Digital Twin Identifiers
What Next?

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Universally Unique Identifiers (UUID)

- UUID is a large number that is unlikely to ever be duplicated
- There are four types of UUID
  - UUID.4 is generally preferred
  - UUID.5 retains some history
- Different opinions on how to use the UUID
  - UUID used for one value/entity
  - UUID links several values/entities
- This project is about using UUID’s to identify digital twins
  - The digital twin is described in many places / data formats
  - The UUID identifies the twin in all the places.

Use cases for manufacturing

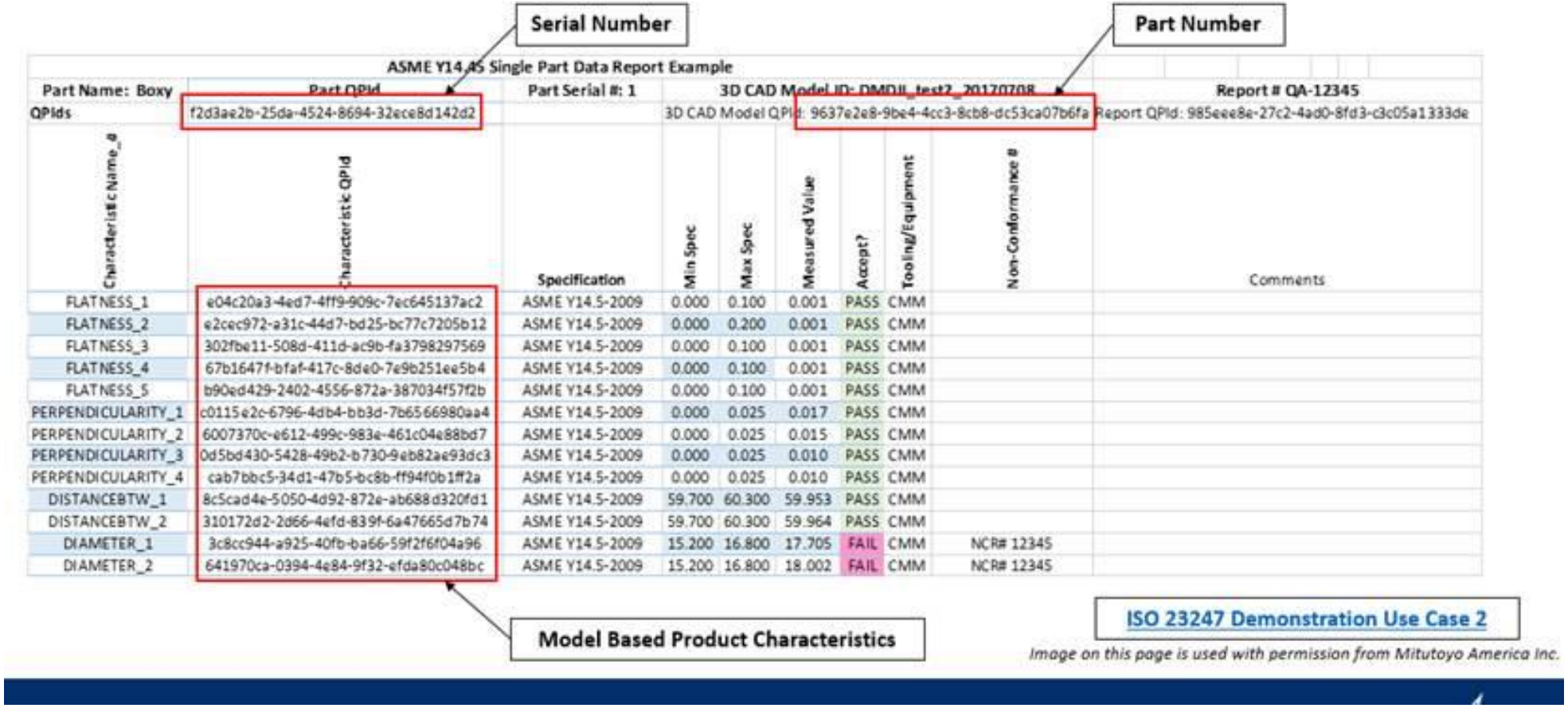
1. The digital twin is explicitly modeled
   - The design of a bolt
2. The digital twin is implicitly modeled
   - The six bolts in the AS1 assembly
3. The digital twin will exist at a future time
   - The holes that are going to be drilled and filled on a wing

