

Digital Twin Manufacturing

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Why digital twinning for manufacturing?

- Digital models of the production items (AP242)
 - Machines, cutters, fixtures, robots
- Digital models of the production processes (AP238)
 - Workpiece, rawpiece, stage models
- Why is it different ?
 - Inclusion of Semantic GD&T enables intelligent manufacturing
 - Inclusion of production kinematics enables more accuracy
- What are the benefits?
 - On machine measurement
 - Interoperability and data sharing
 - Faster communication across supply chain

Digital Twin manufacturing framework



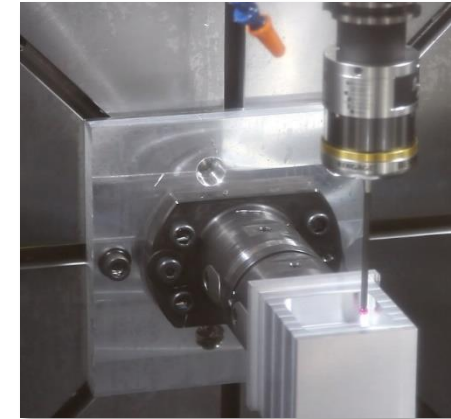
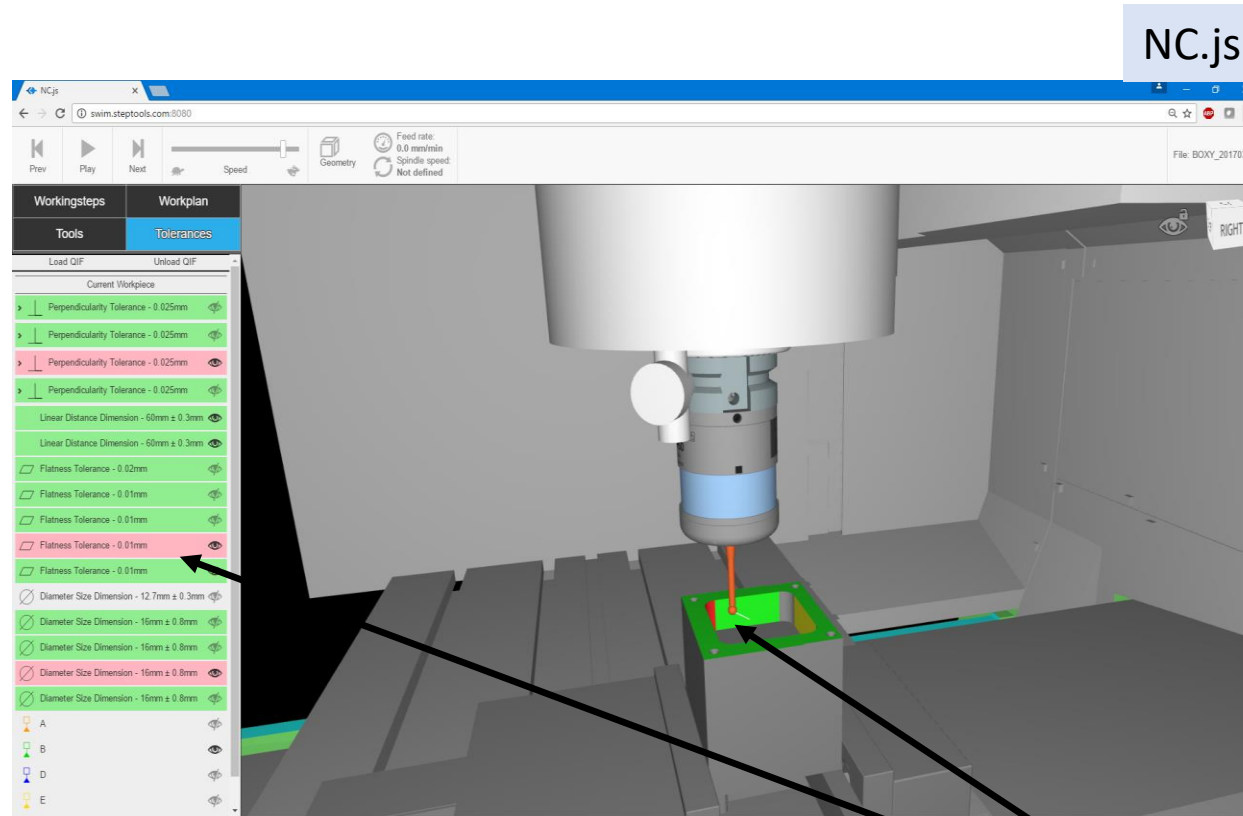
STEP is for product definition
MTConnect is for result streaming
QIF is for quality reporting

