

Cyber Benefits and Challenges with Raman Analysis Systems



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ISA 99 WG-10 Cyber Security Use Cases

ISA 108 Intelligent Device Management

ISA 95 Enterprise Integration

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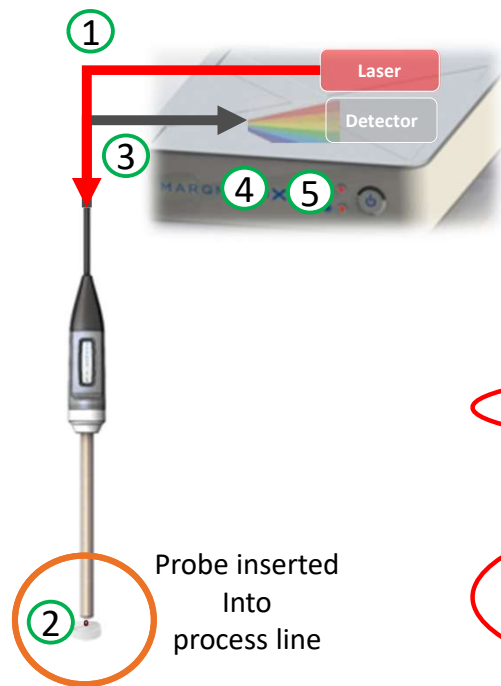
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ISA Technical Program
Los Angeles / Orange County

08 DEC 2020

Raman is possible because of massive improvements in plant computing power



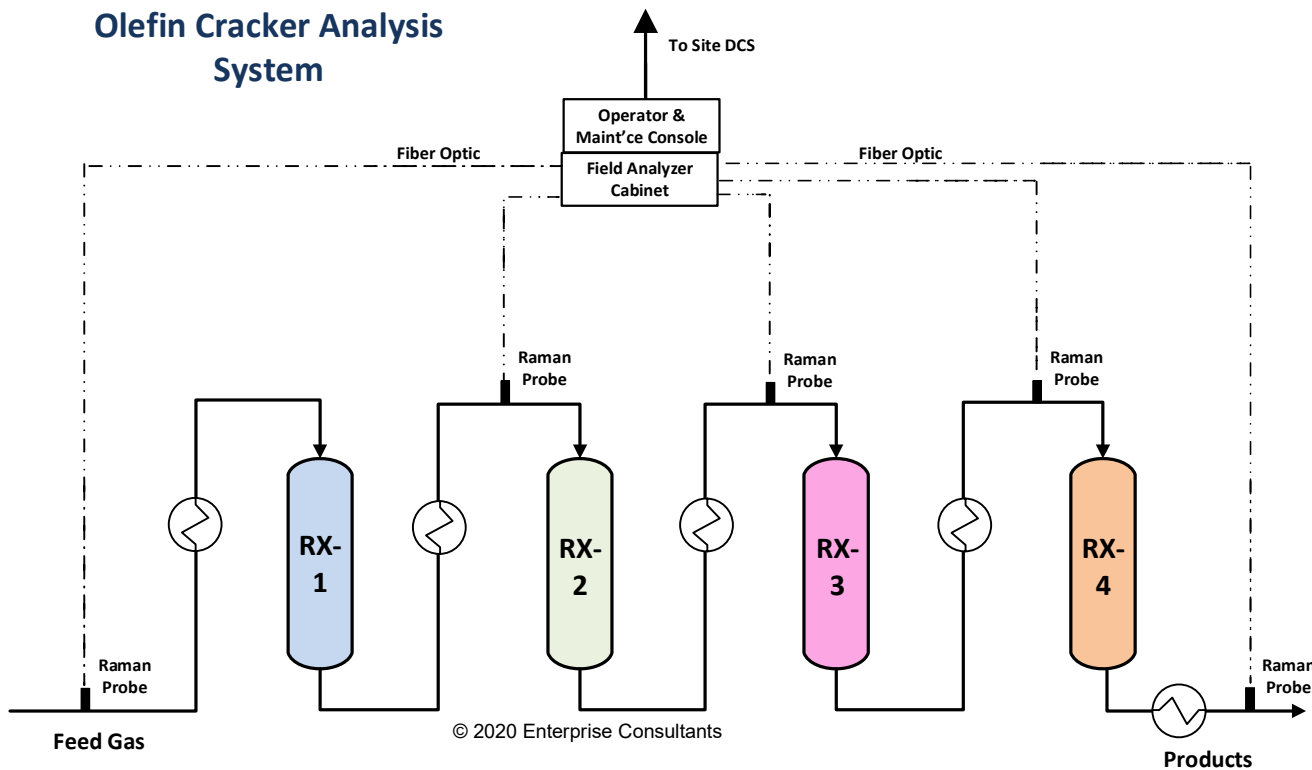
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1. Laser beam excites molecules at ②
2. Chemical bonds in molecule absorb energy and then radiate it at their unique frequency.
3. Fiber optic cable carries reflected waves from probe to a detector in the spectrometer.

