MTConnect Overview and Architecture

Conference · Workshop · Expo

Myself & Mazak

- 27 Years at Mazak (Large Turnkeys, Custom Software)
- Microsoft Certified Professional (MCP)
- Responsible for Implementing MTConnect at Mazak *i*-Smart factory
- Chairperson for the “Machine Tool Working Group”

- Mazak one of the founding participants at Institute
- Mazak one of the leading supporters of the Standard
- Mazak one of the leading implementers (*i*-Smart factory)

[MC²]

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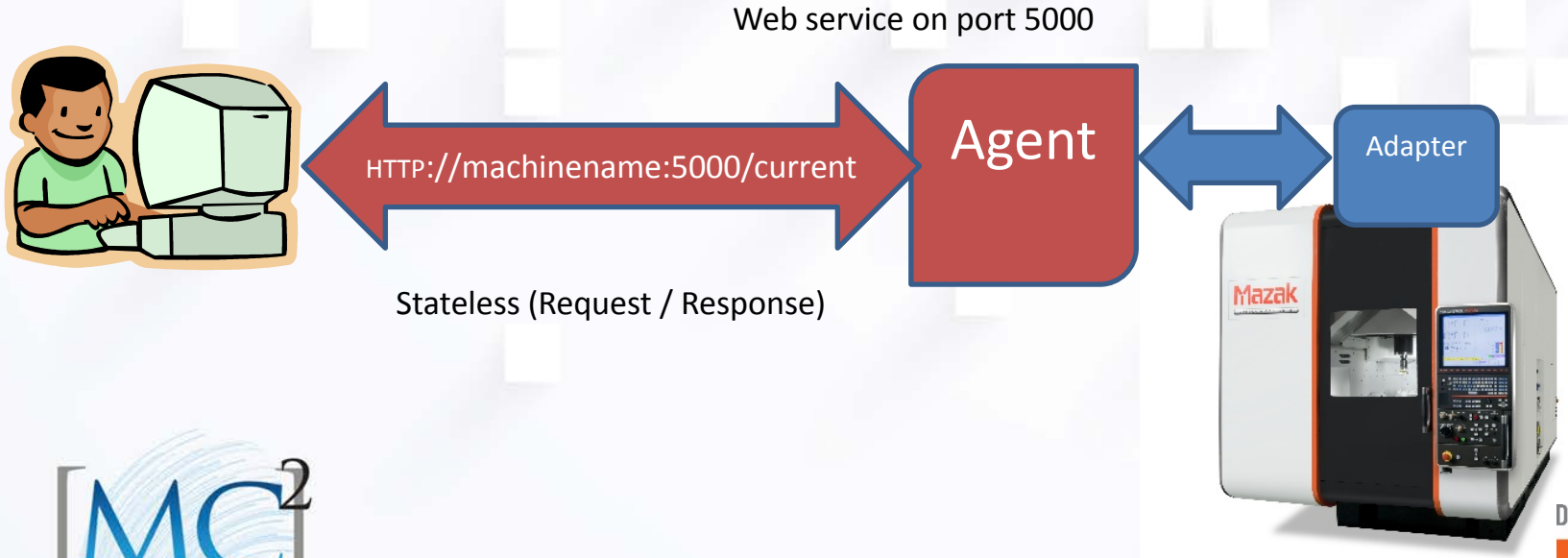
Agenda

- How does it all work?
- What Can I do with it?
- Future capabilities
- Crawl, Walk, Run

How it Works (Adapter / Agent Relationship)



