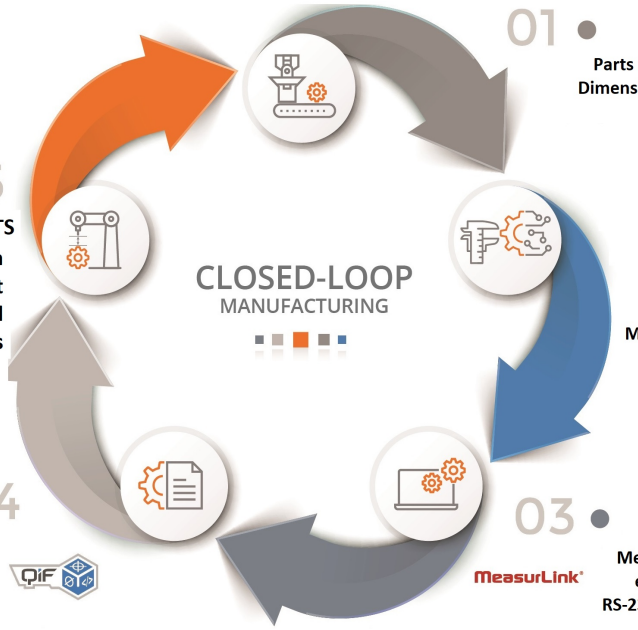
4.0 MANUFACTURING – SMART FACTORY CONCEPT



01 **PRODUCTION**

Parts are manufactured and moved from machining to Dimensional Measuring Equipment (DME) for inspection

02 **TESTING/INSPECTION**

Measurement results are produced by the DME eg. CMM, Vision System, Mirometer, Caliper, etc

03 **Data Management**

Meausrement results from the DME are sent electronically to MeasureLink via QIF, HID, RS-232, orDDE. Process capability statistics are produced from multiple measurements

