Model-Based Characterization: Tracing Design Characteristics throughout the Enterprise using QIF and UUIDs

Leveraging MCAD to Enable Characteristics Digital Thread through QIF
Siemens NX & Characteristics & QIF

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INDUSTRY 4.0
MODEL-BASED DEFINITION (MBD)

Building MBD Workflows with:
Siemens Digital Industries Software helps organizations of all sizes digitally transform using software, hardware and services from the Siemens Xcelerator business platform. Siemens' software and the comprehensive digital twin enable companies to optimize their design, engineering and manufacturing processes to turn today's ideas into the sustainable products of the future. From chips to entire systems, from product to process, across all industries. Siemens Digital Industries Software – Accelerating transformation.
Model Based Characterization

Product Characteristics as Enterprise Data

- **Legacy State**: atomic unit of product enterprise data is the part
- **New State**: more granularity — atomic unit of product data is the characteristic
  - Primarily managed in PLM, but tracked in other domains: requirements, manufacturing (MES), quality (QMS, ERP), supply chain, program management, sustainment, etc.
- Track your **Bill of Characteristics** (BOC) across your enterprise
- QIF provides the data structure to manage your BoC (with features & characteristics)
NX delivers world-class mechanical engineering solutions that enable you

- to build the richest most comprehensive digital twin of your product
- to engage with personalized adaptable software, and
- to use the best solutions built on a flexible Open Ecosystem
NX Design and Characteristics Data Model

**What is it**
- **Characteristic** -- A trait, quality, or attribute on an element of a feature such as its size, location, form, or property, which may be a specification limit, a dimension with tolerance etc.
- **Bill of Characteristics** -- a list of all the characteristics applied to a product

**Types**
- **Model-Based vs Drawing-Based**
- **Lifecycle Discipline**
  - **Product Characteristic**
  - **Operation Characteristic**
  - **Service Characteristic**
- **Augmentation Based Characteristics**
  - **Critical Characteristic**
  - **Driven Characteristic**
  - **Verification Characteristic**
## Characteristics: Data Model Examples

### Design Model

![Design Model Image]

### Bill of Characteristics

<table>
<thead>
<tr>
<th>Characteristic ID</th>
<th>Presentation State</th>
<th>Feature</th>
<th>Product and Manufacturing Information (PMI)</th>
<th>Datum Reference Frame (DRF)</th>
<th>Criticality</th>
</tr>
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**Universal Unique Identifier (UUID)**
NX Design and Characteristics
QIF Application areas

- QIF file format requirements
- Solid modeling geometry
- Product & Manufacturing Information (PMI)
- (NEW) Characteristics
- Capvidia NX QIF bi-directional translator
What about UUIDs?

What problem do they solve?

- Enterprise data is managed in various silos
- Some enterprise-level data needs to be traceable through more than 1 silo
- E.g.: Part number
  - Part number is an ID, it is unique, it is universal
- So really, the question is: what data needs to be tracked across my enterprise?
- A UUID is a very good way to tag these entities
- Model Characteristics need to be tracked across your enterprise!
Workflow Overview

Characterize PMI in NX → Generate QIF and view BoC in MBDVidia → Author CMM Program in PC DMIS with QIF → Track Inspection Results using QIF
Characterize PMI in NX
Generate QIF and view BoC in MBDVidia
Author CMM Program in PC DMIS with QIF
Export Inspection Results using QIF
Workflow Overview

1. Characterize PMI in NX
2. Generate QIF and view BoC in MBDVidia
3. Author CMM Program in PC DMIS with QIF
4. Track Inspection Results using QIF
Digital Thread: Adding Characteristics

One platform - unified change, unified configuration, unified digital validation

**Virtual Concept & Engineering**
- Ideation
  - Voice of customer
  - Portfolio
  - Resources
  - Budget
- System
  - MBSE
  - Requirements
  - Features
  - Architecture
- Analysis
  - 1D-3D
  - Multi-physics
  - Simulation

**Series Development**
- Design
  - Mechanical
  - Software
  - E/E
- Multi-domain EBOM
- Prototype
- Color parts

**Physical Manufacturing & Operations**
- MBOM
  - Plant MBOM
  - Plant BOP
  - Plant BOE
  - As-built
- SBOM
  - Service plan
  - Spares, kits
  - Training
  - As-maintained

**Quality**
- APQP
- PPAP
- FAI
- Root cause
- Risk management

**Supply Chain**
- Market intelligence
- Visibility
- Selection
- Integration
- Logistics

**Program Management**
- Deliverables
- Work breakdown structures
- Schedule

Physical Assets
- Over the air updates

One platform - unified change, unified configuration, unified digital validation
Conclusions and Q&A

1. Model Characteristics are important enterprise business objects
2. Tracking Characteristics with QIF can provide the link between these business objects as authored in the PLM/CAD domain to other areas of your enterprise — including supply chain
3. This is not pie-in-the-sky thinking — commercial tools are emerging to provide this solution.
4. The vision for MBE and QIF is bigger than just reducing manual data re-entry. It is also about providing digital data, at a more granular level, and across the entire enterprise.

Thanks!

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