems Engineering now must develop a strategy for the near future, while there is already significant interest in the adoption of SysML v2 and planning of pilot projects within the industry. Depending on the current situation, if the organization is already working with MBSE, the following two scenarios have been identified and detailed based on use cases and requirements:

- **Scenario 1: Introduction of MBSE**
  If an introduction of model-based development, or Model-Based Systems Engineering in particular, is planned or ongoing, the decision for a modelling language is a crucial point. Since the modelling language is in principle independent from the selection of the modelling tool and the method, in practice the selection of these so-called Three Pillars of MBSE is not free of mutual constraints. None of the available tools at the market can work with every language, thus there are technically limited combinations of tool and language. Additionally, the selected tool (and hence the modelling capabilities) and the language pose significant implication to the applied method
- **Scenario 2: Migration**
  If a company already has profound knowledge of MBSE and possesses a significant amount of digital data stored in models (e.g. SysML v1 or a tool-vendor-proprietary language), a strategy whether at all and if so, how to migrate to SysML v2. Both the timing and the selection for a tool accompanied by the assessment of necessary changes to the method are important points. A readiness assessment should first evaluate the organization's current MBSE maturity, as organizations currently struggling with foundational SysML v1 practices may find the transition premature.

Organizational/Technical Challenges 2025

SysML v2 is the new standard notation for MBSE and eliminates some of the main shortcomings of SysML v1 (and to some extent of other non-SysML based languages) through a more formalized, expressive, and integrative language, aligned with modern software engineering practices. Organizations planning to adopt SysML v2 must consider the introduction not only as a pure technological upgrade, but as an organizational change process requiring strategic planning, tool chain integration and investments in tools and Human Resources. Thus, the prostep IVIP organization started a new project group on SysML v2 and all members are invited to join the working group to enhance processes and methods to drive innovation, develop systems and collaborate successfully in future using MBSE

Participants

- :em AG
- Airbus
- ANSYS
- AUDI AG
- AVL List GmbH
- BHC GmbH
- The Boeing Company
- Robert Bosch GmbH
- Conveawer GmbH
- Dassault Systems Deutschland GmbH
- Denso Corporation
- EP
- Formalmind
- Gulfstream Aerospace Corporation
- HCL Technologies Ltd.
- IBM
- JAXA
- KI-Marktplatz
- Kostal
- LieberLieber Software GmbH
- Mercedes-Benz Car
- NTT DATA Deutschland SE
- Oose
- Philips
- PTC
- RTX
- Schaeffler Technologies AG & Co. KG
- Sensmetry
- Siemens
- Toshiba Digital Solutions Corporation
- Toyota Motor Europe
- TWT GmbH
- Vector Informatik GmbH
- xPLM Solution GmbH

The challenge in initiating the new working group in 2025 was on the one hand side to generate interest and ensure the participation of companies in the following year. On the other hand, it was necessary to jointly coordinate and approve the scenarios, use cases, and tasks as a mandate for the project work in future.

What is Planned in 2026

SysML v2, the next generation of the Systems Modeling Language, is designed to support the evolving practice of model-based systems engineering (MBSE) and to address the challenges posed by increasing system complexity and technological changes. SysML v2 will increase the effectiveness and adoption of MBSE and enhance the way engineers conceptualize, design, and manage complex systems.

The SysML v2 project group gathers industrial requirements and use cases regarding modeling and tools, prioritizes them and offers recommendations for their implementation. Based on practice-oriented use cases, it examines how SysML v2 can be used best in industry and what needs to be done in the future in terms of collaboration. It is intended that the results be incorporated in best practices for collaboration between development partners (e.g. OEMs and suppliers in aero or auto industry) and be submitted to the respective committees for enhancing SysML v2 language on one hand side and tool vendors on the other hand side.

Project Coordination Statement

"In order to establish new working group, joint initiatives (e.g. workshops, round table discussions and panel discussions at Symposium) including support from different stakeholders (e.g. board members, other project coordinators, engaged members) were actively supported to prepare the ground for SysML v2 working group in 2026."