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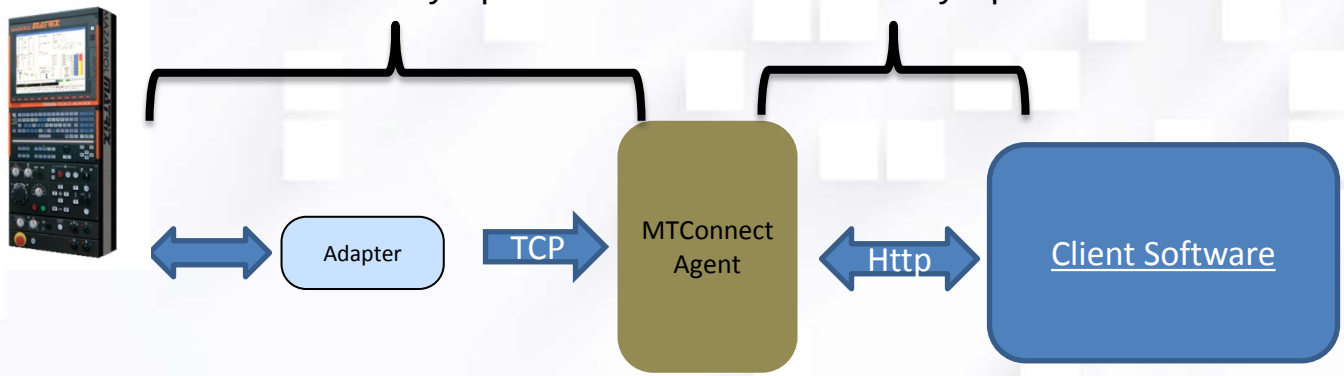
Adapters not part of the MTConnect standard



State Info
Assets Data
Documents
Transformations

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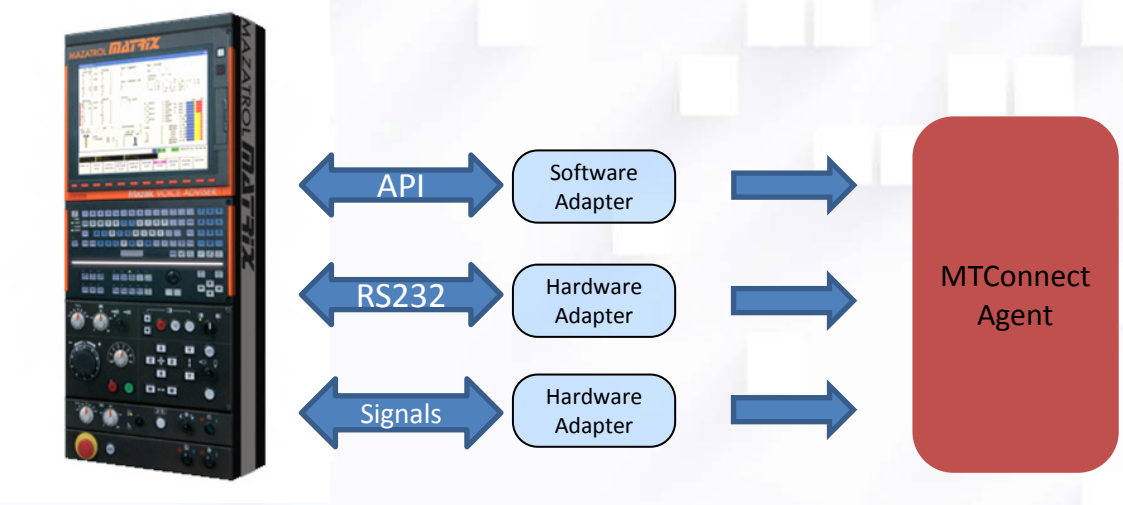
Adapters can be Hardware or Software



