CP500009

Smart design of mechanical components and PCBs in a seamless workflow

Melanie Thilo
Autodesk

Richard Hammerl
Autodesk

Learning Objectives

- Get the basics of Electronics in Fusion 360
- Implement a seamless collaboration workflow for mechanical and electronic designers
- Assess the best workflow for your use case
- Identify the values of this connected collaboration

Description

Inventor is Autodesk's top tool for mechanical design. Fusion 360 provides the electronics designer with a great tool for PCB design. In agile product development, it is important that these two very different engineering disciplines work very closely together. Especially because more and more products are made up of PCBs as well as mechanical components. In this session you will learn how to set up a seamless workflow for mechanical and electrical design.

Speakers

Melanie Thilo has worked for more than 10 years as a mechanical design engineer and project manager for different companies and industries. Since 2018 she is a Technical Specialist in presales for design and manufacturing at Autodesk.

Richard Hammerl is a mechanical engineer with more than 20 years experience in the electronics sector. As one of the long-time experts for the now standardized PCB design software EAGLE, Richard offered technical support and documentation in direct contact with customers and PCB manufacturers - this made him one of the most well-known faces of the PCB industry in Europe and helped to increase the popularity of EAGLE and make it the most used PCB software worldwide. His experience and expertise has led him to help integrate PCB design into mechanical CAD - EAGLE is now part of Fusion 360 - providing PCB designers and mechanical engineers with better functionality, less error possibilities and shorter lead times - helping his customers to remain competitive in global markets and increasing profit margins for those who create assemblies with integrated electronics.

Table of Contents

Design Challenges

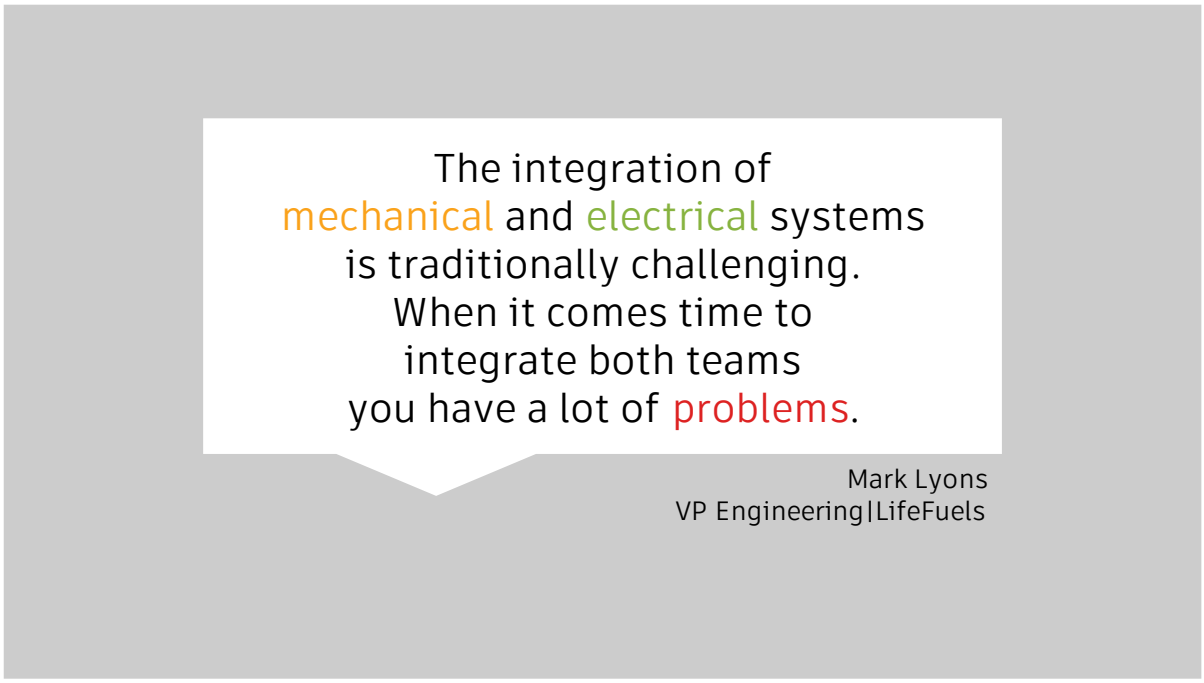

FIGURE 1 – CHALLENGES

How to face these design challenges?

1. A design environment that meets both the electrical and mechanical requirements of product development with one platform.
2. Be confident that all in product development involved personas are working with the most recent version of the electrical and mechanical designs. Enforce secure data exchange across systems and processes.
3. Respond quickly to design changes through easy collaboration with other teams.

