Adapting to Change

Rick Orandle
Valero Memphis Refinery

Experion PKS and APACS
Agenda

• Project overview
• Conceptual design
• Testing
• Applications
• Lessons learned
• Recommendations
Project Overview

- Islands of automation
- Legacy DCS and SLDC
- Experion PKS
- Centralized control
- Operator-friendly environment
- The SRU Complex Options
  - Dual DCS
  - Use Legacy DCS
  - Replace Legacy DCS
  - Integrate Legacy DCS
Project Overview

Integration Advantages

• APACS API solid with 10-year track record
• Very satisfied with APACS
• Very satisfied with HMIWeb and FTE
• Hot cutover with parallel HMI
• No field wiring changes
• Low cost - $1,000,000 savings for SRU #2
• Low risk
• One operator workstation
Conceptual Design

APACS Interface
Network Architecture

- APACS Controllers
- Industrial Ethernet Modules
- EPKS Servers
  APACS Runtime API

Fault Tolerant Ethernet (FTE)

Server A  Server B

MBus

ACM ACM IIO
Conceptual Design

- Siemens network
  - APACS redundant controllers
  - Dual fault-tolerant proprietary M-Bus
  - Dual parallel NIM (Network Interface Module)
  - Simplex E-Net to FTE switches

- Honeywell network
  - Redundant EPKS servers
  - FTE networking
  - APACS runtime API
Technology Hurdles

- APACS interface not redundant
  - Option 1 – use OPC with RDM
  - Option 2 – rewrite APACS interface
- Honeywell DE – Australia
- Test facility
- Siemens support

Initial testing results:
- Data communications – OK
- Diagnostics – FAILED
- Built in-house diagnostics
Testing – Plan

• APACS system
  • ESP = Saw Tooth Wave (1 Minute Frequency)
  • 50 secondary loops
  • Tail to mouth simulation
  • 3 types of NIMs (RNI, NIM32, IEM)
• EPKS server (R201)
  • 7 addresses per loop (1-second scan)
  • 4 alarms per loop (8 events per minute)
  • 3 channels / 3 controllers
• Testing methodology
  • Hardware failures
  • Stress testing
Testing – Results

• Standard tests
  • Excellent data COMM
  • No data COMM diagnostics (no vendor support)
  • Data COMM non-deterministic
  • The 2\textsuperscript{nd} hardware failure, 15-sec freeze
    • IEM > NIM32 > RNI

• Stress tests
  • Increased loading to 4320 PPS
  • Ran out of memory in controller
  • Server channel overload warning ~2880 PPS
  • Process constraint – 2500 PPS
Testing – Conclusions

• APACS API is robust and proficient
• User must build data COMM diagnostics – EPKS channels
• Honeywell must productize package
  – Documentation
  – Support – TAC
Applications – SCADA Hardware

- Channel = NIM (IP address, hosts)
- Controller = ACM (resource name)
- Process control channels – redundant
- Diagnostic channels – simplex
- LISSCN – rates, groups
- Alarms are server-based (limited)
- Read = SCAN, background
- Write = Immediate
Applications – SCADA Points

- Analog – PV, SP, OP, MD, A1, A2, A3, A4
  - A1 = standby synch
  - A2-A4 = tuning parameters

- Status – PV, OP, MD
  - PV = boolean or integer (8 states)
  - State alarming is a plus

- Custom faceplates and detail displays
Applications – Faceplates

17TI050
Deprop Tray 3

17LC063
Deprop OVHD Drum

17LALL732
Amine Tower Low Level Interlock

PV 65.06 EU

PV -0.66 EU

OP 0.41 %

MD MAN

1 OK

0 LOWLEVEL

ALARM
Applications – Graphics

- Mimic C200 project
- Develop SCADA shape library
- Utilize identical standards
- Customize faceplates
- Customize mode acronyms
Applications – Schematic
Applications – Detail General

17TC041
Debutanizer Tray 34

Range
Units
100%
0%

Services
- Scanning and Control enabled
- Alarms enabled

Displays
Associated Display: SGP_DEBUT

Algorithms
- PV Algorithm
- Action Algorithm

Performing Detail (or double clicking) on the Algorithm No. will call up the Algorithm Configuration Page.
### Applications – Detail Scanning