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Agent Responsibility

Respond to the following commands…

Probe

Return the device file

Current

Return data matching PATH parameter, else all data

Sample

Return specific data in buffer at location and/or interval

Assets

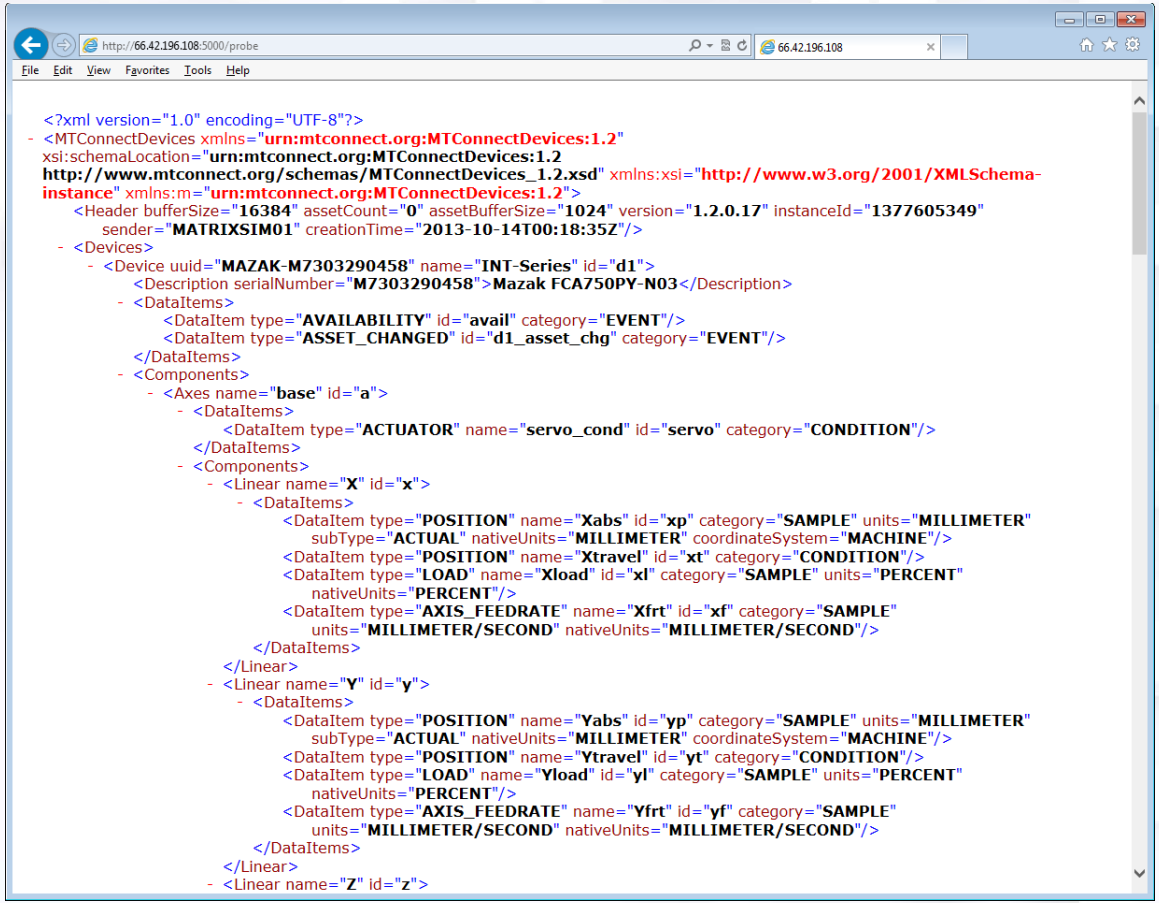
Return Asset documents (Tools,etc)

RAW Data View

This method is used for testing. Not recommended for daily use.

But yes…this is cool!

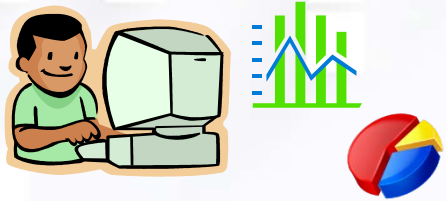
HTTP://mtconnect.mazakcorp.com:5612/probe