Workflow

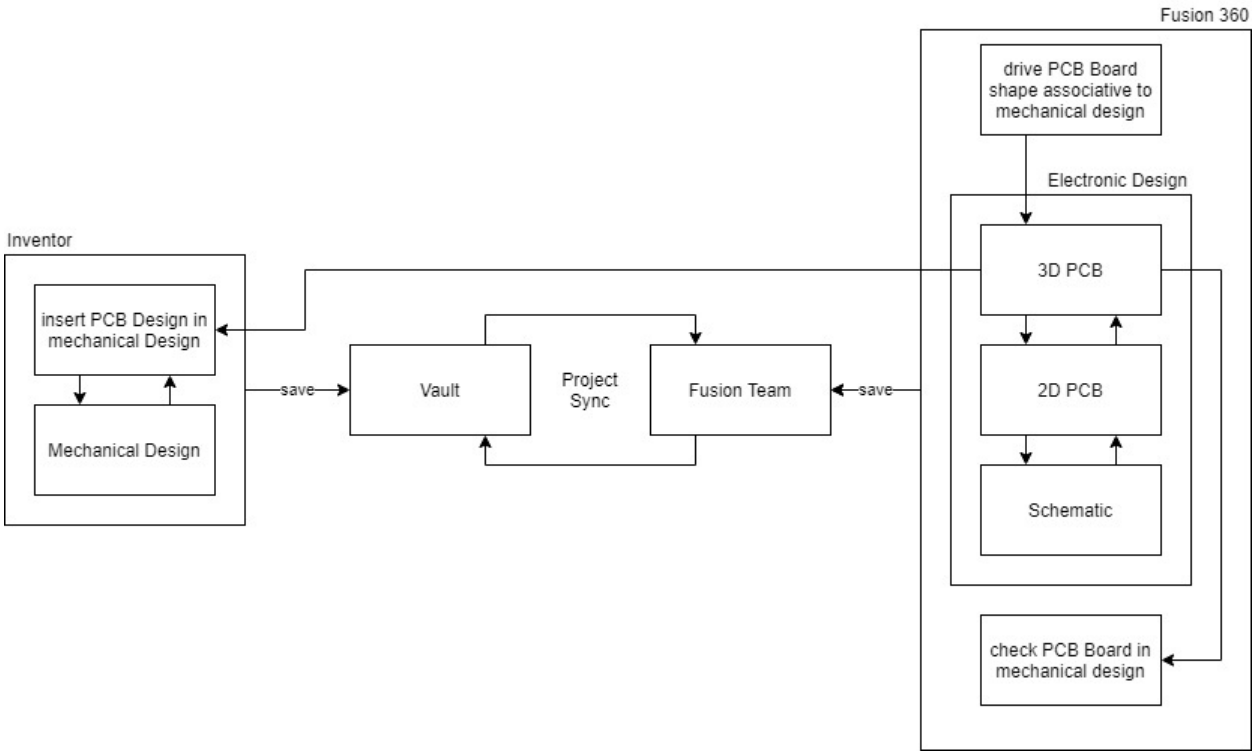

FIGURE 2 - DESIGN PROCESS OF A SMART DEVICE

Inventor is a common solution in many mechanical design departments and usually used in combination with Vault for Data Management. Learn more about Vault-based Collaboration. The design and manufacturing platform Fusion 360 includes various features like Electronics Design and Collaboration. With the so-called Project Sync we can connect Fusion Team and Vault to sync your design data.

FIGURE 3 - TOOLS FOR A SEAMLESS WORKFLOW

Demo

Melanie is used to work with Inventor and designs the mechanical part of the device. She reserves some space for the electronics part, the printed circuits board (PCB), of this smart product.

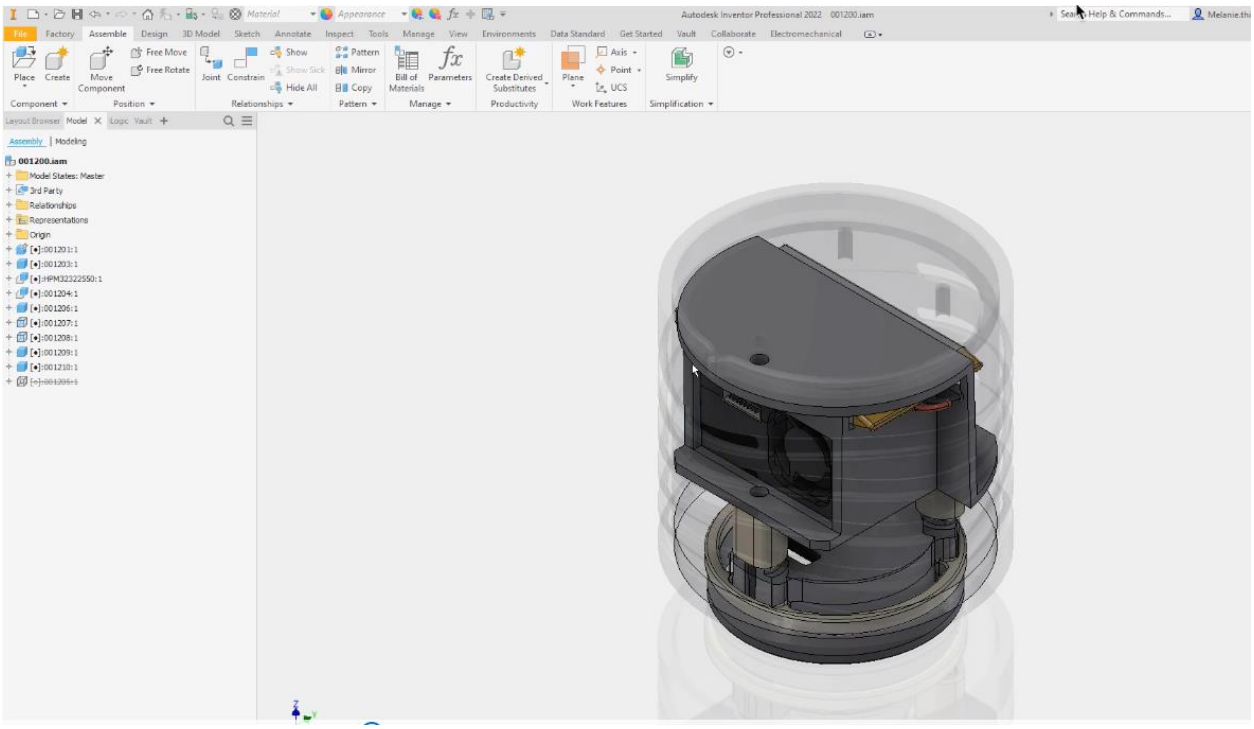

FIGURE 4 - PRODUCT DESIGN IN INVENTOR

For data management Melanie uses Vault and automatically checks in Inventor data on a regular basis. Vault also does a project sync with Fusion Team, the collaboration platform for all Fusion 360 users.
Richard, who designs his electronics projects with Fusion 360, usually shares his projects with his team members easily on Fusion Team. Data is accessible with a web browser for invited people.
In our Inventor – Fusion 360 project, Vault syncs Melanie's data with Fusion Team.

