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OPC 3: The Sequel for UA

Motivation, Technology, and Collaboration behind the OPC Unified Architecture

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Agenda

- History of OPC and OPC Foundation
- Current OPC Specifications
- OPC UA Motivation
- OPC UA Overview
- Who, What, When, Where & How
- OSIsoft's Involvement in OPC and OPC Products
- Migration to OPC UA
- Goals for OPC UA

History of OPC and OPC Foundation

OLE for Process Control or is It?

Why OPC ?

- Interoperability
- Standards: fact or fiction?
- Where did OPC come from?
- Four Core Companies
- OPC Foundation
- Write a communications driver one time
- Solve World Hunger?

InterOperability

Performance

Before OPC:

Custom interfaces

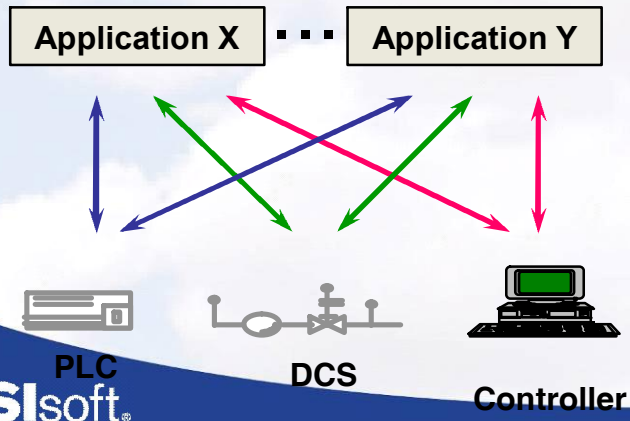
- **costly**
- **inefficient**
- **risky**

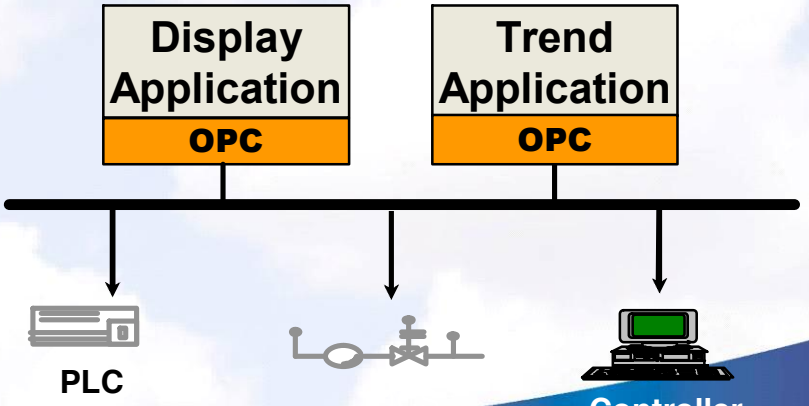
With OPC:

Client and Server write to a standard

- **reduce cost**
- **protect investment**
- **more choices**
- **increase productivity**

Connectivity





OPC Foundation

- International Industry Standard Organization
  - 450+ Member Companies / 100+ end-users Members
  - 2500+ Total Companies Build OPC Products = 15000+ Products
- Vision – Foundation for secure reliable interoperability
  - Moving information, not just data
  - Vertically – from the factory floor through the enterprise of multi-vendor systems (with stops in between…)
  - Horizontally – between devices on different industrial networks from different vendors
- Collaboration is key to pulling multiple “open” standards into unified open platform architecture…

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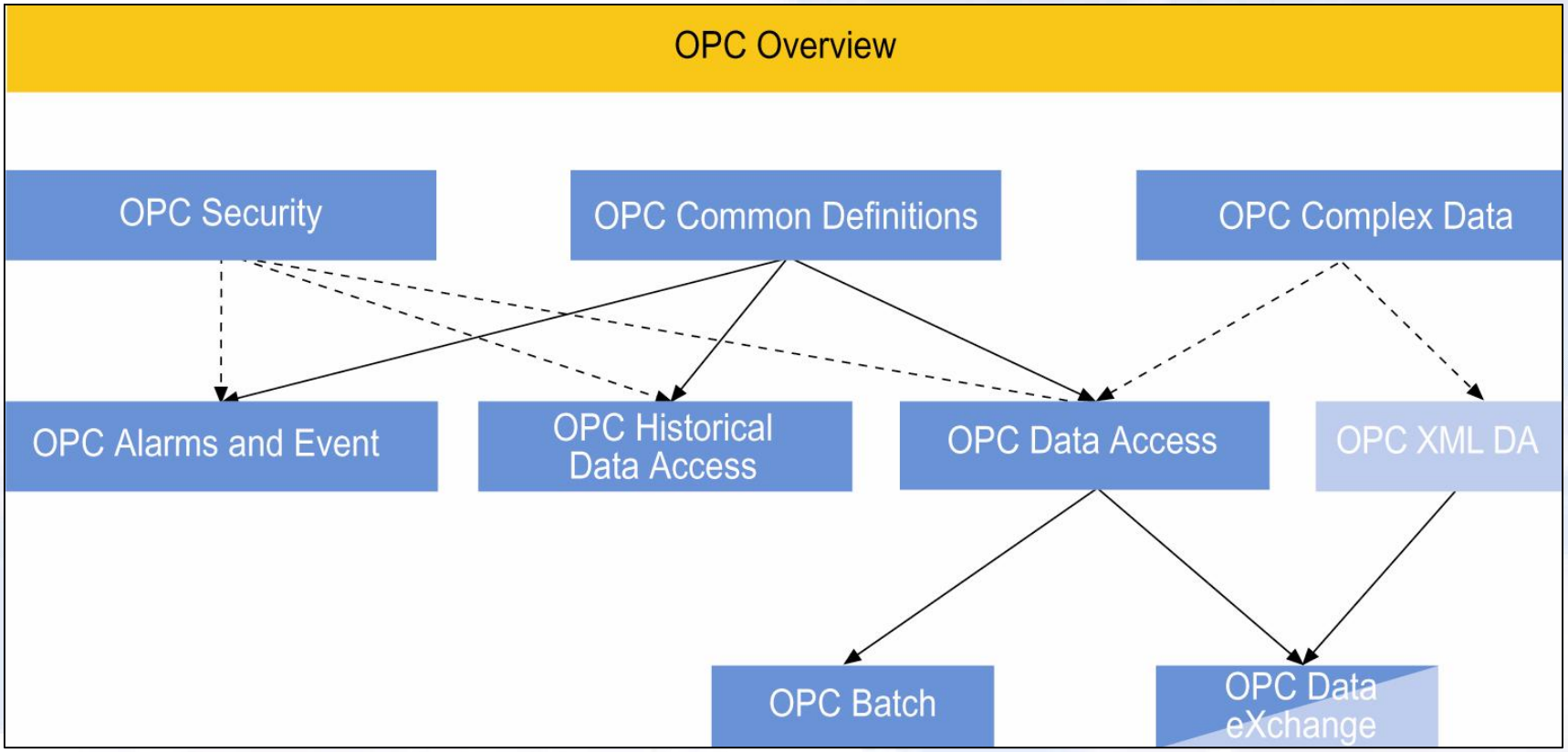
OPC-COM Specifications

- OPC DA – Data Access (1996)
  - Real-time data
  - Integration from DCS/PLC to HMI systems
- OPC A&E – Alarms and Events (1998)
- OPC HDA – Historical Data Access (2000)
  - Historical data
- OPC XML DA – XML Data Access (2004)
  - Real-time data via HTTP
- Others… (DX, Batch, Security)

OPC – Functional Areas



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Opportunities with COM-based OPC

- No cross-platform interoperability
- No integration between different specifications: DA, HDA, A&E and etc.
- Information model is very simple and not extensible
- Clients and servers are not always OPC compliant
- COM/DCOM technology issues
  - Poor connection reliability
  - DCOM configuration is challenging
  - Security is based on Window security only
  - DCOM is not Firewall friendly

OPC Unified Architecture Motivation

Today's Integration Challenges

- Numerous incompatible protocols
- Complex configuration and maintenance
- Islands of automation
- Rigid infrastructure
- Vulnerability to system and network failures
- Security

Numerous Incompatible Protocols

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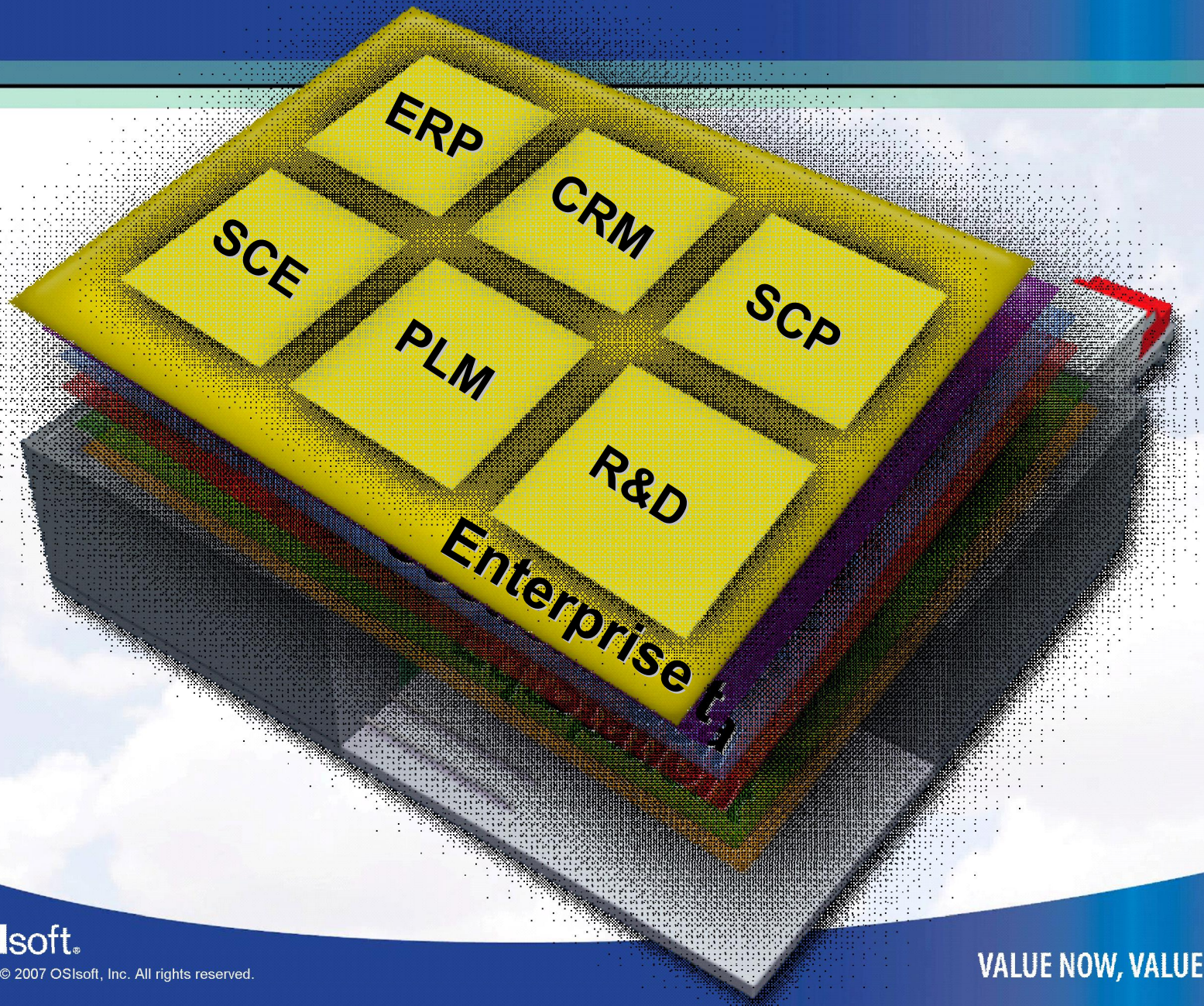
Numerous Incompatible Tiers



