Monitoring BizTalk Server

eG Innovations Product Documentation

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Total Performance Visibility

Table of Contents

Table of Figures

Chapter 1: Introduction

Microsoft BizTalk server provides a powerful web-based development and execution environment that integrates loosely coupled, long- running business processes, both within and between businesses. The server provides a standard gateway for sending and receiving documents across the Internet, as well as providing a range of services that ensure data integrity, delivery, security, and support for the BizTalk Framework and other key document formats.

As mission-critical business processes are integrated via the BizTalk server, it is imperative that the BizTalk server itself stays in good health at all times. To ensure the continuous availability and smooth functioning of the BizTalk server, you need to constantly monitor the server, and promptly detect performance issues, so that the issues can be fixed before they prove fatal to the critical business processes that ride on the server.

eG Enterprise offers two dedicated models for monitoring the BizTalk server - one each for BizTalk Server 2000 and BizTalk Server 2010. Both these models are capable of monitoring the entire pipeline of the processes happening within the BizTalk server. This document takes a closer look at both the models.

Chapter 2: Administering eG Manager to work with BizTalk server

To manage the BizTalk server in the eG administrative interface, do the following:

1. Log into the eG administrative interface.
2. The BizTalk server cannot be discovered by the eG Enterprise system. Therefore, proceed to add it using the **COMPONENTS** page that appears when the menu sequence, Infrastructure -> Components -> Add/Modify is followed. Remember that components manually added are managed automatically. Discovered components, however, are managed using the **COMPONENTS - MANAGE/UNMANAGE** page. Figure 2.1 clearly illustrates the process of adding a BizTalk server component.

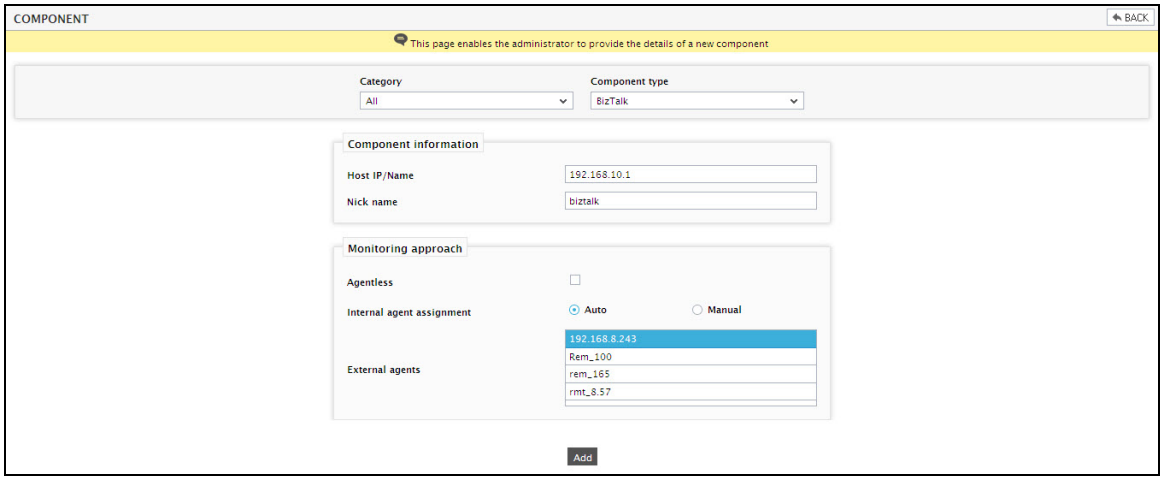

Figure 2.1: Adding a new BizTalk component

3. Specify **Host IP/Name** and **Nick name** of the BizTalk component (see Figure 2.1). Then click on the **Add** button to register the changes.
4. Next, sign out of the eG administrative interface.

Chapter 3: Monitoring the BizTalk Server

BizTalk server includes a document interchange engine, a business process execution engine, a business document editor, a business document mapper, and a set of business document and server management tools. Initially, an agreement should be made between the organizations, to determine the following:

- the source and destination locations of the business documents
- the transportation medium to be used,
- the source and destination formats of the business documents

After the agreement, the business process diagram should be drawn by using the VISIO style-drawing tool. The business process diagram is then compiled to a XLANG file using XLANG Scheduler tool given by the BizTalk Server environment. The XLANG engine loads the XLANG file at runtime environment.

The sender application (say Application 1 of Organization A) is responsible for generating business documents in well-defined XML format (for e.g., a purchase order). This business document is submitted to the BizTalk server. Then, the business document has to be transformed using Schema transformations. Here, a mapping is done to transform the business document from the source organization's native representation to the representation requested by the destination organization (for e.g., the source organization may submit an XML document, but the destination organization may require the document in EDI format). The source XML document is parsed to determine the well-defined XML standard. Encoding and encryption is done when specified. Until this stage, the documents are available in the work queue. Then, the document is serialized to the standard that is ready for transmission. The document in the interchange form will be available in the scheduled queue. By using the specified transportation medium, the document interchanges are transmitted to the destination location that has been specified in the agreement. Decryption and decoding of the business document is done at the receiving end (Application 2 of Organization B) if necessary. At this stage, the business document is in the target representation form. It is received by the target application that is running in Organization B. The business documents and interchanges will be in the retry queue when the BizTalk server is overloaded. In this case, the documents and interchanges are re-submitted to the BizTalk server automatically. When any error happens during the above stages, the documents and interchanges are moved to the suspended queue and cannot be re-submitted to the BizTalk server.

