

OPC Unified Architecture

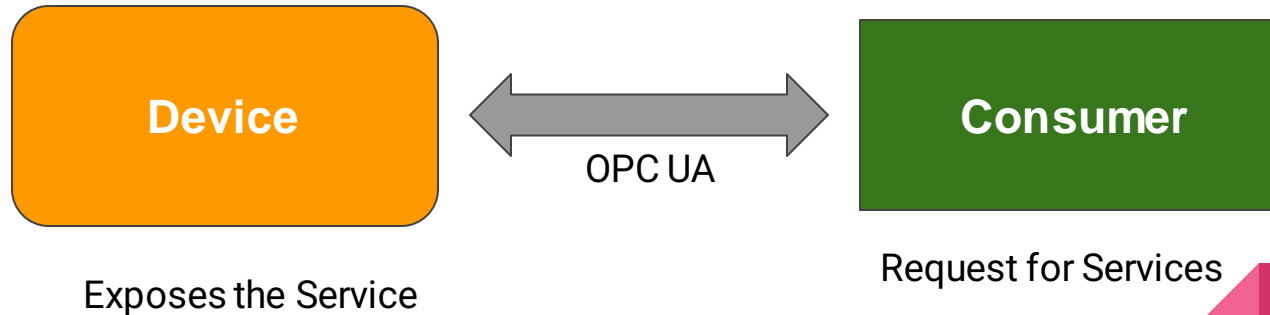
Kaushal K | Cdac, Pune | Jun2022

Agenda

- Features
- Layered Architecture
- Client Server Layout
- Security Model

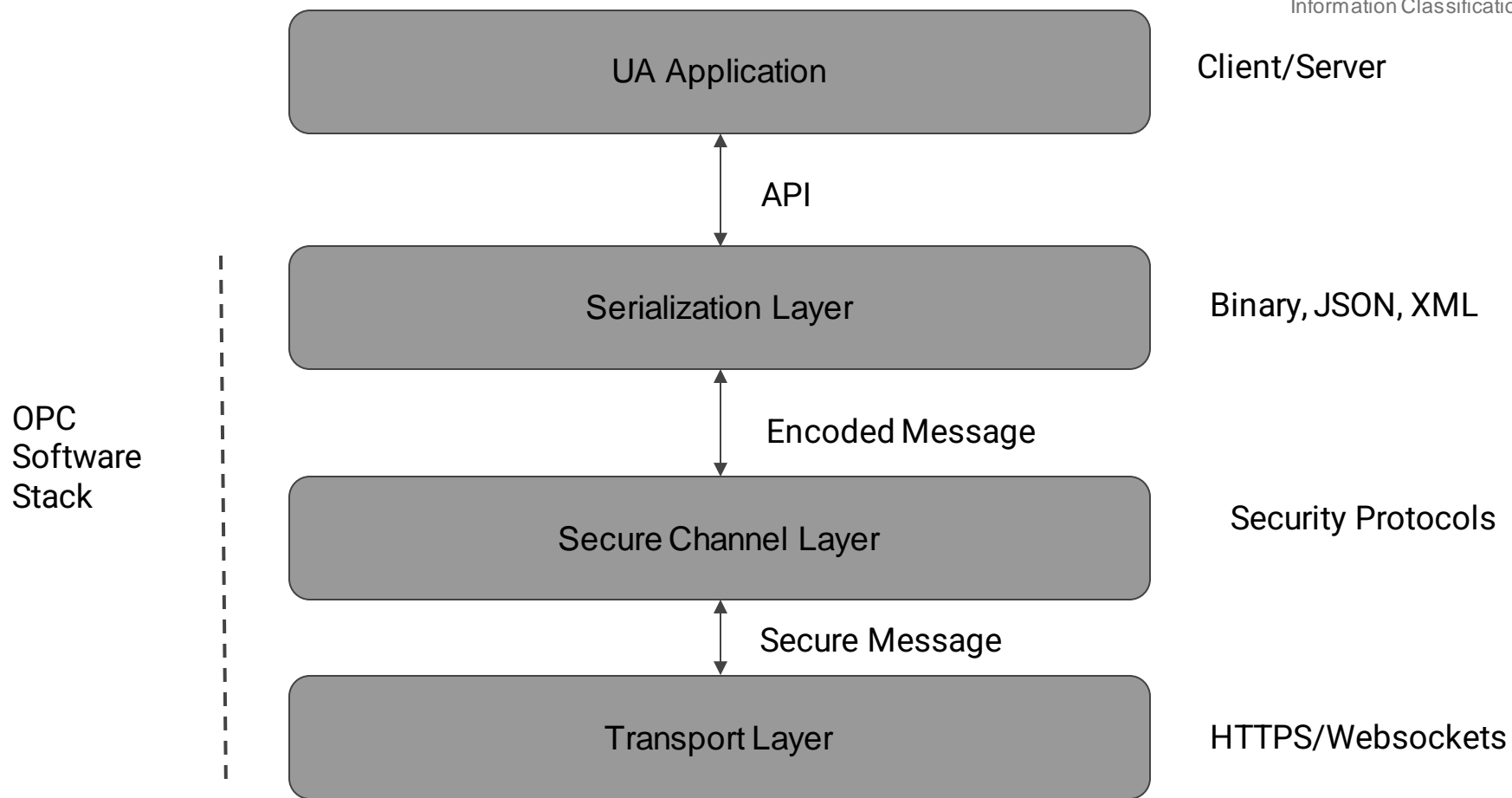
OPC UA

- It is a platform-independent standard through which various kinds of systems and devices can communicate by sending request and response Messages between Clients and Servers or NetworkMessages between Publishers and Subscribers over various types of networks.