Project Leadership

Chair WF, IF, BM
Daniel Siegl, LieberLieber

prostep ivip Contact
(Coordination)
Dr. Sven Kleiner
:em engineering methods AG
+49 151 1480 7176
sven.kleiner@em.ag

VES/ECAD Project Groups

Vehicle electrical system development is a multi-stage, highly collaborative process in which a highly individualized and complex product is created. To support this process efficiently, the automotive companies and suppliers participating in the Vehicle Electrical System Workflow Forum (VES WF) define the "Vehicle Electric Container" (VEC) as a complete digital product model and develop methods for cross-company, model-based development. In addition to the ongoing development and maintenance of the standards "Vehicle Electric Container" (VEC, PSI-21 / VDA 4968) and "Wire Harness List" (KBL, PSI-19 / VDA 4964), the project group develops implementation guidelines and use-case-specific tutorials to prevent the formation of dialects.

Participation in the project group provides an enormous amount of learning about the wire harness, its components, special cases, modeling approaches in tools, and of course the VEC itself. This knowledge is directly applicable in day-to-day work and in the implementation of the VEC.

VES-WF Project Partner Statement (BMW AG)

The ECAD Implementor Forum (ECAD IF) serves as the platform for system providers. It supports vendors and users in the implementation and validation of solutions based on the aforementioned standards through implementation guidelines and joint test rounds. The activities of the VES WF and ECAD IF are closely interlinked. Vendors are involved at an early stage in the review process for implementation guidelines and in the discussion of open issues and planned model extensions.

Priorities & Concrete Results 2025 – User Perspective

As the standards mentioned above are already in active industrial use, the VES WF currently has two primary areas of focus: on the one hand, the requirements-driven further development of the VEC based on feedback from projects currently using it; on the other hand, topic-driven advancement addressing foreseeable future challenges.

The following results and topics from the project group in 2025 are particularly noteworthy:

- Successful publication of VEC Release V2.2
- Complete mapping of the content of the „Data Requirements" chapter in the forthcoming DIN72036:2025 through VEC V2.2
- Publication of VEC V2.1 content within OPC UA in the document OPC 40570 Wire Harness Manufacturing
- Introduction of a VEC-specific GitHub repository for targeted further development of the VEC standard
- Organization and participation in the Congress „Bordnetze Digital 2025" in cooperation with ARENA2036
- Consolidation of project group results on the topic of Delta Change Exchange

Priorities & Concrete Results 2025 – Vendor Perspective

The ECAD IF has proven its value as an exchange platform for implementing companies. It is used intensively to clarify implementation questions prior to the adoption of VEC concepts. To this end, a dedicated workshop in the format of a hackathon was held, focusing on specific topics from the vendor perspective. Open issues identified during this validation exercise were fed back to all participants. In addition, the insights gained were used for model improvements and the development of new implementation guidelines. Further progress was also made in the mapping of KBL and VEC, enabling toolchains to be further enhanced going forward.

Organizational & Technical Challenges 2025

Online collaboration via Teams has become an established approach for handling straightforward issues. The conduct of regular in-person workshops remained necessary for content that is in part highly innovative and complex. However, individual travel restrictions meant that in-person meetings were generally also offered in a hybrid format. Participants in the ECAD IF responded positively to the regular, biweekly one-hour Teams meetings.

Plans for 2026

In 2026, the focus will be placed on the one hand on the continuous further development of the VEC and the streamlining of the Recommendation, and on the other hand on advancing Harness Data Exchange and the representation of graphical annotations still commonly used in typical wiring harness drawings within the VEC framework. To this end, the Implementation Guideline Harness will be finalized and mapping rules from KBL Harness to VEC Harness will be defined. Building on this, the ECAD IF plans to conduct test rounds in the area of data exchange, taking into account specific dialects in the toolchain.

Project Coordination Statement

„The excellent and harmonious collaboration within our project groups was the key to our success. Through intensive exchange and shared commitment, we were able to initiate significant topics and reach important milestones. The transition to GitHub played a decisive role in this, facilitating collaboration and substantially increasing our efficiency."

