

The Information Revolution for the Enterprise



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Agenda

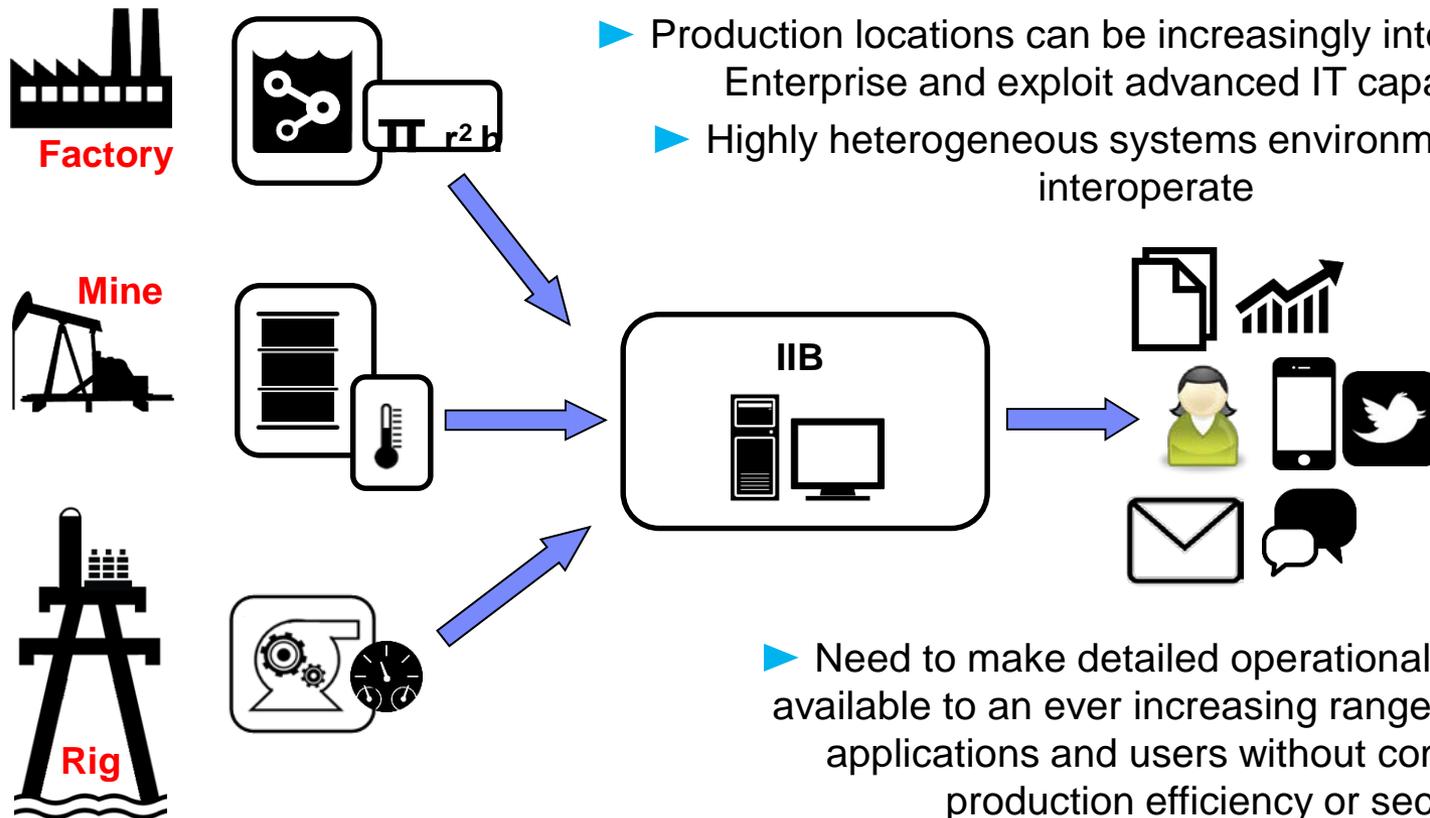
- Introduction
- Convergence and Integration of Enterprise, Operational and Internet
- Integration Landscape from Enterprise Perspective
 - Approaches
 - Standards
 - Technologies
- Integration of Operational and Enterprise
 - IBM and OPC-UA