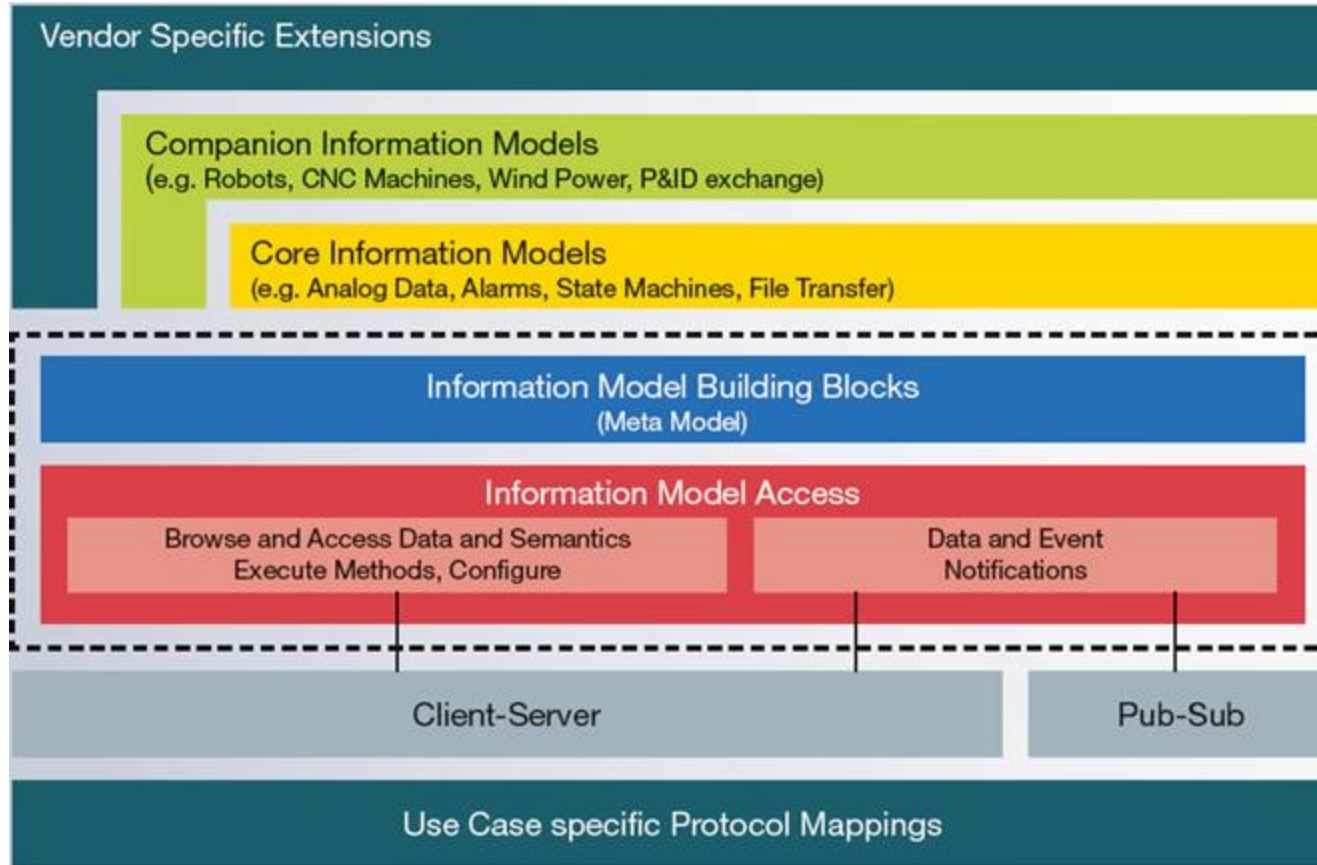


Features

- **Functional equivalence:** all COM OPC Classic specifications are mapped to UA
- **Platform independence:** from an embedded micro-controller to cloud-based infrastructure
- **Secure:** encryption, authentication, and auditing
- **Extensible:** ability to add new features without affecting existing applications
- **Comprehensive information modeling:** for defining complex information



