White Paper
July 2009

Gaining insight into critical enterprise applications with IBM CICS and business events

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An aspect of event processing which is gaining considerable momentum is a focus on the business value which can be obtained from events.

Executive summary

The ability to detect events in IBM CICS® application processing, and to emit those events for consumption in a variety of ways without making changes to the existing applications, opens up a number of new opportunities for businesses.

Events from IBM CICS Transaction Server for z/OS® allow processing within CICS to be monitored, enabling insight into CICS applications and the business processes that they support, without the need to make application changes. It is also possible to extend the processing in new ways by using CICS events, enabling flexible and timely responses to business opportunities or threats. Events from CICS can also be used to look for particular patterns of events, either from CICS alone or from CICS and other sources, which might indicate potential breaches of corporate, industry, or government regulations or other undesirable situations.

This paper provides an introduction to the importance of CICS as a source of business events and to products with which CICS can interoperate using these events. It outlines how events can be monitored, used to drive additional processing, and included in pattern detection using CICS together with other IBM products.

Introduction

Event processing and event-based systems have been around for some time, used in particular in managing and monitoring IT systems. An aspect of event processing which is now gaining considerable momentum is a focus on the business value which can be obtained from events. This is based on the growing need to react and make decisions much closer to real time and to gain insight into business processing, in response to the introduction of compliance regulations along with the desire to respond rapidly to changes in the business without entailing long development cycles.[1]

Highlights

IBM CICS Transaction Server for z/OS handles billions of transactions a week. In Martin Campbell-Kelly's history of the software industry, *From Airline Reservations to Sonic the Hedgehog*, he states that, "Although most people are blissfully unaware of CICS, they probably make use of it several times a week, for almost every commercial electronic transaction they make."[2]

Companies around the world run their key business processing within CICS. However, there is a great deal of information locked up in this processing, to which they do not currently have access. This ranges from understanding the business decisions encapsulated in the applications to detecting business opportunities and threats.

Event processing technology provides the ability to gain business understanding and insight, with new support that enables CICS to act as a source of business events.

New event processing technology provides the ability to gain this business understanding and insight. With new support that enables CICS to act as a source of business events, business monitor dashboards such as IBM WebSphere® Business Monitor can be quickly and easily configured to derive value from the information in CICS applications, and business event engines such as IBM WebSphere Business Events can provide enhanced insight and action by detecting patterns among events.

Leveraging events to more rapidly address the needs of the business

Business managers and analysts understand actionable situations—the key events and the desired actions to be taken. However, they have not previously had the solutions available to enable them to identify and respond to the volume and complexity of these situations themselves. At the same time, although millions of potentially actionable events are flowing freely through the IT infrastructure today, support for advanced event-driven solutions has previously required long development and test cycles.

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The event support in CICS is designed to significantly reduce the development time for introducing event-driven solutions, and to allow IT to respond more rapidly to requests from the business.

The challenge of closer alignment between business and IT is addressed by business event processing, which combines event processing with capabilities that enable users to make use of events and to define the event processing behavior themselves. Business event processing provides IT with the functionality to support advanced event processing requirements in a high-performance, manageable, scalable environment.

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IBM solutions for integrated business event processing

The IBM software portfolio enables a range of options for processing business events. This section provides an overview of two key products which interoperate with events from CICS: WebSphere Business Monitor and WebSphere Business Events.

IBM WebSphere Business Monitor is comprehensive business activity monitoring (BAM) software that provides business users with a real-time and end-to-end view of business processes, events, and operations. It is a core part of the IBM WebSphere Dynamic Process Edition foundational offering of the IBM Business Process Management (BPM) Suite, and is also available as a standalone product.[3]

IBM WebSphere Business Events helps businesses detect, evaluate, and respond to the impact of business events based on the discovery of actionable event patterns. WebSphere Business Events is specifically designed to support business event processing by meeting the high-volume demands and

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processing required across industries and application domains. Equally important is the extensive use of graphical, codeless user interfaces that greatly simplify implementation and empower business users to directly develop and maintain event processing logic.[4] WebSphere Business Events V6.2.1 extends the platform coverage to z/OS.