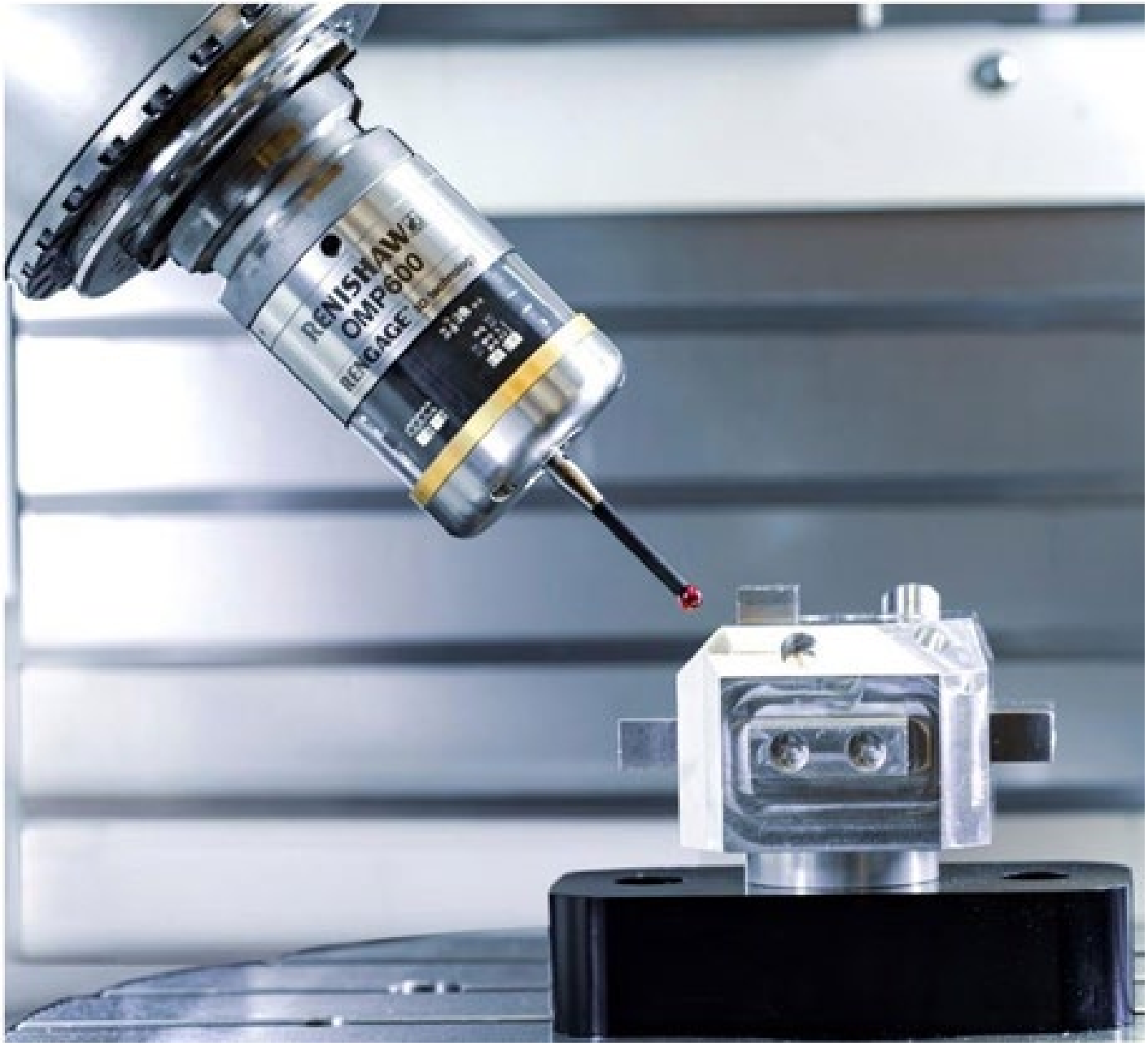
04 **ACTIONABLE INFORMATION**

A QIF File is created with measurement results and process capability statistics. QIF closes the digital loop from metrology to manufacturing

05 **AUTOMATIC TOOL OFFSETS**

The 'Smart' controller or compensating application uses the results and statistics to automatically adjust tool offsets for the next part, preventing defects and maintaining a high quality manufacturing process

Process Control Through Metrology-
Key to the future of CNC Automation



Industrial Metrology

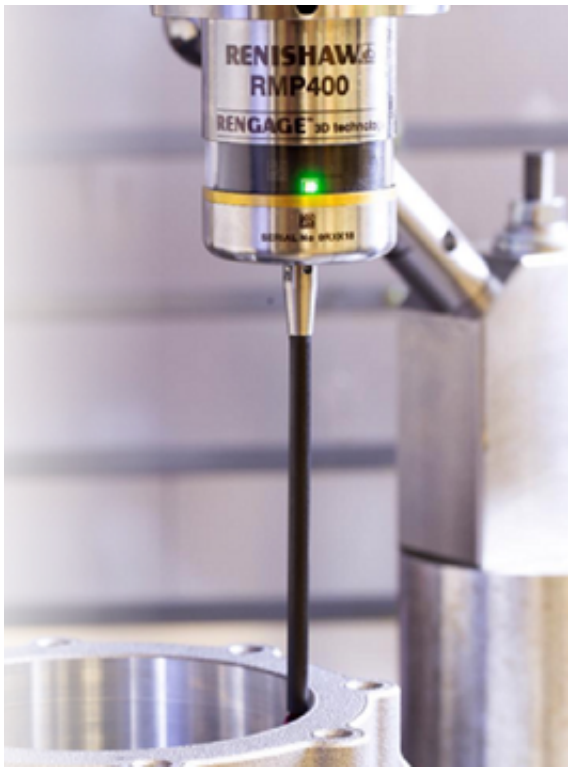
- **Process Control**
- **Process Validation**
- **Process Verification**
- **Continuous Improvement- streamline and optimize**
- **CNC Machine calibration and performance assessment**
- **Consistent process output**
- **Compensate for changes or drift during machining**
- **Verification of parts to meet design intent**

On-Machine Gauging Enables

- **Adapting metal cutting to variations in the machining process**
  - **Part distortion, tool deflection, thermal effects**
- **Updating coordinate systems, parameters and offsets based on actual real time conditions**