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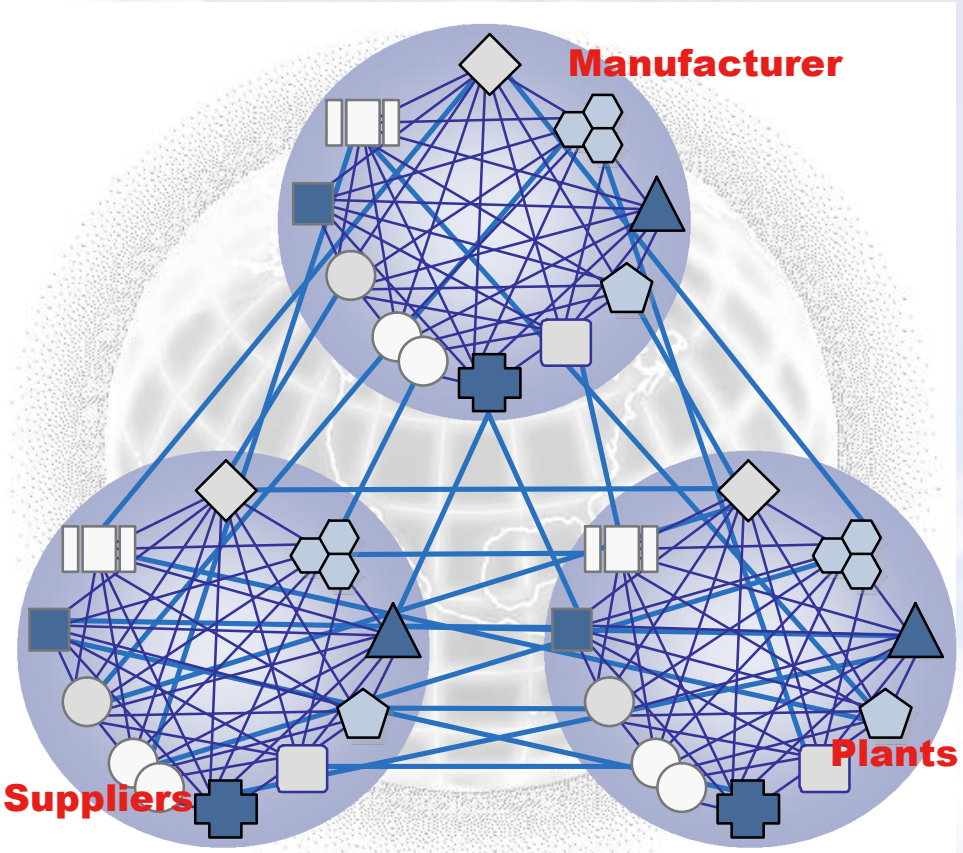
The Inter-Enterprise Nightmare

- Best-of-breed solutions
  - Many different vendors
  - Custom made solutions
  - Proprietary technologies
  - Point-to-point Integration
  - Limited real-time information
- Risking future success
  - Complex business environment
  - Maintenance nightmare
  - Multiple dependencies
  - Multiple standards



Customer value is lost

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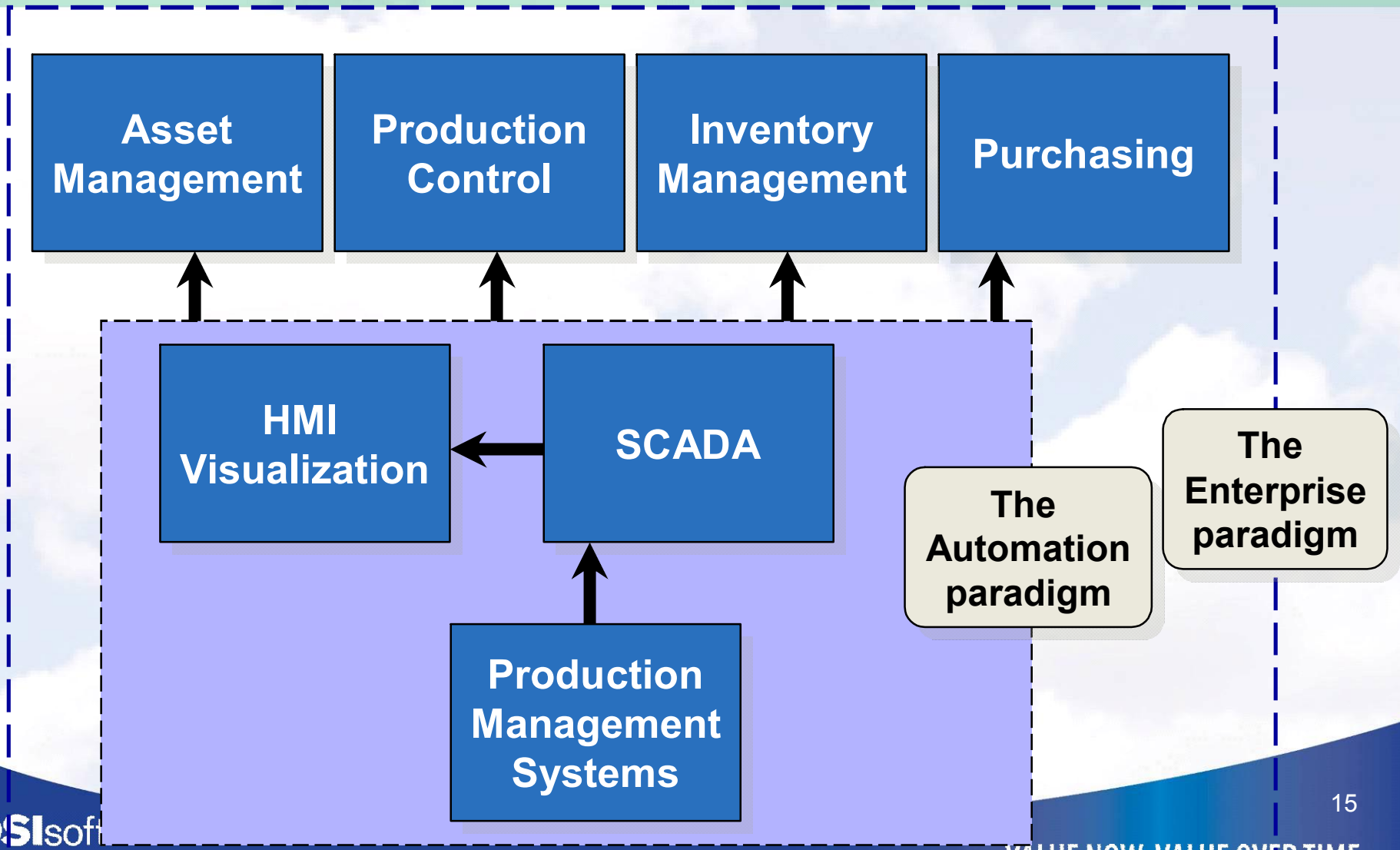
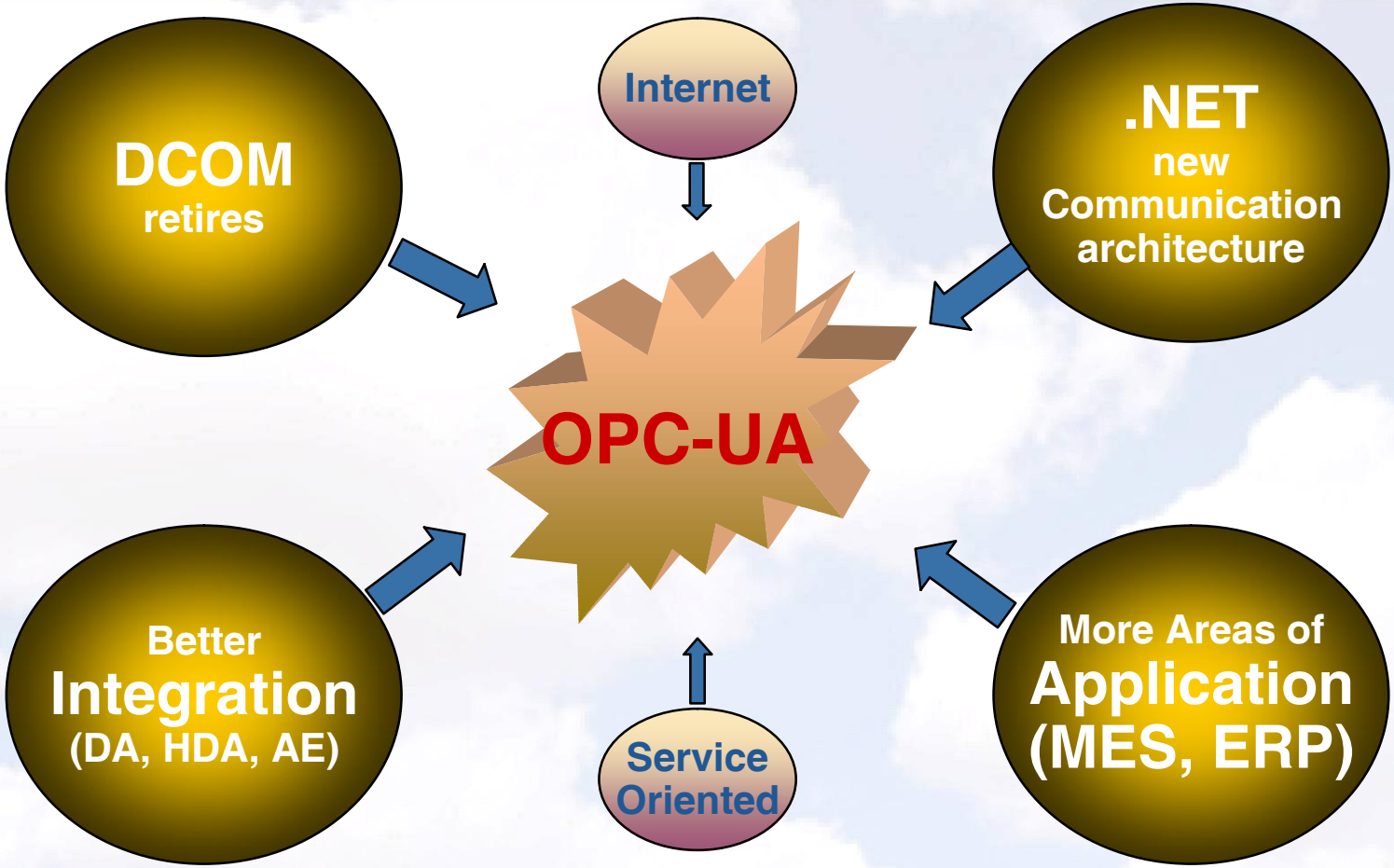
Unified Architecture Evolution