Event capability in CICS Transaction Server for z/OS

In December 2008, IBM enabled support for interoperation between WebSphere Business Events V6 and CICS Transaction Server for z/OS V3 through a new SupportPac capability, available for download from the CICS Web site for all licensed users of CICS Transaction Server for z/OS V3.[5] This CICS SupportPac allows event points to be implemented in CICS applications, and positions CICS Transaction Server for z/OS as a key source for emitting business events in a format suitable for consumption by WebSphere Business Events.

CICS Transaction Server for z/OS V4.1 supports "non-invasive" event detection and emission, and interoperates with a wide range of event consumers.

CICS Transaction Server for z/OS V4.1 extends this capability in a number of ways, of which the two most significant are support for "non-invasive" event detection and emission, and interoperation with a wider range of event consumers. This non-invasive event detection enables the capture of events without the need to change the application code.

CICS systems run an enormous amount of existing business logic which carries out processing and makes business decisions that represent interesting business events. Due to the critical nature of these applications and a growing skills gap, there is a reluctance to directly enhance these applications. The event-based approach in CICS Transaction Server for z/OS V4.1 makes it possible to gain insight into processing in CICS, and to easily introduce additional extensions to applications in a dynamic and decoupled fashion.

As shown in Figure 1, CICS event processing support allows existing business logic to be enabled to emit events. Tooling is used to define events and the data associated with them, and to deploy the events to CICS. The tooling creates event specifications which also include information about how the events can be detected by the CICS runtime, and indicates how a related group of events are to be formatted and routed. This tooling is the Event Binding Editor, provided with CICS Transaction Server for z/OS as part of the CICS Explorer™. The Event Binding Editor allows application analysts to quickly create the information required by CICS to identify when events of interest occur and to collect the data required. This information is packaged together into a bundle resource which can be deployed into CICS using the CICS Explorer.

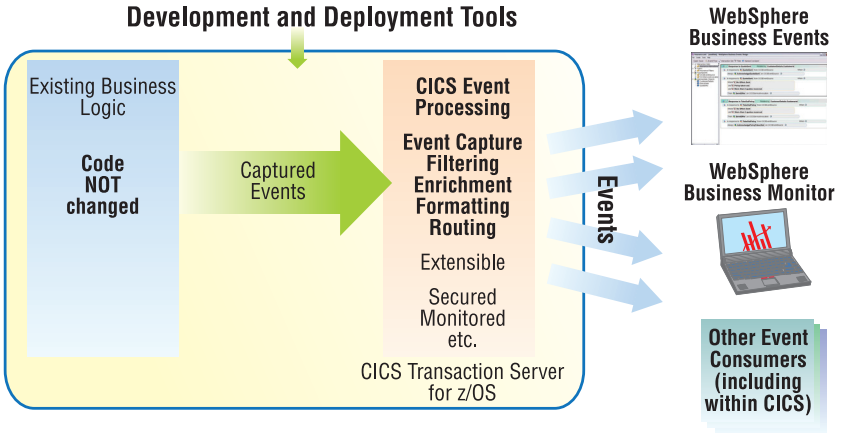

Figure 1: Overview of CICS event processing support

The CICS runtime detects events that are described by currently enabled event specifications, and captures the events to enable rapid, easy deployment of event-based solutions.

CICS event processing is a core component of the CICS runtime, and provides all the qualities of service you would expect of CICS. When CICS captures events, it can carry out specified filtering, enrich the event with information about the application context in which it occurred, format the event, and route it so that it can be consumed by the appropriate event consumer.

CICS event specifications hierarchy

Figure 2 shows the logical hierarchy of event specifications for CICS events.

