Optimize Production with SQL Data Exchange Modules
Topics

- Benefits of data collection for analytics & tracking
- Advantages of using databases
- Options for PLC to Database Connectivity
- tManager ControlLogix <-> Database Appliance Solution
- Application Examples
- Questions?
Softing Inc.

- Global Headquarters in Munich, Germany
- Founded 1979, Publicly traded since 2000
- Acquired OLDI (long time Rockwell Tech Partner) in 2014
- Rockwell Automation *Global Encompass partner*
- North America headquarters in Knoxville, TN
- Sales through local Rockwell Automation distributors

Copyright © 2017 Softing Industrial. All rights reserved.
Benefits of Data Collection & Tracking

- **Overall Equipment Effectiveness**
  - Analyze cycles times – find bottlenecks/make efficiencies
  - Determine KPI – Key Performance Indicators
  - Measure Availability, Performance & Quality

- **Track & Trace (Serialization)**
  - Capture production attributes at each stage
  - Correlate to finished good (via serial numbers)
  - Quickly identify affected goods and sources

- **Automating Data Collection/Recipe Management - has its own benefits**
  - Decreases workers’ time (no manual data entry)
  - Eliminates “human error” of data entry (production/quality)
  - Significantly increases amount of data collected for better analytics
Advantages of Using Databases

- **Already used in most business systems** (minimal investment)
  - Order Entry/Finance/Warehouse Logistics
  - The engine behind many ERP systems
  - May be (can be) central to Manufacturing Execution Systems (MES)

- **Bidirectional data**
  - Database tables may be read from and written to
  - Also supports Track/Trace & Recipe Management

- **Databases offer a plethora of tools**
  - Querying
  - Reporting
  - Analytics

- **Databases provide excellent storage of transactional data & are bidirectional**
  - Historians are best when capturing variables at high scan rates
Data Exchange Challenges on the Plant Floor


- Reliability/vulnerability of PC platforms
  - Windows updates
  - Malware/viruses & scanning
  - Licensing issues & Windows OS versions
  - Hardware failure (data loss)

- Complex HMI/VB scripting – troubleshooting/support
  - Complex programming – who supports later for troubleshooting/changes?
  - Production stoppages if HMI fails or needs updated

- Network/process congestion with OPC scanning

- Data collection modifications only during shutdowns (support for 24/7 operation)

- Lack of PLC feedback/diagnostics if transactions fail

- Wide range of devices/protocols – locked down PLCs
Connecting Plant Floor & IT Systems

Database Tables & Procedures

**Transactional information:** orders, supply network, product design……

- ERP
- FINANCIAL
- LOGISTICS
- QUALITY
- WAREHOUSE

**Real-time data:** alarms, events, states, energy, diagnostics……

- PAC/PLCs
- MATERIAL & TRANSPORT
- MACHINES

- Windows server with specialized software?
- HMI/SCADA with scripting?
- Purpose-built PLC Hardware Appliance
Connecting Plant Floor & IT Systems

**Business Systems/MES/ERP**

**Transactional information:** orders, supply network, product design……

ERP    FINANCIAL    LOGISTICS    QUALITY    WAREHOUSE

**Real-time data:** alarms, events, states, energy, diagnostics……

PAC/PLCs    MATERIAL & TRANSPORT    MACHINES

**tManager Data Exchange Module for ControlLogix**

- Purpose-built PLC Hardware Appliance
“Configure & Go” Data Transfers

Enterprise Databases (MES/Recipe Systems)
- Microsoft SQL
- Oracle
- MySQL
- IBM DB2 (AS/400)
- JMS
- MQTT/Cloud

Up to 16 Controllers
- Rockwell Automation
  - ControlLogix®
  - CompactLogix
  - SLC 500
  - Schneider Quantum
  - Siemens S7-300 or S7-400

Ethernet or Rockwell Bridges

No Dedicated Computer Hardware/Software Required

Read & Write

tManager® Appliance
- Inserts
- Updates
- Selects
- Stored Procedures
Download process instructions, upload production results, stepped migration to legacy PLC’s, move past interoperability, start optimizing your plant.
tManager Advantages

• No computer needed to operate
  – No Windows OS to manage (no updates, malware, version management)
  – No computer hardware required (no white box or thin client)
  – No VMWare management

• No logic changes required to PLC programs
  – Perfect for locked down systems (validated/OEM Machines)
  – Background Class 3 messaging – low data traffic/no PLC burden

