IBM CICS and Events: Concepts and Event Specifications

Pradeep Gohil
CICS Software Engineer
gohilpr@uk.ibm.com

IBM CICS® User Conference 2009

© 2009 IBM Corporation

© IBM Corporation 2009. All Rights Reserved.

The workshops, sessions and materials have been prepared by IBM or the session speakers and reflect their own views. They are provided for informational purposes only, and are neither intended to, nor shall have the effect of being, legal or other guidance or advice to any participant. While efforts were made to verify the completeness and accuracy of the information contained in this presentation, it is provided AS IS without warranty of any kind, express or implied. IBM shall not be responsible for any damages arising out of the use of, or otherwise related to, this presentation or any other materials. Nothing contained in this presentation is intended to, nor shall have the effect of, creating any warranties or representations from IBM or its suppliers or licensors, or altering the terms and conditions of the applicable license agreement governing the use of IBM software.

References in this presentation to IBM products, programs, or services do not imply that they will be available in all countries in which IBM operates. Product release dates and/or capabilities referenced in this presentation may change at any time at IBM's sole discretion based on market opportunities or other factors, and are not intended to be a commitment to future product or feature availability in any way. Nothing contained in these materials is intended to, nor shall have the effect of, stating or implying that any activities undertaken by you will result in any specific sales, revenue growth or other results.

Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.

All customer examples described are presented as illustrations of how those customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics may vary by customer.

The following are trademarks of the International Business Machines Corporation in the United States and/or other countries:
ibm.com/legal/copytrade.shtmlAIX, CICS, CICSPlex, DataPower, DB2, DB2 Universal Database, i5/OS, IBM, the IBM logo, IMS/ESA, Power Systems, Lotus, OMEGAMON, OS/390, Parallel Sysplex, pureXML, Rational, Redbooks, Sametime, SMART SOA, System z , Tivoli, WebSphere, and z/OS.

A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at ibm.com/legal/copytrade.shtml.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.
IT Infrastructure Library is a registered trademark of the Central Computer and Telecommunications Agency which is now part of the Office of Government Commerce
Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.
Microsoft and Windows are trademarks of Microsoft Corporation in the United States, other countries, or both.
ITIL is a registered trademark, and a registered community trademark of the Office of Government Commerce, and is registered in the U.S. Patent and Trademark Office
Intel and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.
UNIX is a registered trademark of The Open Group in the United States and other countries.
Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Topics

- **CICS and Event Processing**
  - Introduction to event processing
  - Why and How
  - A few example scenarios
- **Event Specifications**
  - Event Capture
- **Event Processing Adapters**
- **Event Binding Editor**
  - CICS EP Tooling
- **Using CICS Events**
  - Integration with WebSphere Business Monitor
  - Integration with WebSphere Business Events
- **Summarizing scenario, Summary and Q&A**

© 2009 IBM Corporation

CICS and Event Processing

An introduction to CICS as a source of business events

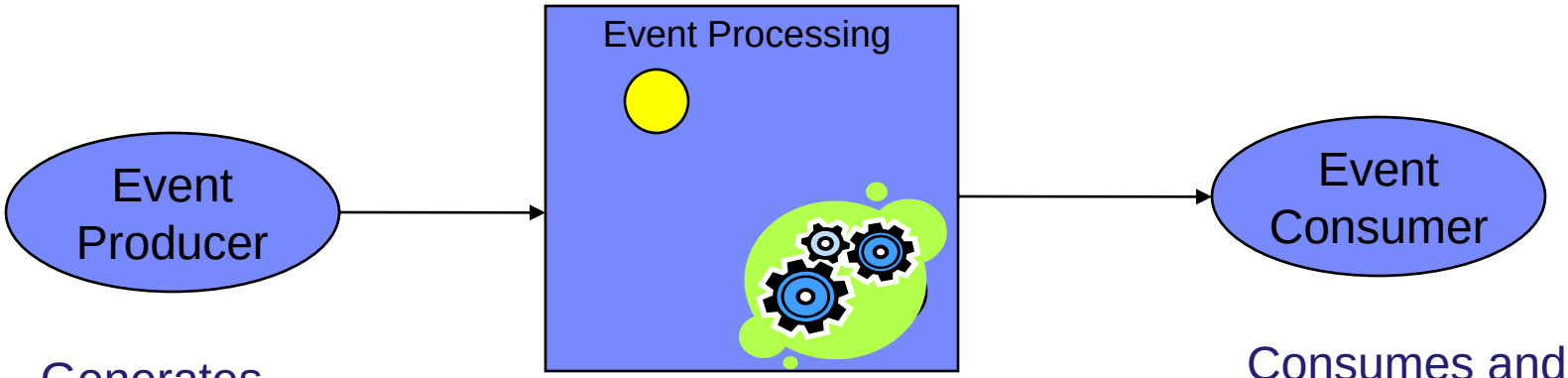
© 2009 IBM Corporation

What is an event?

- **An event is**
  - *Anything that happens (or is contemplated as happening)*
  - An event has a name and usually some data (its payload)
  - Produced and responded to asynchronously
- **Simple event**
  - A single event, meaningful in itself
  - e.g. order placement; bank account update; stock trade
- **Complex event processing**
  - Detect and respond to patterns of events
  - e.g. three orders from customer A in 2 days; bank withdrawal after PIN change update; interesting pattern of stock trades
- **Business Event Processing**
  - Detect and respond to events that indicate business-impacting situations across the enterprise
  - Extends event processing capabilities to business users
    - e.g. IBM WebSphere Business Events provides complex event processing for business users

© 2009 IBM Corporation

Event Processing in a Nutshell



Generates events

performs operations on events

Consumes and reacts to either raw or complex events

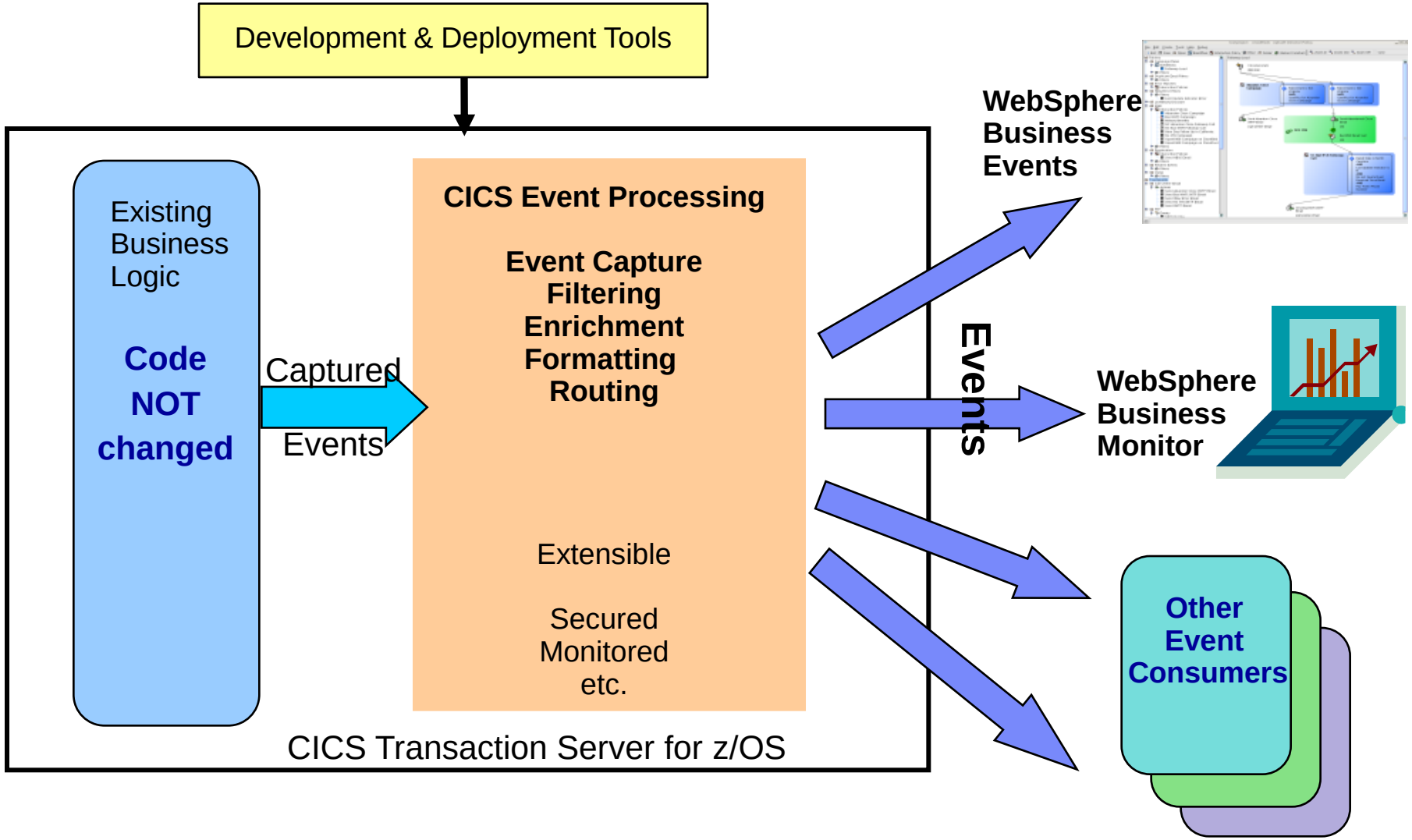
© 2009 IBM Corporation

CICS and Business Events

- **Event processing addresses the need for agility**
  - Modern businesses must react quickly to circumstances
  - Decision makers need reliable, timely information
- **CICS systems run an enormous amount of existing business logic**
- **Using an Event-based approach, there is potential to gain insight into the processing in CICS and to introduce additional extensions to applications**
  - In a dynamic, de-coupled fashion
  - Without the need to change the applications
- **CICS Transaction Server for z/OS V4.1 allows you to emit business events from existing applications**
  - Supporting shifting corporate policies
  - Without having to modify the applications
  - And driving your choice of destination
    - WebSphere Business Monitor, WebSphere Business Events, CICS application, application through WebSphere MQ, …

© 2009 IBM Corporation

CICS and event processing Overview



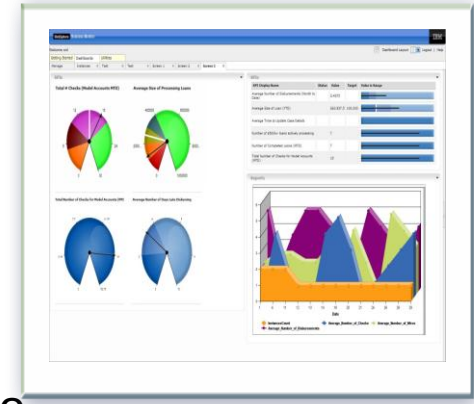
© 2009 IBM Corporation

A few example uses of CICS events

© 2009 IBM Corporation

EP Scenario 1 – Observe business processing

- **Identify key points in order processing business logic**
  - e.g. order requested, order placed, order confirmed, order dispatched, order cancelled
  - Collect relevant contextual data associated with the event, including a way to correlate events for the same order, and emit event
  - Events sent e.g. to WebSphere Business Monitor
    - Observe orders being received, processed, cancelled
    - Study KPIs – numbers of orders received per week, time to process and dispatch orders, etc.
    - Take action when thresholds exceeded, when value of a customer's orders exceeds a certain amount, etc.
- **Original application continues processing independently:**
  - Event instrumentation is 'non–invasive' to the application



© 2009 IBM Corporation

EP Scenario 1 – KPIs and Dimensions in Business Space

Instances

Export ... Search for: Reset

orderID	itemID	customer name	item price	item quantity	order duration	order start time	order end time	order price	order status
+000012784	0001	Steve	20	20	24 m, 19.121 s	May 27, 2009 10:38:13 AM	May 27, 2009 11:02:32 AM	400	order canceled
+000012785	0002	Lijia	5	40	23 m, 25.009 s	May 27, 2009 10:39:24 AM	May 27, 2009 11:02:49 AM	200	order shipped

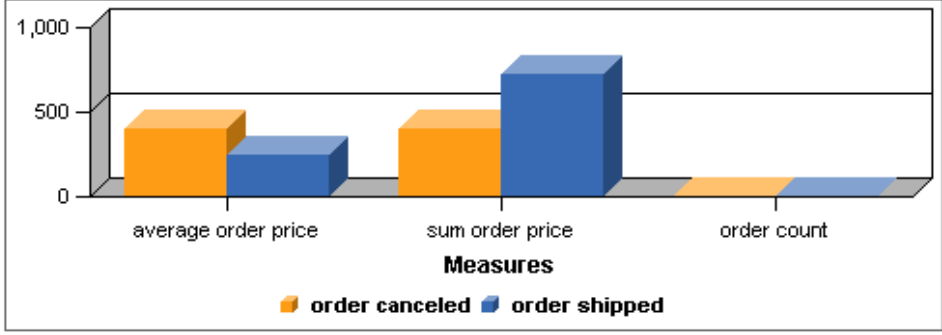
KPIs

KPI Name	Status	Value	Target	Actions	Value in Range
average time on order shipped		23 m, 18.601 s	1 h, 0 m, 0 s		
percent of order cancelled		25.00%	30.00%		

Dimensions

File Edit View Bookmarks Data Chart Tools Help

Drill Down



order status dimension	average order price	sum order price	order count
All order status dimension	280	1120	4
order canceled	400	400	1
order shipped	240	720	3

© 2009 IBM Corporation

EP Scenario 2 – Non-invasive change to business processing

- **Application extended by triggering new or existing separate program for extra, asynchronous processing**
- Examples:
  - Extend governance practices by automatically updating an audit log or sending an alert when certain data is viewed or altered
  - Asynchronously send details of special offers or discounts when large customer orders have been placed
    - This example may be seasonal and is easily enabled/disabled without application change. The interpretation of a large order can be changed outside the application.

