

Heterogeneous CAD

Interoperability in a

Synchronous Collaborative

Environment

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Brigham Young University site of the
NSF center for e-Design

GLOBAL PRODUCT DATA INTEROPERABILITY SUMMIT 2015



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Awareness is the reason drafting tables were great for collaboration.

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- **Multi-user Heterogeneous CAD (Interoperability)** - Complex model/assembly and related data can be *simultaneously* edited by many clients using different applications.
- **Conflict Feedback Loop** – Design conflicts caused by asynchronous collaboration that cause re-work
- **Translation Feedback Loop** - Errors and data loss in a data translation process that cause re-work
- **Collaborative, Parallel Design Workflows** – working simultaneously in a shared virtual environment

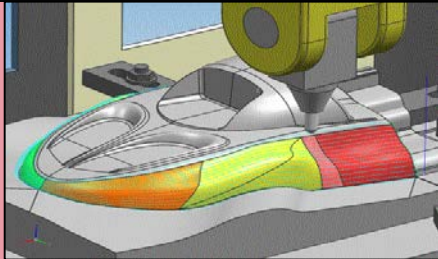
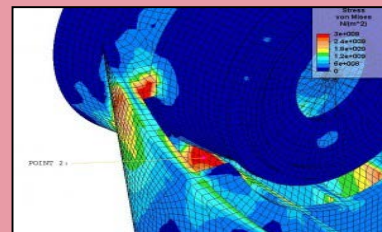
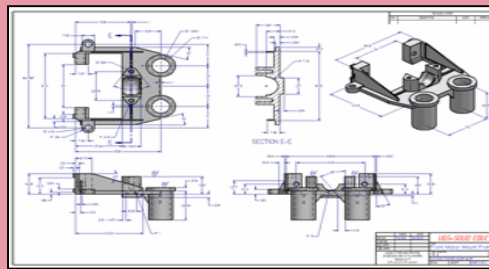
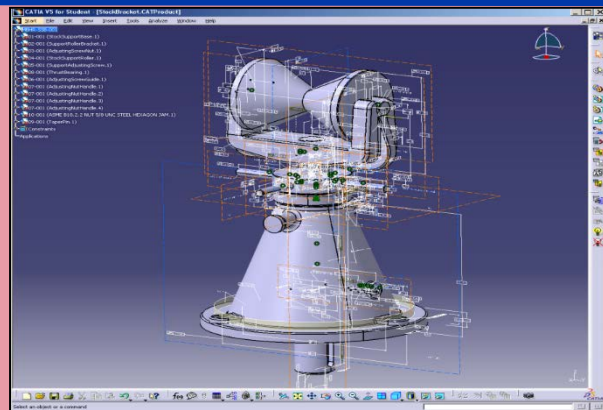
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Collaboration Today

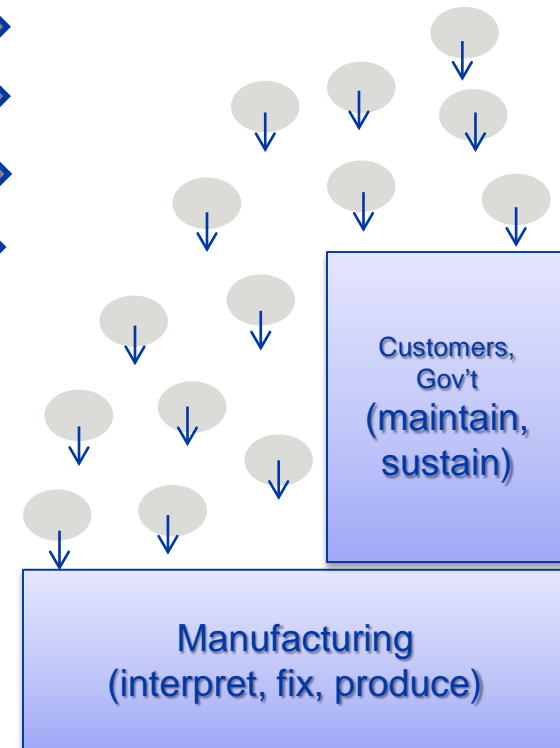
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- Models decompose into product data of many forms and types!
 - Product applications like CAD, CAE, CAM are not collaborative!
 - Applications, disciplines and data collect together!

Data snowflakes
(no 2 are the same!)