OPC Unified Architecture Motivation



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OPC UA Overview

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OPC Unified Architecture

- Web Services / XML
- Easy Configuration and Maintenance
- Increased Visibility
- Broader Scope
- Reliability, Reliability, Reliability
- Security, Security, Security
- Performance, Performance, Performance
- Platform Neutrality
- Legacy Products Plug Right In…

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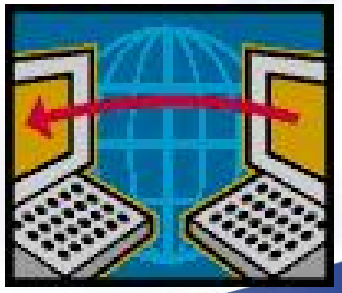
OPC-UA Fundamentals

- Based on standards for the Web
  - XML, WSDL, SOAP, WS-*
- WS-Policy negotiates protocol and encoding
- WS-SecureConversation provides secured sessions
- Optimized for the Intranet
  - OPC Binary encoding over TCP



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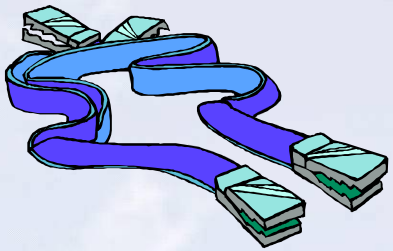
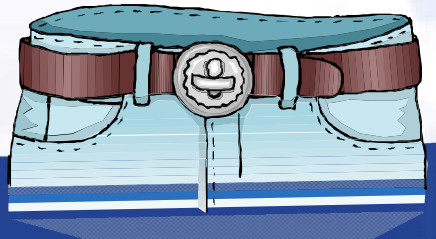
Robustness



- Subscription Update Features
  - Keep-alive (heartbeat) messages
    - Allows clients to detect a failed server or channel
  - Sequence Numbers in each update message
    - Allows client re-sync to obtain missed messages
  - Decouples callback channel from notification mechanism, allowing callback channel to be reset without loss of data
- Redundancy Features
  - Designed for easy (optional) redundancy of both Clients and Servers
    - e.g. re-sync request can be sent to a backup server



Security

- UA Clients present credentials to UA Servers (x509 certs on both sides).
- UA Servers require authentication and authorization.
  - Access control can be fine-grained down to the property level.
- Optional message signing and encryption.

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OPC Unified Architecture

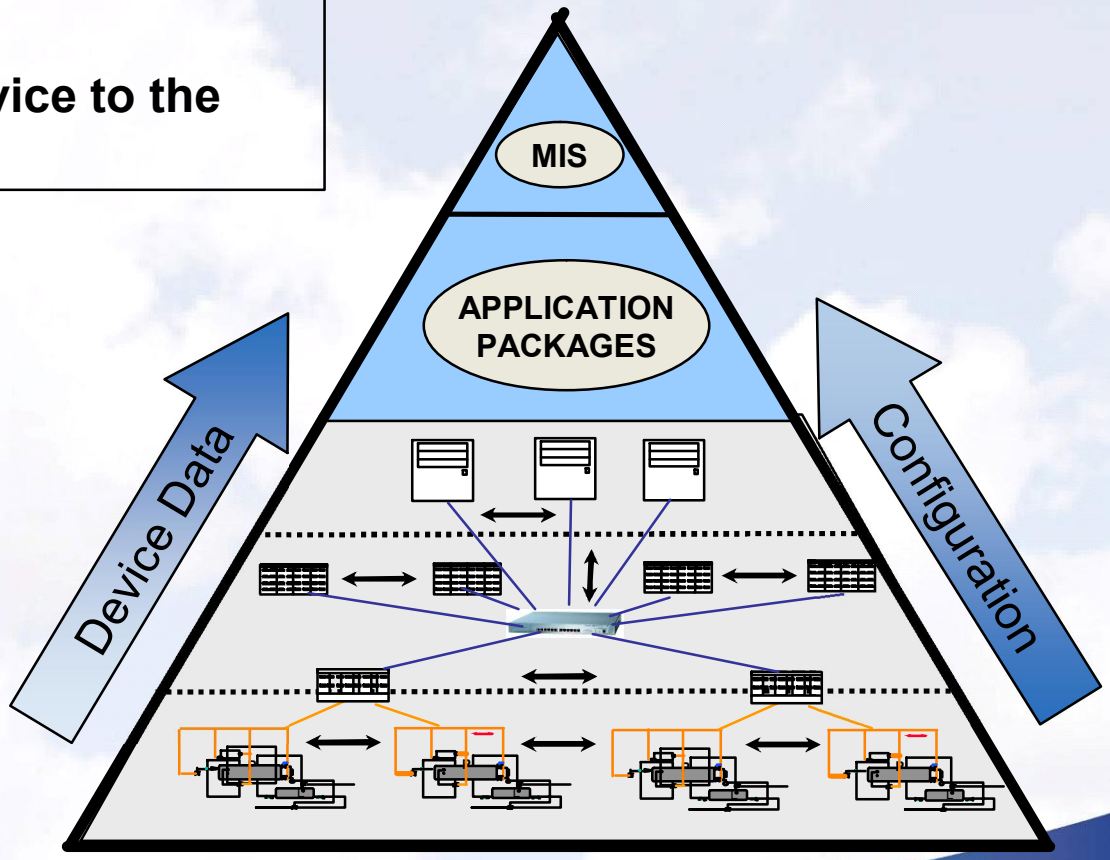
Open Standards to Deliver Interoperability

Device to Device and Device to the Enterprise

Enterprise Integration (ERP, Asset Management, Advanced Diagnostics, etc.)

Subsystem Integration

Device Integration (FF, Profibus, HART, etc)



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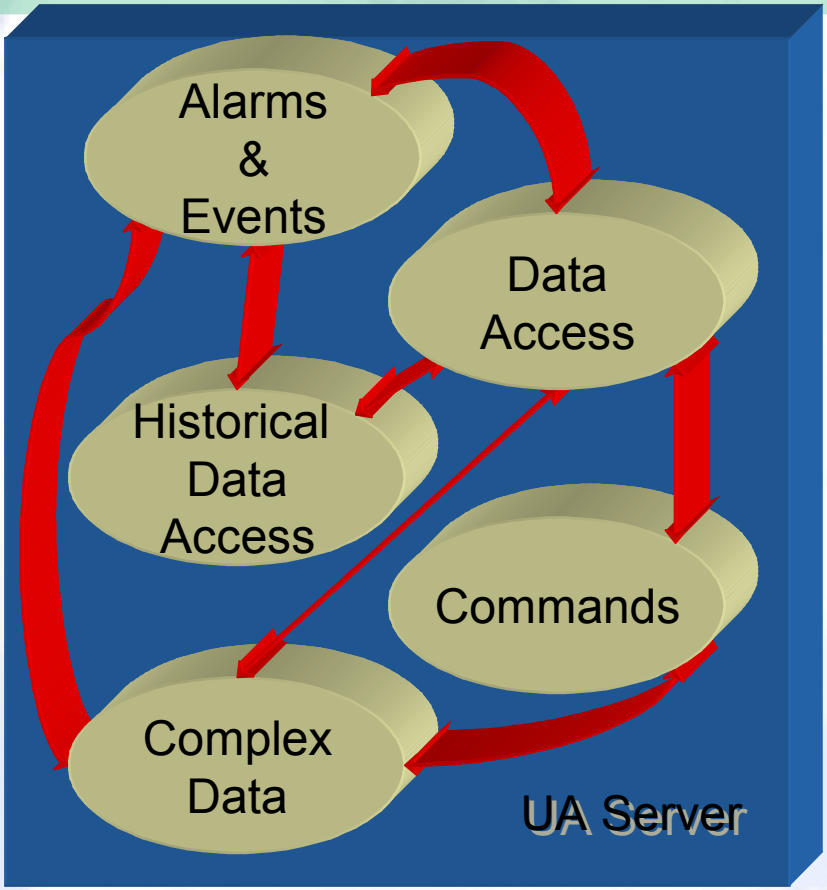
OPC Interface Unification



- SOA
- Single set of Services
  - Query, Read, Write, Subscribe…
- Named/Typed relationships between nodes.

The UA Server embodies the functionality of existing OPC Servers using a single set of services