- **Original program continues processing independently**
- **Consumer program can run within CICS or externally**
  - Flexibility to use available skills and other resources
  - Choice of processing platform depends on nature of processing, interaction with other subsystems

© 2009 IBM Corporation

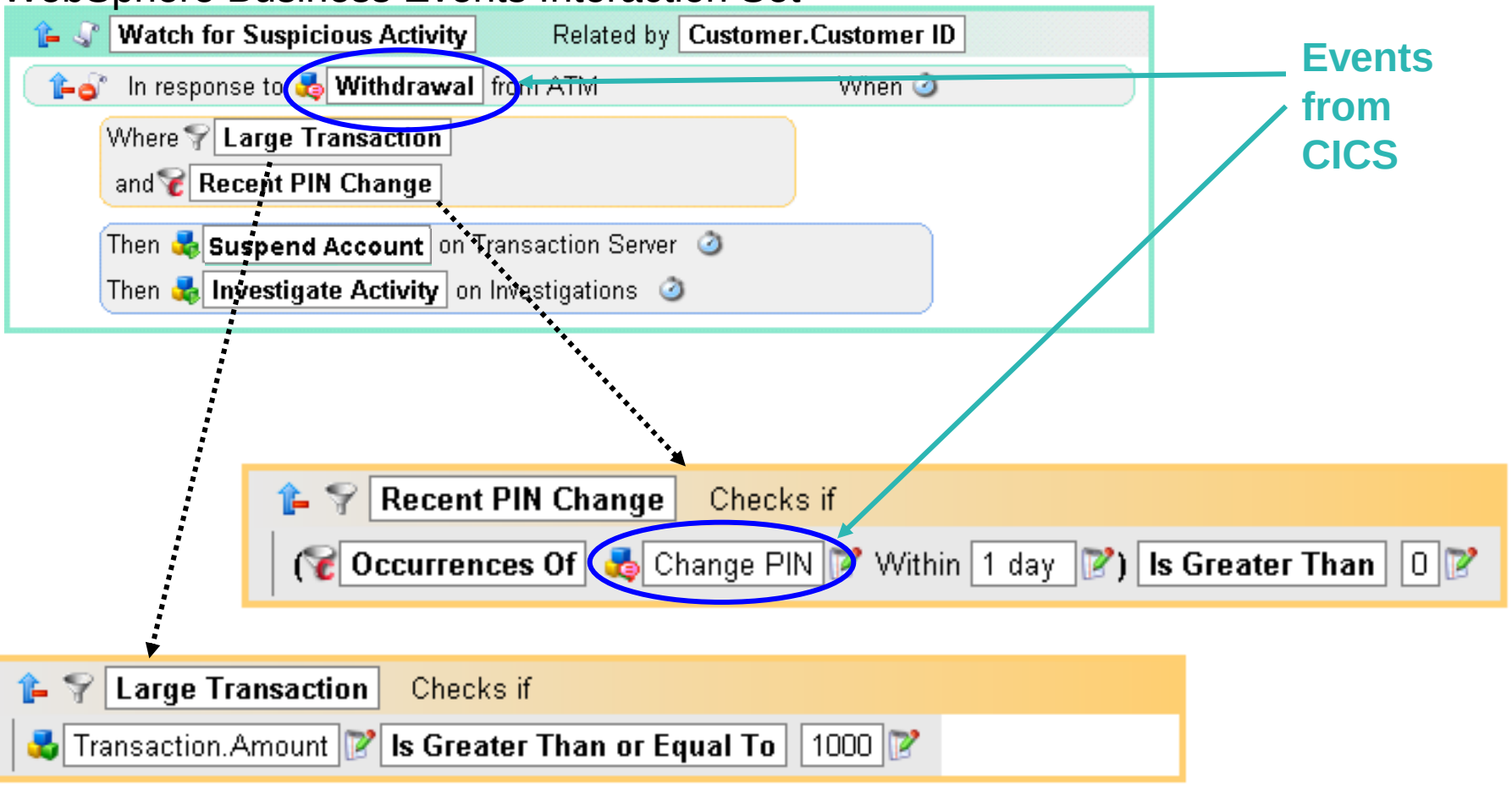
EP Scenario 3 – Event Combination

- **Collect events relating to credit and other bank card usage**
- **Check for unusual patterns of behaviour using WebSphere Business Events**
  - New card ordered within a week of an address change request
  - Several online purchases where none had been made before
  - 2 or more cash withdrawals in quick succession when withdrawals rare on this card, or normally for smaller amounts
  - Purchases in different geographical locations in short period of time
  - etc.
- **Specify actions to take in WebSphere Business Events e.g. confirm with cardholder that this change is expected**

© 2009 IBM Corporation

EP Scenario 3 – Detecting event pattern using WebSphere Business Events

WebSphere Business Events Interaction Set



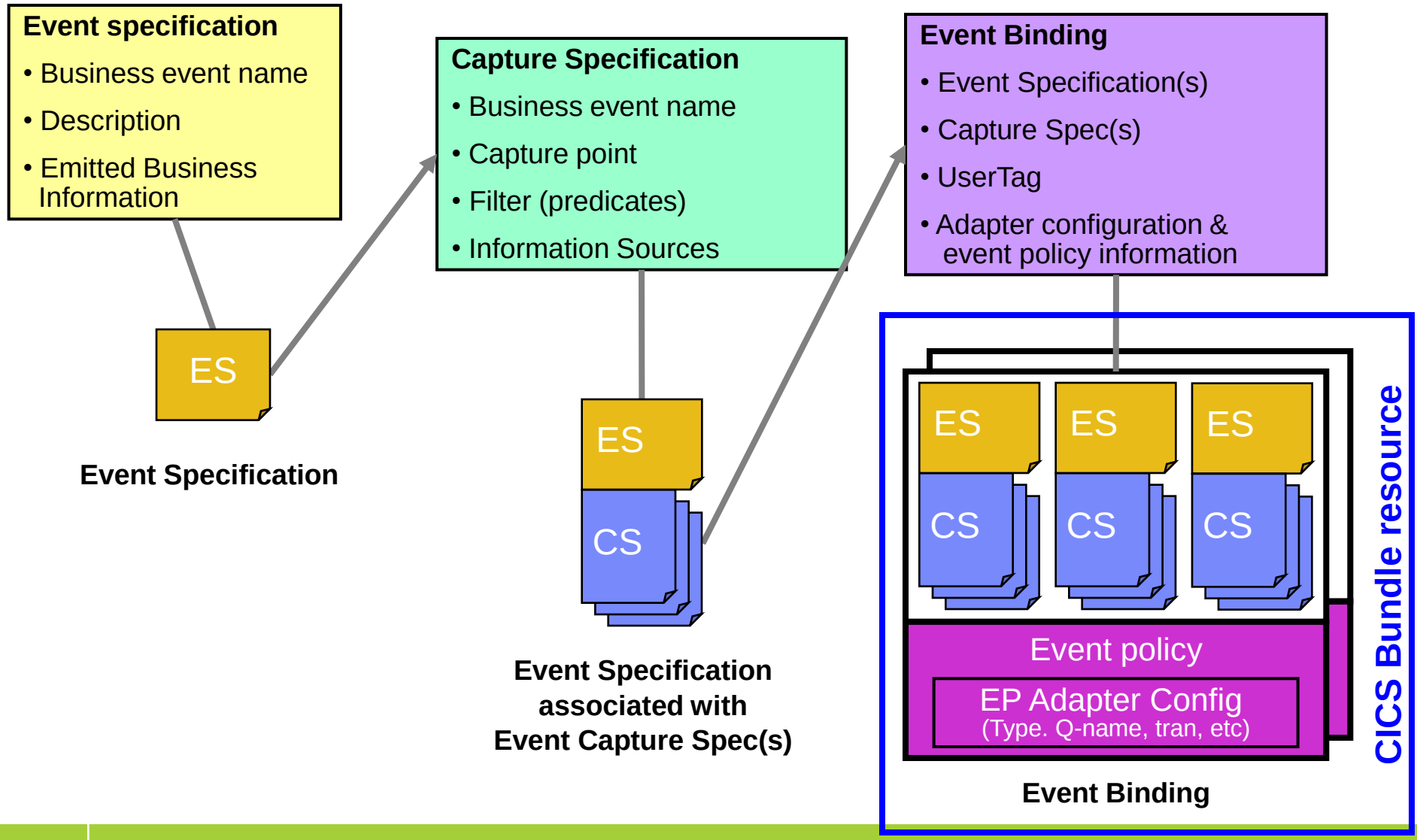
© 2009 IBM Corporation

CICS Event Specifications

or… how CICS knows where the events occur

© 2009 IBM Corporation

CICS Event Specification



© 2009 IBM Corporation

CICS Event Specification Example

Event Specification:

Event name: order_OverTenThousand_Received

Event description: Whenever an order is processed that is for over 10 thousand, this event is triggered

Emitted business information: customer ID, OrderNumber

Capture Specification:

Before EXEC CICS LINK command ← **Capture Point**

to PROGRAM(OrderDB) ← **Application Command Options Predicate**

from current_program = OrderUI ← **Application Context Predicate**

where OrderVal > 10K ← **Application Data Predicate**

OrderVal is in the Commarea or channel passed on the LINK

How to provide event data from data available from application and context ← **Information Sources (Captured Data)**

Note: This identifies an EXEC CICS command and some filters, it does not 'point' directly at a specific location in the application code; the capture spec can be made more or less specific by use of filtering predicates

Event Binding:

order_OverTenThousand_Received,

order_FromMajorCustomer_Received, … ← **Event binding includes other related events**

EP Adapter = CICSTransaction ← **How events in this Binding are emitted**

© 2009 IBM Corporation

CICS Event Capture

© 2009 IBM Corporation

CICS Event Capture options

- **Non-invasive**
  - Declare event points in application logic without opening up the application
  - Use application knowledge to map business event onto point(s) in the logic where the event occurs

- **Explicit API**
  - **EXEC CICS SIGNAL EVENT**
    - EVENT supplies an event identifier
    - Data can be supplied as either FROMCHANNEL or Data area and length
    - Identifier to be used in event specification
  - Explicit way of adding a capture point to an application
    - Allows exact pinpointing of the event point, and exact selection of relevant data
    - Use to “event-enable” the application
    - Once this is done, the instrumentation can be used for different purposes
  - Define as event within an event binding
    - Allows filtering and selection of data to use for different business events
    - Allows event to be enabled and disabled
    - ‘fast path’ in tooling to simplify specification of explicit events

© 2009 IBM Corporation

Eventable CICS Commands – Principles

- **Focus is on events of interest in business terms, so commands relating to system activity not eventable**
  - e.g. not ABEND, DUMP TRANSACTION, HANDLE CONDITION, SPI commands
- **Anything that starts work has a good likelihood of mapping to business events**
  - e.g. START, START TRANSID, LINK, INVOKE WEBSERVICE
  - Also enable event capture for program initiation via whatever means (e.g. Web services pipeline, entering tranid at a terminal)
- **Getting data into or out of CICS can be a good way of finding out about business events**
  - e.g. RECEIVE MAP, RECEIVE, SEND MAP
- **Writes to CICS data resources (files, queues) may often occur when processing business events**
  - e.g. WRITE FILE, WRITEQ TS
- **Reads of CICS data resources are also interesting, as events do not only occur when data is updated**
  - e.g. READ FILE, READQ TD
- **Do not (initially) plan to event enable data-oriented commands which can be evented in other ways (such as via the database)**
  - e.g. not RMI (DB2, MQ)
  - In a future release, might event enable these commands to get the additional application context
    - **but** only limited information about the command could be available to CICS & included in capture specs

© 2009 IBM Corporation

Eventable CICS Commands

- **Channel commands**
  - PUT CONTAINER, START (TRANSID)
- **File Control**
  - WRITE, REWRITE, DELETE
  - READ, READNEXT, READPREV
- **Interval Control**
  - START, RETRIEVE
- **Program Control**
  - LINK, RETURN, XCTL
- **Scheduling Services**
  - START (ATTACH)
- **Temporary Storage**
  - WRITEQ TS, READQ TS, DELETEQ TS
- **Transient Data**
  - WRITEQ TD, READQ TD, DELETEQ TD
- **Web support**
  - INVOKE (WEB)SERVICE
  - WEB READ, WEB READNEXT
- **BMS**
  - RECEIVE MAP
  - SEND MAP
  - SEND TEXT
- **Terminal Control**
  - CONVERSE, RECEIVE, SEND
- **New APIs**
  - SIGNAL EVENT, INVOKE SERVICE
- **Program initiation**
  - Enable event when program starts

© 2009 IBM Corporation

Filterable and Capturable Data

- **Application Context – applies to all commands**
  - Filterable (can be included in a predicate):
    - Tranid, Current program, Userid, Command response (OK/not OK)
  - Captured automatically:
    - UOWid, Network-qualified CICS applid, Date & time
    - also: Event name, Event binding name, User tag, Capture spec name
  - Capturable (can be information source for an item of emitted business information):
    - Tranid, Current program, Userid
- **Application command options and application data – Command-specific**
  - e.g. For RECEIVE MAP
    - Filterable and capturable: MAP*****, MAPSET, EIBaid, EIBCposn
      - ** Primary Predicate* for each command is the data item on which filtering is *strongly recommended* for performance
  - e.g. For LINK
    - Filterable & Capturable: Program*****, Data from channel or Commarea
- **Most commands captured *after* they occur, some offer option to capture *before* e.g. LINK**

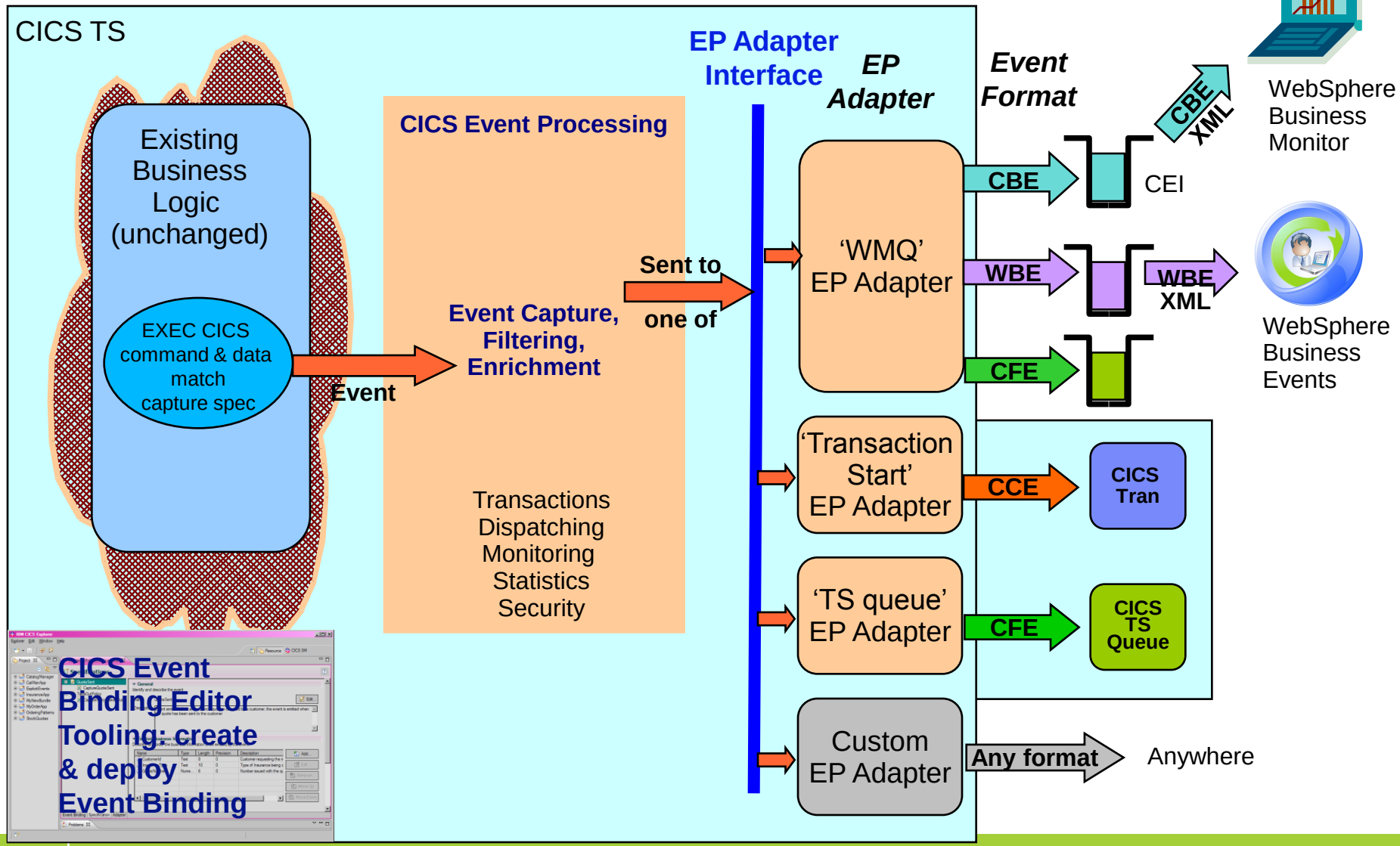
© 2009 IBM Corporation

CICS Event Processing Adapters

Formatting and Transport of CICS events

© 2009 IBM Corporation

CICS Event Processing Adapters



© 2009 IBM Corporation

Event Transactionality

- **Transactional option on the event definition**
  - Part of the advanced adapter options on an event binding
  - When set, causes CICS to wait for syncpoint completion before either emitting or discarding event (depending on syncpoint outcome)
  - For many events, will not want transactionality e.g. attempt to write to file could be as interesting as succeeding
- ***Note***
  - Transactional events are not emitted until the UOW reaches syncpoint – for a long-running transaction, this could mean the events are not very close to real-time