#### Parameter | Period | Cntrl | Source Address | Destination Address
--- | --- | --- | --- | ---
SP | 5 Sec | 1 | DEBUT_.17TC041.SP | not applicable
PV | 2 Sec | 1 | DEBUT_.17TC041.PV | DEBUT_.17TC041.AUTO
OP | 5 Sec | 1 | DEBUT_.17TC041.OUT | DEBUT_.17TC041.AUTO
MD | 30 Sec | 1 | DEBUT_.17TC041.AUTO | DEBUT_.17TC041.AUTO
A1 | 5 Sec | 1 | DEBUT_.17TC041.SS | DEBUT_.17TC041.CONTROLLER_PG
A2 | 5 Min | 1 | DEBUT_.17TC041.CONTROLLER_PG | DEBUT_.17TC041.CONTROLLER_PG
A3 | 5 Min | 1 | DEBUT_.17TC041.CONTROLLER_TI | DEBUT_.17TC041.CONTROLLER_TI
A4 | 5 Min | 1 | DEBUT_.17TC041.CONTROLLER_TD | DEBUT_.17TC041.CONTROLLER_TD

#### Processing Options
- **PV clamp**
- **OP Reverse**
- **Drift Deadband**: 0.0 %

#### Control Safeguards
- **Normal Mode**: AUTO

#### Control Limits
- **Upper Limit**: 500.00 EU
- **Lower Limit**: 10.00 EU
- **OP**: 28.80 %
- **MAN**: 0.00 %

### PV Last Processed
- **3/30/2008 0:12:10**
Applications – SCADA Tuning

- Use auxiliary parameters A2, A3, A4
- Trend comes standard with AUX
- R/W with SUPV permission – custom AUX
- A2 = PG, A3 = TI, A4 = TD
- Scan = 5 minutes
Applications – Detail Auxiliary

17TC041
Debutanizer Tray 34

| SF | 73.47 |
| PV | 74.30 |
| OP | 1.87 % |
| MD | MAN |

Auxiliary Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>SS 1.00</td>
</tr>
<tr>
<td>A2</td>
<td>PG 3.00</td>
</tr>
<tr>
<td>A3</td>
<td>TI 4.00</td>
</tr>
<tr>
<td>A4</td>
<td>TD 0.00</td>
</tr>
</tbody>
</table>
Applications – SP Ramping

- Use second analog point, “tag”_rmp
- Map using auxiliary parameters
- Target, time, command
- Shape calls popup
Applications – SP Ramping
Lessons Learned

- APACS interface is functional and solid
  - Channel - 4320 PPS, OVLD @ 2880
  - Controller – 750 addresses maximum (tested 6 controllers / channel)
  - Maximum recommended – 2000 PPS
- SGP application
  - Compressor and 5 towers
  - 50 loops, 200 points, 1000 addresses
  - 220 PPS
Lessons Learned

Points
• SCADA points are NOT C200 points
• Custom faceplates
• Free form alarm handling
• Multi-state status points
• Parameter addressing read .vs. write
• SCADA trend data

Graphics
• Develop SCADA library
• HMIWeb integrates SCADA and C200
• Nothing preconfigured
Lessons Learned – Other

- Develop project standards
- Third party controller configuration tool (not FTE qualified)
- Maintain a non-integrated HMI database (quick builder)
- Build and maintain custom diagnostics
- Segregate control networks
- Troubleshooting support from multiple vendors
- Spare parts
- Service agreement
Closing Remarks

- APACS integration worth $1 million in savings for SRU Complex
- Short-term strategy is to integrate legacy DCS and C200 platforms
- Long-term strategy is to replace legacy DCS with C300 when economics dictate

- APACS Interface (SGP, SR1, WT, ECU, NS, SF)
- 2006 - WCU, CRYO
- Future - ALKY, CCR, Blender
Questions

Rick Orandle
richard.orandle@valero.com
901.647.1475 (cell)