

Grand Challenge Configuring and Running the Digital Twin Hub

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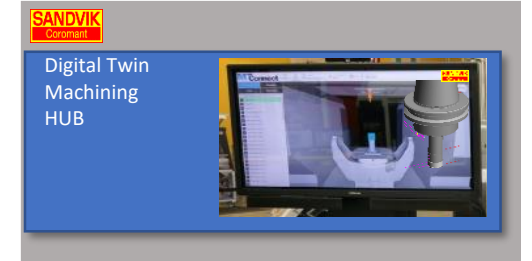
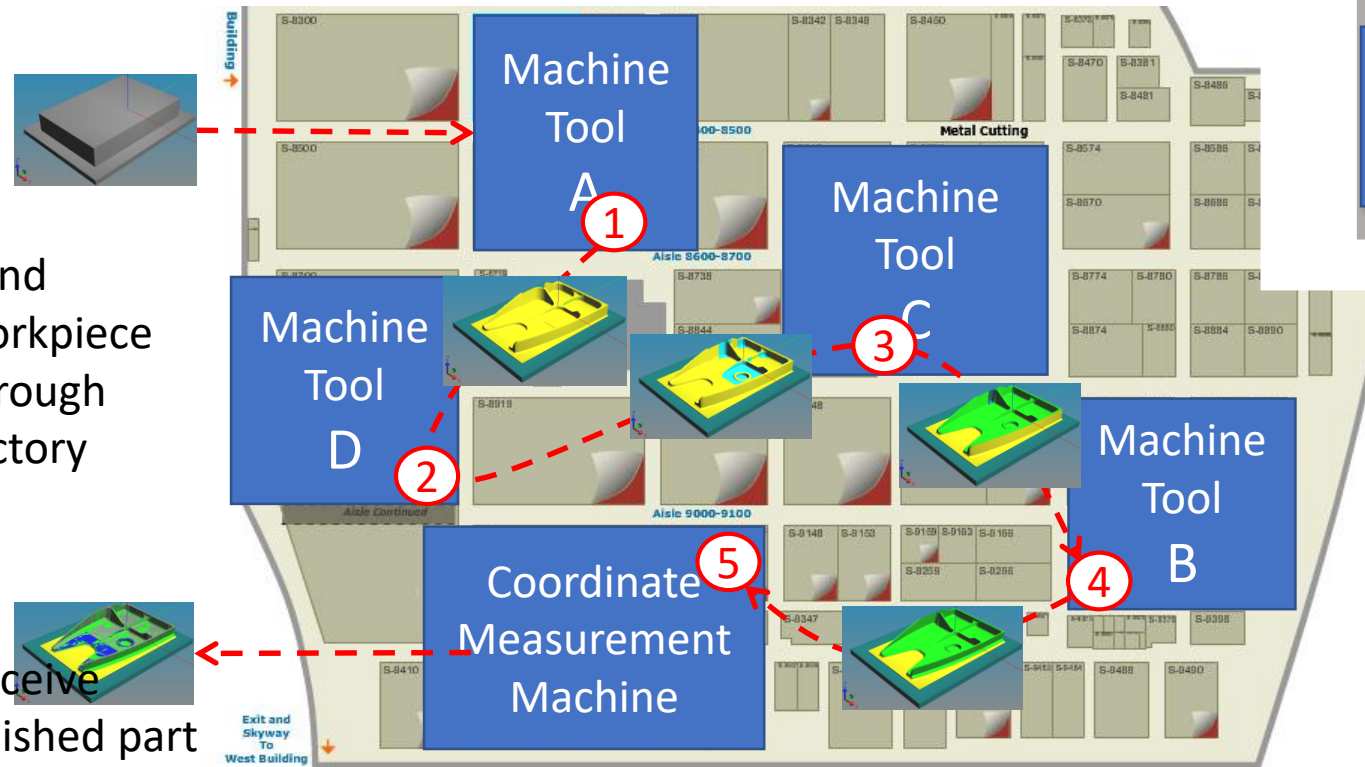
Digital Twin Machining at IMTS 2018