© 2009 IBM Corporation

Other event processing policy attributes

- **Dispatch Priority**
  - Specify priority of events in the event binding as Normal or High
- **Userid the EP Adapter is to run under**
  - Specify a userid under which the EP adapter will run
    - e.g. might be needed to allow access to required WMQ queue, or for actions carried out by custom EP adapter
  - 'Use context userid' will run EP adapter under the same userid as that running when the event was captured
  - By default, EP adapters run under CICS region userid
- **Transaction ID the EP adapter is to run under**
  - Normally runs under a default tranid
- **Can specify a different tranid or userid for charging**
- **Some performance implications of specifying tranid or userid**

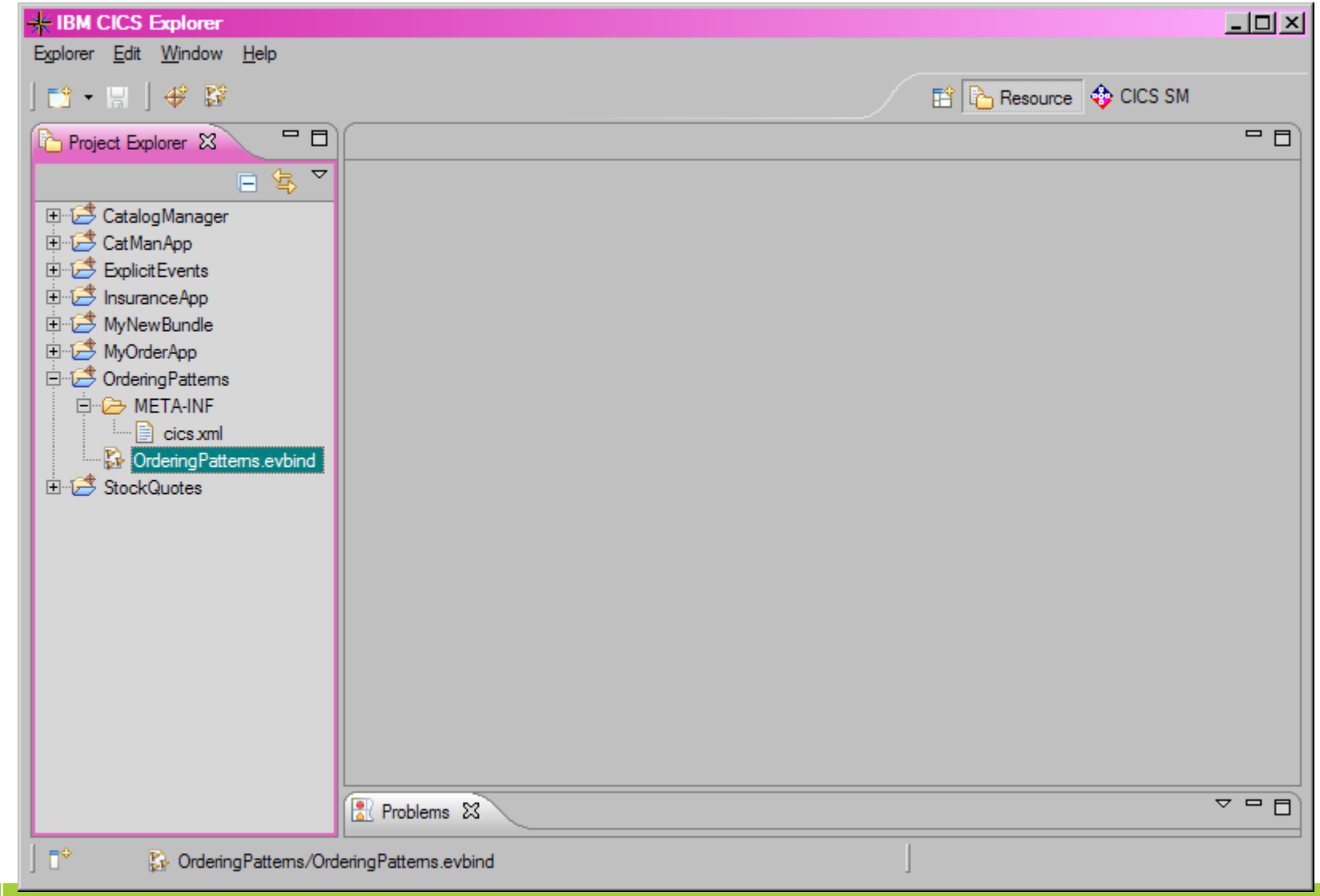
© 2009 IBM Corporation

Event Binding Editor

The CICS event specification tooling

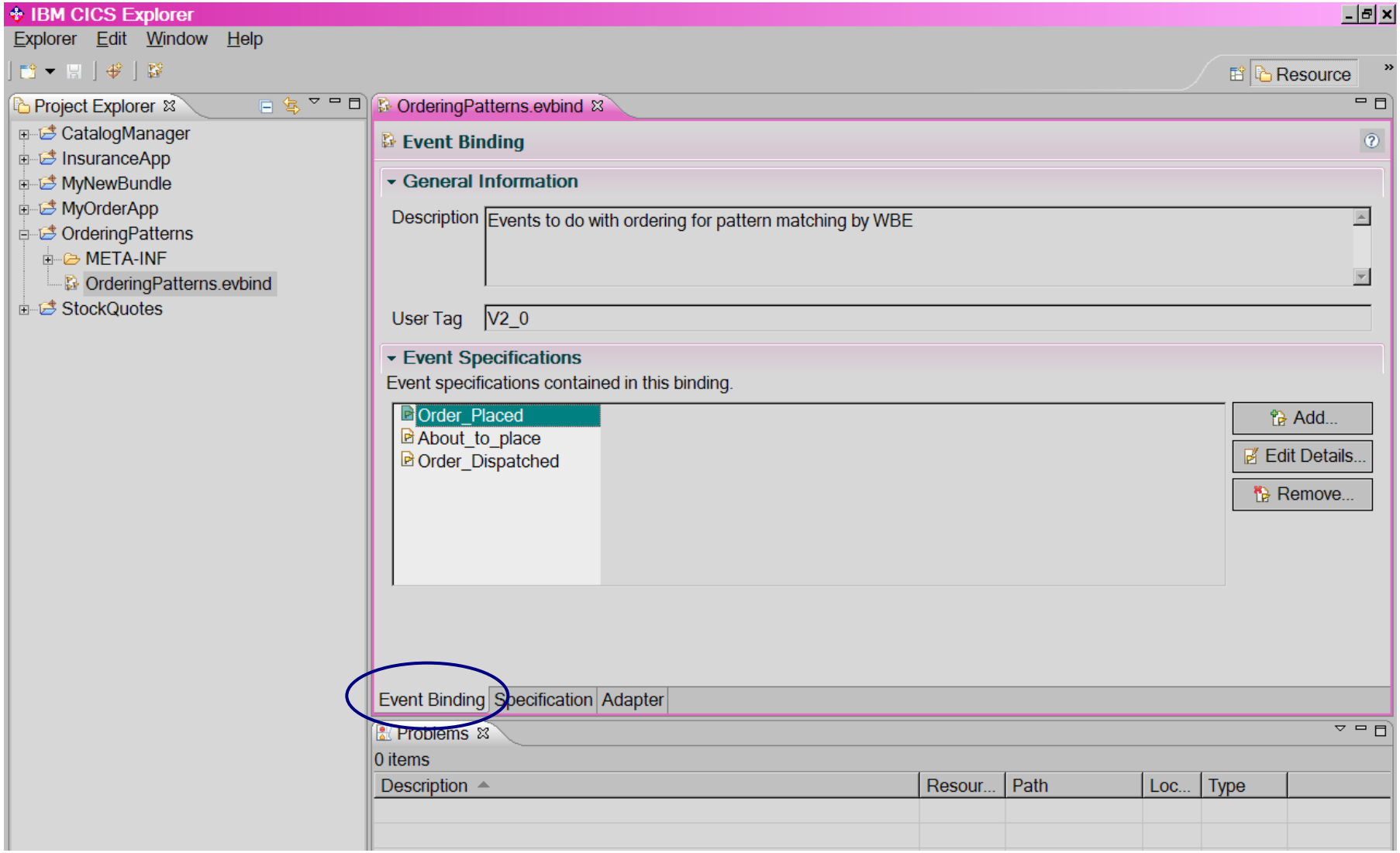
© 2009 IBM Corporation

CICS Explorer Resource Perspective



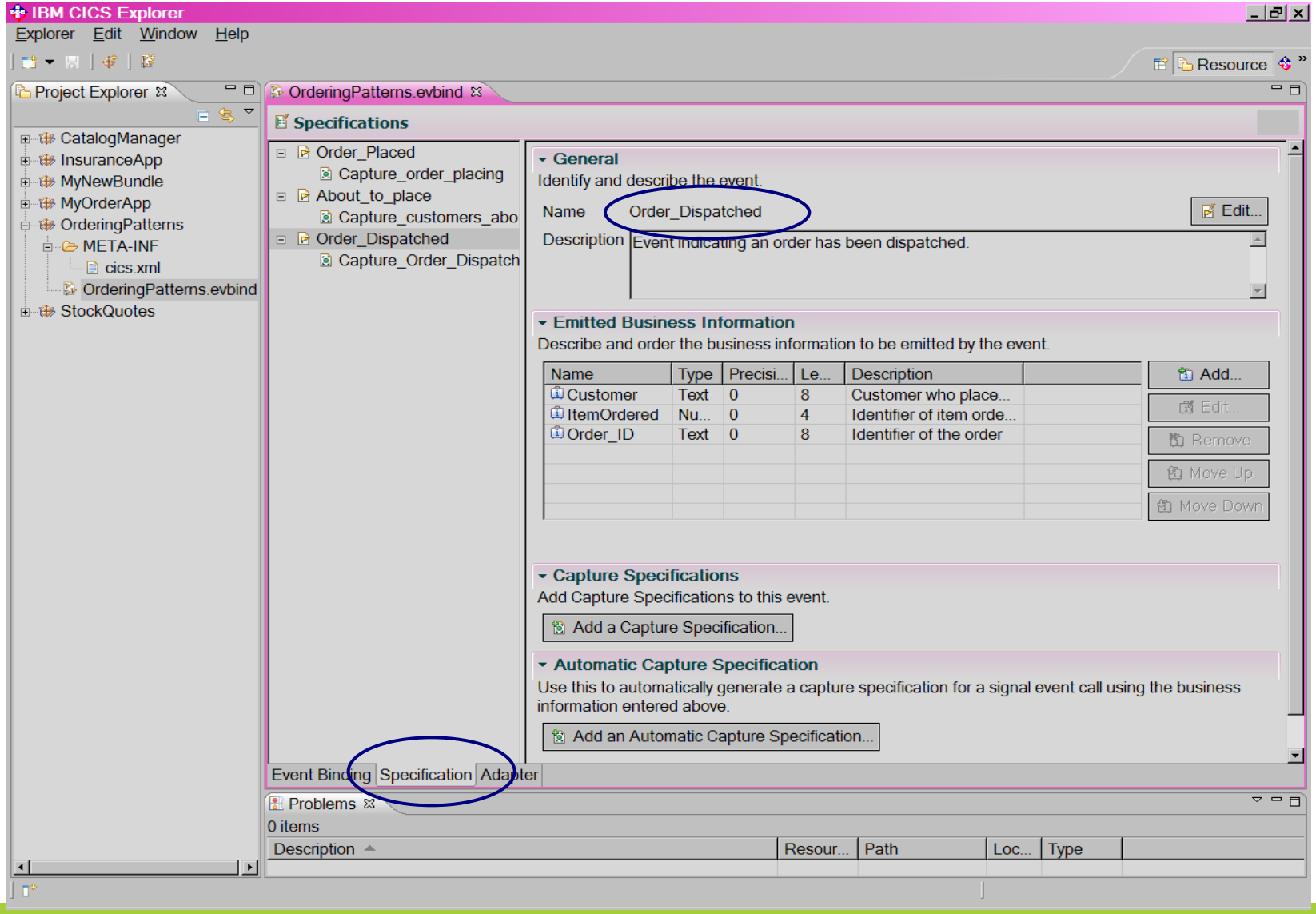
© 2009 IBM Corporation

Event Binding Editor – Event Binding



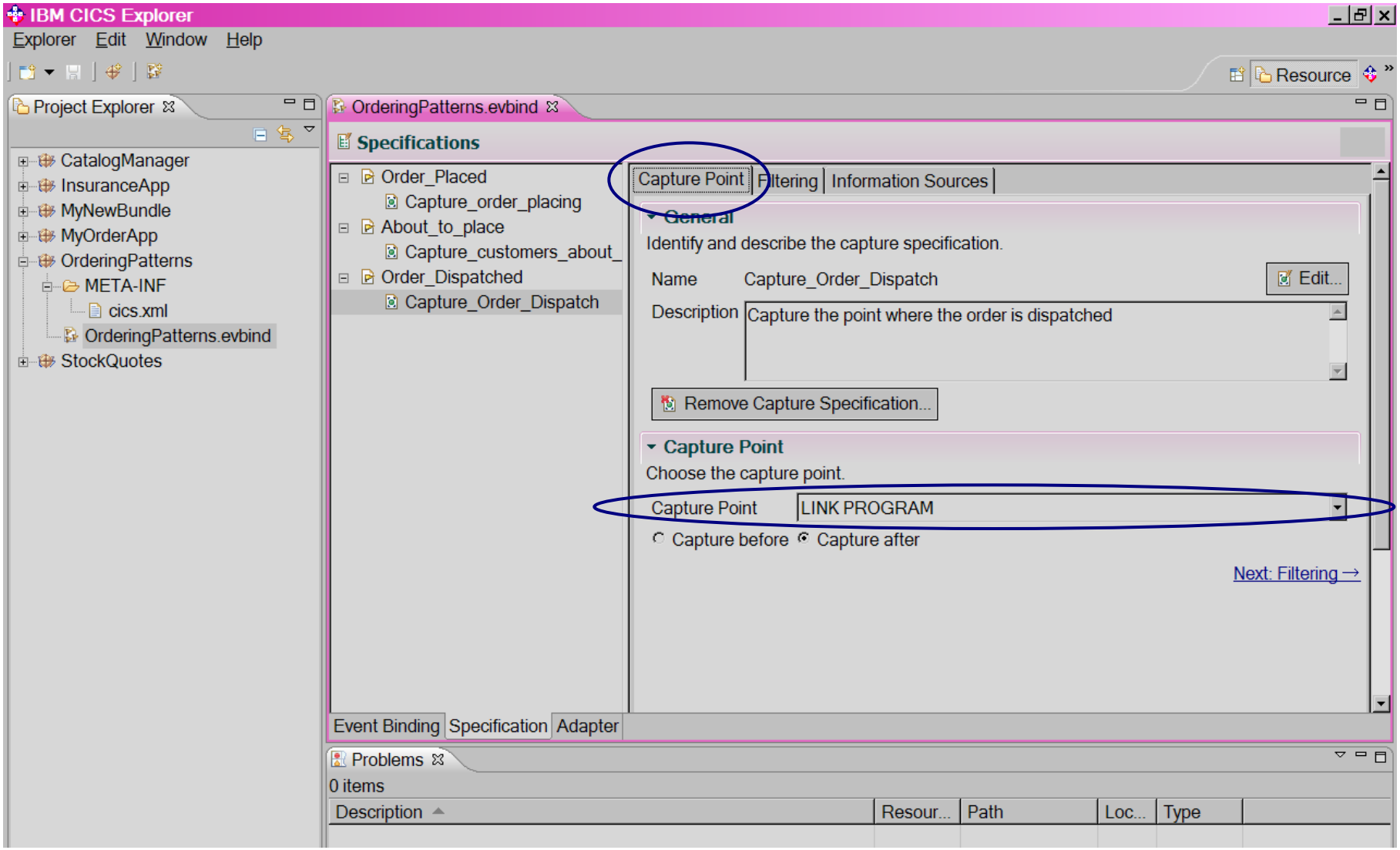
© 2009 IBM Corporation

Event Binding Editor – Event Specification



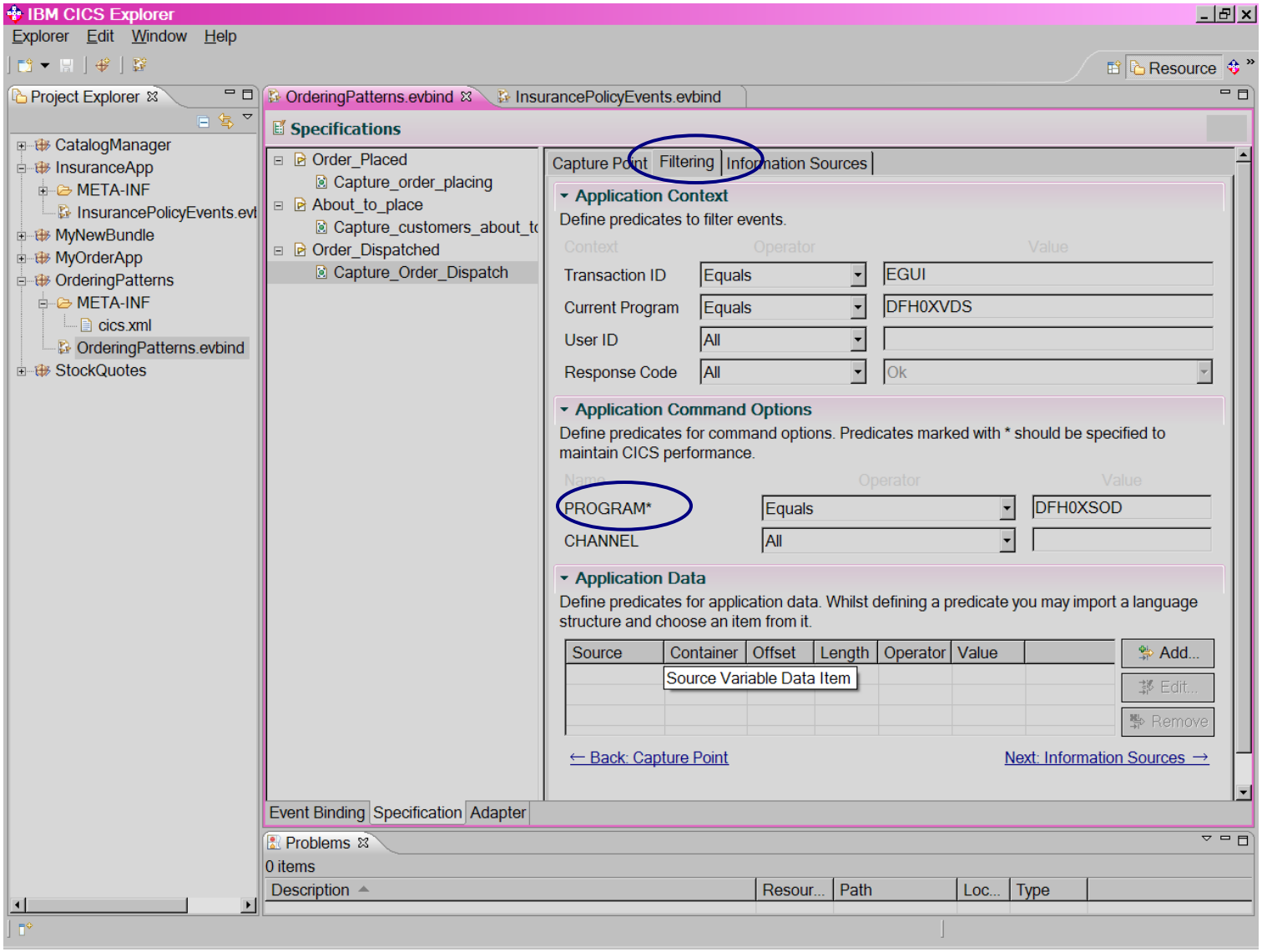
© 2009 IBM Corporation

Event Binding Editor – Capture Specification



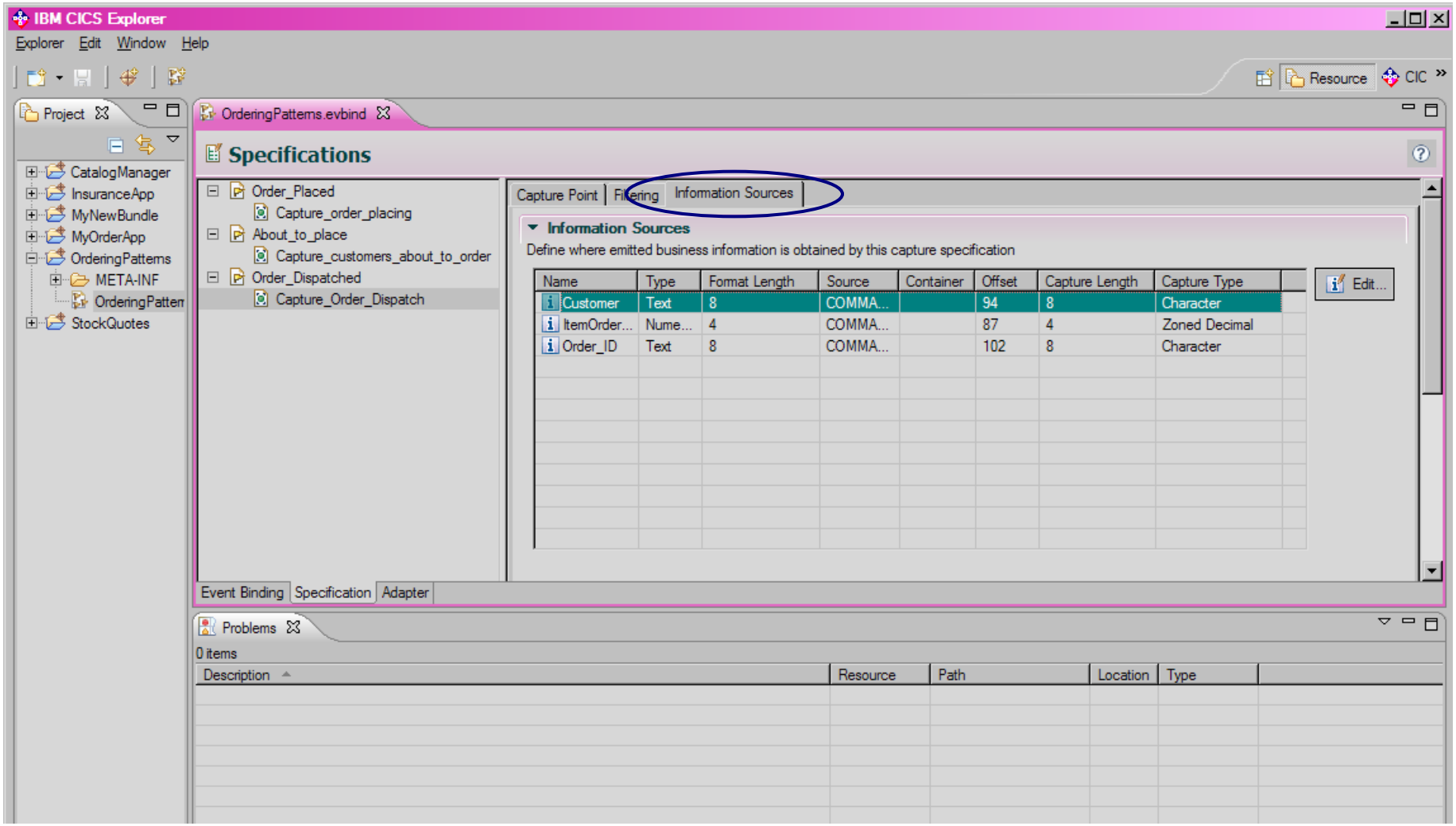
© 2009 IBM Corporation

Event Binding Editor – Capture Specification Filtering



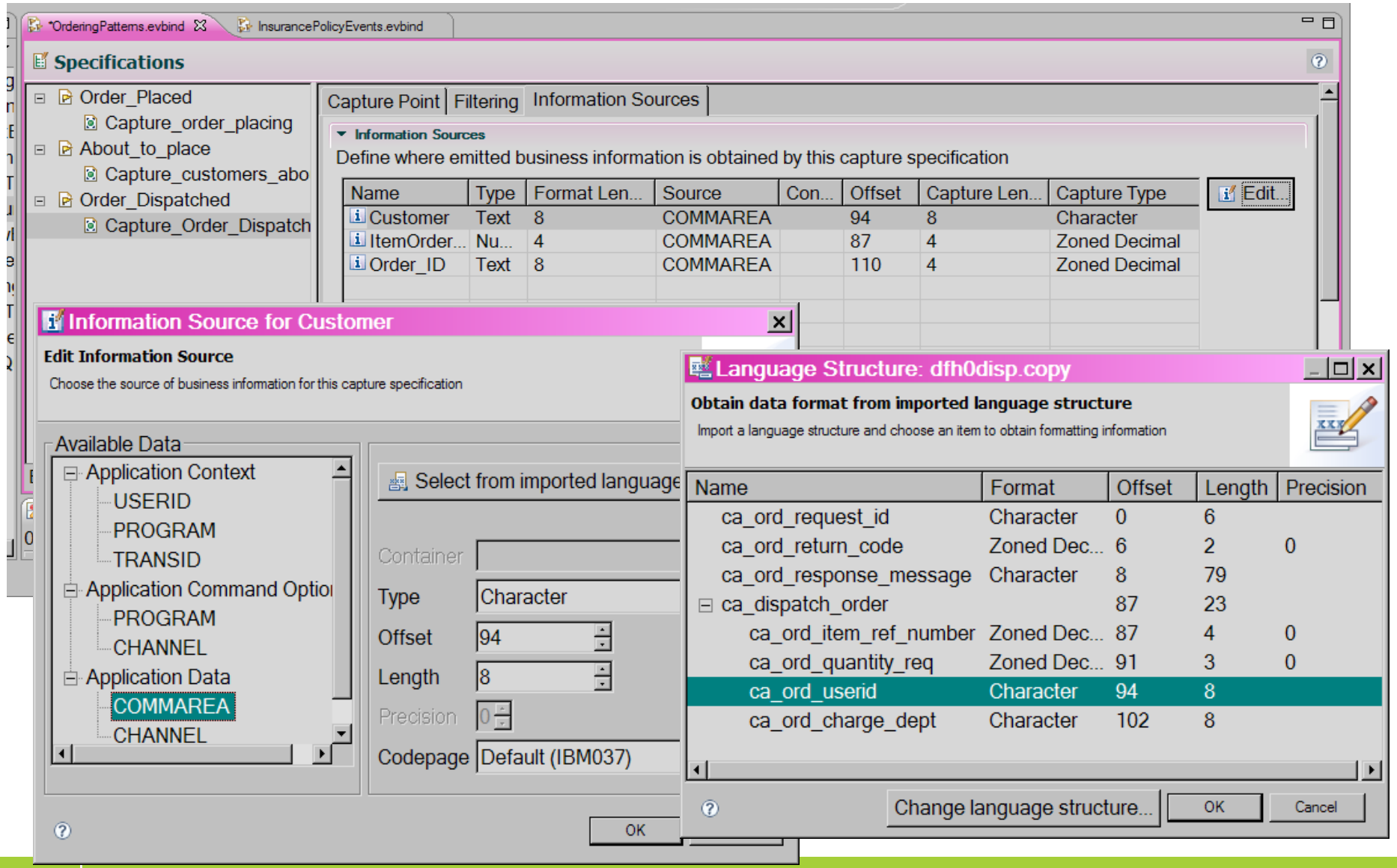
© 2009 IBM Corporation

Event Binding Editor – Information Sources



© 2009 IBM Corporation

Event Binding Editor – Information Sources Import