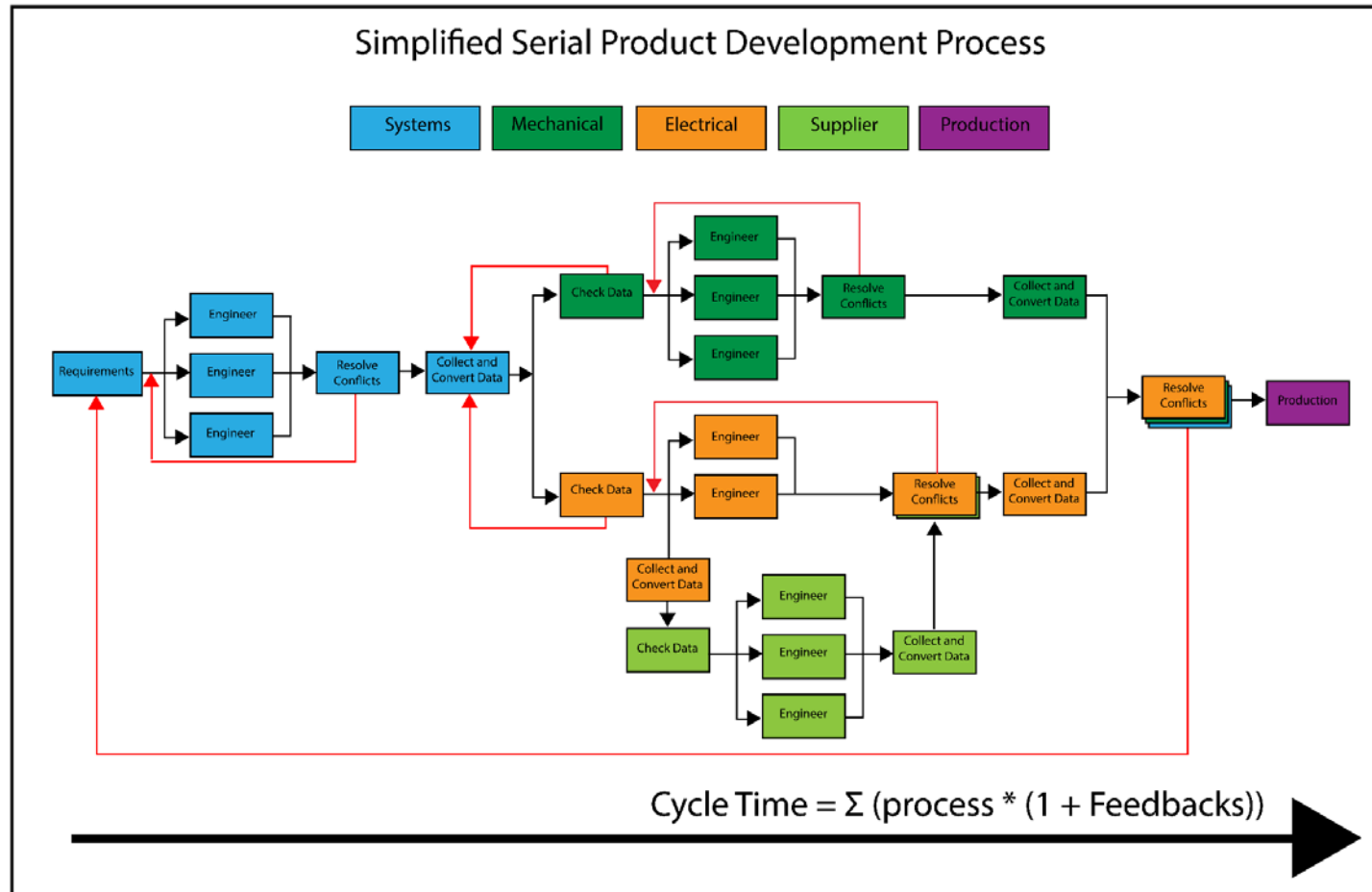
Supply Chain (model translation and data conversion)



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A Few Problems Facing Our Industry Partners

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Collaborative awareness

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- We have learned a lot about synchronous collaboration from video games.

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Collaborative Awareness

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Why Awareness Works

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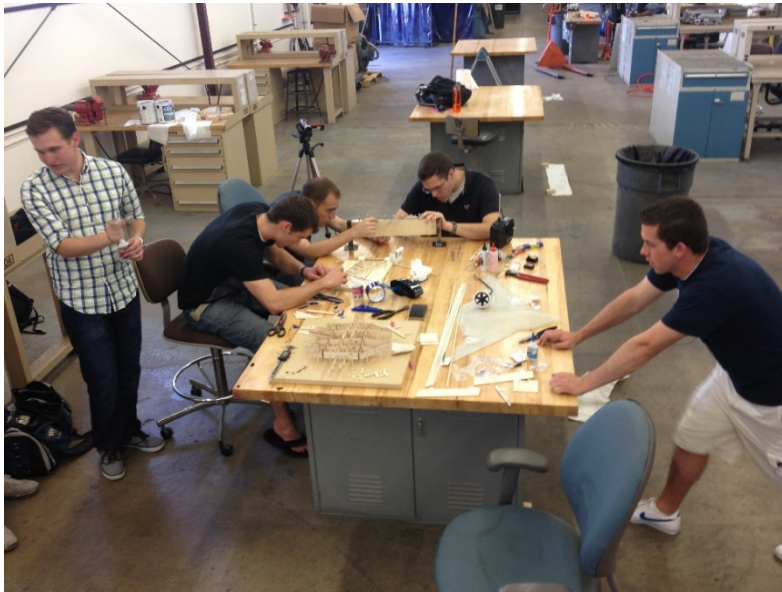
- Where would you sit?
- This is not a trick question!
- Social situations like this are easy to navigate.



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Why Awareness Works

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- In a real-world project, it is very easy to see what needs to be done and where you can contribute.
- Individuals naturally work where they are needed.