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



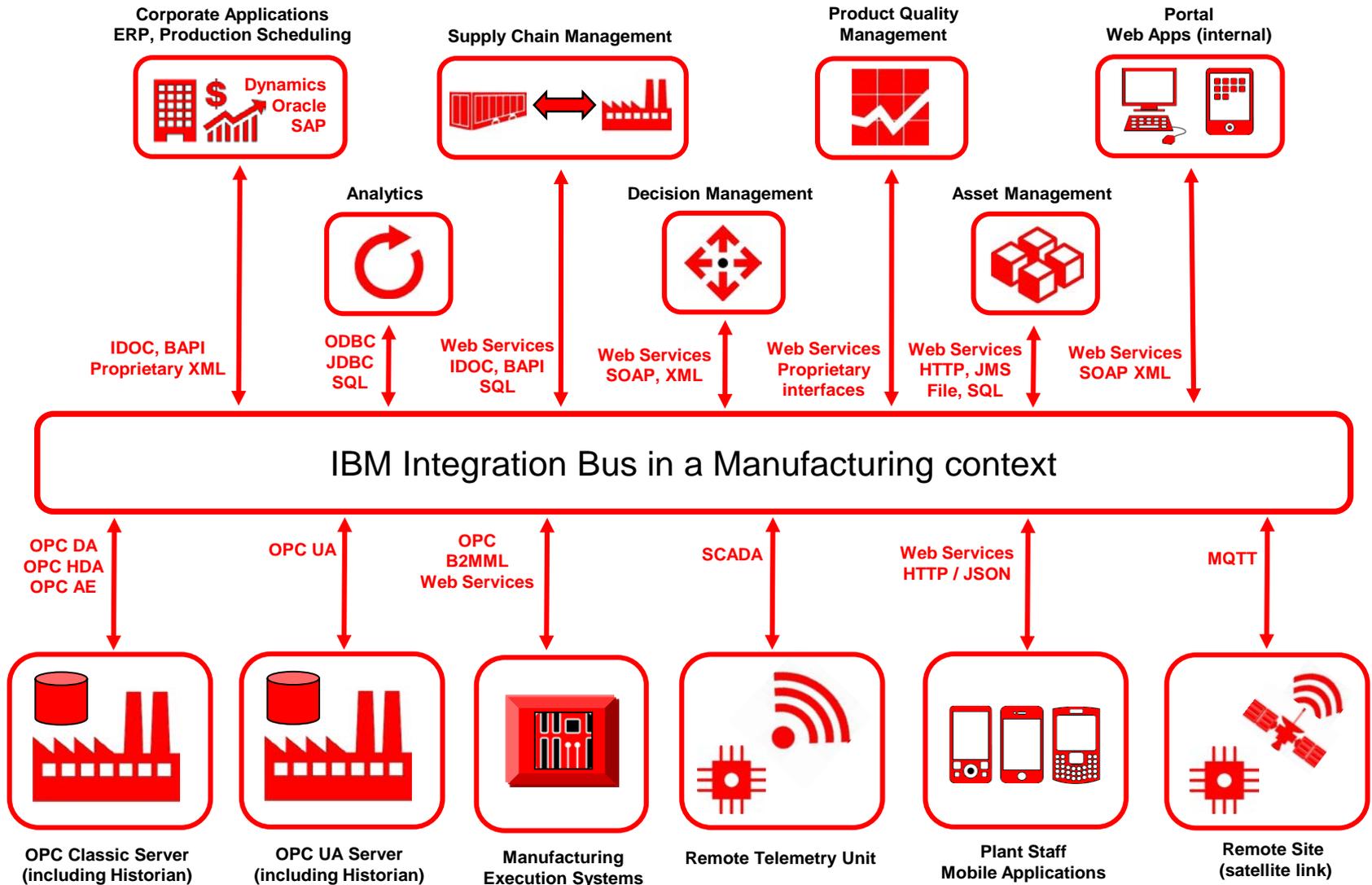
- ▶ Need to make detailed operational information available to an ever increasing range of consuming applications and users without compromising production efficiency or security