Layered Architecture



Important Terms

- AddressSpace
 - Collection of information Server makes visible to Client
- Aggregate
 - A function that calculates derived values from Raw Data
- Discovery
 - Process by which Client obtains information about Servers, including endpoints and security information
- Node
 - Fundamental component of AddressSpace
- Profile
 - Specific set of capabilities to which a Server may claim conformance

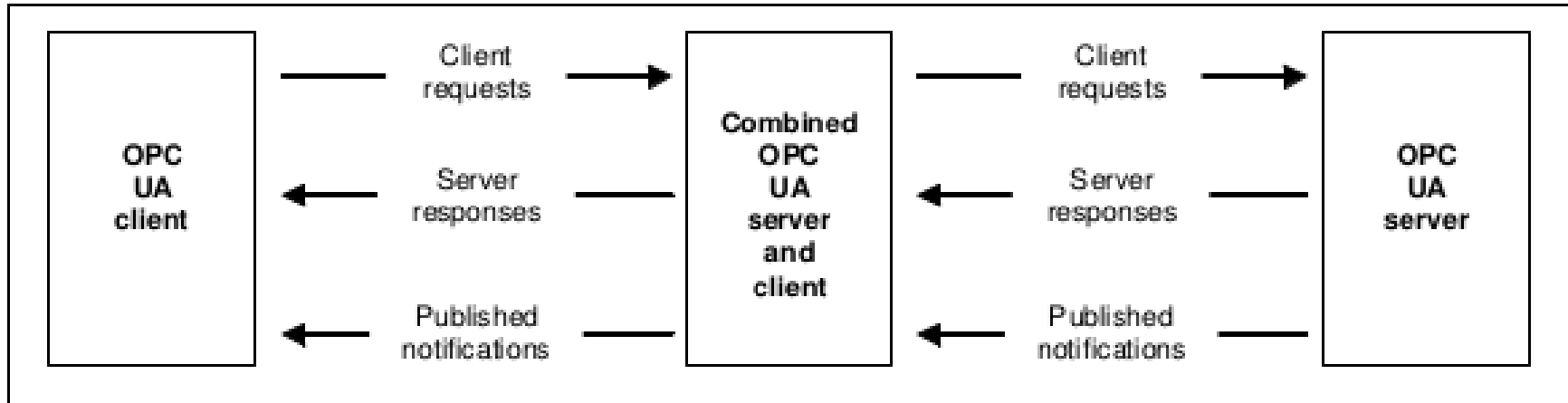
Introduction

- OPC UA is designed as the migration path for OPC clients and servers that are based on Microsoft COM technology.
- Care has been taken in the design of OPC UA so that existing data exposed by OPC COM servers (DA, HDA and A&E) can easily be mapped and exposed via OPC UA.
- OPC UA unifies the previous models into a single integrated address space with a single set of Services.

