"Where Today Meets Tomorrow" The 2019 Siemens Digital Industries Software Media & Analyst Conference

CIMdata Commentary

Key takeaways:

- Siemens PLM Software, now Siemens Digital Industries Software, a name that represents the growth of the company and the scope of its solutions, introduced Xcelerator, the new name of their integrated portfolio of software, services, and application development.
- Mendix, both an application development platform and an integration mechanism, is being widely used within and across the Siemens product suite to significantly reduce the time and cost to create personalized solutions by both Siemens and its customers.
- Simcenter Flex is a new, token-based, licensing model that provides access to any module within the Simcenter STAR-CCM+, Simcenter 3D base, Simcenter Testlab base, and Simcenter Amesim base product suites.
- Siemens Opcenter integrates Siemens' manufacturing operations management solutions and now extends closed-loop manufacturing to quality.
- Siemens and Bentley Systems announced availability of Capital Asset Lifecycle Management for Teamcenter—a solution to help companies consolidate asset data and weave a digital thread from project delivery into operations.
- Siemens is pursuing an aggressive cloud strategy supporting Amazon Web Services, Azure, and Alibaba (for China) and enabling customers to decide how each wants to use both cloud and on-premise solutions singularly or in hybrid combinations.

CIMdata, and over 100 other industry analysts and journalists, recently attended Siemens Digital Industries Software's 12th annual analyst conference in Brooklyn, New York from September 3 through 6, 2019. At this event, Siemens PLM Software announced a name change to Siemens Digital Industries Software (Siemens). Siemens stated that this new name better reflects its position inside the core operating company of Siemens Digital Industries, and also their evolution beyond an industry leader in Product Lifecycle Management (PLM) to a company with a very broad portfolio of industrial software and services that is the technical foundation for digitalization strategies at companies around the world. PLM solution areas provided by this new group include Product Data Management (PDM), Computer-Aided Design (CAD), Simulation and Analysis (S&A), Application Lifecycle Management (ALM), Electronic Design Automation (EDA), and embedded software development tools and services. Other solutions include Manufacturing Operations Management (MOM). the MindSphere cloud-based, open IoT operating system, the Mendix application development platform, and performance analytics software.

Keynotes

The opening keynote was delivered by Mr. Tony Hemmelgarn, President and CEO, who stated the theme of the conference was "Where Today Meets Tomorrow." He discussed the explosion of product and systems complexity, and stressed that the ability to manage complexity can provide companies a competitive advantage. He also noted that the information explosion is

not always a positive—too much information acts like very little information. Mr. Hemmelgarn went on to describe the three pillars of Siemens' solution strategy:

- Comprehensive Digital Twin
- Personalized, Adaptable, Modern
- Flexible, Open Ecosystem

In sessions throughout the conference, the presenters provided several illustrations of how Siemens was delivering against these three pillars.

To encompass this three-pillar strategy, Mr. Hemmelgarn introduced Xcelerator, their new term to describe their integrated portfolio of software, services and application development that integrates solutions for PLM, EDA, ALM, MOM, and the Internet of Things (IoT)—and more. According to Mr. Hemmelgarn, Xcelerator combines Siemens' full portfolio of software with the low-code Mendix multiexperience application development platform and the MindSphere open IoT Ecosystem.



Mr. Hemmelgarn noted that Siemens believes that a comprehensive digital twin is a necessity to support an effective digitalization transformation strategy. He further described how companies can use their Mendix low-code/no-code development environment to accelerate innovation and create personalized solutions. In another example, Mr. Hemmelgarn said that Siemens technologies, like their artificial intelligence (AI) driven adaptive user interface in NX, can help increase personalization of a solution.¹ To emphasize Siemens' commitment to an open ecosystem, Mr. Hemmelgarn stated that there are over 4 million Parasolid solid modeling kernel users (including many running on solutions provided by Siemens' competitors), 130 JT Open members, and over 90,000 developers for Siemens software solutions. To illustrate how open Siemens remains, he described the case of convergent modeling, which supports both facets and B-rep design data.² This advanced capability is based on Parasolid and adding it to the Parasolid kernel offering made it available to all Parasolid users, including designers using SOLIDWORKS from Dassault Systèmes. CIMdata is pleased to see Siemens' continued commitment to openness even when it means providing core, differentiating capabilities for use by a competitor.

