

# Data Integrity



*"What goes in, must come out"*  
Marc Schmidt, NMI Certin BV



# Presentation Goal

- Data Integrity
- Focussed on Metrology
- Not just Legal Metrology
- Mainly Oil & Gas

A white speech bubble with a black outline, containing the word 'CONTENTS!' in a bold, italicized, sans-serif font. The bubble is set against a black rectangular background.

## CONTENTS!

- Introduction
- Conventional System Architecture
- Today's Situation
- Future System Architecture?
- Testing & Certification: Old vs. New
- Summary
- Questions / Discussion

# Introduction



- Team Leader Oil & Gas at NMI Certin
- Approvals Expert & Lead Assessor Oil & Gas
- Convenor of WELMEC WG10
- Technical expert OIML R 81, R 117 and R 139





# Introduction NMI

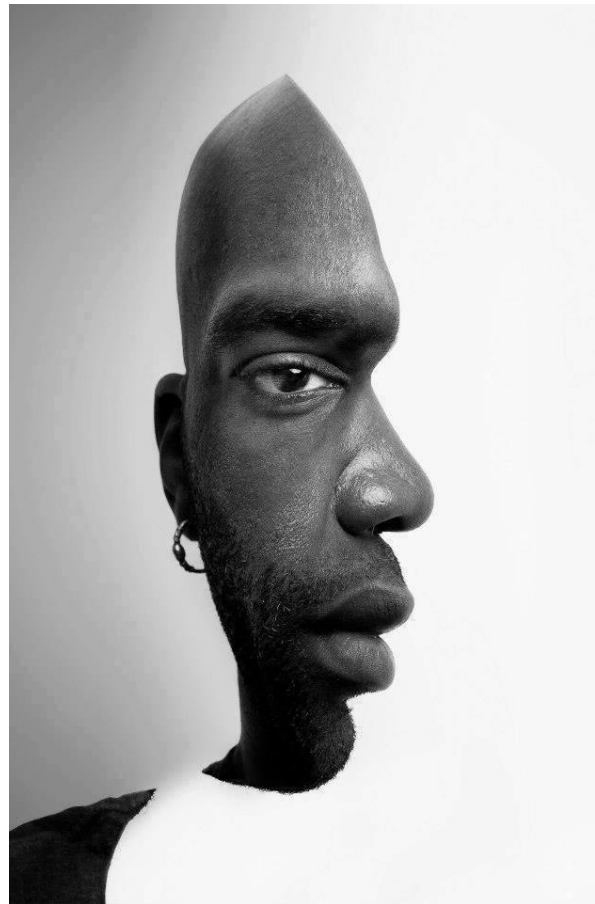
- Legal metrology
- Testing, certification, verification and calibration
- Notified Body and Issuing Authority (national, EU, OIML)
- NMI is more focusing on:
  - Loss control
  - Mass Balance
  - Diagnostics