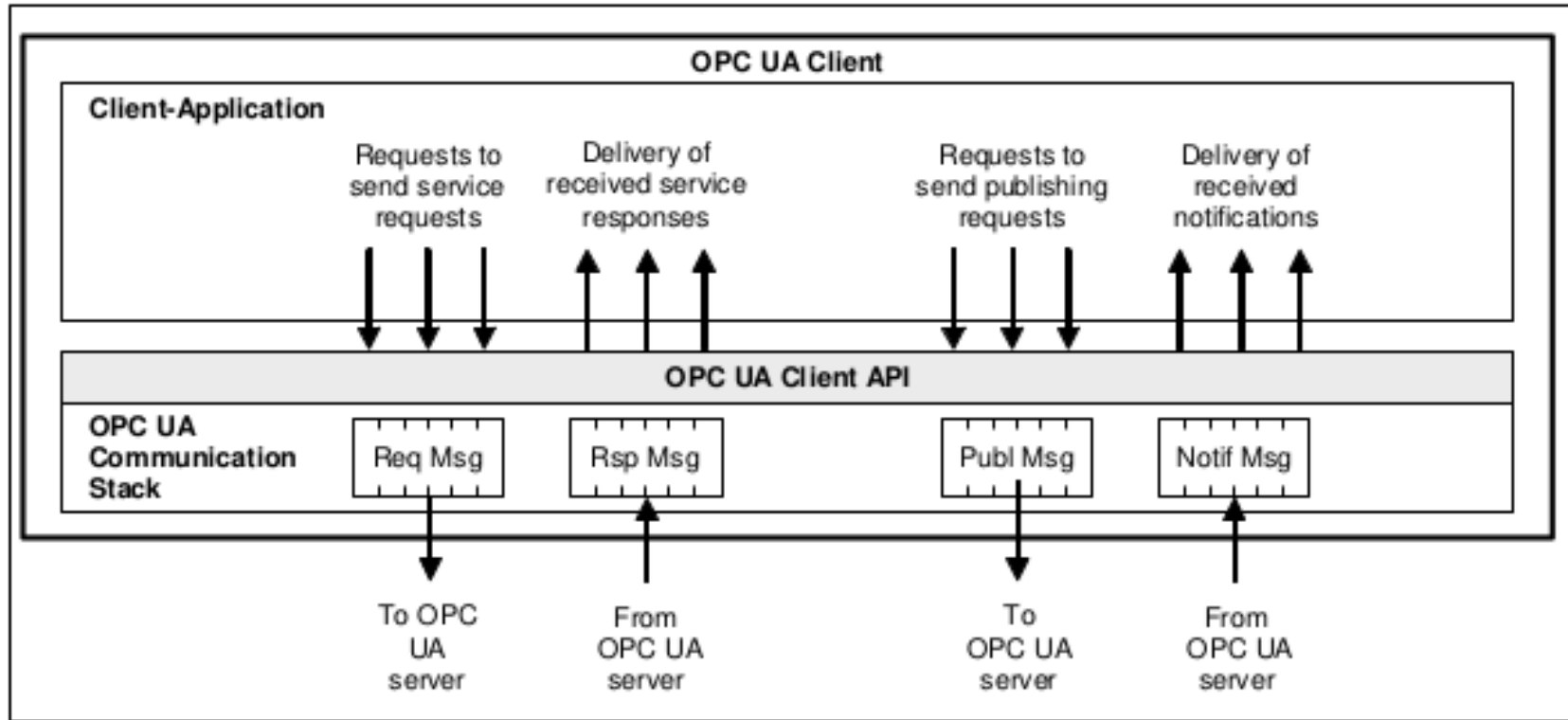
Security Model

- Discovery and Session
 - X.509 certificates
- Auditing
 - Traceability
- Transport Security
 - Data encryption

