



CREDC

CYBER RESILIENT ENERGY
DELIVERY CONSORTIUM

Seminar Series

Oil and Gas Pipeline Transmission Infrastructure Cybersecurity and Resiliency

Al Rivero, PE



CREDC Summer School

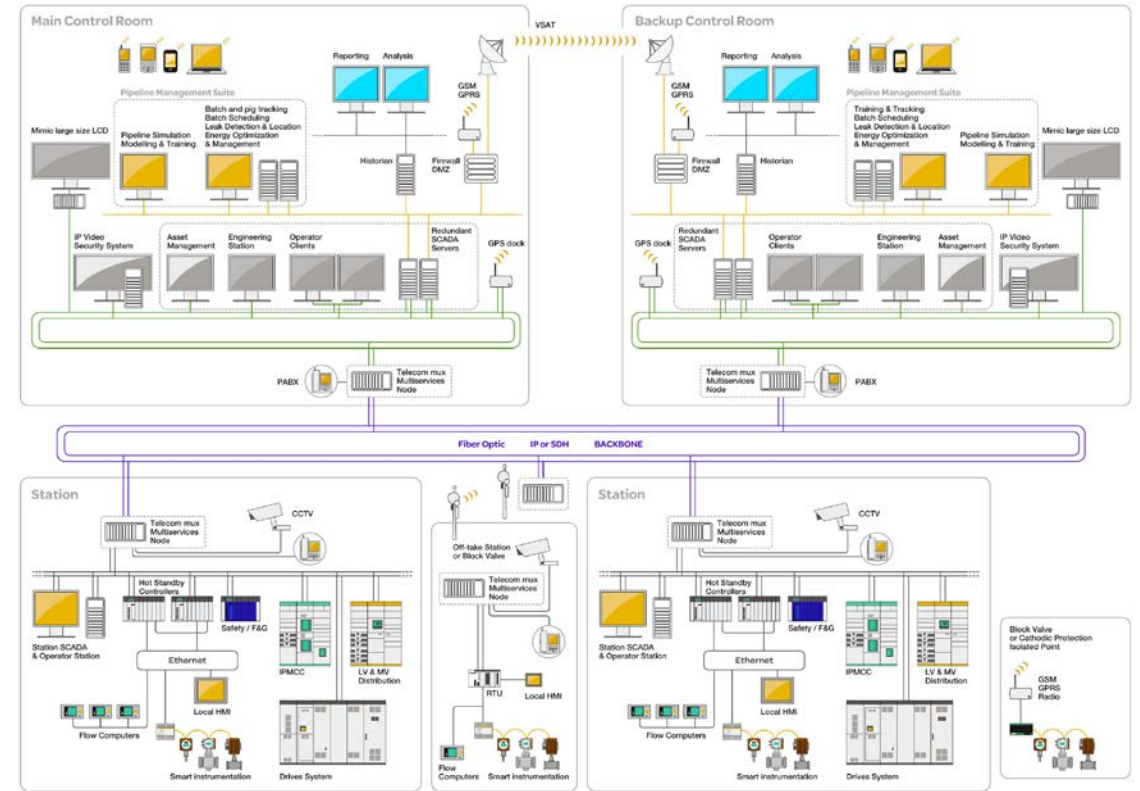
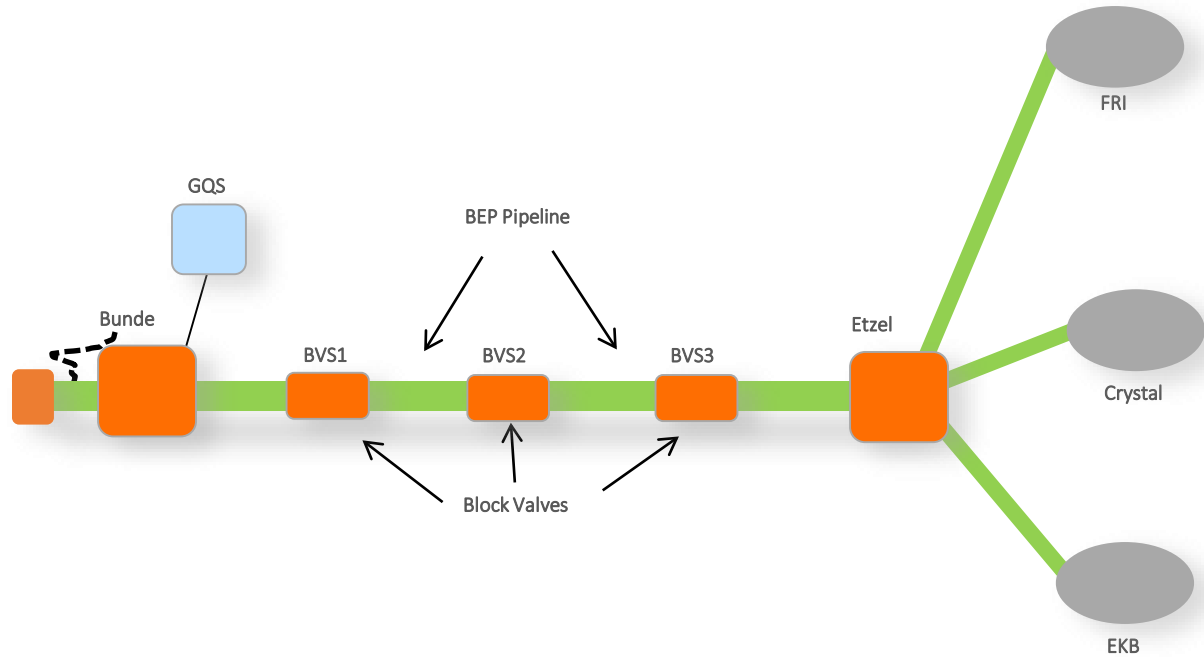
February 5th, 2018



