

Measurement Data Analytics using QIF

How the Quality Information Framework (QIF) serves as an
enabler for big data analytics







The Quality Information Framework

What is QIF?
An overview



Why QIF?

What is it that makes the Quality Information Framework so important?



QIF Workflows: Data Aggregation and Analytics

How QIF can be used to enable analytics on massive amounts of measurement results data



The Quality Information Framework

What is QIF?

An overview

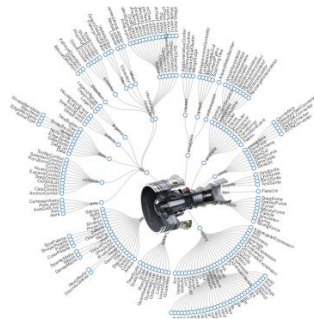
What is QIF?



Feature-Based
Ontology of
Manufacturing Quality
Metadata



XML Technology:
Simple Implementation
and Built-In Code
Validation



Data semantically
linked to Model for full
data traceability to
CAD

What is QIF?



Feature-Based
Ontology of
Manufacturing Quality
Metadata

Semantic, software readable
data structures.

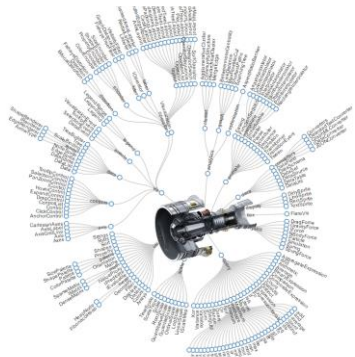
Not dumb text...



XML Technology:
Simple Implementation
and Built-In Code
Validation



XML provides modern benefits
like: simplicity, built-in validation,
software-readability, distributed
data, etc.



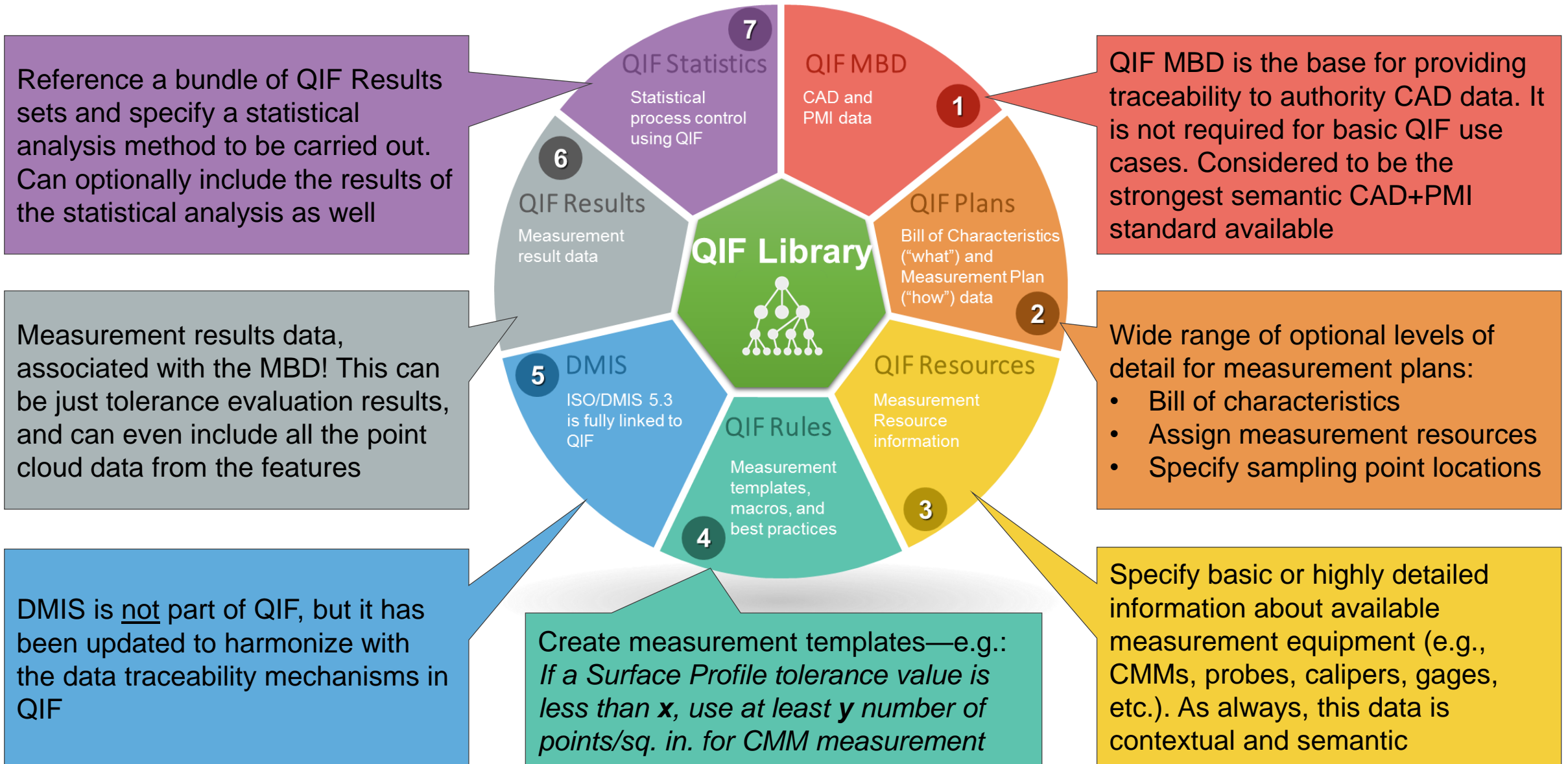
Data semantically
linked to Model for full
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CAD

