knowledge

Honeywell

2013 Honeywell Users Group EMEA

Rod Stein

The Evolution of OPC: Classic to Unified Architecture

Agenda

- Welcome / Introduction / OPC refresh
- Evolution of OPC
- OPC Unified Architecture
- Under the Hood
- Migration
- More info and Questions
- Standard Architectures Classic (Optional)

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What is OPC

- Common communication specification
- Idea: Connect anything by anyone to anything else
- Goal: Save you money and time
- Governed by the OPC Foundation
- Used by all industries

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What is the OPC Foundation?

- Non-Profit Organization
- Dedicated to ensuring OPC interoperability in automation by creating and maintaining open OPC specifications for standardized communications
- Has 470 members around the world located in every major region of the world:
  - Europe: 48%
  - North America: 33%
  - Japan: 6%
  - China: 5%
  - Rest of the world: 8%

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THE EVOLUTION OF OPC

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The Evolution of OPC

Connectivity Vision

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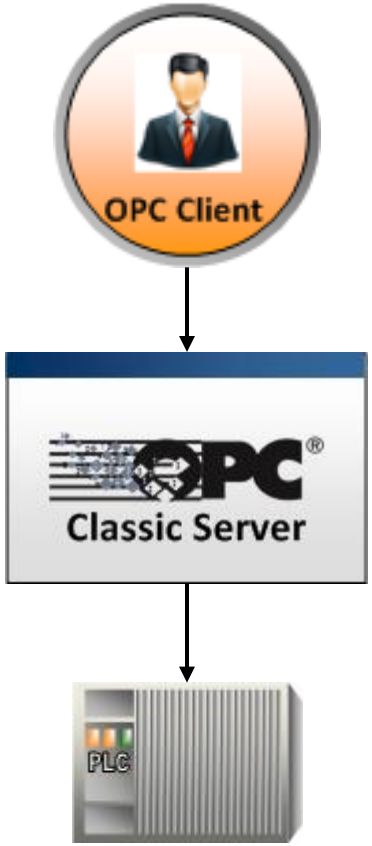
Role of OPC – Universal Data Connectivity



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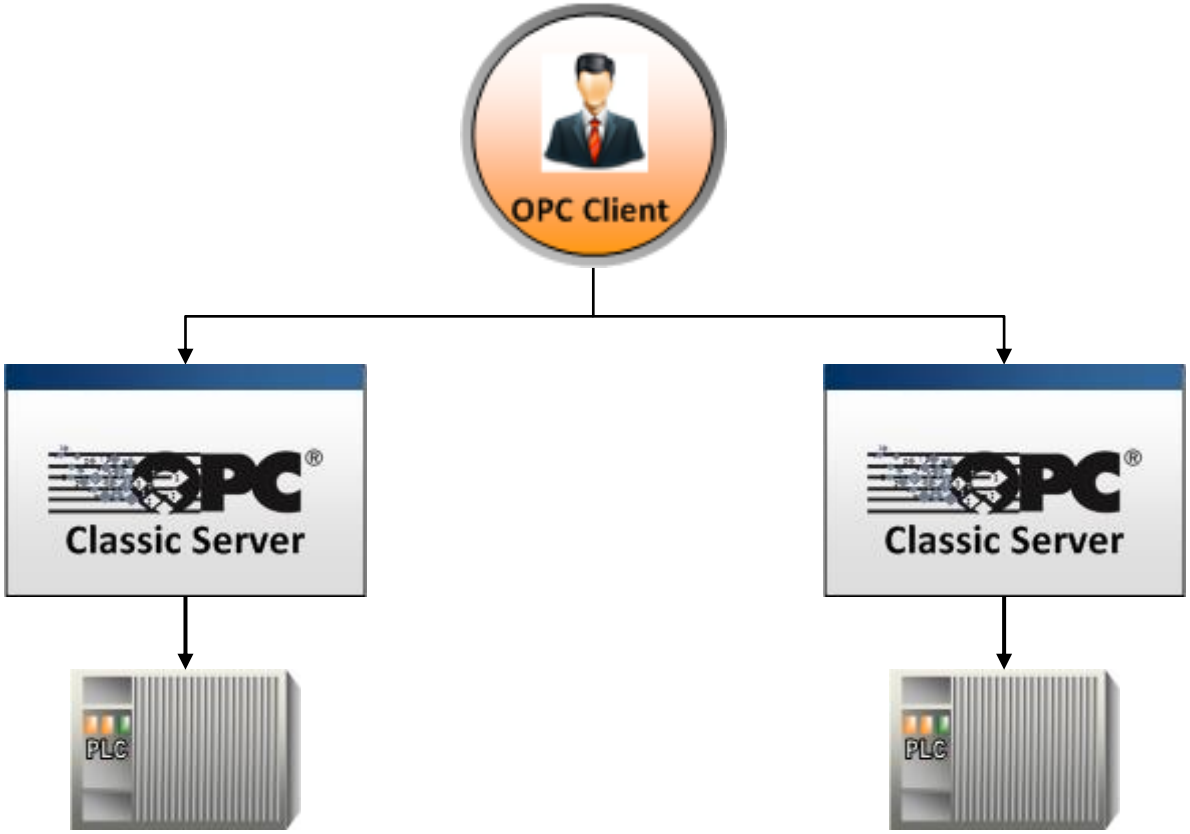
Role of OPC – Server Level Redundancy



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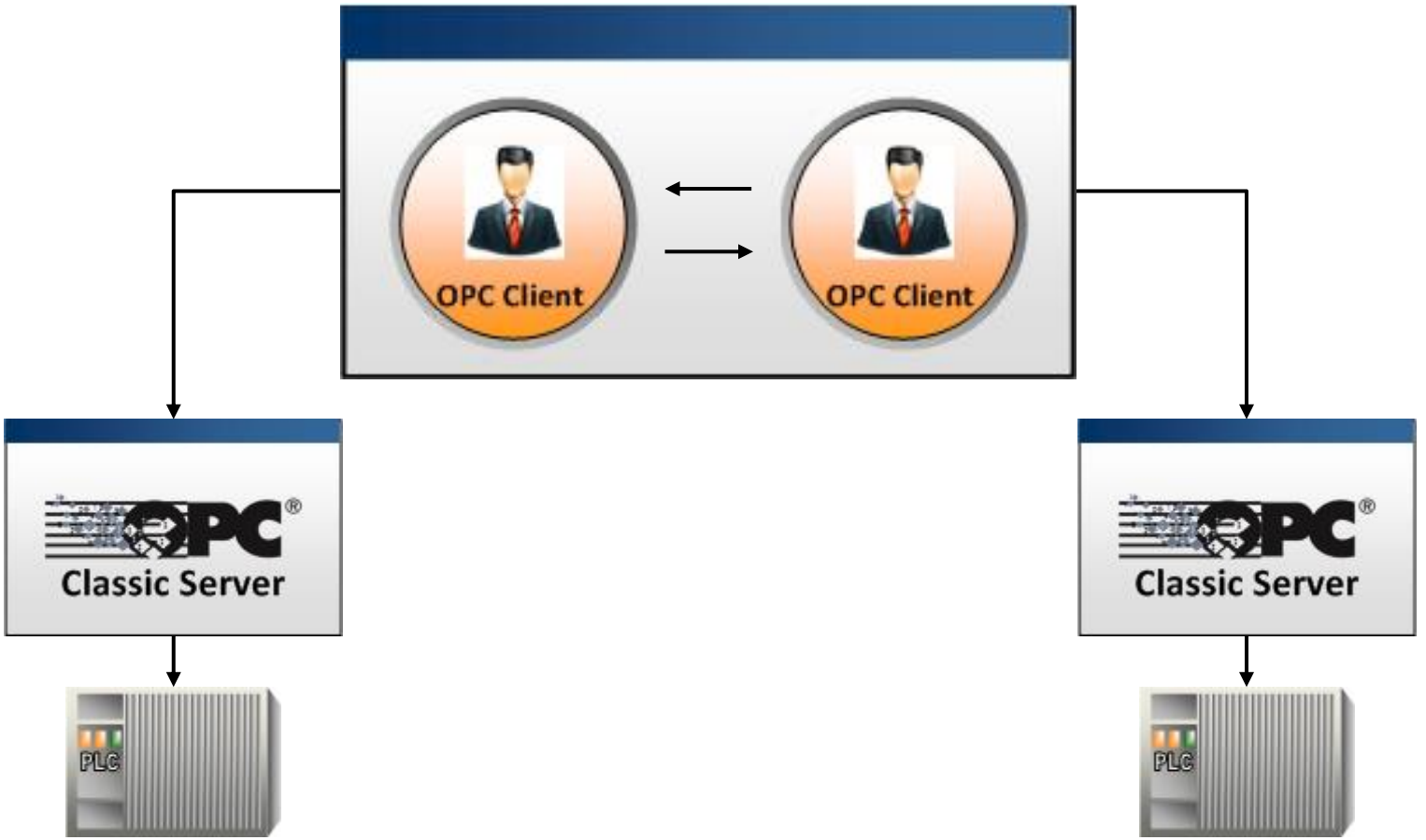
Role of OPC – Device-to-Device Communication



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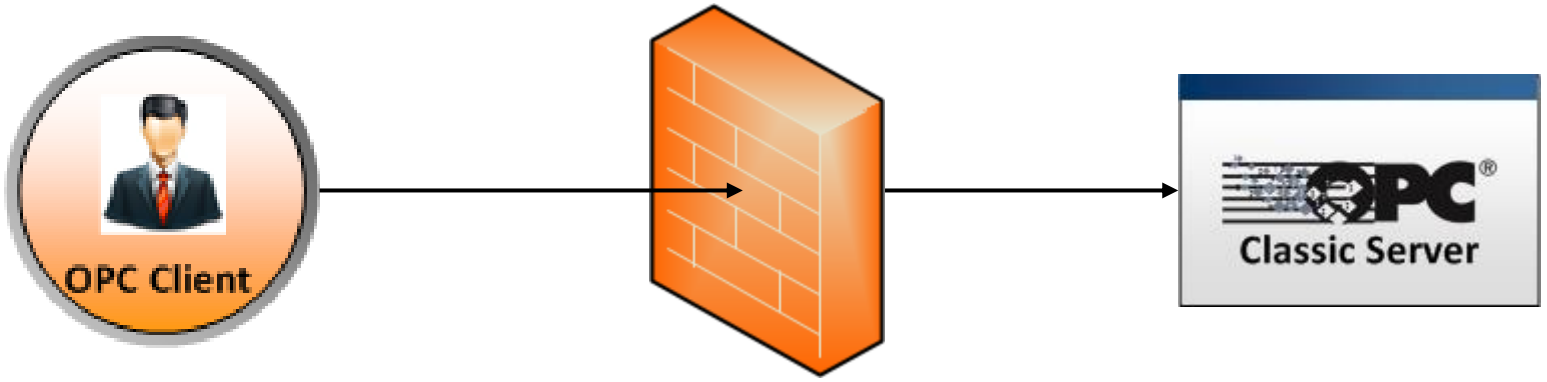
Role of OPC – Reliable Communication



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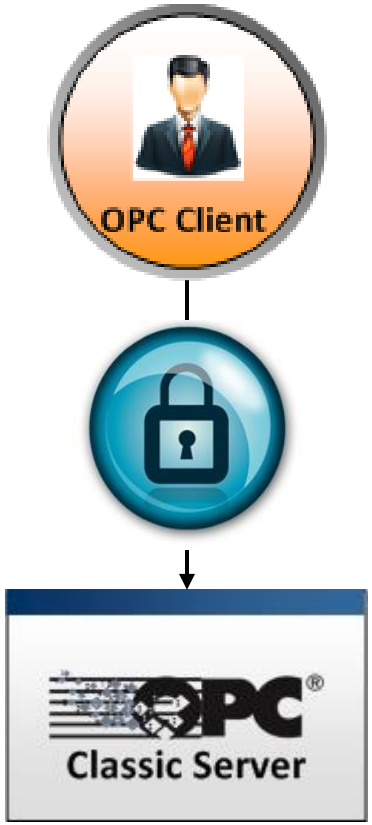
Role of OPC – Secure Communication



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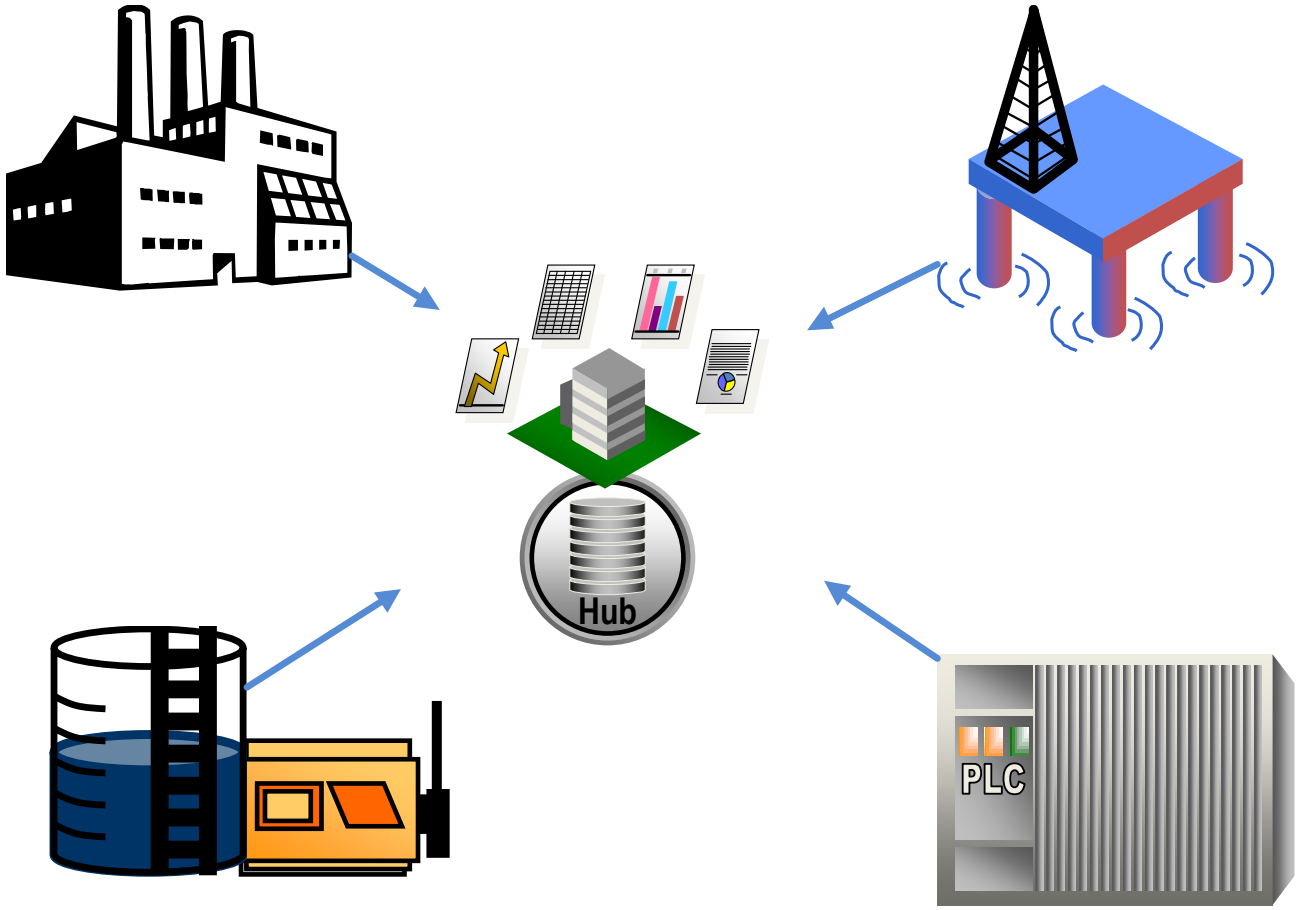
Role of OPC – Geographic Distribution