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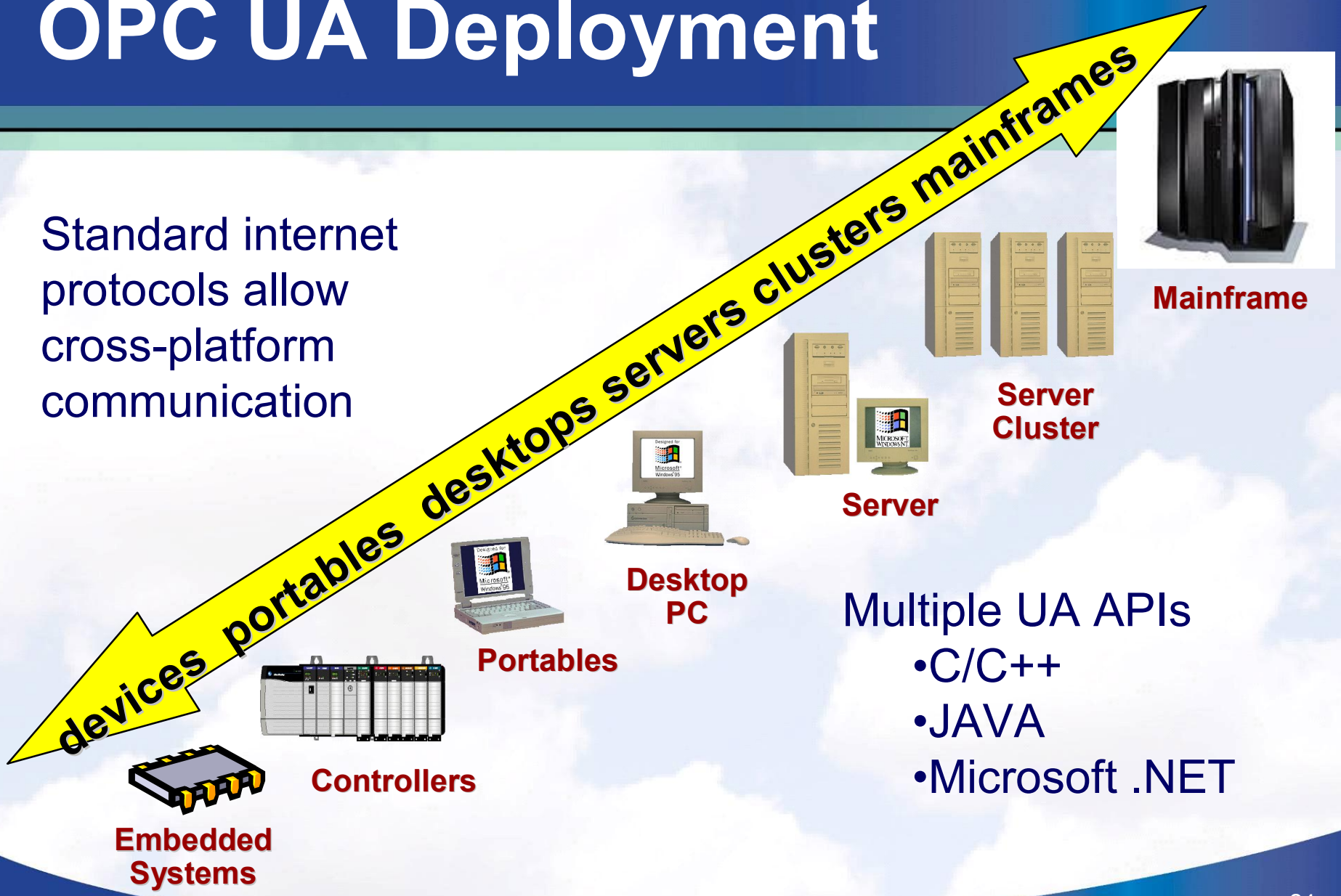
OPC UA Deployment

Standard internet protocols allow cross-platform communication



Multiple UA APIs

- C/C++
- JAVA
- Microsoft .NET

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Existing OPC Features Retained

- Address Space visibility through browsing & query
- Efficient report-by-exception communication
- Similar base information models for easy adapters

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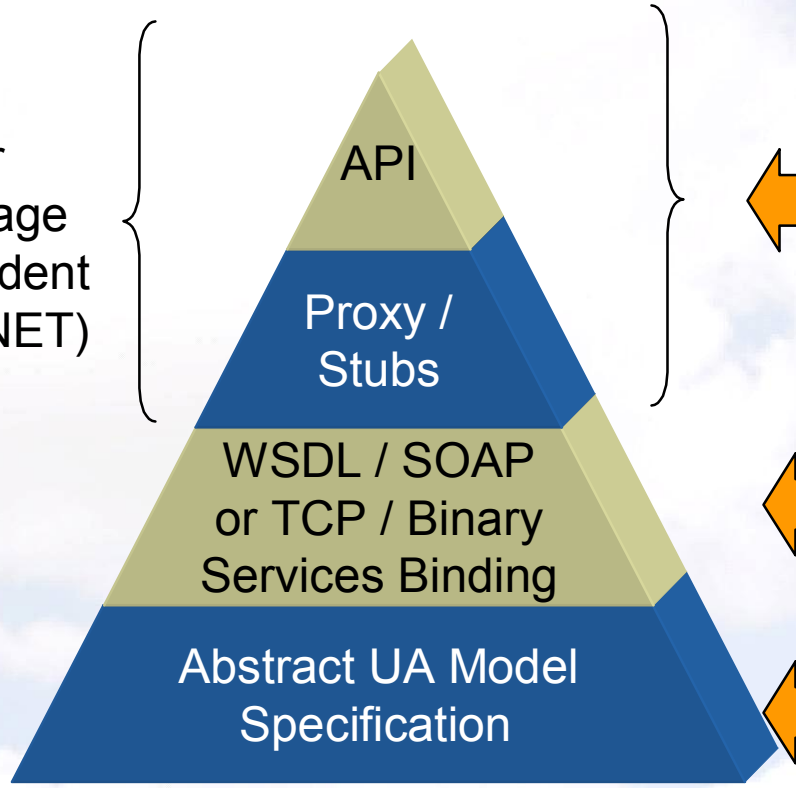
Communication Layering



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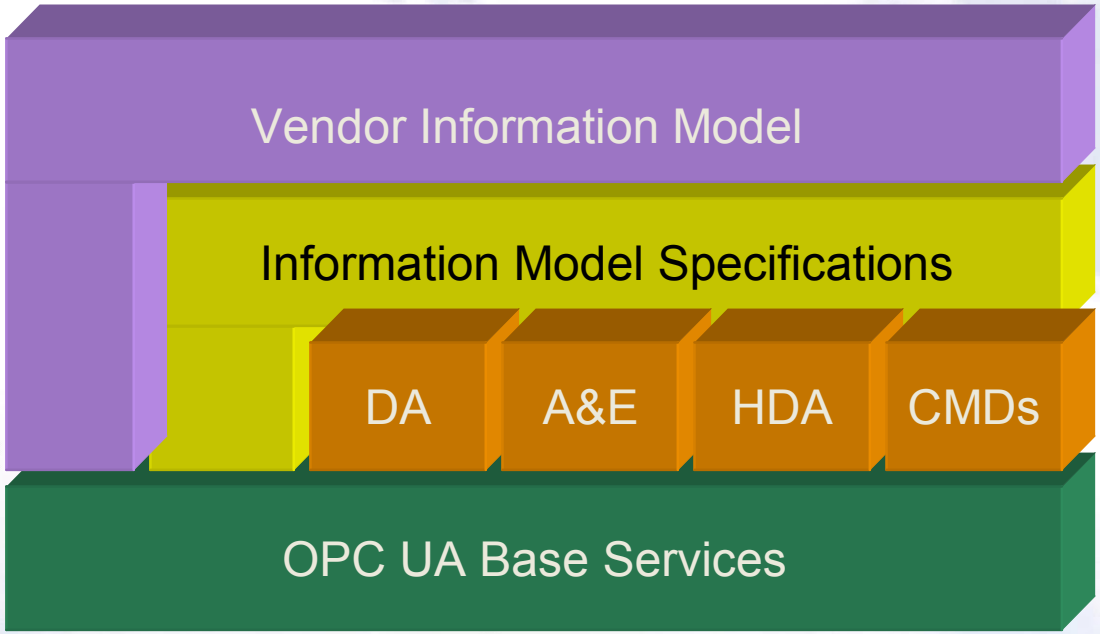
Specification Layering



IEC, ISA, OAGi, EDDL…

OPC Information Model

All Necessary Services

Clients written to just the base can still discover and access all data from the derived layers!

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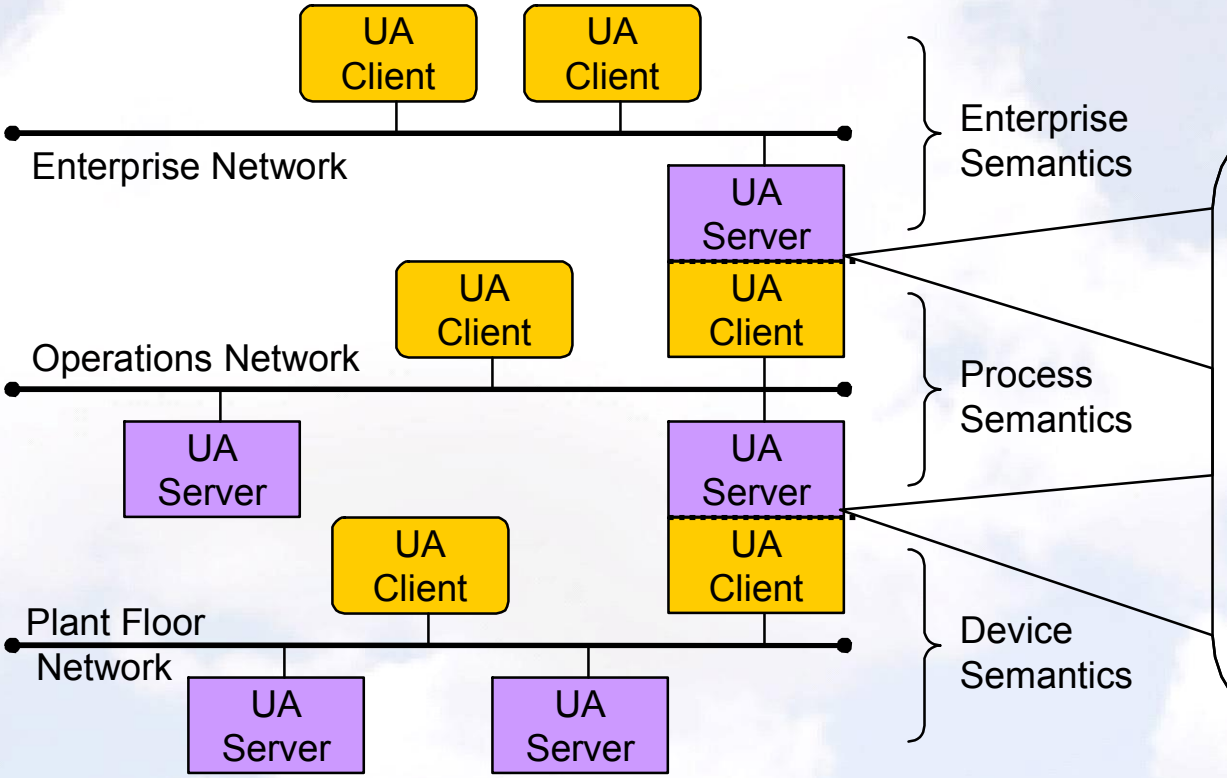
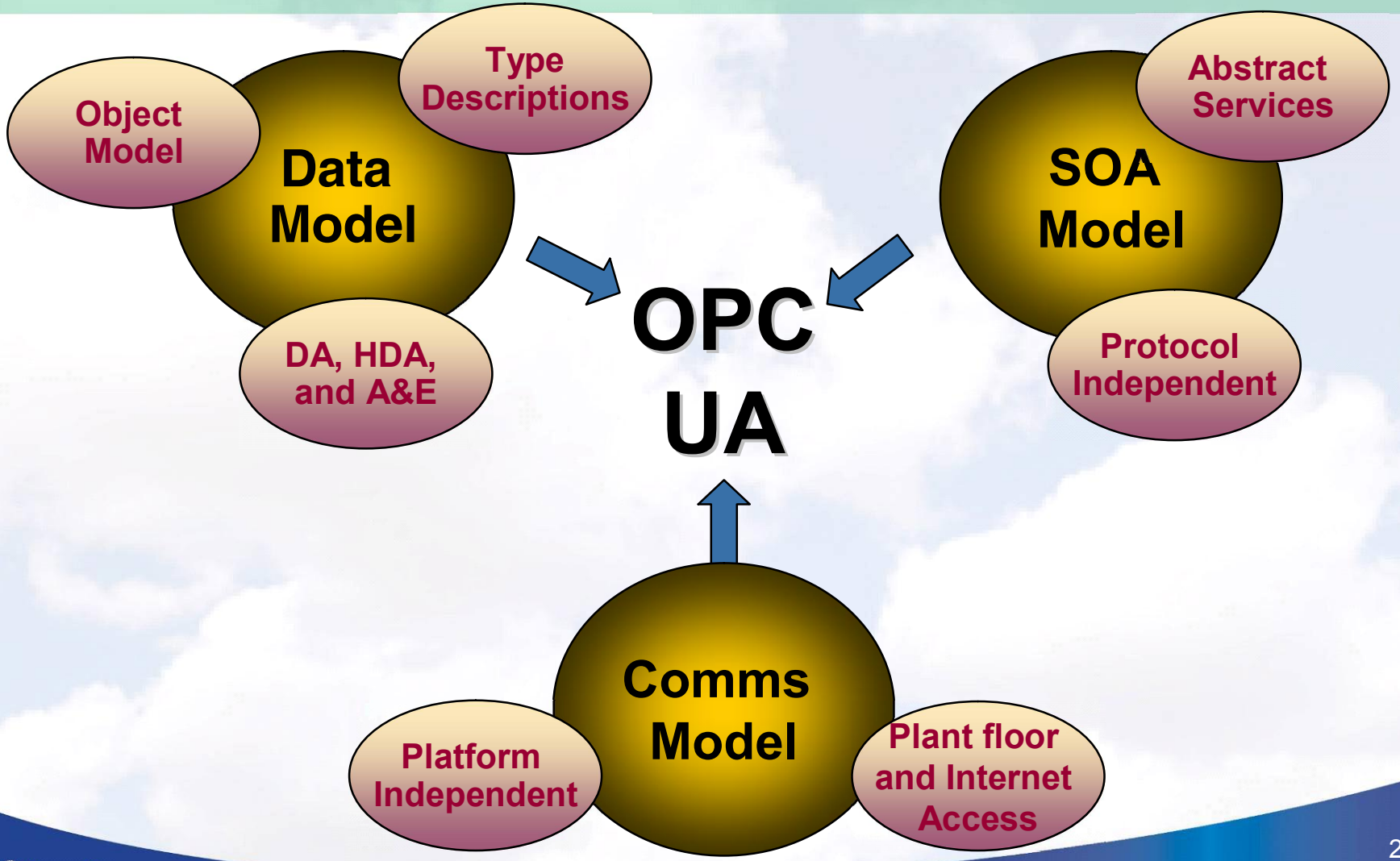
UA Server Chaining