Since QIF is built on MBD
structures, links to Authority
CAD can be maintained to
make all measurement data an
integral part of the MBD

QIF Application Areas



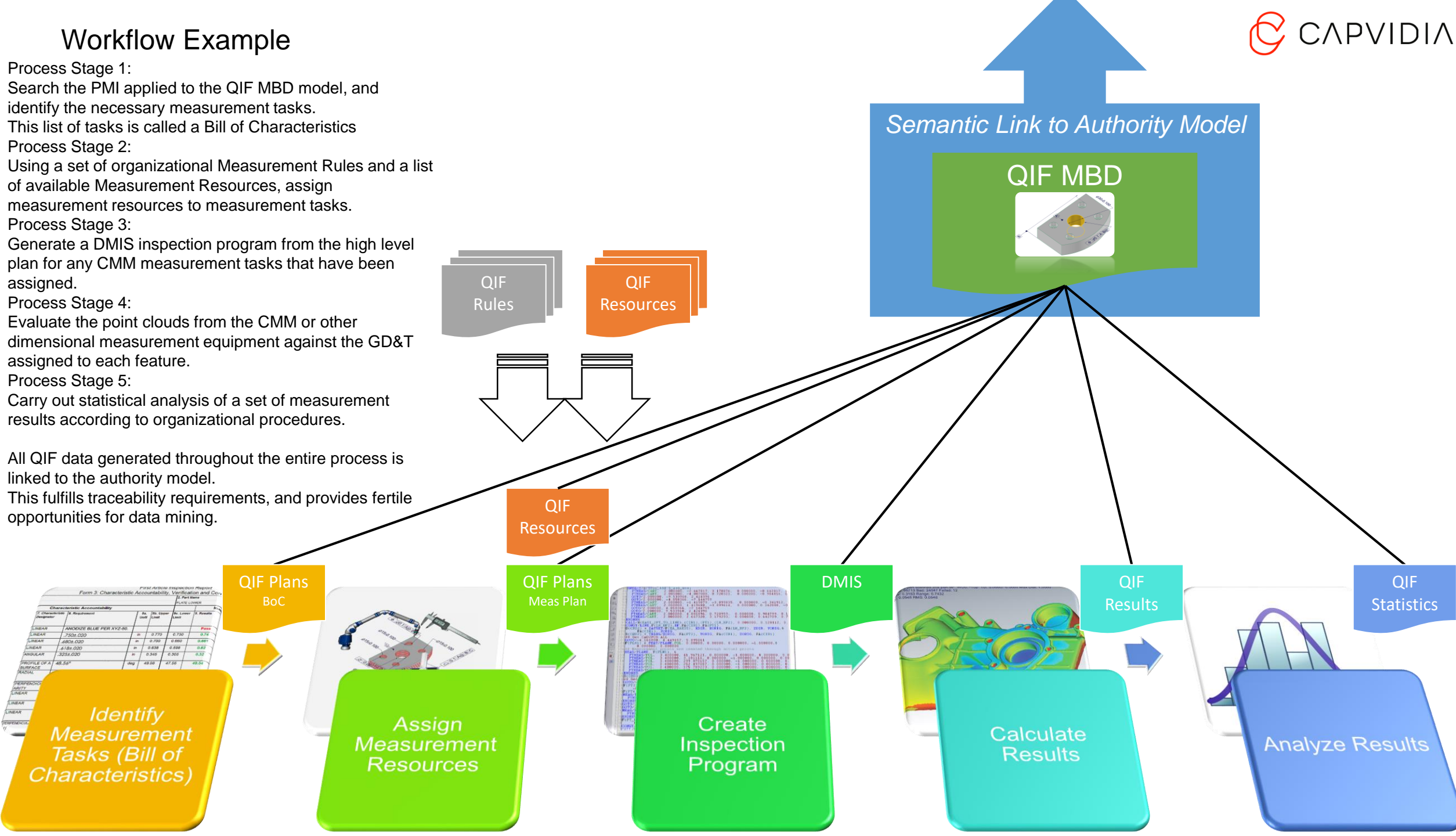
QIF Application Areas



Workflow Example

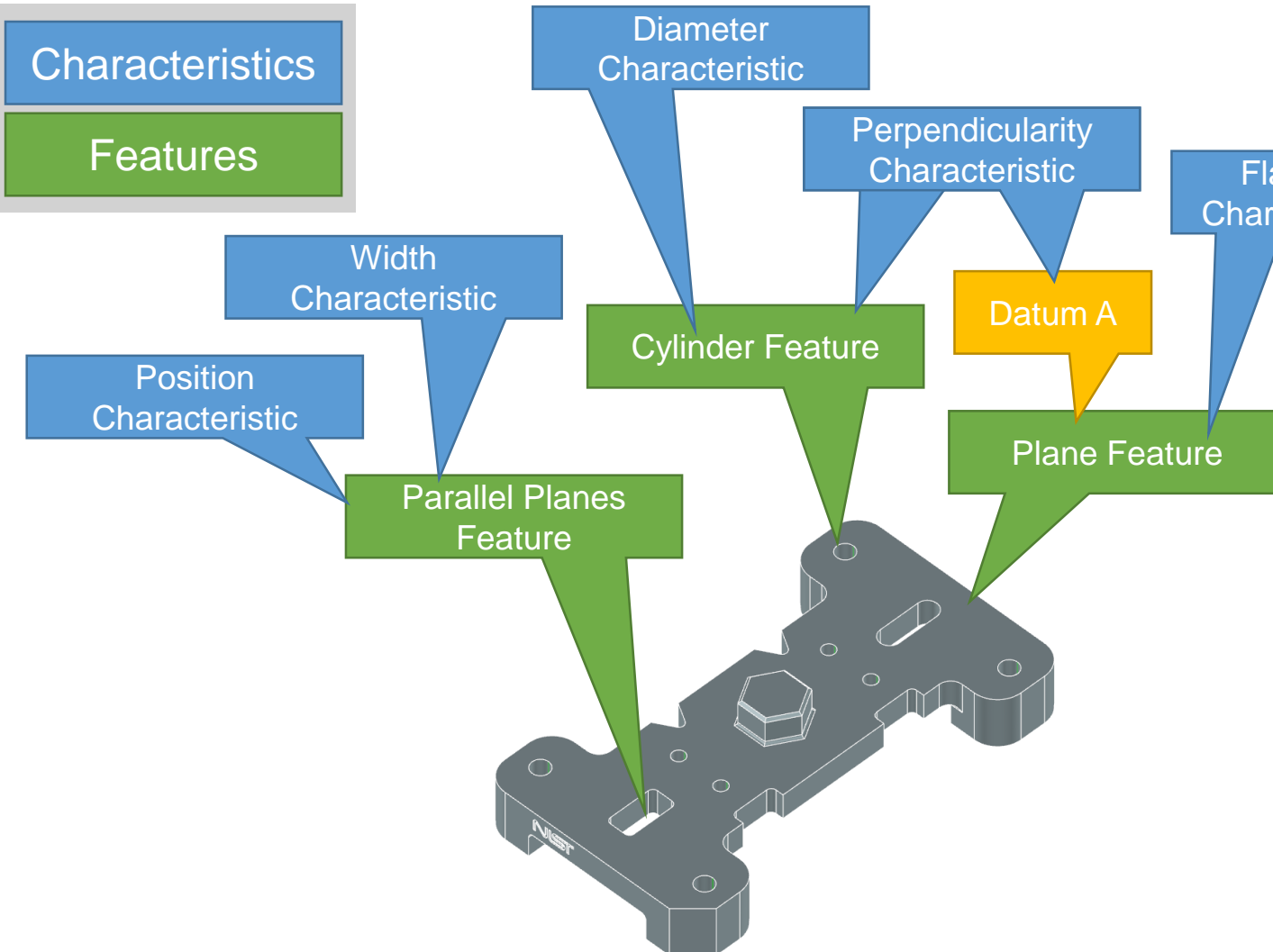
- Process Stage 1:** Search the PMI applied to the QIF MBD model, and identify the necessary measurement tasks. This list of tasks is called a Bill of Characteristics
- Process Stage 2:** Using a set of organizational Measurement Rules and a list of available Measurement Resources, assign measurement resources to measurement tasks.
- Process Stage 3:** Generate a DMIS inspection program from the high level plan for any CMM measurement tasks that have been assigned.
- Process Stage 4:** Evaluate the point clouds from the CMM or other dimensional measurement equipment against the GD&T assigned to each feature.
- Process Stage 5:** Carry out statistical analysis of a set of measurement results according to organizational procedures.

All QIF data generated throughout the entire process is linked to the authority model. This fulfills traceability requirements, and provides fertile opportunities for data mining.



