Driving Customer Requirements
in 2017 -
Electronic Instrument Design Requirements

Today's OMNI Presenters

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Clear Thinking

Those who cannot remember the past are condemned to repeat it.

George Santayana, *1905*

Discussion Objectives

What are Customer Key Requirements

Quality System: Product Design ISO 9001:2015

Industry Standards & Metrological Certifications (API/AGA/UL/OIML/IEC)

System Architecture

SW: Configuring vs Programming

Cyber Security - Securing Metering Data

What are Customer Key Requirements

Intended Use / Contractual Agreements

Safety and Environmental

Product Reliability

Sustainability of Product

Migration / Obsolescence

Quality System: Product Design

ISO 9001:2015

OEM or Customer Risk?

Quality in Design:

Design controls designates the application of a formal methodology to the conduct of product development activities.
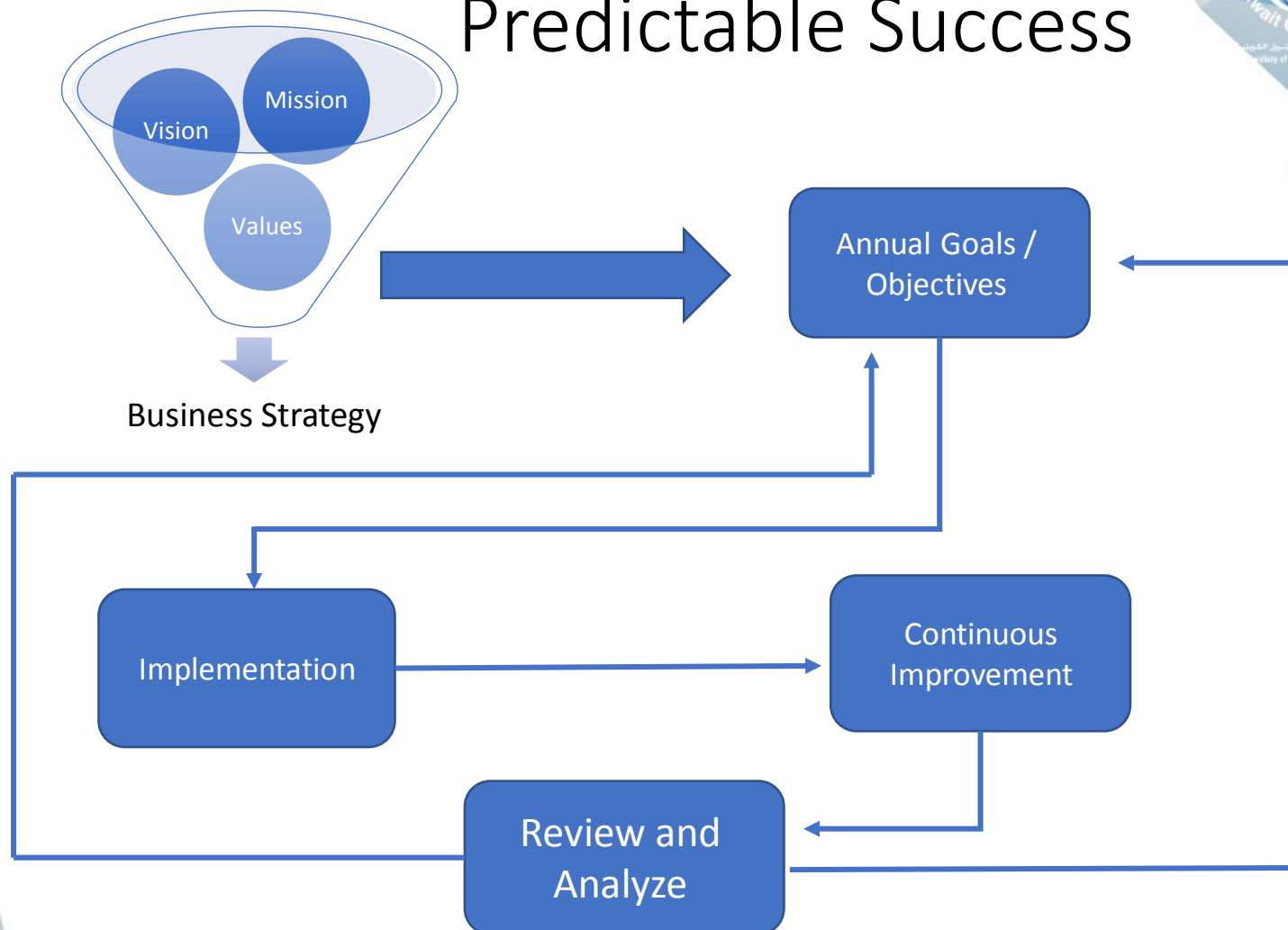
It is mandatory (*by regulation*) to implement such practice when designing and developing products within regulated industries.
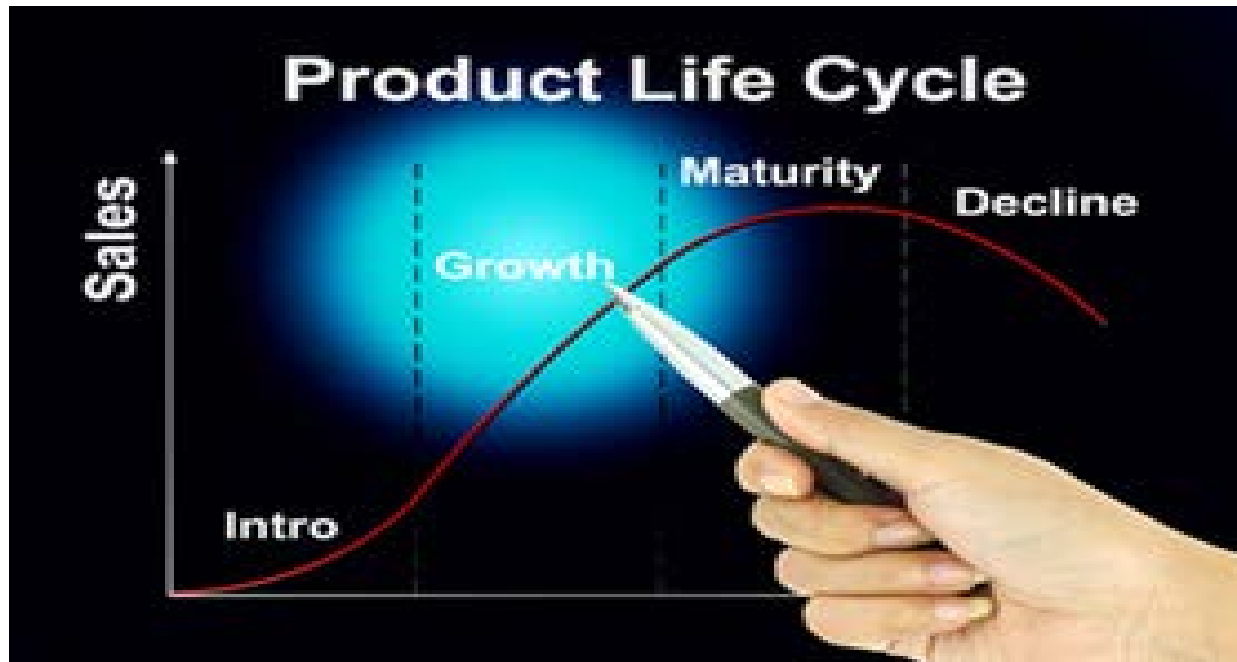
ISO 9001:2015