Status of Specification

10,000 ft View

Client Apps/Dashboards



Database

Agent 5000

Adapter 7878

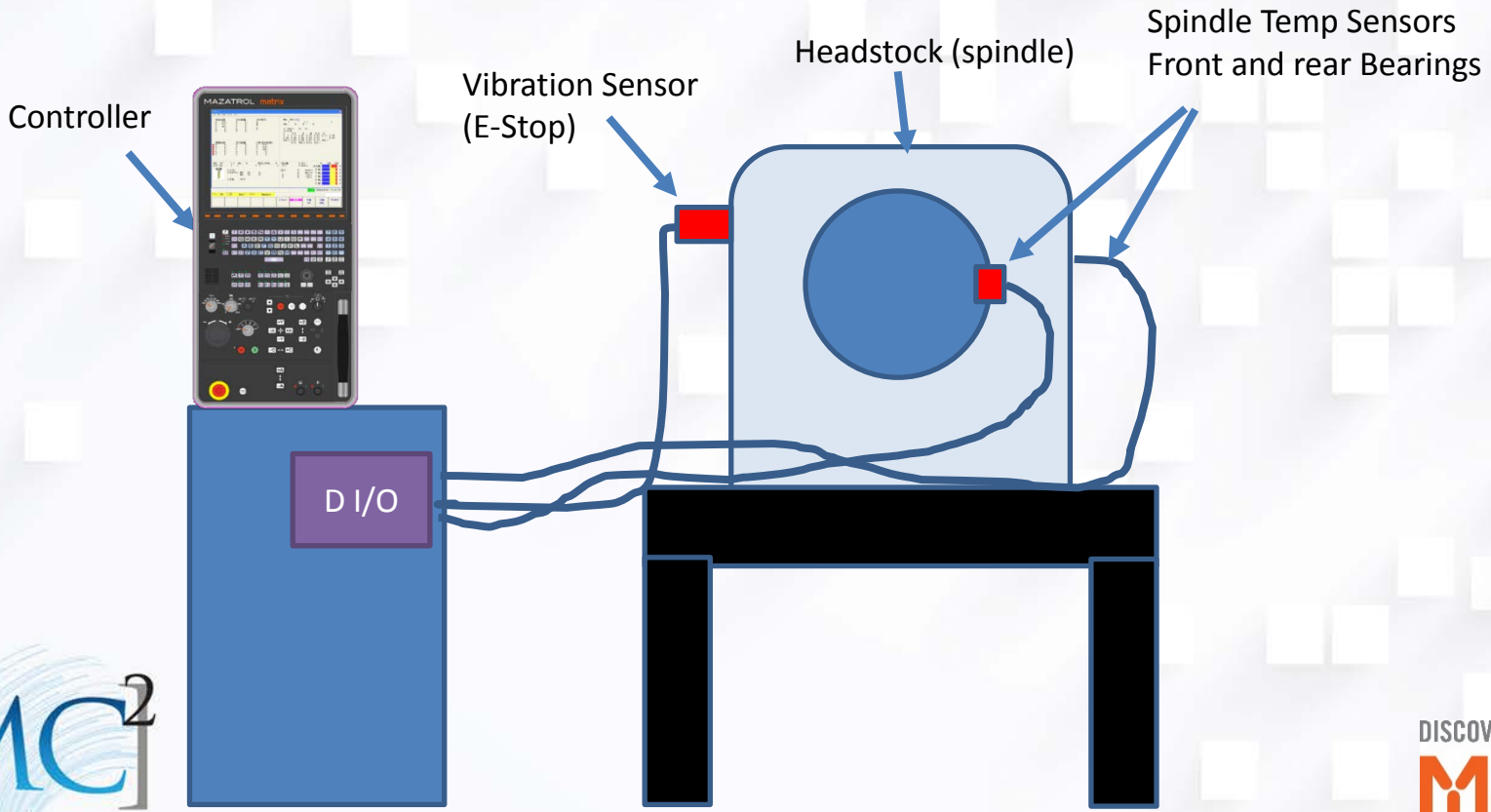
Agent 5000

Adapter 7878

Utilization

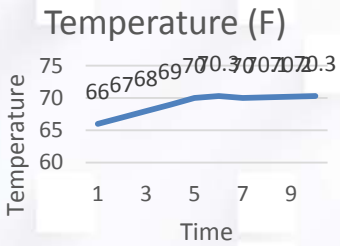
- Shop Floor Dashboard
- Self Managing Operators

