

Course Guide

Development and Administration of Applications with IBM Business Monitor **V8.5.7**

Course code WB8961 / ZB8961 ERC 1.0



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Course description

Development and Administration of Applications with IBM Business Monitor V8.5.7

Duration: 3 1/2 days

Purpose

IBM Business Monitor is a business activity monitoring (BAM) product that supports BPM by measuring business performance, monitoring both InFlight and completed processes, and reporting on business transactions. This course includes topics of interest for students who want to use the IBM Business Monitor environment to develop applications.

In this course, you learn how to develop, implement, and test IBM Business Monitor applications so that you can generate real-time business views of enterprise data. The course begins with an overview of BAM and BPM, and the capabilities that IBM Business Monitor provides. In subsequent units, you learn how to build monitor models, establish performance metrics, monitor events, manage action services, and build a business space dashboard. You also learn how to enable events from various sources, including using BPEL and BPMN processes from IBM Business Process Manager Advanced and IBM Integration Bus. Finally, you learn how to monitor events from JMS emitter and REST emitter sources. You also learn some basic administration and maintenance capabilities of IBM Business Monitor.

From the hands-on exercises that are provided throughout the course, you develop and implement a monitoring solution. The exercises include how to use the various components of IBM Business Monitor, such as the IBM Cognos Business Intelligence and the Monitor development toolkit, for reporting and dimensional analysis along with WebSphere Application Server. You use the Monitor development toolkit to develop a monitor model, and then use the IBM Integration Designer to test the model. You also build customized business space dashboards that can be used to analyze and troubleshoot process performance.

The lab environment for this course uses the Windows 2012 server R2 64-bit platform.

Audience

This course is designed for implementation consultants, integration developers, IT specialists, project managers, technical business analysts, and support engineers.

Prerequisites

Familiarity with WebSphere related products

Objectives

- Explain monitoring concepts

- Describe the architecture of IBM Business Monitor
- Explain how IBM Business Monitor retrieves business data from various sources
- Generate events by using Dynamic Event Framework
- Develop the business measures mode
- Test Monitor models by using the unit test environment servers
- Configure the Action Services Manager
- Configure Business Monitor widgets in a business space
- Monitor events from various sources such as BPEL, BPMN, JMS and REST API.

Agenda



Note

The following unit and exercise durations are estimates, and might not reflect every class experience.

Day 1

- (00:15) Course introduction
- (01:00) Unit 1. Overview: BPM, BAM, and IBM Business Monitor
- (01:30) Exercise 1. Exploring IBM Business Monitor
- (01:00) Unit 2. IBM Business Monitor architecture and integration
- (00:30) Exercise 2. Creating a monitor model
- (01:30) Unit 3. Monitoring events
- (01:00) Exercise 3. Selecting events and generating a monitor model
- (01:00) Unit 4. Monitor development toolkit and monitoring concepts

Day 2

- (00:45) Unit 5. Using the Monitor model editor to define elements
- (00:45) Exercise 4. Creating triggers in a monitor model
- (00:30) Unit 6. Dimensional, KPI and visual models
- (01:00) Exercise 5. Creating metrics in a monitor model.
- (01:00) Unit 7. Deploying a monitor model
- (01:00) Exercise 6. Deploying and running the monitor model and the application
- (01:00) Unit 8. Using IBM Business Monitor business space dashboards to manage business processes
- (01:30) Exercise 7. Building dashboards in IBM Business Monitor

Day 3

- (01:00) Unit 9. Managing action services and event emissions
- (02:30) Exercise 8. Monitoring events from a BPEL process
- (01:00) Unit 10. Monitoring events from other products
- (00:30) Exercise 9. Monitoring events from IBM Integration Bus
- (02:00) Exercise 10. Monitoring events from a BPMN process

Day 4

- (01:30) Exercise 11. Monitoring events from JMS emitter and REST emitter.
- (01:00) Unit 11. Administering IBM Business Monitor and monitor models
- (01:00) Unit 12. Maintaining and troubleshooting IBM Business Monitor
- (00:30) Unit 13. Course summary

Unit 1. Overview: BPM, BAM, and IBM Business Monitor

Estimated time

01:00

Overview

This unit provides an overview of the features of IBM Business Monitor, and how IBM Business Monitor supports business process management capabilities in an organization.

How you will check your progress

- Checkpoint
- Exercise

How to check online for course material updates



Note: If your classroom does not have internet access, ask your instructor for more information.

Instructions

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<http://ibm.biz/CloudEduCourses>
2. On the wiki page, locate and click the **Course Information** category.
3. Find your course in the list and then click the link.
4. The wiki page displays information for the course. If an errata document is available, this page is where it is found.
5. If you want to download an attachment, such as an errata document, click the **Attachments** tab at the end of the page.

Comments (0) Versions (1) **Attachments (1)** About
6. To save the file to your computer, click the document link and follow the dialog box prompts.

Figure 1-1. How to check online for course material updates

Unit objectives

- Describe the business and IT challenges that the WebSphere tool set addresses
- Explain the concept of business process management (BPM)
- Identify the primary capabilities of IBM Business Monitor

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-2. Unit objectives

Organizations need adaptable tools and processes

- Organizations are struggling to keep up with main challenges:
 - Adapting to rapid change
 - Increased competition to offer more complex products and services
 - Increased work complexity because of globalization and automation
- Over time, the tools and business processes that are put into use are often unable to keep up with the pace of change

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-3. Organizations need adaptable tools and processes

According to CEO studies, one of the major challenges for organizations is the constant change that occurs in the way they do business. Challenges to adapt to faster rates of change and increase in competition for customers are the major areas of concern.

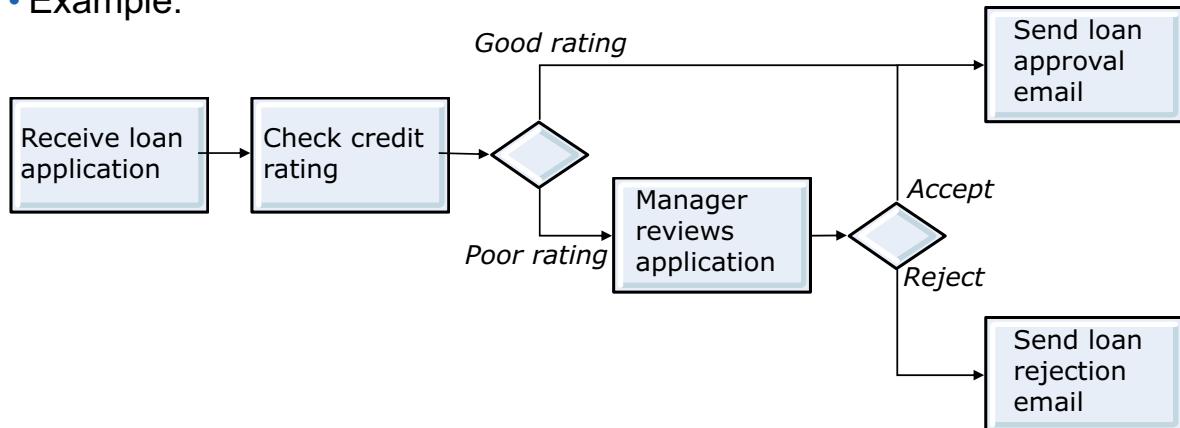
First, the effects of globalization and automation allow for more global collaboration and customer bases. Increase in competition and automation allows for design and delivery of more competitive products, which offers more complex features and services. Because of these offerings, customers have more options, choices, and knowledge of the offerings, and demand better services and products.

The consequence is that the work of the organization becomes more complex to meet the demands. Customer demands allow organizations to provide differentiating products that they can use to attract and retain customers. These customers are becoming not only more prosperous, but more informed about their choices and needs, with socially aware electronic networks that change the way products are marketed and needs are created.

A major challenge for the organization is to anticipate and put in place business processes and tools that can adapt to the rapid change.

Business processes support business goals

- A business process is a set of linked activities that create value by transforming an input into a more valuable output
 - Both input and output can be artifacts or information, or both
 - Human actors, machines, or both can do the transformation
- Example:



Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-4. Business processes support business goals

A business process is a collection of interrelated tasks that solve a particular issue.

Business process management (BPM)

- Business process management is a systematic approach to manage and improve business processes for organizations
 - Describes activities and events that manage, improve, and optimize a business process
 - The goal of BPM is to make business processes more effective, more efficient, and more capable of adapting to a rapid changing environment
- IBM Business Process Manager solution identifies the following capabilities for a successful agile BPM strategy:
 - Dynamic business processes and models
 - Flexible IT infrastructure that is based on service-oriented architecture (SOA)
 - Efficient team collaboration

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-5. Business process management (BPM)

Business process management differs from business process reengineering, in that it does not aim at on-off revolutionary changes to business processes, but rather at their continuous evolution.

Business process management (BPM) governs the cross-functional, core business processes of an organization. It achieves strategic business objectives by directing the deployment of resources from across the organization into efficient processes that create customer value. This focus on driving overall bottom-line success differentiates BPM from traditional functional management disciplines. In addition, the principle of continuous improvement is intrinsic to BPM, which means perpetually increasing value generation and sustaining the market competitiveness (or dominance) of the organization.

Related process improvement methods

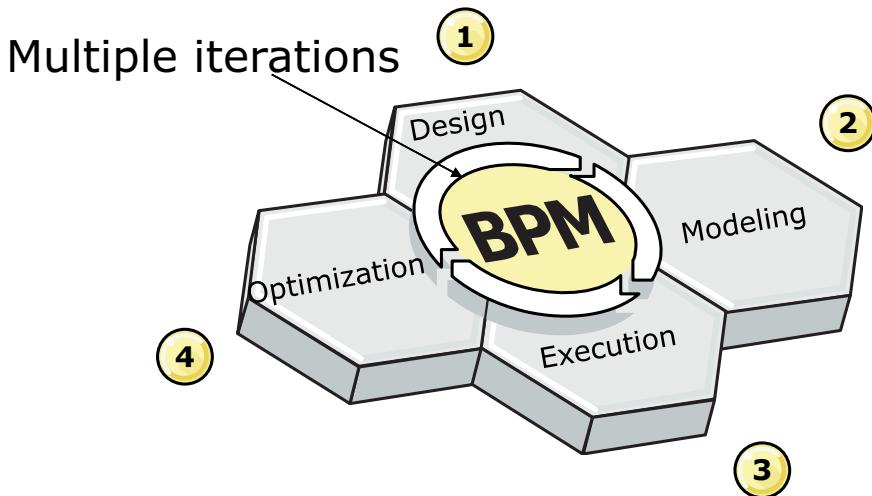
- Business activity monitoring (BAM):
 - The aggregation, analysis, and presentation of real-time information about activities inside organizations and activities that involve customers and partners
- Six Sigma:
 - A business improvement methodology, originally developed by Motorola, to systematically improve processes by eliminating defects
- Lean Enterprise:
 - A management philosophy that focuses on reduction of the seven wastes to improve overall customer value: transportation, inventory, motion, waiting time, overproduction, processing, and defective products (scrap in manufactured products)
- Lean Six Sigma:
 - Combines the Lean Enterprise focus on speed with the Six Sigma focus on quality
 - The result is better quality, faster

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-6. Related process improvement methods

IBM BPM process lifecycle



Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-7. IBM BPM process lifecycle

Business process management (BPM) is a systematic approach to improving business processes for an organization. BPM makes business processes more effective and efficient through a cycle of continuous improvements.

The BPM process lifecycle has four phases: design, modeling, execution, and optimization.

Looking at the BPM process lifecycle, it becomes apparent that there are opportunities to use the expertise of business and IT to collaborate in each phase of the process lifecycle. Using this approach to BPM, the business process is stable and on target. This stability is because of the overall iterative improvement cycles in keeping up with business goals, business change, and opportunities within each phase to make critical adjustments.

To have business and IT working in concert throughout this BPM process lifecycle, it requires a clear set of goals for each phase. Matched against those lifecycle phase goals are the responsibilities for each group. Clearly, the governance of the business process varies at each phase for each group, but the involvement of both ensures that the process improvement is realized.

The goals of each phase are as follows:

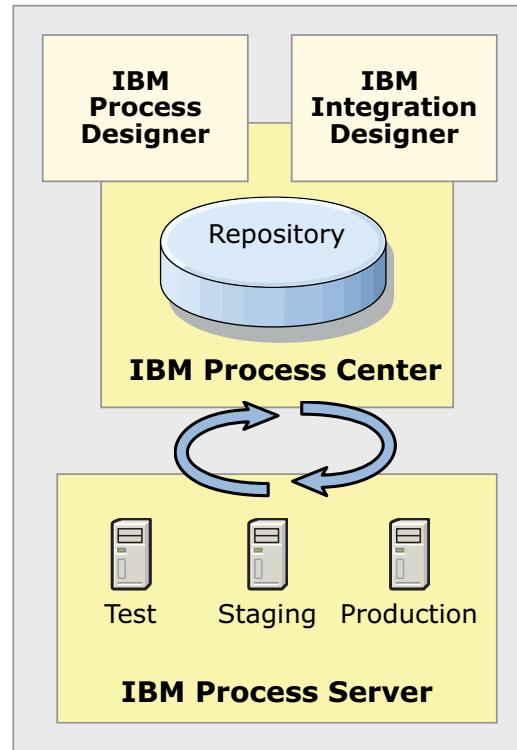
- Design goals:
 - Capture executive vision

- Process nomination
- Process prioritization
- Process discovery
- Process analysis
- Modeling goals:
 - Create a process model
 - Process adjustments
 - Process simulation
- Execution goals:
 - Implement the process model as a process application
 - Adjust business process requirements as needed
 - Deploy and monitor the process application
- Optimization goals:
 - Analyze and evaluate process performance data
 - Evaluate the business process ability to meet new business goals

After business practices or external conditions change or the current process is no longer optimal, BPM iterates again through the lifecycle. This continual iteration allows the effective management of business processes. A true BPM implementation tool allows these iterations to be easily applied.

IBM Business Process Manager (1 of 2)

- Tools for modeling, designing, implementing, and deploying business processes
- Includes:
 - **IBM Process Designer:** An authoring environment that is used for creating process models that contain automated and human tasks
 - **IBM Integration Designer:** An authoring environment that is used for creating process models and advanced implementations that include mediations, business rules, and human tasks
 - **IBM Process Center:** Includes a repository for all processes, services, and other assets that are created in the authoring environments
 - **IBM Process Server:** Provides a single runtime environment for supporting process models, service orchestration, and integration capabilities



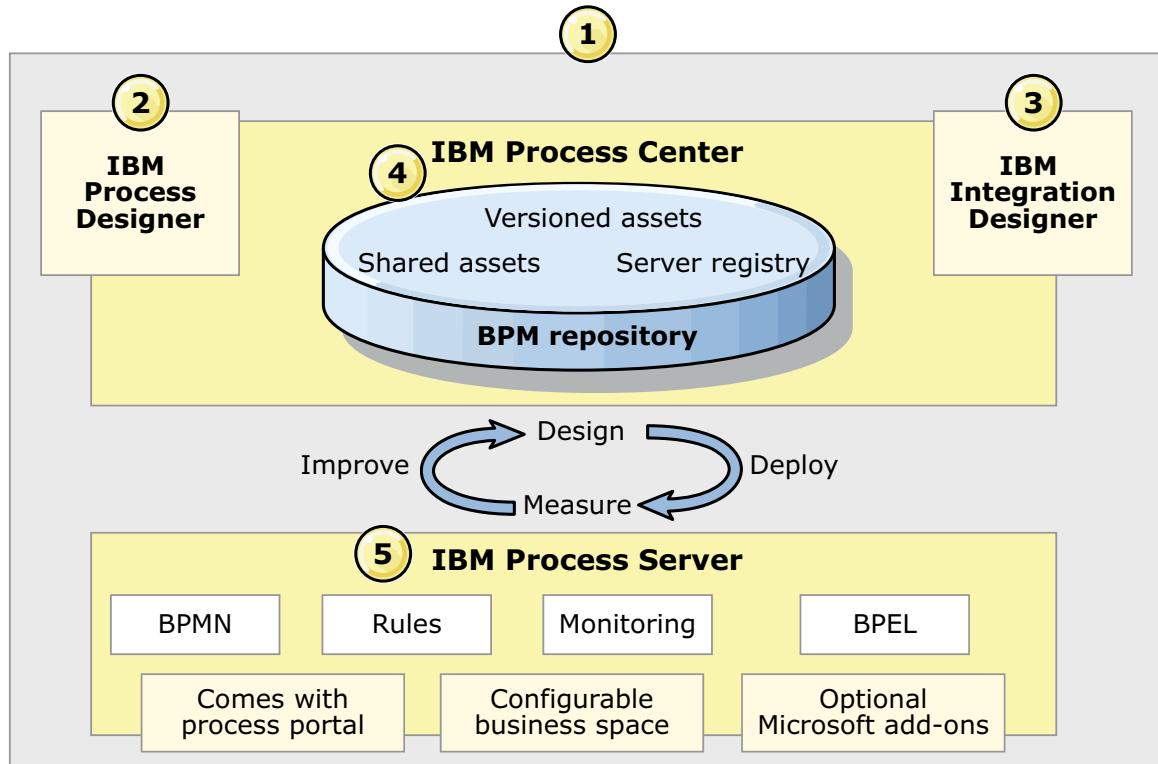
Overview: [BPM, BAM, and IBM Business Monitor](#)

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Figure 1-8. IBM Business Process Manager (1 of 2)

IBM Business Process Manager is a suite of products that includes a number of tools for working with business processes. These tools are useful for modeling, designing, implementing, and deploying business processes. These tools include IBM Process Designer, IBM Integration Designer, IBM Process Center, and IBM Process Server. To another degree, BlueWorks Live is a utility in the cloud, which can be used for elementary modeling of business processes. These processes can then be imported and designed in IBM Process Designer.

IBM Business Process Manager (2 of 2)



Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-9. IBM Business Process Manager (2 of 2)

The tools of IBM Business Process Manager include (1) IBM Process Designer, IBM Integration Designer, IBM Process Center, and IBM Process Server. IBM Process Designer (2) and IBM Integration Designer (3) are authoring environments for creating process applications, services, and implementations of activities in business process applications. IBM Process Center (4) offers a repository where development teams can store versioned or shared assets, and keep record of them in a server registry. Eventually, these process applications can be deployed to the IBM Process Server (5), a runtime environment that supports several different implementation options (such as BPMN, business rules, and BPEL). IBM Process Server also offers the ability to integrate with other systems, courtesy of process portals, business spaces, or other add-ons.

What is business activity monitoring?

- Business activity monitoring (BAM) is the presentation of real-time information that is related to activities inside organizations and across relationships with external partners and customers
- This information is role-based, targeted, and focused to the status and results of various operations, processes, and transactions
- This information is used to make informed, quick business decisions, and to act to address problem areas
- BAM systems collect and process business events that are fed from applications, integration software, or from business process management software

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-10. What is business activity monitoring?

IBM Business Monitor capabilities

IBM Business Monitor:

- Captures specified business-related data from business applications that are based on the monitor model
- Extracts the measurement variables from the data
- Transforms the variables into metric and key performance indicator (KPI) values
- Displays the measurement values on the monitor dashboard
- Provides business intelligence insight through dimensional analysis and reporting
- Enables users to define actions when specified situations occur
- Identifies and notifies users of operation failures for inspection and analysis

[Overview: BPM, BAM, and IBM Business Monitor](#)

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Figure 1-11. IBM Business Monitor capabilities

IBM Business Monitor is a web-based client/server application that measures business performance, monitors processes and work flow, and reports on business operations. The information that is captured can help you identify problems, correct faults, and change processes to achieve a more efficient business.

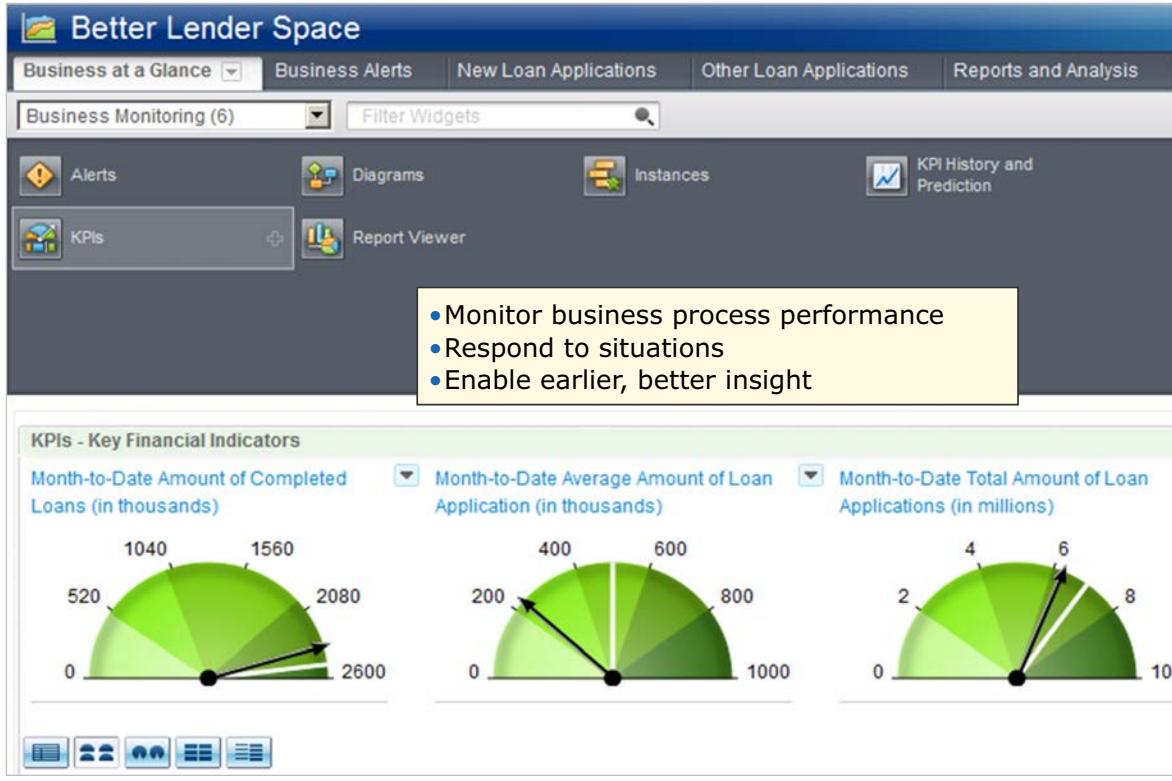
IBM Business Monitor monitors business processes at run time by monitoring event-emitting runtime engines. IBM Business Monitor uses collected events, which are based on a specific model, to calculate key performance indicators (KPIs) and metrics. The calculated KPIs and metrics values are represented on a number of views that are based on business needs. IBM Business Monitor notifies users of incidents that require their attention and can also take corrective actions to avoid failures. It supports different notification methods (alert, email, cell phone, pager, and service invocation) against situations and actions that are associated with defined conditions.

IBM Business Monitor depends on business measures models for its monitoring procedure. These models are created in the Business Measures editor, where you can specify the measuring points and event filters, and define the measurements, their correlations, and sources of the business data. When the business measures model is complete, you can export it to IBM Business Monitor. It then recognizes the model to be monitored and the measurements to be captured from the incoming events. You use the Business Measures editor to open the process models that are created in IBM Process Designer. For each business measures model, you can define the metrics,

KPIs, event emission points, event filters, event composition rules, and situations that trigger specific actions at run time.



IBM Business Monitor at a glance



Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-12. IBM Business Monitor at a glance

With IBM Business Monitor, you can:

- Monitor business process performance
 - In-progress processes can be monitored and bottlenecks can be eliminated
 - Track key performance indicators
- Respond to situations
 - Detect unusual situations, such as:
 - Out-of-threshold KPIs
 - Individual process instances that need attention
 - Take corrective action before problems arise
- Enable earlier, better insight
 - Analyze KPIs over time and other dimensions
 - Use business measures to identify trends

You can have dashboards that are automatically generated when you deploy a monitor model, instead of configuring the dashboards manually. Generated dashboards facilitate rapid iterative development and provide immediate playback.

IBM Training



IBM Business Monitor at a glance: Monitor process performance

- View key performance indicators (KPIs) calculated from live process data
- Display KPIs in various ways



Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-13. IBM Business Monitor at a glance: Monitor process performance

A KPI is any key business measure a customer must measure to monitor the health of a business. IBM Business Monitor analyzes many event messages and captures a tremendous amount of information. However, one of its primary objectives is to distill this mass of data into relevant, consumable, business-level information pertinent to the role of the user.

In the business measures model, key performance indicators (KPIs) were defined for the process. Now, as the process is running, these key performance measurements are updated in real time and are displayed in various forms for the user. This chart shows available views that display KPIs:

- A KPI table view
- A gauge view that displays KPIs as automotive gauges with defined targets and limits

Combinations of these and other views can be used together, depending on the role of the user.

IBM Business Monitor at a glance: Respond to situations

- Detect situations and act
- View alerts from active processes
- Send notifications for manual response
 - Email messages
 - Mobile phone
 - SMS messages
- Invoke automated responses

The screenshot shows a table titled 'Alerts' with the following data:

Subject	Priority	Model	Status	Date and Time
• Late order shipment	3	CATOrderMgmtMonitoringModel	Available	January 27, 2015 2:56:48 PM
• Late order shipment	3	CATOrderMgmtMonitoringModel	Available	January 27, 2015 1:55:48 PM
• Late order shipment	3	CATOrderMgmtMonitoringModel	Available	January 27, 2015 12:55:48 PM

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-14. IBM Business Monitor at a glance: Respond to situations

SMS (short message service) is a communications protocol that allows the interchange of short text messages between mobile telephone devices.

As processes are running, the Monitor server examines the arriving events and detects any conditions that require actions to be taken.

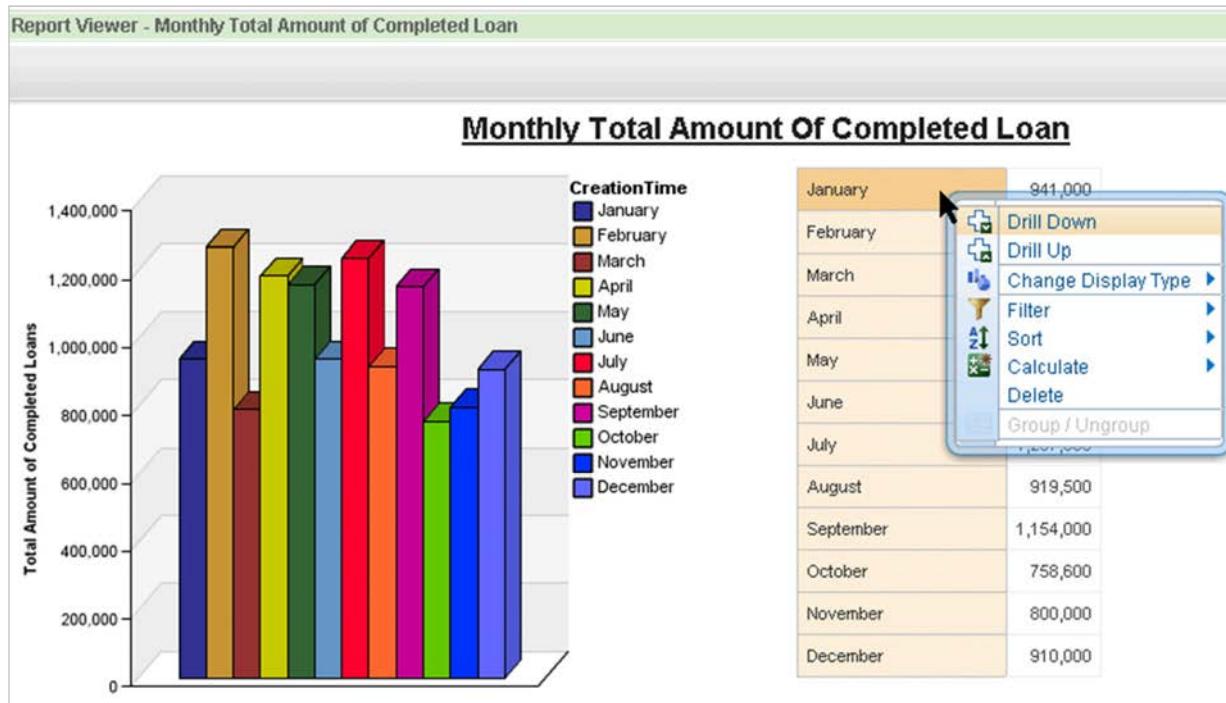
In these cases, the Action Manager is triggered, and one or more things can happen.

- Alerts: A special alert view (shown in figure) can be displayed to appropriate users for follow-up action.
- Email and pagers (by using email) might also be used for a manual response.

The Action manager can also be defined to respond automatically to certain business situations. In this case, the action manager can start an existing BPEL process available on the Process Server, or it can invoke an available web service in response to this situation.

IBM Training

IBM Business Monitor at a glance: IBM Cognos Business Intelligence



Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-15. IBM Business Monitor at a glance: IBM Cognos Business Intelligence

Cognos is the strategic platform, which contains more features:

- Support for rolling time periods, fine-grained security, and more chart types.
- Use Cognos Business Insight Advanced to author custom reports against monitor data.
- Use Cognos Mobile to view reports from smartphones.
- Cognos for Microsoft Office, which is separate purchase, has plug-ins to Microsoft Office for working with Cognos data.
- Dimensional model did not change in the MME.
- Install Cognos BI during IBM Business Monitor installation.
- Register cubes with Cognos BI during monitor model application installation.
- New widgets in business space to enable dimensional analysis.

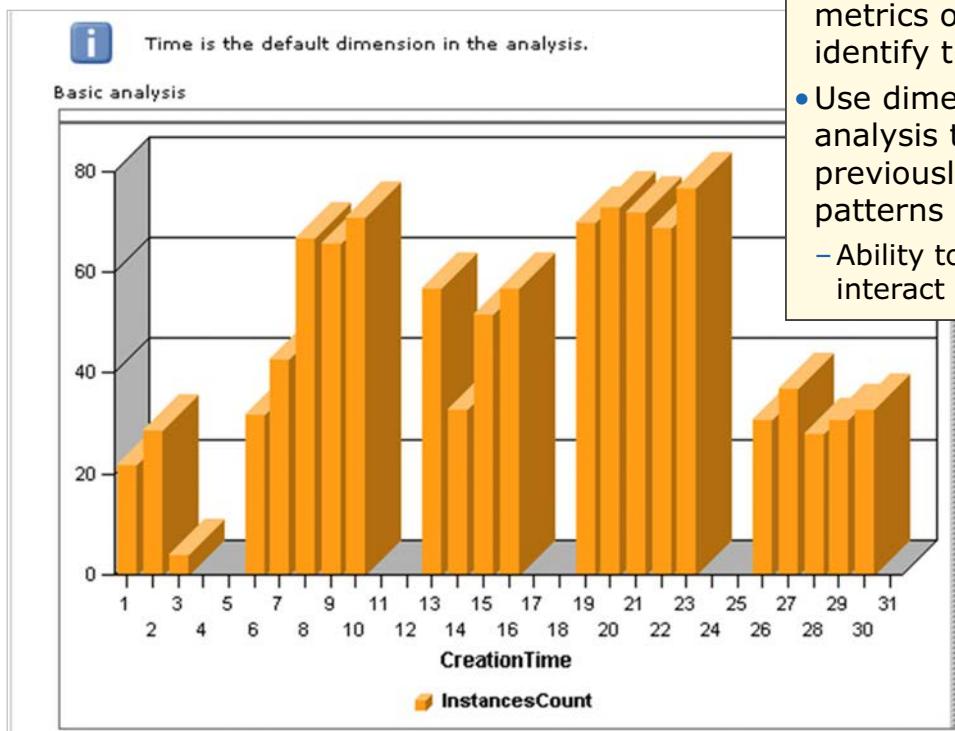
See IBM Knowledge Center IBM Cognos Business Intelligence:

https://www.ibm.com/support/knowledgecenter/SS7NQD_8.5.7/com.ibm.wbpm.mon.doc/intro/intro_cognos.html

IBM Training



IBM Business Monitor at a glance: Embed business intelligence (1 of 3)



- Analyze business metrics over time to identify trends
- Use dimensional analysis to discover previously hidden patterns
- Ability to graphically interact with data

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-16. IBM Business Monitor at a glance: Embed business intelligence (1 of 3)

Here are some important definitions:

- IBM Cognos Business Intelligence (BI):** It generates graphical representations of database data so that applications do not have to do this function. In addition to this representation, it allows analysts to interact with the graphical representations so they can separate the data as needed.
- Cube views:** Query tables that are prepared ahead, which boost performance of the dashboard.
- Report view:** Provides performance reports relative to a time axis. Such reports typically contain tables and graphs that analyze historical data that is contained within the performance warehouse data store.

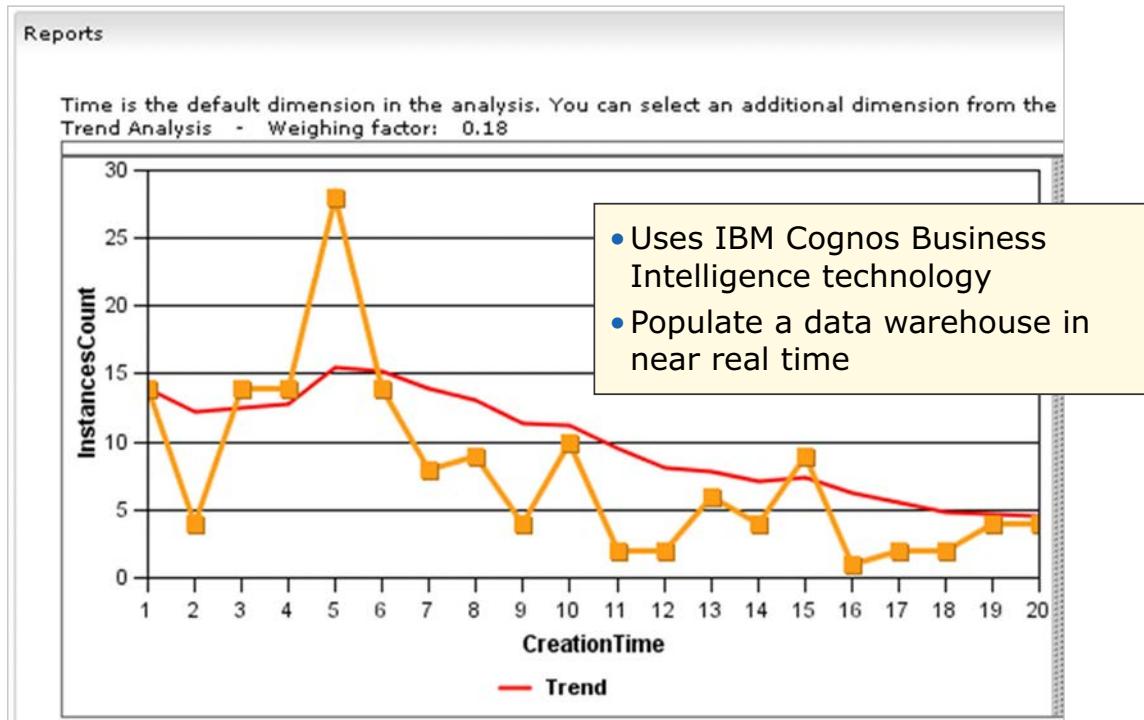
The Report view has built-in analysis types that include quartile, trend, and control analysis, with many chart type options.

- Dimensional view:** Provides a multidimensional view of business data. Users can pivot on dimensions to view the various performance aspects.

The example on the slide shows a trend view; the example on the next slide is a dimensional view. IBM Cognos BI technologies are used as the basis for these views. Only a small fraction of the capabilities can be mentioned here. Other customized views can be combined with these views and

the other available portlets (views) to provide a highly customized environment that is tailored to the needs of the role.

IBM Business Monitor at a glance: Embed business intelligence (2 of 3)



Overview: BPM, BAM, and IBM Business Monitor

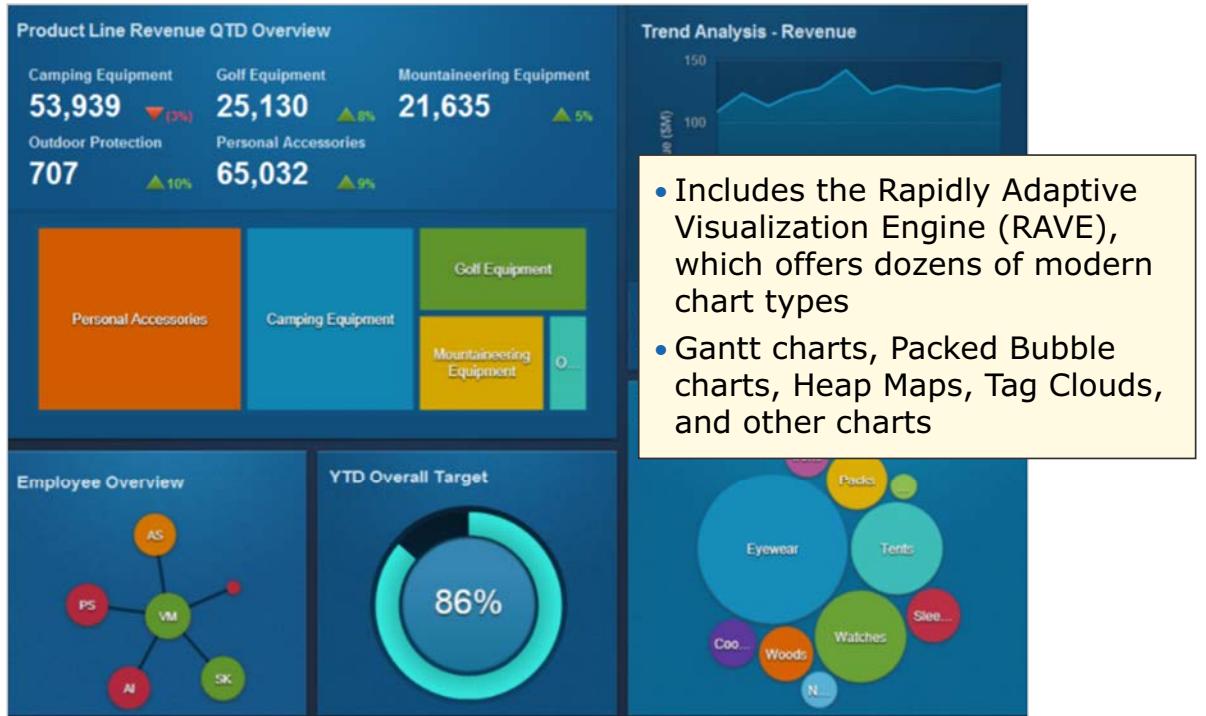
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Figure 1-17. IBM Business Monitor at a glance: Embed business intelligence (2 of 3)

The slide displays a dimensional view.

IBM Training

IBM Business Monitor at a glance: Embed business intelligence (3 of 3)



Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-18. IBM Business Monitor at a glance: Embed business intelligence (3 of 3)

Here is a dimensional view that is using the Rapidly Adaptive Visualization Engine (RAVE) chart types. You can use this feature to create Gantt charts, bubble charts, heap maps, and others with monitor dimensional model information.

Defining business measures

- Business measures can be defined in IBM Process Designer
- Provides a way for business analysts to specify what to monitor when the business process is running
 - The business analyst has insight into key elements of the business process that can indicate the success or failure of strategic business goals
- Business measures can be associated with process elements
- Predefined and custom business measures can be built
- The business analyst's specification of what to monitor is exported to the IBM Business Monitor toolkit
 - The integration designer then completes the implementation

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-19. Defining business measures

IBM Process Designer provides a set of business measure templates for commonly monitored business measures. Instance metrics capture information across a single run of the process. To capture specific kinds of information, such as the working duration of a task or the value of a specific business item attribute, you can create instance metrics that are based on predefined business measure templates. You can also create custom instance metrics.

Aggregate metrics are calculated across multiple runs (or instances) of the process so that you can find the average, maximum, minimum, sum, or number of occurrences.

You can create business measures that are based on a set of predefined business measure templates. The templates are designed to help you create business measures that are frequently required. For example, you can add a business measure to track the working duration of a task or whether a process is delayed. You can also add a business measure to access any data that is carried through the process by a business object.

Business measures in IBM Business Monitor toolkit

- Creates monitor models that can be transformed into executable code for IBM Business Monitor
- Runs on IBM Integration Designer or Rational Application Developer
- Includes the Monitor model editor (MME) and the IBM Business Monitor test environment
- Business measures can also be defined in the Monitor model editor in IBM Business Monitor toolkit
 - Create a monitor model from scratch in the Monitor model editor
 - Import a preliminary monitor model from IBM Process Designer

[Overview: BPM, BAM, and IBM Business Monitor](#)

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Figure 1-20. Business measures in IBM Business Monitor toolkit

Here are some important definitions:

- The **monitor model** describes how to:
 - Gather information from events that are stored in a data warehouse for reporting
 - Group events about the same monitored entity together
 - Structure this information (for example, to allow dimensional analysis)
 - Combine this information (for example, to identify trends)
 - Identify business situations in near real-time, and trigger resulting actions by sending out events
- The **MME** (Monitor model editor):
 - Is in the Business Monitoring Eclipse perspective
 - Contains the Project Explorer
- Monitor model editor view components:
 - Monitor details model tab
 - KPI model tab

- Dimensional model tab
 - Visual model tab
 - Event model
 - XML-based text editor tab
- **Rational Application Developer** is an integrated development environment (IDE).
 - Made by IBM Rational Software division for visually designing, constructing, testing, and deploying web services, portals, and Java 2 Enterprise Edition (Java EE) applications

Business monitoring concepts (1 of 2)

- Key concepts to model, monitor, analyze, and improve the performance of your business:
 - Business measures, including metrics and key performance indicators
 - Business measures models
- First, determine what performance indicators give you the information you need
 - These performance indicators are called *business measures*

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-21. Business monitoring concepts (1 of 2)

Business measures, metrics, key performance indicators, and business measures models are key concepts that are used to model, monitor, analyze, and improve the performance of your business. IBM Business Monitor helps to monitor and manage your business operations and systems.

When you plan to monitor a certain area of your business to assess its efficiency, identify problems, and improve performance, you first determine what performance indicators give you the information you need. These performance indicators are called business measures. Business measures describe the performance management aspects of your business that are required for real-time business monitoring.

Evaluating the business measures of your processes is crucial for achieving your business objectives. The performance of processes is evaluated against the values of metrics, KPIs, counters, and stopwatches. The values of these business measures provide extensive information about performance. A metric is a measurement of a process or process element (task or reusable subprocess) that is used to assess business performance. A metric can be used alone or in combination with other metrics to define the calculation for a KPI, which measures performance against a business objective. IBM Process Designer is used to define a metric within a specific process. IBM Business Monitor is used to capture and evaluate the value of that metric. A metric can have numeric values, such as the duration of a process, or non-numeric values, such as the delivery dates of shipments. Examples of business metrics are a supplier's average response time and the cost of the risk assessment step in an insurance process.

A KPI is a business measure that is made up of one or more metrics. It is associated with a specific process and can have upper or lower limits, or both, forming a range, value, or performance target that you want the process to achieve. A KPI is generally represented as a numeric value. In other words, a KPI is a metric with limits, and is itself made up of one or more metrics. An example of a simple KPI is for the average time of response to a customer inquiry to be less than two business days. A more complicated KPI would take the form of detailed specifications, such as the shipment duration of a delivery process, in which the order date would be tracked against the delivery date. It is monitored when the average time to shipment is within a 20% range of a five-business-days target.

Counters and stopwatches are specialized metrics that measure the number of occurrences of a situation or an event. They are defined within the business measures model to track these numbers. Counters can track, for example, the number of the instances of the order-processing process that are created per day. Stopwatches can track, for example, the time since the order-processing process started.

Metrics, KPIs, counters, and stopwatches are defined within the context of the Business Measures editor in IBM Process Designer. IBM Business Monitor then evaluates and measures them.

For each process, IBM Process Designer can create a business measures model. A business measures model is a container that carries information about what is monitored and the business measures that are monitored in it. The user of the Business Measures editor decides which processes to monitor, whether to monitor their subprocesses, and which business measures to use. The user creates a business measures model and then exports it to IBM Business Monitor. The model carries all defined business measures (metrics, KPIs, counters, and stopwatches) in the process and its subprocesses.

IBM Business Monitor receives the business measures model. Based on the imported business measures model, IBM Business Monitor provides two levels of monitoring: one for the process and the other for the process instances.

Based on the business measures in the imported model, IBM Business Monitor applies real-time monitoring for each process instance. For example, the order cost (business measure) can be measured for the order-processing process. If there are three instances of the process, then the order cost would be generally different for each process instance as follows:

- Instance I1 = 100
- Instance I2 = 150
- Instance I3 = 125

IBM Business Monitor can further monitor the process as a whole by applying aggregations over each of its process instances. For example, in the order-processing process, the average order cost (business measure) can be measured. If there are three instances of the process, IBM Business Monitor checks the order cost across all instances of the process and calculates the average as follows:

- $(\text{Instance I1} + \text{Instance I2} + \text{Instance I3}) / 3 = 125$

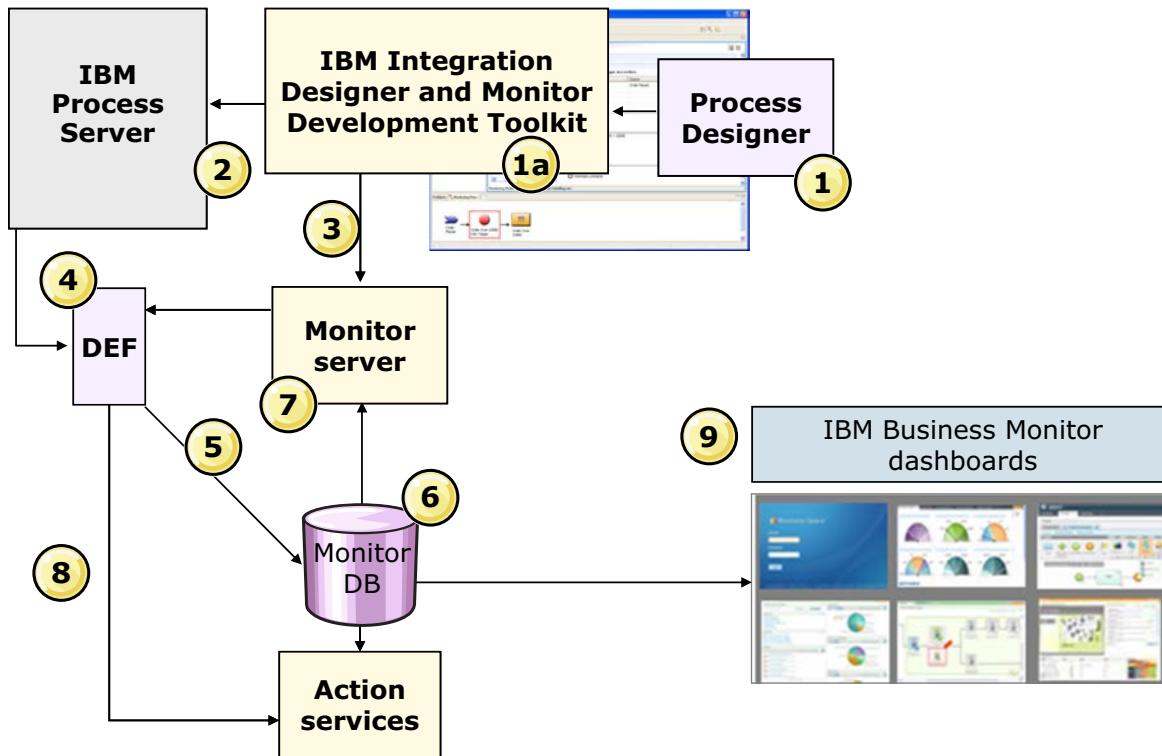
IBM Business Monitor can do aggregate calculations across process instances only if the user of the Business Measures editor specifies KPIs for that process. When exporting the business measures model to IBM Business Monitor, an implicit aggregate process is created. It is appended with the “Aggregates” name to indicate that the KPIs within that process are intended to be

measured only across the process instances. This action provides a measurement value for the process as a whole. Some views in IBM Business Monitor are designed to make aggregate calculations over the instances of the process at run time. They are the gauges and key performance indicators (KPIs) views. The Instances view evaluates both the process instances and the process.

Business monitoring concepts (2 of 2)

- Create a business measures model for each process in IBM Process Designer
 - A business measures model is a container that carries the information that is monitored and the business measures that are monitored in it
- As soon as it is implemented, the business measures model is then deployed to IBM Business Monitor
 - The model carries all defined business measures in the process
- Based on the imported business measures model, IBM Business Monitor provides monitoring for the process and the process instances

Logical architecture for business activity monitoring



Overview: BPM, BAM, and IBM Business Monitor

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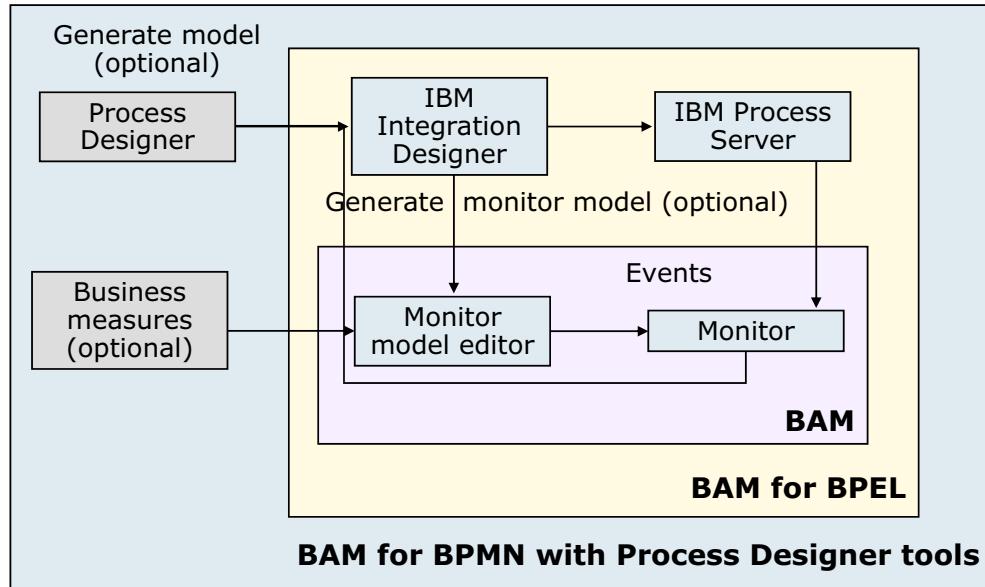
Figure 1-23. Logical architecture for business activity monitoring

A process design tool can be used to create the process model, which is then exported to IBM Integration Designer.

1. Process Design: Use IBM Process Designer to create the business process model, and optionally, to create business measures.
- 1a. If necessary, BPEL implementation is assembled, but not if the process is only BPMN. The Monitor development toolkit is used to create the monitor model for IBM Business Monitor execution.
2. The BPEL and/or BPMN application is deployed to IBM Process Server.
3. The monitor model is deployed to the Monitor server.
4. Events are generated from IBM Process Server and sent to the Dynamic Event Framework (DEF). DEF replaces the deprecated CEI for processing events. More about DEF is explained in the upcoming units.
5. DEF writes the events into the Monitor incoming events table database, and they are analyzed for subscription by specific registered monitor models.
6. The server persists metric data to the state tables in the Monitor database.
7. The server emits situation events to DEF, if needed.

8. DEF sends situation events to the action manager, which does the defined action.
9. Dashboards query the data warehouse for reporting and, when needed, exporting actual data from completed process instances.

Monitor model lifecycle: Scenarios



Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-24. Monitor model lifecycle: Scenarios

Use IBM Process Designer to create the business process model, and optionally, to create business measures.

- BAM: Business activity monitoring
- BPEL: Business Process Execution Language

Unit summary

- Describe the business and IT challenges that the WebSphere tool set addresses
- Explain the concept of business process management (BPM)
- Identify the primary capabilities of IBM Business Monitor

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-25. Unit summary

Checkpoint

1. _____ refers to activities that organizations use to manage and improve their business processes.
 - A. Service-oriented architecture (SOA)
 - B. Business process management (BPM)
 - C. Business activity monitoring (BAM)
2. What is service-oriented integration?
 - A. A repeatable business task
 - B. A set of related and integrated services that support a business process that is built on an SOA
 - C. A way of integrating a business as linked services and the outcomes that they bring
3. _____ is the presentation of real-time information that is related to activities inside organizations and across relationships with external partners and customers.
 - A. Service-oriented architecture (SOA)
 - B. Business process management (BPM)
 - C. Business activity monitoring (BAM)

Overview: BPM, BAM, and IBM Business Monitor

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Figure 1-26. Checkpoint

Write your answers here:

- 1.
- 2.
- 3.

Checkpoint answers

1. **B:** Business process management (BPM)
2. **C:** A way of integrating a business as linked services and the outcomes that they bring
3. **C:** Business activity monitoring (BAM)

Exercise 1

Exploring IBM Business Monitor

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Figure 1-28. Exercise 1

Exercise objectives

After completing this exercise, you should be able to:

- Examine a monitor model in the IBM Business Monitor toolkit for IBM Integration Designer
- Install a monitor model in IBM Business Monitor
- Generate events
- Create a business space dashboard to view performance-related data

Unit 2. IBM Business Monitor architecture and integration

Estimated time

01:00

Overview

This unit describes the architecture and main components of IBM Business Monitor, and explains how it integrates with other products.

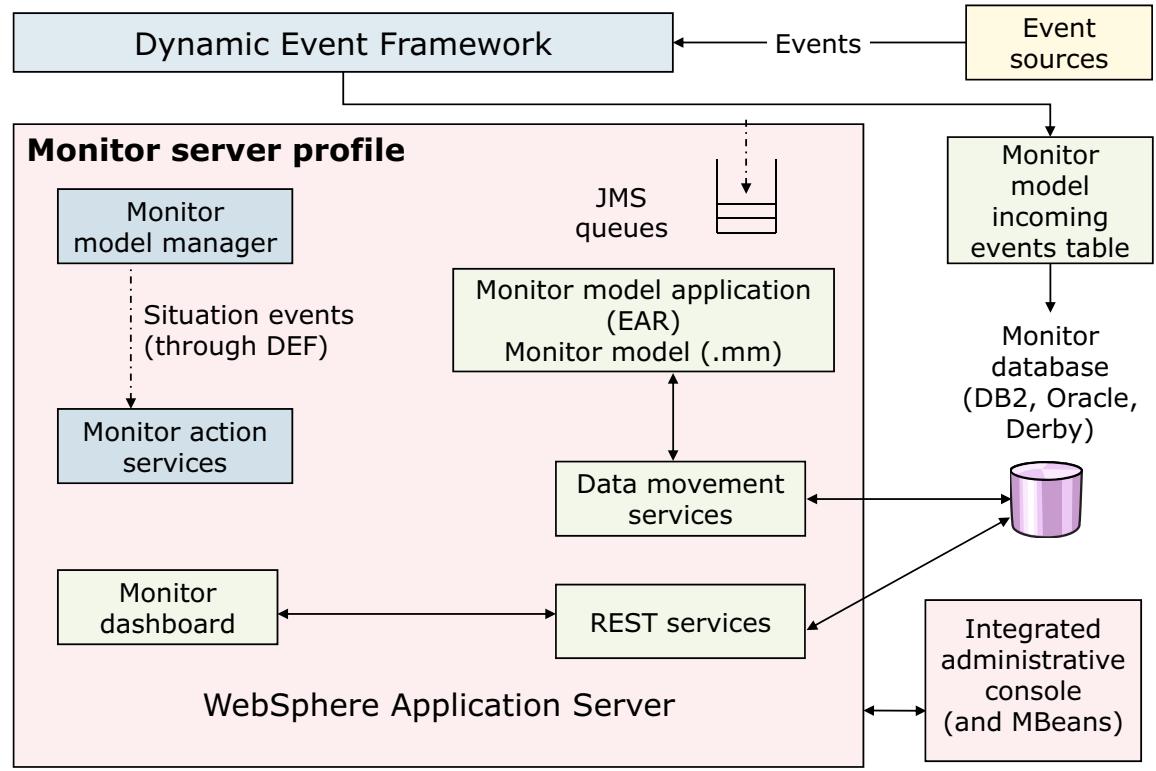
How you will check your progress

- Checkpoint
- Lab exercise

Unit objectives

- Explain the architecture of IBM Business Monitor
- Describe the major components of IBM Business Monitor, including Monitor server, action services, dashboards, databases, and data movement services
- Explain how IBM Business Monitor integrates with the Lotus Mashups framework

IBM Business Monitor runtime architecture



IBM Business Monitor architecture and integration

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Figure 2-2. IBM Business Monitor runtime architecture

This slide shows the runtime architecture diagram for IBM Business Monitor. Begin by focusing on the center of the diagram.

- The Monitor server application is hosted on a WebSphere Application Server profile. It consists of two major components: the Monitor model manager and action services.
- *Action services* support sending email or paging in response to certain defined situations. Their functions are covered in greater detail later in this unit.

Other components include:

- The monitor dashboard component (business space).
- The REST services and related APIs. *REST* (REpresentational State Transfer) interacts with monitor resources such as monitoring context definitions, key performance indicators, and instance data.
- The required monitor database that holds the monitor models definitions and the data that is gathered during event processing.
- The optional data movement services that can be configured to optimize the performance of the monitor database.
- The Dynamic Event Framework is an event processing engine and infrastructure to receive or emit events and an extension to the integrated administration components.

