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AM Data and Innovation

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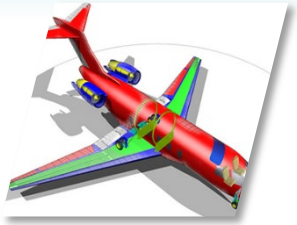
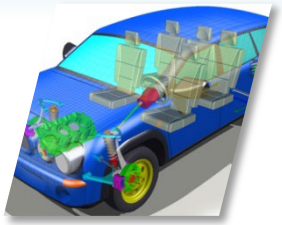
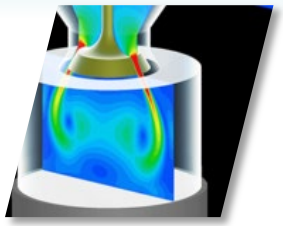
Hexagon Manufacturing Intelligence

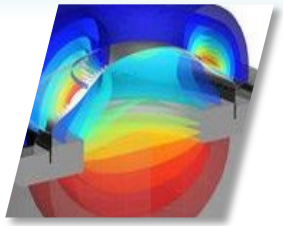
Portfolio spans the physical and virtual worlds

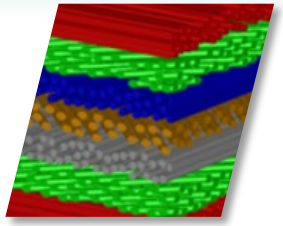
Design & Engineering

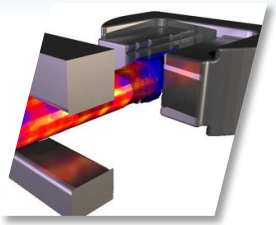

Structural analysis


Multibody dynamics

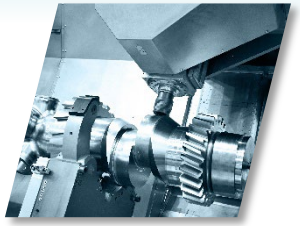

Thermal & fluid dynamics


Acoustic simulation


Materials modeling


Manufacturing process simulation

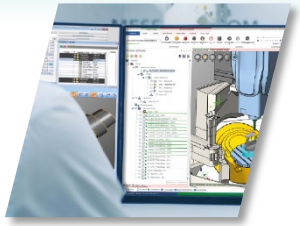
Production Software


Production machining


Mould & die design and manufacturing


Sheet metal fabrication


Woodworking


CNC simulation


Factory automation

Metrology


Dimensional analysis


Metrology-assisted manufacturing


Robot & machine calibration


Reverse engineering

MSC Software

VOLUME GRAPHICS
Enabling better products

CAEfatigue

FTI FORMING TECHNOLOGIES

vero Software

ESPRIT

SA SpatialAnalyzer

m&h

AICON 3D Systems

ROMER

brown & sharpe

Leitz

Additive Manufacturing Portfolio

Process Simulation

Simufact Additive
- L-PBF / EB-PBF
- MBJ

Simufact Welding
- Arc & Laser DED

Digimat AM
- FDM / FFF / CFF
- SLS

Metrology

Hardware
- Laser Scanners
- Structured Light
- Laser Trackers
- CMMs

Software
- Inspire
- PC-DMIS
- Spatial Analyzer

Analysis

Volume Graphics
- Computed Tomography (CT) Inspection
- AM geometry compensation

Apex GD
- Generative Design

Data Management

Sim Manager
- Simulation Process and Data Management (SPDM)

Material Center
- Materials Lifecycle Management (MLM)

