

OPC UA DEVELOPMENT TRAINING

OPC Introduction

AGENDA

- History of OPC, OPC Overview
- History OPC Classic and OPC UA
- Differences OPC Classic and OPC UA

OPC UA INTRODUCTION

- Tutorial as PDF available via Download

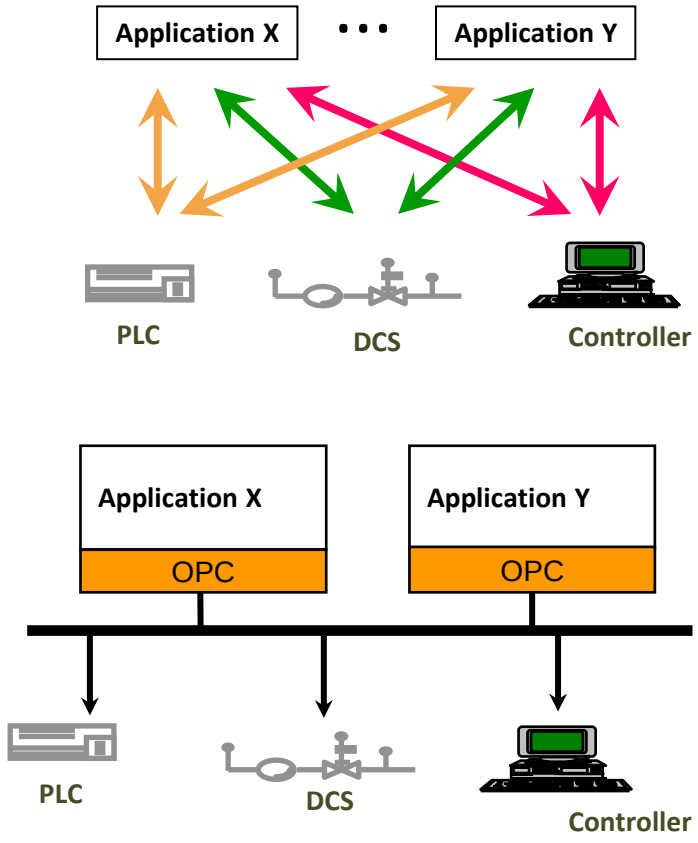
  https://technosoftware.com/documentation/OPC_UA_SDKs_NET_Standard_Introduction.pdf

- or from GitHub

  https://github.com/technosoftware-gmbh/opc-ua-net-standard

OPC – HISTORY

- Problem
  - Different Vendors
  - Increasing number of protocols
  - Customer specific Solutions
  - Maintenance Problem
  - …
- Idea
  - Unifiying the development of drivers
- Solution
  - OPC



OPC – HISTORY

- Definition of the term **OPC** in the history and today
  - History
    - **O**LE for **P**rocess **C**ontrol
    - **O**penness **P**roductivity **C**ollaboration
  - Definition since 2011:
    - **O**pen **P**roductivity & **C**onnectivity
    - The Interoperability Standard for Industrial Automation™

OPC – HISTORY

- 1995
  - Establishment of the OPC Task Force
    - Fisher-Rosemount, Intellution, Intuitive Technology, Opto22, Rockwell, Siemens AG
    - Microsoft delivered technical support
- August 1996
  - Publication of the ***OPC Specification Version 1.0***
- September 1996
  - Establishment of the OPC Foundation at the ISA Show in Chicago

OPC – HISTORY

- February 1997
  - Establishment of the OPC Foundation Europe
- September 1997
  - Publication of an updated ***OPC Specification*** under the new name ***OPC Data Access Specification 1.0A***
  - This version was used as base for the first products which supported OPC.
- October 1998
  - Publication of the ***OPC Overview Specification 1.0***
  - Publication of the ***OPC Common Definition & Interfaces Specification 1.0***
  - Publication of the ***OPC Data Access Specification 2.0***

