

# Welcome to Session 6

Global Product Data Interoperability Summit | 2020

**This Session is being recorded**

**All Attendees have been placed on 'mute'**

**If you have a question please place it in the 'chat' and make sure you select  
"To All Participants"**

**We will begin shortly**

**CAMSC**

**MBSE**

**ET/IT**

**3D MBD**

**DevOps**

**PLM Roadmap**

**PDES**

# Our Sponsors

Global Product Data Interoperability Summit | 2020



GPDIS 2020 PARTNERS



# Welcome to the 2020 GPDIS Virtual Sessions!

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## History and Focus of GPDIS

- Global Product Data Interoperability Summit (GPDIS) was formed in 2009. It was the consolidation of two conferences (Data Exchange and SOA Deep Dives) addressing integration technologies along with the non-proprietary exchange of data
- GPDIS functions as a communications hub for industry principals to foster knowledge through the exchange of ideas, solutions and methods.

## 2020 Theme: The Great Race of Digital Transformation

How is your model based enterprise today?

- Together we will explore digital transformation and what it will take us to FULLY achieve it. Using the Great Race as a metaphor, we will explore the building blocks of digital transformation and how interoperability will enable the digital transformation journey for industry.

CAMSC

MBSE

ET/IT

3D MBD

DevOps

PLM Roadmap

PDES

# Data Standards for Manufacturing 2020

David Odendahl, Technical Fellow  
The Boeing Company  
November 10, 2020  
RROI # 20-167269-ETT

GLOBAL PRODUCT DATA  
INTEROPERABILITY  
**S U M M I T**  
**2020**



**Virtual  
Sessions**

# Agenda

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- Your Speaker
- Why are we here?
- Product Definition
- Process Definition
- Cutter Assemblies
- Inspection
- Framework
- Questions

# Your Speaker

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## Boeing

- **1984-1985** Electronics Technician  
Rockwell, El Segundo
- **1985-1990** Maintenance Engineer  
Rockwell, El Segundo
- **1990-2005** Controls Engineer  
Rockwell/Boeing, Tulsa
- **2005-2017** CAD/CAM Development  
Boeing Puget Sound
- **2018-2020** Production Engineering  
Boeing Puget Sound

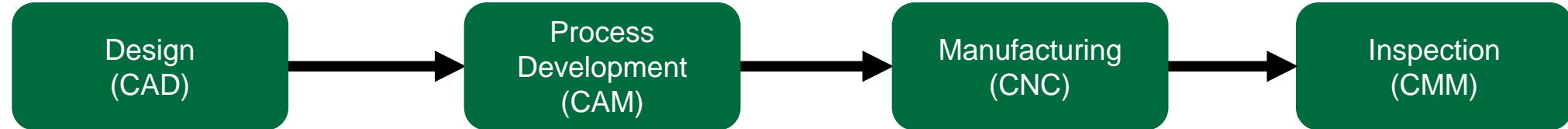
## Industry

- ISO TC184/SC4/WG15 (STEP Manufacturing)
- OMAC Machine Tool Workgroup



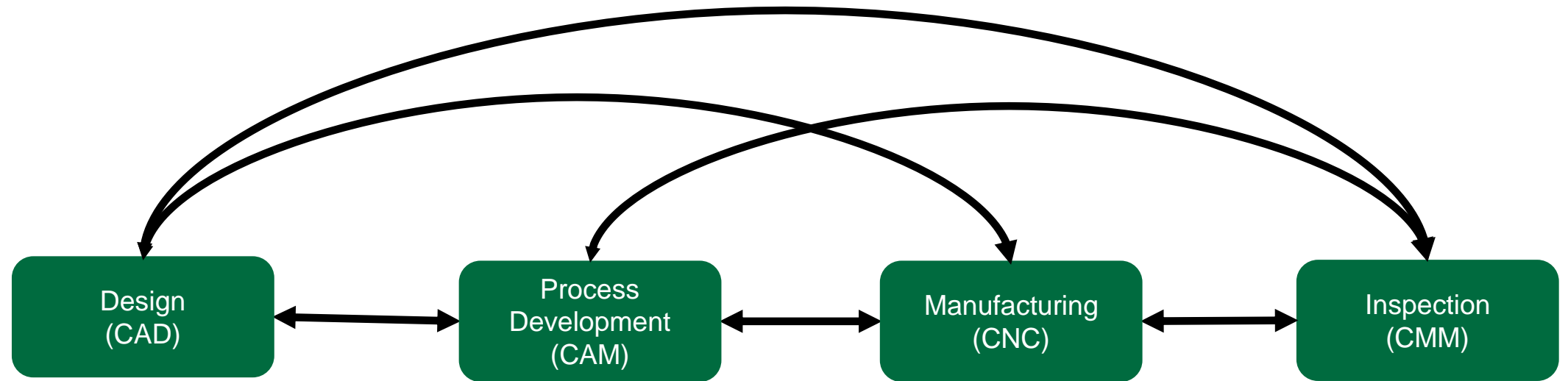
# Traditional CNC Manufacturing

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# Digital Thread CNC Manufacturing

