REVEAL YOUR BEST

Andrew Brodie & Robert Kotoski
June 10, 2019

ControlEdge PLC EtherNet/IP Support and Platform Update
Americas HUG
ControlEdge PLC

ControlEdge™ PLC provides the ultimate engineering flexibility with more I/O options for system design, connectivity to more devices, the most protocols for native connectivity, and the first PLC support for lean project execution.

Agenda

-----------------------------------------------

Product Overview

-----------------------------------------------

R151 and R152 Features

-----------------------------------------------

New Features in Upcoming Release

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Success Stories
ControlEdge™ PLC – Product Overview

<table>
<thead>
<tr>
<th>ControlEdge PLC Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Redundant control option</td>
</tr>
<tr>
<td>• Redundant power supply option 60W (110/240 VAC, 24VDC)</td>
</tr>
<tr>
<td>• Redundant communication</td>
</tr>
<tr>
<td>• IO Racks (4, 8, 12 Slots)</td>
</tr>
<tr>
<td>• Serial Interface Module – 2x RS232, 2x RS485 Isolated</td>
</tr>
<tr>
<td>• HART enabled Universal IO module (16 Ch)</td>
</tr>
<tr>
<td>• 10 IO Modules + 2 New IO module options</td>
</tr>
<tr>
<td>• 16-Bit resolution (AI), DI/DO – line monitoring (Open/Short circuit)</td>
</tr>
<tr>
<td>• 2304 I/O channel per PLC</td>
</tr>
<tr>
<td>• ControlEdge Builder tool (common tool with RTU)</td>
</tr>
<tr>
<td>• Five IEC 61131-3 programming languages</td>
</tr>
<tr>
<td>• Cyber Security – Secure Boot, Built-in firewall, IPSEC, ISASecure L2 certified (R140)</td>
</tr>
<tr>
<td>• Embedded OPC UA (server and client)</td>
</tr>
<tr>
<td>• Embedded EtherNet/IP (server and client)</td>
</tr>
<tr>
<td>• HMI and 3rd party device integration via Modbus</td>
</tr>
<tr>
<td>• Experion PKS, HS and PPC integration using OPC UA</td>
</tr>
<tr>
<td>• PLC to Experion C300 controller Peer to Peer communication over CDA protocol</td>
</tr>
<tr>
<td>• FDM and FDM Express Integration</td>
</tr>
<tr>
<td>• HART Command Function Blocks</td>
</tr>
<tr>
<td>• User defined protocol</td>
</tr>
<tr>
<td>• Simulation on Virtual Engineering Platform</td>
</tr>
<tr>
<td>• Operating temperature - 0 to 60°C</td>
</tr>
<tr>
<td>• Certifications - CE, UL, ATEX, CSA, FM, RCM, ABS</td>
</tr>
</tbody>
</table>
## Balance of Plant PLC Applications

<table>
<thead>
<tr>
<th>Target</th>
<th>Applications To Focus On</th>
<th>R151 Enhancements fit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HPS Core Vertical Markets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refining</td>
<td>• Utilities and ancillary services – water treatment, cooling/heat exchange systems, environmental monitoring,</td>
<td>MCC, Elec. Integration, Sub Sys. Integration on Serial interface</td>
</tr>
<tr>
<td>Petrochem</td>
<td>• Environmental monitoring, mixing, pumping, water treatment</td>
<td>MCC, Elec. Integration, Sub Sys. Integration on Serial interface</td>
</tr>
<tr>
<td>Upstream O&amp;G</td>
<td>• Large/complex multi well pads, Batteries, Loading Stations, Water handling/processing, Water Injection facilities</td>
<td>MCC and Elec. Integration</td>
</tr>
<tr>
<td>Pulp &amp; Paper</td>
<td>• Environmental monitoring, mixing, pumping,</td>
<td>Drives and MCC Integration</td>
</tr>
<tr>
<td>Midstream O&amp;G (Pipelines &amp; Terminals)</td>
<td>• Block Valve Stations, Compression and Pumping, Tank Farms, Small Processing Facilities</td>
<td>Coriolis metering integration on serial Interface; Weigh scales</td>
</tr>
<tr>
<td><strong>Adjacent Vertical Markets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemicals (Bulk / Batch Applications)</td>
<td>• Blending, loading, pumping, compression, water treatment and purification, environmental monitoring,</td>
<td>Drives, MCC and Elec Integration, Special IO Spec</td>
</tr>
<tr>
<td>Food &amp; Beverages</td>
<td>• Batch processes, breweries, water purification, Clean in Place</td>
<td>Drives &amp; HMI on EIP</td>
</tr>
<tr>
<td>Pharma</td>
<td>• Batch processes, Bio Reactors, water purification, Clean in Place, Air handling</td>
<td>Drives &amp; HMI on EIP. Serial interface for specials eg analyser</td>
</tr>
<tr>
<td>Metals &amp; Mining</td>
<td>• Pumping, refining, environmental monitoring, heat treating</td>
<td>Drives and Electrical Integration</td>
</tr>
<tr>
<td>Cement &amp; Glass</td>
<td>• Material handling, batch mixing, oven/kiln control</td>
<td>Drives and Electrical Integration</td>
</tr>
<tr>
<td>Power</td>
<td>• Water handling, cooling, environmental monitoring, coal/ash handling, Utilities and Ancillary services, Burner Management system</td>
<td>Drives and Electrical Integration, High voltage DI, Special EIP IO</td>
</tr>
<tr>
<td>Utility Water</td>
<td>• Pumping/lift stations, agitation, quality monitoring, chem dosing</td>
<td>Expansion/ Integration with ROK</td>
</tr>
<tr>
<td><strong>Other Verticals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail / HVAC / Data Centres / Commercial</td>
<td>• Air handling, water treatment/handling, chiller control, environment monitoring, net metering of utilities</td>
<td>EIP devices integration – sensors, IO, Analysers,</td>
</tr>
</tbody>
</table>
Release R151 Features