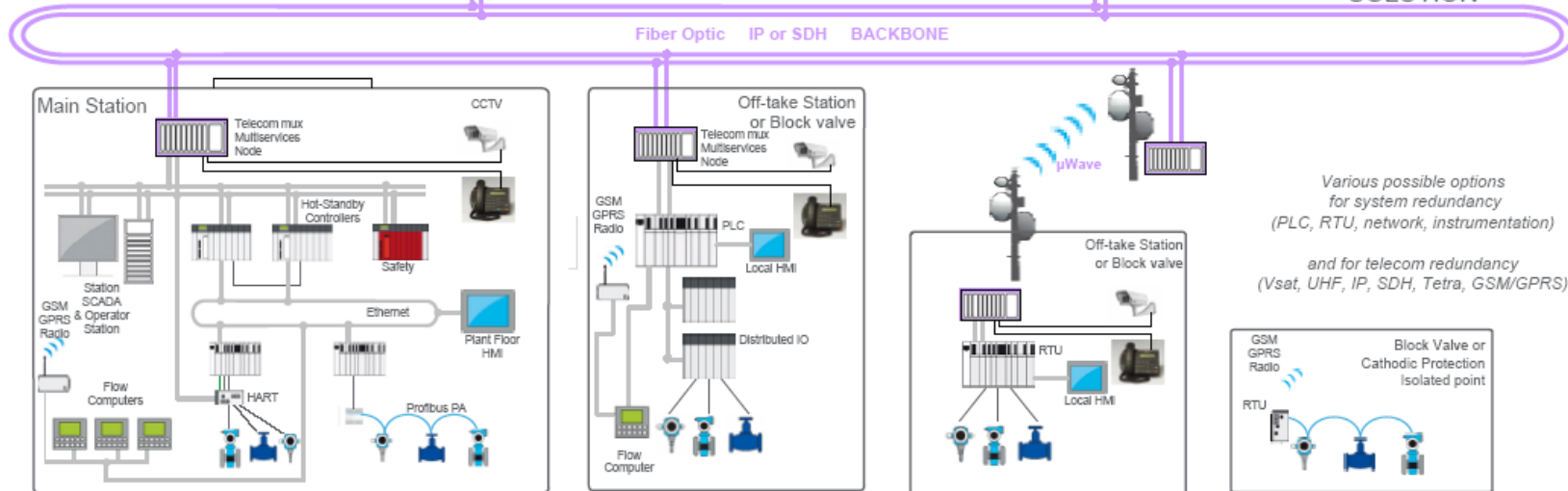
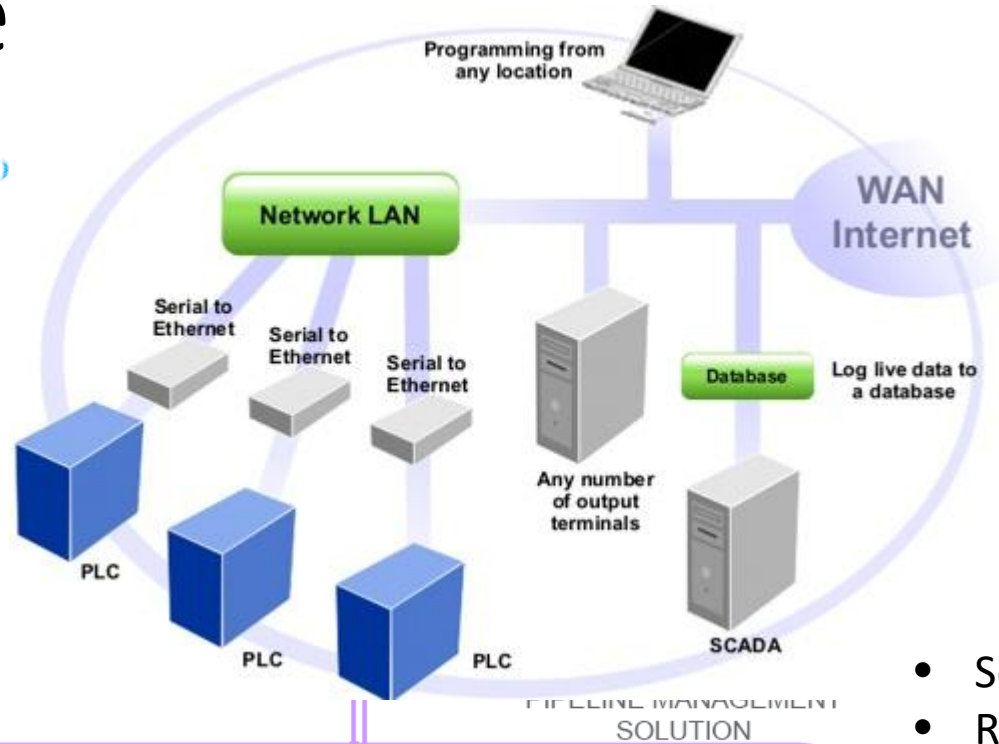