Digital Twin machining

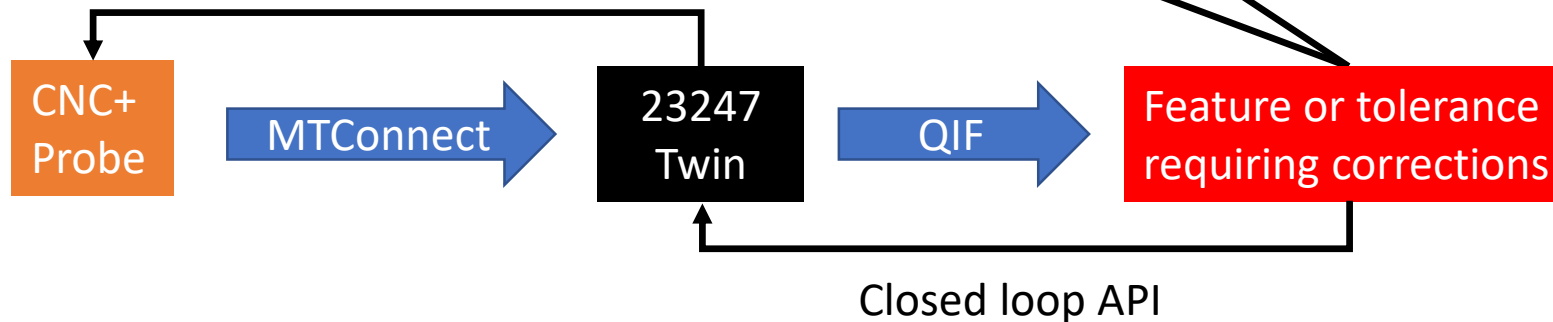


- Real time twinning from MTConnect
 - <10Hz trace the plan data
 - >30Hz model the run data
- Open stack
 - STEP in Node.js
 - View in Three.js
 - UI in React.js