Sensors



Mazak Factory Spindle Test Stands using MTConnect

Dashboards/ Analysis / Tracability



MES / Utilization Apps

ERP systems Integration

Microsoft Dynamics

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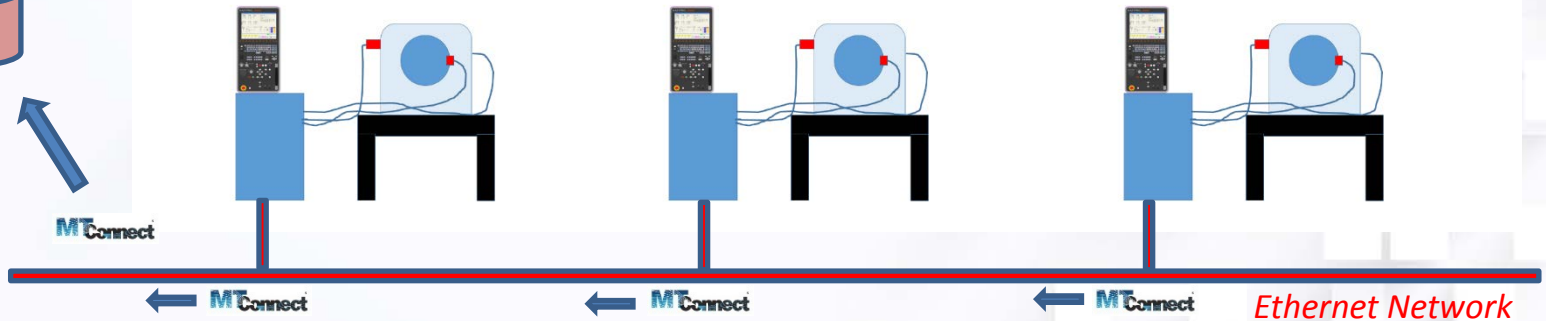
Database

MC²



Add Sensors to Existing Equipment

172.26.83.69

Adapter

Adapter

Agent 5000

172.26.83.70

AGENT.CFG FILE

```
Devices = mazak.xml
ServiceName = MTConnect_Agent_MC1
Port = 5000
BufferSize = 14
FilterDuplicates  =  yes
AllowPut = false
IgnoreTimestamps = true

Adapters {
        Mazak {
                Device = Mazak
                Host = 172.26.83.69
                Port = 7878
                }

        MOXA {
                Device = Mazak
                Host = 172.26.83.69
                Port = 5254
                }

}
```

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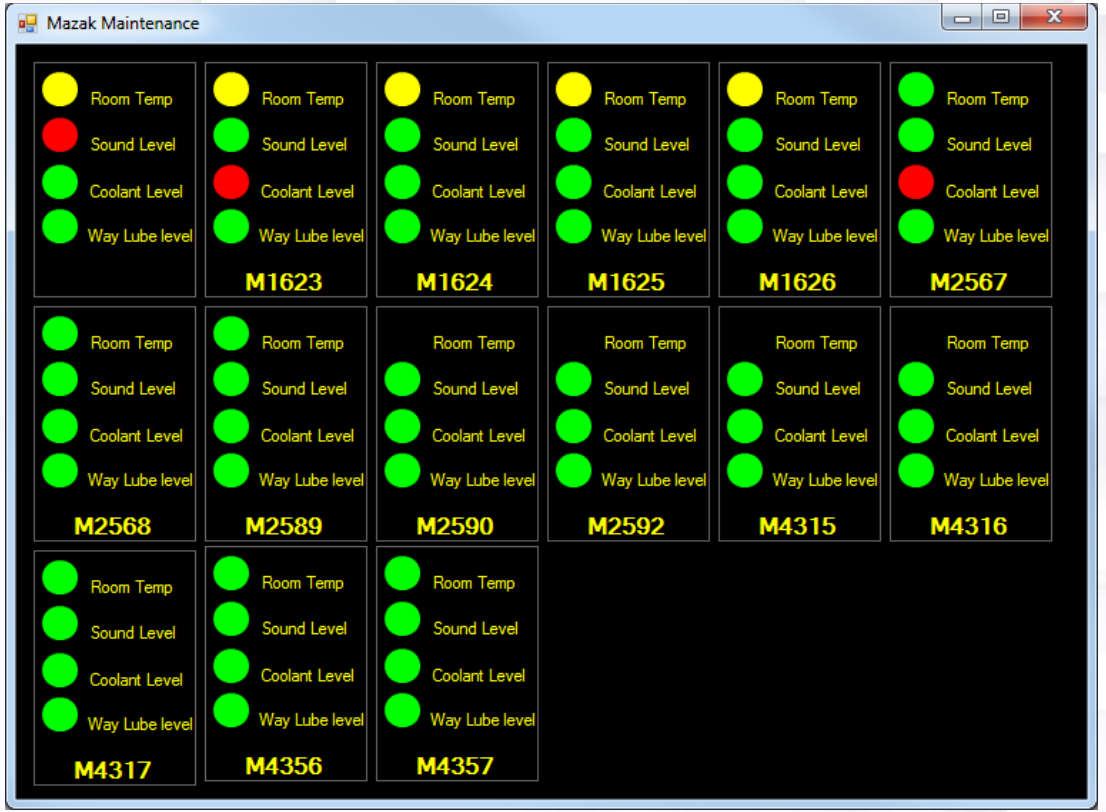
Maintenance

