

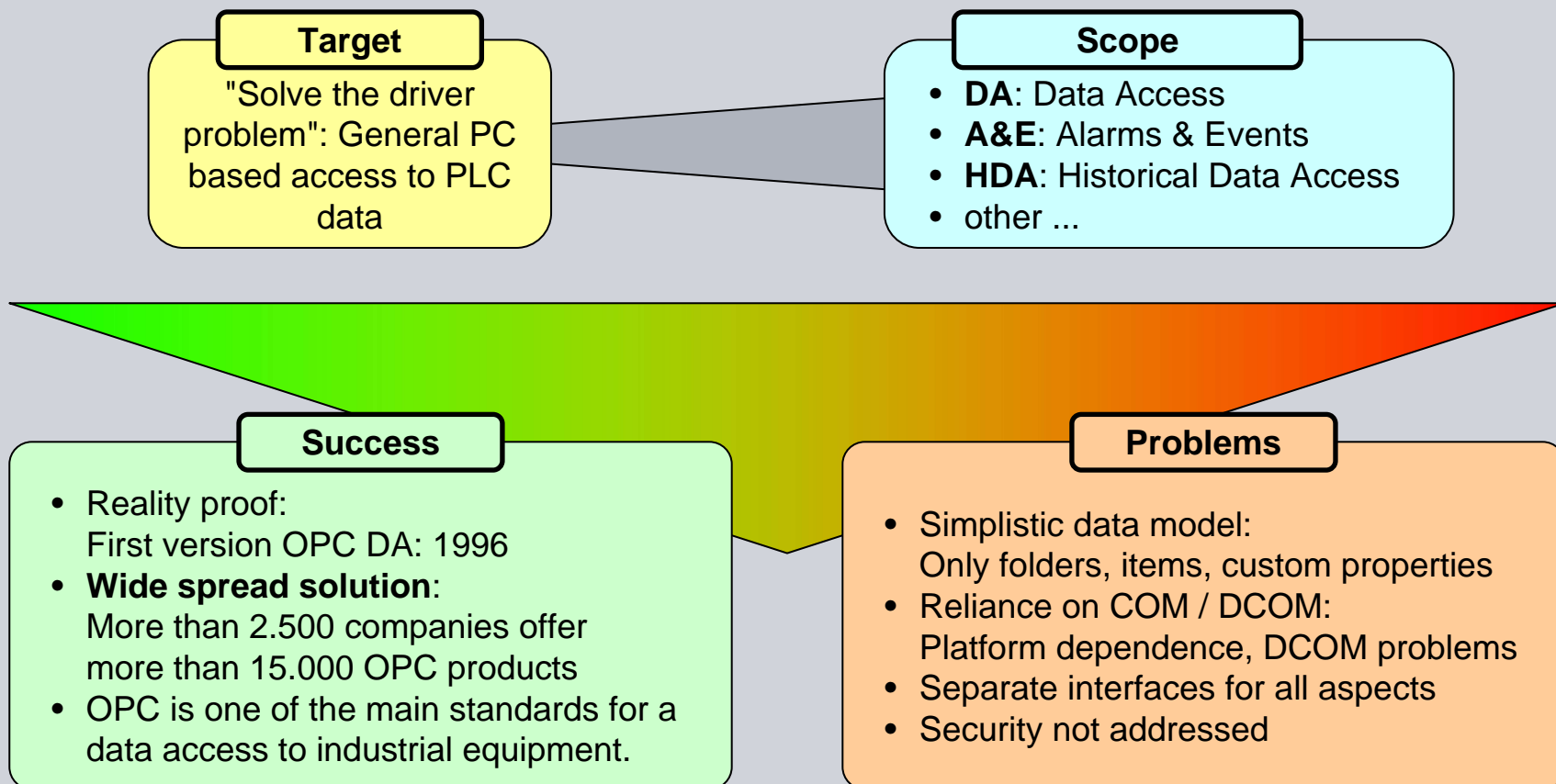
OPC Unified Architecture

Rome, October 2007



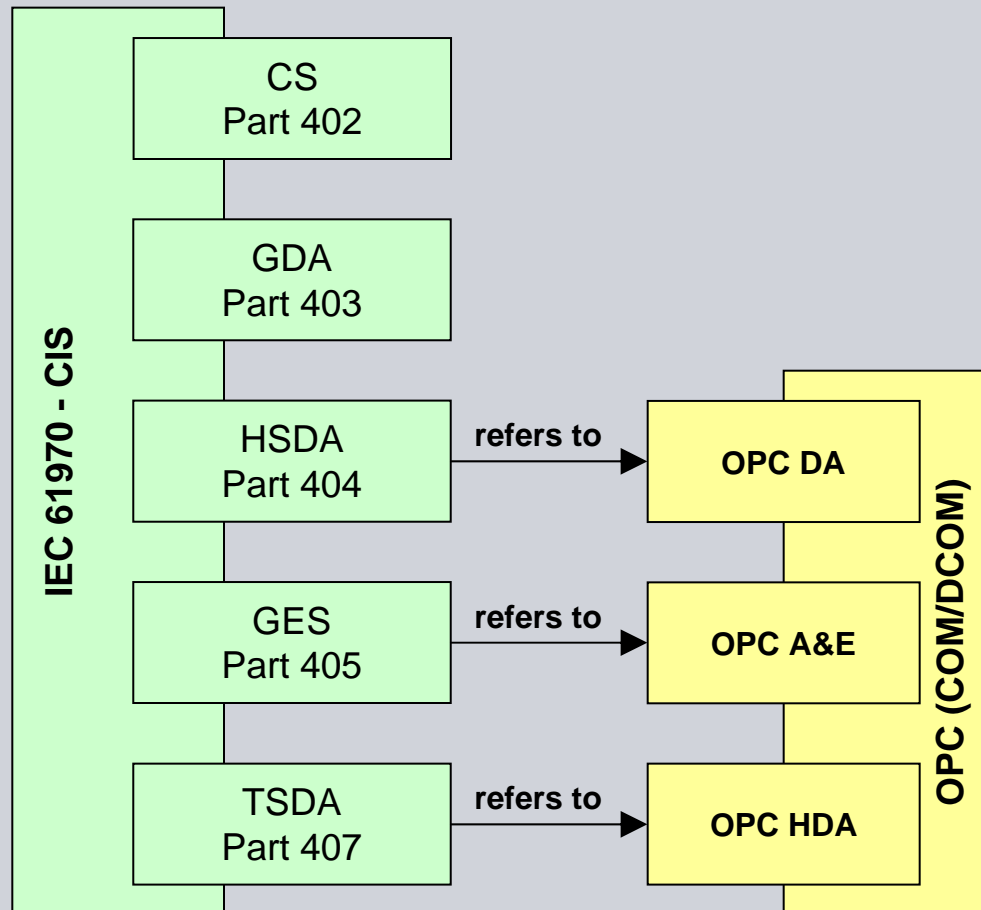
Classical OPC is widely used in industry, but has some shortcomings

OPC CLASSIC - SUCCESS AND PROBLEMS



There are relationships, but classical OPC can only cover parts of CIS

RELATIONSHIP IEC 61970 CIS - OPC



GAPS

- Missing object model:
No type instance concept
- Platform dependence:
Only for Microsoft Platforms
- No common services:
Each interface separate
- Some of the functions not covered or with smaller scope
- Focus on "southbound"
PLC like integration

Former OPC problems are addressed by OPC Unified Architecture (UA)

ISSUES ADDRESSED WITH OPC UNIFIED ARCHITECTURE

Single set of services

- "Service oriented": Few broad services (approximately 40)
- One set of services to cover all function of DA, A&E, HDA, CMD
- Common browse and query functions

Platform independence

- Separation between interface definition and technology mapping
- Reference implementations for .Net, ANSI-C, Java
- Focus also on embedded usage

No longer COM/DCOM

- Binary as well as HTTP protocols are defined (tech. mapping)
- Reference implementation for MS-platform without COM/DCOM: Usage of .Net 3.0 and WCF (Windows Communication Framework)