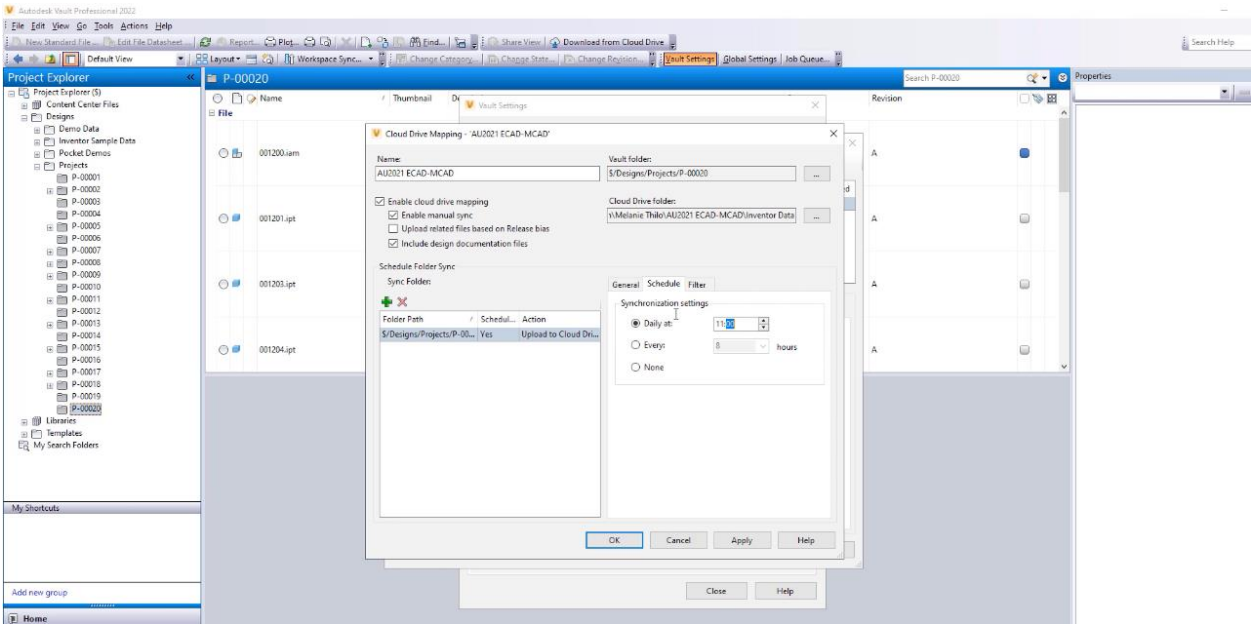

FIGURE 5 - VAULT'S SYNCING SETTINGS

Richard already started his electronics design and worked on the schematic. As soon as the electronics project is fully developed, one of the final steps is to check the schematic with the Electrical Rule Check.

It's just one click to switch from schematic to 2D PCB. All components and all signals are transferred into the layout. Richard does not know the final board shape yet, but he already starts to think about a possible arrangement of the components.

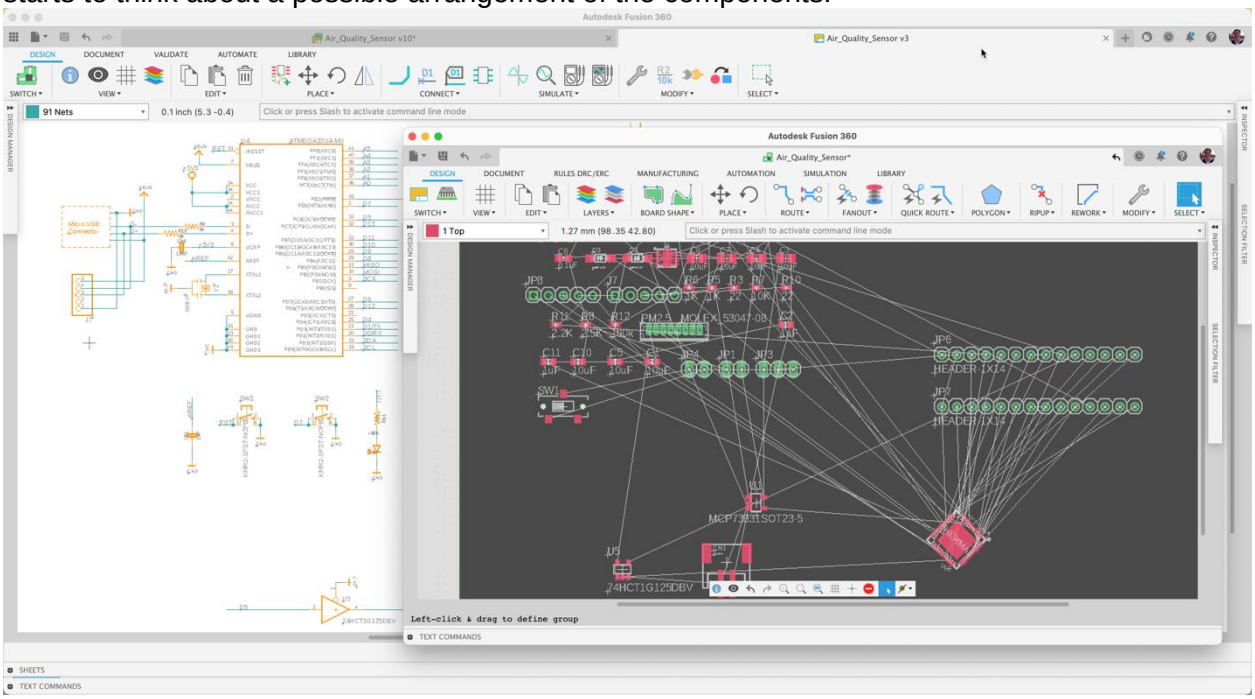

FIGURE 6 - SCHEMATIC DONE, PRELIMINARY WORK IN 2D PCB

Melanie invites Richard to her team, and he can access the Inventor data in Fusion 360.

Since Richard already started his design before he got access to Melanie's hub, he transfers his data to the team hub.