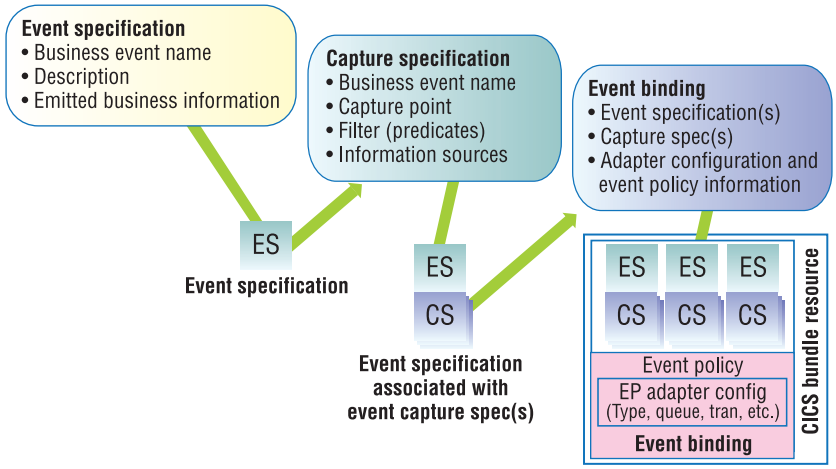

Figure 2: CICS event specifications

The *event specification* is a statement of the event required (such as "Request for Insurance Quote") and the business information to be emitted as part of the event (such as customer and insurance type).

Associated with an event specification is normally one capture specification. The *capture specification* provides the information that CICS will use to detect the event in application processing running within the system. For example, when an insurance quote program is linked to via an EXEC CICS LINK command, and data in a container passed to the program indicates that a quote is being requested, then this indicates that the event of interest has happened. The capture specification also relates information available in the application at this point to the business information to be emitted as part of the event. Using our insurance program as an example, the customer and insurance type might be obtained from data in other containers in the channel.

The capture specifications used to define CICS events differ from the mechanism used to specify when events are to be emitted by some other event producers, such as IBM WebSphere Process Server or IBM WebSphere Message Broker. The points in CICS applications where the interesting events occur cannot be tied simply to the start of a Business Process Execution Language (BPEL) process or to the entry or exit of a node, but can occur anywhere within the CICS application. CICS event capture specifications provide a way of accessing the events buried within a CICS application.

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Related event specifications and their associated capture specifications are grouped together into an *event binding*. The event binding also provides information about how (what format) and to where (such as to which WebSphere MQ queue) the event is to be emitted. This information is in the *event processing adapter configuration*.

An event binding is the unit of enablement for a group of related events. It is defined to CICS and deployed as part of a CICS bundle resource, which is a new resource type introduced in CICS Transaction Server for z/OS V4.1. The CICS bundle could contain several related event bindings, as well as other new CICS entities which are installed and managed using CICS bundle resources.

The main focus for CICS event processing support is on the ability for CICS to capture events without the need to change the application code. This is referred to as "non-invasive" event capture. The subset of the EXEC CICS API which is supported for event capture has been selected to give the best chance that users will be able to specify where events occur in their applications in this non-invasive manner.

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However, there will be some situations where explicit control over capturing of events is desirable, and to meet this need, a new EXEC CICS SIGNAL EVENT command has been introduced into the CICS API. This should be thought of as an event opportunity: it does not cause the event to be automatically emitted every time, but instead allows the command to be included within an event capture specification, which gives full flexibility to enable and disable the events—and to vary the way in which they are used—without further change to the application.

There is also one event capture point which is not an EXEC CICS command. This is program initiation, which allows an event to be specified when a program starts.

Event processing adapters

When an event has been captured by the CICS runtime, it is dispatched to an *event processing adapter* (EP adapter), based on what has been specified in the event binding. All EP adapters are invoked using a standard EP adapter interface, providing an opportunity for custom-written EP adapters.