Benefits:

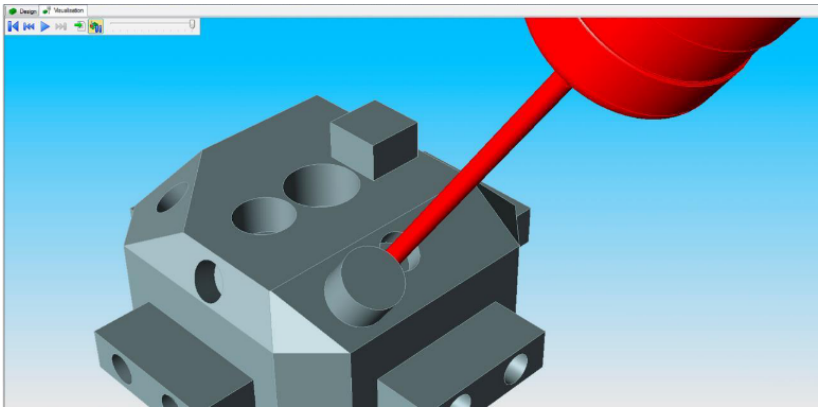
- **Processes can respond to actual conditions in order to maintain accuracy**
- **Quicker predictable decision making about reject conditions increases value added process time**
- **Reduced scrap and defects causes by inherent process variations**



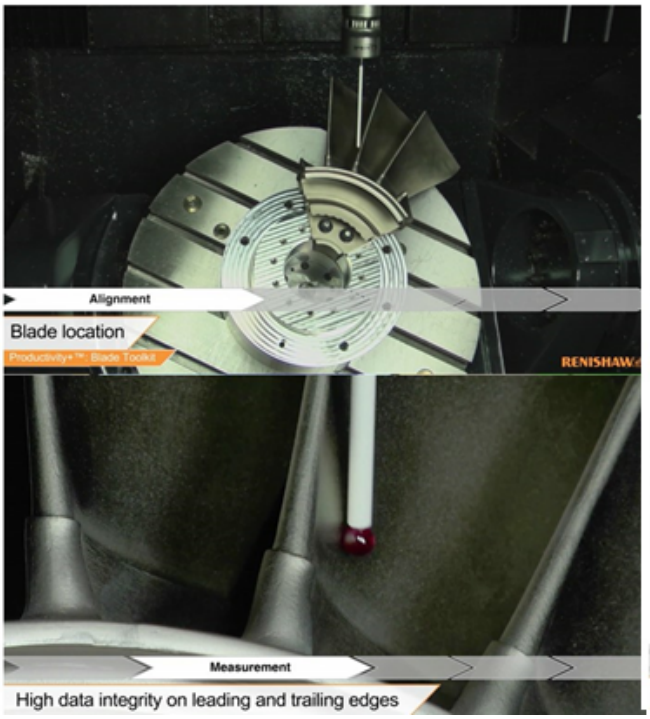
Programming the Machine

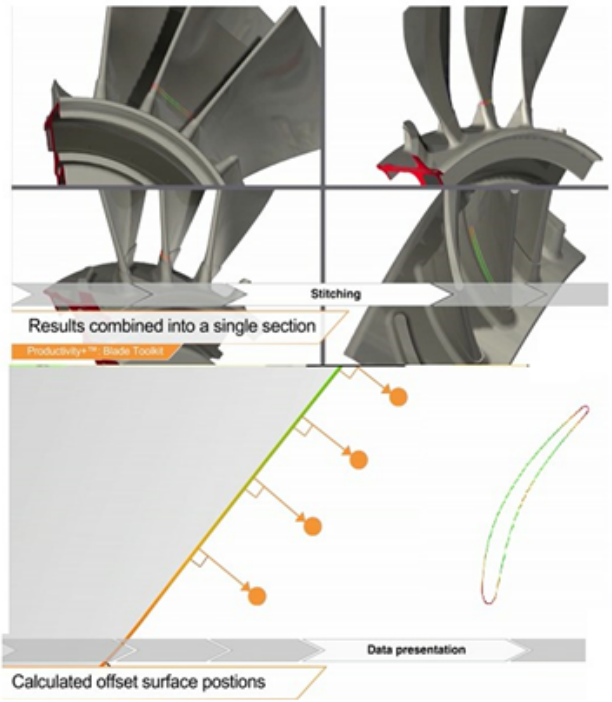
Bring in CAD Model to program machine paths/clearances
Align the part
Machine the part
Take measurements on the part
Stitch results
Calculate result deviation from nominal
Correct machining process