Additionally, he briefly described two partnerships Siemens has established to help companies better manage physical assets and asset-intensive projects:

- IBM with the integration of Maximo and Teamcenter
- Bentley Systems with Capital Lifecycle Asset Management (CALM) for Teamcenter

CIMdata thinks the name change to Siemens Digital Industries Software and the definition of the Xcelerator portfolio show the growth Siemens software solutions beyond the traditional PLM boundaries and correctly emphasizes how the digital thread and comprehensive digital twin are essential to successful digitalization of the extended enterprise. CIMdata believes the three pillars of Siemens' strategy articulated by Mr. Hemmelgarn provide a strong foundation

¹ https://blogs.plm.automation.siemens.com/t5/NX-Design-Blog/New-Adaptive-UI/ba-p/567780

² https://www.plm.automation.siemens.com/global/en/our-story/glossary/convergent-modeling/24461

for the creation of comprehensive, future-proof business solutions. CIMdata was also pleased to see Siemens continue to partner with other industry leading companies thereby fully leveraging and complementing Siemens' own capabilities.

Siemens' Cloud Strategy and Solutions

A topic of major interest from many of the attendees, and one addressed in several sessions, was Siemens' cloud strategy and status. Mr. Ray Kok, VP Technology Office, presented an overview of Siemens cloud strategy and associated solutions. He stated that Siemens is offering a mix of cloud ready solutions (e.g., Teamcenter and Simcenter), application platform solutions, and cloud-based applications. He noted that Siemens is also developing some cloud-native solutions. Figure 1 illustrates Siemens cloud strategy and its focus on Connect, Access, and Build-Integrate-Extend.



Figure 1—Siemens Cloud Strategy (Courtesy of Siemens)

Figure 2 graphically presents Siemens cloud platform strategy.



Figure 2—Siemens Cloud Platform Strategy (Courtesy of Siemens)

Mr. Kok stated that Siemens is currently delivering their solutions on three public cloud service providers: AWS, Azure and Alibaba (for China). He stated that their customers could implement a combination of on premise and three cloud-delivered options:

- 1. Cloud streamed—solutions residing in the cloud, i.e., MindSphere, Mendix, NX, Teamcenter, Simcenter, etc.
- 2. Cloud connected—purchase through the Siemens store, get automated deployment and updates
- 3. Managed services—Siemens manages the applications and infrastructure (the cloud environment)

Mr. Kok noted that Siemens currently has over 1,000 cloud customers, 650+ partners, and their cloud business is delivering 40%+ annual rate of return.

CIMdata is impressed with Siemens cloud strategy and how they are implementing it. Cloud implementation and integration continues to be more and more important and CIMdata believes that Siemens is taking a pragmatic approach to both their strategy and how they let their customers select what is best for them at any given time.

Mendix

Joining Mr. Kok during the Cloud Strategy session, was Mr. Derek Roos, CEO, Mendix, who described how the Mendix technology and solutions are used to deliver the Build-Integrate-Extend element of Siemens' cloud strategy. He noted that companies are using Mendix to build apps that extend any of their systems, not just product development or PLM-specific applications. According to Mr. Roos, Mendix applications are designed to sit on top of the "platform" and support multiple experiences, running on any device both online and offline. Mr. Roos stated that Mendix applications can connect to any data source and any system, including structured and real-time data.

According to Siemens, the use of Mendix continues to grow within and across the Siemens portfolio. As illustrated by many speakers throughout the event, it is an application development platform used to accelerate innovation and enable Siemens and its customers to quickly create tailored, personalized applications and solutions. Key characteristics of the Mendix platform include:

- No-code/low-code development
- Designed for use by domain, process, and engineering experts as well as professional software developers
- Multi-experience—creating applications for use on any device both on and offline
- Connect to any data source including Teamcenter, MindSphere, ERP, CRM, etc.
- Deep integration with Siemens portfolio to build applications that enable a comprehensive Digital Twin

In a session titled "Building IoT Applications with MindSphere and Mendix," Mr. Dave Mitchell, VP MindSphere Products, showed examples of how Mendix is being used to develop MindSphere and integrate IoT apps to expand the MindSphere operational environment and solution.