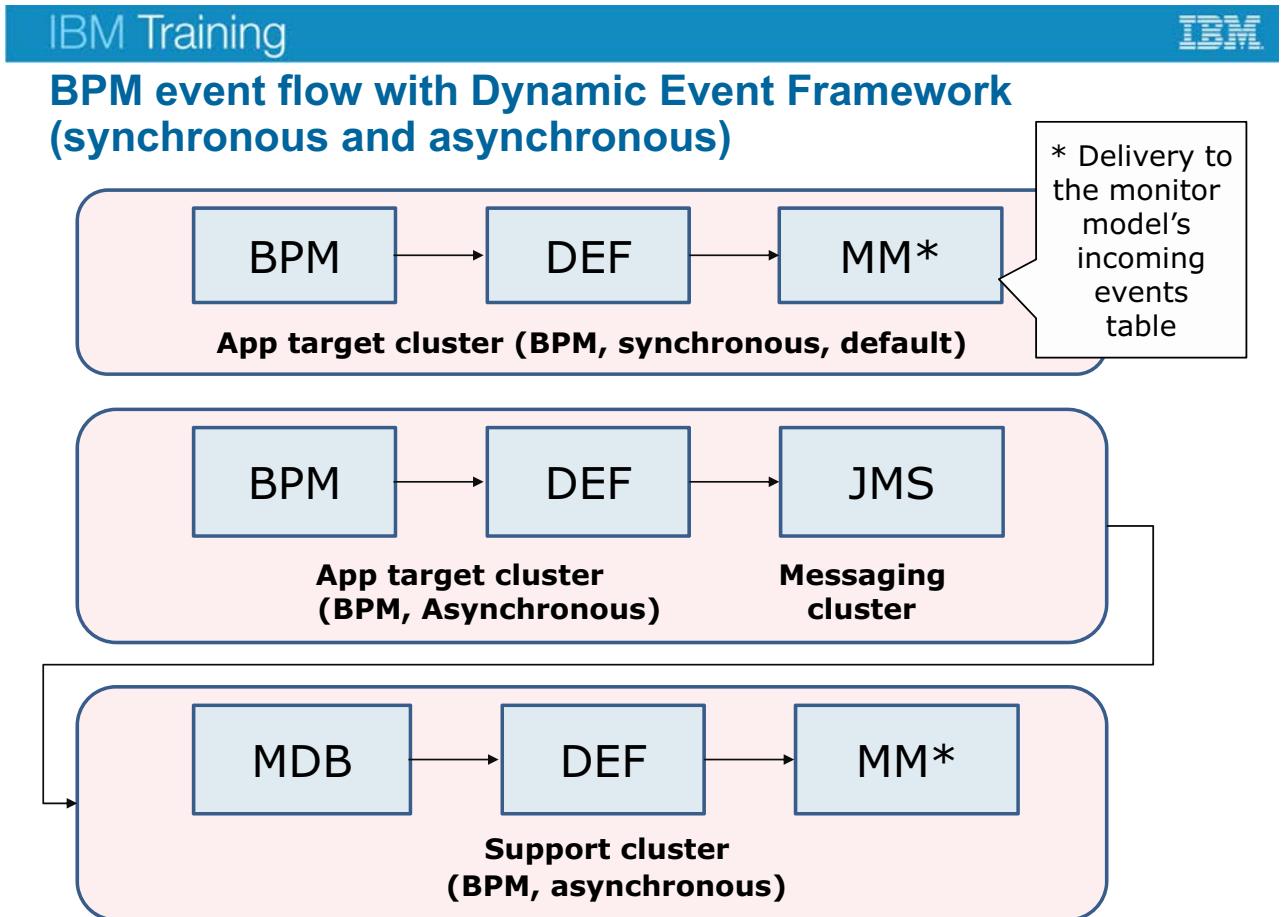
- EAR files are used to install monitor model projects as Java EE enterprise applications. The IBM Business Monitor development toolkit is used to create and export these EAR files.
- *MBeans* are *managed beans*, Java objects that represent resources to be managed.
- A *profile* defines the runtime environment. The profile includes all of the files that the server processes in the runtime environment that you can change. In a high availability environment, you need multiple profiles to correctly manage the complexity of the system. You can either create new profiles or augment existing profiles after installing IBM Business Monitor. IBM Business Monitor has profile templates to enable functions that are specific to IBM Business Monitor. After installing the product, you can create and augment profiles either by using the Profile Management Tool wizard or with the `manageprofiles` command. (If you are using the 64-bit version of IBM Business Monitor, you must use the `manageprofiles` command.)

Event sources and Dynamic Event Framework

- Events for Business Monitor can arrive from various sources
- An event source is the producer of an event or events that are relevant to a monitor model
- A remote event source can be a remote cell hosting IBM Business Process Manager or IBM Business Monitor as an example
- Events can be sent by using Dynamic Event Framework (DEF) or Common Event Infrastructure (CEI)
- CEI is deprecated but still available for migration to DEF

Figure 2-3. Event sources and Dynamic Event Framework

Events for Business Monitor can be emitted by BPM or BPEL applications that run on IBM BPM, or they can be emitted by other applications. The other applications might be using CEI for event emission. In this case, the monitor model would need to be implemented to support the Common Base Event format with CEI, which is deprecated in IBM Business Monitor.



IBM Business Monitor architecture and integration

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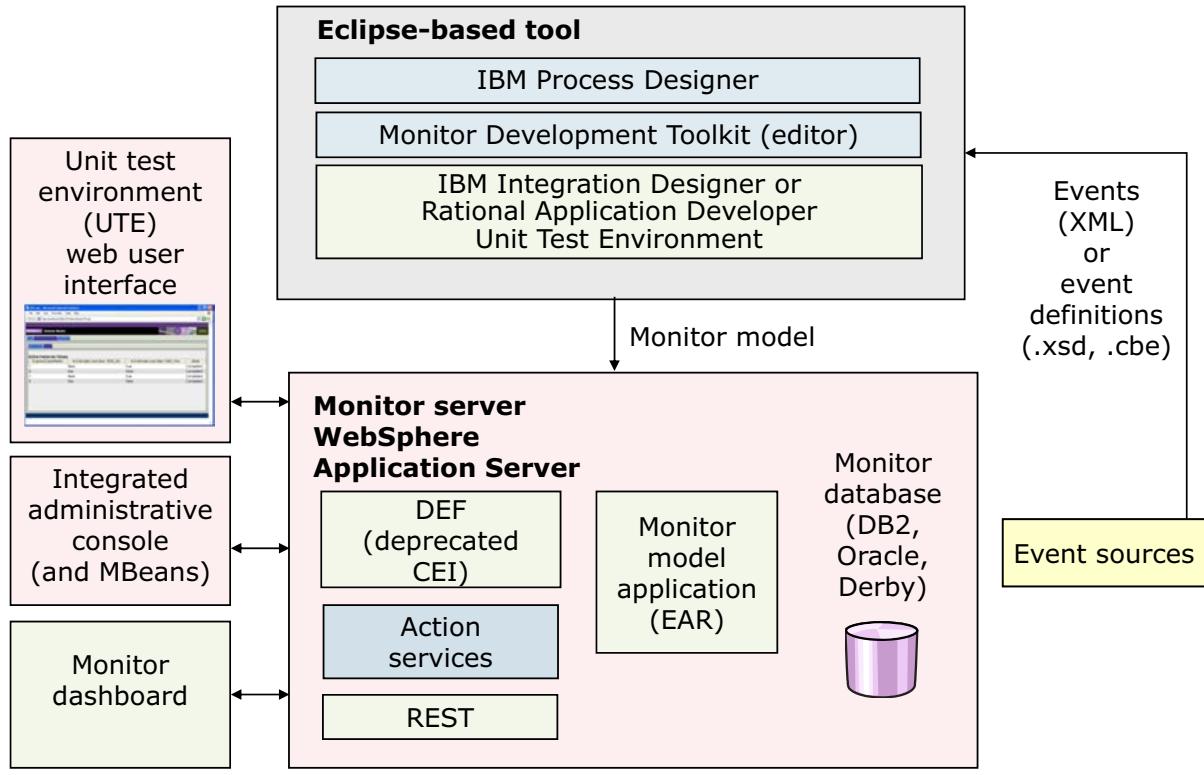
Figure 2-4. BPM event flow with Dynamic Event Framework (synchronous and asynchronous)

This slide shows the event flow from a BPM application that emits events that the Dynamic Event Framework processes in either a synchronous or an asynchronous transaction.

At the top box of the slide is the default configuration for a BPM process application that is emitting events for Business Monitor in a synchronous transaction scenario. The application target cluster is used throughout the lifecycle for the events that are in a synchronous transaction. In the MM box is where the incoming events are delivered to the monitor model incoming events table in the monitor database.

The bottom two boxes on this slide contain the event flow from a BPM application, which is emitting events that the Dynamic Event Framework processes in an asynchronous transaction scenario. In this scenario, the BPM application and the DEF event processing are done in the application target cluster. JMS then processes the events in the messaging cluster, and then the MDB (message-driven bean) and the DEF process the events in the support cluster. Finally, the events are delivered to the monitor model incoming events table in the monitor database.

IBM Business Monitor build time architecture



IBM Business Monitor architecture and integration

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Figure 2-5. IBM Business Monitor build time architecture

Build time architecture views capture configuration and build-time properties that are present in build management artifacts such as build scripts, system source code, object files, binary files, library files, and build configurations.

Monitor server

- Group of applications responsible for event processing, calculating business metrics, and responding to business situations
- Runs on WebSphere Application Server
- Consists of
 - Monitor model manager
 - Action services
 - Monitor data security
 - Data movement services

IBM Business Monitor architecture and integration

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Figure 2-6. Monitor server

The Monitor server is responsible for event processing, calculating business metrics, and responding to business situations.

IBM Business Monitor server can be hosted on WebSphere Application Server

Monitor model manager

- The Monitor model manager acts as the execution engine for the monitor model
 - Monitor models are XML files that conform to the `Monitor.xsd` schema
 - Deployed as Java EE projects
- Handles all of the metric calculations and business situation detections that are required for business process management
- The Monitor model manager uses events from the Dynamic Event Framework and sends events to monitor action services
- The Monitor model manager then uses the model, receives the events, and calculates the metrics to be persisted for future display on dashboards
- Stores metrics in a database repository according to the monitor model definition

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Figure 2-7. Monitor model manager

The Monitor model manager acts as the execution engine for the monitor model that the IBM Business Monitor development toolkit creates. During model development, you can define the metrics and key performance indicators (KPIs) to monitor the events that are used in calculating them. The Monitor model manager then uses the model, receives the events, and calculates the metrics to be persisted for future display on dashboards.

The Monitor model manager handles all of the metric calculations and business situation detections that are required for business process management. It creates, reads, updates, and terminates context instances, and calculates the metric values of these instances.

The Monitor model manager consumes events from the Dynamic Event Framework (DEF) to update the metrics and KPIs displayed on dashboards. It also sends events to the DEF, as defined by the Monitor model for action services.

Monitor action services

- Monitor action services is a component of IBM Business Monitor
 - IBM Business Monitor invokes Monitor action services when IBM Business Monitor and other applications emit the defined situation events
- Action services types include:
 - Notifications by email or Monitor dashboard Alerts view
 - Automated web services invocation
- Actions are based on user-defined, configurable action templates
- Situation events binding table defines situation events to action service relationships
 - Each time the situation occurs, an event is emitted, which the Monitor action services detect
 - Based on the events binding table, corresponding action services are started

Figure 2-8. Monitor action services

A deployed monitor model emits events when a business situation (as defined in the model) occurs. The Monitor action services component receives those situation events, dispatches a notification of the business situation, and takes one or more user-defined actions to address the reported situation. The actions are based on user-defined action templates. For example, assume that within a business process, you want to detect a particular business situation when it happens and be notified that it occurred. First, you must define the particular business situation that you want to detect, for example, when a metric exceeds its acceptable threshold. Then, you define one or more events to be emitted when this situation occurs. These situations and corresponding event notifications are defined in the Monitor model editor in IBM Process Designer.

After the monitor models are deployed, an event is emitted each time that the situation occurs, and the Monitor action services detect it. The Monitor action services component dispatches a notification of the business situation and takes one or more user-defined actions to address the situation.

To ensure that the notifications and actions take place, you must do the following tasks:

- Define the business situation and events to be emitted when the situation occurs.
- Define templates for the action services that you want to invoke as a result of the event. An action handler such as an alert handler or mail handler uses the templates to invoke the action

services that send a dashboard alert or a mail event. The delivery channel for the alerts can be the following types:

- Dashboard alert
 - Email
 - Cell (email address)
 - Pager (email address)
- Bind the situation events with the template definitions. The binding defines the configuration that is used at run time so that Monitor action services can determine which action services must be invoked upon receiving the situation event.

When the Monitor action services component receives those situation events, it invokes the Monitor action services that are identified from the template definitions that are bound to the situation event. It notifies you of the situation as you specified.

Monitor action services use federated repositories to locate user information to enable it to send notifications. Federated repositories can be configured to use a number of user registries, such as Lightweight Directory Access Protocol (LDAP), file-based user registry, and custom user registry. Monitor action services can also use an explicitly supplied user ID or email address to send notifications, which are useful in an integrated test environment.

Monitor action services:

- Receive situation events that use Common Base Event XML formatting and invoke one or more action services
- Administer the configuration of templates and event-to-action service bindings
- Emit Common Base Event-formatted events before and after action invocation
- Support the following action service types:
 - Notification.
 - Invocation of a web service.

Dashboards

- Used to view user-specified measurement data of a business
- Interact with monitor database to retrieve required information
- Multiple dashboard interfaces:
 - Business space dashboards enable a business user to visualize business performance data by using various widgets
 - Portlet-based dashboards are implemented as portal pages in WebSphere Portal
 - Mobile dashboards allow viewing of a mobile version of the dashboard on your mobile device
- Operate in near real-time environment to monitor business situations so that users can manage appropriate actions
- Used for viewing user-specified measurement data of a business
- Generate multidimensional analysis of data with IBM Cognos Business Intelligence

Figure 2-9. Dashboards

IBM Business Monitor offers a browser-based dashboard that can provide easy access to important information about the current state of your business. This dashboard is conceptually similar to the dashboard of an automobile, which provides easy access to your odometer and check-engine light.

Business space is the browser-based dashboard that is provided with IBM Business Monitor and other WebSphere products.

- IBM Business Monitor also provides portlet-based dashboards for WebSphere Portal users.
- Business space and portlet-based dashboards provide the same function.

REST APIs

- The Representational State Transfer (REST) application programming interfaces (APIs) are public APIs that are used to extract monitor data
- Used for creating custom dashboards and reports that are based on monitor data
- REST implementation allows for easy-to-use HTTP services
- Language-independent and platform-independent; stateless, scalable, and easily parsed
- REST APIs are useful for creating Ajax-style web applications such as the monitor dashboards

Figure 2-10. REST APIs

The Representational State Transfer (REST) APIs are public APIs that you can use to extract monitor data or to create custom dashboards and reports that are based on monitor data. The REST implementation allows for easy-to-use HTTP services that are language-independent, platform-independent, stateless, scalable, and easily parsed. The REST APIs are useful for creating Ajax-style web applications, in the same vein as the monitor dashboards.

REST services provide a set of Uniform Resource Identifiers (URIs) that you can use to interact with monitor resources such as monitoring context definitions, key performance indicators, and instance data. The services can be invoked from any HTTP client application, and define an expected response in the form of a JavaScript Object Notation (JSON) object. JavaScript and other products, tools, and languages can easily parse and consume the JSON format, which offers you greater flexibility in using IBM Business Monitor in your own environment.

Many of the services take a simple HTTP GET URI as input. More complicated services take a JSON input by using HTTP GET (for retrieval), POST (for create), or PUT (for update). Results are typically returned in JSON, except for services that are naturally XML-based, such as the diagram service, which returns an SVG XML document. Any error messages and status indicators are returned in the HTTP response as JSON output.

Monitor database

- IBM Business Monitor uses two databases, the MONITOR database and the COGNOSCS database, to store all data and metadata that is associated with the monitored environment
- Stores monitor models metadata
 - Deployed IBM Business Monitor models
 - Key performance indicators (KPIs) and metric definitions
- Stores runtime information
 - Current state of monitoring contexts that is used for event processing
- Stores business metrics and key performance indicator history
 - Provides the data for the dashboards
- Stores the action services that are defined according to the action services in the action catalog

Figure 2-11. Monitor database

IBM Business Monitor uses two databases: the MONITOR database and the COGNOSCS database.

The MONITOR database stores information about the current state of monitoring contexts that are used for event processing by the IBM Business Monitor server. It also stores definitions of the deployed IBM Business Monitor models along with other IBM Business Monitor information and the corresponding key performance indicator (KPI) and metric definitions, and provides the data for the dashboards.

The MONITOR database stores both instance (runtime) information and metadata that is related to a model. Runtime information includes metrics and the final status of recently completed or failed processes. The metadata describes information about deployed monitor models.

The following components use the MONITOR database:

- **Administrative console:** The IBM Business Monitor administrative console is used to install a monitor model. The definition of the monitor model is stored in the MONITOR database.
- **Dashboards:** The dashboards display data in various ways. The MONITOR database stores the model metadata that is used for configuring your dashboards. The database also stores the actual monitoring context instance data, KPIs, and alerts that are displayed in View mode of the dashboard data.

- **IBM Business Monitor server:** The IBM Business Monitor server uses the MONITOR database to persist data about monitoring context instances that are in progress.

Each monitoring context is represented as a table in the MONITOR database. These tables can be automatically created as part of the monitor model installation, or created later. The tables must exist before the IBM Business Monitor server can process events for the monitor model. These same tables are used to support the dashboards. Under high volumes, there can be contention between the monitor server and the dashboard's use of these tables. In these cases, the data movement service (DMS) should be enabled. DMS creates a duplicate set of tables that are dedicated for dashboard queries, and then initiates the transfer of data from the server tables to the dashboard tables.

The COGNOSCS database is the content store for IBM Cognos Business Intelligence. If you have an existing IBM Cognos BI, you can use your existing content store.

Data movement services

- Data movement service optimizes server processing and reporting in higher volume production environments
- Operational tables are optimized for inserts and updates, and the reporting tables are optimized for dashboard queries
- When enabled, runs automatically as a WebSphere application on the Monitor server
- Configured and monitored on the WebSphere Application Server administrative console
- Data movement service works across DB2 and Oracle
- The scheduler manages the frequency and timing of the execution of the data movement service
- Data movement service is optional
- Not recommended for development and test environments where performance is not a concern

Figure 2-12. Data movement services

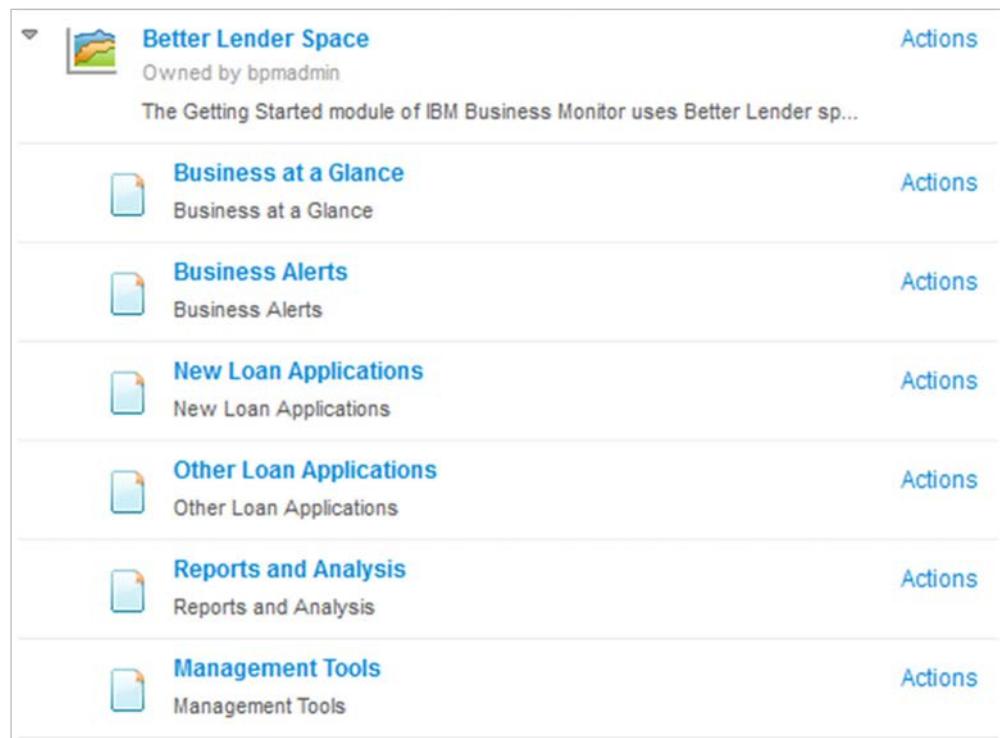
If the data movement service was not enabled during installation of a monitor model, you can use the WebSphere Application Server administrative console to enable this service. This enabling is done either by running the enable data movement service scripts for that monitor model automatically, or by exporting the scripts and then running them manually.

Data movement service optimizes server processing and reporting in higher-volume production environments. Operational tables are optimized for inserts and updates, and the reporting tables are optimized for dashboard queries. When it is enabled, the data movement service runs automatically as a scheduled service. After it is enabled, the data movement service cannot be disabled. The data movement service is optional in this release. It is not considered the best choice for development and test environments, or for small production environments where performance is not a concern. Therefore, it is not supported in the unit test environment (UTE), also referred to as the integrated test environment (ITE).

IBM Training



ShowCase model: Better Lender



Component	Description	Actions
Better Lender Space	Owned by bpmadmin The Getting Started module of IBM Business Monitor uses Better Lender sp...	Actions
Business at a Glance	Business at a Glance	Actions
Business Alerts	Business Alerts	Actions
New Loan Applications	New Loan Applications	Actions
Other Loan Applications	Other Loan Applications	Actions
Reports and Analysis	Reports and Analysis	Actions
Management Tools	Management Tools	Actions

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Figure 2-13. ShowCase model: Better Lender

A new ShowCase model is available that helps you understand the usage of IBM Business Monitor, especially the dashboards in business space. Monitoring context instance data and KPI data are loaded into the database, so you can open the provided dashboards and view the various monitor widgets. It is helpful for new monitor users, when they are trying to discover the usage of the many widgets in the dashboard. Monitor models are also provided so you can view the models to see how they are constructed.

The ShowCase model is available upon completion of installation, and can be installed into the Monitor toolkit.

Business space and Lotus Mashups

- A mashup platform enables the rapid creation, sharing, and discovery of reusable application building blocks
- Business space uses the page assembly or Mashup Builder framework from IBM Mashup Center
 - Internally, this code is called the Mashup Enabler, Mashup Server + Mashup Builder
- By sharing code, widgets, pages, and spaces can be moved across platforms (such as Mashup Center, Business Space powered by WebSphere, and WebSphere Portal)
- Business space and BPM customers can purchase IBM Mashup Center to obtain the full mashup experience

Figure 2-14. Business space and Lotus Mashups

Business space is built on the IBM Lotus Mashups framework. This configuration has many benefits, including tools that you can use to more easily create custom widgets in business space.

- Business space is a common UI that is included with BPM products.
- It is built on top of the IBM Mashup Center widget container and page assembly technology.
- It supports rapid creation of BPM applications.

Integrated Test Client

- In IBM Business Monitor, only CEI-based monitor models are supported for use with the Integrated Test Client



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Figure 2-15. Integrated Test Client

Restriction: Only CEI-based monitor models are supported for use with the Integrated Test Client.

The Integrated Test Client is installed as part of the IBM Business Monitor development toolkit installation and is integrated into Rational Application Developer or IBM Integration Designer. You can use this tool to emit sample events for the Monitor test environment server and to quickly test a monitor model. The target server can be a local server or a remote server.

Monitor integration

- IBM Business Monitor can monitor business events from any application
- Business data from any application can be mediated into events that IBM Business Monitor can read, by using products such as:
 - IBM Business Process Manager
 - WebSphere Adapters
 - IBM Operational Decision Management
 - IBM Integration Bus
- IBM Business Monitor can also monitor events from CICS and IMS
- Also, use IBM Business Monitor event emitter services, REST event emitter API, and JMS event emitter, to emit events from source applications

Figure 2-16. Monitor integration

IBM Business Monitor can monitor business events from any application. Business data from any application can be mediated into events that IBM Business Monitor can read, by using products like IBM Business Process Manager, WebSphere Adapters, IBM Operational Decision Management, IBM Integration Bus. IBM Business Monitor can also monitor events from products like CICS and IMS. You can also use IBM Business Monitor event emitter services, the REST event emitter API, and the JMS event emitter to emit events from source applications.

Unit summary

- Explain the architecture of IBM Business Monitor
- Describe the major components of IBM Business Monitor, including Monitor server, action services, dashboards, databases, and data movement services
- Explain how IBM Business Monitor integrates with the Lotus Mashups framework

Checkpoint

1. _____ is responsible for event processing, calculating business metrics, and responding to business situations.
 - A.Monitor server
 - B.Action services
 - C.Dashboard
2. True or false: Monitor unit test environment can be installed on both Rational Application Developer and IBM Integration Designer.

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Figure 2-18. Checkpoint

Write your answers here:

- 1.
- 2.

Checkpoint answers

1. A: Monitor server

2. True

Exercise 2

Creating a monitor model

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Figure 2-20. Exercise 2

Exercise objectives

After completing this exercise, you should be able to:

- Create a monitor model from scratch with the event definition that contains business information

Unit 3. Monitoring events

Estimated time

01:30

Overview

In this unit, you learn what types of business event data can be monitored and how it is retrieved for processing by IBM Business Monitor.

How you will check your progress

- Checkpoint
- Exercise

Unit objectives

- Explain how IBM Business Monitor retrieves business data from various sources
- Explain Dynamic Event Framework
- Explain the architecture of the Common Event Infrastructure (CEI) in IBM Business Process Manager Advanced
- Describe how to configure the CEI in IBM Business Process Manager Advanced to generate events for IBM Business Monitor
- Describe the difference between the table-based and queue-based methods of receiving events
- Differentiate between a Common Base Event and an XML schema definition event
- Explain event parts

Dynamic Event Framework

- The Common Event Infrastructure (CEI) is now deprecated and is replaced with Dynamic Event Framework (DEF)
- By default IBM Business Monitor no longer monitors events from CEI without prior configuration to support CEI
- You can configure previous versions of IBM Business Process Manager to emit events to CEI so that monitor models that were generated in previous releases of Business Monitor that rely on CEI event emission can still be used
- Other applications that used CEI to send events to IBM Business Monitor can still be monitored by using the deprecated CEI support in IBM Business Monitor

What can be monitored? (1 of 2)

- Any application that generates a series of events that are sent to IBM Business Monitor in XML format
- The available events contain the required data, and a monitor model can be created to describe how to monitor the application
- Monitor models contain monitoring contexts, which define the set of information to be collected at run time
- A monitoring context is created for each real-world object that is monitored
- The monitoring context receives the events that report changes in the real-world object, and updates its properties that are based on information that is extracted from these events

Figure 3-3. What can be monitored? (1 of 2)

A monitoring-enabled application generates a series of events that the event source sends to the Dynamic Event Framework (DEF) or the deprecated Common Event Infrastructure (CEI). When the available events contain the needed data, a monitor model can be created to describe how to monitor the application.

Based on the monitor model configuration, IBM Business Monitor receives and extracts required information from the events. Then, it updates the metrics that are defined in the model, and represents the collected values in a number of ways on a dashboard, based on the business needs. The Monitor action services also automate what action to take in response to outbound events that report on the occurrence of a business situation.

Often, information from several events must be correlated. For example, to measure the delivery time for an order, you might need the time stamp of an order-submitted event and of a goods-received event. However, because many orders are processed and delivered, you need a correlation identifier to match a goods-received event with the corresponding order-submitted event. The correlation of events can be based on information that the system provides (such as a process ID) or business information that is contained in the events (such as an order ID).

What can be monitored? (2 of 2)

- IBM Business Monitor can monitor business events from any application
- Business data from any application can be mediated into events that IBM Business Monitor can read, with products like:
 - IBM Business Process Manager
 - WebSphere Adapters
 - IBM Operational Decision Management
 - IBM Integration Bus
- IBM Business Monitor can also monitor events from CICS and IMS
- Also, use IBM Business Monitor event emitter services, the REST event emitter API, and the JMS event emitter to emit events from source applications

Figure 3-4. What can be monitored? (2 of 2)

IBM Business Monitor can monitor business events from any application. Business data from any application can be mediated into events that IBM Business Monitor can read, with products such as: IBM Business Process Manager, WebSphere Adapters, IBM Operational Decision Management, and IBM Integration Bus. IBM Business Monitor can also monitor events from products like CICS and IMS. You can also use IBM Business Monitor event emitter services, the REST event emitter API, and the JMS event emitter to emit events from source applications. IBM Business Monitor also provides other event emitter services and APIs:

- A REST event emitter API
- A JMS event emitter API
- A Java event emitter
- A web service interface with Web Services Notification

Dynamic Event Framework overview

- Dynamic Event Framework
 - A mechanism for emitting and delivering events
 - This dynamic event handling can be used for events from Business Monitor or IBM Business Process Manager
 - For earlier versions of IBM Business Monitor and IBM Business Process Manager or other event sources, you must configure the event source to send events by using the methods previously available
- The Dynamic Event Framework is responsible for the following functions:
 - Configuration that is associated with defining an event source
 - Registration, which tells an event source which events a monitor model expects to receive
 - Sending events to consumers
- Use the IBM Business Monitor event emitter services, the REST event emitter API and the JMS event emitter, to emit events from source applications via the Dynamic Event Framework

Figure 3-5. Dynamic Event Framework overview

Dynamic Event handling can be used for events from Business Monitor V8.5.5 or later and IBM BPM V8.5.5 or later. Use IBM Business Monitor event emitter services, the REST event emitter API, and the JMS event emitter to emit events from source applications via the Dynamic Event Framework. For other applications that need to be monitored, the previously available methods for monitoring must be used and configured.

Event sources (local and remote)

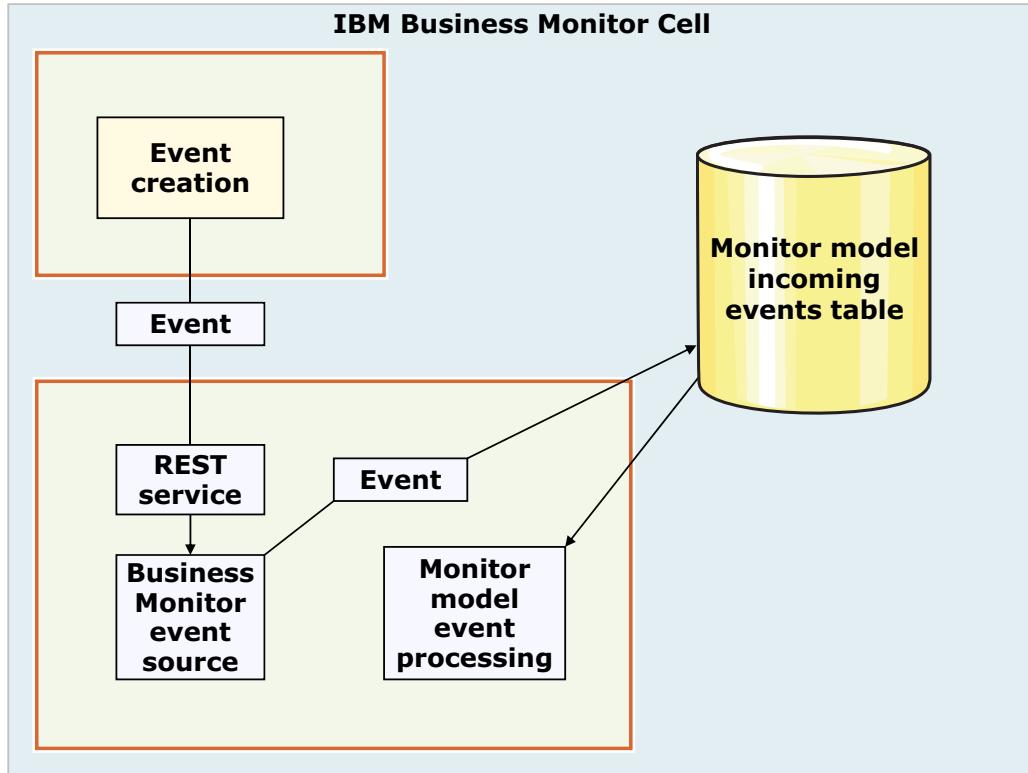
- IBM Business Monitor requires an event source on the Business Monitor side
 - Local event source to Business Monitor
- The event source requires host and port credentials so that, when you deploy a monitor model, you can select the application where the events are emitted
- Only events that the model requires are emitted from the event source
- When you deploy a monitor model, the monitored events are automatically enabled for you
- The Dynamic Event Framework allows you to update monitor models without stopping the event sources

Figure 3-6. Event sources (local and remote)

Business Monitor requires an event source on the Business Monitor side that is the local event source. The event source requires host and port credentials so that when you deploy a monitor model, you can select the application where the events are going to be emitted.

Only events that the model requires are emitted from the event source.

Local event source (everything in the same cell)



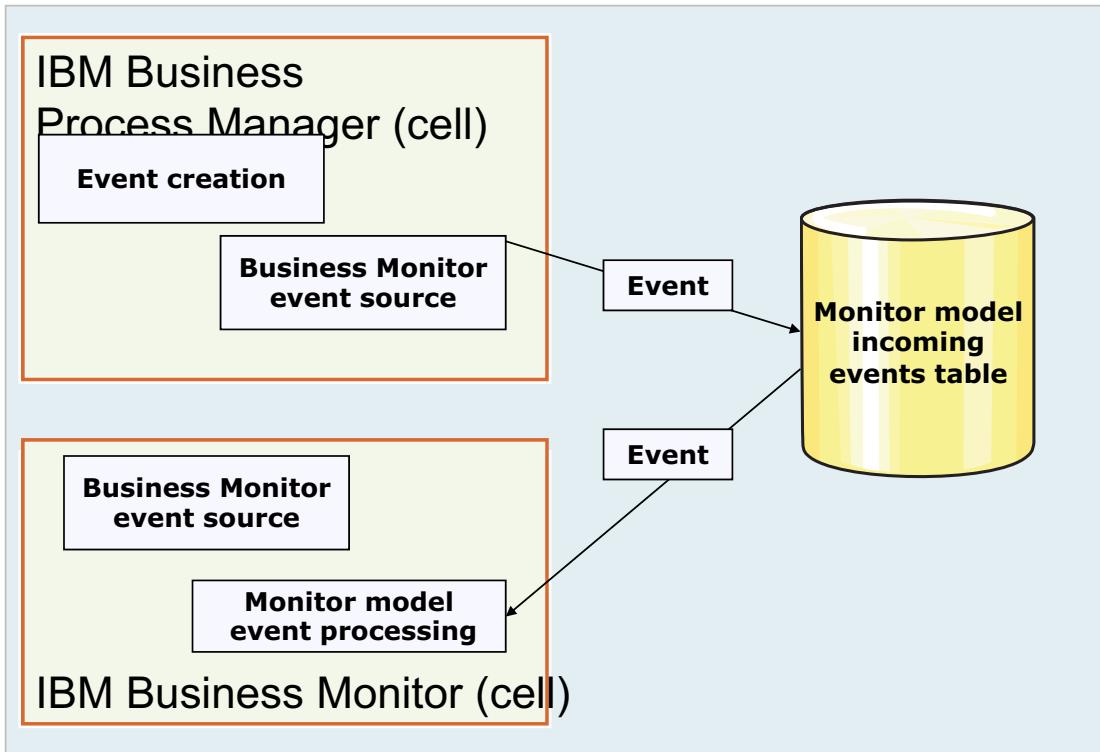
Monitoring events

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Figure 3-7. Local event source (everything in the same cell)

A Business Monitor event source can route events for consumption by a Business Monitor server in the same cell or on a remote cell. For example, a monitor model that is running in the same cell as the local Business Monitor event source emits an event (known as an *outbound event*) to the local Business Monitor event source. This event source routes the event directly to the monitor model table associated with a monitor model. In this case, the local Business Monitor event source is the event producer.

Event flow from IBM BPM to IBM Business Monitor in a cross-cell environment: Remote event source



Monitoring events

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Figure 3-8. Event flow from IBM BPM to IBM Business Monitor in a cross-cell environment: Remote event source

The Business Monitor server can be a producer or a consumer of events. The Business Monitor server in one cell can monitor events that are emitted in a different cell. The Business Monitor event sources must be defined before the monitor models can subscribe to events in those locations.

Common Event Infrastructure overview (deprecated)

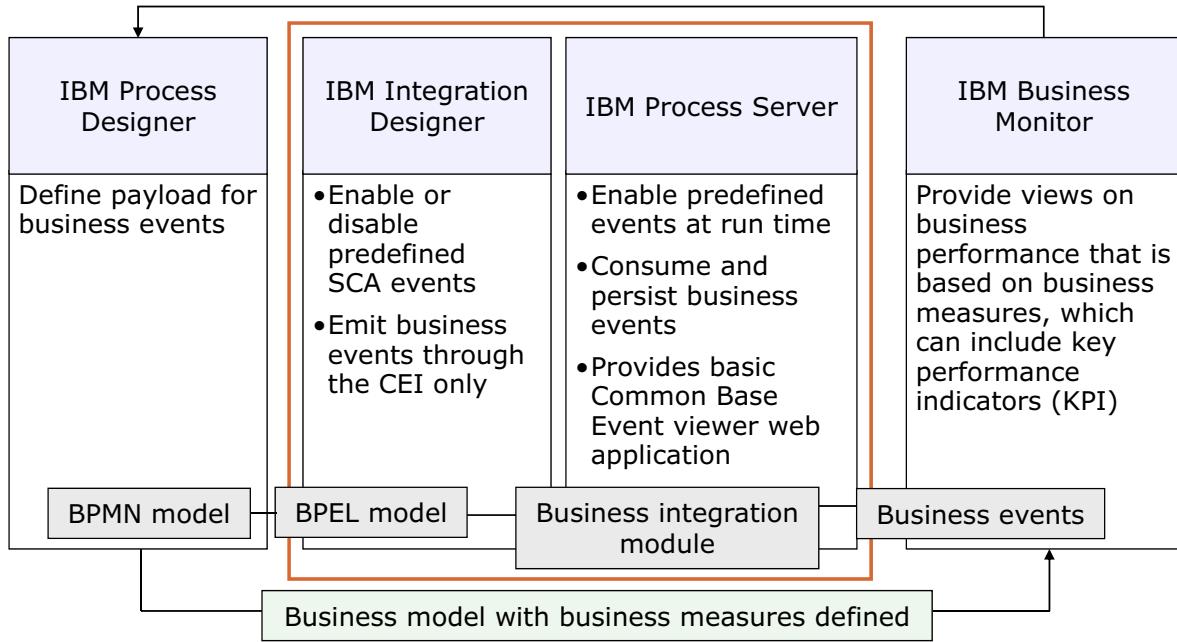
- Common Event Infrastructure (CEI) provides a framework to capture events and publish them for event consumers
- Events can be distributed or queried for extra processing by event consumers
 - Tracking application process (audit trails)
 - Coordinating work between independent business processes
 - Monitoring for application exceptions
 - System performance (CEI is generally used for business events not performance data)
 - Basic troubleshooting
 - Monitoring key performance indicators; for example, not completing a business operation within a certain time

Figure 3-9. Common Event Infrastructure overview (deprecated)

The deprecated CEI is a built-in framework for capturing events that are published from various sources, and turning them around by publishing them to event consumers. The CEI is the IBM implementation for handling events that can be generated for various purposes. Events can be used for administrative tasks, such as setting up audit trails within an application for performance or troubleshooting purposes.

Monitoring business transactions

Dynamic Event Framework (DEF) using XML events and CEI with the Common Base Event format provide the framework for a monitoring solution



Monitoring events

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Figure 3-10. Monitoring business transactions

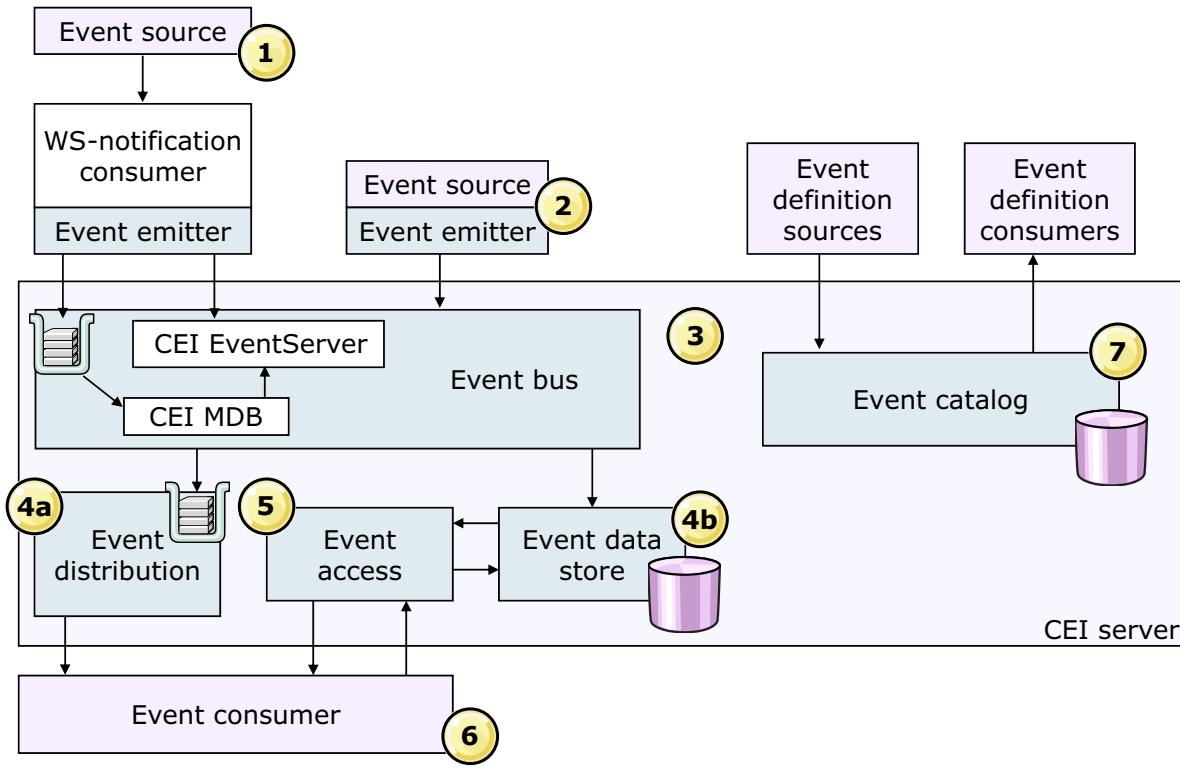
The focus of this class is IBM Business Monitor. IBM Business Monitor and IBM Business Process Manager support Dynamic Event Framework, and IBM Integration Designer with the Monitor model editor supports the configuration of monitor models that use Dynamic Event Framework. DEF type events are the default for IBM Process Designer. Other IBM products like IBM Integration Designer and IBM Process Server still support CEI and can send events to Business Monitor by using the CEI for event processing. Since CEI uses the Common Base Event format, the Common Base Event viewer web application can be used with applications that use CEI event processing. IBM Integration Designer can emit business events only in the Integrated Test Client that uses CEI.

The products that are outlined here are from the IBM BPM family of products.

During this phase, key performance indicators (KPI) are defined and attached to the model. KPI represents important runtime information that describes the health of a business process. For example, the number of loan applications that the bank managers process per week is one example of a KPI.

Integration developers use IBM Integration Designer to import a BPEL model. The business process is assembled in a business module. The integration developer can configure more CEI events to be generated at the SCA component, business process, or business activity level.

Common Event Infrastructure architecture (deprecated)



Monitoring events

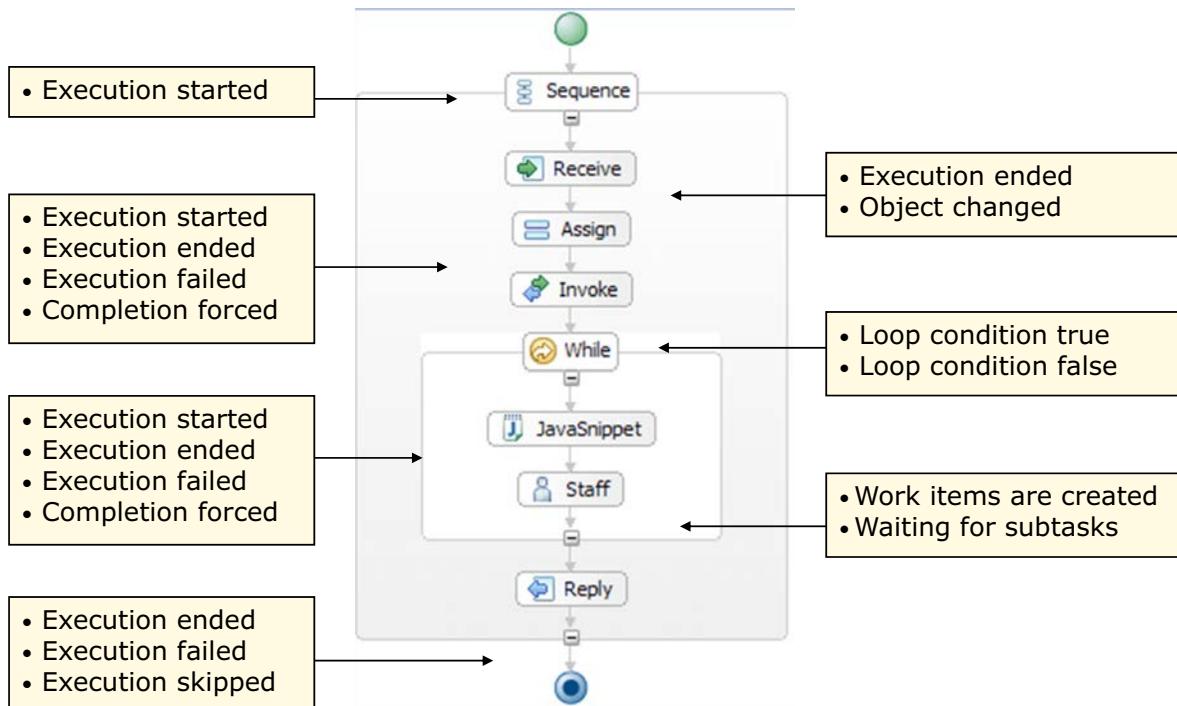
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Figure 3-11. Common Event Infrastructure architecture (deprecated)

1. Applications that submit requests to create events are known as event sources.
2. Components that are known as event emitters create events from event source requests. Event emitters also verify and filter event data before sending the event to the CEI server.
3. The event bus is the entry point for event creation requests into the CEI runtime environment. It passes event data to the event data store for persistence and to the event distribution component for publication to consumers.
- 4a. The event distribution component delivers events to subscribed consumers throughout the network.
- 4b. The event data store saves event messages for later retrieval through the event access component.
5. The event access component provides a programming interface for event consumers to query events that are persisted in the CEI runtime environment.
6. Applications that retrieve events from the event bus or update entries in the event data store are known as event consumers.
7. The event catalog allows applications to search for the definition of these application-specific fields in an event metadata repository.

The Common Base Event base model does not restrict the application-specific data that is stored in the extended or context data elements.

Possible events for business processes



Monitoring events

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Figure 3-12. Possible events for business processes

This slide shows some of the events that can be turned on in a BPEL process. This list is not exhaustive. It is intended to give you an idea of the types of events that you can emit, and for which events consumers can then look. By using execution started on Receive, and also in Reply, you can discover when it ended and use them to determine how long the overall business process took. By using a started and ended on a staff activity, you can determine how long it takes for people to complete work items.

BPEL events are not enabled in IBM Integration Designer Business Integration perspective. The events are selected for emission when loading the BPEL process into IBM Integration Designer and when using the Monitor toolkit to enable and select which events are emitted. This selection is done by using the wizards and templates to generate the monitor model, which allows the developer to select which events to monitor.

Common Base Event and XML Schema Definition event

- IBM Business Monitor can monitor two types of events:
 - XML types events that are defined inside XML Schema Definition (XSD) files or Web Services Description Language (WSDL) files
 - Common Base Event formatted types that follow the Common Base Event proposed standard format inside the .cbe files
- The events definition is used to reference the types for inbound and outbound events in the monitor model
- The monitor models are defined following the `monitor.xsd` schema definition

Figure 3-13. Common Base Event and XML Schema Definition event

Each inbound and outbound event in the monitor model refers to a particular event definition that defines its structure. Event definitions can be found in XML Schema Definition (XSD), Common Base Event, or Web Services Description Language (WSDL) files, or a combination of the three.

In older versions, IBM Business Monitor monitored only one type of event, the Common Base Event. Although Common Base Events themselves are not proprietary, the format of this type of file was restricted to IBM Business Monitor. However, in later versions, IBM Business Monitor can monitor XSD events and Common Base Events. The XSD type is a generic XML Schema Definition.

XSD events can be made up of fragments of structures that exist for other purposes, for example, business objects for passing data through an application. You can also reference standard XSD event definitions from the XML catalog, which is a storage repository for commonly used schemas and other definitions. The XML catalog is available at development time only. To access the catalog, go to **Window > Preferences > XML > XML Catalog**.

WSDL files can contain embedded XML schemas within the `<wsdl:types>` section. Business Process Execution Language (BPEL) processes and other IBM Process Server components emit the events, which refer to the types in these schemas. You can also import industry-standard WSDL files that contain types to be used as event part types.

Common Base Event and XSD: When to choose which

- XSD definitions are more robust than Common Base Event definitions
 - Use XSD event definitions if you are creating an application
- Use Common Base Event definitions if you must monitor events that are emitted from BPEL applications
- If you want the action services receive the outbound events, and generate an alert in the dashboards, then
 - The event must contain an extended data element named BusinessSituationName, with a corresponding value
 - A default Common Base Event named ActionServicesEvent with the required BusinessSituationName element provided
 - Event definition can be a mixture of Common Base Event and XSD types
 - You can use the provided Common Base Event and also add one or more event parts in XSD format

Figure 3-14. Common Base Event and XSD: When to choose which

XSD definitions are more robust than Common Base Event definitions, so you might prefer to use XSD event definitions if you are creating an application. Use Common Base Event definitions if you must monitor events that are emitted from BPEL applications.

If you want the action services in IBM Business Monitor to receive the outbound event and generate an alert in the dashboards, the event must contain an extended data element, BusinessSituationName, with a corresponding value. A default Common Base Event that is named ActionServicesEvent with the required BusinessSituationName element is provided for you. Because event definition can be a mixture of Common Base Event and XSD types, you can use the provided Common Base Event and also add one or more event parts in XSD format.

Event part

- An event part is an XML Schema Definition (XSD) type that provides information about the structure of the part of an event
- A single event definition can have different event parts and different XML schemas can define them
- All the event parts, together with the Common Base Event definition, if one is provided, describe the structure of the entire event
- Each event part describes how to identify and locate itself within the actual event that is received at run time
- An event part has the following key pieces of information:
 - An ID that is used to refer to the event part within path expressions
 - A path that defines how to find, at run time, the content that the event part describes
 - A type that defines the structure of the content that is identified from the path

Monitoring events

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Figure 3-15. Event part

An event part is an XML Schema Definition (XSD) type that provides information about the structure of part of an event. A single event definition can have different event parts that different XML schemas define. All of the event parts, along with the Common Base Event definition if one is provided, describe the structure of the entire event.

Each event part describes how to identify and locate itself within the actual event that is received at run time. An event part has the following key pieces of information:

- An ID that is used to refer to the event part within path expressions
- A path that defines how to find, at run time, the content that the event part describes
- A type that defines the structure of the content that is identified according to the path

The ID for an event part provides a shortcut for accessing a particular event part within the event definition. Instead of writing a full path expression to locate the event part, for example, for a filter expression, you can write an expression such as:

MyInboundEvent\myEventPart\myDataInsideEventPart

The path is an XML Path Language (XPath) expression that identifies the location in the event definition of the structure that the event part type defines. The expression is based on the structure of the actual event instance to be received at run time. It always starts with `cbe:CommonBaseEvent` and proceeds into content that is placed in the `xs:any` slot of the Common Base Event. The event

parts that you want to define are usually from the `wbi:applicationData` section, when it exists, because that section contains the business information. An XML Schema Definition (XSD) that is used to define an event structure might contain an `<xsd:any>` or `<xsd:anyType>` slot. In general, if it does, you must use an event part to specify the actual structure of the content that fills that slot at run time. For events from IBM Process Server, the section contains elements (specifically, the `<wbi:value>` element) with type `<xsd:anyType>`, so an event part must be used to define its actual structure.

The type is a QName that can refer to either an XSD complex or a simple type, or to an XSD global element declaration. When the type refers to an XSD type, it indicates that the event definition includes content with the structure defined by that type at the location where the path identifies it. Similarly, when the type refers to an XSD global element declaration, it prescribes the structure of the information in the event. However, the type that is associated with the element defines the structure. The ability to reference an element declaration as an event part type is useful when an XML schema document contains a global element declaration with an anonymous type. Because the event part type can refer to the element declaration, the structure of an event can still be prescribed even though the anonymous type cannot be externally referenced.

For an outbound event, you typically create a schema (the XSD) for the information that you want to communicate, and then create a single event part that references that schema. For inbound events, you might require several event parts that are based on the definition of the incoming event.

Receiving events from Common Event Infrastructure (CEI)

- Table-based is the method for receiving events from CEI
- Table-based event delivery uses a database table to deliver events to the monitor model
- Configure your event service to send events to the event database table for the monitor model
- For CEI applications, IBM Business Monitor uses table-based event delivery exclusively
- For queue-based event delivery in an earlier version, you must reconfigure your applications to use table-based event delivery
- Table-based enables events to be processed without using an intermediate JMS queue
 - Events are sent directly to a table in the Monitor database and improves performance
 - Eliminates JMS queue depth limits
 - Simplifies the system configuration

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Figure 3-16. Receiving events from Common Event Infrastructure (CEI)

IBM Business Monitor provides the only method for receiving events from the inbound Common Event Infrastructure (CEI) server. By employing the table-based method, you can process events without using an intermediate JMS queue.

Table-based: Bypassing JMS queues (1 of 2)

- Configure CEI event service to send the events to the event database table for the monitor model, bypassing the queue
- Is a simplified configuration
- In a single-server environment, or when IBM Business Monitor or IBM Process Server is installed on every node in the cell, no further configuration steps are needed
- In a multiple cell environment, extra configuration is needed:
 - Copy cross-cell files if IBM Process Server is not installed
 - Create a data source in the remote CEI cell by running the `wbmConfigureQueueBypassDatasource wsadmin` command

Figure 3-17. Table-based: Bypassing JMS queues (1 of 2)

To receive events without using a JMS queue, you can configure your Common Event Infrastructure (CEI) event service to send the events to the event database table for the monitor model, thus bypassing the queue. This table-based method has a simplified configuration because you are not required to configure the service integration bus link and its associated resources. Additionally, bypassing the queue improves performance by eliminating an extra persistence step that is required for the JMS queue.

Table-based: Bypassing JMS queues (2 of 2)

Table - INCOMING_EVENTS						
Schema	: MYTESTMODEL	Columns				
Creator	: DB2ADMIN	Key	Name	Data type	Length	Nullable
Columns	: 6					
Actions:			ID	BIGINT	8	No
Open			VERSION	BIGINT	8	No
Query			QUEUE_ID	VARCHAR	128	No
Show Related Objects			OBSERVED	SMALLINT	2	No
			PAYLOAD_VARCHAR	VARCHAR	30000	Yes
			PAYLOAD_BLOB	BLOB	1048576000	Yes
		Create New Table				

- ID: Incrementing key.
- VERSION: Version to which the event belongs.
- QUEUE_ID: String key to indicate how to treat the event.
- OBSERVED: Flag to indicate whether an event is consumed (gets reset during MM application startup).
- PAYLOAD_***: Fields to store the events. If either has a value, the event is present.

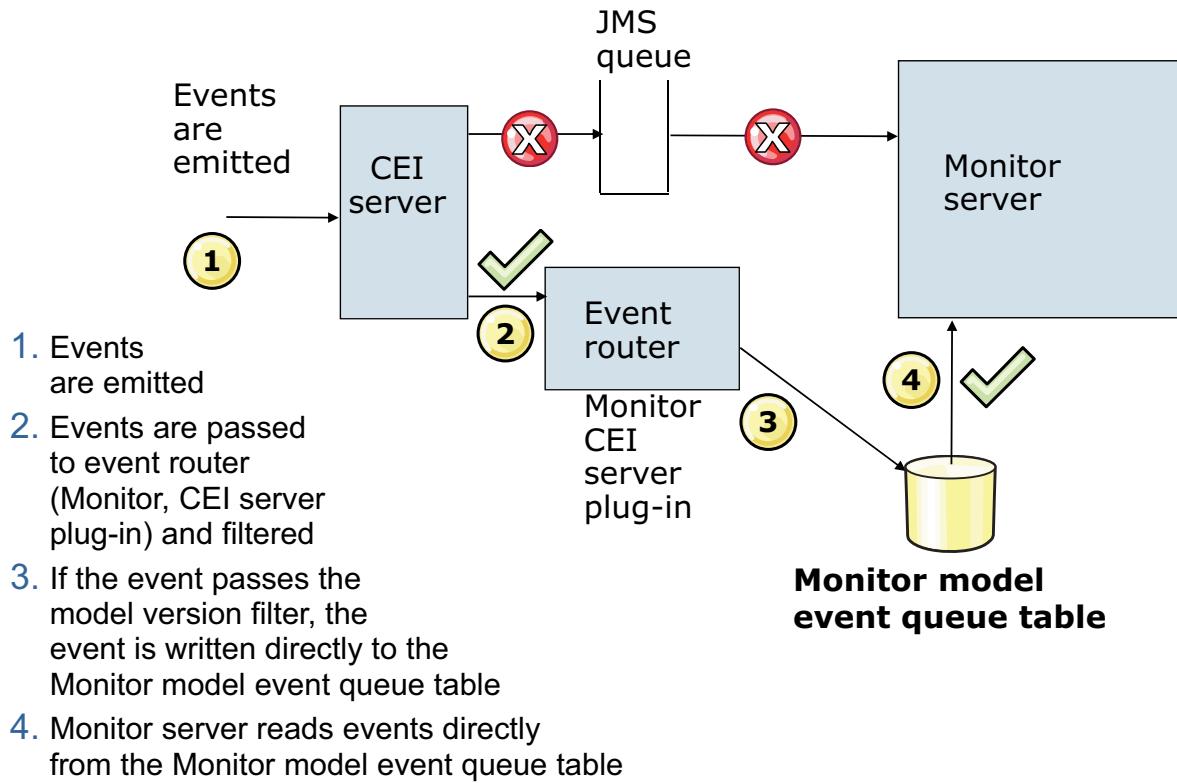
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Figure 3-18. Table-based: Bypassing JMS queues (2 of 2)

The INCOMING_EVENTS table stores all incoming events in the database.

Table-based event flow



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Figure 3-19. Table-based event flow

Table-based event flow avoids a database write step that the JMS queue requires. The event flows from the application emitter directly to the Monitor database.

It uses a single phase commit transaction for event consumption, which means that less processor power is used than in a two-phase commit transaction.