The role of an EP adapter is to format the event and route it to potential consumers. The EP adapters that are provided by CICS enable:

- *Emitting the event over WebSphere MQ, in one of three formats: the standard Common Base Event (CBE) format for consumption over the Common Event Infrastructure by products such as WebSphere Business Monitor; the WebSphere Business Events XML format recognized by WebSphere Business Events; and a non-XML text-based format called CICS flattened event (CFE) format, to allow the event to be read from the WebSphere MQ queue.*
- *Starting a new CICS transaction as a result of an event to drive new work in this or another CICS system, providing the event details in containers within a channel (the CICS channel-based event format).*
- *Writing the event to a CICS temporary storage queue, in the text-based CFE format, primarily used to test that events are emitted when expected and contain the correct data.*

Highlights

The ability to consume events in a WebSphere Business Monitor dashboard can provide insight into CICS applications in a way that was not previously possible.

Business process monitoring with CICS events

CICS Transaction Server for z/OS V4.1 provides for interoperation with WebSphere Business Monitor using events from CICS. Providing the ability to consume such events in a WebSphere Business Monitor dashboard can provide insight into CICS applications in a way that was not previously possible. Events produced by CICS applications carry information about the processing within CICS, and by consuming those events using WebSphere Business Monitor, or other event monitoring products, you can quickly and easily get value out of that information.

To produce events from CICS that can be consumed by WebSphere Business Monitor, the EP adapter specified in the event binding should be the WebSphere MQ Queue EP adapter with the CBE format selected. Other configuration details, such as the WebSphere MQ queue to which the event should be emitted, will also be specified. This queue will be configured to be received by a queue defined to the Common Event Infrastructure (CEI) used by WebSphere Monitor, allowing the event to be consumed by WebSphere Business Monitor.

Highlights

Business monitoring can be used to gain insight into business processing, and to see whether KPIs are being met.

Business monitoring can be used to gather useful business metrics. For example, users can obtain monitoring information from a sequence of single events. When a customer places an order, an event from CICS can be produced with information about the customer placing the order, the item being ordered, and the value of the order. From that information it is possible to create reports about a customer's actions—from total value of that customer's purchases for the month to the value of each specific sale. Business monitoring dashboards created in Business Space powered by WebSphere provide a number of ways to display this information, from a simple counter that moves each time an order is placed, to charts showing the value of orders placed by different customers.

Business monitoring can be used to gain insight into business processing, and to see whether KPIs are being met. This scenario gives an example of monitoring a business process using events that occur during the processing. By producing events from CICS whenever an order is placed, when it is dispatched, and when it is cancelled, it is possible, for example, to obtain insight into:

- *How long it is taking to dispatch the orders.*
- *How often orders are cancelled after they have been dispatched.*

Figure 3 shows KPIs for another scenario, relating to issuing of credit cards, including how frequently cards are being reissued because the previous cards have been lost or stolen. A CARDISSUE event is emitted when a card is issued because the previous card was either lost or stolen, with the event including information indicating the reason. The capture specification for the CARDISSUE event is defined such that issuing of a completely new card does not cause an event to be emitted.