Ideas explored - November 2021 to May 2022

- FAIR example – showing value of linking data
- EBOM vs MBOM issues
- Assembly breakdown and digital twin indexes
- UUID management methods
  - OT solution using Information model
  - IT solution using Linked data
- Digital Twin examples

FAIR Example

Example: QIF report.

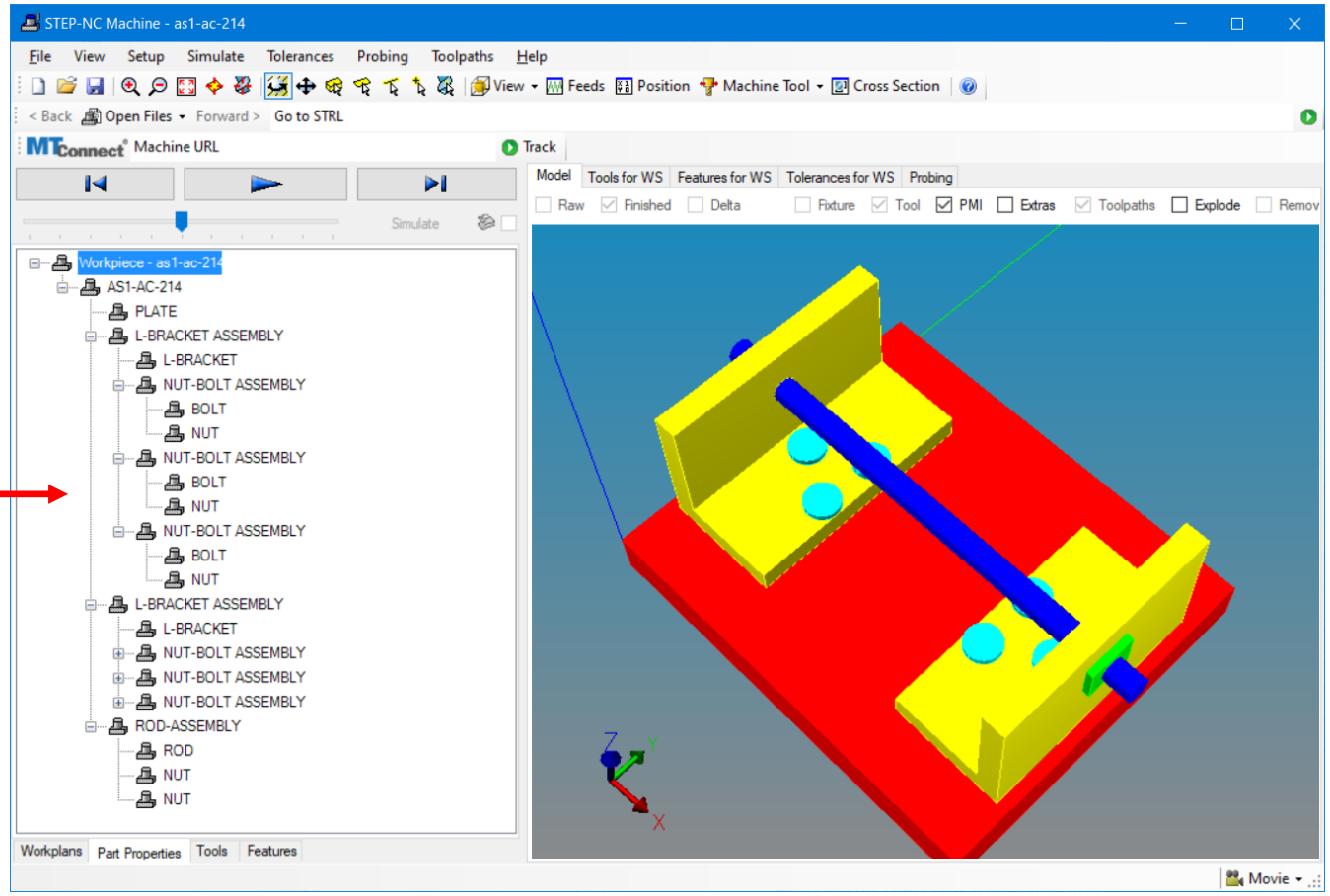


EBOM/MBOM test case

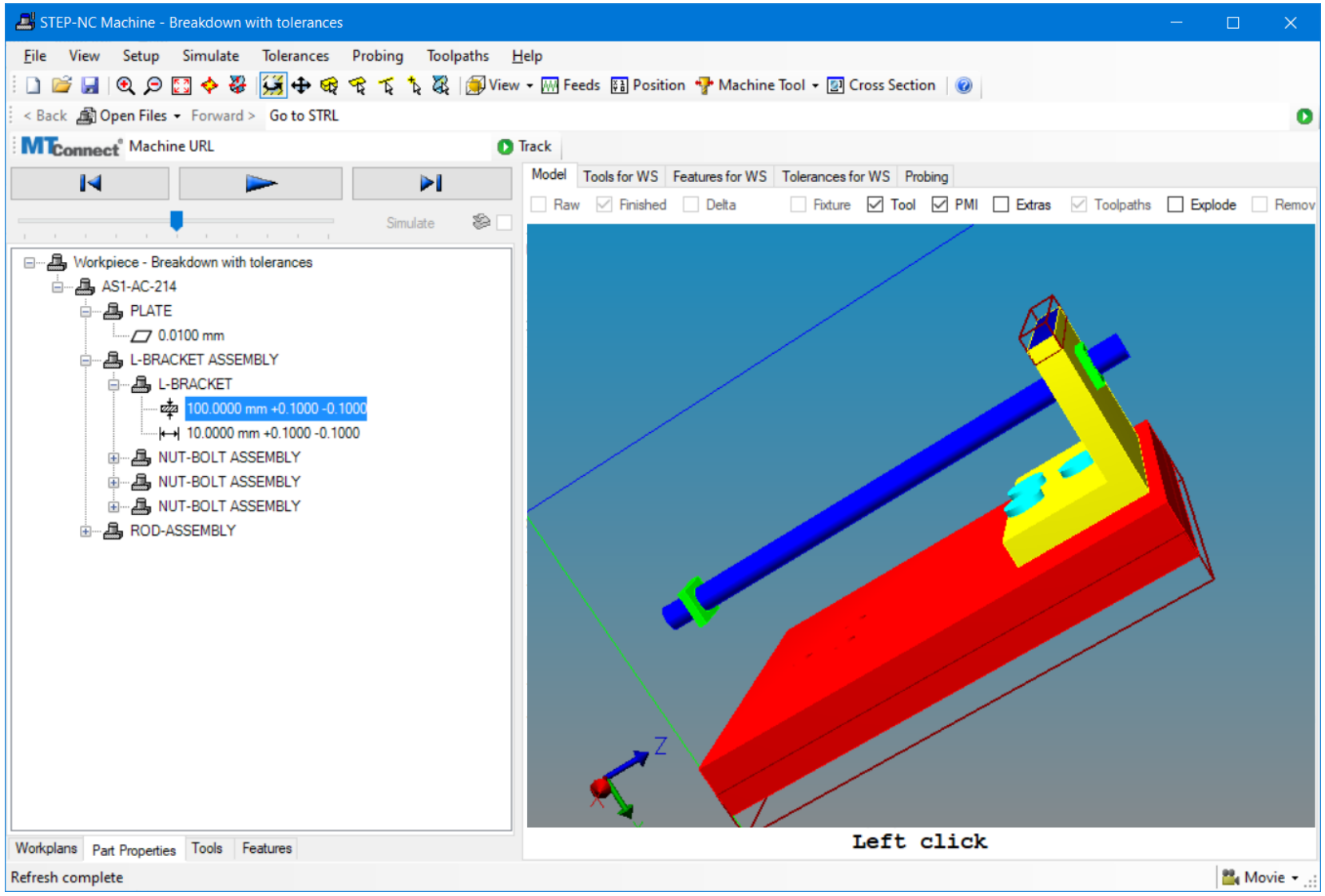
5 designed items have engineering requirements (plate, L-Bracket, nut, bolt, rod)