Event point key and filter (DEF style events)

- When events are emitted to IBM Business Monitor, they include an event point key as part of the XML
- The event point filter defines which events are included in the subscription when a monitor model is deployed
- Events that use the Dynamic Event Framework are only emitted to a monitor model if the events are defined in the event point filter

▼ Event Point Key (Read only, managed by application)

Use generated values if they are present or specify values for the event point filter to identify which events to emit and monitor. To subscribe to all the events for a version of an application, provide the application name and version and use asterisks (*) in the other five fields.

Application name:	<input type="text" value="CATS"/>
Version:	<input type="text" value="*"/>
Component type:	<input type="text" value="om/xmlns/prod/websphere/scd/business-process/6.0.0"/>
Component name:	<input type="text" value="CATOrderMgmt/Processes/OrderHandling:OrderHandling"/>
Element type:	<input type="text" value="Process"/>
Element name:	<input type="text" value="/-1821696720"/>
Nature:	<input type="text" value="ENTRY"/>

Figure 3-20. Event point key and filter (DEF style events)

The event point key and filter are used for DEF style events. Events that use the DEF style are emitted to a monitor model only if the events are defined in the event point filter.

Event point key and filter

- When you are using IBM Business Process Manager, BPMN and BPEL applications can generate monitor models by using wizards in the Monitor model editor
- The event point keys in a generated monitor model must not be changed and are read only
- If you are manually developing a business activity model, you can define the event point filter to emit a few specific events or a broad range of events to the monitor model
- If the application you are monitoring runs in an environment other than IBM Business Process Manager, you send events in XML format to one of the event services (JMS or REST)
- The event service then delivers the event to the monitor model table

Figure 3-21. Event point key and filter

You can also create a monitor model manually:

- When you create the monitor model, you specify the attributes from the event point key that you want to monitor.
- Provide an event point filter as part of the event description.
- The Dynamic Event Framework uses the filter values to route events directly to your monitoring model event processing.

Event sequencing

- When a set of events is sent from the same event producer, it is important that the events be processed in the order in which they were produced
- Events can erroneously be delivered to a monitor model in the wrong order for several reasons
 - Asynchronous event emission
 - Network delays
- If event order is important for the models, incorrect event sequence order can result in model processing exceptions and incorrectly calculated data

Figure 3-22. Event sequencing

When the same event producer sends a set of events to IBM Business Monitor, such as an instance of a process, events must be processed in the order in which they were produced. Events can erroneously be delivered to a monitor model in the wrong order for several reasons, such as asynchronous event emission and network delays. For models in which event order is important, incorrect event sequence order can result in model processing exceptions and incorrectly calculated data. IBM Business Monitor has a mechanism for putting the events back into the correct order for processing.

To illustrate the effects of event order, note the following example. If metric A defaults to 3, and event one sets metric A to 5, and then event 2 sets metric B to $2 * A$ (2 times metric A), there are two possible outcomes. If all events arrived in the correct order and event 2 follows event 1, then metric B is correctly set to 2 times 5, or 10. If the events arrived out of order and event 1 follows event 2, then metric B is incorrectly set to 2 times 3, or 6.

Event processing

- The business process emits events are processed from two server subsystems:
 - Event stream moderator process the events; events are temporarily cached and staged; event order is maintained
 - Second, the model logic, which represents the monitor model that you created process the events
- Each event is registered into its unique event group (or batch) of messages corresponding to its unique instance ID
- Batch of events is submitted as a work request
- To ensure that events are processed sequentially, only one work request for a specific instance ID is submitted to the model logic for processing at a time

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Figure 3-23. Event processing

To understand the event resequencing (reordering) mechanism available in IBM Business Monitor, it is helpful to first understand how the server processes events.

There are two server subsystems monitoring the business process, which emits events.

- First, the event stream moderator, which is a part of the server that temporarily caches and stages the events, processes the events.
- Second, the model logic, which represents the monitor model you created, processes the events.

It is the first part, the event stream moderator, in which event order is maintained and events are rearranged into the correct order, if event reordering is enabled for the monitor model.

The event stream moderator maintains a set of active event stream instance groups, and a unique instance ID identifies them. That is, the moderator groups events that must be processed relative to one another. The same unique instance ID associates these events together. An example is an online order entry system. As Bill adds items to the order, the instance of the business process Bill is using generates events, and those events are associated with the same unique instance ID. As Sue adds items to her order, her instance of the same business process generates events that are associated with a different unique instance ID. This way, Bill's events are grouped and Sue's events are grouped; and both are separate from one another. If Bill and Sue are entering orders at the same time, then their events typically arrive at the server in a random manner that is interwoven in

time. If there are hundreds of people actively placing orders online, the event stream contains events from all of them, all interwoven with one another.

As events arrive, each event is registered into its unique event group (or batch) of messages corresponding to its unique instance ID. When the event stream moderator decides that a batch of events for an instance ID is ready to be processed, the batch of events is submitted. It is submitted as a work request to the monitor model logic module to be processed. The decision is based on how many events are in the group, when the events arrived, and how long the events were held in the group.

While a batch of events is being processed for a specific instance ID, the event stream moderator continues to register newly arrived events in a new batch for the same instance ID that is being processed. Hence, events are cached in the next batch as the model logic process the current batch of events. To ensure that events are processed sequentially, only one work request for a specific instance ID is ever submitted to the model logic for processing at a time. An active work request for an instance ID must be complete before another work request for that same instance ID is sent to the monitor model logic module. In addition, that next work request for that instance ID can be processed only if that batch of events is ready to be processed. Many work requests can be processed concurrently, but not for the same instance ID. In other words, the model logic can be processing batches of events from many unique instance IDs at the same time.

Event resequencing

- Before sending a batch of events to the model logic, the event stream moderator has a chance to examine a field in the event
- It is to determine whether the event is out of order with others for the same instance ID
- The event field that is examined is called the **Event Sequence** field
 - Contains a value that is called the event sequence index
- For event resequencing to be enabled, you must specify an event sequence path
 - Specified in the inbound event in the Monitor model editor
 - Event sequence index from all events within the same instance ID can be compared to each other to determine whether the order is maintained

Figure 3-24. Event resequencing

As events arrive in the event stream moderator, and before sending a batch of events to the model logic, the event stream moderator has a chance to examine a field in the event. It examines the field to determine whether the event is out of order among others for the same instance ID. The event field that is examined is called the Event Sequence field.

The Event Sequence field contains a value that is called the event sequence index. For event resequencing to be enabled, you must specify an event sequence path, which is specified in the inbound event in the Monitor model editor, for all event types in the monitor model. When all event types have this field, the event sequence index from all events within the same instance ID can be compared to each other to determine whether the order is maintained.

The event sequence index must be a string value that indicates relative order, and it must be one that can be compared. This value can be a simple incrementing integer or a more complex string that is assembled from several other fields in the event. See “Event sequence index” for more details and examples.

Resequencing works as follows: As events arrive for a specific instance ID, they are held together in a group before the model logic process them. They are ordered (sorted) in the group by their event sequence index value. Each event is tagged with its arrival time and its departure time. To calculate the departure time, you add the late arrival stand-off delay server configuration value (the default is 5 seconds) to the arrival time.

When the departure time expires, the event is flagged as being available for processing by the model logic. However, even though the departure time expires, the event is not processed if an event that is sorted earlier in the group has a departure time that is not expired. Hence, the group of events is sorted in order as specified by the event sequence index, and it represents a queued set of events. Events are processed from the front of this queue while the event at the top has an expired departure time. Event processing is paused as soon as an event is reached whose departure time is not expired. Event processing resumes as soon as the departure time expires for the event at the top of the queue.

If the events arrive in order, all events are placed in their group in the order in which they arrived. This order is the same order as specified by the event sequence index for each event, so no event reordering takes place. The departure times are also represented in increasing time values. The model logic processes each event as soon as its departure time expires. For example, with arrival times as second 1 and second 2, if event A arrives at time 1, then it is processed 5 seconds later at time 6. If event B arrives at time 3, it is processed at time 8. The late arrival stand-off delay time delays the entire event stream by 5 seconds in time, but the events are processed in the correct order, one at a time as each event departure time expires.

If the events do not arrive in order, the process is slightly different. As before, arriving events are held together in a group that is based on their instance ID before the model logic process them. As each event is received, its departure time is calculated by adding the late arrival stand-off delay time to the event arrival time. If an event arrives out of order, it is placed into its group in the correct order position as dictated by its event sequence index.

The difference in the reordered group from the non-reordered group is that, even though the events are in the newly corrected order, the departure times are not in order. That is, an event that arrived late has a later departure time than its higher-event-sequenced neighbor, which arrived earlier. But the late-arriving event is placed before its neighbor in the event group.

To reiterate, the events are processed in the order that the event sequence index specifies. The departure time of the event at the front of the group is watched. As soon as it expires, the event is processed. The difference is that when the event at the front of the group is a late arrival event, the departure times of the events that follow the front event expire first. But because the late arrival and reordered event is at the front of the group, those events behind the front event are not processed yet. As soon as the departure time for that front event expires, it and all events behind it (whose departure times are expired) are processed at the same time, and in order.

Extended XPath V2.0 support

- Business events can contain complex XML that might contain:
 - Constructs such as repeating elements (sequences)
 - Information that is qualified from parent, child, or sibling nodes
 - Information whose location or interpretation depends on other content
- For processing such complex event content, IBM Business Monitor provides built-in functions

Function	Purpose
<code>wbm:serialize(...)</code>	Extract and convert XML document fragments from an inbound event into a single string.
<code>wbm:evaluate(...)</code>	Evaluate XPath 2.0 expressions on the string representation of an XML document and produce a string result.
<code>wbm:send-events(...)</code>	This function works with the Common Event Infrastructure (CEI). Create and send an outbound event for each item in a sequence. These events can be received as inbound events and used to create new monitoring contexts, one per item.
<code>send-events(...)</code>	This function works with the Dynamic Event Framework. Create and send an outbound event for each item in a sequence. These events can be received as inbound events and used to create new monitoring contexts, one per item.
<code>wbm:escape-special-characters(...)</code>	Replace all special characters so that the string representation of the XML can be displayed in a web browser (for example, replace < with <).

Monitoring events

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Figure 3-25. Extended XPath V2.0 support

The `wbm:serialize(...)` function retrieves XML fragments from incoming events, serializes them, and returns them as one string. The first version of the function is equivalent to the second version with an empty delimiter string. The function returns an empty sequence only if the evaluation of `$xml` results in an empty sequence.

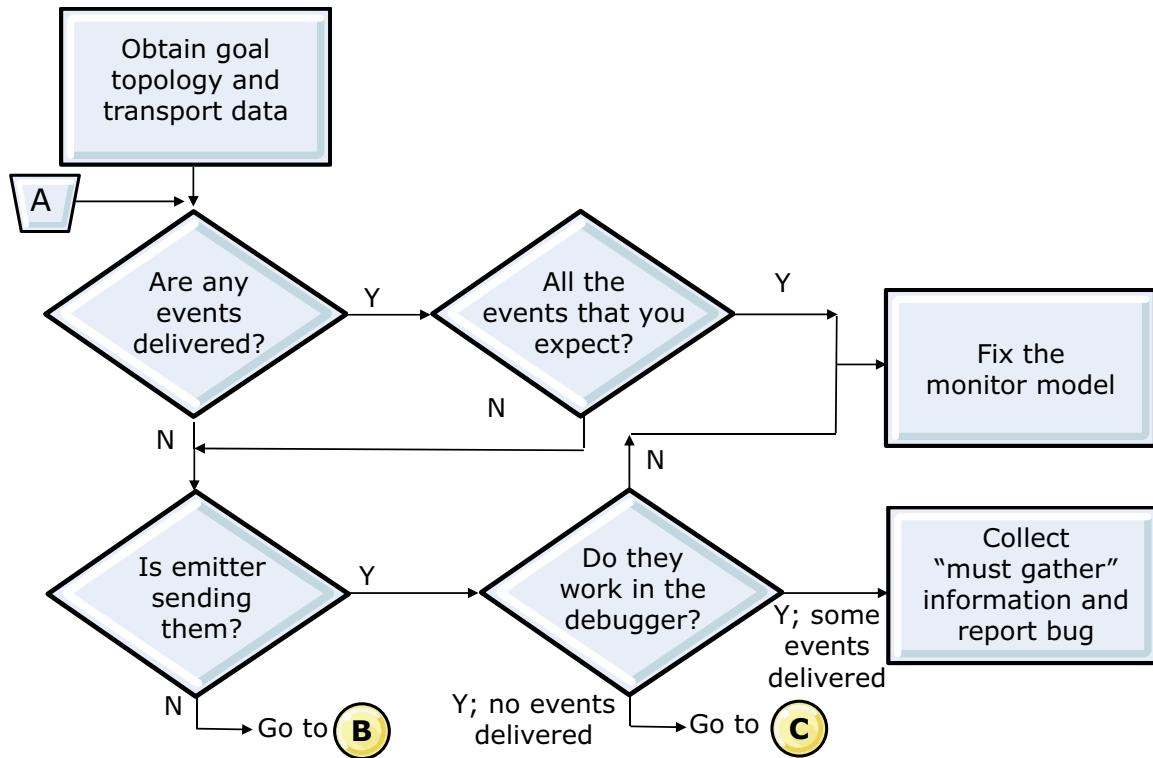
The `wbm:evaluate(...)` function evaluates an XPath V2.0 expression on a serialized XML document, and returns a serialized form of the result. If the first argument (`$xml`) is empty, an empty sequence is returned.

The `wbm:send-events(...)` function sends outbound events for each item in a sequence, with one event per item.

The `wbm:escape-special-characters(...)` function does the following character replacements:
 < > & " ' <tab>

The `send-events(...)` function is used to send outbound events using the Dynamic Event Framework. To use this function, copy the `BusinessMonitorFunctions855.jar` file to a monitor model project in IBM Integration Designer.

Event flow troubleshooting (1 of 2)



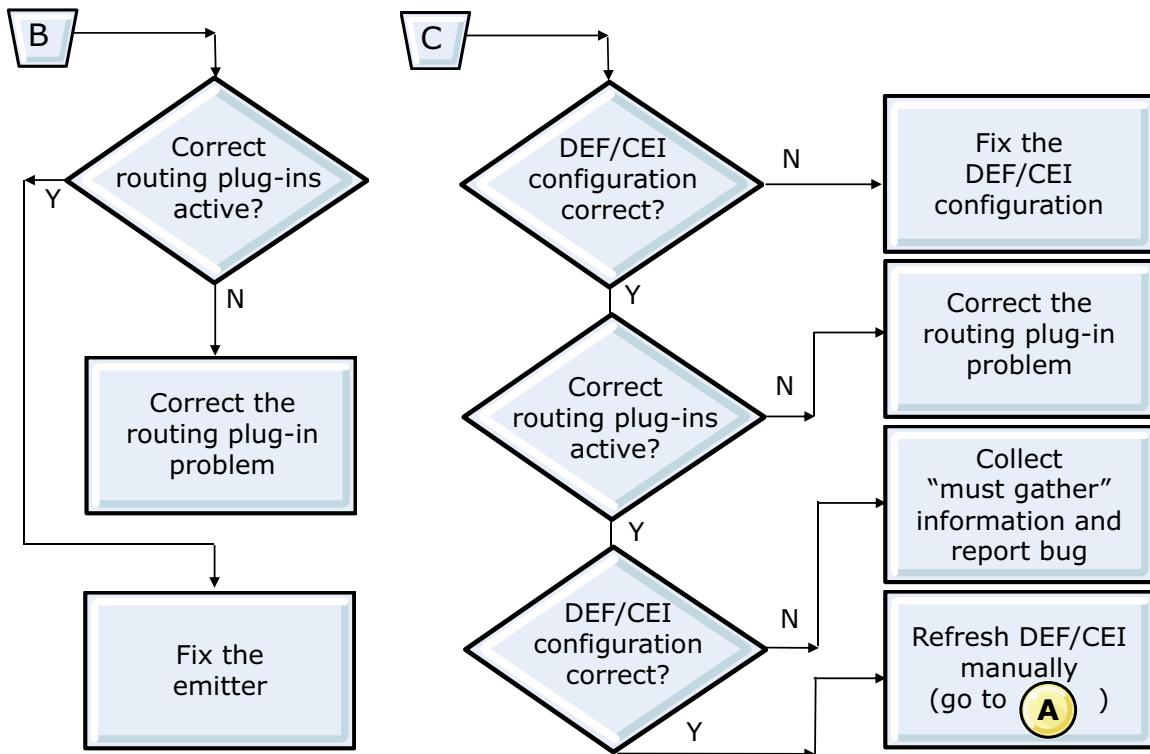
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Figure 3-26. Event flow troubleshooting (1 of 2)

The flowchart displays the basic steps to follow when troubleshooting an event flow in a monitor model. The flowchart is continued on the next page.

Event flow troubleshooting (2 of 2)



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Figure 3-27. Event flow troubleshooting (2 of 2)

Unit summary

- Explain how IBM Business Monitor retrieves business data from various sources
- Explain Dynamic Event Framework
- Explain the architecture of the Common Event Infrastructure (CEI) in IBM Business Process Manager Advanced
- Describe how to configure the CEI in IBM Business Process Manager Advanced to generate events for IBM Business Monitor
- Describe the difference between the table-based and queue-based methods of receiving events
- Differentiate between a Common Base Event and an XML schema definition event
- Explain event parts

Checkpoint

1. _____ provides a framework to capture events and publish them for Business Monitor and Business Process Manager consumers.
2. True or False: Using the Dynamic Event Framework method of receiving events in IBM Business Monitor and IBM Business Process Manager is the recommended way.
3. _____ is an XML Schema Definition (XSD) type that provides information about the structure of the part of an event.

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Figure 3-29. Checkpoint

Write your answers here:

- 1.
- 2.
- 3.

Checkpoint answers

1. Dynamic Event Framework
2. **True.** Dynamic Event Framework is the recommended way to send and receive events from IBM Business Monitor and IBM Business Process Manager. Component Event Infrastructure (CEI) is deprecated.
3. Event part

Exercise 3

Selecting events and generating a monitor model

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Figure 3-31. Exercise 3

Exercise objectives

After completing this exercise, you should be able to:

- Import a business process
- Create several inbound events for the monitor model

Figure 3-32. Exercise objectives

Unit 4. Monitor development toolkit and monitoring concepts

Estimated time

01:00

Overview

This unit explains the Monitor development toolkit and how it is used to create a monitor model.

How you will check your progress

- Checkpoint

Unit objectives

- Describe the components of the IBM Business Monitor development toolkit
- Explain the monitor model and define monitoring concepts
- Explain the following monitor model elements:
 - Inbound event
 - Outbound event
 - Metric
 - Map
 - Stopwatch
 - Counter
 - Trigger

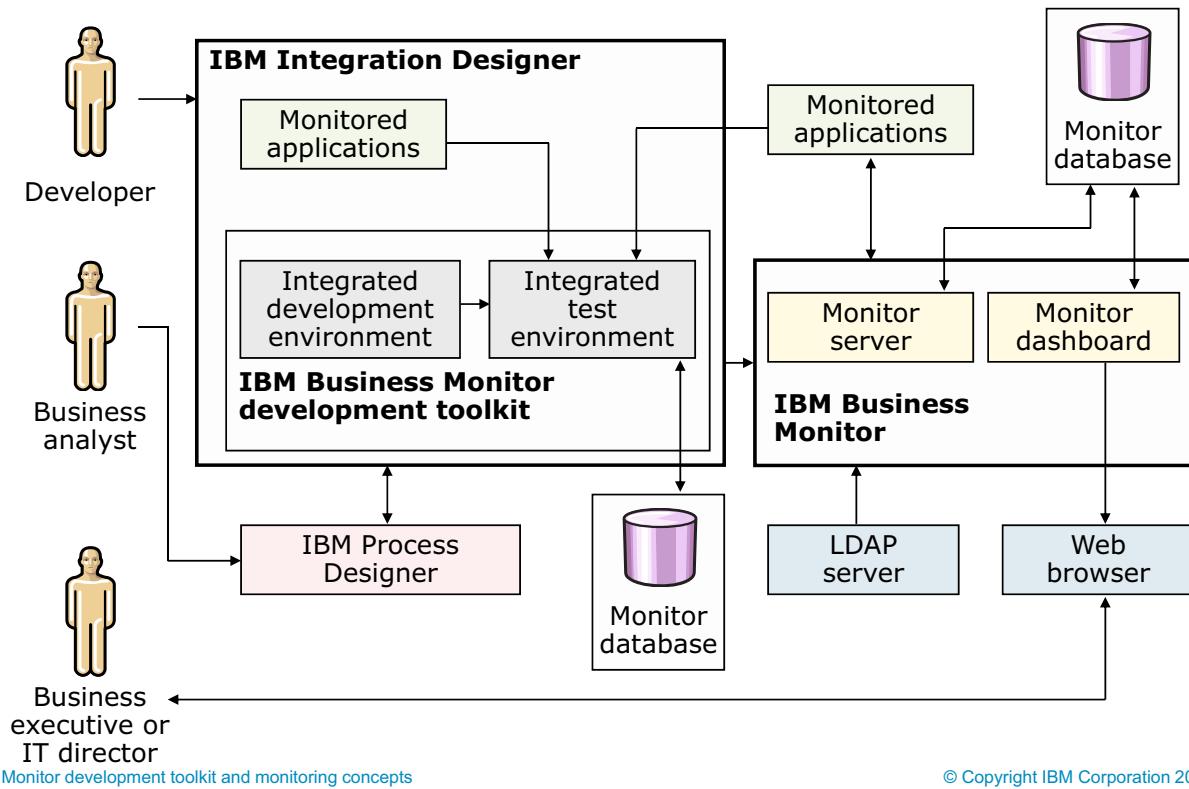
IBM Business Monitor development toolkit (1 of 2)

- Provides the tools for creating monitor models that can be transformed into executable code for IBM Business Monitor
- Runs inside IBM Integration Designer or Rational Application Developer
- Includes the Monitor model editor and unit test environment
 - The Monitor model editor is a visual editor for creating monitor models
 - The unit test environment is a lightweight environment for testing the monitor model in IBM Integration Designer and requires no prerequisites

IBM Training



IBM Business Monitor development toolkit (2 of 2)



Monitor development toolkit and monitoring concepts

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Figure 4-3. IBM Business Monitor development toolkit (2 of 2)

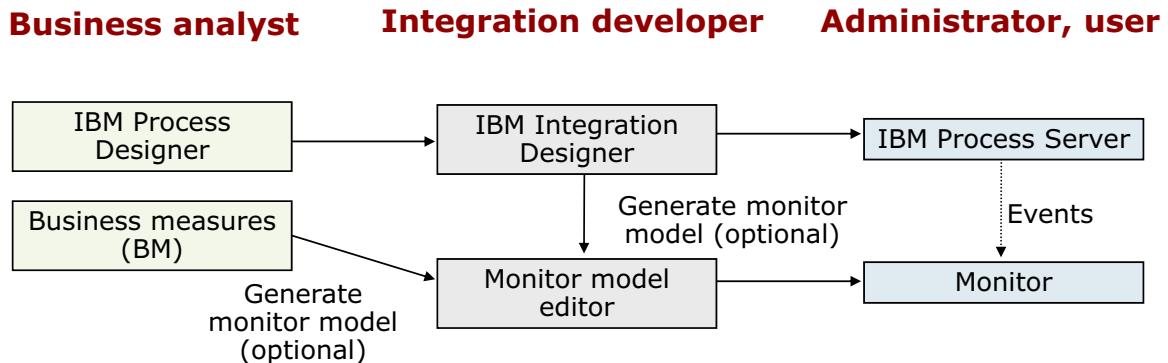
The diagram illustrates the high-level architecture of IBM Business Monitor development toolkit and IBM Business Monitor. It shows how they relate to each other and their interfaces with external components.

The diagram can be divided into two sections, as highlighted. The right side describes the Monitor runtime environment; the center describes the development environment. The toolkit can be installed into an existing IBM Integration Designer, as shown, or a Rational Application Developer environment. The development toolkit consists of two main components: the Monitor integrated development environment and the Monitor integrated test environment.

- The Monitor integrated development environment includes the Monitor model editor.
 - The Monitor model editor is a visual editor for creating monitor models. Developers can create monitor models from scratch or can import preliminary monitor models from IBM Process Designer.
- The Monitor integrated test environment includes a complete single IBM Business Monitor server, including Business Space.
 - With the Monitor test environment, developers can deploy monitor models to an IBM Business Monitor server, configure Monitor action services, and view the data in the business space.

- Developers can create test events and emit them.
- The Monitor test environment is installed on one of the following environments:
 - In WebSphere Application Server test environment if using IBM Integration Designer
 - WebSphere Application Server test environment if using the Rational Application Developer
- You must use the same version of the development toolkit as the server that you plan to use to deploy the monitor model. For example, if you use IBM Business Monitor development toolkit V8.5.7 to create your monitor model, you must use IBM Business Monitor server V8.5.7 to deploy the model in a production environment.
- Restriction: Only CEI-based monitor models are supported for use with the Integrated Test Client.

Role-based business measures development

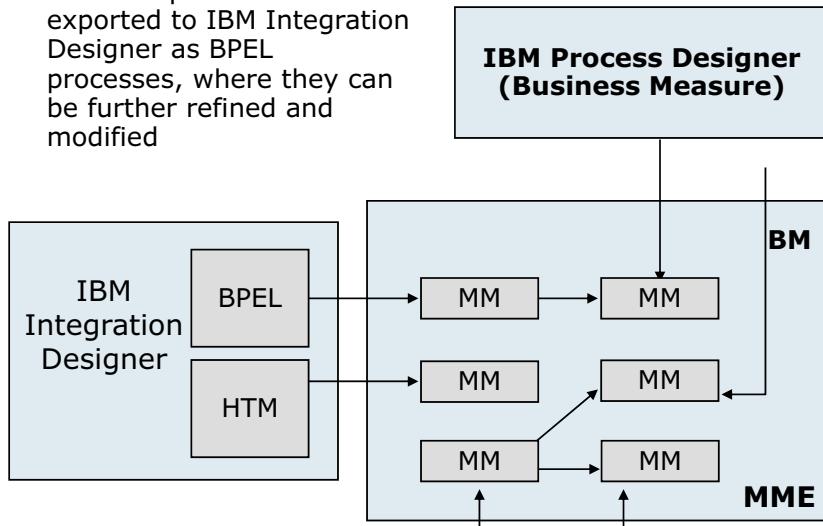


1. Business analyst creates a high-level monitor model (MM) in IBM Process Designer
2. Integration developer creates the final monitor model in the Monitor model editor (MME)
3. Monitor model editor is loosely coupled with the modeled process
 - Allows BAM without dependency on a business process model
 - High flexibility

Figure 4-4. Role-based business measures development

Monitor tool overview

- Business processes are exported to IBM Integration Designer as BPEL processes, where they can be further refined and modified



- User creates high-level MMs to be further refined and implemented in the MME
 - MMs are created independently of the (optional) BPEL or BPMN representation of the process

- MMs do not need to be based on BPEL or BPMN processes
 - They can be created to collect events from any Common Base Event producer (including runtime systems or other monitor models)

- The MME user can connect a “technical” or low-level MM with a higher-level MM
 - Communication between these MMs is accomplished through outbound or inbound events

Monitor development toolkit and monitoring concepts

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Figure 4-5. Monitor tool overview

The MME does not distinguish between the source of the MM, whether it was created from a BPEL or BPMN process or directly within the MME itself. All can be deployed and monitored on the dashboard.

Monitor model editor

- Monitor models are defined with the sets of views that are organized in the Business Monitoring perspective
- Monitor model project resources are organized in the Project Explorer view in catalogs:
 - Event definitions: Use the Integrated Event Definition editor of IBM Integration Designer to create custom event definitions
 - Monitor models: Defined as XML files by using the `monitor.xsd` schema (`.mm` files)
 - SVG diagrams
- Monitor model editor components:
 - Monitor details model
 - Monitoring flow view
 - KPI model
 - Dimensional model
 - Visual model
 - Event model
 - XML-based text editor

[Monitor development toolkit and monitoring concepts](#)

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Figure 4-6. Monitor model editor

The Monitor model editor is in one of the Business Monitoring Eclipse perspectives. This perspective organizes projects with the project explorer navigation view. Each project view contains a category to organize the monitor models that are implemented within it. The monitor models are created and edited with different editors.

The Monitor details model editor is where the metrics are designed. This view also offers an associated monitoring flow view to see a diagram of the relationships of the various elements in the Monitor details model.

The KPI model editor is where the key performance indicators are designed.

The dimensional model editor allows users to design dimensions and associated aggregate metrics.

You can use the visual model editor to associate SVG diagrams to visually reflect changes in the measures.

The event model editor organizes the definitions of the subscribed events for the monitor model.

Finally, there is an XML-based text editor view where you can edit the monitor model directly with the XML elements.

In the Project Explorer, you can also view the Integrated Event Definition editor of IBM Integration Designer. You use this tool to create custom event definitions and those events that are emitted

from Monitoring Models, and also a category for organizing SVG files and an associated viewer. They can be associated to the monitor models to provide a visual component of the measures.

Monitor model (1 of 3)

- Describes business measures (such as metrics and key performance indicators), their dependencies on incoming events, conditions warranting business actions (business situations), and outbound events that report such conditions and might trigger business actions
- Specifically, the monitor model describes how to:
 - Gather information from events that are stored in a data warehouse for reporting
 - Group events about the same monitored entity
 - Structure this information (for example, to allow dimensional analysis)
 - Combine this information (for example, to identify trends)
 - Identify business situations in near real-time, and trigger resulting actions by sending out events
- The monitor model defines these steps in enough detail to allow their execution in a runtime environment for business monitoring (which is called a *monitor*)

Figure 4-7. Monitor model (1 of 3)

The key to having a successful set of business measures is deciding upon the few key measures that are linked to your success. First, determine your business goals and the business measures against which you can compare your current performance with these goals. Such business measures can include financial data, time-related data, throughput measures, or other performance indicators. Next, determine the business events that contain the information that is required to calculate the business measures. They can come from business applications, process engines, or other systems. Such events often include order entry notifications, delivery notifications, and events that report warehouse inventory transactions. Next, create a monitor model that includes subscriptions to the events that are of interest. Add instructions to the monitor model to describe how to calculate business measures from event data. Based on this model, Monitor then provides the required business measures both in real time and historically.

In IBM Business Monitor, monitor models are represented as Extensible Markup Language (XML) documents. The XML specifies how values are extracted from Common Base Events at run time and collected, combined, and stored for representation on a dashboard. A monitor model consists of several parts that describe different aspects: the Monitor details model, the data mart model, the KPI model, the visual model, and the event model.

Monitor model (2 of 3)

- The monitor model is the top-level container
- Monitor details model
 - Monitoring contexts, metrics, and triggers
- Key performance indicator (KPI) model
 - KPI contexts and KPIs with their events and triggers
- Dimensional model
 - Cubes, dimensions, and measures
- Visual model
 - Diagrams that are associated with monitoring contexts and KPI contexts for display in the dashboard
- Event model
 - References to event definitions for all inbound and outbound events

Figure 4-8. Monitor model (2 of 3)

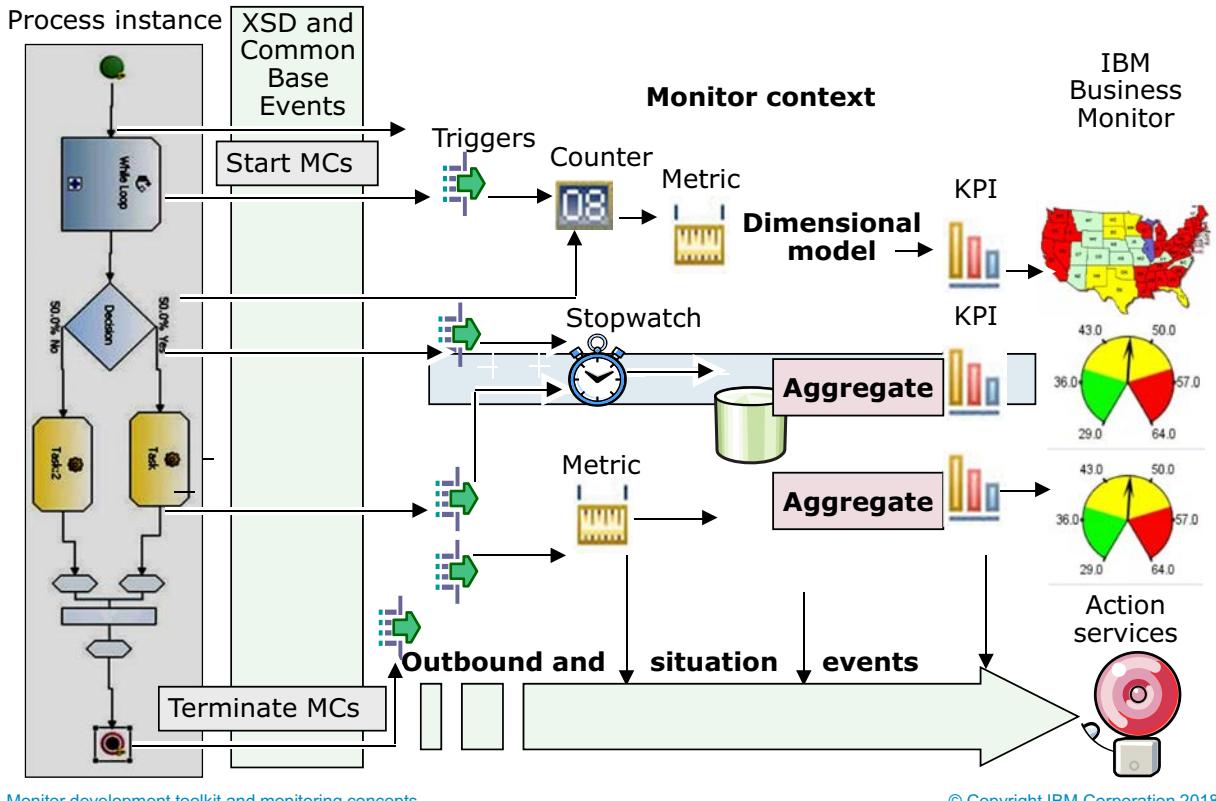
The monitor model is the top-level container. It contains various parts:

- The **Monitor details model**, where the monitoring contexts, metrics, and triggers are designed
- The **key performance indicator (KPI) model**, where the KPI contexts and KPIs with their events and triggers are designed
- The **dimensional model**, where the structures in forms of cubes, dimensions, and measures are designed, and dimensional reports and analysis, which are designed with IBM Cognos BI
- The **visual model**, where the visual diagrams are associated with monitoring contexts and KPI contexts for display in the dashboard
- The **event model**, which contains references to event definitions for all inbound and outbound events that are used in the monitor model

IBM Training



Monitor model (3 of 3)



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Figure 4-9. Monitor model (3 of 3)

This slide shows how KPIs are built from high-level business measure constructs. Typically, a trigger starts other constructs such as counters, stopwatches, or metrics calculations. The metric or KPI values can be aggregated over all relevant process instances. Finally, they are displayed in dashboard views as gauges or in other diagrams.

Monitoring concepts (1 of 2)

- Monitoring context
 - Used to group a set of metrics, counter, timers, and triggers that collectively describe how to monitor an “observed instance” (for example, a Process instance)
 - One monitoring context is created in the monitor for each instance (or occurrence) of the observed entity
- Key
 - Used to correlate runtime events with the instance of the monitoring concept
- Inbound events
 - Refer to the Common Base Event type to be received
 - Define criteria for the event to be delivered to a monitoring context by using the keys
- Outbound events
 - Refer to the XSD Events or the deprecated Common Base Event event type to be sent
 - Can specify how to set the attribute values for an event when the event is triggered

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Figure 4-10. Monitoring concepts (1 of 2)

A **monitoring context** is a container that is used to group a set of metrics, counters, timers, and triggers that collectively describe how to monitor an “observed instance” (for example, a process instance). One monitoring context is created in the monitor for each instance (or occurrence) of the observed entity.

A **key** is a unique value that is associated with a monitoring context instance. It is used to correlate runtime events with the instances of the monitoring contexts that receive the event. When you define the monitoring context, you must create at least one metric that has the *isPartOfKey* attribute set to **true**.

Inbound events refer to the XSD events or the deprecated Common Base Event *event type* to be received:

- Define criteria for the event to be delivered to a monitoring context with the keys
- Can optionally specify a filtering condition

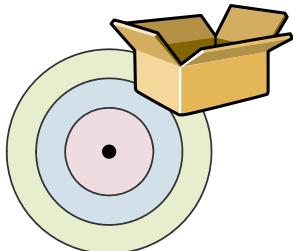
Outbound events refer to the XSD events and the deprecated Common Base Event *event type* to be sent:

- Where appropriate, can specify how to set the event attribute values when the event is triggered
- Can optionally specify a filtering condition

Monitoring concepts (2 of 2)

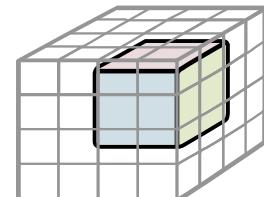
- KPI context
 - Before defining KPIs in your model, you must create one or more KPI contexts, which act as containers for the KPIs
 - Defined at the KPI model level
- KPI
 - Driven by cubes
 - Can be qualified by time periods or other dimensions
 - Data can be aggregated before a monitoring context terminating
 - Can only be of the types decimal and duration (default is decimal)

KPI model concepts

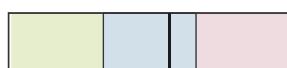


KPI context

Container for managing key performance indicators

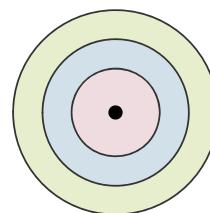


KPI



KPI range

Defines boundaries of acceptable values for a KPI



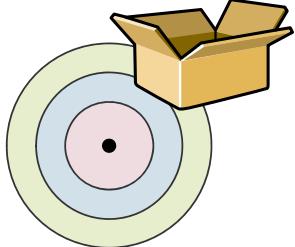
KPI target

Specified value for a KPI

Figure 4-12. KPI model concepts

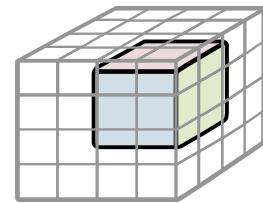


KPI example



Container for managing key performance indicators

Aggregate values across time periods



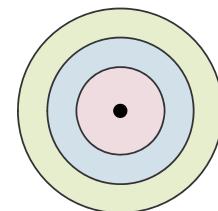
KPI context: CustomerExampleKC



Defines boundaries of acceptable values for a KPI

KPI range

Start	End	Name	Color
0	30 secs	Excellent	Green
30 secs	1 min	Good	Blue
1 min	2 min	Fair	Black
2 min	1 min	Poor	Red



Specified value for a KPI
KPI target: 30 secs

Figure 4-13. KPI example

Monitor details model (1 of 2)

Container for monitoring contexts and their associated metrics, keys, counters, stopwatches, triggers, and events

Elements are:

- Monitoring context (MC) definition
 - Defines structure and behavior of MC instances
- Inbound event definition (event subscription)
 - Defines an event entry point (receiving slot) in an MC and conditions for event subscription
- Outbound event definition
 - Defines an event exit point (sending slot) in an MC and conditions for event emission

Figure 4-14. Monitor details model (1 of 2)

A monitor model consists of several parts that describe different aspects: the Monitor details model, the KPI model, the dimensional model, the visual model, and the event model. The Monitor details model is a container for monitoring contexts and their associated metrics, keys, counters, stopwatches, triggers, and events. The Monitor details model holds most of the monitor model information.

Monitor details model (2 of 2)

- Metric definition
 - Counter and stopwatch (timer) are special cases
 - Subset of metrics defines MC key
- Trigger definition
 - Defines a conditional, internal signal (not emitted to event bus)

Figure 4-15. Monitor details model (2 of 2)

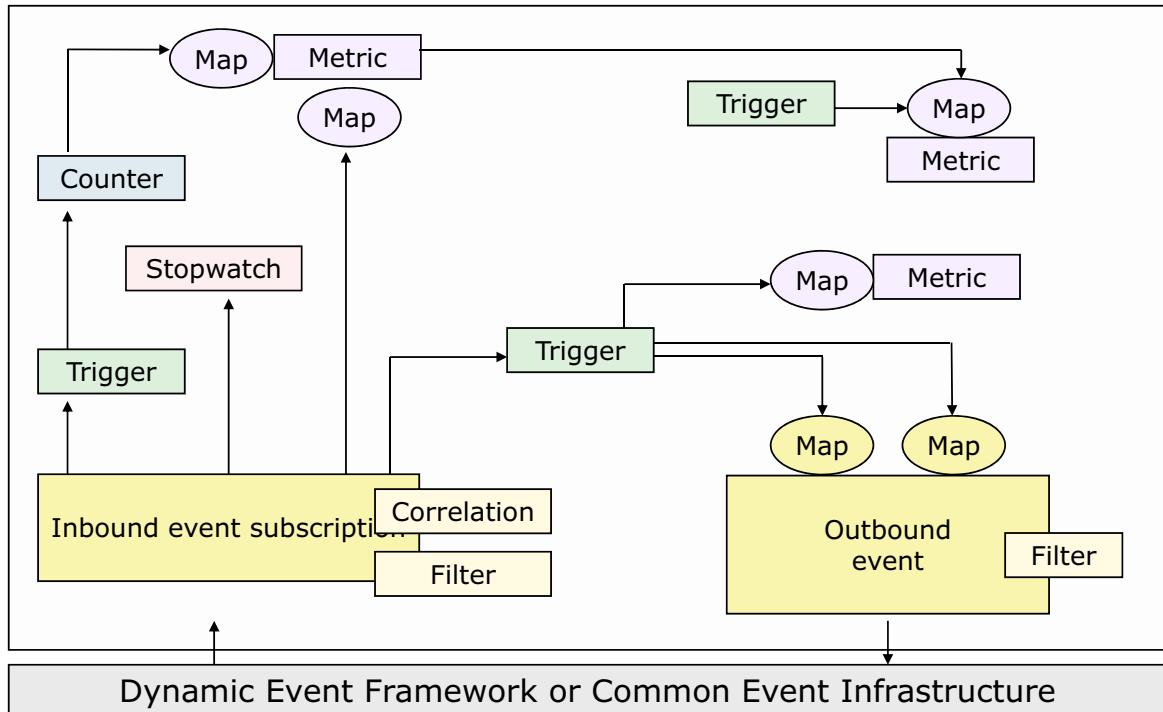
The Monitor details model also defines the metrics that the model collects. The counter and the stopwatch are two special types of metrics that are included in the toolkit.

Remember that a subset of metrics defines the monitoring context key.

A trigger defines a conditional internal signal (not emitted to the event bus) that fires actions within the monitoring context.

The elements of a monitor model

Monitoring context



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Figure 4-16. The elements of a monitor model

This slide shows the elements that can be in a Monitor details model:

- Monitoring context definition
- Inbound event definition (event subscription)
- Outbound event definition
- Metric definition
- Counter definition
- Stopwatch definition
- Trigger definition
- Map

All of them use expressions that set the content of metrics and outbound events at run time. The arrows indicate the flow of control between these elements. For example, an incoming event might fire a trigger, which in turn controls a stopwatch; it might also increment a counter, and provide input to a map that updates a metric. Some elements, such as trigger and map definitions, carry expressions: trigger conditions control whether a trigger fires, and map expressions define a map output as a function of its inputs. These expressions can depend on fields that are defined in the

monitoring context (metrics, counters, and stopwatches) and on event attributes if an inbound event causes it to evaluate.

Event sources send events to the Dynamic Event Framework (DEF) or the deprecated Common Event Infrastructure (CEI). These inbound events are delivered to a monitoring context if they are events to which it subscribes. Outbound events from a monitoring context are sent to the Dynamic Event Framework (DEF) or CEI.



Inbound event

- An inbound event is defined to specify that you want this monitoring context to subscribe to a particular event
- Associate the event with a previously defined event type
- Define a filter condition to restrict which events are applicable to this monitoring context
- Define a correlation expression to match the events for an instance with the monitoring context that is tracking that instance
- Specify the action to take when one instance, no instances, or multiple instances are found as a result of evaluating the correlation expression

Figure 4-17. Inbound event

A monitoring-enabled application generates a series of events. To indicate the events that are of interest to the monitoring context, you define inbound events in the Monitor model editor. The inbound events are subscription points or entry points for inbound events in a monitoring context. IBM Business Monitor subscribes to the events you specify, and delivers them to all event entry points with a matching event subscription.

Because the events are being generated elsewhere and IBM Business Monitor is listening for them, you usually import the definitions of the inbound events from somewhere else. For example, if you are monitoring process executions, the workflow engine that runs those processes might predefine the events to which you subscribe.



Outbound event

- Emitted from a monitoring context
- Can be received by any event-processing application
- Refers to a particular event definition that defines its structure, and uses maps to specify the values that each event attribute must have when the event is sent

Figure 4-18. Outbound event

Outbound events can be emitted from a monitoring context. Any event-processing application can receive outbound events. One of these applications is the Adaptive Action Manager in IBM Business Monitor, which allows an administrator to specify the actions to take in response to an event. The receiving application can also be IBM Business Monitor so that an outbound event from one monitoring context can be an inbound event to another monitoring context or to a KPI context.

Each outbound event refers to a particular event definition that defines its structure, and uses maps to specify the values that each event attribute must have when the event is sent. Expressions are optional for each attribute, but attributes for which no expression is specified have no content when the event is sent. Each map must have a trigger. Triggers are optional for maps that update metrics, but are required for maps that populate outbound events.

Each outbound event can optionally have a filter condition that determines whether it is sent. When a trigger fires, if the trigger controls a map that populates an outbound event, the following occurrences take place:

- The associated map is run.
- The filter condition is evaluated.
- If the filter condition evaluates to true, the outbound event is sent.

Metric



- Is a holder for information, usually a business performance measurement, in a monitoring context
- Associated with one or more maps that, when evaluated, give the metric a value
- Can be used alone or in combination with other metrics to define the calculation for a key performance indicator (KPI), which measures performance against a business objective
- Examples of metrics:
 - Working duration of a process
 - Name of the user that is assigned to a task
 - Supplier's response time
 - Cost of the risk assessment step in an insurance process

Figure 4-19. Metric

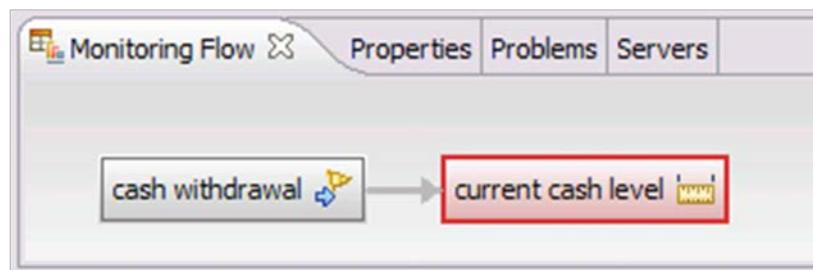
Every metric is associated with one or more maps, which define how the metric gets its value. Maps are used to derive metrics from events, to derive higher-level metrics from lower-level metrics, and to populate outbound events with metric values.

- Each map can optionally have a trigger. The map runs when:
 - Its trigger fires (if it has an explicit trigger).
 - An inbound event that is referenced in the map arrives. If a map references an inbound event in its expression or expressions, the map runs only when that inbound event arrives. A map can reference, at most, one inbound event.
 - A metric or counter that is referenced in the map is updated. If the map has no trigger and does not refer to an inbound event, the map runs when a metric or counter that is referenced in the map changes.

The map expression can reference other metrics in the monitoring context. It can also use the values that are carried with events.

Map (1 of 2)

- Output values are XPath V2.0 expressions
- Input from inbound events, metrics, counters, timers (stopwatches)
- Triggered by
 - Explicit trigger (gated map)
 - Inbound event (gated map)
 - Input value changes, if the trigger is not an explicit trigger or inbound event
- Control logic that is shown in Monitoring Flow graph



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Figure 4-20. Map (1 of 2)

XPath is a language for selecting nodes from an XML document. In addition, XPath can be used to compute values (strings, numbers, or Boolean values) from the content of an XML document.

Map (2 of 2)

```

<outboundEvent displayName="low cash alert" id="lowCashAlert"
    type="./'low cash notification'">
    <map>
        <trigger ref="lowCash"/> ← Explicit trigger
        <outputValue>
            <assignments>
                <assignment leftValue="lowCashAlert/extendedData/ATM"
                    rightValue="ATM_id"/>
            </assignments>
        </outputValue>
    </map>
</outboundEvent>

<metric displayName="current cash level" id="cashLvl" type="xsd:decimal">
    <map>
        <outputValue>
            <singleValue expression=
                "cashLvl - cashWdrwlEvent/extendedData/amount"/>
        </outputValue>
    </map>
</metric>

```

The diagram illustrates two XSD snippets for monitoring. The top snippet shows an outbound event triggered by 'lowCash'. It contains an assignment that sets the ATM ID from the extended data of the lowCashAlert event. The bottom snippet shows a metric triggered by 'cashWdrwlEvent'. Its output value is a single value expression calculating the difference between cashLvl and the amount from the extended data of the cashWdrwlEvent.

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Figure 4-21. Map (2 of 2)

Stopwatch and counter



- Specialized metrics to track elapsed time or to count occurrences
- Stopwatches can be started, stopped, and reset by inbound events or by triggers
- The primary purpose of a stopwatch is tracking the elapsed time since an event arrived, not the time between two events
- Counters can be incremented, decremented, or set to zero by inbound events or by triggers
 - Example: Tracking the number of times a task was started within a loop in the process

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Figure 4-22. Stopwatch and counter

Key performance indicators (KPIs) often depend on elapsed time, or on the number of occurrences of some situation or event. You can define stopwatches and counters, which are specialized metrics, in the Monitor model editor to track elapsed time or to count such occurrences.

Stopwatches can be started, stopped, and reset by inbound events or by triggers. When the stopwatch starts, it begins counting the elapsed time. When the stopwatch stops, it stops counting and keeps its value. If it is started again, it begins counting by adding to the previous stored value. If the stopwatch is reset, it sets the value to zero.

For example, you can use a stopwatch to track the elapsed time since a request was sent, or the time since a process started. The primary purpose of a stopwatch is tracking the elapsed time since an event arrived, not the time between two events. The time between two events can be calculated from the time stamps of those events after the second event arrives. However, to detect timeout situations, a stopwatch is necessary because the event that indicates the end of the period and is monitored might never arrive.

- The value of a stopwatch is always a duration.
- The value of a counter is always an integer.



Trigger

- Detects an occurrence and can cause additional processing in response
- Can be fired based on any of the following occurrences:
 - The value of a metric, counter, or key is updated (even if that does not result in a change)
 - An inbound event arrives or another trigger fires
 - A specific time interval (such as every 10 minutes) has expired
- Can cause any of the following actions:
 - Update of a metric (the value is recalculated each time that the trigger is activated)
 - A change in a stopwatch (stop, start, or reset)
 - A change in a counter (increment, decrement, or set to zero)
 - Transmission of an outbound event
 - Evaluation of a secondary (cascading) trigger
 - Termination of the monitoring context

Figure 4-23. Trigger

Triggers are the control points, the gatekeepers that determine when things happen. Each trigger has one or more occurrences that determine when it might fire, and a condition that determines whether it fires. You can think of the occurrences as defining when the trigger is tested (for example, every 10 minutes), and the trigger condition as the actual condition that is monitored (for example, inventory < threshold).

Triggers can be tested based on the following occurrences, when:

- The value of a metric, counter, or key is updated (even if that does not result in a change)
- An inbound event arrives
- Another trigger fires
- A specific time interval (such as every 10 minutes) expires

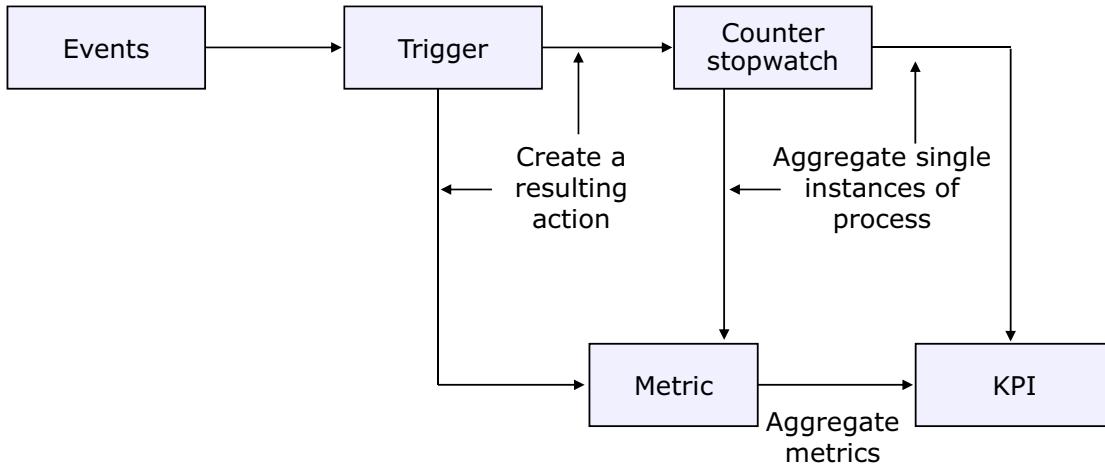
After the occurrence, the condition is evaluated to determine whether the trigger will fire. For example, an inbound event might be received for each new customer order. A trigger might be tested each time a new order event arrives. However, its condition tests the event customer status field for a value of GOLD and returns true only when an order for such a customer arrives. The trigger then fires, setting off some other action.

As soon as its condition is met and it fires, a trigger can cause any of the following actions:

- Update of a metric (recalculation of the value each time the trigger is activated)

- A change in a stopwatch (stop, start, or reset)
- A change in a counter (increment, decrement, or set to zero)
- Transmission of an outbound event
- Evaluation of a secondary (cascading) trigger
- Termination of the monitoring context

Interaction of business measures



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Figure 4-24. Interaction of business measures

Situation events are generated when a business situation arises, such as when a printer runs out of paper or when an ATM runs out of cash.

Metrics, key performance indicators (KPIs), counters, and triggers can all optionally generate situation events that can cause business actions.

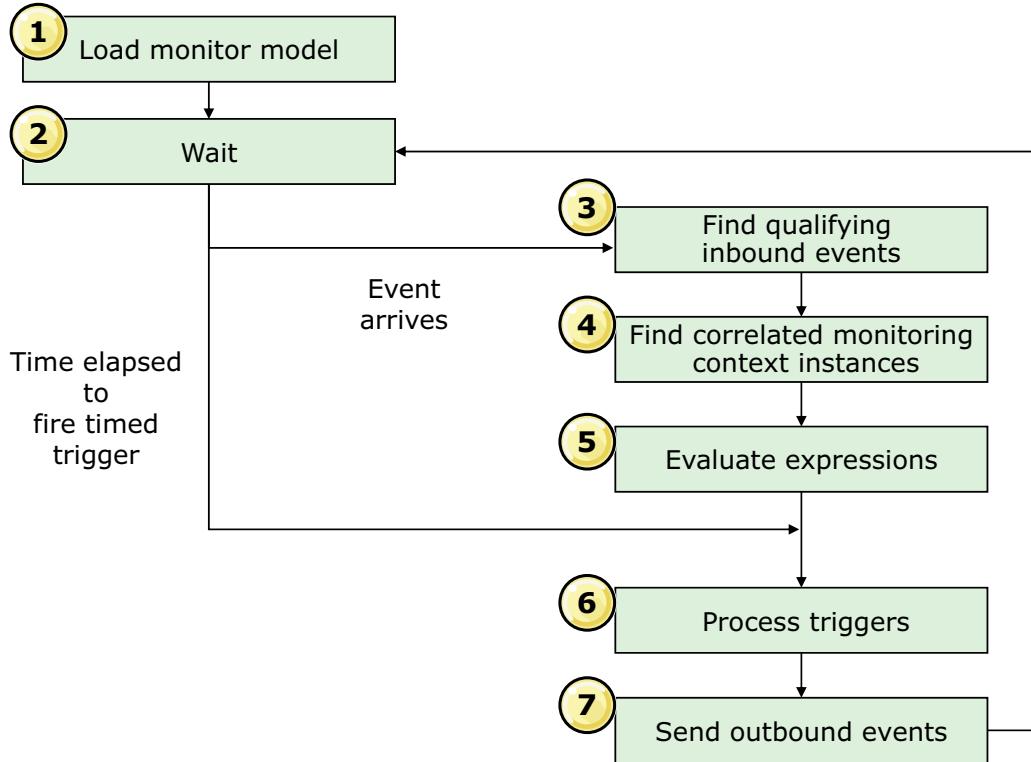
When the process is running after being deployed, IBM Business Monitor is listening for this situation event. The IBM Business Monitor administrator uses the Adaptive Action Manager to specify what happens when the situation event is received. The Adaptive Action Manager has two types of actions: notification actions and service invocation actions. Notification actions take the form of an email, SMS, pager message, or dashboard alert. Service invocation actions start a web service or a BPEL process through a web service invocation.

The events then trigger any of the following actions:

- Incrementing or decrementing a counter
- Starting or stopping a stopwatch
- Evaluating a metric

These values can then be used in calculating aggregate metrics or evaluating KPIs.

Summary: How monitoring works



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Figure 4-25. Summary: How monitoring works

1. Load the monitor model.

At startup, after the monitor model is deployed to the server, IBM Business Monitor server loads the monitor model, which defines its configuration. A monitor model contains one or more monitoring context definitions.

2. Wait.

IBM Business Monitor then waits for one of these occurrences:

- The arrival of an inbound event, after which it proceeds to step 3.
- A time that is defined as the *recurring wait time* for a trigger expires, when it proceeds to step 6.

3. Find qualifying inbound events.

When an inbound event arrives, IBM Business Monitor finds all subscriptions for this type of event in all of the monitor models that are loaded. Event subscriptions are defined through event types and filter conditions at event entry points (which are called inbound event definitions) in a monitoring context definition. Events that have a matching type and that satisfy the filter condition are considered for delivery (through this entry point) to the monitoring context instances. The specific instances for event delivery are determined at the next step.