ECAD-IF Project Partner Statement (AUCOTEC AG)

"Across all industries, generating reliable data – the concept of the 'digital twin' – and making it available to specialists in development, design, customer service, and other stakeholders involved in the development process is becoming increasingly critical. The existing exchange formats have served their purpose to date but are no longer fit for the future. AUCOTEC joined the ECAD IF to co-define a new, sustainable exchange format in the form of the VEC – accompanying the standardization of a comprehensive object model for such a twin from the very beginning. This allows us to contribute our own requirements and experience to the process while also benefiting from the knowledge and expertise of the other participants."

Participants

VES Workflow Forum:

- Aptiv Services Deutschland GmbH
- BMW AG
- Mercedes-Benz AG
- Nexans autoelectric GmbH
- Sumitomo Electric Bordnetze SE
- Volkswagen AG

ECAD Implementor Forum:

- 4Soft GmbH
- Aptiv Services Deutschland GmbH
- AUCOTEC AG
- PROSTEP AG
- Siemens Mentor Graphics (Deutschland) GmbH
- Vector Informatik GmbH
- Volkswagen AG

Project Leadership

Chair VES WF, ECAD IF
Jorgos Kyriazis, Volkswagen AG

prostep ivip Contact
(Coordination)
Paul Grasedieck
+49 151 1063 7803
paul.grasedieck@prostep.com

Infoplatform – Web Seminars

The primary objective of the Info Platform is to disseminate the results achieved through the technical work of the prostep ivip Association. In 2025, a variety of formats were once again employed to make project group content accessible and to facilitate exchange within the membership.

Milestones 2025

In 2025, web seminars were no longer delivered as live formats but made available as recordings in the prostep media library. This allows content to be accessed flexibly and independently of fixed schedules. Contributions continue to consist of compact technical presentations from the project groups, providing structured insights into current work results and developments. Content is accessible to all members; selected topics are also made available to a broader public.

Overall, however, fewer web seminar recordings were completed and published in 2025 than originally planned. The on-demand format has proven its value in principle, and the number of recordings provided is set to increase again in the coming year.

Alongside digital formats, the Info Platform continued to support the planning and execution of specialist events. The STEP Day took place in Paris in 2025, once again providing a platform for technical exchange on STEP and interoperability. The JT Day was held as the "JT Day Express" in a fully online format, enabling intensive community engagement despite the virtual setting. In addition, the AI Day was delivered as an online event, while the Sustainability Day took place as an in-person event, placing sustainability and regulatory requirements at the center of discussion. The aim remains to combine digital and in-person formats in a purposeful way and to further strengthen the visibility of project results.

Outlook 2026

For 2026, the media library is planned to be systematically expanded and the number of recorded web seminars brought back in line with the originally intended level. At the same time, established event formats and topic-specific in-person events will be continued and further developed in response to evolving needs. For example, the STEP Day and JT Day will for the first time be held jointly as the Engineering Interoperability Day.

Project Leadership

Chair
Bernd Feldvoss, Airbus

prostep ivip Contact
(Coordination)
Nora Tazir
+49 178 950 9215
nora.tazir@prostep.org

The prostep ivip Office Team

Membership, project collaboration, events, publications, innovations – for any matter concerning the association, our team is personally at your disposal.

Feel free to reach out.

Dr. Alain Pfouga
General Manager
alain.pfouga@prostep.org
+49 178 9509402

Fabienne Kreusch
Public Relations & Event Manager
fabienne.kreusch@prostep.org
+49 151 20528679

Nora Tazir
Technical Program Manager
nora.tazir@prostep.org
+49 6151 9287-434

Sabrina Reis
Member Support & Project Controlling
sabrina.reis@prostep.org
+49 6151 9287-336

Kirsten Cornet
Account Manager
kirsten.cornet@prostep.com

Rachel Bauer
Research & Innovation Manager
rachel.bauer@prostep.org
+49 151 14085968

Angelika Fels
New Member Communication Coordinator
angelika.fels@prostep.org

Priyanga Jeyabala
Member Support & Project Controlling

Imprint

prostep ivip Association
Heinrich-Hertz-Straße 3-7
64295 Darmstadt
Germany
Tel. +49 6151 9287-336
psev@prostep.com
www.prostep.org

Production
MUELLER-STOIBER+REUSS