Building HMI and IIoT solutions with Linux devices

AVEVA Edge, IoT View (Linux)

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Industrial Internet of Things (IIoT) / Industry 4.0

AVEVA Edge as an IoT Gateway and/or HMI/SCADA node

Cloud Analytics and Mobile Access
analytics, consolidation, artificial intelligence (AI), machine learning (ML),
remote management/deployment, remote notifications and monitoring

Edge devices
data acquisition, data manipulation (aggregations, filtering, contextualization, normalization), link with the cloud, local maintenance, local operation

Instrumentation and Controllers
operational real-time control, raw data measurements

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World-leading Linux HMI

Challenge
• Many geographically disperse, low end “edge” devices needed to collect, filter, and historize data

Solution
• AVEVA Edge IoT View (Linux) used to communicate, filter and log data

Benefits
• Small Footprint, lower cost hardware
• 18 native drivers on Linux
  • Communicate to any required device
• OPC UA included supporting global standards
• Python scripting for filtering
• Keep required data, Local, SQL, Historian, Insight
Interoperability

OT+IT native integration

Native built-in drivers (connectors)

HTTP/HTTPS REST

Plant Floor Integration
Schneider-Electric, OMRON, GE, Allen Bradley, Siemens, Modbus, Profinet, DeviceNet, Beckhoff, MQTT Sparkplug B, OPC UA/DA/XML, and many others...

Cloud and IT Integration
Email, data, and page interface from mobile devices

Mobile Access and Web Solution
Access to the system from anywhere using a single browser

Client Stations
Redundancy
Data Exchange in Real-Time
Third-Party Systems
Thin Clients

Web
(HTML & XML)

OPC UA,
DA, .NET,
XML

Protocols
(Drivers)

Driver & Database API

XML
ODBC/ADO
DDE

Open Architecture
System Integration
Product Customization

Enterprise
Excel, Access, Oracle, MySQL, Sybase
SQL Server, SQL Azure, AVEVA Historian, AVEVA Insight, AVEVA Integration Studio, OSI PI and many others...

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What makes an HMI?

• **Hardware:**
  - General Industry: Proprietary, Windows, few Linux
  - IoT View: X64 (x86) or ARM based

• **Communications**
  - Drivers and OPC

• **Graphics**
  - Meters, graphs, buttons, lights, trends, alarms

• **Functional**
  - Scripting, Event, Logging (history)
What makes an IIoT device?

The data you need, where you need it

• At the “Edge”, close to where the data is generated
• Reduce latency, improve network traffic
• Raw data acquisition, without normalizing
• Data manipulation (aggregations, filtering, contextualization, normalization)
• Data Historization (with store-and-forward)
  o Local (Disconnected)
  o SQL Database
  o Historian (On Prem or Insight)
IIoT solution – collect data and historize for “actionable insights”

- Linux device (Raspberry Pi)
- IoT view runtime
- Laptop
  - AVEVA Edge IDE
  - Modbus simulator
    - (or OPC UA or MQTT Broker)
- AVEVA Insight
- Remote or local view on Browser
- Python script
  - Filter
  - Analyze
  - AI/ML Anomaly Detection
Steps to build a Linux-based HMI

1. Install and configure
   1. Install IoT View on Device (follow documentation)
   2. Configure Project
   3. Configure Tags
   4. Configure Graphics
   5. Communications Modbus (but could be MQTT or OPC UA)
   6. Download and test (Quick Check)

2. Configure Logging
   1. Local Logging (HST/CSV)
   2. Configure Insight
   3. Download, Run (Quick Check)

3. Add Python script
4. Download, Run

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# Number of iterations for accuracy
iterations = 10000

# Initialize variables
pi = 0
sign = 1

for i in range(iterations):
    pi += sign * 4 / (2 * i + 1)
    EdgeM1.SetTagValue("test", pi)
    EdgeM1.SetTagValue("test2", i)
    sign = -sign

# Store Pi to 10 digits
pi = "%.10f" % pi

EdgeM1.SetTagValue("test", pi)
Summary

• Benefits, pain points
  o Use on geographically disperse systems, wind, O&G, utilities, infrastructure
  o Ideal solution coupled with low bandwidth connections
  o Ideal solution for low cost or horsepower devices
    ▪ Can be “headless” (no display)
  o Use on Linux based networking devices for a “no additional HW cost” solution
  o Shadow Sensing or Parallel I/O
    ▪ Monitor status without touching machine PLC
  o Regulatory reporting

• Solution for AVEVA products
  o Use AVEVA Edge IoT View to complement other products as a complete solution

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