Since a BizTalk server acts as a bridge between systems having heterogeneous inputs, it is critical for the BizTalk server to perform optimally so as not to choke the performance of the system being integrated. The eG Enterprise suite of products is capable of monitoring the BizTalk server 2000 inside out. The BizTalk monitoring model that is used by the eG Enterprise suite for monitoring the BizTalk server is shown in Figure 3.1.

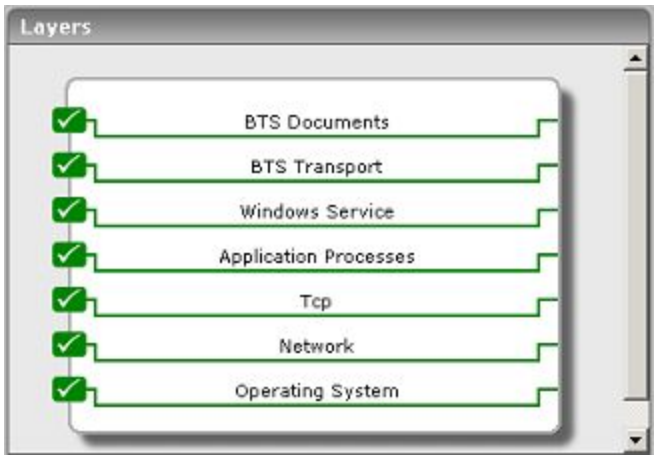

Figure 3.1: Layer model of a BizTalk server

Each layer of Figure 3.1 is mapped to tests that report a wide variety of metrics revealing the internal health of the BizTalk Server. Using the metrics so reported, administrators can find quick and easy answers for many persistent performance queries, such as the following:

- Is the rate of interchange decodes and interchange decrypts unusually low?
- How is the transport mechanism functioning? Could problems in this mechanism be causing a slowdown in the reception and transmission of the interchange?
- Can the BizTalk server encode, encrypt, and serialize interchanges?
- Are applications able to receive and submit documents quickly to the BizTalk server?
- Is the BizTalk server experiencing any delays in document processing?
- Is the BizTalk server able to map documents?

The details about the 5 layers at the bottom of Figure 3.1 are available in the *Monitoring Unix and Windows Servers* document. The sections to come will therefore discuss the top 2 layers only.

3.1 The BTS Transport Layer

This layer monitors the transportation of the BizTalk documents and interchanges using the InterChangeRcvd test and InterChangeXmit test shown in Figure 3.2. A business document is an

XML document containing the business transaction data. This transaction data may represent a purchase order, invoice, sales forecast, or any other business information. A BizTalk document is a combination of one or more business documents, and zero or more binary file (s). BizTalk interchanges refer to a collection of one or more document instances that comprises a single transmission. This is exchanged from application to application within an organization or from one trading partner to another.

Figure 3.2: Tests mapping to the BTS Transport layer

3.1.1 Inter Changes Received Test

BizTalk messaging service enables the administrator to send, receive, parse, and verify the integrity of the documents, track interchanges and documents, and provide secure methods for exchanging documents with trading partners and applications. This test tracks the performance of the messaging service while receiving interchanges from the BizTalk server.

Target of the test : A BizTalk server

Agent deploying the test : An internal agent

Outputs of the test : One set of results for every BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The IP address of the machine where BizTalk has been installed.
Port	The port at which the host listens to. This parameter is not applicable to this test, so set this to NULL.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Decode rate	This measure indicates the number of interchanges being decoded per second by the runtime process.	Intchanges/Sec	A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running. In case of an unusually low value, verify the status of the interchange in the suspended queue using the BizTalk server administration.
Decrypt rate	This measure indicates the number of interchanges being decrypted per second by the runtime process.	Intchanges/Sec	A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running. If the value of this measure is unusually low, then it indicates that the certificate might have expired. Verify the validity of the certificate in the Certificate Microsoft Management Console Snap-in.
Receive rate	This measure indicates the number of interchanges received by the BizTalk messaging service between trading partners.	Intchanges/Sec	A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running. If the value of this measure is unusually low, then it indicates that the transport mechanism (HTTP/MSMQ/FTP) used may not be functioning.

3.1.2 Inter Changes Transmitted Test

This test tracks the performance of the messaging service while receiving interchanges from the BizTalk server. The outputs of the test are given below:

Target of the test : A BizTalk server

Agent deploying the test : An internal agent

Outputs of the test : One set of results for every BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The IP address of the machine where BizTalk has been installed.
Port	The port at which the host listens to. This parameter is not applicable to this test, so set this to NULL.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Encode rate	This measure indicates the number of interchanges being encoded per second by the runtime process.	Intchanges/Sec	A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running. In case of an unusually low value, verify the status of the interchange in the suspended queue using the BizTalk server administration. If the status corresponding to an interchange is Encoding, then it implies that the BizTalk server could not encode the interchange. Resubmitting the interchange to the BizTalk server may solve this problem.
Encrypt rate	This measure indicates the number of interchanges being encrypted per second by the runtime process.	Intchanges/Sec	A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running.