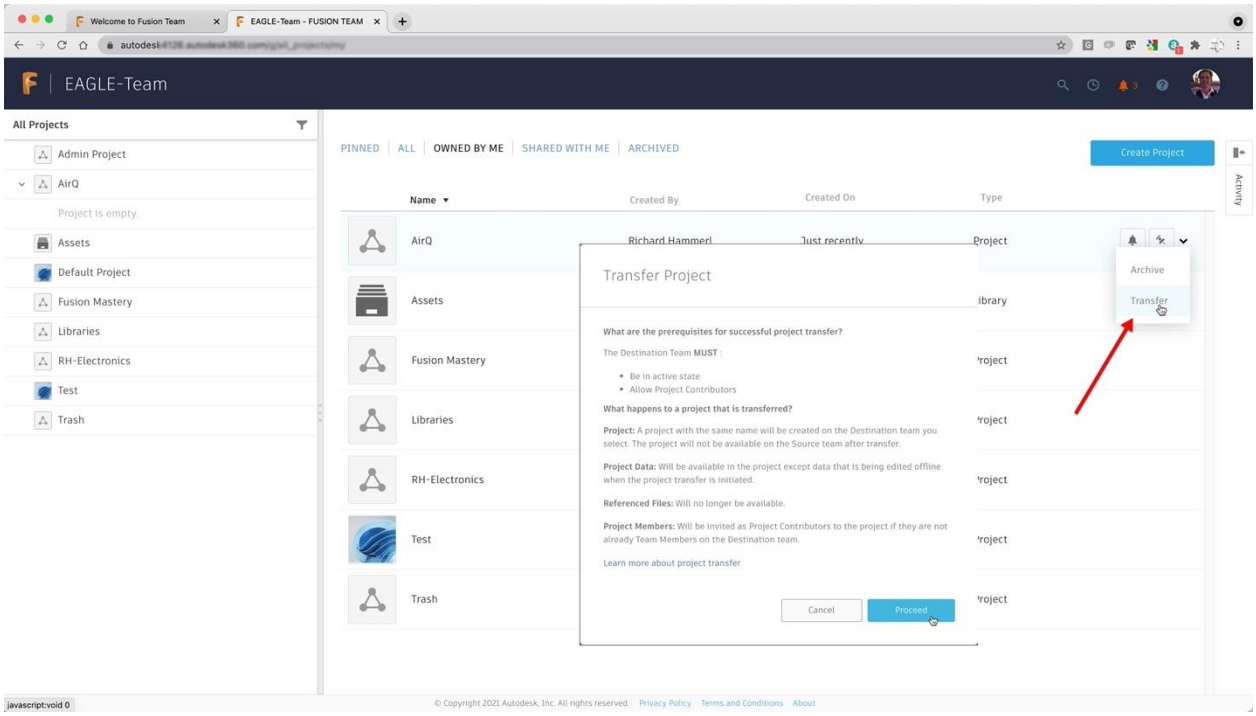

FIGURE 7 - TRANSFER PROJECT TO MELANIE'S TEAM HUB

Now both are working in a common environment and communicate directly via Fusion Team. Melanie made a comment and showed Richard where the PCB has to be positioned.

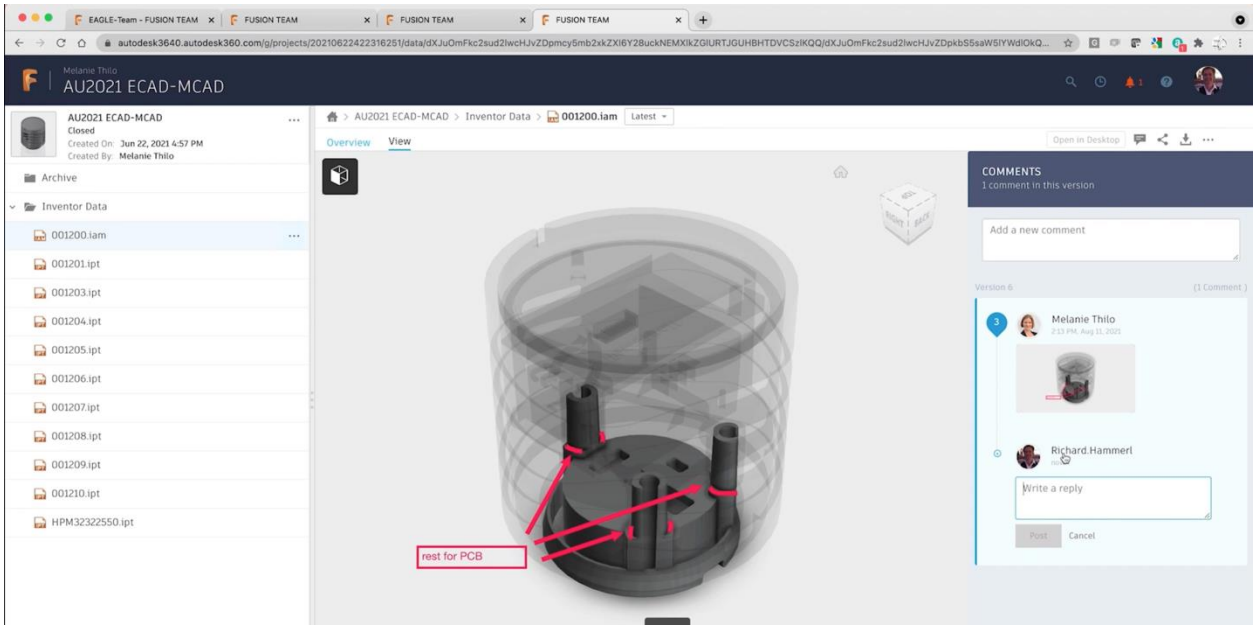

FIGURE 8 - FUSION TEAM ALLOWS EASY COMMUNICATION BETWEEN TEAM MEMBERS

Richard opens Melanie's Inventor data directly in Fusion 360 and works out the final board geometry in the mechanical design environment. In our demo he draws a sketch at the position Melanie showed him in her comment.

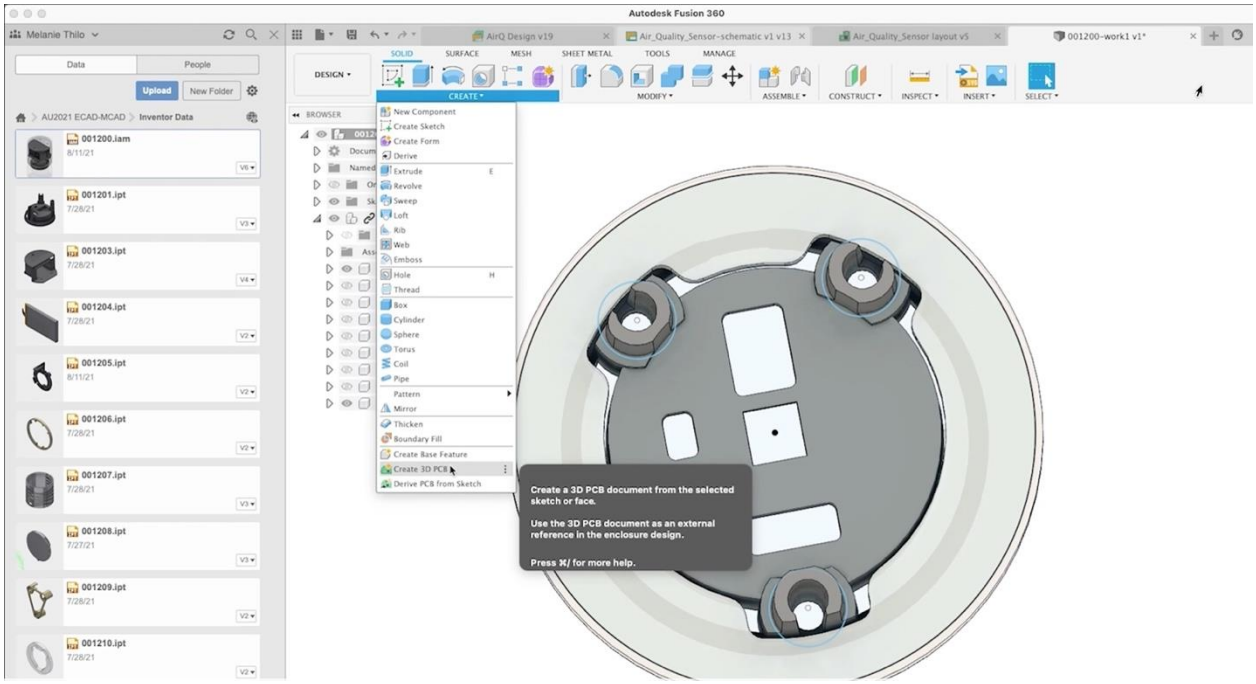

FIGURE 9 - CREATE 3D PCB FROM SKETCH

Fusion allows to create a 3D PCB from the sketch and Richard links it to his 2D PCB.