Characteristic	Requirement	Min. Value	Max. Value	Min. Level	Max. Level	Results
LINEAR	AXISZOE BLUE PER XYZ-20	0	0	0	0	0
LINEAR	750x.020	0	0	0	0	0.74
LINEAR	260x.020	0	0	0	0	0.69
LINEAR	618x.020	0	0	0	0	0.62
ANGULAR	325x.020	0	0	0	0	0.32
PROFILE OF A SURFACE	48.5x	0	0	0	0	0.54
RADIAL		0	0	0	0	0.54
PERPENDICULARITY						
LINEAR						
LINEAR						
PERPENDICULARITY						

Features & Characteristics



The fundamental constructs behind QIF:
Features & Characteristics

- CAD geometry is wrapped by **Features**
 - Different concept from CAD features!
 - Sometimes referred to as:
 - Tolerance Features
 - Metrology Features
 - Measurement Features
- Features are referenced by **Characteristics**
 - Usually, these are GD&T



Why QIF?

What is it that makes the Quality Information Framework so important?

Digital Transformation of Industry

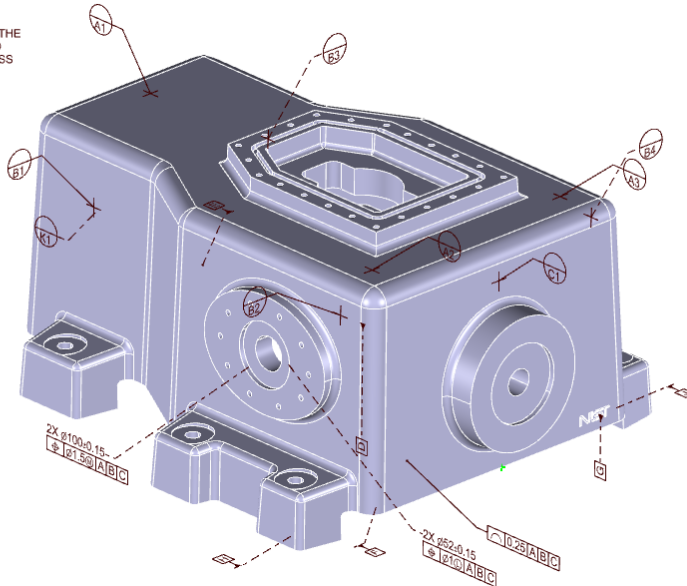


These are all about using DATA to solve business problems
(Data, not software)
It's all about **Digital Transformation**

Model Based Definition (MBD)
Model Based Enterprise (MBE)
Industry 4.0
Digital Enterprise
Advanced Manufacturing Enterprise
Digital Twin
Digital Thread
Digital Tapestry

NOTES (UNLESS OTHERWISE SPECIFIED):

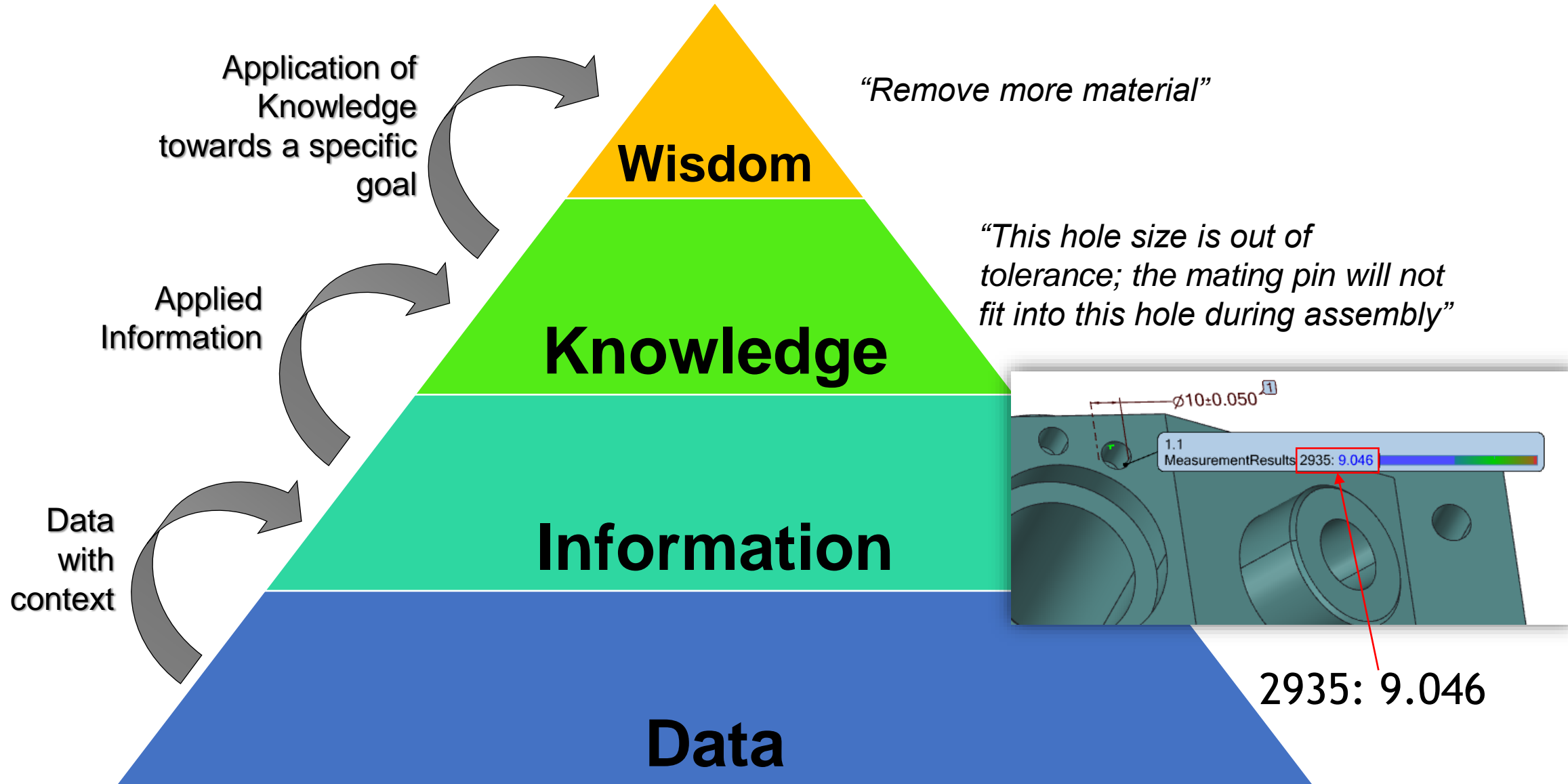
1. OBTAIN DIMENSIONS FOR ALL UNDIMENSIONED FEATURES FROM THE MODEL. ALL DIMENSIONS OBTAINED FROM THE MODEL ARE BASIC UNLESS OTHERWISE SPECIFIED.
2. ASME Y14.41-2003 APPLIES TO DATASET.
3. ASME Y14.5M-1994 APPLIES TO DIMENSIONING AND TOLERANCING.