• Very easy to use configuration GUI
  – No SQL command expertise required
  – No PLC program changes required (Class 3 messaging)

Reduces costs & improves production reliability
tManager Advantages

- No computer needed to operate
- No Windows OS to manage (updates, malware, version management)
- No computer hardware required (no white box or thin client)
- No VMWare

- No logic changes required to PLC programs
- Perfect for locked down systems (validated/OEM Machines)
- Background Class 3 messaging – low data traffic/no PLC burden

- Very easy to use configuration GUI
- No SQL command expertise required
- No PLC program changes required (Class 3 messaging)

Reduces costs & improves production reliability
tManager Advantages

- **Database client security**
  - Credentials to connect and authenticate to DB (IT)
  - Access only to Tables and/or Stored Procedures for project

Reduces costs & improves production reliability
tManager Advantages
tManager Advantages
tManager Advantages
tManager Advantages

Transaction Trigger Options

- **Periodic** (scanned) with optional condition (e.g. change in Tag value)
  - as fast as 250ms
- **Event** (PLC MSG Instruction) – fastest
- **Scheduled**
  - Time of day
  - Once an hour/day/week/month….
  - Etc.

Trigger types may be combined
tManager Advantages

• **Highly reliable** (continuous operation)
  – Store & Forward (2 GB onboard memory)
  – Automatic database failover
  – Status Tags for monitoring
    – tManager appliance health
    – Store & Forward State – e.g. HMI Alarm
    – Transaction complete (feedback to PLC program)
    – Successful Messages
    – Errors/Timeouts
    – Messages in Queue/Dropped/Expired
    – Percent Full

• **Transaction logging**, alarms/alerts, performance

• **Supervisory PLC** may control tManager/Projects (on/off)

**Improve production reliability**
tManager Advantages

- Highly reliable (continuous operation)
- Store & Forward (2 GB onboard memory)
- Automatic database failover
- Status Tag for monitoring
tManager appliance health
- Store & Forward State
- HMI Alarm!
- Successful transaction (feedback to PLC program)
- Transaction logging, alarms/alerts, performance
- Admin credentials for DB access & Network firewall

Reduces costs & improves production reliability
tManager Advantages

• Highly reliable (continuous operation)
  – Store & Forward (2 GB onboard memory)
  – Automatic database failover
  – Status Tag for monitoring
  – tManager appliance health
  – Store & Forward State
  – HMI Alarm!
  – Successful transaction (feedback to PLC program)
  – Transaction logging, alarms/alerts, performance
  – Admin credentials for DB access & Network firewall

• Rockwell Network Connectivity
  – EIP, CNET or Data Highway access to CompactLogix, SLC, PLC-
    – Up to 16 controllers

Reduces costs & improves production reliability
tManager Database Functions

- **Insert**
  - Write data to new record

- **Update**
  - Update information in existing row

- **Select**
  - Query rows, return data tags
  - Ideal for recipe management

- **Stored Procedures**
  - Call database custom written programs

- **Supports Arrays**
  - UDT/Complex Arrays & XML

Automatically Creates SQL Code
New – tManager Integrated MQTT/Cloud Support

- MQTT Publisher & Subscriber
- JSON Support
- Read/Write to Cloud
  - AWS (Amazon)
  - Microsoft AZURE
  - GE
  - Etc.
- Secure data back-up (Cloud mirroring)
- Cloud Apps (analytics, etc.)
tManager Customer Applications

• Production/Quality Data Collection
• Track & Trace ( Serialization )
• Machine Monitoring ( OEE )
• Recipe Download/Management
• Advanced Resource Planning ( ERP )