CIMdata thinks that Mendix, by enabling subject matter experts to develop their own applications, will help ensure those new applications meet their needs and can be delivered at

the pace needed to support digital transformation initiatives. Mendix is also providing Siemens the ability to rapidly extend their solutions to meet new and changing customer requirements.

Teamcenter

Mr. Joe Bohman, SVP Lifecycle Collaboration Services, delivered a session on "Where the Smart Product Lifecycle Meets Tomorrow." He stated that Teamcenter is the underlying foundation for product management and collaboration providing the digital thread used to create and connect the comprehensive digital twin throughout the enterprise. Teamcenter is used throughout the Siemens portfolio and some solutions within Simcenter and Opcenter are developed using it. One of the key factors discussed by Mr. Bohman for successfully embracing complexity was the need to break down barriers between business and functional domains and make them fit together. He described the need for connected engineering between the mechanical, electronic, electrical, software, and network domains as each defines the features and functional and non-functional requirements pertinent to their domain. He said a multi-domain architecture is required to deliver these capabilities and that Siemens is continuing to build out such an architecture.

Mr. Bohman introduced a new Teamcenter capability called Integrated Program Planning and Execution (IPPE). With it, companies can create work breakdowns (e.g., a work BOM) and define templates for reuse. He stated that IPPE incorporates agile methodology that can be used to organize work. Mr. Bohman also announced Teamcenter for Contract Manufacturing, a new Teamcenter module that is part of their overall supplier collaboration capability. He noted that it incorporates controlled access to IP, seamless change and redline facilities, and provides up-to-date status and information on mechanical, electrical, and software activities.

Mr. Bohman described the concept of the Engineering Digital Mockup (EDU), which he thought could do for Engineering what DMU did for CAD. While a DMU can help answer questions like "what does it weigh?" and "will anything interfere?" EDU will enable companies to answer questions like "what function am I performing?," "how might it fail?," "why was this decision made?," and "does it work?" The EDU concept is supported using a combination of Siemens solutions. CIMdata thinks that the EDU concept is both overdue and needed to deal with the systems engineering issues of today's complex products.

Mr. Bohman then announced the availability of CALM for Teamcenter, a new solution developed collaboratively by Siemens and Bentley Systems to address the challenges typically faced across an enterprise's greenfield and brownfield capital projects, including rampant delays and cost overruns, which can be caused by lack of system interoperability and a failure to appropriately leverage digitalization. The Teamcenter CALM solution has been designed to help companies consolidate asset data and weave a digital thread from project delivery into operations, enabling the creation of a closed-loop digital twin—the virtual representation of a physical asset—to visualize and simulate project designs, construction execution, and operational performance. CIMdata believes that CALM for Teamcenter addresses an important missing capability in the asset management domain and we are pleased to see Siemens and Bentley Systems working together to deliver a solution that aggregates, manages, and traces capital project and operational data at an enterprise level.

Simcenter

Mr. Willy Bakkers, VP Simulation and Test Solutions, and Mr. Jean-Claude Ercolanelli, VP Simulation and Test Solutions, Computational Continuum Mechanics, led a session on Predictive Performance Engineering. Mr. Bakkers and Mr. Ercolanelli described how Simcenter

integrates systems simulation, CAE simulation, and physical testing to enable performance engineering and comprehensive design space exploration, while using Teamcenter to maintain digital continuity for multi-domain traceability and change and configuration management. They presented how Simcenter is providing electrical system simulation including capabilities like Simcenter Battery Design Studio. Mr. Bakkers noted that the acquisition of Saab Medav NVH has helped Siemens deliver capabilities for end-of-line quality testing for engines, transmissions, electric motors, and motor-driven components and systems.

The speakers announced a new licensing option, Simcenter Flex. This new licensing scheme applies to several Simcenter applications. Based on a token/credit paradigm, customers will be able to use any module (subject to restrictions) within the Simcenter STAR-CCM+, Simcenter 3D, Simcenter Testlab base, and Simcenter Amesim base product suites without having to license each module individually. A base product license is required to be purchased and tokens/credits are applied toward additional products within the product family. CIMdata believes that Simcenter Flex will enable Siemens customers to have better access to the different simulation tools they need to do their work without requiring more cumbersome licensing contracts.