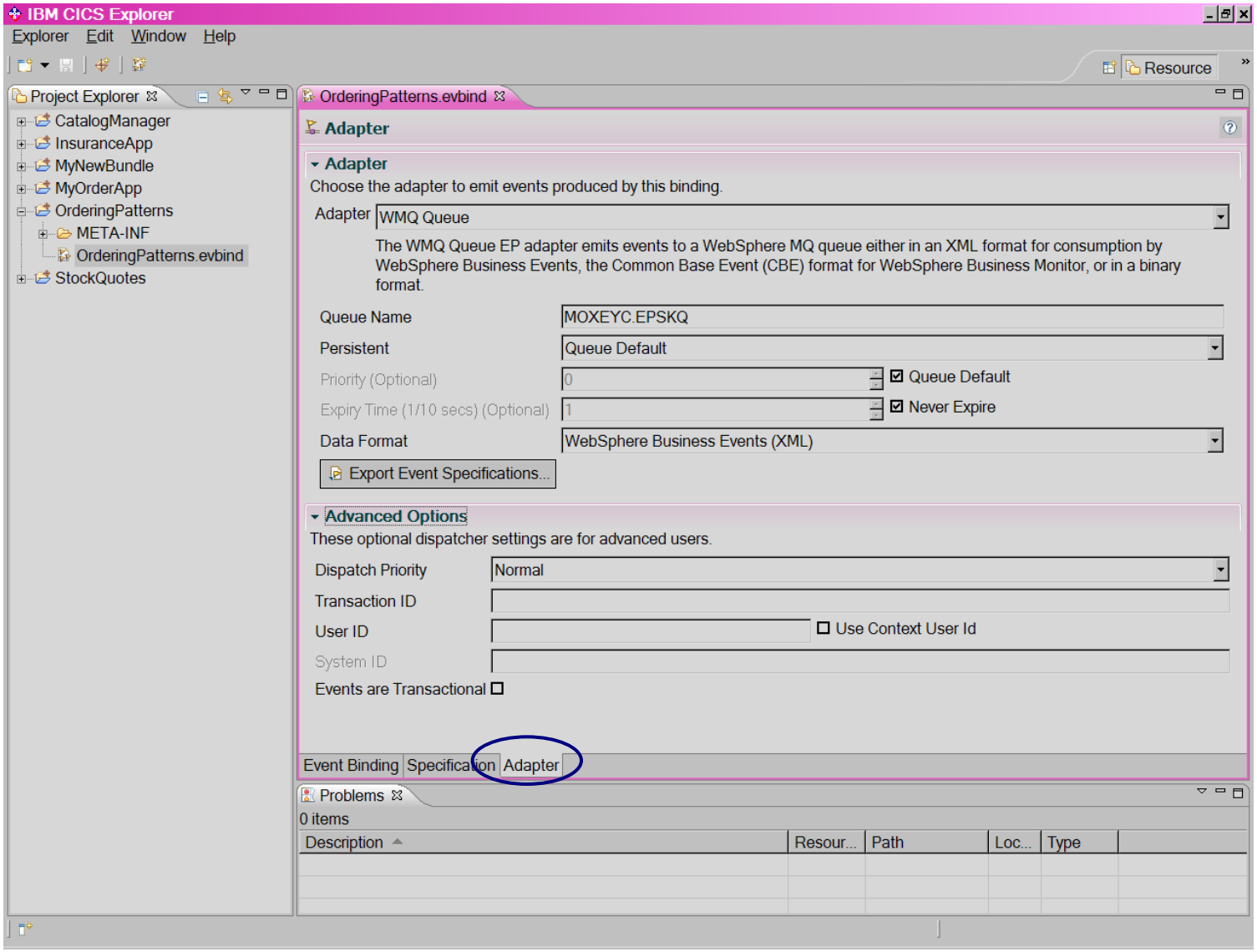


© 2009 IBM Corporation

Event Binding Editor – EP Adapter

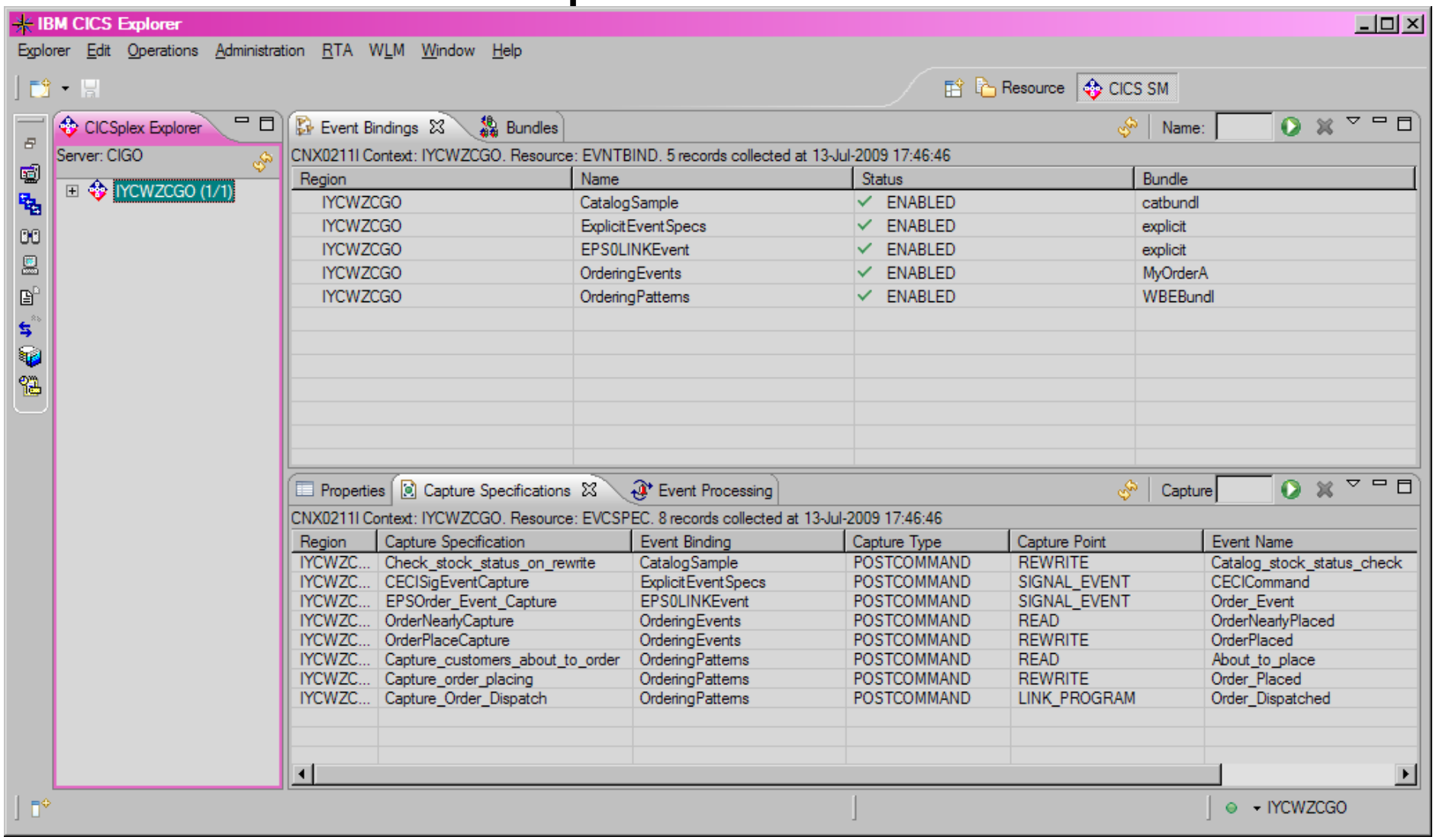
EP Adapter specification, showing the configuration details for WMQ Queue EP adapter, with Queue name and other WMQ parameters.

The Advanced Dispatcher Options are shown, but nothing other than the defaults have been selected.



© 2009 IBM Corporation

Events in CICS Explorer



© 2009 IBM Corporation

Using CICS Events

Integration with WebSphere Business Monitor and WebSphere Business Events

© 2009 IBM Corporation

Value from CICS Events

- **Use CICS events to**
  - Monitor what is happening in the system
  - Drive additional processing as a result of events
  - Detect interesting patterns amongst events
- **to enable**
  - Business insight
  - Business flexibility and innovation
  - Regulatory compliance and management of business risk

© 2009 IBM Corporation

CICS and WebSphere Business Monitor

© 2009 IBM Corporation

WebSphere Business Monitor (WBM) – a Business Activity Monitoring Solution

Business activity monitoring (BAM) provides process visibility

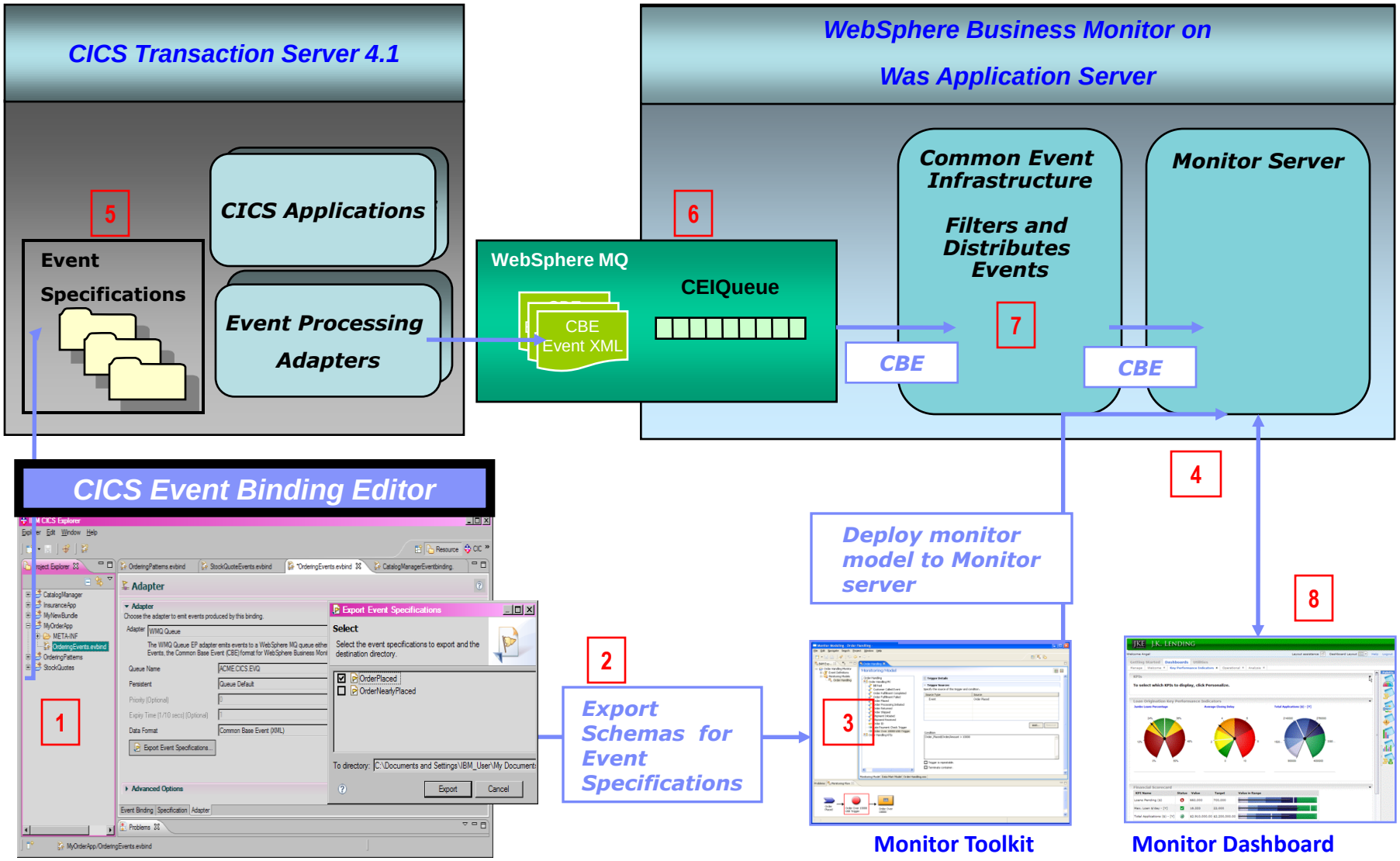
Business leaders gain real-time visibility and actionable insight into processes

Real-time information consolidated into customizable, role-based dashboards

Business leaders monitor process **KPIs** and receive alerts

© 2009 IBM Corporation

CICS and Monitor Integration



IBM Confidential

© 2009 IBM Corporation

CICS CBE format event for WBM

```
<cbe:CommonBaseEvent xmlns:cbe="http://www.ibm.com/AC/commonbaseevent1_0_1"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.0.1"