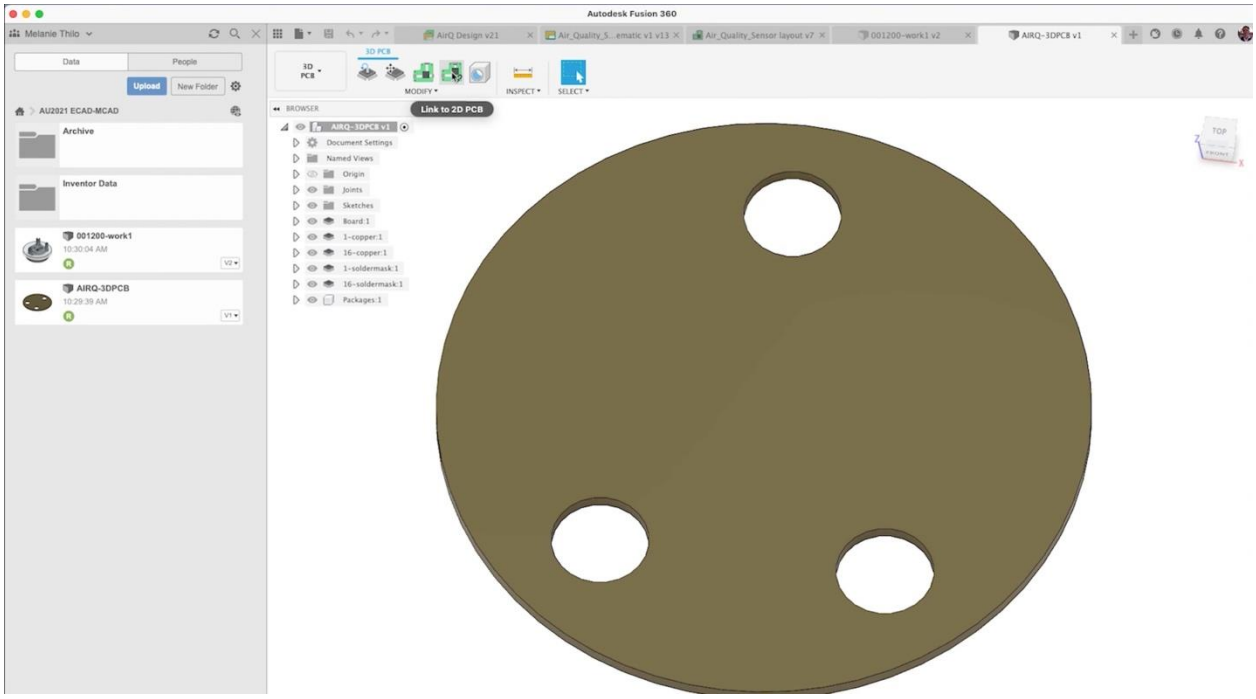

FIGURE 10 - THE BARE 3D PCB EXTRACTED FROM A SKETCH

The board contour template is replaced by the final 3D geometry. Now the layout design can begin. As soon as the layout has been finished, Richard pushes it back to the 3D PCB.