- ▶ Industry appetite to exploit advances in IT Security, distributed and virtualised IT solutions

Convergence and Integration of Enterprise, Operational and Internet

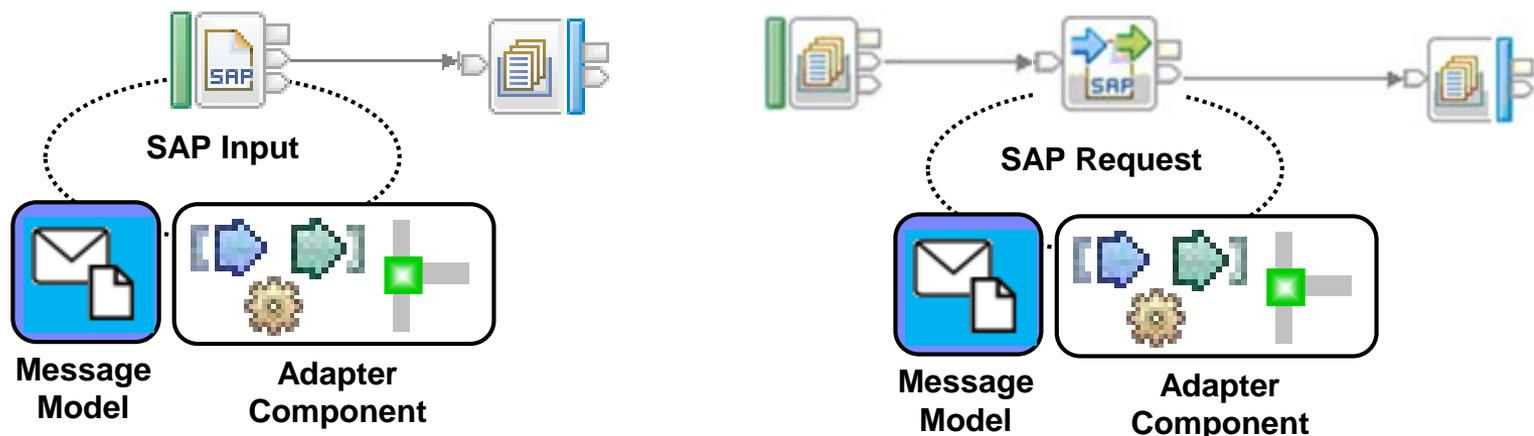
- Industrie 4.0, Industrial Internet Consortium, SMLC focus the effort of governments, academia and business to significantly advance manufacturing capabilities
- Integration challenges presented by the evolution of Enterprise IT technologies over the last 25 years drove Message Brokers, SOA, Web Services, 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



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

Flow_Mapping

Message Assembly		GetMaterialDefinition
<Click to filter...>		
Properties	[0..1]	PropertiesType
GetMaterialDefinition	[1..1]	GetMaterialDefinitionType
releaseID	[1..1]	normalizedString
versionID	[0..1]	normalizedString
ApplicationArea	[1..1]	TransApplicationAreaType
DataArea	[1..1]	<Anonymous>
Get	[1..1]	TransGetType
MaterialDefinition	[1..*]	MaterialDefinitionType
ID	[1..1]	IdentifierType
schemeAgencyID	[0..1]	normalizedString
schemeAgencyName	[0..1]	string
schemeDataURI	[0..1]	anyURI
schemeID	[0..1]	normalizedString
schemeName	[0..1]	string
schemeURI	[0..1]	anyURI
schemeVersionID	[0..1]	normalizedString
value	[0..1]	normalizedString
Description	[0..*]	DescriptionType
Location	[0..1]	LocationType

Message Assembly		SapMaterialFind
<Click to filter...>		
Properties	[0..1]	PropertiesType
SapMaterialFind	[1..1]	SapMaterialFind
Matnr	[0..1]	<string>

Move

Application Development
Patterns Explorer

Application Development New...

