Stefan-Helmut Leitner, ABB Corporate Research Germany, Zukunft der Netze 2011, Hamburg

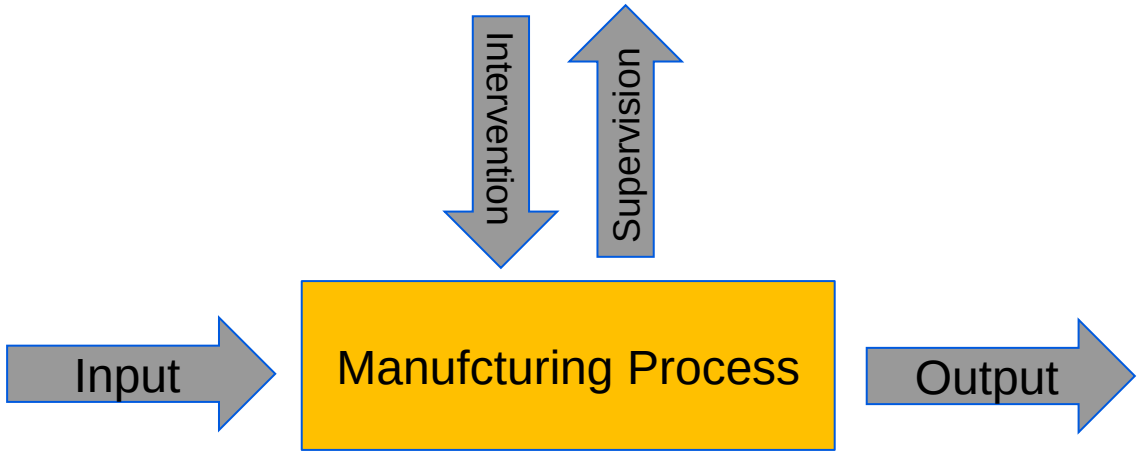
Secure Communication in Industrial Automation by Applying OPC UA

Agenda

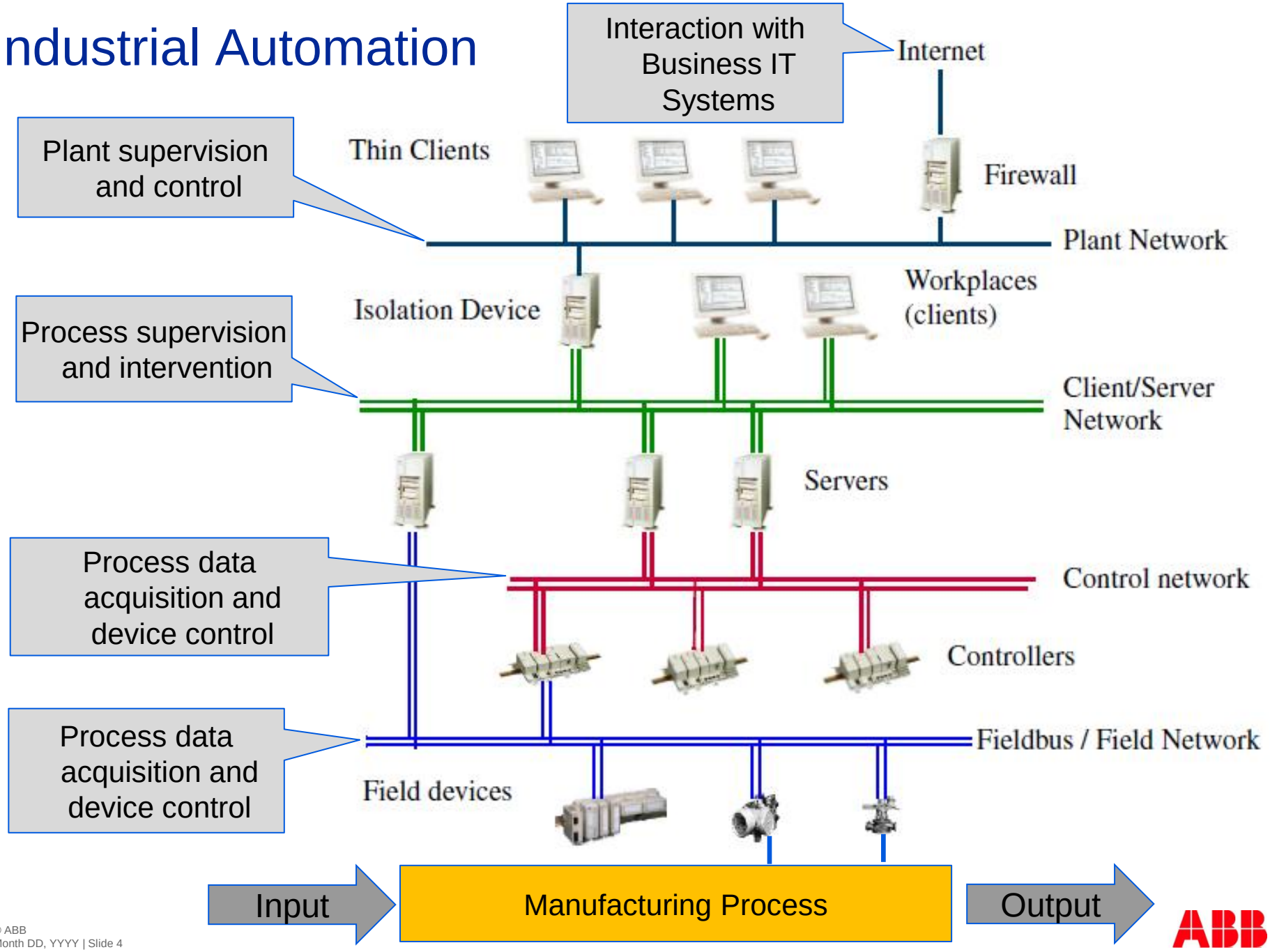
- Industrial Automation
- Classic OPC and OPC UA?
- All problems solved?
- Future?