A. EtherNet/IP Protocol built-in
   a. EtherNet/IP Client
   b. EtherNet/IP Server

B. Serial Interface Module and Communication protocols
   a. RS 232 x 2 Ports and RS 485 x 2 Ports
   b. Modbus RTU and ASCII master and slave
   c. User defined protocol
   d. Modbus UDP Support

C. New IO Modules
   a. High Voltage Digital Input module
   b. Analog Output module

D. LEAP Enhancements
   a. PLC Simulator
   b. Virtual Engineering Platform Support

E. Experion Integration Enhancements
   a. Support R150 and R151 IO modules diagnostics

The latest release of ControlEdge™ PLC provides the ultimate engineering flexibility with more I/O options for system design, connectivity to more devices, the most protocols for native connectivity, and the first PLC support for lean project execution.

EtherNet/IP and LEAP support simplifies engineering
# Top Customer Challenges For Any Plant

<table>
<thead>
<tr>
<th>Customer Issues</th>
<th>Impacts</th>
<th>Desired Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple PLCs across plants</td>
<td>• Unsupported and obsolete systems</td>
<td>Standardization of Solution</td>
</tr>
<tr>
<td></td>
<td>• Complex / loose integration of systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No single owner - EPC, OEM, PLC vendors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High maintenance costs</td>
<td></td>
</tr>
<tr>
<td>Last minute changes impact schedule</td>
<td>• Production losses due to late plant startup</td>
<td>Engineering Flexibility</td>
</tr>
<tr>
<td></td>
<td>• Project cost overrun</td>
<td></td>
</tr>
<tr>
<td>Poor connectivity – difficult to pull data from proprietary protocol</td>
<td>• Lack centralized asset performance data</td>
<td>Connectivity</td>
</tr>
<tr>
<td></td>
<td>• Delayed service leads to risk of downtime</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Low quality visualization – information silos</td>
<td></td>
</tr>
<tr>
<td>Cyber security risks</td>
<td>• Higher insurance cost</td>
<td>Cyber Security</td>
</tr>
<tr>
<td></td>
<td>• Risk to plant safety and availability</td>
<td></td>
</tr>
</tbody>
</table>

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Experion Integration - Efficient Engineering & Commissioning

OTHER PLCs with Experion

- Inefficient and Higher Cost
  - Multiple teams
  - Extensive co-ordination
  - Higher risk
  - Inconsistent operator interface
  - Higher training expenses

ControlEdge PLC with Experion

- Efficient and Low Cost
  - Few teams
  - Less co-ordination
  - Low risk
  - Consistent operator interface
  - Lower training expenses

Easy Engineering With Less Hassle
Superior Integration with Honeywell Systems

1. Single Automation Vendor
   - PLC, DCS, SCADA, Asset Management and HMI panel
2. Simplified integration with Honeywell systems
3. Reduced configuration efforts and improved project schedule
4. Open Protocols for multi-vendor support
5. Improved plant uptime and Easy maintenance due to *Integrated HART device diagnostics on FDM*

**Advanced Experion Integration**

- FDM – R500.2
- FDM Express – R500
- Experion HS – R500
- Experion PKS R500

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A.1 Experion HS, PKS, SCADA and Experion PPC Integration

1. **Experion Server integration**
   - Auto-Configuration of Quick Builder points.
   - Name space based mapping using OPC UA

2. **Peer to peer communication with C300**
   - CDA

3. **Common HMI platform**
   - HMI Web Display builder, Shapes Library, Faceplates and Experion Station

4. **Integrated alarm summary**
   - C300 and ControlEdge PLC alarms integrated on one alarm summary