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The Evolution of OPC

Classic OPC Specifications

OPC DA

OPC XMLDA

OPC Security

OPC HDA

OPC A&E

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The Evolution of OPC

Based on a Specific Technology

COM/
DCOM

Security

Scalability

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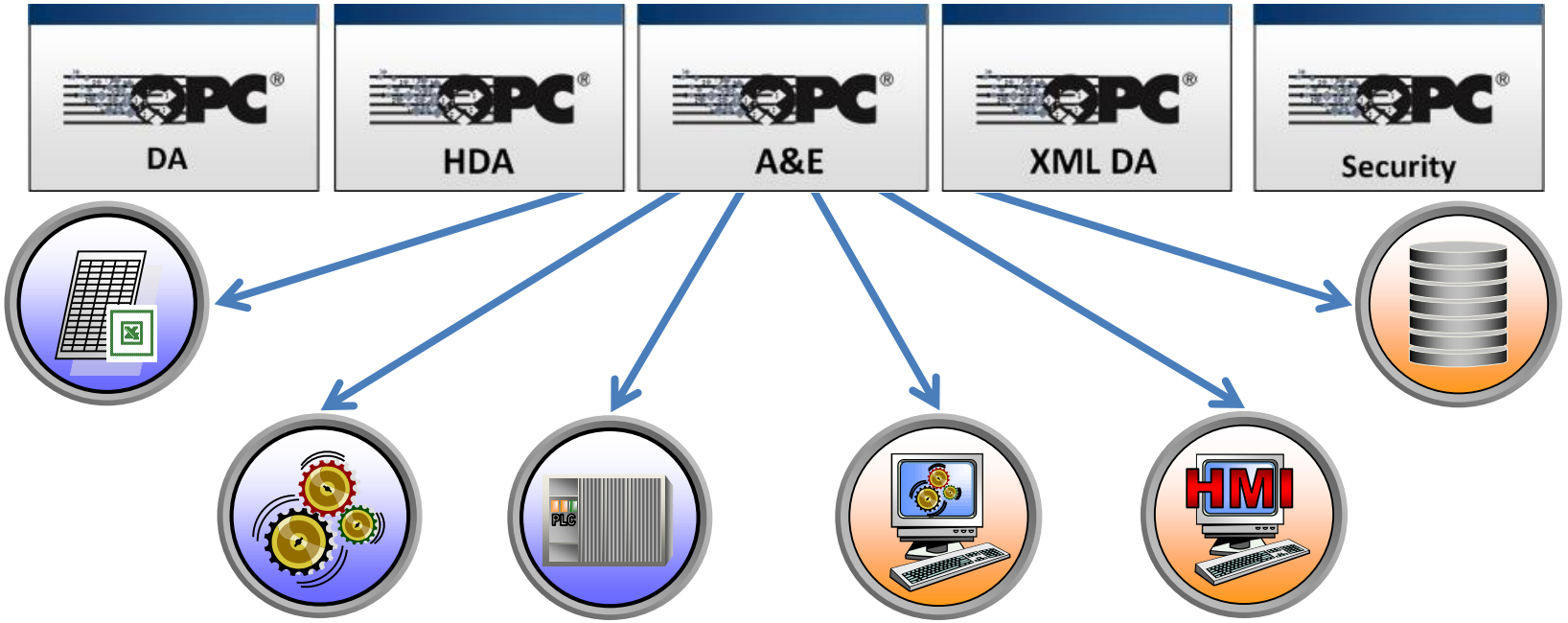
The Evolution of OPC

Information Model



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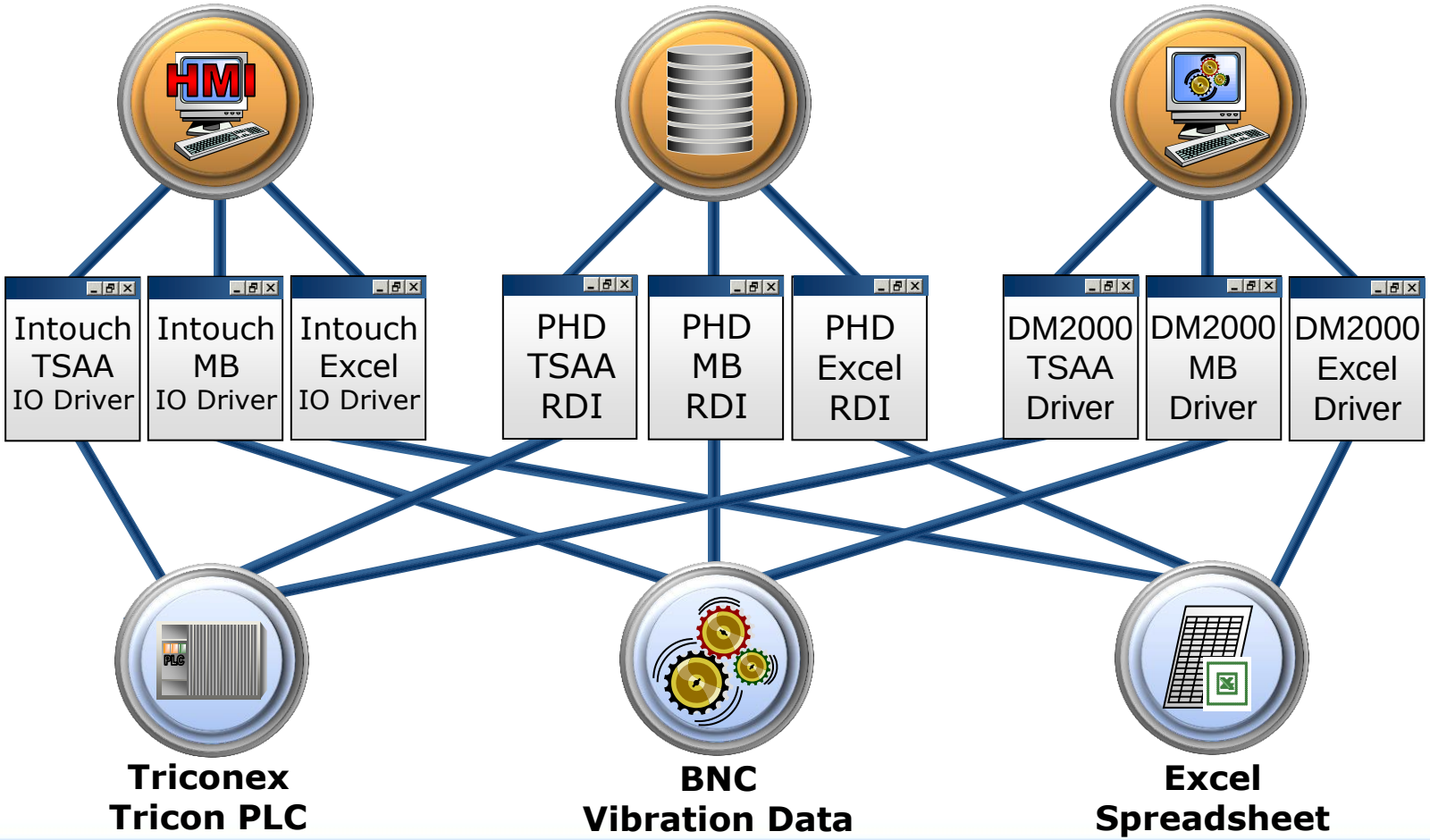
Traditional Solution – A Network of Proprietary Software



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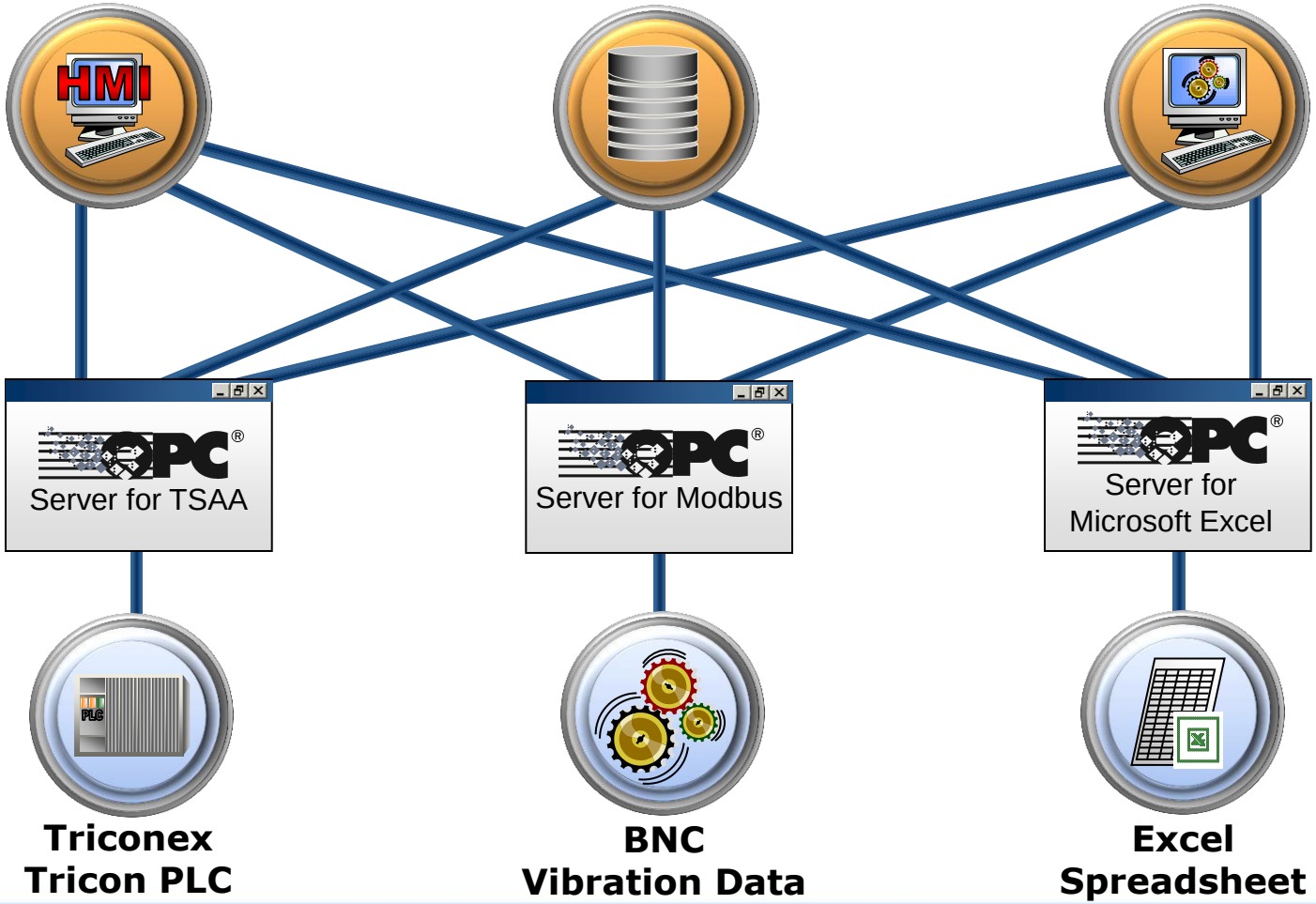
The Classic OPC Solution



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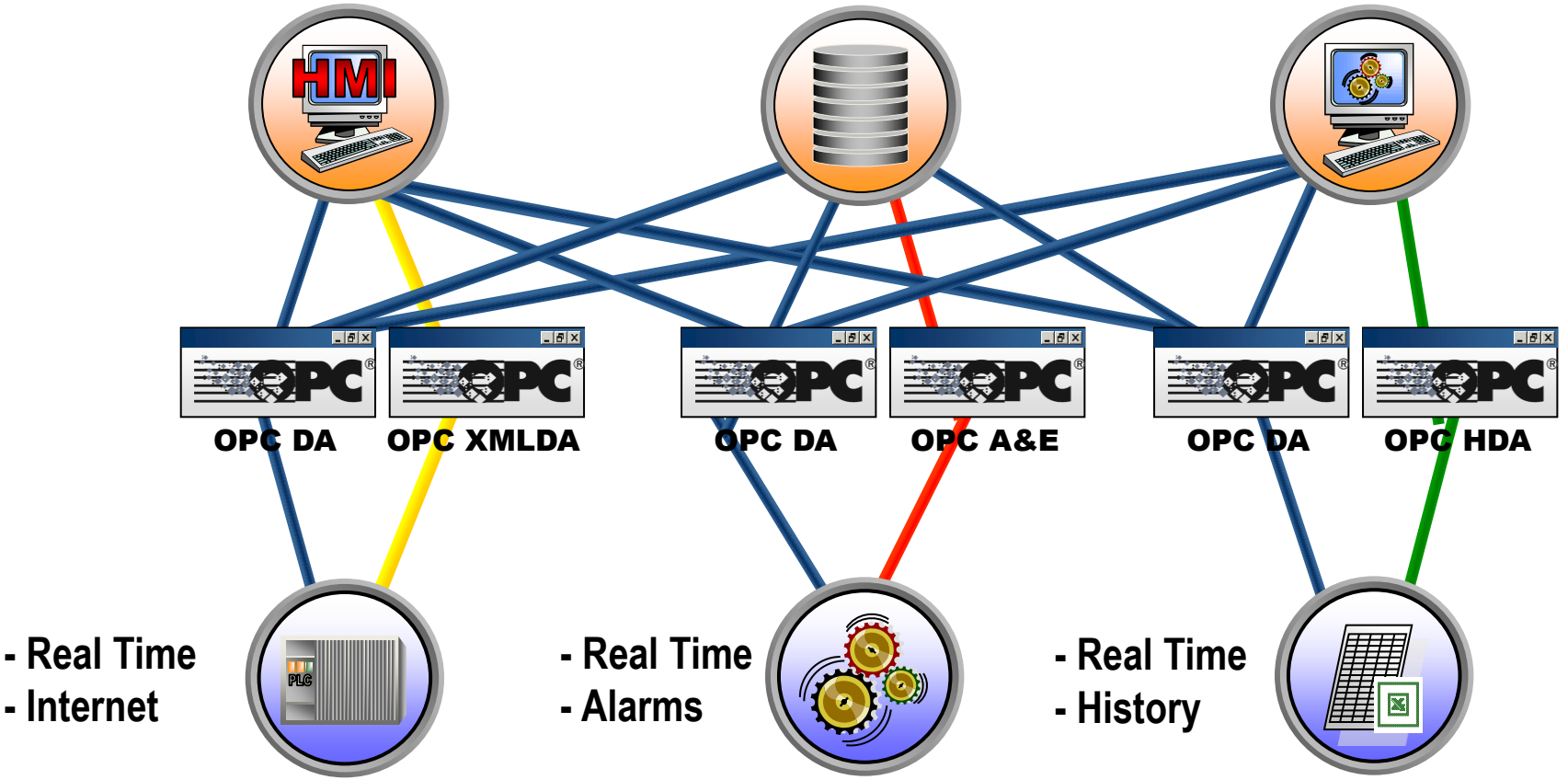
Network of Classic OPC Software