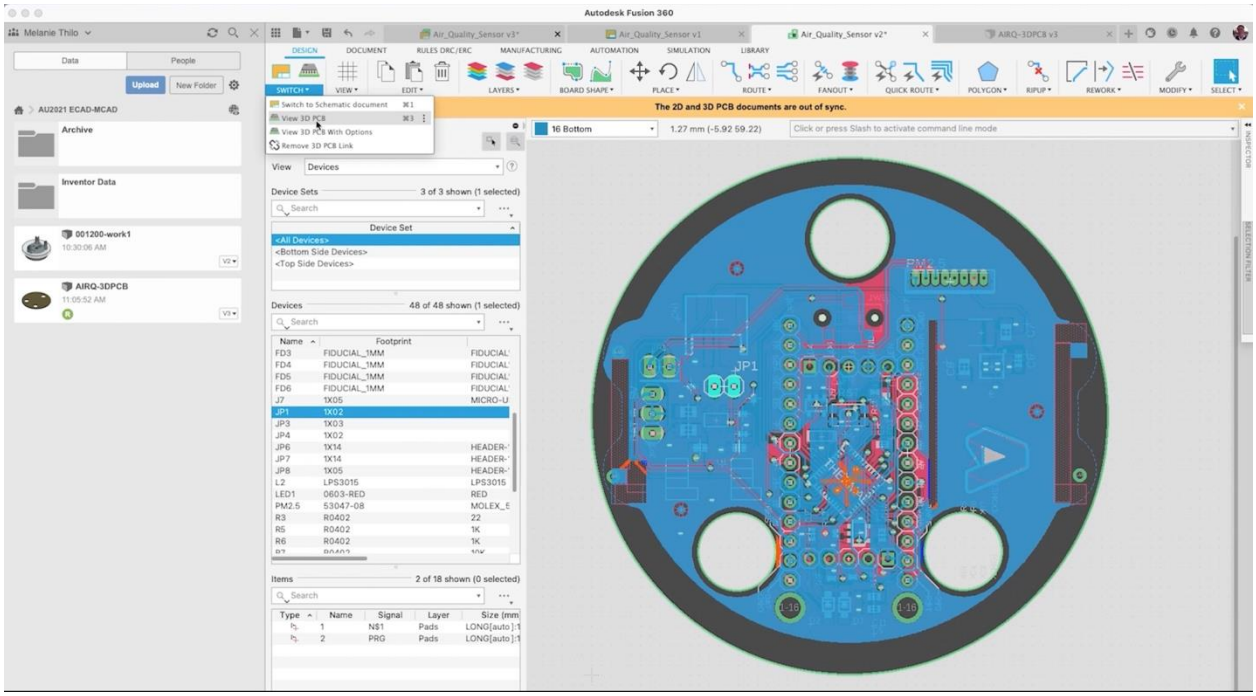

FIGURE 11 - THE FINAL LAYOUT IN THE 2D PCB EDITOR READY TO PUSH TO 3D

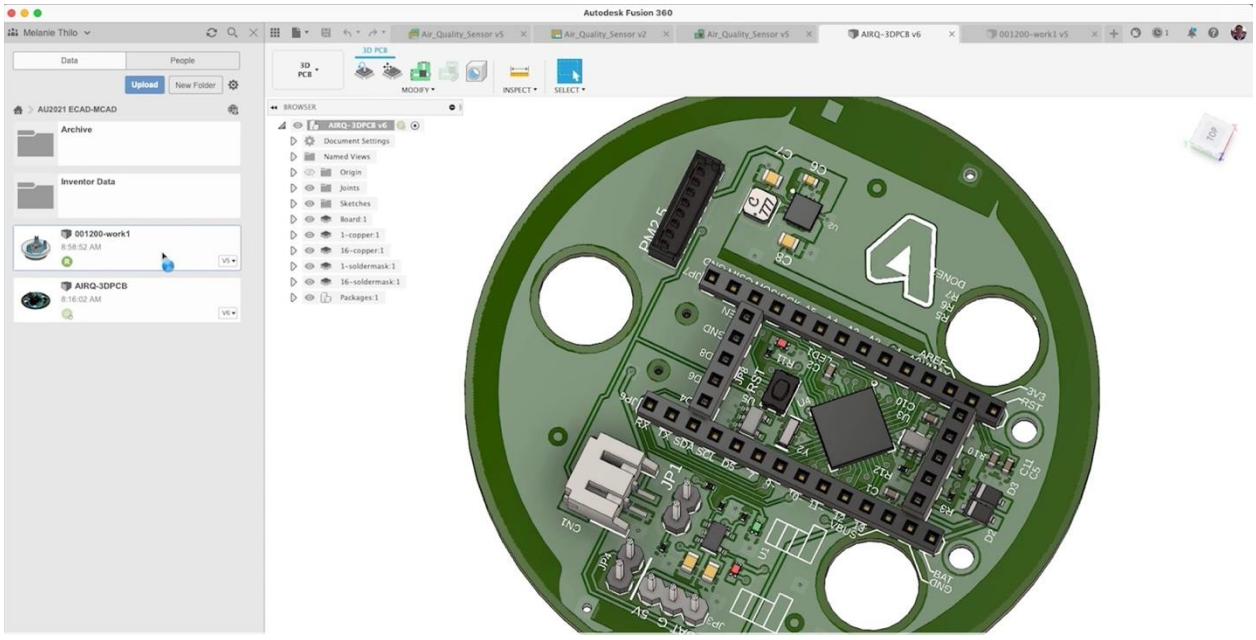

FIGURE 12 - FINAL 3D PCB

Now Richard inserts the 3D PCB into Melanie's Inventor drawing. As soon as it is saved with Fusion 360, Vault syncs the data and is available for Melanie in Inventor.

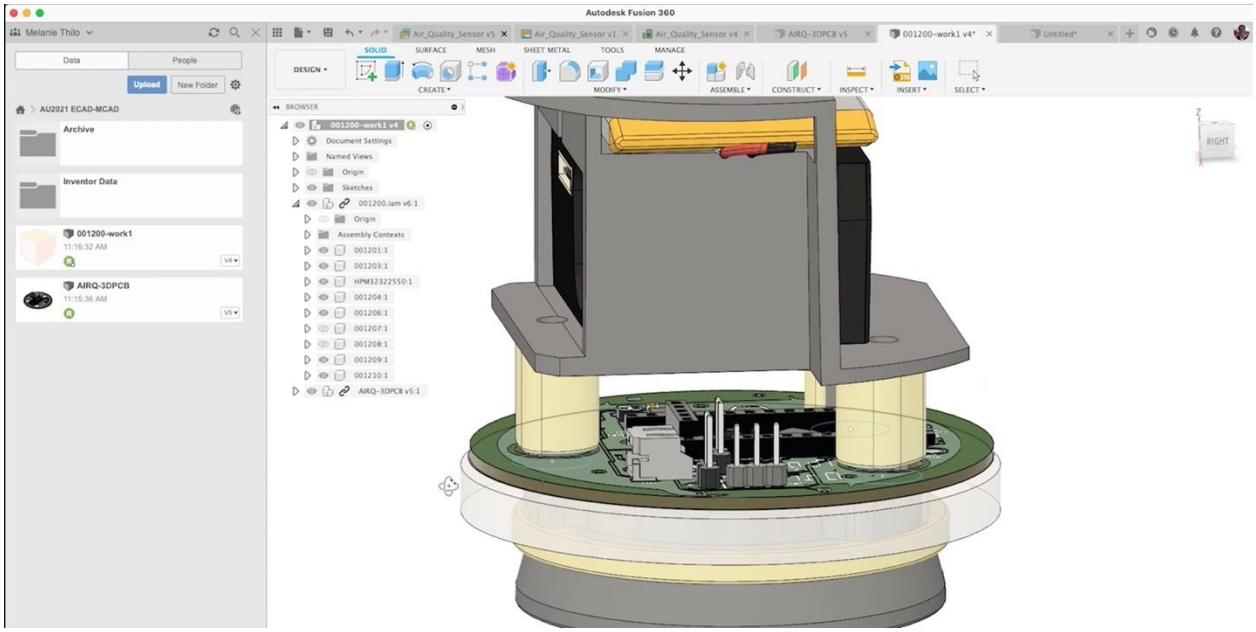

FIGURE 13 - THE FULL ASSEMBLY IN FUSION

For a flawless collaboration Melanie and Richard use Fusion Team. Team members easily have access to a project through a web browser. They can investigate the design, check progress, do some commenting and redlining in real time.
In our demo project, Richard found a small problem with fixing the printed circuits board in the product. Melanie thought the PCB had a thickness of 2mm, but it's about 1,6mm only. Richard notifies Melanie a comment in Fusion Team.