Structured data

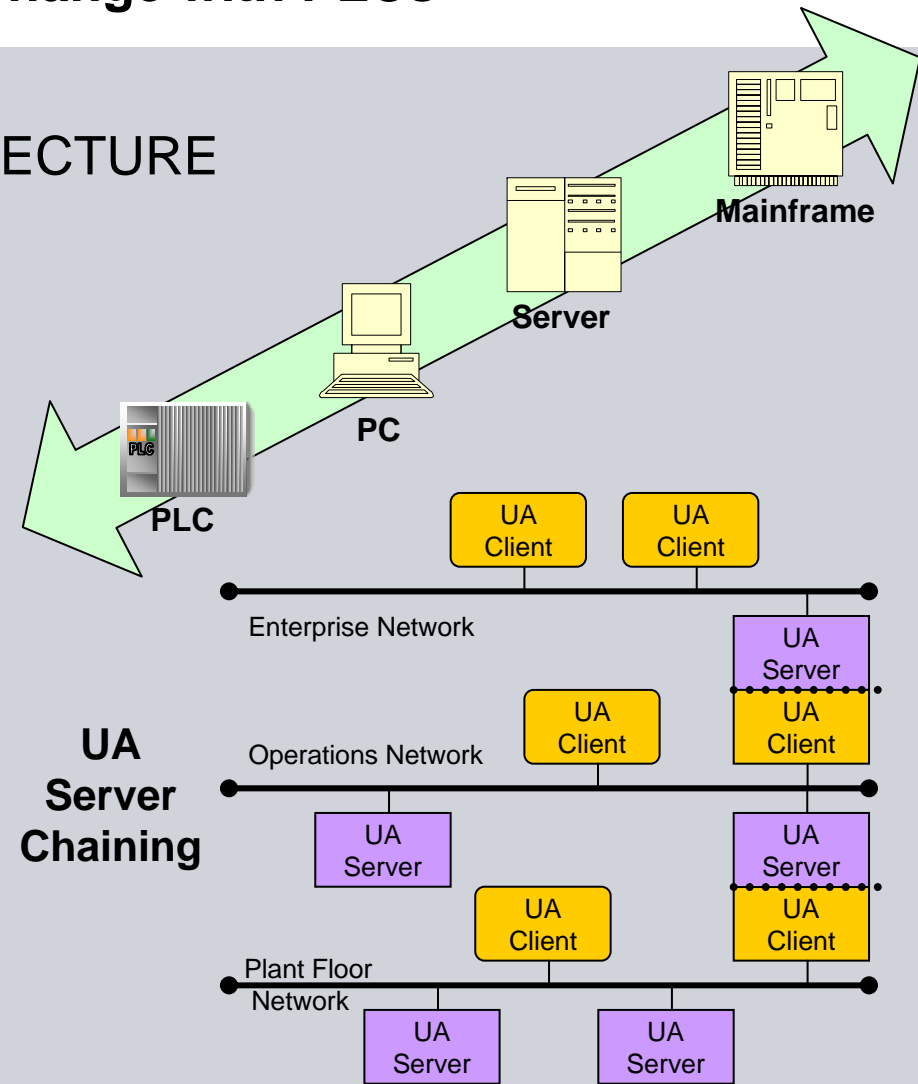
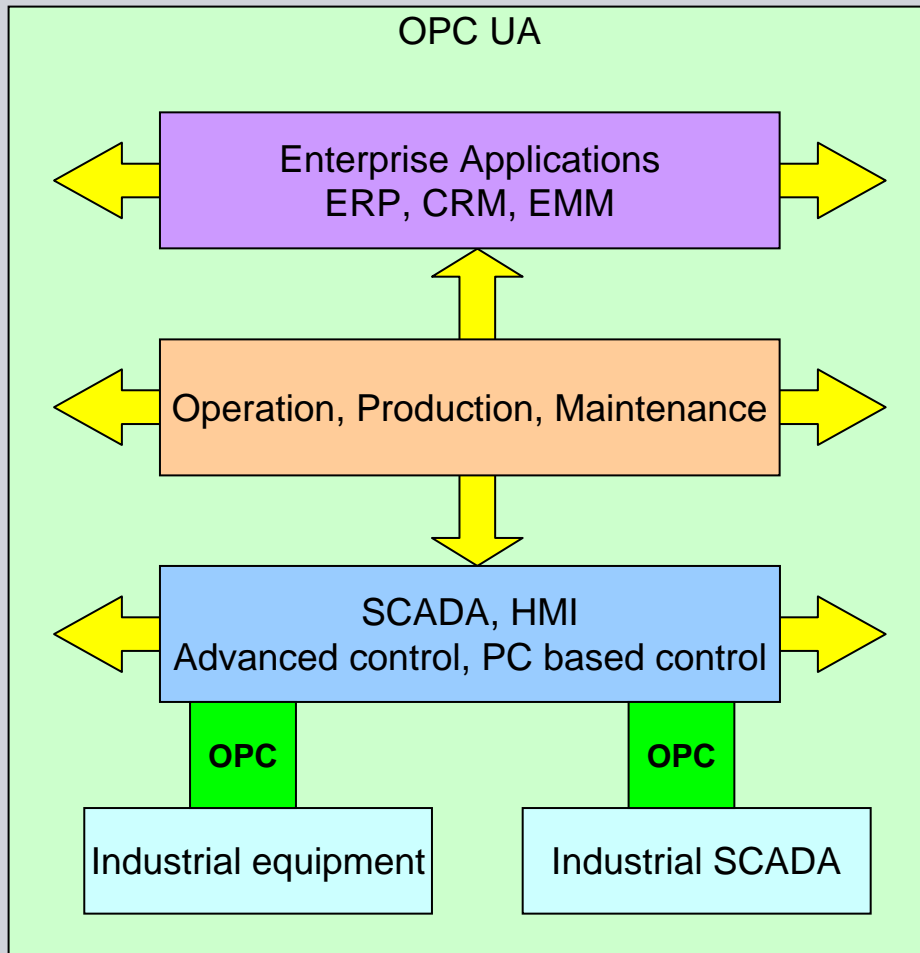
- Rich, browsable data model with associations
- Instances as well as types accessible via the interface
- Possibility to model and exchange complex structured data