    creationTime="2009-02-11T02:42:06+00:00“

     <cbe:sourceComponentId component="IBM CICS TS#4.1.0" componentIdType="ProductName“
        executionEnvironment="IBM z/OS"
        instanceId="GBIBMUVW.IYK1X2YZ" location="MV2C" locationType="Hostname"
        subComponent="CICS EP“ componentType="http://www.ibm.com/xmlns/prod/cics/eventprocessing"/>
      <cbe:situation categoryName="OtherSituation">
          <cbe:situationType xsi:type="OtherSituation" reasoningScope="EXTERNAL">
              <CICSApplicationEvent/>
          </cbe:situationType>
      </cbe:situation>


        <cics:event xmlns:cics="http://www.ibm.com/xmlns/prod/cics/events/CBE">
            <cics:context-info>
                <cics:eventname>Order_Placed</cics:eventname>
                <cics:usertag>V0_9</cics:usertag>
                <cics:networkapplid>GBIBMUVW.IYK1X2YZ</cics:networkapplid>
                <cics:timestamp>2009-02-11T02:42:06+00:00</cics:timestamp>
                <cics:bindingname>Order_Processing</cics:bindingname>
                <cics:capturespecname>Order_PlacedCapture</cics:capturespecname>
                <cics:UOWid>1A11C7C2C9C2D4C9E8C14BC9E8C3E6E3C3F9F9BABD6C7A0D35000A</cics:UOWid>
            </cics:context-info>
            <cics:payload-data>
                <data:payload xmlns:data="http://www.ibm.com/prod/cics/V0_9/Order_Placed">
                    <data:Customer>Customer1</data:Customer>
                    <data:Item_Ordered>0030</data:Item_Ordered>
                    <data:Number_Ordered>4</data:Number_Ordered>
                </data:payload>
            </cics:payload-data>
        </cics:event>

</cbe:CommonBaseEvent>
```