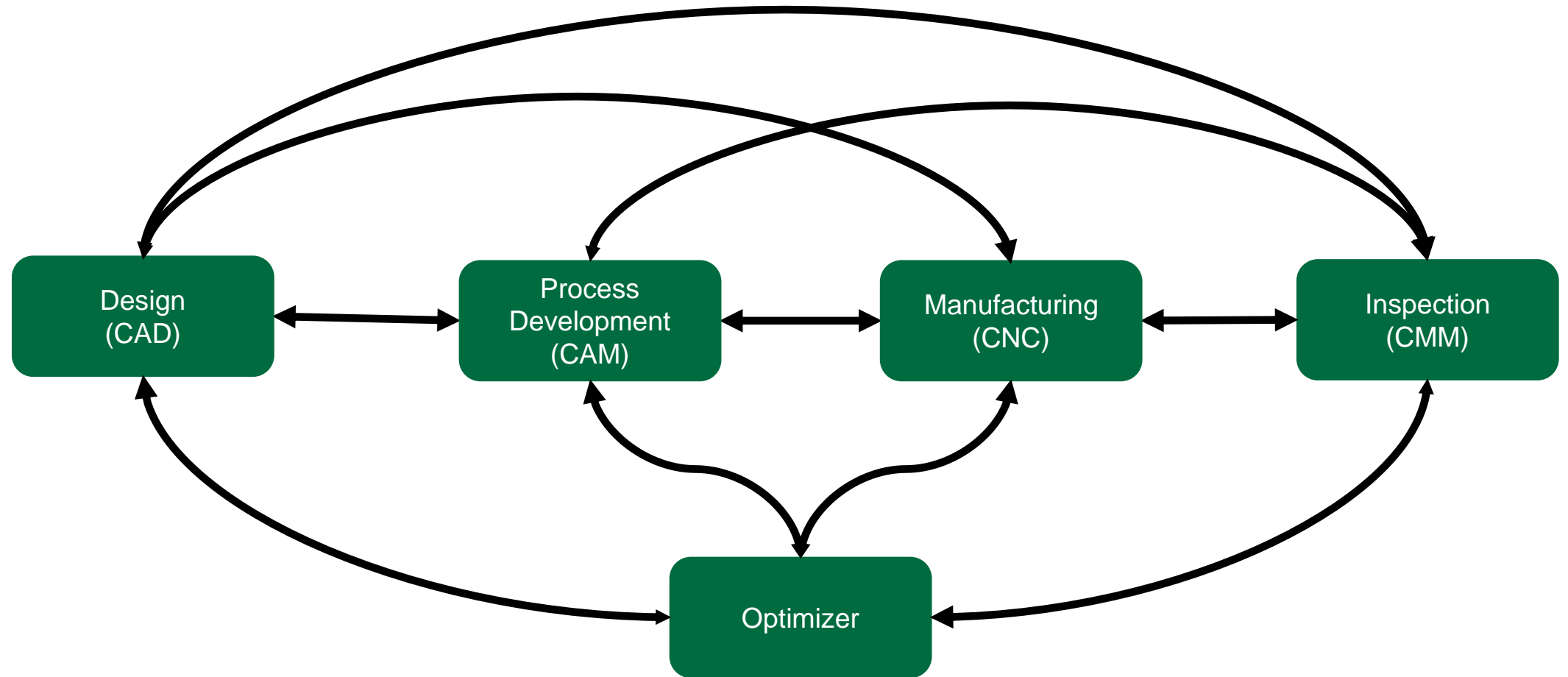
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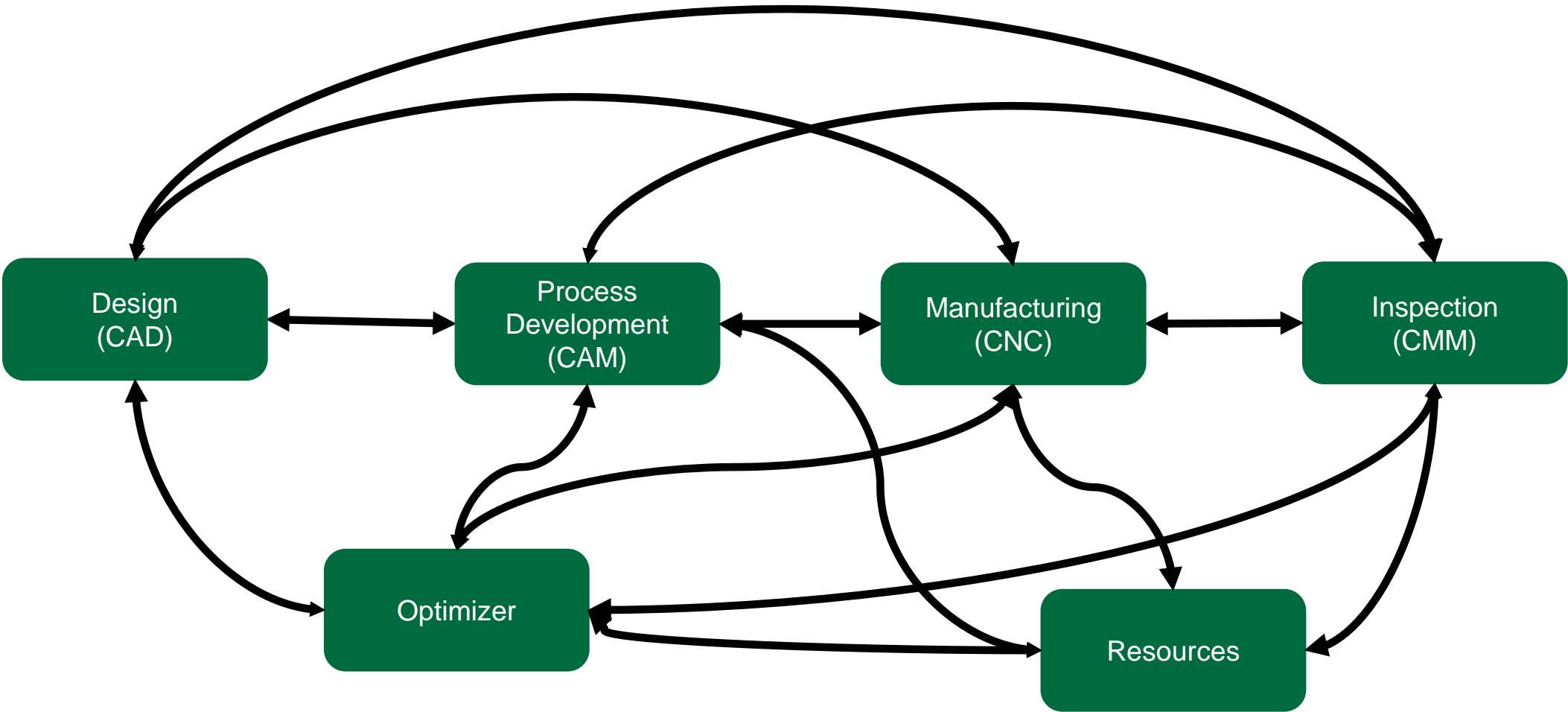
# Digital Thread CNC Manufacturing with Optimization

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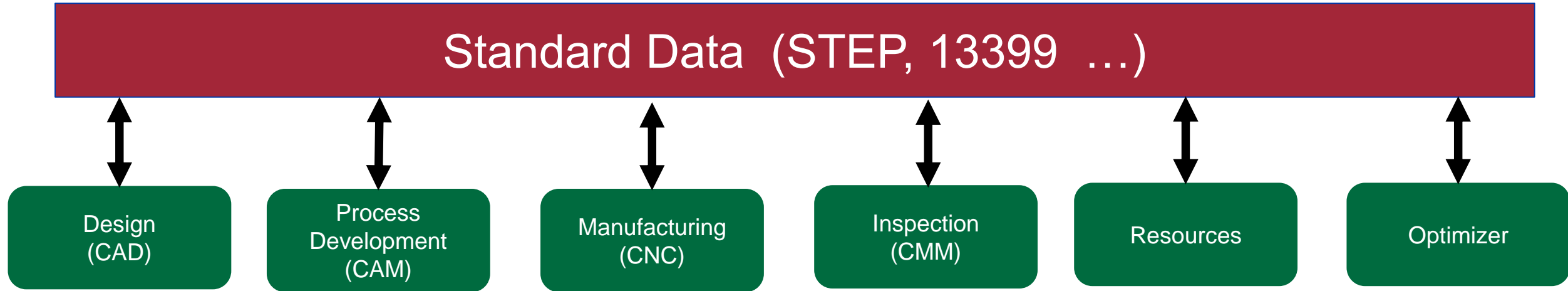
# Digital Thread CNC Manufacturing with Optimization and Manufacturing Resources