Measurement	Description	Measurement Unit	Interpretation
			In case of an unusually low value, verify the status of the interchange in the suspended queue using the BizTalk server administration. If the status corresponding to the interchange is Encrypting , then it signifies that the BizTalk server could not encrypt this interchange. Also, verify the expiration of the certificate in the Certificate Microsoft Management Console snap-in.
Serialize rate	This measure indicates the number of interchanges being serialized per second by the BizTalk runtime process.	Intchanges/Sec	A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running. In case of an unusually low value, verify the status of the interchange in the suspended queue. If the status corresponding to the interchange is Serializing, then it implies that the BizTalk server could not convert the interchange to its native format. Resubmitting the interchange can solve this problem.
Transmit rate	This measure indicates the number of interchanges being transmitted per second by the BizTalk messaging service.	Intchanges/Sec	A high value over a period may indicate that transmission took a long time to attain completion. A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running. If the value of this measure is unusually low, verify the transport address in the channel. Correct the problem in the channel and resubmit

Measurement	Description	Measurement Unit	Interpretation
			the interchange. Alternatively, the BizTalk server might have taken a long time to transmit the interchange. Verify the transport mechanism used. Another reason could be that the BizTalk administrator might have moved the interchange to the suspended queue, resubmitted the interchange from the suspended queue. Alternatively, the computer on which the BizTalk server could be running out of memory, restart the server and resubmit all the interchanges in the suspended queue.

3.2 The BTS Documents Layer

This layer reports the statistics about the various attributes of the documents being handled by the BizTalk server using the DocReceive test and DocSubmit test shown in Figure 3.3.

Figure 3.3: Tests mapping to the BTS Documents layer

3.2.1 Documents Received Test

This test tracks the performance of the messaging service while it is receiving documents from the BizTalk server.

Target of the test : A BizTalk server

Agent deploying the test : An internal agent

Outputs of the test : One set of results for every BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The IP address of the machine where BizTalk has been installed.
Port	The port at which the host listens to. This parameter is not applicable to this test, so set this to NULL.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Receive rate	This measure indicates the number of documents being received per second by the application from the BizTalk server.	Docs/Sec	A value of –1 for this measure indicates that either the BizTalk messaging service or XLANG Schedule Restart Service or Distributed Transaction Coordinator (MSDTC) may not be running. If the value of this measure is unusually low, then verify the interface between the BizTalk server and the application.

3.2.2 Documents Submitted Test

The test tracks the performance of the messaging service while submitting documents to the BizTalk server.

Target of the test : A BizTalk server

Agent deploying the test : An internal agent

Outputs of the test : One set of results for every BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The IP address of the machine where BizTalk has been installed.
Port	The port at which the host listens to. This parameter is not applicable to this test, so set this to NULL.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Submit rate	This measure shows the number of documents submitted asynchronously per second to the BizTalk server from the application. Once submitted, the BizTalk server holds the documents in the work queue for further processing.	Docs/Sec	A sudden increase in the value of this measure denotes a change in the workload. A value of –1 for this measure indicates that either the BizTalk messaging service or XLANG Schedule Restart Service or Distributed Transaction Coordinator (MSDTC) may not be running. If the value of this measure is unusually low, then verify the interface between the BizTalk server and the application or check the event log entry in the BizTalk server administration.
Map rate	BizTalk runtime process maps the actual document content from one structural form to another. This measure shows the number of documents that have been mapped per second by the runtime process.	Docs/Sec	A sudden increase in the value of this measure indicates that the BizTalk runtime process is mapping larger number of documents. This scenario indicates an increased workload. A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running.

Measurement	Description	Measurement Unit	Interpretation
			For other reasons, verify the status of the document available in the suspended queue using the BizTalk server administration. If the status corresponding to a document is Mapping then it indicates that the document has been failed to map. To rectify this problem, delete the document from the suspended queue, correct the map and resubmit the document.
Parse rate	This measure shows the number of documents in the work queue that is being parsed per second by the appropriate parser.	Docs/Sec	A sudden increase in the value of this measure indicates that the parser is parsing larger number of documents. This scenario may be due to the deletion of large number of documents from the suspended queue, which affects the performance of the parser. A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running. Incase of an unusually low value, verify the status of the documents available in the suspended queue using the BizTalk server administration. If the status corresponding to the document is parsing then it indicates that the BizTalk server was unable to parse the data. The other reasons could be that the timestamp of the document is no longer valid, or the document does not contain enough information to locate the channel.
Process rate	This measure indicates the number of documents	Docs/Sec	A high value for this measure over a period may indicate that the runtime

Measurement	Description	Measurement Unit	Interpretation
	being processed successfully (necessary changes to the document) per second by the runtime process.		system is processing larger number of documents. This scenario may indicate a change in the workload. A value of –1 for this measure implies that the BizTalk messaging service or Distributed Transaction Coordinator (MSDTC) or XLANG Schedule Restart Service may not be running. In case of an unusually low value, verify the status of Microsoft SQL server in the Service Manager tool available in the Microsoft SQL server environment. Also check the status of the document available in the suspended queue using the BizTalk server administration.

Chapter 4: Administering eG Manager to work with BizTalk 2010 server

To manage the BizTalk 2010 server in the eG administrative interface, do the following:

1. Log into the eG administrative interface.
2. The BizTalk 2010 cannot be discovered by the eG Enterprise system. Therefore, proceed to add it using the **COMPONENTS** page that appears when the menu sequence, Infrastructure -> Components -> Add/Modify is followed. Remember that components manually added are managed automatically. Discovered components, however, are managed using the **COMPONENTS - MANAGE/UNMANAGE** page. Figure 4.1 clearly illustrates the process of adding a BizTalk 2010 component.