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Awareness in the Past

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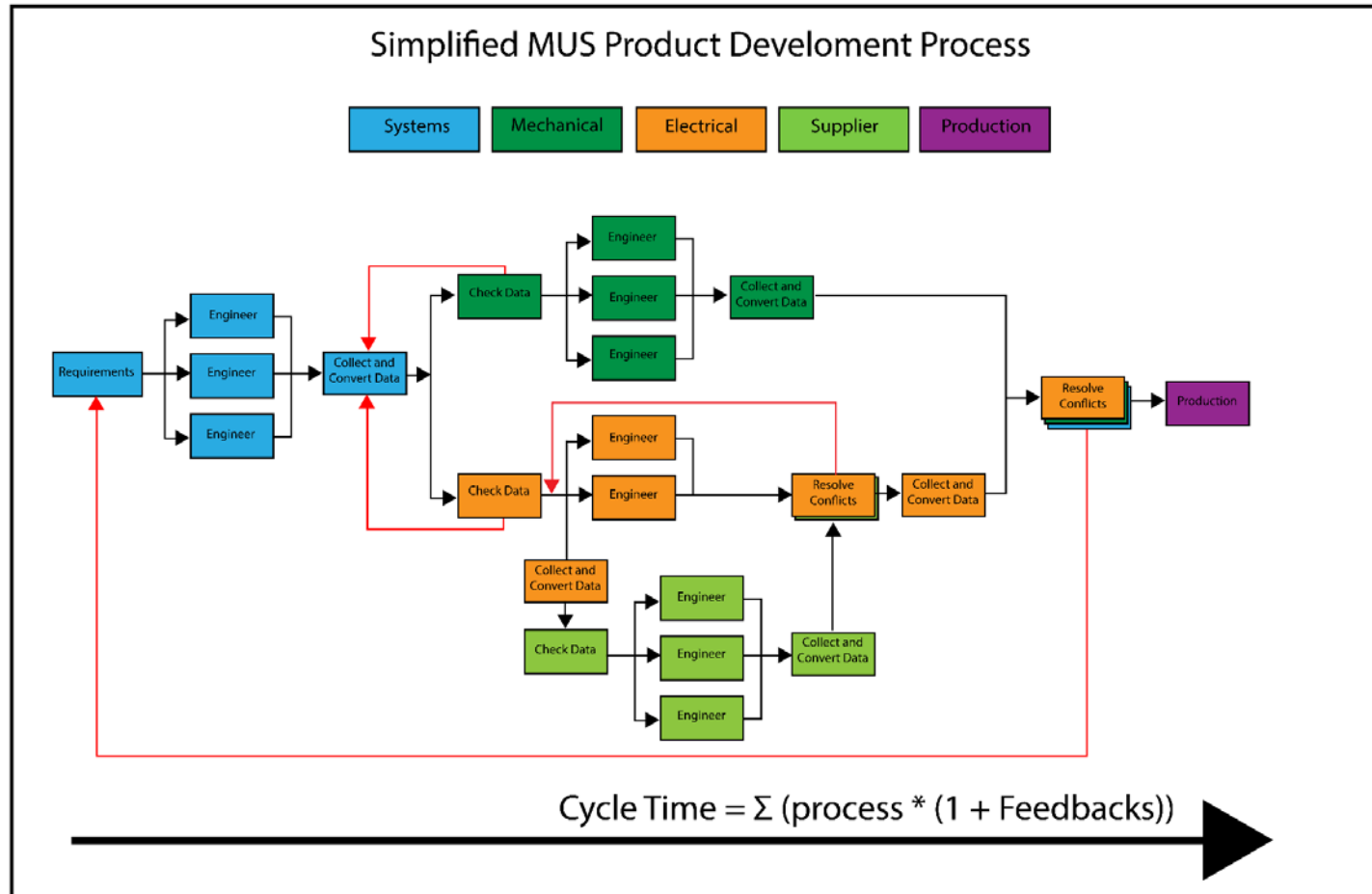
Awareness is the reason drafting tables were great for collaboration.



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NX Connect Brought Awareness to CAD

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One of our new interview-style videos

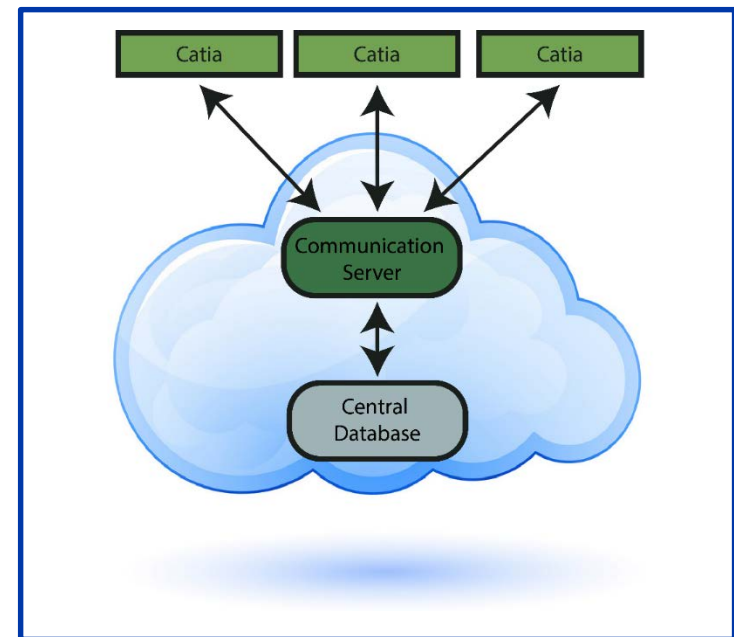
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How does Multi-user CAD work?