5. **Integrated history, trending & reporting**
   - For Experion & ControlEdge PLC through Experion facility

6. **Single engineering station**
   - ControlEdge Builder application and integration workflow tasks launch from Experion Configuration Studio

7. **Standard PLC diagnostics on Experion**

C300 peer to peer integration over CDA is supported from Experion release R501
ControlEdge PLC – Experion Integration Workflow

1. OPC UA Server Setup in PLC
2. Configure Experion Controller
3. Publish Data to Experion
4. Auto-Configure PLC points in quick builder & validate
5. Download to Experion Server

- Significant reduction in cost of integration
- Easy to update changes on Experion Server
- OPC UA based mapping eliminates address mapping efforts
- Faster deployment of project
- Simplified change management

A.1

Standardization of Solution
Engineering Flexibility
Connectivity
Cyber Security

Plc: ControlEdge Builder
IEC61131-3 PLC program

Experion: Configuration Studio – Quick Builder

Simplified Integration Workflow Saves SCADA Configuration Efforts
ControlEdge™ PLC - C300 Peer to Peer Communication

Display Access by CDA
(Such as SCADA, Historian, Trend, Alarm)

Connection limits:
- Maximum 20 initiators

Parameter limits:
- 1000 PPS Pull/Get rate
- 100 ms fastest scan rate (C300 limit)

Communication Latency:
- <250 ms
ControlEdge PLC integration with Experion Panel PC

- Better integration than a 3rd party PLC
- Single UI across control room and local panel
- “Operate from the equipment or the control room… more easily without learning different systems”
- “Connect the PLC to Experion system… with less effort”
- “Integrate my Experion system with PLC over a Secure Interface …improved cyber security”
- Secured (Encrypted and Authenticated) connection
ControlEdge PLC Integration with Experion PPC and Experion PKS

- Better operator emergency response
- Seamless, quick start-up and commissioning
- Transparent process view

- Easy, lean and secure integration
- Reduced training, maintenance overhead
- Improved total cost of ownership
Dramatically Improve Experion Integration Workflow

For Implementing a New Control Strategy in ControlEdge PLC

BEFORE
(3rd party PLC over Modbus)

12 HOURS

- Map variables (100 variables)
  1 hr
- Create channel and controller
  15 mins
- Diagnostics configuration
  6 hrs
- Configure & validate points (100 points)
  5 hrs

AFTER
Integrated ControlEdge PLC

98% saving

- Configure controller
  5 mins
- Automatically generate and review points (100 points)
  10 mins

For Updating a Control Strategy in ControlEdge PLC

BEFORE
(3rd party PLC over Modbus)

17 MINS

- Download points
  2 mins
- Map variables (5 variables)
  5 mins
- Configure & validate points (5 points)
  10 mins

AFTER
Integrated ControlEdge PLC

82% saving

- Automatically generate and review points (5 points)
  2 mins
- Download points
  1 min

Save Time with ControlEdge PLC
Universal IO HART Support & FDM Integration

- Onboard HART Support on Any of 16 Universal IO Channels – No Extra Hardware

**FDM Integration**

- Fast & Accurate Commissioning of Field Devices
  - Pre-built templates from FDM
  - Easy device configuration, downloads and uploads

- Better Maintenance Decisions
  - Simplifies diagnostics
  - FDM highlights device specific faults
  - More productive (& fewer) site trips
  - No need to go into hazardous areas
ControlEdge PLC with HART and HART-IP Support

FDM and HART-IP Offer Design Flexibility

1. **HART IP Open Standard**
   - Integration with FDM and other Asset Management System
   - Remote access to devices for device management
   - Can deliver asset information directly to SCADA/DCS systems supporting HART-IP

2. **Investment protection through use of existing plant network infrastructure**
   - FDM can integrate devices connected to other HART supported control system at site
   - FDM supports multiple protocols and standards
     - HART, Profibus, ISA100, Wireless and DE
     - EDDL, DFT/DTM and FDI standards in same tool

3. **Scalable** to any size of project small to large

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HART Function Blocks for HART Commands

Cost Saving in Commissioning and Installation
- Loop Integrity checks
- Calibration
- Support for multivariable field devices
- Wiring and equipment saving

Improved Plant operation
- Device operational values easily monitored
- Easy remote updates to device parameters (e.g. travel limit, damping time constant, Scale correction)

Improved device diagnostics
- Access to all HART command information in PLC program except burst mode

Cost reduction due to savings on wiring, equipment and operations
ControlEdge PLC Supports Star Topology

**Star Network**

- Star Network utilizes switches between CPM and I/O racks
- It is easier to add nodes or expand in case of a star network vs ring network
- Star Network may use longer cable runs. A node is only lost in case of dual cable failure.
ControlEdge PLC Supports Ring Topology

