

IBM Integration Bus

The Swiss Army Knife of z/OS integration



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IMS Technical Symposium 2015

System z Technical University



- THE IBM z System conference in Europe for 2015
- As well as the new z13, z/OS, etc., loads of sessions on IMS and other z System topics: MQ z/OS, DB2, CICS, WAS z/OS, IIB z/OS
- Dublin, 18-22 May 2015
- <http://www.ibm.com/services/learning/ites.wss/zz/en?pageType=page&c=Q549350A81365Q21>
- Meet the developers and meet your peers throughout Europe
- A terrific investment in *your* skills

A screenshot of the IBM z Systems Technical University 2015 event page. The page features a navigation bar with links for Industries & solutions, Services, Products, Support & downloads, and Training. The main content area includes the event title, dates (18-22 May), location (Dublin, Ireland), and a registration link. A sidebar on the right contains resources and a 'REGISTER NOW!' button. The background of the page is decorated with a 3D grid of purple cubes.

IBM Industries & solutions Services Products Support & downloads M Training

Training - worldwide > Technical events & conferences > Calendar >

2015 IBM z Systems Technical University

Featuring IBM z/OS, z/VM, z/VSE, Linux, System Storage, WebSphere and CICS

18 - 22 May | Dublin, Ireland
Registration open: January 15, 2015

Overview Registration and Travel Agenda Solution Center

IBM z Systems Technical University will explore these capabilities in depth and allow you to take a deeper dive into smarter computing implementation, product announcements, as well as, key topics across the z Systems platform. This 4,5 day event is designed for your technical and professional development.

Discover the new IBM z13 at the z Systems Technical University

This event will be held at the Doubletree by Hilton Dublin

Resources

- Dublin - Week at a glance (116KB)
- Dublin - Z Systems Flyer (851KB)

Have questions? +

REGISTER NOW!

Agenda



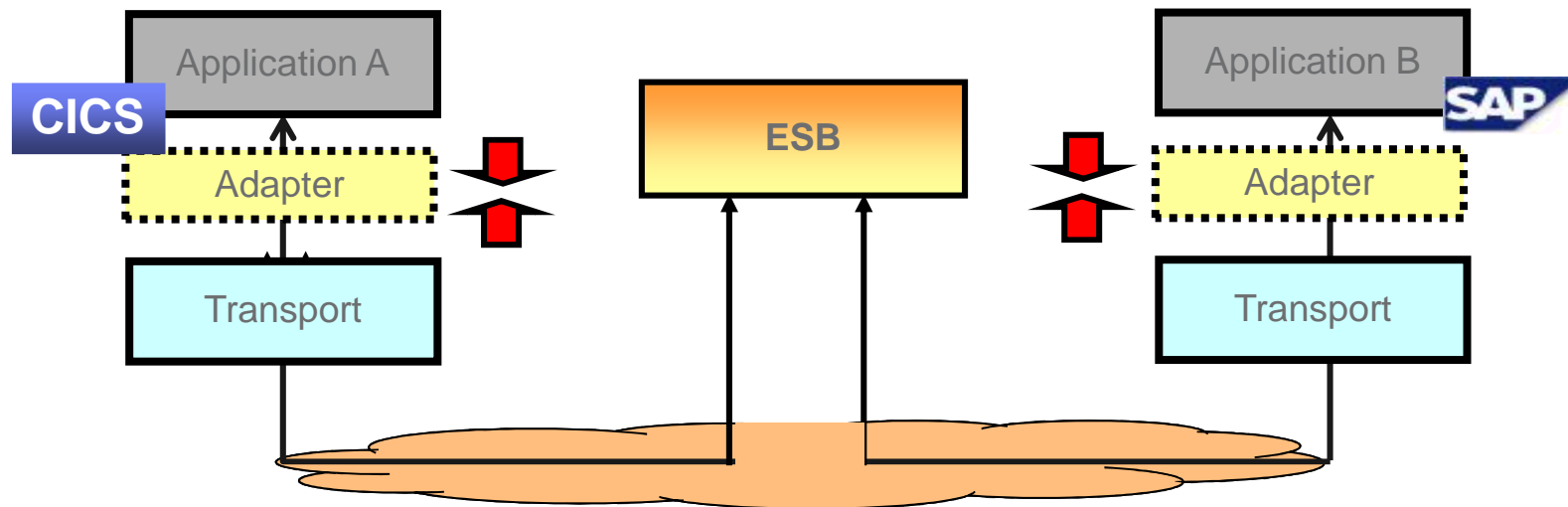
- What's an ESB?
- What is the IBM Integration Bus?
 - Development
 - Administration
 - Architecture
- IIB on z/OS
 - IIB and IMS
 - Who is using an IIB?



What is an “Enterprise Service Bus (ESB)”?



"Gartner estimates that up to 30% of the cost of implementing an application is related to the development of the interfaces" -Gartner



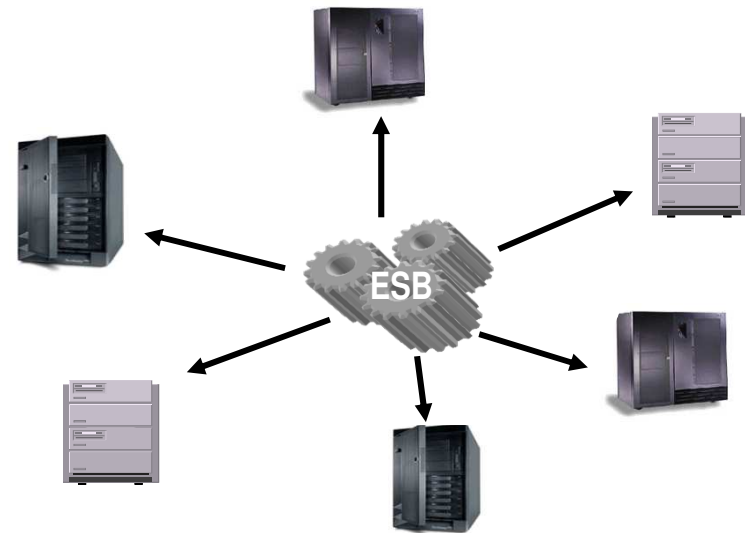
- The “Broker” (or “hub” or “gateway” or ...) is central and the intermediary between the applications
- It typically has responsibility for routing and transforming data between the applications
- An ESB must be polyvalent with support for multiple data formats and protocols, extremely reliable and scalable

Business value of an ESB



- Traditional communications
 - Point to point
 - Each application must adapt the data to its particular need
 - The number of transformations grows exponentially $n*(n-1)$
- Communications with a ESB
 - Hub 'n spoke logic
 - Maintenance can be centralised
 - Promotes reutilisation

(Note: although an ESB appears architecturally as a single middle point, scalability and high-availability requirements imply that multiple physical hubs are required)



Agenda



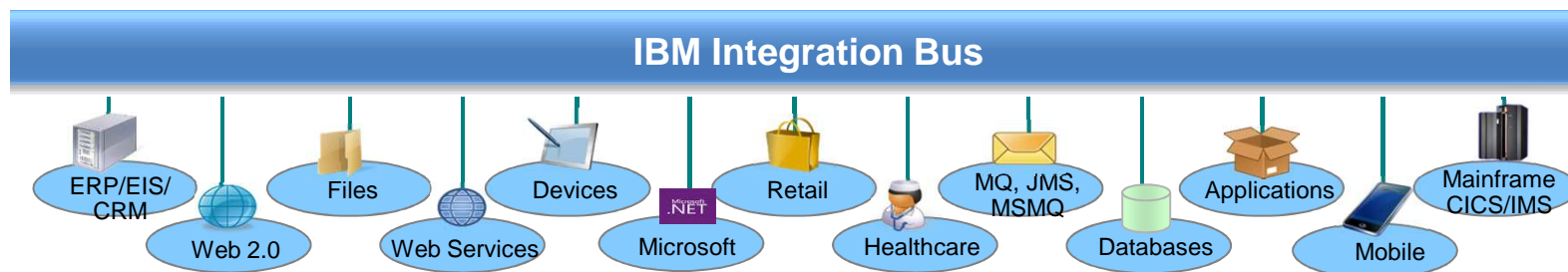
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What is the IBM Integration Bus?



- IBM's strategic enterprise integration technology
 - Single engineered product for fully heterogeneous integration scenarios



- IBM Integration Bus is the new name for WebSphere Message Broker
 - Technology progression over 15 years, installed at 2500+ customers worldwide across all industries
 - Fully supported worldwide by IBM global support network, standard 5 + 3 years support policy
 - Version to version migration is key design consideration
 - Global skills availability - SME's available globally via IBM and partners
 - Close interaction with growing and loyal customer base: beta and lab advocacy programs



IBM Integration Bus....

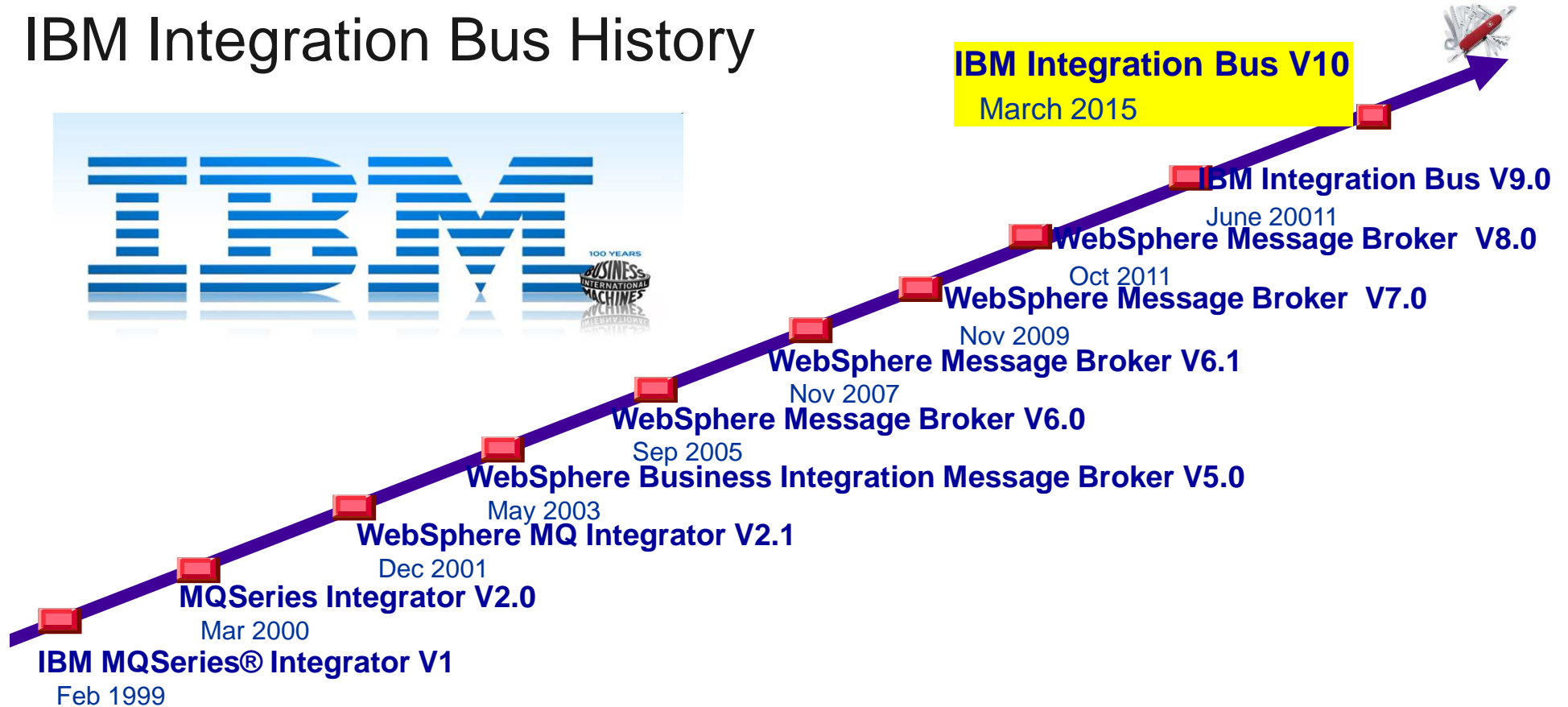


- **Routes, Transforms, Augments** “messages”
- Accepts a large variety of “messages”: MQ, JMS, HTTP, SOAP, TCP/IP, local files, FTP, etc.)
- Supports **multi-format** (XML, SOAP, fixed, variable length, tagged, SWIFT, IDOC, etc.)
- Offers full **database** support (DB2, Oracle, Informix, Microsoft SQL Server, Sybase, etc.)
- Supports common **ERP** and **EIS** interfaces (CICS, IMS, SAP, PeopleSoft, Siebel, etc.)
- Provides a drag ‘n drop **visual development** based upon Eclipse, supporting a variety of **development languages** (Java, eSQL, XSLT, PHP, .Net, etc.)
- Offers a **scalable, high-performance, resilient, low-latency** “execution container”
- Supports **transactionality** (2-Phase-Commit)
- Supports Point-To-Point, Pub/Sub, Event, Synchronous and Asynchronous message processing styles
- Includes full life-cycle tooling (development, administration, runtime)
- Is extensible with open parser, node & administration interfaces
- Supports all major hardware and O/S platforms

Truly the “Swiss Army knife” of integration!