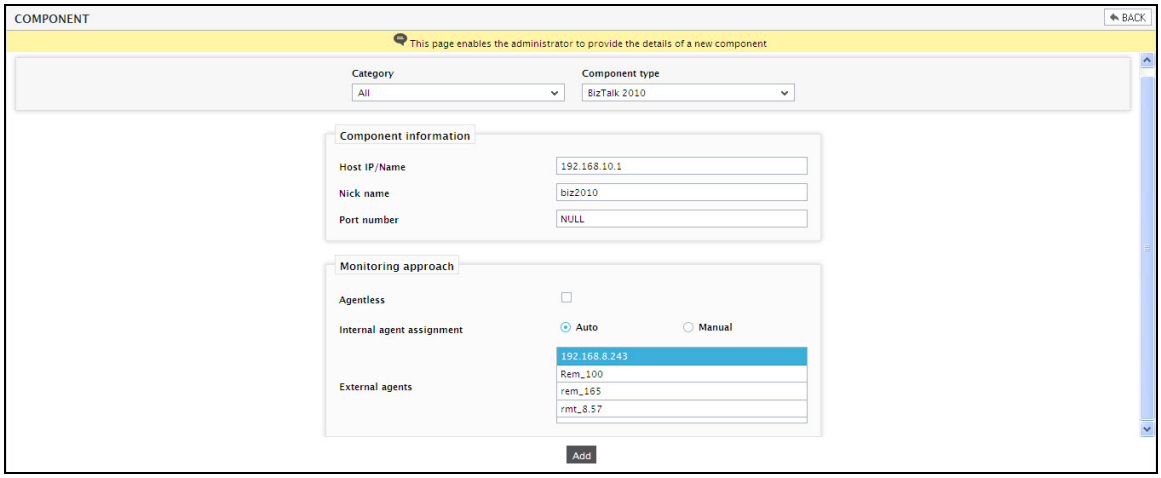

Figure 4.1: Adding a new BizTalk 2010 component

3. Specify the **Host IP** and the **Nick name** of the BizTalk 2010 server in Figure 4.1. Then click the **Add** button to register the changes.
4. Next, sign out of the eG administrative interface.

Chapter 5: Monitoring the BizTalk Server 2010

BizTalk Server is Microsoft's Integration and connectivity server solution. A mature product on its seventh release, BizTalk Server 2010 provides a solution that allows organizations to more easily connect disparate systems. Including over 25 multi-platform adapters and a robust messaging infrastructure, BizTalk Server provides connectivity between core systems both inside and outside your organization. In addition to integration functionality, BizTalk also provides strong durable messaging, a rules engine, EDI connectivity, Business Activity Monitoring (BAM), RFID capabilities and IBM Host/Mainframe connectivity.

The BizTalk Server includes a range of technologies. The figure below illustrates the product's major components.

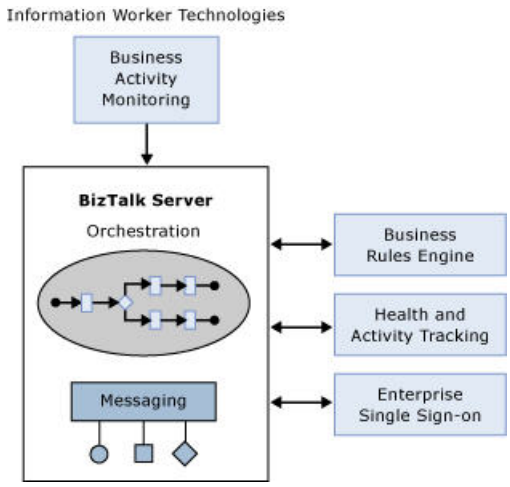

Figure 5.1: The major components of a BizTalk server

As the figure suggests, the heart of the product is the BizTalk Server Engine. The engine has two main parts:

- A messaging component that provides the ability to communicate with a range of other software. By relying on adapters for different kinds of communication, the engine can support a variety of protocols and data formats, including Web services and many others.
- Support for creating and running graphically-defined processes called orchestrations. Built on top of the engine's messaging components, orchestrations implement the logic that drives all or part of a business process.

Several other BizTalk components can also be used in concert with the engine, including:

- A Business Rule Engine that evaluates complex sets of rules.
- A Group Hub that lets developers and administrators monitor and manage the engine and the orchestrations it runs.
- An Enterprise Single Sign-On (SSO) facility that provides the ability to map authentication information between Windows and non-Windows systems.

On top of this foundation, BizTalk Server includes Business Activity Monitoring, which information workers use to monitor a running business process. The information is displayed in business rather than technical terms, and business users determine what information is displayed.

As the present era is all about business process management, the BizTalk server plays a vital role in connecting and communicating with disparate business processes that may be operating within an organization or across organizations. If this 'connector' malfunctions, it could break the only link that exists between the processes, thereby significantly affecting the way the enterprise functions. All software-dependent activities of the enterprise - from the performance of simple, routine operations to the execution of critical business transactions - could either experience delays or could come to a virtual standstill. If such adversities are to be avoided, the BizTalk server has to be monitored 24x7.

eG Enterprise provides a BizTalk 2010 monitoring model that provides in-depth monitoring of the BizTalk Server 2010. Each layer of this model is mapped to a series of tests that report issues in the overall health of the adapters and protocols supported by the BizTalk server, thus shedding light on applications with which the server is unable to communicate.