# Introduction

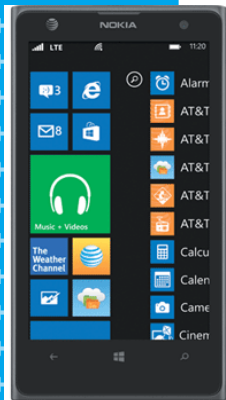
*"More than one face"*



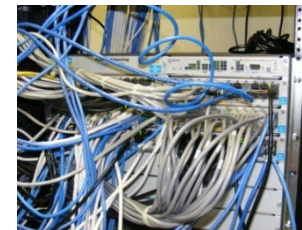


# The many Faces#1


- Safety
- Privacy
- Security / Espionage / Fraud
- (Legal) Metrology
- Payment

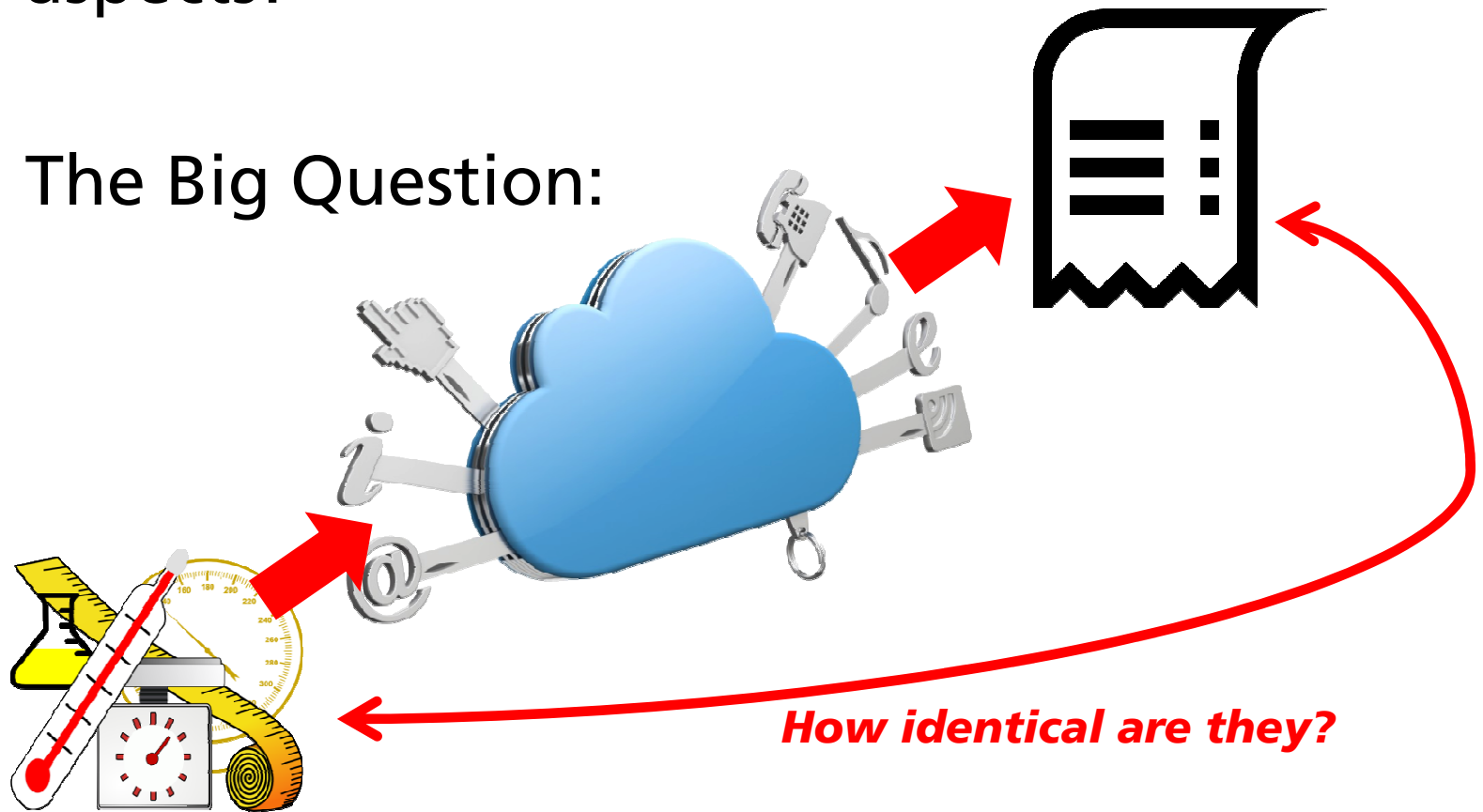