Smart Manufacturing and Opcenter

Ms. Tali Segal, VP Innovation, Mr. Rene Wolf, SVP Manufacturing Operations Management Software, and Mr. Zvi Feuer, SVP Manufacturing Engineering Software delivered a session titled "Where Smart Manufacturing Meets Tomorrow." They described how increasingly complex products are driving change in manufacturing and it must innovate at the rate of the new smart connected products. This is driving increased complexity in manufacturing processes and systems. Smart manufacturing requires flexible, autonomous, re-configurable production systems. The speakers described how Siemens was using the comprehensive digital twin to integrate the information and processes across both R&D and manufacturing to help companies move from fixed, manual manufacturing operations to flexible, autonomous operations that are smart and self-adjusting.

The speakers stated that the digital twin of manufacturing process is critical to get from innovative ideas and raw materials to real products. It provides a bridge between product design, production planning and engineering, and production execution. This Production Digital Twin incorporates the digital twin of the manufacturing process and the digital twin of the plant. The speakers described how Siemens Opcenter is designed to be the digital brain of the factory, as a holistic MOM solution that supports digitalization of manufacturing operations. Built on the Teamcenter foundation, Opcenter delivers multiple capabilities including solutions for:

- Advanced Planning and Scheduling
- Manufacturing Execution
- Quality Management
- Manufacturing Intelligence and Performance
- Research, Development, and Laboratory

Siemens Opcenter is designed to enable companies to create continuous closed-loops between as-planned and as-is manufacturing data, transform production systems' real-time data into IoT actionable information (smart data), and provide data analytics and reporting for operational and enterprise intelligence. It can also be used to extend closed-loop manufacturing to quality. CIMdata thinks that Siemens Opcenter, with its integration of multiple

manufacturing functions and information and closed-loop feedback, can help companies improve their operational efficiency, agility and effectiveness.

MindSphere

In many sessions throughout the event Siemens referenced MindSphere and how it was being used to create IoT/IIoT solutions and help companies create closed-loop development and operating environments. Friday of the conference, the sessions were devoted to MindSphere and provided a good update on the MindSphere product suites and where and how Siemens is using and selling this technology. Siemens continues to expand the MindSphere technologies and solution suite. As part of its commitment to MindSphere, Siemens has established 70 MindSphere Application Centers in 17 countries, staffed with over 1,000 software developers, data specialists, and engineers. Supporting 20 different industry markets, the objective of the application centers is to co-create solutions with their customers.

In addition to the "standard" IoT connectivity, MindSphere is also used to integrate and manage edge applications and devices to create a cloud-to-edge ecosystem. New MindSphere solutions include a MindSphere Integrated Data Lake (IDL), and Semantic Data Interconnect (SDI). The SDI supports automated schema discovery, ability to semantically correlate data from multiple systems, and query semantically correlated data. The IDL provides secure storage of data and metadata, direct access to the lake via cloud provider tools, and allows customers to include their own data stores.

Siemens stated that organizations move through multiple phases of digital maturity during their Digital IIoT journey, as shown in Figure 3.





Siemens has created the following three solution packages that combine a set of tailored software, hardware, and services to help companies on their IIoT digital journey.

 Connect and Monitor—helps businesses connect critical assets, gain operational transparency, and take actions to optimize performance and health to maximize production and profits.

- Analyze and Predict—provides solutions that enable manufacturers to use integrated data sets and modern data analysis to derive deep, predictive insights about asset health and performance.
- Digitalize and Transform—helps manufacturers already realizing many of the benefits of IoT to take the next step in their digital transformation journey by building targeted applications that are key to developing new business models and products, such as asset-as-a-service offerings.

Siemens also noted that drivers for MindSphere investments are:

- Edge Analytics—deliver a highly secure edge computing, control and analytics framework.
- Data Federation and Sharing—manage data of various types by providing extensive connectivity across diverse data sources.
- Digital Twin Closed Loop—continuous integration and management of in-context semantic-rich representations.
- Application Lifecycle—efficiently develop, test, and operate IoT solutions supported by streamlined application development capabilities.
- Marketplace—provide a streamlined experience for all participants focusing on ease-of-transaction.
- Applications & Solutions—build and deliver industry-tailored applications and solutions that solve business challenges.