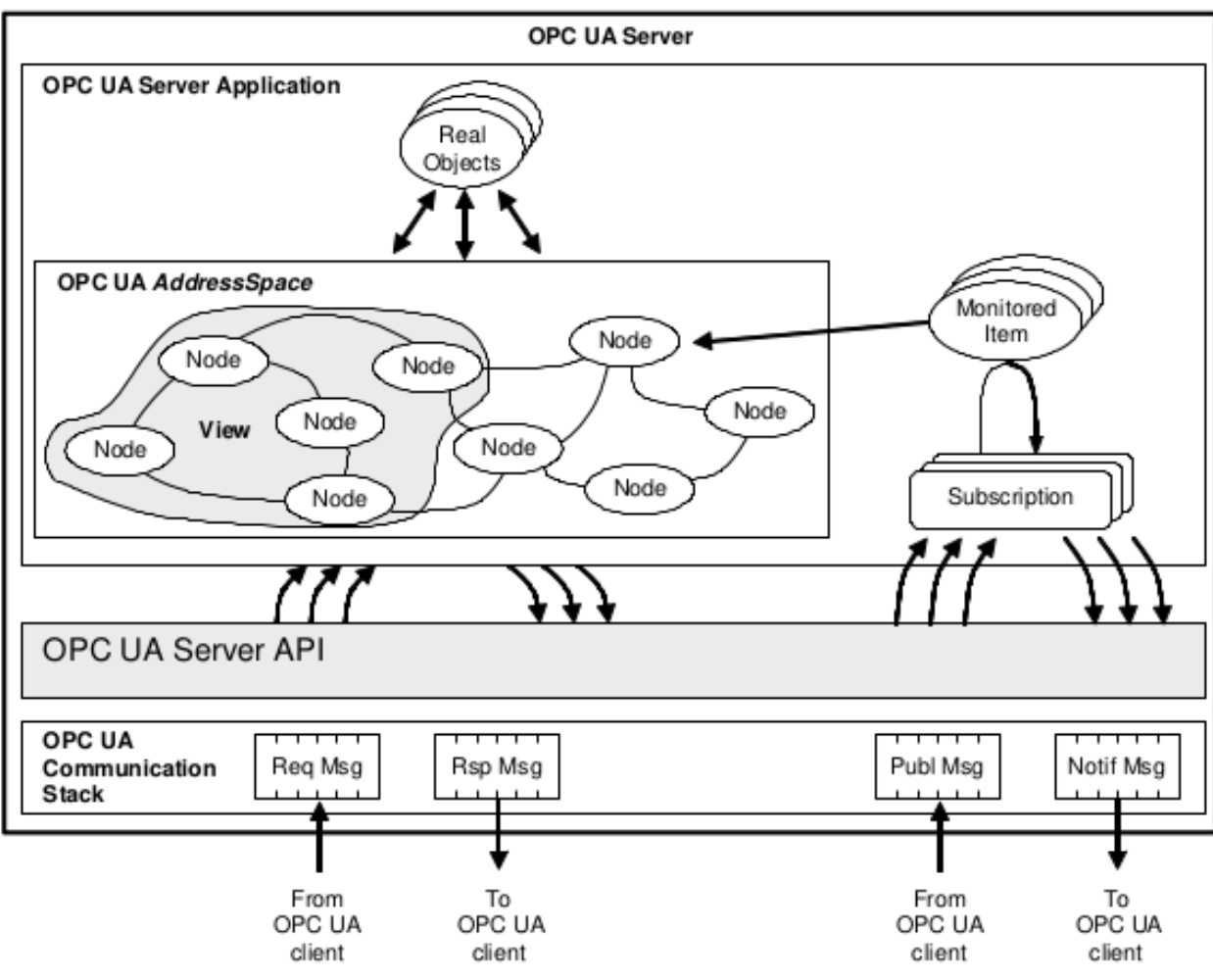
System Concepts

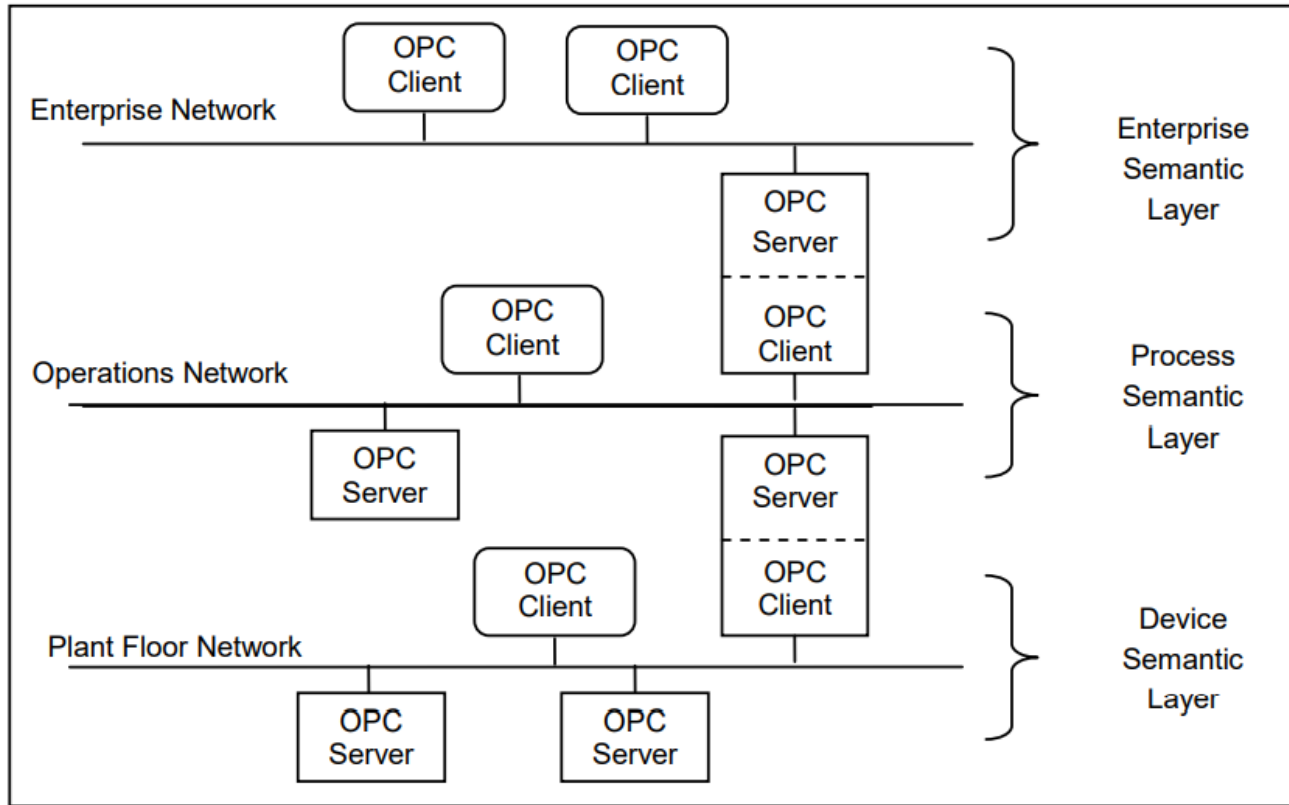


OPC UA Clients



OPC UA Server



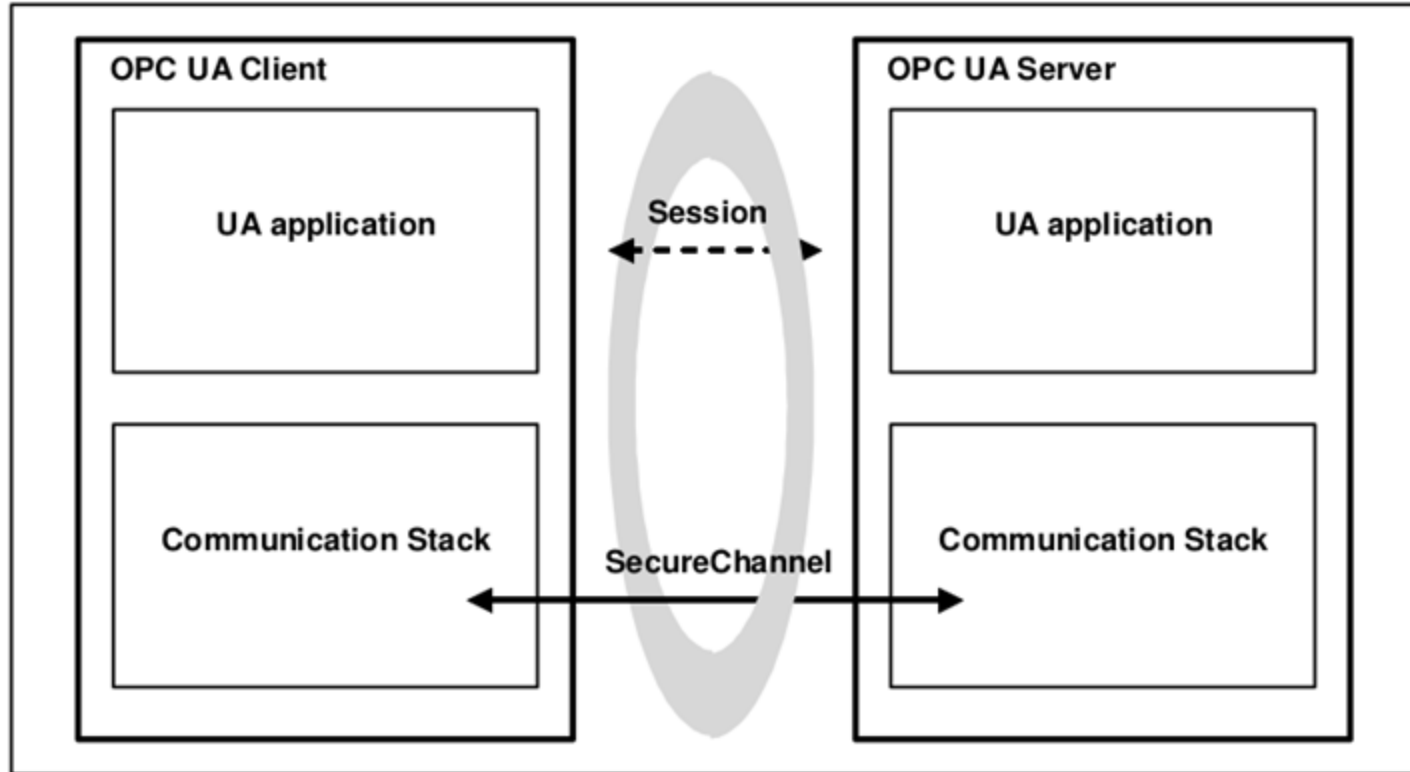


Server-to-Server Interactions

Service Sets

- OPC UA Services are divided into Service Sets, each defining a logical grouping of Services used to access a particular aspect of the Server
- Whether or not a Server supports a Service Set, or a specific Service within a Service Set, is defined by its Profile