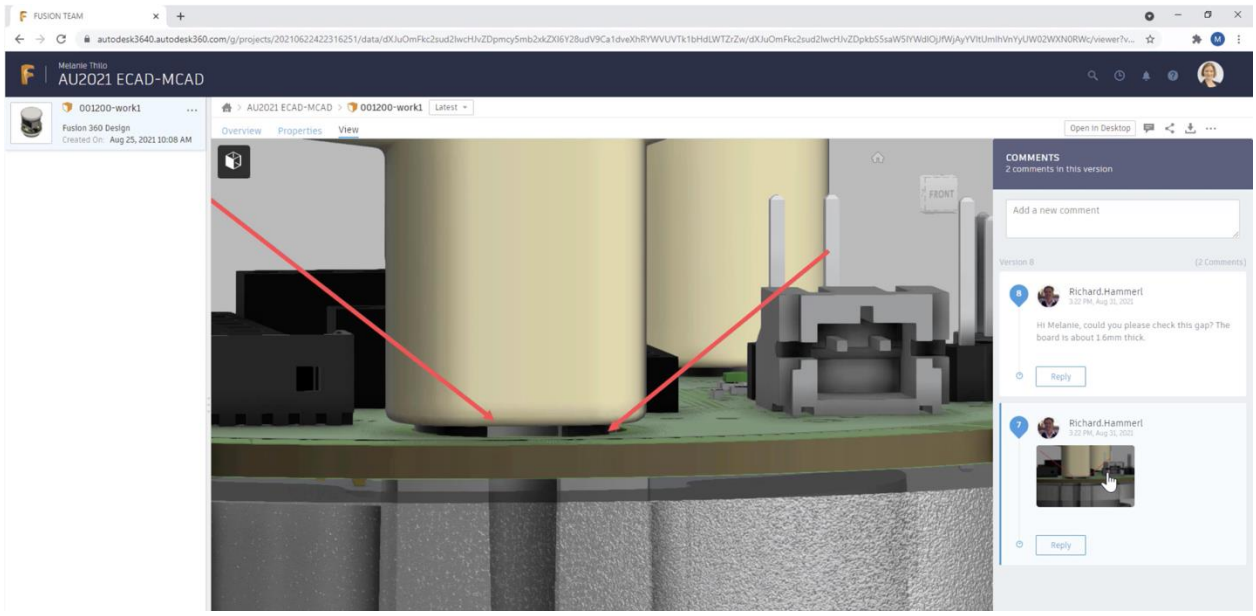

FIGURE 14 - COLLABORATION IN FUSION TEAM

Melanie imports the 3D PCB into Inventor. She chooses to import it as a Reference Model which directly links it to the Fusion data. As soon as Richard makes changes in the 3D PCB, Melanie will see the latest version automatically in Inventor. There is no need to convert data or send files with the latest version back and forth.

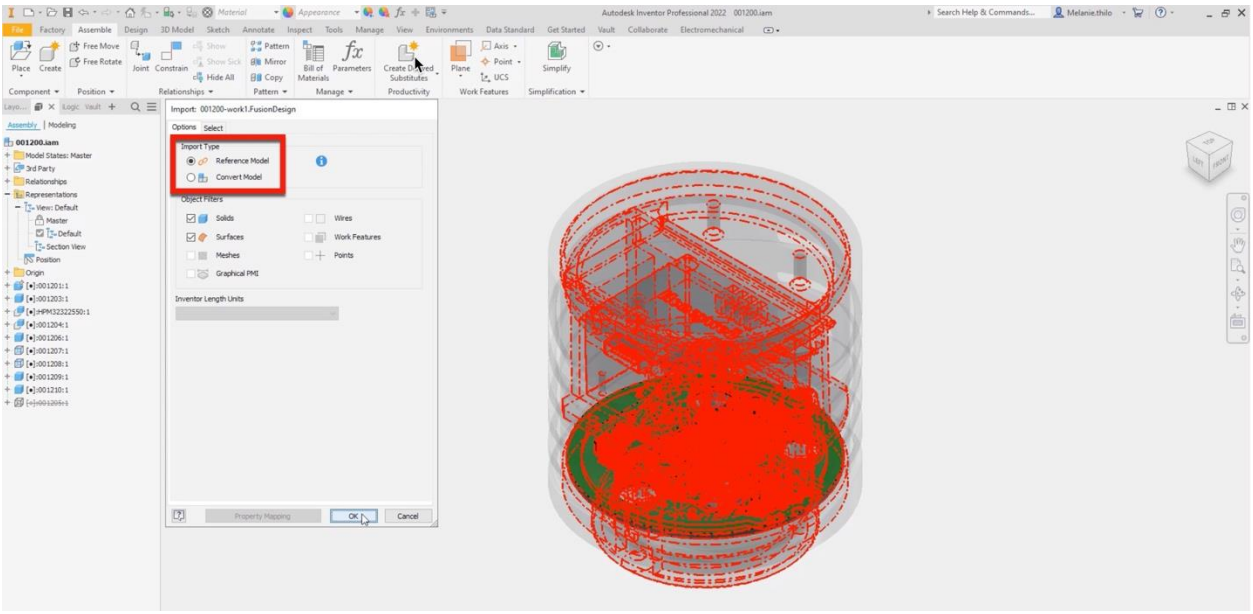

FIGURE 15 - IMPORTING THE 3D PCB INTO INVENTOR

Melanie checks the gap between PCB and the holders in the product and changes the holder design. Now she saves the file and checks in the latest version. It will be synced automatically to Fusion Team and Richard will also get the latest version of the design. This all happens automatically in the background.