ISO 9001:2015   Quality Design Process

- Identify Key Requirements
- Research
- Idea Generation
- Idea Development
- Production
- Testing
- Implementation
- Evaluation
- Approval
- Release to market

ISO 9001:2015 - Road to Predictable Success

Vision

Mission

Values

Business Strategy

Annual Goals / Objectives

Implementation

Continuous Improvement

Review and Analyze

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Product Life Cycle begins with the Design

Designing a migration path for flow computer development that **continues quality leadership** in providing the best lifecycle, reliability, and ROI based on historical data from 35 years of metering experience.

A Future-Proof Market?
Says Who? Show Me!

Will 2020 see a "new" PLC/DCS paradigm?
Will Oil & Gas really entertain such Risk?

1987 **2017** **2037**

What product lifecycles and support costs
can be afforded in a project lifetime?

FC/PLC/DCS/HMI/Meter Minefield & Cemetery!

ISO 9001:2015 -
OEM or Customer Risk

- Determining Risk and Opportunity
- Take Action to address the Risk
- Evaluate the effectiveness of the action on the Risk
- Analyze the Results
- Promote Risk Based Thinking

Risk & Opportunity

Assessing Customer Business Risks

How they manage and assess risk of choosing a single point of failure for the CASH REGISTER!

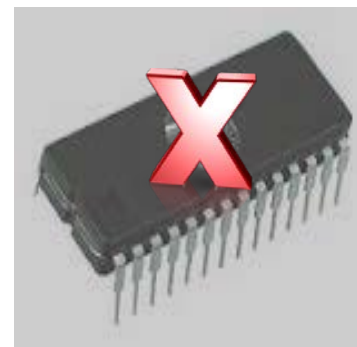# Industry Standards & Metrological Certifications

OIML (Metrology)

API (Measurement Standards)

IEC (EMI / EMC)

UL (Safety Standards)

Achieving OIML Compliance Today

Technology Changes. User Needs?

Today – PC based User programmable & compiled High Density Memory files and libraries have replaced mfr. - EPROM based embedded Firmware that only the Mfgr could change.

 General migration away from **mfr.-embedded** firmware programs (FLASH & EPROM) towards **open source** software tools where the integrators generate their own compiled files for downloading to FLASH memory.

Regulatory Compliance to OIML D31

Software Control Validation– WELMEC 7.2

Ch 4.2, P2 - Legally Relevant software shall be clearly identified (calculation block, all measurement parameters).

Ch 4.2, P2 If it cannot be separated, then it's all relevant !

Ch 4.2, P5 - Legally relevant software and measurement data should be protected against unintentional changes as well as intentional changes (Traceability).

Ch 4.2, P7 - Parameters that fix legally relevant characteristics of the measuring instrument shall be secured against unauthorized modification (Audit Trail and Events).

System Architecture

Compliant Software Architecture

I/O Processing

- Independent Liquid/Gas Flow meters
- Densitometer Interface
- RTD Direct Interface
- Weighted Averages

Flow Computations

- Resident Algorithms For primary Liquid/Gas Fluids
- 64-bit Calculation of Flows & Totalizers
- Station Combinator

Security

- Local Key-Pad Access
- MAC/SSL Encryption
- Totalizer Security
- User ID/Password Control
- Config Event Log
- Factory Programs

PID Control

- Flowrate
- Pressure
- High/Low Error Select
- Startup / Shutdown

Prover Functions

- Sequence & Control
- Meter F. Calculation
- Meter F. Linearization
- Viscosity Linearization

Reporting

- Prove, Batch Tickets, Daily, Hourly, Audit Trail, GC Data averages, Configuration Data, Alarms, Data Archives Historian
- Custom Report Templates

Liquid & Gas Tickets and Control

- Batch Schedule Stack
  Batch ID Strings
  Product Names
  Size of Transactions
- Batch Preset Counters
  Batch End Warning Flags
  Batch Complete Flags
- Product Interface Detection
- Sampler Control
- Programmable Valve Control