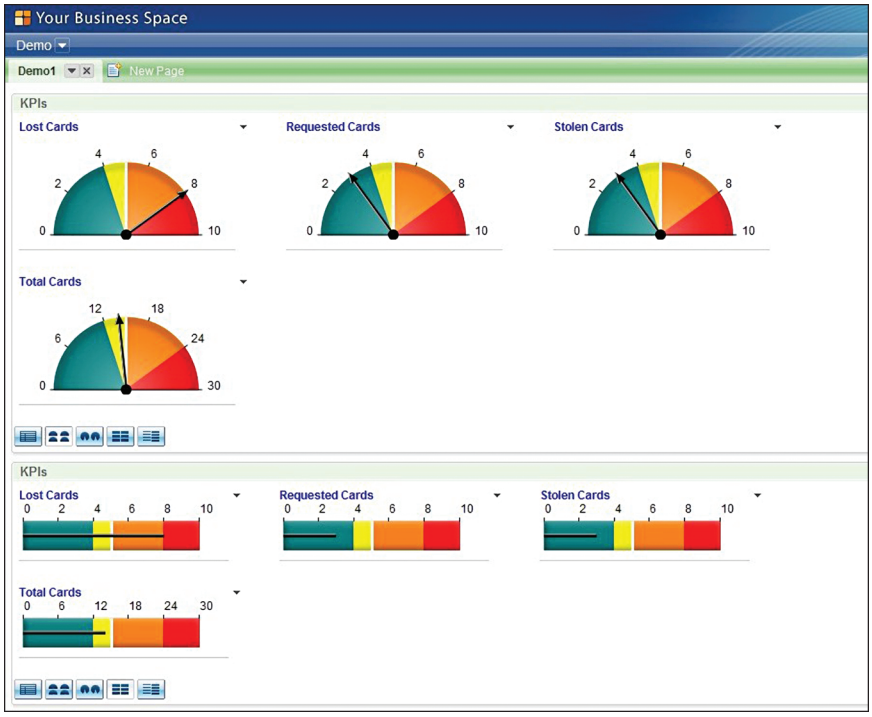

Figure 3: Business Space powered by WebSphere dashboard showing monitoring with CICS events

Figure 3 shows dashboard views in Business Space powered by WebSphere for this scenario. It shows information about numbers of card requests and numbers of lost and stolen cards separately, and indicates whether the numbers of such reissues are becoming unacceptable. Business Space powered by WebSphere provides a user-friendly, browser-based interface. It is the unifying front end for IBM's BPM products, and is included with products such as WebSphere Business Monitor, WebSphere Business Services Fabric, and WebSphere Process Server. Business Space powered by WebSphere allows business users to build their own dashboards using widgets.

Another example involves obtaining insight into business processing from events which occur during the processing. This scenario focuses on insight that can be gained from the point the customer first expresses interest in the product. For example, by producing events when an item is inquired upon, and when it is ordered, it is possible to derive information about how many potential customers are not ordering items that they look at and how easy it is to place an order for an item they have inquired about (from the average time between inquiring about an item and ordering it).

It is also possible that the overall process does not take place within CICS. For example, there might be an end-to-end process which is managed within WebSphere Process Server, but portions of the processing (perhaps the order handling and the billing) are carried out within CICS. WebSphere Process Server already has the capability to produce events at various stages in its processing, and CICS Transaction Server for z/OS V4.1 makes it possible to follow the processing once it enters CICS.

Highlights

WebSphere Business Events can be used to derive useful information and actions from CICS events, supporting detection of fraudulent situations and facilitating compliance with corporate governance policies and industry regulations.

A similar range of examples could be given for many other applications across a wide range of domains. For example, suppose that a software application processes hospital admissions. Events could be emitted when a patient is admitted to hospital, when certain preliminary tests are being carried out, and when the patient is assigned to a bed. These events could be used to monitor average admission processing times or to display a dimension showing the numbers of different types of admissions (such as emergency admissions, referral by a doctor, or referral by a specialist within the hospital).

Detecting patterns and taking action with CICS events

WebSphere Business Events can be used to derive useful information and actions from CICS events. CICS events can be used to provide both responsiveness and business flexibility as well as to facilitate the detection of fraudulent situations and help satisfy governance and compliance regulations.

For example, an insurance company could detect events occurring in CICS relating to obtaining quotes for policies, and then use WebSphere Business Events to look for patterns between these and events indicating that a policy has been taken out. This represents an opportunity to sell other policies to the customer, which could be responded to by sending a targeted offer. Alternatively, WebSphere Business Events could look for a pattern where one or none of the policies is taken out within a period of time, and drive an action to follow up with the customer.

Events from CICS could also be used to help ensure that regulations that require banks to detect potentially fraudulent situations are satisfied. Events relating to bank card usage could be emitted from CICS to WebSphere Business Events, and then used to check for unusual patterns of behavior, such as a new card ordered within a week of an address change request.