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The Evolution of OPC

Summary

1. Classic OPC developed to resolve existing issues with proprietary software
2. Places where users found limitations
   a. Platform independence
   b. Simple Data Representation
   c. Security
   d. Limited network capability

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OPC UNIFIED ARCHITECTURE

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The UA Specification

Core Specification Parts

Part 1 Overview and Concepts

Part 2 Security Model

Part 3 Address Space Model

Part 4 Services

Part 5 Information Model

Part 6 Service Mappings

Part 7 Profiles

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The UA Specification

Access Type Specification Parts

- Part 8 Data Access
- Part 9 Alarms and Conditions
- Part 10 Programs
- Part 11 Historical Access

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The UA Specification

Utility Specification Parts

Part 12 Discovery

Part 13 Aggregates

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The OPC Unified Architecture Specification

Design Goals

Address Space

Services

Type Definitions

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The OPC Unified Architecture Specification

Design Goals

Multiple Hierarchies

Reliable Data

Failure Recovery

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The OPC Unified Architecture Specification

Design Goals

Variety of Implementations

Future-Proof

Migration

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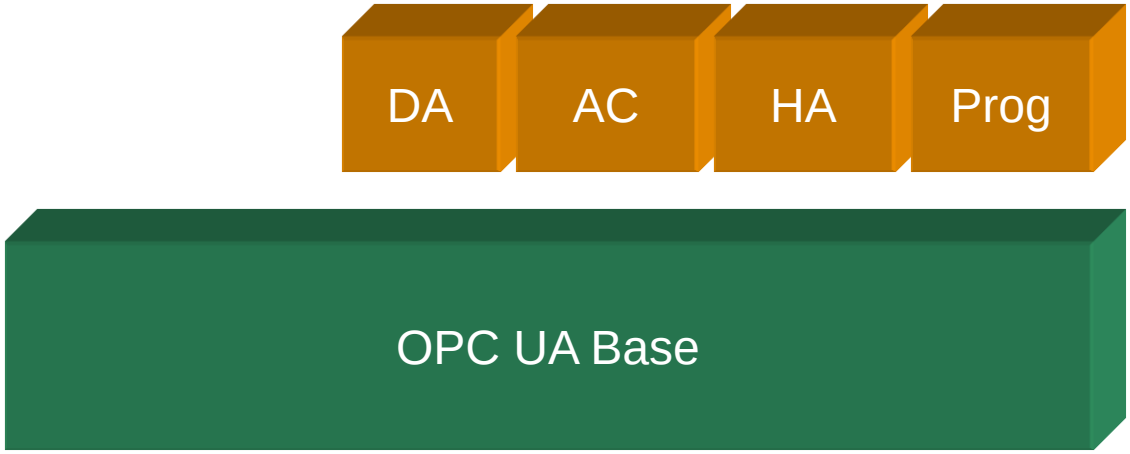
The Address Space

Information Modeling



Additional information modeling for the successful features of Classic OPC is provided in Parts 8, 9, 11 and 13 of the OPC UA specification, on top of those already provided in the base.

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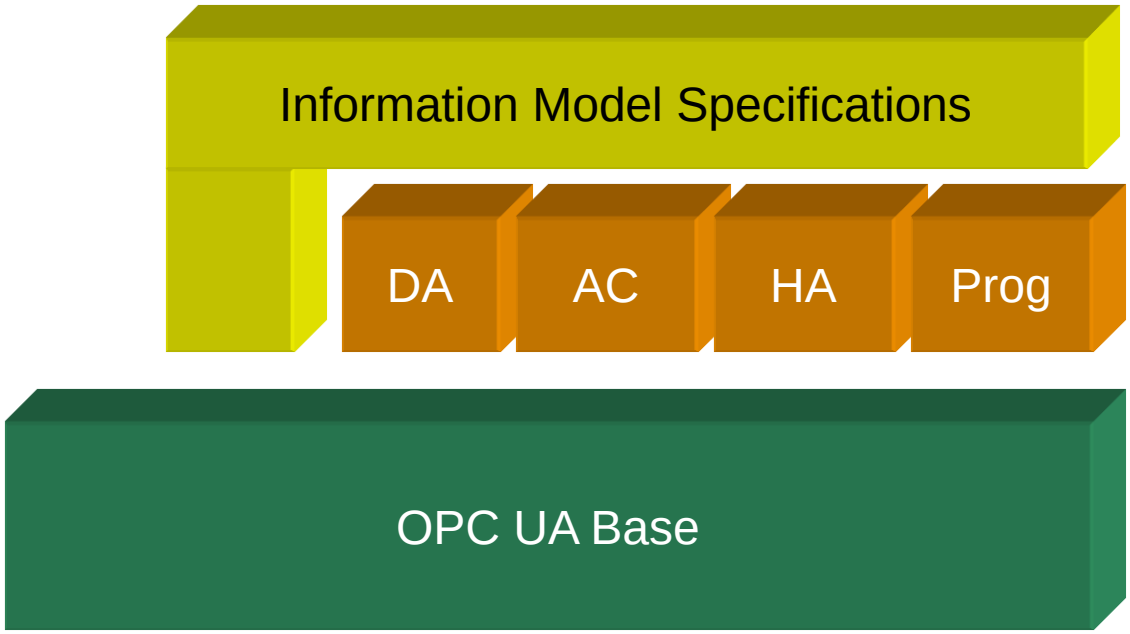
The Address Space

Information Modeling



These same building blocks can be used by vendors to effectively model other specifications than OPC. PLCOpen and BACNet are examples of these.

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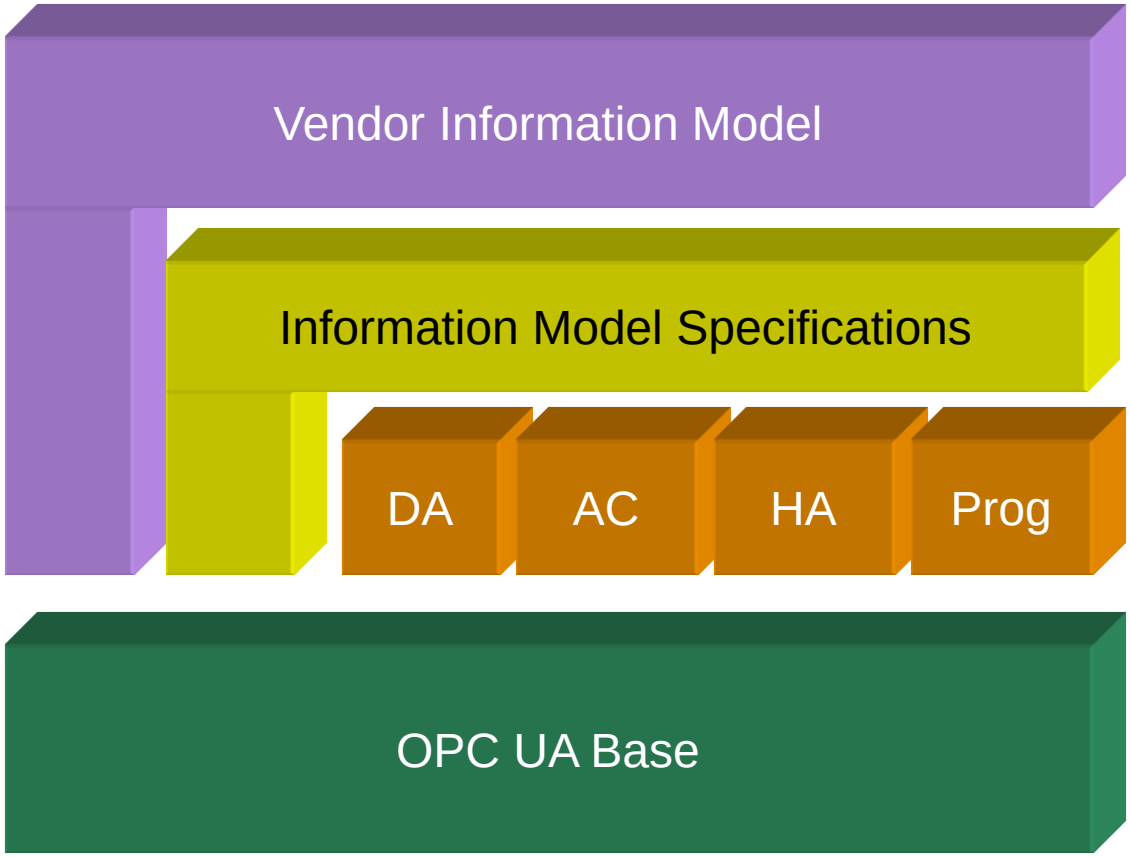
The Address Space

Information Modeling



Vendors can also use these building blocks to construct models that conform to a specific device or protocol.

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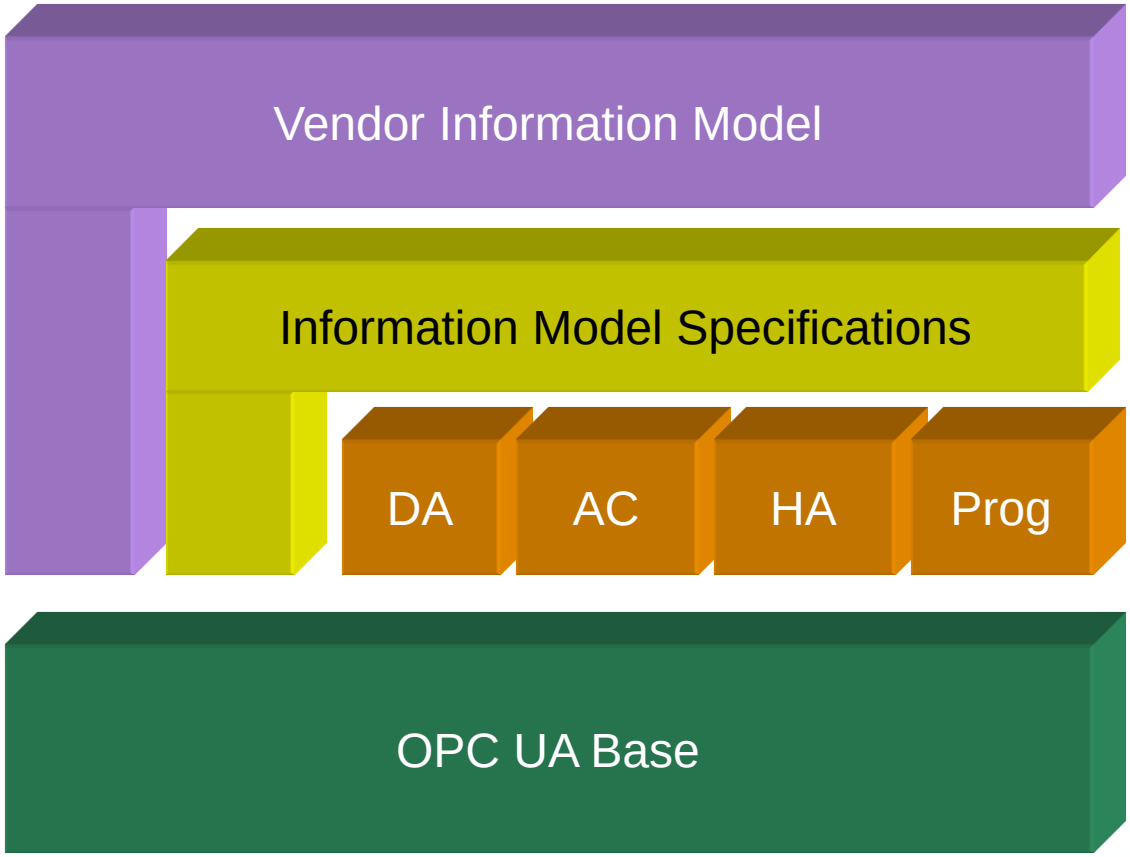
The Address Space

Information Modeling



This all assumes that the vendor is creating a model for which all of the components are defined. Where this is not the case, the vendor can create his own definitions based on the data available in the device.

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UA UNDER THE HOOD

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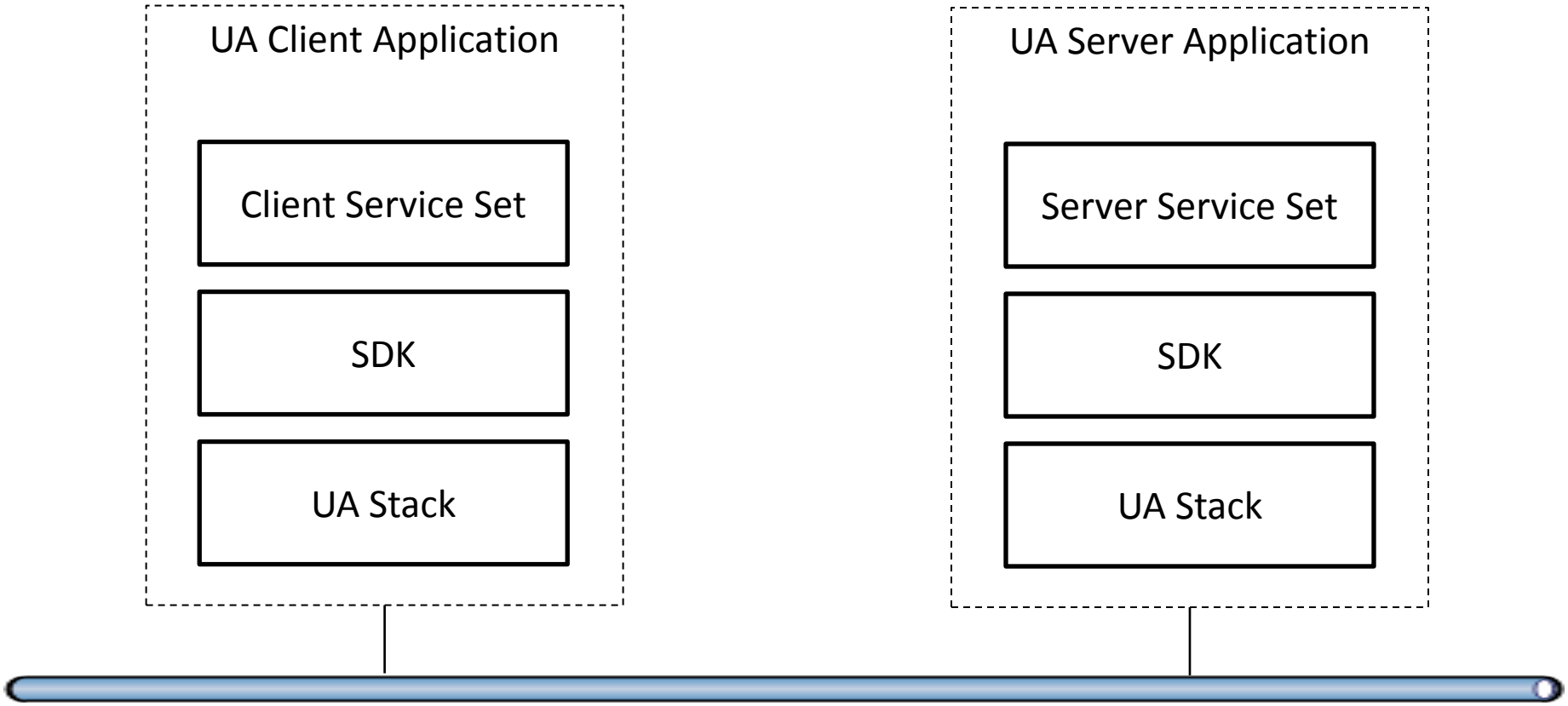
The UA Stack