- Availability of Knowledge
- Accessibility, more options



# The many Faces#2

- Impossible to fully separate various aspects!
  - The Big Question:
- 





# Conventional Architecture





# Schematic, Conventional#1

Office



PC-  
Network

HMI /  
Operator

Control  
Room

PLC

DCS

Printer

Flow Computer /  
Batch Controller

Field

F

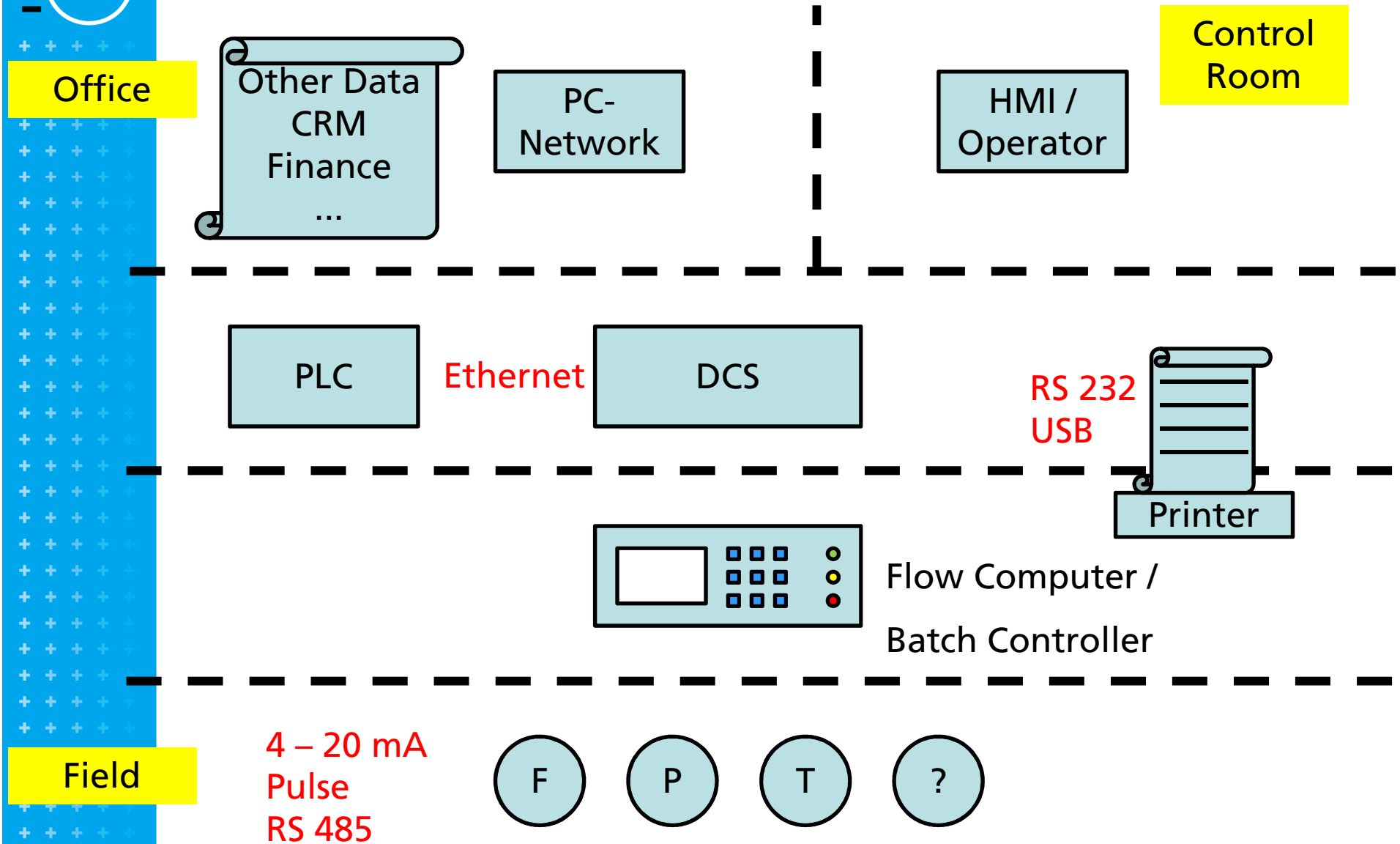
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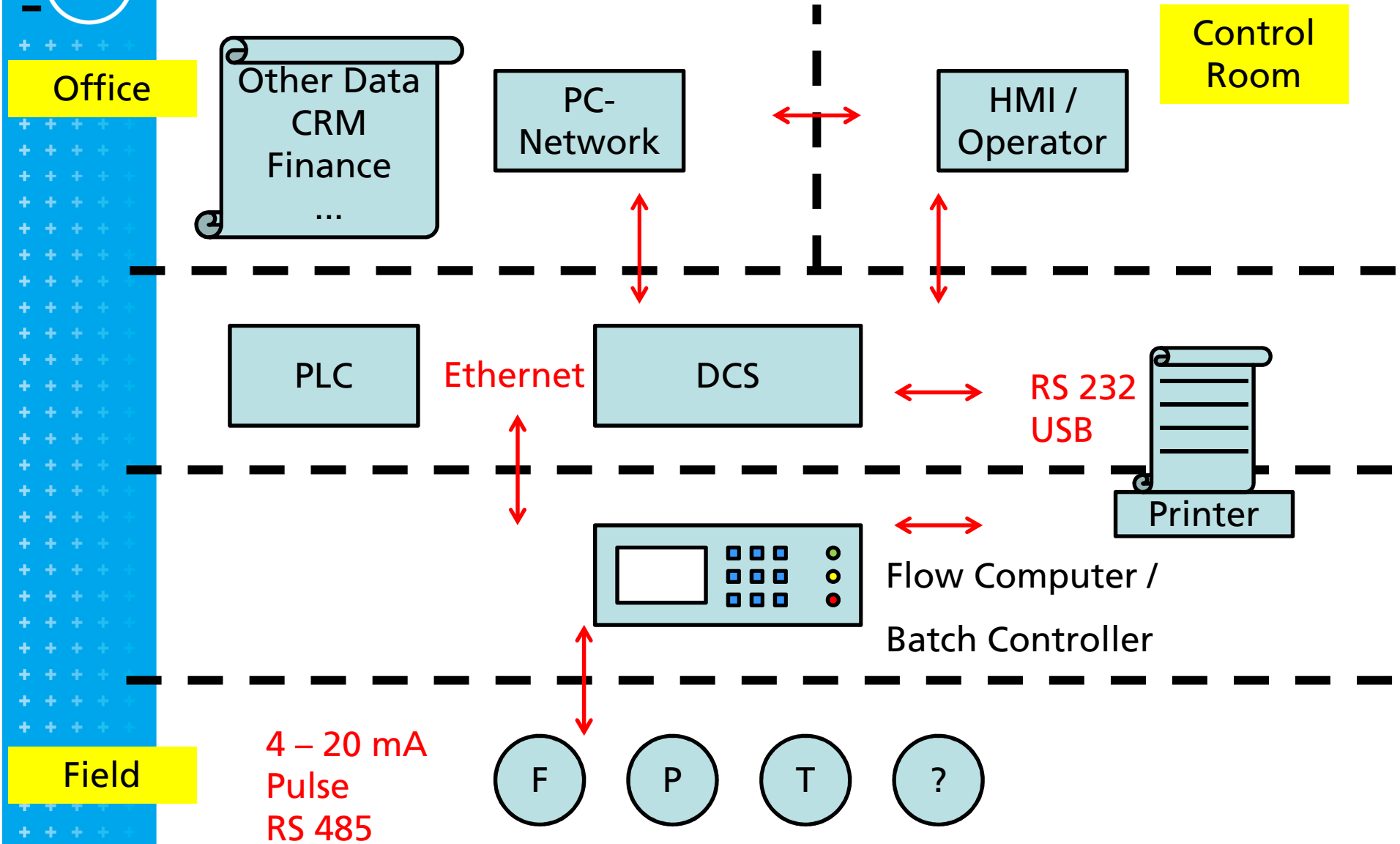