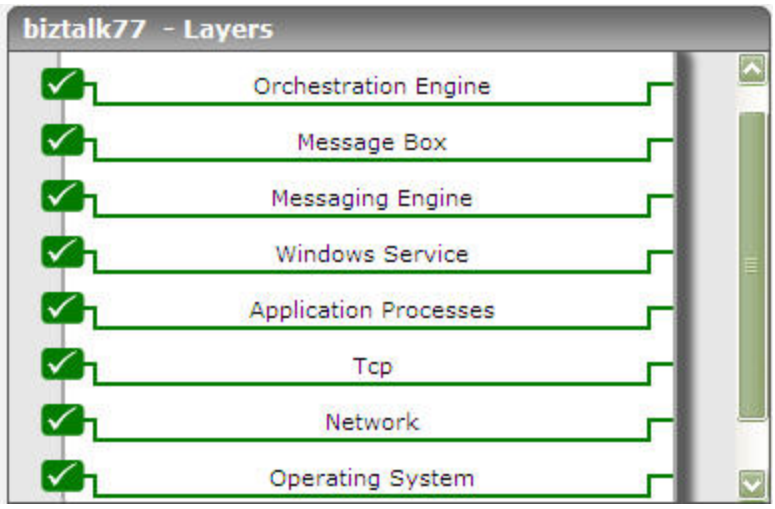

Figure 5.2: The layer model of the BizTalk Server 2010

The metrics extracted by these tests enable administrators to find answers to persistent performance queries such as the following:

- Which host instance is heavily loaded in terms of documents processed?
- Is any host instance experiencing processing bottlenecks?
- Have any documents been suspended by a host instance? If so, which host instance is it?
- Have any request messages timed out without response messages?
- How are the receive and send adapters on a host instance handling the load? Is any receive/send adapter experiencing a slowdown in processing? Which adapter is it - the file adapter, FTP adapter, HTTP adapter, Msmq adapter, POP3 adapter, SMTP adapter, SOAP adapter, or the SQL adapter?
- Is the messaging engine experiencing any latencies - if so, where did the delay originate? while delivering messages to the MessageBox, or while delivering messages to a target application?
- Are too many messages pending processing in the host queue?
- Are any SQL agent jobs taking too long to complete? If so, which ones?
- Is the depth of the spool table optimal, or is it growing continuously?
- Is the tracking data table growing uncontrollably in size?
- Have too many orchestrations been suspended or discarded?
- What is the rate at which dehydrations and rehydrations take place?
- Have the orchestrations acknowledged all the messages they received, or are there too many pending messages?
- Is there a contention for physical memory resources on any host instance?
- Have any BAM (Business Activity Monitoring) events failed?
- Has the tracking data decode service failed to process any batches?
- How is the host throttling mechanism functioning? Are message processing and/or message publishing throttled? Were any delays imposed on the message processing/publishing rates?
- Has process memory consumption exceeded its threshold?
- Has thread count exceeded its threshold?

The details about the 5 layers at the bottom of Figure 5.2 are available in the *Monitoring Unix and Windows Servers* document. The sections that follow will discuss each layer of Figure 5.2 in great detail.

5.1 The Messaging Engine Layer

The BizTalk Server Messaging engine enables users to create business processes that spans multiple applications by providing two primary things:

- A way to specify and implement the logic driving that business process
- A mechanism for communicating across the applications that the business process uses

The figure below illustrates the main components of the engine that address these two problems.

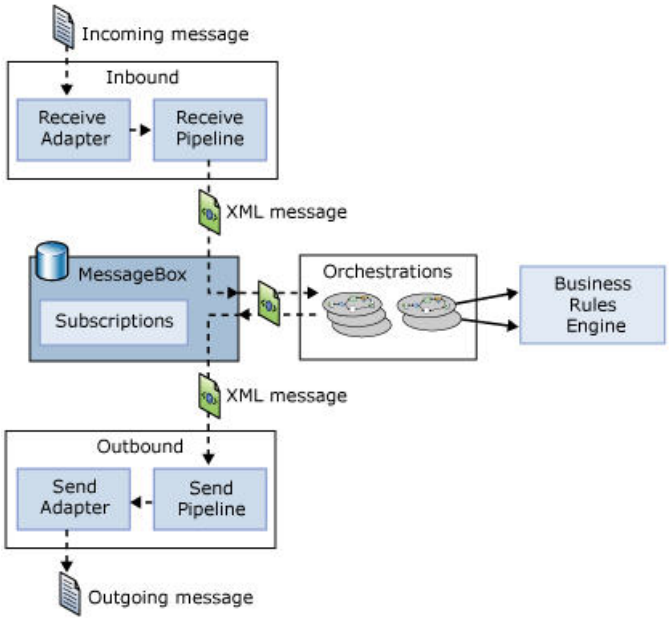

Figure 5.3: Messaging architecture

As the diagram shows, a message is received through a receive adapter. Different adapters provide different communication mechanisms, so a message might be acquired by accessing a Web service, reading from a file, or in some other way. The message is then processed through a receive pipeline. This pipeline can contain various components that do things such as converting the message from its native format into an XML document, validating a message's digital signature, and more. The message is then delivered into a database called the MessageBox, which is implemented using Microsoft SQL Server.