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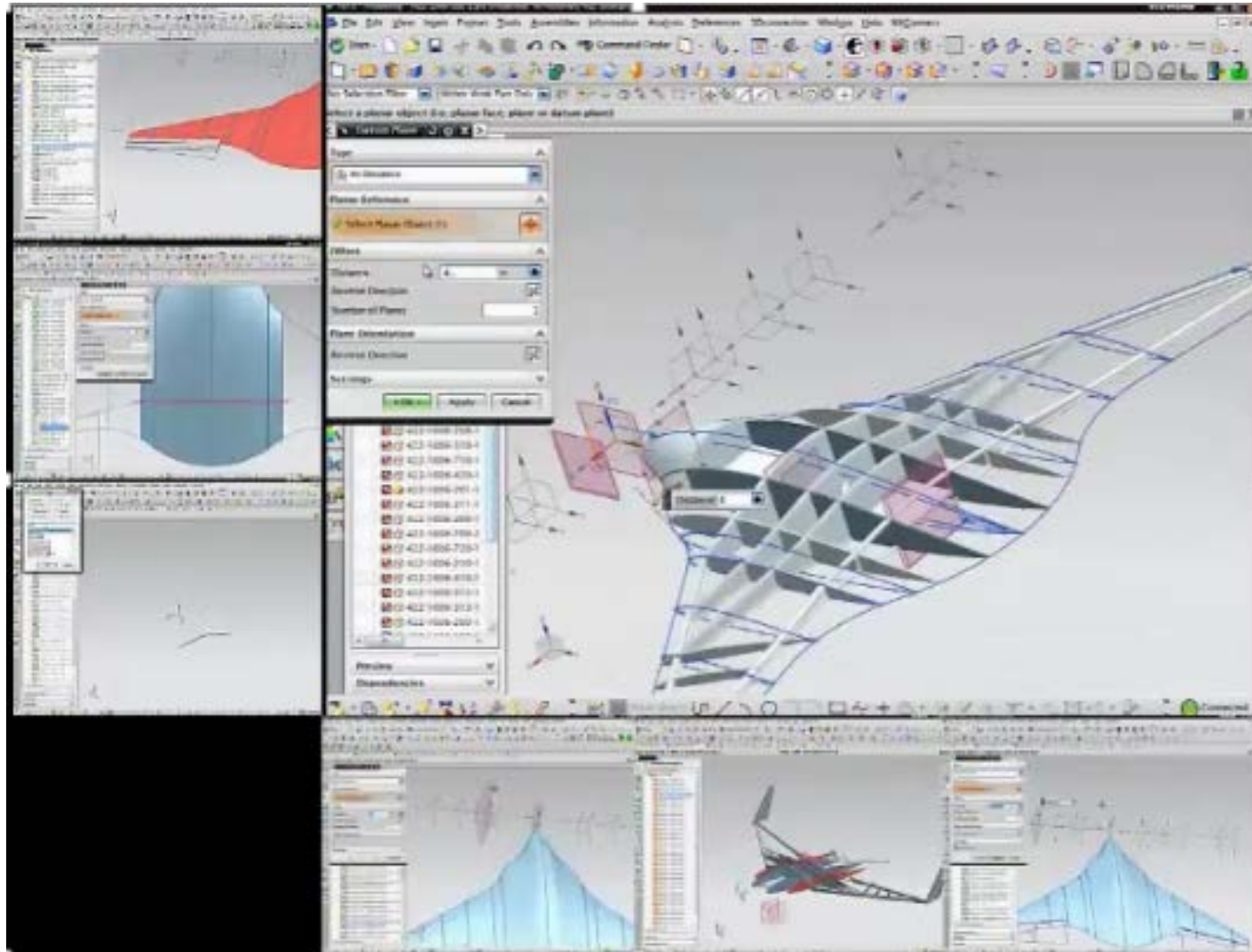
- Each user operation is captured by a client application.
- A server in the background is listening for changes.
- When a change arrives at the server, it is saved in our own format and a message is sent out to all clients.
- This is similar to the way online video games function.



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NXConnect Demo Video

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State of Multi-user IP and App