Industrial Automation

Industrial Automation deals with automation of manufacturing processes



Industrial Automation

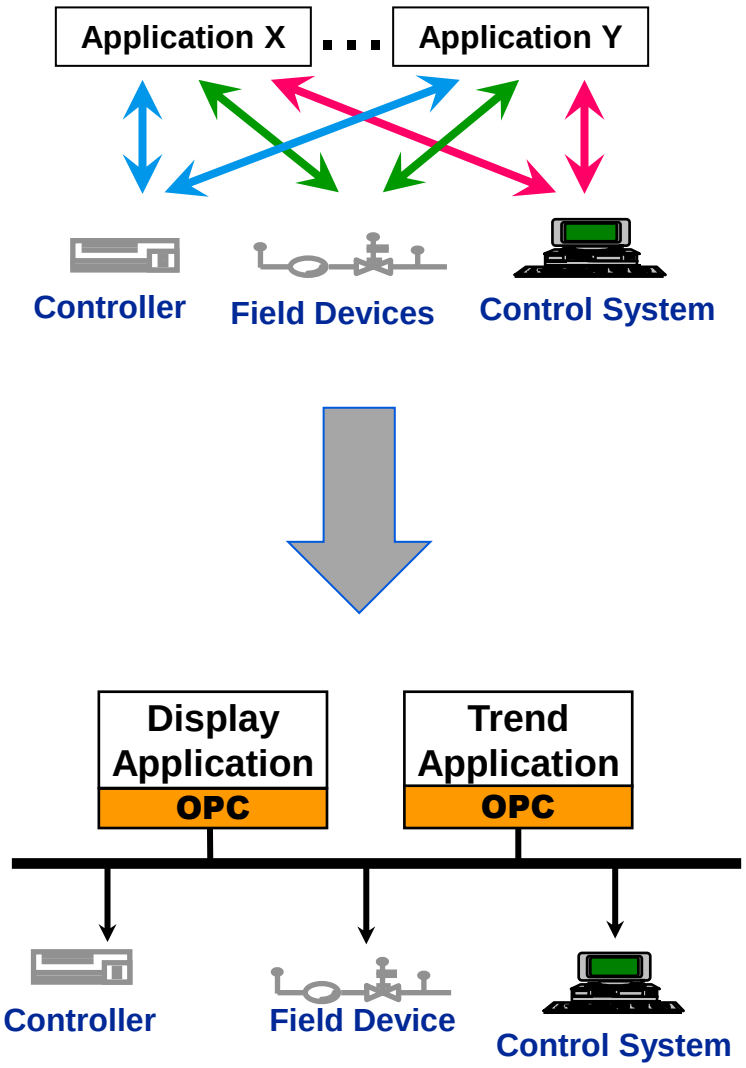


Industrial Automation

- Differences compared to Business IT
  - Availability has highest security goal
  - Safety is (often) more important than security
  - Long system lifetime (<20 years without interruption)

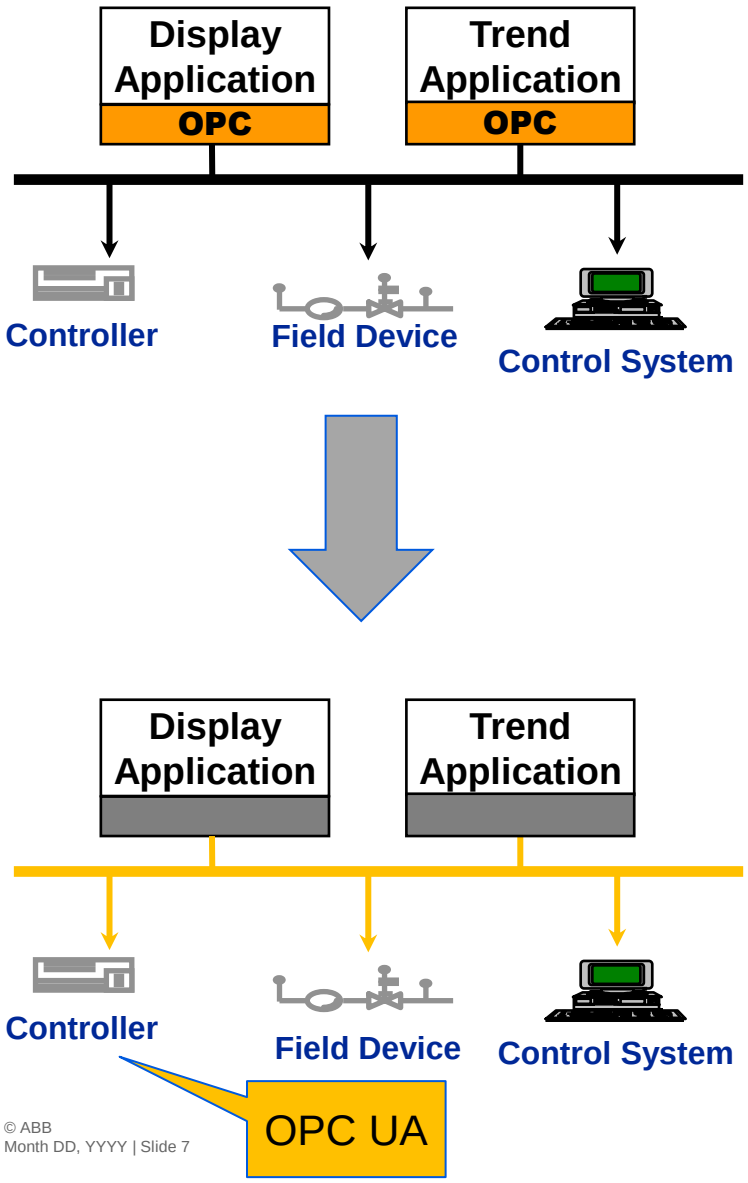
- Other Challenges
  - Increasing interconnectivity
  - Increasing usage of COTS and Open Source
  - Interoperability and standardization
    - Example: OPC

Classic OPC and OPC UA



- OPC
  - Widely adopted industry standard
  - Data exchange with process devices
  - Pure interface specification
  - Based on Microsoft COM/DCOM
- Deficiencies
  - Technology Dependency (COM/DCOM retires)
  - Complicated security configuration
  - Security not sufficiently considered in architecture