Field Proven for Critical Applications
# tManager Customer Applications

<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
<th>Industry</th>
<th>Integrator</th>
<th>End-Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track &amp; Trace</td>
<td>Automotive Tier 1 Track &amp; Trace with MS SQL</td>
<td>Automotive</td>
<td>Stone</td>
<td>Nemak</td>
</tr>
<tr>
<td>Track &amp; Trace</td>
<td>Automotive Aluminum Casting with MS SQL</td>
<td>Automotive</td>
<td>Stone</td>
<td></td>
</tr>
<tr>
<td>Track &amp; Trace</td>
<td>Appliance Track &amp; Trace with MS SQL &amp; replication</td>
<td>Appliance</td>
<td>Stone</td>
<td></td>
</tr>
<tr>
<td>Track &amp; Trace</td>
<td>Medical Device Quality Monitoring with MS SQL</td>
<td>Medical Device</td>
<td></td>
<td>Lifescan</td>
</tr>
<tr>
<td>Track &amp; Trace</td>
<td>Precious Metal Recovery with IBM WAS JMS</td>
<td>Metals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track &amp; Trace</td>
<td>Construction Equipment Manufacturing with Oracle/MS SQL</td>
<td>Construction Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track &amp; Trace</td>
<td>Lithium Battery Production with MS SQL</td>
<td>Battery</td>
<td>Roche</td>
<td>Bathium</td>
</tr>
<tr>
<td>Measure &amp; Monitor</td>
<td>Tire Production Monitoring with Oracle</td>
<td>Tire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure &amp; Monitor</td>
<td>Gas Transmission Monitoring with MS SQL</td>
<td>Oil &amp; Gas</td>
<td>EN Engineering</td>
<td></td>
</tr>
<tr>
<td>Measure &amp; Monitor</td>
<td>Material Weighing</td>
<td>Metals &amp; Mining</td>
<td>Jordan Engineering</td>
<td></td>
</tr>
<tr>
<td>Measure &amp; Monitor</td>
<td>Tire Curing Data Collection</td>
<td>Tire</td>
<td></td>
<td>Bridgestone</td>
</tr>
<tr>
<td>Material Handling</td>
<td>Global Warehouse Management System with DB2/AS400</td>
<td>Food</td>
<td>Grantek</td>
<td></td>
</tr>
<tr>
<td>Material Handling</td>
<td>Automated Warehousing/Palletizing</td>
<td>Various</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Handling</td>
<td>Automated Warehousing/Tote Routing</td>
<td>Distribution</td>
<td>Werner Electric</td>
<td>Werner Electric</td>
</tr>
<tr>
<td>Instruction Download</td>
<td>Global Label Printing</td>
<td>Chemical</td>
<td>Roche</td>
<td>AkzoNobel</td>
</tr>
<tr>
<td>Instruction Download</td>
<td>Auto Mfg with FactoryTalk ProductionCentre MES; IBM WAS JMS; multiple ControlLogix as data concentrators</td>
<td>Automotive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction Download</td>
<td>Turbine Blade Heat Treatment with MS SQL; replacing VB Scripting</td>
<td>Aerospace</td>
<td>PCC Airfoils</td>
<td></td>
</tr>
<tr>
<td>Error Proofing</td>
<td>Error Proofing system for discrete assembly</td>
<td>Various</td>
<td>Rockwell SSB</td>
<td></td>
</tr>
</tbody>
</table>
tManager: Automotive Track & Trace
Finishing Line - Idea

- Melt ing
- Cast ing
- Fin ish ing
- Qual ity on tro
- Res in s & San ds
- Recycling
- Bir th cer tificate
- Sto rage
Manager: Automotive Track & Trace
Finishing Line - Challenge

- Automotive plant assembly lines:
  - Create unique part ID/"birth certificate"
  - Track and trace
  - Record equipment used

- For Data Transfer
  - Connect to legacy controllers
  - Replace Visual basic scripting in SCADA
  - Buffer data in case of lost wireless communication

Replace fragile VB Script solution with industrial solution
**tManager: Automotive Track & Trace**

**Finishing Line - Results**

- Add 3 ControlLogix systems as data concentrators
- Use tManager modules to transfer data to and from Enterprise Server

- Track and Trace easily implemented, robust built for purpose solution, easy to support through standard approach
- Speed
  - Fast data exchange between MS SQL and PLCs
- Robust
  - Customer confident in validity of transactions due to handshaking and error messaging from tManager module
  - Spare tManager on the shelf for quick recovery

Islands can connect together and to the Enterprise RA bridge modules simplifies connection to older PLC systems
Connectivity & Diagnostic Solutions

**Data Exchange & Connectivity**

- **eATM-tManager**
  - Enterprise-to-Controller Data Exchange
- **eATM-OPC UA Server**
  - UA Client Connectivity
- **dataFEED**
  - OPC & OPC-UA Server Software

**Network Diagnostics**

- **WireXpert 4500**
  - Copper/Fiber Cable Certifier
- **NetXpert 1400**
  - Cable Qualifier Network Tester
- **FiberXpert**
  - Fiber OTDR
- **mobiLink**
  - HART/FF/PA Communicator Tool
Thank You!

Contact for Demo or more info:
Jim Ralston
NA Channel Sales Director
724-554-8498
jim.Ralston@softing.us

https://industrial.softing.com/us/