The logic that drives a business process is implemented as one or more orchestrations, each of which consists of executable code. These orchestrations are not created by writing code in a language such as C#, however. Instead, a business analyst or (more likely) a developer uses an appropriate tool to graphically organize a defined group of shapes to express conditions, loops, and

other behavior. Orchestrations can optionally use the Business Rule Engine, which provides a simpler and more easily modified way to express complex sets of rules in a business process.

Each orchestration creates subscriptions to indicate the kinds of messages it wants to receive. When an appropriate message arrives in the MessageBox, that message is dispatched to its target orchestration, which takes whatever action the business process requires. The result of this processing is typically another message, produced by the orchestration and saved in the MessageBox. This message, in turn, is processed by a send pipeline, which may convert it from the internal XML format used by BizTalk Server to the format required by its destination, add a digital signature, and more. The message is then sent out using a send adapter, which uses an appropriate mechanism to communicate with the application for which this message is destined.

This layer monitors the messaging engine of the BizTalk server, measures the load on the engine, reports how quickly every send and receive adapter processes the message load, and sheds light on current / potential processing bottlenecks (if any) in the engine. All the tests mapped to this layer report metrics for each host instance on the BizTalk server. A host is a logical representation of a Microsoft Windows process that executes BizTalk Server artifacts such as send ports and orchestrations. A host instance is the physical representation of a host on a specific server.

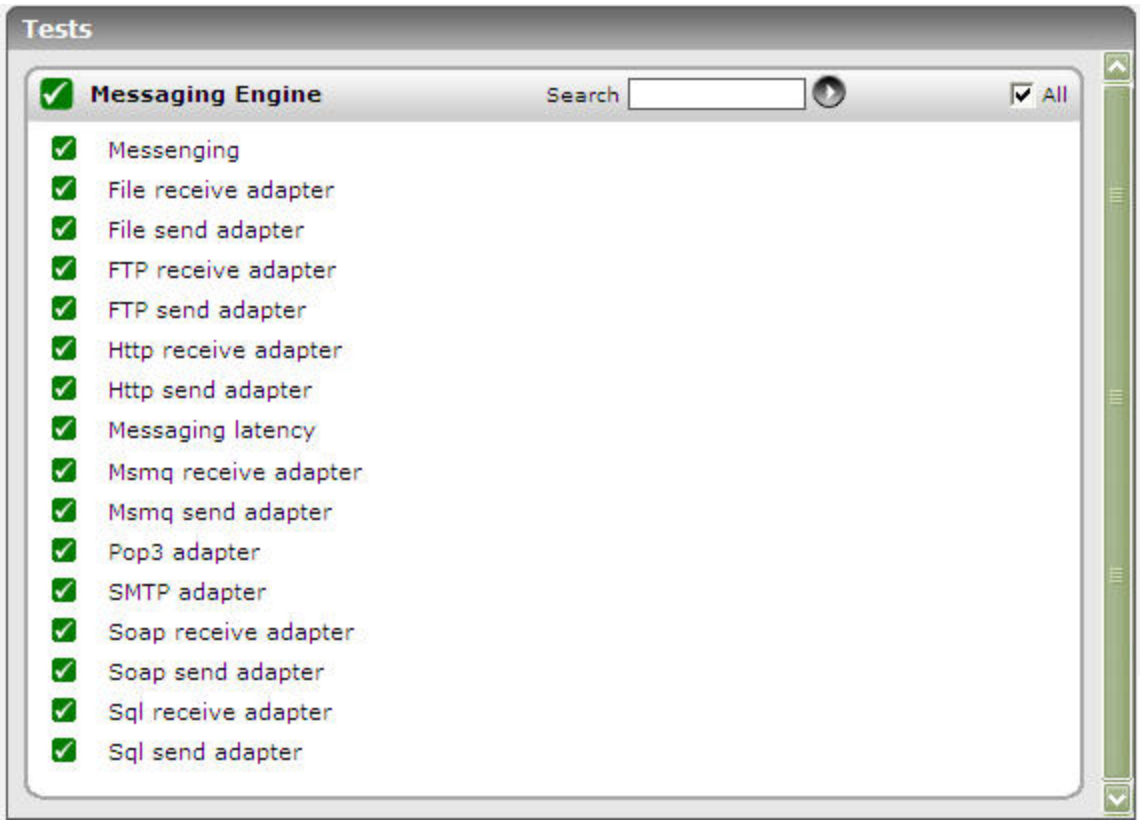

Figure 5.4: The tests mapped to the Messaging Engine layer

5.1.1 BT Messenging Test

This test monitors the documents received and sent by each host instance on the BizTalk server, and reports the load on that host instance and delays experienced by the host instance while processing the documents.