Not all data is created equal. Consider:

dat txt tif csv xls
pdf xml prt stp jt

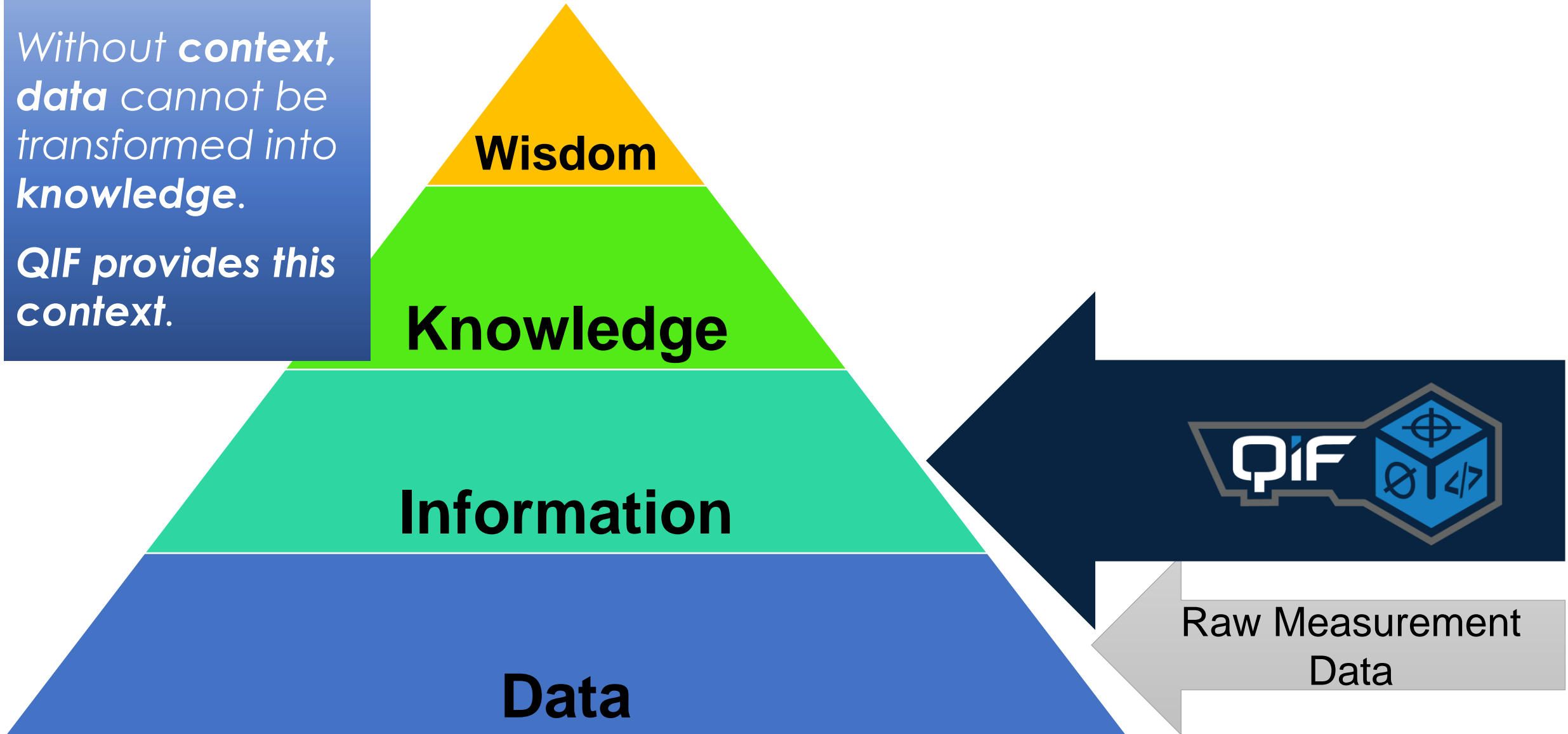
DIKW Pyramid & QIF