# Schematic, Conventional#2



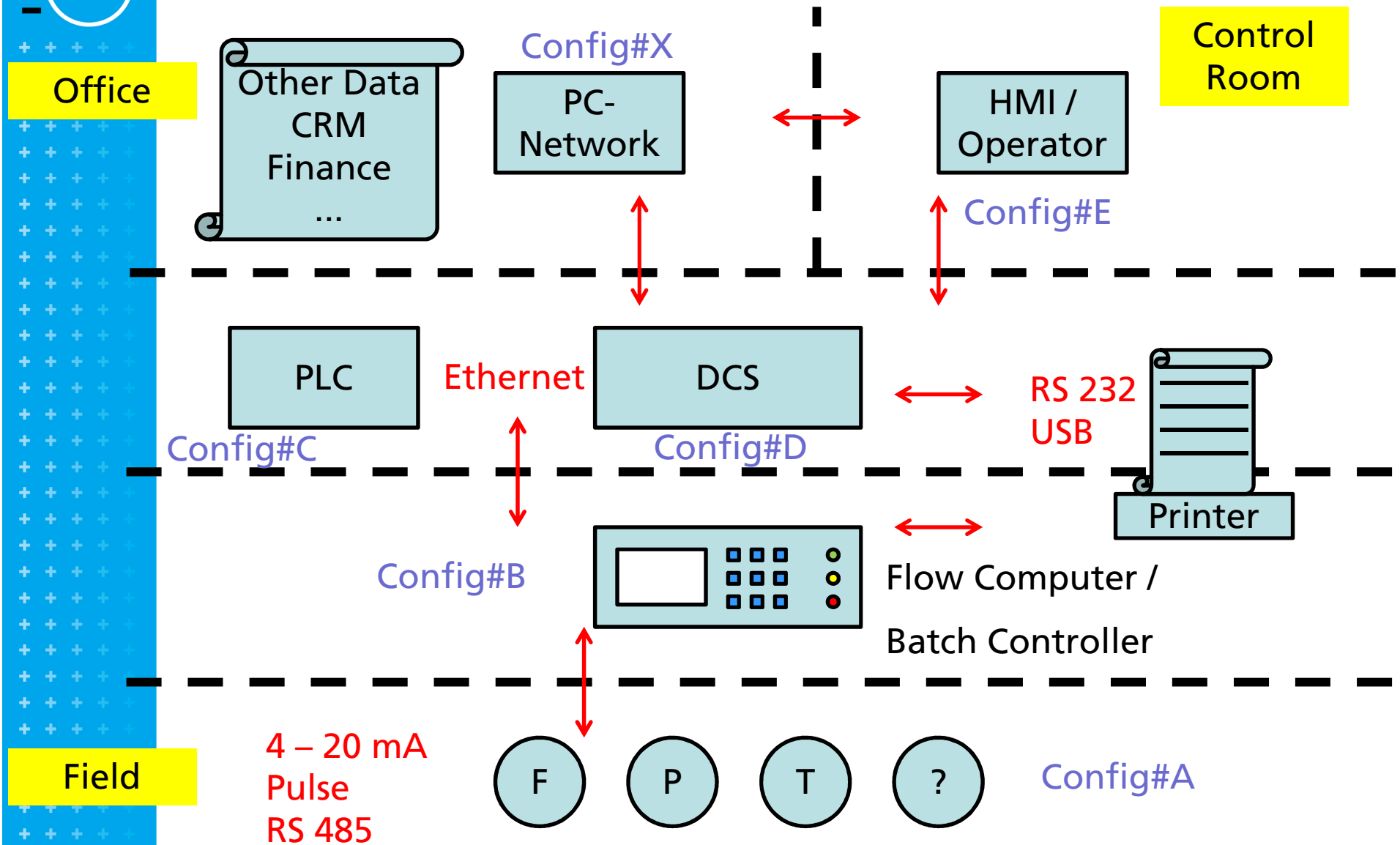


# Schematic, Conventional#3





# Schematic, Conventional#4





# Typical Properties

- Hard-wired
- Hardware (mostly) dedicated
- Many:
  - Local Processing
  - Many Conversions ( A/D, D/D )
- Based on many local Configurations
- Where “are” critical parameters?
  - Zero / Span
  - Batch-end
  - Meter-factor
  - ...