4. Computer analyzes complex reflected wave and measures photons from target bonds.

5. Raman software determines concentration of molecules that radiate at the unique frequency for that compound. Other techniques measure physical properties and infer composition (e.g. chromatographs actually measure adsorption of compounds).

Example Unit Performance Optimizer



Immediate Cyber Benefits

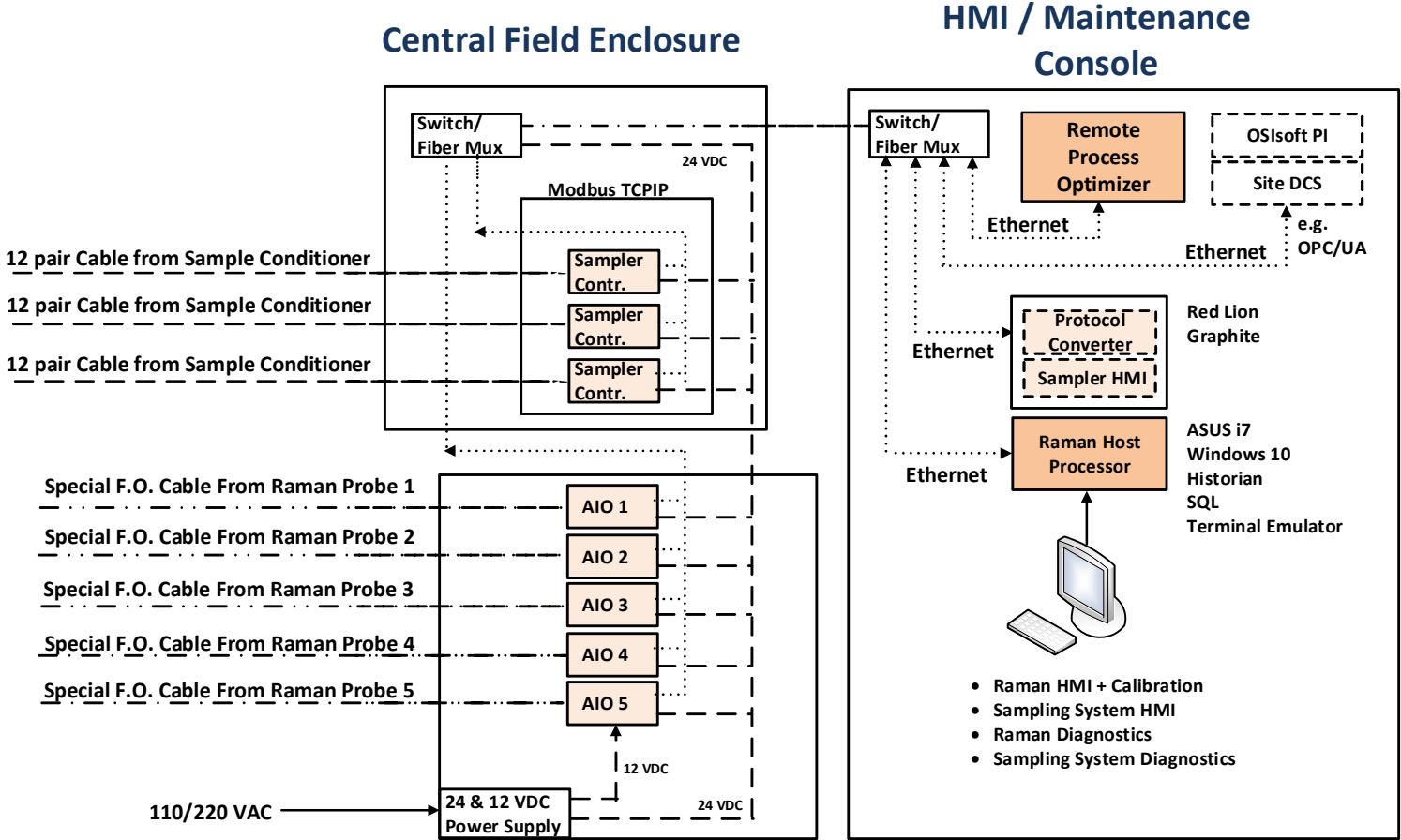
Complete performance data every 6 seconds.