Real time measurements taken on the shop floor and feedback offsets to machine tool. Not post process



Program from CAD





Inspect Features during machining

- **Collect inspection results to track the process**
  - **Reduce scrap**
  - **Unmanned machining**

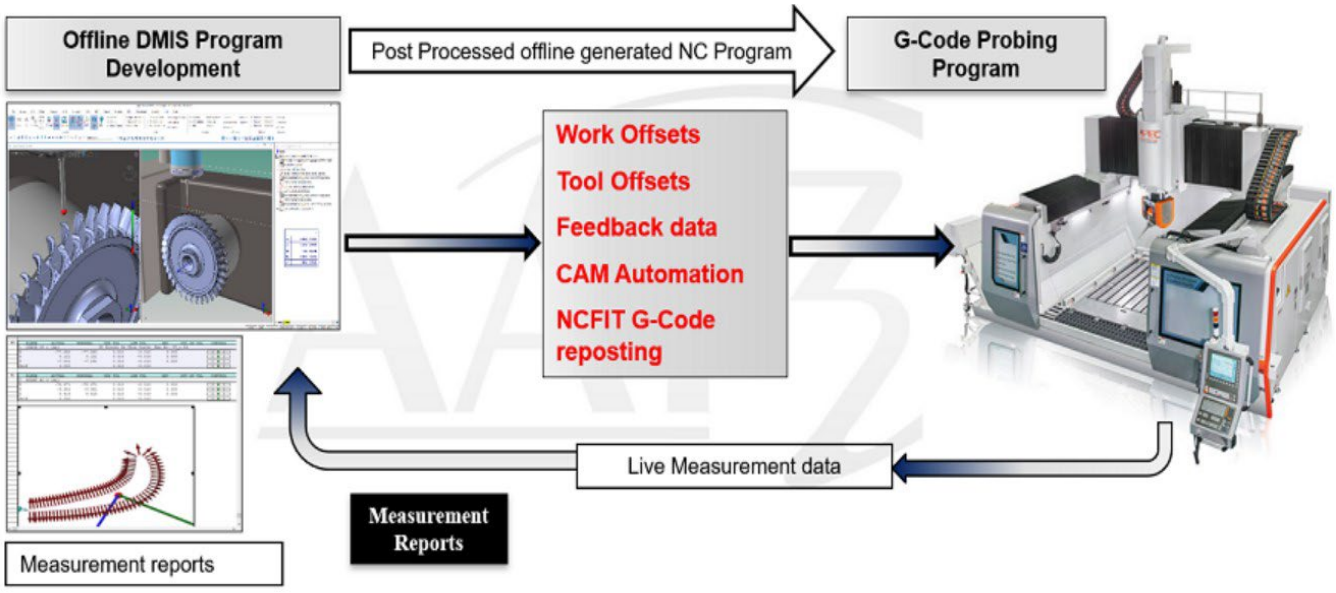
Tool Monitoring

Tool condition monitoring recognizes

- **Presence of the tool**
- **Position of the tool to ensure pull out has not occurred**

Benefits

- **Rapid checkes to monitor tooling problems and reduce scrap**
- **Checks voids allowing process to continue with sister tooling avoid waiting for operator**