IBM Integration Bus History



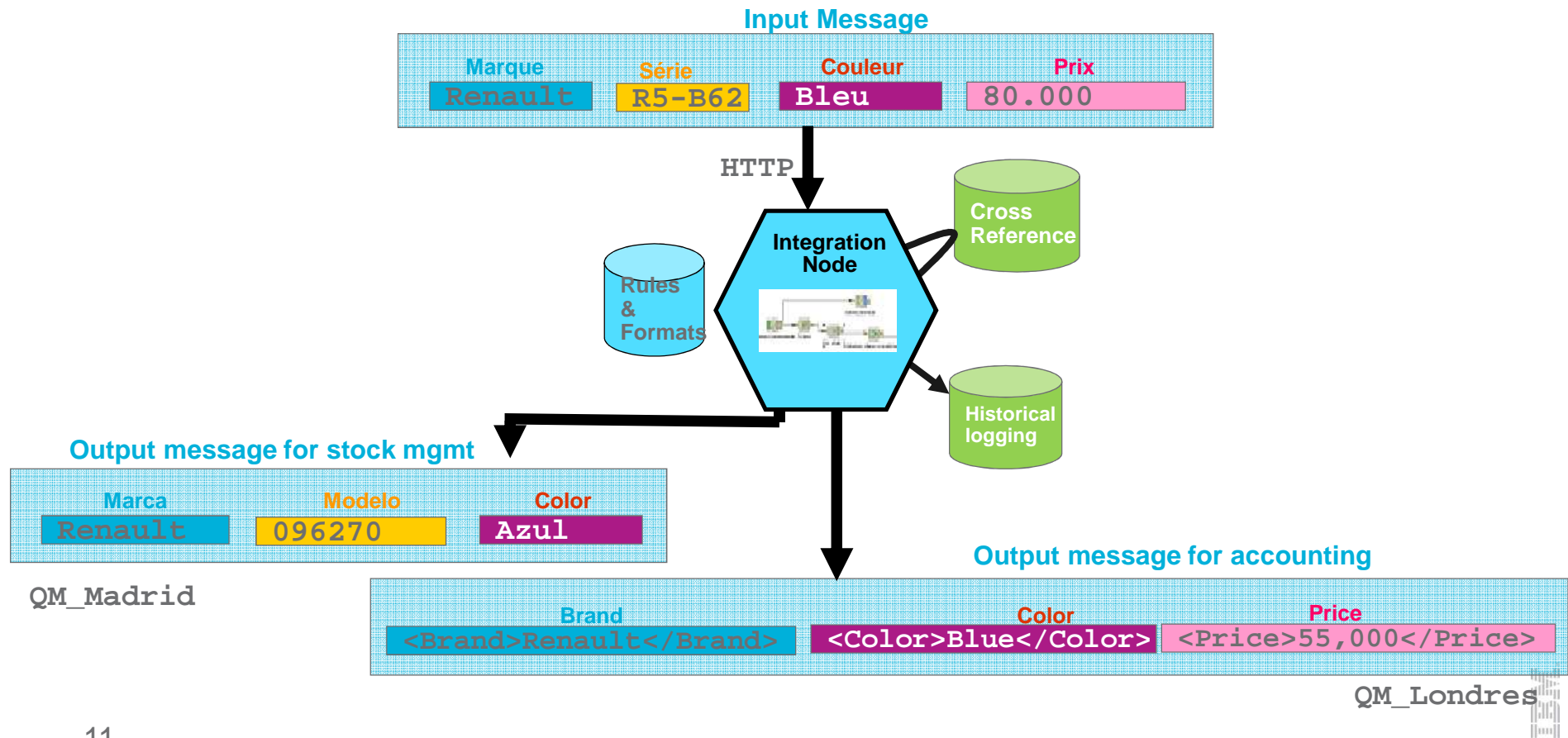
New Jargon warning



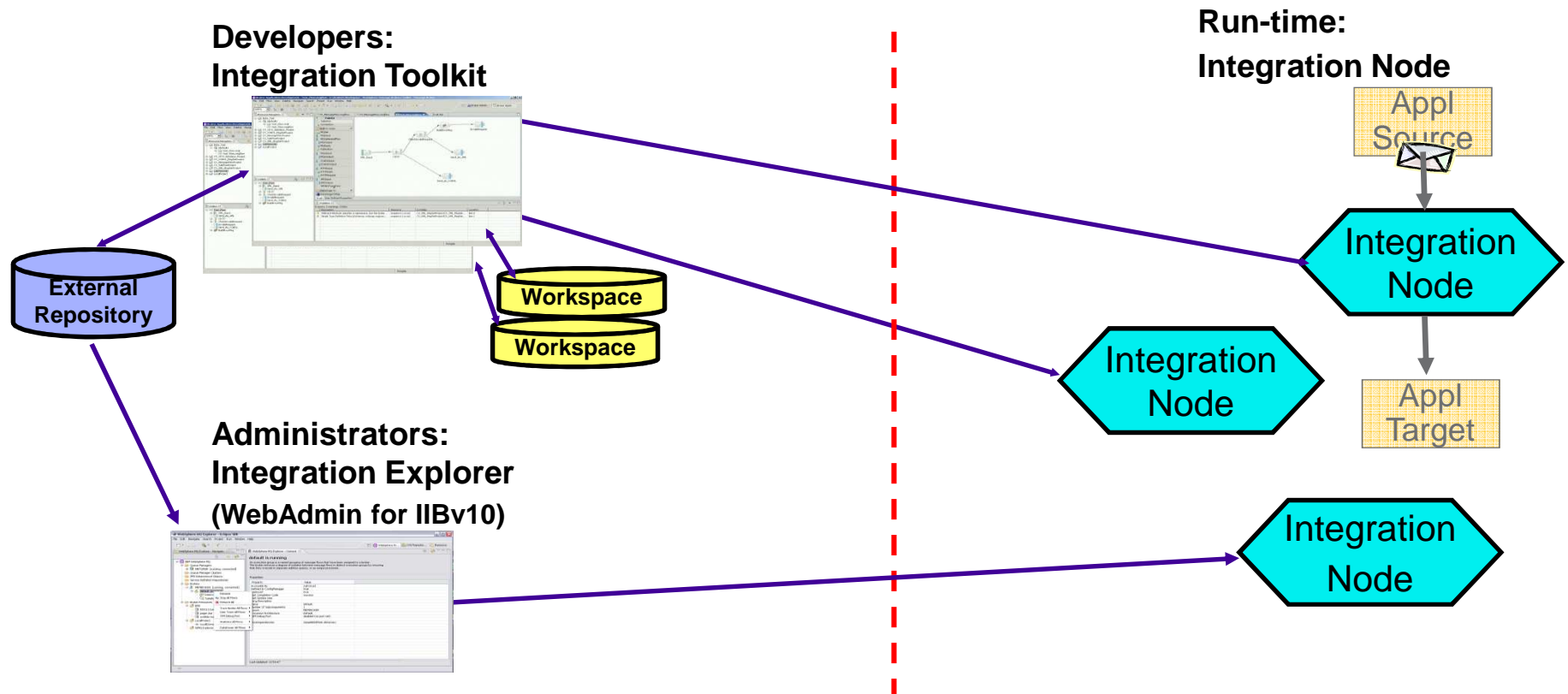
With the new name “IBM Integration Bus” come several changes for component names....

WebSphere Message Broker	IBM Integration Bus
Broker	Integration Node
Execution Group	Integration Server
:	:

IIB: Routing and Transformation




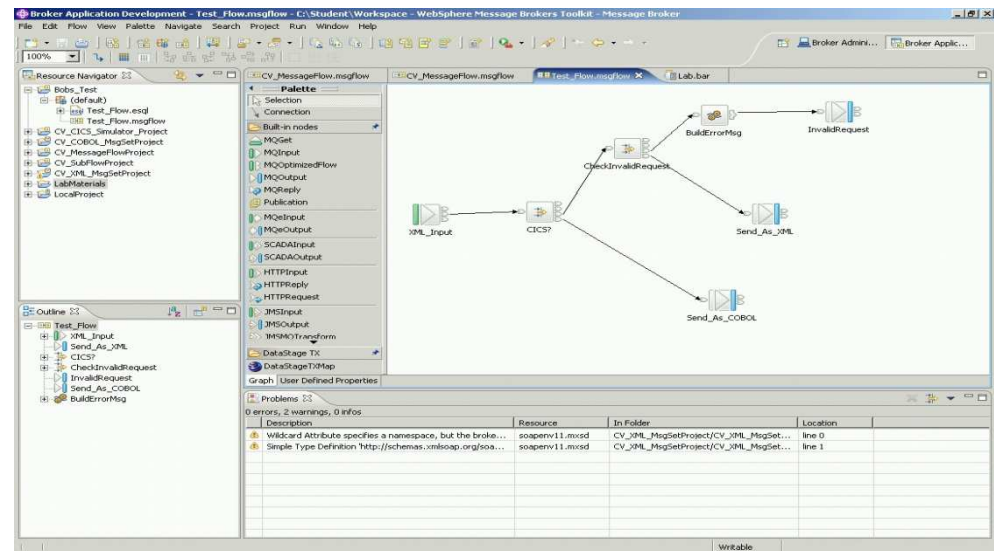
IIB Components & Lifecycle



The Integration Toolkit



- The GUI used for all ESB development tasks
-  based, standard interface for Windows or Linux (<http://www.eclipse.org/org/>)
- Provides various “perspectives” for different tasks to be performed
 - Message Flow Developer Perspective
 - Debug Perspective
 - Java Perspective
 - etc...
- Let's take a closer look at it.....



The Integration Toolkit tour



The screenshot displays the WebSphere Message Broker Toolkit interface. The main workspace shows a message flow diagram with nodes: COLL_IN1, COLL_IN2, COLL_IN3, COLL_NODE, COLL_TRACE1, COLL_COMPUTE, COLL_TRACE2, COLL_OUT, COLL_COMP_EXPIRE, and COLL_EXPIRE. The interface includes several panes:

- Navigator pane:** Located on the left, showing a tree view of projects and flows.
- Outline pane:** Located at the bottom left, showing a hierarchical view of the current project's components.
- Properties:** Located at the bottom right, showing the default values for message flow properties for the selected component.
- Editor pane:** The central workspace where the message flow diagram is edited.

Default Values for Message Flow Properties - CollectorNodeSample	
Description	
Monitoring	
Version	<input type="text"/>
Short description	<input type="text"/>
Long description	<input type="text"/>



Integration Toolkit - Flow definition



The screenshot displays the WebSphere Message Brokers Toolkit interface for defining a message flow. The main canvas shows a flow diagram for 'DemoCommande.msgflow' with the following steps: 'DemoCommande' (input), 'Validate', 'Log_commande', 'Ajouter modèle', and 'Pour Strasbourg?'. The flow branches into two paths: one leading to 'Demo.Lille' and another to 'Demo.Strasbourg'. A yellow box highlights the flow definition with the text: "A flow defines the handling of a message".

