INDUSTRIAL EXPERIENCE

# 3DEXPERIENCE **PLATFORM FOR INTELLIGENT CONNECTED SYSTEMS**

Imagine, engineer and experience smart products and systems

Industrial Equipment companies need to efficiently design connected complex embedded systems in an environment that allows manufacturers to streamline multiple disciplines and focus on strategic new product innovation.

DASSAULT SYSTÈMES

CONNECT SYSTEMS, PEOPLE AND DATA TO STREAMLINE MULTIPLE DISCIPLINES

The soul of tomorrow's smart product innovations originates from an intelligent core of embedded systems and electronics. But while advancing smarter products, innovators must also manage complexity, optimize performance and ensure product safety. Systems engineers rely on the **3D**EXPERIENCE® platform to streamline multiple disciplines, drive innovation and generate more business.
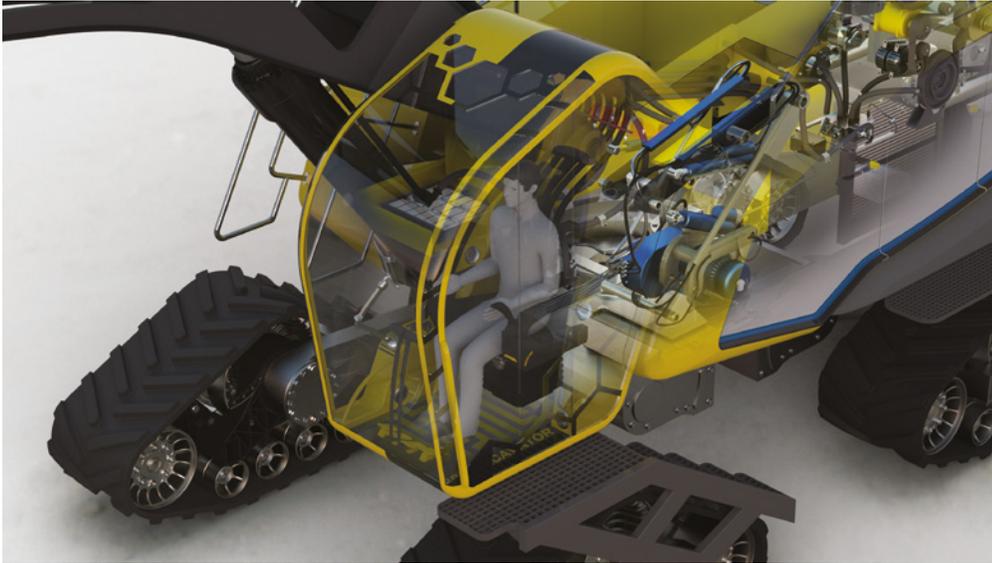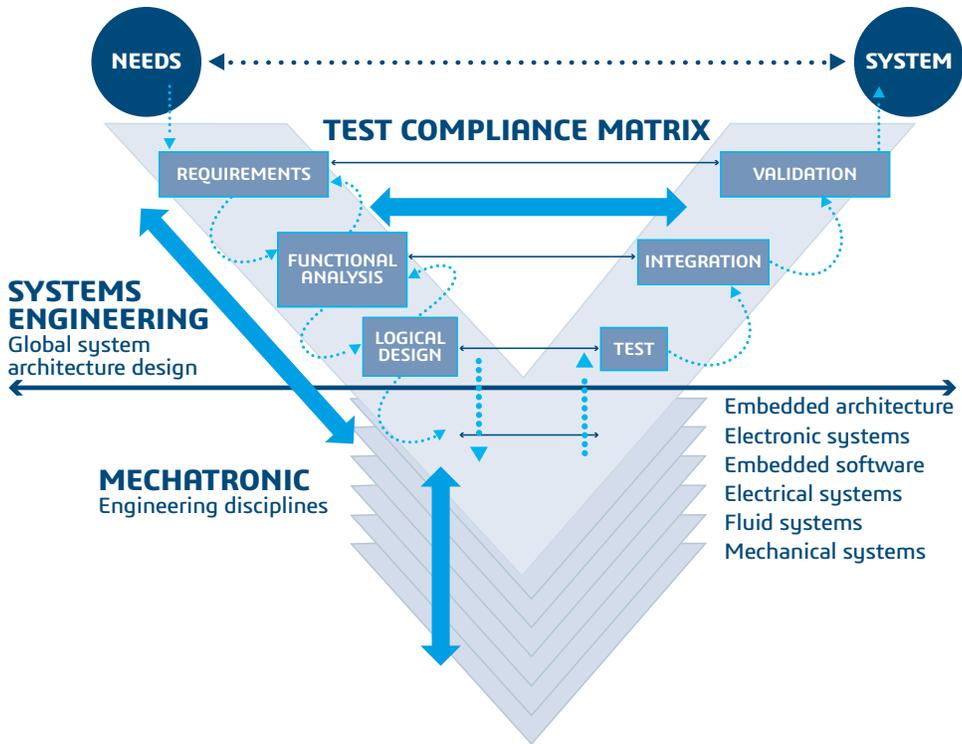

The platform accelerates the delivery of product innovations to market, strengthens your ability to manage complex systems and provides an integrated platform for mechanical, electronic and software systems development and simulation. Through virtual 3D experiences of real products and their systems, it is possible to validate all new product innovations early in the development cycle. With assurance that industry standards for safety and embedded systems are fulfilled, you are free to focus on strategic new product innovations.