Ring Network

- Ring Network uses no switch between CPM and I/O
- More work is required to add a node to a ring network when a system is running
- Communication between I/O and CPU is maintained in the event of a single break in the ring
OPC UA Offers Lean Architecture, Easy Integration

Dedicated Data Model

Before OPC UA

OPC Client (COM)

DA
HDA
A&E

After OPC UA

OPC Client (UA)

UA

Unified Access

Proprietary Communication

DCS/SCADA
History
HMI

Multivendor Interoperability

PLC

OPC

GW

ControlEdge

OPC UA

HMI

$180K reduction through easy integration, maintenance and less hardware (network gear, gateways, etc…)*

*5 PLC’s with 400 IO’s each
ControlEdge PLC Helps OEM Enable Secure Cloud Connectivity

- Improved equipment serviceability in shorter time
- Equipment performance monitoring across various sites
- Secure cloud connectivity with built in firewall

* This is future state vision for ControlEdge PLC

IIoT Ready PLC Will Drive New OEM Business Models
Built-in EtherNet/IP Sever and Client support

**EtherNet/IP**
Built-in Server and Client

<table>
<thead>
<tr>
<th>Ethernet/IP Server Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO Modules</td>
</tr>
<tr>
<td>Drives – AC/ DC</td>
</tr>
<tr>
<td>Analyzers</td>
</tr>
<tr>
<td>Transmitters</td>
</tr>
<tr>
<td>Sensors</td>
</tr>
<tr>
<td>Network Components (Switch’s, Gateways etc.)</td>
</tr>
<tr>
<td>HMI Panel</td>
</tr>
<tr>
<td>Overload Relays</td>
</tr>
</tbody>
</table>

- **IO Modules**
- **Drives** – AC/DC
- **Analyzers**
- **Transmitters**
- **Sensors**
- Network Components (Switch’s, Gateways etc.)
- **HMI Panel**
- **Overload Relays**

**Expansion Processor Module**
(Expansion 900 Racks)

- **PLC Controller**
- **900 IO & EtherNet/IP Server Devices**

- **3rd party IO Module**
  (e.g. Turck Counter module)

- **3rd party EthernetIP Controller**
  (e.g. existing Rockwell ControlLogix)

- **3rd party EthernetIP Controller**
  (e.g. existing Rockwell ControlLogix)

**3rd party EthernetIP Controller** (e.g. existing Rockwell ControlLogix)
EtherNet/IP Client – Network Topologies

- RING
- LINEAR
- STAR
- MIXED

Flexible Architecture Design
Use Cases – ControlEdge PLC to UOC/ 3rd Party controller P2P communication and Existing IO/ device integration

Peer to Peer Communication with UOC and 3rd Party controllers simplified
Use Cases – ControlEdge PLC EtherNet/IP Client for IO and Drives integration

- Multi-Vendor IO on same network
- Range of specifications
- Combination of different EtherNet/IP server device type

Multi-Vendor EtherNet/IP IO options to meet project needs

* IOs makes and models are just for example – Refer Manual for list of qualified devices for R151
* Any new device qualification needs an RQUP

- TURCK IO e.g. IP20; Harsh IO IP67
- ETAP* Mixed Digital IO
- Advantech Mixed Digital IO
- Phoenix Contact 15-ch Isolated Digital I/O
- Rockwell ArmorBlock – IP67
- Yaskawa Drive

Standardization of Solution
Engineering Flexibility
Connectivity
Cyber Security
Key Features – EtherNet/IP Protocol

- EtherNet/IP Server and Client built on CPM
- Cyber Security for ControlEdge PLC as Server
- Support EtherNet/IP devices and existing 900 IO modules on same network
- 10ms* to 3200ms RPI (Requested Packet Interval)
- Up to 160* CIP connections for Class-1 Implicit message
  - Time critical communication with EtherNet/IP IO Devices
- Up to 10 CIP connections for Class-3 Explicit message
  - Peer to peer communication with other EtherNet/IP Controllers
- Create generic EtherNet/IP modules. Support configuration of I/O modules with EtherNet/IP adapter.
- Support various communication data type of Class-1 implicit message
- Support up to 8 data type BOOL, SINT, INT, DINT, INT, USINT, UINT, REAL for EtherNet/IP Server and P2P
- Support device version comparison (Electronic Keying)
- ODVA certification

* Estimated - Limit depends on system configuration and design

Comprehensive EtherNet/IP offering suitable for wide application range
R151 EtherNet/IP Devices qualification and process for projects