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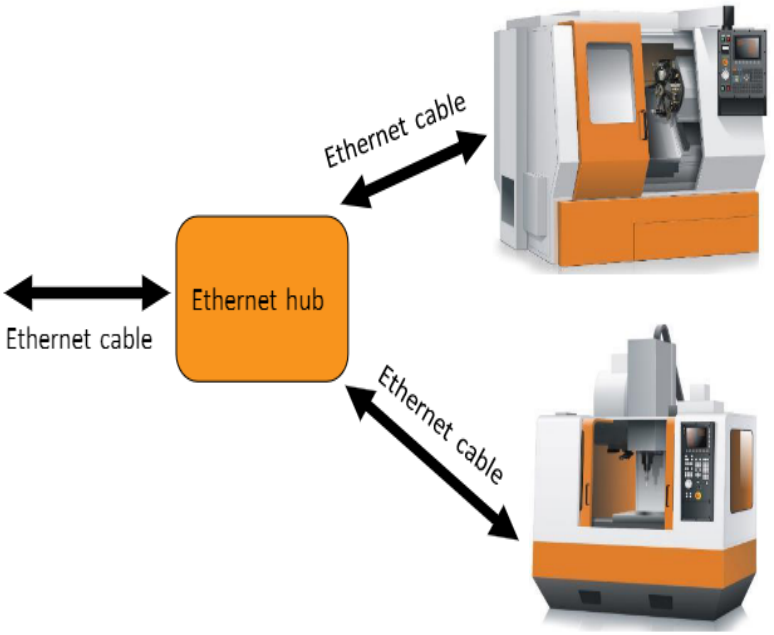
- **CNC MACHINE CUSTOM MACRO PROGRAMMING**
- **ROBOTICS AND INTEGRATION**
- **MEASURING EQUIPMENT**
- **PROCESS MONITORING-FEEDBACK**
- **PART HANDLING-MACHINE**


SCAN F60
sylvac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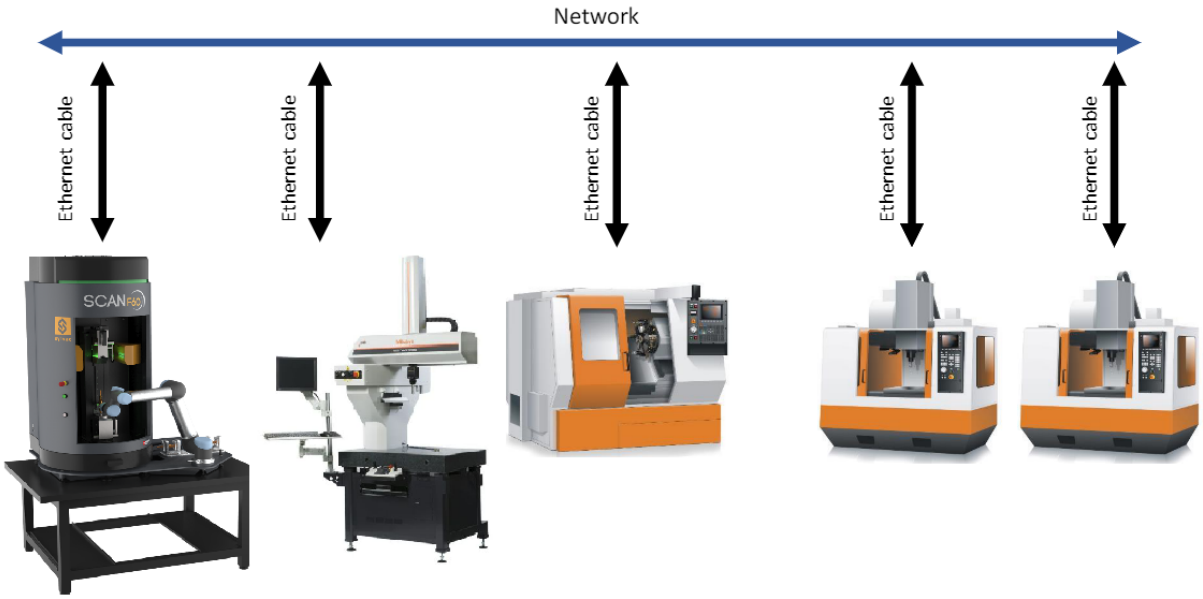
Ethernet hub
Ethernet cable
Ethernet cable


Network
Ethernet cable
Ethernet cable
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SCAN F60