SIEMENS

AEROSPACE AND DEFENSE, ELECTRONICS AND SEMICONDUCTORS

Unison

Using process automation to shift left integration of mechanical and electrical models

Products

NX, Xpedition, Teamcenter

Business challenges

Improve collaboration between mechanical and electrical design teams

Reduce the risk of project delays and manual errors

Accelerate product development

Keys to success

Integrate digital thread between NX and Xpedition Enterprise

Provide a single source of truth for baselines, proposals and responses

Deliver transparency and accountability with change histories and versioning

Results

Used process automation to reduce manual errors

Sped up transfers between MCAD and ECAD models

Improved processes adopted across the wider organization

Unison uses Xpedition and NX to boost collaboration between mechanical and ECAD engineers and reduce errors

Standing up to a harsh environment

Unison, a GE Aerospace company, is a leading provider of differentiated controls and engine performance monitoring solutions in the aerospace, defense and space segments. Drawing on four decades of expertise in challenging engine systems, Unison is a key supplier for many engine and airframe programs, catering to a broad range of critical applications. Aerospace technology involves complex integrated electrical and electronic systems across the aircraft. These systems are particularly challenging to design due to the unique environmental and safety factors in the industry. Engines present an especially harsh environment for electronic components, which must be able to withstand severe heat, vibration and electromagnetic interference (EMI) for hours at a time.

Figure 1. Artemis rocket featuring sophisticated ignition system built by Unison. (Photo courtesy of Unison)

"NX and Xpedition Enterprise mean that collaboration between MCAD and ECAD teams now takes days instead of weeks."

Travis Carter
Principal Engineer
Unison

There are stringent design requirements because these components are critical to the safe operation of the aircraft. Keeping the craft as light as possible is also important for electronics.

Travis Carter, a principal engineer at Unison, got his introduction to Xpedition™ Enterprise software while facing these challenges during the design of ignition systems for commercial and military jet and rocket engines. He soon realized the tight integration of Siemens Digital Industries Software's Xpedition and NX™ software presented great potential for Unison's printed circuit board (PCB) design processes. Xpedition and NX are part of the Siemens Xcelerator business platform of software, hardware and services.

An aircraft engine's ignition system creates the spark that ignites the fuel and air in the engine's combustion chamber. The PCBs are part of the ignition exciter that triggers that spark with an electrical discharge between two electrodes. They must work efficiently with transformers, ignition coils, capacitors and other components to ensure high performance.

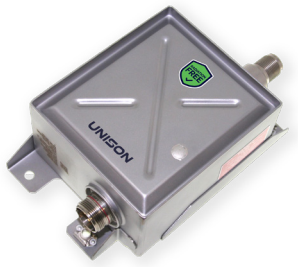

Figure 2. Unison radiation-free ignition exciter for aircraft engines. (Photo courtesy of Unison)

The mechanical modeling side of the process in NX drives the integration of the PCBs into their housing and the engine. Enhancing collaboration between mechanical and electronic engineers is vital to the overall success of the design.

"Historically, MCAD and ECAD modeling have been in their own little worlds," says Carter. "There was some manual collaboration, but not a digital thread between the two models."

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That manual collaboration was not quick – it could take weeks for a model to be transferred from the mechanical team to the electrical team and back again.

With NX for mechanical modeling and Xpedition for electronic modeling, the Unison engineering team could digitalize the previously manual process. NX and Xpedition can be used to interchange data using the Interdomain Design Exchange (IDX), which is an XML messaging format for the efficient and incremental exchange of information between ECAD and MCAD engineers and tools.

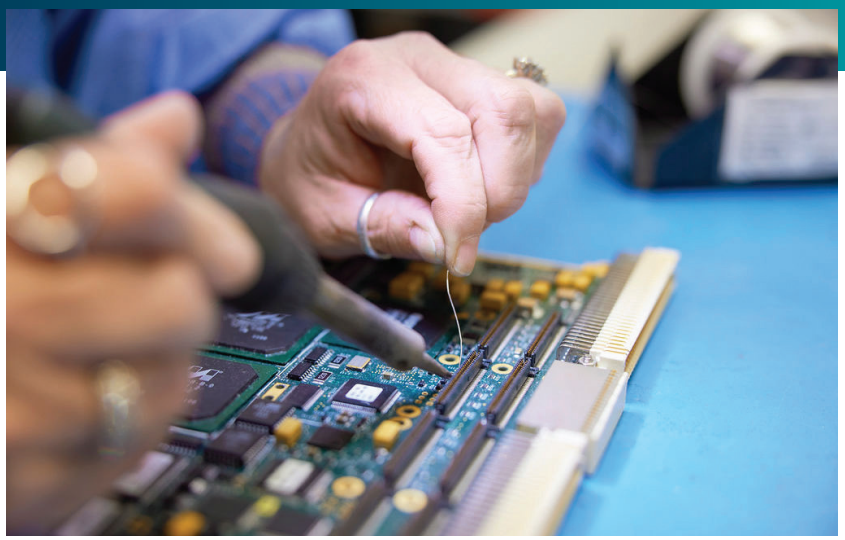

Figure 3. (Photo courtesy of Unison)

"NX and Xpedition Enterprise mean that collaboration between MCAD and ECAD teams now takes days instead of weeks," says Carter. "Once we started using IDX files for MCAD collaboration, it was a couple of clicks and then 'voilà!'"