R151 Device qualification summary

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Qualified Device Count*</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO Modules (Adaptor based, Block, etc)</td>
<td>23</td>
</tr>
<tr>
<td>Drives (AC and DC)</td>
<td>4</td>
</tr>
<tr>
<td>Networking components (Switches, Gateway)</td>
<td>5</td>
</tr>
<tr>
<td>Valves</td>
<td>1</td>
</tr>
<tr>
<td>HMI panel</td>
<td>1</td>
</tr>
<tr>
<td>Controllers</td>
<td>1</td>
</tr>
<tr>
<td>EtherNet/IP device simulator</td>
<td>1</td>
</tr>
</tbody>
</table>

* Numbers may change on completion of development and test

Device qualification for projects

1. Identify EtherNet/IP devices needed
2. Check device status in existing qualifications
3. Prefer use of pre-qualified device
4. Locally test device compatibility, if not prequalified
5. Ask for DE team’s support for compatibility test
6. Raise an RQUP before committing to customer

Note – Detail process will be available in the document

* Step 5 needs shipment of the test device to one of the development centers – consider 6-8 weeks time, start proactively

Final qualified device list is available in product documentation
Serial Interface Module – 2x RS232 and 2x RS485

- **Scalable** – Six modules per controller
- **Support Remote Installation** – Expansion rack, remote racks
- **Low hardware cost** – 4 ports per module, Uses same slots as IO modules
- **Multi-Protocol Support** - Modbus ASCII Master and Slave, Modbus RTU Master and Slave, User defined protocol
- **Broad connectivity** - 300bps to 115200bps, Flow Control
- **Harsh Environment support** – G3 coated, HAZLOC certification
Strong Communication protocol portfolio and options

- OPC UA
- EtherNet/IP™
- Modbus TCP
- Modbus RTU
- Modbus ASCII
- User defined protocols
- Modbus UDP
- CDA
- HART-IP
- CPM
- Serial Interface Module

Higher flexibility and lower hardware cost with more protocol options on few hardware modules
Universal IO Provides Flexibility in Late Changes

What makes Universal IO so Valuable?

- Easily adapts to changes
  - Mitigates delays due to late design inputs / changes at any stage in project
- Reduced hardware
  - Eliminate marshalling with direct landing from field
  - Reduce/simplify marshalling with no cross-wiring
  - Remote IO eliminates multi-core cables
- Fewer spares
  - One UIO module vs. four standard modules

UIO is Universal IO – allows various types of signals to terminate on a single IO module.

End User  EPC  System Integrator  OEMs
### IO Module Options

<table>
<thead>
<tr>
<th>24VDC</th>
<th>24VDC</th>
<th>120/240 VAC</th>
<th>120/240 VAC</th>
<th>Pulse &amp; Frequency Input</th>
<th>High Level Analog Input</th>
<th>Analog Output</th>
<th>Digital Input – Contact Type</th>
<th>Digital Output Relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>UIO</td>
<td>UAI</td>
<td>DI</td>
<td>DI</td>
<td>DO</td>
<td>DO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TC, RTD, V</td>
<td>24VDC</td>
<td>120/240 VAC</td>
<td>24VDC</td>
<td>120/240 VAC</td>
<td>24VDC</td>
<td>120/240 VAC</td>
<td>120/240 VAC</td>
</tr>
</tbody>
</table>

- New IO modules offer multiple choices and flexibility in system design to meet specs
- Improves our ability to serve more applications
  - AC/DC or sinking/sourcing IO ability
  - Product fit in Americas with AC DI and DO modules

### Examples
- PFQ module - Gas and Liquid metering stations, CNG stations
- HLAI - AHU, Positioning, Stacker
Two new IO Module Options – Total 13# ‘900 IO Modules’ supported

- Serve new applications
  - High Voltage AC - MCC, Electrical Switch Gears, Motors, Pumps, Valves, Heater, Lights

- Reduced Cost – High density AO

- Connect to existing EtherNet/IP IO at site

New IO modules based on proven platform offer flexibility in system configuration
ControlEdge PLC is first PLC to be ISASecure EDSA Level 2 certified

What is ISA99 and ISA/IEC 62443?

• **The ISASecure program** - developed by an industry consortium called the ISA Security Compliance Institute (ISCI)

• **Goal** - accelerate industry-wide improvement of cyber-security for Industrial Automation and Control Systems (IACS)

• Offers a common industry-recognized set of device and process requirements that:
  • drive device security
  • simplify procurement for asset owners
  • device assurance for equipment vendors
Four Levels of Security defined by ISA62443

Level 1: Protection against casual or coincidental violation

Level 2: Protection against intentional violation using simple means

Level 3: Protection against intentional violation using sophisticated means

Level 4: Protection against intentional violation using sophisticated means with extended resources

ControlEdge PLC is Level 2 certified
ControlEdge PLC has been assessed against three areas:

1. **Software Development Security Assessment (process + practice)**
   - Level 1: 1 green triangle
   - Level 2: 2 green triangles
   - Level 3 and Level 4: No green triangles