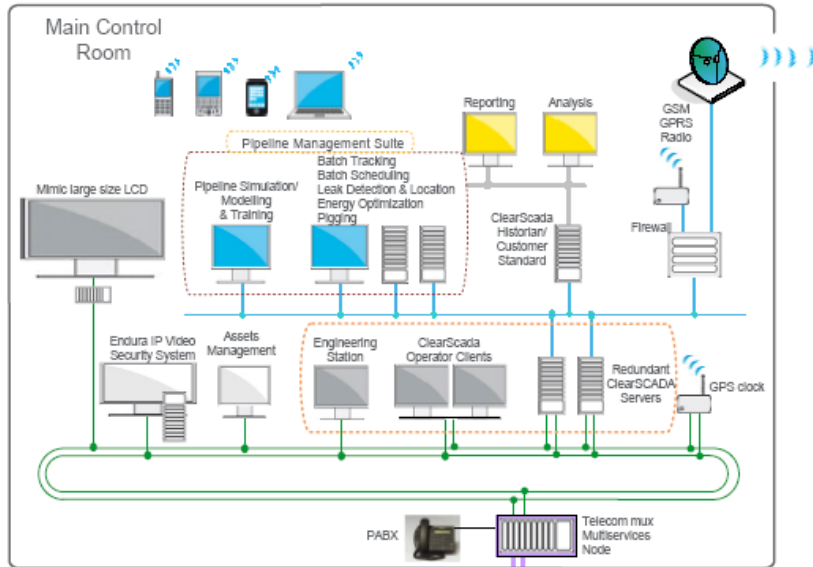
Agenda