Software Layering



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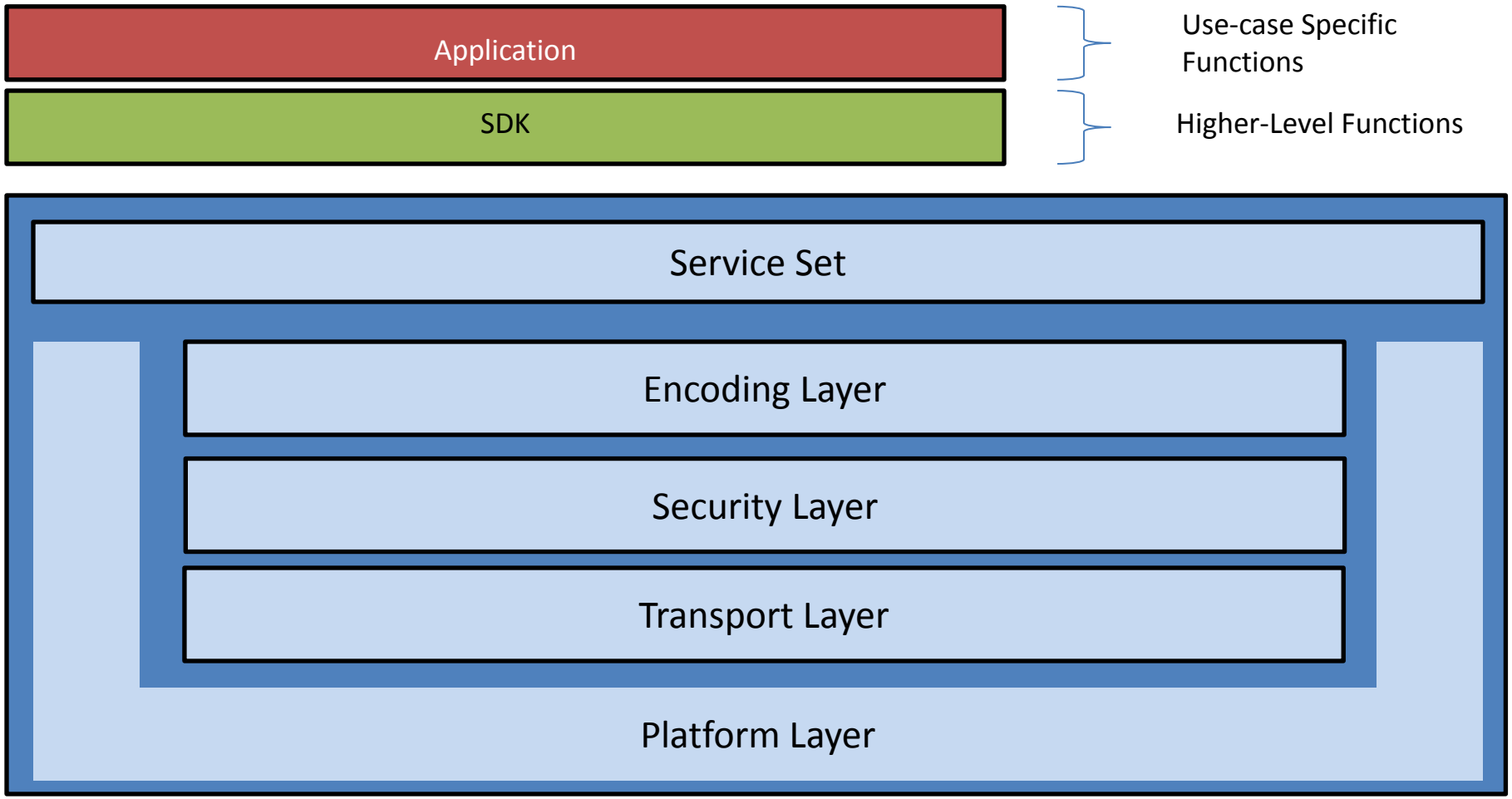
The UA Stack

Software Layering



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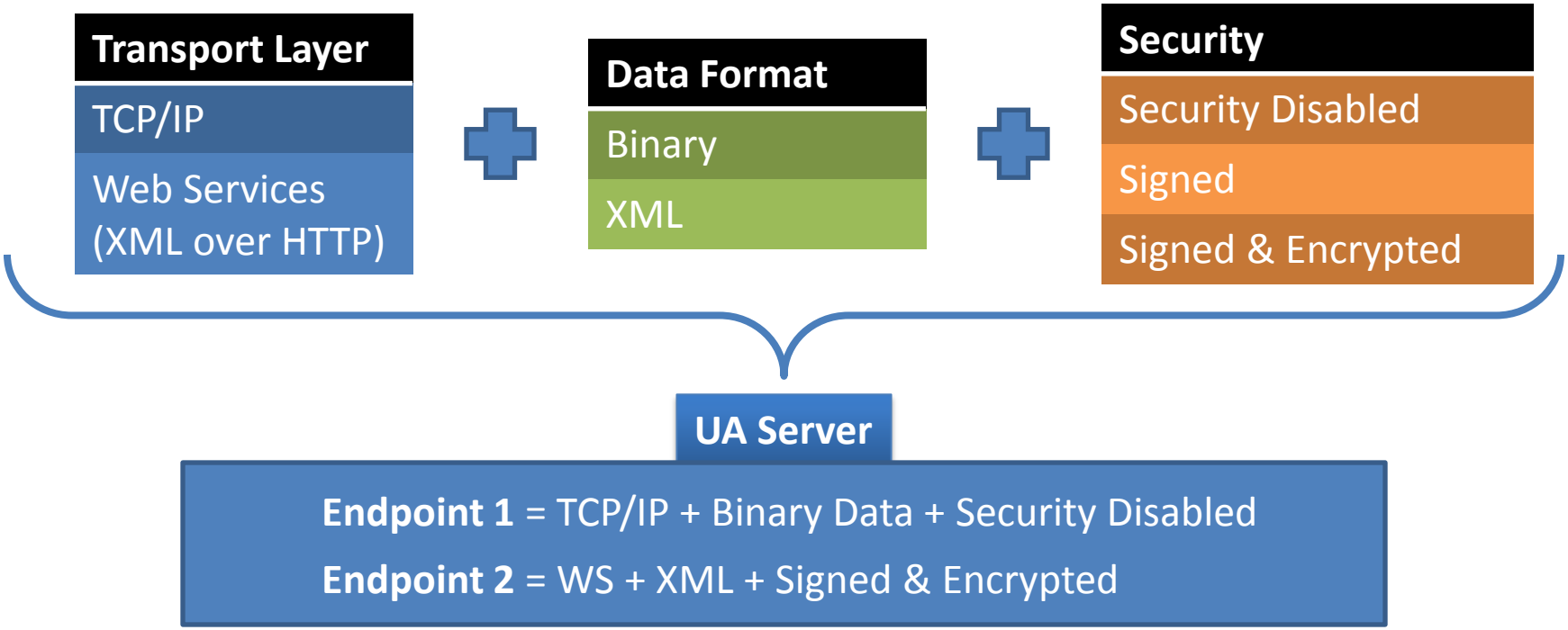
UA Stack

- Multiple connection types supported:



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Endpoint Type Trade-offs

Configuration 1: TCP/IP + Binary Data

- Low Overhead: Fastest method of transferring
- Firewall Configuration required
- Preferred in Control Level environments

Endpoint 2: Web Services + XML

- High Overhead, CPU intensive
- Firewall friendly
- SAP, MES, and Enterprise wide communications

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Technology Options

Transport Protocols

- OPC UA TCP
  - Full duplex communication between client and server
  - Responses can be returned in any order
  - Responses can be returned on a different transport endpoint if transmission failures cause temporary TCP session interruption

2. SOAP/HTTP
   - XML-based syntax for exchanging messages between applications
   - SOAP 1.2
3. HTTPS
   - HTTP messages exchanged over a SSL/TLS connection
   - Point-to-point communication

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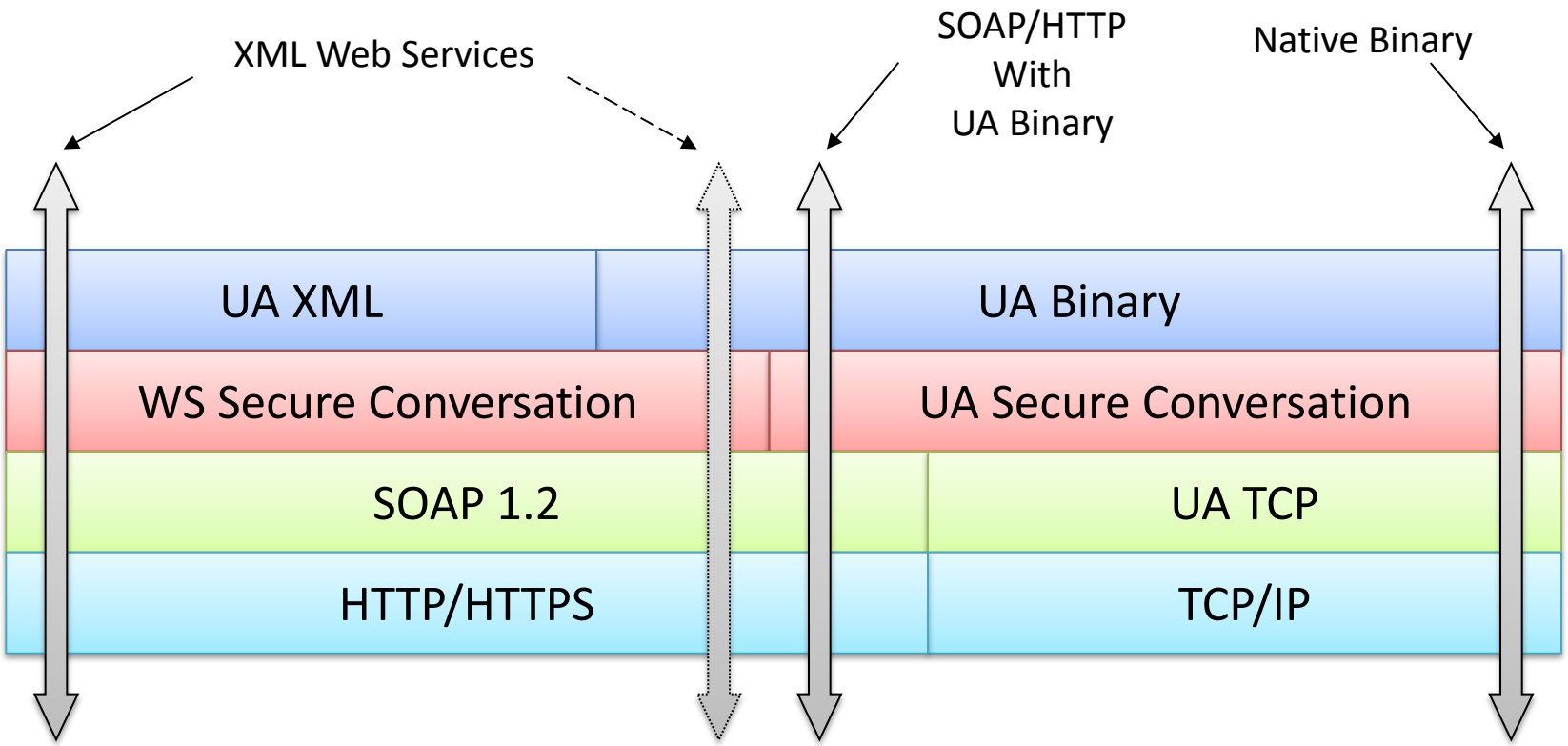
UA Stack



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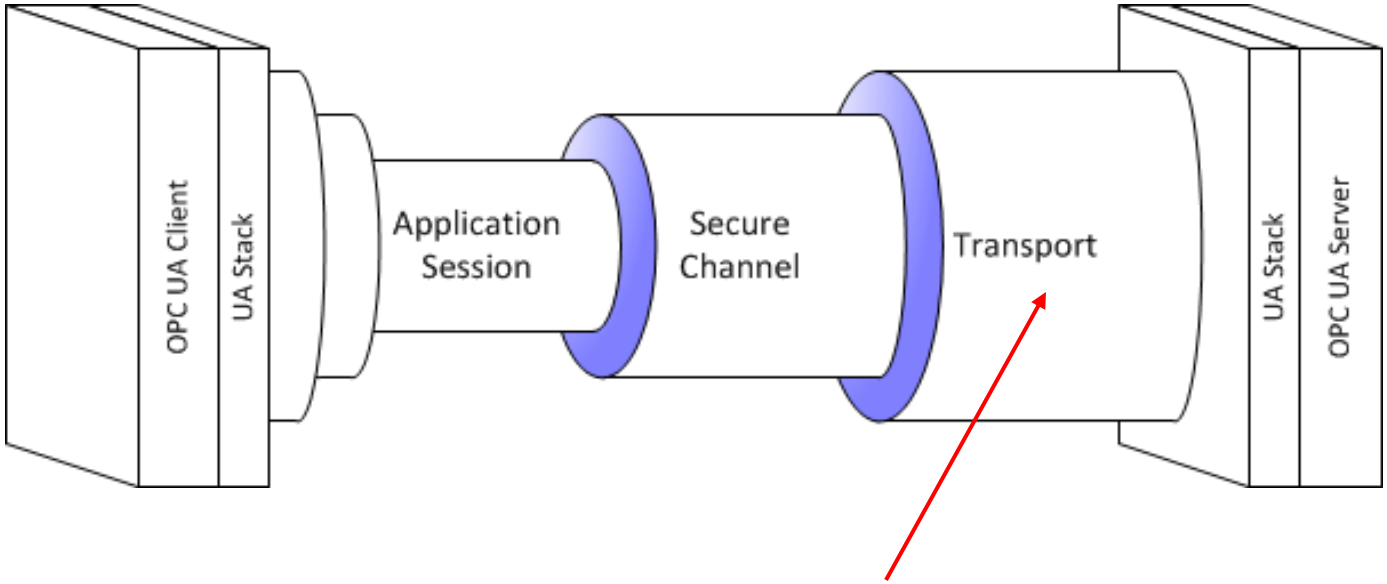
OPC UA Security and Implementation