CBE Envelope

xs:any slot

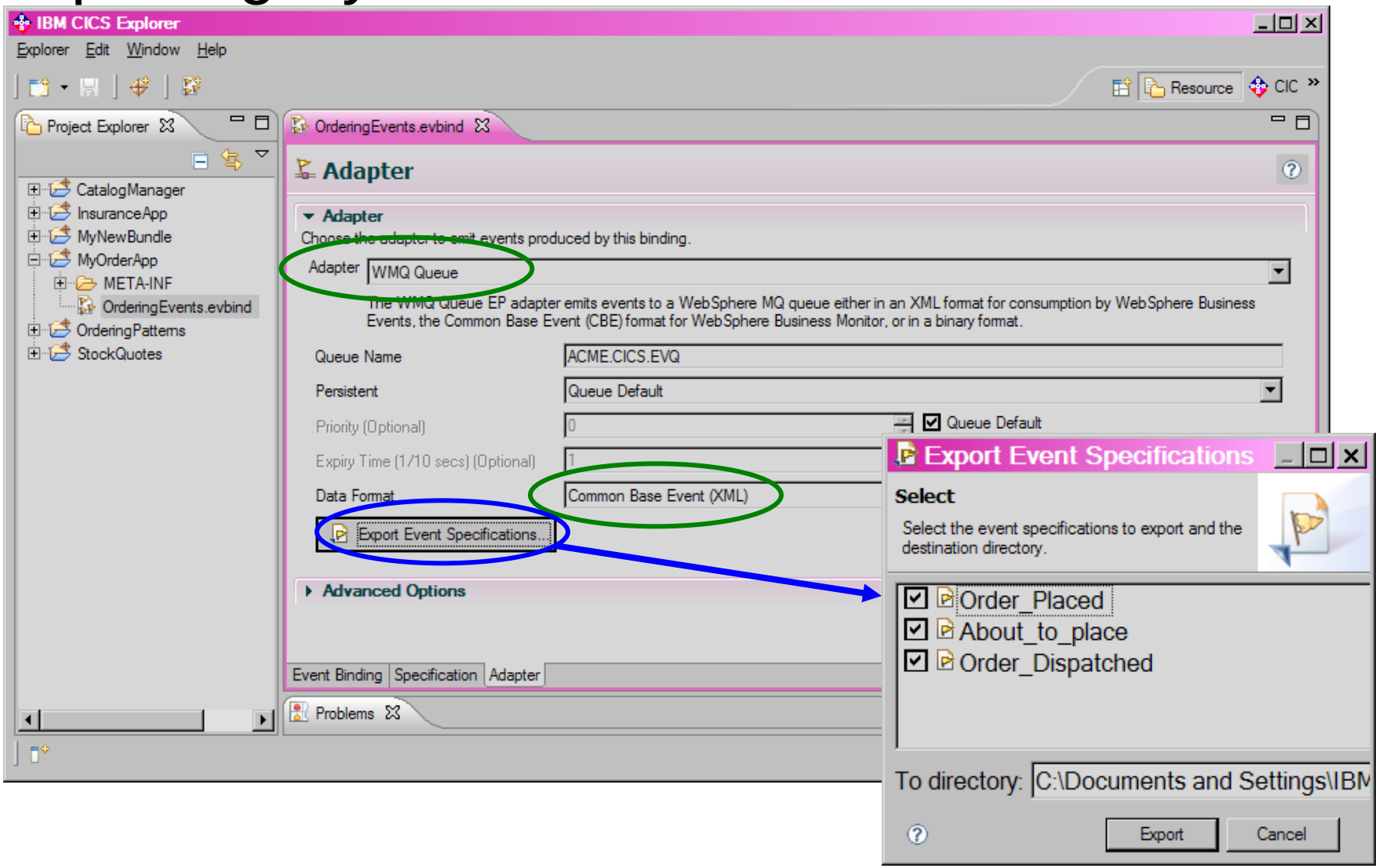
© 2009 IBM Corporation

Example – Business process performance and KPIs

- **Order Processing application**
  - Events emitted during order processing
    - Order Placed
    - Order Shipped
    - Order Cancelled
- **Business information required**
  - How long on average does it take to dispatch orders?
    - Are we meeting our “shipped in 5 working days” SLA?
  - How often are orders cancelled?
  - How often are orders cancelled after they have been shipped?
  - etc.

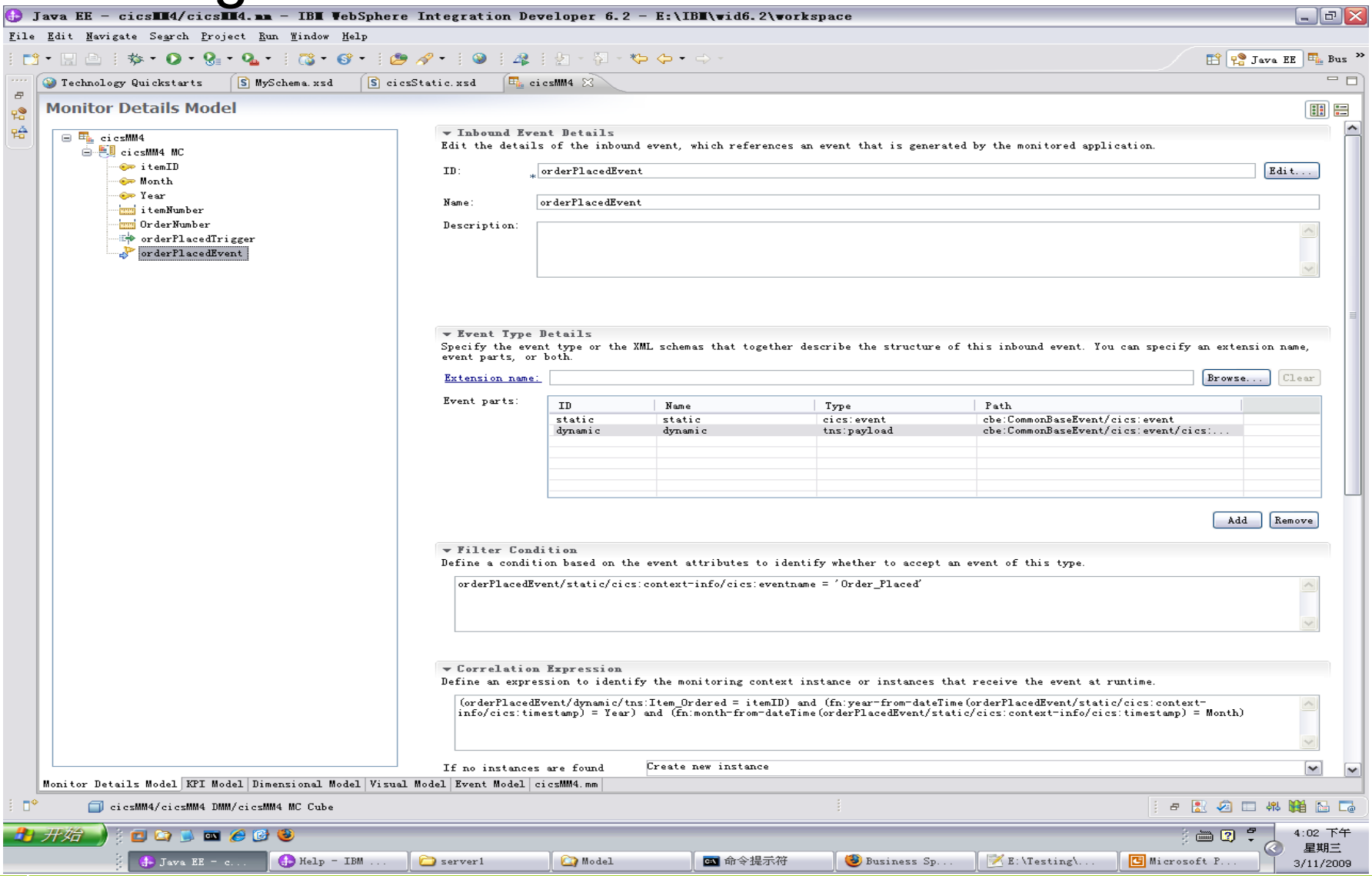
© 2009 IBM Corporation

Exporting Dynamic Schema for CBE



© 2009 IBM Corporation

Authoring the Monitor Model in WID



© 2009 IBM Corporation

Business Process Performance and KPIs in Business Space

Instances

Export ... Search for: Reset

orderID	itemID	customer name	item price	item quantity	order duration	order start time	order end time	order price	order status
+000012784	0001	Steve	20	20	24 m, 19.121 s	May 27, 2009 10:38:13 AM	May 27, 2009 11:02:32 AM	400	order canceled
+000012785	0002	Lijia	5	40	23 m, 25.009 s	May 27, 2009 10:39:24 AM	May 27, 2009 11:02:49 AM	200	order shipped

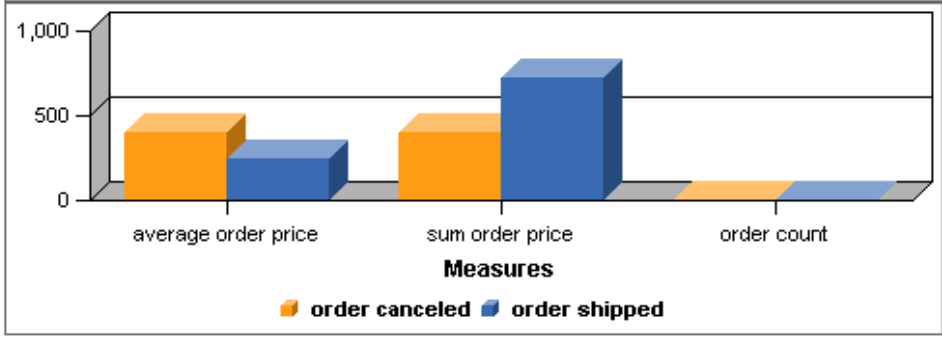
KPIs

KPI Name	Status	Value	Target	Actions	Value in Range
average time on order shipped		23 m, 18.601 s	1 h, 0 m, 0 s		
percent of order cancelled		25.00%	30.00%		

Dimensions

File Edit View Bookmarks Data Chart Tools Help

Drill Down



order status dimension	average order price	sum order price	order count
All order status dimension	280	1120	4
order canceled	400	400	1
order shipped	240	720	3

© 2009 IBM Corporation

Other monitoring opportunities

- **Follow the end-to-end processing of orders**
  - Events at all stages in the process
    - Catalog request, inquiry on item, request for price quote, place order, confirm order, order dispatched, invoice issued, payment received, stock replenished, etc.
  - Might involve a process choreographed by **WebSphere Process Server**, but with some processing carried out within CICS
    - CICS event processing support opens up the ‘black box’ that hitherto has been the processing in CICS

© 2009 IBM Corporation

Business Flexibility with CICS Events

© 2009 IBM Corporation

Using CICS events to extend applications

- **CICS event can start new CICS transaction**
  - Transaction Start EP Adapter
  - Run new program, passing event information
- **CICS event can be written to WMQ queue**
  - WMQ Queue EP Adapter
  - Program can read event from queue and carry out new processing
  - Events can be sent to WebSphere Business Events, where they might be combined with other events, and result in actions which drive new processing

© 2009 IBM Corporation

Example of application extension

- **Copy of bank account details have fallen into wrong hands**
- **Bank needs to immediately detect activities on those accounts**
- **Events captured at all places where**
  - Money withdrawn from accounts
  - Contact details updated
  - New check (cheque) book requested

- **Drive CICS transaction which does lookup against account details in Shared Data Table**

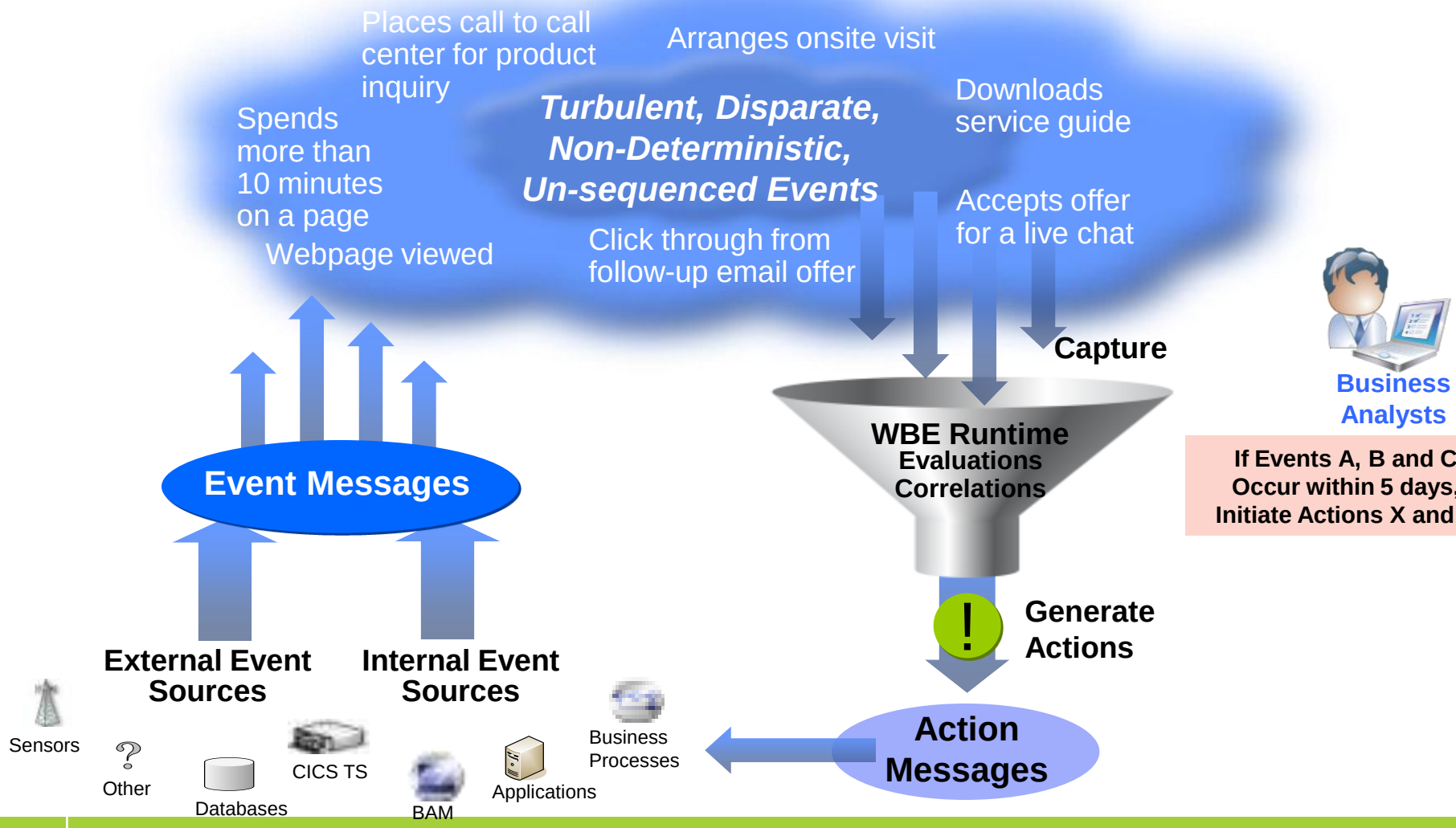
© 2009 IBM Corporation

CICS Events and WebSphere Business Events

© 2009 IBM Corporation

WebSphere Business Events

Correlation of business events from any source, over any time frame



© 2009 IBM Corporation

CB11: CICS Events for WBE SupportPac

- CICS SupportPac CB11 provides a taster of CICS acting as a source of events to WebSphere Business Events
- The SupportPac runs on CICS TS V3.1 and V3.2, and was made available December 2008 (refreshed May 2009 to run on CICS TS V4.1)
- Requires a small change to existing CICS application code
  - Invoke the program supplied by the SupportPac, passing event details in a channel
- The SupportPac formats the event information into XML conforming to WBE format and emits the event for consumption by WebSphere Business Events (or other consumer program) via the WebSphere MQ transport
- WebSphere Business Events can include the event in interaction blocks to carry out pattern matching etc.