28 nodes in assembly tree

18 machined items (8 nuts, 6 bolt, 2 brackets, 1 plate, 1 rod)

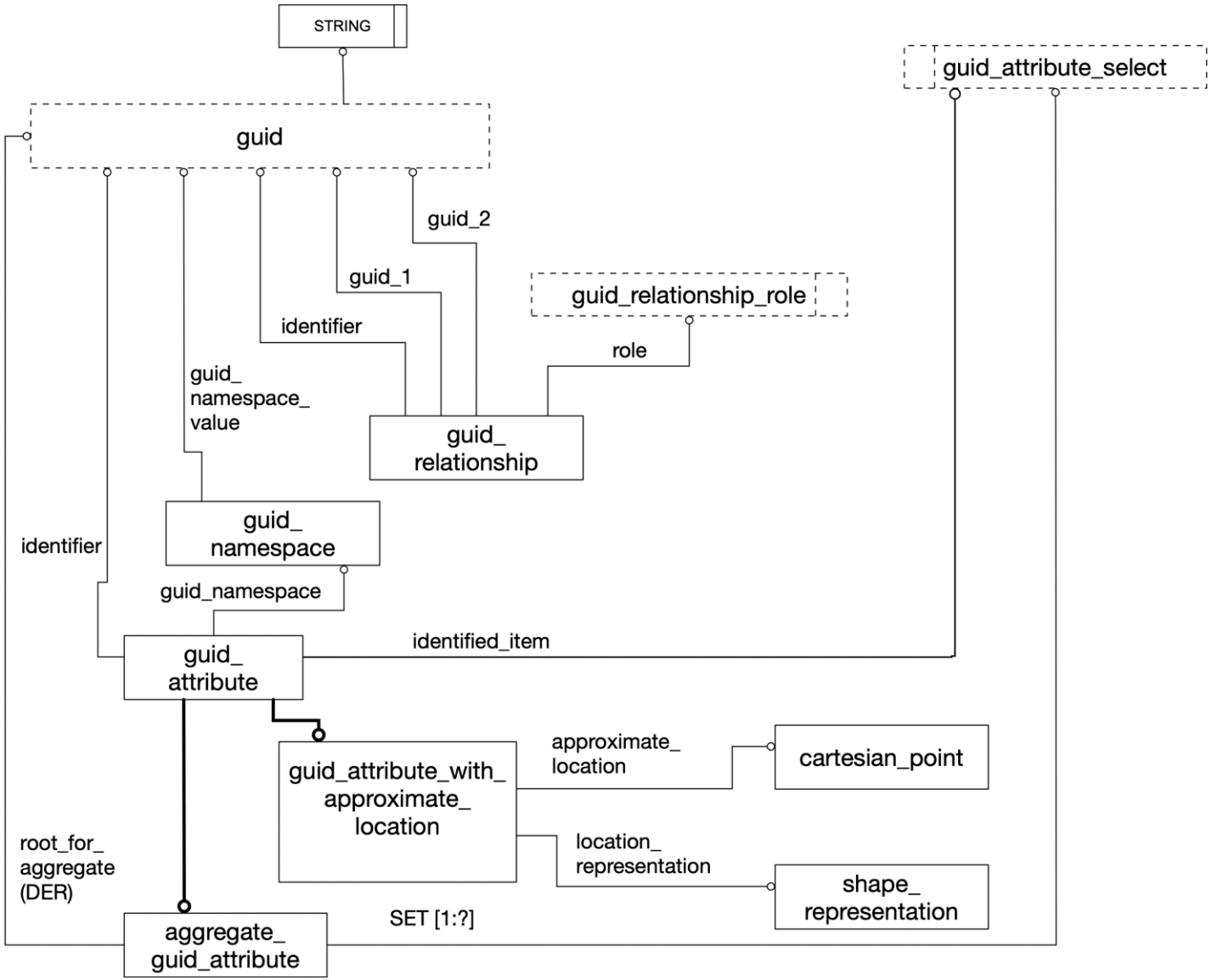