Moment of inspiration

In any organization it is easy to get accustomed to existing processes and methodologies. It can take a moment of inspiration to break out of standard operating procedures (SOPs) and initiate change.

That happened to Carter while preparing for a design review. He needed high-quality visuals of boards and other components, but his colleagues told him it would take them a week to generate them.

"Going from the 2D ECAD world into an MCAD model was so painful," says Carter. "That's what kicked off my journey into developing these tools and features – you should be able to have a model with a couple of clicks."

Carter talks about what he calls the "blood, sweat and tears rating" when discussing the difficulty of the old process. Not only would mechanical/electronic collaboration take a long time, but it was such demanding work that designers would avoid doing it at all.

Shifting left and risk reduction

Such an arduous process incentivized designers to, if possible, put off doing model transfers. This meant they would only discover certain design flaws at the end of a project, lengthening schedules and driving up costs.

Unknowns like these present a risk to any project and eliminating them as soon as possible is key to avoiding delays and overspend. The longer you leave it,the greater the potential impact.

That is how designers have used Xpedition and NX integration to streamline some of their critical tasks. Using these tools has also enabled Unison to manage risk earlier in their design projects.

Mechanical to electronic transfers are no longer the last thing a designer wants to do, but something they can do quickly and easily at any point in a project. Shifting left the time these two design worlds meet lets them identify and rectify issues sooner.

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Figure 4. Ignition system for GEnx turbine engine. (Photo courtesy of Unison)

> “Having mechanical and electronic design digitally linked through NX, Xpedition Enterprise and Teamcenter is a huge advantage.”
>
> Travis Carter
> Principal Engineer
> Unison

“Burning down risk is our big thing because having changes or issues toward the latter half of the project is way more impactful than knowing it sooner,” says Carter. “The close integration between Siemens Xcelerator products has allowed us to shift critical design stages left and reduce risk in our product development projects.”

Automating a process that designers and engineers once left until the last minute because they dreaded it so much has also decreased manual errors and helped reduce risk further.

Traceability and accountability

The development of a digital thread has also helped Unison improve their overall design management.

They now have a single source of truth, which the company increasingly manages using Teamcenter® software across mechanical and electronic computer-aided design (ECAD) with all the historical data in one accessible place for use in baselines, proposals and responses. Versioning allows them to see all changes and the people who made them.

This replaces what Carter describes as a free-for-all and has led to increased quality and reduced errors.

“If you know that a year from now somebody’s going to know what you did, then you’re going to take a little extra time to check and verify your work,” Carter says. “Having mechanical and electronic design digitally linked through NX, Xpedition Enterprise and Teamcenter is a huge advantage.”

Teamcenter is also part of Siemens Xcelerator.

Solutions/Services

NX
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Customer's primary business

Unison, a GE Aerospace company, is a leading provider of differentiated controls and engine performance monitoring solutions in aerospace, defense and space segments. Unison is a global company employing more than 2,000 people across five major manufacturing locations as well as engineering centers and supporting sites worldwide. Unison seeks to continually set new standards for performance and technology.
www.unisonindustries.com

Customer location

Jacksonville, Florida
United States

An organization-wide success

Carter tested the process on some evaluation projects. Knowing the intricacies of Xpedition and NX, the team was keen to explore the interactions between the two.

The evaluation projects proved such a success that Unison rolled out the new integrated process as the norm for new electronic product development.

Teams have nuanced differences in how they work, but the integration between NX and Xpedition is flexible enough that each team can tweak Carter's new process as needed. It is even adaptable for teams using different product lifecycle management (PLM) systems.

After conducting several relatively simple evaluation projects, the process has also been tested on more complex designs.

A recent example involved a system with five circuit boards of varying shapes and sizes that had to be integrated into the same mechanical design. It took hours instead of days to get a baseline ECAD design and fully account for key mechanical details such as the connector and mounting hole.

Carter has helped implement these processes as he has moved from a design background to more of a systems engineering role. He is building on the experience to achieve similar gains using Siemens Xcelerator to facilitate an integrated system-level process combining electronic, electrical and mechanical design.

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Americas 1 800 498 5351
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