Security Profiles



Security can be implemented in the transport protocol

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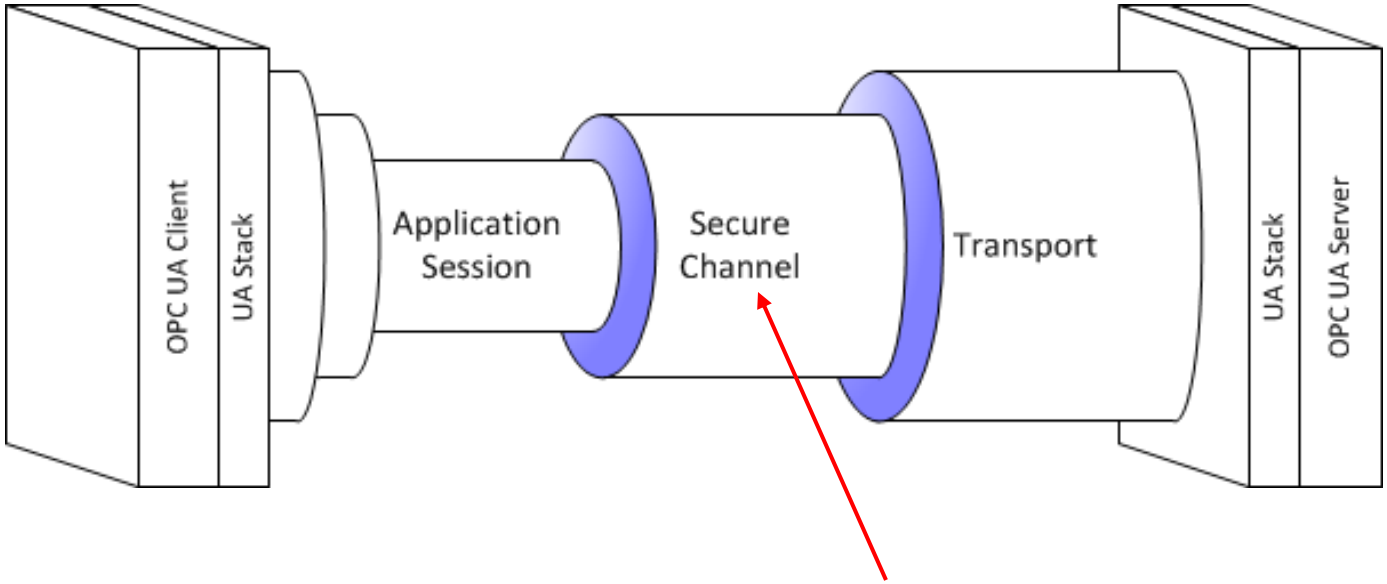
OPC UA Security and Implementation

Security Profiles



The Security mechanisms defined in the stack are used by the *SecureChannel* to secure messages passed over this channel

PKI X.509

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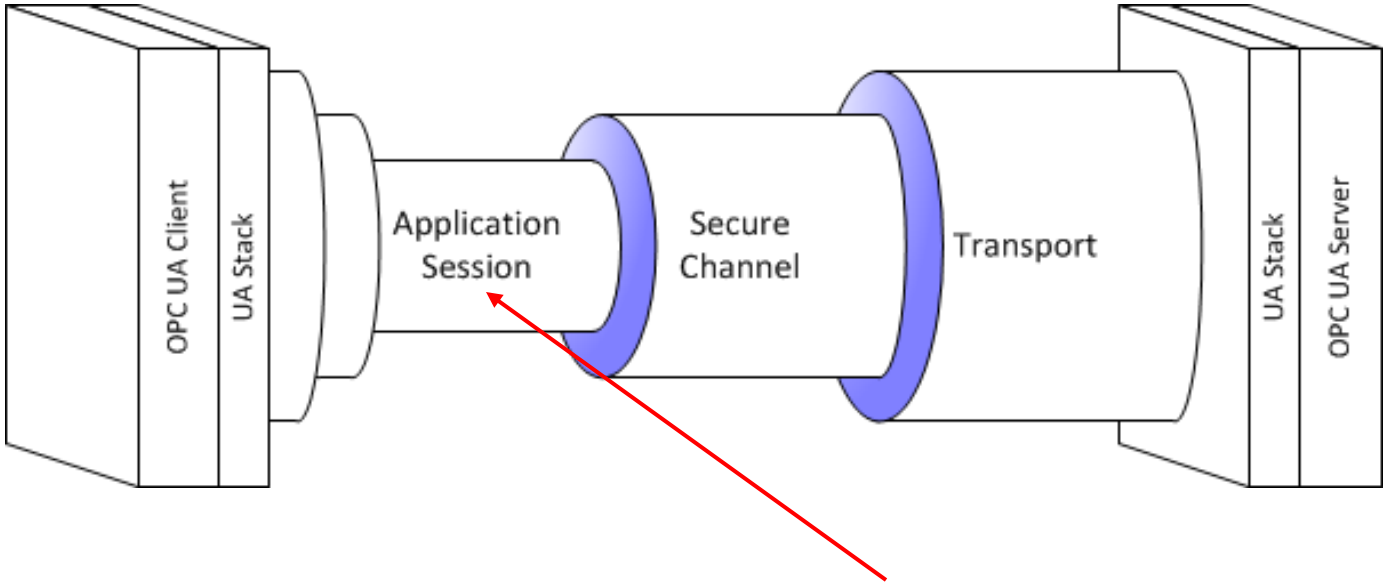
OPC UA Security and Implementation

Security Profiles



The session uses the algorithms defined for the channel and assigns an identity to the connection

Token: None, User/Pswd, Kerberos, X.509

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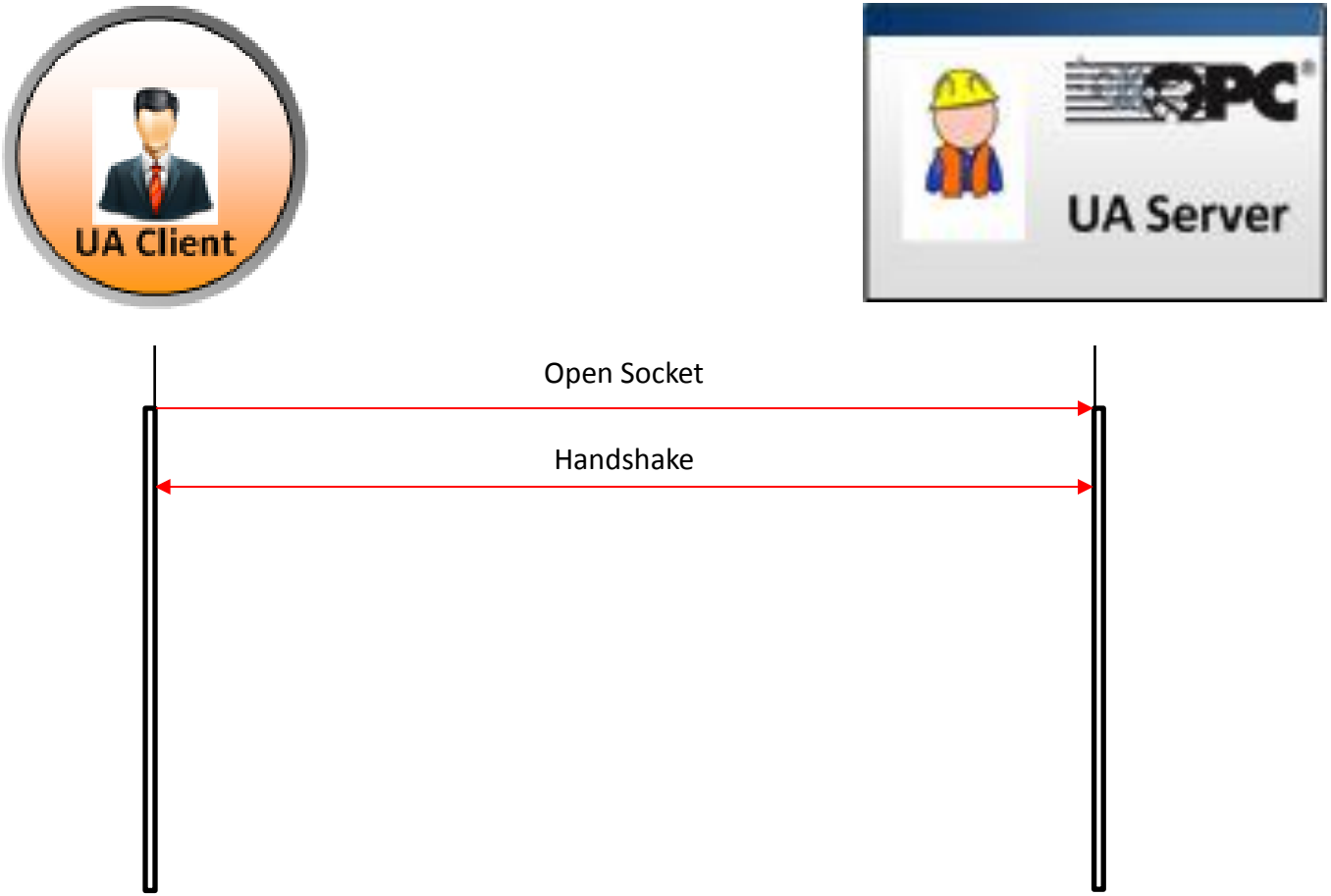
The Connection Process

Create a TCP Connection



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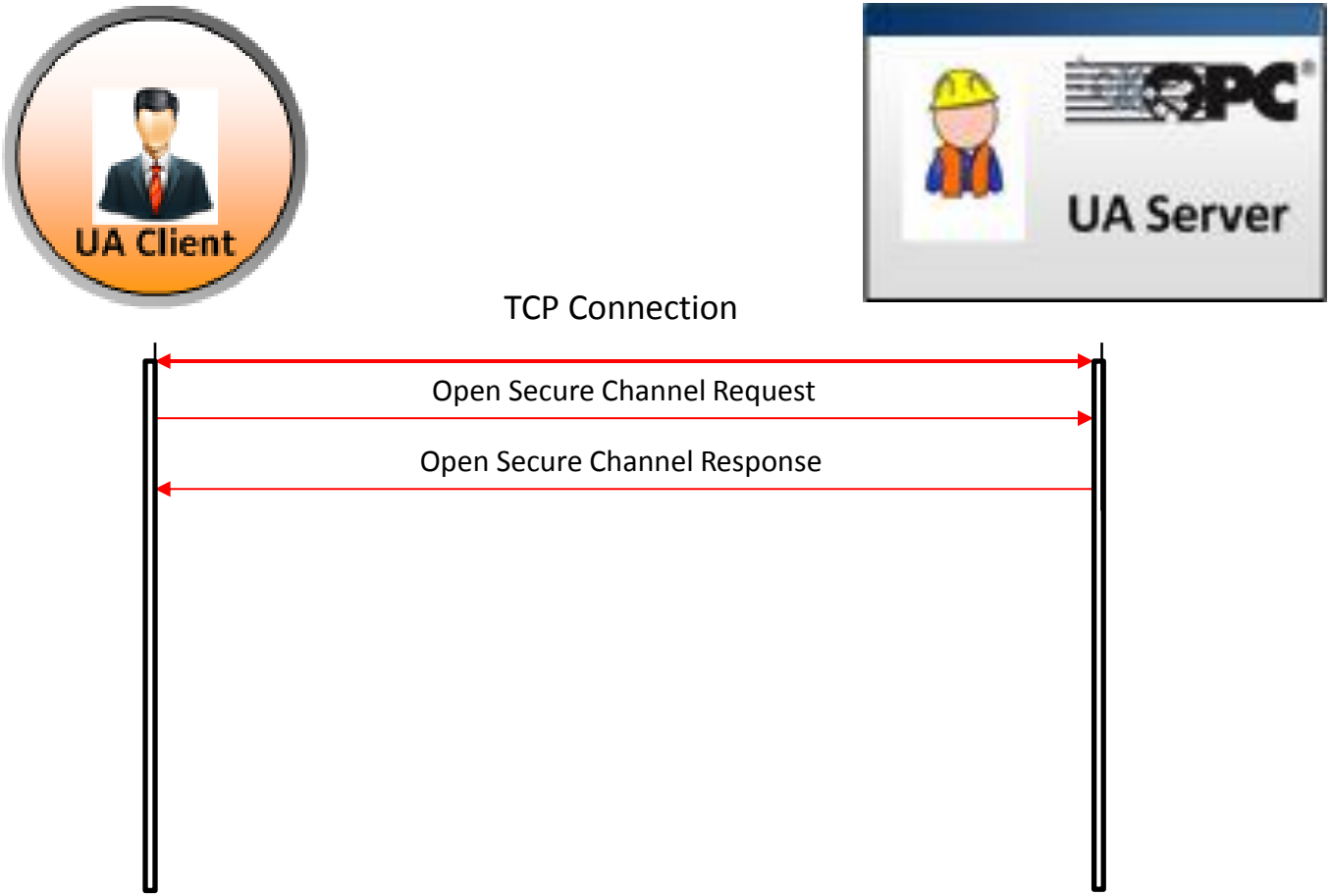
The Connection Process

Create a Secure Channel



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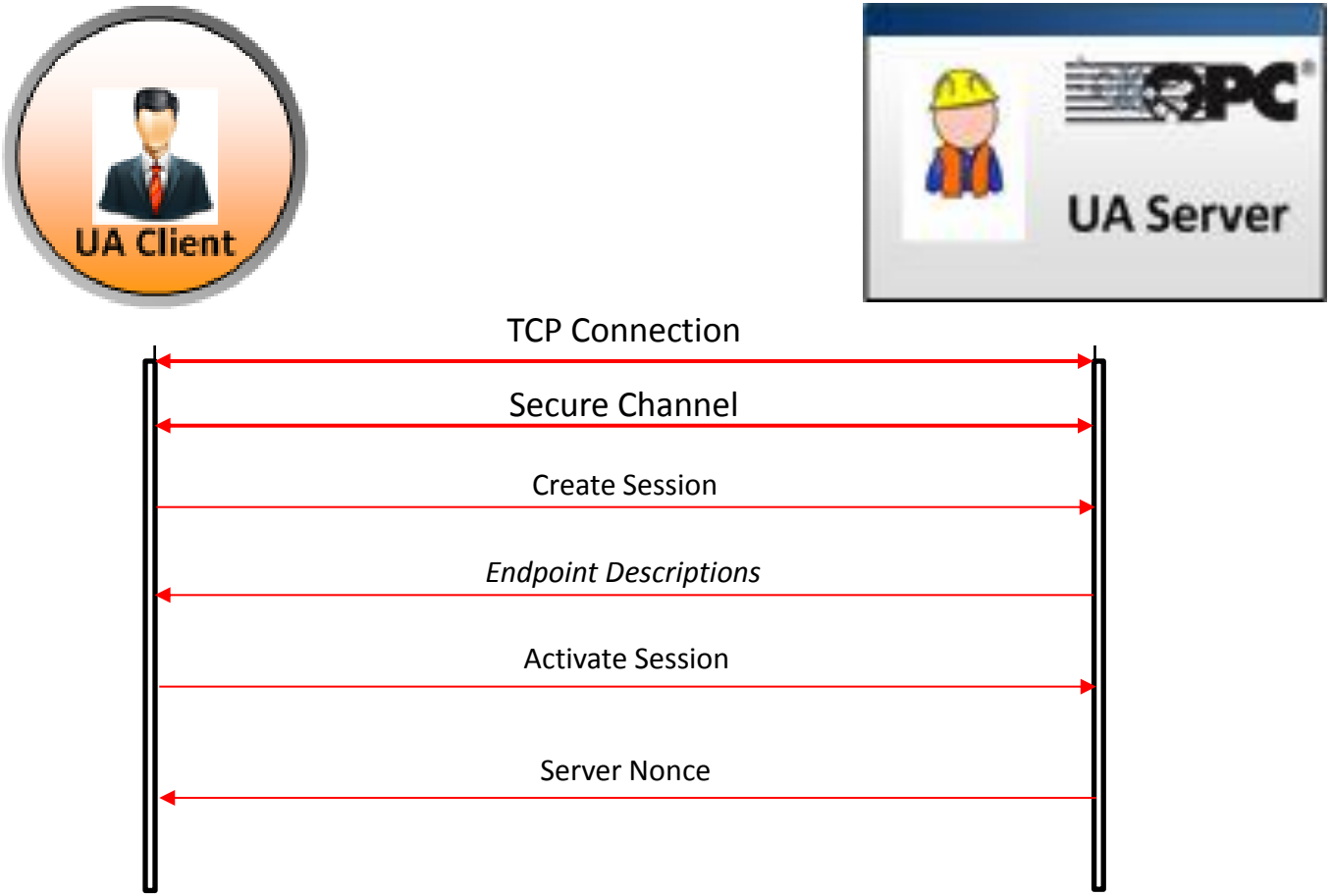
The Connection Process