Highlights

There are a number of regulations affecting many industries which require such situations to be detected in real time. For example, the U.S. FACT (Fair and Accurate Credit Transactions) Act requires companies to have a "red flag" policy for detecting potential instances of identity theft.

Business event processing can also be used to deliver a business advantage. Imagine a scenario in which a bank customer requests a product from a teller. With business event processing, the system can detect the inquiry issued by the teller about this product and relate it to previous events for this customer, allowing the system to prompt the teller to offer a complementary product based on the apparent interests of the customer.

Business event processing can also be used to deliver a business advantage, helping organizations ensure continued customer retention, or to encourage increased purchasing.

In the area of online retail, the detection of event patterns could offer a variety of opportunities to ensure continued customer retention, or to encourage increased purchasing. These patterns could include detecting a change in a customer's normal ordering pattern and responding to it, studying the patterns of orders of more active customers and using these to make suggestions to less active customers, or using geographical information to make relevant suggestions.

As mentioned earlier, the event processing support in CICS Transaction Server for z/OS V4.1 extends and enhances the capabilities provided by the CICS Events for WebSphere Business Events SupportPac. A refresh of CICS Events for WebSphere Business Events (SupportPac CB11) enables it to run on CICS Transaction Server for z/OS V4.1, but the recommended mechanism for emitting events from CICS in this version is via the new support, either using the non-invasive mechanism or the EXEC CICS SIGNAL EVENT command. Among the benefits offered by CICS Transaction Server for z/OS V4.1 event support are:

- *Events can be specified without code changes, whereas SupportPac CB11 requires changes to application code.*
- *Events can be changed without code changes (or without further code changes if using the SIGNAL EVENT command), whereas SupportPac CB11 requires further application changes if the details of the event, such as the data included, are to be changed.*
- *Only the minimum necessary processing is carried out on the thread of the application emitting the event, and CICS benefits such as Open Transaction Environment (OTE) are used to optimize the other processing.*
- *As well as emitting events to WebSphere MQ in the format consumable by WebSphere Business Events, CICS Transaction Server for z/OS V4.1 can also support other event formats, together with a pluggable customization interface.*

Highlights

WebSphere Business Events provides tooling for IT users to define building blocks which represent the events to be received and processed.

In-depth example: Insurance quote

WebSphere Business Events provides tooling for IT users to define building blocks which represent the events to be received and processed by the system, and their data. Previously defined building blocks can then be used by business users in the definitions that they create for conditions (also known as filters) and interactions. Defining interactions (event processing logic) involves defining the "events – conditions – actions" groupings. The interaction UI and its supporting condition UI use a drop-down, point-and-click approach usable by both business and IT users.

Figure 4 shows an interaction set defined using WebSphere Business Events tooling that builds on the insurance quote scenario discussed earlier. The WebSphere Business Events: Design tool is used to specify the interactions and conditions shown in Figure 4. The interaction is for "Response to TakeOutPolicy." This states that when a "TakeOutPolicy" event is received, check both that no offers have already been sent to the customer, and also whether there have already been at least two instances of a "QuoteSent" event for this customer (by checking the "More than 2 quotes received" filter condition).