Using this test, administrators can easily isolate host instances that are overloaded or are experiencing bottlenecks in processing.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Active receive locations	Indicates the number of receive locations currently enabled in this host instance.	Number	A receive location is the configuration of a single endpoint (URL) to receive messages.
Documents processed	Indicates the number of documents processed by this host instance.	Number	This is a good indicator of the load handled by a host instance. Comparing the value of this measure across host instances will reveal which instance is

Measurement	Description	Measurement Unit	Interpretation
			currently overloaded.
Documents processed	Indicates the rate at which this host instance processed documents.	Docs/Sec	A very low value or a consistent decrease in the value of this measure indicates a slowdown in the corresponding host instance.
Documents received	Indicates the number of documents received by this host instance from a target source.	Number	This is a good indicator of the load handled by a host instance. Comparing the value of this measure across host instances will reveal which instance is currently overloaded.
Documents received	Indicates the rate at which documents were received by this host instance.	Number	
Documents suspended	Indicates the number of documents that have been suspended by this host instance.	Number	By default, the BizTalk server places failed messages/documents in the Suspended queue. The value of this measure indicates the number of documents in the Suspended queue. A message failure can occur in one of the following instances: • Failures in the disassembly phase : Processing might also fail during the disassembly phase; that is, failure in one of the pipeline components. For example, decryption failed due to absence of decryption cert on the processing server, or parsing failure due to problem either in the schema or in the message. • Failures in routing : After a message disassembles successfully, the next potential failure point is routing; for example, users enable a corresponding receive location of an orchestration and forget to enlist the

Measurement	Description	Measurement Unit	Interpretation
			orchestration. In this case, the message picked up from the receive location fails routing and the MessageBox database generates a Routing Failure report. Routing Failure reports are listed in the BizTalk Server Administration Console as non-resumable suspended messages. Each Routing Failure report contains a message property snap shot taken when the routing failure occurred. You can use the information in each report to determine why routing failed for its associated message. If the associated message is resumable, you can correct the routing problem and resume the message so that processing continues. • Failures during the transformation phase: When a message is received from Receive Location, the message is disassembled (for example, decrypted and parsed), the message might optionally be transformed to a different format via an Inbound Map specified on a receive Port, and published to the MessageBox for routing to an orchestration or a Send Port. In this case, processing may fail during transformation phase due to incorrect Inbound Map, or problems in the schema or in the message received. When a message is to be sent to a Send Location, an Outbound Map

Measurement	Description	Measurement Unit	Interpretation
			configured on Send Port might optionally transform the message. Then the transformed message is assembled and handed to the adapter for final transmission to the Send Location. In this case, processing may fail during transformation phase due to incorrect Outbound Map or problem in schema or source message. • Failures in the message assembly phase: Processing can also fail during message assembly phase – in other words, failing in pipeline component. After a message successfully assembles, the next potential failure point becomes transmission to Send Location; for example, the Send Location (which belongs to the partner) might be down or not exist.
Documents suspended	Indicates the rate at which documents were suspended by this host instance.	Docs/Sec	
Request/Response timeouts	Indicates the number of request messages that have not received a response message within the time limit specified by the adapter associated with this host instance.	Number	A high value of this measure could indicate that too many messages are getting timed out. You may want to consider reconfiguring the timeout period.

5.1.2 BT Messaging Agents Test

Most of the processing that takes place on a BizTalk server occurs within a logical entity known as a BizTalk Server host instance, which is a process running as a Windows service or an isolated host process on the BizTalk server. To manage the use of resources by a host instance process, BizTalk

Server utilizes an adjustable throttling mechanism that governs the flow and processing of messages through a host instance.

The throttling mechanism moderates the workload of the host instance to ensure that the workload does not exceed the capacity of the host instance or any downstream host instances. The throttling mechanism also prevents a condition known as resource contention that can lower the overall performance of the host instance process or other system processes. Resource contention occurs when one or more processes consume a limited resource to the detriment of themselves and/or another process. For example, the consumption of excessive memory or threads can lead to memory allocation failure or high thread context-switches, which can impact the performance of the process. Resource contention like this can be detrimental to the overall performance of BizTalk Server.

The host throttling mechanism also detects when available resources are being underutilized. If available resources are underutilized then the throttling mechanism allows additional messages to be processed by a host instance. The host throttling mechanism continually monitors if available resources are being over or underutilized and adjusts message flow through the host instance accordingly.

The BizTalk Server host throttling mechanism helps to ensure that the system operates at an optimal and sustainable level.

This test measures the efficiency of the host throttling mechanism.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Publishing delay	Indicates the current delay imposed on each message publishing batch.	MilliSec	This measure is applicable only if the message publishing is throttled and if the message publishing batch is not exempted from throttling. Message publishing throttling in BizTalk Server, is applied to host instances that contain receive adapters or orchestrations that publish messages to the MessageBox database. An inbound host throttling condition can be triggered under the following conditions: • The amount of memory, the number of threads, or the number of database connections used by the host instance exceeds the throttling thresholds defined • Downstream hosts are unable to process the messages that are published. • The Message publishing incoming rate for the host instance exceeds the Message publishing outgoing rate * the specified Rate overdrive factor (percent) value. • The default throttling behavior has been modified by setting a registry value or values to control the throttling behavior of a host process. Depending on the severity of the throttling condition, the following actions are taken: • A progressive delay in the

Measurement	Description	Measurement Unit	Interpretation
			• processing logic of the host instance is implemented. The delay may be implemented when an End Point Manager (EPM) thread receives a batch of messages from the transport adapter, and/or when the EPM submits a batch of messages to be published into the MessageBox database. Both the duration of the processing delay and the rate at which the duration is incremented scale with the severity of the throttling condition. • The number of threads that are available to the End Point Manager (EPM) is restricted. The EPM receives batches of messages from adapters and publishes the messages to the MessageBox database. By default, the EPM is configured to use 20 threads per CPU. If the host throttling mechanism detects a stress condition for inbound processing then it can temporarily reduce the number of threads available to the EPM until the stress condition is eliminated. The EPM cannot process messages from transport adapters or deliver message batches to the MessageBox database unless an EPM thread is available to service the inbound message batch. • The use of memory and other resources is reduced as applicable. BizTalk Server can send instructions to other service classes

