

Designing OMF Into a Multifunctional Edge Device

David Krenek

Subject Matter Analytics – Monitoring & Analytics



Monico Monitoring Inc

- Asset Integration with Control & Monitoring Systems
- Multi-Protocol
 - Cat Data Link, Modbus, Allen-Bradley, Siemens, BACnet, J1939



Monico Monitoring Inc

- Multi-Industry
 - Oil & Gas
 - Marine
 - Electric Power
 - Mining



Business Challenge

- Growth of Industrial Internet of Things
 - Connectivity - Cybersecurity Concerns
 - Computational Power at the Edge
 - Rugged Design
- New Product - MonicoLive™
- PI System Growth
- Cost Effective Single Asset Solution
- Existing Platform Limitations

MonicoLive™

- Hosted Monitoring Service based on PI System
- Multiple Service Tiers
 - Visualization with Simple Reporting and Notifications
 - Basic Condition Monitoring with Automated Notifications
 - Condition Monitoring with Subject Matter Expert



Solution - mCore® Secure Data Router

- Secure Data Router
 - Designed Ground Up with Security in Mind
 - Custom Linux Kernel
 - Hardened OS
- Protocol Translator
- Edge Analytics Device
- PI Connector



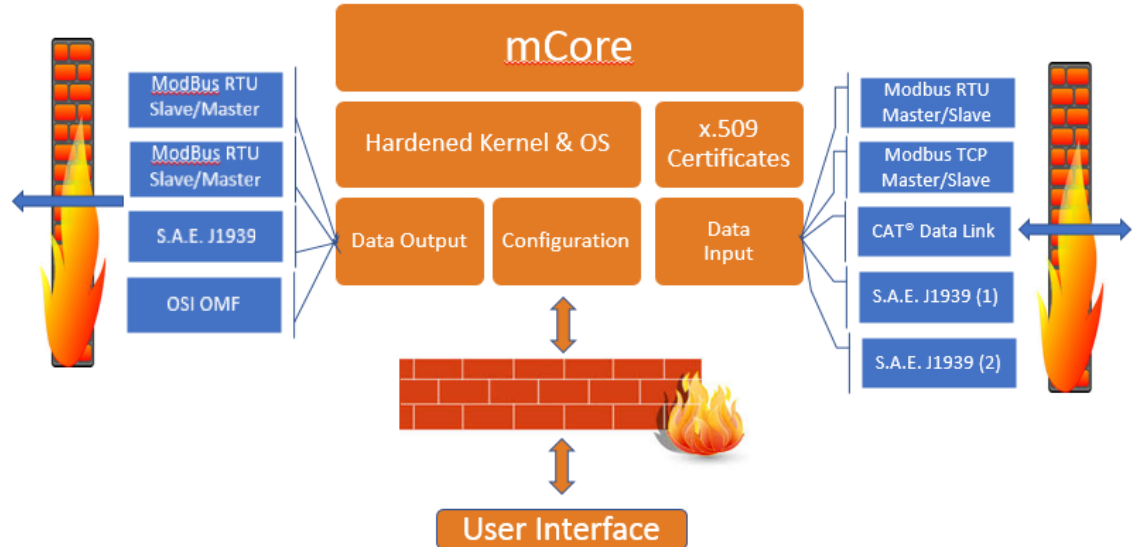
Solution - mCore® Secure Data Router

- IP66/IP67 Enclosure
- Hazardous Location
- x.509 Security Certificates
- SSL/TLS Encryption Sockets
- 7 Billion FP Calculations/sec
- 2 GB RAM
- 4 GB Non-Volatile Storage
- Up to 128 GB MicroSD Storage
- OMF Support
- Protocol Translation



mCore Design Areas

- Protocol Translation
- Data Management
- Security
- Configuration Tool (User Interface)
- OMF
 - Exception Reporting
 - Buffering
- Validation