 - Discovery Service Set
 - Secure Channel Service Set
 - Subscription Service Set

Secure Channel and Session Services



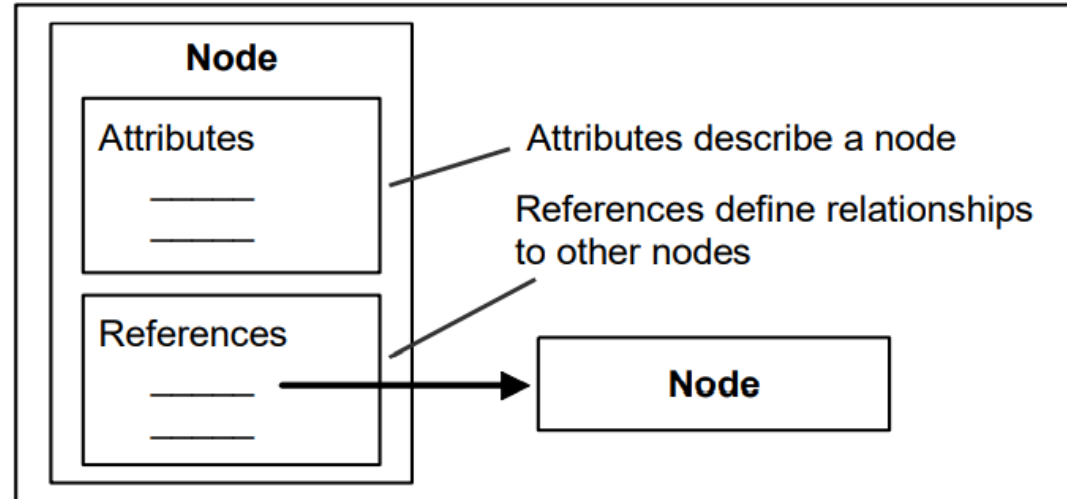
Publish Subscribe

OPC UA PubSub supports two largely different Message Oriented Middleware variants

- A broker-less form, Subscribers and Publishers use datagram protocols like UDP multicast.
- A broker-based form, where the Message Oriented Middleware is a Broker.