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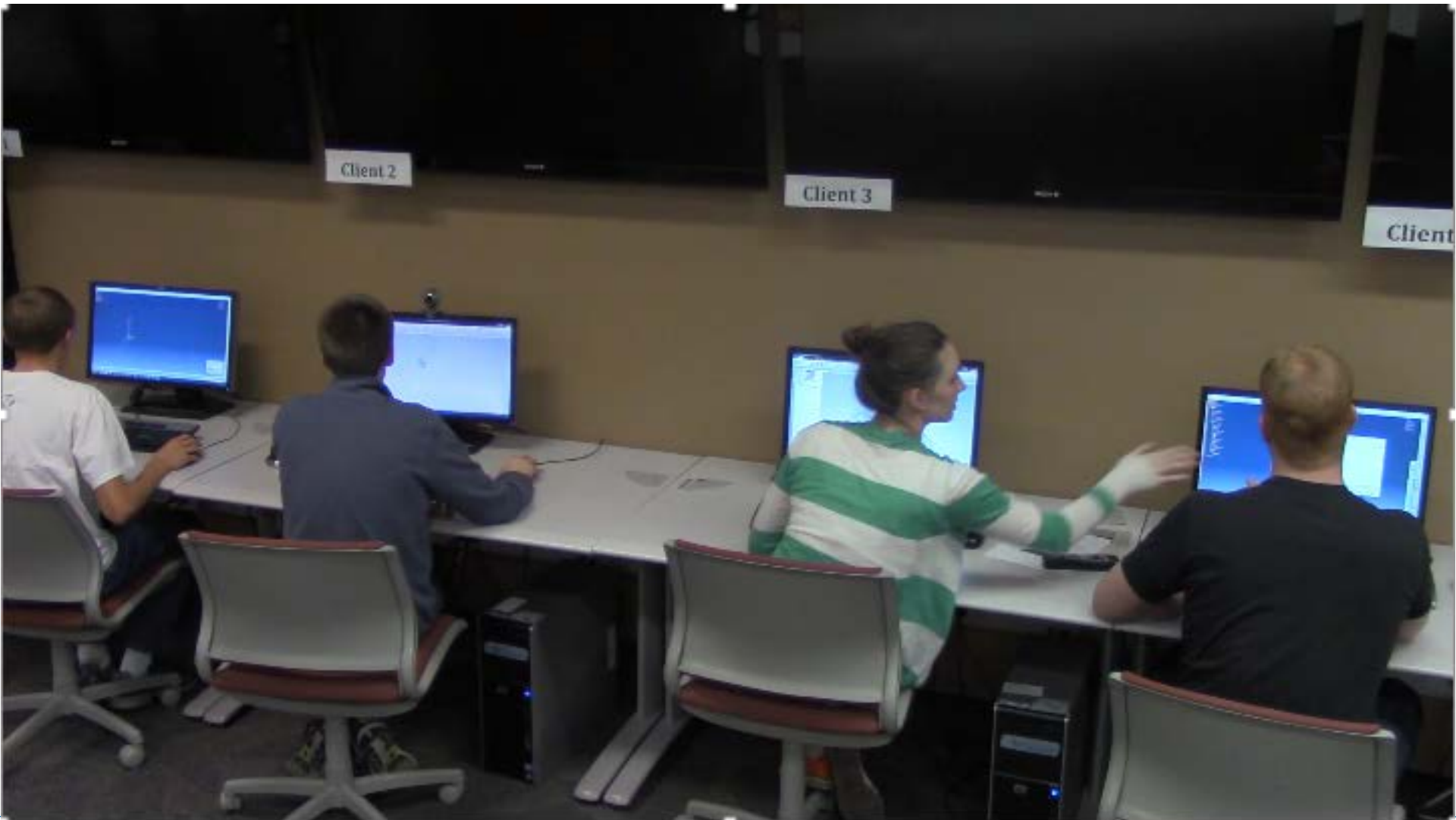
Prototype	BYU Name	TRL	IP
Siemens NX MUS CAD	NX Connect	4	Y
<u>PTC Creo MUS CAD</u>	<u>Creo Connect</u>	<u>3</u>	<u>Y</u>
CATIA MUS CAD (Dassault Systemes)	CATIA Connect	2	Y
AutoDesk Inventor MUS CAD	Inventor Connect	1-2	Y
Siemens MUS CAM	Siemens MU CAM	2	Y
MUS concept drawing & design rationale	Telestrator	2	Y
Siemens CAE	MU CAE	2	Y
MUS Team Organizer	Team Former	2	Y

- For more information contact:
Dave Brown, Associate Director
BYU Technology Transfer
dave_brown@byu.edu
(801) 422-4866

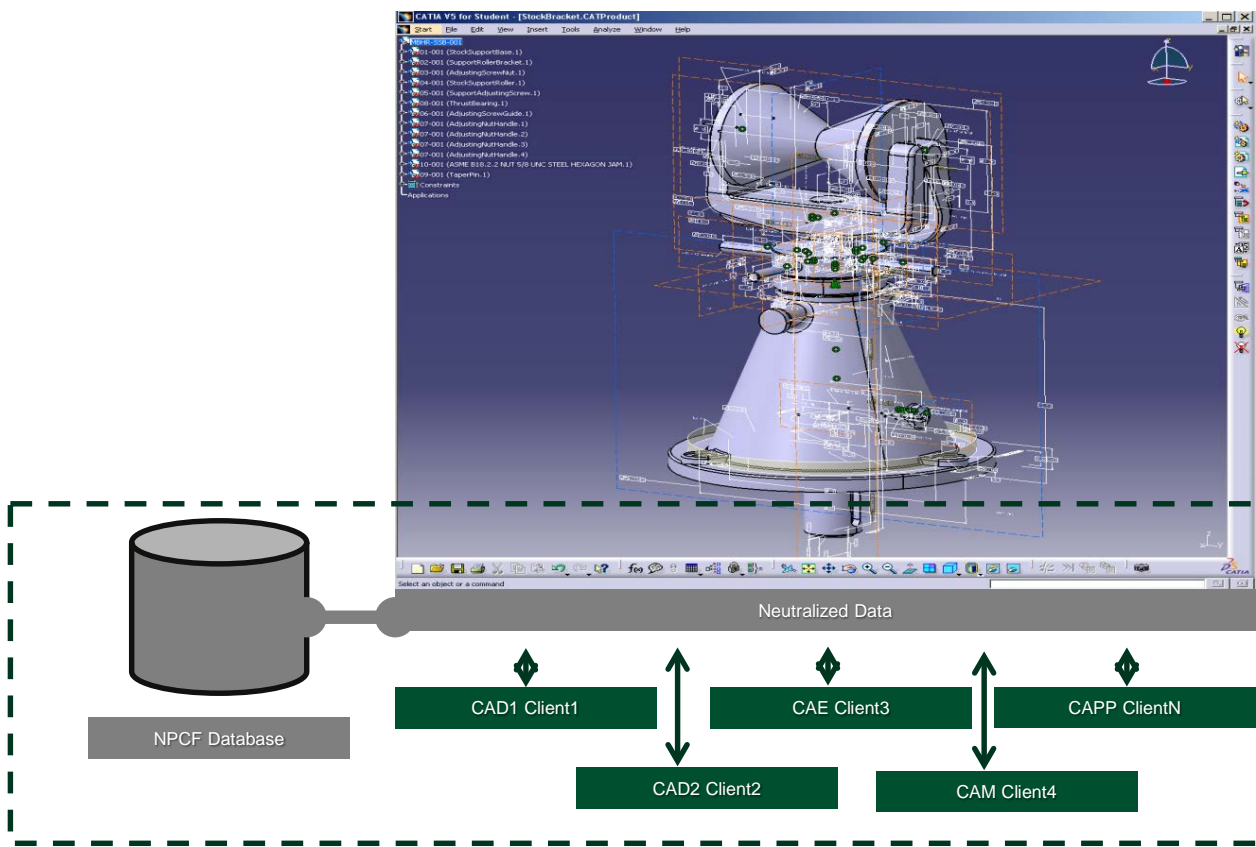
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The second interview style video