Create and Activate a Session



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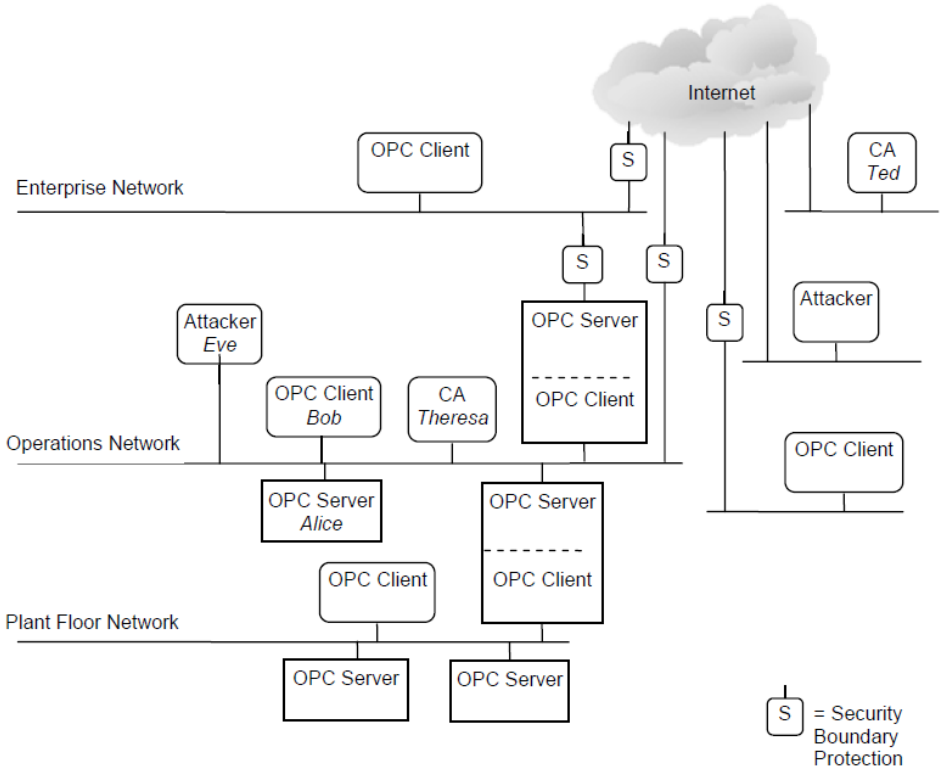
OPC UA Security and Implementation

Integration With Site Security



OPC UA applications will be deployed in a wide variety of locations within a wide variety of environments.

The site-specific security policies will determine what the overall security implementation will be.

This will address security policy and procedures, personnel, responsibilities, audits and physical security.

OPC UA applications will implement the features that are expected to be required by the customer

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MIGRATION

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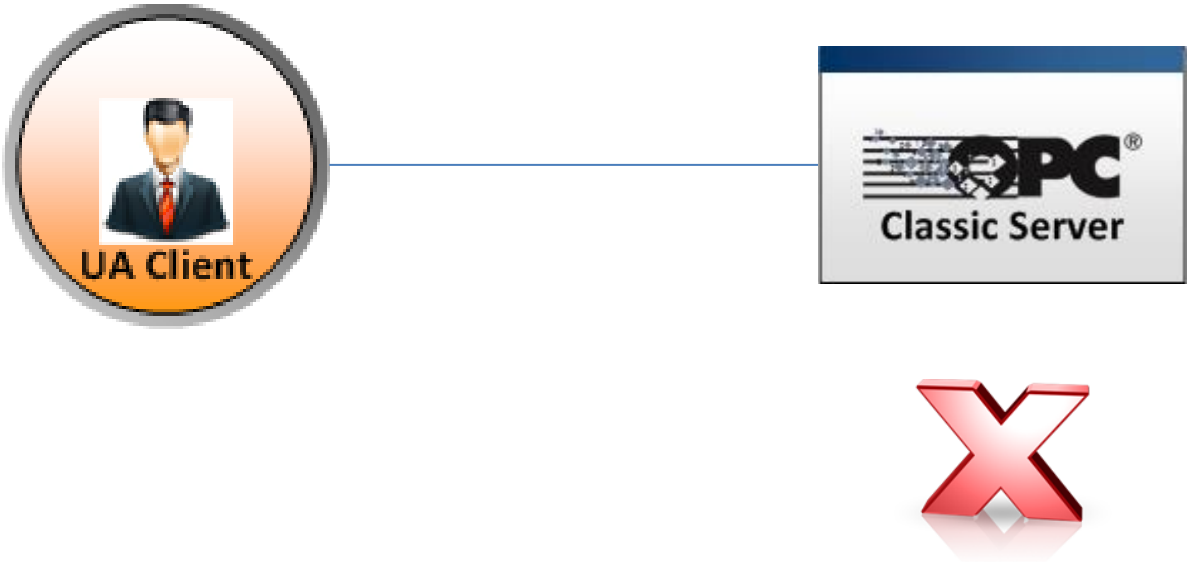
Migration

OPC Components



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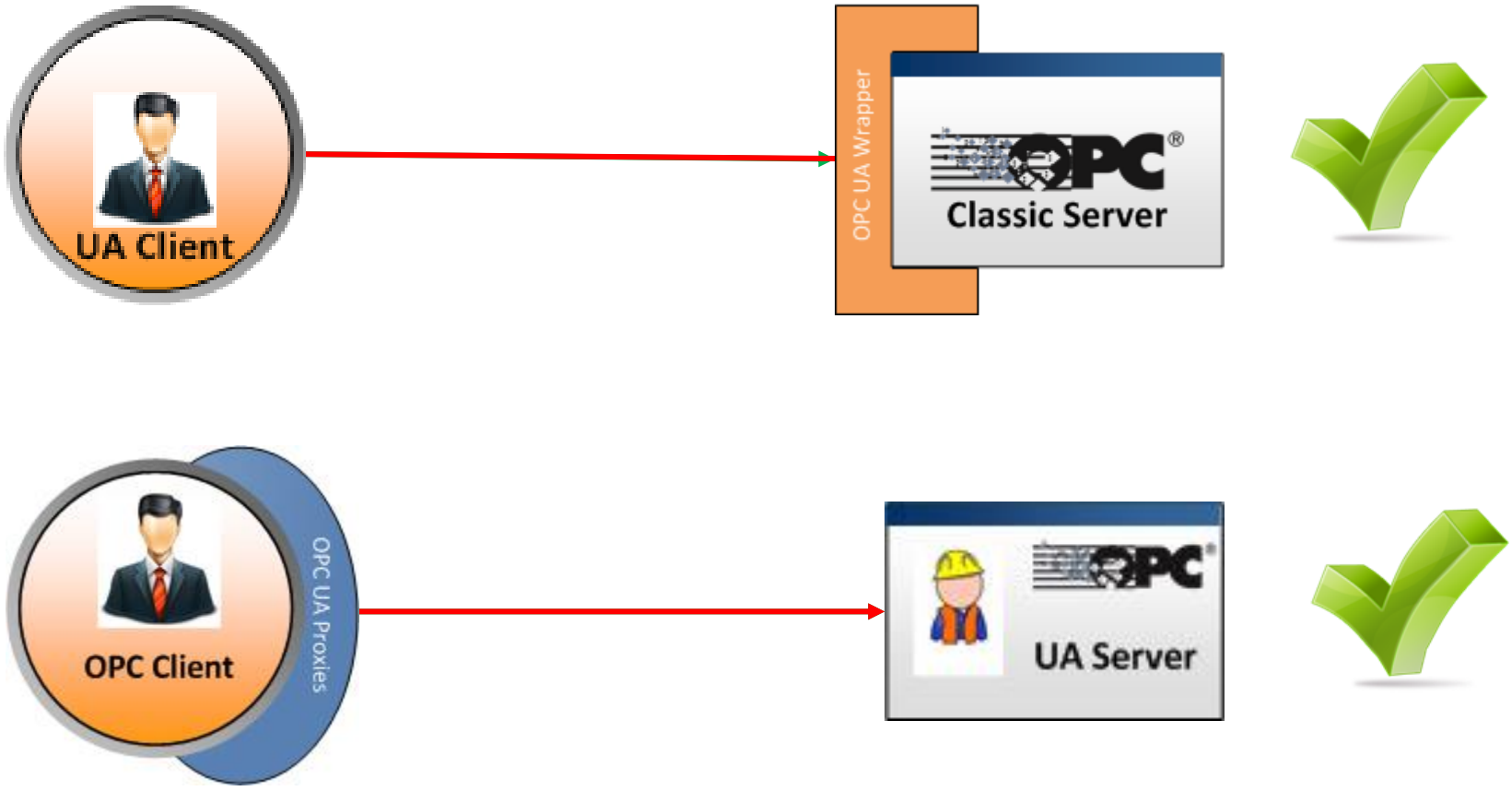
Migration

OPC Components



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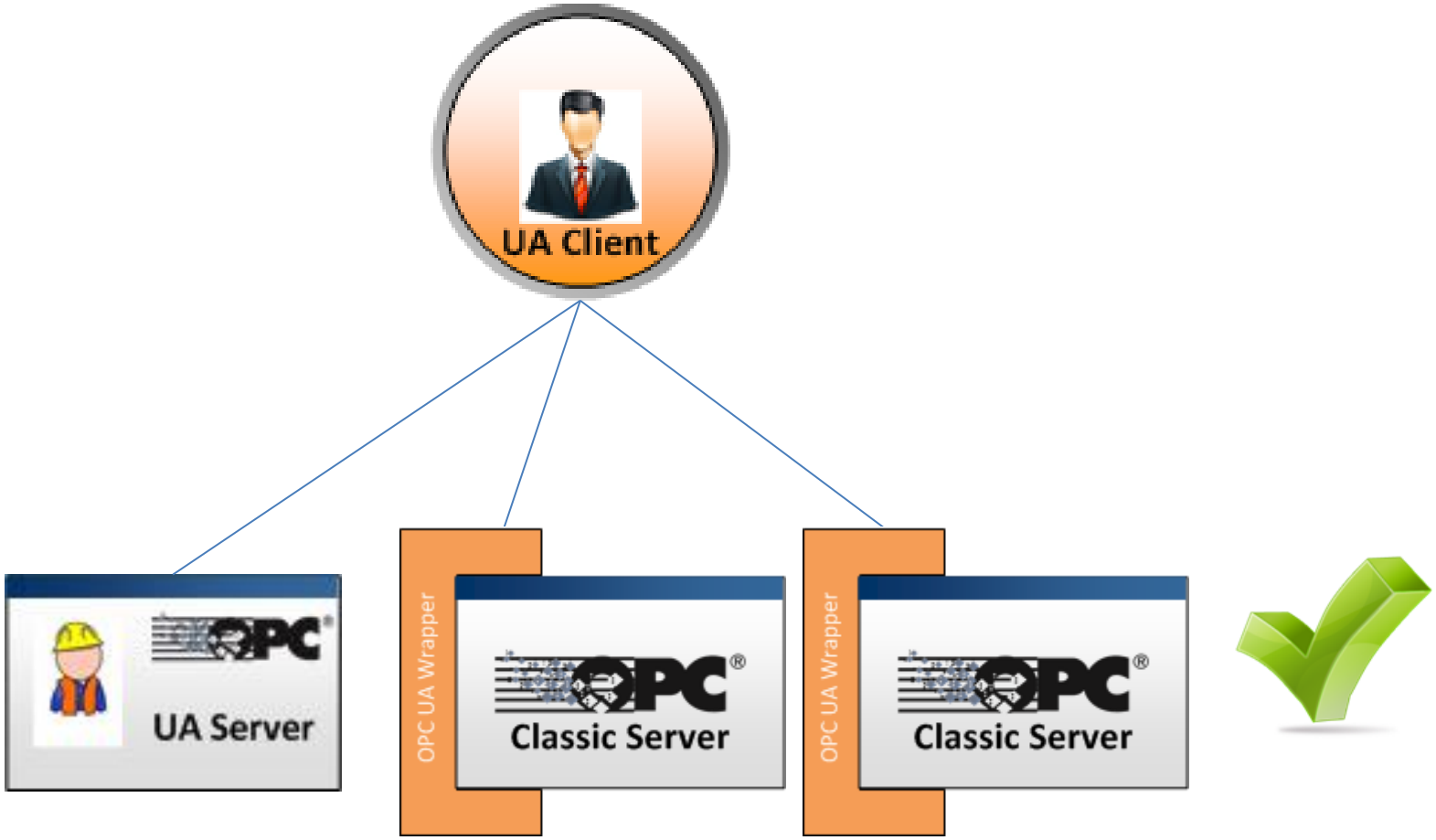
Migration

OPC Components



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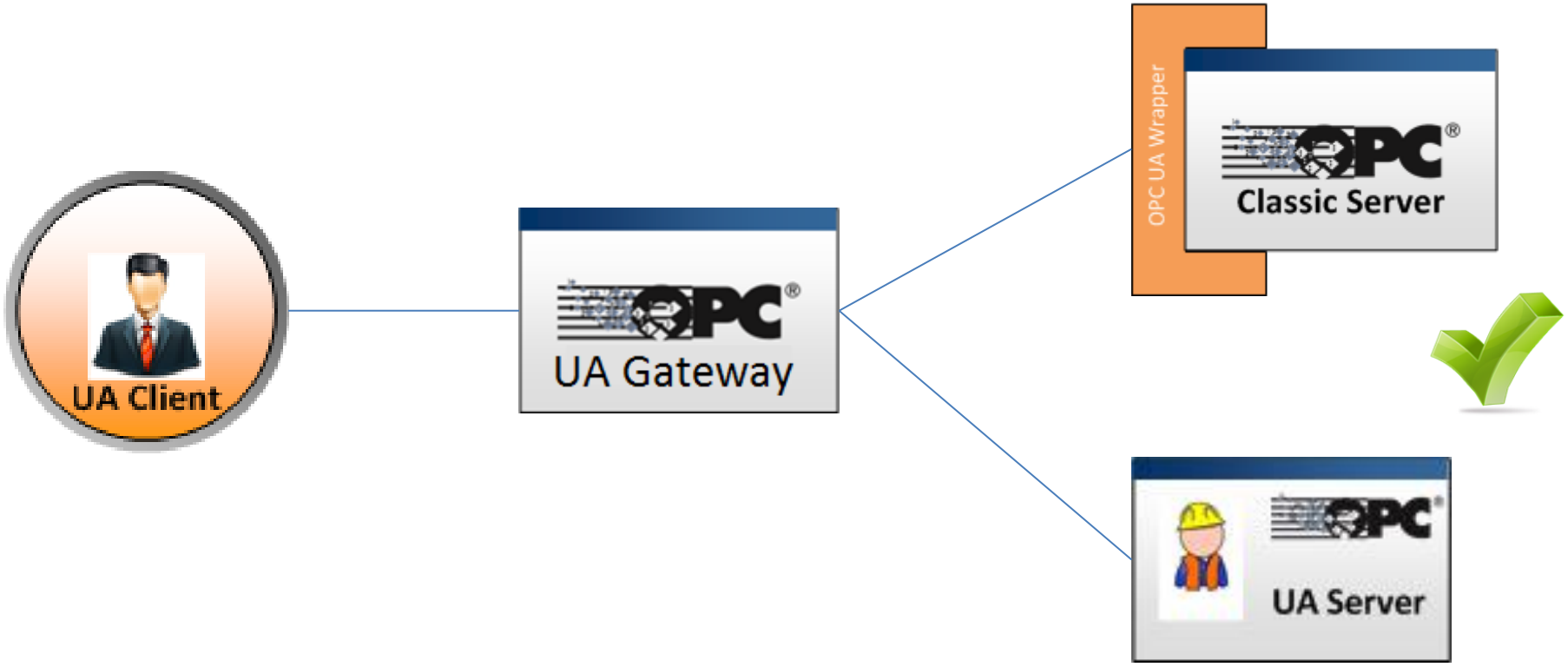
Migration

Gateway



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Migration

Native Development

Classic OPC → Transition → OPC UA

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Migration

Native Development

- All functionality from the Classic OPC specifications are available within OPC UA.
- The Access Type Specification Parts define how the functionality of Classic OPC is expressed in OPC UA.
- This does not mean that OPC UA clients will be allowed to access Classic OPC servers directly. The OPC UA server can be made to collect the same data and present it to the OPC UA client in the same manner as the Classic OPC server.
- This provides improved performance over wrappers and proxies.

