

Aerospace and defense

CUONICS

Avionics specialist uses Polarion to enable traceable product development and production

Products

Polarion, Mentor

Business challenges

Adhere to strict safety requirements

Meet acute time pressure in product development

Trace the origin of built-in parts

Keys to success

Integrate hardware and software development

Extend Polarion ALM to create an integrated ALM/PLM solution

Provide support for materials management and production

Results

Enabled traceable development and production

Accelerated cross-domain review processes

Provided lean and efficient processes that enhanced the firm's agility

Enhanced customer interest in CUONICS solution

Siemens Digital Industries Software solution helps CUONICS accelerate reviews and develop lean and efficient processes

Combining hardware and software in one system

As a manufacturer of safety-critical hardware and software solutions for civil and military aviation, CUONICS must always be able to trace which components are built-in to which devices. Polarion ALM™ software from Siemens Digital Industries Software not only documents the company's mechanical, software and hardware development, but also the entire product development process, from requirements management to validation. It is also used to control production. Polarion is an application lifecycle management (ALM) system that supports the development, verification and maintenance of software applications. CUONICS has extended the solution to an integrated ALM/product lifecycle management (PLM) platform for interdisciplinary systems engineering of hardware and software solutions, which is well regarded by customers. It is also used for ordering and has been applied to more tasks for which the enterprise resource planning (ERP) system was previously responsible. "Our customers are enthusiastic about how consistently we have mapped the aviationspecific processes in Polarion," says Philipp Lemberger, founder and managing director, who started the company in Straubing, Germany in 2015.



Electronics engineers use different software tools for PCB layout and FPGA design. All data is stored in SVN and managed in Polarion.

"Hardware and software artifacts and design data are stored in the same repository, so we can restore and analyze any configuration state at any time."

Harald Rauer Head of Software Development CUONICS



Mounting the printed circuit boards is highly automated and under the full control of the ALM/PLM solution.

CUONICS specializes in the development and production of customer-specific system solutions for flight control and input/output (I/O) communication in airplanes, helicopters and drones. In general, these are systems that must meet the highest safety requirements up to Development Assurance Level (DAL) A. The failure of a DAL A system would have catastrophic consequences for pilot, crew and passengers. Standards for aviation such as for safety-critical hardware (RTCA DO-254) and software (RTCA DO-178) therefore prescribe precisely how they are to be developed and how their development must be tested and documented.

Consistent configuration management

In addition to the high-quality requirements, time pressure is a major challenge for developers, as Lemberger emphasizes. End-toend digital information flows are the key to accelerating business processes. When setting up the information technology (IT) landscape, the company focused on developing an easy-to-use system environment with the option of integrating different authoring tools and defining uniform workflows for cross-domain processes. Version control and configuration management for hardware and software should occur in a uniform system in order to facilitate interdisciplinary cooperation in systems engineering, says Gerald Thonigs, head of development. "With Polarion, we removed the hurdles that arise when changing systems."

CUONICS uses Polarion in conjunction with the open source software Subversion (SVN), which serves as a repository for development data. SVN is not only used to store the software source code, but also the mechanical components from SolidWorks software, the printed circuit board (PCB) layouts and

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"Each component must be traceable back to the manufacturer in order to be able to determine exactly in which devices the components were incorporated in the event of a faulty batch."

Philipp Lemberger Managing Director CUONICS

Quality assurance of incoming batches is important for tracing components back to the manufacturer in case of failures.

electronic components from Altium Designer EDA software, and the Very High Speed Integrated Circuit Hardware Description Language (VHDL) code for Field-Programmable Gate Arrays (FPGAs), which are designed with the HDL Designer™ FPGA synthesis tool and simulated with the ModelSim™ tool, both from Mentor, a Siemens business.

"Hardware and software artifacts and design data are stored in the same repository, so we can restore and analyze any configuration state at any time," explains Harald Rauer, head of software development.

The fact that Polarion is based on SVN was one of the reasons CUONICS chose the software, says Rauer. But it was also important to be able to combine organizational processes and technical content, adds Thonigs. The aviation-specific process requirements resulting from the standards are mapped in the form of templates with corresponding workflows, milestones and checklists. The system also is used to manage the requirements for the overall system, from which the discipline-specific requirements and the corresponding tasks for mechanical, electronic and software development are derived. "For each work result there is a ticket in Polarion that refers to the file in SVN, which can be linked, for example, with a requirement or other objects," says Thonigs.