The 'Properties' window for 'DemoCommande_Log_commande.msgmap' shows the following structure:

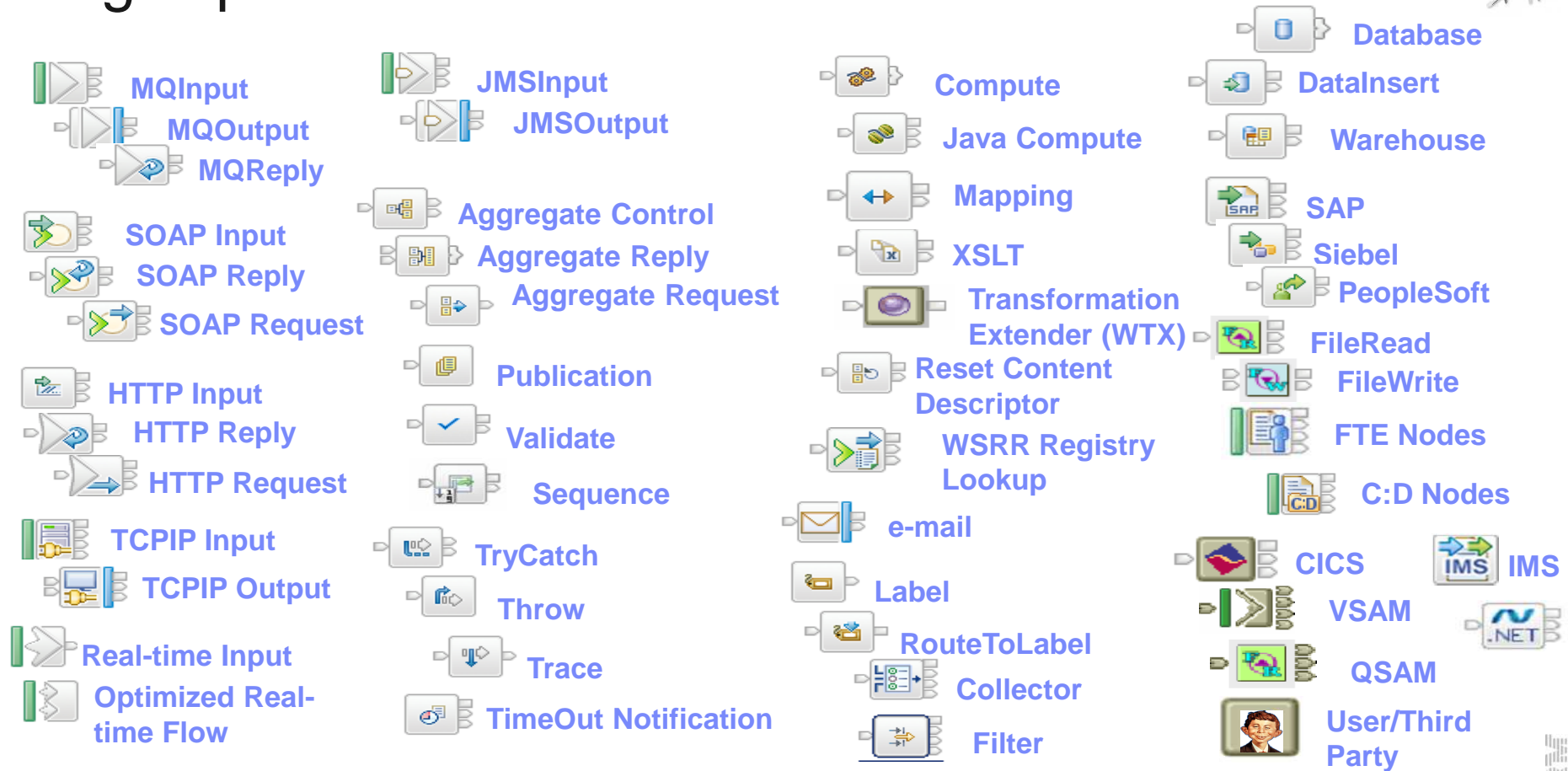
```
[source: Message "MultCommandes"]
├── Properties (PropertiesType_MultCommandes)
│   ├── Commande (anonymous)
│   │   ├── Type (xsd:string)
│   │   ├── Client (anonymous)
│   │   │   ├── Code (xsd:string)
│   │   │   ├── Nom (xsd:string)
│   │   │   ├── Prenom (xsd:string)
│   │   │   ├── Adresse (anonymous)
│   │   │   ├── Option (xsd:string)
│   │   │   ├── Couleur (xsd:string)
│   │   │   ├── Prix (xsd:string)
│   │   │   ├── Devis (xsd:string)
│   │   │   └── Modele (xsd:string)
│   └── Log_commande (anonymous)
└── sdb:insert - TEST.CFARKAS.DEMOLOG
    ├── DATE
    ├── HEURE
    └── COMMAND
```

The 'Map Script' window shows the following configuration:

Map Script	Value
Parameters	
sdb:insert	
COMMAND	<code>\$source/MultCommandes/Commande/Type</code>
DATE	<code>esql:current-date()</code>
HEURE	<code>esql:current-time()</code>



A glimpse of some of the standard nodes...



Development



The image displays two screenshots from the IBM Message Brokers development environment. The left screenshot shows the 'CVS Repository Exploring' window, which provides a hierarchical view of the project's source code, including folders for various lab components and CVSROOT. The right screenshot shows the 'Flow Debug' window, which is used for developing and debugging message flows. It features a tree view of the message flow structure, including nodes like 'MQMD', 'Customer', and 'Parts'. Below the tree, a graphical flow diagram illustrates the message flow process, starting with 'PARTS_SUM_IN' and passing through nodes such as 'Total Price', 'Inject order', 'Map to Legacy', 'Trace', 'PARTS_SUM_FAILURE', and finally 'PARTS_SUM_OUT'.

- When “drag ‘n drop” development with the standard nodes isn’t sufficient, programming can be done typically with eSQL (procedural language based upon the SQL99 standard), Java, PHP, .Net, XSLT or additional add-on extensions such as WTX
- Custom nodes can also be developed either in Java or C++
- Toolkit supports tracing and interactive debugging
- Team development and administration is supported by scripting and/or standard market plugin extensions to the IIB Toolkit, eg. CVS, ClearCase, PVCS, TeamCode, etc.



eSQL



DataInsert

```
IF Root.XML.Person.Taille > 183 THEN
INSERT INTO Database.MesGrandsCopains
(Name,Height,Age)
VALUES (Body.Person.Nom,
Body.Person.Taille,
Body.Person.Age);
ENDIF;
```



Compute

```
IF (Body.Person.Name = 'Carl') THEN
OutputRoot.Properties.MessageFormat = 'XML';
ELSE IF (Body.Person.Name = 'Rudi')
OutputRoot.Properties.MessageFormat = 'CWF';
ELSE IF (Body.Person.Name = 'Saad')
OutputRoot.Properties.MessageFormat = 'TDS';
ENDIF;
```

Data types

INTEGER
FLOAT
DECIMAL
STRING
DATETIME
BOOLEAN
REFERENCE
NULL
...

Operators

- + * /
||
AND OR NOT
= <> > >= < <=
IN BETWEEN
LIKE
IS EXISTS
...

Statements

Basic

DECLARE
SET
IF ENDIF
WHILE

Tree

MOVE
CREATE
DETACH
ATTACH

Database

INSERT
DELETE
UPDATE
PASSTHRU
EVAL

Node

PROPAGATE
RETURN
THROW
...

Functions

String

LENGTH
TRIM LTRIM RTRIM
OVERLAY
POSITION
SUBSTRING
UCASE LCASE

Numeric

ABS
BITAND NOT (X)OR
MOD ROUND
SQRT
TRUNCATE
EXTRACT

Datetime

EXTRACT
CURRENTDATE
CURRENTTIME

Field

BITSTREAM
CARDINALITY
FIELDTYPE
SAMEFIELD

Complex

CAST
SELECT
...

Java Compute Node



- Support for Java as IIB transformation language (Java Compute Node)
 - Complete support for Java JSE v7 integrated into IIB
 - Java classes deployed in the IIB Broker ARchive with the flow (.BAR)
 - “Wizards” used to simplify the development
 - Classes provided for XPATH message tree navigation
 - **zAAP** support for IIB on z/OS!

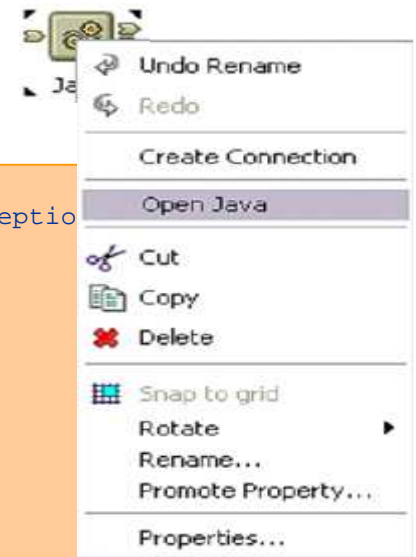
```
public class CarlJNode extends MbJavaComputeNode {
    public void evaluate(MbMessageAssembly inAssembly, MbInputTerminal inTerm) throws MbException
    :
    MbMessage outMessage = new MbMessage(inAssembly.getMessage());

    // Add user code below

    MbElement cadet =
        outMessage.getRootElement().getLastChild().getFirstChild().getLastChild();

    rc = cadet.createElementAfter(MbElement.TYPE_NAME, "NewElm", "mon truc chouette");

    // End of user code
    MbMessageAssembly outAssembly =
        new MbMessageAssembly(inAssembly, outMessage);
    getOutputTerminal("out").propagate(outAssembly);
    outMessage.clearMessage();
}
}
```



Other integrated transformation options...



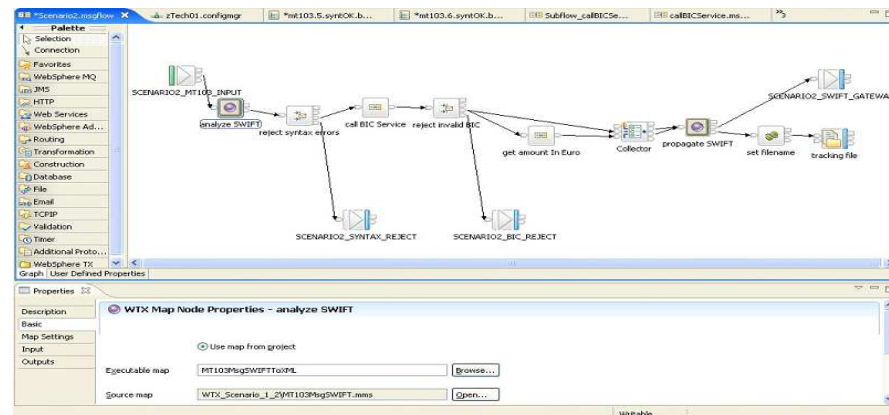
- Standard XML Transformations via XSLT
- PHP (Hypertext pre-processor) support

```
$message->a->b->c = $input_body->Message;  
  
for ($index = 0; $index < $output_root->Menu->Food->count; $index++) {  
    $item = $output_root->Menu->Food[$index];  
}
```

- WebSphere Transformation Extender (WTX) integration - for bulk transformations

- ✓ Full Development-time integration into toolkit
- ✓ Full Runtime integration
 - Invoke WTX parser
 - WTX mapping

- .Net integration (Windows only... of course)



IIB message modelling



The screenshot displays the IBM Message Broker development environment. The left pane shows a project tree with various message types and mappings. The central pane shows the 'Properties Hierarchy' for the 'Nom (xsd:string)' message type, including logical and physical properties. The right pane shows the 'Details' for the physical representation, with fields for Physical Type (Fixed Length String), Length Count (20), Length Reference, Length Units (Bytes), String Justification (Left Justify), Padding Character, and Representation of null values (NullLogicalValue). A yellow callout box highlights the following features:

- Definition of both logical and physical format of message
- Support for XML, fixed length, variable length, delimited, tagged format messages, etc.
- Predefined parsers for other industry standards such as SAP IDOC, SWIFT, EDIFACT, ACORD AL3, SOAP, etc.
- Direct import for C or COBOL headers, DTD, schemas, WSDL, etc.
- Other industry libraries available



DFDL

- Data Format Description Language (DFDL)
 - Simple & powerful standard for data modelling (non—XML, non-JSON)
 - New standard for binary, text & industry data formats
 - Logical structure with physical annotations
 - e.g. endian, ASCII/EBCDIC, padding, justify...
 - For use in IBM and non-IBM products
 - forge.gridforum.org/projects/dfdl-wg
- Built-in facilities to model data easily
 - Quick wizards for (e.g.) CSV, record oriented data
 - Auto-model importers (e.g.) COBOL copybooks
 - DFDL editor for power users
 - Create logical model & physical refinements
- All nodes can exploit new DFDL parser
 - Configure as existing XML, JSON, MRM... parsers
 - Excellent performance characteristics

The screenshot illustrates the DFDL workflow in IBM DataStage. At the top, a table with columns A-E (Year, Make, Model, Description, Price) is shown. An 'Export' button is visible. Below the table, a yellow sticky note displays the corresponding CSV output: `Year,Make,Model,Description,Price
2008,SK Inc,MBTK7,"4293cc, V8",53880.00
2010,Hans On,DFDL,3000cc straight 6,31395.00
2010,AOD corp,MB8,"4163cc, V8",51435.00`. Below this, the 'Configure schema for CSV data' dialog is shown, with 'Carriage Return & Line Feed - %CR;%LF;' selected for the record terminator and 'Skip a blank record' checked. At the bottom, the 'DFDL Test - Logical Instance' window shows the resulting XML structure:

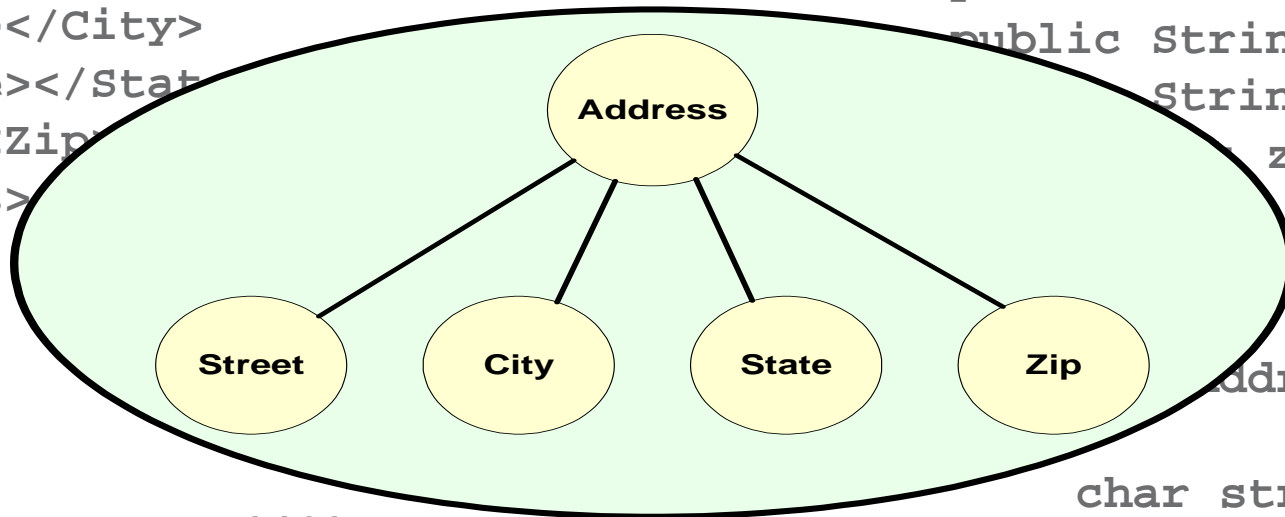
Name	Type	Value
Company		
CompanyName	xs:string	My Company
Employee		
EmpNo	xs:integer	111111
Dept	xs:integer	500
EmpName	xs:string	Alice Wong
Address		
Tel	xs:string	905-347-5649
Salary	xs:decimal	135599.95
Employee		
EmpNo	xs:integer	222222

Example data representations



```
<Address>
  <Street></Street>
  <City></City>
  <State></State>
  <Zip></Zip>
</Address>
```

```
class Address
{
  public String street;
  public String city;
  public String state;
  public int zip;
```



```
01 ADDRESS.
```

```
02 STREET PIC X(40).
02 CITY PIC X(40).
02 STATE PIC X(20).
02 ZIP PIC 9(5).
```

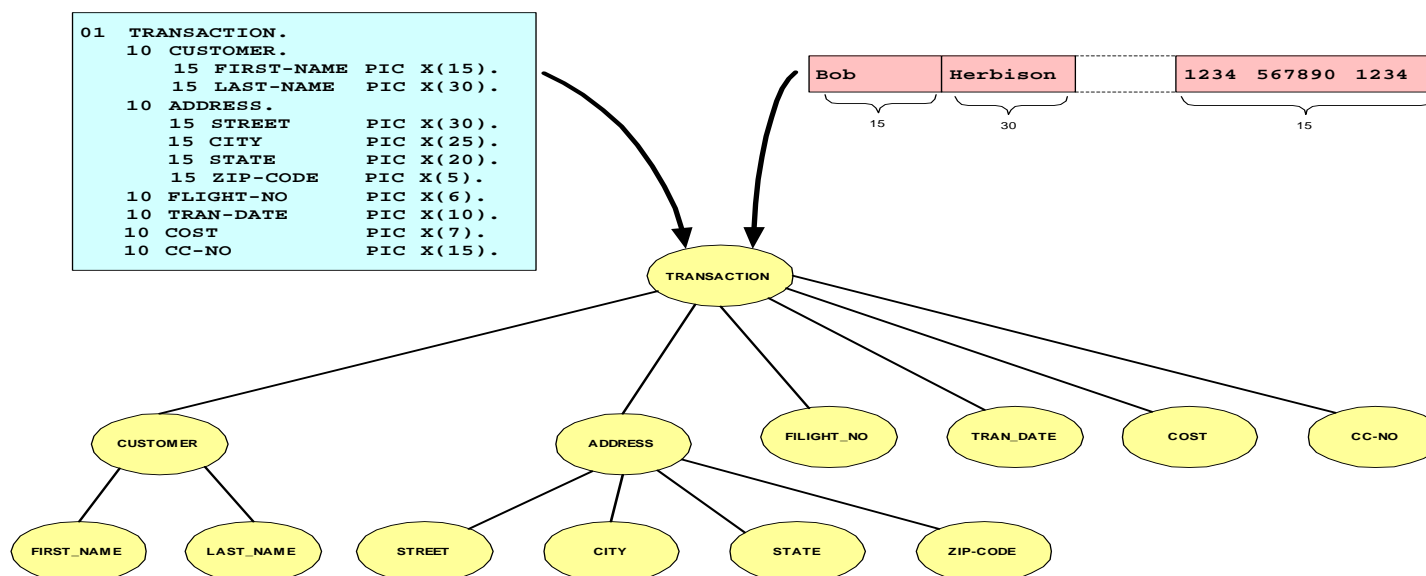
```
char street[40];
char city[40];
char state[20];
int zip;
```





The Logical Message Model

- A consistent, convenient way to represent message content inside the IBM Integration Bus
- Removes/Isolates the physical details of the message
- Organized as a message tree
- Element values stored in Unicode – facilitates code conversions
- Elements in the tree addressed by dotted name notation; in eSQL, for example, `Body.TRANSACTION.CUSTOMER.FIRST_NAME = 'Bob'`;



Agenda




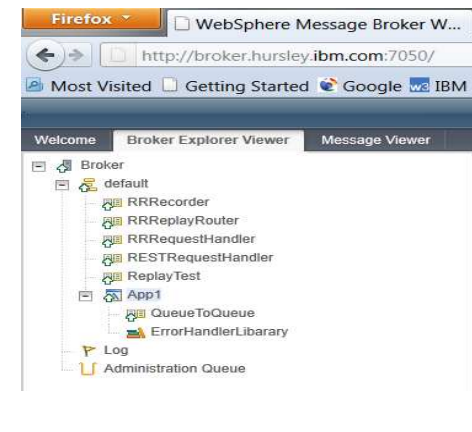
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IBM Integration Bus Administration



- IBM Integration Bus offers a wide variety of flexible administration tools
 - This reflects its underlying nature as a production strength tool
 - 3rd party administration tools are also available (BMC, CA, IBM Tivoli...) for integrating into a corporate administration
- ✓ IBM Integration Explorer is the visual (GUI) interface for casual administration (thru IIBv9)
 - Eclipse- based plugin for WMQ Explorer
 -  on Linux and Windows
- ✓ Lightweight Web Administration for zero-footprint visual administration (unique GUI as of v10!)
 - Supports IE, Firefox, Safari, Chrome....
- ✓ A full Command Line interface is also available
 - Consistent interface on all platforms
 - Useful for administration from scripting environments
 - SDSF commands also provided for IIB on z/OS
- ✓ The IIB Java API is the underlying administration API
 - Available to any administrator to develop routines
 - A solid base for corporate, repeatable, controlled administration
- ✓ REST-based administration interface supporting HTTP clients
 - Compatible with Java API



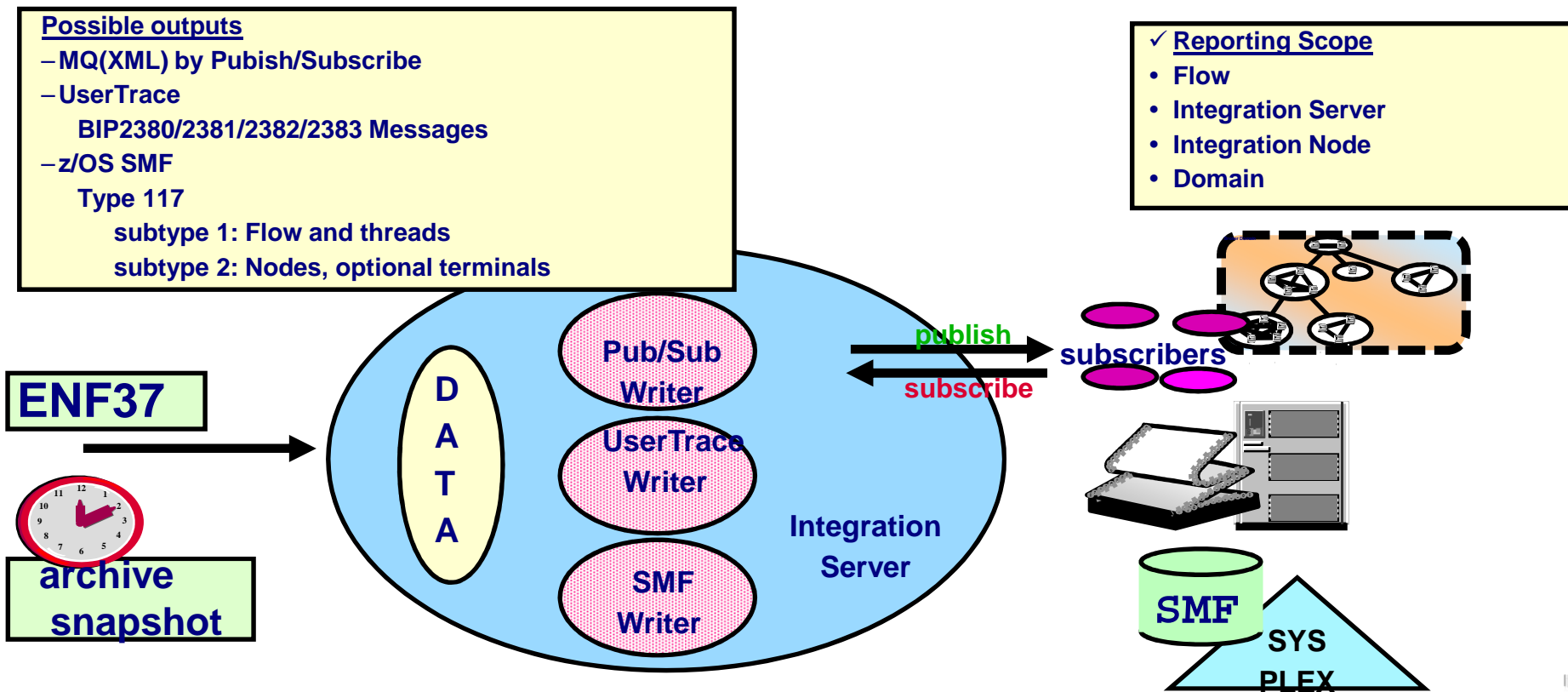
The Integration Explorer



The screenshot displays the WebSphere MQ Explorer interface. On the left, a tree view shows the hierarchy of components, including Queue Managers (MB7QMGR), Brokers (MB7BROKER), and various resources. A context menu is open over the 'default' broker, listing actions like 'Rename', 'Stop All Flows', and 'Trace Nodes All Flows'. The main content area shows a description of an execution group and a 'Message Broker Statistics Graph'. The graph displays three stacked bars for 'CountOfInvocations', 'MaximumCPUTime', and 'TotalCPUTime', with values for FilterNode-Filter, MQOutputNode-MQOutput, and MQInputNode-MQInput. Below the graph is a table of statistics.