THE CHALLENGE of developing embedded systems has never been greater. During the initial 60% of the development process, no physical prototypes exist. Less than 10% of systems engineers get to validate their sub-systems in a complete product, making it impossible to validate and optimize a system's behavior in its environment or its interaction with other systems across all possible product configurations.

> VIRTUAL **3D**EXPERIENCE—high-fidelity 3D experiences of a virtual product and its systems to accurately predict how the real product and its system will actually behave in real life.

Many of the new features and functions in today's smart products are delivered through embedded electronic systems—the source of 80% of today's new product innovations. These systems can account for more than 40% of new product development costs and are driven by tens of thousands of market, product, systems and regulatory requirements.

Hundreds of disconnected systems engineering tools and processes are used to model, define, simulate and validate these systems. This disconnected approach makes it difficult to build a holistic systems view that integrates all disciplines. It makes it impossible to model and simulate the behavior of a system in the context of a complete product and its environment or its interaction with other systems. And finally, it limits the ability to reuse system assets across multiple product options and programs.

TEST COMPLIANCE MATRIX

NEEDS — SYSTEM

REQUIREMENTS
VALIDATION
FUNCTIONAL ANALYSIS
INTEGRATION
LOGICAL DESIGN
TEST

SYSTEMS ENGINEERING
Global system architecture design

MECHATRONIC
Engineering disciplines

Embedded architecture
Electronic systems
Embedded software
Electrical systems
Fluid systems
Mechanical systems

THE IMPACT of these issues is increasingly serious. Products are delayed, they are often poorly integrated with sub-optimal systems and engineering costs are inflated by unsynchronized and duplicated development effort. And it is getting worse. As product complexity and the demand for product variants increases, the resulting demand for systems content and cross-disciplinary collaboration and integration is rising exponentially.

WHAT IS NEEDED to address these challenges is a fully integrated environment that makes it possible to create true, high-fidelity 3D experiences of a virtual product and its systems, to accurately predict how the real product and its system will actually behave in real life. We need to bring together all product definition data including geometry, behavior and control systems in a single integrated modeling and simulation environment. An environment that integrates all disciplines to enable them to collaborate, create and share a single integrated definition of a product and its systems.