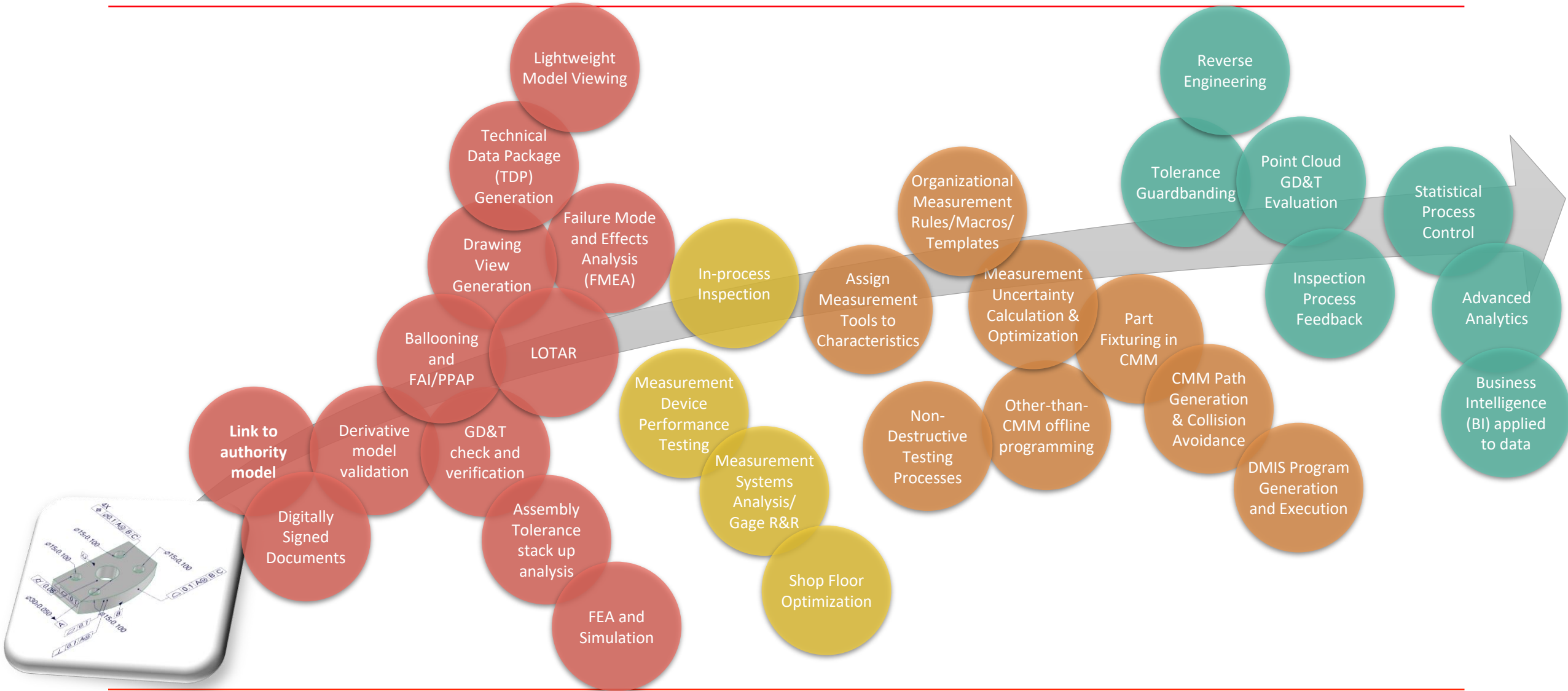
DIKW Pyramid & QIF

Without **context**,
data cannot be
transformed into
knowledge.

QIF provides this
context.