4. Find correlated monitoring context instances.

If an inbound event is of the required event type and passes the filter of an event entry point, its correlation expression is evaluated. It is evaluated for each existing monitoring context instance in each monitor model that matches the condition in step 3. (Step 3 checks all applications, whereas step 4 finds the matching instances within an application.) This evaluation can result in zero, one, or multiple matches. In each case, model-defined settings determine the action. The possibilities include the following actions:

- Deliver to the matching monitoring context instance
- Deliver to any matching monitoring context instance
- Deliver to all matching monitoring context instances
- Create a monitoring context instance
- Treat as an error
- Ignore the event

After IBM Business Monitor determines which monitoring context instances must receive the event, it delivers the event to each event entry point with a matching correlation predicate and a “deliver event” setting. Events can be delivered to zero or more monitoring context instances.

Steps 5 and 6 occur in each monitoring context instance to which the event was delivered (or in which a trigger occurred).

1. Evaluate expressions.

All expressions that depend on the incoming event are evaluated and update their target metrics. Expressions with input that depend on metrics that were changed are evaluated iteratively to calculate any secondary effects. This behavior is similar to updating a spreadsheet, in which updating one cell can lead to cascading updates of other cells, which are based on spreadsheet formulas. The spreadsheet formulas are the equivalent of these expressions.

2. Process triggers.

The incoming event activates any triggers, and the metric changes. The expiration of a time interval is now checked to see which ones fire. If their conditions evaluate to true, the triggers fire.

Any counters or stopwatches that depend on a trigger are updated: counters are incremented, decremented, or reset; stopwatches are stopped, started, or reset. All metrics that depend on an expression that a trigger controls are updated.

If metrics were updated, new triggers might fire. Steps 5 and 6 are repeated until all cascading effects are processed. A monitor model must not contain any cyclic dependencies, so the cascading effects always end in a finite number of steps.

A trigger controls the outbound events, which have expressions that are evaluated. The event attribute values are entered, and the events are emitted if their filter conditions evaluate to true.

Finally, any monitoring contexts to be terminated as a result of a trigger are marked for termination, and they are terminated after all other effects are processed. Terminated monitoring contexts are unable to receive future inbound events. The values of their metrics and counters are still available to IBM Business Monitor.

3. If applicable, send outbound events.

The Monitor server then continues to wait for events or time triggers (step 2).

Unit summary

- Describe the components of the IBM Business Monitor development toolkit
- Explain the monitor model and define monitoring concepts
- Explain the following monitor model elements:
 - Inbound event
 - Outbound event
 - Metric
 - Map
 - Stopwatch
 - Counter
 - Trigger

Checkpoint

1. The _____ is a visual editor for creating monitor models.
2. True or False: A trigger detects an occurrence and can cause additional processing in response.
3. Which of the following specialized metrics is used to track elapsed time and to count occurrences?
 - A. Stopwatch and counter
 - B. Maps and triggers
 - C. Outbound and inbound events
4. _____ is a holder for information, usually a business performance measurement, in a monitoring context.

Figure 4-27. Checkpoint

Write your answers here:

- 1.
- 2.
- 3.
- 4.

Checkpoint answers

1. Monitor model editor
2. True
3. A: Stopwatch and counter
4. Metric

Unit 5. Using the Monitor model editor to define elements

Estimated time

00:45

Overview

In this unit, you learn about the elements that a monitor model comprises.

How you will check your progress

- Checkpoint
- Exercise

Unit objectives

- Describe how to create a monitor model in the IBM Business Monitor toolkit
- Use the Monitor model editor to create monitor models
- Explain the purpose and use of monitor model templates
- Define the following elements:
 - Inbound event definition (event entry point)
 - Outbound event definition (event exit point)
 - Metric definition
 - Stopwatch definition
 - Counter definition
 - Trigger definition

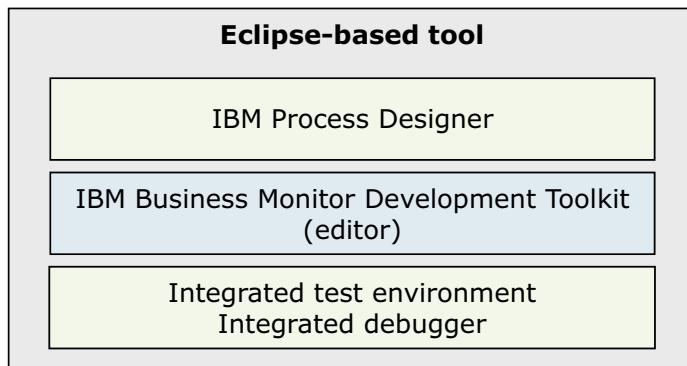
Using the Monitor model editor to define elements

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Figure 5-1. Unit objectives

Monitor model editor environments

- Installed on IBM Integration Designer
 - Other capabilities include monitoring templates and synchronization between application module and monitor model
- Rational Application Developer
 - Install as a plug-in on Rational Application Developer if there is no requirement for monitoring IBM Process Server applications
 - Monitoring templates
 - Synchronization between application module and monitor model



Using the Monitor model editor to define elements

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Figure 5-2. Monitor model editor environments

Monitor model editor

- Monitor models are defined with the sets of views that are organized in the Business Monitoring perspective
- Monitor model project resources are organized in the Project Explorer view in catalogs:
 - Event definitions: Use IBM Integration Designer to create custom event definitions
 - Monitor models: Defined as XML files that by using the `monitor.xsd` schema (`.mm` files)
 - SVG diagrams
- Monitor model editor components:
 - Monitor details model
 - Monitoring flow view
 - KPI model
 - Dimensional model
 - Visual model
 - Event model
 - XML-based text editor

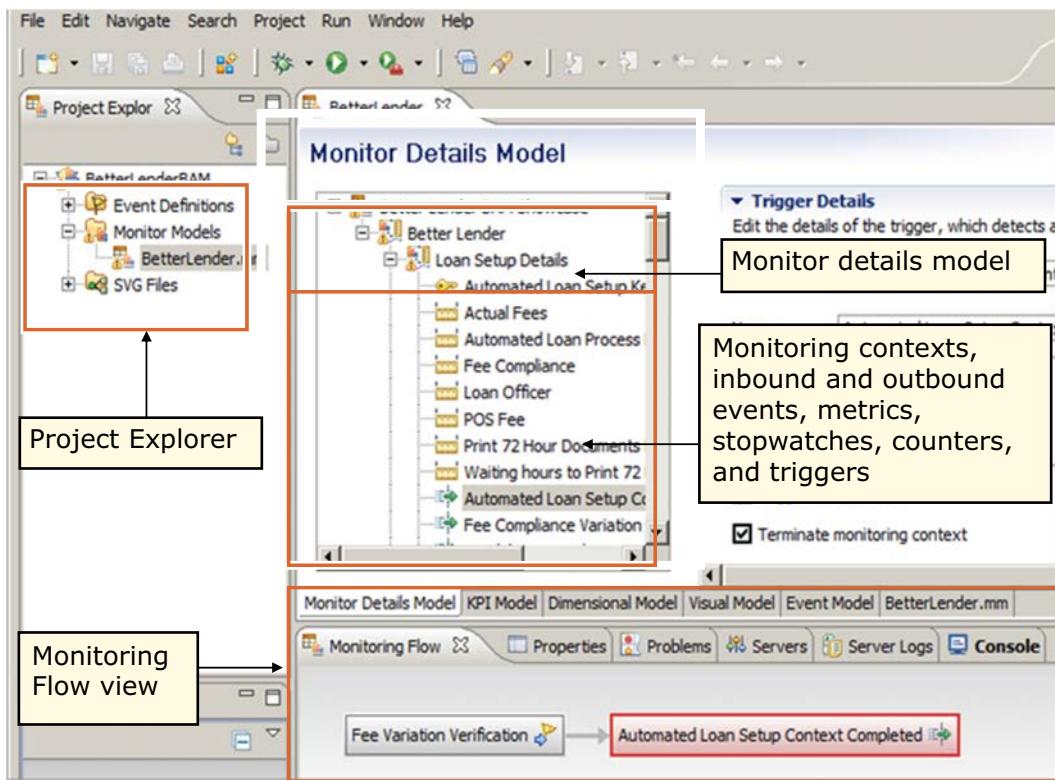
[Using the Monitor model editor to define elements](#)

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Figure 5-3. Monitor model editor



Monitor model editor: Graphical editor



Using the Monitor model editor to define elements

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Figure 5-4. Monitor model editor: Graphical editor

This figure shows the main part of the toolkit interface: the Monitor details model. You can define monitoring contexts, inbound and outbound events, metrics, stopwatches, counters, and triggers.

Monitor model editor: XML editor

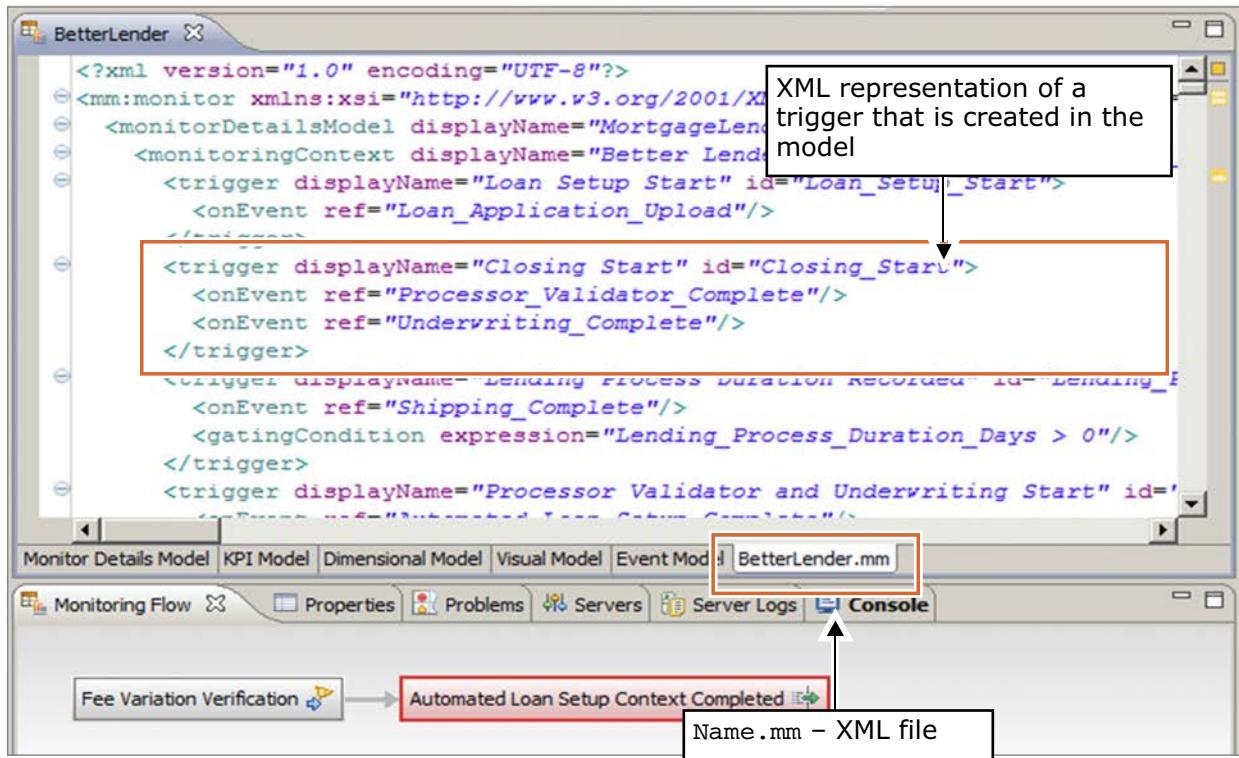


Figure 5-5. Monitor model editor: XML editor

In the monitor model file, you can see the XML representation on the **MM** tab, which is the last tab. You can edit the XML directly, or use the GUI. The changes that are made with the GUI are reflected in the XML file.

Monitoring context (MC) definition (1 of 3)

- Defines structure and behavior of monitoring contexts (instances)
 - Similar to the “class definition” in Java, whose instances (objects) are the monitoring contexts
- Defines all of the data that must be collected about a monitored entity as the system is running
- The runtime instances collect information that is useful for making business decisions
- The information is extracted from data that inbound events carry
 - It is held in metrics, counters, and stopwatches, which represent the business measures that a monitoring context collects

[Using the Monitor model editor to define elements](#)

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Figure 5-6. Monitoring context (MC) definition (1 of 3)

A monitoring context definition defines all of the data that must be collected about a monitored entity while the system is running. Its runtime instances (monitoring context instances) can be considered event-processing agents that are dedicated to monitoring a particular (real or abstract) entity. This entity might be, for example, a particular process execution, the state of a particular order, or the stock level of an item in a warehouse. They collect information, which, individually or in combination, is useful for making business decisions. The inbound events carry the data that extracts the information. The data is held in metrics, counters, and stopwatches, which represent the business measures that a monitoring context collects.

A monitoring context can be thought of as a shadow image of an entity to be monitored, which is used to group the business measures associated with that entity, and which:

- Subscribes to events that report the state changes of the entity
- Uses information that is extracted from these events to update the business measures that describe the entity observed state

Stated differently, the monitor captures events to keep shadow images of entities synchronized with their real or abstract counterparts, and to allow their observation on a business dashboard. These shadow images are called monitoring contexts because they provide a context, within the monitor, to receive and correlate events from the observed entity. They also build up-to-date state information, and detect business situations of the entity that might require action.

The Monitor details model contains definitions of monitoring contexts.

Monitoring context (MC) definition (2 of 3)

Monitoring context lifecycle:

- Created through the inbound event: If no correlating MC is found and `noCorrelationMatches = createNewContext`
 - New MC is instantiated
 - All fields are initialized
 - All updates from inbound event are processed
- Terminated through the trigger
 - If `terminateContext` attribute for the trigger is true
- MC definitions can be nested
 - This nesting capability allows a whole-part relationship of monitored entities (process-activity, order-item, power station-reactor)

[Using the Monitor model editor to define elements](#)

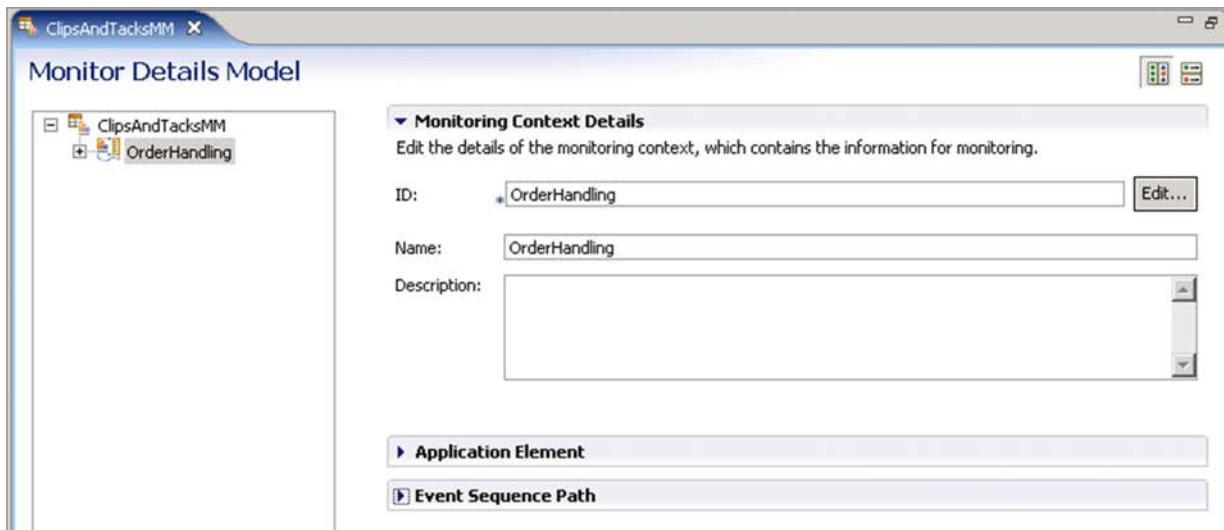
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Figure 5-7. Monitoring context (MC) definition (2 of 3)

IBM Business Monitor creates a different instance of a monitoring context definition for each instance of the corresponding observed entity. For example, to monitor a network of ATMs, you create one monitoring context definition for ATM entities that are instantiated as many times as there are cash machines to be monitored. The resulting monitoring contexts (the instances) are in a one-to-one correspondence with the observed ATMs. Each monitoring context must contain a key to relate it to the corresponding instance. In the ATM example, this key might be the ATM machine number. For a process execution, this key might be the process instance ID; for a purchase order, the order number; and for a warehouse item, a *stock keeping unit* (SKU) number. Keys can also have multiple parts. For example, if an airline wants to monitor flights, an airline code identifies each flight along with flight number and departure date.

The creation of a monitoring context usually happens as a result of the first inbound event from the monitored entity. The logical termination occurs when the monitoring context instance or the monitored entity reaches a final state. Monitoring contexts can form a hierarchy, and when a monitoring context instance is terminated, any descendant context is terminated as well.

Monitoring context (MC) definition (3 of 3)



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Figure 5-8. Monitoring context (MC) definition (3 of 3)

The following items are important to the monitoring context:

- Application elements:

When a monitoring context is generated from an IBM Process Server application, the monitoring context is associated with the application element that it is monitoring. For example, a monitoring context can be associated with a particular Business Process Execution Language (BPEL) process or activity, a Service Component Architecture (SCA) component, or a business state machine or a BPMN process. Collectively, this set of elements within the application that can be associated with monitoring contexts is known as an application element (or sometimes, as an event source). The application element is the source of events for the monitoring context.

- Event sequencing:

If you know that events are likely to arrive out of order at run time, you can specify an XML Path Language (XPath) expression that points to an event attribute in an inbound event. The event attribute indicates the order in which the monitor processes the inbound events. If you specify this path at the monitoring context or KPI context level, the path is used for all of the contained and descendant inbound events. You can override it for individual inbound events by specifying a path to an event attribute for the inbound event.

Inbound event definition: Event point key and filter (1 of 2)

- Event point key
 - When events are emitted to IBM Business Monitor, they include an event point key as part of the XML
- Event point filter
 - The event point filter defines which events are included in the subscription when a monitor model is deployed
 - Events that use the Dynamic Event Framework are only emitted to a monitor model if the events are defined in the event point filter
- When you are using IBM Business Process Manager, BPMN and BPEL applications can generate monitor models
 - The event point keys in a generated monitor model must not be changed
 - If you are manually crafting a business activity model, you can define the event point filter to emit a few specific events or a broad range of events to the monitor model

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Figure 5-9. Inbound event definition: Event point key and filter (1 of 2)

Monitor models have an event point key, which is used when events are emitted to Business Monitor. The key is part of the XML. The event point filter defines which events the model subscribes to when it is deployed and events are emitted from the event sources. Events that use DEF are only emitted to a monitor model if the events are defined in the event point filter.

Event point keys are generated in IBM BPM, BPMN, and BPEL applications when you use the wizards to generate a monitor model. These keys must not be changed and are shown as read only in the generated monitor model. If you are manually creating a monitor model, you can define the event point filter to emit some specific events or a range of events, depending on your definitions in the monitor model.

Inbound event definition: Event point key and filter (2 of 2)

- When you create the monitor model:
 - Specify the attributes from the event point key that you want to monitor and provide an event point filter as part of the event description
 - The Dynamic Event Framework uses the filter values to route events directly to your monitoring model event processing
- Event point filters specify which events are emitted
 - If you are using IBM Business Process Manager, the event point filter can configure the BPMN engine to emit events only if the process application name is MortgageLending, the snapshot version is 1.0, the process name is LoanProcessing, and the activity name is LoanApproval
- Events are sent only if something such as a monitor model subscribes to them
 - New subscriptions take effect dynamically
 - The event point filter is where that subscription is specified

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Figure 5-10. Inbound event definition: Event point key and filter (2 of 2)

When you create a monitor model, you specify the attributes from the event point key and event point filter that you want to monitor as part of the event description. The Dynamic Event Framework uses the filter values to route events directly to the monitoring model event processing. The event point filters specify which events are emitted.

KEY POINT: This methodology for emitting events from applications is different from the past. In the past, you specified what events to emit as part of authoring your emitting application (the events were specified in a .mon file inside the process application). To change the events that were emitted, you had to publish a new snapshot of that process application. Now event emissions are dynamic and sent only if something such as a monitor model subscribes to them.

Inbound event definition: Event point key attributes

Attribute	Possible Values	Example
Application Name	The name of the application that is the source of the events to monitor	PROCESS1
Version	The version of the application to monitor	2064.add1501f-0935-4af4-a205-cff82c36ed1aT
Component Type	The type of the component to monitor	BPD
Component Name	The name of the component to monitor	MyProcess
Element Type	The type of element to monitor	ACTIVITY
Element Name	The name of the element to monitor	LoanActivity01
Nature	The nature of the event. One element can send various events, such as STARTED, ACTIVE, COMPLETED	STARTED

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Figure 5-11. Inbound event definition: Event point key attributes

This table shows the event point key attributes and some possible values. Seven attributes are either generated for you if you generate the monitor model from a process that is supported, or you must define them if you manually develop a monitor model event definition. See the Monitor Information Center for complete descriptions of the event point key attributes.

If you manually define a filter rather than using generated values, every field in the event point filter must have a valid value or an asterisk (*) to indicate that the field is not used. Suppose that the filter had an application with the name “MortgageLending” and an element name “LoanApprovalActivity”, and all the rest of the attributes had an asterisk (*) in the attribute field. Then, the monitor model would use all events that matched that combination.

Inbound event definition: Event Type Details (1 of 2)

- Event type must inherit from XSD Events or Common Base Events
 - Subtypes define XSDs or Common Base Event extended data elements and user-definable properties
- Event type and filter expression define an event subscription
- Correlation predicate defines the target MC
 - Evaluated for all existing MC instances
 - Can result in zero or one or multiple matches
 - Correlation settings define what to do in each case
- Can cause same effects as trigger (except MC termination)

no correlation match	ignore event	treat as error	<i>create MC instance</i>
one correlation match	ignore event	treat as error	deliver event
multiple correlation matches	ignore event	treat as error	deliver event to any or all MCs

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Figure 5-12. Inbound event definition: Event Type Details (1 of 2)

Inbound event definition: Event Type Details (2 of 2)

- An Extension name, event parts or both can be specified
- The following example is from a generated model by using a BPEL application
- The information is read-only because the model was generated from the BPEL application

▼ Event Type Details (Read-only if managed by application)

Specify the event type or the XML schemas that together describe the structure of this inbound event. You can specify an extension name, event parts, or both.

Extension name:	<input type="text"/>	<input type="button" value="Browse..."/>	<input type="button" value="Clear"/>																												
Event parts:	<table border="1"> <thead> <tr> <th>ID</th> <th>Name</th> <th>Type</th> <th>Path</th> </tr> </thead> <tbody> <tr> <td>BaseData</td> <td>BaseData</td> <td>wbi:Event</td> <td>wbi:event</td> </tr> <tr> <td>EventHeaderData</td> <td>EventHeaderData</td> <td>wbi:EventHeaderData</td> <td>wbi:event/wbi:eventHeaderD...</td> </tr> <tr> <td>BPELData</td> <td>BPELData</td> <td>bpc:BPC.BFM.ACTIVITY.S...</td> <td>wbi:event/wbi:eventPointDat...</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			ID	Name	Type	Path	BaseData	BaseData	wbi:Event	wbi:event	EventHeaderData	EventHeaderData	wbi:EventHeaderData	wbi:event/wbi:eventHeaderD...	BPELData	BPELData	bpc:BPC.BFM.ACTIVITY.S...	wbi:event/wbi:eventPointDat...												
ID	Name	Type	Path																												
BaseData	BaseData	wbi:Event	wbi:event																												
EventHeaderData	EventHeaderData	wbi:EventHeaderData	wbi:event/wbi:eventHeaderD...																												
BPELData	BPELData	bpc:BPC.BFM.ACTIVITY.S...	wbi:event/wbi:eventPointDat...																												
	<input type="button" value="Add"/>	<input type="button" value="Remove"/>																													

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Figure 5-13. Inbound event definition: Event Type Details (2 of 2)

Outbound event definition: Event exit point (1 of 2)

- Event type must inherit from XSD events or from Common Base Events
 - This requirement is the same as for inbound events
- Trigger of event-populating map controls event emission
- Extra emission control through the optional filter

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Figure 5-14. Outbound event definition: Event exit point (1 of 2)

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Outbound event definition: Event exit point (2 of 2)

Outbound Event Details

Edit the details of the outbound event, which is sent by the monitoring context. The type must be an event definition.

ID:	*Late_Order_Shipped_Event	Edit...
Name:	Late Order Shipped Event	
Description:		

Event Type Details

Event Attributes Details

Specify the triggers that cause the event to be sent. Use the Expression column to specify the value for each event attribute when the event is sent.

Name	Type	Expression
late_order_fulfillment	Event	
Property Data		
Extended Data		
OrderProcessingTime	string	X>Y xs:string(Order_Fulfillment_Duration) =?
OrderNumber	string	X>Y xs:string(Order_Number) =?
BusinessSituationName	string	X>Y 'Order handling duration is too long' =?

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Figure 5-15. Outbound event definition: Event exit point (2 of 2)

Metric definition (1 of 2)

- Defines a typed field in an MC
 - Supported types:
`xs:boolean, xs:integer, xs:decimal, xs:string, xs:duration,`
`xs:dateTime, xs:date, xs:time`
- Default value that is set during MC initialization
- Updated through maps
 - Similar to formulas that define the value of a spreadsheet cell
- Subset of metrics defines MC key
 - Value must be unique among child MC instances of same parent
 - Global key is aggregation of “key metrics” in MC and ancestors



Metric definition (2 of 2)

Metric Details

Edit the details of the metric, which is a holding spot for information used in other calculations.

ID:	<input type="text" value="*Order_Status"/> <input type="button" value="Edit..."/>
Name:	<input type="text" value="Order Status"/>
Description:	<input type="text"/>
Type:	<input type="text" value="String"/> <input type="button" value="Edit..."/>
Maximum String Length: <input type="text" value="256"/>	
<input type="checkbox"/> Allocate additional space in database to accommodate Unicode string for globalization	
<input checked="" type="checkbox"/> A value is required for this metric	
Default Value: <input type="text" value="*'New'"/> <input type="button" value="Edit..."/>	
<input type="checkbox"/> This metric can be used for sorting	

Metric Value Expressions

Specify the expressions that set the value of the metric. If a trigger is specified, the map is evaluated when the trigger fires.

Trigger	Expression
Order Shipped Trigger	X=Y =? 'Shipped'
Order Cancelled Trigger	X=Y =? 'Cancelled'

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Figure 5-17. Metric definition (2 of 2)

Stopwatch definition (1 of 2)



- Stopwatch provides specialized metrics
- Can be used for measurement of time between two events
- Can be started, stopped, and reset by triggers or by the arrival of inbound events
- Add to the model tree under the monitoring context
- Define the stopwatch in the form editor
- Accumulating stopwatch:
 - Each start signal is interpreted as the beginning of a new activity with a duration to be measured
 - Each stop signal is interpreted as the end of such an activity
- Stopwatch can be used for sorting and can be indexed in the database

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Figure 5-18. Stopwatch definition (1 of 2)

Stopwatches can be started, stopped, and reset by inbound events or by triggers. When the stopwatch starts, it begins counting the elapsed time. When the stopwatch stops, it stops counting and keeps its value. If it is started again, it begins counting by adding to the previous stored value.

For example, you can use a stopwatch to track the elapsed time since a request was sent, or the time since a process started. The primary purpose of a stopwatch is to track the elapsed time since an event arrived, not the time between two events. The time between two events can be calculated from the time stamps of those events after the second event arrives. However, to detect timeout situations, a stopwatch is necessary because the event that indicates the end of the period and is monitored might never arrive. The value of a stopwatch is always a duration.

Stopwatch definition (2 of 2)



▼ Stopwatch Details

Edit the details of the stopwatch, which keeps track of elapsed time. If an accumulating stopwatch is given two or more start and stop times, the durations are added together to produce an accumulated time.

ID:	<input type="text" value="Order_Fulfillment_Duration"/> *	<input type="button" value="Edit..."/>
Name:	<input type="text" value="Order Fulfillment Duration"/>	
Description:	<input type="text"/>	

This stopwatch is an accumulating stopwatch
 This stopwatch can be used for sorting

▼ Stopwatch Controls

Specify what causes the stopwatch to change and what action is taken.

Trigger / Inbound Event	Resulting Action
New Order Trigger	Start
Order Cancelled Trigger	Stop
Order Shipped Trigger	Stop

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Figure 5-19. Stopwatch definition (2 of 2)

Counter definition (1 of 2)

08

- Counter provides specialized metrics
- Tracks the number of occurrences of a situation or events
- Counters can be incremented, decremented, or set to zero by triggers or by the arrival of inbound events
- The value of a counter is always an integer

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Figure 5-20. Counter definition (1 of 2)

Key performance indicators (KPIs) often depend on elapsed time, or on the number of occurrences of some situation or event. You can define stopwatches and counters, which are specialized metrics, in the Monitor model editor to track the elapsed time or to count such occurrences.

Counters can be incremented, decremented, or set to zero by inbound events or by triggers. You can use a counter to track, for example, the number of times a task was started within a process in which the task is contained in a loop. The value of a counter is always an integer.

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Counter definition (2 of 2)

08

Counter Details
Edit the details of the counter, which counts the number of occurrences of some situation or event.

ID: *

Name:

Description:

This counter can be used for sorting

Counter Controls
Specify what causes the counter to change and what action is taken.

Trigger / Inbound Event	Resulting Action
Ship Order EXIT	Add One

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Figure 5-21. Counter definition (2 of 2)

Trigger definition (1 of 3)



Two important aspects to defining a trigger:

- **When** to evaluate (evaluation strategy)
 - When metric or counter or key value is updated
 - When inbound event arrives
 - When other trigger fires
 - Periodically
- **Whether** to fire (trigger condition)
 - A Boolean condition that depends on fields in the MC (and the event if applicable)

Figure 5-22. Trigger definition (1 of 3)

You must define triggers to cause outbound events to be sent, and you might also want to define triggers to update metrics, stopwatches, or counters that are based on special conditions. To define a trigger, you specify its evaluation times and its trigger condition.

Evaluation times can be either periodic or based on occurrences such as inbound events, value changes of metrics, other triggers firing, or a combination of these elements. When an evaluation time arrives, the trigger condition is evaluated. If the condition is true, the trigger fires. You can prevent repeated firing (for example, to avoid redundant notifications of the same problem) by declaring the trigger nonrepeatable.

Trigger definition (2 of 3)



- Effects
 - Update a metric
 - Start or stop or reset stopwatch
 - Increment or decrement or set-to-zero counter
 - Trigger map
 - Trigger outbound event
 - Trigger evaluation of cascading trigger
 - Trigger termination of monitoring context
- Can be repeatable or nonrepeatable

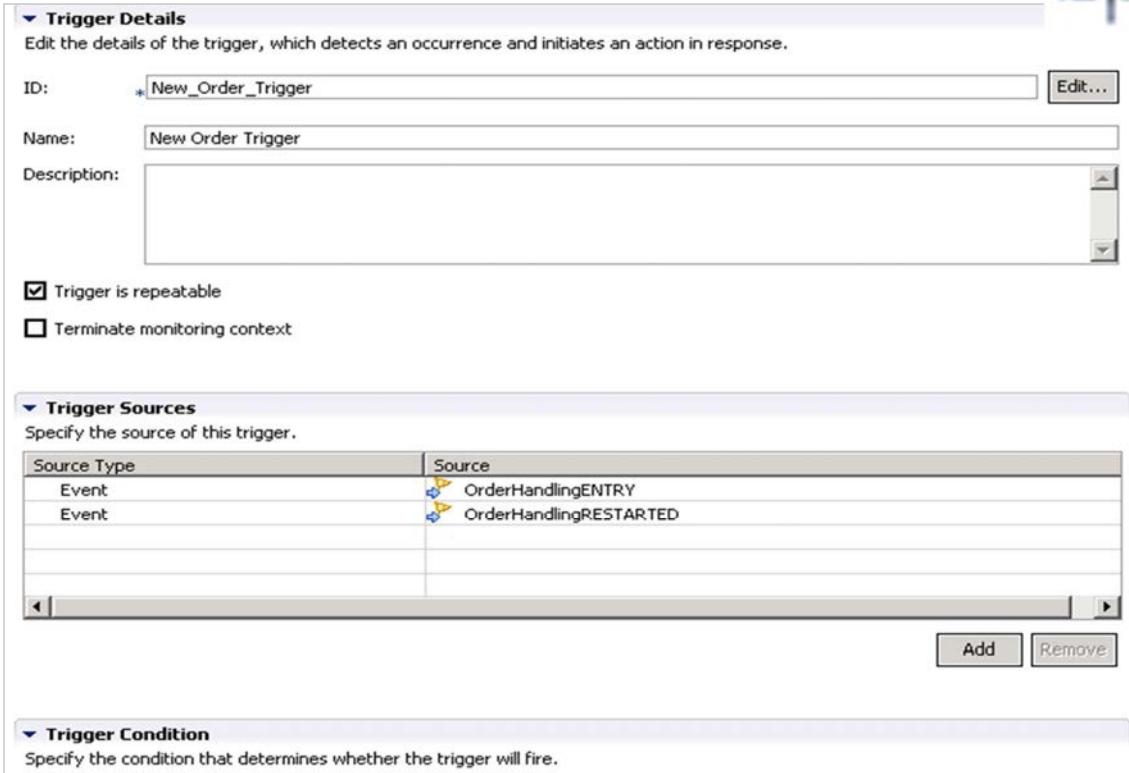
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Figure 5-23. Trigger definition (2 of 3)

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Trigger definition (3 of 3)



Trigger Details
Edit the details of the trigger, which detects an occurrence and initiates an action in response.

ID: *New_Order_Trigger

Name: New Order Trigger

Description:

Trigger is repeatable
 Terminate monitoring context

Trigger Sources
Specify the source of this trigger.

Source Type	Source
Event	OrderHandlingENTRY
Event	OrderHandlingRESTARTED

Trigger Condition
Specify the condition that determines whether the trigger will fire.

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Figure 5-24. Trigger definition (3 of 3)

Unit summary

- Describe how to create a monitor model in the IBM Business Monitor toolkit
- Use the Monitor model editor to create monitor models
- Explain the purpose and use of monitor model templates
- Define the following elements:
 - Inbound event definition (event entry point)
 - Outbound event definition (event exit point)
 - Metric definition
 - Stopwatch definition
 - Counter definition
 - Trigger definition

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Figure 5-25. Unit summary

Checkpoint

1. Name three Monitor model editor view components:

- _____
- _____
- _____

2. True or False: A trigger can be used for measurement of time between two events.

3. Which of the following elements can be set to zero by triggers or by the arrival of inbound events?

- A. Stopwatch
- B. Counter
- C. KPI

4. Name three effects from a trigger:

- _____
- _____
- _____

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Figure 5-26. Checkpoint

Write your answers here:

- 1.
- 2.
- 3.
- 4.

Checkpoint answers

1. Possible answers:

- Monitor details model tab
- KPI model tab dimensional model tab
- Visual model tab
- Event model
- XML-based text editor tab

2. **False.** A trigger is used to cause outbound events to be sent or to update metrics, stopwatches, or counters that are based on special conditions. To define a trigger, you specify its evaluation times and its trigger condition.

3. **B:** Counter

4. Possible answers:

- Update a metric,
- Start or stop or reset stopwatch
- Increment or decrement or set-to-zero counter
- Trigger map or outbound event
- Evaluation of cascading trigger
- Termination of monitoring context

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Figure 5-27. Checkpoint answers

Exercise 4

Creating triggers in a monitor model

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Figure 5-28. Exercise 4

Exercise objectives

After completing this exercise, you should be able to:

- Define triggers in the monitor model

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Figure 5-29. Exercise objectives

Unit 6. Dimensional, KPI and visual models

Estimated time

00:30

Overview

This unit explains the types of common models that are used in business monitoring.

How you will check your progress

- Checkpoint
- Exercise

Unit objectives

- Explain dimensional and visual model support
- Explain the key performance indicators (KPIs) model
- Describe how user-defined functions are used in the monitor model

Dimensional, KPI and visual models

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Figure 6-1. Unit objectives

Dimensions

- Dimensions are data categories that are used to organize and select instances for reporting and analysis
 - Examples of dimensions: time, accounts, products, and markets

- Dimensions are composed of one or more attributes, which are hierarchical
 - Examples of Location attributes: City, Region, and Country

[Dimensional, KPI and visual models](#)

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Figure 6-2. Dimensions

In dimensional analysis, measures are what you add up (such as order quantity, cost of order), and dimensions are how you divide your data (such as time, customer, location, product). You might want to calculate average profit by city, or maximum salary by time.

For example, the location attributes of city, region, and country can be represented in the following dimension hierarchy:

Country

Region

City

Country is at a higher level than region, which is at a higher level than city. If you consider a set of actual values that can fill this structure, you might have the following values at the country level:

- Canada
- United States

At the region level under Canada, you might have the following values:

- Ontario
- Quebec

- Manitoba

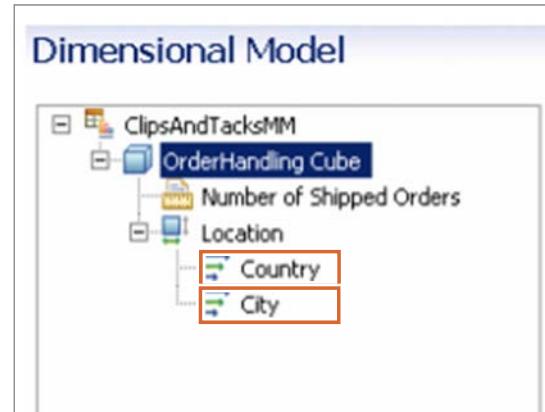
At the region level under United States, you might have the following values:

- Michigan
- Wisconsin
- California

With each level, you can aggregate the levels that are below it; for example, at the country level, you might have the subtotal of all data for all regions within that country. At the region level, you might have the subtotal of all data for all cities within that region.

Dimensional model

- Defines the cubes that are used for storing, retrieving, and analyzing the data that is gathered over time
- A dimensional model cube is associated with only one monitoring context definition
- A default cube is created for each monitoring context definition, but extra cubes can be created
- A dimensional model is implemented in the Monitor server as an optional model when IBM Cognos Business Intelligence is installed
- Aggregated metrics and dimensions categories and attributes are derived from the metrics that are defined in the monitoring context definitions



Dimensional, KPI and visual models

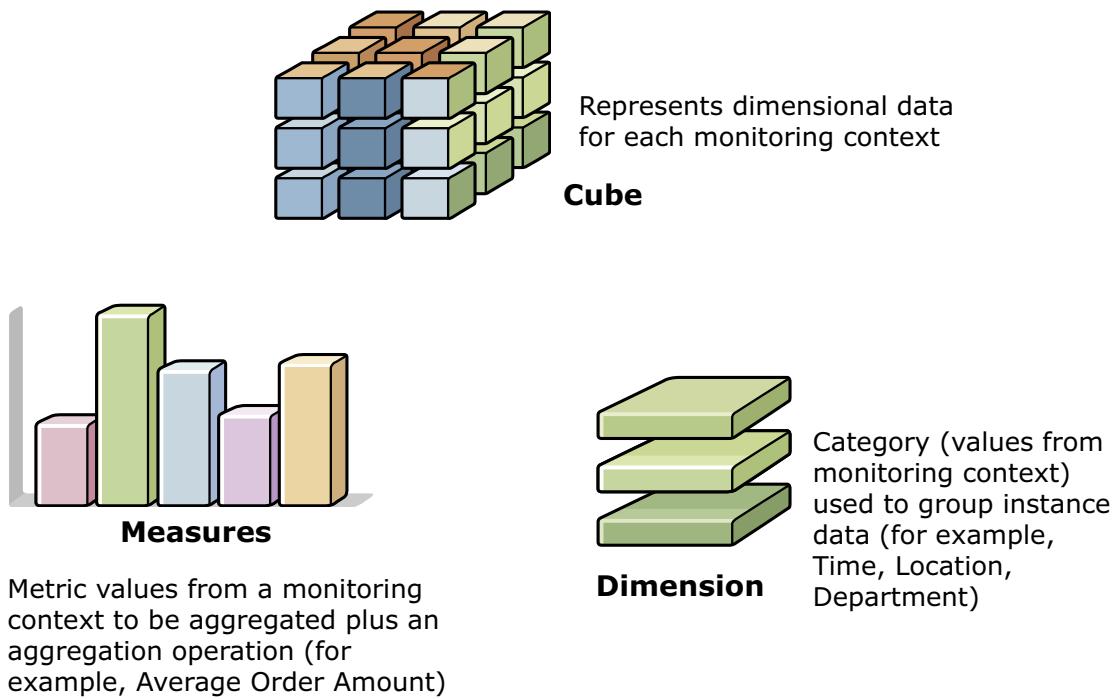
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Figure 6-3. Dimensional model

A Monitor database is a database or collection of databases that contains data that is tailored and optimized for the specific reporting needs of a department or team.

To set up a cube, you specify the facts that you want to track, such as order amount. You specify the aggregate function to apply to each fact to create a measure, such as average order amount or total number of orders. You specify the dimensions that you want, such as order time, location, and sales representative. IBM Cognos BI is an optional component during the Monitor installation.

Dimensional model concepts



Dimensional, KPI and visual models

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Figure 6-4. Dimensional model concepts

To do dimensional analysis in the dashboards, you must use IBM Cognos Business Intelligence with IBM Business Monitor.

Dimensional model: Cube details

- Each cube tracks all the instance metrics values that the monitoring context collects over time
- The cube can combine all the instances of that monitoring context so that you can query aggregate information

Cube Details

Enter the details of the cube, which is a multidimensional representation of data used in the Dimensional Viewer and Report Viewer in the dashboards.

ID:	<input type="text" value="OrderHandling_Cube"/> Edit...
Name:	<input type="text" value="OrderHandling Cube"/>
Description:	<input type="text" value=""/>
Monitoring context:	<input type="text" value="*OrderHandling"/> Browse...

Figure 6-5. Dimensional model: Cube details

When a monitoring context is created, the MME automatically creates an associated cube. However, it is possible to delete cubes so new cubes can be created from the Monitor menu. Each cube must be associated with a monitoring context.

The Cube Details page is where the user can create measures, dimensions, and dimension levels. It also provides a summary of the artifacts that are associated with the cube.

Dimensional model: Measures and dimensions

Cubes contain facts, measures (groups of facts), and dimensions

Measure	Source Metric	Aggregation Function
Number of Shipped Orders	Shipped Order Counter	Sum

Dimension / Dimension Level	Source Metric
Location	

Figure 6-6. Dimensional model: Measures and dimensions

Facts are automatically assigned from the metrics that are defined in the monitoring context.

Measures are defined with metrics that are defined in the monitoring context and apply an appropriate aggregation function, like **sum** or **average**.

Dimensions are defined with hierarchical levels, which extract the value from a source metric. After a metric is used to populate a dimension level attribute, it is removed from the fact table.

Click **New** to create a measure. Base the measure on an existing metric, key, counter, or stopwatch, or choose to create a metric within the monitoring context. Select a valid aggregation function for the metric type.

Click **New Dimension** to add dimensions. Click **New Level** to create a dimension level. The behavior for dimensions and dimension levels is apart from the fact that a metric can be used as both a measure and a dimension.

Facts and measures

- Facts are numeric data that can be examined and analyzed
 - A fact defines the cells in a cube data structure and associates them with metrics, counters, and stopwatches that supply the values
- Measures are calculations that are based on facts
 - A measure points to a fact (such as order amount) and specifies an aggregation function (such as average or sum)
- When you create a metric, key, counter, or stopwatch in the form editor, a fact is added to the fact table
 - Measures can take the instance-based values from the fact and aggregate them to produce a single value
 - They distill the instance information into something that is useful, such as the average order amount, the total order amount (the sum function), or the total number of orders (the count function)

Figure 6-7. Facts and measures

The facts can also be called fact attributes because they are attributes of the fact table. The fact attribute provides the place to store the value because the fact itself is an individual value that is produced at run time.

The dimensional model is the part of the monitor model that contains the cubes that are used for dimensional analysis. The cubes in turn contain measures and dimensions. You can generate multidimensional charts and graphs that are based on historical business performance data by using dimensions and reports in IBM Business Monitor. In dimensional analysis, a large table of facts is described with measures and dimensions. Measures take on many values and participate in calculations; dimensions are entry points for manipulating and analyzing the data in meaningful ways.

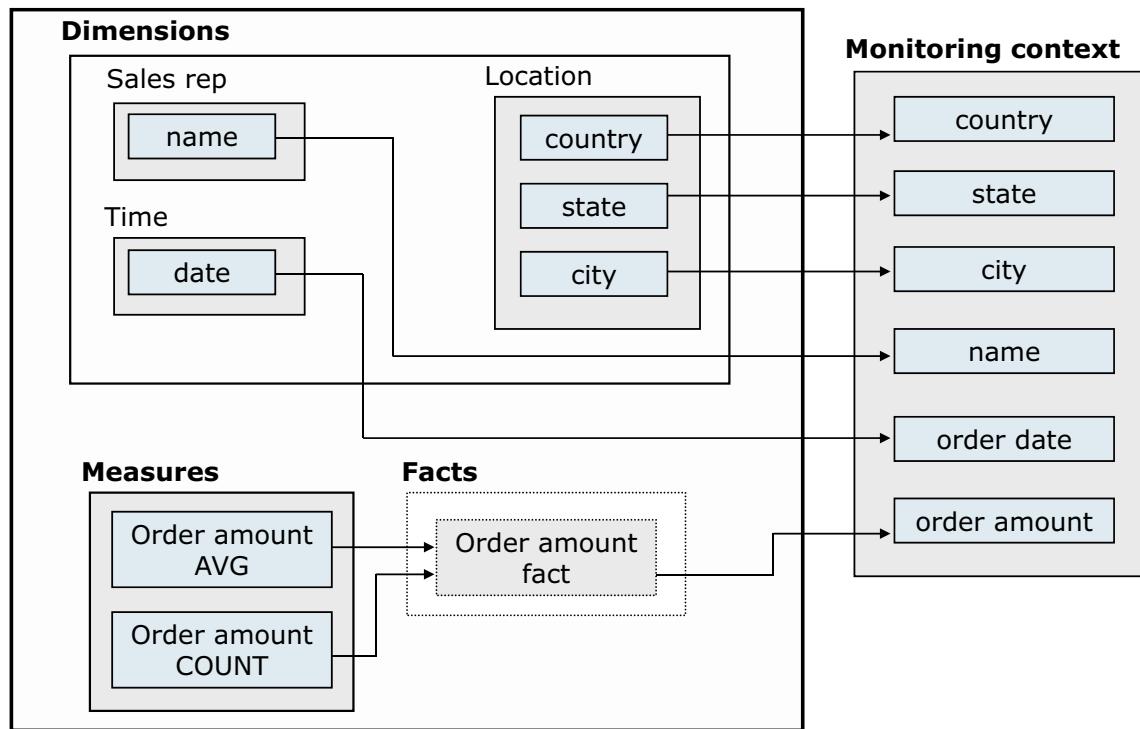
As an example of dimensional analysis, consider an insurance company that has a claim process and uses IBM Business Monitor to monitor each of the claims. The monitoring context instance represents each claim. Each claim has metrics, such as claim number, policy number, amount, type, status, claim date, country, city, and processing time. The company wants to analyze the claims at an aggregate level and visualize the data by various groupings. They use dimensional analysis to do so. They create measures, which include average claim amount, total claim amount, total number of claims, and average claim processing duration.

Specific dimensions can analyze these measures. For example, they can look at the total number of claims of type auto in 2010, and can drill down to see the number of claims by month and day.

They can look at the total number of claims that are not paid. They can further analyze the data by country and city to get a better understanding of the nature of the claims and how the claim process is done in various regions.

Sample cube

Cube



Dimensional, KPI and visual models

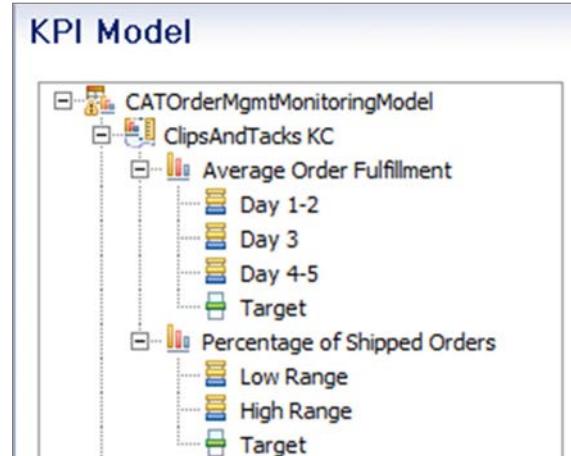
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Figure 6-8. Sample cube

A simplified cube is shown in this diagram. This cube has only one fact: order amount. Two measures are based on this fact: average order amount and total number of orders. Based on this cube, you can create KPIs relating the measures to dimensions. You can, for instance, find the average order amount for all orders that were placed in the United States. At a more detailed level, you can determine the average order amount for Nebraska by sales representative Sally for the last 30 days. In addition to the other dimensions that you define, cubes require at least one time dimension before you can define meaningful key performance indicators (KPIs). You might want several time dimensions, for example, a start time dimension and an end time dimension.

Defining KPIs

- The KPI model defines a top-level container to collect instance metrics values and create aggregated metrics
- Choose an existing metric or define a new one
- Validation verifies that the aggregation function is supported for the metric type
- Choose which instances to include in calculation (those instances that use only the current model version or all versions)



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Figure 6-9. Defining KPIs

There are two types of KPIs:

- Based on a new or existing metric
 - Metrics must be of type **decimal** or **duration**.
- Based on an expression that involves other defined KPIs
 - You can optionally add a target value for the KPI.
 - You can optionally add ranges that provide a descriptive qualification of how the KPI value compares against the target value.

You can add filtering options to decide which monitoring context instances of the metric to include in the calculation:

- Filter by model version
- Filter by time
- More metric values that filter

To create a KPI, you:

1. Select **Base this KPI on a metric and an aggregation function**.
2. Select **Browse** and then select a monitoring context.

3. Select **Browse** to choose a pre-existing metric from within the MC, or to define a new metric for the KPI.
4. Select a valid aggregation function for the metric type that is used. It is not necessary to first define a measure that is used in the KPI. Available aggregation functions are min, max, sum, count, and average. Validation rules enforce that the selected aggregation function is valid for the chosen metric type.
5. Choose whether to include values that are collected from all versions of the monitor model in the calculation, or alternatively, just values collected with the current version of the monitor model.

KPI details

- ID is required, and must be unique within the monitor model
- ID must be an XML NCName (noncolonized name), which means that it must start with a letter or underscore, and can contain only letters, digits, underscores, hyphens, and periods

KPI Details

Edit the details of the KPI, which is a performance measurement used to track business objectives.

ID:	* <input type="text" value="Number_of_Completed_Loans"/>
Name:	<input type="text" value="Number of Loans Completed"/>
Description:	<input type="text"/>
Type:	* <input type="text" value="Decimal"/>
Currency	<input type="text"/> Decimal Precision <input type="text" value="0"/> <input type="checkbox"/> Show as a percentage
<input type="checkbox"/> Keep track of historical values for this KPI	

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Figure 6-10. KPI details

You might find the following naming scheme useful when naming KPIs:

- Operator name (such as **maximum**, **average**, or **number**)
- Metric name
- Optionally, metric data type and whether the value is based on a duration
- Time reference (such as year or month) as in the following examples:
 - Total Orders
 - Max Completed Orders
 - Max Orders \$/Day
 - Max Orders \$/Day

Although the name of the KPI must be meaningful, try to keep it short for viewing in the dashboards.

Select **Keep track of historical values for this KPI** to calculate the KPI value every hour and store it in the Monitor database.



KPI targets and ranges

- Specify each range as a percentage of the target value or as an actual value
- Description is used only in the Monitor model editor and is not displayed anywhere in IBM Business Monitor
- Start value and end value cells are both required
- The start value of each row must equal the end value for the previous row

▼ KPI Target and Ranges

Specify a target, which is an exact value for the KPI to achieve, or ranges against which to track the KPI, or both.

Target:	46																								
Ranges:	* Actual value																								
<table border="1"> <thead> <tr> <th>Range name</th> <th>Start value</th> <th>End value</th> <th>Color</th> </tr> </thead> <tbody> <tr> <td>My Range</td> <td>15</td> <td>< 25</td> <td></td> </tr> <tr> <td>My Range 1</td> <td>25</td> <td>< 35</td> <td></td> </tr> <tr> <td>My Range 2</td> <td>35</td> <td>< 45</td> <td></td> </tr> <tr> <td>My Range 3</td> <td>45</td> <td>< 55</td> <td></td> </tr> <tr> <td>My Range 4</td> <td>55</td> <td>< 65</td> <td></td> </tr> </tbody> </table>		Range name	Start value	End value	Color	My Range	15	< 25		My Range 1	25	< 35		My Range 2	35	< 45		My Range 3	45	< 55		My Range 4	55	< 65	
Range name	Start value	End value	Color																						
My Range	15	< 25																							
My Range 1	25	< 35																							
My Range 2	35	< 45																							
My Range 3	45	< 55																							
My Range 4	55	< 65																							

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Figure 6-11. KPI targets and ranges

If you complete your start and end range values before creating the next range, when you click **Add**, the start value of the new range is automatically configured with the end value of the previous range.



KPI based on metric: Optional date and time filters

Optional filtering by time with metric of type *date* or *dateTime*

Time Filter

Select a time period over which the KPI should be calculated.

Metric:

Time period:

None Repeating Rolling Fixed

Start date: End date:

Time zone: ▼ Location (daylight saving): ▼

Data Filter

Select the metrics that you want to use to determine what values to use in the calculation. For example, if you have a KPI called Average Price in London, you only want to use monitoring contexts where the value of the City metric is London.

Metric	Operator	Values	Case-sen...
<input checked="" type="checkbox"/> Order S...	equals	<input type="text" value="Shipped"/> ▼	<input type="checkbox"/>

Figure 6-12. KPI based on metric: Optional date and time filters

Optional: A user specifies metric filter information in the Data Filter section of the UI metrics. Keys, counters, or stopwatches can be used for filtering. They must have one of the following types: string, integer, decimal, duration, Boolean, time. The user specifies the operator to use for the data filter condition; see the table in the figure for allowable metric type and operator combinations. The user clicks the values cell and enters an XPath expression to specify the values to use in the filter condition.

KPIs or any other nonconstant values cannot be included in this condition. If the XPath expression is a list of values (for example, the **in** operator), the [...] button can be selected to open a dialog for list entry. Alternatively, the values can be entered as a comma-separated list, with inverted commas that surround each value.

- In the case-sensitive column for metrics of type string, the default is left cleared.
- The filtering of aggregated KPIs is based on metrics.
- In both cases, you have the option of defining a new metric for filtering if a suitable one does not exist; this option applies to all of the **Browse** buttons.
- The quarterly option is available when choosing a time filter that uses a repeating period.
- Minutes, hours, months, and years can be used when specifying a rolling period for the time filter.



KPI formatting

KPI Details

Edit the details of the KPI, which is a performance measurement used to track business objectives.

ID:	* My_KPI
Name:	My KPI
Description:	(empty text area)
Type:	* Decimal
Currency:	CAD - Canadian Dollar
<input style="border: 1px solid red; padding: 2px 10px; margin-right: 10px;" type="button" value="Decimal Precision 2"/> <input checked="" style="margin-right: 10px;" type="checkbox" value="Show As Percentage"/> Show As Percentage	
<input checked="" type="checkbox"/> Keep track of historical values for this KPI	

KPI Target and Ranges

Specify a target, which is an exact value for the KPI to achieve, or ranges against which to track the KPI, or both.

Target:	(empty text field)																
Ranges:	* Actual value																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Range name</th> <th>Start value</th> <th>End value</th> <th>Color</th> </tr> </thead> <tbody> <tr> <td>My Range</td> <td>0</td> <td>< 5</td> <td>#ffff80</td> </tr> <tr> <td>My Range 1</td> <td>5</td> <td>< 16</td> <td>#00ff00</td> </tr> <tr> <td>My Range 2</td> <td>16</td> <td>< 16</td> <td>#0000a0</td> </tr> </tbody> </table>		Range name	Start value	End value	Color	My Range	0	< 5	#ffff80	My Range 1	5	< 16	#00ff00	My Range 2	16	< 16	#0000a0
Range name	Start value	End value	Color														
My Range	0	< 5	#ffff80														
My Range 1	5	< 16	#00ff00														
My Range 2	16	< 16	#0000a0														

Formatting for currency and decimal precision show as percentage and range colors

Visible only when type is decimal

Default range colors to shades of blue

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Figure 6-13. KPI formatting

In the monitor model, you can specify simple KPI formatting for currency, decimal precision, show as percentage, and range colors. Then, you can immediately view formatted KPIs on the dashboard without having to use the KPI manager each time the monitor model is deployed.

The KPI manager widget displays the key performance indicators (KPIs) that you own, or that you are given access to view. You can use it to work with them directly from a dashboard.