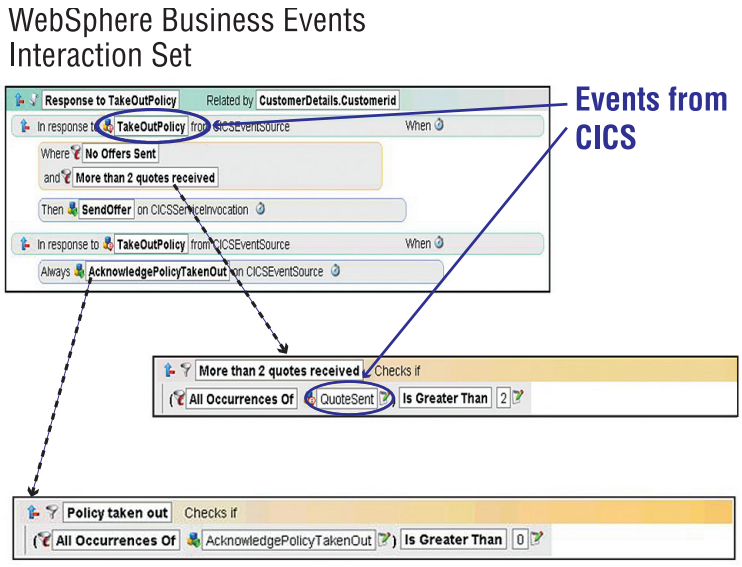

Figure 4: Interaction set and filters for insurance quote scenario

If so, then this is the first policy following several quotes, and the action to be taken when this situation occurs is to send an offer to the customer: the "SendOffer" action. (The interaction set also includes an action to acknowledge the receipt of each "TakeOutPolicy" event, which is a common way of handling events that are used in interactions in WebSphere Business Events.) The events that are being checked for are events that occur in CICS. The WebSphere Business Events Design Data tool has been used to define the incoming events and their data, which are then used in the Design tool to define the interaction set. An additional interaction set (not shown) is also used when some of the "QuoteSent" events occur after the first policy is taken out.

Figure 5 shows the event specifications for "QuoteSent" and "TakeOutPolicy" events within an event binding called InsurancePolicyEvents in the CICS Event Binding Editor. The upper screen shot shows details of the capture specification for the "QuoteSent" event, and in particular the filtering used to enable CICS to detect the required event. The lower screen shot shows that the events within this event binding are to be emitted using the WebSphere MQ queue EP adapter, with the WebSphere Business Events (XML) format, and specifying the WebSphere MQ queue to use. This queue and WebSphere Business Events are configured to allow the events to be received by the WebSphere Business Events runtime.

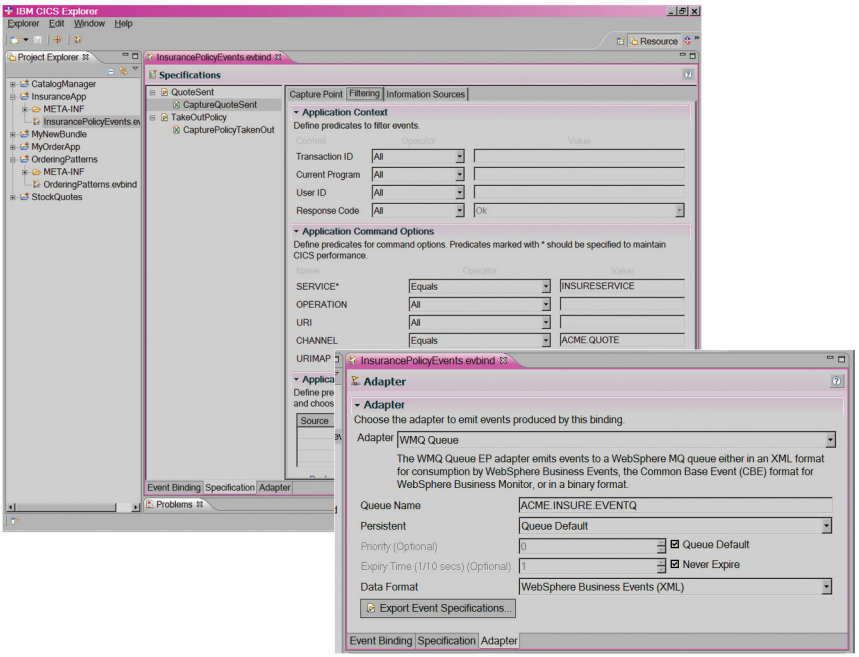

Figure 5: Insurance quote events in the Event Binding Editor

As shown in Figure 6, CICS carries out the processing of insurance quotes, and handles the processing of insurance policies, including a customer taking out a policy. The event binding is installed and enabled in CICS containing capture specifications for “QuoteSent” and “TakeOutPolicy” events, and indicating that these events should be processed by the WebSphere MQ queue EP adapter and formatted in WebSphere Business Events format (as seen in Figure 5).