# Today's Situation





# Current Examples

## Consumer Market:

- SMART Meters
- Payment by Mobile Phone
- ...

## Industry:

- Wireless Instruments
- Remote Reading
- Remote Access
- ...





# Legal Metrology

## Status of Laws:

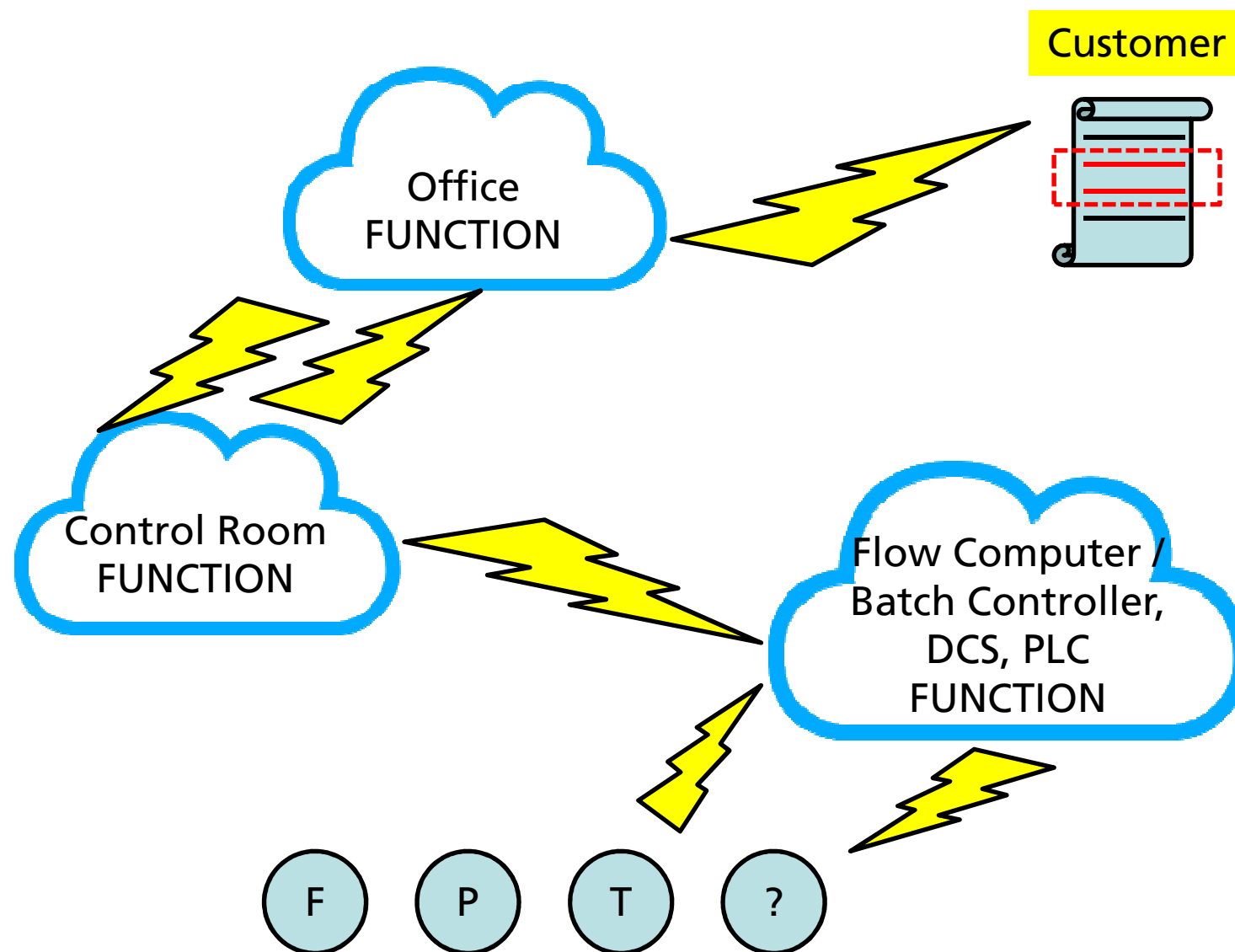
- SMART Meters: Possible
  - Decisive Registration Accessible
- Payment by Mobile Phone: e-receipt, NOT possible yet (under Discussion)
- Wireless Instruments: Possible
- Remote Reading & Access: Possible