2. **Functional Security Assessment**
   - Level 1: 1 green triangle
   - Level 2: 2 green triangles
   - Level 3: 3 green triangles
   - Level 4: 4 green triangles

3. **Communication Robustness Testing (All Levels)**
   - Level 1: 1 green triangle
   - Level 2: 2 green triangles
   - Level 3: 3 green triangles
   - Level 4: 4 green triangles

**How does this assessment help?**

1. **Software Development Security Assessment**
   - Builds trust in supply chain, hardware and software development

2. **Functional Security Assessment**
   - Helps ensure various attacks (e.g. ransomware, man in the middle) are mitigated
   - Helps ensure denial of service attacks do not affect essential functions (e.g. maintaining IO)

3. **Communication Robustness Testing**

**Functional Security Assessment - 7 areas**

- Access Control
- Use Control
- Data Integrity
- Data Confidentiality
- Restrict Data Flow
- Timely Response to Event
- Network Resource Availability
Cyber Security – PLC Communication Secured Using IPSec

- Prevents Man-in-the-middle attacks and protects ControlEdge PLC from unauthorized access using NSA Suite B recommended algorithms
- Locked down communication (requires explicit enabling for Configuration, ModBus, HART-IP and OPC UA communications)
- Three modes of communication supported
  - Encryption (for assuring integrity and confidentiality of data en route)
  - Authentication (for assuring integrity of data en route)
  - Cleartext (for special interoperability only situations)
ControlEdge PLC Simulator - Architecture

**Efficient simulation**
- Common project file between simulator and physical controller – Easy to switch & download
- Support redundant and non-redundant projects
- Debug program in integrated environment – Virtual P2P, Physical SCADA, RTU and PLC

**Simplified SCADA integration test**
- Validate the connection between SCADA and PLC
- Test point connections & references in SCADA & HMI
- Support demo and presentation with HMI

**Reduced setup time**
- Common architecture for ControlEdge RTU
- Simulator delivered as virtual machine
- Available on VEP for projects

*Supported for ControlEdge PLC and RTU R151 onwards*
The Virtual Engineering Platform (VEP)

Collaboration between multi-location engineering teams
Take Project Execution off the Critical Path

Virtual Controller appliance and IO References completely decouple application configuration from hardware configuration

Absorb Late Changes on Projects Easily
ControlEdge Transition - PLC5 and SLC500 Migration Service

Project Workflow

- Site Survey
- Pre-Sales
- Detail Design
- Engineering
- Install/Commission

Features

- Online Questionnaire
- Mobility Support
- Bidding Reports
- IO Assignment
- Pre-Migration Reports
- Predefined Map sets
- Custom Map sets
- Migration
- Post-Migration Reports
- Site Documentation

Benefits

- Reduces on-site time
- Online documentation
- Informed estimates with reduced assumptions
- Hardware Optimization
- Source system analysis
- Reduce design time and rework
- Reduced reverse engineering time
- Simplified installation

Reduced migration cost and improved project schedule

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The selected MDIS protocol is OPC-UA
- 28 members were invited to vote
- 1 abstention/vote not received
- OPC-UA was strongly preferred by Operators and Subsea vendors
- The split within DCS vendors and Integrators was less clear

- The MDIS companion specification was released in January 2017
- Honeywell was the first DCS vendor to do a Proof Of Concept (POC) demo using the OneSubsea/Cameron OPC UA server at the February 2014 meetings
November 2017 the API Standard 17F fourth edition is released

If a fully integrated control system philosophy is selected for the host facility, the subsea wells shall be monitored and controlled from standard operator stations as the first option. In this case, the subsea production control system application software should be integrated with the host-facility software to ease offshore maintenance and operation. The control and monitoring of subsea functions should be as similar as possible to that for the topside-located equipment.

When the control and monitoring of the subsea production system is to be integrated or interfaced with the ICSS, the physical interface and communication protocol between the topsides ICSS and subsea MCS or gateway should be defined using the MCS-DCS Interface Standardization (MDIS) Standard.
Library of Custom MDIS Function Blocks

- Library of Custom Function Blocks
- Example of a custom Function block representing the MDIS valve object that can consume data from any MDIS compliant UA Server
A project could select either architecture shown above

Honeywell’s recommended MDIS solution is to use a combination of the two

- All the critical Subsea controls such as shutdown sequences, process interlocks, Subsea meters, choke ramping etc. will be included in the ControlEdge PLC
- All diagnostic and housekeeping I/O at the Experion server which will also retrieve valve signature files for integrity management.