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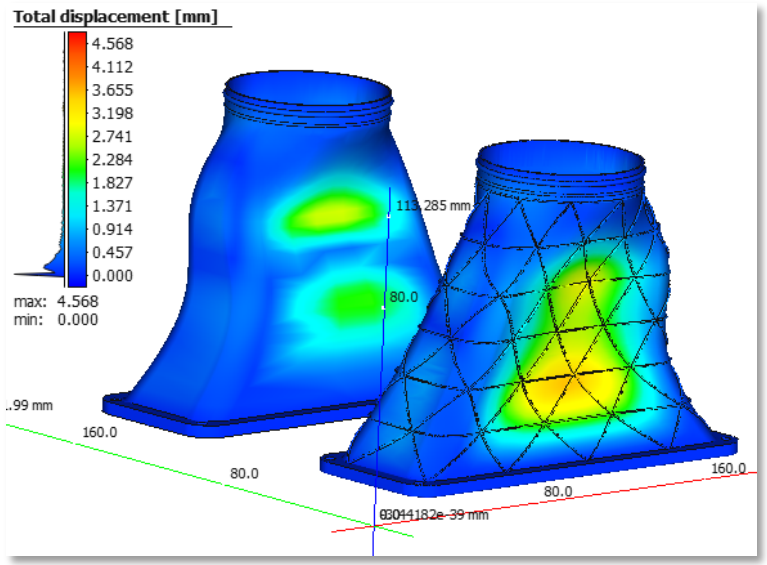
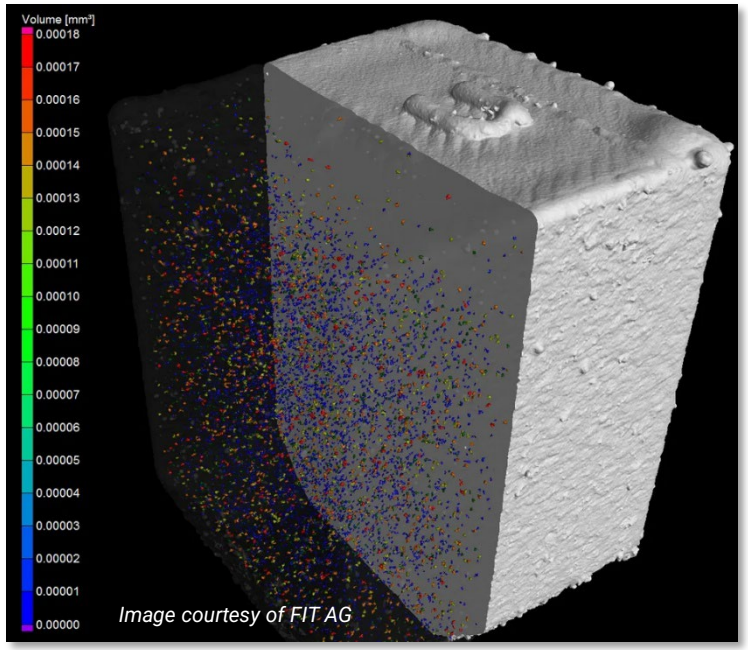
Additive Manufacturing Portfolio

Frontline Metal AM Tools



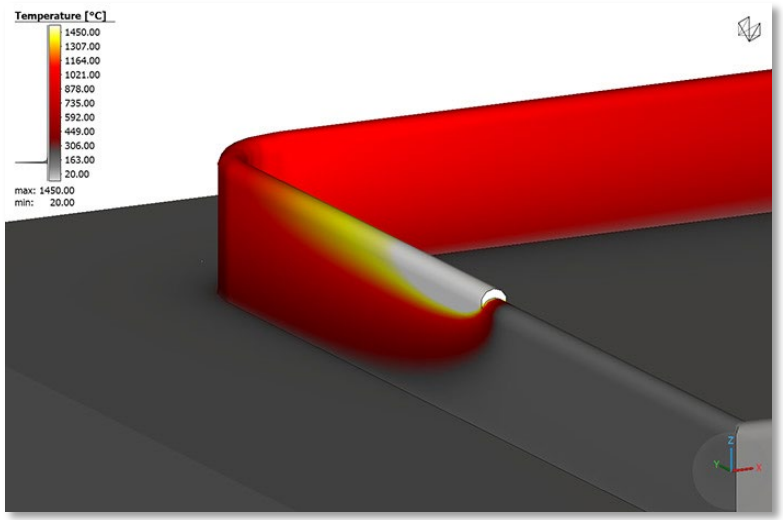
Simufact Additive

- L-PBF Process
  - Distortion & support optimization
- MBJ Sinter Process
  - Shrinkage & distortion optimization



Volume Graphics

- CT Inspection
  - Full metrology suite
  - Analysis tools for powder, foam, lattice, porosity, inclusions
- AM Geometry Correction
  - Scan-based compensation for AM input files