KPI based on aggregation function

Optional metric data filtering

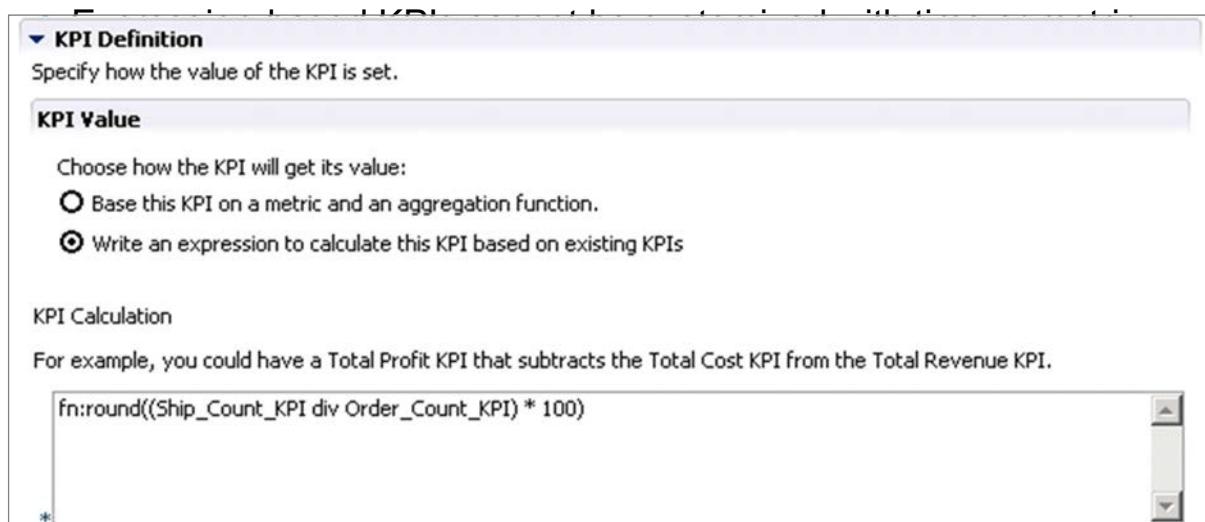
- Metric type and operator combinations that are allowed:

String	Integer, Decimal (includes counters)	Boolean	Duration (includes stopwatches)	Time
=, !=	=, !=	=, !=	=, !=	=, !=
<, <=, >, >=	<, <=, >, >=		<, <=, >, >=	<, <=, >, >=
IN, NOT IN	IN, NOT IN			IN, NOT IN
IS NOT NULL	IS NOT NULL	IS NULL, IS NOT NULL	IS NULL, IS NOT NULL	IS NOT NULL
LIKE (% and _ wildcards)				
NOT LIKE (% and _ wildcards)				

Figure 6-14. KPI based on aggregation function

Expression-based KPIs

- Content assist provides access to other KPIs in the KPI context
- Inbound events in the KPI context can also be accessed
- User-defined functions are available for use in expression-based KPIs



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Figure 6-15. Expression-based KPIs

1. The user chooses **Write an expression to calculate this KPI based on existing KPIs**.
2. The user can use content assist to help with composing the expression for the KPI calculation.
3. Content assist provides access to all KPIs and inbound events within the KPI context in which the new KPI is being defined.
4. Any user-defined functions available to the monitor model are available for use within the expression, and content assist helps with writing an expression.
5. Note: No time or metric filtering is possible with this type of KPI.

KPI history

- **Track and analyze** KPI changes over time
- **Snapshots** of KPI values are persisted so that you can view and analyze the historical values
- KPI widget
 - Fully interactive experience supports altering displayed time range and granularity of data points

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Figure 6-16. KPI history

You can use the KPI history and prediction function of IBM Business Monitor to collect data from a KPI over time and analyze the data to see trends. The KPI history function can be implemented in the business process model, or you can enable the function from the KPI manager widget. The KPI history and prediction widget displays historical and predictive data for a KPI in a graph format that is fully interactive. Because of the flexibility of the graphical interface, you can easily change the time periods and data points that are displayed on the graph.

The usefulness of historical data and the predictive capabilities of IBM Business Monitor are more apparent in the unit on Business Space. The next several visuals look at the types of historical data you can gather and the predictive scenarios you can create with IBM Business Monitor.



Quality of service

Event Type Details

Filter Condition

Correlation Expression

Quality of Service

Specify the following quality of service properties for the inbound event.

Event Sequence Path
Specify the location of the attribute in the inbound events that indicates the order in which inbound events should be processed. If there is no event sequence path specified, events will be handled in the order they arrive at the Monitor server.

Override inherited value from parent context

Event sequence path

Event Creation Time
Specify the location of the attribute in the inbound event that indicates the creation time. The Monitor server uses this attribute as the current date and time, for example to determine the start and stop times of a stopwatch.

Override inherited value from parent context

Creation time path

Global Instance ID
Specify the location of the attribute in the inbound event that indicates the global instance ID. This ID is used to relate the problem determination message to a specific event when there is an error at run time.

Override inherited value from parent context

Global instance ID path

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Figure 6-17. Quality of service

You can use, as event data, key “quality of service” information that is previously specified in the Common Base Event wrapper, such as event sequence path, creation time path, and global instance ID path. It can be set for all inbound event definitions in a particular monitoring or KPI context. A particular inbound event definition can override or specify it.

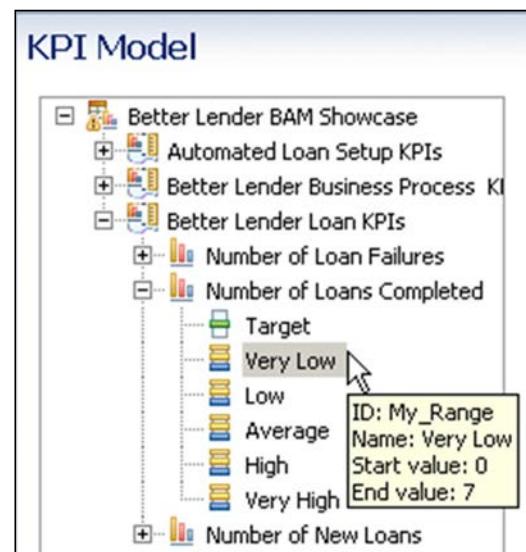
This information is optional. The Monitor server runtime provides appropriate default behavior. If you would like to specify a value for a particular inbound event, you can select the **Override inherited value** check box in the **Inbound Event** page and edit the value of the corresponding field. You can specify an event sequence path, which is a path to an event attribute that indicates the processing order for inbound events. If no event sequence path is defined, events are processed in the order in which they arrive.

You can also specify a creation time path. The creation time is used for stopwatches and for any date or time functions that are used in expressions.

You can specify the path to the global instance ID. This ID is used to relate the problem determination message to a specific event when there is an error at run time, for example in the WebSphere Application Server log. By default, the value that is used at run time is the path to the Common Base Event `globalInstanceId`, which is an automatically generated identifier to uniquely identify the event.

Key performance indicator (KPI) model

- Contains the KPI contexts, which contain KPIs and their associated triggers and events
- KPIs are the detailed specifications that are used to track business objectives
 - These measurements break down key areas of your business so that you can see how they contribute to business results



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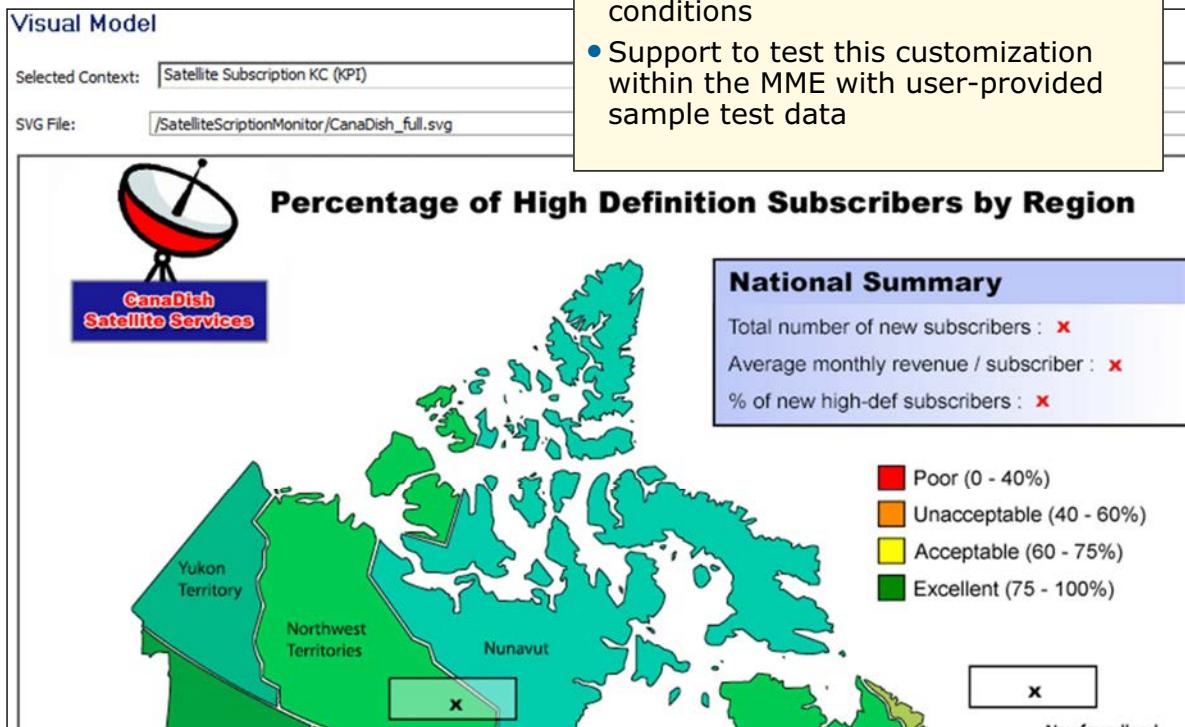
Figure 6-18. Key performance indicator (KPI) model

Key performance indicators (KPIs) are quantifiable measurements of the improvement or deterioration in the performance of an activity critical to the success of a business. These measurements break down key areas of your business so that you can see how they contribute to business results. KPIs differ depending on the business. For example, in a call center, the timely answering of customer calls is a key business activity. A KPI can be the average time for response to a customer call for the last 30 days, with a target of less than 1 minute.

When selecting KPIs to monitor, you choose them to reflect the goals of your business, to be critical to its success, and to allow corrective action through early detection of problems. The KPI enables the organization to measure an aspect of the business against a defined target. In IBM Business Monitor, the KPI target is compared with the attained results to determine the level of success.

Each KPI has a type that can be either decimal or duration.

Visual model (1 of 2)



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Figure 6-19. Visual model (1 of 2)

The enhancements to the visual model editor in Monitor provide validation before deployment, thus greatly reducing the time that is required for developing and testing an effective visual model. A drop-down menu at the top of the visual model provides the facility to select each SVG diagram and provide any necessary customization.

Visual model (2 of 2)

- SVG diagrams are shown in the project tree within an **SVG Files** group
- Clicking a shape in the editor SVG diagram highlights the corresponding shape that is set in the following table

The screenshot shows the IBM Visual Model Editor interface. In the Project Explorer panel, there is a project named "SatelliteScriptionMonitor" containing "Event Definitions", "Monitor Models" (with a file "SatelliteSubscriptions.mm"), and an "SVG Files" group containing several SVG files: "_Satellite_Subscription_Process_Business", "CanaDish_Central.svg", "CanaDish_East.svg", "CanaDish_full.svg", and "CanaDish_North.svg".

The main workspace displays the "Add and Edit Shape Set Actions" panel. It has a title bar "Add and Edit Shape Set Actions" and a subtitle "Specify how the SVG elements represented by the shape sets change their properties at run time. Click Test to see the results." Below this is a table:

Shape Set / Action	Action Attribute Value	Test Result
<uncategorized>		
avg_monthly_revenue_per_subscriber_text		
Set text		
condition	X ^Y fn:true()	
text color	#ff0000	
text value	X ^Y concat('\$', Average_Monthly_Revenue_Per_Subscriber)	
CENTRAL		
EAST		
NORTH		

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Figure 6-20. Visual model (2 of 2)

Using the panel in the lower left of the visual editor, actions can be associated with specific conditions with expression editors to relate shape set actions to specific conditions.

Test data can be provided by using the Shape Set Actions panel. The user is prompted to enter test data for all metrics and KPIs used within the expressions for the selected SVG diagram. If you click shapes in the SVG diagram within the visual model editor, the corresponding shape set is highlighted in the shape sets table below the diagram.

Event Model

- Contains references to the event definitions
- The Event Model references each Dynamic Event Framework event or Common Base Event definition that you use as an inbound or outbound event type in the Monitor details model or KPI model

Event Model

This table specifies the event definition references that are imported in the event model.

Import Location or Namespace	Event Definition Type Name
loanApplicationComplete.cbe	loanApplicationComplete
automatedLoanSetupComplete.cbe	automatedLoanSetupComplete
processorValidatorComplete.cbe	processorValidatorComplete
underwritingComplete.cbe	underwritingComplete
closingComplete.cbe	closingComplete
fundinaComplete.cbe	

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Figure 6-21. Event Model

You can click the **Event Model** tab of the editor to see the event model in a tabular format. The table shows each Dynamic Event Framework event or Common Base Event file that is referenced in the monitor model. You can expand each file name to see the complete set of event definitions in that file. All event definitions in the Common Base Event file are shown, whether they are used in the monitor model or not.

Event groups

- Event groups are containers for inbound events to group related inbound events together without using a monitoring context
 - UI-only constructs that act as lightweight containers for events
 - Assist with providing an ordered display of a monitor model
- Allow for the visual and logical grouping of events without using a monitoring context
 - Can avoid the costs that are associated with unnecessary monitoring contexts, such as keys or cubes
- Event groups have no representation or impact at run time
- Event groups cannot be nested
- Inbound events within event groups must contain the same correlation expressions as if they were directly in the containing monitoring context

Figure 6-22. Event groups

Event groups are containers for inbound events. You can use them to group related inbound events together without using a monitoring context. Monitoring contexts introduce more processing time in the form of keys and cubes, whereas event groups are just containers. Event groups are purely a visual construct and are not represented in the monitor model XML file.

You can use an event group when it is not necessary to track each individual instance of an activity separately within a process. For example, you might create an event group to represent a Business Process Execution Language (BPEL) activity when you know that the activity runs only one time in a specific process instance. The event group contains a set of inbound events that represent the events that BPEL activity emits at run time.

You might also use event groups if you have many events that come into a single monitoring context and if some of them can be logically grouped. For example, you might be monitoring an order handling process in which all events have the same order ID and are delivered to the same monitoring context. If one group of events deals with processing the order and another group of events deals with shipping the order, you can put the events into different event groups. This use of event groups reduces clutter in the visual display.

You can add an event group only within a monitoring context or a KPI context. Because event groups are not part of the monitor model, they do not have an ID.

Inbound events within an event group must still contain filter and correlation expressions. The correlation expressions must refer to keys in the monitoring context that contains the event group, as if the inbound event were directly contained by the monitoring context itself. However, event groups do not have an ID, which means that inbound events in an event group are not required to use an extra step. That extra step is in the path expressions (such as the paths for correlation expressions) when referencing elements in the containing monitoring context. A correlation expression for an inbound event that is not in an event group is identical to a correlation expression for an inbound event that is in an event group, for example, `myInboundEvent/myEventProperty = myKey`.

User-defined XPath functions

- User-defined functions (UDFs) are listed in the monitor model details and available throughout the model through content assist
- Any user-defined functions available to the monitor model are available for use within the expression and content assist help
- XPath V2.0 UDFs are implemented in Java
- Java archive (.JAR) file that includes the functions is imported in the library that is referenced in the monitor model project
- Accesses external data
- Does specialized calculations
- Can be used in metric maps, triggers, correlation, filters including metrics, and KPIs
- Can be used in expressions

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Figure 6-23. User-defined XPath functions

You can make classes of custom XML Path Language (XPath) functions accessible to the Monitor model editor. After you add the classes, expressions within the monitor model can use the user-defined XPath functions. The user-defined functions are shown in the table on the Monitor Details Model page and added to the available functions listed in content assist, where appropriate.

To add the Java function that you plan to use in your XPath expressions, create an XPath function Java archive (JAR) file in Rational Application Developer or IBM Integration Designer. To make user-defined functions accessible to the monitor model, you must add a reference to the JAR file in your Monitor project with the Monitor model editor.

Common monitoring templates

- When using an IBM Integration Designer application, the user can choose to apply one or more predefined common monitoring templates
- These templates are collections of predefined monitoring constructs:
 - KPI templates
 - Metric templates
 - Measure templates
 - For example, a template to capture the elapsed duration of a Business Process Execution Language (BPEL) process
- The generated monitor model from the template is automatically set up with the constructs that are required to capture the information

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Figure 6-24. Common monitoring templates

KPI templates

The KPI templates produce metric-based key performance indicators (KPIs). These KPIs do not include targets, ranges, or metric filters, but you can add those definitions later in the Monitor model editor. The following KPI templates are available:

- Average elapsed duration
- Average working duration

When you apply one of these templates, an inbound event is created for each event that can create or terminate a monitoring context. In addition, each event or resume event (or similar events, such as unassigned for a human task) creates an inbound event. A single stopwatch is created that references all inbound events. A KPI is created based on the stopwatch and calculates the average working duration.

Metric templates

The metric templates produce instance metrics. The following metric templates are available:

- Start time: The start time template captures the time at which the start event arrives for the event source.
- Completion time: The completion time template captures the time at which the end event arrives for the event source.

- Assigned user: The assigned user template stores the name of the user who claims the task.
- State: The state template tracks the state of an event source. For information about the state values for process, activity, and activity scope events, see “Business process events” in the IBM Process Server documentation.
- Elapsed duration: The elapsed duration template measures the time difference between the end event and the start event for an event source.
- Working duration: The working duration template measures the time difference between the end event and the start event for an event source, not counting the time that elapses during pause or suspend events.

Inbound events are created only one time. If you apply both a start time and a completion time template, you have only one set of inbound events. All generated template elements refer to this one set of inbound events.

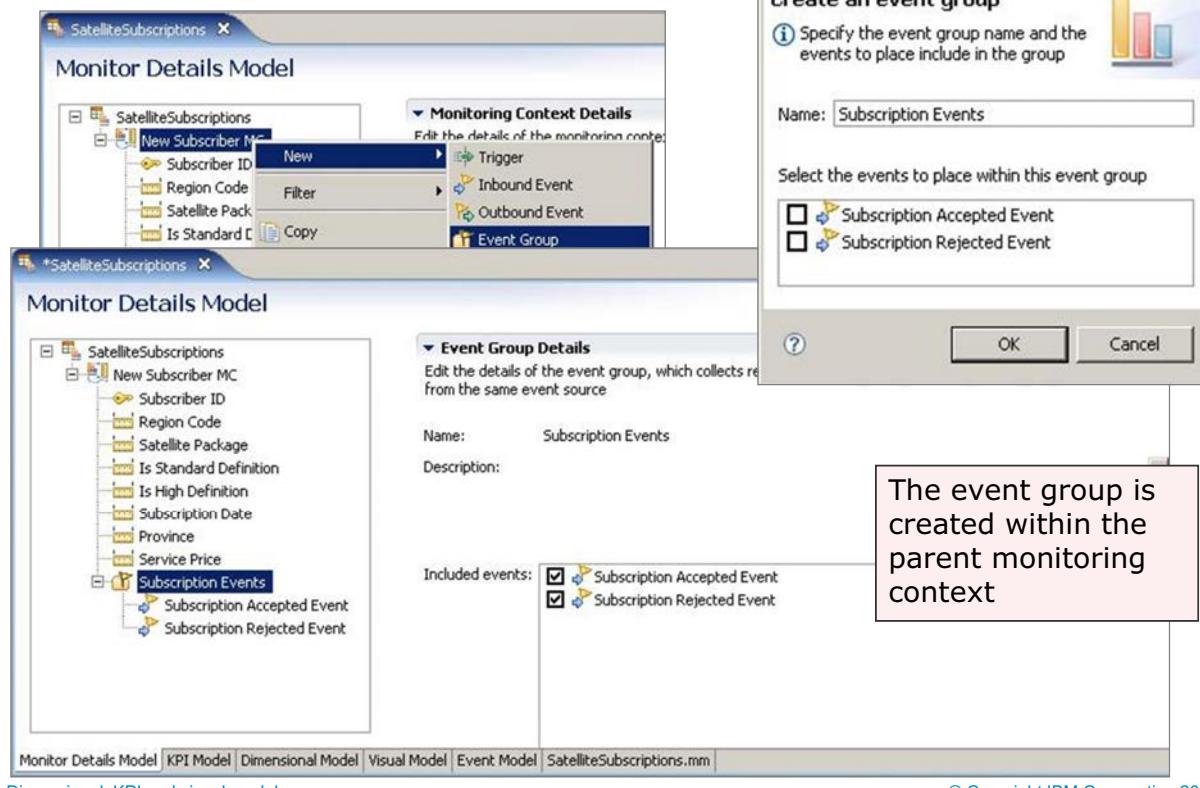
Measure templates

The measure templates produce measures and stopwatches. The following measure templates are available:

- Average elapsed duration: The elapsed duration template measures the time difference between the end event and the start event for an event source.
- Average working duration: The working duration template measures the time difference between the end event and the start event for an event source, not counting the time that elapses during pause or suspend events.

IBM Training

Event groups



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Figure 6-25. Event groups

An event group is created as follows:

1. The user chooses to create an event group by using the menu of monitoring contexts. The event group is created within the parent monitoring context.
2. The Create New Event Group dialog is displayed, allowing the user to specify the event group name and select from the events available for inclusion in the event group. All events in the containing monitoring context that are not already included in event groups are listed.
3. The new event group is listed in the monitor model tree. Selecting the event group displays the event group properties and allows extra events to be added, if available.

Note: It is possible to create metrics from the event group menu. The new metric would be created within the monitoring context that contains the event group, not the event group itself. This placement is consistent with the behavior of the rest of the Monitor details tree; new constructs are placed within the nearest ancestor element.

Unit summary

- Explain dimensional and visual model support
- Explain the key performance indicators (KPIs) model
- Describe how user-defined functions are used in the monitor model

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Figure 6-26. Unit summary

Checkpoint

1. A dimensional model is only available if _____ is installed.
 - A. Process Server
 - B. DB2 Alphablox
 - C. IBM Cognos BI
2. There is visual editor support for associating _____ diagram actions with specific conditions.
 - A. JPEG
 - B. Microsoft Visio
 - C. SVG
3. True or False: A dimensional model contains more than one cube for each monitoring context definition.
4. In the key performance indicator (KPI) model, _____ are the detailed specifications that are used to track business objectives.

Figure 6-27. Checkpoint

Write your answers here:

- 1.
- 2.
- 3.
- 4.

Checkpoint answers

1. **C:** IBM Cognos BI
2. **C:** SVG
3. **False:** A dimensional model contains one cube for each monitoring context definition.
4. KPIs

Exercise 5

Creating metrics in a monitor model

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Figure 6-29. Exercise 5

Exercise objectives

After completing this exercise, you should be able to:

- Create several metrics for the monitor model
- Create a counter for the monitor model

Unit 7. Deploying a monitor model

Estimated time

01:00

Overview

In this unit, you learn the various methods that are used to deploy models to the IBM Business Monitor runtime environment.

How you will check your progress

- Checkpoint
- Exercise

Unit objectives

- Explain various deployment mechanisms, such as using the administrative console with either the default settings or custom settings
- Describe the steps that are involved in deploying a model
- Describe how to use the administrative console to install a monitor model
- Describe the options available for scripted monitor model installations

Deploying a monitor model

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Figure 7-1. Unit objectives

Different ways of deploying a monitor model

Use the administrative console to install a new monitor model

- Default settings (FastPath) **NOTE: When deploying a monitor model that uses the FastPath method, the local cell event source is selected by default. The local cell event source is where the IBM Business Monitor is running and is selected by default. You cannot specify a remote event source unless you change it from the console after deployment. Otherwise, use the Detailed deployment where you can specify a remote event source.**
- Modified settings (Detailed)

Use scripts to install a new monitor model

- “Headless deployment” of a monitor model
- Uses a script to generate the Java EE EAR file for the monitor model by using an exported project interchange file that includes the monitor model and supporting source files
- Use the wsadmin scripting client to deploy a version of a model

[Deploying a monitor model](#)

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Figure 7-2. Different ways of deploying a monitor model

Headless deployment of a monitor model:

- It is possible to generate the Java Platform, Enterprise Edition (Java EE) application code for a specified monitor model without starting the IBM Business Monitor development toolkit. This deployment is called headless deployment, meaning that it does not require a user interface. It is useful for automated development and testing. The monitor model file and all of the supporting source files that the Monitor model editor produces can be exported as a project interchange file and used as input for the headless deployment.

Using wsadmin to deploy a monitor model:

- You can use the wsadmin scripting client to deploy a version of a model.

Installing a monitor model with the default settings

- Using the default settings, a user can quickly use the WebSphere Application Server administrative console to install a new monitor model or to install a new version of an existing monitor model
- Before installation, complete the following steps:
 - Back up the Monitor database
 - Verify that the name of the monitor model is short
 - Verify the path to the Monitor server by using a short path
- If installing a new version of an existing monitor model, the version time stamp must be more recent than any previously installed versions of that model
- When installing a new version, the previous version is automatically configured to process events associated with existing monitoring context instances only
- You can also run a script to migrate existing monitoring context instances to the latest version
- Only the new version creates monitoring context instances

[Deploying a monitor model](#)

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Figure 7-3. Installing a monitor model with the default settings

Windows path-length restrictions might be exceeded when long application names are used or when the WebSphere Application Server is installed in a deep directory structure. Be careful to keep both the model name and the path as short as possible to avoid potential problems.

Installing a monitor model with modified settings

- Use the WebSphere Application Server administrative console to customize the installation of a new monitor model or a new version of an existing monitor model:
 - Select installation options
 - Map modules to servers
 - Select Monitor model options
 - Select Monitor model IBM Cognos BI options
 - Select Monitor model Event source options
 - Summary to verify that all installation information is correct
- Complete the installation of a monitor model in a secured environment
 - You can give remote access to the foreign bus and foreign destinations that are created after deploying a model with a remote event sources
 - Add the Monitor administrative user ID to the sender role on the remote event source server

[Deploying a monitor model](#)

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Figure 7-4. *Installing a monitor model with modified settings*

Select installation options:

- If you want to change the name of the monitor model, click **Map modules to servers**.
- If you want to take advantage of workload management throughout a cluster for your monitoring model, click **Select Monitor model option** to map Enterprise JavaBeans (EJB) modules to different servers or clusters.
- If you want to change some of the Monitor model IBM Cognos BI options, click **Select Monitor model IBM Cognos BI options**.
- If you want to change some of the Monitor model Common Event Infrastructure (CEI) options, click **Select Monitor model CEI options**.
- To verify that all of the installation information is correct and to complete the installation process, click **Finish**.

To complete the deployment of the model in a secured environment, complete the following steps to add the user IDs to the sender roles:

1. On the cell that contains the remote CEI event server, type `wsadmin` to launch the wsadmin scripting client.

2. Add the administrative user to the sender role for the foreign bus by entering:

```
$AdminTask addUserToForeignBusRole { -type foreignBus -role Sender -bus BusName  
-foreignBus ForeignBusName -user username}
```

where

- BusName is the Monitor bus name
- ForeignBusName is the foreign bus name
- username is the administrative user name

1. Add the administrative user to the sender role for the destination by entering:

```
$AdminTask addUserToDestinationRole { -type foreignDestination -role Sender -bus  
BusName -foreignBus ForeignBusName -destination destinationName -user username}
```

where

- BusName is the Monitor bus name
- ForeignBusName is the foreign bus name
- destinationName is the destination that starts with wbm_modelname
- username is the administrative user name

1. To save the configuration, enter: \$AdminConfig save

2. To close the wsadmin prompt, type: exit



Deploying a monitor model

Monitor Models

Use this page to manage all versions of monitor models and their associated applications. To start or stop a version of a monitor model, you must start or stop the associated application. All models are initially added to the root resource group and may not be visible by its intended dashboard users. Use the Monitor data security panel to assign permission to the models.

Select	Model	Version	Deployment	Application	Data Security	Status
<input type="checkbox"/>	CATOrderMgmtMonitoringModel	2015-01-20T11:56:54	OK	CATOrderMgmtMonitoringModelApplication	Members assigned	
<input type="checkbox"/>	MortgageLendingBAMShowcase	2013-09-09T18:00:00	OK	BetterLenderApplication	Members assigned	

Total 2

Deploying a monitor model

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Figure 7-5. Deploying a monitor model

Monitor models:

- You can use the **Start**, **Stop**, and **Install** buttons to start or stop an installed model, or to install a model that is not yet deployed.
- From the **Model** link, you can:
 - Manage data movement service
- From the **Version** link, you can:
 - Manage schema
 - Manage Cognos cubes
 - Enable data movement service
 - Change CEI distribution mode
 - Change runtime configuration
 - View the model
- From the **Application** link, you can:
 - Access detailed properties about the monitor application

Version link

[Monitor Models > CATOrderMgmtMonitoringModel \(2015-01-20T11:56:54\)](#)

Use this page to tune and configure the error handling and KPI properties of this model version.

General

General Properties

Model

CATOrderMgmtMonitoringModel

Version

2015-01-20T11:56:54

Application

CATOrderMgmtMonitoringModelApplication

Event consumption mode

CreateNewInstances

Active MC instances

1

Deployment

Dashboards enabled

Schema created

Cognos cubes created (optional)

Version Properties

- [Manage schema](#)
- [Manage Cognos cubes](#)
- [Change event sources](#)
- [Change event consumption mode](#)
- [Change runtime configuration](#)
- [View model](#)
- [Purge model version](#)

Manage Monitor Data

- [Export instance data](#)
- [Import instance data](#)
- [Purge and archive instance data](#)

Deploying a monitor model

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Figure 7-6. Version link

From the Monitor Models page, you can get to the version detail page by clicking the version time stamp. It shows the Event Consumption mode and the number of active MC instances. On the right side of this page, you can select other options that you can use to manage the schema, DMS, Cognos cubes, change event sources, runtime configuration, and monitor data.

IBM Training

Change event sources

Monitor Models

Monitor Models > CATOrderMgmtMonitoringModel (2014-12-09T20:41:53) > Change event sources

Modify the event sources that are currently registered to this model version.

Select	Display Name	Version Support Status
<input type="checkbox"/>	Dynamic Event Framework event source on local host	<input checked="" type="checkbox"/> V8.5.5.0+
<input type="checkbox"/>	Dynamic Event Framework event source on ws2008r2x64.wetraining.com	<input checked="" type="checkbox"/> V8.5.5.0+

Back

Deploying a monitor model

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Figure 7-7. Change event sources

From the “Versions details” page in the Versions Properties section, you can click the **Change** event sources link, which goes to the “Change event sources” page. Here you can add or remove event sources for the monitor model that is deployed. A local event source would normally be defined on the Monitor server, and then one or more Remote event sources can be defined. The remote event sources can be from the BPM server, which runs in a separate cell, or other non-BPM event sources.



View model

Monitor Models > [CATOrderMgmtMonitoringModel \(2015-01-20T11:56:54\)](#) > View model

Use this page to examine the model version XML file.

[Expand All](#)

[Collapse All](#)

```
<mm:monitor displayName="CATOrderMgmtMonitoringModel" id="CATOrderMgmtMonitoringModel" times="10" dashboardOption="true" name="CATOrderMgmtMonitoringModel 20150120-115654" user="admin" />


- <monitorDetailsModel displayName="CATOrderMgmtMonitoringModel" id="MDM" >
  - <monitoringContext displayName="Order Handling" id="Order_Handling" >
    - <inboundEvent displayName="Order HandlingCOMPENSATED" id="Order_HandlingCOMPENSATED" creationTimePath="Order_HandlingCOMPENSATED/EventHeaderData/wbi:CreationTime" eventPartitionPath="Order_HandlingCOMPENSATED/EventHeaderData/wbi:ECSCurrentID" eventSequenceIDPath="fn:string-length(xs:string(Order_HandlingCOMPENSATED/BPELData/bpc:eventProgressCounter)))", Order_HandlingCOMPENSATED/BPELData/bpc:localName="Order_HandlingCOMPENSATED/BPELData/bpc:localName="Order_HandlingCOMPENSATED/BPELData/bpc:localCounter" globalInstanceIDPath="fn:concat(Order_HandlingCOMPENSATED/BPELData/bpc:localName, 'COMPENSATED')", multipleCorrelationMatches="raiseException" noCorrelationMatches="raiseException" onEvent="Order_HandlingCOMPENSATED/BPELData/bpc:processTemplateId='OrderHandling'" type="wbi:Event" />
              <eventPart displayName="BaseData" id="BaseData" path="wbi:event" type="wbi:Event" />
              <eventPart displayName="EventHeaderData" id="EventHeaderData" path="wbi:event/wbi:eventHeaderData" type="wbi:EventHeaderData" />
              <eventPart displayName="BPELData" id="BPELData" path="wbi:event/wbi:eventPointData" type="bpc:BPC.BFM" />
              <correlationPredicate expression="Order_Handling_Instance_ID = Order_HandlingCOMPENSATED/EventHeaderData/bpc:processTemplateId='OrderHandling'" />
              <filter expression="Order_HandlingCOMPENSATED/BPELData/wbi:eventNature = 'COMPENSATED' and Order_HandlingCOMPENSATED/BPELData/bpc:processTemplateId='OrderHandling'" />

```

Deploying a monitor model

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Figure 7-8. View model

This figure shows the XML file (.mm) from the Monitor toolkit. You cannot change anything, but you can see the basis for the model. This knowledge can be helpful in debugging.



Complete deployment

- The **Status** icon changes from a red X to a green arrow when the model deployment is complete, and **Deployment** displays **OK**

Monitor Models						
Use this page to manage all versions of monitor models and their associated applications. To start or stop a version of a monitor model, you must start or stop the associated application. All models are initially added to the root resource group and may not be visible by its intended dashboard users. Use the Monitor data security panel to assign permission to the models.						
<input type="checkbox"/> Preferences Start Stop Install 						
Select	Model ▾	Version	Deployment ▾	Application ▾	Data Security	Status ▾
<input type="checkbox"/>	CATOrderMgmtMonitoringModel	2015-01-20T11:56:54	OK	CATOrderMgmtMonitoringModelApplication	Members assigned	
<input type="checkbox"/>	MortgageLendingBAMShowcase	2013-09-09T18:00:00	OK	BetterLenderApplication	Members assigned	
Total 2						

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Figure 7-9. Complete deployment

After the monitor model is deployed to the server, you see the **OK** under Deployment column, and the **Status** icon turns green.



Model link

- Monitor models
- From the model link, you can:
 - Change configuration
 - Manage data movement service

Monitor Models

Use this page to manage all versions of monitor models and their associated applications. To start or stop a version of a monitor model, you must start or stop the associated application. All models are initially added to the root resource group and may not be visible by its intended dashboard users. Use the Monitor data security panel to assign permission to the models.

[Preferences] Start Stop Install

Select	Model	Version	Deployment	Application	Data Security	Status
<input type="checkbox"/>	CATOrderMgmtMonitoringModel	2015-01-20T11:56:54	OK	CATOrderMgmtMonitoringModelApplication	Members assigned	
<input type="checkbox"/>	MortgageLendingBAMShowcase	2013-09-09T18:00:00	OK	BetterLenderApplication	Members assigned	

Total 2

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Figure 7-10. Model link

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Monitor Models > Model

The screenshot shows a web-based configuration interface for a monitor model. At the top, a blue header bar contains the text "Monitor Models". Below this, the title "Monitor Models > CATOrderMgmtMonitoringModel" is displayed. A descriptive message states: "Use this page to view the configuration for this monitor model. Click the links to access pages for further configuring of model properties." A "General" tab is selected, indicated by a blue border. On the left, under "General Properties", there are three input fields: "Model" (containing "CATOrderMgmtMonitoringModel"), "Number of versions" (containing "1"), and "Resource group" (containing "root"). On the right, under "Model Properties", there are three links: "Manage Scheduled Services", "Change resource group", and "Purge model". At the bottom left of the main content area is a "Back" button.

Deploying a monitor model

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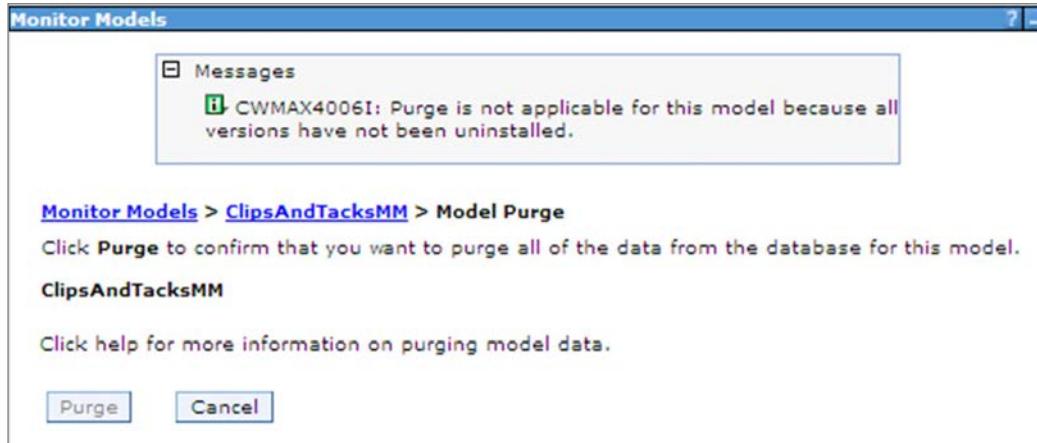
Figure 7-11. Monitor Models > Model

Under **Monitor Models > Model**, you are given the model name and the number of versions that are deployed for your information. You also can see the model properties and click into those menus.

IBM Training 

Monitor Models > Model > Purge

To purge all data from the database for a monitor model, uninstall all versions of the model; then purge the model



Deploying a monitor model

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Figure 7-12. Monitor Models > Model > Purge

To purge Monitor data from the database, you must first uninstall all versions of the model.

Uninstall the deployed Java enterprise application that contains the model, and then use the Monitor model version link to purge the data.

After all versions are uninstalled, you can purge the model.

You can archive data before purging, either on a one-time or a scheduled periodic basis. This archive applies to instance data only, not KPI history.



Application link

- Monitor models
- Click the **Application** link to view detailed properties of the Java EE application that is associated with the monitor model

Monitor Models

Use this page to manage all versions of monitor models and their associated applications. To start or stop a version of a monitor model, you must start or stop the associated application. All models are initially added to the root resource group and may not be visible by its intended dashboard users. Use the Monitor data security panel to assign permission to the models.

[Preferences](#)

Select	Model ▾	Version	Deployment ▾	Application ▾	Data Security	Status
<input type="checkbox"/>	CATOrderMgmtMonitoringModel	2015-01-20T11:56:54	OK	CATOrderMgmtMonitoringModelApplication	Members assigned	
<input type="checkbox"/>	MortgageLendingBAMShowcase	2013-09-09T18:00:00	OK	BetterLenderApplication	Members assigned	

Total 2

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Figure 7-13. Application link

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Monitor Models > Application

Monitor Models

Monitor Models > CATOrderMgmtMonitoringModelApplication

Use this page to configure an enterprise application. Click the links to access pages for further configuring of the application or its modules.

Configuration

General Properties

- ▶ **Name**
CATOrderMgmtMonitoringModelApplication
- Application reference validation**
Issue warnings

Detail Properties

- [Target specific application status](#)
- [Startup behavior](#)
- [Application binaries](#)
- [Class loading and update detection](#)
- [Request dispatcher properties](#)
- [Custom properties](#)
- [View Deployment Descriptor](#)
- [Last participant support extension](#)

References

- [Resource references](#)
- [EJB references](#)
- [Shared library references](#)
- [Shared library relationships](#)
- [Resource environment references](#)

Modules

- [Manage Modules](#)
- [Metadata for modules](#)
- [Display module build Ids](#)

Enterprise Java Bean Properties

- [Default messaging provider references](#)
- [Application profiles](#)
- [EJB JNDI names](#)

Client Module Properties

- [Client module deployment mode](#)

Database Profiles

- [SQLJ profiles and pureQuery bind files](#)

Deploying a monitor model

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Figure 7-14. Monitor Models > Application

This section allows users to define the application properties.

Specify monitor model database options

Specify information about database scripts, model runtime options, and KPI merge

- Run scripts to create the schema (**yes** or **no**; default is **yes**)
- Run scripts to enable data movement services (**yes** or **no**; default is **no**)
- Run scripts to delete the schema during uninstallation (**yes** or **no**; default is **no**)
- Processing strategy (the default is based on monitor model capabilities as documented in the Monitor EAR file)
- Enable event reordering (**yes** or **no**; the default is based on monitor model capabilities as documented in the Monitor EAR file)
- Enable KPI migration from previous version (**yes** or **no**; the default is **yes**)
- Enable KPI merge from previous version (**yes** or **no**; the default is **yes**)
- Enable business situations merge from previous version (**yes** or **no**; the default is **yes**)
- Is profile migration in progress? (**yes** or **no**; the default is **no**. Do not change the default.)

[Deploying a monitor model](#)

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Figure 7-15. Specify monitor model database options

By migrating KPIs, you can transfer the KPIs you created in one version of a model to a newer version. This migration preserves both the KPIs themselves and their settings, such as range colors and status icons. You can migrate the KPIs from an older version of model to a newer one when you deploy it.

Deploying a monitor model by using scripts (1 of 2)

- Headless deployment is for deploying without using the IBM Business Monitor development toolkit
- Generate the Java Enterprise Edition application code
- Does not require a user interface
- Useful for automated development and testing
- Monitor model file and all of the supporting source files can be exported as a project interchange file
- Used as input for deployment by using scripts
- Use one of these methods to validate the model:
 - Fixing all errors in the Monitor model editor
 - Headless validation using the `mmvalidate` script:

```
mmvalidate -r <rad_root or wid_root> -j <java>
           -w <workspace> -f <model_file> [ -v ]
```

Deploying a monitor model

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Figure 7-16. Deploying a monitor model by using scripts (1 of 2)

It is possible to validate a specified monitor model without starting the IBM Business Monitor development toolkit. This validation is called headless validation, which means that it does not require a user interface. It is useful for automated development and testing.

Headless validation uses the `mmvalidate` script, available from the command line. The command has the following format:

```
mmvalidate -r <rad_root or wid_root> -j <java> -w <workspace> -f <model_file> [ -v ]
```

Where:

- `<rad_root or wid_root>` indicates where IBM Integration Designer or Rational Application Developer is installed.
- `<java>` indicates the Java directory to use.
- `<workspace>` indicates the workspace that contains the model file. It is important to note that the workspace must not be in use by another process.
- `<model_file>` indicates the absolute path name or relative path within the workspace.
- `-v` is an option to use verbose validation

You can find the `mmvalidate` script in one of the following locations:

- **For the Rational Application Developer environment, the `mmvalidate.bat` file is in `<RAD_install_directory>`.**
- **For the IBM Integration Designer environment, the `mmvalidate.bat` file is in `<WID_install_directory>`.**

Deploying a monitor model by using scripts (2 of 2)

Headless deployment uses the `mmdeploy` script:

- `mmdeploy -pi <project_interchange_file> -w <workspace> -db <database_type> -ear <path/filename_of_ear_file> [options]`
 - **Restriction:** Because this command can process only one IBM Business Monitor model, the business monitoring project in the PI file must contain only one monitor model
 - **Important:** The workspace must not be in use by another process

Available options:

- `-ignorevalidation`: Ignore model validation
- `-noejbdeploy`: Do not deploy Enterprise JavaBeans (EJBs)
 - If this option is used, select the **Deploy enterprise beans** check box in the WebSphere Application Server installation wizard when you install the application
- `-novalidation`: Turns off model validation

Figure 7-17. Deploying a monitor model by using scripts (2 of 2)

Headless deployment uses the `mmdeploy` script at the command line. The command has the following format:

```
mmdeploy -pi <project_interchange_file> -w <workspace>
          -db <database_type> -ear <path/filename_of_ear_file> [ options ]
```

Where:

- `<project_interchange_file>` is a project interchange (PI) file that was generated from the Monitor model editor by using **File > Export > Other > Project Interchange**. The PI file must contain a project with a single monitor model and its associated event definitions. The event definitions can be in the same project as the monitor model or in an associated project. If the events are in an associated project, both projects must be included in the PI file that is used as input to the `mmdeploy` command.

Restriction: Because this command can process only one monitor model, the business monitoring project in the PI file must contain only one monitor model.

- `<workspace>` indicates the workspace that contains the model file.

Important: The workspace must not be in use by another process.

- <database_type> must be one of the following values: DB2V82, CloudscapeV10, OracleV10g, or DB2V8zOS.

<path/filename_of_ear_file> is the name to use for the resulting enterprise archive (EAR) file, which is the file that can be deployed to the Monitor server. If the EAR file exists at the specified location, it is overwritten.

Available options are as follows:

- -ignorevalidation means ignore model validation.
- -noejbdeploy means do not deploy Enterprise JavaBeans (EJBs). If you select this option, select the **Deploy enterprise beans** check box in the WebSphere Application Server installation wizard when you install the application.
- -novidification means turn off model validation.

You can find the mmdeploy script in one of the following locations:

- **For the Rational Application Developer environment, the mmdeploy.bat file is in <RAD_install_directory>.**
- **For the IBM Integration Designer environment, the mmdeploy.bat file is in <WID_install_directory>.**

Essentially, the mmdeploy script has the following command format:

```
java -cp "%PathToRADInstallDirectory%startup.jar" org.eclipse.core.launcher.Main
-application com.ibm.wbmonitor.deploy.mmdeploy.MonitoringModelDeploy
-data "%WorkspaceDirectory%"
-pi %ProjectInterchangeFileName%
%* ]
```

Deploying a monitor model by using wsadmin

- Use the wsadmin scripting client to deploy a version of a model
- Make sure that the following prerequisites are met:
 - Use the Monitor model editor to generate a monitor model enterprise archive (EAR) file
 - Start the WebSphere Application Server associated with the Monitor profile
- Use one of these methods to install the EAR file:
 - Using the default values
`$AdminApp install path_to_Monitor_ear_file`
 - Using the installation wizard
`$AdminApp installInteractive path_to_Monitor_ear_file`

Deploying a monitor model

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Figure 7-18. Deploying a monitor model by using wsadmin

You can specify the following options:

- Monitor model database options
- Monitor model CEI options (if applicable) and monitor model Cognos options
- `wbmRegisterRemoteEventSources` commands: Use the `wbmRegisterRemoteEventSources` command to create an event source with the connection information for a remote server

Unit summary

- Explain various deployment mechanisms, such as using the administrative console with either the default settings or custom settings
- Describe the steps that are involved in deploying a model
- Describe how to use the administrative console to install a monitor model
- Describe the options available for scripted monitor model installations

Deploying a monitor model

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Figure 7-19. Unit summary

Checkpoint

1. A user can use the WebSphere Application Server administrative console to install a new monitor model with _____ or _____ settings.
2. Name three options when using a monitor model to install custom settings:
 - _____
 - _____
 - _____
3. Which of the following links in the monitor model allows user to change the event source configuration?
 - A. Model link
 - B. Version link
 - C. Application link
4. _____ deployment is deploying without using the IBM Business Monitor development toolkit.

[Deploying a monitor model](#)

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Figure 7-20. Checkpoint

Write your answers here:

- 1.
- 2.
- 3.
- 4.

Checkpoint answers

1. Default or custom

2. Possible answers:

- Select installation options
- Map modules to servers
- Select Monitor model options
- Select Monitor model Cognos options
- Select Monitor model Event Source options

3. B: Version link

4. Headless

Exercise 6

Deploying and running the monitor model and the application

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Figure 7-22. Exercise 6

Exercise objectives

After completing this exercise, you should be able to:

- Complete the monitor model and generate the enterprise application
- Deploy the monitor model to an IBM Business Monitor test environment

Unit 8. Using IBM Business Monitor business space dashboards to manage business processes

Estimated time

01:00

Overview

In this unit, you learn how to use business space dashboards to construct customizable user interfaces for IBM Business Monitor users.

How you will check your progress

- Checkpoint
- Exercise

Unit objectives

- Explain the concept of the business space
- Describe the business space dashboard and the benefits of using it
- Use KPI history and prediction
- Describe the widgets that are provided in IBM Business Monitor business space:
 - KPI manager
 - KPI history
 - Reports
 - Alerts
 - Diagrams
 - Instances
 - Dimensions

Using IBM Business Monitor business space dashboards to manage
business processes

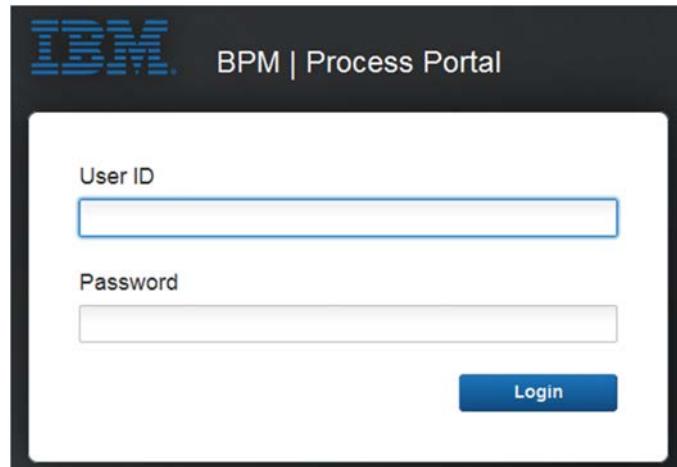
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Figure 8-1. Unit objectives

Introducing Business Space (1 of 2)

Goals of business space:

- Empower the business user
- Integrate the creation of the user experience with the authoring of the business application itself
- Enable collaboration between all participants in the business process
- Transform IT administration into a business-centric and solution-centric experience



[Using IBM Business Monitor business space dashboards to manage business processes](#)

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Figure 8-2. Introducing Business Space (1 of 2)

The business space provides a rich, holistic, and transformative experience to users across the business process management and connectivity product portfolio stack. The business space is a common infrastructure component that comes with all business process management products.

It empowers the business user by enabling key processes (for example, dashboards, point-of-business agility, and composite application policy).

The business space integrates the creation of the user experience with the authoring of the business application itself:

- With the business space, both business users and IT developers can create and deliver rich content for a broader audience of BPM users across a range of roles.
- It uses the same capabilities for empowering the user experience that is being built for the business application.

It also makes collaboration possible between all participants in the BPM process:

- Different levels of collaboration in day-to-day activities across role boundaries: human tasks and coordination, strategy, review, modeling of processes, and organizational navigation.

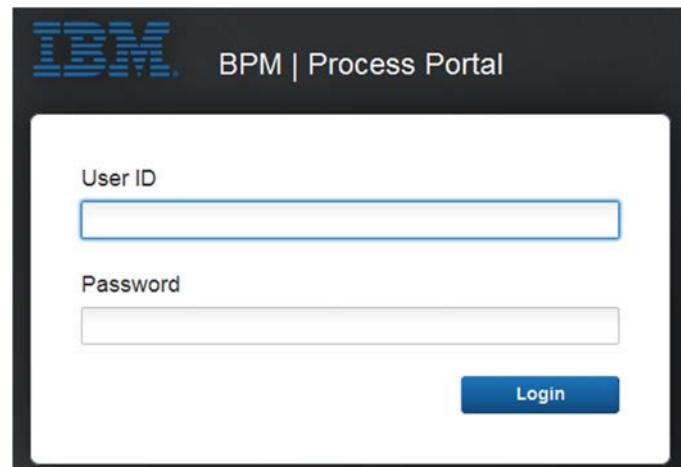
It transforms IT administration into a business-centric and solution-centric experience:

- It shifts the focus of the user experience away from deployment-centric to business application-centric administration and integrates IT administration into the BPM lifecycle optimization process.

Introducing Business Space (2 of 2)

Features of business space:

- Common user interface infrastructure that is included with BPM products
- A holistic and pre-integrated interface to the BPM product portfolio
- Use mashup technology to build views
- A user interface customizable by business users
- Integration with WebSphere Portal



[Using IBM Business Monitor business space dashboards to manage business processes](#)

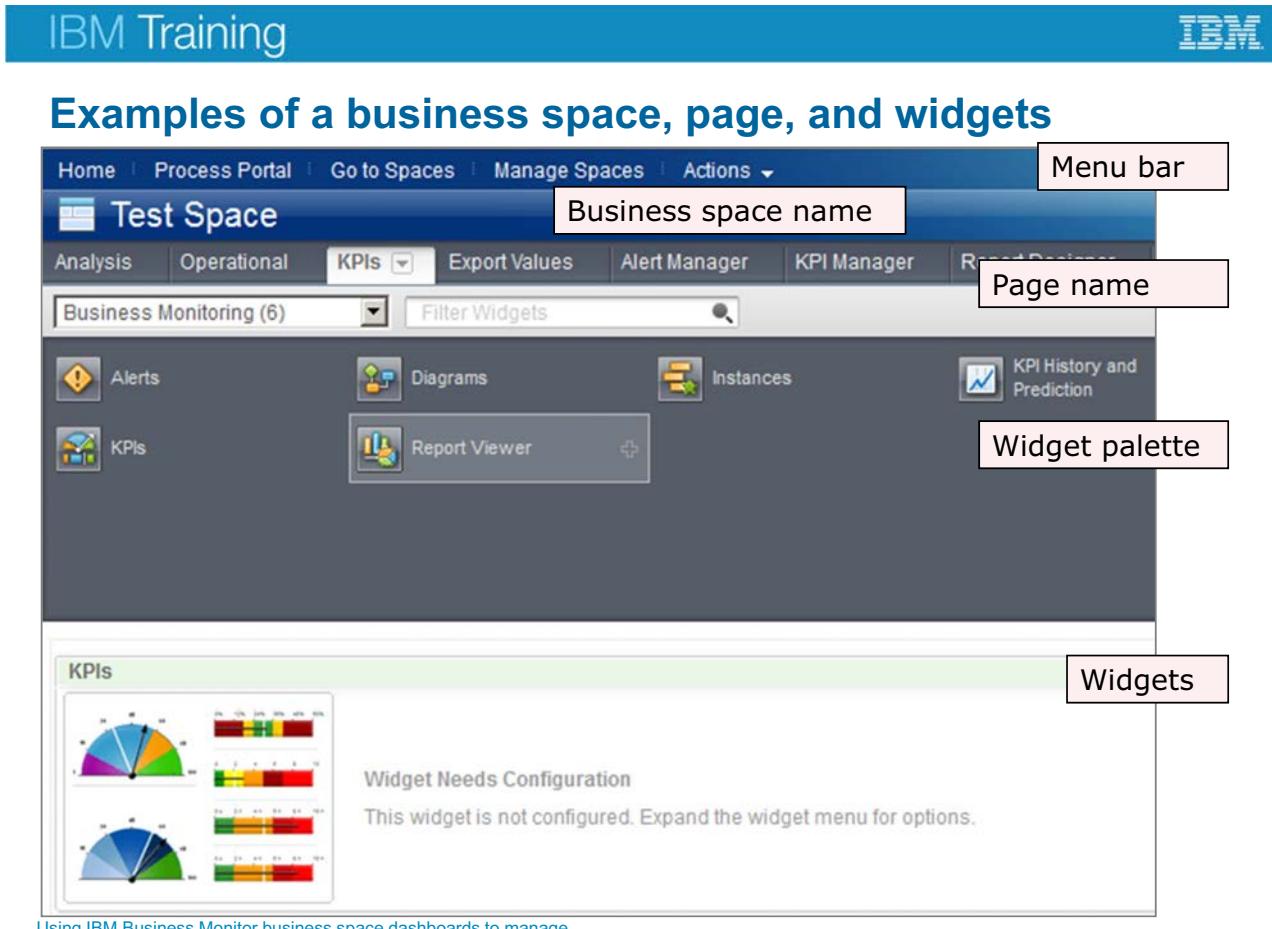
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Figure 8-3. Introducing Business Space (2 of 2)

Business space offers the following features:

- Page building improvements: Improved drag-and-drop capability, controlled vertical sizing of widgets, and dynamic resizing support
- Template management and the ability to create templates from spaces
- Usability improvements to space management
- Resizing support, which results in better use of screen area
- Integration with Lotus Mashups, full iWidget support, and custom widget development
- Performance and load time improvements
- Direct-to-deploy integration with generation of business spaces
- Integration for rendering iWidgets in Portal
- Enhanced user registry support: VMM and WebSphere Application Server custom UserRegistry implementations and local OS support
- Administrative support for configuring runtime REST endpoints and automatic registration in IBM Process Server

- Deployment of business spaces as part of creating a deployment topology in IBM Process Server



Using IBM Business Monitor business space dashboards to manage business processes

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Figure 8-4. Examples of a business space, page, and widgets

Business space is a common component that is included with BPM products. It is a web browser-based rich Internet application (RIA). Business space is a user interface that business users can customize.

A business space comprises one or more pages. Each page contains one or more widgets. Widgets are user interface components that are combined to provide the functions of the pages in your business spaces. REST APIs back widgets to access runtimes. Spaces and pages are built by using mashup technology that integrates widgets.

Some pages are configured in the business space that is displayed in the example. The widgets on this page interact with each other and are known as a mashup. Some of the widgets interact with each other by reacting to events from other widgets.

Important terminology

- **Widget:**
 - Configurable piece of graphical user interface function, provided as an embeddable component
 - Multiple instances can be on the same mashup page, each with a different configuration
- **Page:**
 - Layout of widgets, their configuration, and an event flow between widgets
 - Also known as a mashup
- **Business space:**
 - Collection of mashup pages that are organized into tabs
 - Typically represents a collaborative user interface or an interface for a BPM application
 - Authorization controls determine who can view and edit a space
- **Template:**
 - Prearranged mashup pages that can quickly be used to create a business space instance

Using IBM Business Monitor business space dashboards to manage
business processes

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Figure 8-5. Important terminology

The technology behind the business space provides a Web 2.0 user view of BPM data for non-IT personnel. The technology provides a holistic view into how business users can handle their day-to-day interaction with BPM data. The overriding concept with the business space is to provide content and solutions from a common front end.

IBM Training

Widgets

Instances

Widget Needs Configuration
This widget is not configured. Expand the widget menu for options.

- Plug-in user interface components
- Define functionality of a business space
- Combine widgets to create a page (mashup)

KPIs

Widget Needs Configuration
This widget is not configured. Expand the widget menu for options.

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Figure 8-6. Widgets

Widgets are pluggable user interface components that are used to define the functions of business spaces. By themselves, widgets typically have limited or specific capabilities. However, widgets can be combined to interact with each other to do related tasks. Combined widgets are called a *mashup*. For example, take a widget that displays news items from an RSS feed and another widget that is used to create tasks that you assign to someone. Combine the two widgets into one page, and you create a mashup. In this mashup, you can see a news event and react to it by assigning someone to investigate whether the event might affect your business. Some widgets communicate with other widgets so that events in one widget affect the contents of a different widget.

The business space provides a widget palette that contains categories of widgets you can use to configure the pages in business spaces. These categories include:

- Business configuration
- Business monitoring
- Business monitoring tools
- Solution management
- Tasks and workflows
- Viewers

- Visual step
- Reviewing

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Styles support

Space style:



Choose an icon:



Style selection applies both colors and banner images to spaces



Home :: Process Portal :: Go to Spaces :: Manage Spaces :: Actions ▾

 Better Lending

Home :: Process Portal :: Go to Spaces :: Manage Spaces :: Actions ▾

 Better Lending

Home :: Process Portal :: Go to Spaces :: Manage Spaces :: Actions ▾

 Better Lending

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Figure 8-7. Styles support



Display business space content in other web pages

ClipsAndTacksBusinessSpace

Page 1

- All Widgets
- Layout
- Edit Settings...
- Show Link...
- Display on a Web Page...**
- Reorder Page...
- Delete

Display on a Web Page: Page 1

To display this page on another web page, as well as here, copy (Ctrl-C) the markup below, and paste it (Ctrl-V) into the HTML markup of the web page.