- Review of O&G Transportation 5 Mins
- Applications, Networks Layers, Segmentation 15 Minutes
 - Transportation
 - Liquide
 - Gas
- Design of Pipeline Components – Why 20 Minutes
 - Regulatory requirments
 - Industry Recommended Practices and Guidelines
- Hypotheticals and Q&A 15 Minutes

Typical

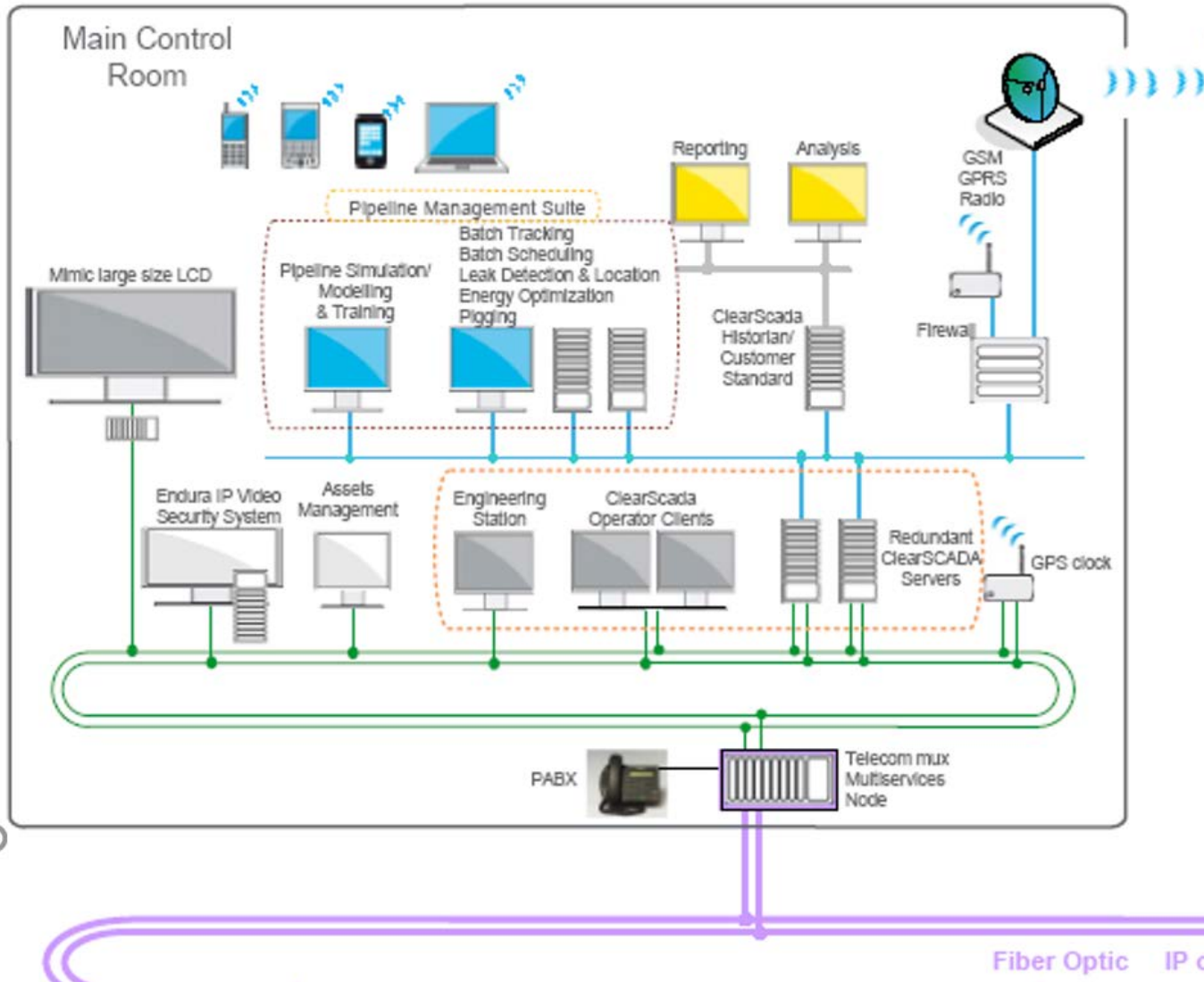


Typical Pipeline

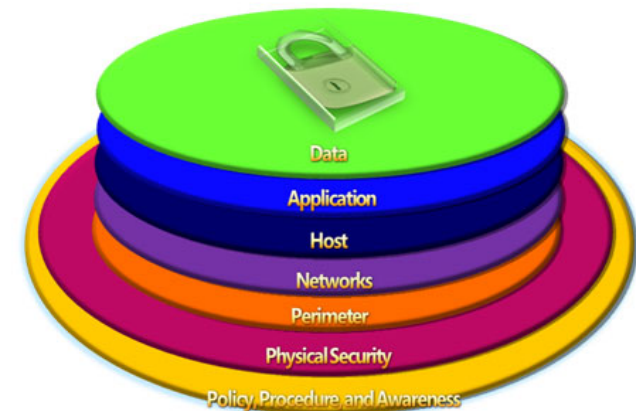


- Servers - OS
- Routers/Switches
- LAN/WAN
- Sensors & end devices.
- Programmable Logic Controllers (PLCs)
- I/O Servers
- Operator Clients
- Historian

Typical Pipeline



- Servers - OS
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-
- Multiple layers deep (n-3)
 - Onion Philosophy (Guard the keys)



Design of Pipeline Components

Natural Gas

- Subpart D 49CFR192.1XX/2XX
- 49CFR192.203
 - Instrument, control, and sampling pipe and components.