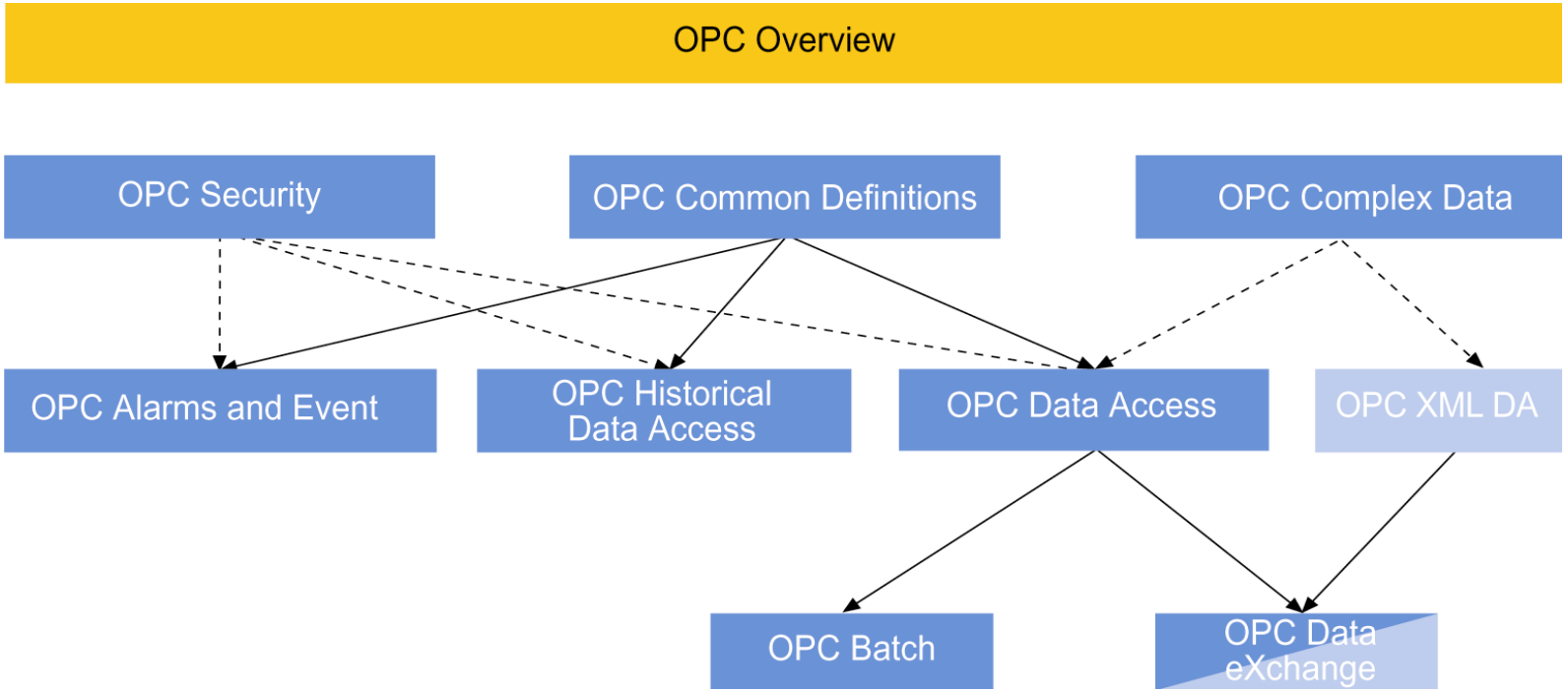
OPC – HISTORY

- 1999 until 2003
  - Publication of additional specifications, like
    - ***OPC Alarms&Events Specification 1.01***
    - ***OPC Historical Data Access Specification 1.0***
    - ***OPC Security Specification 1.0***
    - ***OPC DX Specification 1.0***
    - ***OPC Data Access Specification 3.0***
    - ***OPC XML-DA Specification 1.0***

➢ All specifications except OPC XML-DA base on the DCOM technologie

➢ The OPC XML-DA specification was just an intermediate step to a complete rework of the OPC specifications

