Support of Device Connectivity by SAP

SAP ERP

SAP MII

SAP ME

SAP EWM

SAP Plant Connectivity (PCo)

Devices and Control
Plant Connectivity: Overview

- **Agents**: OPC DA, Socket, OSI PI, Custom
- **Agent Instance 1**: OPC DA
- **Agent Instance 2**: Custom
- **Source 1**: (OPC DA)
- **Source 2**: (Custom)
- **Destination 1**: ...
- **SDK**: .dll
- **.NET**: ...

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Plant Connectivity: Processes

Bookings, Alerts, etc. → Source System (E.g. OPC DA Server) → Agent instance → Notification → Target System

Transaction

ERP

PM
MM
PP
QM

Destination (E.g. MII)

Dashboards, Applications

Tag-Query

Query Interface

Agent instance

Source System

Plant Connectivity

OPC Tags

Source (E.g. OPC DA Server)

OPC Tags
Plant Connectivity: Notification Process

- PCo registers events or condition changes
- PCo creates specific notifications including current data
- Sending to destination(s)
- Target system (e.g. MII) processes the notification
- All MII functions (Dashboards, Alerting, Processing, Forwarding, Mapping) can be used

Bookings, Alerts, etc. → PM, MM, ERP → Dashboards, Applications

Transaction

Target System

Notification

Source System

Agent instance

OPC Tags

(E.g. OPC DA Server)

Source

(E.g. MII)

Destination

Plant Connectivity

Query Interface

Agent instance

Source System

ERP

TPM

PP

QM

Query

Interface

Tag-Query
Plant Connectivity: Query Process

- In MII queries to all agent instances are possible (if they support queries).
- There are agents for different protocols/data sources available (e.g., OPC DA/UA, OSI PI,...).
- MII processes data from PCo.
- All MII functions (Dashboards, Alerting, Processing, Forwarding, Mapping) can be used.

**Source**
(E.g., OPC DA Server)

**Destination**
(E.g. MII)

**Plant Connectivity**

- OPC Tags

**Tag-Query**

**Query Interface**

**Agent instance**

**Source System**

**Target System**

**Transaction**

**ERP**

PM
MM
PP
QM

**Bookings, Alerts, etc.**

**Dashboard, Applications**
Details of the PCo Notification Process

- **Target System 1**
  - Transaction 1
  - Transaction 2

- **Target System 2**

- **PCo**
  - Agent Instance
  - Notification 1
    - Value change
    - Formula ('Item 1' > 100)
    - Events
  - Trigger
  - Message
  - Reliability Settings
  - Subscription Items
    - Item 1
    - Item 2
    - Item 3
    - Item 4

- **Source System**
  - E.g. OPC Tags

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Plant Connectivity: Architecture Options (Selection)

One PCo for multiple Source systems. In this case PCo usually runs on a different machine than the data sources (using DCOM or OPC UA).

One PCo per Source System. For high data volume PCo can also run on the same machine (communication via COM).

Multiple agent instances per data source.
Plant Connectivity: Example of System Landscape (PCo/MII/ERP)
Reliability

Settings
- Retries
- Persistence
  - Keep all / first / last
- Lifetime

Monitoring
- View messages
  - Retries
  - Failures
  - Expired
- View message details
- Resend manually
- Delete manually
Remote Monitoring

Functions

- Display status (PCo + agent Instances)
- Start/stop/restart of agent instances
- Retrieve configuration (XML)
- Retrieve log (CSV)
- Manage active monitoring
# PCo Functions / Agents

<table>
<thead>
<tr>
<th>Function/Agent</th>
<th>PCo 2.0</th>
<th>PCo 2.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidirectional Queries</td>
<td></td>
<td>new</td>
</tr>
<tr>
<td>Software Development Kit (SDK) for custom agents</td>
<td></td>
<td>new</td>
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<tr>
<td>OPC-DA</td>
<td>x</td>
<td>x</td>
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<td>OPC-A&amp;E</td>
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<td>x</td>
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<tr>
<td>OPC-UA</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Socket Agent (EWM)</td>
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<td>x</td>
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<td>OPC-HDA</td>
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<td>new</td>
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<tr>
<td>GE Fanuc Proficy Historian</td>
<td></td>
<td>new</td>
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<tr>
<td>OSIsoft PI</td>
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<td>new</td>
</tr>
<tr>
<td>OLEDB</td>
<td></td>
<td>new</td>
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</table>
PCo Performance (Standard Notebook)

Queries

<table>
<thead>
<tr>
<th>Scenario</th>
<th>1/s *</th>
<th>CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query Tester</td>
<td>446</td>
<td>57 %</td>
</tr>
<tr>
<td>Internal MII Query</td>
<td>123</td>
<td>18 %</td>
</tr>
<tr>
<td>External MII Query (Grinder)</td>
<td>16</td>
<td>2 %</td>
</tr>
</tbody>
</table>

Notifications

<table>
<thead>
<tr>
<th>Scenario</th>
<th>1/s *</th>
<th>CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation Destination (NUL)</td>
<td>30000</td>
<td>55 %</td>
</tr>
<tr>
<td>MII Transaction</td>
<td>60</td>
<td>8 %</td>
</tr>
</tbody>
</table>

* Maximum results achieved from various test runs

- State of the art hardware is sufficient for high performance (Standard SAP Notebook)
- PCo alone allows high throughput rates (Query Tester / Simulation Destination)
- Together with other target systems (e.g. MII / ME) the performance can be significantly lower. Given the low CPU Load on PCo side the bottleneck is likely on the target system side.
Summary

- Small .NET-based installation (~ 35 MB):
  - Near the data source (COM)
  - In the near-production network (DCOM / OPC-UA Web Service)
- Surveillance of unplanned events:
  - Events, Value changes, Rule violations (e.g. Limits)
- Rule engine (Expressions)
- Distribution of messages to different destinations: SAP MII, SAP EWM
- Message can contain multiple tag information
- Bi-directional Queries
- Software development kit (SDK) for additional agents
- Fail safe (Buffering and repetition of messages)
- Microsoft MMC-based remote monitoring for surveillance of Agenten instances and multiple PCo Systems
Thank You!

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