"Aggregating" UA Servers extract and process data from lower level "Device" UA Servers.

Data is recast using different information models appropriate for the clients at the higher level.

Putting it all together



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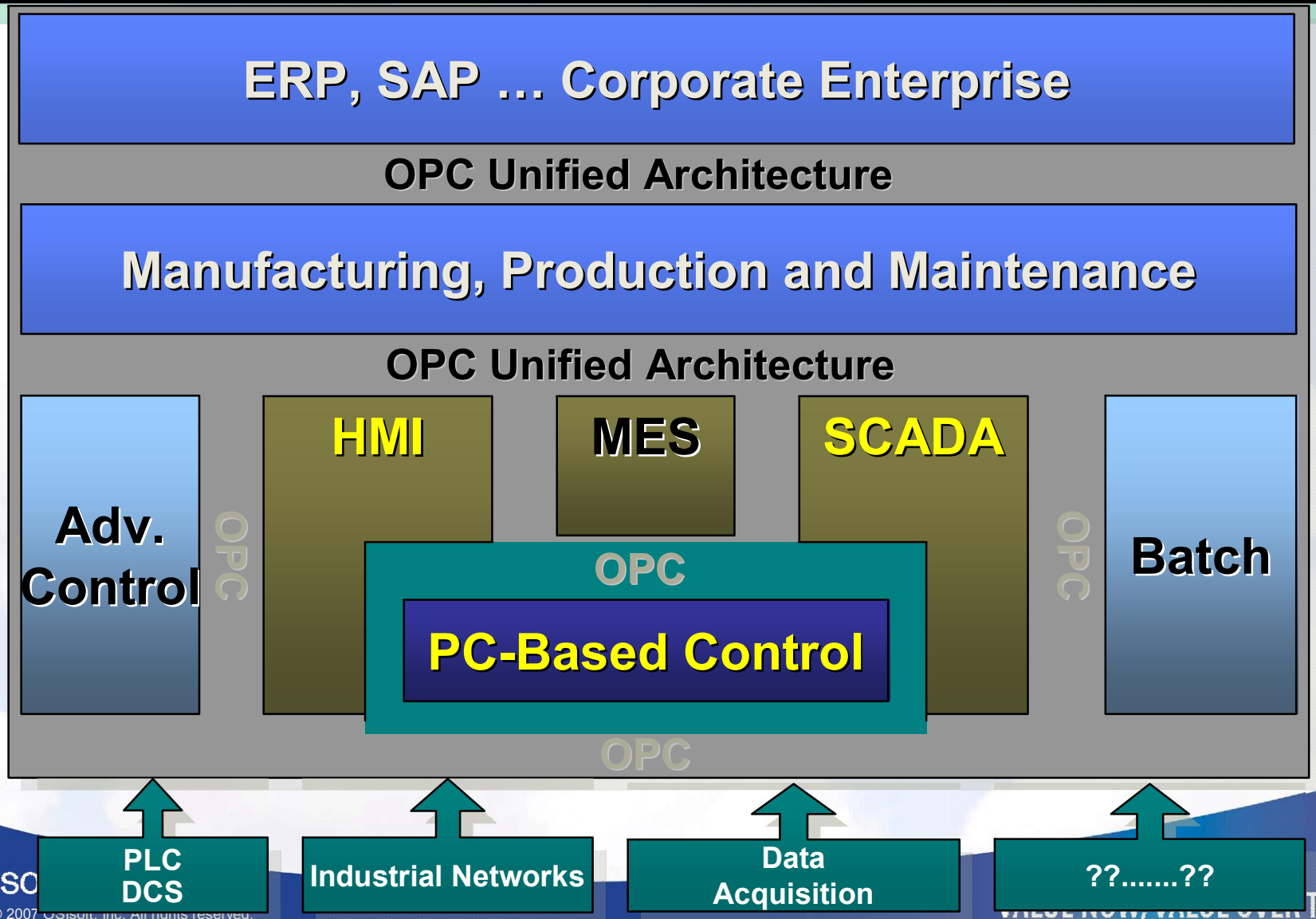
OPC Provides Industry-Standard interOperability, Productivity & Collaboration



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Who, What, When, Where & How

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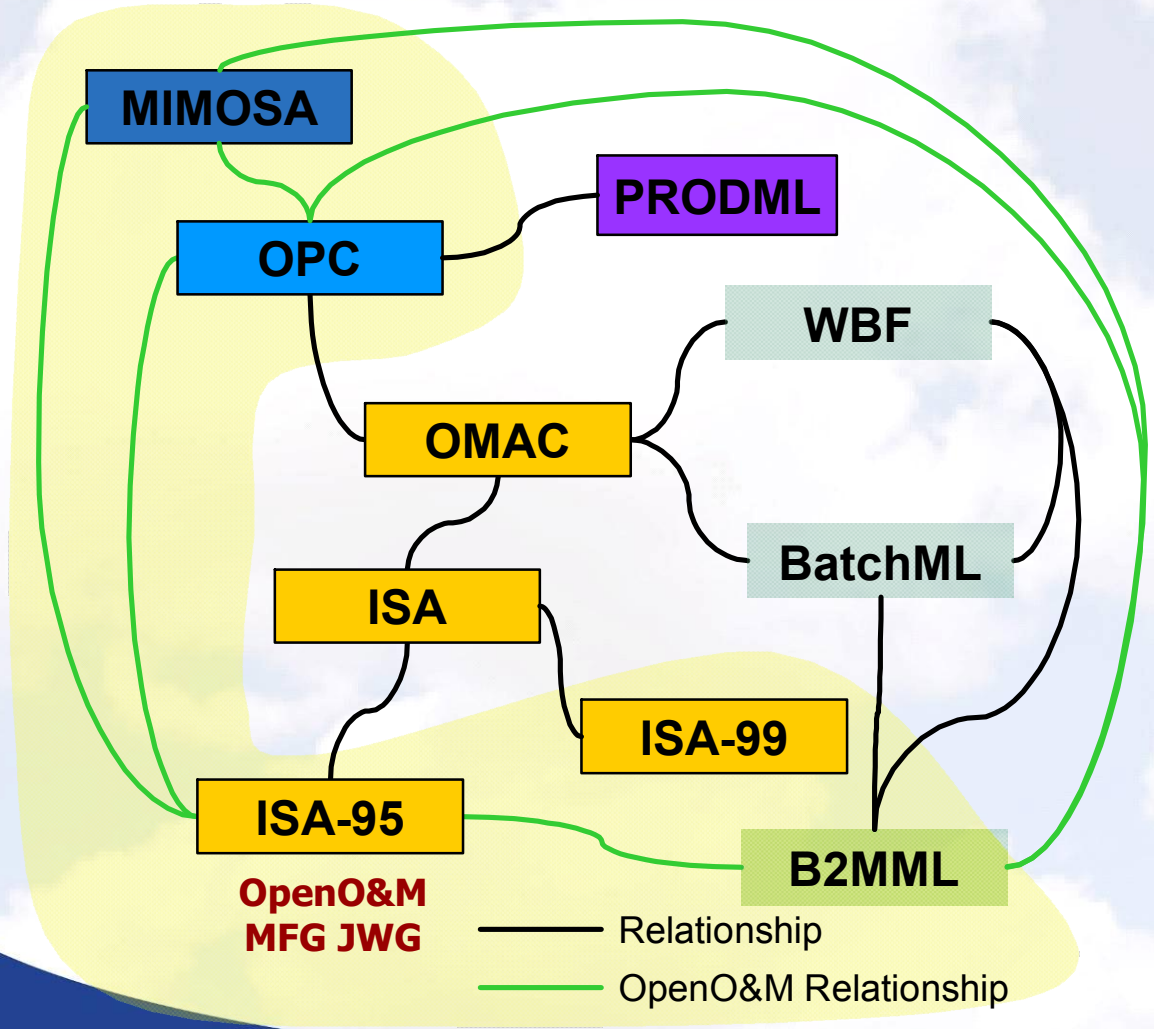
OPC UA Early Adopter Companies