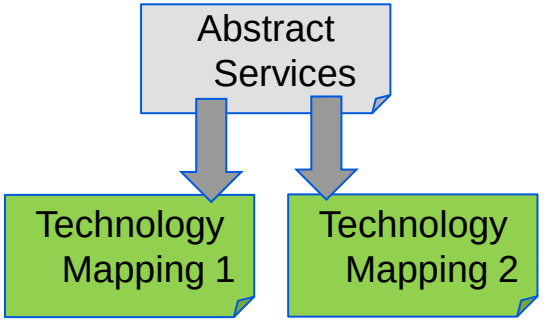
Classic OPC and OPC UA



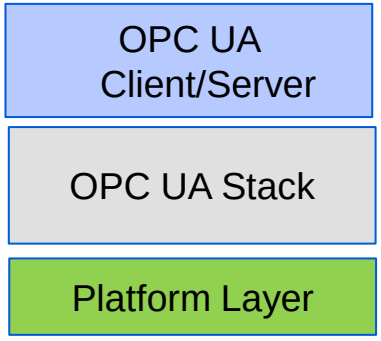
- OPC UA
  - Abstract protocol specification and concrete technology mappings
  - Service-oriented Architecture
  - More areas of applications incl. embedded systems
- Benefits compared to OPC
  - Reduced technology or vendor dependency
  - Security is inherent part of architecture and implementation
  - Simplified security onfiguration

Classic OPC and OPC UA
Reduced technology or vendor dependency

- Specification
  - Abstract service and technology mappings
  - *Allows adding new mappings in case of security vulnerabilities!*