Validating customer requirements

Requirements engineering is a complex and time-consuming process for safety-critical aviation systems, which results from the standards. CUONICS cannot limit itself to just implementing customer requirements but must first check the meaningfulness and completeness of these requirements and carry out a preliminary safety assessment, which usually results in additional requirements. "If errors occur in safetycritical applications, it is usually not due to programming, but to the fact





CUONICS develops and manufactures safety-critical systems for flight control and input/output communication in airplanes, helicopters and drones.

requirements have not been correctly understood or certain things have not been taken into account," emphasizes Thonigs.

Requirements are validated in close consultation with customers, who usually specify their requirements using Rational DOORS software. The avionics specialists receive it as a signed and binding PDF document and in Excel spreadsheet software, which often lists thousands of individual items that are imported into Polarion for validation. This list goes back-and-forth between the customer and CUONICS a few times until the requirements are so mature they can be released. Then they are refined step-by-step and assigned as tasks to the individual disciplines.

"Polarion supports the breakdown of the requirements by linking tickets hierarchically," says Thonigs. "This is one of the great strengths of the solution compared to other tools."

In order to more comfortably visualize and edit the hierarchical structure with thousands of requirements, CUONICS has integrated Sparx Systems' Enterprise Architect (EA) software into Polarion. The interface enables it to transfer certain partial requirements to the editor, to visualize the relationships graphically, and to add, move or delete links and play the changed requirements back to Polarion. "We completely redesigned the interface because the existing integration caused problems when reimporting changes," says Rauer.

EA is also used for function modeling and logic simulation. For software verification, the avionics specialists integrated the LDRA tool suite so they can manage test cases to secure safety-critical system functions and the associated test results in a unified environment.

"Polarion is programmed to know the dependencies between the disciplines and their work results and ensures the hardware is linked to the valid software version in accordance with the process," explains Thonigs.

Traceable manufacturing processes

One of the special features of the ALM/PLM application is it also supports ordering at CUONICS. All electronic components are stored in the software with development data, links to the data sheets, purchase requisitions, the list of approved suppliers and the quality agreements. Although the order is still created in the ERP system, it is linked to, and released from Polarion after the technical and commercial checks are completed. After the quality check, the batches of delivered components are recorded in the incoming goods department in Polarion, which is a prerequisite for a complete proof of use. In the future, the fully automatic

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Gerald Thonigs Head of Development CUONICS

Solutions/Services

Polarion ALM siemens.com/polarion HDL Designer mentor.com/products/fpga/hdl_ design/hdl_designer_series/

Customer's primary business

CUONICS GmbH was founded in 2015 and is based in Straubing, Germany. The company develops and manufactures safety-critical system solutions for flight control and I/O communication in fixed wing aircraft, helicopters and drones. Its customers include renowned European aircraft manufacturers and system suppliers. www.cuonics.com

Customer location

Straubing Germany



The customer-specific solutions developed and manufactured by CUONICS must meet the highest safety requirements of the aerospace industry.

warehouse system is to be connected to the ALM/PLM platform in order to avoid the material management system and access the inventories directly.

"Each component must be traceable back to the manufacturer in order to be able to determine exactly in which devices the components were incorporated in the event of a faulty batch," explains Lemberger. For this reason, in the future CUONICS also wants to control its manufacturing processes with Polarion. The production orders from the ERP system are currently mapped again in the ALM/PLM application in order to complete the electronic CodeView (CV) files. Using these files even decades later, it is still possible to prove which placement machine and feeder a component was mounted on, on which board and day.

CUONICS does development and manufacturing mostly in-house in order to meet the high-quality requirements of aviation technology. Although they have the circuit boards manufactured by external suppliers, the assembly takes place in their production plant with ultramodern automatic machines, which photographically record the individual work steps. Many aviationspecific rules must be observed, especially during assembly. Thonigs says, "The more process steps we have in-house, the easier it is to guarantee traceability."

Saving time in the review process

At CUONICS, using Polarion not only makes the product lifecycle more easily traceable, but also accelerates the review process, as Lemberger emphasizes: "With the help of the ticket system, we can assign work packages to the employees of the various departments and disciplines and use the tickets and checklists to easily track how far they have come with their work. In the past, we had to sit down to review the results. That cost us a lot of time."

Most CUONICS customers use various ALM, PLM and ERP systems. However, when they audit CUONICS they are always impressed by the level of integration the Polarion solution offers. This solution delivers lean and consistent processes that help make companies agile.

Siemens Digital Industries Software

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