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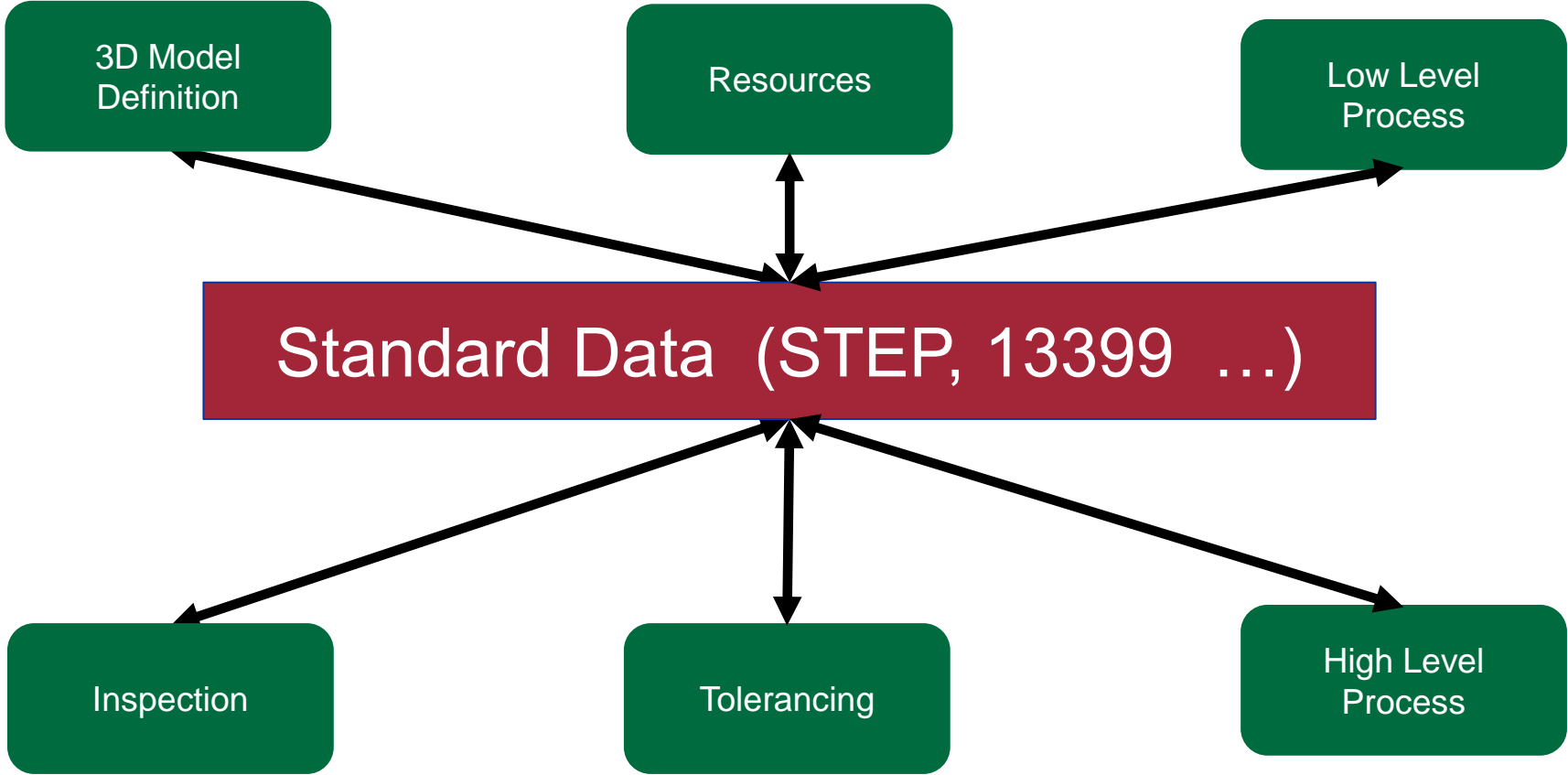
# Digital Thread CNC Manufacturing with Standards Resources

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# Digital Thread Contextual Relationships

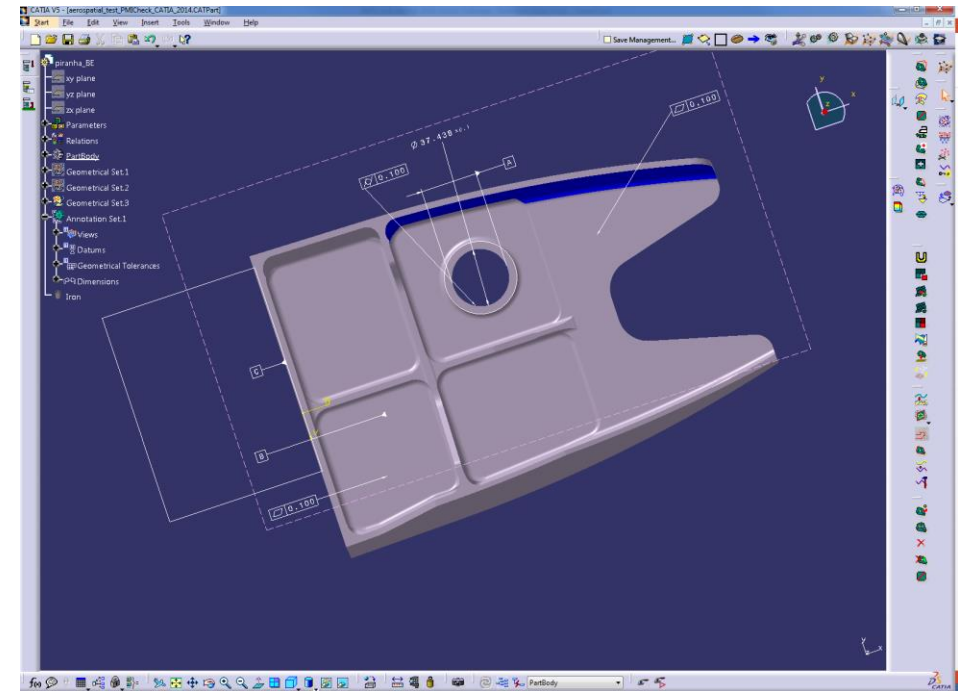
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# ISO 10303-242: “Managed Model Based 3D Engineering”

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- A “convergence” of capabilities of AP203 and AP242
- Supported by most CAD
- Additional Capabilities
  - Tessellated or Brep Geometry
  - Assembly Kinematics
  - **3D Electrical harness**
  - 3D Piping
  - **GD&T**
- Edition 2 approved by ISO in 2020