Label	Type	TotalElapsedTime	MaximumElapse...	MinimumElapse...	TotalCPUTime	MaximumCPUTime	MinimumC...
Filter	FilterNode	89000	3000	1000	78125	15625	15625
MQOutput	MQOutputNode	1006000	77000	1000	15625	15625	15625
MQInput	MQInputNode	297000	51000	1000	0	0	0

Statistics – technical monitoring



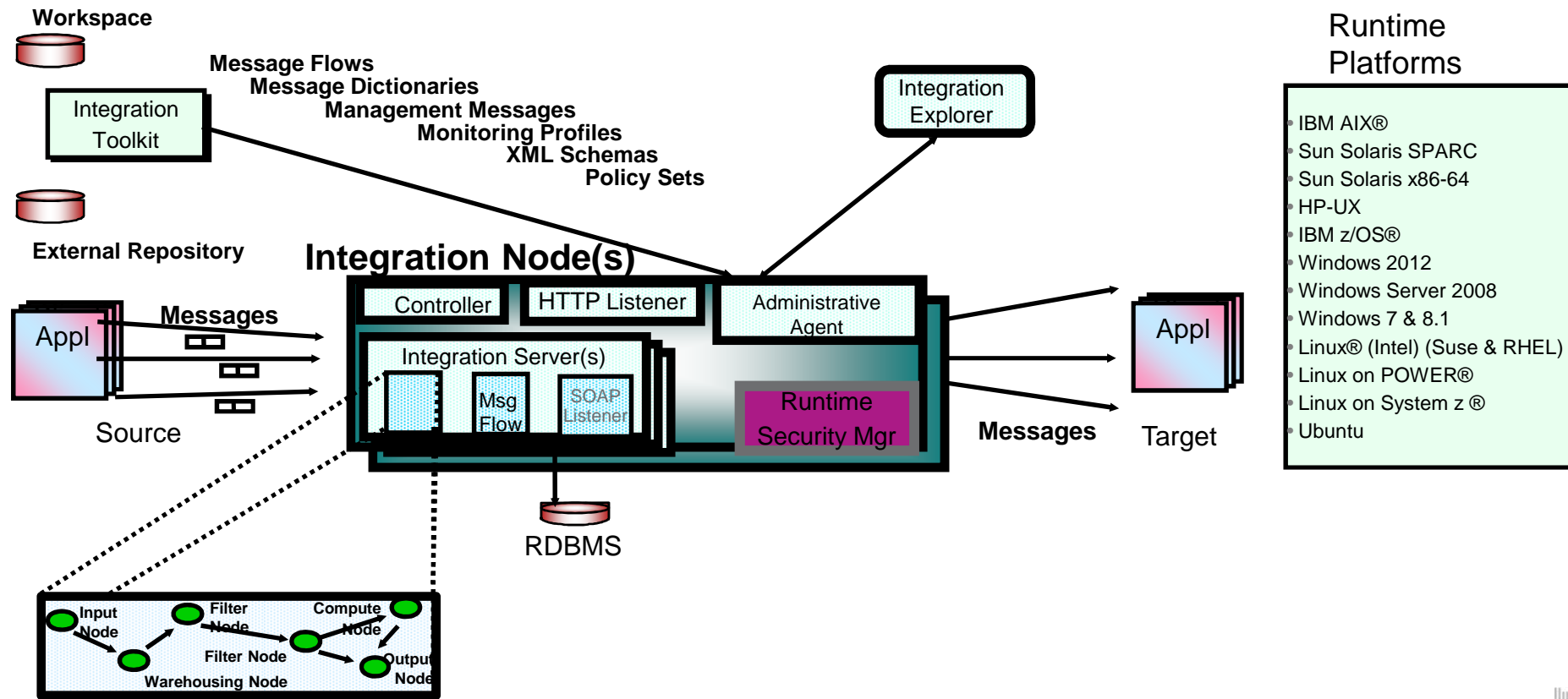
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IBM Integration Bus System Architecture



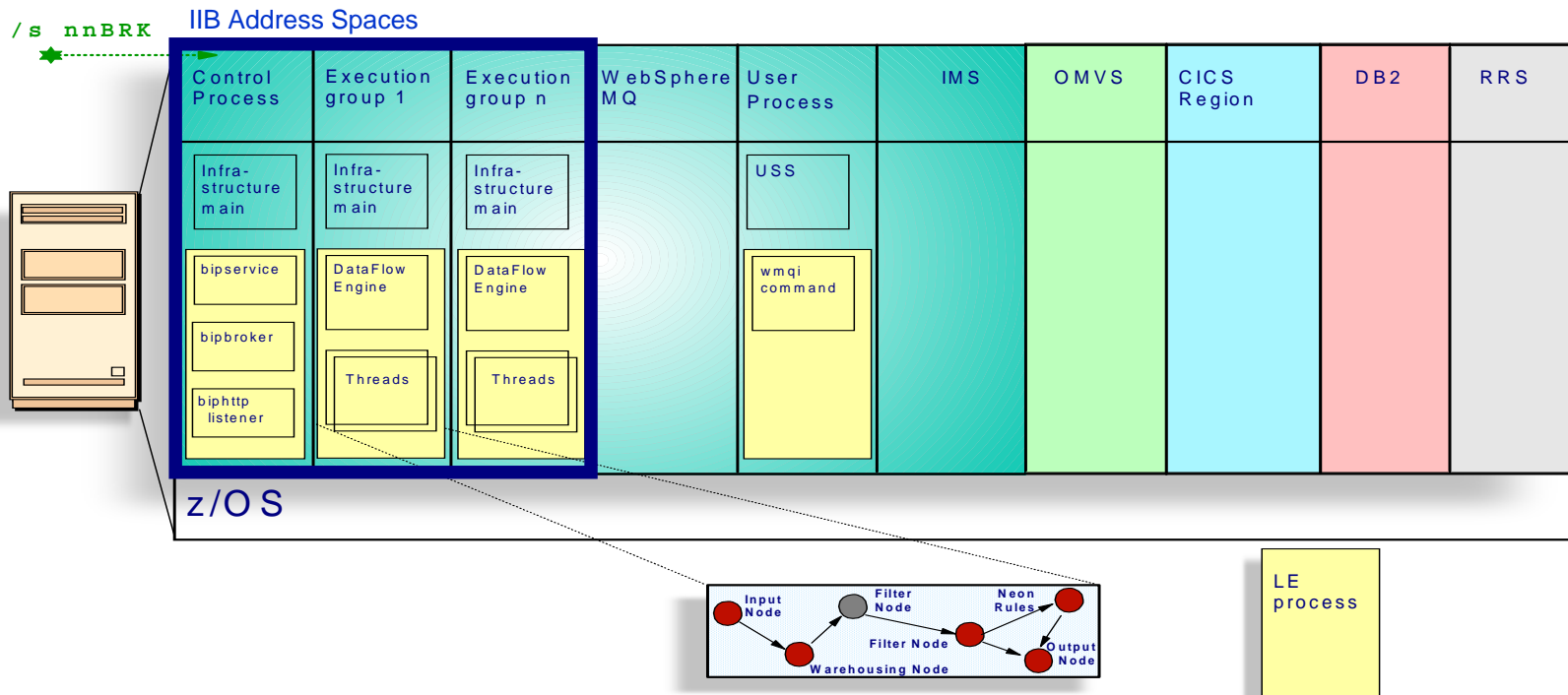
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IIB on z/OS



The Integration Node address spaces



The image displays three overlapping screenshots of a z/OS terminal window, illustrating the integration node address spaces. The windows are titled "B - Carl z/OS - ToFlex.WS".

Top Window: Shows a command prompt with the following output:

```

SDSF DA SYS1 P39
COMMAND INPUT ==
NP JOBNAME
CSQ1MSTR 1
CSQ1CHIN 0
CSQ1BRK 0
CSQ1BRK 16
    
```

Middle Window: Shows a console output for the IIB control process:

```

SDSF ULOG CONSOLE IBMUSER LINE 17 COLUMNS 44- 123
COMMAND INPUT ==> SCROLL ==> CSR
-D OMVS,U=CSQ1BRK
BPX0040I 06.13.06 DISPLAY OMVS 899
OMVS 000D ACTIVE OMVS (DB)
USER JOBNAME ASID PID PPID STATE START CT_SECS
CSQ1BRK CSQ1BRK 0042 50307221 1 1WI--- 06.08.29 14.33
LATCHWAITPID= /usr/lpp/mqsi/V5R0M1/bin/bipimain bipser 14.33
    
```

Bottom Window: Shows the output of the command `ps -ef ! grep CSQ1BRK`:

```

IBMUSER @ P390: />ps -ef ! grep CSQ1BRK
CSQ1BRK 50397221 1 - 07:08:30 ? 0:16 /usr/lpp/mqsi/V5R0M1/bain DataFl
in/bipimain bipservice CSQ1BRK AUTO 100.50
CSQ1BRK 65574 50397221 - 07:08:31 ? 0:16 bipservice CSQ1BRK AUTO-fd00-000
0 100.50
CSQ1BRK 65575 65574 - 07:08:50 ? 0:16 bipbroker CSQ1BRK
CSQ1BRK 50397224 1 - 07:09:26 ? 3:18 /usr/lpp/mqsi/V5R0M1/b
in/bipimain DataFlowEngine 00001007 00002004
CSQ1BRK 65577 50397221 - 07:09:28 ? 3:18 DataFlowEngine CSQ1BRK
e5193470-fd00-0000-0080-af32a61fbe65 default 1
OMVSKERN 16842796 65578 - 07:26:14 tty0000 0:04 g
IBMUSER @ P390: />
    
```

Orange callout boxes identify the following components:

- WebSphere MQ** (top window)
- IIB control** (middle window)
- IIB IntSrv (ExGroup)** (middle window)
- IIB control** (bottom window)
- IIB IntSrv (ExGroup)** (bottom window)



What's different on z/OS?