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Goal: Reduce feedback loops across the product enterprise by associating data with models



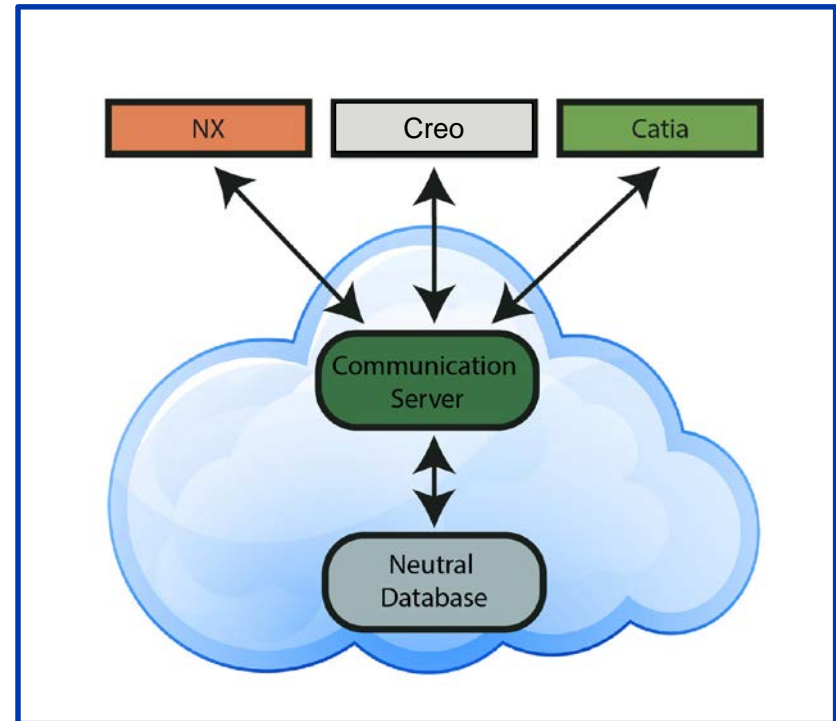
Interop neutralizes model data and promotes simultaneous collaboration; both reduce feedback loops!

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Heterogeneous Cloud

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- Almost the same architecture as multi-user CAD.
- Make the central database store the data in a neutral format.
- The key to this is like any other standardization.
- The key is an open, neutral format.
- This format must be feature based instead of geometry based.