# ISO 10303-242 Edition 2 Capabilities

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- Modular
- Enhanced Tolerancing/PMI
- Composites Definition
- Kinematics Enhancement
- Process definition

Software-readable annotations

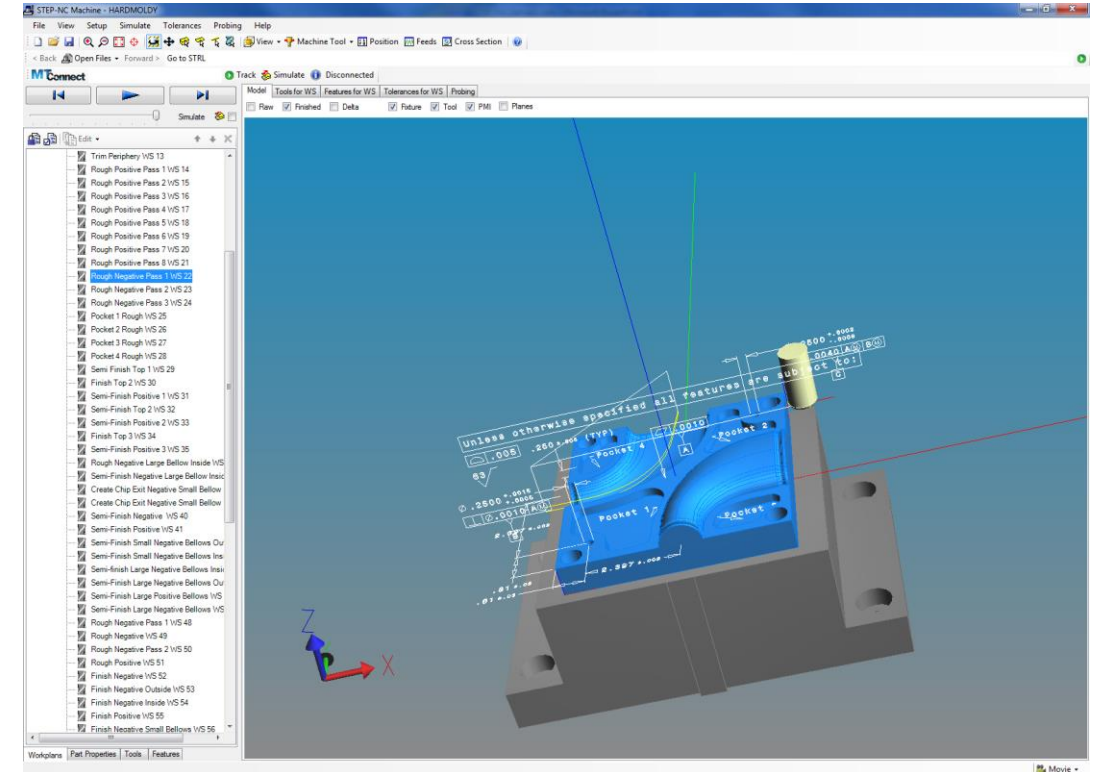
The screenshot displays a software interface with a table of PMI data on the left and a 3D model of a mechanical part on the right. The table lists various PMI entities and their representations, including datum systems, dimensional characteristics, and geometric tolerances. The 3D model shows a complex part with various features and annotations, including dimensions and tolerances.

ID	Entity	PMI Representation	Similar PMI
5385	datum_system	A   B   C	
5434	datum_system	A   B   C	
5456	datum_system	A	
5466	datum_system	A   B   C	
5514	datum_system	A	
5398	dimensional_characteristic_representation	Ø34.80-35.20	Ø34.8-35.2
5408	dimensional_characteristic_representation	Ø34.80-35.20	Ø34.8-35.2
5422	dimensional_characteristic_representation	60.00*±0.5*	
5442	dimensional_characteristic_representation	Ø25.00 ± 0.15	
5474	dimensional_characteristic_representation	Ø20.00 +0.05 -0.10	
5484	dimensional_characteristic_representation	Ø20.00 +0.10 -0.05	
5494	dimensional_characteristic_representation	Ø35.00 0 -0.2	
5504	dimensional_characteristic_representation	Ø35.00 +0.2 0	
5511	flatness_tolerance	0   0.2 ▽   [A]	
5388	(geometric_tolerance_with_datum_reference) (position_tolerance)	⊕   0.75   A   B   C	
5468	(geometric_tolerance_with_datum_reference) (position_tolerance)	⊕   0.75   A   B   C	
5436	(geometric_tolerance_with_datum_reference)	⊕   1.25   A   B   C	

# ISO 10303-238: “Application interpreted model for computerized numerical controllers”

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- “STEP-NC”
- Modern, data structure
- Supports CNC manufacturing processes
  - High level process information
    - Finished part
    - Stock
    - Fixturing
    - Cutters
  - Low level process information
    - Cutter motion
    - Machine motion
    - Auxiliary functions
- Over 1 million parts produced at Boeing in 2018 using AP238
- Edition 2 DIS in review





# ISO 10303-238 Edition 2 Key Capabilities

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- **Modular**
- **Automated Composites Manufacturing**
- **3D Printing Process Definition**
- **Inherits AP242 capabilities**
  - Tolerancing
  - Kinematic Modeling





# ISO 13399: Cutting Tool Information Standard

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- **Tool components**

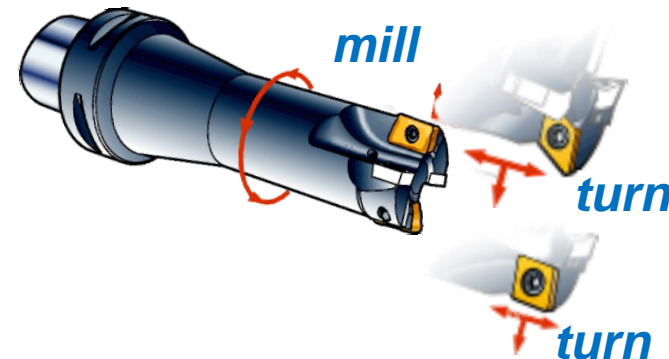
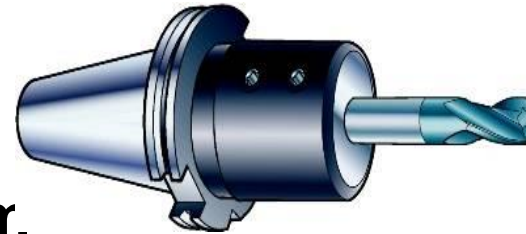
- Tools, inserts, adapters
- Screws, clamps