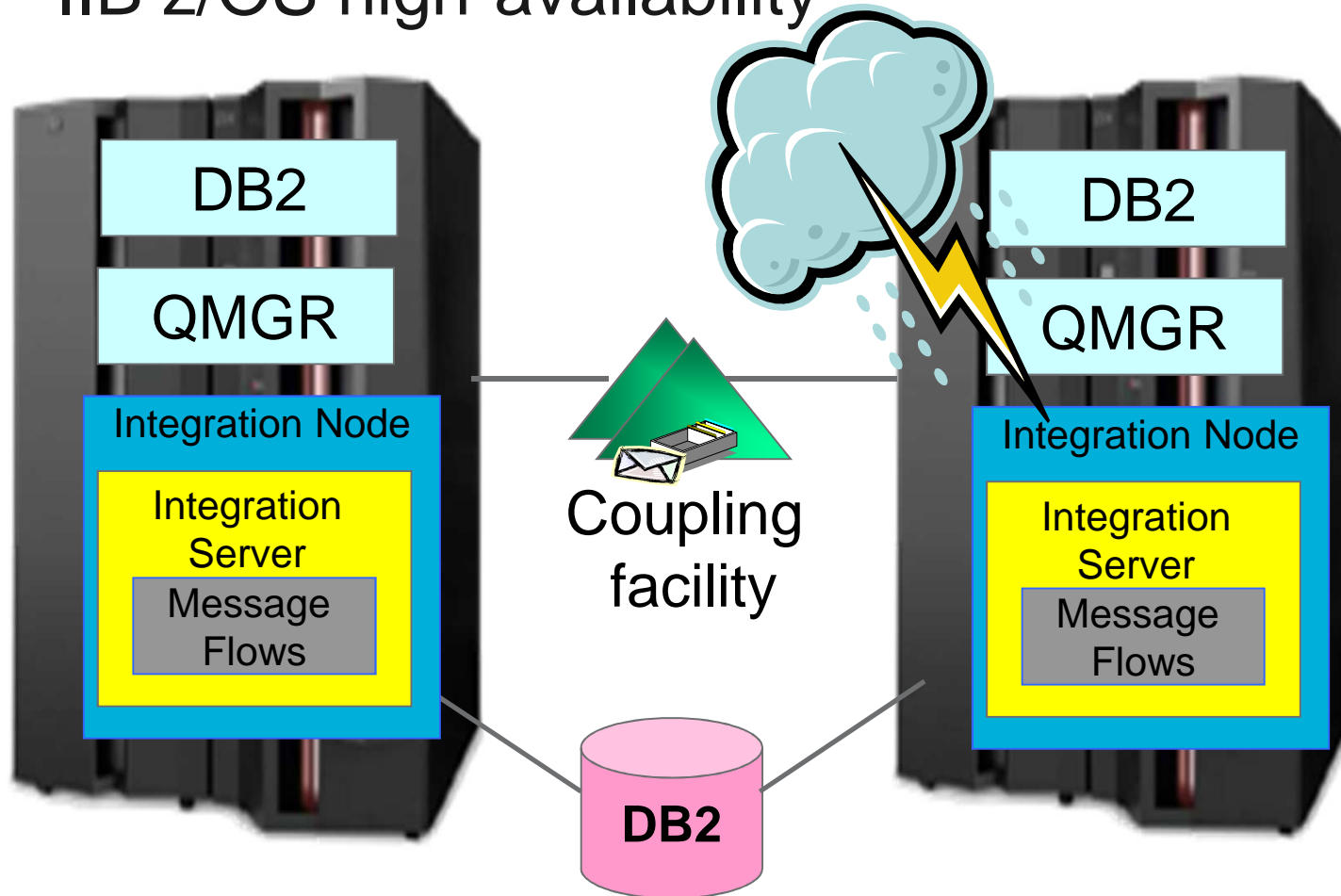
- The IIB is essentially identical on all platforms as far as the facilities and any APIs.
 - Almost all flows run “as-is” regardless of the platform
- IIB z/OS does benefit, however, from a few z/OS-specific nodes for better exploiting z/OS:
 - VSAM nodes for direct access to VSAM datasets
 - QSAM nodes for direct access to QSAM datasets
- IIB z/OS also leverages several other z/OS-exclusive features...
 - z/OS is the only platform that can offer the highest levels of **scalability and high-availability** by taking full advantage of the z/OS Parallel Sysplex and WebSphere MQ **Shared Queue** technology
 - IIB uses z/OS **ARM** feature used to auto (re-)start in case of failure
 - z/OS **RRS** is used to ensure IIB transactionality
 - Each integration server can leverage z/OS **SAF** (eg. RACF) security with security per server.
 - IIB z/OS takes advantage of **WLM** and corporate business goals can be assigned to Execution Groups
 - IIB z/OS makes full use of **SMF** for performance monitoring



Customers choose to run the IIB on z/OS typically when interfacing with host data and/or when they require the best QOS only found on z/OS



IIB z/OS high-availability



- ▶ Any Flow in the QSG can access messages
 - “Natural” load-balancing based upon availability
- ▶ Any Flow can recover messages in case of an outage
- ▶ z/OS ARM can restart any stopped component

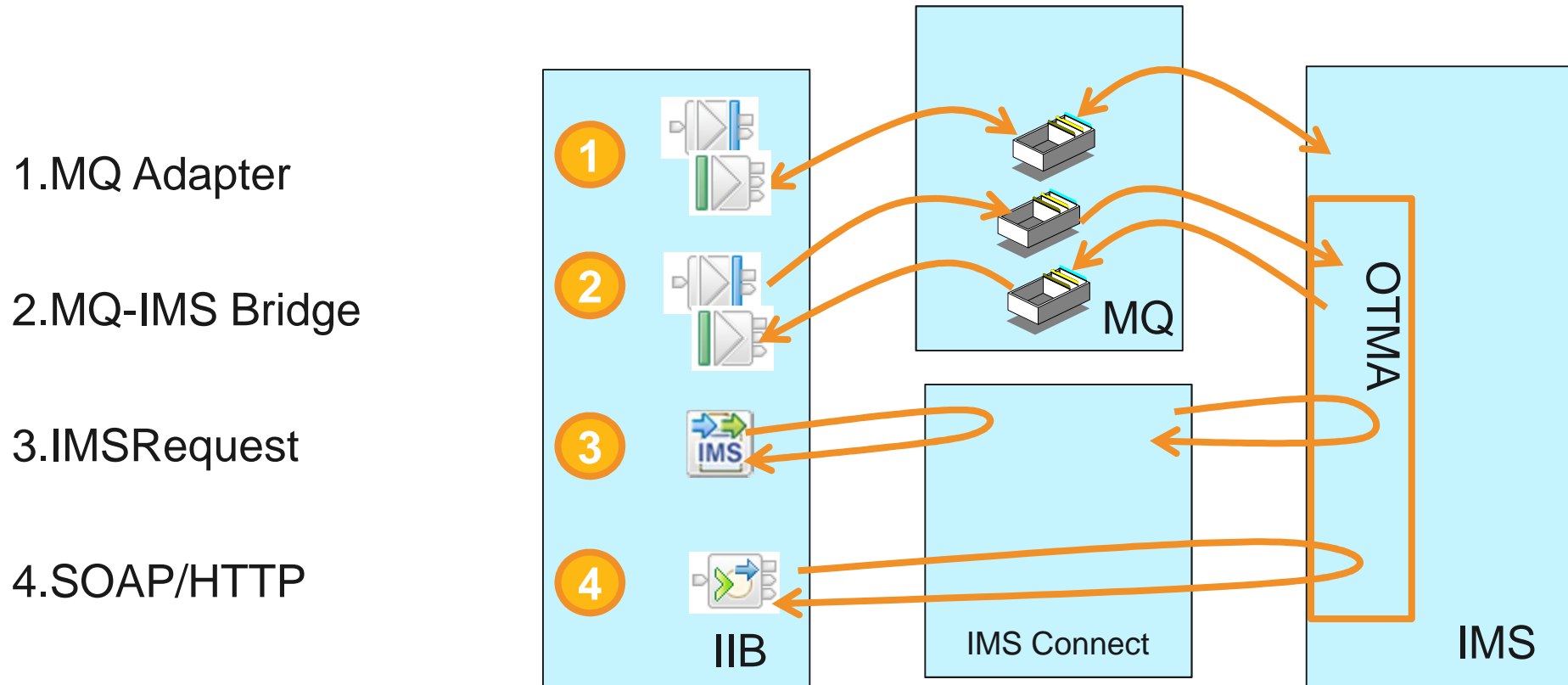
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IIB & IMS – So how can they speak?





IIB & IMS Integration - Options Comparison

	1 MQ Adapter	2 MQ-IMS Bridge	3 IMS Request Node	4 SOAP/HTTP
Protocol	Asynchronous, Symmetric	Asynchronous, Asymmetric (generally for IMS inbound)	Synchronous, Asymmetric (IMS inbound only)	Synchronous (generally), Symmetric
Middleware	MQ IMS Adapter ("explicit") as ESS	MQ IMS Bridge ("implicit") to OTMA	IMS Connect to OTMA	IMS Connect to OTMA; prereqs IMS SOAP Gateway
IIB usage	MQ or JMS output nodes MQ or JMS input nodes reply	MQ or JMS output nodes MQ or JMS input nodes reply	IMSRequest node	SOAPRequest, SOAPReply and SOAPInput
IMS usage	IMS codes MQ API; IMS BMP Trigger Monitor can start the IMS Transaction; 100MB maximum message size;	IMS OTMA; GU to receive, IOPCB or ALTPCB reply; 32K maxi segment size, but multi-segment supported.	IMS OTMA; GU to receive, IOPCB or ALTPCB reply; 32K maxi segment size, but multi-segment supported with restrictions.	IMS OTMA; GU to receive, IOPCB or ALTPCB reply; 32K maxi segment size, but multi-segment supported with restrictions.
Development – IIB Side	Relatively easy – build MQ messages, but need to correlate replies, handles timeouts.	Relatively easy – Build MQ messages with IIH header, but need to correlate replies, handles timeouts	Easy – ICON message built by IIB; no reply/request coordination	Easy – build SOAP message; industry standard;
Development – IMS Side	New IMS Apps using MQ API & ESS.	Very easy – Based on IMS standard API; no specific MQ dev.	Very easy – Based on IMS standard API; no specific MQ dev.	Relatively easy; need converter routines (easy with RDz).



IIB & IMS Integration - Options Comparison, cont'd



	1 MQ Adapter	2 MQ-IMS Bridge	3 IMS Request Node	4 SOAP/HTTP
Transactionality	Split in 3 UOWs: one in IIB request (MQ, etc.), one in IMS, one in IIB reply (MQ, etc.). RRS used for IIB trans.	OTMA CM0 and CM1 support; Split in 3 UOWs: one in IIB request (MQ, etc.), one in IMS, one in IIB reply (MQ, etc.).	OTMA CM0 and CM1 support; No 2PC support (today); IIB tran can cover MQ+DB2, but not IMS transaction work.	IIB tran (RRS) can cover MQ+DB2, but not IMS transaction work.
Security	Classic MQ security; Encryption with MQ Advanced Message Security product (AMS).	Userid in MQMD IMS Security based on it; Support of encrypted message by IMS Apps.	ICON SSL support if needed; Single userid/psw from Dbparms or Propagation ID/psw / message; Encrypted message by IMS apps.	SSL support if needed; WS-Security supported by IIB.
Performance	In a message driven environment MQ forces a Close/Disconnect and Connect for each message – Need IMS preload; a lot of processing if trigger “all” with standard trigger monitor.	Performance tests (see MP16 and MP1J support packs). show > 1000 tx/sec. Can cause significant IMS logging.	No problem reported IMS 13 perf: 100K tr/sec!!	No figures available, but likely less performance than alternatives presented here.
Scalability & HA	With MQ SQs for HA & scalability.	With MQ SQs for HA & scalability.	With multiple port per ICON With multiple ICON & Sysplex Distributor.	With multiple port per ICON With multiple ICON & Sysplex Distributor.

Agenda



- What's an ESB?
- What is the IBM Integration Bus?
 - Development
 - Administration
 - Architecture
- IIB on z/OS
 - IIB and IMS
 - Who is using an IIB?



A few IIB customers that presented their stories at InterConnect2015...Perhaps you'll be the next?



Did you know that many of the largest financial institutions in Germany, France, UK, France, Italy, Spain, USA, etc. are using the IIB (WMB) on z/OS today?