Simufact Welding

- DED Process
  - GCode driven
  - Distortion prediction

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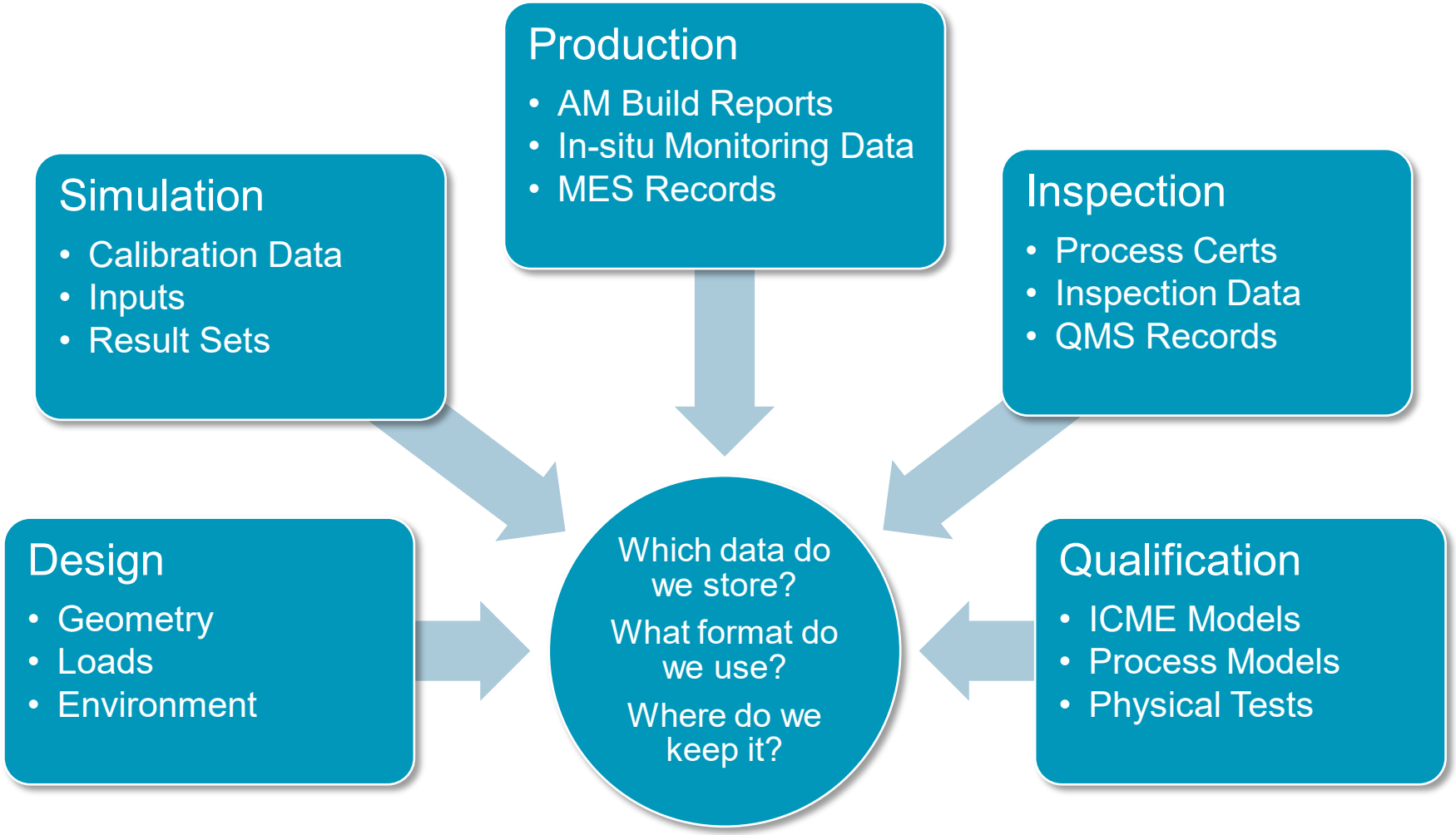
The AM Data ~~Headache~~ Harmonization Issue

