The Information Revolution for the Enterprise
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Agenda

- Introduction
- Convergence and Integration of Enterprise, Operational and Internet
- Integration Landscape from Enterprise Perspective
  - Approaches
  - Standards
  - Technologies
- Integration of Operational and Enterprise
  - IBM and OPC-UA
Introduction
Convergence and Integration of Enterprise, Operational and Internet

- Huge increase in expectations of real-time availability, data accuracy and types of information available across Enterprise and Supply Chain

- Production locations can be increasingly integrated with Enterprise and exploit advanced IT capabilities.

- Highly heterogeneous systems environments can interoperate

- Need to make detailed operational information available to an ever increasing range of consuming applications and users without compromising production efficiency or security

- Industry appetite to exploit advances in IT Security, distributed and virtualised IT solutions
Convergence and Integration of Enterprise, Operational and Internet

- Industrie 4.0, Industrial Internet Consortium, SMLC focus the effort of governments, academia and business to significantly advance manufacturing capabilities

- Integration challenges presented by the evolution of Enterprise IT technologies over the last 25 years drove Message Brokers, SOA, Web Services, Enterprise Service Bus

- Those integration approaches are embodied in Enterprise products and solutions - and are again evolving to integrate newer platforms such as Cloud Internet of Things, Industrial Internet.

- Supporting a revolution in availability of action-able information across the business and beyond – with huge demands for operational data and events
An Enterprise Integration Perspective of Manufacturing Landscape

IBM Integration Bus in a Manufacturing context

Corporate Applications
ERP, Production Scheduling
Dynamics
Oracle
SAP

Supply Chain Management
ODBC
JDBC
SQL

Product Quality Management
Web Services
SOAP, XML

Portal
Web Apps (internal)

Analytics
IDOC, BAPI
Proprietary XML

Decision Management
Web Services
SOAP, XML

Asset Management
Web Services
SOAP XML

IBM Integration Bus in a Manufacturing context

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Asset Management
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SOAP XML
Example : SAP Integration

- SAP is an example of an Enterprise Information System (EIS).
  - An EIS offers a well-defined set of services exposed as local or remote interfaces, for example ERP and CRM systems

- The Integration Bus SAP nodes use an “Adapter component”:
  - The Adapter component uses the SAP Java Connector (SAP JCo) API to communicate with SAP. Adapter component utilizes the Java Connector Architecture (JCA) 1.5 which standardizes the way in which application components, application servers and EISs interact.

- You can invoke a message flow when data changes on the SAP server by generating an adapter component that listens for events on the SAP server and notifies message flows with the update.
Example: B2MML to SAP

Application Development

- Schema Definitions
    - SapMaterialFind.xsd

- Flows
  - Flow.msgflow

- Maps
  - Flow.Mapping.map

- Adapters
  - Outbound
    - SAP
      - OutboundComponent.outadapter

- References

- Other Resources

SAP Request Node Properties - SAP Request

<table>
<thead>
<tr>
<th>Properties</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>Basic Primary adapter component*</td>
<td>Adapters/SAP/OutboundComponent.outadapter</td>
</tr>
<tr>
<td>Response Message Parsing</td>
<td>Secondary adapter mode: None</td>
</tr>
<tr>
<td>Transactionality</td>
<td>Default method*: executeSapMaterialFind</td>
</tr>
</tbody>
</table>

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The Power of Patterns

Configure Pattern Parameters

Provide values for pattern parameters. Click the "Generate" button or click [here](#) to generate a pattern instance.

Pattern parameters are ready. Click the "Generate" button to generate a pattern instance.

Pattern Parameters

- SAP Connection
- SAP Configuration
- CRM Connection
- Operation Selection
- Logging
- Error Handling
- General

Generate
MQTT: Open Technologies for Integration

Initiative to develop integration components as open source
- Source freely available on popular Github website under flexible Eclipse Public License
- Community contributions (including modifications) actively encouraged!