Digital Twin measurement

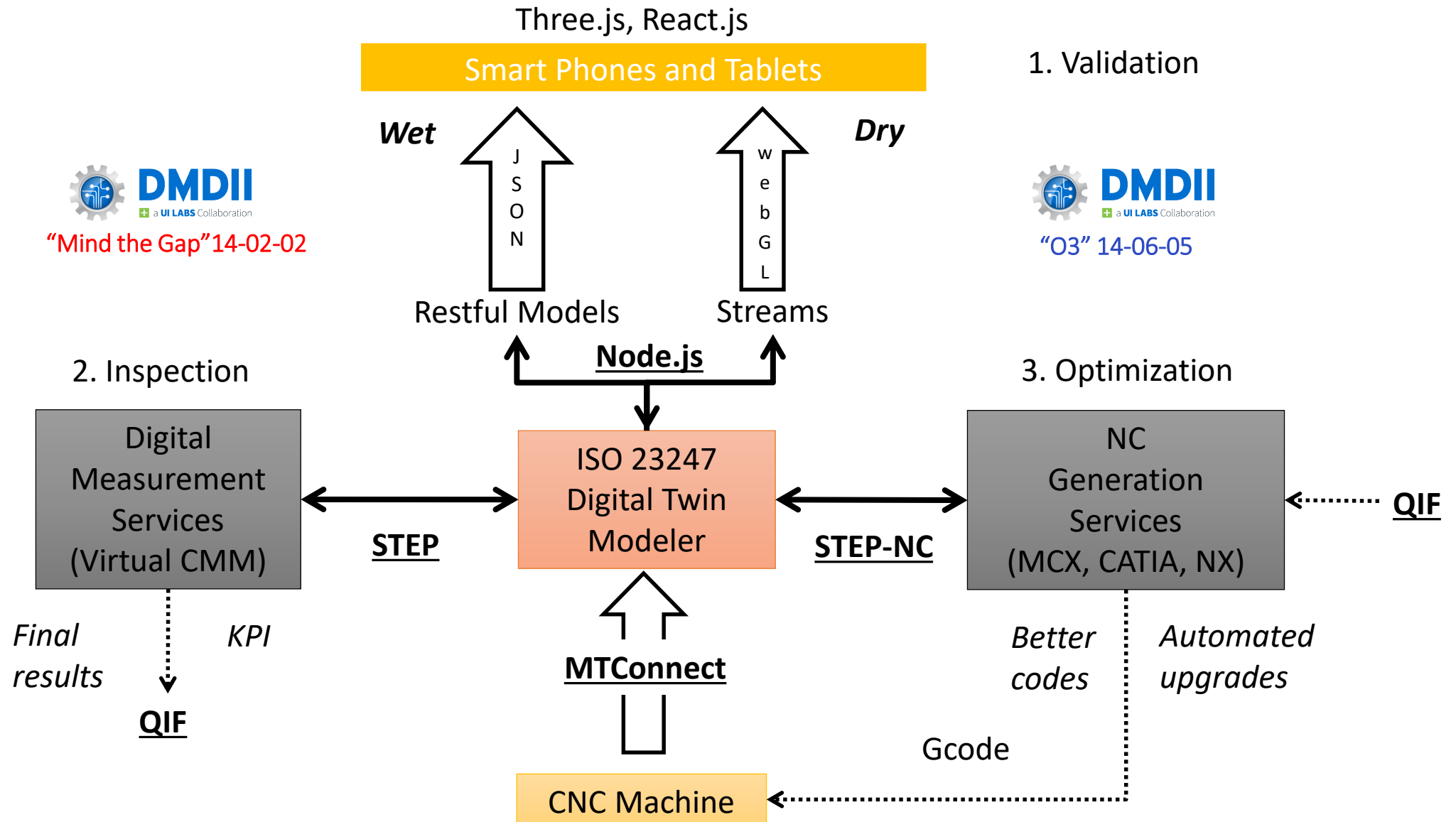


Just in time codes



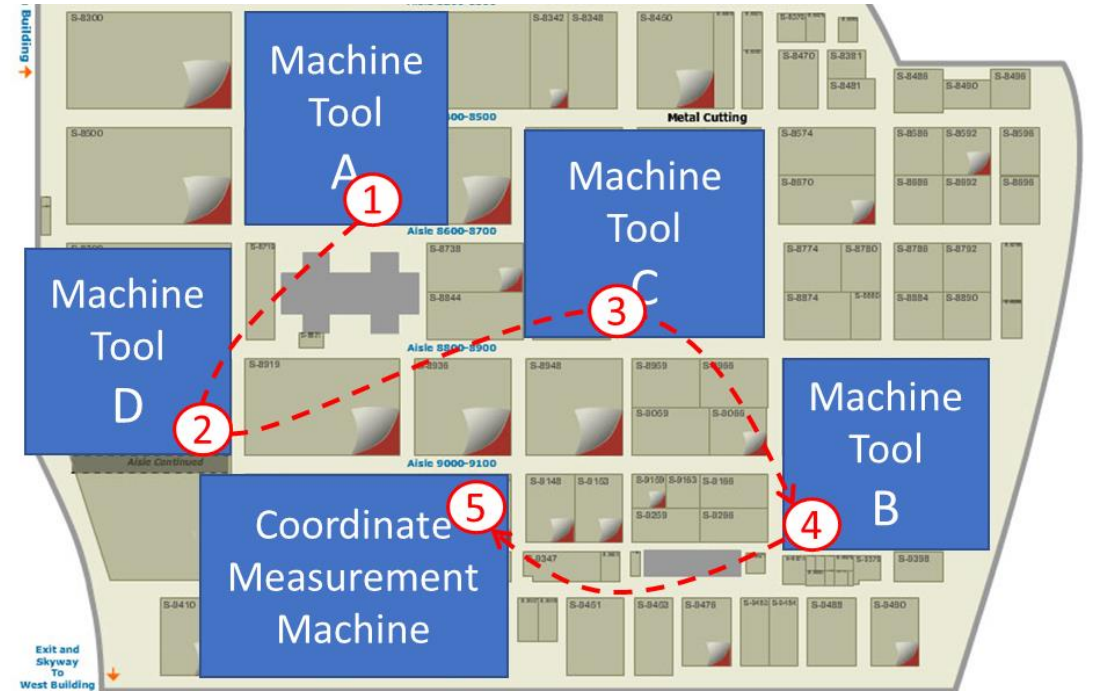
- Green good
- Red bad
- Yellow good and bad