OPC SPECIFICATION



OPC SPECIFICATION

Specification	Description	Version
OPC Overview	It gives background information, motivation, architectural highlights and an abstract for each OPC topic	1.00
OPC Common Definitions and Interfaces	Contains common rules and design criteria and the specification of interfaces which are common for several topics	1.10
OPC Data Access Specification	Definition of an interface for reading and writing of "real-time" data	3.00
OPC Alarms&Events Specification	Definition of an interface to monitor events	1.10
OPC Historical Data Access Specification	Definition of an interface for accessing historical data	1.20
OPC Batch Specification	Definition of an interface for accessing data, which are required for the batch processing	2.00

OPC SPECIFICATION

Specification	Description	Version
OPC Security Specification	Definition of an interface for setting and use of safety aspects	1.00
OPC Data eXchange (DX)	Communication between the server and server	1.00
OPC Complex Data	Definition of possibilities to describe the structure of complex data and the access to those complex data	1.00
OPC Commands	Definition of ways to describe the structure of complex data and to access such data	Draft 1.00
OPC XML-DA	Integration of OPC and XML to create Web applications	1.00

OPC UA – HISTORY

- 2004
  - Establishment of the OPC Unified Architecture working group
- 2006
  - ***OPC Unified Architecture Version 1.0*** becomes available.
- 2007
  - OPC Certification Program and Test Labs are introduced.
  - Automation vendors begin offering the first products based on OPC UA.
- 2009
  - ***OPC Unified Architecture Version 1.01*** becomes available.
- 2010
  - The first embedded OPC UA devices are released.
  - OPC UA for IEC 61131 is released as a companion specification.

OPC UA – HISTORY

- 2012
  - IEC 62541 is released (UA).
- 2013
  - ***OPC Unified Architecture Version 1.02*** becomes available.
  - OPC UA for ISA-95 is released.
  - OPC UA for Devices 1.01 is released.
  - The OPC Foundation supports over 480 members across China, Europe, Japan and North America.
- 2015
  - ***OPC Unified Architecture Version 1.03*** becomes available.
  - 62541:2015 Version released
  - Industrie4.0 reference architecture Modell (RAMI4.0) is listing OPC UA for communication layer

OPC UA – HISTORY

- 2016
  - The OPC Foundation supports over 490 members across China, Europe, Japan and North America.
- 2018
  - ***OPC Unified Architecture Version 1.04*** becomes available.
  - Total of 18 companion specifications released including specifications for Energy Automation (based on IEC61850), Tobacco industry, multiple fieldbus mappings, PackML, AutomationML
  - About 20 working groups developing further OPC UA companion specifications for additional machines or Industries
  - The OPC Foundation supports over 636 members across China, Europe, Japan and North America.

COMPARE CLASSIC OPC – OPC UA

	Classic OPC	OPC UA
Standardization	Yes, OPC Foundation	Yes, OPC Foundation
Interoperability	Yes	Yes
Performance	• Very good performance of DCOM-based specifications • Low performance of XML-DA specification	• Very good performance when using the UA Binary protocol • Low performance when using SOAP
Remote Access	Yes (DCOM, SOAP)	Yes (UA Binary, SOAP)
Interactions (Functionality that goes beyond the mere exchange of process data)	Yes (Only a few products implements those functionality)	Yes (Structured data types, information models, calling programs, monitoring ongoing operations)

COMPARE CLASSIC OPC – OPC UA

	Classic OPC	OPC UA
Security	Defined by DCOM, use of firewalls impossible	Yes, based on W3C standards with user authentication, exchange of digital certificates and optional encryption of messages
Robustness	• Quality attribute to process data and timestamp • No Redundancy • No Keep-Alive	• Quality attribute to process data and timestamp • Redundancy on client, server and device level • Keep-Alive • Data buffer

COMPARE CLASSIC OPC – OPC UA

	Classic OPC	OPC UA
Platform Independence	• Only on Windows (DCOM) • XML-DA on other systems	Yes
Scalability	No Static, complex DCOM stack memory intensive	Yes Embedded systems with single-task and single-threaded operation up to mainframes
Type Information	No	Yes • There are methods to access type information • Support for any information models with arbitrary data types