- Real-time Dashboard for Maint dept
- Preemptive Diagnostics
- Email / Text notifications
- Push events into Maintenance ticketing system



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Internal Solution (Vendor Supplied)

Customer Supplied….

- Windows Server
- Network
- Database

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Cloud Solution (Vendor Supplied)

Customer Supplied..

- Network/Internet connection

Vendor Supplied…

- Server
- Database

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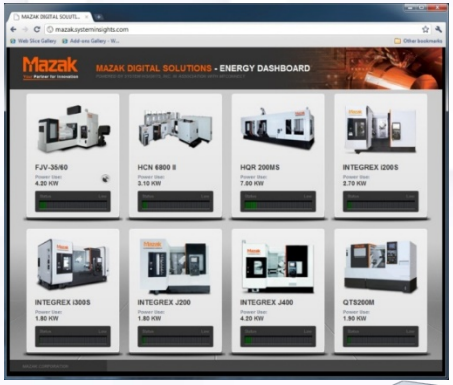
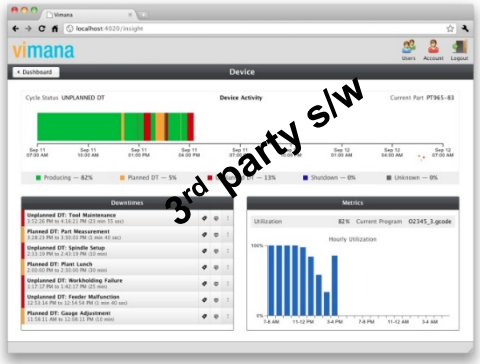
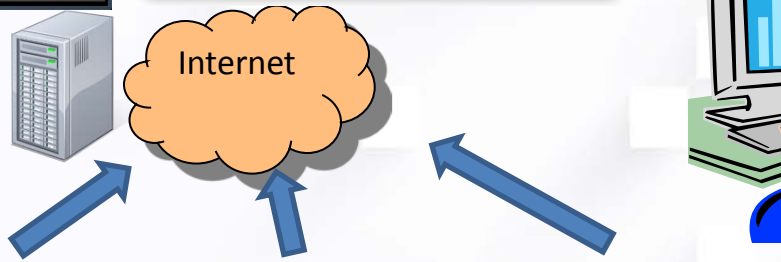
Cloud Solution (Remote Facilities)