Security

- Security is a non-optional feature
- PKI (public key infrastructure) is addressed
- WS-SecureConversation and other WS-Security standards considered

OPC UA not restricted to data exchange with PLCs

SCOPE OF OPC UNIFIED ARCHITECTURE



Reliability, robustness, and security are addressed in OPC UA

ROLE OF SECURITY AND ROBUSTNESS IN OPC UA

Reliability, Robustness, Performance

- **Robust Publish - Subscribe**
 - No Client-Side "Server"-Functionality
 - Mechanisms for timely detection of communication problems with rapid recovery
 - No loss of data via "Republish" and sequence numbers
- **Handling of Hardware Redundancy**
 - Redundant Clients and Server with Switch-Over Mechanisms
- **Performance:** Binary as well as XML channels

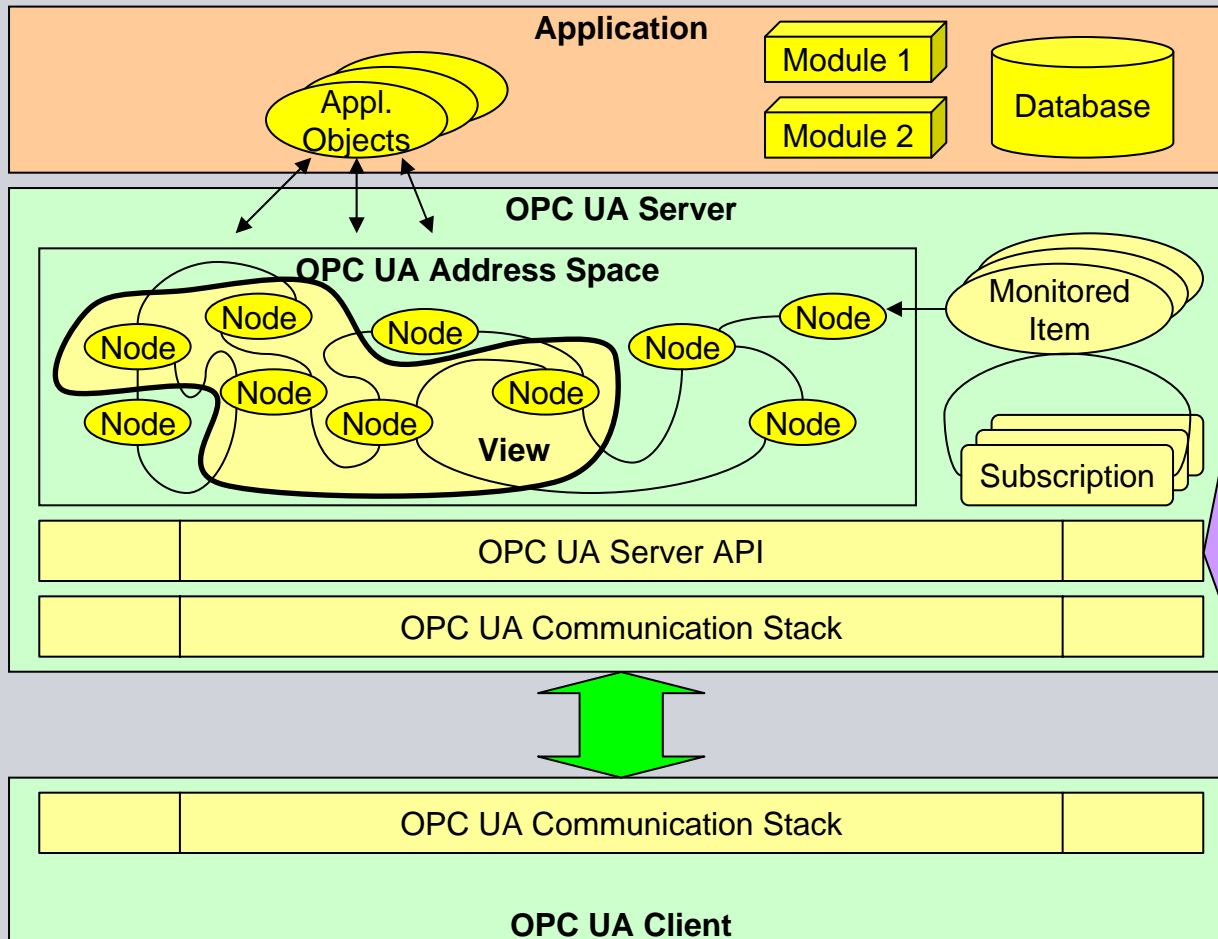
Security

- **Standards**
 - Basis are WS - Secure Conversation and a binary UA Secure Conversation
- **Authentication via Certificates**
 - Basis is a "Secure Channel"
 - Server as well as clients are validated via certificates
- **Confidentiality:** (Optional) Asymmetric encryption based on PKI
- **Authorization:** Functions accessible according to user rights