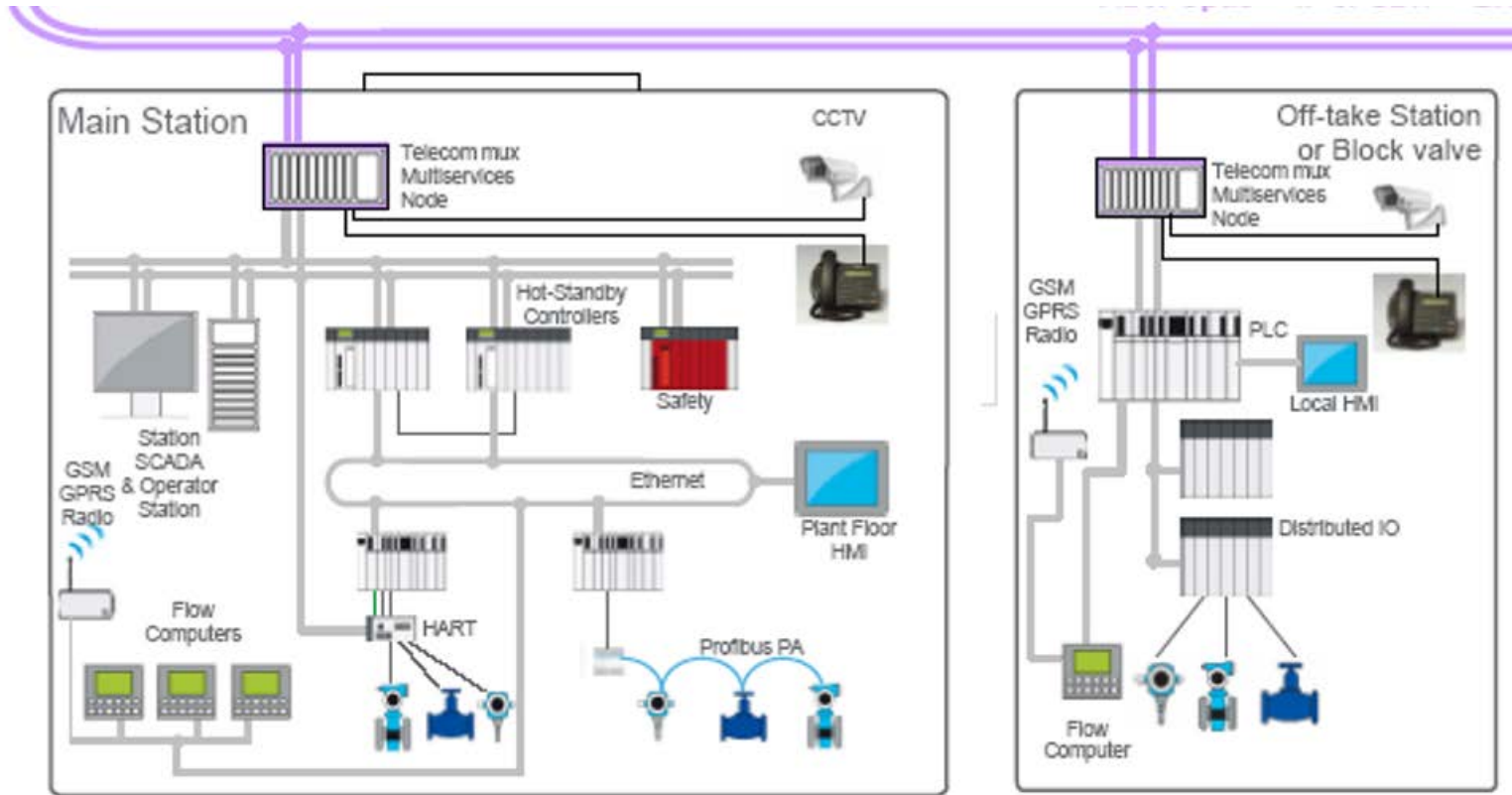
Hazardous Liquids/Carbon Dioxide

- Subpart C 49CFR195.1XX
 - 49CFR195.100 Scope
 - 49CFR195.101 Qualifying metallic components other than pipe.
 - 49CFR195.102 Design temperature.
 - 49CFR195.104 Variations in pressure.
 - 49CFR195.106 Internal design pressure.
 - 49CFR195.108 External pressure.
 - 49CFR195.110 External loads.
 - 49CFR195.111 Fracture propagation.
 - 49CFR195.112 New pipe.
 - 49CFR195.114 Used pipe.
 - 49CFR195.116 Valves.
 - 49CFR195.118 Fittings.
 - 49CFR195.120 Passage of In-Line Inspection tools.
 - 49CFR195.122 Fabricated branch connections.
 - 49CFR195.124 Closures.
 - 49CFR195.126 Flange connection.
 - 49CFR195.128 Station piping.
 - 49CFR195.130 Fabricated assemblies.
 - 49CFR195.132 Design and construction of aboveground breakout tanks.
 - 49CFR195.134 CPM leak detection.

Typical Pipeline



- Programmable Logic Controllers (PLCs)
 - Watchdog Timers
 - Last Message
- I/O Servers
- Operator HMI
- Historian
- Mechanical Devices
 - Mainline Block Valves
 - Pressure Relief Valves
 - Flame Arrestors





Hypotheticals and Q&A

- Disgruntled Employee
 - Knowledgeable Insider
 - Isolate system
 - Corrupt Historian
 - Clone HMI
- Outsider
 - Requires an entry point (Insider or Gain access)
 - Web and Email Spam | Sites used in unsolicited commercial email.
 - Malicious Websites | malicious code.
 - Phishing and Other Frauds | counterfeit legitimate sites to elicit | user information
 - Needs patience to monitor activity
 - Understand protocols
 - Command structure



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