Assembly breakdown



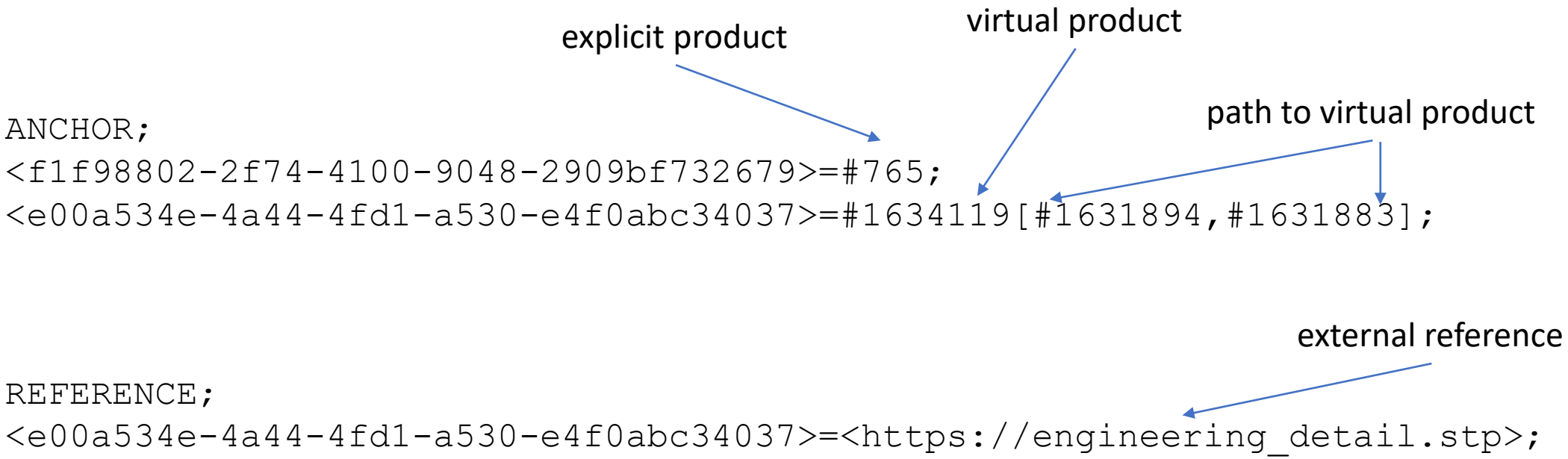
Tolerances specific to this stage of the manufacturing.