- Application
 - Schema Definitions
 - http://www.ibm.com/xmlns/prod/websphere/j2ca/sap/sapmaterialfind
 - SapMaterialFind.xsd
 - Flows
 - Flow.msgflow
 - Maps
 - Flow_Mapping.map
 - Adapters
 - Outbound
 - SAP
 - OutboundComponent.outadapter
 - References
 - Other Resources

B2MML.IN Mapping SAP Request

SAP Request Node Properties - SAP Request

Description		
Basic	Primary adapter component*	Adapters/SAP/OutboundComponent.outadapter Browse...
Response Message Parsing	Secondary adapter mode	None ▼
Transactionality	Default method*	executeSapMaterialFind ▼
Request		

The Power of Patterns

Application Development

- B2MML_Library
 - Schema Definitions
 - (default namespace)
 - B2MML-V0600-CoreComponents.xsd
 - http://www.mesa.org/xml/
 - AllSchemas.xsd
 - B2MML-V0600-Comm...
 - B2MML-V0600-Confir...
 - B2MML-V0600-Equipme...
 - B2MML-V0600-Material...
 - B2MML-V0600-Operatic...
 - B2MML-V0600-Operatic...
 - B2MML-V0600-Operatic...
 - B2MML-V0600-Operatic...
 - B2MML-V0600-Operatic...
 - B2MML-V0600-Operatic...
 - B2MML-V0600-Personn...
 - B2MML-V0600-Physical...
 - B2MML-V0600-ProcessS...
 - B2MML-V0600-ProductI...
 - B2MML-V0600-Resourc...
 - B2MML-V0600-Transact...
 - B2MML-V0600-WorkAle...
 - B2MML-V0600-WorkCa...
 - B2MML-V0600-WorkDe...
 - B2MML-V0600-Workflo...
 - B2MML-V0600-WorkPer...
 - B2MML-V0600-WorkSc...
 - BatchML-V0600-BatchInformation.xsd
 - BatchML-V0600-BatchProductionRecord.xsd
 - BatchML-V0600-GeneralRecipe.xsd
 - http://www.mesa.org/xml/B2MML-V0600-AllExtensions

SAP Outbound Resource Adapter

SAP system connection information

Use load balancing

To use load balancing, specify the load balancing properties in the Additional connection configuration panel under the Advanced tab.

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

Specification Configuration

Select...