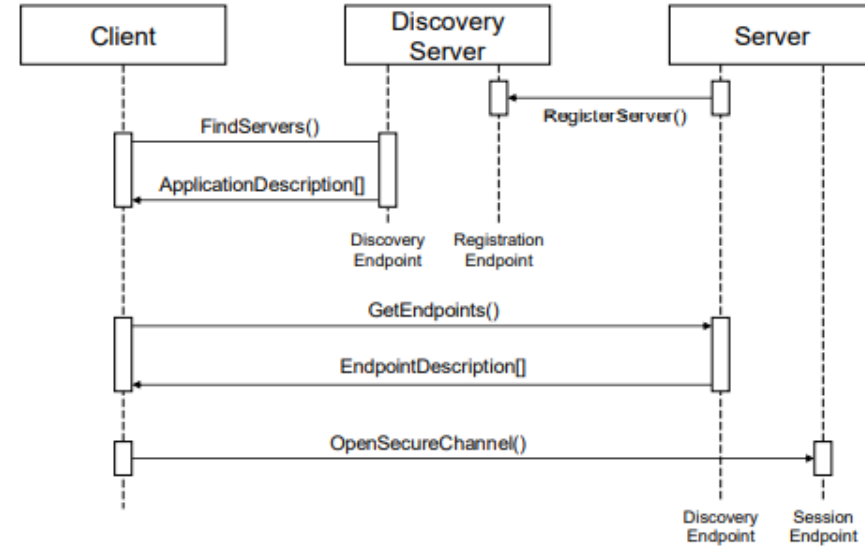
AddressSpace Model

- The set of objects and related information that the OPC UA Server makes available to Clients is referred as AddressSpace
- Objects and their components are represented in the AddressSpace as a set of Nodes



Discovery Service Set

- It defines Services used to discover the Endpoints implemented by a Server and to read the security configuration for those Endpoints
- Every Server shall have a DiscoveryEndpoint that Clients can access without establishing a Session

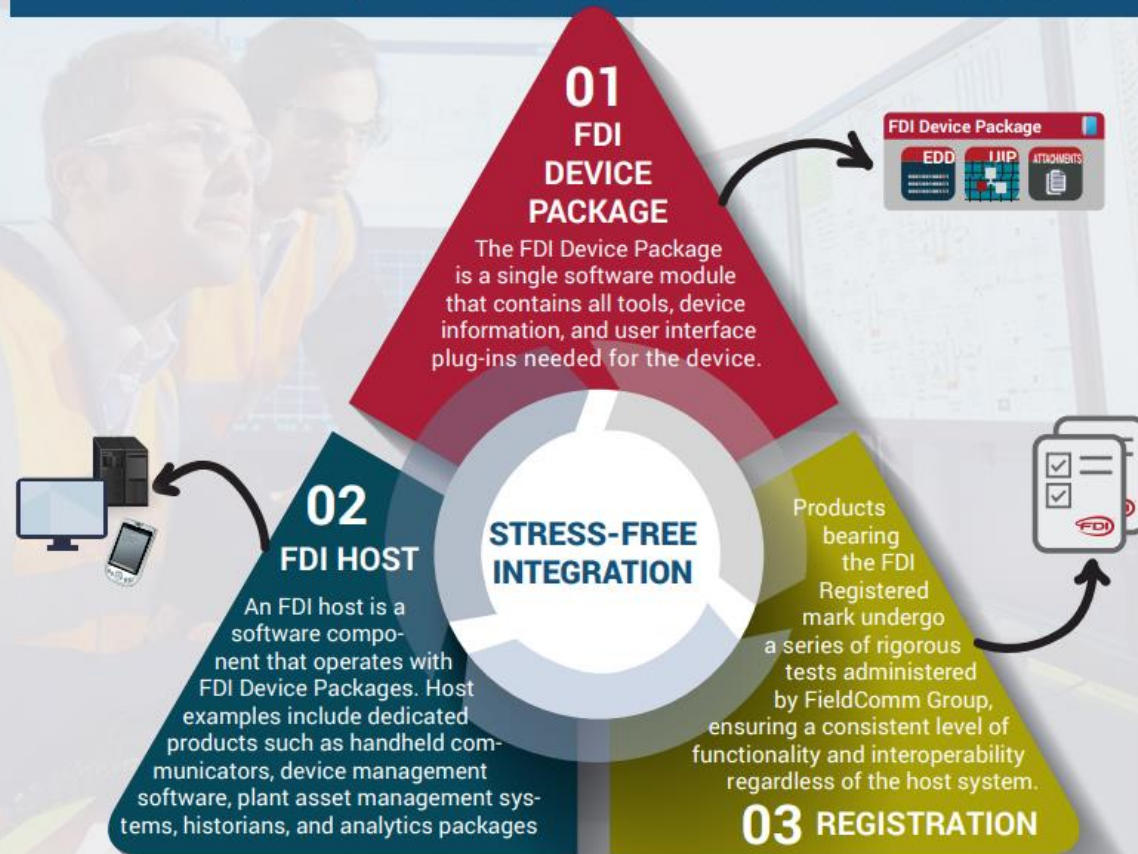


Field Device Integration is need because...