MECHANICAL SYSTEMS

ELECTRICAL AND ELECTRONIC SYSTEMS

MECHATRONIC SYSTEMS

EMBEDDED CONTROL SYSTEMS
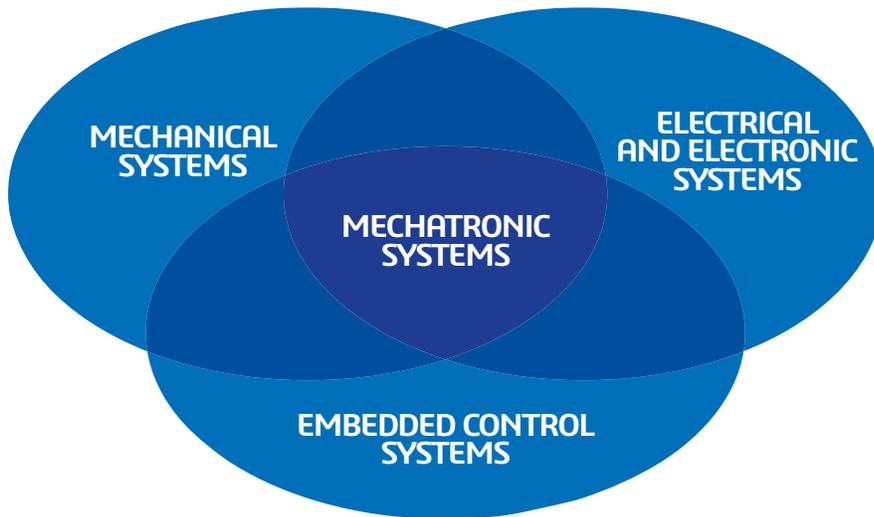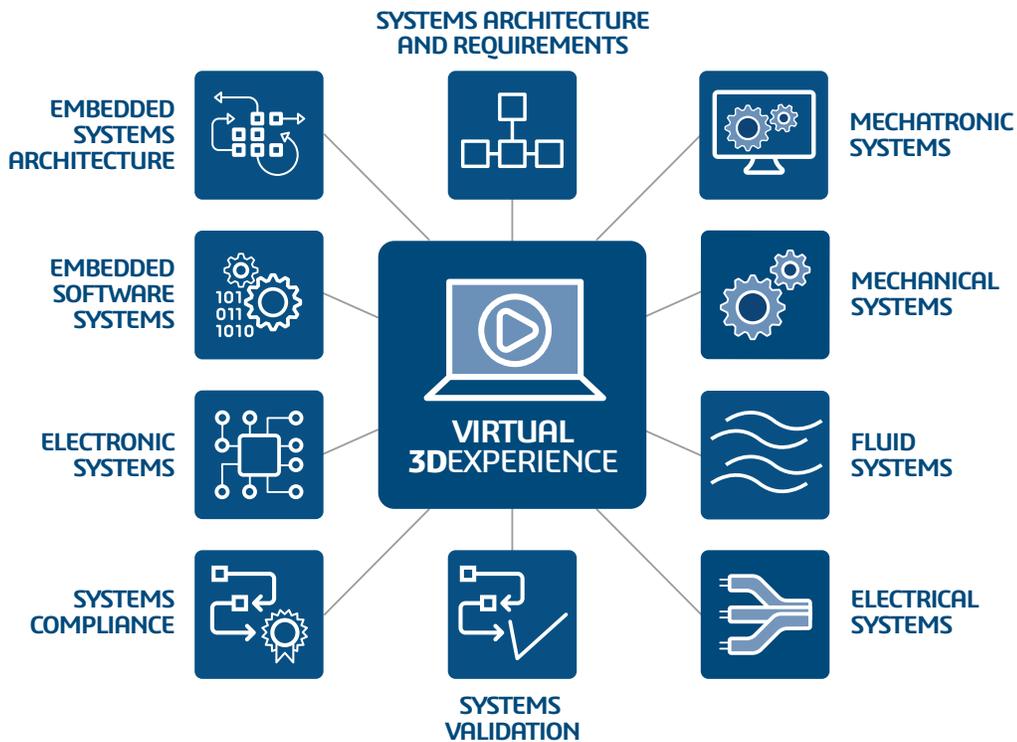
To create these 3D experiences, an integrated set of capabilities is needed that encompasses:

- **Systems architecture and requirements definition** – define and compose system solutions through an integrated set of system requirements and cross-disciplinary architectural models.

- **Embedded systems architecture** – define, simulate, implement and manage complex embedded systems.

- **Embedded software development** – develop and validate AUTomotive Open System Architecture (AUTOSAR)-compliant embedded systems.

- **Mechatronic systems modeling and simulation** – create realistic high-fidelity 3D behavior experiences of future products or systems to accurately predict the behavior and experience of the real product.

- **Electrical systems design** – design the electrical wire harness interconnect between the many Electronic Control Units (ECUs), sensors and actuators within the product and produce all necessary manufacturing data.

- **Electronic systems design** – design rigid and flexible Printed Circuit Boards (PCBs) and their associated enclosures.

- **Fluid systems design** – design hydraulic, pneumatic and fluid transfer systems.

- **Systems compliance management** – manage, document and demonstrate compliance with system requirements and regulatory standards such as ISO 26262.

- **Program, lifecycle, configuration and change management** of all assets through a rich collaborative framework that supports the creation, sharing and reuse of information.

THE 3DEXPERIENCE **PLATFORM FOR SYSTEMS ENGINEERING** from Dassault Systèmes delivers a unique and innovative Model-Based Systems Engineering development platform. It provides an integrated and powerful set of discipline-specific capabilities to accelerate the development and validation of the most complex products and their embedded systems. Through an open, extensible and integrated system engineering environment that shares a common and consistent set of systems models, it transforms the systems development process by integrating all engineering disciplines.

The platform can readily be adapted to complement existing tools. It processes and accelerates the development and validation of systems through rich 3D experiences of real products and systems. These 3D experiences begin with the planned usage of the product or system, through to its detailed design, implementation and virtual validation. Throughout the development process, the platform manages and analyzes huge amounts of systems data, enabling this data to be transformed into real business intelligence and innovative system designs.

EXPERIENCE	Systems experience and validation
DEVELOP	Systems architecture and requirements
	Embedded systems architecture
	Embedded software
	Mechatronic systems
	Electrical systems
	Fluid systems
	Mechanical systems
MANAGE	Collaborative innovation
	Program, lifecycle, configuration and compliance management
	Open and extendable common data model and repository

The **3D**EXPERIENCE platform for systems engineering makes it possible to:

- **Transform** all aspects of developing complex systems, from defining and developing systems architectures through to their implementation and validation in the context of a virtual **3D**EXPERIENCE.