“A large financial company in Australia”



- One of the largest financial companies in Asia-Pacific is using the Broker for many years on z/OS.
- Broker used for many different applications, and notably as a common integration interface for Internet and Mobile banking.
- Steady prime-time sustained Broker transaction rates exceed 1.1 million trans/hour (> 300 trans/second), with higher peaks spread over 2 x LPARs.
- Upstream queries are going to IMS, over MQ adapter.

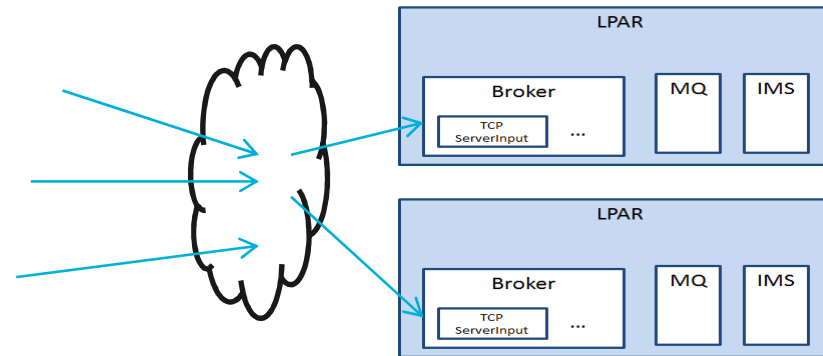


- One of the largest banks in Sweden, and running the WMB for many years.
- Swedbank used to run WMB on Distributed platforms, but migrated to z/OS in 2009. The preferred z/OS for its QOS (HA, scalability, stability, backup, management, etc.).
- Over 150 flows are in production today, and more are on the way.
- Most requests are arriving to WMB via MQ or SOAP/HTTP, and then Interfacing to IMS “upstream”. The WMB is seen more and more as the primary “service provider”.
- Most new development is exploiting Java on z/OS; exploiting the speed and economy of Java on the mainframe.
- Swedbank is leveraging MQ Shared Queues.





- Norway's largest financial services group, and running WMB for many years on z/OS for multiple projects.
- Broker flows accept multi-channel requests (ATMs, Net banks, mobile, etc.), many via raw TCP nodes.
- Peaks of 200 MQ msgs/second, using MQ-IMS Bridge.
- IMS outbound flows also via MQ Adapter.
- Broker also used for high-value payments platform and SWIFT interfacing.



Summary

- Universal Enterprise Service Bus

- The IBM Integration Bus supports a wide range of different data formats, protocols and transformation “languages”

- Simple & Productive

- IIB provides a complete interface for defining, modifying and routing data

- Dynamic, Managed & Secure

- IIB allows the creation of dynamic and governed solutions

- High Performing & Scalable

- IIB provides a platform and technology neutral connectivity option

- IMS-ready

- Running today with rich, effective IMS interfacing



And how about IIB v10?



- Flexible MQ topologies
 - Much more flexibility in IBM MQ usage
 - The IIB in many cases can now directly use 0-N queue managers; MQ is no longer a pre-requisite for IIB (note: for the moment, however, still required on z/OS)
- Big emphasis on simplifying development, attracting development community
 - Significantly smaller footprint (1GB)
 - Very fast install (a few minutes)
 - Richer unit test environment, regression testing
 - Externalized policies for runtime properties
 - Real shared libraries
 - New generators for JavaScript and REST interfacing

**IIB v10
announced
and GA 13
March 2015!**



Backup



Bibliography



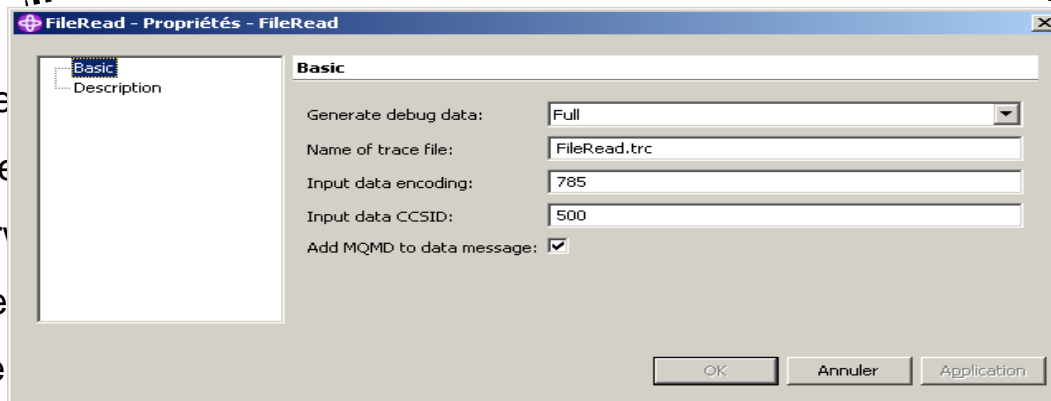
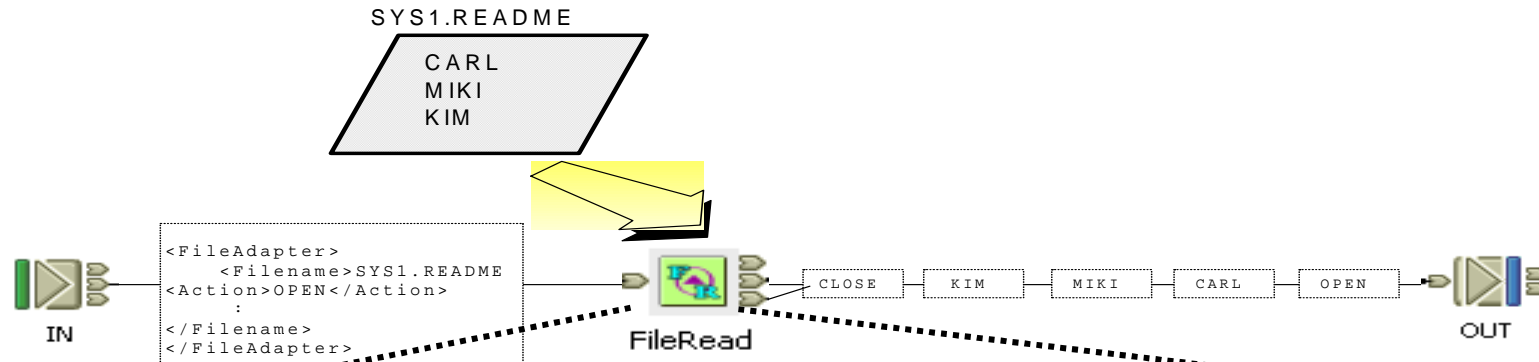
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- SG24-7090 WebSphere Business Integration Message Broker Basics
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- WP101617 Migration to WebSphere MQ V7.0.1 and WebSphere Message Broker V7.0 on z/OS
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- SG24-7335 Implementing an ESB using IIBv6 and WESBv6 on z/OS
- REDP4644 WebSphere Message Broker V7.0 Integration with WebSphere Adapter for SAP

The full IIB documentation is available online at

http://www-01.ibm.com/support/knowledgecenter/SSMKHH_9.0.0/mapfiles/help_home_msgbroker.html



QSAM nodes



- Nodes work with se
- SupportPac IA11, le
- Simple, straight-for
 - FileRead: the
 - FileWrite: the

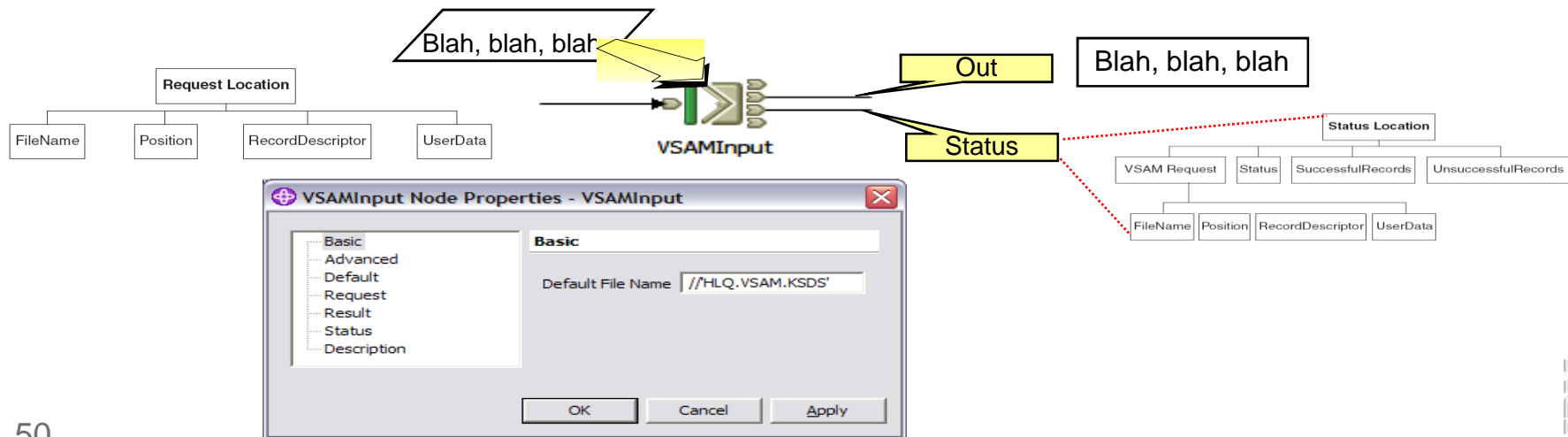
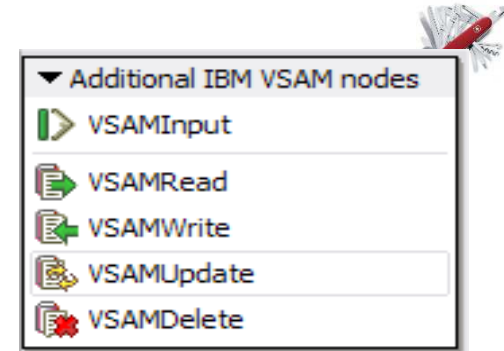
leDelete, FileRename
 out message to the node
 received

- Not an “input” node; the QSAM nodes are called synchronously within the flow



VSAM nodes

- Suite of 5 nodes to perform operations on VSAM Files
 - VSAM Input Node
 - VSAM Read Node
 - VSAM Write node
 - VSAM Update node
 - VSAM Delete node
- VSAM file support: KSDS, ESDS, RRDS, KSDS_PATH, ESDS_PATH
- SupportPac IA13, level 3 (product extension), only available on IIB for z/OS
- Set parameters in node properties, or via control message





CICS node

- Synchronous call within a flow to a CICS transaction
- Simple interface with parameters pre-set on node or via input message
- COMMAREA and Channel support
- Works in 2-tier (IIB -> CICS) or 3-tier (IIB->CTG->CICS)



CICS Request Node Properties - CICS Request

Basic

CICS Network Applid*

CICS Program Name*

Use message location for Program Name

CICS Program Name location in tree

CICS Userid*

Use message location for CICS Userid

CICS Userid location in tree

OK Cancel Apply

IMS Node

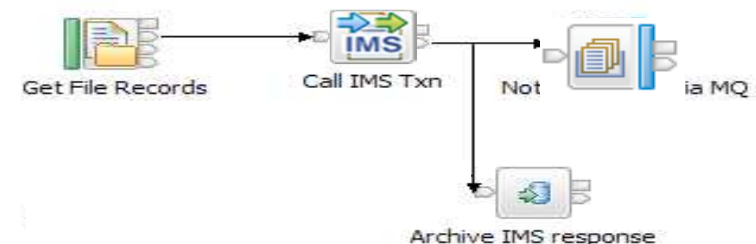


- **IMS Request node**

- Allows message flows to call IMS transactions and handle responses
- Typical scenarios include Web Service->IMS, File->IMS, SAP->IMS...
- Provides high performance, synchronous, multi-platform access to IMS
- Complements MQ IMS Bridge and IMS Web Services currently accessible via Broker

- **Synchronous invocation of IMS transactions and commands**

- Supports a broad range of IMS facilities
 - MPP, BMP and Fast Path transaction regions
 - Commit mode 0, 1
 - SyncLevel NONE, CONFIRM
 - Single and multi segment IMS messages