CIMdata believes that the MindSphere suite, coupled with the Mendix low-code development tools can provide significant capabilities for companies to address the growing and complex environments of cloud-to-edge smart connected devices and closed loop integration from R&D through service.

Design Solutions

Mr. George Rendell, Senior Director, Design Product Management, Product Marketing, and Business Development joined Mr. Dan Staples, VP of Mainstream Engineering, R&D in a breakout session to discuss the evolution of model-based definition (MBD) to model-based engineering (MBE). Of particular note, they described Siemens' selection of the 3D PDF file format for technical data packages (TDPs) used in company-to-company data exchange. While not diminishing their emphasis on the JT lightweight data format, CIMdata sees their choice of 3D PDF and the product representation compact (PRC) format³ for 3D model geometry an interesting and balanced approach.

Customer Presentations

Customer success presentations are always a highlight and Siemens delivered this year with their choices. Mr. Marco Suvilaakso, Chief Strategy Officer Polar Electro, described the scale and scope of their use of Siemens products throughout their design and manufacturing processes for smart watches. Mr. Brian Sniegocki, Sr. Business Analysis, Global Quality Systems Dana Corporation, described the importance of closed loop manufacturing with closed loop quality at a tier 1 automotive supplier. Mr. Lateef Khan, General Manager and Business Development Executive Mercury Digital Services at Mercury Marine, described their broad use

³ www.pdf3d.com/about-prc/

of Siemens technology including supplier relationship management with 3D data sharing, and how MindSphere was used to solve a casting issue with their boat engines.

The highlight of the customer presentations and arguably the entire event was the presentation delivered by Mr. Dave Lyon, Chief Designer, Vinfast. He described why and how the Vin Group in Vietnam decided to become a car manufacturer. Without any prior auto experience, the Vin Group reclaimed land, built a 250,000 car per year capacity factory, designed a luxury sedan and SUV, used social media to select from the design options, and launched production all within a two-year time period. The speed at which this entire process was executed was stunning and showed what could be accomplished with the right determination, strategy, tools, technology, and suppliers. Mr. Lyon stated that their full commitment and trust in Siemens digital tools and processes was key to success.

Conclusion

While this commentary is longer than usual, in some ways it is only scratching the surface of the information provided during this 2.5-day analyst event. Siemens' solution portfolio has become so broad that one such event is really not large enough to describe it. Organizing the event around strategic themes helped show how different parts of the Siemens portfolio can be used in combination to address those themes. CIMdata thinks Siemens' three portfolio strategy pillars (Comprehensive Digital Twin; Personalized, Adaptable, Modern; Flexible Open Ecosystem) are excellent foundational characteristics for solutions that need to integrate and span an extended enterprise. Siemens continues to make rapid progress integrating the technologies and capabilities of the various products they have acquired. This is delivering new, expanded solutions that address integration of mechanical, electrical, electronic, and software elements of today's complex smart products. Other solutions address generative engineering, hybrid manufacturing, and the integration of the engineering and manufacturing domains of the enterprise.

CIMdata was impressed by the continued expansion of the MindSphere ecosystem and the customer examples shown. Siemens has made great strides in developing and delivering IoT technology and solutions in a short time. In a related note, MindSphere and the MindSphere community have already benefited from adding Mendix to the development environment. Mashups are a key element in IoT applications, and, with Mendix Siemens obtained a globally deployable enterprise-grade solution to build these applications and many more capabilities. The Teamcenter user and development community are also able to use this capability to provide and enhance personalized solutions. The benefits are starting to accrue across the Xcelerator portfolio, with more to come.

The customer presentations support the name change to Siemens Digital Industries Software while the customer success stories, built using advanced PLM, EDA, MOM, and IoT software to meet business objectives, showed why Siemens is so successful in the marketplace. They know how to get things done and take care of their customers.

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About CIMdata

CIMdata, an independent worldwide firm, provides strategic management consulting to maximize an enterprise's ability to design and deliver innovative products and services through the application of Product Lifecycle Management (PLM). CIMdata provides world-class knowledge, expertise, and best-practice methods on PLM. CIMdata also offers research, subscription services, publications, and education through international conferences. To learn

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