Redundant Ethernet Communications

- Configuration Access
- HMI, PLCs & DCS
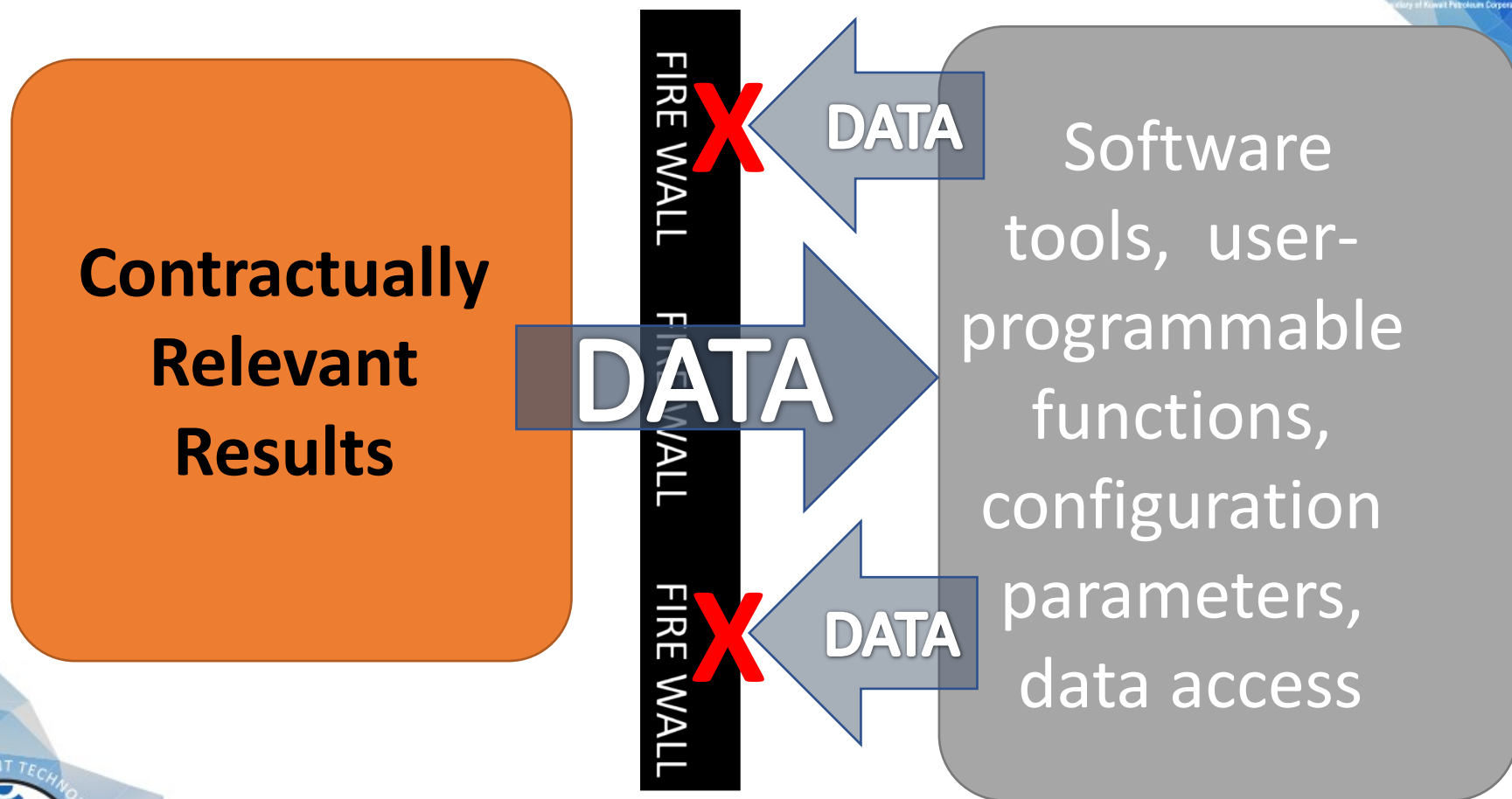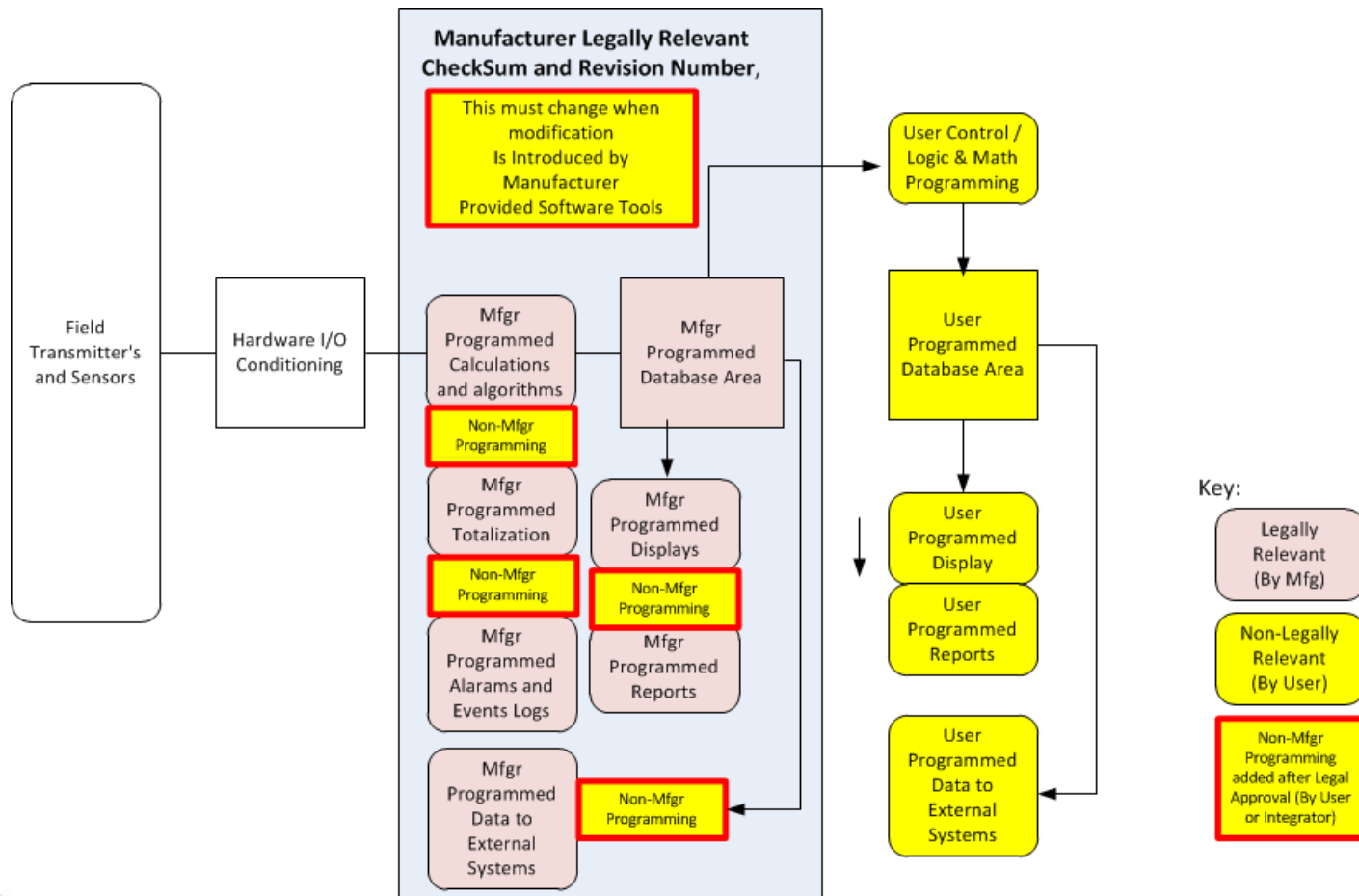- Network Printer
- Intranet/Internet

Software

Programmable vs Configurable

What are the Risks of Field Programmable Devices?