UUIDs in an Information model



UUIDs in Linked data

- Anchor section adds additional IT data
- Reference section uses the anchors to link files



Comparison of UUID management methods

Information model

One big master file

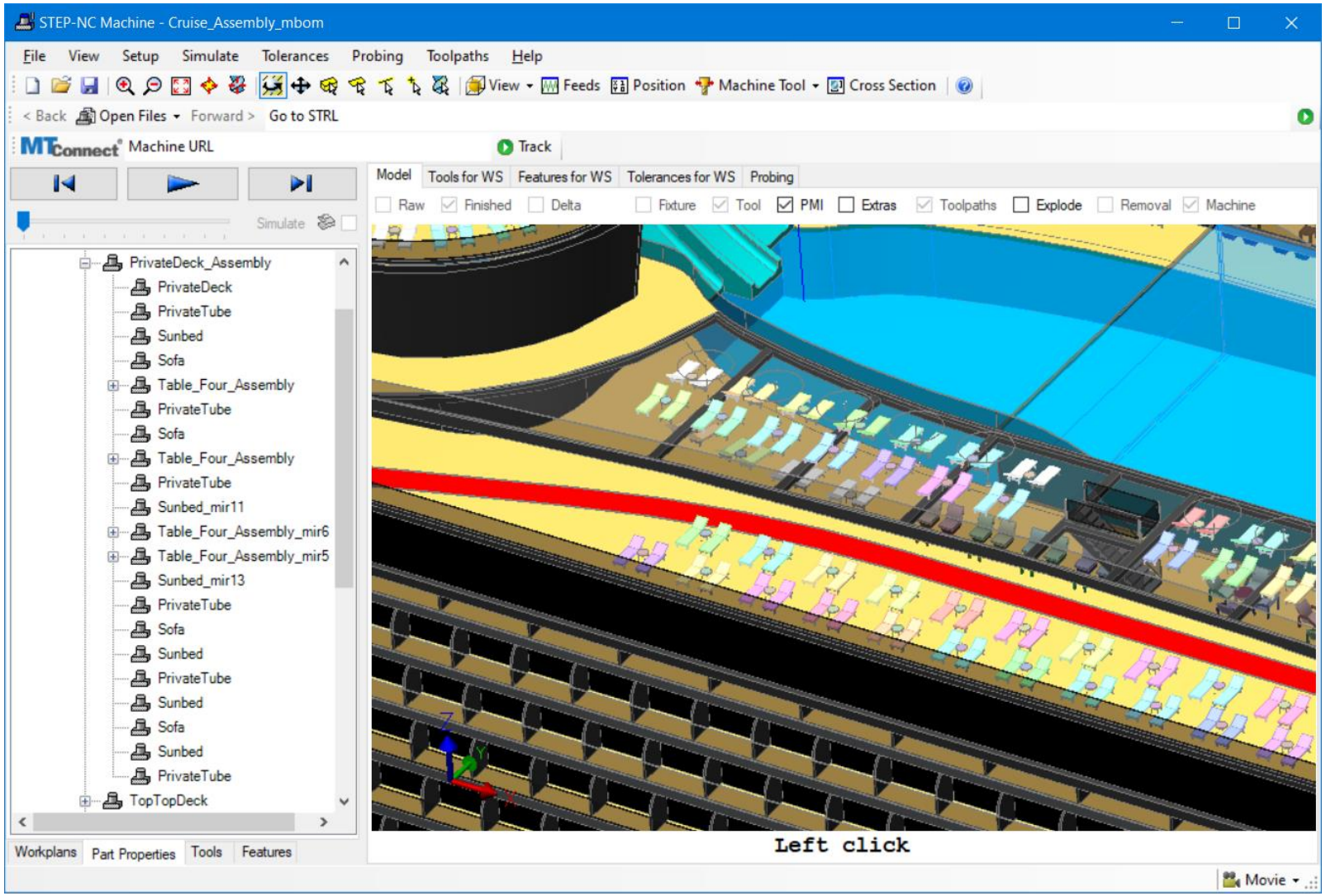
- All data in one place
- With many views in data
- Additions and exceptions
- PLCS & MLRD describing relationships is complex
- Hard to tolerance
- Fragile because one error disables very large file