- **Improve** decision-making at the conceptual design stage and reduce the need for physical prototypes through powerful ,3D lifelike simulation and validation.

- **Collaborate** and share information across all stakeholders through a shared common systems definition.

- **Simulate** the behavior of systems in the context of the complete product and its environment.

- **Reuse** systems assets across multiple product programs and model variants.

- **Manage** the complete product and systems development lifecycle by sharing an open, extendable and common data model and repository with all stakeholders.

MANAGE THE SYSTEMS DEVELOPMENT PROCESS

By using the power of 3D to accelerate product innovation, the **3D**EXPERIENCE platform fortifies the ability to manage the development of complex systems. It provides a powerful, fully integrated, model-based systems engineering solution to architect, define, simulate and validate complex systems that include embedded software, mechatronic and electrical systems.

Industry leaders rely on these proven solutions to trace customer requirements, validate design options, test the performance of systems and reuse assets across multiple product programs. With the confidence that industry standards for safety and embedded systems are fulfilled, teams can refocus on strategic new product innovation.

The **3D**EXPERIENCE platform for systems engineering provides provides a fully integrated set of lifecycle management capabilities that promotes:

- **Collaboration** through powerful services for real-time social collaboration, dashboarding, visualization and content management. The platform provides a scalable solution capable of supporting systems development from the smallest to the largest and most complex engineering projects.

- **Program management** with task status collection becoming a natural part of the design process itself. By collecting information passively throughout the design process, it provides decision makers with real-time assessments and gives increased confidence in information.

- **Lifecycle management** through a unified global system engineering development and change management processes that enable early visibility of the change impact to all data consumers—including across the supply chain, all in the context of a configured systems definition.

- **Configuration management** enables the use of a single standardized platform for all product lines with functional variants based on customer and market needs. By reducing the number of explicit system definitions, the platform reduces the number of definition assets, the duplication and number of tests and increases systems asset reuse across multiple product options and programs.

- **Compliance management** through comprehensive traceability, impact analysis and automated reporting capabilities to satisfy regulatory and corporate requirements while meeting deadlines. Using powerful dashboarding, traceability and analysis capabilities across more than 60 systems engineering tools, it is possible to assess the completeness of requirements coverage and impact of system changes across all engineering data at both the project and program level.

- **Big Data** social listening, information federation, dashboarding and analytic capabilities to quickly and easily get real business intelligence from distributed and fragmented systems information.

- **Extensible data model and shared repository** that provides a unified environment for managing all systems definition, design and simulation data. It provides a single source of information to ensure all stakeholders always work with a consistent view of the latest information.

- **Open platform** to protect your existing investment in tools and processes through standards-based integration and sharing of information across common systems engineering tools.

Support of Open Standards

- **Codex of PLM Openness:** An initiative for establishing openness of IT systems in the context of Product Lifecycle Management (PLM) between end users, tool vendors and service providers.

- **Functional Mockup Interface (FMI):** A tool-independent standard to support both model exchange and co-simulation of dynamic systems models

- **Modelica®:** An open language for the object-oriented modeling and simulation of multi-domain physical systems.

- **Open Service for Lifecycle Collaboration (OSLC):** An open community that defines a set of specifications that enable integration of PLM, Application Lifecycle Management (ALM) and IT software.

- **Requirements Interchange Format (ReqIF):** An XML file format that can be used to exchange requirements, along with its associated metadata, between software tools from different vendors.

- **AUTOSAR:** An automotive software architecture that enables the development and reuse of automotive software components.

CONCLUSION

An intelligently connected system is a proven catalyst for Industrial Equipment companies that want to successfully bring smart products to the market. Despite the challenges presented with complex systems and multiple disciplines, it is a universal single source of information that systems engineers rely upon to achieve their objectives.

The **3D**EXPERIENCE platform is the solution for manufacturers to accelerate the delivery of product innovations by strengthening the ability to manage complex systems. Through virtual 3D experiences of real products and their systems, it is possible to validate all new product innovations early in the development cycle. With assurance that industry standards for safety and embedded systems are fulfilled, you are free to focus on strategic new product innovations.

Adopt a connected approach and build a holistic system. The **3D**EXPERIENCE platform brings together all product definition data including geometry, behavior and control systems in a single integrated modeling and simulation environment. An environment that integrates all disciplines to enable them to collaborate, create and share a single integrated definition of a product and its systems.

An intelligently connected system is not as complex as it may seem. Learn more about how you can make it a reality for your business in the more in-depth video.

Our **3D**EXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3D**EXPERIENCE® Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced, and supported. Dassault Systèmes' collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. The group brings value to over 220,000 customers of all sizes in all industries in more than 140 countries. For more information, visit **www.3ds.com**.

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