- ABB
- Absynt Technologies Ltd
- ascolab GmbH
- Beckhoff
- CAS
- Cognex
- Cyberlogic
- Helsinki University of Technology
- Honeywell
- Iconics
- InduSoft LLC
- Ing.-Buero Allmendinger
- Invensys/Foxboro
- Invensys/Wonderware
- Kepware
- Matrikon
- Metso Automation
- Microsoft
- OPC-F
- **OSIsoft, Inc.**
- Prosys PMS Ltd
- Rockwell
- SAP
- Siemens
- SISCO
- SMAR
- Softing AG
- Software Toolbox
- SRI International
- Tampere University of Technology
- Technosoftware AG
- VTT
- Wapice Ltd
- Yokogawa Electric Asia

Standards and Collaboration



OpenO&M – Joint work by MIMOSA, OPC & ISA-95 to integrate operations and maintenance information

ISA Standards

ISA-95 – Enterprise/Control System Interface Standard, Parts 3 & 4 define MES Functions

ISA-99 – Control System Cyber-Security Standard

OMAC – Open Modular Architecture Controls group standardizing packaging machinery interfaces

WBF

BatchML – XML Schemas based on ISA-88

B2MML – XML Schemas based on ISA-95

OPC – DCOM and XML interfaces. New Web Services Unified Architecture (UA) under development

MIMOSA – Asset Mgt and Maintenance Mgt Schema, Meta Data and Interfaces

PRODML – A Shared Solution for Upstream Oil and Gas Companies to Optimize Their Production

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Market Interoperability

- OPC used in process & discrete manufacturing
- OPC adopted in the following:
  - Semiconductor
  - Plant Maintenance and Production Management
  - Industrial Ethernet …..
  - Security
  - Building Controls
  - RFID
  - Retail/ Financial
  - ….

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OSIsoft's Involvement in OPC and OPC Products

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OSIsoft's involvement in OPC

- Corporate Member of OPC Foundation since 1996
- Helped develop OPC HDA Specification
- Active participant of major OPC Foundation events (IOP workshops, DevCon's, etc.)
- Intimately involved in developing UA specifications and code deliverables
  - UA Working group
  - Early Adopters Program
  - Technical Advisory Council
  - Collaboration

OSIsoft's Current OPC Products

- OPC Interface – Data Access (DA) client
  - 33% of interfaces shipped today are OPC
  - 25% of all active interface nodes are running OPC
- OPC HDA Interface – Historical DA (HDA) client
- OPC A&E Interface – Alarms & Events client
- XML Interface – XML DA client
- OPC DA Server
- OPC HDA Server
- Testing and configuration tools

Migration to OPC UA

Why Offer a Migration Path?

- OPC Foundation offers a comprehensive migration strategy to UA
  - Maintain momentum of OPC technology
  - Sustain confidence in the existing OPC products
  - Help vendors to adopt UA
  - Facilitate native UA product development
  - Bring UA products to the market faster

- Provide a smooth transition from COM/DCOM to SOA
  - Deployment and configuration
  - Security infrastructure
  - Platform independence

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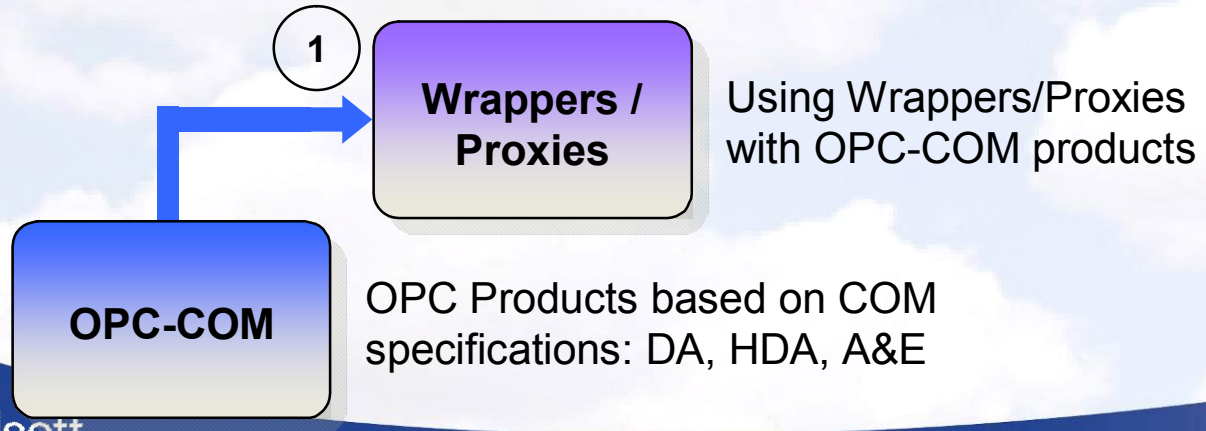
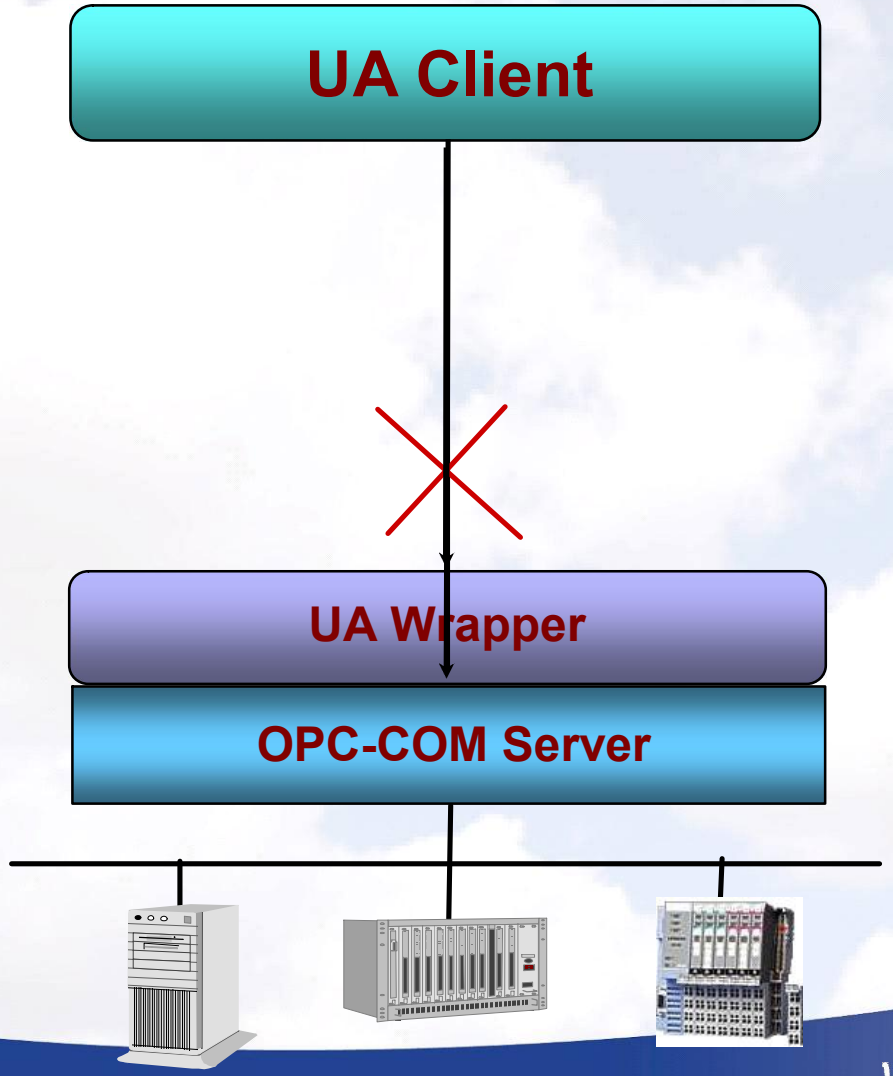
Migration Stages (1)

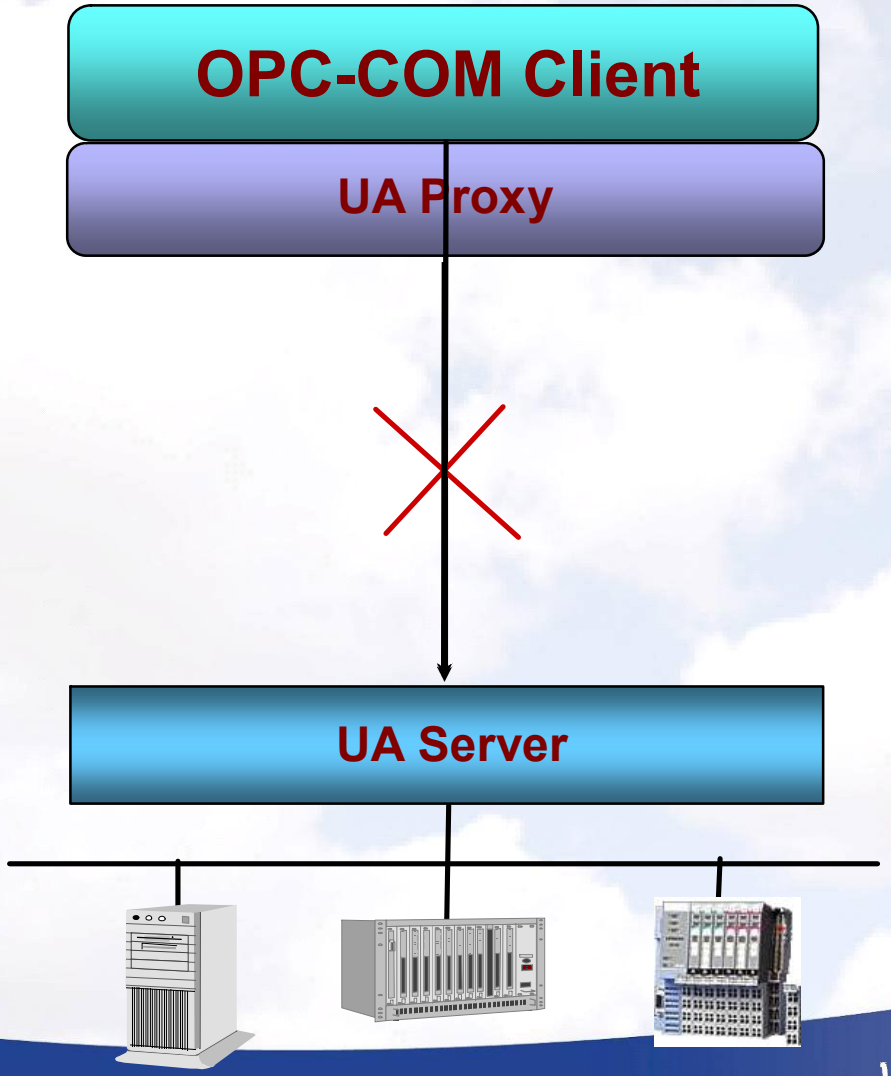
- Using Wrappers and Proxies
  - Wrappers are used for OPC-COM Servers
  - Proxies are used for OPC-COM Clients