Model Based Quality Workflow



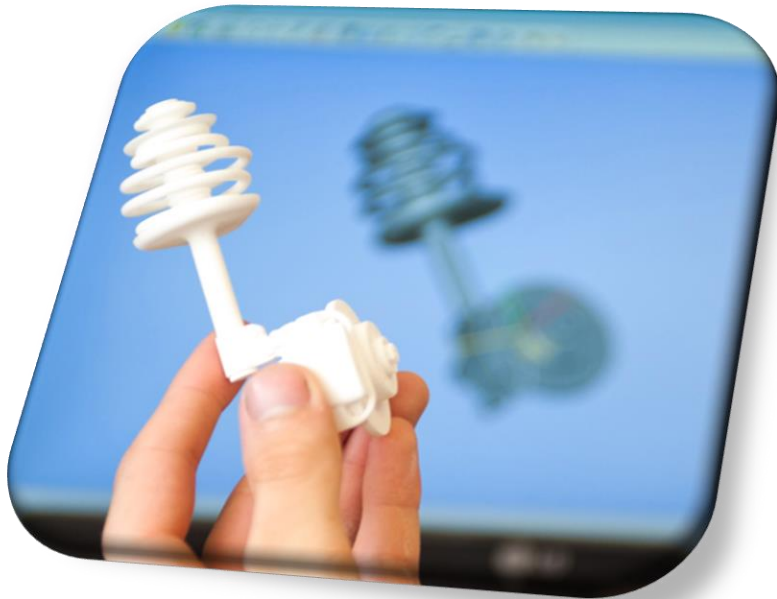


QIF Workflows: Data Aggregation and Analytics

How QIF can be used to enable analytics on massive amounts of measurement results data

Digital Twin

- Digital representation of a product or process
- Use computer modeling and simulation to gain product knowledge *a priori*

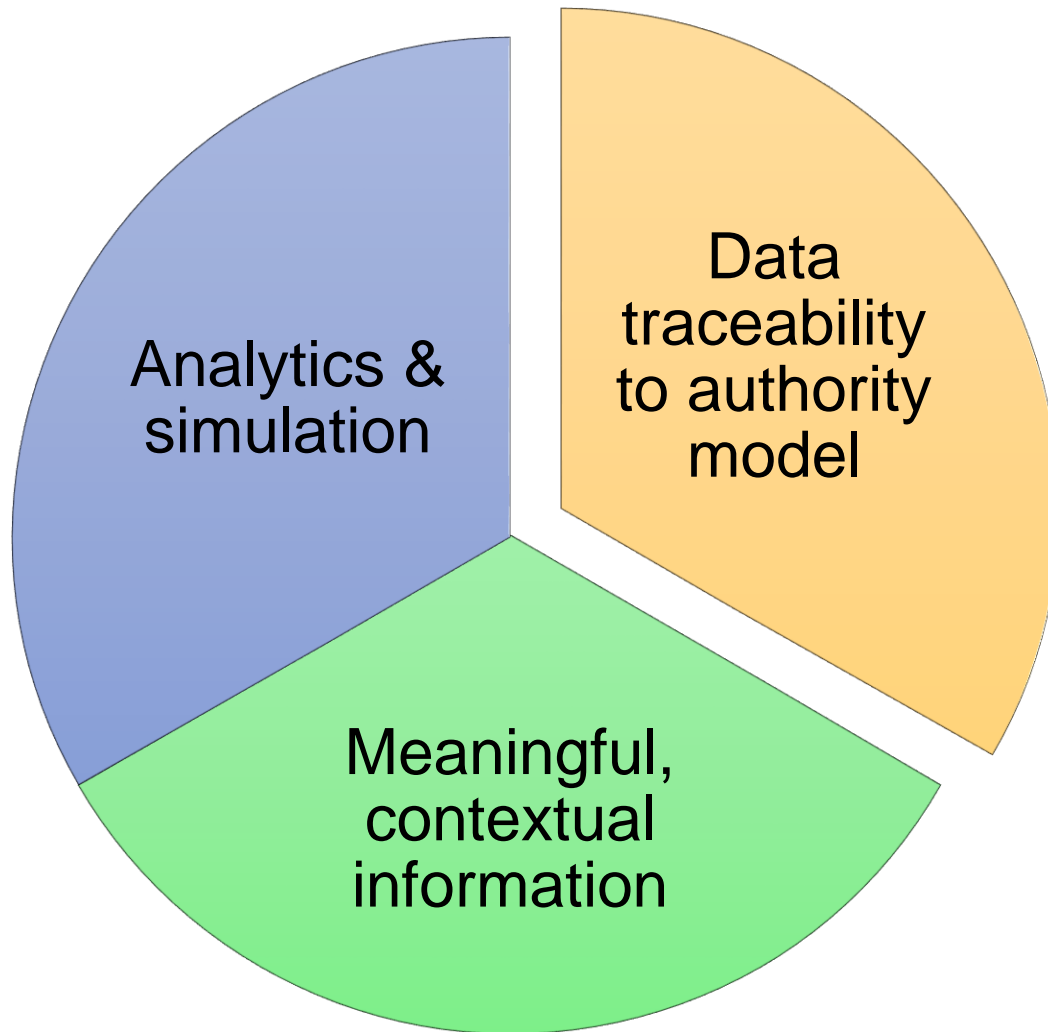


*...a digital twin is a set of computer models that provide the means to **design, validate and optimize** a part, a product, a manufacturing process or a production facility **in the virtual world.***


Zvi Feuer
Senior VP of Manufacturing Engineering Software
Siemens PLM Software

[Source](#)


Foundations of Digital Twin



These are the key elements to a successful approach to Digital Twin. The quality of the data is paramount.