Assessing Best Practice
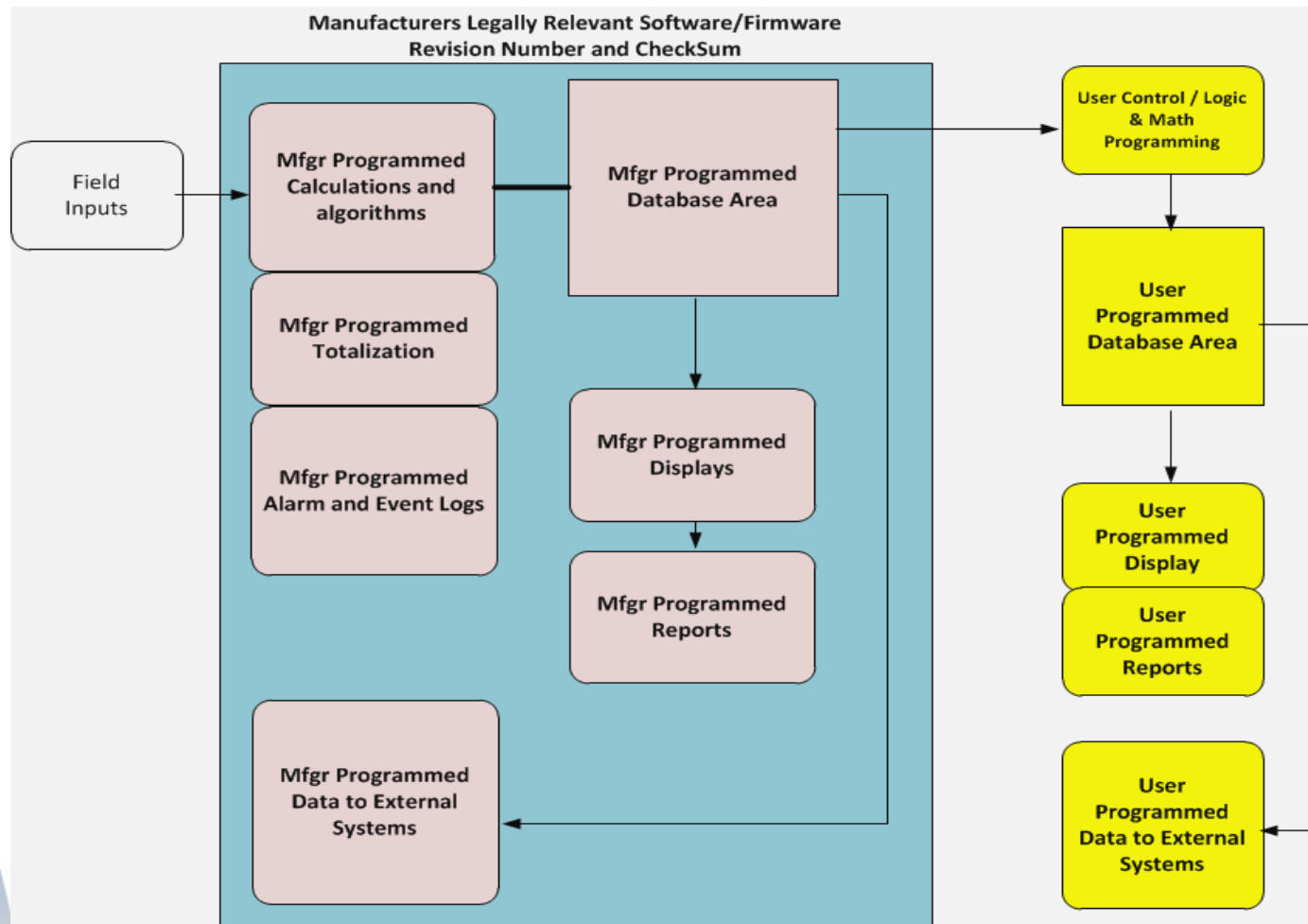# of 35 years vs Customer Future Risk

Contractually Relevant Results

FIRE WALL

X

DATA

DATA

X

DATA

Software tools, user-programmable functions, configuration parameters, data access

Unsecured Software will look like...

..but how will you know?

Compliant Software will look like……

Manufacturers Legally Relevant Software/Firmware Revision Number and CheckSum

Field Inputs

Mfgr Programmed Calculations and algorithms

Mfgr Programmed Totalization

Mfgr Programmed Alarm and Event Logs

Mfgr Programmed Database Area

Mfgr Programmed Displays

Mfgr Programmed Reports

Mfgr Programmed Data to External Systems

User Control / Logic & Math Programming

User Programmed Database Area

User Programmed Display

User Programmed Reports

User Programmed Data to External Systems

Change

If you don't like something, change it

If you can't change it, change the way you think about it!