Legend:
- SCM = Subsea Control Module is located Subsea at the production tree, water injection tree or manifold
- SPCU = Subsea Production Control Unit, part of Subsea Equipment Vendors (SEV) system located in a safe area topsides.
- SCU = Subsea Control Unit, the DCS vendors PLC (ControlEdge) or C300 controller
- ESS = Emergency Support System, main safety system for the platform, would typically be a Safety Manager.
- SCS = Subsea Control System, used to encompass the DCS vendors Subsea scope. Several ControlEdge PLC’s and dedicated Subsea Experion servers all forming part of the SCS

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Enhanced Logic Manager Module on ControlEdge PLC

• New Solution using ControlEdge PLC
  • Designed as migration solution for obsolete Logic Manager
    • Logic Manager module replaced by ELMM
    • IPC 620 (PLC) replaced by ControlEdge PLC
    • LCS IO replaced by ControlEdge platform 900 IO
    • Rack based controller that could reuse the same space as left behind by the displaced LM rack.
    • ControlEdge PLC is fully compliant to IEC 61131-3 supporting all five programming languages: Ladder Diagram (LD), Function Block Diagram (FBD), Structured Text (ST), Instruction List (IL), Sequential Function Chart (SFC)
  
• Multiple alternate use cases being explored
  • Sub system interface (Standardized serial interface for multiple 3rd party devices incl. PLCs)
  • Non-Honeywell PLC replacement (with ability to integrate to EUCN)
  • EPLCG replacement
  • CLM replacement
LM with IPC as it’s PLC/processor

- The LM is depicted for a quick reference

R152 is only available through RQUP
ELMM on ControlEdge PLC

- ELMM on ControlEdge PLC – ELMM and PLC on the same platform
Peer communication support

R152 is only available through RQUP
UPCOMING RELEASE ROADMAP
New Features in upcoming Releases (Q4 2019 and Q1, 2020)

**EtherNet/IP Enhancement (Q4, 2019)**
- a. Native DLR (Device Level Ring) support without ETAP
- b. Communication with Rockwell 1756 and 1794 IO modules
- c. EDS file modification in CE Builder

**DNP3 Multi-Master on CPM Ethernet port (Q4, 2019)**

**Marine Certifications (Q4, 2019)**
- a. DNV-GL
- b. BV
- c. KR
- d. LR

**Built-in Profinet protocol (Q1, 2020)**

**CDA Point Browse supported in Experion (Q1, 2020)**

**Enriched Capabilities to meet customer demands**
ControlEdge PLC Roadmap

Focus on Experion integration, IO Module Variants and wide Communication Interface support

R101 – Jan ’19
Competitive Migrations Tool
• PLC5 to ControlEdge PLC Application
• Pre migration and Post migration reports
• SLC500 to ControlEdge PLC Application
• Pre migration and Post migration reports

R102 – April 2019
• MDIS integration for Sub-Sea Automation
• LM and LCS620 migration

R151 – November ’18
• Communication modules (Serial RS232, RS485), Modbus RTU, ASCII, User defined protocols
• Ethernet/IP (Server and Client)
• Controller Simulation
• 2 New IO modules

R152 – April 2019
• MDIS integration for Sub-Sea Automation
• LM and LCS620 migration

R160 Oct 2019
• EtherNet/IP enhancements
  • EDS file modifications in ControlEdge Builder
  • Qualify more EDS files from Rockwell 1756 and 1794 IO family,
  • Support native DLR without ETAP
  • DNP3 Multi-master (Multiple SCADA Centers)
  • Marine Certifications (BV, DNV, KR, LR)

Future releases (subject to reprioritization based on opportunities and budget approval)
• Redundant UIO
• Wider Operating Temperature
• Protocols:
  • OPC UA Enhancements, Profinet Enhancements, IEC61850, Profinbus, Ethernet/IP Enhancements, DNP3 protocol enhancements
  • Performance Enhancements
  • 20ms Loop scan time, 10,000 IO per controller, Redundancy performance improvement, CPM Dual rack redundancy
• New Features –
  • DI SOE, IO Redundancy, EPM Redundancy, Cloud Connectivity, Augmented reality app, History Backfill, Data Logging, AGA Algorithms
  • Flexera Licensing
• Certifications – ISASecure update
• Migration tool update – Siemens, Schneider, ABB

R170, Q1 2020
• Built-in Profinet protocol
• CDA Point Browse supported within Experion (Experion Release R511.3)
• Enhanced LLAI and AO Module
SUCCESS STORIES
Ingenio Plan de Ayala- México

Location: Ingenio Plan de Ayala is an industrial unit to produce refined granulated sugar, with a milling capacity of 6,000 tons of cane daily and a production of 600 tons of sugar (depending on the relative quality of the cane). It is located in the municipality of Ciudad Valles, San Luis Potosí.

Ingenio Plan de Ayala chose Honeywell to deliver a wide range of automation and safety solutions. Honeywell offers the ControlEdge PLC controller for the control system designed to the highest industry standards.