Digital Transformation of Industry  CAPVIDIA

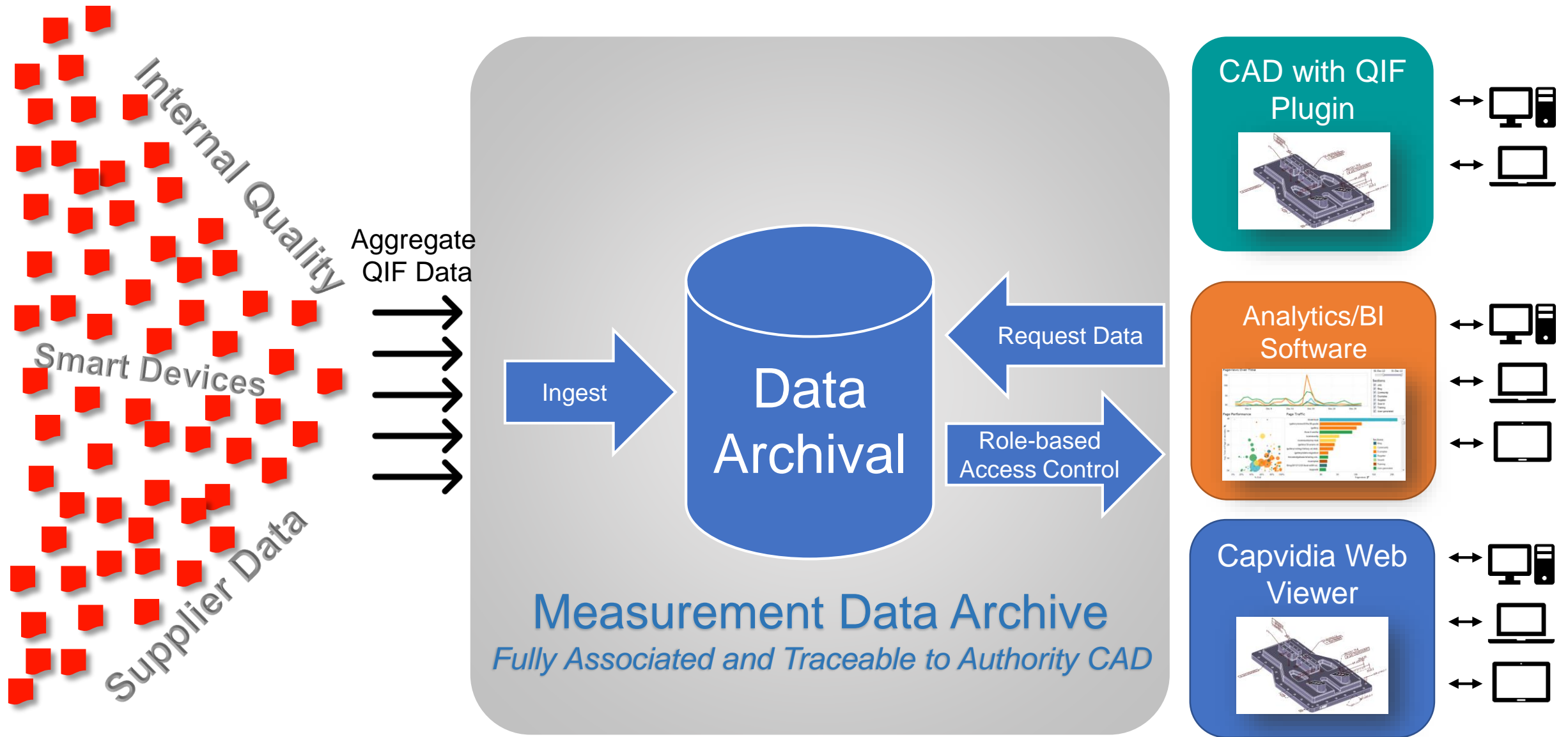
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Data Aggregation and Analytics with QIF



QIF Benefits

- ANSI Standard
- Rich Data Model
- Traceability to native authority CAD
- 100% Interoperability
- XML Based (smart data)
- Integrity controlled through XSD/XSLT schemas
- Compactness; smaller than native CAD & compressible
- Web-based visualization
- Easy PLM integration



Any questions?

Measurement Data Analytics using QIF

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Thanks!