- **Cutting tool assembly**

- Assembly instructions for tool room.
- Tool information used by CAM/CNC

- **Multi-function**

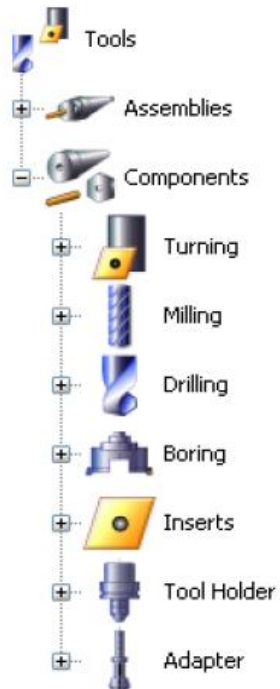
- "Multiple tools" on one body



# ISO 13399 Generic Tool Catalog

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## Tool Classification



## Product Data

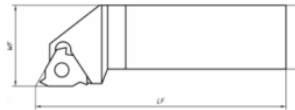
```
ISO-10303-21;  
HEADER;  
FILE_DESCRIPTION (('Product data'), '2:1');  
FILE_NAME ('5759934_013-01-24T17:39:08');  
FILE_SCHEMA (('P21', 'YCHEMA_ARM'));  
ENDSEC;  
DATA;  
#1 = ORGANIZATION ('Sandvik', '0000060901', 'Sandvik');  
#2 = LANGUAGE ('en');  
#3 = STRING ('hydrogrip, Adaptive');  
#4 = MULTILINE_STRING ('O', #3);  
#5 = STRING_WITH_LANGUAGE ('392.410CGB-63 12 21');  
#6 = MULTILINE_STRING ('', #5);  
#7 = ITEM (#4, 'O', #6);
```

p21

## 3D Models



## 2D Drawings



## Connection Rules



## Icons



## Pictures



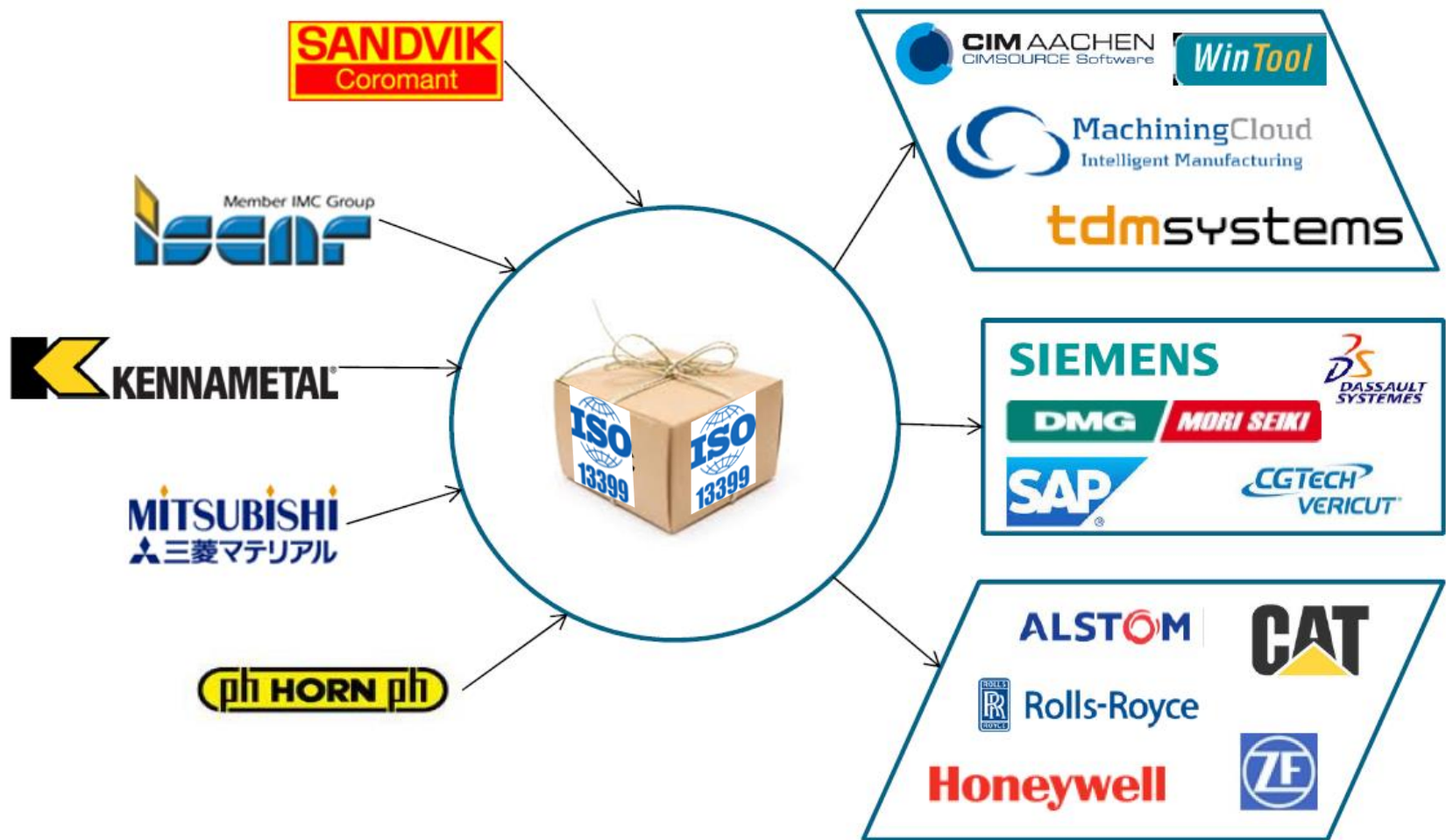
## Packing Slip



- Who created the data?
- What does it include?
- When was it created?