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Questions?

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ARCHITECTURES

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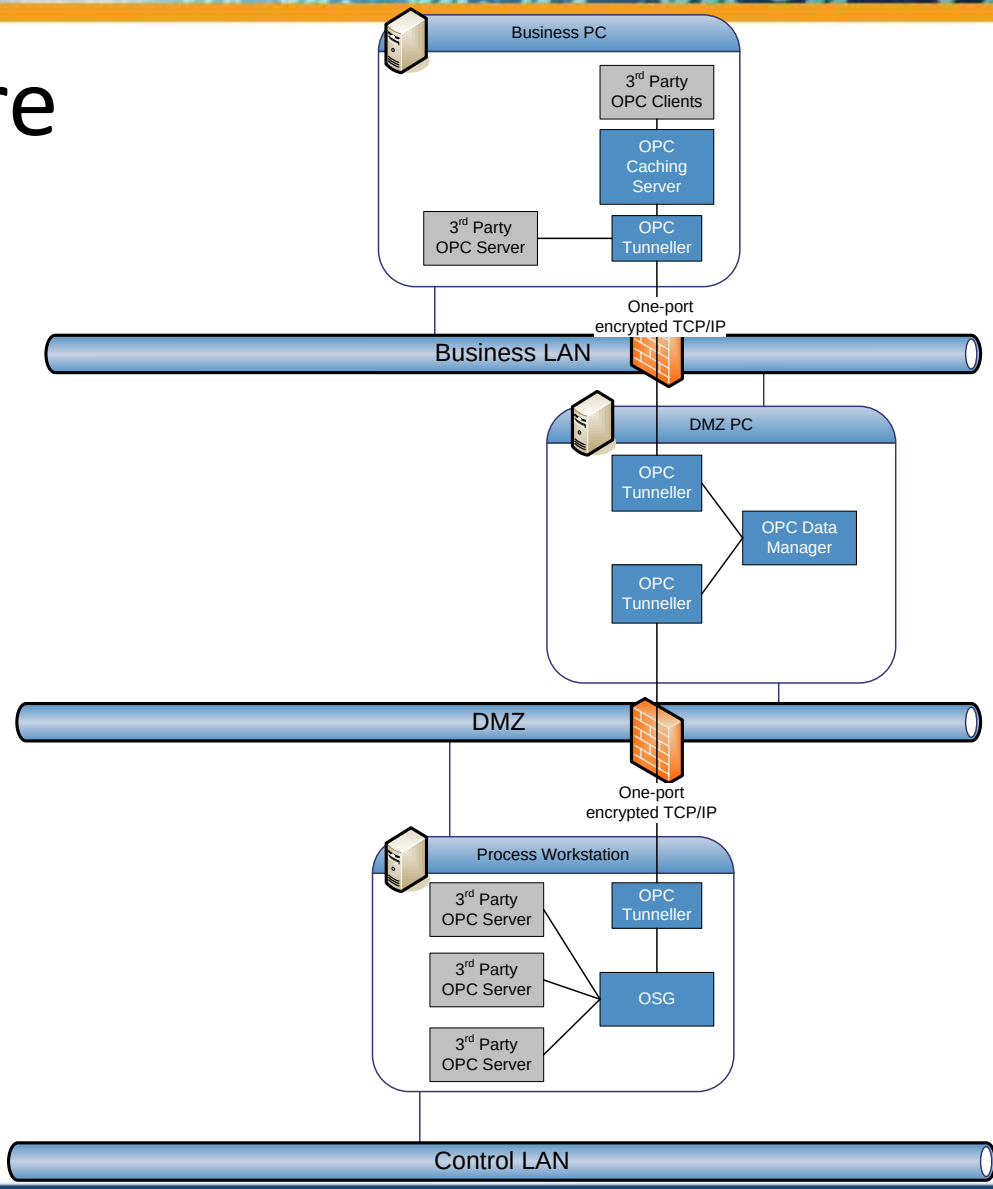
OPC DMZ Architecture



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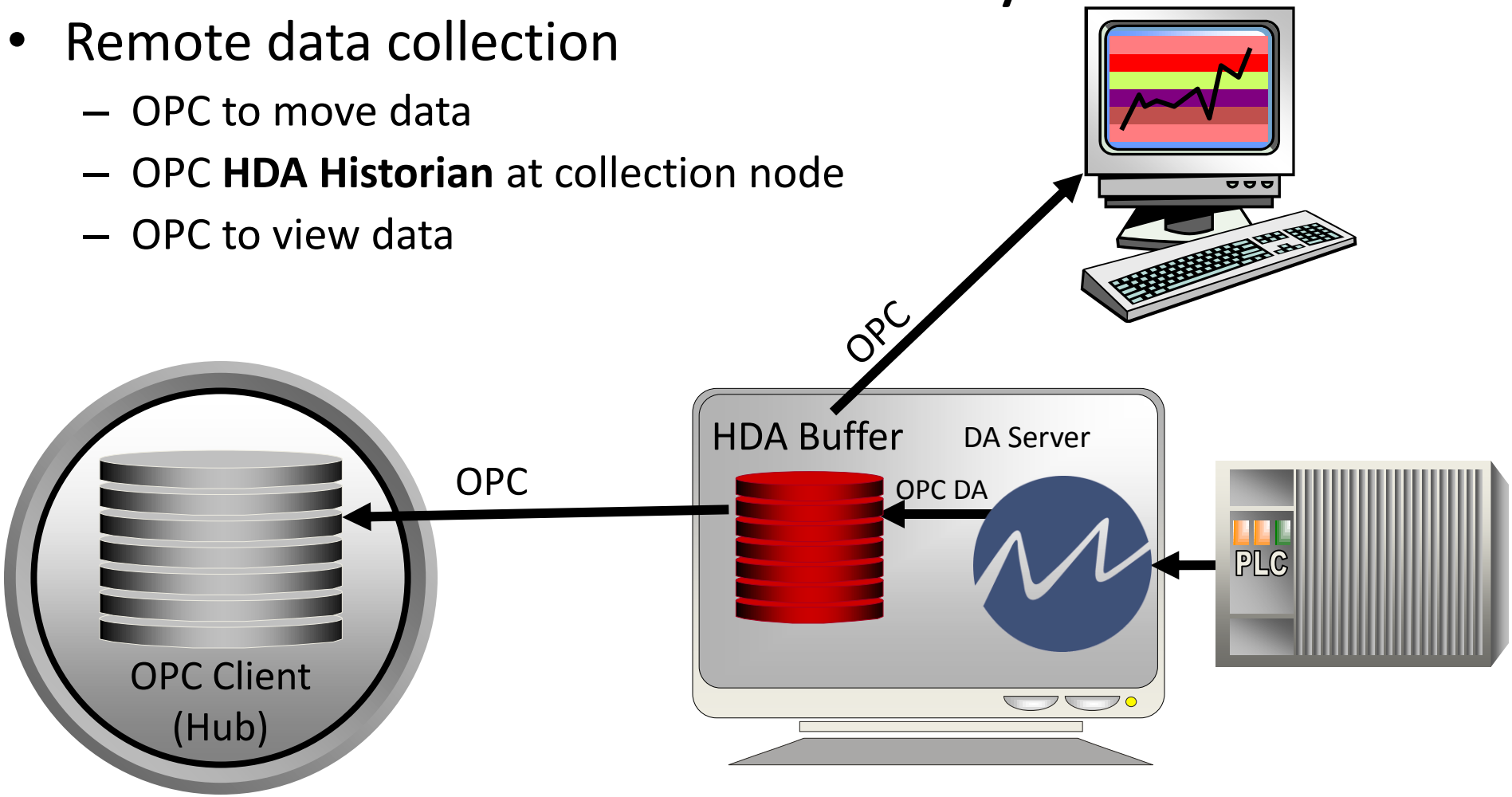
OPC Solution: Transfer History!

- Remote data collection
  - OPC to move data
  - OPC **HDA Historian** at collection node
  - OPC to view data



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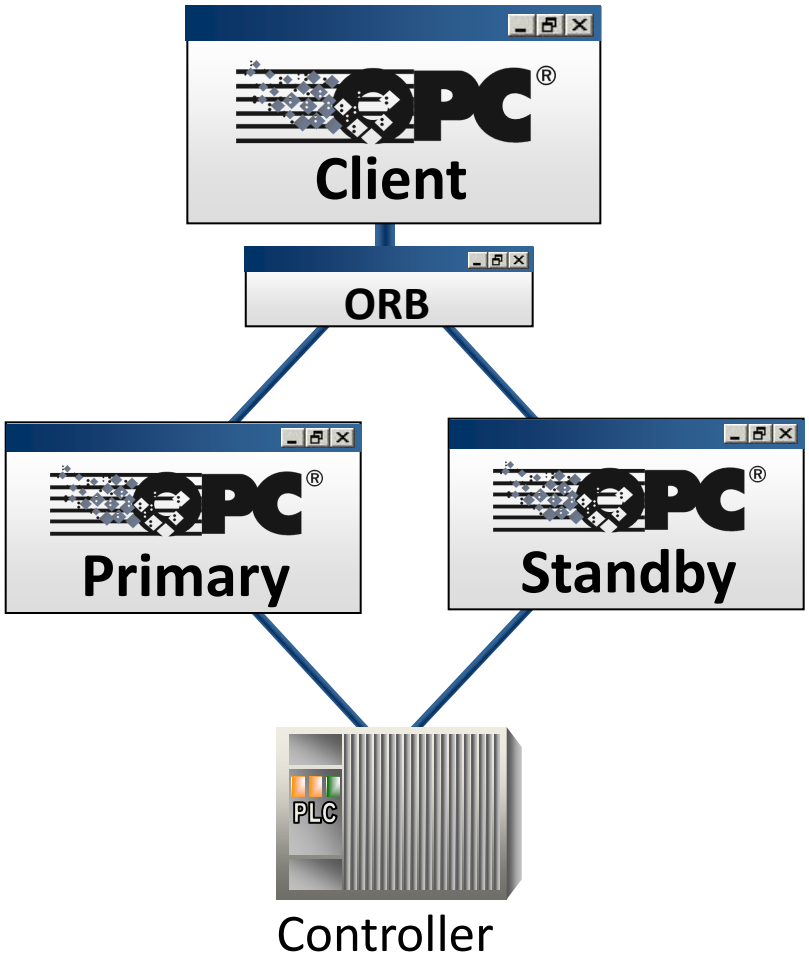
Reliability: OPC Redundancy Broker (ORB)



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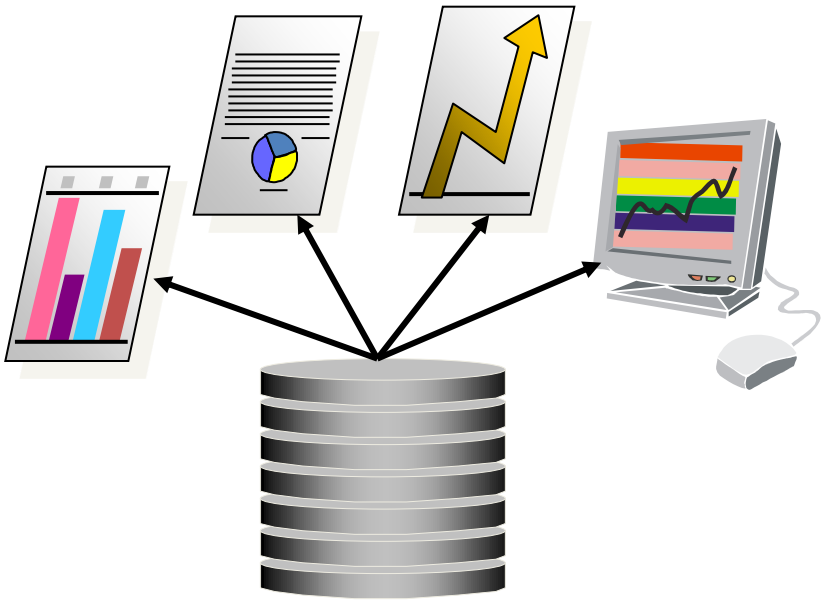
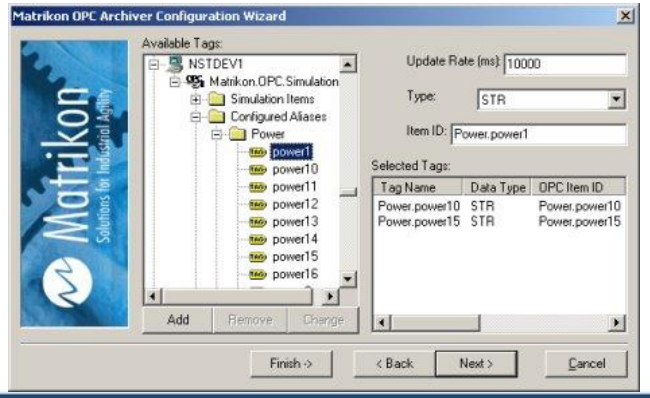
MatrikonOPC Desktop Historian

- Operations/Field Historian
  - Flexible data storage (day, week, month)
  - No compression
  - Single data source on same PC
  - Simple install (less than 5 minutes)
  - Sub-second collection rates
- **Operation** historical analysis
  - No maintenance
  - No training
  - No per-point pricing
  - No per-connection pricing