Direct interface with Data Historian, Lab Quality Systems

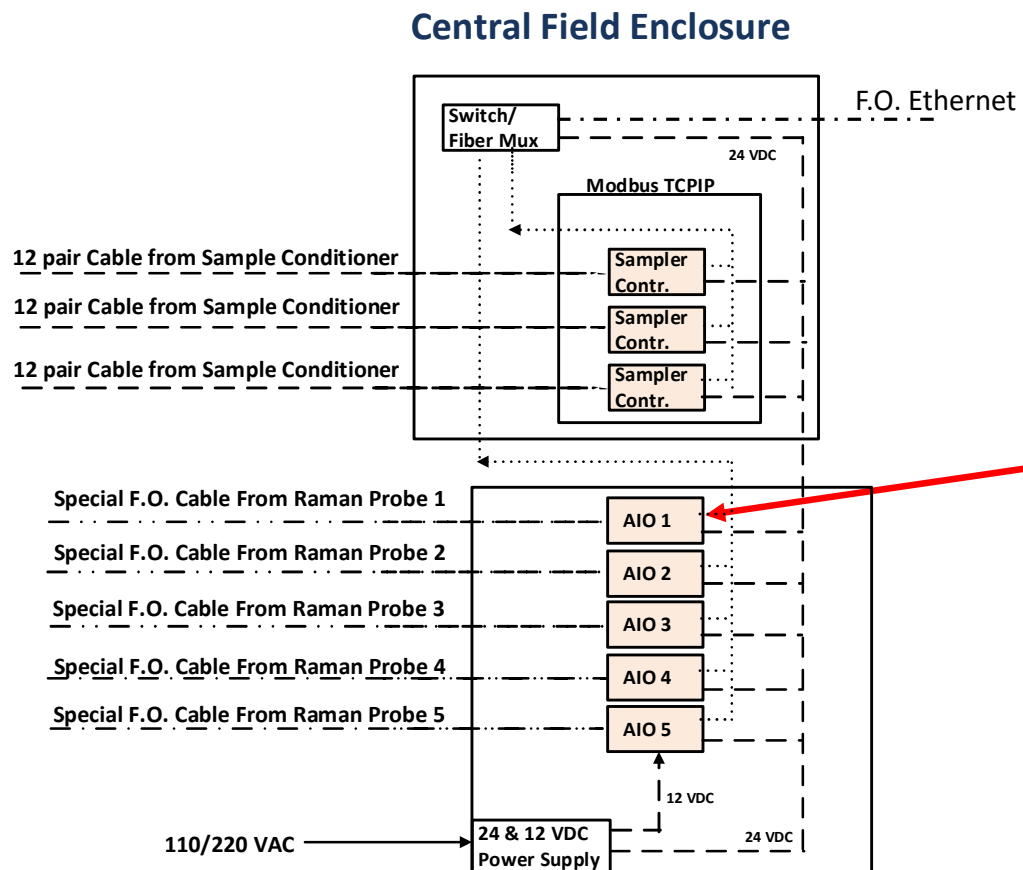
Plug and Play interface to DCS

Maintenance monitoring and remote support

Modular Computer Architecture is Powerful but Requires Significant Computer & Network Skills