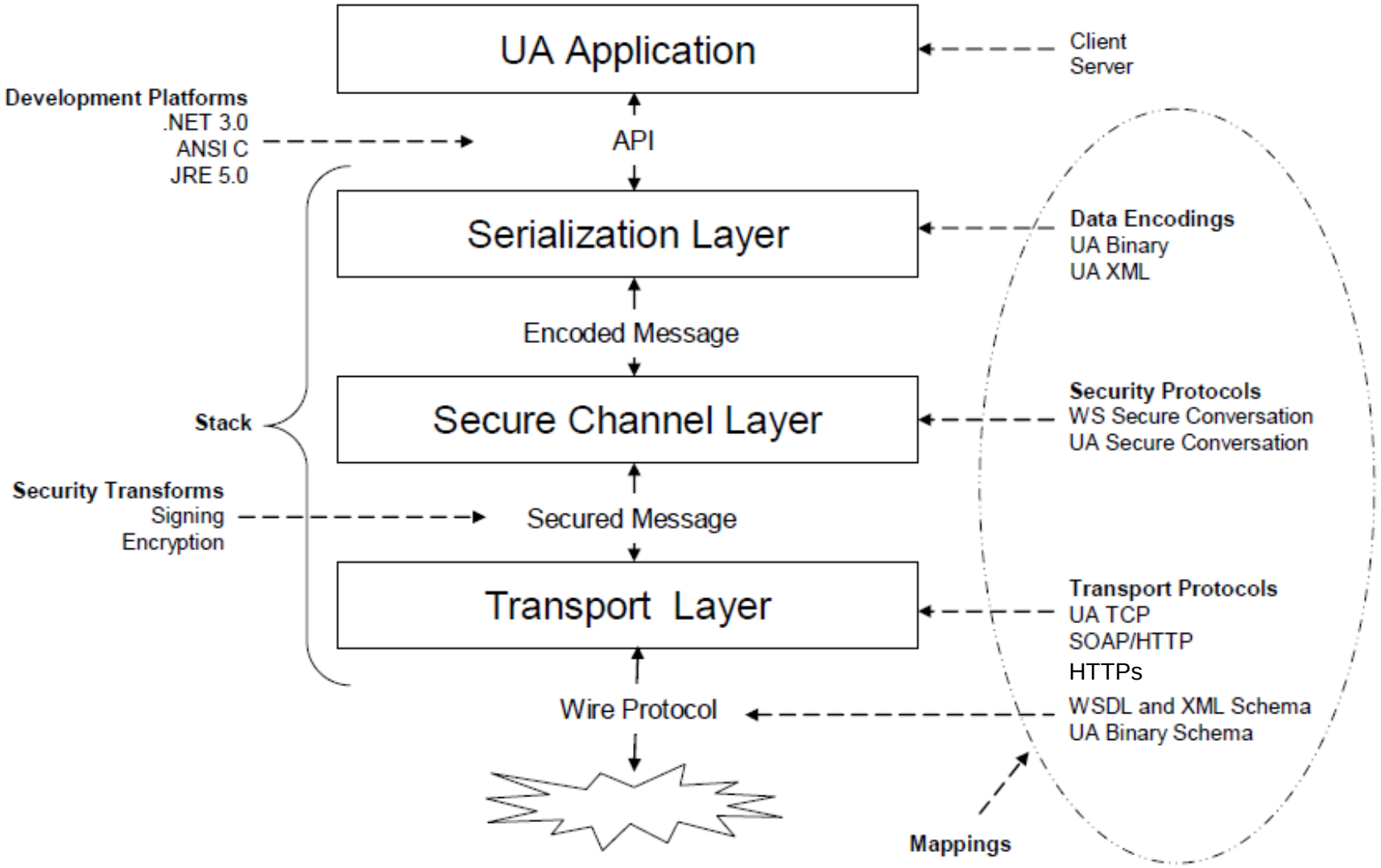


- Protocol Stack Implementation
  - Minimal platform-dependent layer
  - *Allows replacing libraries in case of security vulnerabilities!*



Classic OPC and OPC UA

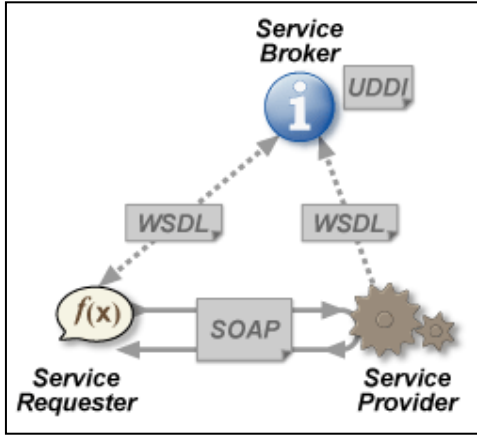
Security is inherent part of architecture and implementation



Classic OPC and OPC UA
Simplified security configuration

- Few well-defined security policies
  - Consistent set of security-related configuration for communication
    - Algorithms for encryption and digital signatures
    - Type of user credentials
    - …
- Agreement of applied security can be done by
  - Pre-configuration by client
  - Selection after server discovery
  - Automatic negotiation between client and server

Classic OPC and OPC UA
Simplified security configuration



OPC UA Discovery Server

Well-known Endpoint

1. Where are the servers?

2. What session endpoints are available and how can I access them?

0. Register (What does the server support?

OPC UA Client

OPC UA Server

Discovery Endpo

Session Endpoint

3. Connect to the session endpoint.

Alternative: Offline Configuration and skip step 0, 1 and 2

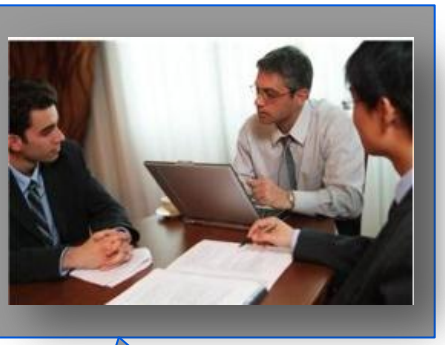
Classic OPC and OPC UA
…and where are remaining challenges?