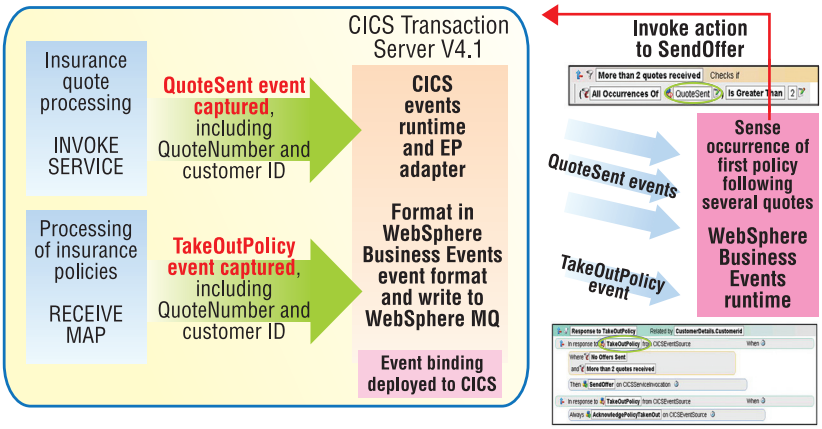

Figure 6: Insurance quote scenario using CICS Transaction Server V4.1

The insurance quote processing invokes a service to send the quote, and the capture specification in the event binding uses this to detect a quote being sent, so that a "QuoteSent" event is captured when this happens, along with information about the customer, policy, and quote. The WebSphere MQ queue EP adapter formats the captured event and emits the event to the WebSphere MQ queue specified in the event binding. This queue has been configured to emit the event to the WebSphere Business Events runtime.

Highlights

IBM CICS Transaction Server for z/OS V4.1 provides the strategic direction for integration with event processing products in the WebSphere portfolio, enabling business insight, business flexibility and innovation, regulatory compliance, and management of business risk.

The program which processes insurance policies carries out the processing for a customer taking out a policy when it receives a MAP with a particular name. A capture specification also specifies how to capture information about the customer taking out the policy. The WebSphere MQ EP adapter formats the "TakeOutPolicy" event and emits it to WebSphere Business Events.

When the "TakeOutPolicy" event is received, this causes WebSphere Business Events to check for two or more previous "QuoteSent" events for the same customer, and if found (and no offer has yet been sent) then this triggers an occurrence of the interaction. The action associated with this is to send an offer to the customer concerning other insurance policies. A request is made to CICS (such as a Web Service invocation) to carry out this action.

Conclusion

IBM has invested in significant new event technology that is a fully integrated part of the CICS runtime and that has been introduced with CICS Transaction Server for z/OS V4.1. This provides the strategic direction for integration with event processing products in the WebSphere portfolio. CICS support for events allows CICS applications to emit business events in a non-invasive way, and a new SIGNAL EVENT API is provided, to add explicit event-enabling points into applications where an additional level of control is required.

CICS events can help to enable business insight, business flexibility and innovation, regulatory compliance, and management of business risk. This can involve monitoring what is happening in the system using WebSphere Business Monitor, driving additional processing as a result of events, or detecting significant patterns among events using WebSphere Business Events.

For more information

To learn more about IBM CICS Transaction Server for z/OS V4.1, please contact your IBM sales representative or IBM Business Partner, or visit:

ibm.com/cics

Acknowledgements

The author would like to thank all members of the CICS event processing team for enabling the support described in this document, and especially Gillian Curwen and Michael Baylis for their assistance with the examples used.

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Produced in the United States of America
July 2009

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