Width: 750 px Height: 850 px

Scroll bars: On Off

Refresh Markup

```
<script src="https://localhost:9444/mum/embedding?uri=widget:js&url=https%2A%2F%2Flocalhost%2A9444%2FBusinessSpace%2FWidget%2Fwidgets%2Fsystem%2FcolumnLayout%2FcolumnLayout.xml&pid=C0A82A97F13AA3707E1D13E60B6E82000005&h=850&w=750&sb=yes"></script>
```

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Figure 8-8. Display business space content in other web pages

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Pages or mashups

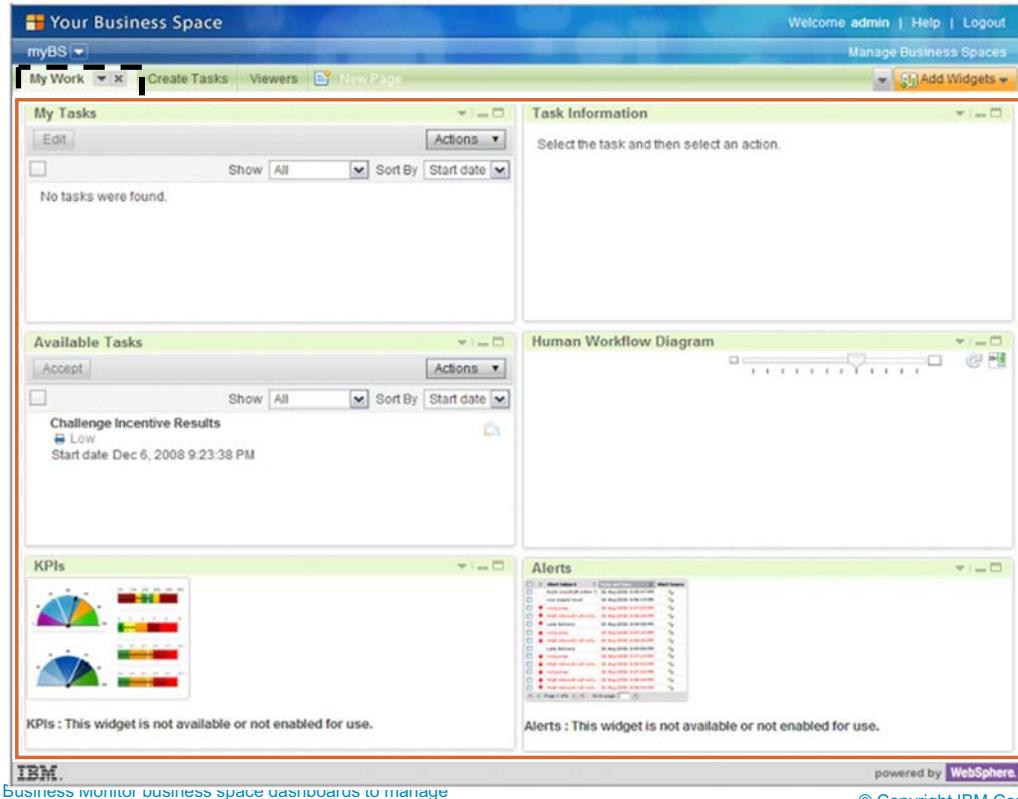


Figure 8-9. Pages or mashups

A page acts as a container for one or more widgets. If more than one widget is placed on a page, it becomes a mashup. By definition, a mashup combines data from more than one source into a single integrated tool. This example shows six widgets that are placed on the page **My Work**.

The screen capture illustrates the mashup; do not be concerned about reading the text in the graphics.

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Business spaces

The screenshot shows a business space dashboard with the following layout:

- Top Bar:** Welcome admin | Help | Logout | Manage Business Spaces | Add Widgets
- Left Sidebar:** myBS | My Work | Create Tasks | Viewers | New Page
- Central Area (highlighted by a red box):**
 - Task Information:** Select the task and then select an action.
 - Available Tasks:**
 - Challenge Incentive Results
 - Low
 - Start date Dec 6, 2008 9:23:38 PM
 - Human Workflow Diagram:** (empty)
- Bottom Left:** KPIs : This widget is not available or not enabled for use.
- Bottom Right:** Alerts : This widget is not available or not enabled for use.
- Footer:** powered by WebSphere | Using IBM Business Monitor business space dashboards to manage business processes | © Copyright IBM Corporation 2018

Figure 8-10. Business spaces

Business spaces are collections of related web content that provide insight into the business and the organization's ability to react to changes in it. A business space consists of pages or mashups that the business user defines. Each page can contain one or more widgets that are configured to do business tasks. You can have many business spaces with each one having a different purpose. For example, a space with widgets from IBM Business Monitor can be used to monitor key performance indicators in your business.

You can create a business space in any of the following ways:

- Creating a business space by using the widget palette to define the tasks
- Using a preconfigured template
- Importing an existing business space

The screen capture illustrates a business space; do not be concerned about reading the text in the graphics.

Templates

- Prebuilt and configured business spaces
- Expedites creation of new business spaces
- Categorized according to functionality

Template categories and uses	
Category	Use
Business monitoring	Managing tasks and workflows
Initiating process improvements	Managing your tasks
Managing business performance	Reviewing
Solution management	Managing your team's tasks

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Figure 8-11. Templates

Using the preconfigured templates that come with a business space, you can configure it more easily. You can access the templates when you create a business space. In addition to the provided templates, you can also create customized templates from business spaces. If you create a business space that you want to save as a template that can be shared with other users, a superuser can convert the business space into a template. The template can then be shared with other users. If any of these users change any of the pages in the customized template, then the changes are forwarded to other users who share the template. However, because future updates to the business space can overwrite this type of change, the superuser must create a copy of the original template before modifying anything.

Monitoring with business space dashboards

- Personalize the analysis and display of business performance data, and compress information to focus on business objectives and key performance indicators
- View business-critical information graphically, by using visual cues such as color to improve the probability of timely problem determination and the speed of decision making
- Visualize performance data such as KPIs and metrics, which can be summarized in reports and graphs
- Analyze and investigate business situations by using drill-down capabilities to trace situations to individual events and to inspect event details
- Set up actions and alerts that are part of the management phase of a business performance management solution

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Figure 8-12. Monitoring with business space dashboards

Dashboard widgets (1 of 3)

- Each widget within a dashboard addresses a specific business performance management function
- The following widget types can be created:
 - Alerts: Display alerts that notify users of defined situations that occur at run time
 - Diagrams: Display diagrams that are associated with a particular monitoring context or KPI context
 - Instances: Display the available monitoring contexts in either individual instances or user-defined groups of context instances
 - KPIs: Display details of KPIs, such as a KPI value relative to the defined ranges, the target (if applicable), and the status

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Figure 8-13. Dashboard widgets (1 of 3)

IBM Business Monitor dashboards are created to comprise a set of views. Each view has its unique representation capabilities and can display different forms of business data. Views also differ in their configuration and usage scenarios.

Dashboard widgets (2 of 3)

Using IBM Cognos BI, users can add the following widgets on their dashboards:

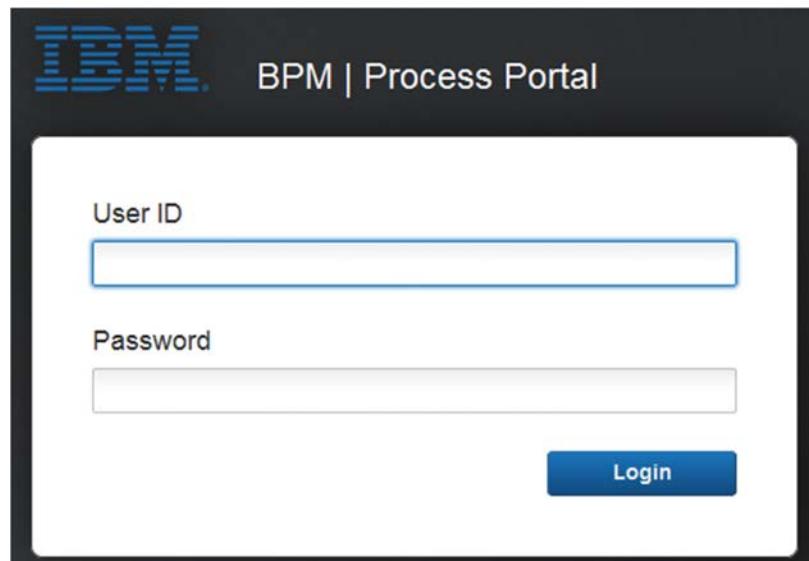
- **Report Designer** is a tool for creating simple or detailed reports directly from a business space dashboard
 - Using this widget, you can edit the reports that you created and also edit reports that were created with IBM Cognos Business Intelligence
- **Report Viewer** is an interface that provides optimal report viewing capabilities from business space
 - Using this widget, you can view graphical, multidimensional reports and change the display in various ways, such as choosing a different chart type and drilling down on measures to expose more data

Dashboard widgets (3 of 3)

The following widgets are supported:

- **Alerts Manager:** Use it to create alerts directly from the dashboard and manage how alerts are received
 - Users can create alert notifications from existing key performance indicators (KPIs)
- **KPI Manager:** Use to define, copy, and update KPIs directly from the dashboard interface
- **KPI history and prediction:** Collect data from a KPI over time and analyze the data to see trends
 - The historical data that is collected can be used to predict future trends for the KPI

Getting started with Monitor business space



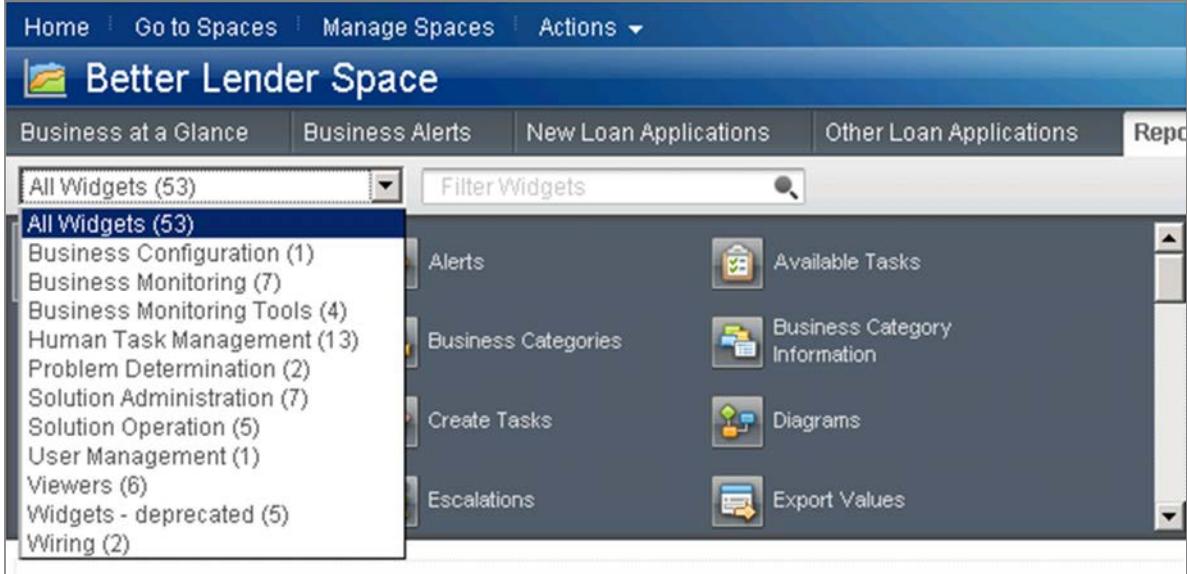
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Figure 8-16. Getting started with Monitor business space

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IBM Business Monitor business space



The screenshot shows the IBM Business Monitor business space interface. At the top, there's a navigation bar with links for Home, Go to Spaces, Manage Spaces, and Actions. Below the navigation bar, the title "Better Lender Space" is displayed next to a small icon. The main area is divided into two sections: a sidebar on the left and a content area on the right.

Left Sidebar (Widget Catalog):

- All Widgets (53)
 - All Widgets (53)
 - Business Configuration (1)
 - Business Monitoring (7)
 - Business Monitoring Tools (4)
 - Human Task Management (13)
 - Problem Determination (2)
 - Solution Administration (7)
 - Solution Operation (5)
 - User Management (1)
 - Viewers (6)
 - Widgets - deprecated (5)
 - Wiring (2)

Right Content Area:

- Alerts:** Available Tasks
- Business Categories:** Business Category Information
- Create Tasks:** Diagrams
- Escalations:** Export Values

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Figure 8-17. IBM Business Monitor business space

The screenshot shows the 'IBM Training' interface with a blue header bar. The main title is 'Create a business space (1 of 2)'. Below it is a navigation bar with links: Home, Go to Spaces, Manage Spaces, and Actions. A sub-header 'Welcome to Business Space' is displayed above a 'Getting Started' section with a dropdown menu and a '+' button. The central area features a banner with a woman's face and hands over sticky notes, followed by a 'Space Manager' panel. The 'Space Manager' panel has tabs for 'All Spaces' (selected), 'Favorite Spaces', and 'Recent Spaces'. Under 'Recent Spaces', it says 'Displays the last five spaces you visited'. On the right, there are 'Create Space' and 'Import Space' buttons, and a list of existing spaces: 'Better Lender Space' (Owned by admin) and 'Global Process Monitor (Advanced)' (Owned by admin). The bottom of the page includes a footer with copyright information.

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Figure 8-18. Create a business space (1 of 2)

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Create a business space (2 of 2)

Create Space

* Space name:

* Space style: Default

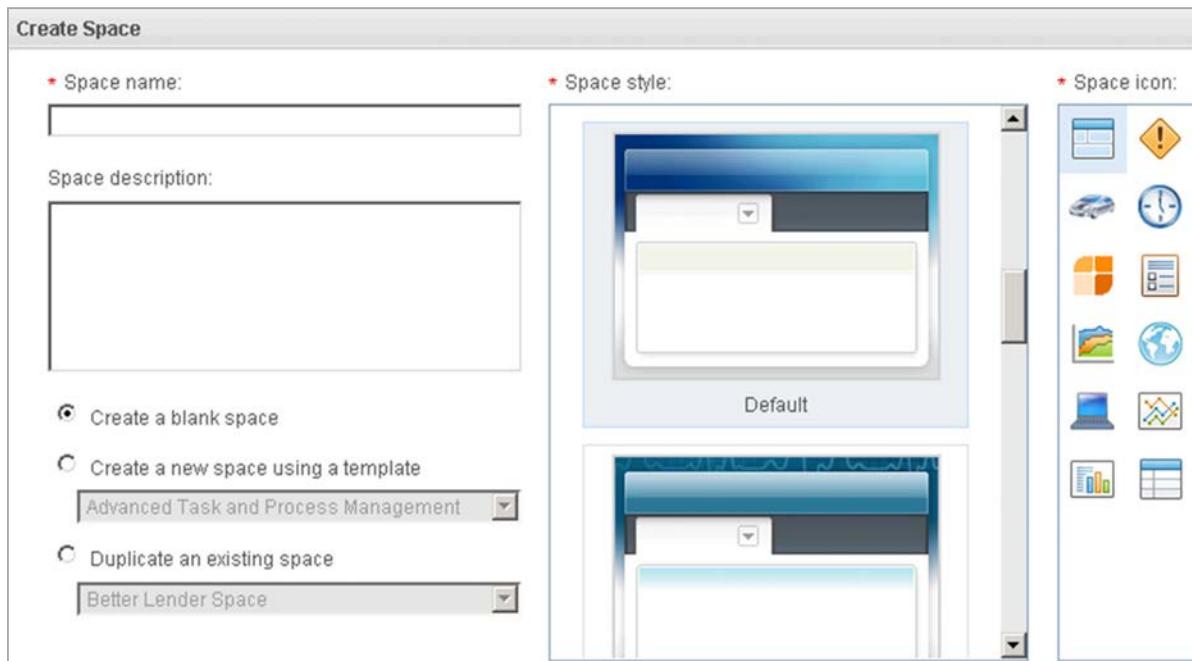
* Space icon: 

Space description:

Create a blank space

Create a new space using a template Advanced Task and Process Management

Duplicate an existing space Better Lender Space



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Figure 8-19. Create a business space (2 of 2)

You can create a business space dashboard or work in the default business space that is provided. IBM Business Monitor provides a template that you can customize to quickly view business performance data in various formats. The option to use a template is available when you are creating a space.

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Instances widget

	id ...	City	COMPLETED	Country	CreationTime	Order Fulfillment
		CityA	★	CountryA	January 24, 2015 12:29:... ...	7 h, 33 m, 30.29 s
		CityB	★	CountryB	January 24, 2015 7:44:... ...	17 m, 10.156 s
		CityC		CountryC	January 24, 2015 7:49:... ...	1 d, 17 h, 2 m, 3 s
		CityD	★	CountryD	January 24, 2015 7:51:... ...	6 m, 54.547 s
		CityE		CountryE	January 24, 2015 7:54:... ...	1 d, 16 h, 57 m, 3 s

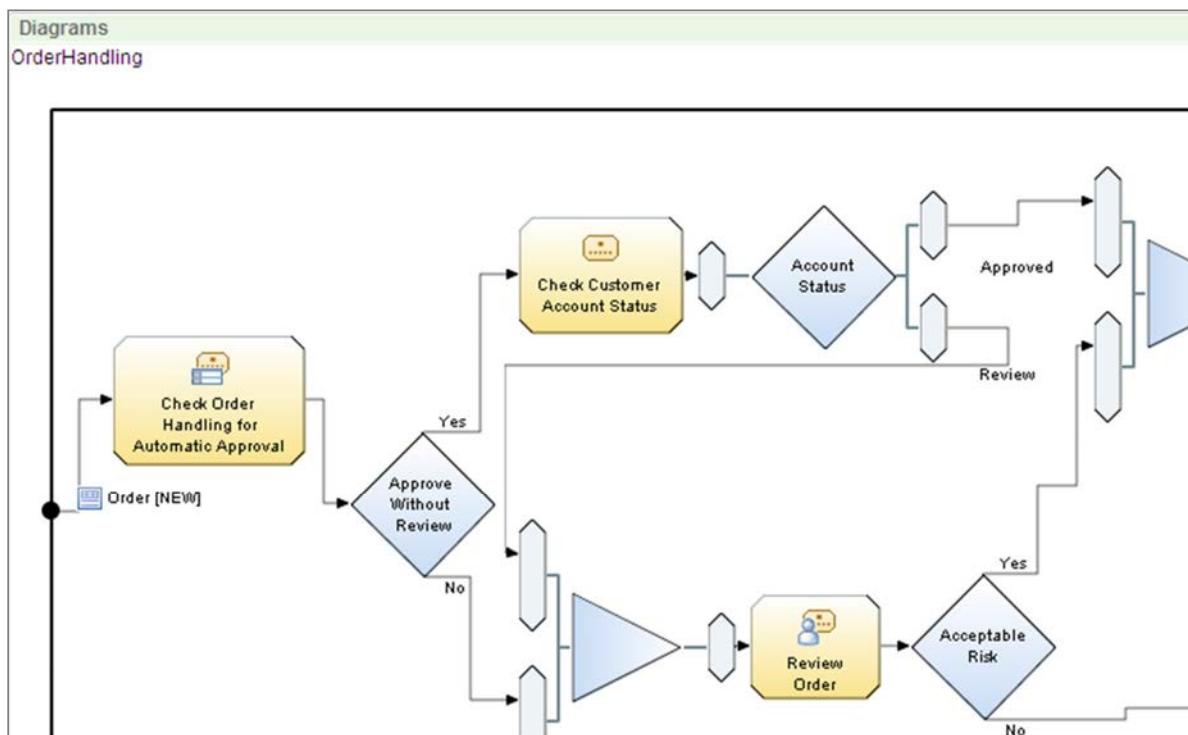
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Figure 8-20. Instances widget

In business monitoring, an *instance* represents a specific data construct that IBM Business Monitor is processing. In an order processing scenario, an order can be considered an instance. Information (data) about each order instance can be monitored, such as the dollar amount of each order. Ultimately, the order instance data is displayed in a customizable table or graph format in the dashboard.

Diagrams widget



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Figure 8-21. Diagrams widget

With the Diagrams widget, you can see a business process from the dashboard in a flowchart format. The flowchart displays status and other information, and you can click a parent process to see related subprocesses.

A diagram is associated with a key performance indicator (KPI) context or monitoring context. An instance diagram can be associated with a monitoring context when there is a cooperative connection with the Alerts widget or the Instances widget. The Diagrams widget requires a monitor model that contains a visualization element, consisting of one or more Scalable Vector Graphics (SVG) diagrams that are associated with a monitoring context or a KPI context.

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IBM

Report Designer widget (1 of 3)

Report Designer

New Report

Save Open

Name: MyReport

Screen Tip:

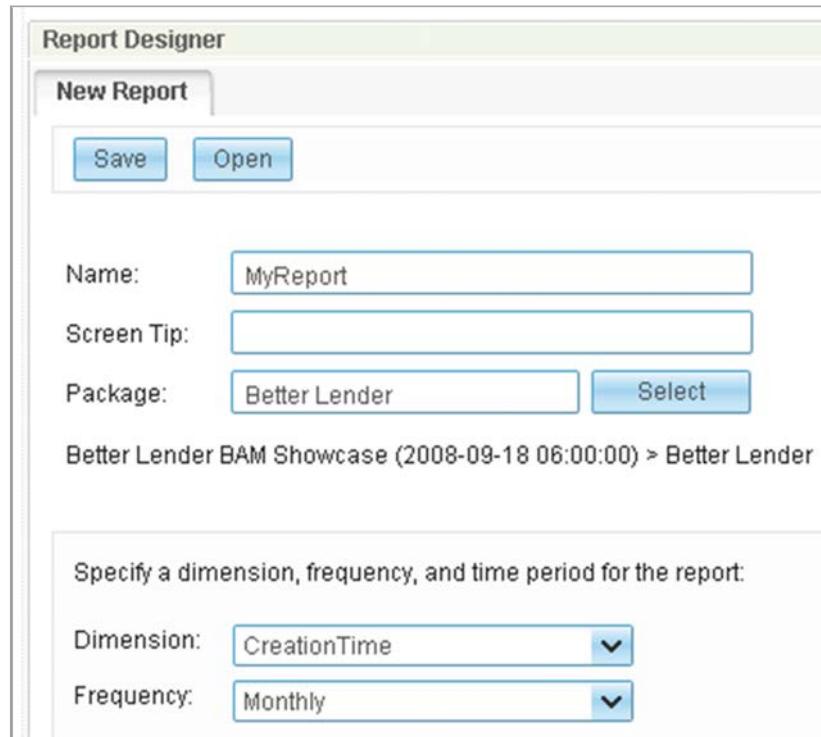
Package: Better Lender Select

Better Lender BAM Showcase (2008-09-18 06:00:00) > Better Lender

Specify a dimension, frequency, and time period for the report:

Dimension: CreationTime

Frequency: Monthly



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Figure 8-22. Report Designer widget (1 of 3)

The Report Designer widget is a tool for creating simple or detailed reports directly from a Business Space dashboard. Using this widget, you can edit the reports that you created and also edit reports that were created with IBM Cognos Business Intelligence.

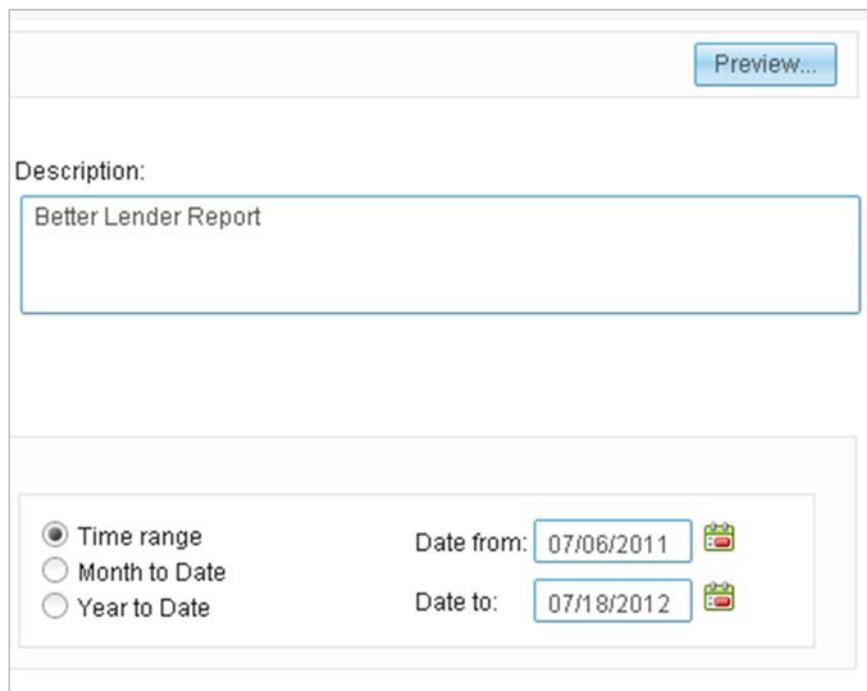
Additionally, the Report Designer widget provides a gateway to IBM Cognos BI, from where you can use the advanced authoring features to enhance your reports.

The Report Designer and Report Viewer widgets are iWidgets that work with Business Space and WebSphere Portal.

Generally, business programmers or reports specialists are the level of users that use the Report Designer widget to create reports. The information that is provided for designing reports is intended for users who are familiar with IBM Business Monitor models, reporting concepts, and in some cases, programming.

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Report Designer widget (2 of 3)



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Figure 8-23. Report Designer widget (2 of 3)

Users can use it to preview the reports. They also can optionally select a time period for the report.

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Report Designer widget (3 of 3)

Select the data you want to include in the report:

<input type="checkbox"/> Dimensions
<input checked="" type="checkbox"/> CreationTime
TerminationTime
Date Loan Processing Started
Loan Officer
Lending Process State

<input checked="" type="checkbox"/> Measures
<input checked="" type="checkbox"/> InstancesCount
<input checked="" type="checkbox"/> Total Amount of Application Loans
<input checked="" type="checkbox"/> Total Number of Application Loans
<input checked="" type="checkbox"/> Maximum Lending Process Duration
<input checked="" type="checkbox"/> Minimum Lending Process Duration
<input checked="" type="checkbox"/> Maximum Application Loan Amount
<input checked="" type="checkbox"/> Minimum Application Loan Amount
<input checked="" type="checkbox"/> Maximum Completed Loan Dollars per Processing Day

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Figure 8-24. Report Designer widget (3 of 3)

Select the dimensions and measures to include in the report.

Report Viewer widget



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Figure 8-25. Report Viewer widget

When you are viewing a report from the Report Viewer widget, use the right-click menu to quickly work with report data. From this menu, you can select to browse, drill down, filter, sort, conduct general calculations, and delete report items from the display.

Using dimensions in your dashboard, you can generate multidimensional reports that analyze different aspects of data that is retrieved from a dimensional model. Charts and grids present data for analysis against different dimensions.

Note: Dimensions are available only when IBM Cognos BI is installed.

A dimension is a data category that is used to organize and select instances for reporting and analysis. For example, a retail business performance might be analyzed according to time, products, and stores. For this business, time, products, and stores are dimensions. Each dimension has one or more levels that define the overall hierarchy of the dimension. For example, the time dimension might have year, month, and day levels.

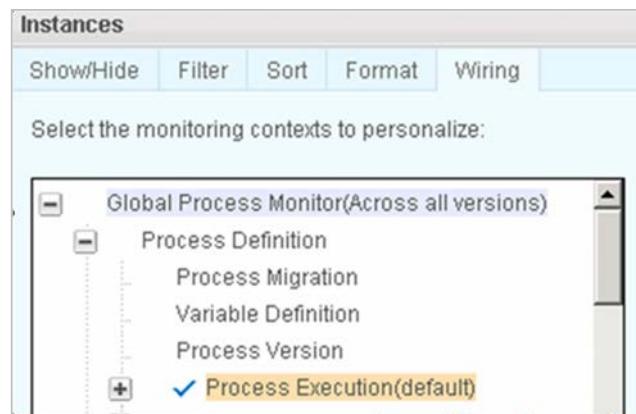
Assume that you collect data such as sales figures for every product your company makes. You then must retrieve information from this data, and answer the following questions:

- What are the total sales for each product by store?
- Which products are selling best over time?
- Who is your highest-performing salesperson?

To answer these questions, you can use the Dimensions widget. It extracts, organizes, and summarizes your data. You can use it to analyze the data, compare, detect patterns and relationships, and discover trends. The Dimensions widget requires a monitor model that contains defined dimensions and metrics. Dimensions and metrics that are related to a business objective, such as sales, constitute a multidimensional cube. For example, a cube can have two dimensions: a location dimension with region, country, and city levels, and a product dimension with product category and product name levels. A metric for total sales can then provide sales figures for each product and type in each city, region, and country.

Wiring instance metrics (1 of 2)

- Send metric data to other widgets
- Enable wiring and select the metrics



Enable this widget to send events over wires

Select the metrics to show or pass to another widget on your dashboard. You can only pass instance metric values to widgets that are wired.

Available	Selected
Audit Events Aux Called Execution Identifiers Aux Called Executions Aux Empty DateTime	

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Figure 8-26. Wiring instance metrics (1 of 2)

The Dimensions widget with the check box is selected to allow the widget to interact with other widgets. In the Instances widget, the wiring is enabled. When you select the dimension, you can right-click it and select **Show Instances**. You can also disable the wiring between the Instances widget and the other widgets by removing the wire.

Alerts widget

- You can add the Alerts widget to a dashboard to view alert notifications of predefined business situations
- A predefined business situation for a catalog sales company, for example, would be when the average response time to process an order is exceeded
- When the order processing unit exceeds the limit that is set for average response time, an alert notification is sent to the manager so that the manager can immediately take corrective action if needed

Alerts				
	Mark Read	Mark Unread	Forward Alert	Remove
	Subject	Priority	Model	Status
<input type="checkbox"/>	MyNewAlert	3	CATOrderMgmtMonitoringModel	Available
	Late order shipment	3	CATOrderMgmtMonitoringModel	Available

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Figure 8-27. Alerts widget

Business user alerts: Alert Manager

- Use dashboard to create alerts that are based on KPIs
- Alert Manager widget
 - Create, edit, copy, delete alerts; also, save changes to alert subscription
- Modeled alerts are also displayed but are not editable
- An alert can be defined on both modeled KPIs and runtime KPIs
- An alert can be defined on predicted KPI values and actual values
- Alerts can be imported and exported from the command line, and are

Alert Name	Dashboard Alert	Cell Phone	E-mail	Pager
Fee Compliance Alert	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Invalid Loan Application Alert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NTB Failure Alert	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Print 72 hours exceeded Alert	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Figure 8-28. Business user alerts: Alert Manager

The Alert Manager widget is shown here. Alerts can be created based on KPIs.

- You can filter alerts to list all alerts, modeled alerts, or by model.
- Both administrative console bindings and business user alerts are shown.
- Both types can be subscribed to by using this widget.
- Business user alerts that the current user owns can be deleted or edited.



Business user alerts: Conditions

Alert

- Conditions** Alert Content Notification
- Alert name: Test Alert
- Description:
- Model: CATOrderMgmtMonitoringModel 2013-04-17 20:11:11
- Owner: bpmadmin
- Conditions**

Notify when all of the following conditions apply

KPI Name	Prediction Model	Condition	Value	
Average Order Fulfillment	None (Use actual data)	Above range	Day 4-5	X

- Timing**

How often to check conditions: Hours 1

When to start notifications: May 1, 2013 12:00:00 AM GMT-08:00 America/Los_Angeles

Notification frequency: Once per selected period when the condition applies

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Figure 8-29. Business user alerts: Conditions

For **Condition**, you can specify conditions such as above, below, or within range; or above, below, or at target.

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Business user alerts: Alert content

Alert

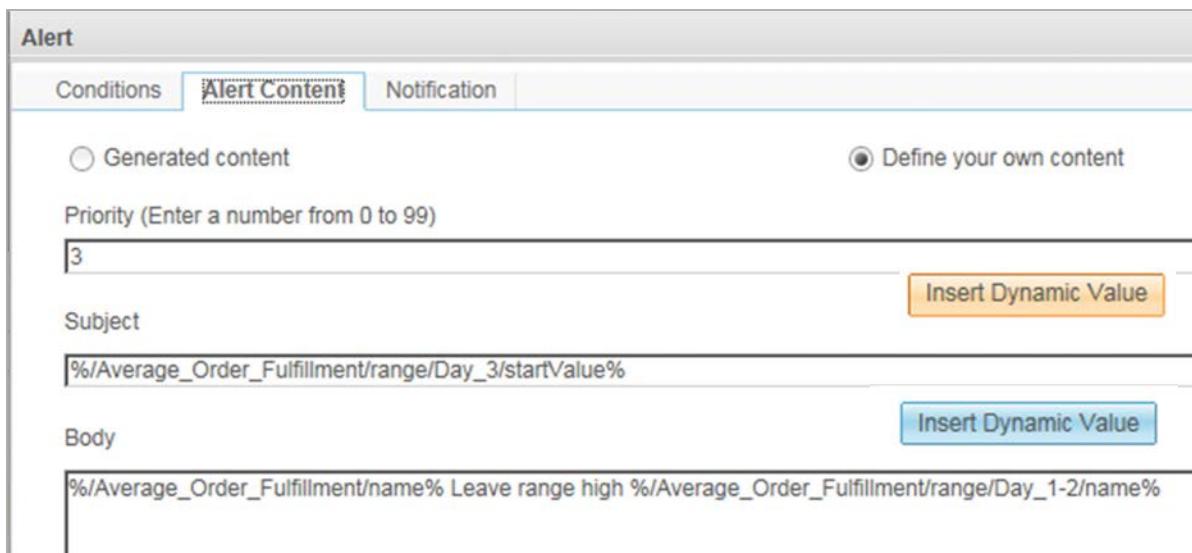
Conditions **Alert Content** Notification

Generated content Define your own content

Priority (Enter a number from 0 to 99)
3 Insert Dynamic Value

Subject
%/Average_Order_Fulfillment/range/Day_3/startValue% Insert Dynamic Value

Body
%/Average_Order_Fulfillment/name% Leave range high %/Average_Order_Fulfillment/range/Day_1-2/name%



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Figure 8-30. Business user alerts: Alert content

If you click a field to insert dynamic values, you are presented a list from which you can select KPI value, target, name, and range information.

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Business user alerts: Notification

The screenshot shows the 'Notification' tab of a configuration interface. At the top, there are three tabs: 'Conditions', 'Alert Content', and 'Notification'. The 'Notification' tab is selected. Below the tabs, there is a section titled 'Recipients' containing the user 'bpmaadmin'. To the right of this section is a checkbox labeled 'Dashboard Alert' which is checked. Below this, there is a grid for selecting notification methods. The grid has columns for 'Cell Phone', 'E-mail', and 'Pager', each with a checkbox. There is also an 'Actions' column with an 'Add' button and a delete icon ('X').

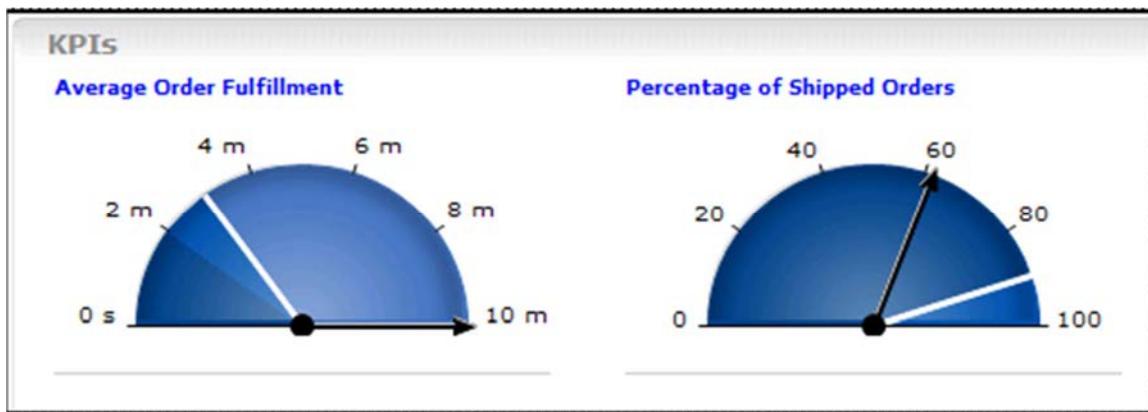
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Figure 8-31. Business user alerts: Notification

You can use the **Notification** tab to add users who would receive the alert and the method to notify the user: dashboard alert, cell phone, email, or pager.

KPI widget



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Figure 8-32. KPI widget

KPIs are quantifiable measures that are designed to track the critical success factors of business processes. These measurements break down key areas of your business so that you can see how each area contributes to the overall business results.

Every KPI is different depending on the business. For example, in telephone sales, the timely answering of customer calls is a key business activity. The percentage of calls that are answered within the first minute might be one of its key performance indicators.

When you are selecting key performance indicators to monitor, choose them to reflect the goals of your business and to allow for corrective action by detecting problems early on. You can use KPIs to represent aggregate and expression business measures. Create each KPI with a target, or ranges, or both. Without a target or ranges, KPIs that are displayed on your dashboard reflect only the value of the aggregated and expression measures.



KPI History and Prediction widget configuration

Configure KPI History and Prediction widget

- Select relevant KPI in the **KPI** tab
- In the **History and Prediction** tab, select prediction model
 - Must be created first in the KPI Manager

Select the models for which you want to retrieve the KPIs.

Latest version All versions

Display options

KPI ranges KPI target

Select the KPI to display. You can choose only one at a time.

OrderItem 2006-08-03 00:00:00
 Avg Order Price
 Sum Price Today

* Historical data collection is not currently active for this KPI.

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KPI History and Prediction

KPI **History and Prediction**

avgOrderPrice

KPI Prediction

Show predictions based on the following prediction model
 PredictionFor30Days

Show prediction data on graph by default

KPI History

Select the default KPI History values to display

Time range type
 Current period

Number of past periods
 2 Month

Time zone
 GMT-06:00

Location (for daylight saving)
 America/Chicago

Show data points
 Daily

Specify a height in pixels to adjust the display area of the chart.
 Chart height
 425 pixels

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Figure 8-33. KPI History and Prediction widget configuration

A user ID with privileges to administer the KPI can create prediction models in the KPI manager.

KPI history tracking must be turned on before prediction models can be created. The prediction model must already be created.

Select the relevant KPI and then select the prediction model.

KPI History and Prediction widget

- Graph and data table, target, ranges
- Granularity: hour, day, week, month, quarter, year
 - For example, if you configure the KPI widget to see weekly KPI values, then only the weekend data points are displayed
- Time range



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Figure 8-34. KPI History and Prediction widget

Use the KPI manager widget to work with KPIs directly from a dashboard interface. You can use the KPI manager widget to:

- Define, copy, and modify KPIs
- View KPI properties; view and create alerts for KPIs
- Configure settings for collecting history and prediction data

You can use the KPI history and prediction functions of IBM Business Monitor to collect data from a KPI over time, and analyze the data to see trends. The historical data that is collected can be used to predict future trends for the KPI.

The KPI history and prediction functions can be implemented in the business process model, or you can enable the functions from the KPI manager widget and create your own prediction models. Before you can use the prediction capabilities, history data must be collected for the KPI.

The KPI History and Prediction widget displays historical and predictive data for a KPI in a fully interactive graph format. Because of the flexibility of the graphical interface, you can easily change the time periods and data points that are displayed on the graph.

KPI predictions are updated hourly, and might not be available immediately after a business process model is deployed.

In this example, the KPI history widget is configured to show weekly KPI values, so you see only the weekend data points. Notice the dark line at the \$20,000 dollar mark across the graph. It represents the target that was set when the widget was configured.

Unit summary

- Explain the concept of the business space
- Describe the business space dashboard and the benefits of using it
- Use KPI history and prediction
- Describe the widgets that are provided in IBM Business Monitor business space:
 - KPI manager
 - KPI history
 - Reports
 - Alerts
 - Diagrams
 - Instances
 - Dimensions

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Figure 8-35. Unit summary

Checkpoint

1. _____ allows users to monitor and manage business performance indicators, and retrieves information quickly and efficiently.
2. Name four widgets on the Monitor dashboard:
 - _____
 - _____
 - _____
 - _____

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Figure 8-36. Checkpoint

Write your answers here:

- 1.
- 2.

Checkpoint answers

- 1.** Dashboard

- 2.** Name four widgets on the Monitor dashboard:
 - Alerts
 - Diagrams
 - Instances
 - KPIs

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Figure 8-37. Checkpoint answers

Exercise 7

Building dashboards in IBM Business Monitor

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Figure 8-38. Exercise 7

Exercise objectives

After completing this exercise, you should be able to:

- Generate and send events to monitor model
- Start the IBM Business Monitor dashboard
- Create an instance widget

Unit 9. Managing action services and event emissions

Estimated time

01:00

Overview

In this unit, you learn how to use the monitor action services component of IBM Business Monitor to take defined actions when events occur within a model.

How you will check your progress

- Checkpoint
- Exercise

Unit objectives

- Describe monitor action services
- Describe how to create action services
- Define situation events
- Explain how to bind situation events to action services
- Describe how to register an action service

Monitor action services and event emissions overview

The Monitor action services and event emissions:

- Is a component of IBM Business Monitor
- Receives situation events that applications emit
- Selects appropriate actions that are based on user-defined rules and policies
- Invokes one or more actions
- Provides user subscriptions to manage alert actions for individual users
- Implements Virtual Member Manager (VMM) support, providing an XPath query for alerts
- Supports direct LDAP queries for migration, but is highlighted as deprecated usage
- Supports web services invocations
- Provides support to allow the action manager to be used without security in environments such as the test environment by providing support for direct alert IDs or direct email addresses

Figure 9-2. Monitor action services and event emissions overview

An administrator for IBM Business Monitor binds situation events to action services by associating an action template with situation events, through the Monitor action services and event emissions administration console. The Monitor action services and event emissions component receives situation events, parses the received events, and selects an appropriate action by looking up the action in the action catalog, where information about bindings is stored. Finally, the Monitor action services and event emissions start the selected action.

Example: Within a business process, you want to detect a particular business situation when it happens and be notified that it occurred. First, you must define the particular business situation that you want to detect, for example, when a metric exceeds its acceptable threshold. Then, you define one or more events that are emitted when this situation occurs. These situations and corresponding event notifications are defined in the Monitor model editor.

After the monitor models are deployed, an event is emitted each time that the situation occurs, which the Monitor action services detect. The Monitor action services component dispatches a notification of the business situation and takes one or more user-defined actions to address the situation.

Monitor action services capabilities

- Receives situation events that use Common Base Event XML formatting and invokes one or more action services
- Administers the configuration of templates and event-to-action service bindings
- Supports the following action service types:
 - Notification on dashboard or by email
 - Web service
- Emits Common Base Event-formatted events before and after action invocation

Figure 9-3. Monitor action services capabilities

A system administrator uses the Monitor action services to notify the appropriate people about events that occur in a model. These notifications can take the form of a dashboard alert, an email, a call to a cell phone, or a call to a pager. Notifications can also be sent to web services. A systems administrator creates an action template, which defines the delivery type, subject, and body of the notification; and the federated repositories or Lightweight Directory Access Protocol (LDAP) query, which defines which users receive alert notifications. The cell phone and pager types are email delivery types that the cell phone or pager provider (if supported) processes and sends to the cell phone or pager device.

- Notification templates: Notifications are sent based on the action service templates that are configured through the administrative console panels of the Monitor action services.
- Web service templates: The web service handler invokes web services as an action template.

Monitor action services and event emissions components

The Monitor action services and event emissions consists of the following two components:

- Monitor action services and event emissions handlers
 - Consists of a set of action handlers that are used to start the appropriate action service
- Monitor action services and event emissions logging service
 - Provides logging and tracing information about action invocations



Managing action services and event emissions

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Figure 9-4. Monitor action services and event emissions components

The Monitor action services and event emissions components interact with each other and with other IBM Business Monitor components to respond to business situations.

The Monitor action services and event emissions include action handlers that invoke services when they receive a situation event. When the events are triggered, the observation manager sends them to the Common Event Infrastructure (CEI), where the Monitor action services and event emissions process the events. Each action handler is then called to initiate the associated action services within the Monitor action services and event emissions.

The Monitor action services and event emissions obtain configuration information for each action handler from the action catalog service. Action handlers are responsible for running action services.

The Monitor action services and event emissions use Common Event Infrastructure (CEI) as the action-logging mechanism to enable action logging.

The Monitor action services and event emissions emit events by using the Common Base Event structure before and after an action is executed. You can track whether an action was taken based on the logging data from the emitted events.

The Monitor action services and event emissions components perform the following functions by interacting with other components in IBM Business Monitor:

- The IBM Business Monitor administrator binds situation events to action services by defining the action handler and the action template, and associating them with situation events.
- The Monitor action services and event emissions receive situation events, and the Monitor server component emits them.
- The Monitor action services and event emissions parse the received situation events and determine an appropriate action by looking up the action in the Action Catalog database, where the information about bindings is stored.
- The Monitor action services and event emissions invoke each action handler with a situation event and an action template to invoke the required action service.

Using the Monitor action services and event emissions

To ensure that the notifications and the actions take place, the following tasks must be performed:

- Identify the situation event
- Define templates for the action services that you want to invoke as a result of the event
 - An action handler, such as an alert handler or mail handler, uses the templates to invoke the action services that send a dashboard alert or a mail event
- Bind the situation events with the template definitions
 - The binding defines the configuration that is used at run time so that Monitor action services and event emissions can determine which action services must be invoked upon receiving the situation event

Figure 9-5. Using the Monitor action services and event emissions

When the Monitor action services and event emissions receive situation events, they apply the definitions and the bindings that you set for those events. They also start the action services that are identified from the templates that are bound to the situation event, and they notify you of the situation in the manner you specified.



Configuring Monitor action services

- For situation events defined in the model, use the Monitor Action Services menus to define the actions to take
- For any changes to take effect, stop and restart the Monitor action services by selecting the **Action Services** application from the administrative console

Enterprise Applications

Use this page to manage installed applications. A single application can be deployed onto multiple servers.

Preferences

Start	Stop	Install	Uninstall	Update	Rollout Update	Remove File	Export
Select	Name						Application Status
							Filter: IBM*
You can administer the following resources:							
<input type="checkbox"/>	IBM Cognos						
<input type="checkbox"/>	IBMUTC						
<input type="checkbox"/>	IBM BPM Emitter Service						
<input type="checkbox"/>	IBM WBM ActionServices						
<input type="checkbox"/>	IBM WBM Data Services						
<input type="checkbox"/>	IBM WBM DBG Services						

Managing action services and event emissions

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Figure 9-6. Configuring Monitor action services

When a user changes the Action Services Manager configuration (on the **General** tab or the **LDAP** tab), the action services application must be restarted. This rule does not apply to the creation of templates or situation event bindings. Those items are created and updated immediately.

Action services templates

- Action services templates define information for the Monitor action services and event emissions to use in invoking a particular action service
- Defined in the **Monitor action services** and **event emissions administration** panes in the administrative console
- Two types of templates:
 - Notification template
 - Web services template
- Templates are bound to situation events so that the appropriate action services are invoked when the event is received

[Managing action services and event emissions](#)

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Figure 9-7. Action services templates

The system administrator uses the Monitor action services and event emissions administrative console to register each action service. An action service notifies defined users about a situation and invokes a web service application.

The registration of the action service involves the creation of a template for this action service. Each template is created specifically for one type of action service only. Afterward, the system administrator binds a situation event to an action service.

Action services templates are defined according to the Monitor action services and event emissions administration panels. These templates are found in the administration node on the WebSphere Application Server administrative console.

Notification templates, such as the alert notification template, typically contain the subject, body, addressee list, and a user-defined LDAP query. They determine the user ID or email addresses of those users who can display the alert or to whom the notifications are sent, and variables for the notification. Other templates, such as web services templates, contain the information necessary to initiate their services.

The notification templates define the alert, email, cell phone, and pager contents. Variables can be inserted into the LDAP query, the subject, and the body. They are delimited as %VariableName%, which is embedded inside their entry field. The VariableName is substituted from the event into its respective field in way that is similar to a variable in a batch file. The number sign (#) can be used

as an escape character to allow percent sign (%) characters to be evaluated as literals. For example, a subject field with value We are at %UsagePercent%# undergoes substitution, and can be We are at 97% when the notification is sent.

The web services template contains the web service parameters that are required for invoking a web service.

To define a template, you must define the configuration parameters for each template in the template definitions pages in the administrative console. You can also modify those parameters later or delete the entire template.

Templates are further bound to situation events so that when the event is received, the appropriate action services are invoked.

Setting up situation events and action bindings

1. Define the situation event in the monitor model
2. Identify the query for the user directory
3. Create a notification template in the administrative console
4. Create a situation event binding in the administrative console
5. Set up the Alert view on a dashboard and give access to users

Managing action services and event emissions

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Figure 9-8. Setting up situation events and action bindings

This slide shows the high-level process for setting up actions in response to situation events that are defined in the monitor model.

- First, you create the situation event in the model and identify the associated trigger.
- You must create a query that identifies the users whom you want to extract from the user directory.
- You create a notification template that identifies the nature of the action, such as email, alert, or web service.
- Then, you bind the situation event to one or more notification templates.
- Finally, for alert type bindings, you configure the Alert view on the dashboard server.

Name	Description
Template name	Unique template name
Description	Template description
Default action service Type	Notification type selection (select only 1)
To (LDAP query)	LDAP query to retrieve the set of users that are intended to receive the Notification
Query base	Variables map to the federated repositories base or LDAP root that is used with the query
Subject	Subject text of notification with inline Common Base Event value substitution variables
Body	Body text of notification with inline Common Base Event value substitution variables

General Properties

* Template name
LateOrderShipmentAlert

Description
Late Order Shipment

Default action service type

Dashboard Alert
 Cell phone
 Email
 Pager

'To' query type

Federated repositories query
 LDAP query
 Email address
 User id

To
wbtadmin

Query base

Subject
Late Order Shipment

Body
The processing time of the order
with order number %

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Figure 9-9. Notification template

In the **To query type** field, select one of the following options to specify what type of query must be entered in the **To** field:

- **Federated repositories query.** If you select this option, a valid federated repositories query must be entered in the **To** field.
- **LDAP query.** If you select this option, a valid Lightweight Directory Access Protocol (LDAP) query must be entered in the **To** field.
- **Email address.** If you select this option, a list of email addresses that are separated with spaces must be entered in the **To** field.
- **User ID.** If you select this option, a list of user IDs separated by spaces must be entered in the **To** field.

Here is a sample LDAP query that pulls all inetOrgPersons in the directory. It is useful for running some tests:

```
(&(objectclass=top)(objectClass=inetOrgPerson))
```

For a production implementation, you would probably use a query to select specific individuals or groups of individuals.

The substitution variable `%OrderNumber%` is used in the body of the alert. OrderNumber is a field that was defined on the Event in the model, and it is substituted for the variable `%OrderNumber%`. You can also use substitution variables in the subject of the notification.



Web services template

Name	Description
Template name	Unique template name
Description	Template description
Target Namespace	The TargetNamespace attribute of the "definitions" element
Service name	The name attribute of the "service" element
End Point address	The location attribute of the "service/port/address" element
Port type	The name attribute of the "portType" element
Operation name	The name attribute of the "portType/operation" element
Input message name	The name attribute of the "portType/operation/input" element

WebServices Template Configuration

General Properties

* Template name:
MyTemplate3

Description:
The WebService template

Target Namespace
my.domain.com

Service name:
MyService

End Point address:
http://my.domain.com:9080

Port type:
SituationManager

Operation name:
handleSituation

Input message name:
xmlSerializedEventMessage

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Figure 9-10. Web services template

The web service is sent the entire event as a serialized XML string. Your web service must be able to parse the XML event string to access the individual elements in the event message.

The web service handler invokes web services as an action template.

The web service is initiated through fields that are defined in the web service template. These fields relate to a typical Web Services Description Language (WSDL) file that web services use. A web service template contains the parameters for a web service invocation. Only web services that take a Common Base Event as an input message can be supported. Business Process Execution Language (BPEL) processes are supported through the web service handler. The BPEL process must be exposed through a Web Services Description Language file definition. Creating a web services template can invoke only an operation that takes a single string variable as input. An XML string representation of the incoming event is put into this string variable.

Situation event binding (1 of 2)

- When a situation event is detected, the Monitor action services and event emissions invoke one or more action service template definitions according to the binding configuration
- Situation events are monitor model elements that are defined as outbound events
 - When the situation is triggered, the situation event is emitted
- When the binding is set, the Monitor action services and event emissions can parse the received situation event and select an appropriate action through the action catalog service

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Figure 9-11. Situation event binding (1 of 2)

By default, an action-service template definition is bound to a particular action handler when the template definition is created. Binding a situation event to an action service template definition that is associated with a particular action handler allows the Monitor action services and event emissions to start the appropriate action service.

When a situation event is detected, the Monitor action services and event emissions invoke one or more action service template definitions according to the binding configuration. A situation event is formatted as a Common Base Event, and it represents a notification of a business situation. Situation events are monitor model elements that are defined as outbound events. When the situation is triggered, the situation event is emitted. For example, a situation can be defined to trigger an event when a certain key performance indicator (KPI) exceeds a threshold. The situation event is then published into the Common Event Infrastructure (CEI). It is also routed to a WebSphere activation specification that is linked to a queue to which the Monitor action services and event emissions are listening.

Situation events are defined into Monitor action services and event emissions by a name and description. They are then bound to an action services template definition, and thus to a corresponding action handler by using the WebSphere Application Server administrative console. This binding at run time allows the Monitor action services and event emissions components to use the action handler and template pairing to start the appropriate action service.

When the binding is set, the Monitor action services and event emissions can parse the received situation event and select an appropriate action through the action catalog service. The appropriate action is then referenced in the action catalog, where information about bindings is stored. Based on this information, the Monitor action services and event emissions create entities called executable actions. An event-to-action determiner function determines what executable actions must be invoked for an incoming situation event by matching it with the situation name stored in an extended data element in the Common Base Event structure.

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Situation event binding (2 of 2)

New Situation Event Binding

General Properties

* Situation Event name:
NewOrder

Description:
Notification of new orders

Apply OK Reset Cancel

Preferences

Select	Template Name	Action Service Type
<input type="checkbox"/>	MyTemplate3	WebServiceHandler
<input type="checkbox"/>	MyTemplate2	EmailHandler
<input type="checkbox"/>	MyTemplate	AlertHandler

Total 3

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Figure 9-12. Situation event binding (2 of 2)

After creating the action templates, the user binds the templates to a situation event. Each template is associated with only one action service.

The action service is bound to the situation event by the value found in the **BusinessSituationName** field within the situation event that is passed to the Monitor action services and event emissions from the server. Monitor action services and event emissions use this value at run time so that they can determine which action services are going to be started upon receipt of the situation event. The situation event can be bound to more than one action service. For example, the situation event can be bound to both an email notification and a web service invocation.

This slide shows a screen capture of the Situation Event Binding for Action Manager. The situation event is NewOrder, and three templates are assigned to this situation event. In this case, each template is handling a different service type: web service, email, and alert.

To access this panel from the administration console, select **Applications > Monitor Services > Monitor Action Services > Installed Situation Event Bindings**.

The **Situation Event** name is the value that is set for the **SituationEventName** attribute in the outbound event definition.



Alerts subscription

- Alerts view is on dashboard
- Define situation events in Monitor model editor
- Configure Monitor to create alerts when situation events occur by using either Action services or Alert Manager widget directly in the dashboard
- Alerts view shows the alerts as they occur; they can be forwarded to other Monitor dashboard users

Alerts					
	Mark Read	Mark Unread	Forward Alert	Remove	Change Priority
	Subject	Priority	Model	Status	
•	MyNewAlert	3	CATOrderMgmtMonitoringModel	Available	
•	Late order shipment	3	CATOrderMgmtMonitoringModel	Available	

Figure 9-13. Alerts subscription

Alerts subscription is a dashboard utility that you can use to subscribe and unsubscribe to alerts. You can also select the type of notification you would like to receive when the subscribed alert occurs, and IBM Business Monitor receives it.

If you are subscribed to an alert when a particular business situation occurs at run time, an alert is sent to you on the notification channels that you select. For example, a manager of an order processing unit might set an upper limit for the average response time for order processing. If the suggested time is exceeded, the manager is notified and can take immediate action.

An administrator or user with access can personalize an alerts subscription by specifying the number of alerts to be displayed per page.

Action catalog data export and import

- Command-line tool can be used to export the defined actions and templates that are stored in the action catalog database to an XML file
- This file can be imported into another action catalog database
 - You do not have to redefine the actions and templates
 - Useful when moving from a testing environment to the production environment
- The action catalog data export and import tool provides logging and tracing

Managing action services and event emissions

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Figure 9-14. Action catalog data export and import

The Monitor action services and event emissions provide a command-line tool that you can use for exporting the defined actions and templates that are stored in the action catalog database to an XML file. This file can be imported again into another action catalog database. You do not have to redefine the actions and templates, for instance, when you are moving from a testing environment to the production environment.

The `Importer.java` command-line tool is used for the export and import, and it is initiated by running a batch file, `runAAMExport.bat`. This tool uses a `config.properties` file that contains required properties and the values that are needed for the export and import operations. By editing these properties, you can determine whether the tool exports the data in the action catalog database to the XML file, or whether it imports the XML file to the action catalog database. You can also change the properties that indicate the target and destination. If an imported action catalog database contains any actions data, it is replaced with the imported data for the identical records (such as identical templates and identical situation-event binding names).

You can override the configuration parameters in the `config.properties` file by using the `-D` command in the command line from which you are running `runAAMExport.bat`. You then include the parameters with different values in this command. You can use this command to start the tool with new values for the parameters without having to change these values in the `config.properties` file.

The action catalog data export and import tool provides logging and tracing. The `logging.properties` file that is in the same directory that contains the `runAAMExporter.bat` file is used to configure logging and tracing. The `logging.properties` file conforms to the JSR47 specification format for controlling logging. By default, this file is set to log data to the command prompt window from which you run the tool. You can reconfigure this file to use different handlers, log levels, and formats. Refer to the JSR47 documentation before editing the `logging.properties` file for details about its contents and how to change the values of its properties.