OPC UA maps application objects into address space for access by services

SERVICE SETS

GENERAL STRUCTURE OF OPC UA

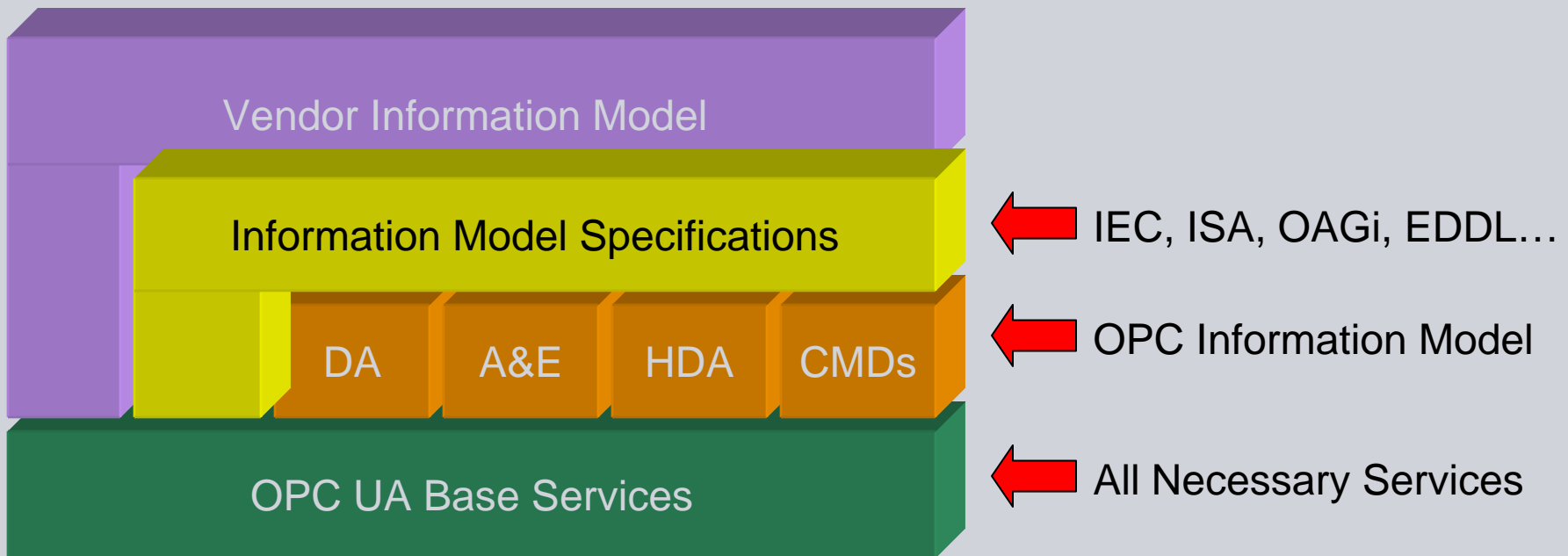


- Discovery**
Discover Servers
- SecureChannel**
Open / close secure commun.
- Session**
Open / close session
- View**
Hierarchical browsing along views
- Query**
Query the instances and types
- Attribute**
Read / write data (incl. history)
- MonitoredItem**
Specify data to subscribe to
- Subscription**
Subscribe to monitored items
- Method**
Call methods of nodes
- NodeManagement**
Add / delete nodes and references