© 2009 IBM Corporation

Insurance Scenario Involving a Business Opportunity

- **Customer has obtained insurance quotes for three or more of car, house, belongings and travel insurance**
  - CICS application code which processes insurance quotes could emit an event when a quote is processed, including a customer name or identifier and the type of insurance policy

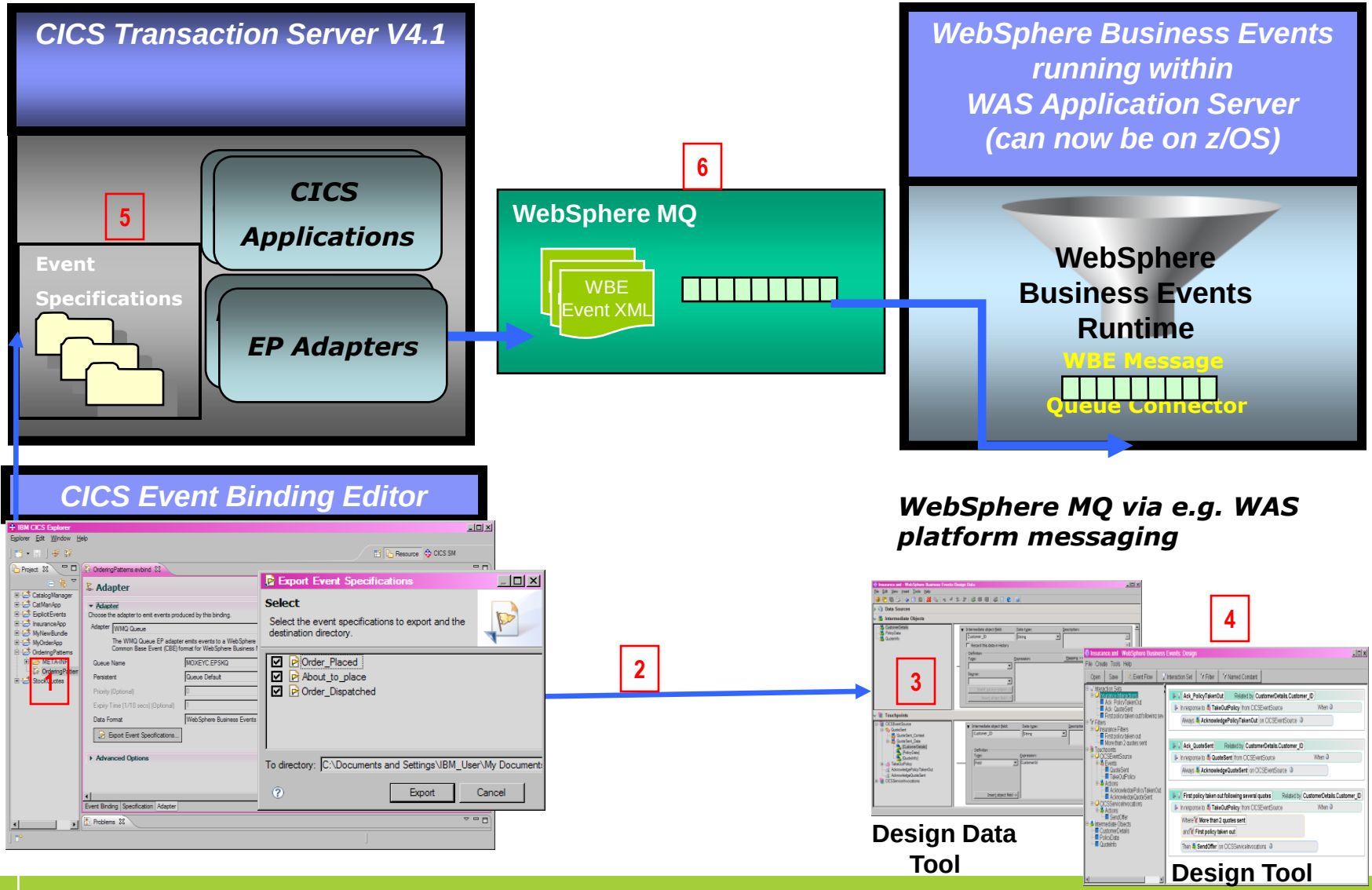
Customer has purchased only one of these insurance policies

- CICS can emit event when purchase of insurance policy is processed, with customer identifier and policy type

- **WebSphere Business Events can detect this pattern**
  - When quotes for these types of policy received but not all have matching purchase (correlated by customer), then take action
- **Send offers to the customer for the other insurance for which quotes were requested**
  - Better targetting than sending offers for all types of insurance available