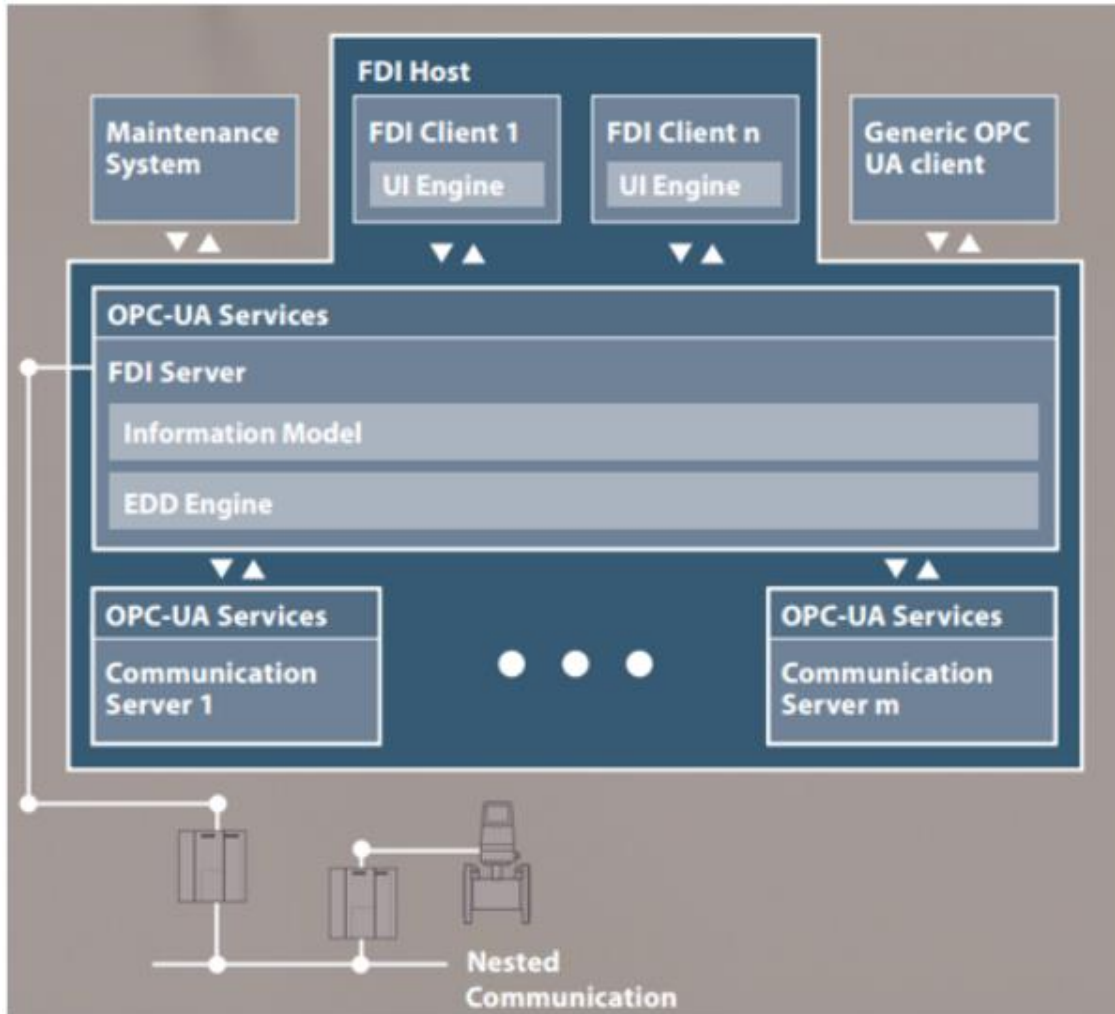
- Many of today's field device's function more like embedded computers than transmitters of physical process values
- As software and systems upgrade, configuration and maintenance becomes an ongoing process to manage
- It is vital for everyday purposes like device configuration, device replacement, maintenance, diagnostics and audit trails – all essential building blocks in a modern field device management system

Field Device Integration

- The primary objective of FDI is to dramatically simplify software installation, configuration, maintenance, and management of field instruments and host systems
- Field devices often include a device information file such as an EDD that provides software access to the features and functions of the device
- FDI brings standardization to the packaging and distribution of all the software and tools necessary to integrate a device with a host system.
- All registered FDI devices will have an associated FDI Device Package.

FDI Device Packages + Hosts + Registration = Stress Free Integration

Field Device Integration Implementation



References

- OPC UA FDI : <https://opcfoundation.org/markets-collaboration/fdi/>
- Ask4FDI: <https://www.ask4fdi.com/new-index-1#/start-ask-4/>
- OPC UA Foundation Case Studies:
<https://opcfoundation.org/resources/case-studies/>



Thank You