- **Exploits IMS TM Resource Adapter**

- Delivered built into IIB, no extra cost/install/customization required
 - IMS Connect is required, but free of charge with IMS
- Configurable Services allow operational control of IMS connection configuration



v9: Decision Management (ODM) support

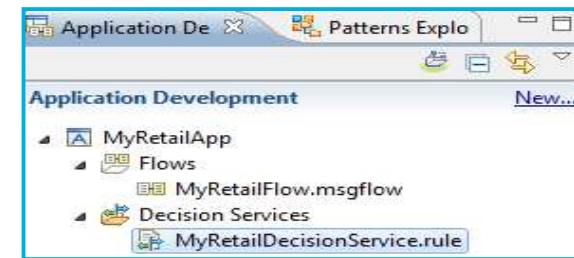


Decision Service

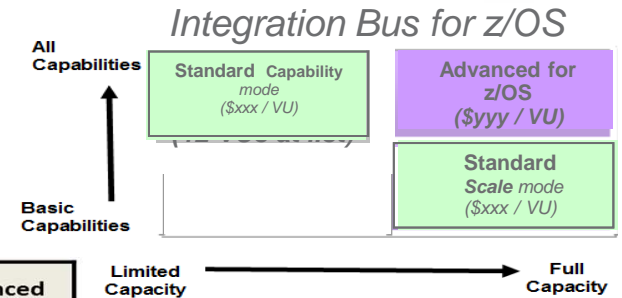
- Provide business insight during integration data flows
 - ▶ e.g. intelligent decision making; score then action in-flight request based on a business rule
 - ▶ User creates (e.g.) if-then-else rules using tool of choice (Excel, Word, Eclipse...)
 - ▶ The bus acts on these rules in flow, e.g. for business level routing
- New Decision Service node
 - ▶ Identifies inputs to business rules from in-flight data
 - e.g. **the customers order** from whole request
 - e.g. **the item price** from key fields...
 - ▶ Invokes the built-in rule engine to perform business logic
- Create rules directly inside Integration Bus toolkit
 - ▶ Automatic package & deploy with integration assets
 - ▶ Dynamically reconfigure business rule using configurable service policy
 - ▶ Optionally refer to business rules on external ODM decision server
 - ▶ Exploit separate full ODM Decision Center for BRMS scenarios
- Embedded rules engine for high performance
 - ▶ Rule is executed in the same OS process as integration data flow
 - ▶ Rule update notification ensures consistent rule execution
 - ▶ Optional governance of rules through remote ODM Decision Center

A screenshot of a rule authoring tool interface. The title bar shows several files: *RetailDiscountFlow.msgfl, Order.xsd, SampleOrder.xml, and MyRetailDecision. The main area contains instructions: "Author the rule(s) that will make up your decision service. Use CTRL+SPACE to bring up the content assist available for rule authoring." Below this, a rule is defined under "Rule 1":

```
if the total cost of 'the customers order' is more than 100
then set the discount of 'the customers order' to "10%";
else set the discount of 'the customers order' to "0%";
```

The text "'the customers order'" in the first line is highlighted with a red rectangular box. At the bottom, there is a "Rule sequence" field.

v9: IBM Integration Bus modes



Capabilities available by Edition	Express	Standard Scale		Standard Capability		Advanced	
	mp	mp	z/OS	mp	z/OS	mp	z/OS
z/OS only: QSAM/VSAM files, SAF/RACF, MQ Shared Queue	-	-	•	-	•	-	•
Windows only: Microsoft .NET integration	•	•	-	•	-	•	-
Multiple execution groups (isolated bus applications), unlimited scalability	-	•	•	-	-	•	•
Web Standards connectivity (HTTP, SOAP, REST, JSON...) **	•	•	•	•	•	•	•
Java connectivity and database (JMS, JDBC, custom)	•	•	•	•	•	•	•
MQ connectivity including MQTT and high performance pub/sub **	•	•	•	•	•	•	•
Graphical mapping and XSL	•	•	•	•	•	•	•
Flow Control (Input/Output/Flow/Route/Trace/Throw/Timer)	•	•	•	•	•	•	•
Email, File and (S)FTP connectivity	•	•	•	•	•	•	•
Third-party / user-defined connectors	•	•	•	•	•	•	•
BPM Support (SCA)		•	•	•	•	•	•
WSRR Support (RegistryLookup, EndpointLookup)		•	•	•	•	•	•
CICS node, IMS node **				•	•	•	•
Built-in Application Adapters - SAP				•	•	•	•
Built-in Application Adapters - Siebel, Peoplesoft, JDE				•	-	•	-
Managed file support (MQ MFT, Connect:Direct, FileRead)				•	•	•	•
SQL (Compute, ODBC Database), CORBA				•	•	•	•
Advanced security processing (SecurityPEP)				•	•	•	•
Advanced processing (e.g. aggregation, collector, (re)sequence)				•	•	•	•
Decision Services (Business Rules)				•	•	•	•
ESQL programming (Compute)				•	•	•	•

Notes: (1) mp = "for multiplatform" offering (supported on Windows, AIX, Linux)

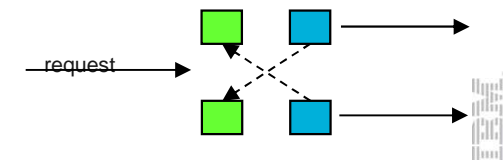
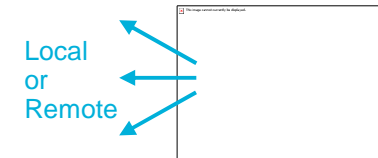
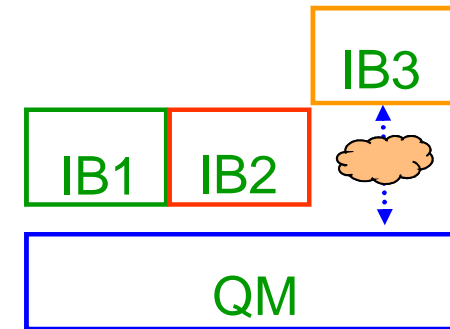
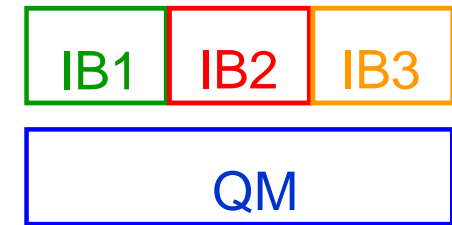
(2) Connectivity with CICS, IMS is also supported via MQ and Web services
 (3) SAP adapter can be added to Standard Scale mode via an add-on adapter license



v10: Flexible MQ Topologies



- Provide more flexible topology options for MQ access
 - Many benefits include simplicity, scalability, availability & migration
 - Relationship evolves to the same as other resource managers – i.e. optional
 - Multiple Buses connected to a single Queue Manager
 - Corresponding updates for commands, CMP & Admin tools
- Automated installation simplified
 - MQ resources will not be installed at the same time
 - Reduces dependency management
 - Simplifies cloud-based installs
 - If MQ is installed, then IIB will detect this and configure appropriately
- IB now supports Local and Remote queue managers
 - Allows IB to be remote from its queue manager
 - Works with single MQ IB support to further simplify MQ topology
 - Many other internal features within IB can exploit this flexibility
- Many MQ Node related Enhancements
 - Input node supports multiple input queues, both local & remote queue managers
 - Includes easy-change policy based control of sources
 - Also applies to MQGet and MQOutput/MQReply nodes
 - Many other MQ node enhancements in pipeline: PubSub, Request/Reply...
- When a queue manager is not available...
 - Some features require MQ e.g. aggregation nodes, XA coordination, SAP Nodes collector nodes, etc.



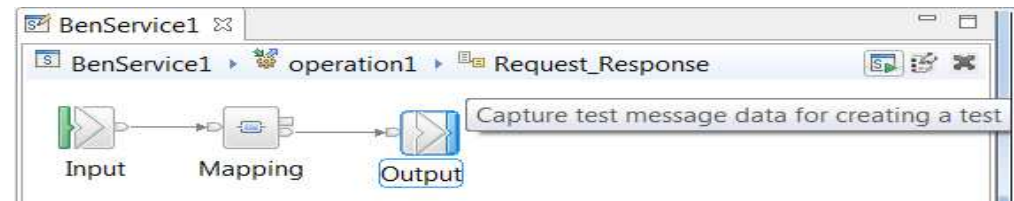
v10: Unit Test and Regression Test



- Improved Facilities for Unit Test and Regression Test
 - Simple to understand, fix and re-factor behaviour during development

Test suite	Total	Pass	Fail	Percent
My flows	20	15	5	75
Your flows	50	48	2	96

- Valuable, foundational first use cases
 - Observe data passing through a flow
 - Capture these data in “test case”
 - Build regression suite from test cases
 - Save data to test case
 - .ibtest contents to define input (source) request and expected output (target) response. Collected into unit test library for subsequent execution



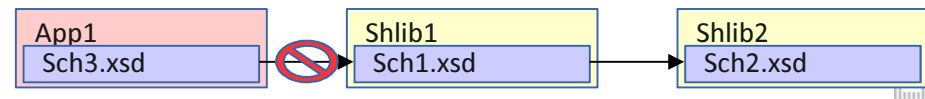
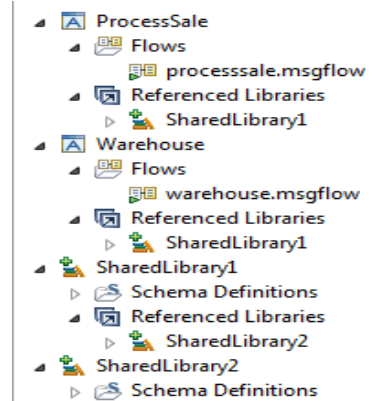
- Regression Testing
 - Compare the actual data with previously captured test case data
 - Regression runs set; aggregate reporting
- Exploits REST/JSON API
 - Initial experience will be developer tools
 - APIs are foundational for bulk operations
 - Tools Integration with Jenkins, Maven, Ant, Hudson...



v10: Shared Libraries



- Major features introduced in V8 and V9
 - Enhanced to fulfil most popular user requests
 - Libraries can now be shared across multiple applications for a broad range of assets
 - Sub-flows are now independent artefacts, significant storage reduction, consistency
- Shared Libraries
 - Libraries can now be referenced by one or more applications
 - Libraries deployed independently of applications – “shared”!
 - Applications will not get “own copy”
 - Libraries can still reference other libraries
 - Shared Library is the default library type
 - Assets in multiple libraries within application are shared
 - Notably schemas, also Maps, ESQL, Java, PHP etc
- Shared Library Restrictions
 - Most notable restriction is that schema imports cannot occur across shared libraries
 - Same for PHP, XML, XSL and other cross library source imports
 - Subflows but not message flows are allowed in shared libraries, other minor subflow restrictions
 - Minor restrictions for ESQL (e.g. empty schema)





v10: Java Script API

- Web APIs are popular technology for simplified access to integration
 - Particular applicability in mobile, browsers, and node.js program scenarios
 - New feature allows Integration Bus service to be invoked via Web API
 - Builds on existing IB mobile features and service definitions
- Start from new or existing service
 - Design the IB service, creating API is single click
 - REST/JSON binding generated automatically
 - JavaScript client, documentation likewise
- Access JavaScript and documentation from URL
 - Point browser at IB node to retrieve assets!
 - Can program via HTTP GET if required

The screenshot shows the IBM Integration Bus console on the left and a browser window on the right. In the console, the 'JavaScript Client API' option is highlighted with a red box. The browser window displays the 'Integration Service: BenService1' page, which includes links for 'SOAP / HTTP' and 'JavaScript Client API'. A red callout box points to the 'JavaScript Client API' link with the text: 'Generated JavaScript "Client API" Coding example invoking generated "Client API"'. Below the browser window, the 'Basic' configuration tab is visible, showing the 'Path suffix for URL*' as '/BenService1/json/*'.