Customer Need
The project consists of the repowering of boilers 4, 5 and 6 of Ingenio Plan de Ayala for increase of its capacity and the use of bagasse (dry pulpy residue after sugar liquid extraction) as fuel.

The automation project consists of replacing the monitoring and control system for these boilers, as well as deaerator, steam circuit and bagasse circuit.

Solution Offered
- Monitoring and Control System with Experion HS
- ControlEdge PLC
- Work Stations

Customer Benefits
- Faster system setup, testing, and troubleshooting
- Flexible and scalable design
- Standardization with less hardware
- Investment protection and easier maintenance
- Seamless support
- Reduced cost over the lifecycle.
Location: Browns Range site, Australia- Sinosteel Browns Range Rare Earth Pilot Plant
Northern Minerals is developing a pilot plant to prove the viability of a process for the extraction of rare earth minerals from ore, and the subsequent production of a mixed rare earth carbonate product. The system includes 3 sets of ControlEdge PLC - for the Beneficiation plant and Hydrometallurgical plant, and 10 sets of ControlEdge RTU systems as Remote IO.

Customer Need
• Competitiveness by increased terminal efficiency & accuracy
• High reliability and availability
• Ease of engineering capabilities
• Interface with 3rd vendor PLC of other Package
• Integration with Experion™ PKS SCADA.

Solution Offered
• Honeywell Experion™ PKS
• Honeywell ControlEdge PLC
• Honeywell ControlEdge RTU

Customer Benefits
• Single vendor for SCADA, PLC and RTU.
• Integrated with SCADA and 3rd vendor PLC (e.g. Siemens S7)
• Improved wiring efficiency
China National Aviation Fuel Group (Midstream)

Location: China National Aviation Fuel (CNAF) Group Corporation is a Chinese state-owned enterprise. CNAF is China’s largest aviation transportation service provider that integrates the purchase, transportation, storage, testing, marketing and refueling of aviation fuel. The main business of CNAF includes aviation fuel, petrochemical trading, logistics and international business.

Honeywell China won China National Aviation Fuel Jin-Jing Pipeline project. This pipeline is China’s first aviation fuel long-distance pipeline. This project uses ControlEdge PLC, HC900 SIL2 and ControlEdge RTU.

Customer Need

- CNAF is building a new aviation fuel pipeline from Tianjin Port to Beijing to meet the aviation fuel demand from Beijing New International Airport.
- Project consists of one Main Control Center, 3 Station Control Systems, and 13 Block Valve Room.
- A mid-size PLC suitable for such applications

Solution Offered

- Three sets of ControlEdge PLC, used for Station Control System.
- One set of HC900 SIL2, used for Pipeline Hydraulic Surge Protection system.
- Thirteen sets of ControlEdge RTU used for Block Valve Room RTU system.
- Experion® PKS R500 as SCADA.
- Tianjin Operation team for engineering and service.

Customer Benefits

- Ease of integration with EPKS – less overheads and associated costs
- Reduced CAPEX and OPEX with Single vendor for PLC, RTU, SIL2 PLC and DCS
- Access to additional data & flexibility in managing data for better management of assets
Turck provides the full range of Ethernet IO Solutions

**BL20 IP20 Modular IO**
- Up to 32 Slices – 512 IO
- All signal types
- Line, Ring, Star
- RFID, Serial, CAN

**Excom IP20 Process IO**
- All process signal types
- 8-24 Slices – 192 IO
- HART
- Hot Swap
- Line, Ring, Star

**FEN20 IP20 Block IO**
- 24VDC Digital IO
- 8-16 Channels
- Operator Stations

**TBEN IP67 Block IO**
- Many IO Types
- RFID, Serial, CAN
- 8-16 Channels
- On-Machine IO

**FDT/DTM or Webserver**
- Design, Configure, Document
- Commissioning
- Diagnostics

**BL20 and TBEN – RFID**
Energy Control Technologies

- ECT uses Open Hardware Implementation
- Organizational Focus on Technology Development and Project Delivery
  - Honeywell ControlEdge & ECT TurboPAC® Apps
- SECURE, RELIABLE – Proven Controls Technology
- ECT TurboPAC software is **productized**: Tested & Proven requires only configuration
- OPEN PLATFORM: **COST SAVINGS** – CAPEX and OPEX
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Achieve a competitive edge with advanced PLC, RTU or controller technology

Buy a discounted ControlEdge™ PLC Starter Kit ($1,949), HC900 Starter Kit ($1,899) or RTU Starter Kit ($1,499) and get all of the necessary I/O modules and software licenses.

Visit the Promotions Center to learn more.

See details at www.hwll.co/HUG19offers. These limited-time discounts and offerings are only available and valid for new inquiries and commitments made at 2019 Americas HUG in Dallas, TX, June 09-14. Orders must be placed within 90 days of receiving an estimate.
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