Digital Twin framework – ISO 23247



Applications

- In-process measurement
 - Measure on the machine
- “Self driving” tools
 - Optimize feeds after tool changes
- Error free manufacturing
 - Prevent collisions on restarts
- Faster life cycle
 - Communicate issues and opportunities to rest of enterprise



Demonstrations at IMTS 2018
and JIMTOF 2018

IMTS and JIMTOF participants

- Participants and observers (* = contributing observer)

- Organizations

- ISO TC184/SC4
- OMAC
- NIST
- AMT/MTConnect
- DMSC/QIF

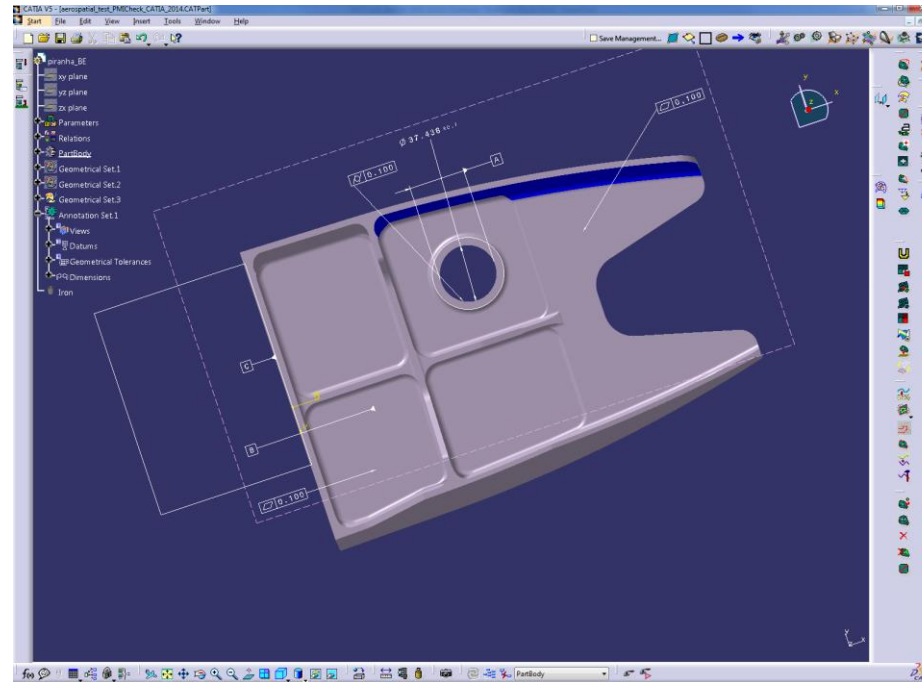
- Technology Providers

- STEP-Tools, Inc.
- Dassault *
- Autodesk *

- Cutters/ HOLDERS

- Sandvik Cormorant
- ISCAR *

CATIA



- Machine Tool Suppliers

- DMG Mori (IMTS, JIMTOF)
- Hyundai (IMTS)
- Makino (JIMTOF)
- Okuma *

- Metrology

- Mitutoyo
- Renishaw

- End Users

- Boeing
- Airbus

Participants add value to STEP, MTConnect or QIF



Questions?