Registering an action service

- Use the WebSphere Application Server administrative console to register each action service:
 - An action service notifies defined users about a situation, or
 - An action service invokes a web service application, or
 - An action service can invoke both
- The registration of the action service involves:
 - Creation of a template for this action service
 - Each template is created specifically for one type of action service only
 - System administrator later binds a situation event to an action service

Unit summary

- Describe monitor action services
- Describe how to create action services
- Define situation events
- Explain how to bind situation events to action services
- Describe how to register an action service

Managing action services and event emissions

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Figure 9-16. Unit summary

Checkpoint

1. _____ receive situation events that applications emit and selects appropriate actions that are based on user-defined rules and policies.

2. Name two action services types that Monitor supports.
 - _____
 - _____

3. _____ define information for the Monitor action services and event emissions to use in invoking a particular action service.

4. _____ is a web browser-based client that users can use to work on their tasks, and process administrators can use to administer process templates, process instances, task templates, and task instances.

Figure 9-17. Checkpoint

Write your answers here:

- 1.

- 2.

- 3.

- 4.

Checkpoint answers

1. Action services
2. Two action services types that Monitor supports:
 - Notification
 - Web service
3. Action services templates
4. Business Process Choreographer (BPC) Explorer

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Figure 9-18. Checkpoint answers

Exercise 8

Monitoring events from a BPEL process

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Figure 9-19. Exercise 8

Exercise objectives

After completing this exercise, you should be able to:

- Complete a model and then generate events from a BPEL process for monitoring
- Create process instances by using the Business Process Choreographer (BPC) Explorer to generate monitored events
- Create an alert template
- Create situation events and bind them to action services
- Start the IBM Business Monitor dashboard and create several widgets

Unit 10. Monitoring events from other products

Estimated time

01:00

Overview

This unit explains how IBM Business Monitor can process events from IBM and non-IBM products.

How you will check your progress

- Checkpoint
- Exercise

Unit objectives

- Explain how IBM Business Monitor can receive events from:
 - IBM CICS
 - IBM IMS
 - IBM FileNet
 - IBM Operational Decision Management
 - IBM Business Process Manager Advanced
 - IBM Integration Bus
 - Other applications (through IBM Adapters) and application programming interfaces for WS-Notification, Java Message Service, and Representational State Transfer (REST)

Monitoring events from many applications

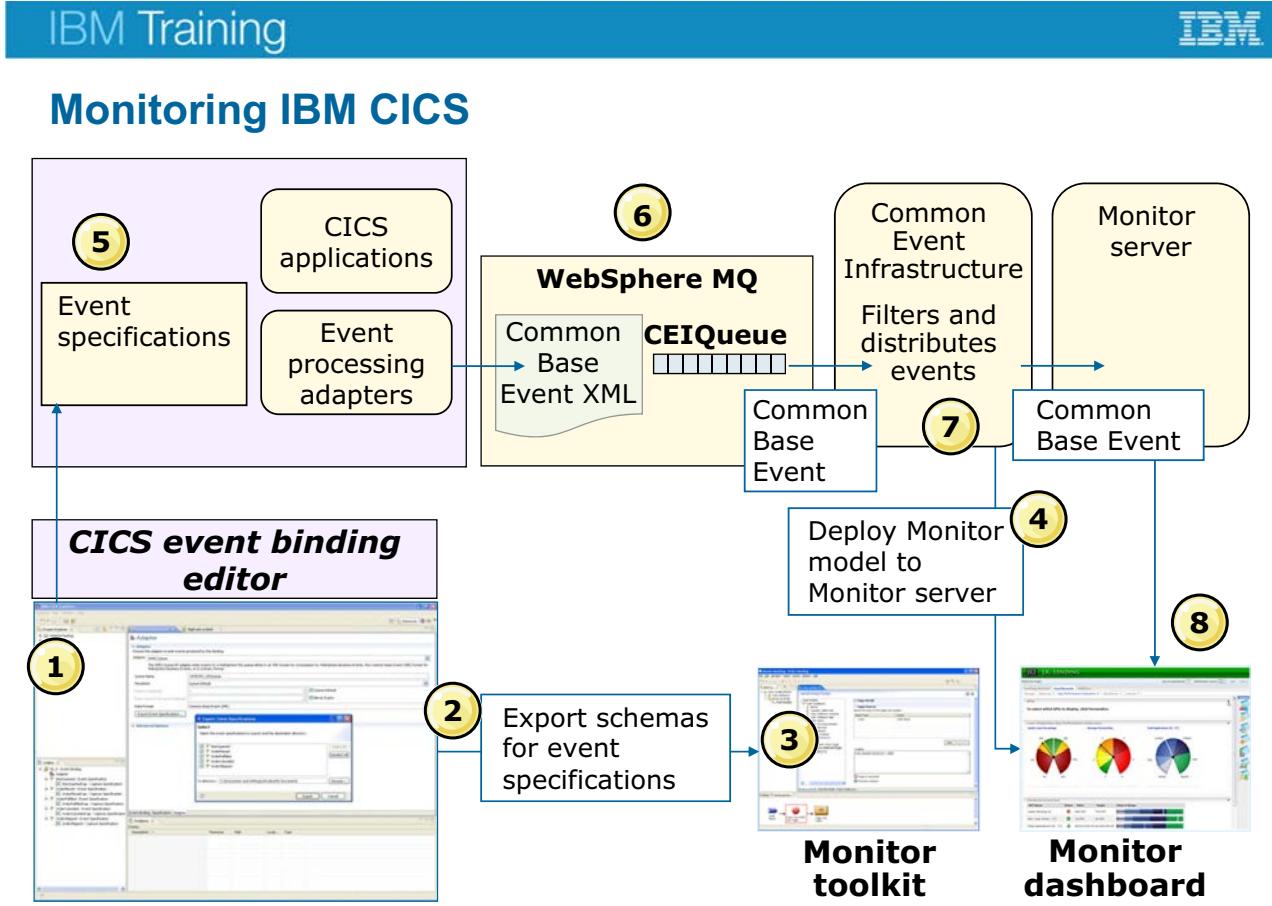
- Using IBM Business Monitor, you can monitor real-time events from a wide variety of sources
 - IBM products
 - Non-IBM products

[Monitoring events from other products](#)

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Figure 10-2. Monitoring events from many applications

With IBM Business Monitor, you can quickly develop monitoring solutions to provide a comprehensive view of the business by collecting real-time events from a wide variety of sources, generated from both IBM and non-IBM products. This unit provides an overview of the various products that can be monitored by using IBM Business Monitor.



Monitoring events from other products

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Figure 10-3. Monitoring IBM CICS

The CICS runtime environment detects instances of events that are enabled and captures the events and payload without changing any application code. When CICS captures events, it carries out specified filtering to enrich the event with information about the application context in which it occurred, and then formats the event and routes it to IBM Business Monitor.

CICS event processing support allows users to identify and select the significant business events that applications emit.

1. The CICS Event Binding Editor, a part of the CICS Explorer, is used to create event specifications, which are installed in the CICS system. The CICS runtime environment uses these event specifications to detect and capture events. Each event specification describes how the data in the event payload is obtained from data available at the time of the event occurrence.
2. After the events are specified in the Event Binding Editor, you can export the schema files, which describe the event payload.
3. These schemas are imported into the IBM Business Monitor toolkit to create monitor model applications that process the incoming events.
4. These monitor models are deployed to the Monitor server.

5. These event specifications are grouped into event bindings. An application analyst can deploy the complete event bindings to the CICS system and enable event emission.
6. When the event binding is enabled, then events are emitted each time there is a match for a set of conditions that the event specification defines. These events are sent over WebSphere MQ to the Common Event Infrastructure (CEI).
7. CEI distributes the event to the Monitor server.
8. The Monitor server processes the events, and they can be displayed on a lightweight web-based dashboard.

A key aspect of the CICS events support is the ability to emit events from CICS applications “noninvasively,” that is, without changing or recompiling the code. This action is done by creating **event specifications** that are installed in CICS, and used by the CICS runtime environment to detect and capture events.

CICS differs from products such as IBM Process Server, which runs clearly defined processes, for which standard events can be emitted to indicate the start and end of processing. In CICS, where the numbers of transactions in the system are frequently in thousands of transactions per second, it is not practical to emit events each time a transaction starts and ends. Also, there is not such an obvious direct connection between a transaction or program that is running in CICS and a significant piece of business processing. Therefore, CICS support for events allows users to identify the significant business events with activity that occurs in their system, such as starting a particular program, or accessing a particular file.

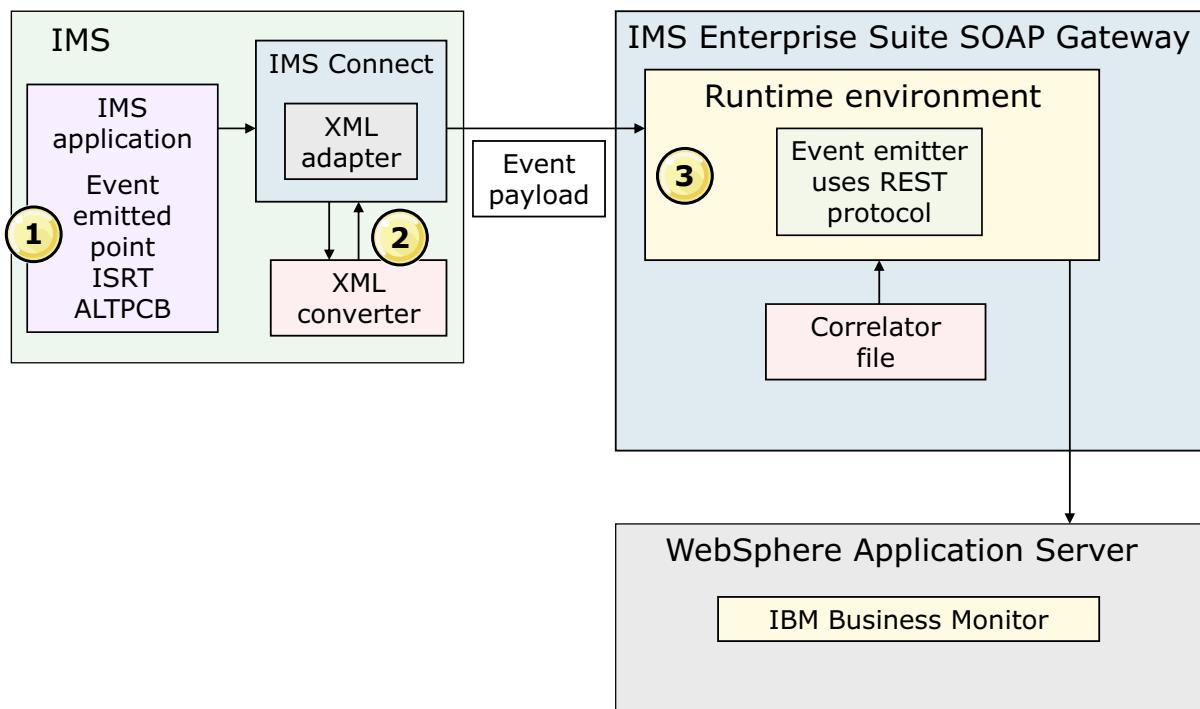
The `xs:any` in a CICS Common Base Event contains both a static portion and a dynamic portion. The static portion is the same for every CICS Common Base Event. The dynamic portion has a different schema for each event specification.

.

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Monitoring IBM IMS



Monitoring events from other products

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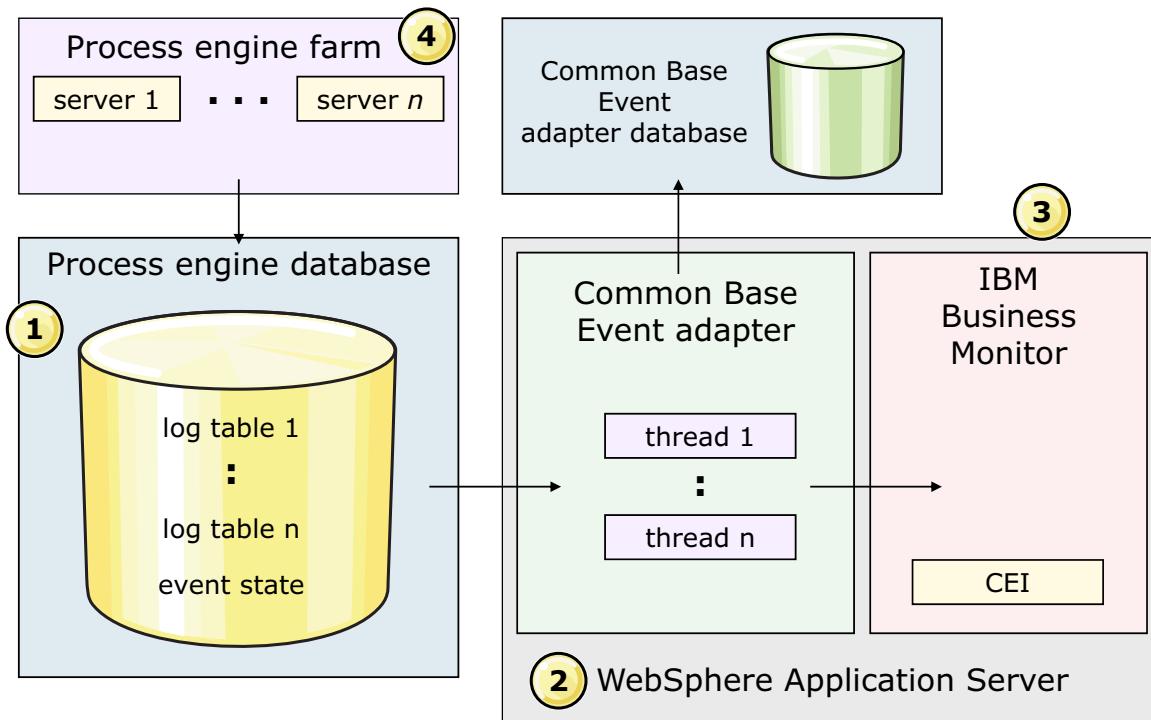
Figure 10-4. Monitoring IBM IMS

IBM Information Management System (IMS) is both a transaction manager and a database manager for z/OS. As IMS developed over the years, new interfaces were added to meet new business requirements. It is now possible to access IMS resources by using a number of interfaces to the IMS components.

Applications running on IMS V11 can generate an event payload that is forwarded to IBM Business Monitor running on WebSphere Application Server. The event payload is routed to IBM Business Monitor through the REST service for event emission.

1. The event is emitted, in this case by inserting a message into the ALT PCB.
2. The message is translated into XML through the XML adapter.
3. The IMS gateway emits the event by using the REST protocol to WebSphere Application Server, where IBM Business Monitor is installed.

Monitoring IBM FileNet



Monitoring events from other products

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Figure 10-5. Monitoring IBM FileNet

IBM FileNet Business Process Manager P8 is the key environment for content-centric BPM solutions. It is important that IBM Business Monitor provides first-class support to monitor FileNet-based processes.

FileNet provides a Common Base Event adapter that retrieves FileNet Process Engine events, transforms those events into Common Base Events, and transmits them to the IBM Business Monitor server. A monitor model that is tailored to monitor FileNet Business Process Manager processes provides a workflow monitoring context, a work item monitoring context, and several predefined measures (processing time, workflow maps, or queues). Many native FileNet Business Process Manager event definitions (for workflows, work items, and activities) are also available for use in IBM Integration Designer and IBM Business Monitor.

The overall flow is as follows:

1. Get an event through JDBC to the process engine event log.
2. Transform events.
3. Transmit the event to Common Event Infrastructure or IBM Business Monitor.
4. Track the current event log state.

Using IBM Business Monitor with IBM Operational Decision Management

- Use IBM Business Monitor together with IBM Operational Decision Management to monitor decision server events and rule sets
- Decision server events can provide XSD schema definitions for events and actions that can be imported into the Monitor model editor
- IBM Business Monitor can also generate events for processing by decision server events, and it can collect actions from decision server events to update the information it displays
- In IBM Operational Decision Management, it is possible to assess business performance by recording how decisions are made with the current set of rules
- Business users can view the trace to analyze the transactional data that is used during the execution of that decision
- Transactional data contains information about the rules that are applied in the transactions

[Monitoring events from other products](#)

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Figure 10-6. Using IBM Business Monitor with IBM Operational Decision Management

IBM Operational Decision Management delivers comprehensive automation and governance of operational decisions that control the actions of critical business systems. Organizations use IBM Operational Decision Management to improve the quality of transaction and process-related recurring decisions and to determine the appropriate course of action.

You can use IBM Business Monitor together with IBM Operational Decision Management to monitor decision server events and rule sets.

Monitoring decision server events

Decision server events are a set of seamless, integrated components that reduce the level of effort that is used to design, develop, test, deploy, maintain, and monitor applications. Integrate decision server events with IBM Business Monitor to get an up-to-date view of the performance of your business.

- Decision server events can provide XSD schema definitions for events and actions that can be imported into the Monitor model editor.
- IBM Business Monitor can also generate events for processing by decision server events, and it can collect actions from decision server events to update the information it displays.

Monitoring rule sets

A rule set is a stand-alone executable container that the rule engine can use. Rules that are related to a business decision are organized and stored in a rule set.

In IBM Operational Decision Management, it is possible to assess business performance by recording how decisions are made with the current set of rules. Business users can view the trace to analyze the transactional data that is used during the execution of that decision. Transactional data contains information about the rules that are applied in the transactions.

In addition to these features, IBM Operational Decision Management Integration for IBM Business Monitor SupportPac provides real-time monitoring by connecting IBM Operational Decision Management and IBM Business Monitor.

- Developers can generate monitor artifacts from rule projects. When creating a monitor model from a rule project, developers can select predefined execution metrics and KPIs such as the percentage of rules fired.
- Business users can use IBM Business Monitor to view KPIs and receive alerts when unusual situations are detected. Business users can also use business dashboards to monitor performance and view the KPIs in the form of gauges and tables.
- Business users and analysts can use the SupportPac to compare two versions of the same rule set deployed in a production environment. One version of the rule set is used for the real production application, and the other version is deployed for monitoring purposes. Business users can then monitor the performance of the rule sets in IBM Business Monitor to identify which rule set provides the best performance.

Monitoring IBM Process Server

- Monitoring can be added to existing enterprise service bus or Process Server components with no alteration of the existing components
- Can use Integrated Test Client to test a monitor model and submit test events

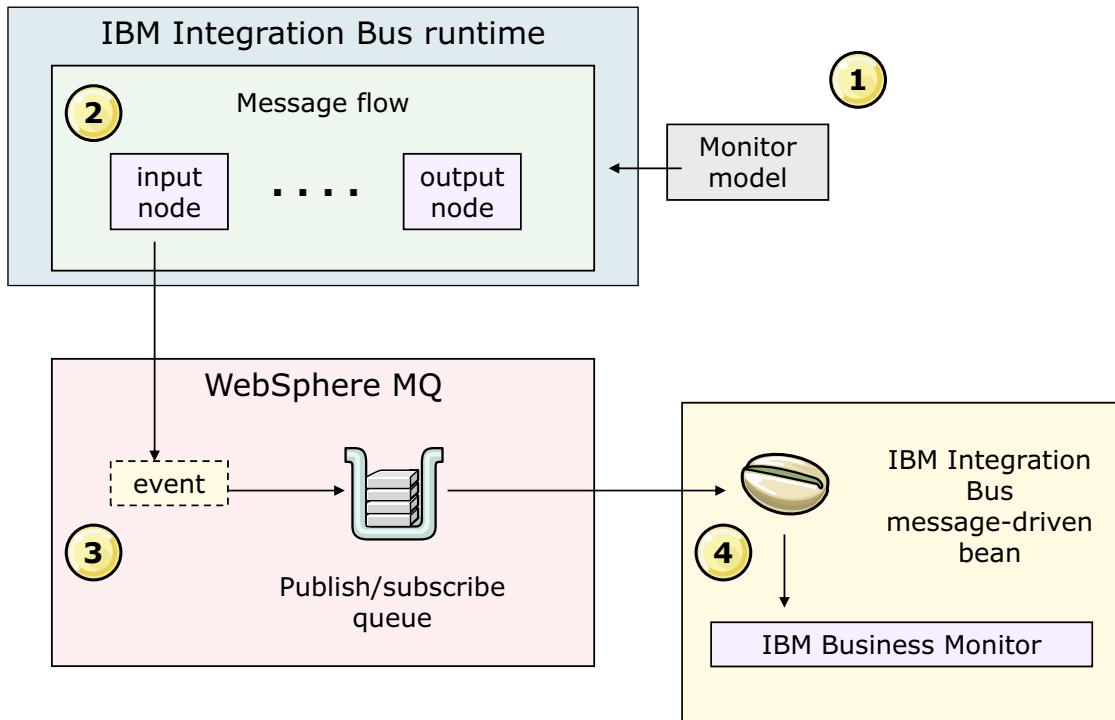
Monitoring events from other products

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Figure 10-7. Monitoring IBM Process Server

You can easily use IBM Business Monitor to monitor IBM Process Server applications. Graphical tools enable developers to configure applications to provide appropriate information for business activity monitoring and creating and deploying business monitoring solutions, without requiring programming. In addition, you can test monitoring solutions by using the Integrated Test Client in IBM Integration Designer.

Monitoring IBM Integration Bus



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Figure 10-8. Monitoring IBM Integration Bus

IBM Integration Bus enables information that is packaged as messages to flow between different business applications, ranging from large traditional systems to unmanned devices, such as sensors on pipelines.

Because developers can configure message flows to emit event messages that can support transaction, auditing, and business process monitoring without modifying the message flows, existing production message flows are enabled easily and unintrusively.

Monitoring activity in IBM Integration Bus includes improved visibility of business changes that occur inside the processing of a message flow. This feature also includes access to business-relevant data, such as the amount of an item in a purchase order. With WebSphere, you find patterns and trends that would otherwise be undetectable.

It provides the following types of events:

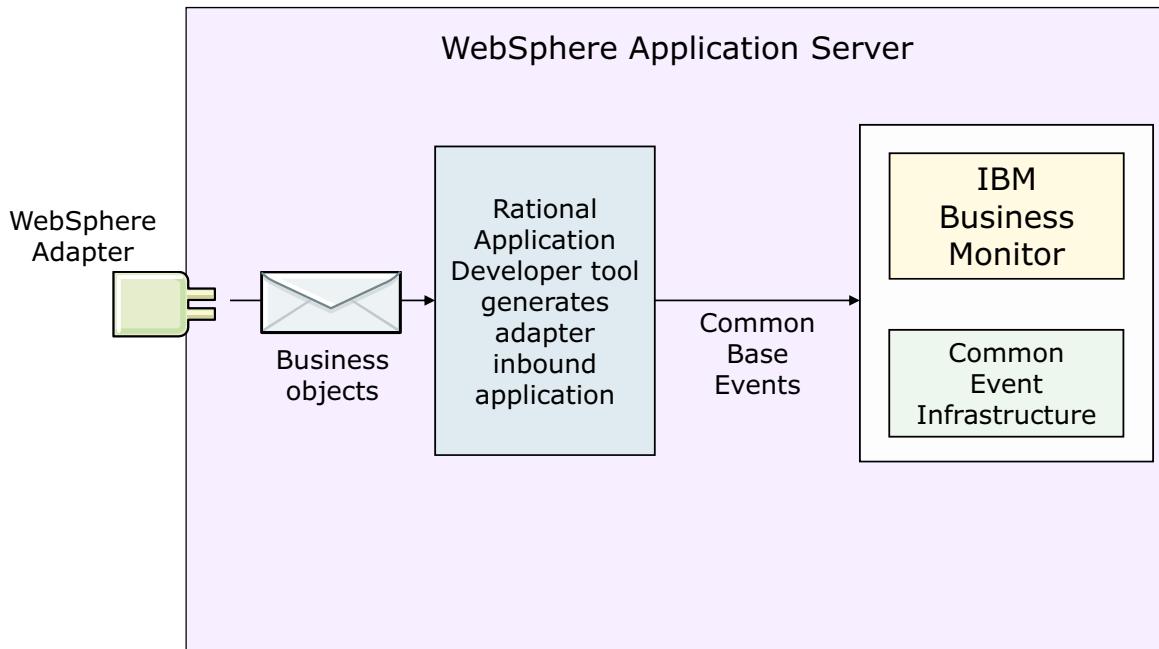
- Terminal events: Any terminal in a message flow can be an event source. If the event source is active, it emits an event each time a message passes through the terminal. The event payload that is emitted can contain anything from the message tree.
- Transaction events: Each input node in a message flow contains three transaction events, in addition to any terminal events:
 - Transaction start

- Transaction end
- Transaction rollback

The diagram shows the basic flow of event information within a monitored IBM Integration Bus application.

1. The IBM Business Monitor developer imports a monitor model application file into IBM Business Monitor to build the monitor model.
2. Based on the monitor model application, the execution of the message flow generates one or more events.
3. The event is passed on through the WebSphere MQ publish/subscribe queue.
4. A message-driven bean processes the message that is sent from the publish/subscribe queue, which signals an event to IBM Business Monitor.

Monitoring with IBM WebSphere Adapters



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Figure 10-9. Monitoring with IBM WebSphere Adapters

To extend the reach of business application monitoring, with WebSphere Adapters you can use events that originate from various enterprise information systems and applications.

The WebSphere Adapters runtime environment can emit events to IBM Business Monitor. Additionally, IBM Rational Application Developer has tools to generate an application to emit Common Base Events.

You can also use IBM adapters to monitor:

- Email
- Flat file input and output, including File Transfer Protocol (FTP) file I/O
- IBM iSeries
- JDBC traffic

Using the REST event emitter service

- REST event emitter service is a public API that you can use to send events
 - IBM Business Monitor can consume these events
- Define the XSD that describes the structure of the business information
 - API handles generating the event and forwarding it to IBM Business Monitor
- Can use the REST event emitter to synchronously publish events without the Common Base Event wrapper
- Event emitter service makes it easier for other products to integrate with IBM Business Monitor

Figure 10-10. Using the REST event emitter service

The REST event emitter service is a public API that you can use to send events that IBM Business Monitor consumes. You can use the REST event emitter to synchronously publish events without the Common Base Event wrapper. This event emitter service makes it easier for other products to integrate with IBM Business Monitor. You define the XSD that describes the structure of the business information, and the API handles generating the event and forwarding it to IBM Business Monitor. The XSDs are then used in authoring the monitor model to process the incoming events.

The event emitter service takes an HTTP POST URI as input. Results are returned in JSON, and any error messages and status indicators are returned in the HTTP response as JSON output.

Using the JMS event emitter

- With Java Message Service (JMS) event emitter, you can publish events asynchronously
 - Without the Common Base Event wrapper
 - To a predefined JMS queue
- The events can be put on the JMS queue even when IBM Business Monitor services are unavailable
- You define the XSD that describes the structure of the business information, and the API handles generating the event and forwarding it to IBM Business Monitor

Figure 10-11. Using the JMS event emitter

You can use the Java Message Service (JMS) event emitter to asynchronously publish events, without the Common Base Event wrapper, to a predefined JMS queue. The events can be put on the JMS queue even when IBM Business Monitor services are unavailable. This event emitter service makes it easier for other products to integrate with IBM Business Monitor.

You can emit XML events to a JMS queue for processing by monitor model applications.

Event XML is emitted as a JMS text message into a known queue that is called `MonitorEventEmitterQueue`, which IBM Business Monitor installs. The JMS event emitter listens for the messages on the queue and then wraps the event XML in a Common Base Events envelope. The message-driven bean places the event XML into the `xs:any` slot of the Common Base Event. It submits the Common Base Event to the Common Event Infrastructure server, where monitor model applications process the XSD style event. The JMS queue supports transactions and rollbacks, and you send the events only one time.

When you install IBM Business Monitor, the message-driven bean is created. It acts as a listener on the predefined JMS queue. During installation, the message-driven bean is packaged with the event emitter for the REST interface in the deployed application `IBM_WBM_EMITTER SERVICES` or `IBM_WBM_XML_EMITTER SERVICES`. When the application is started, the message-driven bean listens to the JMS queue for incoming messages.

Publishing events by using Web Services Notification

- Web Services Notification is a publish/subscribe vehicle for web services
- Web Services Notification can be used with both Java and .NET web services for IBM Business Monitor
- Publish events from essentially any client application capable of being a web service client
- Sample configuration scripts are installed with IBM Business Monitor in the directory `<monitor_root>\scripts.wbm\wsn`

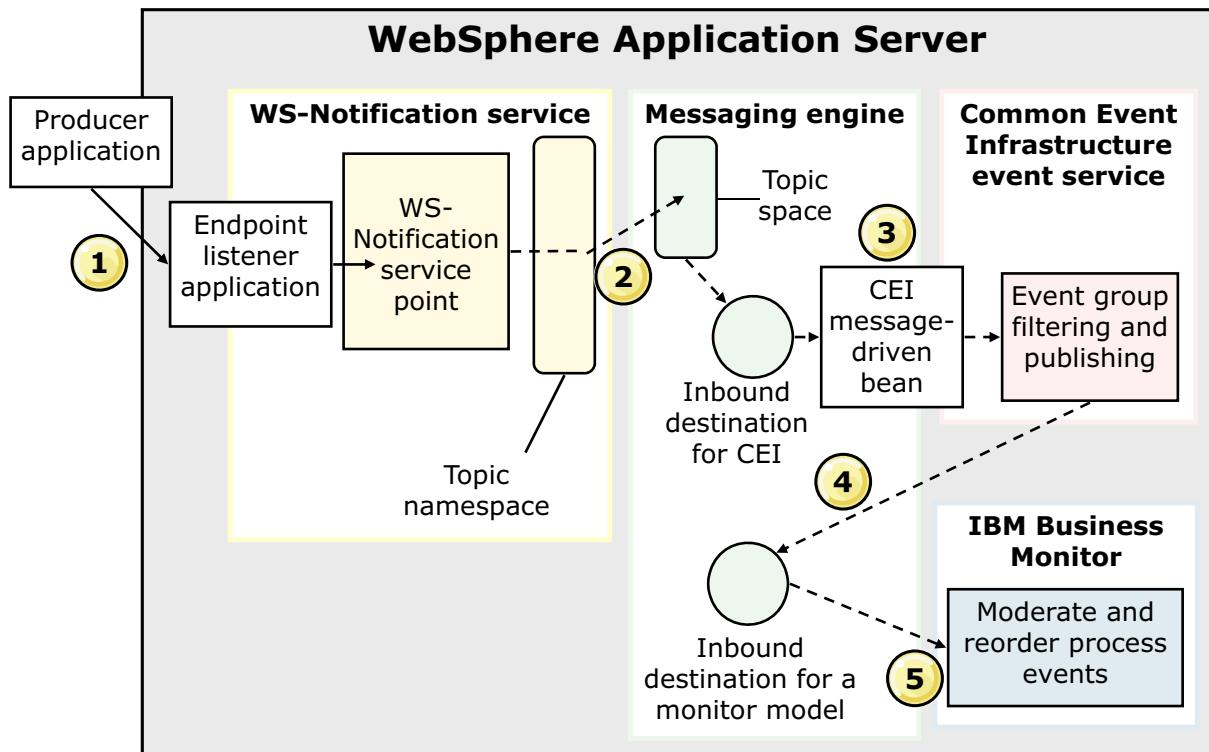
Figure 10-12. Publishing events by using Web Services Notification

Web Services Notification is a publish/subscribe vehicle for web services. You can send events from most sources to IBM Business Monitor through web services by using Web Services Notification. Web Services Notification can be used with both Java and .NET web services for IBM Business Monitor.

Web services can be used to publish events from essentially any client application capable of being a web service client. Because web services provide platform and programming language flexibility, this approach is valuable to many IBM Business Monitor customers.

You can use Web Services Notification to publish an event message to CEI. CEI is still used for event filtering and distribution to the actual monitor model input queues. Hence, Web Services Notification serves as a simple web service interface in front of CEI.

Flow from the Web Services Notification producer



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Figure 10-13. Flow from the Web Services Notification producer

This diagram explains the flow from the Web Services Notification producer:

1. A WS-Notification client acts as a producer application. It creates an event, places the event into a **NotificationMessage**, and invokes the **Notify()** operation on the **NotificationBroker** interface that becomes accessible through the WS-Notification service, which is configured in WebSphere Application Server.
2. The WS-Notification service puts a message on a SIBus destination. This action is configured through a defined relationship between the WS-Notification topic namespace and the SIBus topic space.
3. The Common Event Infrastructure (CEI) is configured to listen on the SIBus queue or topic. The CEI message-driven bean (included in CEI) is triggered when the message arrives.
4. CEI filters based on event group definitions and publishes the event to the appropriate input destination for IBM Business Monitor.
5. IBM Business Monitor processes the event.

Unit summary

- Explain how IBM Business Monitor can receive events from:
 - IBM CICS
 - IBM IMS
 - IBM FileNet
 - IBM Operational Decision Management
 - IBM Business Process Manager Advanced
 - IBM Integration Bus
 - Other applications (through IBM Adapters) and application programming interfaces for WS-Notification, Java Message Service, and Representational State Transfer (REST)

Checkpoint

1. True or False: It is necessary to modify an IBM Process Server application to be able to monitor it.
2. Fill in the blank: The _____ event emitter service is a public API that you use to send events that IBM Business Monitor can consume. This event emitter service makes it easier for other products to integrate with IBM Business Monitor.
3. Fill in the blank: You can use the _____ event emitter to asynchronously publish events even when IBM Business Monitor services are unavailable.

Figure 10-15. Checkpoint

Write your answers here:

1.

2.

Checkpoint answers

1. False. It is possible to monitor an IBM Process Server application without modifying it.
2. The **REST** event emitter service is a public API that you use to send events that IBM Business Monitor can consume. This event emitter service makes it easier for other products to integrate with IBM Business Monitor.
3. You can use the **JMS** event emitter to asynchronously publish events to a predefined JMS queue. The events can be put on the JMS queue even when IBM Business Monitor services are unavailable.

Exercise 9

Monitoring events from IBM Integration Bus

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Figure 10-17. Exercise 9

Exercise objectives

After completing this exercise, you should be able to:

- Explore a sample monitor model that is exported from IBM Integration Bus message flow
- Test the monitor model in the Monitor test environment server

Exercise 10

Monitoring events from a BPMN process

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Figure 10-19. Exercise 10

Exercise objectives

After completing this exercise, you should be able to:

- Import a process in IBM Process Designer
- Enable tracking in a process
- Generate monitor model for a process application and then deploy to monitor server
- Run process instances in Process Portal
- View the data in Business Spacer

Exercise 11

Monitoring events from JMS emitter and REST emitter

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Figure 10-21. Exercise 11

Exercise objectives

After completing this exercise, you should be able to:

- Create JMS resources in IBM Business Monitor
- Create a queue manager and a queue in IBM WebSphere MQ
- Emit events from IBM WebSphere MQ that are consumed by IBM Business Monitor
- Use SOAPUI to send REST events that are consumed by IBM Business Monitor

Unit 11. Administering IBM Business Monitor and monitor models

Estimated time

01:00

Overview

This unit explains how to do some basic administrations tasks in IBM Business Monitor and monitor models.

How you will check your progress

- Checkpoint

Unit objectives

- Describe the features of the IBM Business Monitor administrative console
- Configure Monitor model runtime properties and resources
- Explain and configure Monitor model securityRecord and play back eventsView event details and import events

Figure 11-1. Unit objectives

Monitor administrative console

- An extension to the WebSphere Application Server administrative console



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Figure 11-2. Monitor administrative console

Under the Applications navigational node:

- New Application
- Application Types
- Monitor Models
 - Manage your Monitor models, including installing a specific version of the model on the Monitor Server and the specifying configuration properties
- Monitor Services
- Monitor Action Services
 - Define an action for a situation event and bind that action to the event
- Recorded Events Managements
- Monitor Scheduled Services



Starting and stopping a Monitor model

- Use administrative console to start or stop a version of an installed Monitor model

Select	Model	Version
<input type="checkbox"/>	MortgageLendingBAMShowcase	2013-09-09T18:00:00

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Figure 11-3. Starting and stopping a Monitor model

To start or stop an installed Monitor model, complete the following steps:

- 1.In the WebSphere Application Server administrative console, click **Applications > Monitor Models**.
- 2.In the Select column, select the model you want to start or stop.
- 3.Click **Start** or **Stop** as appropriate. The icon in the Status column is updated to reflect this action.

Configuring Monitor model properties and resources

- Use the administrative console to view the general properties of a Monitor model and to change its model properties
 - Event source configuration of the model
 - Data movement service in relation to the model
 - Purging a specific version (or all versions) of the model
- Changing the event source configuration
 - Local versus remote location
 - DEF versus CEI
 - It is local, is installed on this IBM Business Monitor server
 - It is remote, is installed on a different server; specify host name, RMI port information, and security

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Figure 11-4. Configuring Monitor model properties and resources

You can use the WebSphere Application Server Administrative Console to view the general properties of a Monitor model as well as to change its model properties: changing the Common Event Infrastructure (CEI) configuration of the model, managing data movement service in relation to the model, and purging all versions of the model.

Reviewing Monitor model properties (1 of 2)

- In the administrative console, click **Applications > Monitor Models**
- All installed Monitor models and versions displayed in table
- Click the **Model** link of the model that you want to display the model properties
- Click the **Version** link of the model that you want to display or update the properties of the specific model version

Select	Model	Version	Deployment	Application
<input type="checkbox"/>	ClipsAndTacksMM	2009-12-17T13:18:25	OK	ClipsAndTacksMMApplication
<input type="checkbox"/>	ClipsAndTacksMM	2011-01-09T18:01:45	OK	ClipsAndTacksMMApplication2

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Figure 11-5. Reviewing Monitor model properties (1 of 2)

To list all of the installed models and model versions, click **Applications > Monitor models** in the administrative console. The models and versions are displayed in a table.

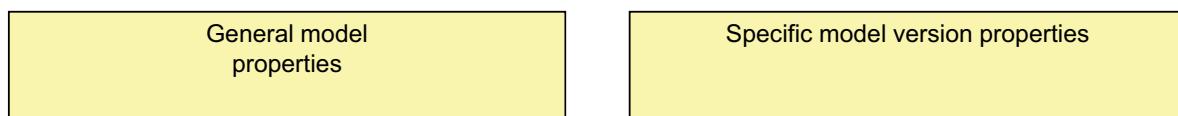
To view the general properties of a model, click the link under the **Model** column. If a model has multiple versions installed, you can select any instance of the model from the table.

Click the link under the **Version** column to view the details of a specific model version.

You can also click the **Application** link to view the properties of the associated application.



Reviewing Monitor model properties (2 of 2)



[Monitor Models](#) > [CATOrderMgmtMonitoringModel](#)

Use this page to view the configuration for this monitor model.

General

General Properties

Model

Number of versions

Resource group

Back

[Version Properties](#)

- [Manage schema](#)
- [Manage Cognos cubes](#)
- [Change event sources](#)
- [Change event consumption mode](#)
- [Change runtime configuration](#)
- [View model](#)
- [Purge model version](#)

Figure 11-6. Reviewing Monitor model properties (2 of 2)

The screen capture on the left shows the result of clicking a Monitor model (clicking the **Model** column). On the right is the result of clicking a Monitor model version (clicking the **Version** column).

For a given Monitor model version, you can:

- Execute the Data Definition Language (DDL) database schema creation script, or export the DDL. You can also execute the database schema deletion script, or export it.
- Publish, export, or delete IBM Cognos cube packages.
- Enable the data movement service.
- Change the Common Event Infrastructure distribution mode.
- Modify runtime configuration options, including a number of tuning parameters, error handling options, and KPI caching values.
- View the XML for the model itself.
- Purge the Monitor model for a specific version, or all versions.

IBM Training

Managing schema

The screenshot shows a web-based administrative interface for managing database schemas. At the top, a blue header bar reads "Monitor Models". Below it, the main content area has a title "Monitor Models > ClipsAndTacksMM (2008-07-19T18:06:27) > Manage schema". A descriptive text block explains that the page allows creating or deleting a schema by running scripts or exporting them for a database administrator to run manually. It also mentions the option to have the schema deleted automatically when the model version is uninstalled.

Create schema

- Run Create Schema Script** (button)
- Export Create Schema Script** (button)

Delete schema

- Run Delete Schema Script** (button)
- Export Delete Schema Script** (button)

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Figure 11-7. Managing schema

On the manage schema page, you can click **Run Create Schema Script** to run the schema DDL script contained in the model EAR file and set up the database for that version of the model. Clicking the **Export Create Schema Script** button invokes the download function of the browser and allows you to download the DDL file to your file system.

Under the **Delete schema** section, clicking the **Run Delete Schema Script** button runs the schema DDL script contained in the model EAR file. It removes the schema for that version of the model. Selecting the **Export Delete Schema Script** button invokes the download function of the browser and allows you to download the DDL file to your file system.

If you prefer to automatically remove the schema when the version is uninstalled, you can select the **Run script to delete the schema during uninstallation** check box. This setting is the default when the server is in development mode (and in that case, this option is disabled and cannot be selected).

IBM Training 

Managing Cognos cubes

[Monitor Models](#) > [GlobalHTMM \(2010-02-17T12:00:00\)](#) > Manage Cognos cubes

Use this page to publish, export, or delete Cognos cube packages.

Publish or republish the Cognos cube packages	Details
<input type="button" value="For this model version"/> <input type="button" value="Publish"/> <input checked="" type="button" value="For this model version"/> <input type="button" value="For each model version"/>	External dispatcher URI <input type="text" value="http://xpbase:9080/p2pd/servlet/dispatch/ext"/>
Export cube package definition into a zip file	Cognos Status
<input type="button" value="Export..."/>	Cognos cube packages published on: Jun 8, 2011 1:52:17 AM
Delete the cube package	Cube package permissions are based on Monitor data security settings at the time of first package publish. The package permissions can be updated by launching the IBM Cognos Connection web client
<input type="button" value="Delete"/>	

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Figure 11-8. Managing Cognos cubes

Use this page to publish, export, or delete IBM Cognos BI cube packages. You can also see information about when the cubes were last published and when any fine-grained security rules were last updated.

To view this administrative console page, click **Applications > Monitor Models > version_id > Manage Cognos Cubes**.

There is a cube package (and underlying schema) for each model version as well as a cube package for cross-versions. For example, suppose version 1 has the dimension State, and version 2 has dimensions State and Product.

- The version 1 cube package is used for reporting against instances in version 1.
- The version 2 cube package is used for reporting against instances in version 2.
- The cross-version cube package is used for reporting against version 1 and version 2 instances and has the dimensions State and Product.

If you are currently working on version 2 and select **For this model version**, the version 2 cube package and the cross-version cube package are published. If you select **For each model version**, the version 1 cube package, version 2 cube package, and cross-version cube package are published.

Export cube package definitions into a zip file exports the cube package XML files into a compressed file. Cube package XML files can then be opened in IBM Cognos BI Framework Manager tooling, so that the cube definitions can be extended or altered.

Delete the cube package deletes the cube package.

The **Details** section displays the following information:

- External dispatcher URI
- The address that IBM Business Monitor uses to connect to IBM Cognos BI for managing IBM Cognos BI cube packages (for example, to publish, export, and delete the packages)

If the external dispatcher URI fails validation, perform one of the following steps:

- If you are using an existing remote IBM Cognos BI server, change the URI in the Configure Cognos Service panel.
- For either a local or remote Cognos server, use the `wbmSetCognosDispatcher` command to reset the URI.

You might need to restart the server after modification.

Cognos Status

Cognos Status shows the date and time that packages were last published.

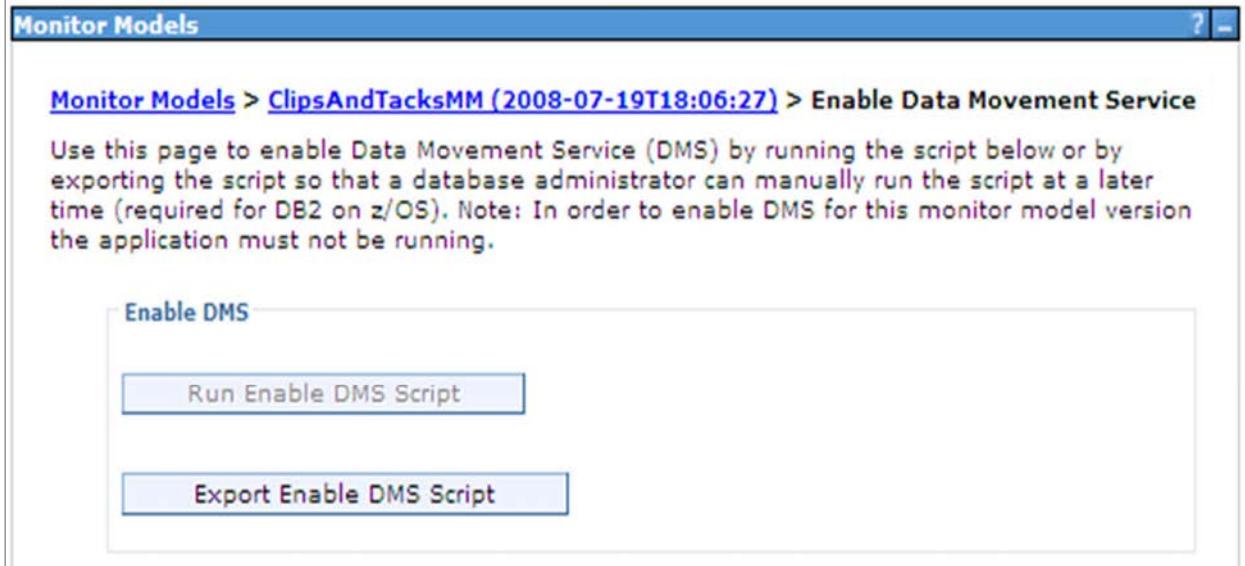
If fine-grained security has been configured for this model, it shows the date and time that the rules were last updated.

Cube package permissions are based on the Monitor data security settings that exist at the time the package is published. Make sure that any Monitor data security changes are valid before you publish the IBM Cognos BI package. If you need to update package permissions (so that they are synchronized with the latest Monitor data security settings), use the IBM Cognos BI Connection web client or `wbmUpdatePackageSecurity`.

If fine-grained security changes were made after the IBM Cognos BI cube packages were last published, you see a warning that you need to republish the cube to take advantage of the latest rule changes.

IBM Training 

Enabling data movement service



The screenshot shows a web-based administrative interface for IBM Business Monitor. The title bar reads "Monitor Models". The main content area has a blue header "Monitor Models > ClipsAndTacksMM (2008-07-19T18:06:27) > Enable Data Movement Service". Below this, a note states: "Use this page to enable Data Movement Service (DMS) by running the script below or by exporting the script so that a database administrator can manually run the script at a later time (required for DB2 on z/OS). Note: In order to enable DMS for this monitor model version the application must not be running." Two buttons are visible: "Run Enable DMS Script" and "Export Enable DMS Script".

Administering IBM Business Monitor and monitor models

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Figure 11-9. Enabling data movement service

Each monitoring context is represented as a table in the IBM Business Monitor database. Under high volumes, there can be contention between the Monitor server and use of these tables by the dashboard. In these cases, it is best to enable data movement services (DMS). DMS creates a duplicate set of tables dedicated for dashboard queries, and then initiates the data transfer from the server tables to the dashboard tables.

On the **Enable DMS** page, clicking **Run Enable DMS Script** executes the DDL script to enable the data movement services for this model version. Clicking **Export Enable DMS DDL** invokes the browser download function and allows you to download the DDL file to the file system.

IBM Training 

Changing event consumption mode

[Monitor Models](#) > [MortgageLendingBAMShowcase \(2013-09-09T18:00:00\)](#) > Change event consumption mode

Use this page to change the event consumption mode for the monitor model version.

General

General Properties

Event consumption mode

Current

CreateNewInstances

Target

Inactive ▾

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Figure 11-10. Changing event consumption mode

IBM Training 

Runtime configuration: Tuning parameters

[Monitor Models](#) > [GlobalHTMM \(2010-02-17T12:00:00\)](#) > Runtime Configuration

Use this page to tune and configure the error handling and KPI properties of this model version.

Tuning	Error Handling	KPI
--------	----------------	-----

General Properties

Processing Strategy

6.0.2 emulation
 Scalable

Event reordering

Event reordering enabled

Action Buttons

Apply OK Reset Cancel

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Figure 11-11. Runtime configuration: Tuning parameters

There are several model version properties that you can modify that can affect the tuning and performance of Monitor models.

- **Tuning tab** Use this tab to configure the tuning properties of the runtime configuration of a Monitor model.
- **Processing Strategy** Displays the processing strategy selected during the deployment of the model version.
- **Event reordering** Displays the processing strategy selected during the deployment of the model version.
- **Event reordering enabled** Indicates whether event reordering was enabled during the deployment of the model version.
- **Late arrival stand-off delay (seconds)** Specifies the number of seconds to delay the processing of a batch of related events to allow late out-of-order events to arrive, be reordered, and added to the batch. The value must be an integer from 10 to 1800. This property is used only when event reordering is enabled.

IBM Training 

Runtime configuration: Error handling parameters

[Monitor Models](#) > [GlobalHTMM \(2010-02-17T12:00:00\)](#) > [Runtime Configuration](#)

Use this page to tune and configure the error handling and KPI properties of this model version.

Tuning	Error Handling	KPI
--------	----------------	-----

General Properties

Processing Strategy
Scalable

Stop event processing conditions

- No instance found correlation error
- One instance found correlation error
- Multiple instances found correlation error
- No parent found error
- Multiple parents found error
- Value out of range error
- Runtime exceptions

Apply OK Reset Cancel

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Figure 11-12. Runtime configuration: Error handling parameters

You can control a number of properties that modify how errors are handled by the Monitor model version, either by the events themselves or during event processing.

Stop event processing conditions:

- **No instance found correlation error, one instance found correlation error, and multiple instances found correlation error:** when selected, halts event processing when a correlation is triggered by no instance found, one instance found, or multiple instances found
- **No parent found error or multiple parents found error:** when selected, halts event processing when a correlation is triggered by no parent or multiple parents
- **Value out of range error:** when selected, halts event processing when a value in an incoming event is out of range
- **Runtime exceptions:** when selected, halts event processing when a runtime error occurs during processing

IBM Training



Runtime configuration: KPI parameters

[Monitor Models > GlobalHTMM \(2010-02-17T12:00:00\) > Runtime Configuration](#)

Use this page to tune and configure the error handling and KPI properties of this model version.

Tuning **Error Handling** **KPI**

General Properties

* KPI cache refresh interval (minutes)
0

Clear KPI Cache Now

Apply **OK** **Reset** **Cancel**

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Figure 11-13. Runtime configuration: KPI parameters

In the KPI tab, you can control the caching used for calculating KPIs.

General properties:

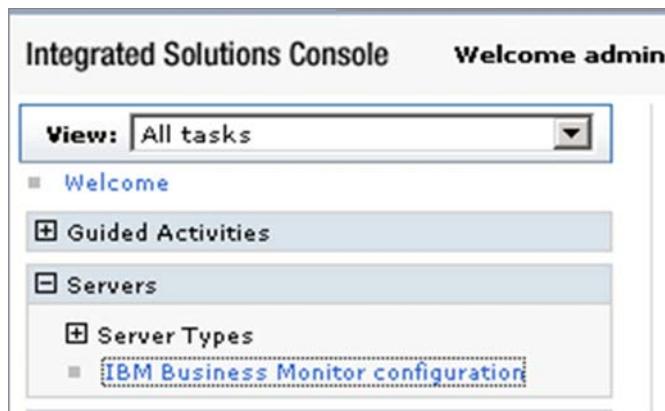
- KPI cache refresh interval:** Number of minutes between KPI cache refreshes. For efficiency, this interval, along with the Cognos cube cache interval, is not to be less than the interval specified for the data movement service (if enabled). Also, if there are any time-based triggers in the Monitor model that reference KPIs, you might want to synchronize the recurring wait time trigger interval with the KPI cache refresh interval. KPI caching is recommended to improve system performance. (The default value is 0, which means that KPIs are not cached.)

- Clear KPI cache now:** Click this button to clear the KPI cache immediately without waiting for the refresh interval.

You must restart the Monitor model application for these changes to take effect.

Monitor topology status (1 of 3)

- Shows the state of the various Monitor components for stand-alone or ND topology
 - Does not matter if component was configured manually or configured using the configuration wizards
- For each component, a wizard is provided to configure the component



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Figure 11-14. Monitor topology status (1 of 3)

You can configure the required IBM Business Monitor components and some optional components, by using the configuration wizard in the administrative console.

Monitor topology status (2 of 3)

Configure IBM Business Monitor

To view the details of a component or to modify a configuration, click the component name.

Required components:
All components must display a green check mark for your IBM Business Monitor environment to work properly.

	Component	Status
<input checked="" type="checkbox"/>	Outbound CEI event service	Configured using the event service on server1 on xpbaseNode01
<input checked="" type="checkbox"/>	Messaging engine	Deployed on server1 on xpbaseNode01
<input checked="" type="checkbox"/>	Action services	Deployed on server1 on xpbaseNode01
<input checked="" type="checkbox"/>	Monitor scheduled services	Deployed on server1 on xpbaseNode01

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Figure 11-15. Monitor topology status (2 of 3)

You can configure the required IBM Business Monitor components and some optional components by using the configuration wizard in the administrative console.

You must have completed the following tasks:

- Created at least one profile. See “Creating and augmenting profiles” for instructions.
- Created at least one cluster. If you used the deployment environment configuration wizard, a cluster or clusters were created for you. Otherwise, see “Creating IBM Business Monitor clusters” in the information center for instructions:
http://publib.boulder.ibm.com/infocenter/dmndhelp/v7r5mx/topic/com.ibm.wbpm.mon.imuc.doc/inst/clus_create.html
- Configured a local Common Event Infrastructure (CEI) event service that IBM Business Monitor can use to send and receive events.

If you have an ND environment and have not configured a deployment environment, none of the components are installed or configured. You must complete the steps to install and configure the components.

In the list of components, if you click **Outbound CEI event service**, the status for the outbound CEI event service and event emitter factory is displayed. If you have an existing MonitorEmitterFactory, the name of the CEI event service that the emitter factory is configured to use is listed in the status

box. If you have not already configured the emitter factory, you see the message Local CEI event service exists, but event emitter factory does not exist. In that case, you must create and configure the emitter factory.

IBM Business Monitor requires its own bus and messaging engine before it can monitor events. If you do not have an existing bus, one is created for you when you configure the messaging engine. The bus is named MONITOR.<cell_name>.Bus, and the name cannot be changed.

You may install and configure the IBM Business Monitor action services application. The action services application invokes actions, such as sending dashboard alerts or email notifications, when it receives defined situation events emitted by other applications. Situation events typically indicate business situations that need attention, such as a printer running out of paper or a metric exceeding a certain value.

You may install the Monitor scheduled services application. You must install this application to schedule recurring services, such as the data movement service and the key performance indicator (KPI) history for Monitor models.

Monitor topology status (3 of 3)

Optional components:

To configure an optional component, click the component name. Components that are already configured display a green check mark.

	Component	Status
<input checked="" type="checkbox"/>	Cognos	Deployed on server1 on xpbaseNode01
<input checked="" type="checkbox"/>	Dashboards for mobile devices	Deployed on server1 on xpbaseNode01
<input checked="" type="checkbox"/>	Inbound event emitter services (JMS and REST)	Deployed on server1 on xpbaseNode01

Shared components:

Components that are already configured display a green check mark. Removing these components might affect other products.

	Component	Status
<input checked="" type="checkbox"/>	REST Services Gateway	Deployed on server1 on xpbaseNode01
<input checked="" type="checkbox"/>	Business Space	Deployed on server1 on xpbaseNode01

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Figure 11-16. Monitor topology status (3 of 3)

If you plan to use IBM Cognos to conduct analysis on your dashboards, you must configure the IBM Cognos service. Also, if you plan to use the IBM Business Monitor dashboards on mobile devices, you must configure the Dashboard service.

To use the Java Message Service (JMS) and Representational State Transfer (REST) event emitter services, you must install the API service applications. Rather than coding or generating Common Base Events directly, you can then use these event emitter services. You provide the event XML, and the event emitter services receive the event XML. They then wrap it in a Common Base Event so that IBM Business Monitor can process it.

You can configure the Representational State Transfer (REST) Services Gateway for widgets for a business space. Since the REST Services Gateway is a shared component, you cannot configure it using the configuration wizard. If you create clusters using the deployment environment configuration wizard, or create a stand-alone profile, the REST Services Gateway is configured for you. The REST Services Gateway must be deployed and registered with the business space before your team can use the widgets in the business space.

Security (1 of 3)

- Use the user or group management UI in WebSphere Application Server (Federated Repositories, VMM)
 - Monitor does not manage users or user groups
 - There are no default rights, so the Monitor administrator must explicitly grant permission (assign a role) to newly deployed models
- WebSphere Application Server authentication
 - Using Virtual Member Manager in WebSphere Application Server, you can configure file system, LDAP, and custom registries
- Portal authentication
 - Lightweight Directory Access Protocol (LDAP) user registry
 - Local OS registry

Figure 11-17. Security (1 of 3)

You can use the user management functions in WebSphere Application Server to manage your users and user groups. When you deploy a model, there are no default rights associated with it, so you must assign them after deployment.

WebSphere Application Server uses the Virtual Member Manager, which can map entries from multiple individual user repositories into a single virtual repository. For Monitor server, you can set up authentication using any registry available to the Virtual Member Manager in WebSphere Application Server. You can configure file system registries, LDAP registries, or custom registries.

For the dashboard server running on Portal, you can set up authentication based on Portal V7, which allows for LDAP registries or local OS registries.

Security (2 of 3)

- Security can be disabled from the WebSphere Application Server console
 - There is no “global security” in WebSphere Application Server — it is split into administrative security and application security
 - Both must be enabled to force an authentication flow; otherwise the web dashboard and RESTful DataService run in an unsecured mode
- REST URI access
 - All URLs are denied unless access is explicitly granted
 - J2EE role-based authorization is inadequate for RESTful DataServices authorization
 - To this end, a resource authorization table (RAT) has been established to control access to data provided through REST

Figure 11-18. Security (2 of 3)

You set administrative security and application security. Both must be enabled to allow Monitor to fully secure your data.

Monitor server and the dashboards use the REST URIs to access the Monitor metadata and monitored data. A table controls this access, and a user interface is provided in the administrative console that gives a Monitor administrator the ability to assign permissions to specific resources and to groups.

The screenshot shows the 'Security (3 of 3)' page in the IBM Business Monitor administrative console. At the top right is the IBM logo. On the left, the 'IBM Training' logo is visible. The main content area has a title 'Security (3 of 3)' and a sidebar titled 'Security' containing links to various security topics. The 'Monitor Data Security' link is highlighted with a dotted border. Below the sidebar is a section titled 'Roles' with instructions and requirements. It lists four roles: Business Manager, Personal KPI Administrator, Public KPI Administrator, and KPI Administrator, each preceded by a plus sign.