UA Wrappers

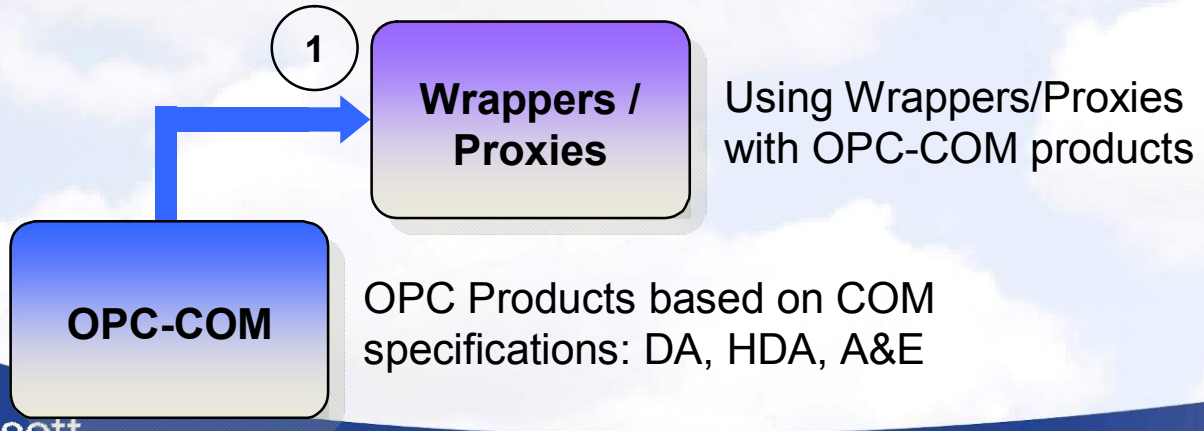


UA Proxies



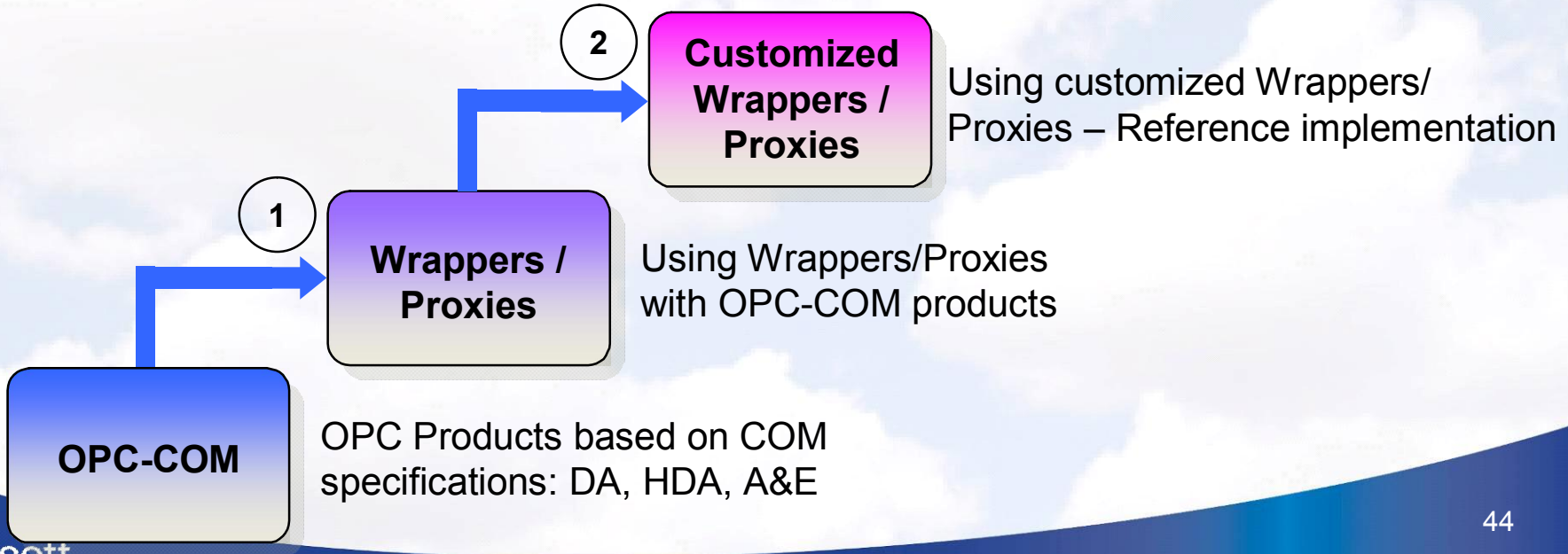
Migration Stages (1)

- Using Wrappers and Proxies
  - Wrappers are used for OPC-COM Servers
  - Proxies are used for OPC-COM Clients
  - Separate wrappers for DA, HDA, A&E
  - Separate proxies for DA, HDA, A&E
  - Distributed with OPC-COM products
  - Configuration tools



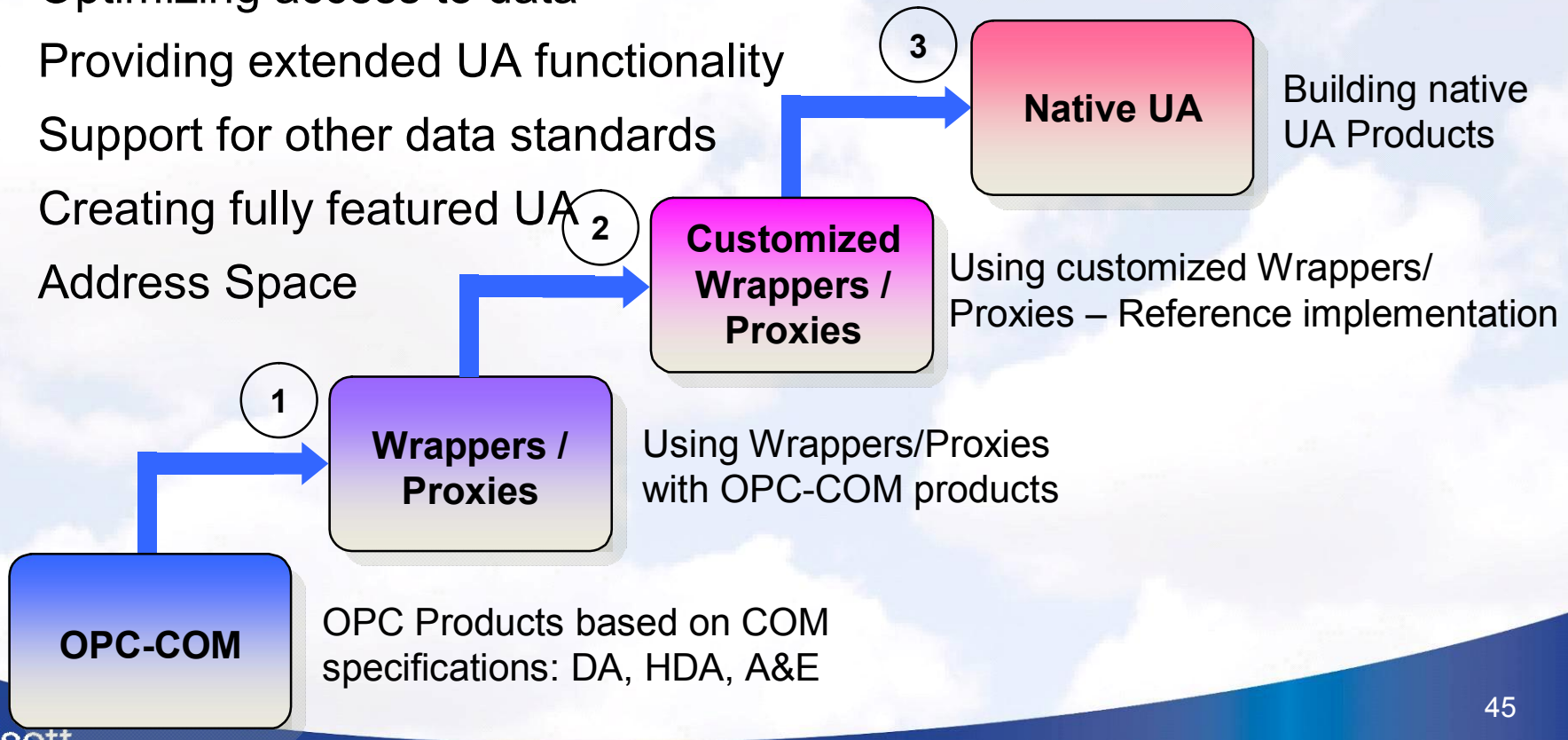
Migration Stages (2)

- Reference Implementation
  - Building UA apps on top of existing infrastructure
  - Customizing wrappers and proxies
  - Providing limited UA functionality
  - Enabling UA security



Migration Stages (3)

- Native UA implementation involves
  - Building UA apps on top of new infrastructure
  - Optimizing access to data
  - Providing extended UA functionality
  - Support for other data standards
  - Creating fully featured UA Address Space



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OSIsoft's Goals for OPC UA and What This Means for You