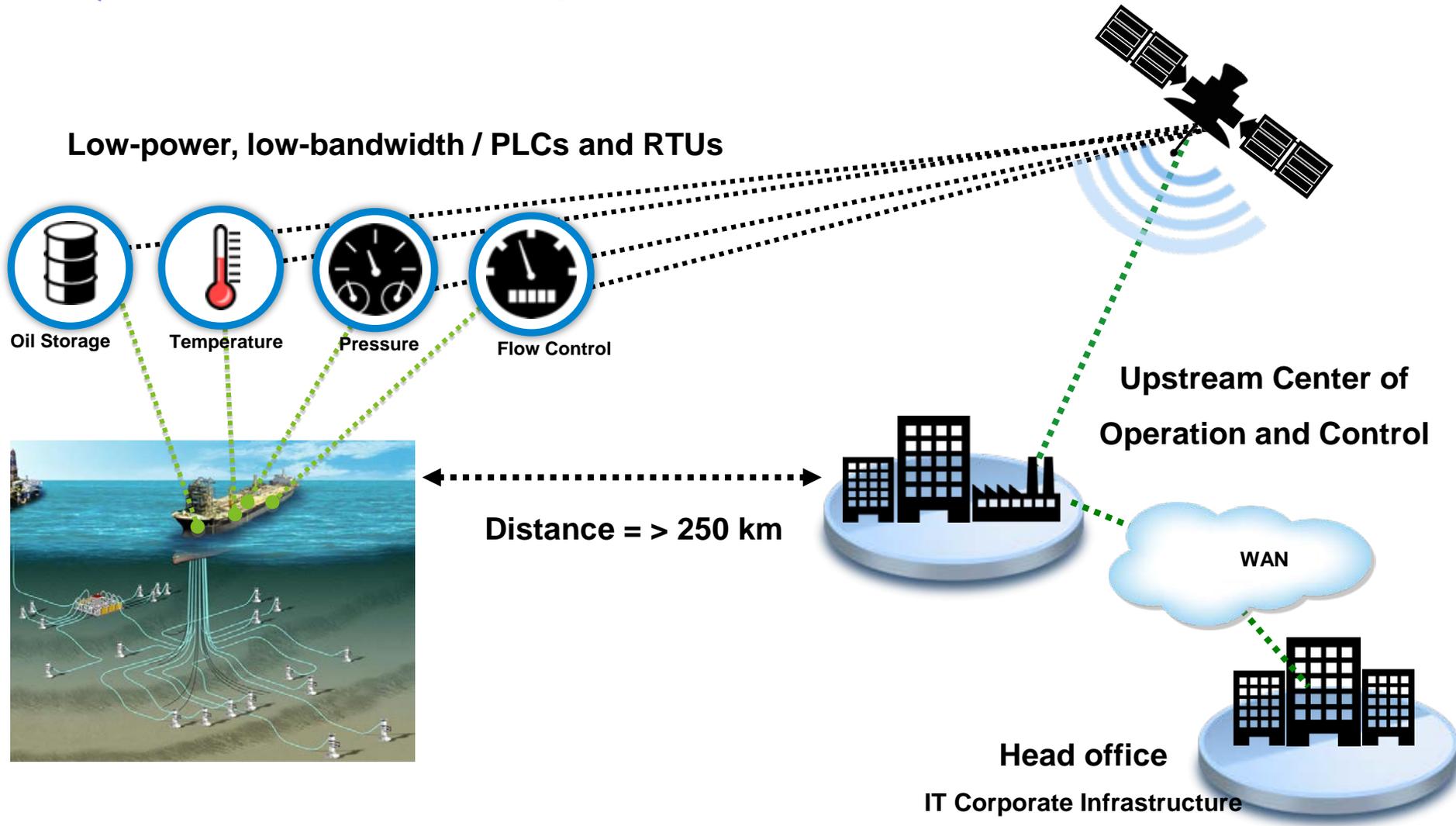
MQTT: Open Technologies for Integration



- ▶ 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!

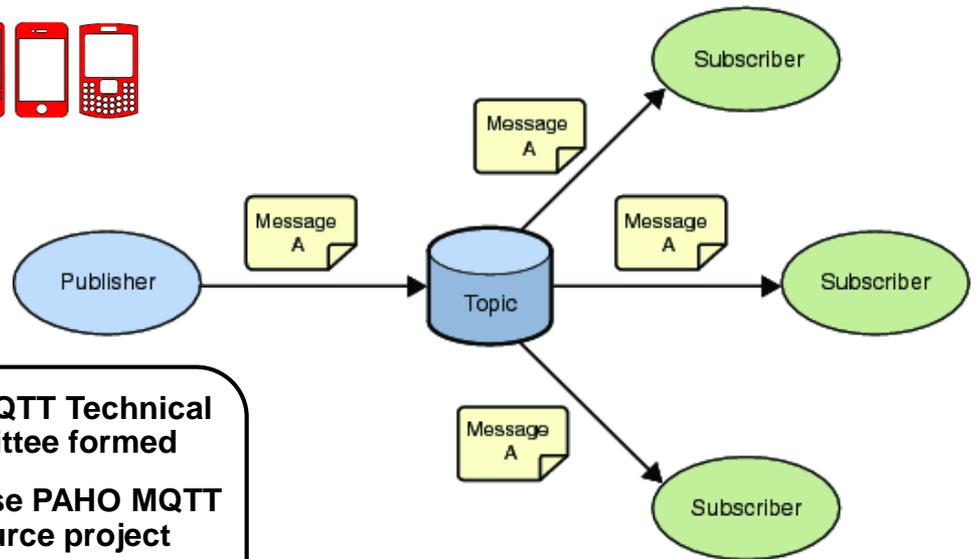
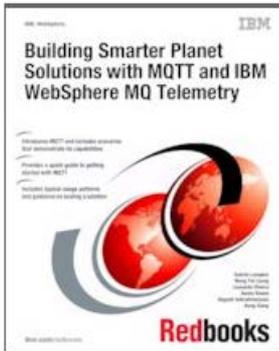
- ▶ Initial contributions
 - MQTT Client connectors
 - Easy-to-use inbound and output connectors to MQTT servers
 - Uses open framework for platform-independent connectors
 - DFDL Schemas for popular industry formats
 - E.g. HL7, ISO8583, IBM4690-TLOG, NACHA
 - ... more to come ...