Each Probe Interface is a Windows 10 Computer

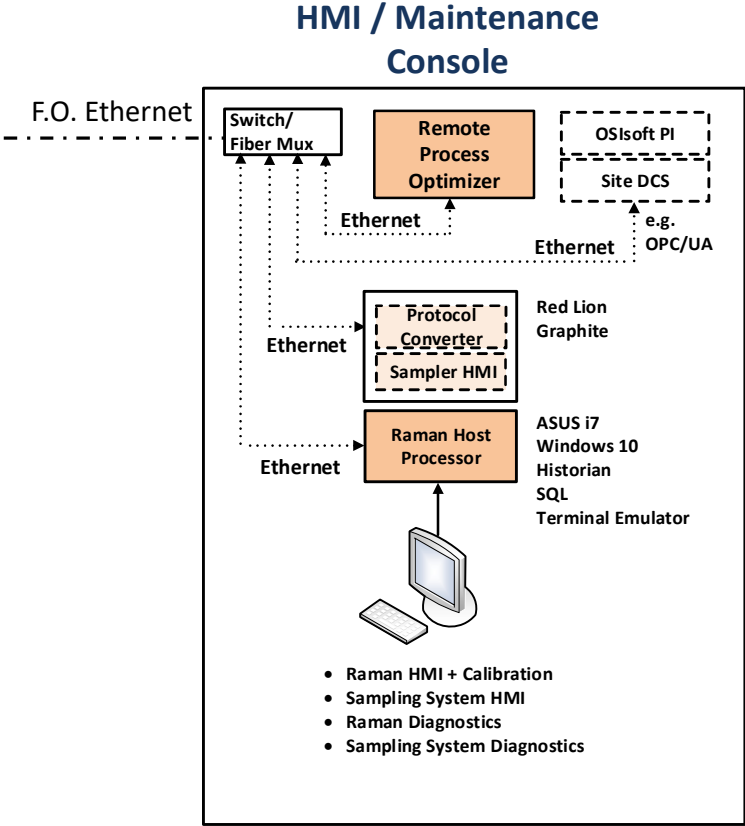


Stainless Steel 4X, Class 1, Div 2, A/B/C/D
Sealed Cabinet with solid state heating/cooling
All Climatic Zones, outdoor or indoor.



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Operations Console is a Server Class Computer



These Computing Systems Offer “Game Changing” Opportunities



- Operating Console can interface with other Modelling Software for:
 - Digital Twin performance monitoring
 - Optimize Production Schedules
 - Optimize Yields with feed variations
- Communications Interfaces
 - 250 “plug and play” interfaces
 - Easy integration with DCS, SCADA or even PLCs
 - Integration with Quality Lab
 - Remote Troubleshooting and Support