- ✓ Plan process

"Factory floor plan" at machine tool show

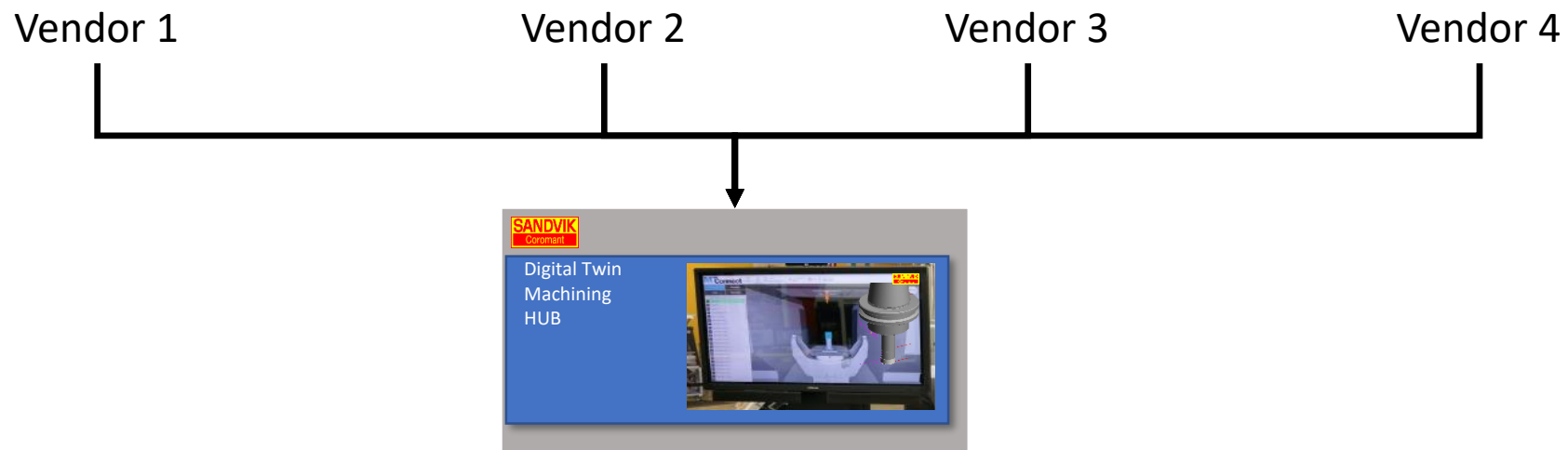
- ✓ Send workpiece through factory

- ✓ Receive finished part



Digital twin hub

- Questions for each vendor
 - What part is being machined
 - What program is being used
 - What machine is doing the work



Framework command suggestions

| Command | Label | Identified Item |
|---------------------|----------------------------|-----------------------|
| Sign on | Makino 01 | Machine tool instance |
| Load workpiece | Fish 01 | Workpiece instance |
| Load program | Fish_three_features_021181 | Project instance |
| Start operation | Contouring 33 | Workingstep |
| Completed operation | Contouring 33 | Workingstep |
| Tool change | Endmill 4 | Cutter instance |
| Measure Feature | Rib | Workplan |
| Evaluate Feature | Rib thickness | Tolerance |
| Unload workpiece | Fish 01 | Workpiece instance |
| Stop program | Fish_three_features_021181 | Project instance |
| Sign off | Makino 01 | Machine Tool Instance |

Which commands are must haves for IMTS 2018?

Managing the digital twin hub

1. What commands do we need to manage the hub?
2. How to implement them in NC.js?
3. And how to support them in
 - In STEP - definition / requirement
 - In QIF - evaluation / report
 - In MTConnect - action / response

Configuring the hub

- Recommendation one server in the hub per CNC machine tool
 - Dedicated for easier configuration management
 - Robust because can switch to a different server
- Recommendation one UUID per workpiece instance
 - Track part as it moves between vendors
 - Keep twin status current
 - Robust because can detect bad operations