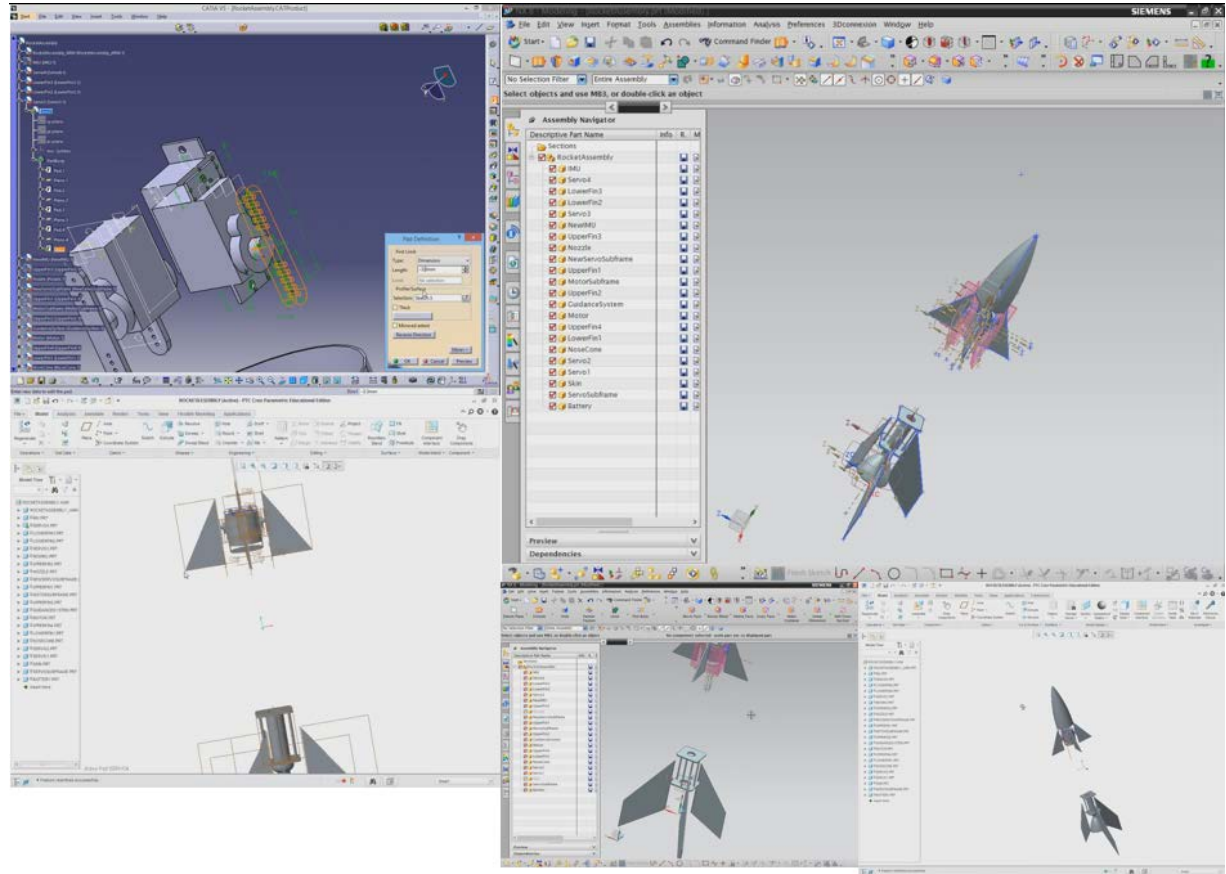


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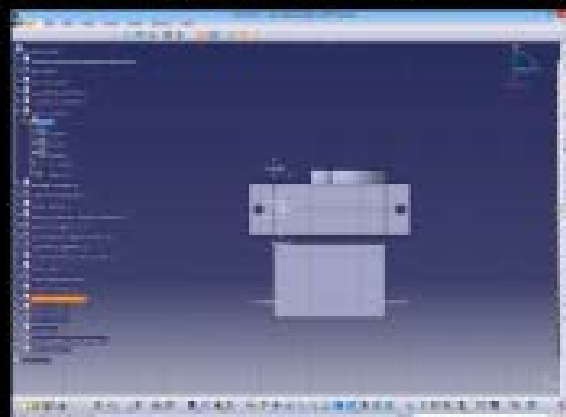
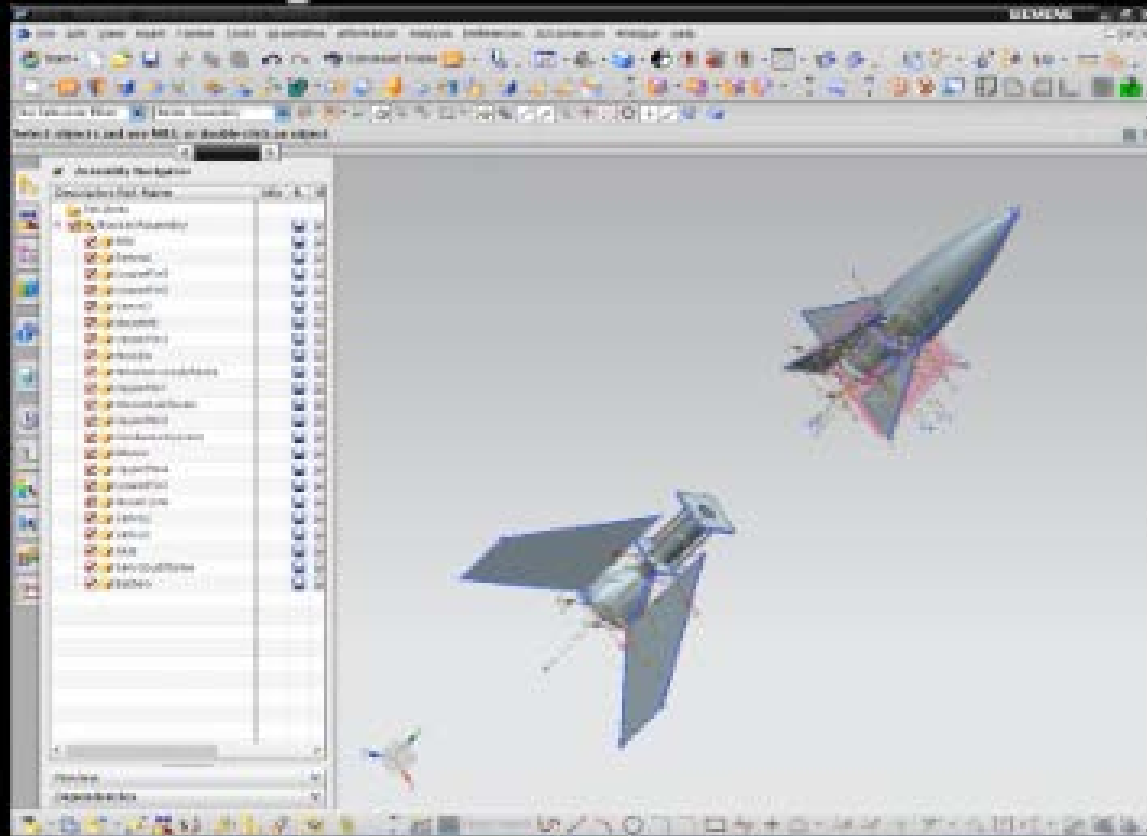
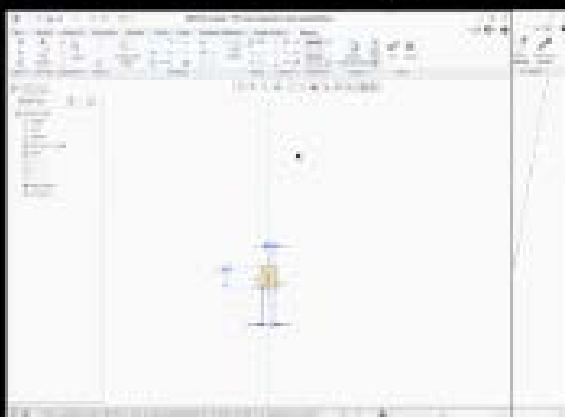
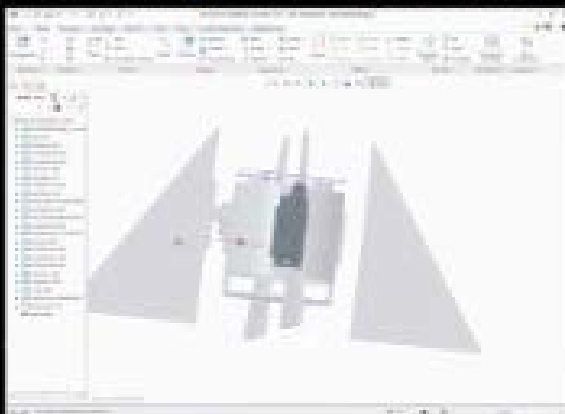
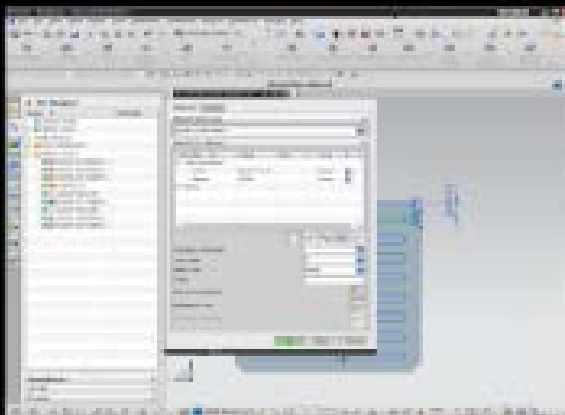
Current State