- OPC UA requires up to three types of digital certificates for different purposes !
- Publik Key Infrastructure required which requires significant efforts.
- Usage of digital certificates is quite new to automation
  - Learning curve is still required
- Dealing with certificates in controllers
  - Limited resources (processing power, memory)
  - Long lifetime without interruption (up to 10-20 years)
  - Poor entropy sources

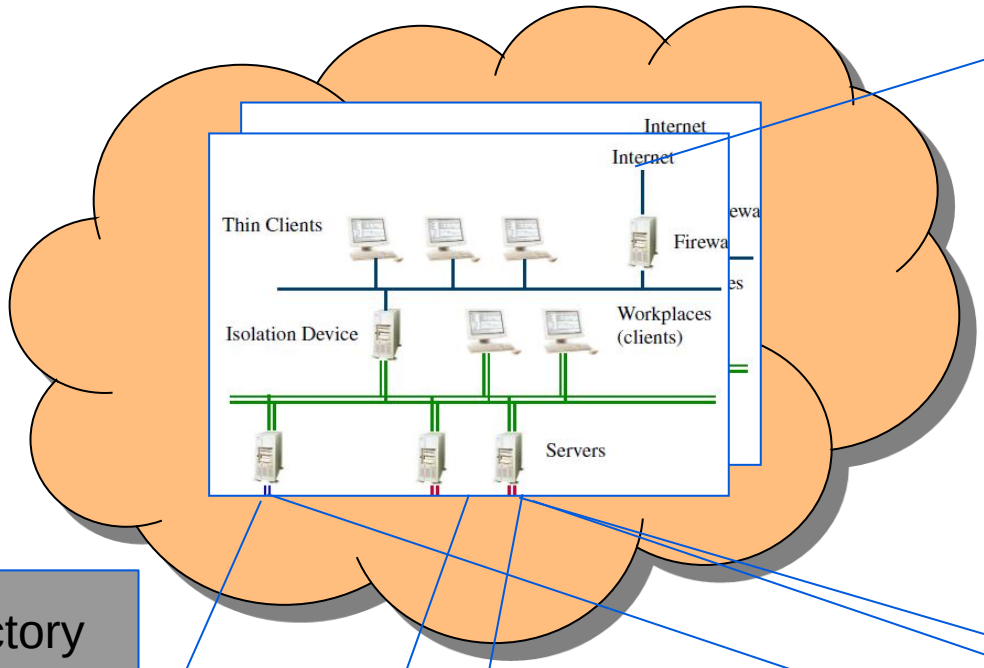
All problems solved?

- Reduced technology dependency ☺
- Security is inherent part of architecture and implementation ☺
- Simplified security configuration ☹

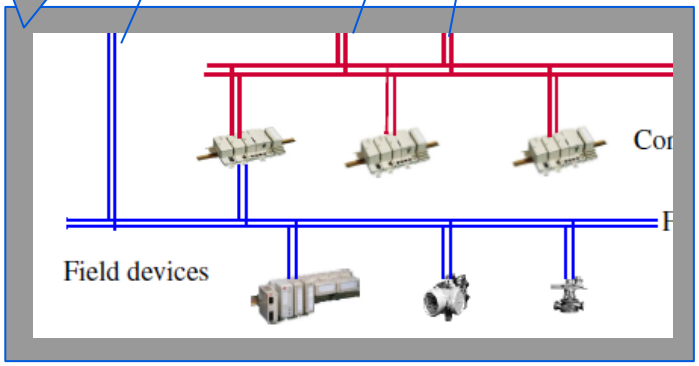
Future?
Security impact of Cloud Computing



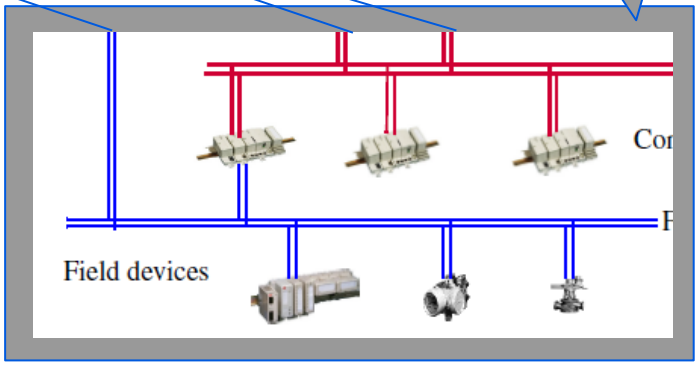
Headquarter



Factory



Factory



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