Mary Engelbreit

ISO 9001: 2015
Flow Computer Design – Business Criteria

Total Cost of Ownership
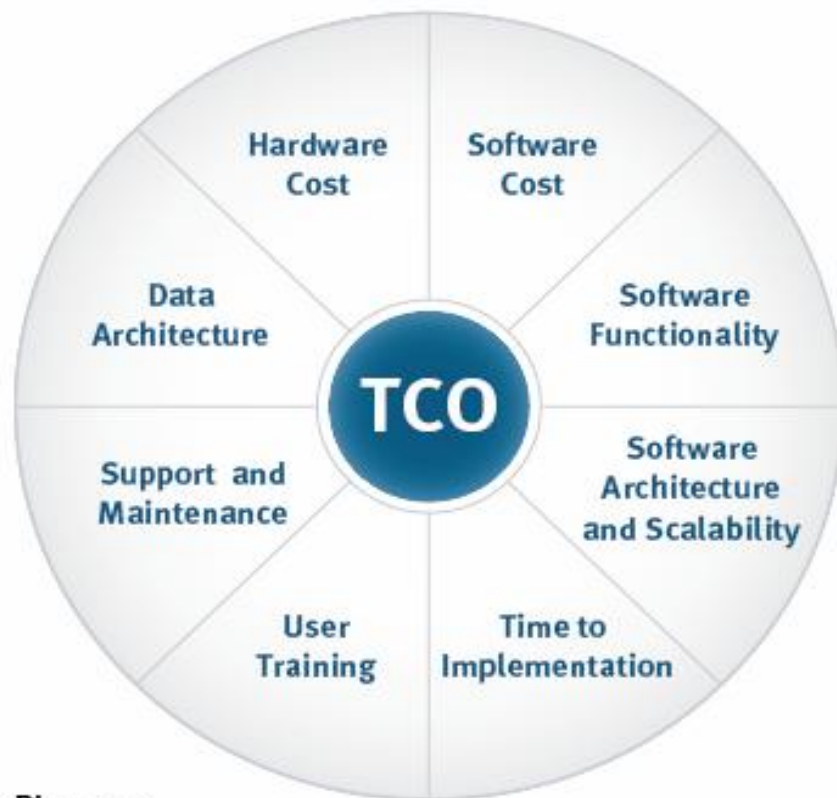
Cost & Reliability

Continuous Policy of Design: Using automotive grade components has yielded the lowest MTBF = .003 outages over a 15 year period
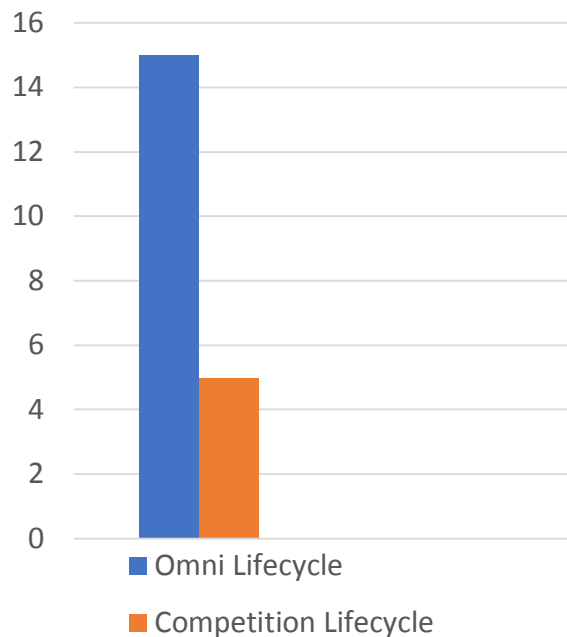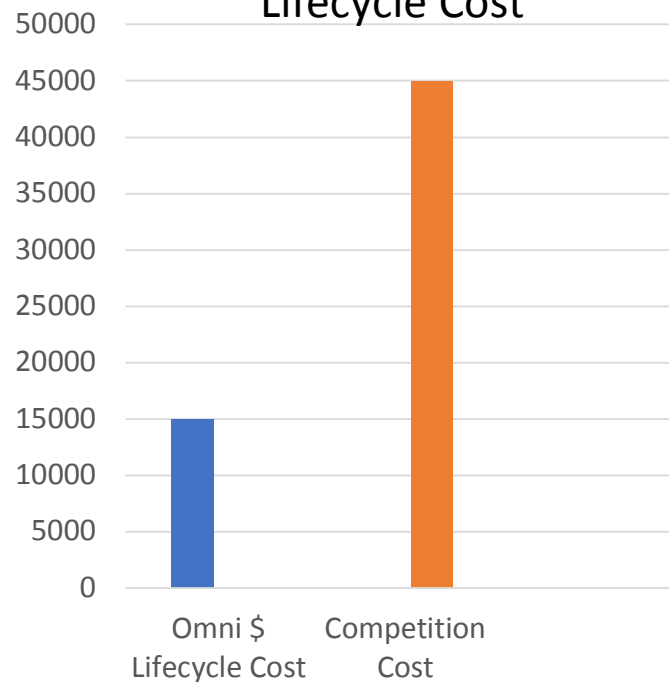
1st Year Cost of Ownership

— USD$

- $16,000
- $15,000 (FC Cost)
- $14,000
- $12,000
- $10,000
- $8,000
- $6,000
- $4,000
- $2,500 (Training)
- $2,000
- $0 (SparePt)

FC Cost — Training — SparePt
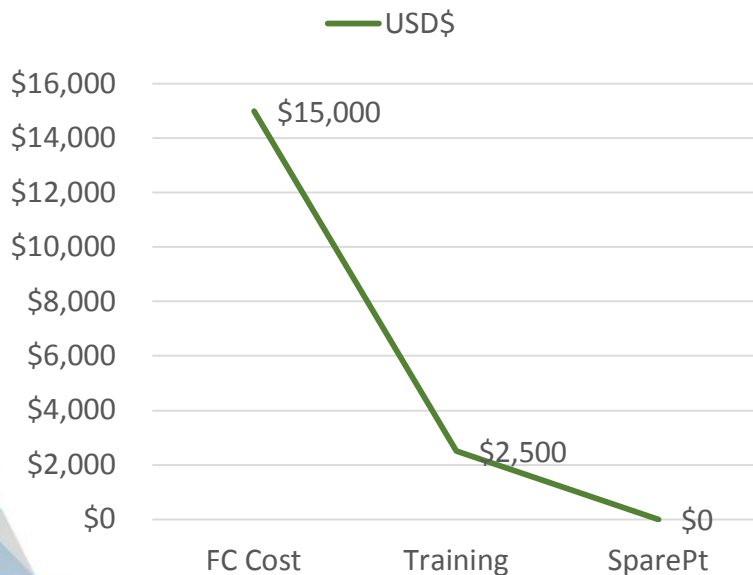
15+ Years Cost of Ownership