Layered architecture allows data model to be included and used by client

SOURCE: OPC UA DEVCON 2007

ARCHITECTURE OF OPC UA

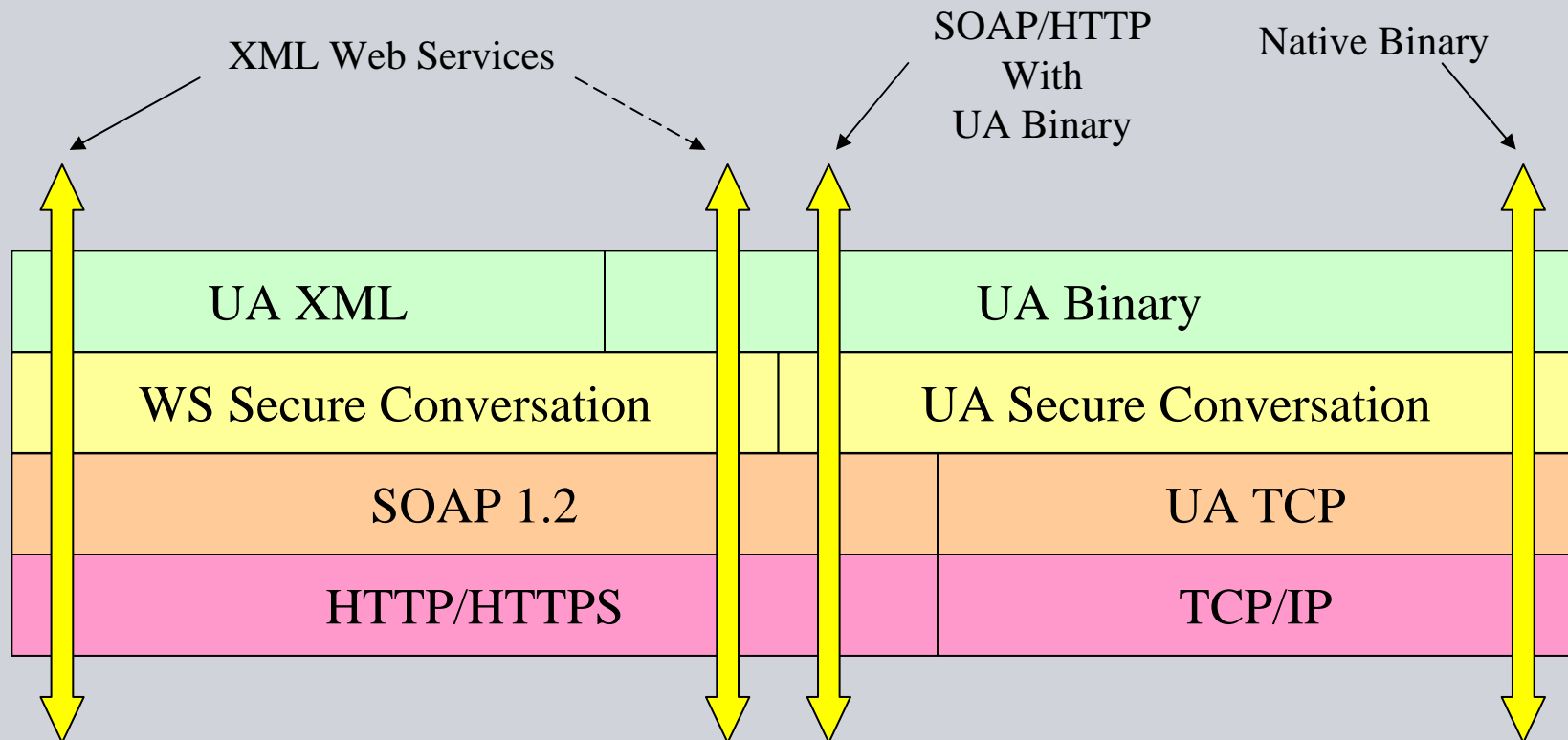


- Layered architecture allows data model information to be included at different levels
- Clients can be written in a generic way and nevertheless use all model information

Depending on requirements binary as well as structured XML communication is available

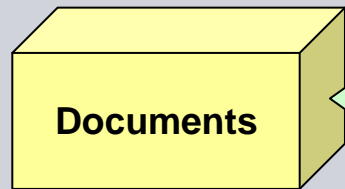
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THE OPC UA STACK

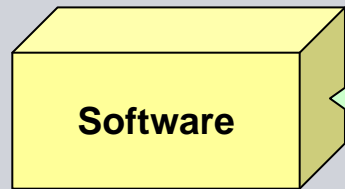


OPC UA is not just documents...

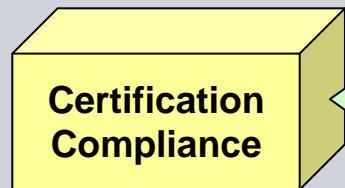
OPC UA DELIVERABLES



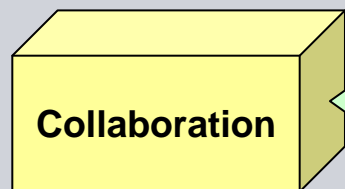
- **General Topics:** Concepts, Data Model, Security
- **Interfaces:** Services, Data Access, Historical Access, Alarms & Conditions, Programs
- **Technology:** Mappings, Profiles



- **OPC UA Stack:** .Net, JAVA, ANSI-C
- **Wrappers:** Wrapper for clients as well as servers to provide for a smooth migration path
- **Samples:** Sample client / server source code



- **Self Testing:** Defined environment, test cases for each profile, run tests against profile
- **Interoperability Testing:** Ad hoc profile based testing
- **Vendor Independent Testing:** OPC UA Test Labs



- **Target:** Define companion standards for industry specific adaptations and data models
- **Current Activities:** IEC, MIMOSA, ISA (S88/S95), WBF, EDDL / FDT, OAGi

OPC UA might help to implement Service Oriented Architecture (SOA) in industrial environments

SUMMARY

OPC UA overcomes many of the former COM OPC problems

OPC UA defines SOA for industry, considering special requirements for **reliability, performance, robustness, and security**

OPC UA may form the basis to implement interfaces compliant to industry specific data models.

OPC UA provides software tools for implementation of clients / servers as well as for testing them