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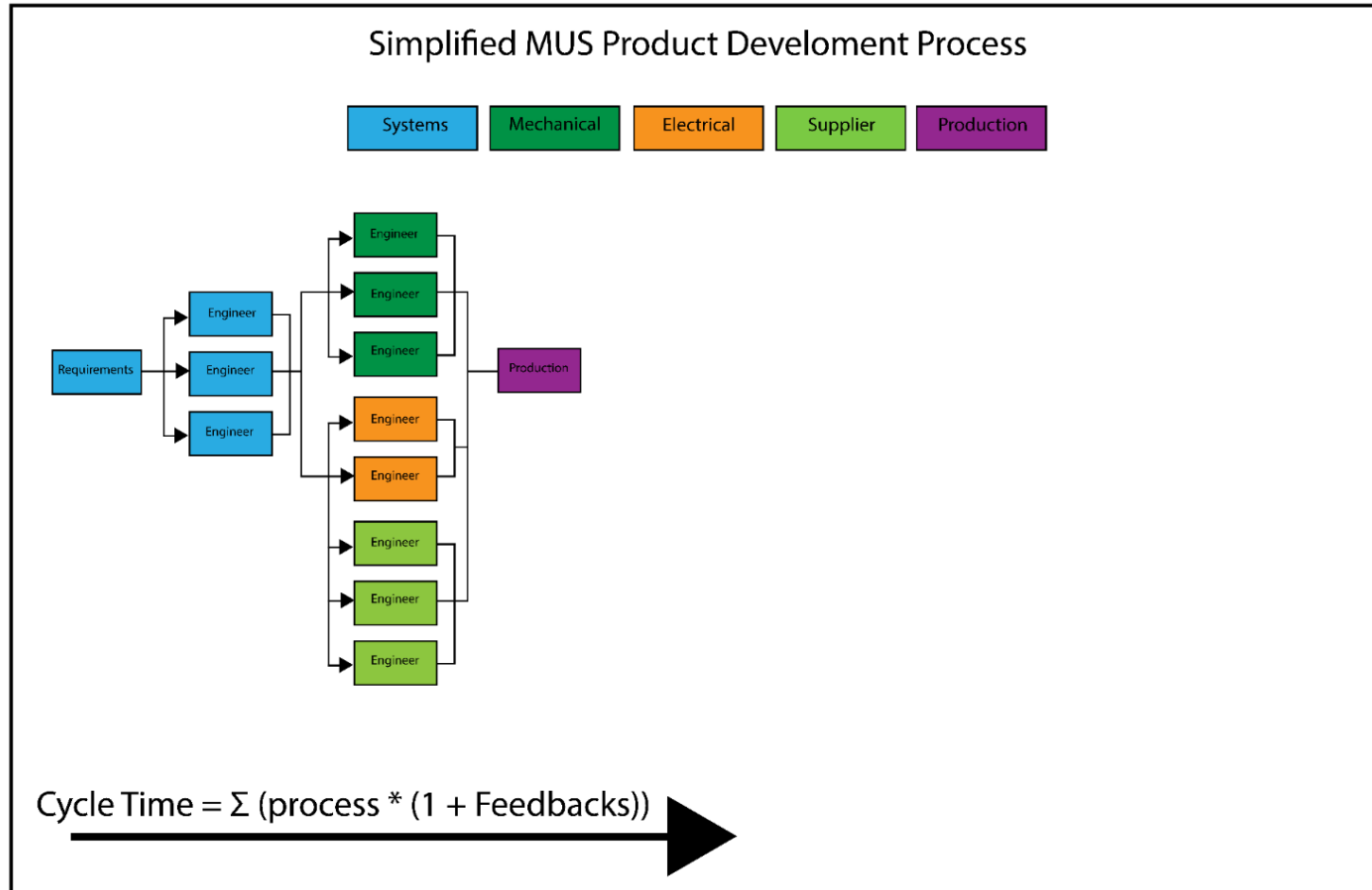
- **Coordinate Systems**
- **Offset Planes**
- **Sketches**
 - Line
 - Circle
 - Arc
- **Extrudes**
- **Revolves**
- **Assemblies**
- **7 simultaneous users**
- **20+ parts at once**



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