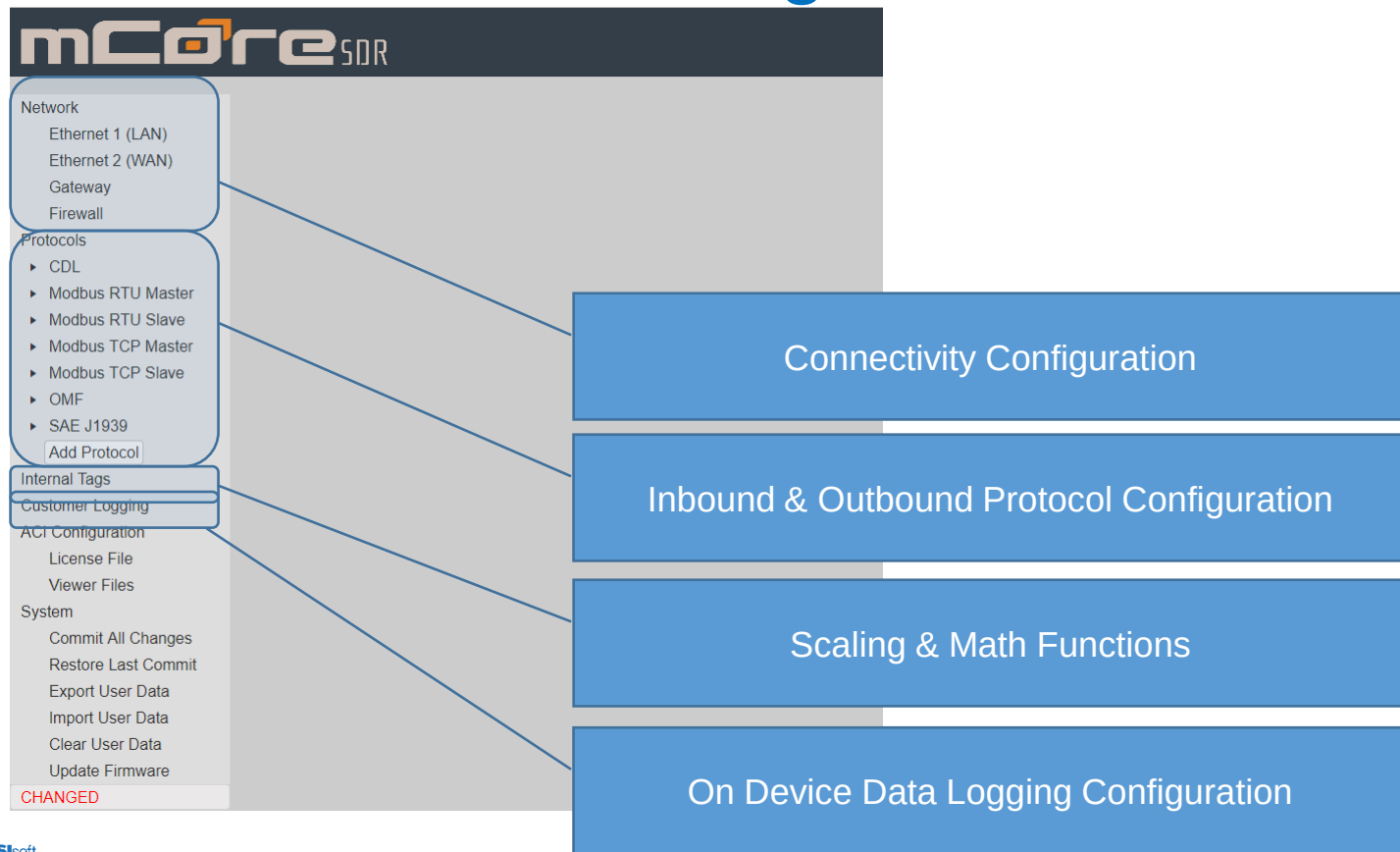
User Interface Configuration Tool

- JSON Knowledge Not Required
- Device Based
- Configuration Reuse



```
1 {
2
3   "protocol": "omf",
4   "port": "none",
5   "commsParamFileName": "none",
6   "metadata_protocol": "omf",
7   "protocolConfig":
8   {
9     "relay_name": "13.91.243.166",
10    "produce_token": "uid=2e197392-1b5c-4daa-8d5e-d2897601bcd5&crt=201808211708487204",
11    "port_number": 5464,
12    "Gzip": true,
13    "number_of_devices": 1,
14    "number_of_parameters": 178
15  },
16  "devices": [
17    {
18      "number_of_parameter_groups": 5,
19      "parameterGroups": [
20        {
21          "name": "Eng1",
22          "repetitionRate": 1000,
23          "time_stamp": true,
24          "number_of_parameters": 112,
25          "parameters": [
26            {
27              "name": "Fuel Position Command",
28              "data_type": 2,
29              "datapool_id": 1039
30            },
31            {
32              "name": "Gas Fuel Correction Factor",
33              "data_type": 2,
34              "datapool_id": 1042
35            },
36            {
37              "name": "Wastegate Position Command",
38              "data_type": 2,
39              "datapool_id": 1043
40            },
41            {
42              "name": "Choke Position Command",
43              "data_type": 2,
44              "datapool_id": 1044
45            },
46            {
47              "name": "Engine Load Factor",
48              "data_type": 2,
```

User Interface Configuration Tool



User Interface - Inbound

Network

- Ethernet 1 (LAN)
- Ethernet 2 (WAN)
- Gateway
- Firewall

Protocols

- CDL
- Modbus RTU Master
- 1 (RS-232)
- Modbus RTU Slave
- Modbus TCP Master
- Modbus TCP Slave
- OMF
- SAE J1939
- Add Protocol

Internal

- Custom
- ACI Co
- Lic
- View

System

- Commit All Changes
- Restore Last Commit
- Export User Data
- Import User Data
- Clear User Data
- Update Firmware

CHANGED