Factory #1 | Factory #2 | Factory #3

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“PURE” MTConnect

Multiple Apps / Same Protocol

Adapte r7878

Agent 5000

MTConnect

Adapte r7878

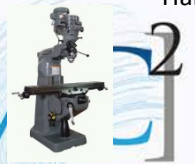
Agent 5000

MTConnect

Agent 5000

MTConnect

Hardware Adapters



Agent 5000

MTConnect

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NOT “PURE” MTConnect

Adapter 7878

Agent 5000

MTConnect

Adapter 7878

Agent 5000

MTConnect

Hardware Adapters

Proprietary Protocol
To App / Dashboard

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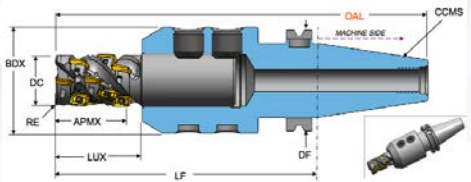
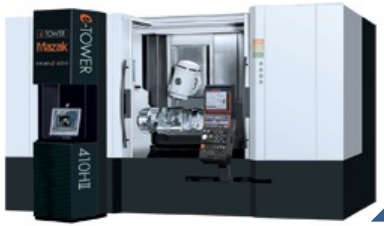
Tool Management



Supports a Universal Tool Management System **based on ISO13399**



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Metrology

Quality Measurement Standards Committee
Quality Information Framework (QIF)

- QIF Components
- QIFLibrary
- QMRules
- QMPlans
- QMExecution
- **QMResults**
- QMStatistics

You will be able to…

Collect on-machine inspection data (process control)
Exchanging data between machine / CMM and Quality systems

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Automation (Traditional)

Bar Feeder Interface

Digital Bar feed interface (Multiple wires)

SLAVE

MASTER

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Automation (MTConnect)

Bar Feeder Interface

Allows for additional info to be transferred

MASTER

Ethernet Cable connection only

MASTER

* Power and ESTOP Circuit must still be connected

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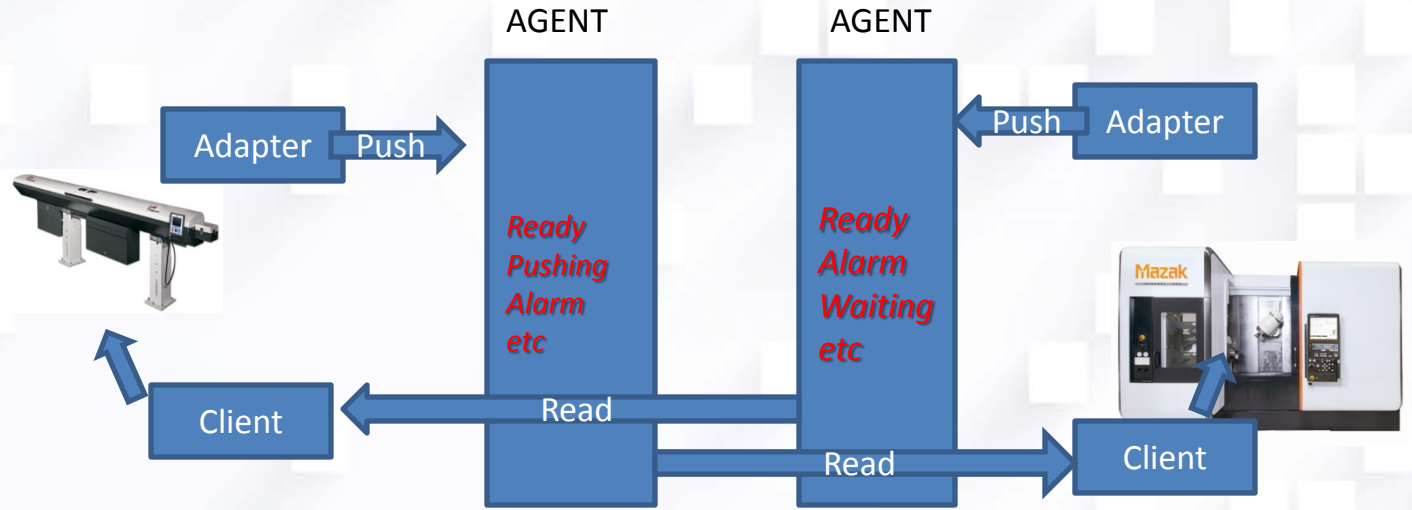
Bar Feeder Interface

