SCADA Integration with a Distributed OPC XML Embedded Server Architecture

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OPC Standard

- Standard method to access data
  - Presents network data as set of “data points”
  - Hides network technology to user
  - SCADA software can concentrate on application

- Defined Services
  - Browsing data points in hierarchical name space
  - Meta-Information (engineering units, value range, …)
  - Data Access (DA)
  - Alarming and Events (AE), Historic Data Access (HDA)
OPC in the Course of Time

• Initially: OLE for Process Control
  • Based on Microsoft’s OLE Technology introduced in the mid 90s

• Today: Openness, Productivity and Collaboration
  • Platform-independent technology through the introduction of Web Services and XML
Limitations of classic OPC

- Based on DCOM (Distributed Component Object Model)
- Binary RPC protocol with a service locator (ORB)
- Problems on embedded platforms
  - Windows-centric
  - Ported versions have large footprint
  - DCOM not firewall-friendly
Web Services

- Alternative to DCOM
  - Web pages with HTTP for static, human-readable information
  - Web service with machine-processable information
- XML instead of binary encoding
- Simple Object Access Protocol (SOAP) transports contents
- Web Services Description Language (WSDL) describes service interface
Motivation for Web Services for OPC

• OPC w/o DCOM for non-Windows systems
• XML integrates with management-level systems
• Runs across firewalls and NAT routers
  • Uses well-known port 80
  • Service is locatable using an Internet URI
  • Transports text blocks (binary data is often subject to filters)
  • Rule of thumb: Web services run where Web pages are accessible
Related Web Services

- Proprietary Systems
  - Early adopters
  - Data Access, Web bindings
  - Problem: re-inventing the wheel

- ASHRAE Web Services
  - standard addendum under review

- oBIX: Open Building Information eXchange
  - Work in progress, current version 0.8
OPC XML DA

• Client/Server Web Service model

• Data Access
  • Browsing hierarchical name space
  • Read and Write service

• Subscriptions
  • Method to collect point updates
  • Subscription comprises a set of points
  • “Delayed response” for event-like update notification
OPC XML DA
Subscription

Client

XML Messages

Server

Subscribe

SubscribeResponse

SubscriptionPolledRefresh

SubscriptionPolledRefreshResponse

Delay response till update

Time
Motivation

• OPC is “The Standard” supported by today's SCADA systems

• Market is asking for
  • performant OPC solutions to be used in LonMark networks
  • ease-of-use over the live cycle
  • robust and embedded OPC solutions
  • scalable solution
  • reasonable costs
Embedded OPC XML-DA Servers handle only small subsystems

SCADA system uses standardized mechanisms to communicate with embedded servers through OPC XML-DA

Integrated Routing capability to guarantee a flat EIA-709 network architecture
• Highly scalable
  • Minimizes reaction time within the subsystems
  • Maximizes system performance
  • Applicable for every system size

• Ease-of-use
  • 1-click configuration
  • Automatic data point mapping
Benefit of Integrated Router Support

- Gives access to the nodes from remote for:
  - commissioning,
  - configuring,
  - firmware download, and
  - remote maintenance (LPA)

- Creates a flat EIA-709 network architecture
  - no gateways needed
  - good performance
  - bindings between the nodes located in different subsystems
“1-click” Configuration

- LNS plug-in scans database
- Presents only data points (NVs) that are available in selected subsystem behind the L-OPC (router)
- Templates for each node class define, how NVs shall be mapped to OPC data points
“1-click” Configuration cont.

• Automatic binding support and polling lists
• Download configuration onto L-OPC
• done
Two-tier Architecture

- Decouples OPC XML-DA Clients (SCADA System) from embedded Servers
- Embedded Servers only talk to Proxy
- Automatisms for proxy configuration
- Supports a large number of OPC XML-DA Clients
Bridge DCOM – XML

- Interconnects SCADA Systems using DCOM with OPC XML-DA servers
- Automatisms for bridge configuration
- Bridge can co-exist with SCADA System on the same PC
Outlook

- OPC Foundation is currently working on the definition of OPC UA (Unified Architecture)
- OPC UA is following the Web Services Interoperability (WS-I) standards
- OPC UA provides mechanisms to easily integrate different OPC servers (DA, AE and HDA)
- Supports integrated Name Space and Object Model
- OPC UA specification is in Draft Status
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