Initial contributions
- MQTT Client connectors
  - Easy-to-use inbound and output connectors to MQTT servers
  - Uses open framework for platform-independent connectors
- DFDL Schemas for popular industry formats
  - E.g. HL7, ISO8583, IBM4690-TLOG, NACHA
- … more to come …
MQTT and Remote Data Sources

Low-power, low-bandwidth / PLCs and RTUs

Distance = > 250 km

Oil Storage  Temperature  Pressure  Flow Control

Upstream Center of Operation and Control

WAN

Head office
IT Corporate Infrastructure

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MQTT

- MQTT (MQ Telemetry Transport) is a publish / subscribe based, lightweight messaging protocol.
- Original design principles are to minimise network bandwidth and device resource requirements whilst attempting to ensure reliability and some degree of delivery assurance.
  - Ideally suited to the emerging Internet of Things and for mobile applications where bandwidth and battery power are very important.

2004 MQTT.org open community
2011 - Eclipse PAHO MQTT open source project
2013 – MQTT Technical Committee formed

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Integration Specialists in a Manufacturing Context

Manufacturing Integration Specialists:
- Responsible for developing and maintaining operation systems at manufacturing locations.
- Have knowledge of OPC and operational production automation systems.
- May not be familiar with Enterprise integration products.
- Create, deploy and manage solutions to integrate plant floor and enterprise systems.

Cloud

Enterprise

Factory

Factory
IBM Integration Bus Industry Packs

- The purpose of an IIB Industry Pack is to provide industry-specific development accelerators which solve common industry integration problems.

- Help users to deploy working integration solutions in literally a few clicks of the mouse.

- IIB Industry Pack content is structured around three delivery pillars:

  **Connectors**
  - Association for Retail Technology Standards
  - Open Applications Group
  - Data Format Description Language
  - Open Grid Forum
  - Health Level 7
  - Digital Imaging and Communication in Medicine

  **Integration Patterns**
  - Commerce WebService Information
  - Sterling HTTP Information
  - Sterling Order Queue
  - Sterling Response Queue
  - Heartbeat configuration
  - Journaling

  **Monitoring**
  - Graphs and Charts
Manufacturing Pack Overview

- **Plant Connectivity Industry and De Facto Standards**
  - Connectors and patterns that support current OPC industry standards for integration of plant and machinery data and events, including OSIsoft PI Server

- **Plant Connectivity Emerging Standards**
  - Support for emerging OPC Unified Architecture standards to enable more sophisticated integration to the enterprise

- **Enterprise Connectivity**

- **Integrations and connectors**, including MQ Telemetry Transport (MQTT), which facilitate the transmission of data from remote locations

- **Web-based interface** to provide operational views of data published from plant and machinery
Factory Publication Pattern

Configure Pattern Parameters

Provide values for pattern parameters. Click the "Generate" button or click here to generate a pattern instance.

Pattern workspace resources are generated successfully!

Pattern Parameters

Input Options

OPC input type

OPC Input Type * OPC-UA Input

Output Options

Output transport type

Output Type * MQTT

OPC-UA Input settings

OPC-UA Input node settings

Server name * opc.tcp://r9e9v8k62547/Quickstarts/DataAccessServer

Update rate * 1000

Tags * /2:Factory/2:East/2:Boiler1/2:Pipe1001/2:Measurement

MQTT Settings

MQTT publish node settings

Connection url * tcp://localhost:1883

Topic name * OPCMeasurement

Client id * FactoryClient

Generate

Specification Configuration
Factory Publication Pattern - Message Flow Example

OPC-UA-Input node propagates logical tree every 1000 ms (configurable). Each propagation contains a data section populated for each subscribed Tag.

MQTT Subscribe node subscribes on the nominated topic and receives publications.

MQTT Publish node publishes the data it receives on the nominated topic.
Pack provides its own Context Root
- Uses internal HTTP server to serve data
- Can reconfigure to listen on user port or disable
- SSL connector configured via mqsichangeproperties
- Displays built upon REST API queries exchanged with IIB node
- Operational Monitoring (relevant to all patterns involving flows)

http://localhost:4414/manufacturing
THANK YOU!  ANY QUESTIONS?