# Implementers

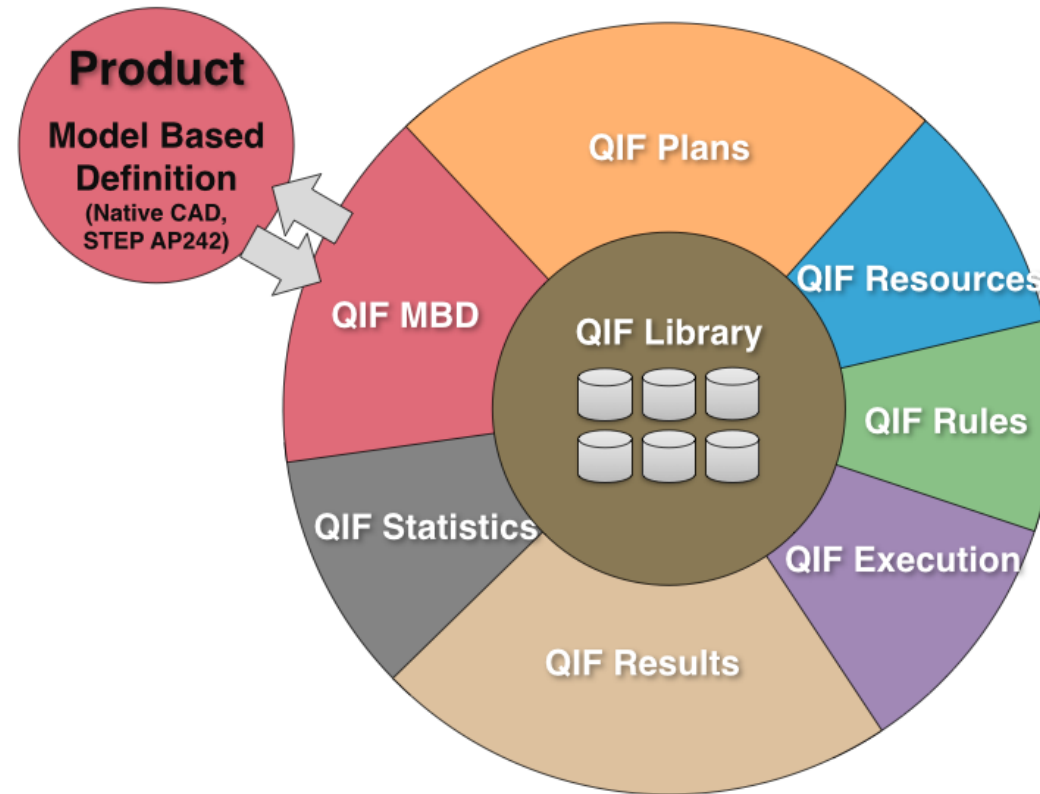
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# QIF: Quality Information Framework

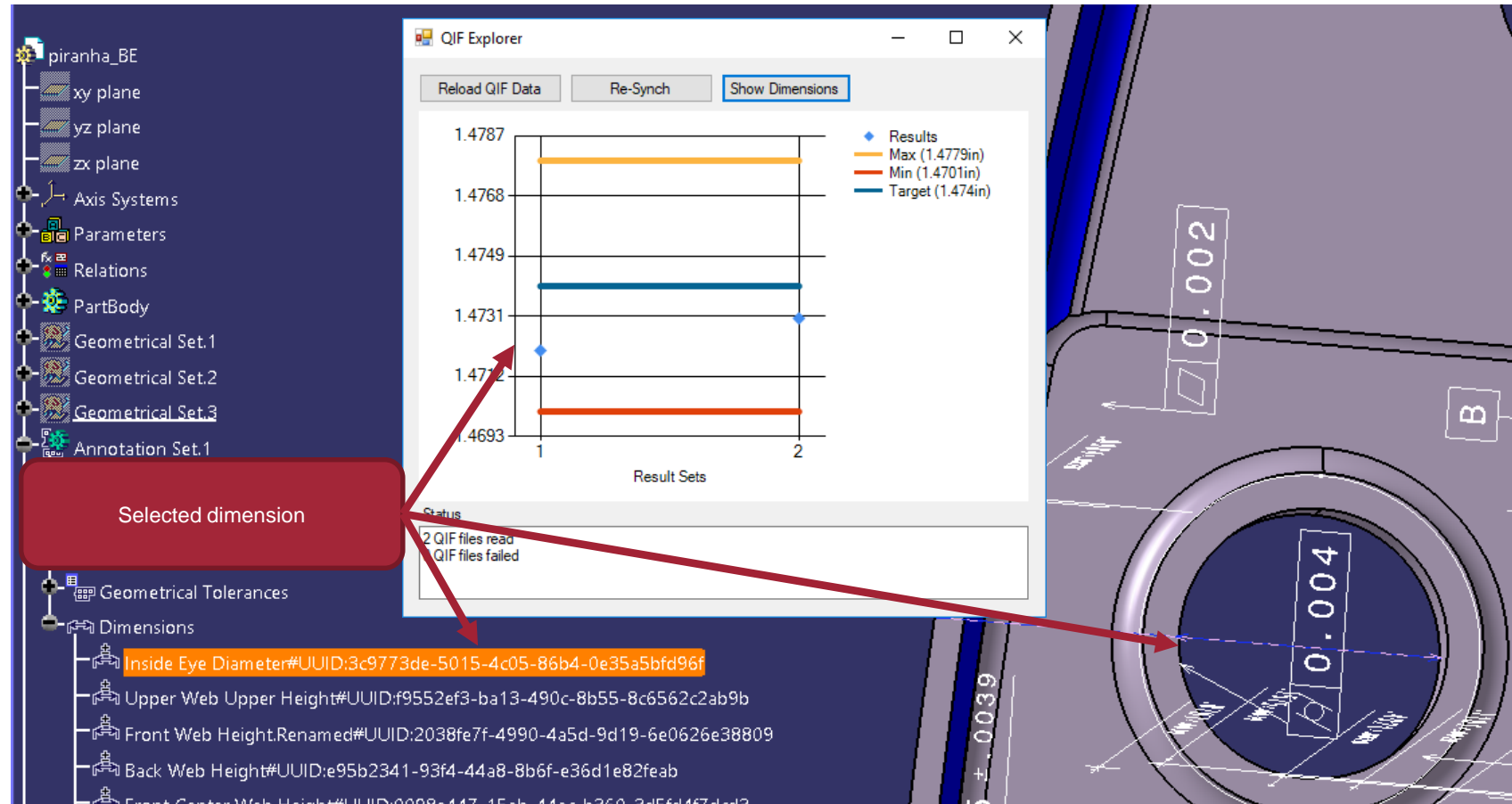
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- “Quality Information Framework”
- Developed by DMSC (Developers of DMIS) <http://www.dmsc-inc.org/>
- ANSI standard harvested by ISO as ISO 23952
- Modern, XML based
- Includes Planning, Inspection, Evaluation
- Development kits available : Python, C#, C++, ( I converted to Visual Basic)
- Stay Tuned!
  - Jennifer Herron DMSC
  - 11/12/2020