Many generators, many consumers, few standards



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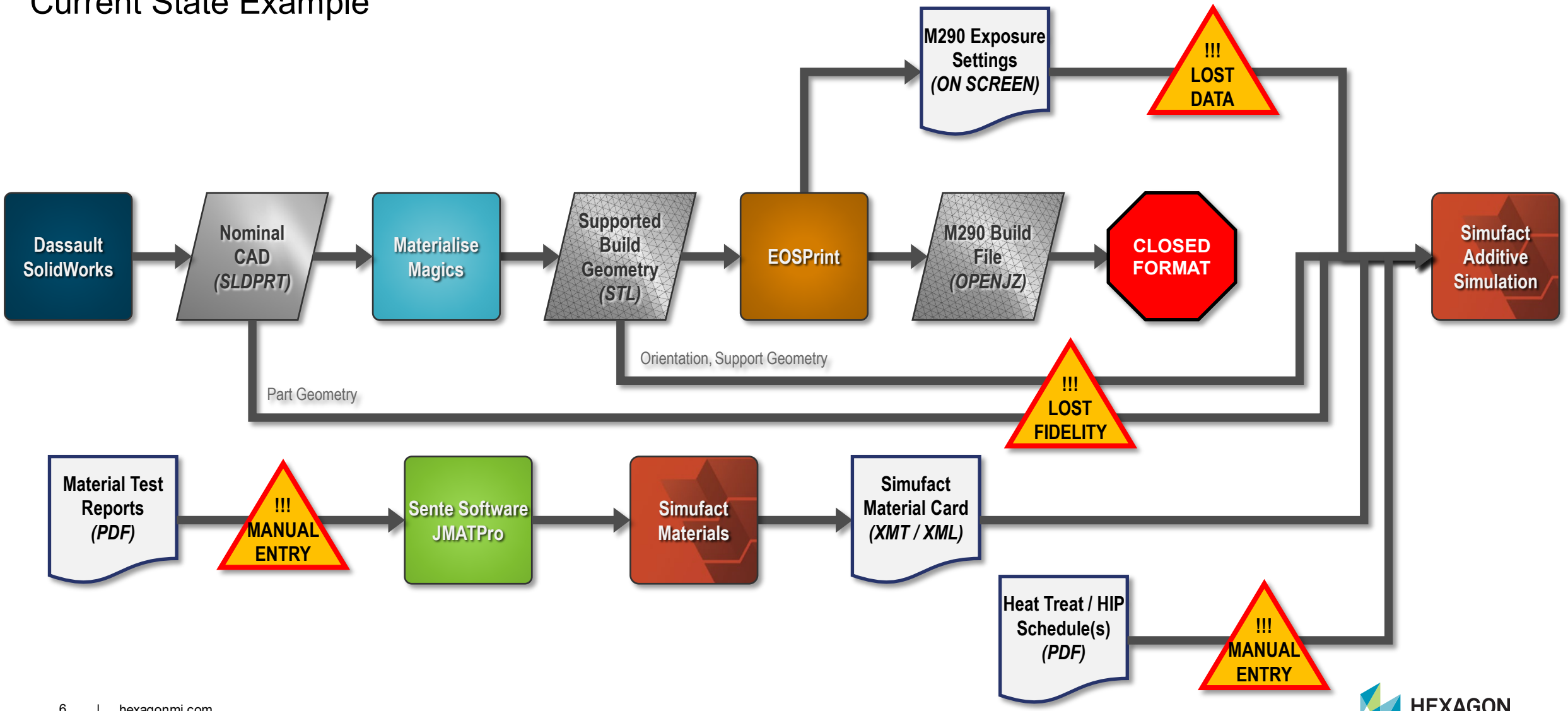
L-PBF Simulation Input Data Flow