Typical Process Plant Architecture

PERA Level

7

PROCESS PLANT PHYSICAL ARCHITECTURE

6

5

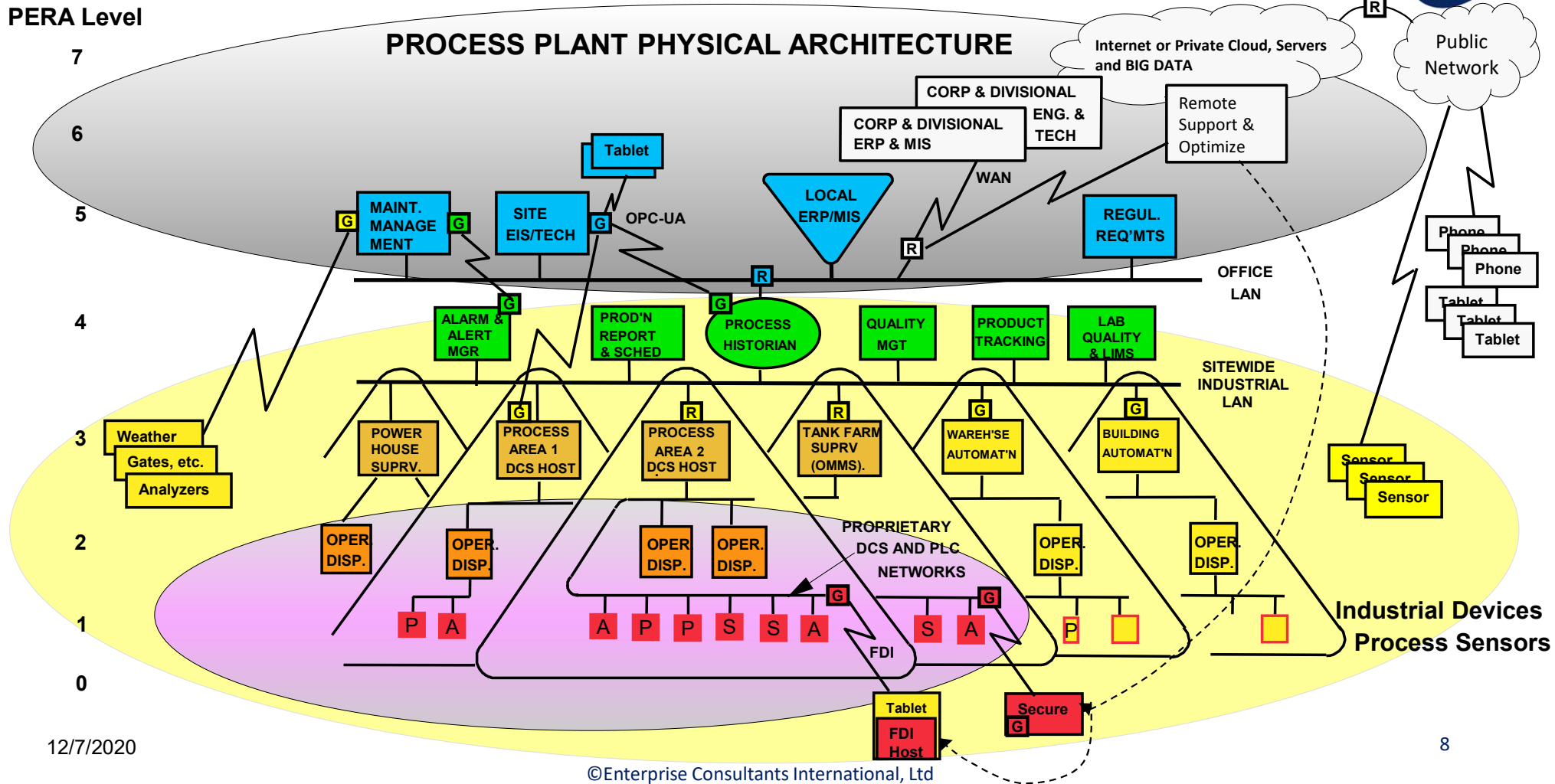
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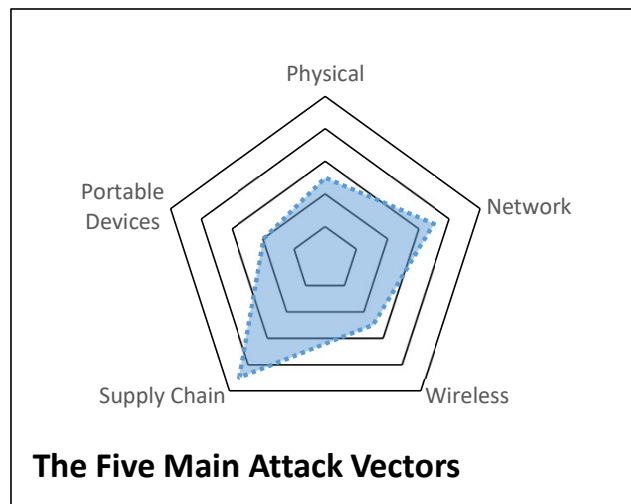
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Cyber Security



- Cyber Security will be a factor in the rate of adoption
- Windows and Ethernet Intelligent devices are cheap and powerful, but vulnerable.
- Remote access and “fleet support” is inevitable but dangerous.