Concept



Intelligence through Read/Read solution

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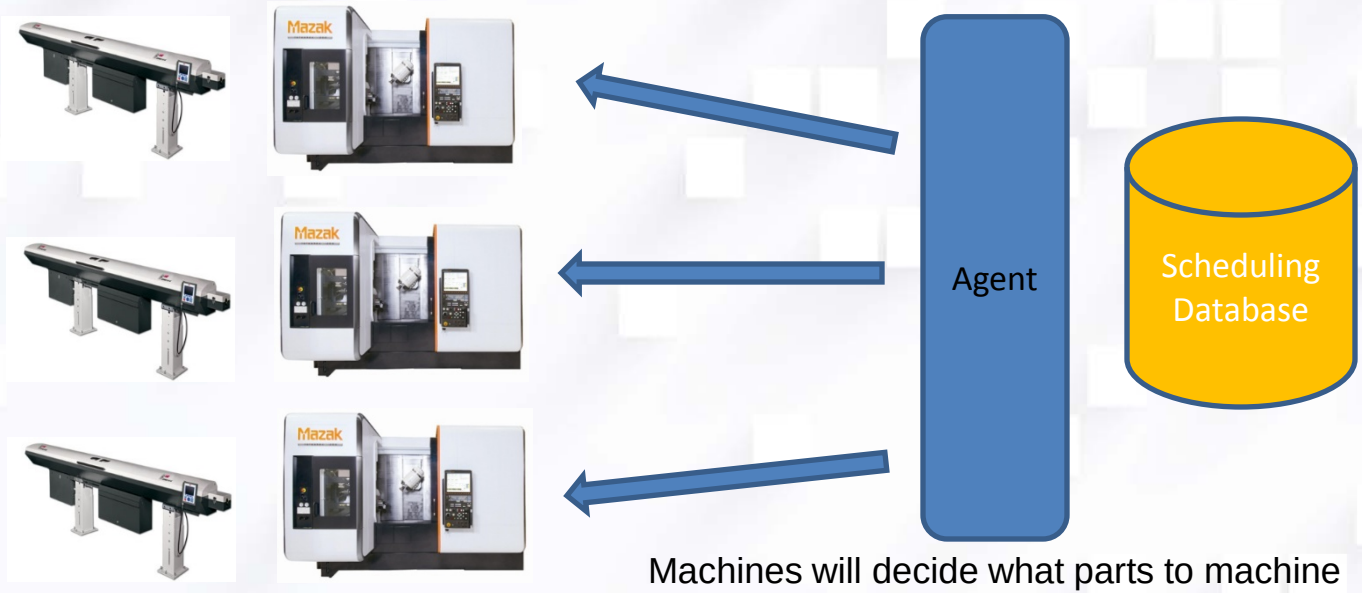
Dynamic Scheduling?



Machines will decide what parts to machine based on their capabilities.

Implementation Levels of Monitoring

Crawl

Utilization
Dashboards
Low Hanging Fruit

Walk

Analysis/Reporting
Operator Feedback
Preventative Maintenance
Unseen Issues

RUN

ERP Integration
OEE
Tool Management
Targeted improvements

“Low Hanging Fruit” (samples)

Availability issues due to…

- No Material at machine /cell
- Missing tooling (Can’t find / other machine using)
- Inadequate manpower (Loading fixtures for cell/multiple machines)
- Workforce issues (Personal issues, sick, late, absent, etc.)

Unseen issues (examples)

Performance issues due to…

- Programmed stops (M00/M01)
- Rapid Overrides not set at 100%
- Feed Overrides not set at 100%
- Spindle Overrides not set at 100%

Targeted Improvements (examples)

- Process flow (Find more efficient flow of materials through the facility)
- Bottlenecks (Manpower or equipment deficiencies)
- Equipment Capacity (Do you need to purchase a new machine?)
- Cycle times not as expected (Review cutting process/tooling)

Overall Equipment Effectiveness (O.E.E.)

OEE measures effectiveness based on scheduled hours
OEE is calculated as the product of its three contributing factors

OEE is calculated with the formula: **(Availability)*(Performance)*(Quality)**

(Availability= 86.6%)*(Performance=93%)*(Quality=91.3%)= (OEE=73.6%)

Thank you for your Time.
Questions?

For more information…

mtconnect@mazakcorp.com

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