- 1st Year Cost
- 5 Years

5 Years 6%
10 Years 7%
15 Years 0%
1st Year Cost 87%
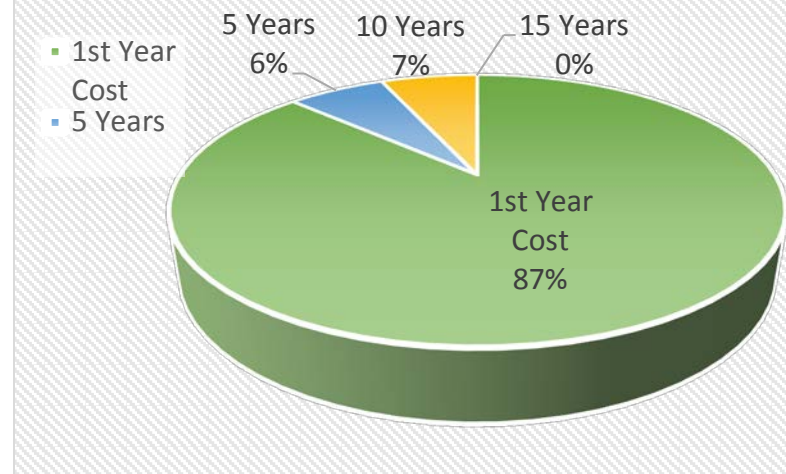
Cost & Reliability

Years of Reliability

Lifecycle Cost

Capital cost +25%
Lifecycle ownership is lowest in the industry by probably more than 60%

Lifecycle & reliability = 100%

Technology Changes. At what cost? The Road to Utopia? Compliant?

Mfgr Claims 5 yrs ago, and DCS today?:

"….custom firmware can be created, compiled and downloaded rather than by our software engineers"

"….allows total freedom of flow computer software for a system integrator"

The burden of and resources for verification passed **from** the Manufacturer to **Integrator & User**. This changed what has been provided by the manufacturer historically.

…..but **how do you know ?**

Cyber Security

Where is Lowest Risk Found?

Note: = third parties, users, programmers and integrators

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Creating a Field Firewall to Protect Calculations, Results & Historian Data

- FCs need a Separate, Redundant, Communications CPU from CPU supervising FC Calculations or Control

- Cyber attacks cannot interrupt flow calculations or access configuration or results data in a secured field device

- Maximize connections for future use

Installing Cyber Security in the Field Device

Physical security can always be overcome. Extend network security with:

SSL Encrypted 100 BaseT Sockets
Encrypted Database
IT-Controlled Access: User ID and Passwords
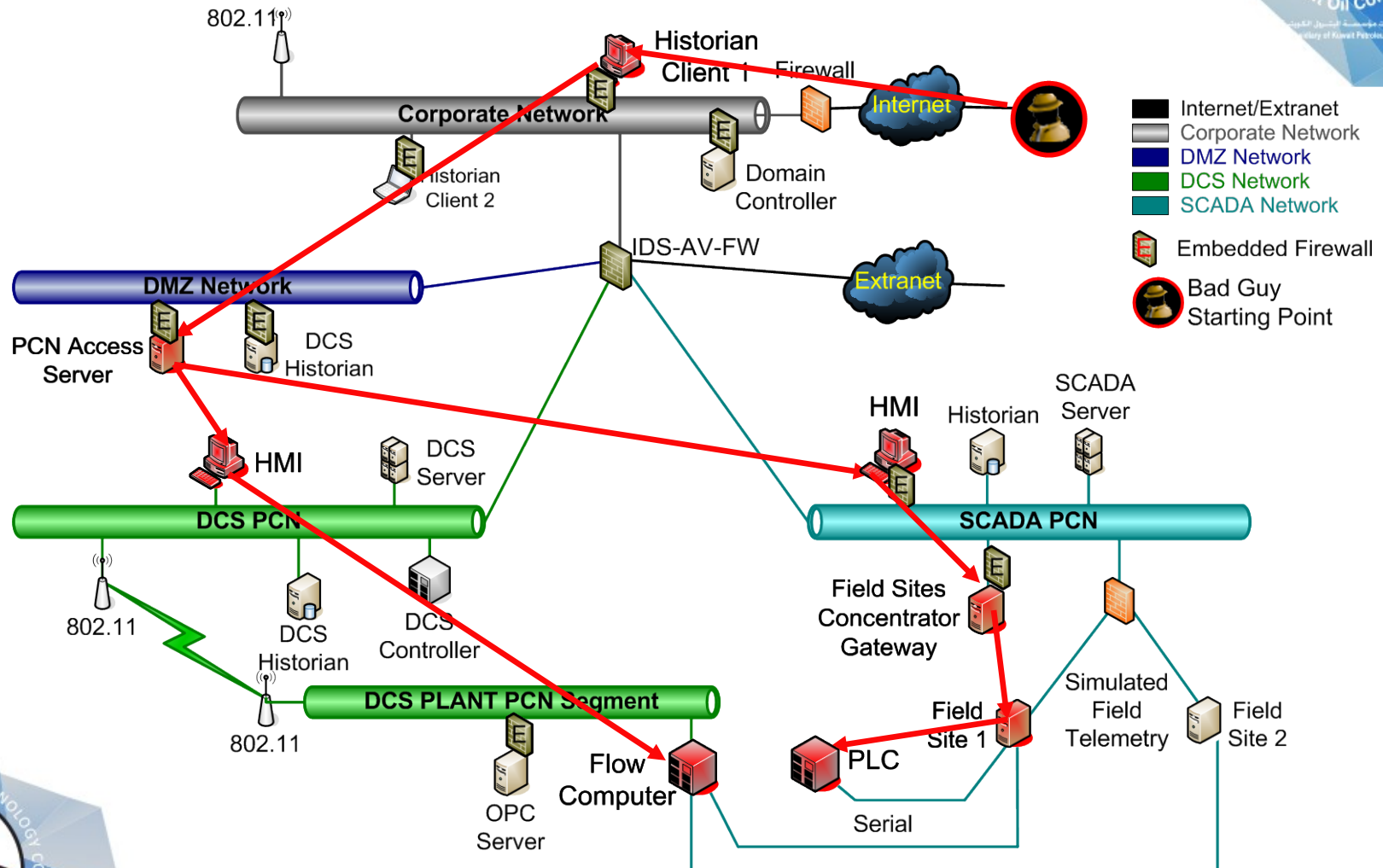Secure Factory-provided Program downloads & Updates
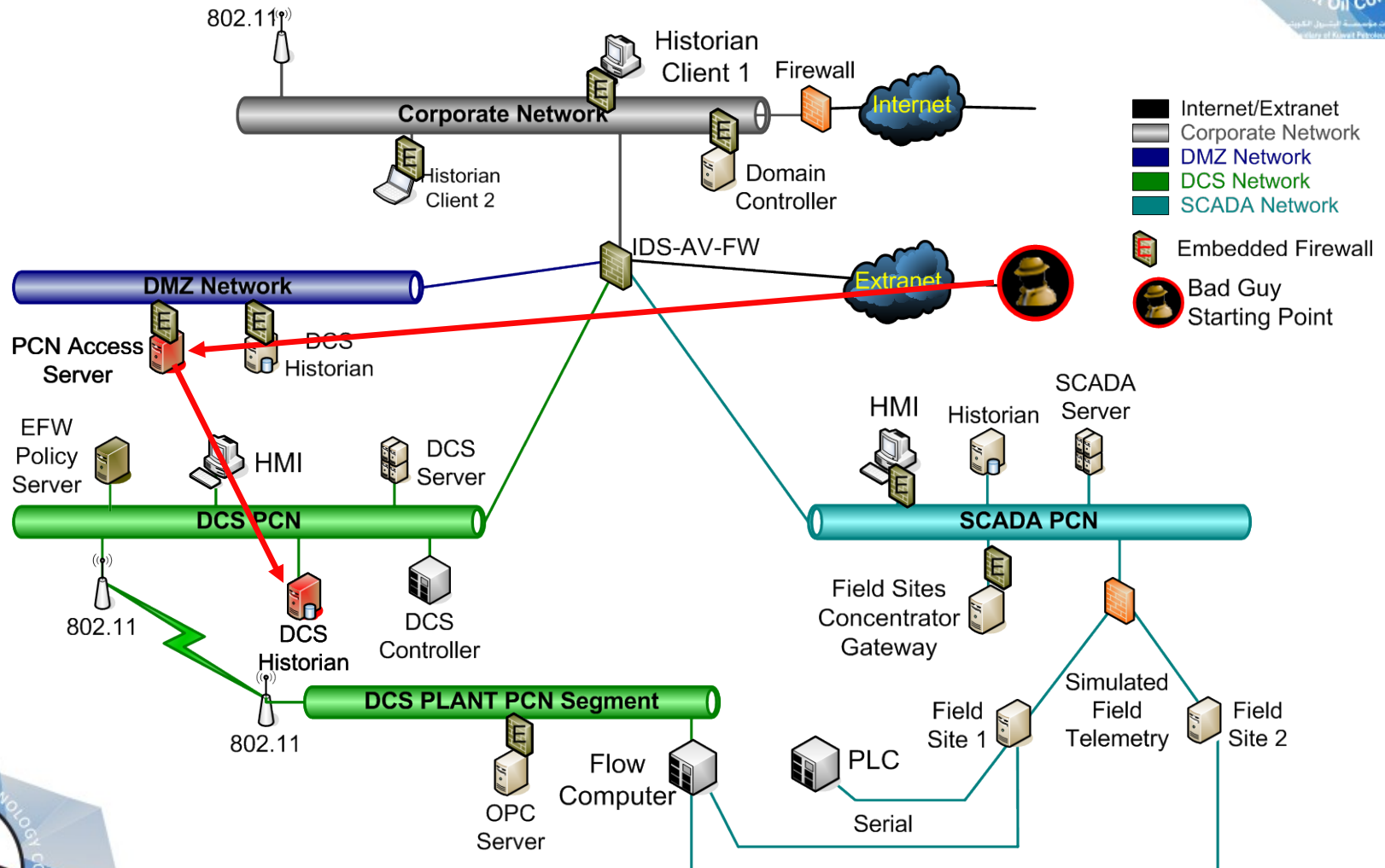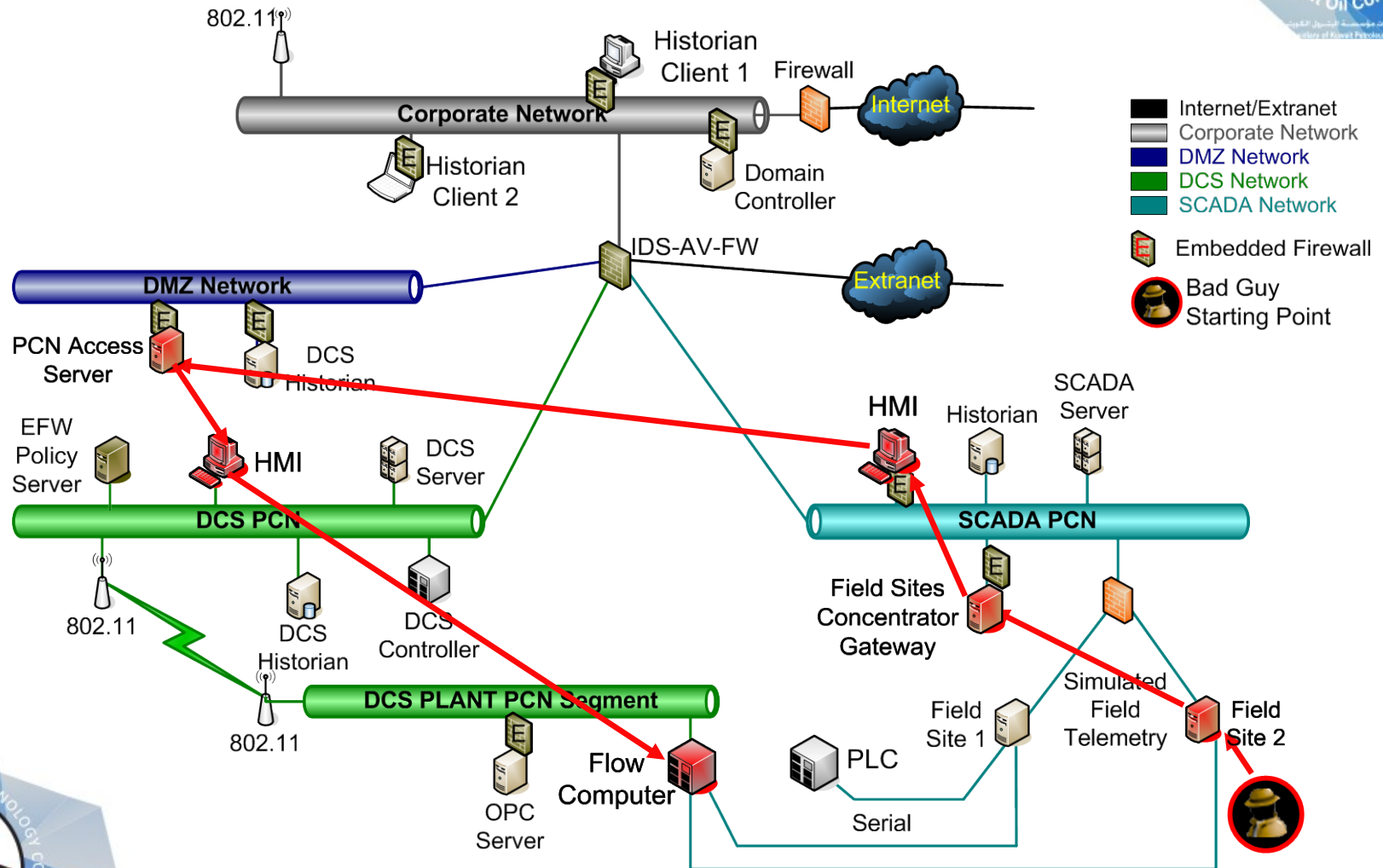
Where is Data Best Secured & Why?
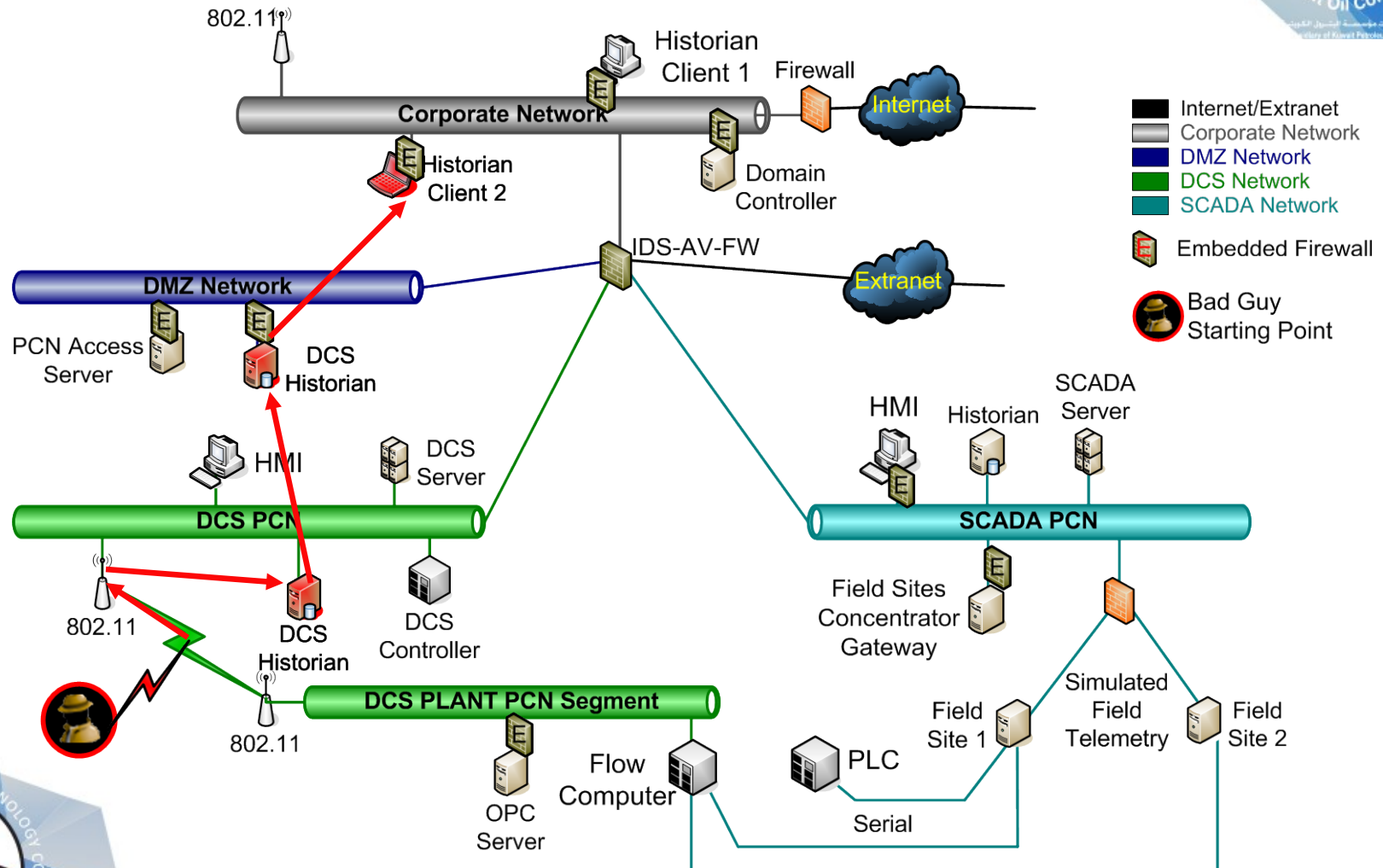
External Attacker

Extranet Attacker

Remote Site Attacker

Wireless Attacker

Summary

Measurement systems are at the heart of the oil and gas operations. As such, they require the highest ISO quality design principles to achieve instrument design certification.

Metrology forms the anchor of system architecture and promotes a wholesome product lifecycle from inception for a project lifetime.

Software and Cyber Security are forethoughts to support IT and Security of Measurement data.

In conclusion, selecting a manufacture that adheres to core principles will assure the return of investment to customers and deliver a path to migration.

Thanks from OMNI Flow Computers
for Your Attention