Linked data

Network of connected files

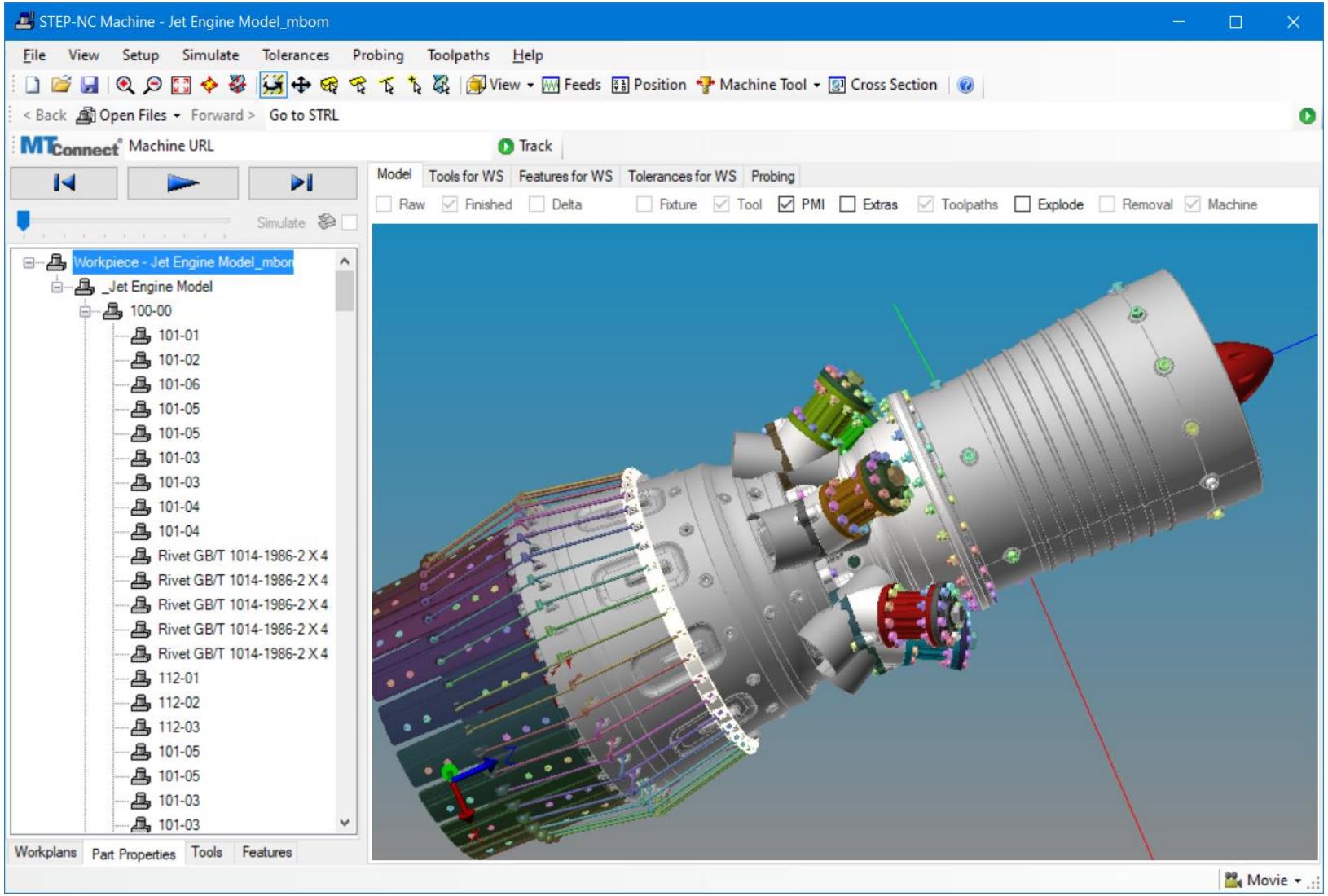
- Data in many detail files
- Detail file for each view
- Detail file for each breakdown
- Links describe relationships between master and details
- Easy to tolerance
- Robust because error in one file does not impact the others

Digital Twinned example – Cruise Ship



Files sizes are doubled

Digital Twinned example – Jet Engine



Digital Twinned example - Stratocruiser