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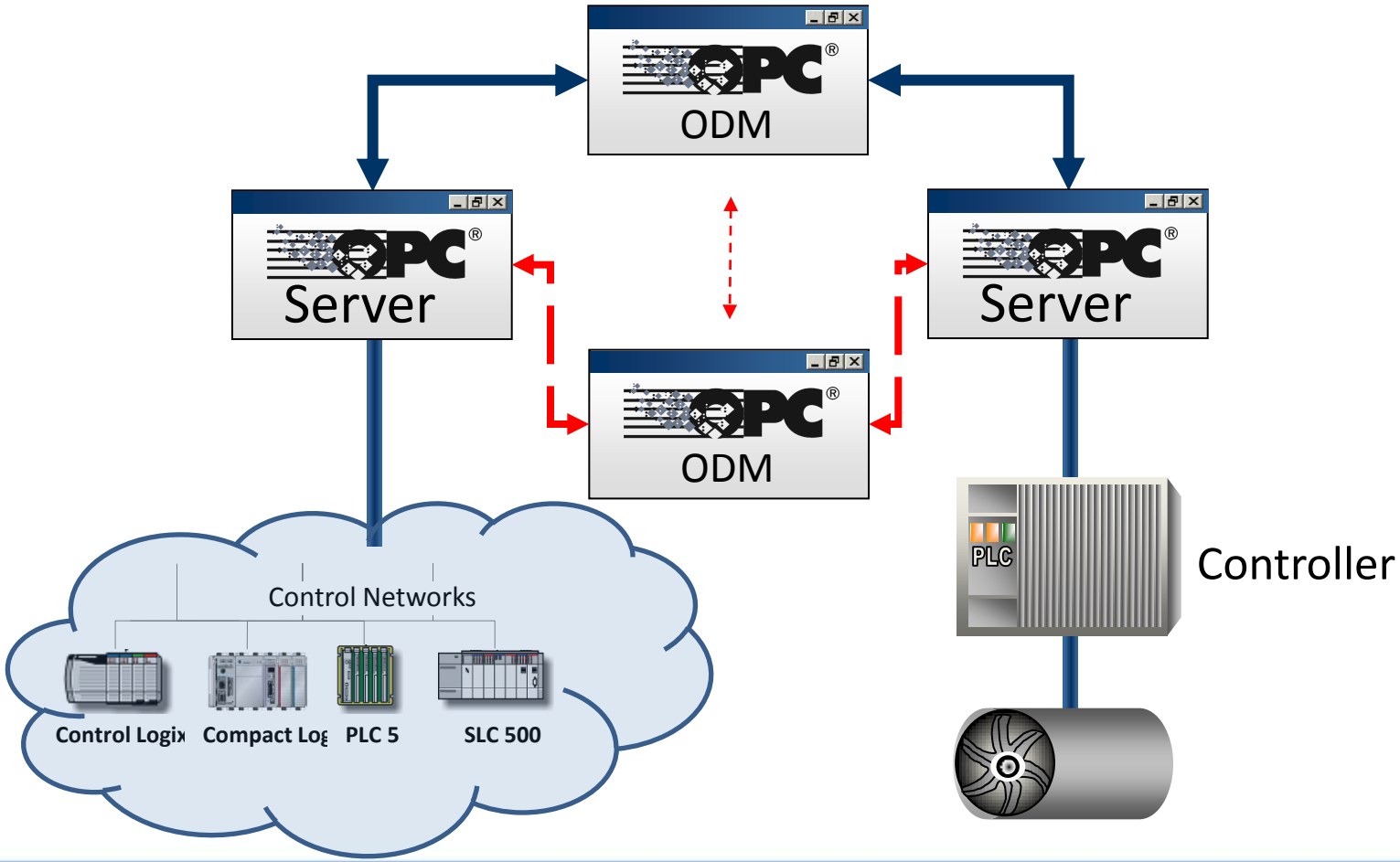
OPC Data Manager



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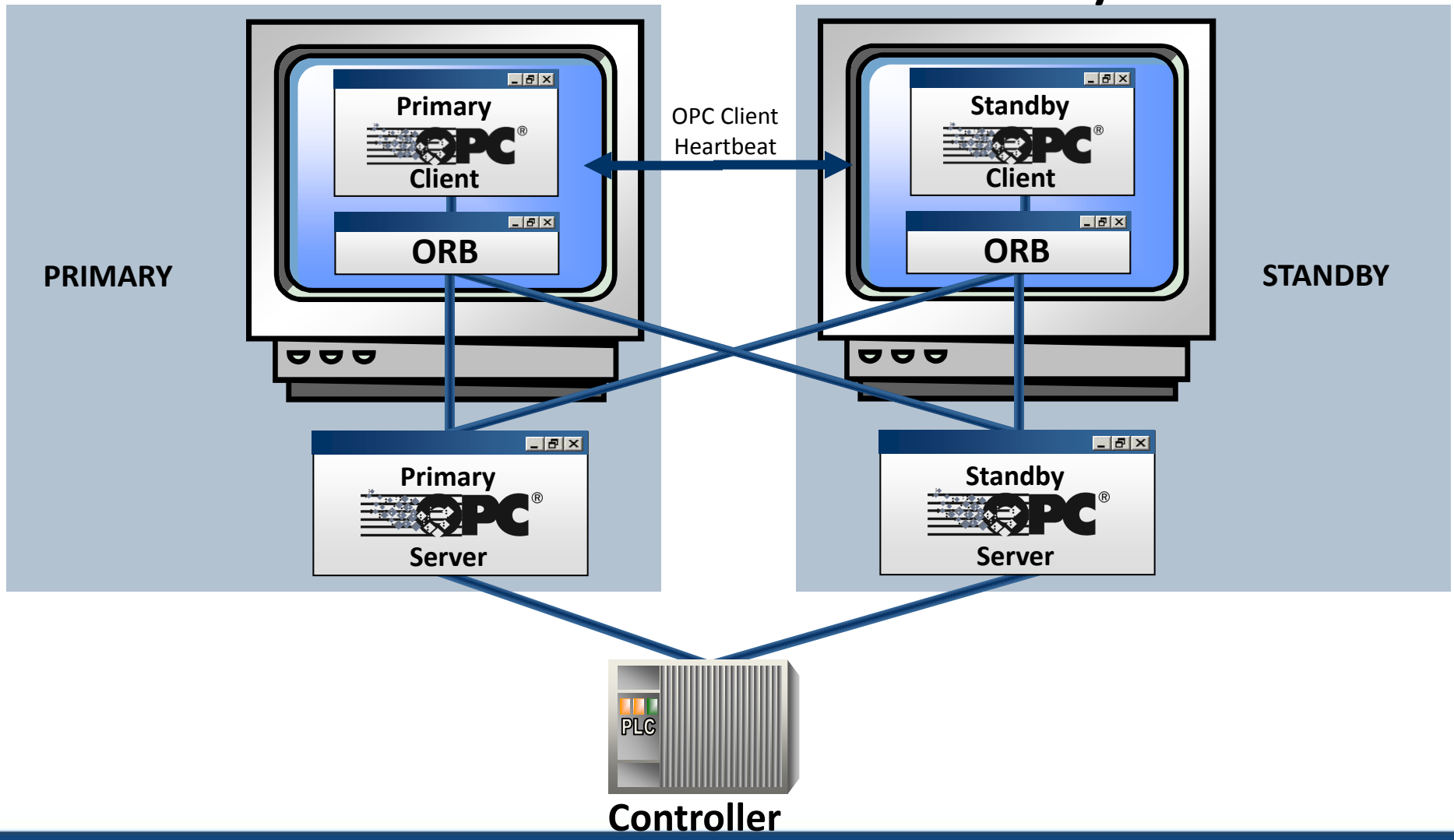
OPC Client and Server Redundancy



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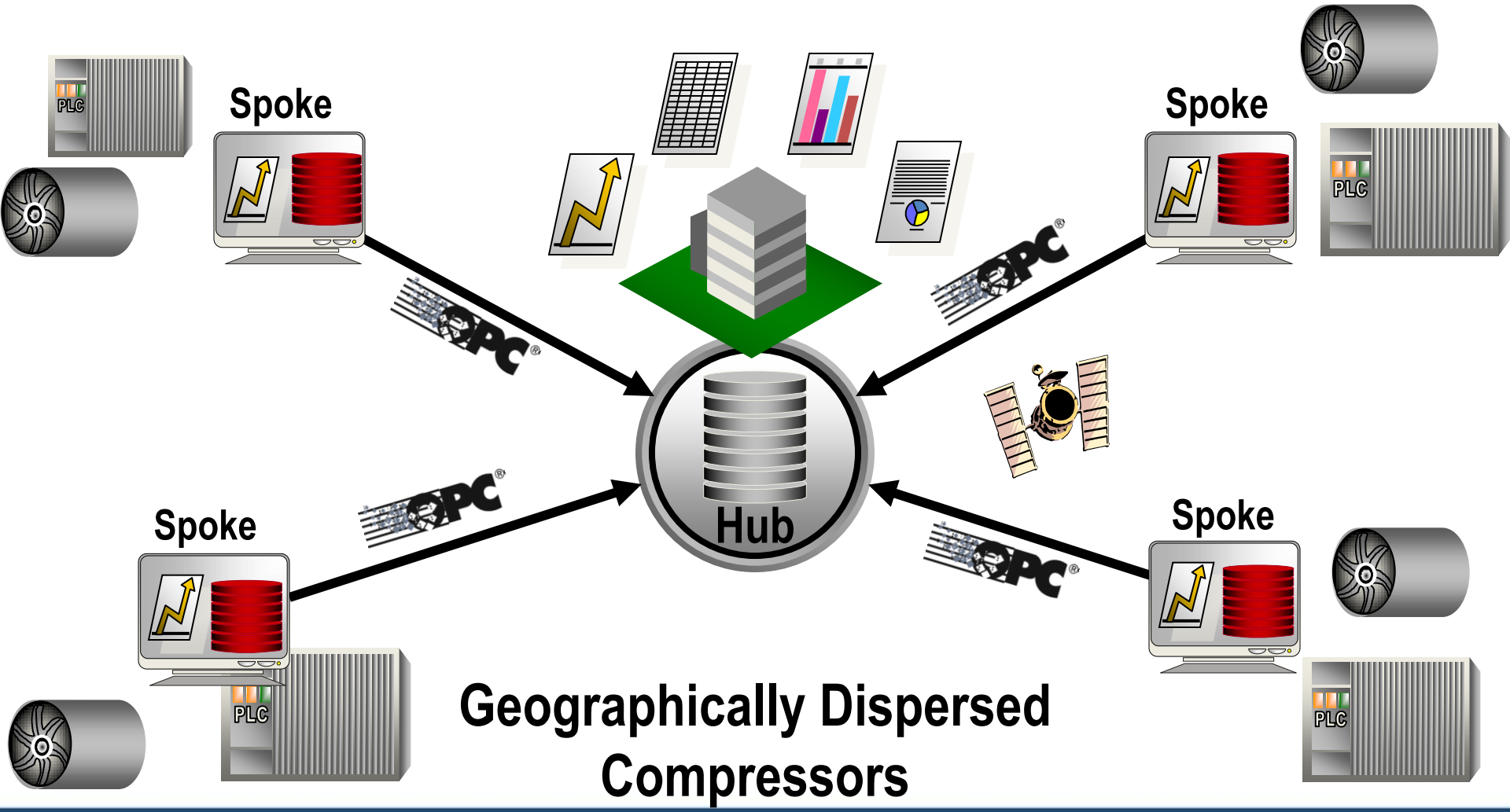
OPC Hub and Spoke



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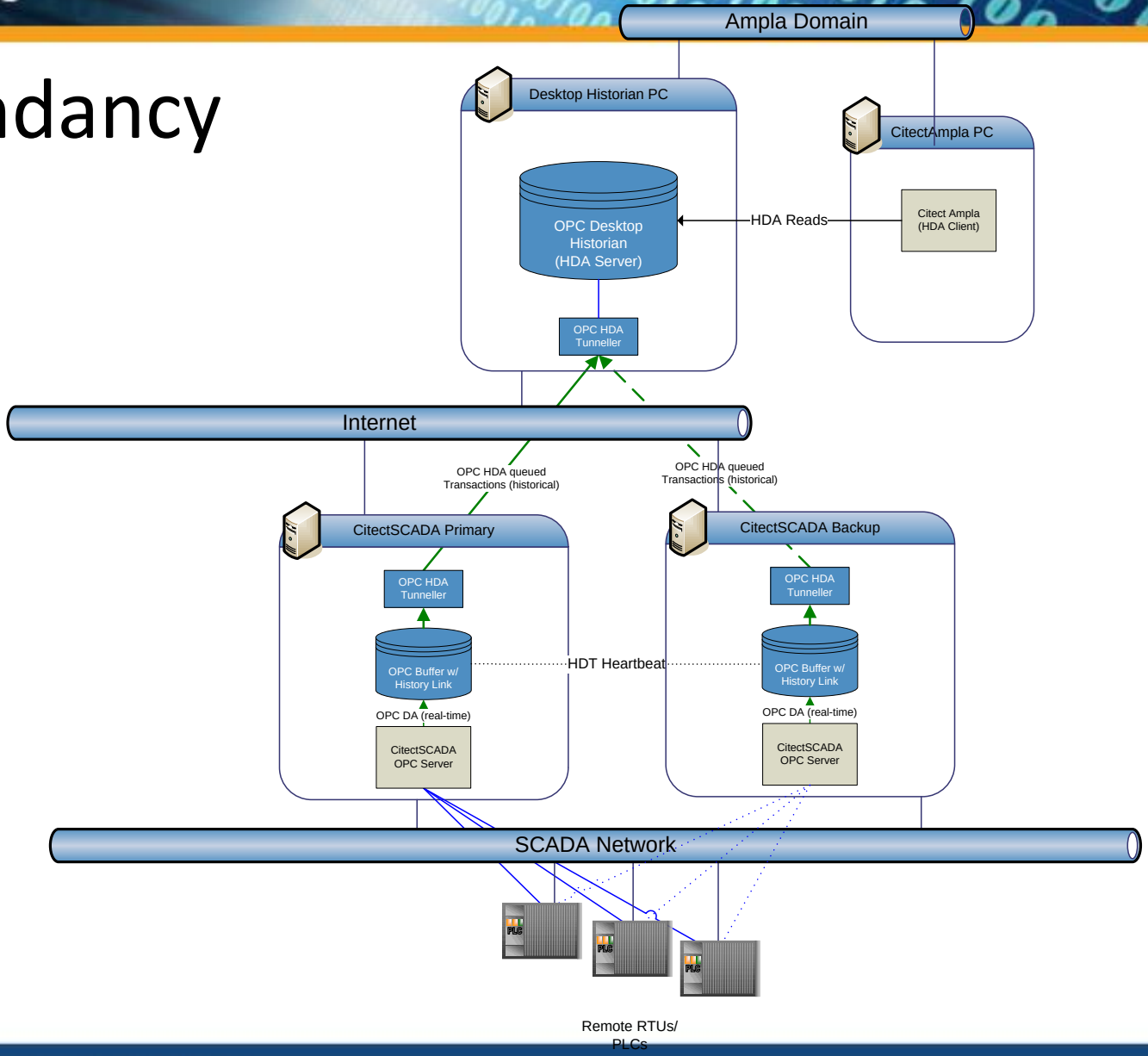
Spoke Redundancy Architecture



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