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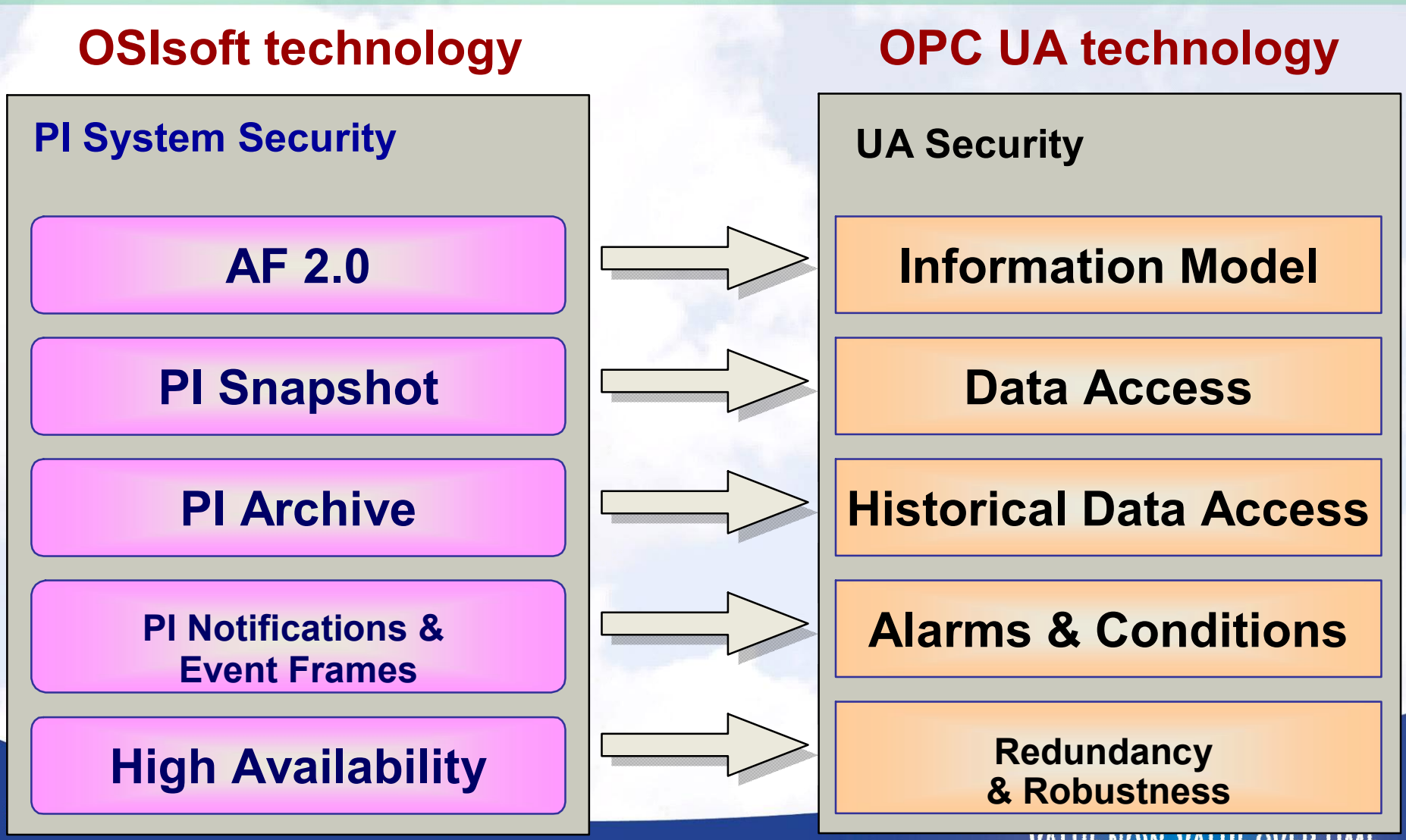
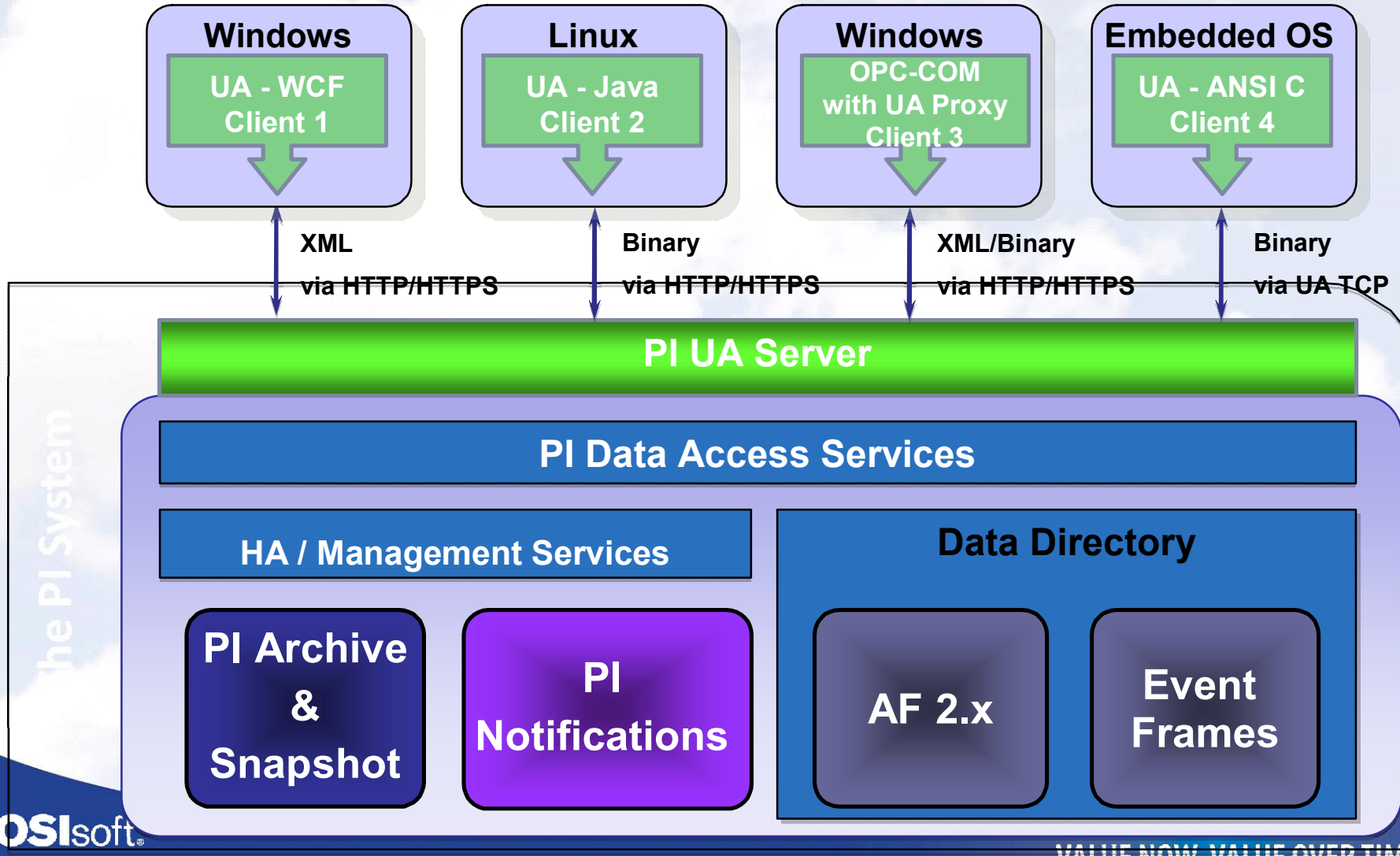
OSIsoft's Goals for OPC UA

- OSIsoft is committed to supporting UA
- Migration strategy includes support of existing OPC products and development of native UA products
- Develop a UA Server that will allow accessing PI System data in a standard and consistent way
- Support data transfer through UA into PI leveraging our smart connector and asset connector concepts
- OPC UA will be one of the primary data access mechanisms for PI System
- OPC UA products will be certified by the OPC Foundation

Mapping OSIsoft Technology to UA



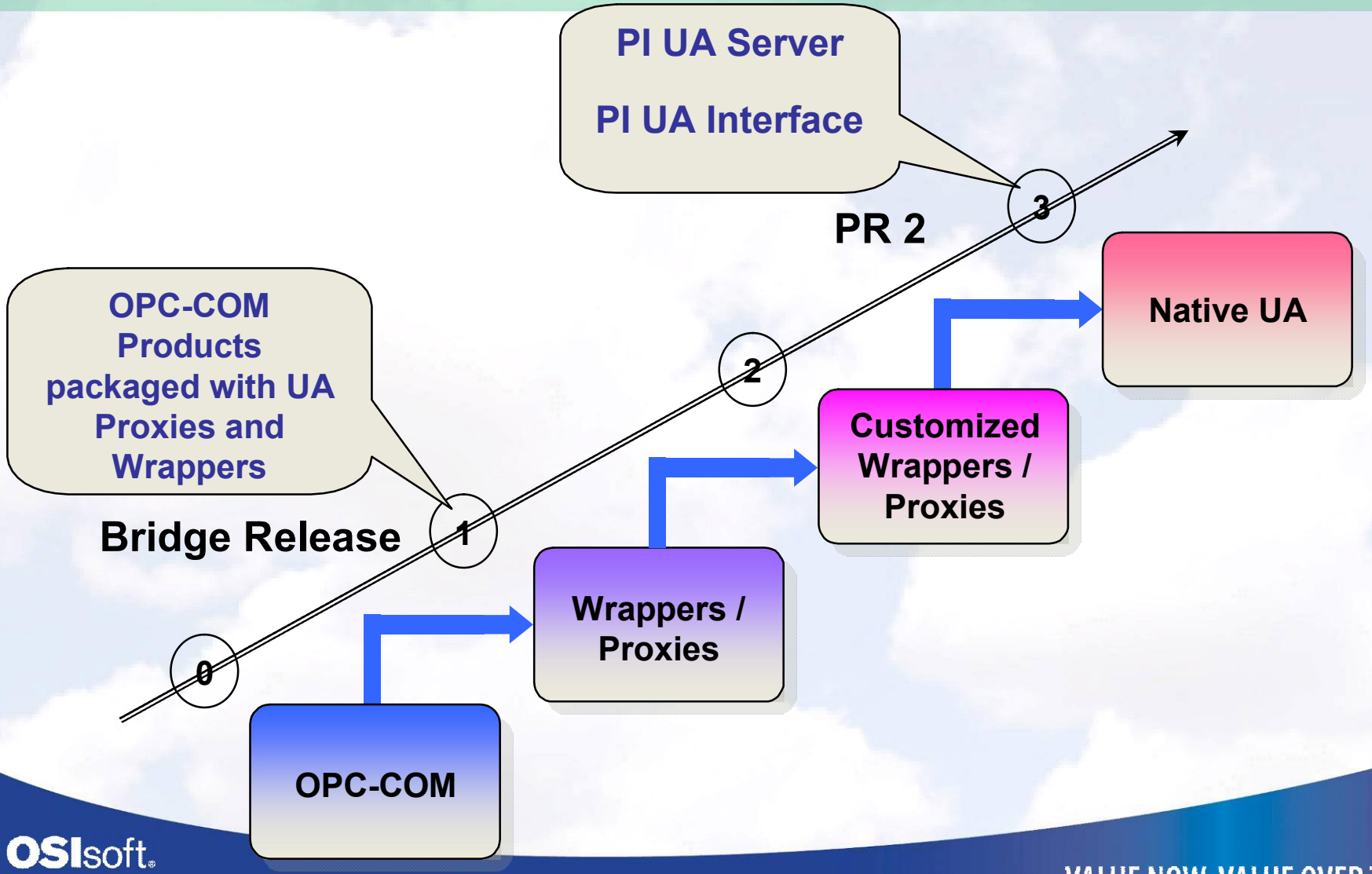
UA Server for PI System



Benefits from PI & OPC UA

- Access to AF Asset Models, PI Notifications, Event Frames
- Data and information exchange between OPC applications in a secure environment
- Enhanced robustness and reliability
- Support for other data standards (i.e. S88, S95, MIMOSA, EDDL, PRODML, B2MML, etc.)
- Support for multiplatform interoperability (Windows, Linux, UNIX, Embedded OS, etc.)

OPC UA Roadmap



What is the Takeaway?

- OPC UA will be a first-class data access mechanism to the PI System
  - PI UA Server
  - PI UA Interface
- OSIsoft will continue to support OPC COM products
- OSIsoft provides a migration path to UA
- Come visit our OPC Pod on Thursday
- Stay tuned for more information…

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Thank You

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