CDL (CDL)

Driver Setup | Data Logging | PGB Manager | Devices

CDL

- CDL1
 - Parameters
 - Add Parameter
 - CDL.NoEngRatingMapsAvail
 - CDL.EngineRatingMapInUse
 - CDL.DetonationLevel
 - CDL.NumberOfDetonationSensors
 - CDL.EngineConfiguration
 - CDL.OxygenSensorStatus
 - CDL.RemoteFaultReset
 - CDL.IgnitionTimingCalibration
 - CDL.LambdaSensorStatus
 - CDL.EngineCoolantLevelStatus
 - CDL.EngineControlSwitchPosition
 - CDL.ShutdownNotifyRelayStatus
 - CDL.OverspeedTestSwitchPosition
 - CDL.RemoteEstopSwitchPosition
 - CDL.StartupModeStatus
 - CDL.AirShutoffStatus
 - CDL.MaxNumberOfCrankCycles

Parameter

Direction

Auto Assign MID

Manual MID

Keep Alive

Source Parameter

Data Refresh Timeout [ms]

CDL_BrakeOilTemp.C

Device to mCore

[AUTO_ASSIGNED]

Select a data pool...

1,000

ADD PARAMETER

Parameter Select Dropdown

Parameter List

User Interface – Outbound OMF

mCore SDR

Network

- Ethernet 1 (LAN)
- Ethernet 2 (WAN)
- Gateway
- Firewall

Protocols

- CDL
- Modbus RTU Master
- Modbus RTU Slave
- Modbus TCP Master
- Modbus TCP Slave
- OMF

OMF (LAN) ✕

- SAE J1939
- Add Protocol

Internal Tags

Customer Logging

ACI Configuration

- License File
- Viewer Files

System

- Commit All Changes
- Restore Last Commit
- Export User Data
- Import User Data
- Clear User Data
- Update Firmware

OMF (LAN)

Driver Setup | Devices

Port: Ethernet 1 (LAN)

Protocol Name: OMF

Pi Server: Customer Supplied Pi Server

Pi Server IP Address: 1.2.3.4

Pi Server Producer Token: 1234

Pi Server Port Number: 5,464

Data Compression: ☒

Data Transmission Efficiency: 2

Max Buffer Size: 2,147,483,648

STORE CHANGES

CHANGED

Destination Configuration

Protocol Configuration

Buffering Configuration

User Interface – Outbound OMF

mCore SDR

Network

- Ethernet 1 (LAN)
- Ethernet 2 (WAN)
- Gateway
- Firewall

Protocols

- CDL
- Modbus RTU Master
- Modbus RTU Slave
- Modbus TCP Master
- Modbus TCP Slave
- OMF
 - OMF (LAN)**
- SAE J1939
- Add Protocol