Current State Example



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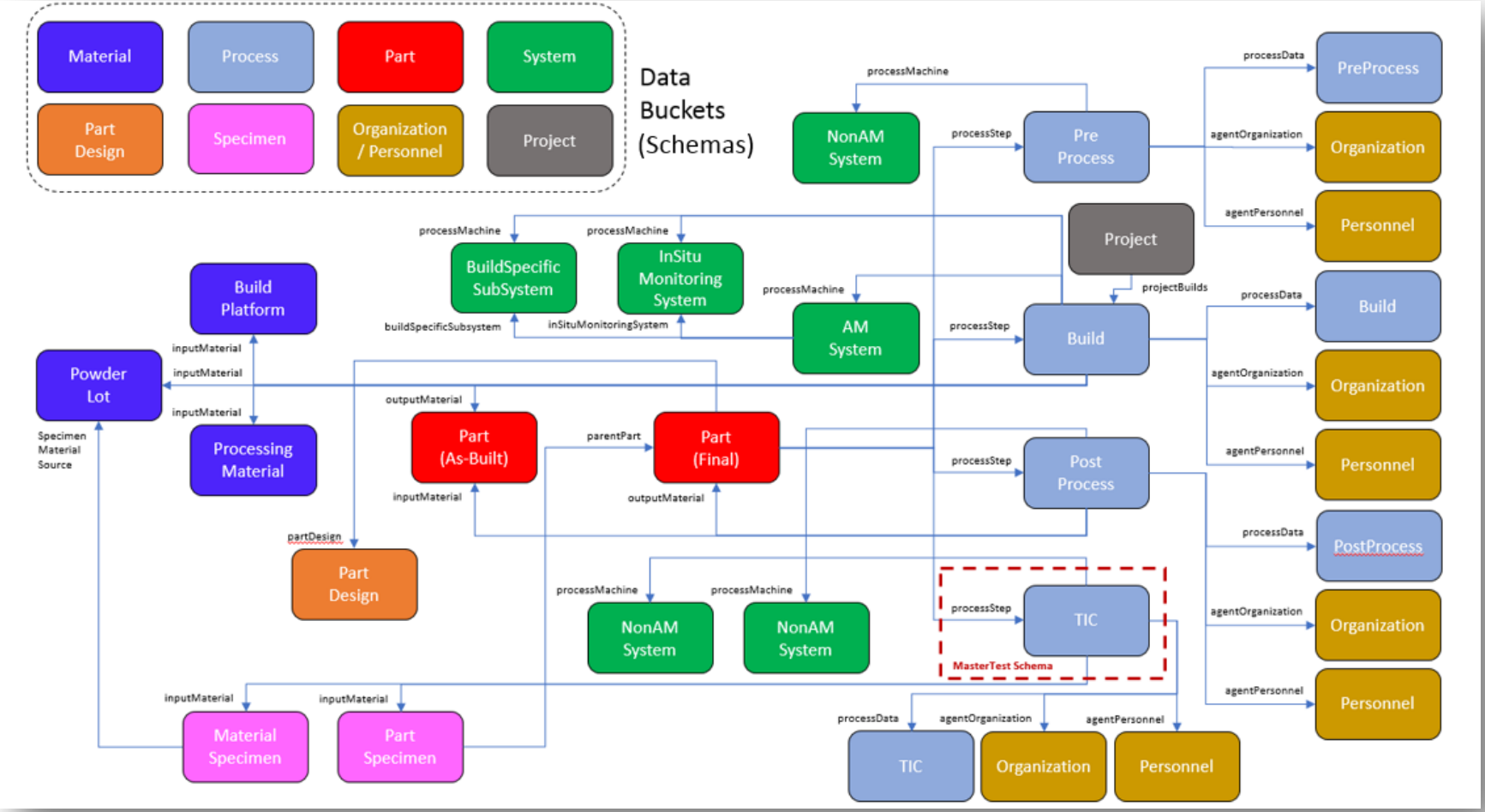
A Better Way

Adoption of a Standardized Data Model



Common Data Model (CDM) Relationships in Material Center

CDM
- Common Data Model
- Generalized AM data schema

CDD
- Common Data Dictionary
- Process-specific terms & fields

CDEF
- Common Data Exchange Format
- Language for data transfer

Extensible to incorporate:
- Simulation data sets
- New AM processes
- More build parameters
- New in-situ monitoring data

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What's to gain?

- AM needs large data sets to move forward
- Users will always select hardware & software that fits their needs
- Many AM "Holy Grails" are only achievable through integrated workflows
  - Rapid qualification and "Born Certified" hardware
  - Closed loop and sophisticated process controls
  - Process-aware design optimization
  - Spatially-dependent material properties
  - Simulation as a quality tool for build anomaly analysis

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Thank You

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