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Protect Smart Control Systems from the 5 Attack Vectors

- Physical access may allow compromise of any software.
- Co-manage Network and Wireless threats with Plant IT and Instrument Engineers
- Manage Supply Chain (Specification and Configuration) with the Instrument/Control System Engineer. 30 Mb per device ! Checksums.
- Control access by portable devices with Instrument Maintenance and IT.

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Alternative - Integrate Analyzers via IIoT

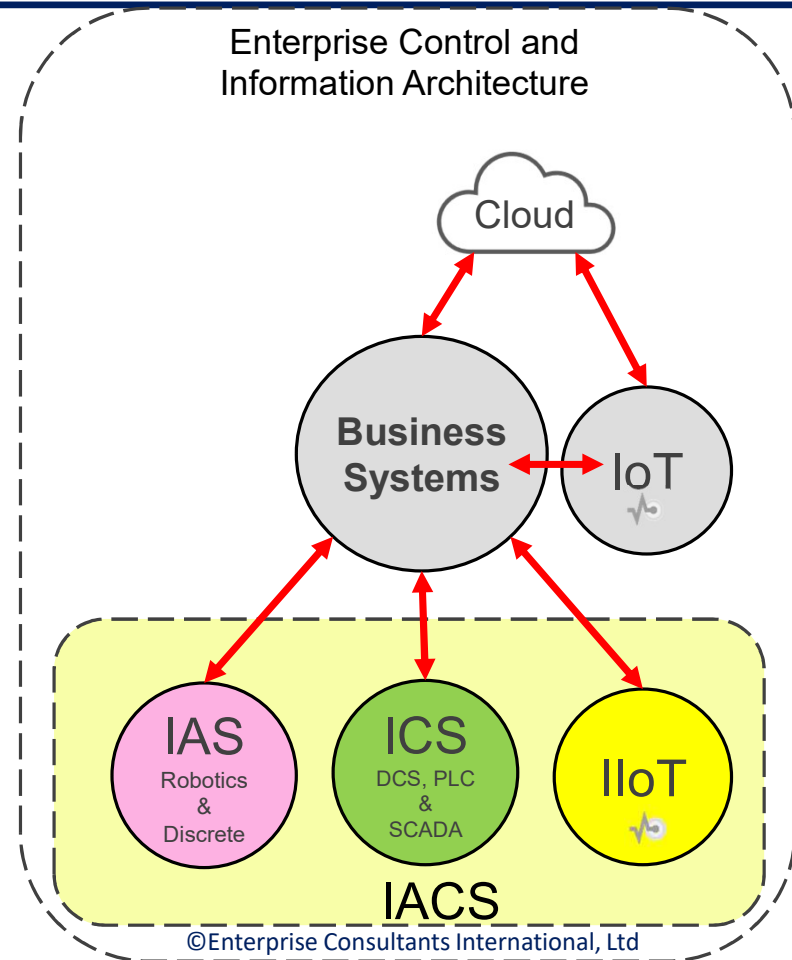


Industry 4.0 requires Integration of the Whole Enterprise Control & Information Architecture

Automated decision making is moving “higher” in the Architecture

To do this, it is necessary to communicate securely and quickly between IACS, IoT, Business Systems and the Internet “Cloud”

IIoT networks are separated from ICS and may provide better environment for intelligent analyzers.



Summary



- 3d Generation Raman Analysis Systems offer Major Opportunities:
 - Faster response, more accurate and reliable
 - Lower installed cost
 - Dramatically Reduced maintenance cost
 - Extremely stable (10 years MTBF on source & CCD)
 - Process optimization possible at many levels
- However, they also offer Major Challenges:
 - Computer and network expertise
 - Packaging and Integration of computers in industrial environments
 - Cyber security
 - Remote and on-site support