Security (3 of 3)

Security

- [Business Integration Security](#)
- [Global security](#)
- [Security domains](#)
- [Administrative Authorization Groups](#)
- [SSL certificate and key management](#)
- [Security auditing](#)
- [Bus security](#)
- [Monitor Data Security](#)

Roles

Select a role for this resource group, and click either Users or Groups.

You must meet the following requirements to assign users or groups to a role:

- Administrative security must be enabled.
- Application security must be enabled.

+ [Business Manager](#)

+ [Personal KPI Administrator](#)

+ [Public KPI Administrator](#)

+ [KPI Administrator](#)

Figure 11-19. Security (3 of 3)

This slide shows the security option in the administrative console. Here, you can create a resource group. Then, for each resource group, you can add one or more models. You can also specify which users or groups are in which roles for this particular resource.

Security roles

Role name	URI	Allowed HTTP action
KPI administrator	/models/*/kpis/*	GET, PUT, POST, DELETE
KPI administrator	/models/*/version/*/kpis/*	GET, PUT, POST, DELETE
KPI administrator	/models/*	GET
Personal KPI administrator	/models/*/kpis/*	GET, PUT, POST, DELETE
Personal KPI administrator	/models/*	GET
Public KPI administrator	/models/*/kpis/*	GET, PUT, POST, DELETE
Public KPI administrator	/models/*	GET
Business manager	/models/*	GET
SuperUser	All URIs without restrictions	GET, PUT, POST, DELETE

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Figure 11-20. Security roles

This visual shows the different security roles that are predefined for Monitor, the URIs that each can access, and the type of actions to be performed against those actions. There are KPI roles of various types. For example, there is a business manager role that basically provides read capability, and there is a superuser role that can do everything.

In a business space, you can assign users to be superusers (or business space administrators). A superuser can view, edit, and delete all spaces and pages. A superuser can also manage and create templates, and can change ownership of a space by changing the owner ID.

Users belonging to the special user group, administrators, have a superuser role by default. As a result, the superuser role assignment is handled by user group membership.

In a single-server environment, the business space server creates the administrators user group in the default user registry. The administrator ID provided during configuration is automatically added as member of this group.

Fine-grained data security

- Secure user or group access by Monitor model
 - Security filters
 - Object security
- Provide a more fine-grained form of data security by granting access to users and groups
- Set at the monitor context instance level or the monitor context object level
- For example:
 - A key performance indicator (KPI) that only specific users are allowed to see
 - A monitor context that includes hundreds of instances, and users need to retrieve only a subset of the instances

Figure 11-21. Fine-grained data security

You secure access to Monitor models by adding users to resource groups (as described in “Configuring data security”). After providing access at the Monitor model level, you can provide a more fine-grained form of data security. This security is achieved by granting access to users and groups at the monitor context instance level or the monitor context object level.

What are the business reasons for restricting access at a more fine-grained level? You might have a key performance indicator (KPI) that only specific users are allowed to see. You might have a monitor context that includes hundreds of instances, and your users need to retrieve only a subset of the instances. Or, you might have a metric (for example, salary data) that is to be restricted to a select group of users.

Fine-grained data security: Security filters

- Security filters
 - Filter the set of instances a user or group has access to
 - Applies to instances, KPIs, cube measure aggregations, and alert conditions
- Examples:
 - Loan officers have access to loans < \$100,000
 - Loan officer managers have access to all loans
 - Regional loan officers have access to loans from “\$account.parameters.country” where “country” is a user parameter in VMM or LDAP

Figure 11-22. Fine-grained data security: Security filters

Fine-grained security applies to all forms of Monitor data, through all Monitor widgets and across REST services and reports.

You restrict access to the instance, key performance indicator (KPI), and dimensional data of a Monitor model by applying a security filter to that Monitor model. By applying the security filter, you can restrict access to the data based on the user or group name, or based on the LDAP attributes of the logged-in user.

Security filters example

The screenshot shows a BAM dashboard titled "Better Lender". A modal window is open, displaying monitoring context details:

- Model: Better Lender BAM Showcase
- Version: All Versions
- Monitoring Context: Better Lender
- Note: Security filters have been applied

A tooltip on the "Monitoring Context" button states: "Administrator creates filter rules. In this case, this rule allows access to instances where Loan Amount is less than \$100,000".

The main table lists loans with the following data:

Loan Number	Loan Officer	Loan Amount	Loan Processing Start Date
110305	Joan Smith	150,000	March 5, 2011
110306	Joan Smith	160,000	March 2, 2011
110313	Robert Gump	330,000	March 13, 2011
110314	Robert Gump	290,000	March 14, 2011
110320	Robert Gump	325,000	March 20, 2011
110321	Gerald Mander	75,000	March 21, 2011
110319	Joan Smith	225,000	March 19, 2011

A cursor is hovering over the "Loan Amount" column header of the main table.

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Figure 11-23. Security filters example

Fine-grained data security: Object security

- Object security
 - Filter the set of monitor objects (metrics, KPIs, alerts, cube measures, cube dimensions) to which a user or group has access
- Examples:
 - Loan officers **do not** have access to KPI “Month-to-Date Amount of Completed Loans”
 - Loan officer managers **do** have access to KPI “Month-to-Date Amount of Completed Loans”

Figure 11-24. Fine-grained data security: Object security

You restrict access to the metric, dimension, measure, key performance indicator (KPI), and alert data of a Monitor model by applying object security rules to that Monitor model.

The first step in the process of filtering object data is to create a file that defines the Monitor model, context ID, and the type of data for which you are setting up rules. A sample file is provided with Business Monitor, and you can use this file as the basis for creating your own object security rules file.

After you create the object security rules file, you import it, using the `importFGSObjSecRules` command-line option. The object security rules you specify are then added, at run time, to queries.

If you modify the object security rules file, you can import it again so that the changes take effect. You can also delete information from the rules, and you can export the information to a file (for example, if you want to use the object security rules in another Monitor environment).

Object security example: Loan officer managers

Loan officer managers **do** have access to KPI "Month-to-Date Amount of Completed Loans"



Figure 11-25. Object security example: Loan officer managers

Object security example: Loan officer

- Loan officers **do not** have access to KPI "Month-to-Date Amount of Completed Loans"
- In this case, this rule prevents the user from seeing the "Month-to-Date Amount of Completed Loans"

KPI Name	Status	Value	Target	Actions	Value in Range
Month-to-Date Average Amount of Loan Application (in thousands)		\$75.00	\$500.00		
Month-to-Date Total Amount of Loan Applications (in millions)		\$0.08	\$7.00		
Year-to-Date Amount of Completed Loans (in millions)			\$25.00		
Year-to-Date Average Amount of Loan Application (in thousands)		\$75.00	\$400.00		
Year-to-Date Total Amount of Loan Applications (in millions)		\$0.22	\$70.00		

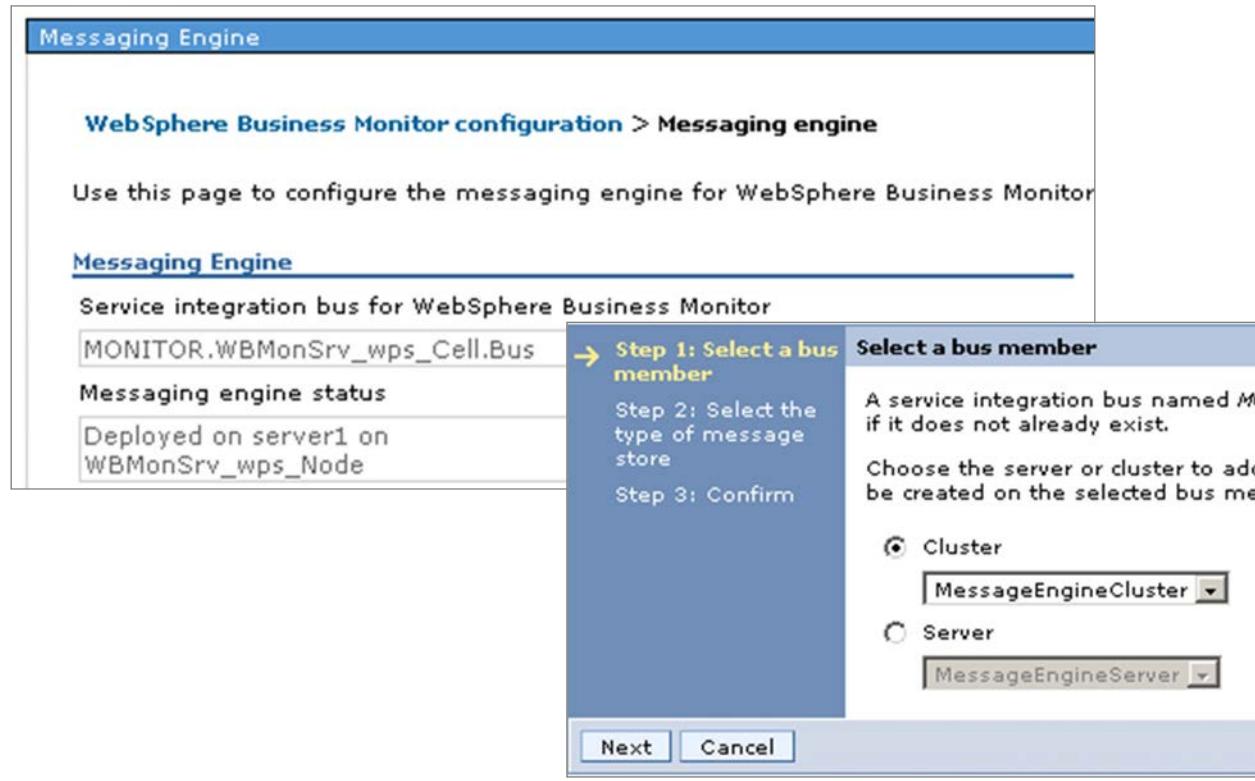
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Figure 11-26. Object security example: Loan officer

IBM Training

Sample component wizard page



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Figure 11-27. Sample component wizard page

The sample component wizard page displays component status. When the component has already been configured, the page simply displays information. If the component has not been configured, a button that launches the component configuration wizard is displayed.

You can see individual component status if the component has already been configured. The page displays the information.

If the component has not been configured, a button that launches the component configuration wizard is displayed where you can start configuring that component.

Event recording and playback

- Use event recording and playback in the Monitor toolkit to iteratively test a Monitor model without having to rerun the emitting application
- Functions:
 - Scripts provided to enable and disable event recording
 - Administrative pages to manage event recording and playback
 - Enable, disable, and clear event recording in the Monitor toolkit without having to launch the administrative console
 - Import recorded events from an event recording file

Figure 11-28. Event recording and playback

You can record and play back events using the Monitor Toolkit. This action allows you to iteratively test a Monitor model without having to rerun the BPEL application over and over again.

Some of the new functions include scripts to enable or disable event recording and administrative pages to manage record and playback. You can import recorded events from an event recording file or from the Monitor toolkit into the Integrated Test Client (ITC) for submission as part of an ITC script.

Enabling event recording

- Server

— Administrative console: You can enable or disable event recording by editing the event source

1. To access the event recording setting using the administrative console, click **Applications > Monitor Services > Event Sources** and then click the event source name.
2. Under **Event Recording**, select or clear the **Enable Event Recording** check box and then save your changes

The screenshot shows the 'Edit event source' page with the following details:

- General Properties** section:
 - Source ID:** DEF-IBMBPMNode01Cell
 - Display name:** Dynamic Event Framework event source on local host
- Event Recording** section:
 - Enable event recording**
 - Produce all events**

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Figure 11-29. Enabling event recording

Event recording and playback (1 of 2)

- Use the administrative console to select events to play back or export

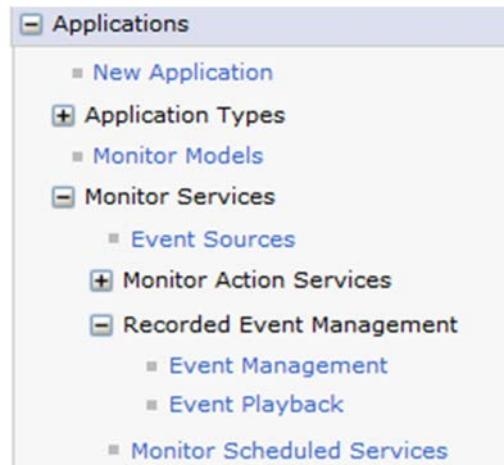


Figure 11-30. Event recording and playback (1 of 2)

You use the administrative console to select events to play back or export.



Event recording and playback (2 of 2)

The screenshot shows two overlapping windows. The top window is titled 'Events Management' and contains a table of recorded events:

Select	Event	Time Recorded
<input type="checkbox"/>	2394	2008-11-13T20:57:55.889
<input type="checkbox"/>	2393	2008-11-13T20:57:55.655

Below this is a section for 'Target Model Version' set to 'GlobalHTMM (2007-06-18T09:54:38)'. The bottom window is titled 'Play Back Events' and also contains a table of events:

Select	Event	Time Recorded
<input type="checkbox"/>	2396	2008-11-13T20:58:55.874
<input type="checkbox"/>	2395	2008-11-13T20:58:55.639

Both windows feature standard navigation buttons like Delete, Export, and Import Events.

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Figure 11-31. Event recording and playback (2 of 2)

Once you have recorded events, you can manage (delete, export, or insert) events, or play them back.



Viewing event details and importing events

- View event details

Events Management

Events Management > View Event XML

Use this page to view the event XML data.

```
<CommonBaseEvent creationTime="2008-11-13T20:56:55.843Z" extensionName="KPI" globalInstanceId="CEF67DF01BE8D7FB3DA100B1C59B04A731" priority="50" source="KPI">
  <contextDataElements name="KpiID" type="string">
    <contextValue> Percentage_of_Orders_Shipped_KPI </contextValue>
  </contextDataElements>
  <contextDataElements name="MonitoringContextID" type="string">
    <contextValue> Order_Handling_KC </contextValue>
  </contextDataElements>
```

- Import events

Events Management

Events Management > Import Events

Use this page to import events from the Integrated Test Client file.

Full path

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Figure 11-32. Viewing event details and importing events

You can drill down on the event and view the events details in XML format (although you cannot change the data). If you click the **Import Events** button, you get the Import Events panel.

Unit summary

- Describe the features of the IBM Business Monitor administrative console
- Configure Monitor model runtime properties and resources
- Explain and configure Monitor model securityRecord and play back eventsView event details and import events

Figure 11-33. Unit summary

Checkpoint (1 of 2)

1. _____ is an extension to the WebSphere Application Server administrative console.
2. True or false: Monitor allows multiple versions of model installed, but only the most recent version can have an event consumption mode of Active.

Checkpoint (2 of 2)

3. In runtime configuration, name three categories in which you can define their properties:

- _____
- _____
- _____

4. True or false: Monitor does not manage users or user groups, and there are no default rights, so the Monitor administrator must explicitly grant permission to newly deployed models.

Figure 11-35. Checkpoint (2 of 2)

Checkpoint answers

1. Monitor administrative console
2. True
3. In runtime configuration, name three categories that you can define their properties:
 - Tuning
 - Error handling
 - KPI
4. True

Unit 12. Maintaining and troubleshooting IBM Business Monitor

Estimated time

01:00

Overview

This unit explains how to do some basic maintenance and troubleshooting in IBM Business Monitor and monitor models.

How you will check your progress

- Checkpoint

Unit objectives

- Explain how to manage Monitor model versions
- Describe how to create, review, and remove Monitor model versions and data
- Explain the maintenance steps for the IBM Business Monitor database
- Describe how to manage monitor scheduled services
- Describe failed and unrecoverable events and how to manage them
- Describe the configuration and use of log files and trace
- Describe considerations for handling exceptions that occur during monitor execution
- Explain additional troubleshooting considerations

Versioning a Monitor model

- Update the model version timestamp, but leave the model ID as-is
- Monitor model editor produces an enterprise archive (EAR) file for each model version created
- Project names used during EAR generation must be unique per model version
- Allows for the installation of multiple versions, but only the most recent version can have a CEI distribution mode of Active
- Upon deployment, create a set of tables and views in the Monitor database to support that version
- No special user intervention is needed for versioning when data movement service is enabled

Figure 12-2. Versioning a Monitor model

Monitor models can be versioned to fix problems or add enhancements. You can deploy multiple versions of a Monitor model on a server if a developer adds new metrics to a model. For example, it might be desirable to have both the old and new versions deployed and running at the same time.

Versioning refers to the following situation: a user modifies aspects of a Monitor model to fix problems or make enhancements (adds a metric, monitoring context, and so on). The user also wants to deploy this new version of the model for future event processing and dashboard reporting, while preserving the data collected from previous model versions.

You create the Monitor model versions using the Monitor model editor. To version a model, update the model version timestamp, but leave the model ID as it is. Updating the model ID makes it appear to IBM Business Monitor that it is a new model. The Monitor model editor produces an enterprise archive (EAR) file for each model version that is created. The project names used during EAR generation need to be unique per model version. You can then install the model versions using the WebSphere Application Server administrative console, in the same way you would deploy a new model.

When the user deploys a new version of the Monitor model, a set of tables and views gets created in the Monitor database to support that version. Additionally, a set of cross-version views gets created to support dashboard queries that require data across all current and previous model versions. If reporting on data that did not exist in previous model versions, null values are returned.

Because the database views union data together across model versions, it is not possible to change the data type of an existing metric. All other Monitor model changes are supported.

To deploy a new version of a model as an entirely independent model, it is necessary to first change the ID of the model. In addition, the names of all Java EE projects generated during EAR generation must also be changed so that they are unique. This action is done so they do not collide with the names used by the already deployed model. You may want to deploy a model as an independent model rather than as a new version. If so, no tables or data are shared between the models, as would be the case for any other two independent models deployed on the Monitor Server.

Because the data movement service always works on a version-specific basis, no special user intervention is needed for versioning when data movement service is enabled.



Version link

Monitor Models > CATOrderMgmtMonitoringModel (2015-01-20T11:56:54)

Use this page to tune and configure the error handling and KPI properties of this model version.

General

General Properties	Version Properties
<p>Model CATOrderMgmtMonitoringModel</p> <p>Version 2015-01-20T11:56:54</p> <p>Application CATOrderMgmtMonitoringModelApplication</p> <p>Event consumption mode CreateNewInstances</p> <p>Active MC instances 1</p>	<ul style="list-style-type: none"> ■ Manage schema ■ Manage Cognos cubes ■ Change event sources ■ Change event consumption mode ■ Change runtime configuration ■ View model ■ Purge model version <p>Manage Monitor Data</p> <ul style="list-style-type: none"> ■ Export instance data ■ Import instance data ■ Purge and archive instance data

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Figure 12-3. Version link

From the Monitor models page, you can get to the version detail page by clicking the version timestamp. It shows the CEI distribution mode, the number of active instances, and other properties for the model.

In previous visuals, you saw the model version properties and how to change them.

Versioning runtime changes and limitations

- After a new version of Monitor model is deployed:
 - Only latest version can be used to create new monitoring context instance
 - Older version continues running until all of its running instances are completed
- Event consumption mode of older version automatically changes from **Active** to **UpdateExistingInstancesOnly**
 - A set of version-specific database tables and views is created to support the deployed version
 - A set of cross-version views is created to support cross-version dashboard queries
- A new version of a Monitor model can contain any model changes except:
 - Existing metric data type change
 - Monitoring context hierarchy change

Figure 12-4. Versioning runtime changes and limitations

Versioning is an application-level answer to a specific situation: you modify a Monitor to fix problems or make enhancements *and* you want to deploy these changes for future event processing or reporting, *while* preserving the data collected from previous model versions.

To create a new version of an already deployed Monitor model, update the model timestamp, but do not change the model ID. During enterprise application generation, the application name is expected to be unique for each model version.

Event consumption modes

CreateNewInstances

Events are processed and new monitoring context instances can be created as a result.

UpdateExistingInstancesOnly

Events for existing monitoring context instances are processed, but events that would create new root monitoring context instances are ignored.

InactiveSaveEvents

Events are saved for a future monitor model version to process. The events are not processed by the current monitor model version.

Inactive

Events are not distributed to this monitor model version.

Event consumption mode – valid transitions

Inactive	->	CreateNewInstances
CreateNewInstances	->	Inactive
	->	InactiveSaveEvents
	->	UpdateExistingInstancesOnly
UpdateExistingInstancesOnly	->	Inactive
InactiveSaveEvents	->	Inactive

- Can change Inactive to CreateNewInstances, providing no later version of the monitor model exists in any state other than Inactive.
- If make a new version CreateNewInstances, any previous versions in CreateNewInstances state will automatically become UpdateExistingInstancesOnly.
- If an old version exists in Inactive state it cannot be changed to any other state if a newer version exists and is in any state other than Inactive.
- To make an old version CreateNewInstances, all newer versions need to be changed to Inactive.

Figure 12-6. Event consumption mode – valid transitions

Versioning is not a model update

- Model update: Replaces the application code associated with the model with a later version
- Model update is of limited use; most common use is when applying a fix to correct a code generation problem

The figure consists of two screenshots of the IBM Business Monitor interface. The left screenshot shows the 'View: All tasks' navigation menu with 'Enterprise Applications' highlighted. The right screenshot shows the 'Enterprise Applications' management page, which includes a toolbar with 'Start', 'Stop', 'Install', 'Uninstall', and 'Update' buttons, and a table listing applications like 'AppScheduler'. The 'Update' button in the toolbar and the 'AppScheduler' row in the table are both highlighted with red boxes.

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Figure 12-7. Versioning is not a model update

When there are multiple model versions installed on the server, only one version can have the distribution mode set to active. Installing a new Monitor model with a status of *active* automatically sets the distribution mode of the previous version to *active* (*no new MC instances*). The timestamp of the new version must be more recent than the previous one.

Though events are being processed independently by Monitor model versions, a set of cross-version views is created to enable dashboards to display data aggregated from all versions.

Note: Versioning is not enabled for development servers.

Versioning use cases summary

Model change	Valid scenario	Recommendation
Add new KPI (based on existing metric, counter)	✓	Use KPI Manager widget instead
Modify existing KPI	✓	Versioning must be used
Add new alert (based on KPI)	✓	Use Alert Manager widget instead
Add new alert (based on metric, counter, and so on)	✓	Versioning must be used
Add new metric, counter	✓	Versioning must be used
Add new dimension	✓	Use Cognos administrative console
Modify or add diagram	✓	Versioning must be used
Change metric data properties (type, default)	✗	
Modify monitoring context hierarchy	✗	

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Figure 12-8. Versioning use cases summary

This visual summarizes when a Monitor model version can be used.

Removing Monitor models and data

- Uninstalling a single version of a Monitor model
 - Removes only the specified version of the model from the database
- Uninstalling all versions of a Monitor model
 - To completely uninstall a model from the database, you must uninstall all versions of a model
- Purging a Monitor model
 - Removes all versions of a model from the repository database. All versions of a model must be uninstalled before you can purge a model.
- Running the delete schema scripts automatically
 - Use the WebSphere Application Server administrative console to run the delete schema scripts automatically
- Exporting delete schema scripts
 - Use the WebSphere Application Server administrative console to export delete schema scripts to a DDL file to be run either at a later time or remotely

Figure 12-9. Removing Monitor models and data

When you no longer have the need for a Monitor model, you can remove it from the runtime environment.

Removing a Monitor model involves multiple operations:

- Removing (“undeploying” or “uninstalling”) the running model from the runtime environment.
- Deleting the database schema associated with the model from the Monitor database. This action deletes the data, as well as the database components (tables, indexes, and so on).

You can remove a single version of a Monitor model (if you have installed more than one version), or you can remove all versions. Recall that a unique set of database tables is created in the Monitor database to support each version of a model. A set of cross-version database views is also created (to support dashboard widgets that require data across multiple versions of a model).

You use the administrative console to remove a Monitor model.

Removing Monitor models and data: Details (1 of 3)

1. Stop the model version to be removed

The screenshot shows two tables side-by-side. The left table lists 'Model' and 'Version' information, while the right table lists 'Application', 'Data Security', and 'Status' information.

Model	Version	Deployment
ClipsAndTacksMM	2009-12-17T13:18:25	OK
GlobalHTMM	2007-06-18T09:54:38	OK

Application	Data Security	Status
ClipsAndTacksMMApplication	Members assigned	
GlobalHTMMApplication	Members assigned	

2. Run script to delete database schema for model version to be uninstalled (or all versions, if deleting entire model)

- Can be done through administrative console, or can also script and run independently through database management utilities

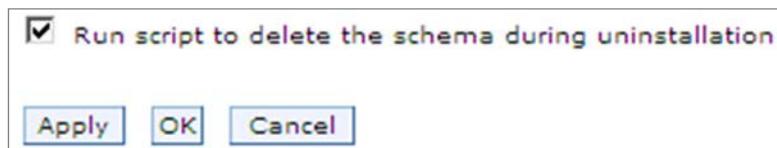
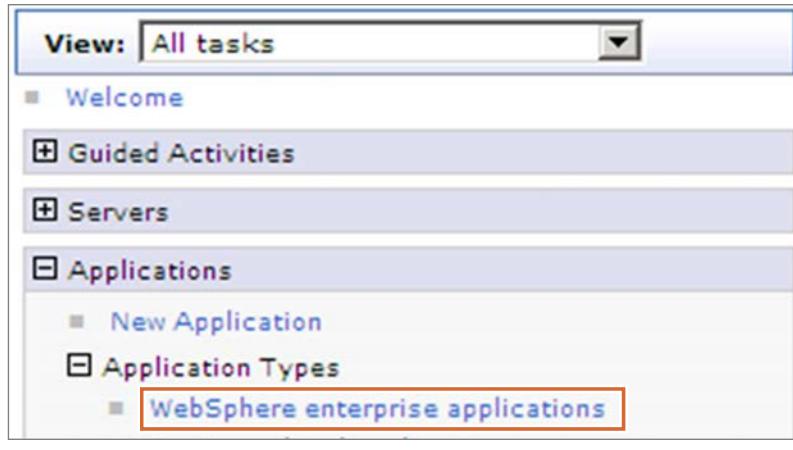


Figure 12-10. Removing Monitor models and data: Details (1 of 3)

To remove a model, you must stop the model or specific model version that you want to remove. Next, you must delete the database schema, which deletes all of the database tables (and therefore the data) and other database objects associated with the model or model version. In most cases, you can allow the administrative console to delete the model for you during the uninstallation process. There are some circumstances where you might want to (or need to) manually export the Data Definition Language (DDL) scripts and run them manually, such as if you are running DB2 under z/OS.

Removing Monitor models and data: Details (2 of 3)

3. Stop the application associated with the Monitor model



<input type="checkbox"/>	<u>ClipsAndTacksMMAApplication</u>	
<input type="checkbox"/>	<u>ClipsAndTacksMMAApplication2</u>	

Figure 12-11. Removing Monitor models and data: Details (2 of 3)

After stopping the model, next stop the application or applications associated with the model or model version. The stop status is indicated by the red X in the list of applications in the administrative console.

Removing Monitor models and data: Details (3 of 3)

4. Uninstall the application



5. Save the master configuration

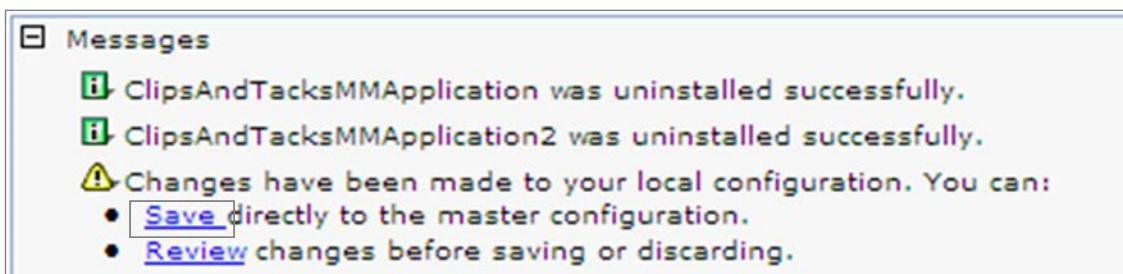


Figure 12-12. Removing Monitor models and data: Details (3 of 3)

Finally, click **Uninstall** to remove the model from the server. If you selected the **Run script to delete schema during uninstallation**, the database schema is deleted before the model or model version is removed.

After the model and applications are uninstalled, save the master configuration.

You uninstall a model in the exercise that accompanies this unit.

Maintaining the Monitor database

- Periodic database maintenance is important for recoverability and performance
 - The Monitor database is backed up regularly to allow recovery in case of disk failure or other problem that corrupts the database
 - The database is tuned periodically to optimize data retrieval for faster dashboard performance
- Procedures and tools are vendor-dependent

Figure 12-13. *Maintaining the Monitor database*

Performing periodic maintenance on the IBM Business Monitor database is an important task:

- Backing up the database allows you to recover the Monitor environment in the event of disk failure or some other problem that corrupts the Monitor database.
- Performing periodic analysis and tuning of the database allows faster queries against the database to populate dashboard widgets.

While these general principles apply regardless of which database management system you use for the Monitor database, the processes and tools you use to perform the maintenance tasks are specific to the database technology. For more information, consult with a database administrator.

Managing Monitor scheduled services

- There are a number of background services that run in the Monitor environment
- These services are used to move data, perform calculations for dashboards, and perform other maintenance functions
 - Data movement service
 - KPI history calculation
 - KPI prediction calculation
 - Dynamic alert evaluation
 - Cube summary table (MQT) refresh
 - Cognos cube caching
 - Purge and archive instance data

Figure 12-14. Managing Monitor scheduled services

There are a number of background processes that run in the Monitor environment.

Using Monitor scheduled services, you can do the following: suspend and resume services; indicate how often to run a service; and view the status, duration, and last completion time of the scheduled service at the model or model version level. You can also assign a priority to each scheduled service. Use the administrative console to schedule and manage services to run for a particular model.

Some of the scheduled services include:

Data Movement Service - before scheduling this service, you must enable it

Each monitoring context is represented as a table in the IBM® Business Monitor database. Under high volumes, there can be contention between the IBM Business Monitor server and dashboard's use of these tables. In these cases, you should enable data movement services (DMS). DMS creates a duplicate set of tables dedicated for dashboard queries, and then initiates the data transfer from the server tables to the dashboard tables. The scheduler manages the frequency and timing of the execution of the data movement service

KPI History Calculation - runs once every hour

The KPI history calculation service collects KPI values for KPIs with history tracking enabled. You can use this information later to analyze historical KPI trends and make predictions for future KPI

values. You can view a model's KPI history calculation service status at the model and model version levels using the administrative console.

KPI Prediction Calculation - runs once every hour

The KPI prediction calculation service makes predictions for KPIs that have associated prediction models. You can view a model's KPI prediction calculation service status at the model and model version levels using the administrative console.

Dynamic Alert Evaluation

The dynamic alert evaluation service evaluates alerts that have been created in the dashboard Alert Manager. If any of the alert conditions have been met, the service sends alerts based on their subscription settings. You can view and schedule dynamic alert evaluations using the administrative console.

Cube Summary Table :

In environments where a monitoring context has many instances, computing aggregates for measures in dimensional analysis might take a long time and adversely affect dashboard performance. Precomputing aggregates and storing them in database summary tables called materialized query tables (MQTs) can significantly improve query performance.

Cognos Cache Clearing

IBM Cognos® Business Intelligence report results are automatically cached, which reduces response time for subsequent report queries from the same user or subsequent users. To obtain refreshed report results, you must clear the Cognos cube cache based on an interval setting.

Purge and Archive Instance Data

You can purge instance data from the monitor database and archive it to a directory on your IBM Business Monitor server. Use the data services scheduler on the WebSphere Application Server administrative console to schedule purging and archiving instance data

Failed and unrecoverable events

- An event that cannot be processed by IBM Business Monitor is called a *failed event*
 - A failed event may be able to be resubmitted for processing, with manual intervention
- A specific type of failed event is called an *unrecoverable event*
 - An unrecoverable event cannot be resubmitted for processing
- Failed and unrecoverable events are posted to the error queue
- You can take action on failed and unrecoverable events
- Can manage failed events via the administrative console, or via script

Figure 12-15. Failed and unrecoverable events

When a Monitor model is generated using the development toolkit, sequences of events that can be run in parallel are identified. Specific instances of these event sequences are identified by their root instance ID (RIID). If an event cannot be processed, the model stops processing all subsequent messages in the event sequence instance, identified by the RIID, in which the fault occurred. These events are known as *failed events*. (Other event sequence instances of the model can continue to process incoming events.) Manual intervention is then required to restart processing of a particular failed event sequence instance.

When an event cannot be processed and the RIID of its event sequence instance cannot be determined, the event is considered unrecoverable. *Unrecoverable events* are generally caused by one of the following: either the event is missing information needed to identify the RIID of the event sequence instance to which it belongs, or the model could not parse the incoming event (for example, because of malformed XML). Unrecoverable events can be inspected in an attempt to establish the cause of a failure, but they cannot be resubmitted.

Managing failed and unrecoverable events

- Use failed event sequence manager in Admin Console to manage failed and unrecoverable events
- You can view:
 - Monitor models with failed or unrecoverable events
 - Failed instances or events for a specific Monitor model
 - Unrecoverable events for a specific Monitor model
- For failed events, you can:
 - Examine the event
 - Delete the event
 - Export the event to a file
 - Import from a file and replace a failed event
 - Resubmit the event
- For unrecoverable events, you can:
 - Examine the event
 - Delete the event
 - Export the event to a file

Maintaining and troubleshooting IBM Business Monitor

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Figure 12-16. Managing failed and unrecoverable events

The failed event sequence manager is available from the administrative console. Once you have invoked it, you can review Monitor models or model versions that contain failed or unrecoverable events. You can also take further action on those events, depending on the event type (for example, you can resubmit a failed event, but not an unrecoverable event).

Managing instance data

- To maintain dashboard performance and ensure that your system runs efficiently, you can purge, archive, export, and import instance data for a Monitor model version
- You can purge instance data on a one-time basis using the administrative console or an administrative script
- You can also use a scheduled service (from the Monitor data services) to take this action on a recurring basis
 - Terminated instances can be purged based on a configurable duration since the instance termination time
- When you purge instance data, you can optionally archive those instances to a CSV file on the file system of the IBM Business Monitor server
 - You can append each set of instance data to the same CSV file or use a new CSV file
 - You can set the maximum size of the CSV file to avoid excessively large files (after the maximum file size is reached, a new CSV file is created)

Figure 12-17. Managing instance data

You can purge instance data from the monitor database and archive it to a directory on your IBM® Business Monitor server. Use the data services scheduler on the WebSphere® Application Server administrative console to schedule purging and archiving instance data.

You can purge and archive instance data as a one-time action on the model version page on the administrative console or as a scheduled service within the administrative console section, Monitor Scheduled Services. By default, the instance data purging and archiving service is suspended, meaning that all instance history is preserved.

Periodically, you might want to purge old terminated instances to improve system performance, or to focus monitoring on more recent or in-progress instances. Terminated instances can be purged based on a configurable duration since the instance termination time.

When instances are purged, you can optionally archive those instances to a CSV file on the IBM Business Monitor server's file system. Each archival can be appended to the same CSV file or use a new CSV file. Additionally, you can set the maximum size of the CSV file to avoid extremely large files. After the maximum file size is reached, a new CSV file is created.

To access Monitor Scheduled Services on the WebSphere Application Server administrative console, click Applications > Monitor Services > Monitor Scheduled Services.

To manage scheduled purging and archiving instance data on the administrative console, click Applications > Monitor Services > Monitor Scheduled Services > *model_name* > Scheduled Services > Purge and Archive Instance Data.

For instructions on changing the interval and start time for a service, refer to *Changing the scheduled service interval and start time*.

For instructions on purging and archiving instance data on a one-time basis, refer to *Managing instance data*.

Using logging and tracing

The screenshot shows a web-based administrative interface for the IBM Business Monitor. At the top, it displays the path: Cell=xpbaseNode01Cell, Profile=ProcSrv01. Below this is a blue header bar with the title "Logging and Tracing". The main content area has a blue header "Logging and Tracing > server1". A descriptive text follows: "Use this page to select a system log to control which components. Use log levels to control which". Below this is a section titled "General Properties" with a bulleted list of links: "Diagnostic Trace", "JVM Logs", "Process Logs", "IBM Service Logs", and "Change Log Detail Levels".

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Figure 12-18. Using logging and tracing

To assist with problem determination, you can use the logging and tracing facilities that are built into the underlying WebSphere Application Server on which the IBM Business Monitor components are deployed. These functions are accessed from the administrative console under the **troubleshooting** section.

There are several types of logs you can access, as well as enabling tracing to provide detailed information about the application server component interoperate. Some configuration changes require a restart of the server before they become effective.

Configuring trace properties

Select:

- Trace destination
- File parameters
- Trace output format

General Properties

Trace Output

None
 Memory Buffer
 File

* Maximum Buffer Size
 thousand entries

* Maximum File Size
 MB

* Maximum Number of Historical Files

* File Name

Trace Output Format

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Figure 12-19. Configuring trace properties

You can write the trace file to a file on disk, or you can store it in memory and write it to a file on demand by clicking the **Dump** button on the runtime properties page. You can also specify the file parameters, and the format in which you want the trace written.

Using the event flow diagnostic and validation tool

- Use to troubleshoot and fix problems with consuming events when IBM Business Monitor model does not consume events
- Helps you track events from the emitter to the Monitor model
- Downloadable from the IBM Business Monitor support website (www.ibm.com/software/integration/wbimonitor)
- A PDF guide to the event flow diagnostic and validation tool also available on support website
 - Helps you gather information about your environment that you need to run the diagnostic tool
 - Also includes instructions for installing and configuring the diagnostic model, enabling event recording, tracking an event, and troubleshooting using the diagnostic model

Figure 12-20. Using the event flow diagnostic and validation tool

It can happen that you have successfully installed your Monitor model application, created its schema, and completed the common-based infrastructure configuration and still cannot consume events. If so, use the **event flow diagnostic and validation tool for IBM Business Monitor** to help determine where events are encountering interference and how to fix basic problems.

The event flow diagnostic and validation tool helps you track events from the emitter to the Monitor model. Knowing how far your events progress towards reaching your Monitor model helps narrow the search for potential problems.

Handling exceptions (1 of 2)

Three types of exceptions can occur in the Monitor environment

- *Soft* exceptions — mismatches between parent and child events, other “expected” events
 - Monitor server logs exception
 - Common Base Event sent to Monitor action services (for example, to be displayed in Alerts section of dashboard for administrator notification)
 - Processing continues
- *Hard* exceptions — unexpected runtime exceptions thrown while processing Monitor model events
 - Monitor server logs exception
 - Common Base Event sent to Monitor action services (for example, to be sent as email alert to administrator)
 - Events that cause a hard exception are rolled back, along with all of their triggered maps and situations

Handling exceptions (2 of 2)

- *In-doubt* exceptions — Monitor server locks up
 - State of some events is set to *in-doubt* — Monitor server cannot determine if in-doubt events were successfully processed
 - Common Base Event sent to Monitor action services (for example, to be displayed in Alerts section of dashboard for administrator notification)
 - Manual intervention required by administrator to determine if these events need to be processed again or deleted

Figure 12-22. Handling exceptions (2 of 2)

You can prevent the IBM Business Monitor server from being blocked by any runtime exceptions by changing the exception destination for the Monitor_Bus_Queue_Destination destination queue from None to System. Then, events causing runtime exceptions are ignored. However, you must configure IBM Business Monitor to do either of the following: halt when a runtime exception occurs, to preserve data consistency and event sequencing; or ignore the event that caused the error to avoid blocking the server, but allow data inconsistency and nonsequential events.

Be sure to consider carefully all ramifications when you plan exception handling strategy to prevent data loss or extensive manual intervention.

Additional maintenance and troubleshooting concepts

- The IBM Business Monitor Information Center contains much more detailed information about troubleshooting
 - Installation issues
 - Administration issues
 - Monitor database issues
 - Development toolkit issues
 - Dashboard issues
 - Server startup and shutdown issues, including considerations on how to prevent locked event or in-doubt status when shutting down and restarting servers
 - How to engage IBM technical support, and steps to take to gather required information before doing so

Figure 12-23. Additional maintenance and troubleshooting concepts

Unit summary

- Explain how to manage Monitor model versions
- Describe how to create, review, and remove Monitor model versions and data
- Explain the maintenance steps for the IBM Business Monitor database
- Describe how to manage monitor scheduled services
- Describe failed and unrecoverable events and how to manage them
- Describe the configuration and use of log files and trace
- Describe considerations for handling exceptions that occur during monitor execution
- Explain additional troubleshooting considerations

Checkpoint

1. True or false: You can leave the database schema in place before purging the associated Monitor model.

2. What are the two types of events that require manual intervention in order to resolve error conditions?
 - _____
 - _____

3. True or false: It is important to perform periodic maintenance on the Monitor database to maintain optimum performance.

Checkpoint answers

1. False
2. Two types of events that require manual intervention in order to resolve error conditions are:
 - Failed events
 - Unrecoverable events
3. True

Unit 13. Course summary

Estimated time

00:30

Overview

This unit summarizes the course and provides information for future study.

Unit objectives

- Explain how the course met its learning objectives
- Identify other IBM Training courses that are related to this course
- Access the IBM Training website
- Locate appropriate resources for further study

[Course summary](#)

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Figure 13-1. Unit objectives

Course learning objectives

After completing this course, you should be able to:

- Explain monitoring concepts
- Describe the architecture of IBM Business Monitor
- Explain how IBM Business Monitor retrieves business data from various sources
- Generate events by using Dynamic Event Framework
- Develop the business measures mode
- Test Monitor models by using the unit test environment servers
- Configure the Action Services Manager
- Configure Business Monitor widgets in a business space

Course summary

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Figure 13-2. Course learning objectives

To learn more on the subject

- IBM Training website:

www.ibm.com/training

- IBM Business Monitor product documentation

http://www.ibm.com/support/knowledgecenter/SSFPJS_8.5.7/com.ibm.wbpm.mon.doc/kc-home.html?lang=en

- Configuring server to server SSL communication

https://www.ibm.com/support/knowledgecenter/en/SSFPJS_8.5.7/com.ibm.wbpm.mon.admin.doc/sec/cfg_ssl.html

- Event sources

https://www.ibm.com/support/knowledgecenter/en/SSFPJS_8.5.7/com.ibm.wbpm.mon.imuc.doc/intro/intro_events_sources.html

Unit summary

- Explain how the course met its learning objectives
- Identify other IBM Training courses that are related to this course
- Access the IBM Training website
- Locate appropriate resources for further study

Course summary

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Figure 13-4. Unit summary

Appendix A. List of abbreviations

Ajax	Asynchronous JavaScript and XML
API	application programming interface
APQC	American Productivity Quality Center
ATM	automated teller machine
BAM	business activity monitoring
BEP	business event processing
BI	business intelligence
BM	business measures
BPC	Business Process Choreographer
BPEL	Business Process Execution Language
BPM	business process management
BPMN	Business Process Modeling Notation
CBD	component-based development
CEI	Common Event Infrastructure
CEO	chief executive officer
CICS	Customer Information Control System
CSV	comma-separated values
DB	database
DBA	database administrator
DDL	Data Definition Language
DDT	database design tool
DEF	Dynamic Event Framework
DHCP	Dynamic Host Configuration Protocol
DMS	data movement services
EAR	enterprise archive
ECM	Enterprise Content Management
EJB	Enterprise JavaBeans
ESB	enterprise service bus
EWMA	exponentially weighted moving average
FTP	File Transfer Protocol

GBS	Global Business Services
HTTP	Hypertext Transfer Protocol
IBM	International Business Machines Corporation
IDE	integrated development environment
IMS	Information Management System
I/O	input/output
IP	Internet Protocol
IT	information technology
ITC	Integrated Test Client
ITE	integrated test environment
ITSO	International Technical Support Organization
Jacl	Java Command Language
JAR	Java archive
Java EE	Java Platform, Enterprise Edition
JDBC	Java Database Connectivity
JMS	Java Message Service
JNDI	Java Naming and Directory Interface
JSF	JavaServer Faces
JSON	JavaScript Object Notation
KAI	key agility indicator
KPI	key performance indicator
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LTPA	Lightweight Third Party Authentication
MC	monitoring context
MDB	message-driven bean
MM	monitor model
MME	Monitor model editor
MQ	Message Queue
MQT	materialized query table
ND	network deployment
NTB	net tangible benefit
OS	operating system
OSBC	Open Standards Benchmarking Collaborative

PCF	Process Classification Framework
PDF	Portable Document Format
PHP	Hypertext Preprocessor
PI	project interchange
POS	point-of-sale
RAT	resource authorization table
RAVE	Rapidly Adaptive Visualization Engine
REST	Representational State Transfer
RIA	rich Internet application
RIID	root instance ID
RSS	Really Simple Syndication
SCA	Service Component Architecture
SDO	Service Data Object
SIB	service integration bus
SIBus	service integration bus
SKU	stock keeping unit
SMS	short message service
SOA	service-oriented architecture
SSL	Secure Sockets Layer
SVG	Scalable Vector Graphics
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
UDB	Universal Database
UDF	user-defined function
UI	user interface
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UTE	unit test environment
VMM	Virtual Member Manager
WSDL	Web Services Description Language
XML	Extensible Markup Language
XPath	XML Path Language
XSD	XML Schema Definition

Appendix B. IBM Business Monitor glossary

This glossary defines commonly used terms used in IBM Business Monitor.

A

action service

A service that triggers a process or notification to inform users about a situation.

action service handler

An entity that is responsible for the invocation mechanism of one or more action services.

alert

A message or other indication that signals an event or an impending event.

B

business activity monitoring

The collection and presentation of real-time information that describes a business process or a series of activities spanning multiple systems and applications.

business graph

A wrapper that is added around a simple business object or a hierarchy of business objects to provide additional capabilities, such as carrying change summary and event summary information related to the business objects in the business graph. Also see *business object*.

business item

A business document, work product, or commodity that is used in business operations. Examples of business items are a manufacturing order, system board, power supply, and memory chip (in a PC assembly process), itinerary and customer information record (in a trip reservation process), and passenger (in a transportation process). Also see *business object*.

business object

In a development or production environment, a set of attributes that represents a business entity (such as an invoice) and the definition of actions that can be done on those attributes (such as the create and update operations). Also see *data object*, *business item*, *Service Data Objects*, *business graph*, and *private business object*.

business object map

An artifact that assigns values to the target business objects based on the values in the source business objects.

Business Process Execution Language (BPEL)

An XML-based language for the formal specification of business processes and business interaction protocols. BPEL extends the web services interaction model and enables it to support business transactions.

business process management (BPM)

The services and tools that support process management (for example, process analysis, definition, execution, monitoring, and administration), including support for human and application-level interaction. BPM tools can eliminate manual processes and automate the routing of requests between departments and applications.

C

CEI

See *Common Event Infrastructure*.

Common Base Event

A specification based on XML that defines a mechanism for managing events in business enterprise applications, such as logging, tracing, management, and business events. Also see *situation*.

Common Event Infrastructure (CEI)

The implementation of a set of APIs and infrastructure for the creation, transmission, persistence, and distribution of business, system, and network Common Base Events. Also see *event emitter*.

counter

A specialized metric used to track the number of occurrences of a specific situation or event. For example, you can use a counter to track the number of times that a task is started within a process, where that task is contained in a loop.

D

data object

Any object (such as tables, views, indexes, functions, triggers, and packages) that can be created or manipulated using SQL statements. Also see *business object*.

DB2

A family of IBM licensed programs for relational database management.

dashboard

A web page that can contain one or more viewers that graphically represent business data.

deploy

To place files or install software into an operational environment. In Java Platform, Enterprise Edition (Java EE), deployment involves creating a deployment descriptor suitable to the type of application that is being deployed.

dimensional model

The part of the monitor model that defines the cubes and cube content that are used for storing, retrieving, and analyzing the data that is gathered over time.

E

event definition

A description of event classes and their allowed content, which is stored by the event catalog.

event emitter

A component of the Common Event Infrastructure that receives events from event sources, completes, and validates the events, and then sends events to the event server based on filter criteria. Also see *Common Event Infrastructure* and *event source*.

event model

The part of the monitor model that contains references to all of the elements of the event definitions used in the monitor model.

event source

An object that supports an asynchronous notification server within a single Java virtual machine. Using an event source, the event listener object can be registered and used to implement any interface.

F

G

H

human task

An interaction between people and business processes or services. Also see *inline task* and *stand-alone task*.

I

inbound event

A declaration that a monitoring context or KPI context accepts a specific event at run time.

Information Management System (IMS)

Any of several system environments available with a database manager and transaction processing that are able to manage complex databases and terminal networks.

inline task

In the human task editor, a unit of work that is defined within an implementation of a business process. Also see *human task* and *stand-alone task*.

interface map

A map that resolves and reconciles the differences between the interfaces of interacting components. There are two levels of interface maps: operation mappings and parameter mappings.

J

Java 2 Platform, Enterprise Edition (J2EE)

See *Java Platform, Enterprise Edition*.

Java Platform, Enterprise Edition (Java EE)

An environment for developing and deploying enterprise applications, defined by Sun Microsystems. The Java EE platform consists of a set of services, application programming interfaces (APIs), and protocols that provide the functionality for developing multitiered, web-based applications. (Sun)

K

key performance indicator (KPI)

A quantifiable measure designed to track one of the critical success factors of a business process.

KPI model

The part of the monitor model that contains the KPI contexts, which in turn contain key performance indicators and their associated triggers and events.

L

LDAP

See *Lightweight Directory Access Protocol*.

Lightweight Directory Access Protocol (LDAP)

An open protocol that uses TCP/IP to provide access to directories that support an X.500 model and that does not incur the resource requirements of the more complex X.500 Directory Access Protocol (DAP). For example, LDAP can be used to locate people, organizations, and other resources in an Internet or intranet directory.

M

mediation flow

A sequence of processing steps, or mediation primitives, that run to produce the mediation when a message is received.

metric

A holder for information, usually a business performance measurement, in a monitoring context.

model

A representation of a process, system, or subject area, developed for understanding, analyzing, improving, and replacing the item being represented. A model can include a representation of information, activities, relationships, and constraints.

Monitor

A facility of the Integrated Test Client that listens for requests and responses that flow over the component wires or exports in the modules of a test configuration.

In performance profiling, to collect data about an application from the running agents that are associated with that application.

Monitor details model

A container for monitoring contexts and their associated metrics, keys, counters, stopwatches, triggers, and inbound and outbound events. The Monitor details model holds most of the monitor model information.

monitored directory

The directory where the rapid deployment tools detect added or changed parts and produce an application that can run on the application server. Also see *automatic application installation project* and *free-form project*.

monitoring context

A definition that corresponds to an object to be monitored, such as a process execution, an ATM, a purchase order, or the stock level in a warehouse. At run time, monitoring contexts process the events for a particular object.

monitor model

A model that describes the business performance management aspects of a business model, including events, business metrics, and key performance indicators (KPIs) that are required for real-time business monitoring.

N O

outbound event

An event emitted from a monitoring context or from a KPI context.

P R

Rational Application Developer

An integrated development environment (IDE) for visually designing, constructing, testing, and deploying web services, portals, and Java 2 Enterprise Edition (Java EE) applications.

relationship role

In EJB programming, a traversal of the relationship between two entity beans in one direction or the other. Each relationship that is coded in the deployment descriptor defines two roles.

relationship service

A service used to model and maintain relationships across business objects and other data

S

SCA

See *Service Component Architecture*.

SCA component

A building block of the Service Component Architecture, it is used to build SCA modules, such as mediation modules.

SCA export binding

A concrete definition that specifies the physical mechanism used by a service requester to access an SCA module, for example, using SOAP/HTTP.

SCA export interface

An abstract definition that describes how service requesters access an SCA module.

SCA import binding

A concrete definition that specifies the physical mechanism used by an SCA module to access an external service, for example, using SOAP/HTTP.

SCA import interface

An abstract definition that describes how an SCA module accesses a service.

SCA module

A module with interfaces that conforms to the Service Component Architecture (SCA).

SCA request

A service request that conforms to the Service Component Architecture (SCA). An SCA module routes the request to a service provider, after having done any additional processing specified by the module.

SCA run time

The server functions that provide support for the Service Component Architecture.

Secure Sockets Layer (SSL)

A security protocol that provides communication privacy. With SSL, client/server applications can communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

selector component

A component that provides a means of interposing a dynamic selection mechanism between the client application and a set of target implementations.

Service Component Architecture (SCA)

An architecture in which all elements of a business transaction, such as access to web services, Enterprise Information System (EIS) service assets, business rules, workflows, databases, and so on, are represented in a service-oriented way.

Service Data Objects (SDO)

An open standard for enabling applications to handle data from heterogeneous data sources in a uniform way, based on the concept of a disconnected data graph. Also see *business object*.

service-oriented architecture (SOA)

A conceptual description of the structure of a software system in terms of its components and the services they provide, without regard for the underlying implementation of these components, services, and connections between components.

situation event

A Common Base Event that is emitted when a defined situation occurs.

Stand-alone task

A unit of work that exists independently of a business process, and implements human interaction as a service. Also see *human task* and *inline task*.

T**trigger**

In database technology, a program that is automatically called whenever a specified action is done on a specific table or view.

A mechanism that detects an occurrence and can cause additional processing in response.

U**V****virtual machine**

An abstract specification for a computing device that can be implemented in different ways in software and hardware.

W**workflow**

The sequence of activities that are completed in accordance with the business processes of an enterprise.

X**Y****Z**

Appendix C. Resource guide

Completing this WebSphere Education course is a great first step in building your WebSphere, CICS, and SOA skills. Beyond this course, IBM offers several resources to keep your WebSphere skills on the cutting edge. Resources available to you range from product documentation to support websites and social media websites.

Training

- **IBM Training website**
 - Bookmark the IBM Training website for easy access to the full listing of IBM training curricula. The website also features training paths to help you select your next course and available certifications.
 - For more information, see: <http://www.ibm.com/training>
- **IBM Training News**
 - Review or subscribe to updates from IBM and its training partners.
 - For more information, see: <http://bit.ly/IBMTrainEN>
- **IBM Certification**
 - You can demonstrate to your employer or clients your new WebSphere, CICS, or SOA mastery through achieving IBM Professional Certification. WebSphere certifications are available for developers, administrators, and business analysts.
 - For more information, see: <http://www.ibm.com/certify>
- **Training paths**
 - Find your next course easily with IBM training paths. Training paths provide a visual flow-chart style representation of training for many WebSphere products and roles, including developers and administrators.
 - For more information, see: <http://www.ibm.com/services/learning/ites.wss/us/en?pageType=page&c=a0003096>

Social media links

You can keep in sync with WebSphere Education, including new courses and certifications, course previews, and special offers, by visiting any of the following social media websites.

- **Twitter**
 - Receive short and concise updates from WebSphere Education a few times each week.
 - Follow WebSphere Education at: twitter.com/websphere_edu

- **Facebook:**

- Become a fan of IBM Training on Facebook to keep in sync with the latest news and career trends, and to post questions or comments.
- Find IBM Training at: facebook.com/ibmtraining

- **YouTube:**

- Visit the IBM Training YouTube channel to learn about IBM training programs and courses.
- Find IBM Training at: youtube.com/IBMTutorial

Support

- **WebSphere Support portal**

- The WebSphere Support website provides access to a portfolio of support tools. From the WebSphere Support website, you can access several downloads, including troubleshooting utilities, product updates, drivers, and Authorized Program Analysis Reports (APARs). To collaboratively solve issues, the support website is a clearing house of links to online WebSphere communities and forums. The IBM support website is now customizable so you can add and delete portlets to the information most important to the WebSphere products you work with.
- For more information, see: <http://www.ibm.com/software/websphere/support>

- **IBM Support Assistant**

- The IBM Support Assistant is a local serviceability workbench that makes it easier and faster for you to resolve software product issues. It includes a desktop search component that searches multiple IBM and non-IBM locations concurrently and returns the results in a single window, all within IBM Support Assistant.
- IBM Support Assistant includes a built-in capability to submit service requests; it automatically collects key problem information and transmits it directly to your IBM support representative.
- For more information, see: <http://www.ibm.com/software/support/isa>

- **WebSphere Education Assistant**

- IBM Education Assistant is a collection of multimedia modules that are designed to help you gain a basic understanding of IBM software products and use them more effectively. The presentations, demonstrations, and tutorials that are part of the IBM Education Assistant are an ideal refresher for what you learned in your WebSphere Education course.
- For more information, see: <http://www.ibm.com/software/info/education/assistant/>

WebSphere documentation and tips

- **IBM Redbooks**

- The IBM International Technical Support Organization develops and publishes IBM Redbooks publications. IBM Redbooks are downloadable PDF files that describe installation and implementation experiences, typical solution scenarios, and step-by-step “how-to” guidelines for many WebSphere products. Often, Redbooks include sample code and other support materials available as downloads from the site.
 - For more information, see: <http://www.ibm.com/redbooks>
- **IBM documentation and libraries**
 - Information centers and product libraries provide an online interface for finding technical information on a particular product, offering, or product solution. The information centers and libraries include various types of documentation, including white papers, podcasts, webcasts, release notes, evaluation guides, and other resources to help you plan, install, configure, use, tune, monitor, troubleshoot, and maintain WebSphere products. The WebSphere information center and library are located conveniently in the left navigation on WebSphere product web pages.
- **developerWorks**
 - IBM developerWorks is the web-based professional network and technical resource for millions of developers, IT professionals, and students worldwide. IBM developerWorks provides an extensive, easy-to-search technical library to help you get up to speed on the most critical technologies that affect your profession. Among its many resources, developerWorks includes how-to articles, tutorials, skill kits, trial code, demonstrations, and podcasts. In addition to the WebSphere zone, developerWorks also includes content areas for Java, SOA, web services, and XML.
 - For more information, see: <http://www.ibm.com/developerworks>

WebSphere Services

- IBM Software Services for WebSphere are a team of highly skilled consultants with broad architectural knowledge, deep technical skills, expertise on suggested practices, and close ties with IBM research and development labs. The WebSphere Services team offers skills transfer, implementation, migration, architecture, and design services, plus customized workshops. Through a worldwide network of services specialists, IBM Software Service for WebSphere makes it easy for you to design, build, test, and deploy solutions, helping you to become an on-demand business.
- For more information, see: <http://www.ibm.com/developerworks/websphere/services/>



IBM Training



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