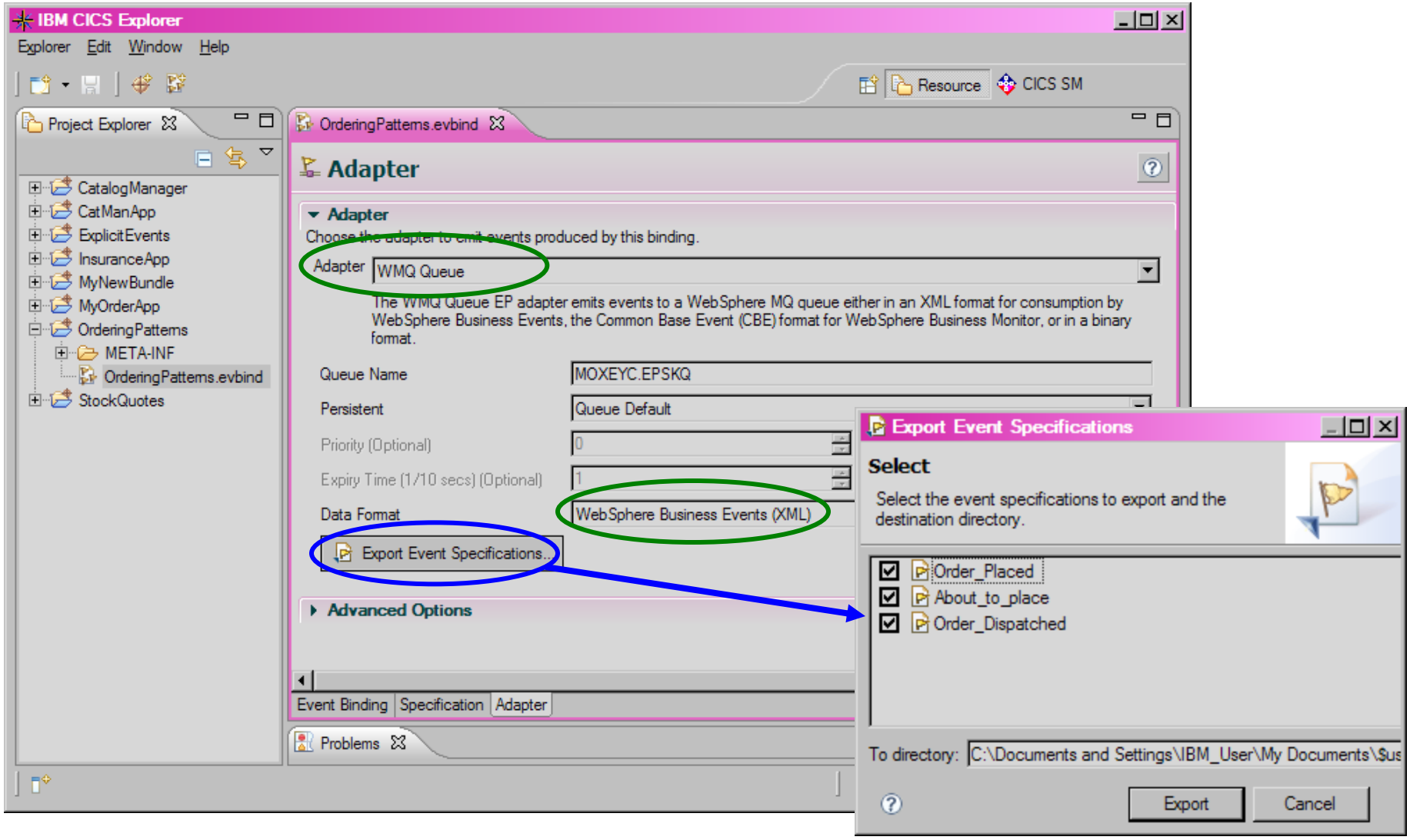
© 2009 IBM Corporation

CICS and WebSphere Business Events Integration



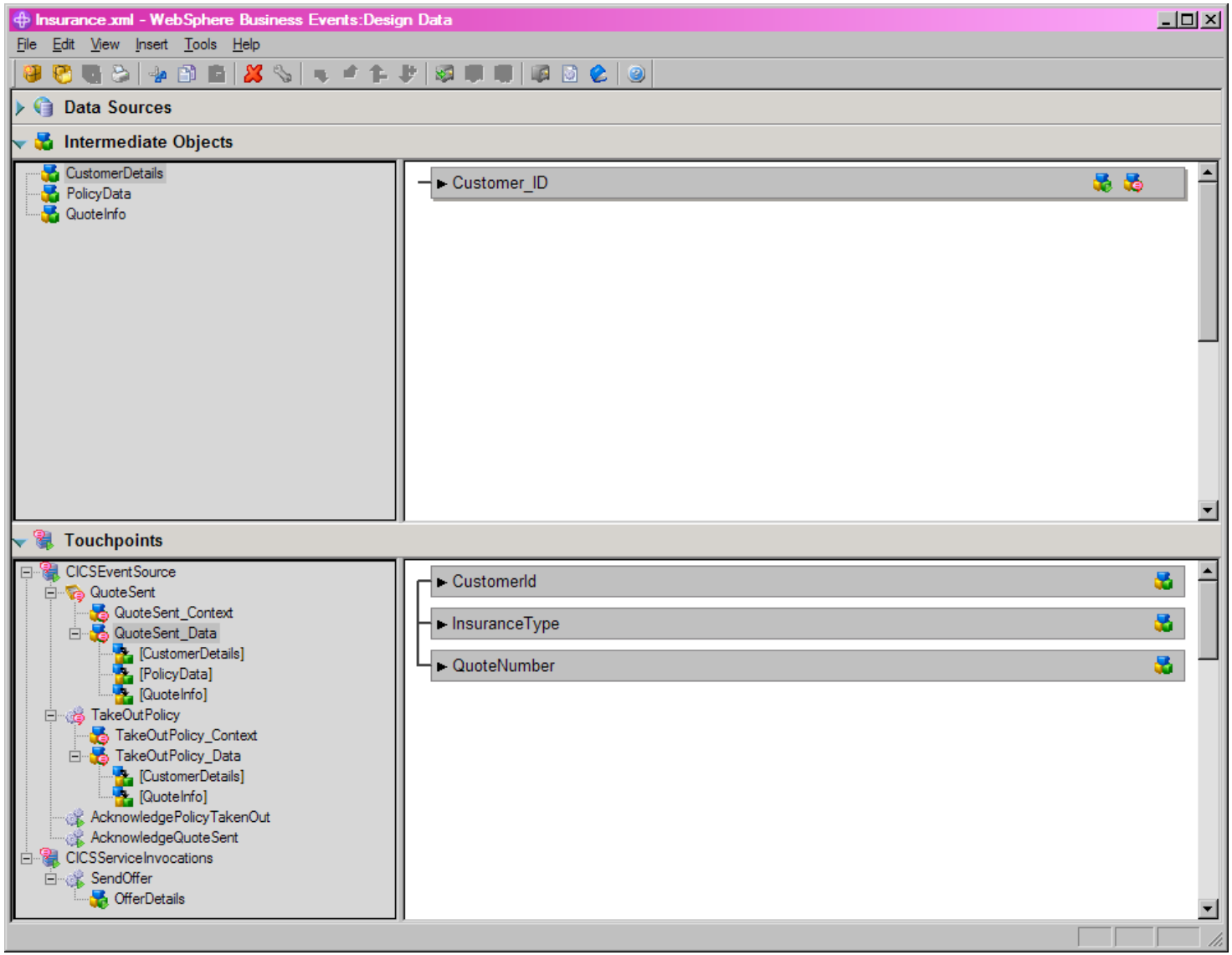
© 2009 IBM Corporation

EP Adapter and Exporting Event Specifications for WebSphere Business Events



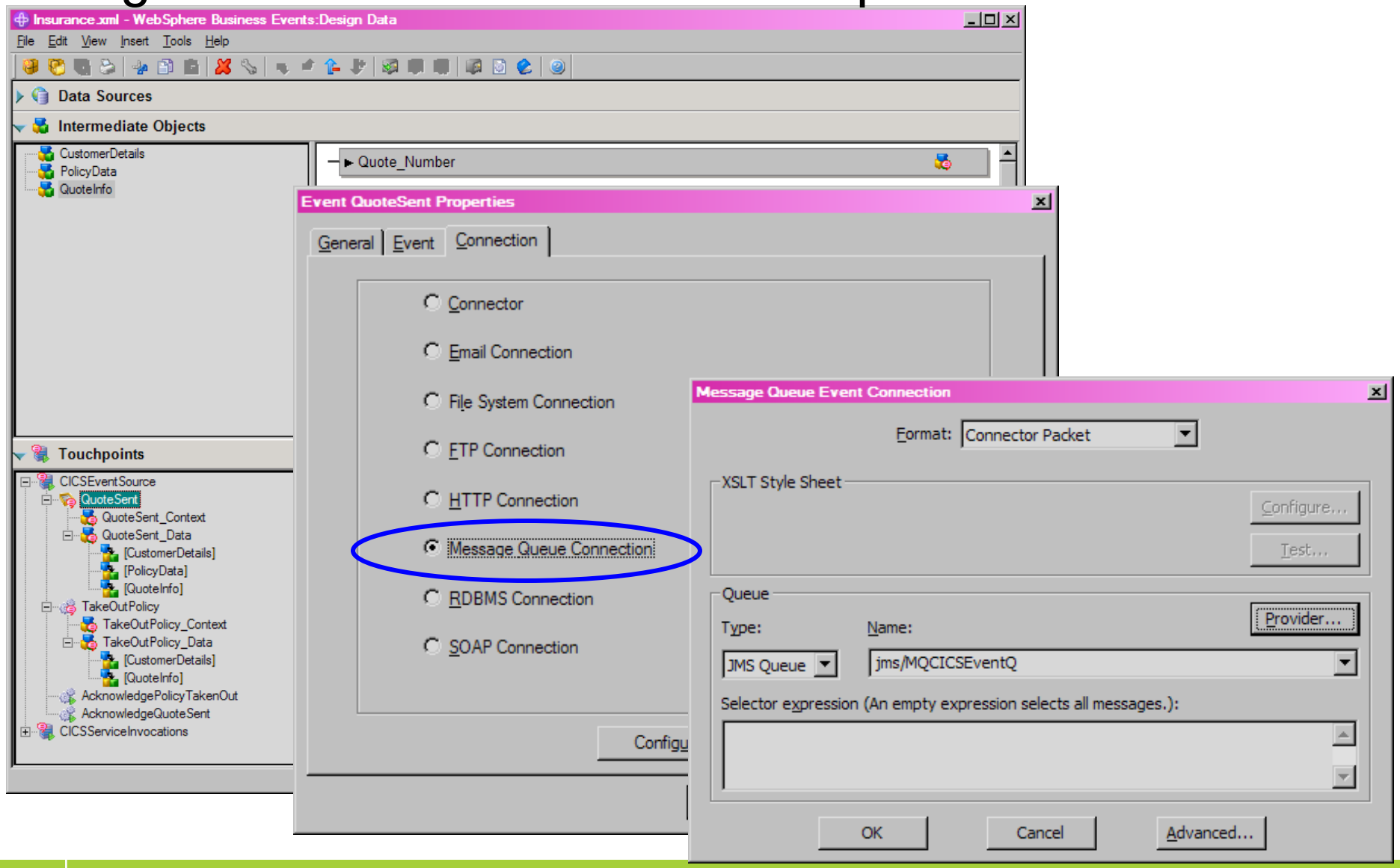
© 2009 IBM Corporation

Design Data : Events and Intermediate Objects



© 2009 IBM Corporation

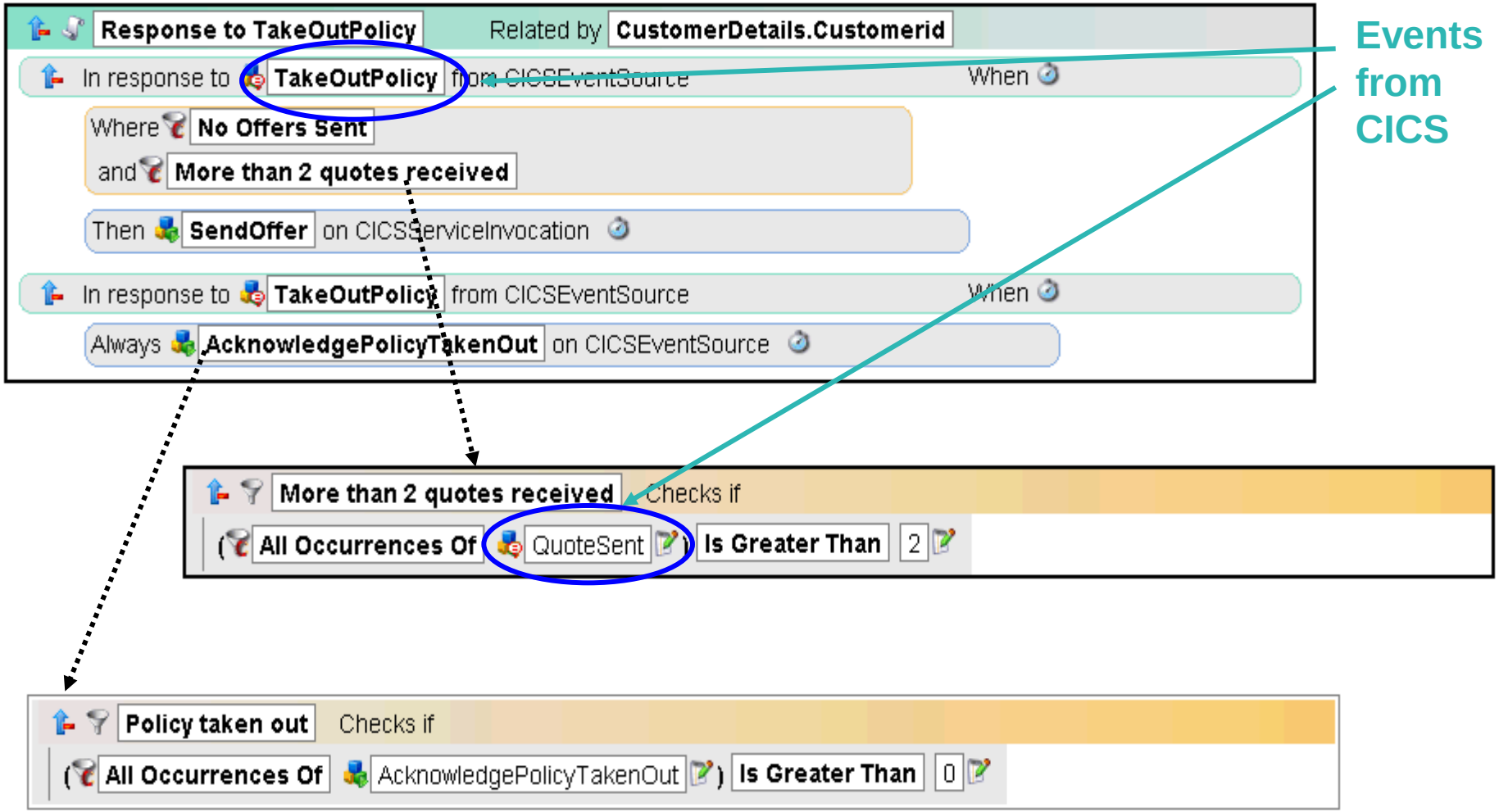
Design Data : Event Connection Specification



© 2009 IBM Corporation

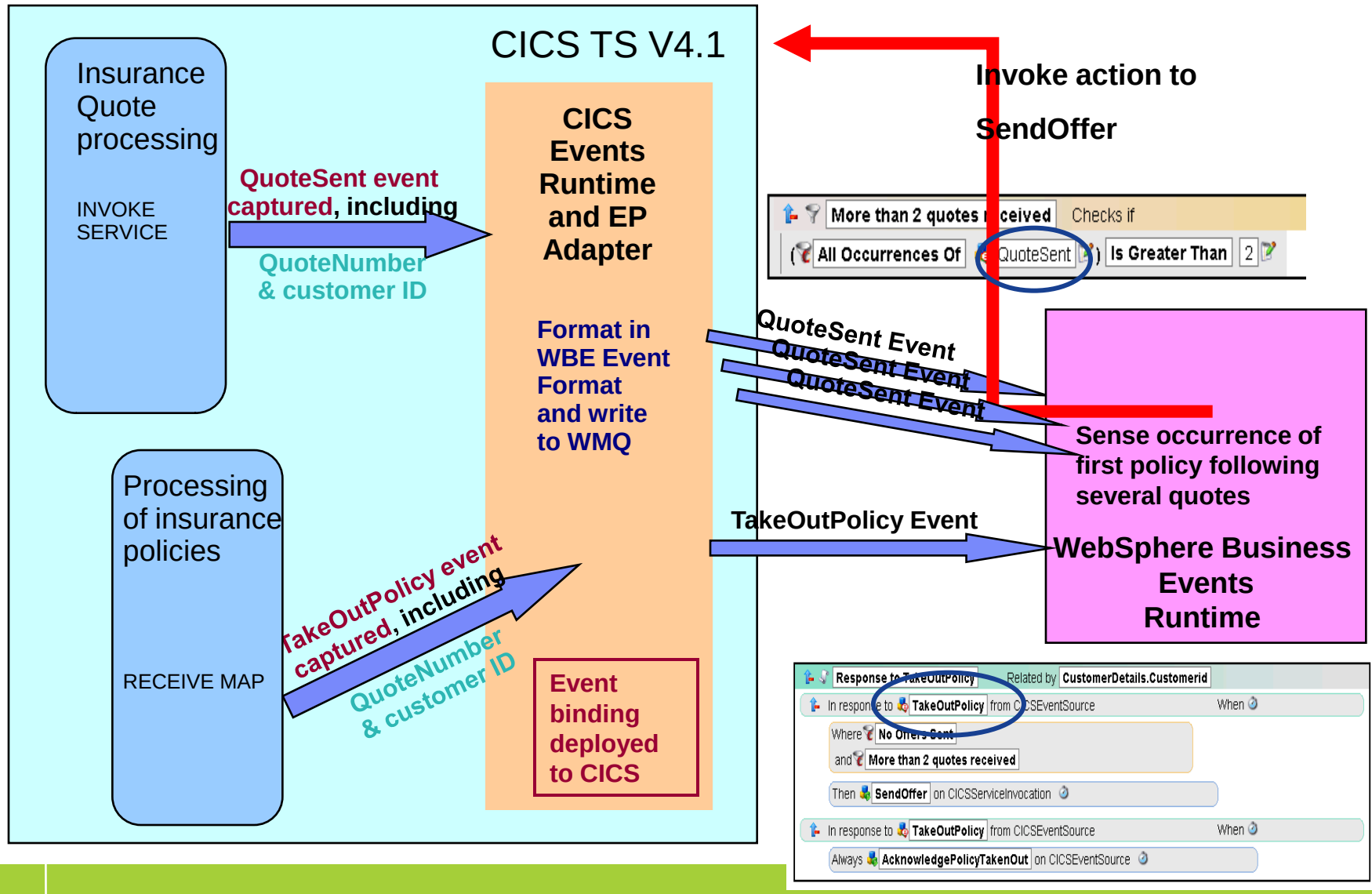
Insurance Quote Example – 1

WebSphere Business Events Interaction Set



© 2009 IBM Corporation

Insurance Quote Example - 2



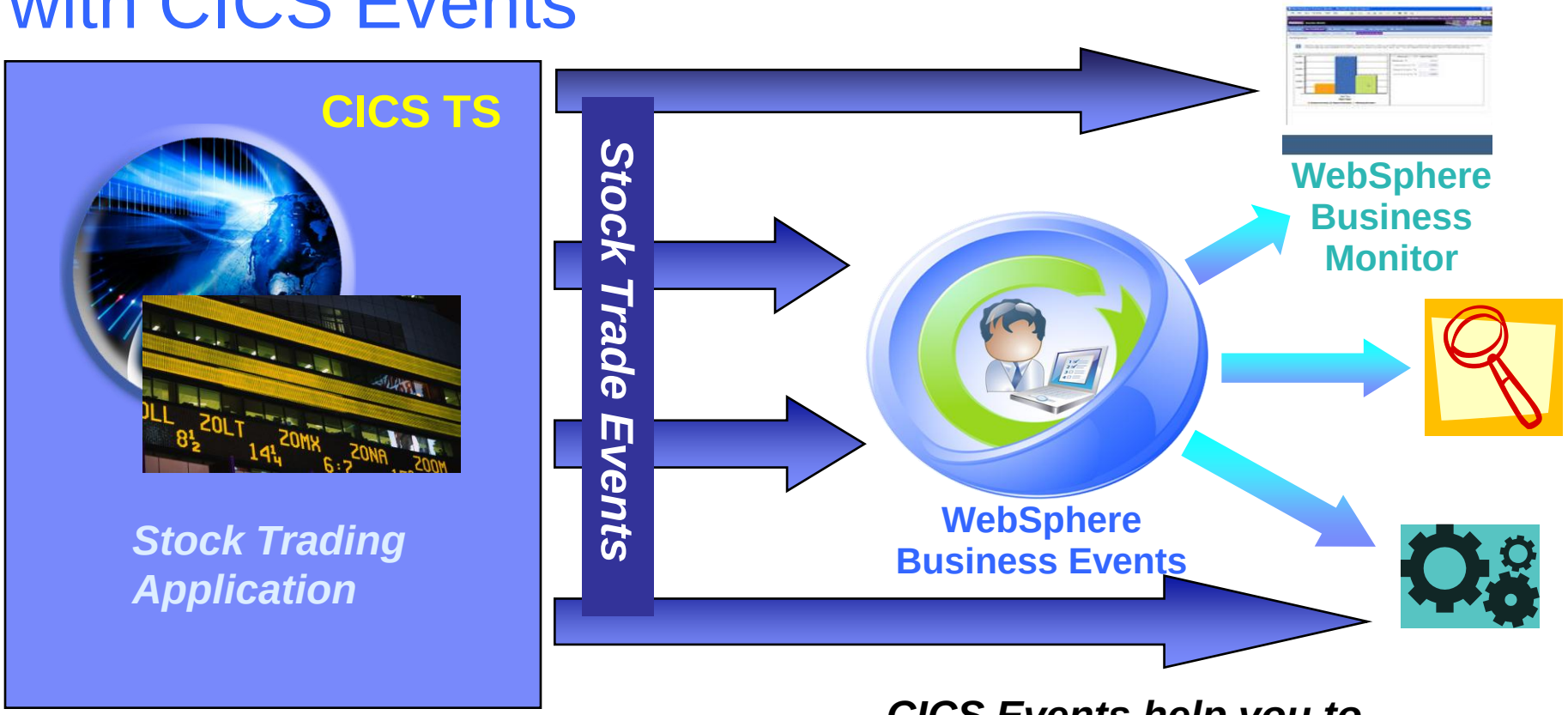
© 2009 IBM Corporation

Summary, References and Q&A

Including a summarising scenario

© 2009 IBM Corporation

Visibility, Compliance, and Business Flexibility with CICS Events



CICS Events help you to

- ***Observe business processes***
- ***Recognize suspicious activity***
- ***Drive new processing***

© 2009 IBM Corporation

References for CICS Event Processing Support

- CICS TS V4.1 Announcement Letter
- CICS TS V4.1 Information Center
- CB11: CICS Events for WBE
- CICS Event Processing on YouTube
  - **CICS Events with WebSphere Business Events High-level**
  - **CICS Events 5 minute demo**
- CICS and Events white papers
  - **IBM event processing solutions (CB11 introduction)**
  - **Gaining insight with IBM CICS and business events**
- WebSphere Business Monitor
  - **WBM Introduction**
  - **WBM V6.2 InfoCenter**
- WebSphere Business Events
  - **WebSphere Business Events Introduction**
  - **WebSphere Business Events V6.2 InfoCenter**

© 2009 IBM Corporation

CICS Event Processing Summary

- **Non-invasive** emission of business events from CICS applications *without need to change* existing business logic
- SIGNAL EVENT API for explicit instrumentation of events
- **Event Binding Editor** tooling within CICS Explorer to create event specifications
- Event specifications deployed to CICS via bundles containing event bindings
  - Specifies event and the emitted business data, and how it can be detected and captured by the CICS runtime
  - Specify event capture points as EXEC CICS command (a subset of the EXEC CICS API) plus filtering on command parameters and data
- Events dispatched to specified EP adapter for formatting and emission to event consumer consumers including **WebSphere Business events** and **WebSphere Business Monitor**
  - CICS-provided EP adapters plus capability for custom EP adapters

© 2009 IBM Corporation

Thank You !

Any further questions?

© 2009 IBM Corporation