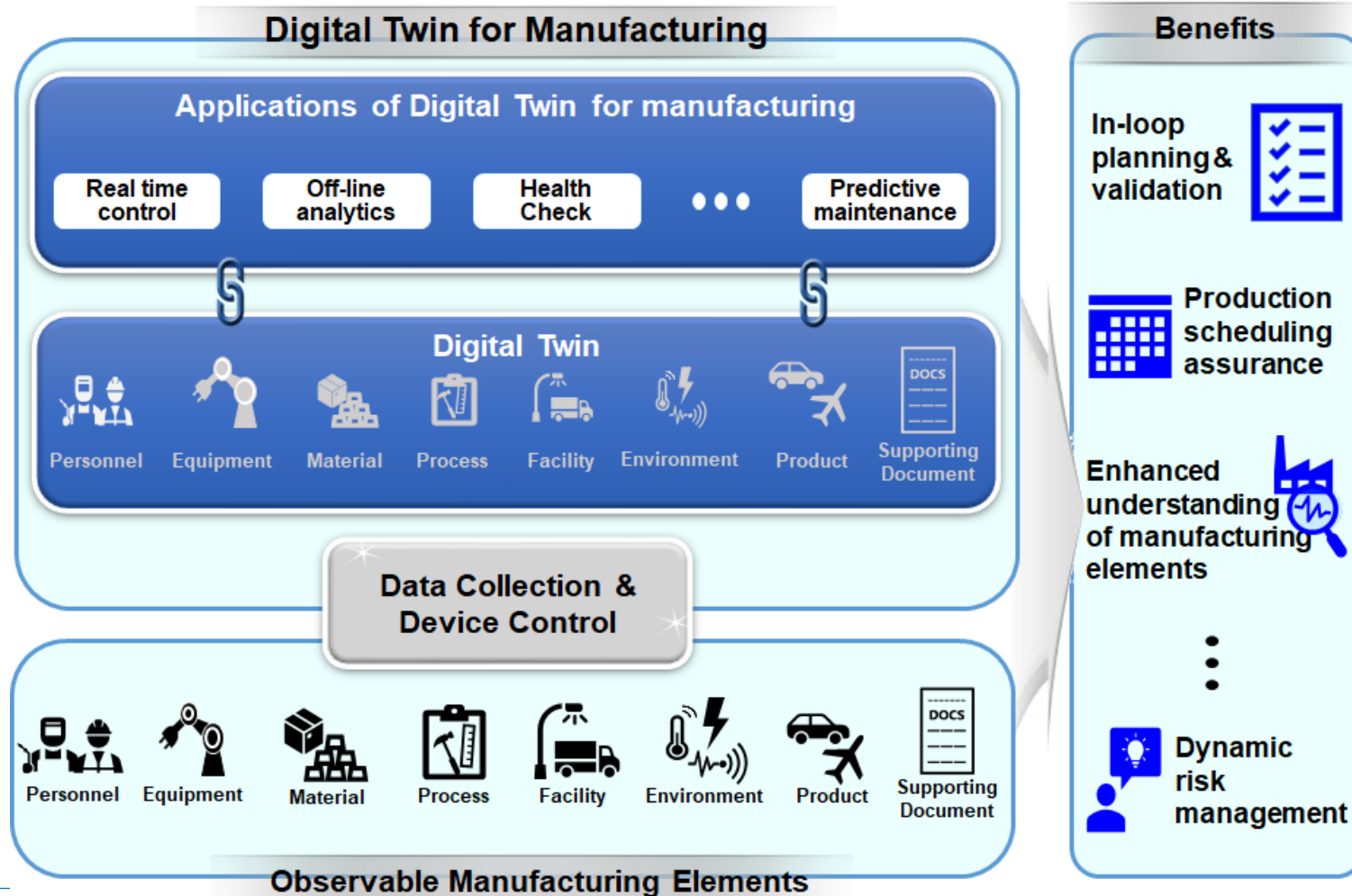
# Contextual Integration using QIF

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# ISO 23247 Digital Twin framework for manufacturing

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“Twin”

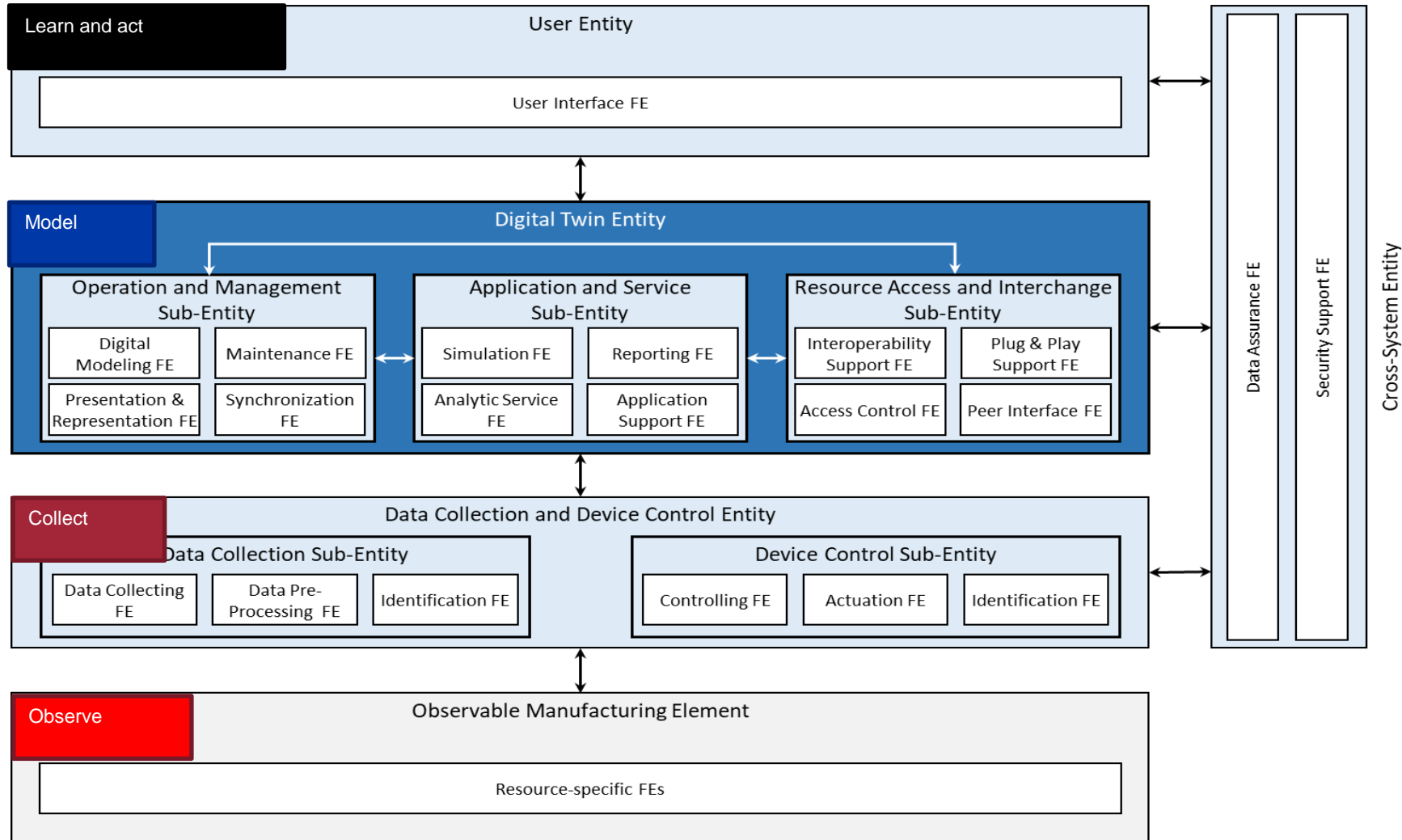
“Framework”