# Future Architecture?



*"Slightly exaggerated"*

# Schematic, Future#1





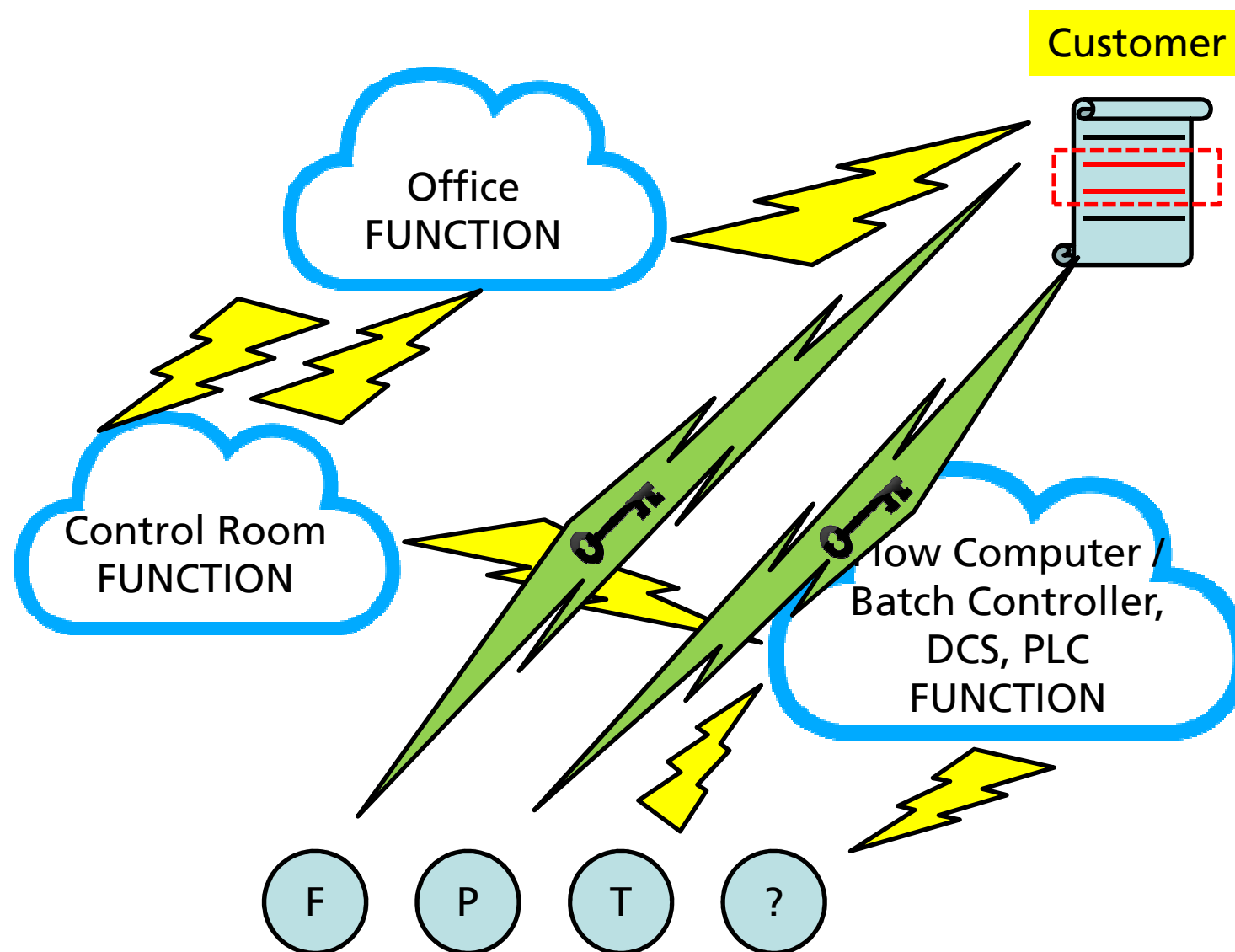
# Main “Ingredients”