MQTT and Remote Data Sources



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.

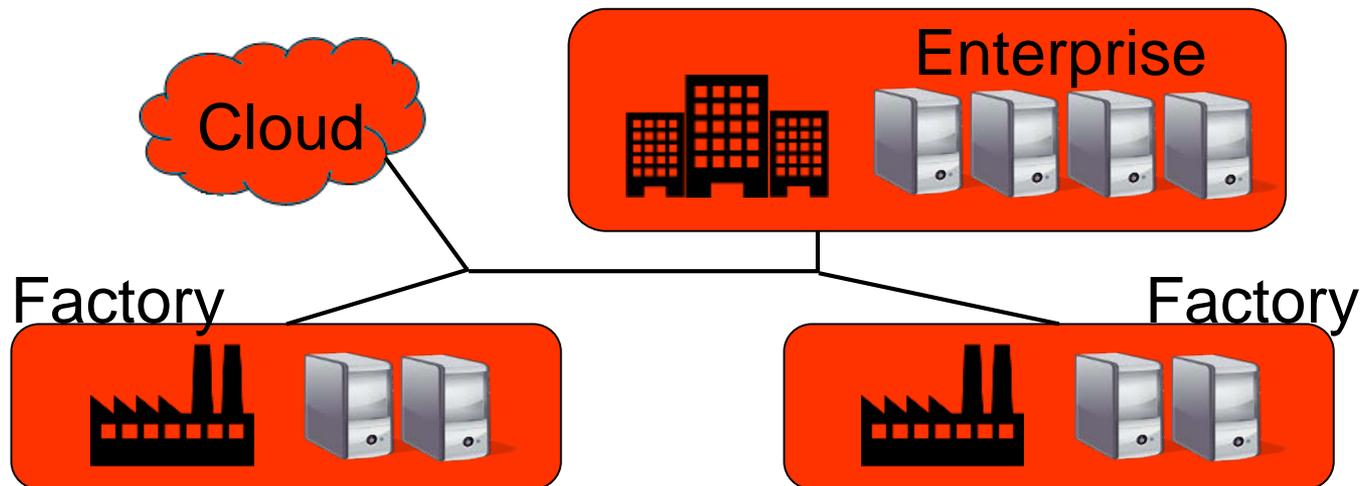


	2013 – MQTT Technical Committee formed
	2011 - Eclipse PAHO MQTT open source project
	2004 MQTT.org open community

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



IBM Integration Bus Industry Packs

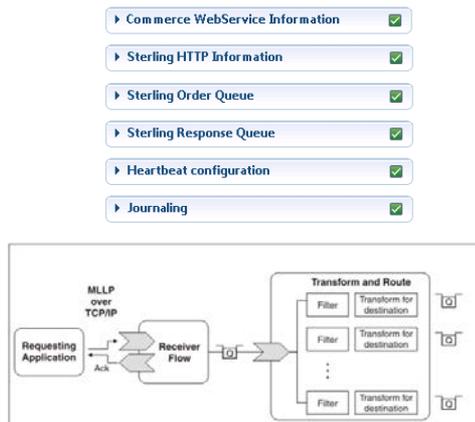
- ▶ The purpose of an IIB Industry Pack is to provide industry-specific development accelerators which solve common industry integration problems
- ▶ Help users to deploy working integration solutions in *literally* a few clicks of the mouse.
- ▶ IIB Industry Pack content is structured around three delivery pillars:

Connectors

Data Definitions

- 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

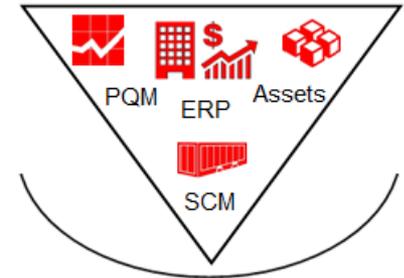


Monitoring

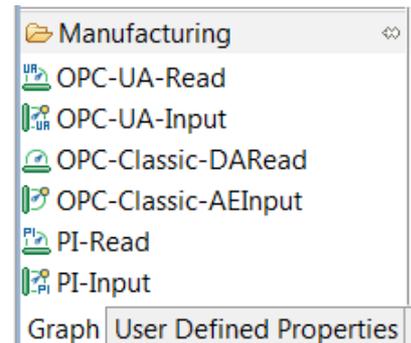
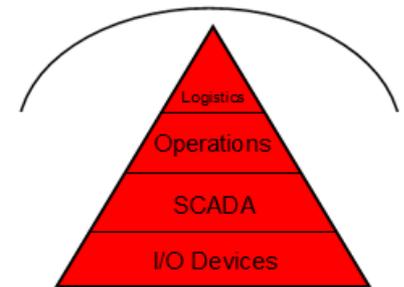


Manufacturing Pack Overview

- 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



Publish / Subscribe



IBM Integration Bus Manufacturing Pack

Manufacturing application monitoring

Filter

No filter applied

OPC		Integration Bus		
Tag	Invocation Count	Flow Name	Node Name	Pattern
Boilers				
Boiler 1	2	Flow 1	Node 1	
Curr Temp	4	Flow 2	Node 1	MyPattern1
max Temp	2	Flow 2	Node 2	MyPattern1



OPC Classic



OPC UA



OSIsoft



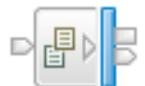
MQTT Subscribe



MQTT Publish



MQTT



Factory Publication Pattern

Configure Pattern Parameters

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

i Pattern workspace resources are generated successfully!

Pattern Parameters

Input Options

OPC input type

OPC Input Type *

Output Options

Output transport type

Output Type *

OPC-UA Input settings

OPC-UA Input node settings

Server name *

Update rate *

Tags *

MQTT Settings

MQTT publish node settings

Connection url *

Topic name *

Client id *

Specification
Configuration

Factory Publication Pattern - Message Flow Example



```

- <OPCData>
  <ServerName>opc.tcp://r
- <Tag>
  <Name>/2:Factory/2:En
  
```

Name	Date modified	Type
mqsiarchive	15/05/2014 23:55	File folder
mqsitransit	15/05/2014 23:55	File folder
Trace	15/05/2014 23:50	File folder
Output1.xml	15/05/2014 23:55	XML Document
Output2.xml	15/05/2014 23:55	XML Document

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



OPC-UA-Input



Trace D:\Manufacturing\Trace\Trace1.txt



File D:\Manufacturing\Output1.xml



MQTT Publish

MQTT Subscribe node subscribes on the nominated topic and receives publications



MQTTSubscribe



Trace D:\Manufacturing\Trace\Trace2.txt



File D:\Manufacturing\Output2.xml

MQTT Publish node publishes the data it receives on the nominated topic

Manufacturing Pack Web UI

IBM Integration Bus Manufacturing Pack

IBM Integration Bus Manufacturing Pack 1.0.0.0

OPC Integration

OPC Integration
▶

B2MML to SAP Publication Pattern

Operational Monitoring:

	Factory Publication Pattern	No instances of this pattern are deployed.
	B2MML to SAP Pattern	No instances of this pattern are deployed.

IBM Integration Bus Manufacturing Pack 1.0.0.0

Integration Server - default

Overview | Statistics

Summary

Throughput per message flow for last 20 seconds. Last u

Flow name	Message Rate (messages/s)	Ave Tim
MonitoredFlow	873.20	
CICSChannelSample	23.87	

<http://localhost:4414/manufacturing>

- 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)

IBM Integration Bus Manufacturing Pack

Manufacturing application monitoring

Filter

No filter applied

Tag	OPC		Integration Bus	
	Invocation Count	Flow Name	Node Name	Pattern
Boilers				
Boiler 1	2	Flow 1	Node 1	
Curr Temp	4	Flow 2	Node 1	MyPattern1
max Temp	2	Flow 2	Node 2	MyPattern1



THANK YOU! ANY QUESTIONS?