Internal Tags

Customer Logging

ACI Configuration

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System

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CHANGED

OMF (LAN)

Driver Setup | Devices

OMF

- Add Device
- Engine 1
 - Add Group
 - Temperatures**
 - Add Parameter
 - CDL.EngineOilTemperature.C

Group Name: Temperatures

Data Refresh Options: On Change

Repetition Rate: 1,000

STORE CHANGES

Live View is not available until changes are committed.

Building Containers and Parameters

User Interface – Outbound OMF

mCore SDR

Network

- Ethernet 1 (LAN)
- Ethernet 2 (WAN)
- Gateway
- Firewall

Protocols

- CDL
- Modbus RTU Master
- Modbus RTU Slave
- Modbus TCP Master
- Modbus TCP Slave
- OMF
 - OMF (LAN)** ✖
- SAE J1939
 - Add Protocol

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System

- Commit All Changes
- Restore Last Commit
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- Clear User Data
- Update Firmware

CHANGED

OMF (LAN)

Driver Setup | Devices

OMF

- Add Device
- Engine 1 ✖
 - Add Group
 - Temperatures ✖
 - Add Parameter
 - CDL.EngineOilTemperature.C** ✖

Label

CDL.EngineOilTemperature.C

Source Data Pool

CDL.EngineOilTemperature.C

Description

Threshold ⓘ

2.5

Data Type

32 bit Real/Float

STORE CHANGES

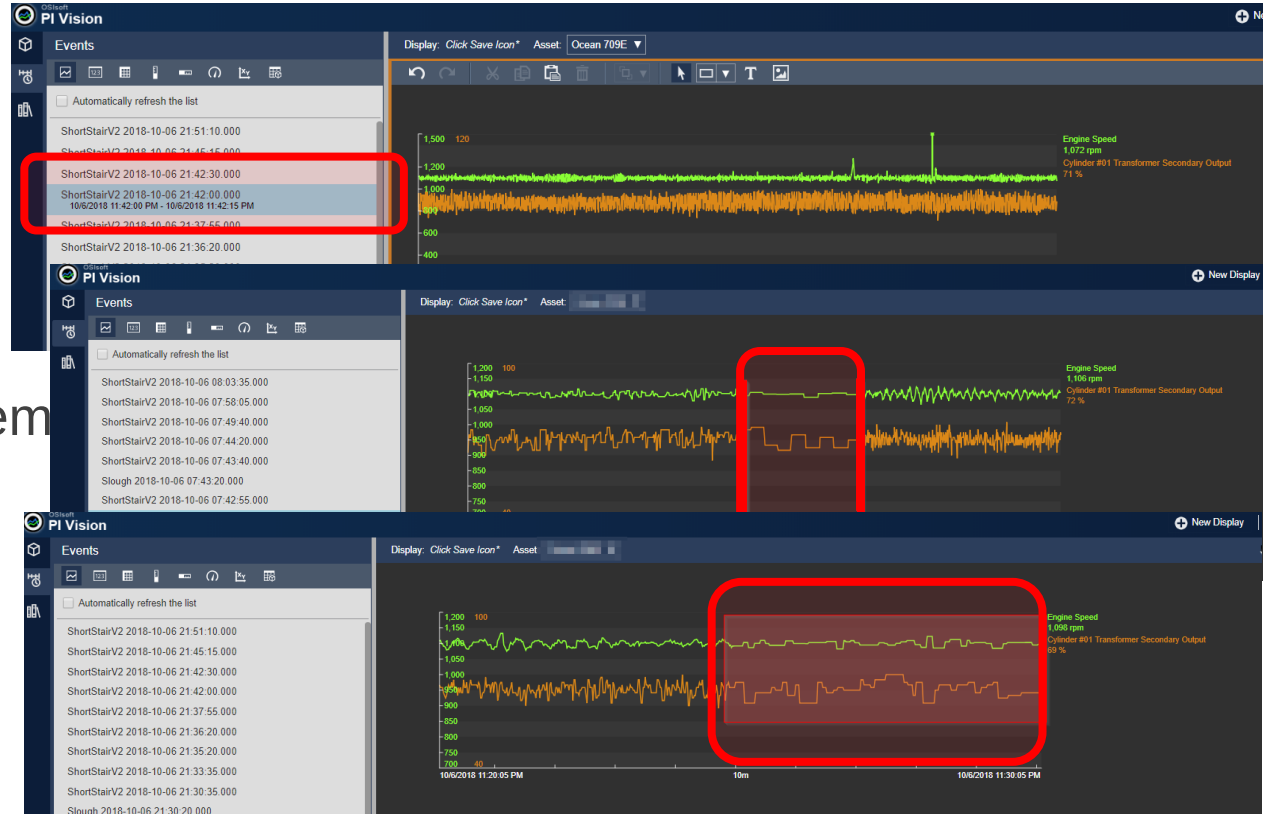
PI Point Name

Exception Deviation

Data Type

Validating with PI System

- Challenges
 - New Platform
 - Protocol Driver Enhancements
- Validated with PI System
 - Event Frames
 - Notifications



Next Steps

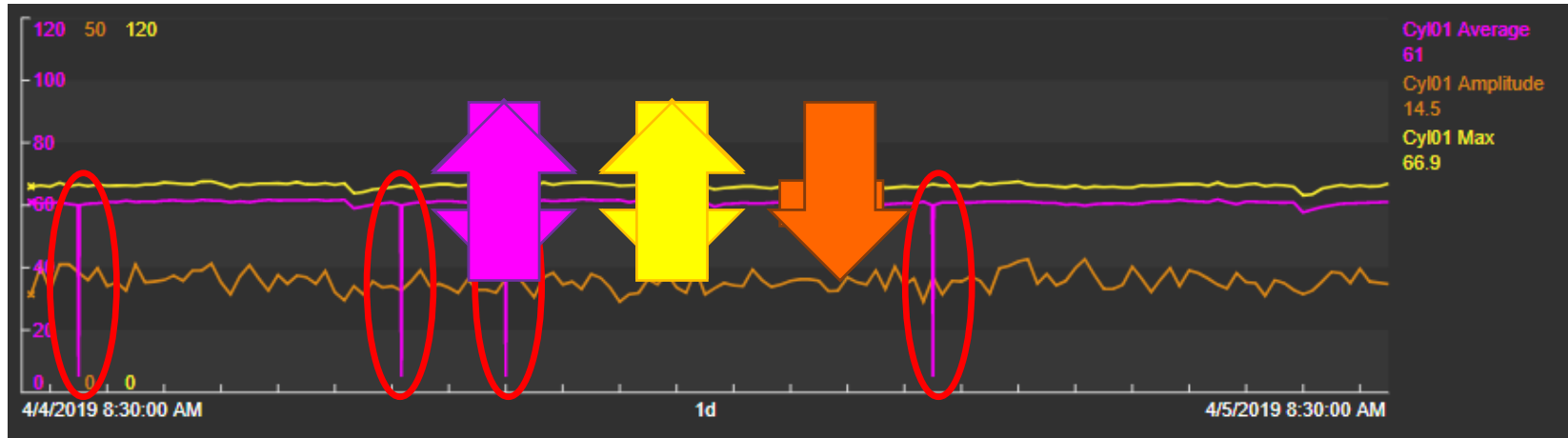
- Continue to Add Features as PI System Continues to Grow
- Expanding Edge Analytics
 - Machine Health
 - Machine Productivity
 - Monico Developed
 - 3rd Party
- Data Conversion / Compression



Data Conversion/Compression

- 5 Failure Modes
- 1 Tag
- 86,400 Datapoints/Day

- 5 Failure Modes
- 3 Tags
- 450 Datapoints/Day



Want to Know More?

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Questions?

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the **microphone**

State your
name & company



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