- Field Instruments are Intelligent

## I don't know:

- Where which cloud is
- What goes on in each cloud
- By which route it travels
- Where my Field Instrument is
- I know what's been measured
- Is my Critical Data correct?

# Schematic, Future#2





# Additions

- Keys are sent via different routes
- Keys for encryption
- Keys for decryption
- Keys for Validation / Authentication

*Think “checksum” on certain pieces / sets of data*

*Also think of receiving your Bank Card and PIN code via different routes*

# Back in the real world



- This will not happen any time soon, in that form, on large scale
- Parts of some data-transfers will go that way



# Testing & Certification





# Today's Testing & Certification#1

- Can Log-counters, Checksums, Addresses be manipulated?
- What is protected by (electronic) Seal?
  - Software-version / -configuration
- Protective Interfaces
  - Read-only, or ...?
- Stored Data, Parameters, etc.
  - Check on correctness (checksum, double storage, ...)
- Checks on data-transmissions, in- and external
- Software Separation: Legal vs. Non-Legal



# Today's Testing & Certification#2

## In overview:

- Combination of Hardware & Software testing
- Ranges from black-box-testing to full code review and testing
- Now, typically dictated by Laws and Application
- Usually laid down in separate software Certificate / Report



## Experience from:

- Gaming
- Online Gaming
- Taximeters (24 h “access” by owner)
- Utilities / SMART metering (24 h “access” by consumer)
- Petrol Stations: Fraud in Spain and Eastern Europe
- Oil & Gas industry: trouble-shooting, disputes, etc.
- And more ...

# Tomorrow's Testing & Certification

- Most of the previous, and
- More stress on:
  - Software
  - Keys
  - QA-systems & Audits
- Integrated with other "faces" / aspects
- Adjusted to Risk
- Detection and Prevention (Software Updates)
- ...





# Summary



- Think ahead
- Know what you're using and buying
- Testing & Certification gives Confidence



100%



- Nothing is 100% full-proof / fool-proof

# References

## Metrology:

- Welmec Guide 7.2 [www.welmec.org](http://www.welmec.org)
- OIML D31 [www.oiml.org](http://www.oiml.org)
- NMI [www.nmi.nl](http://www.nmi.nl)
- WIB / IEC Document and Tool:  
[www.wib.nl](http://www.wib.nl) <http://wib.wck-grc.com>
- ...



# Thank you for your time!



## Best Route To Market

- Gas and Liquid Meters
- Flow Computers and EVCDs
- Level Gauges
- Measuring Systems
- Pressure, Temperature, Density
- Gas Chromatographs
- Software

+++++  
TRUE VALUE  
+++++



## Testing & Certification

- OIML
- CE MID
- Quality Assurance System
- Metrological Reliability

+++++  
TRUE VALUE  
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Oil & Gas  
Food  
Chemicals  
Cryogenics

+++++  
TRUE VALUE  
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TRUE VALUE  
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# TRUE VALUE

- + Testing
- + Certification
- + Calibration
- + Training