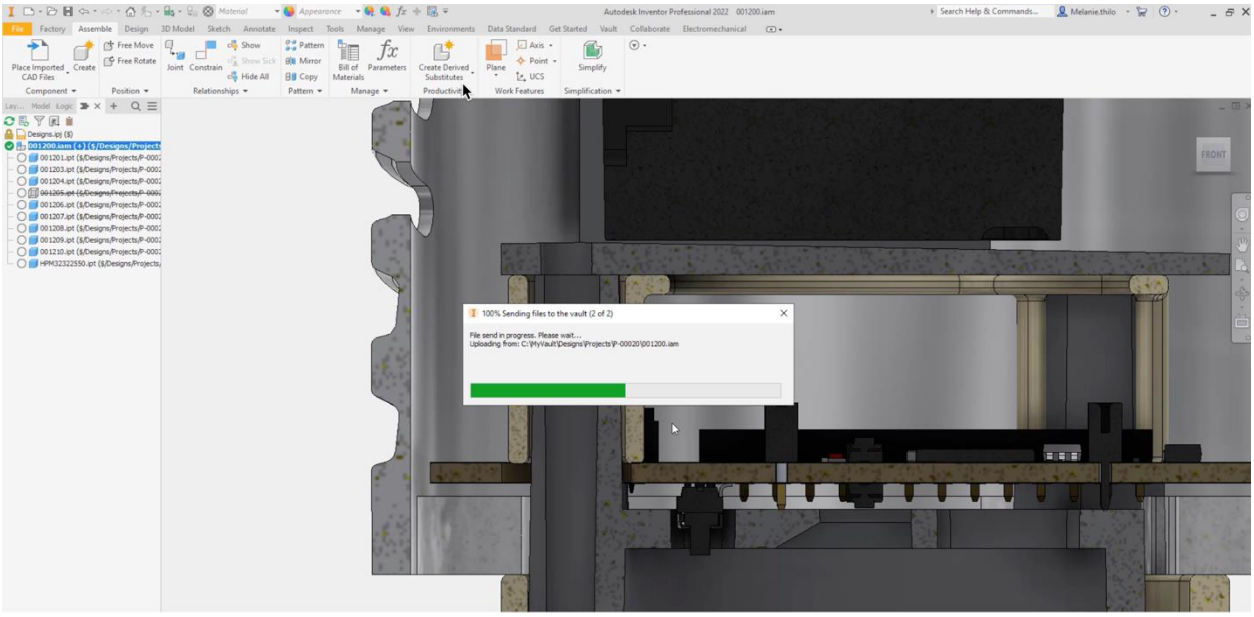

FIGURE 16 - SAVING THE MODIFIED DESIGN SYNCS IT AUTOMATICALLY TO FUSION TEAM

In this whole workflow, we never had to convert data and we did not send emails. It's a fully consistent workflow which addresses all the typical design challenges.

What we learned as we set up the Demo

1. Define one Project as Single Source of Truth and give all Team Members access before you start working. So, you do not have to transfer data from one Hub to another Hub.
2. Project Sync is a great feature to use Vault and Fusion Team as one Platform.
3. Creating a *Work* Dataset in Fusion 360 has many advantages
    a. Insert the PCB easily at the right position in Inventor
    b. Have the complete design in Fusion
    c. Avoid circular references

Wrap Up

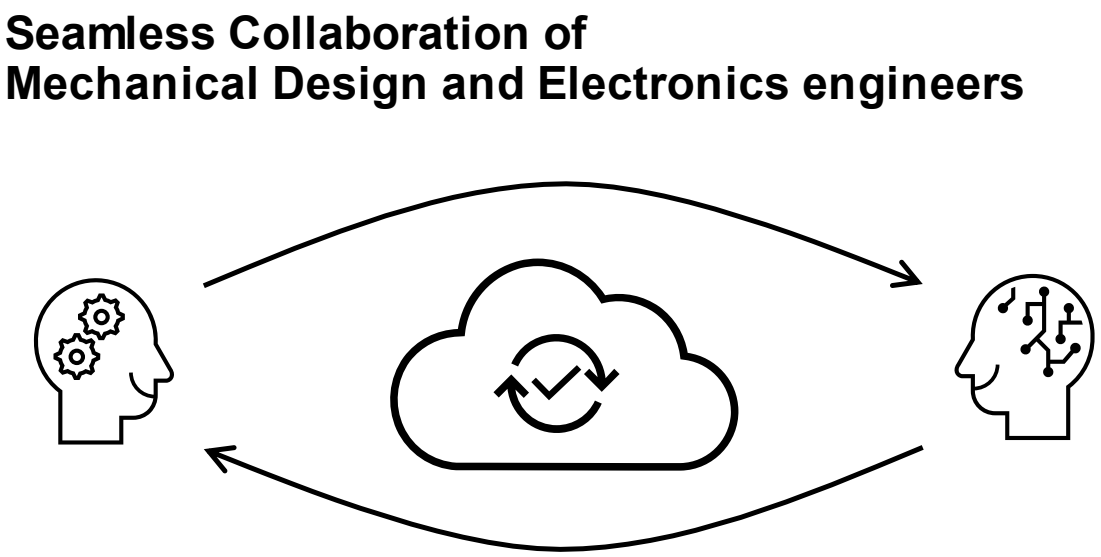

FIGURE 17 – SEAMLESS COLLABORATION OF MECHANICAL AND ELECTRONIC DESIGN

With the shown workflow you all collaborate in a design environment that meets both the electrical and mechanical requirements of product development. On this Data Centric Platform error-prone data conversions are history. Be confident that you are working with the most recent version of your electrical and mechanical design. With the bi-directional cooperation you can quickly respond to design changes made by your colleagues, and easily share your own changes as well.

Collaboration has never been easier!

Helpful Links & additional Resources

Inventor

Manufacturing - Mechanical Engineering
https://customersuccess.autodesk.com/disciplines/mechanical

Autodesk Inventor YouTube Channel
https://www.youtube.com/user/AutodeskMFG

Inventor Blog
https://blogs.autodesk.com/inventor/

Vault

Vault-based Collaboration
https://customersuccess.autodesk.com/disciplines/mechanical/challenges/vault-based-collaboration

Vault Blog
https://blogs.autodesk.com/vault/

Fusion 360

Design Collaboration with Fusion Team
https://customersuccess.autodesk.com/disciplines/mechanical/challenges/design-collaboration-with-fusion-team

FUSION 360 for electronics engineers
https://www.autodesk.com/products/fusion-360/electronics-engineer

Fusion Team
https://www.autodesk.com/products/fusion-360/features#collaboration

YouTube Channel Electronics Design
https://www.youtube.com/playlist?list=PLmA_xUT-8Ull0k9YsKK23onh_0VV2_DP5

360 LIVE: Getting Started with Fusion 360 electronics
https://www.youtube.com/watch?v=eadcyToMdLg

Face the future with Fusion Electronics playlist
https://www.youtube.com/playlist?list=PL_ir_ijcoYt108_mf41POto9slMPNVo6h

Fusion Electronics Dive in playlist
https://youtube.com/playlist?list=PL_ir_ijcoYt1o-Xu003gnH4_b02ZLwTB5

Blog: How to Edit Your Autodesk Eagle Electronic Design Files With Fusion 360
https://www.autodesk.com/products/fusion-360/blog/edit-your-autodesk-eagle-electronic-design-files-with-fusion-360/

Fusion 360 Electronics Blog
https://www.autodesk.com/products/fusion-360/blog#electrical-engineering