“Manufacturing”



# ISO 23247 Digital Twin framework for manufacturing

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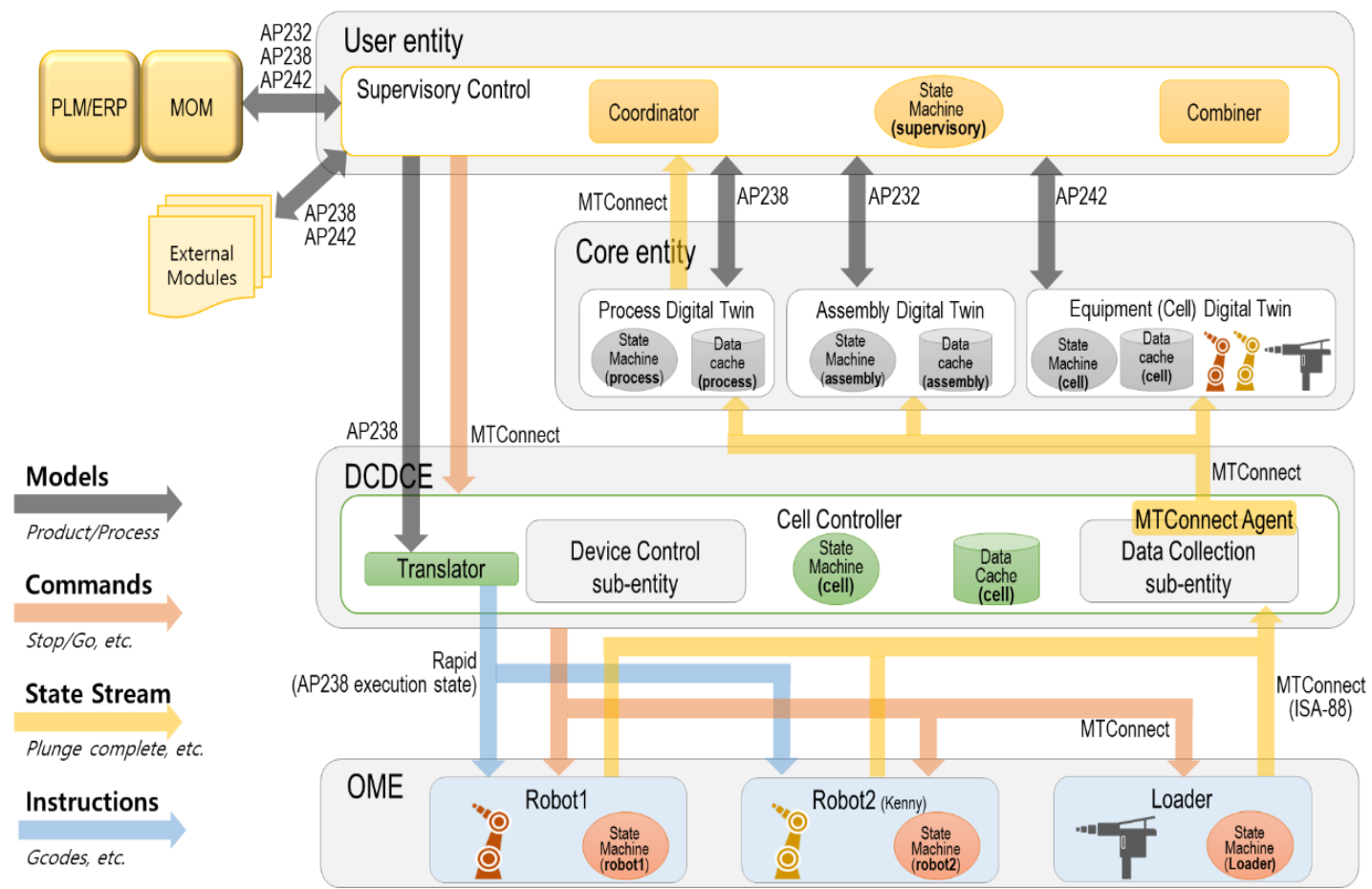
ISO 23247 is layered on the IoT architecture ISO 30141

DIS ballot passed (October 2020)

FE = Functional Element

# ISO 23247 Digital Twin Manufacturing Framework

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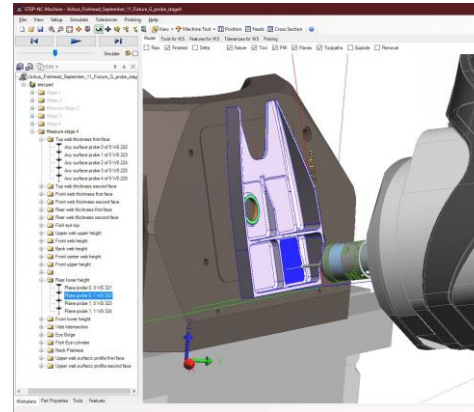


# ISO 23247 Digital Twin framework for manufacturing Use Cases

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October 2020 Demos

[https://youtu.be/wbsC\\_qzB8us](https://youtu.be/wbsC_qzB8us)



Toolpath Cross...		
Name:		
	stored	calc
AD Max:	0.0	7.1376
RD Max:	0.0	11.7222
RD X Ofs:	0.0	-3.7222
AD Y Ofs:	0.0	-0.0186
Csect Area:	0.0	66.0899
CG X Ofs:	0.0	2.4615
CG Y Ofs:	0.0	3.1301
Cross Section Image		

Process optimization



Fastener length optimization

# Overview and Inspiring Call to Action

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- **Standards make complex relationships implementable**
- **We are all win when we communicate with each other**
- **Opportunities exist for participating with and shaping this work**
- **Let's take advantage of the momentum we have**

# Questions

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# Thank you attending this session

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Please join us for the next Session on Thursday,  
November 12<sup>th</sup>

Jennifer Herron, DMSC Member and Curtis Brown, DMSC  
President  
“Using QIF to trace Engineering Changes”

Malcolm Panthaki, VP Analysis Solutions & Tim Keer,  
Director of Customer Solutions  
Aras  
Systems Thinking and an End-to-End Digital Thread must  
include “All-D”, including 3-D

## *2020 GPDIS Virtual Sessions Agenda* All Sessions From 2:00 PM ET to 3:30 PM ET

Session 1: Friday, October 2nd  
Session 2: Tuesday, October 13th  
Session 3: Thursday, October 15th  
Session 4: Tuesday, October 27th  
Session 5: Thursday, October 29th  
Session 6: Tuesday, November 10th  
Session 7: Thursday, November 12th  
Session 8: Tuesday, November 24th

Recordings and presentation decks can be found under the 2020 Presentations at <https://gpdisonline.com/event-history/>