<table>
<tr><th>Measurement</th><th>Description</th><th>Measurement Unit</th><th>Interpretation</th></tr>
<tr><td></td><td></td><td></td><td>to limit memory use by dehydrating running schedules, shrinking memory cache size, and by limiting the usage of memory-intensive threads.</td></tr>
<tr><td>Publishing incoming rate</td><td>Indicates the rate at which the messages are being sent by the message agent to the database of this host instance for publishing.</td><td>Msgs/Sec</td><td rowspan="2">A message publishing throttling condition is also triggered when the Message publishing incoming rate for the host instance exceeds the Message publishing outgoing rate * the specified Rate overdrive factor (percent) value. The Rate overdrive factor (percent) value is defined on the Message Publishing Throttling Settings dialog box available from the Advanced page of the Host Properties dialog box.</td></tr>
<tr><td>Publishing outgoing rate</td><td>Indicates the rate at which the messages are actually published by the message agent in the database of this host instance.</td><td>Msgs/Sec</td></tr>
<tr><td>Publishing throttling state</td><td>Indicates whether the system is throttling the message publishing i.e., indicates whether the XLANG message processing and inbound transports are affected.</td><td>Number</td><td>This measure indicates any one of the following values while indicating whether the system is throttling the message publishing or not.<table><tr><th>Value</th><th>State</th></tr><tr><td>0</td><td>Not throttling</td></tr><tr><td>2</td><td>Throttling due to imbalanced message publishing rate (input rate exceeds output rate)</td></tr><tr><td>4</td><td>Throttling due to process memory pressure</td></tr></table></td></tr>
</table>

<table>
<tr><th>Measurement</th><th>Description</th><th>Measurement Unit</th><th>Interpretation</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Value</th><th>State</th></tr>
<tr><td>5</td><td>Throttling due to system memory pressure</td></tr>
<tr><td>6</td><td>Throttling due to database growth</td></tr>
<tr><td>8</td><td>Throttling due to high session count</td></tr>
<tr><td>9</td><td>Throttling due to high thread count</td></tr>
<tr><td>11</td><td>Throttling due to user override on publishing</td></tr>
</table>
</td></tr>
<tr><td>Delivery delay</td><td>Indicates the current delay imposed on each message delivery batch.</td><td>MilliSec</td><td>This measure is applicable only if message delivery is throttled.

Message processing throttling in BizTalk Server, is applied to host instances that contain orchestrations or send adapters that receive and deliver or process messages that have been published to the MessageBox. An outbound host throttling condition can be triggered under the following conditions:

• The amount of memory, the number of threads, or the number of database connections used by the host instance exceeds the throttling thresholds defined

• The Message delivery incoming rate</td></tr>
</table>

Measurement	Description	Measurement Unit	Interpretation
			for the host instance exceeds the Message delivery outgoing rate * the specified Rate overdrive factor (percent) value. • The number of messages being processed concurrently by the host instance exceeds the In-process messages per CPU * the number of CPUs available on the box. • The default throttling behavior has been modified by setting a registry value or values to control the throttling behavior of a host process. Depending upon the severity of the throttling condition, the following actions are taken: • A progressive delay in the processing logic of the host instance is implemented before delivering the messages to the outbound transport adapter or the orchestration engine for processing the messages. Both the duration of the processing logic delay and the rate at which the duration is incremented scale with the severity of the throttling condition. • The number of messages that can be held by the in-memory queue is limited. The in-memory queue serves as a temporary placeholder for delivering messages from the MessageBox to the Message Agent which in turn delivers messages to XLANG and send adapters. By

Measurement	Description	Measurement Unit	Interpretation
			default, the in-memory queue is set to hold 100 messages per CPU. When the queue is full, no more messages are de-queued from the MessageBox until the in-memory queue is freed up. • The size of the Message Agent thread pool is limited. By limiting the Message Agent thread pool size, the host throttling mechanism effectively reduces the amount of messages that are delivered to XLANG and adapters. • The use of memory and other resources is reduced as applicable. BizTalk Server can send instructions to other service classes to limit memory use by dehydrating running schedules, shrinking memory cache size, and by limiting the usage of memory intensive threads.
Delivery incoming rate	Indicates the rate at which the messages are delivered to the Orchestration engine or the Messaging engine of this host instance.	Msgs/Sec	A message processing throttling condition can also be triggered if the message Delivery incoming rate for the host instance exceeds the message Delivery outgoing rate * the specified Rate overdrive factor (percent) value. The Rate overdrive factor (percent) value is defined on the Message Processing Throttling Settings dialog box available from the Advanced page of the Host Properties dialog box.
Delivery outgoing rate	Indicates the rate at which the messages are processed and sent to the recipients by the Orchestration engine or the Messaging engine of this host instance.	Msgs/Sec	
Delivery throttling state	Indicates whether the system is throttling the	Number	Indicates whether the system is throttling the message delivery i.e.,

<table>
<tr><th>Measurement</th><th>Description</th><th>Measurement Unit</th><th>Interpretation</th></tr>
<tr><td></td><td>message delivery i.e., indicates whether the XLANG message processing and outbound transports are affected or not.</td><td></td><td>indicates whether the XLANG message processing and outbound transports are affected or not.
<table><tr><th>Value</th><th>State</th></tr><tr><td>0</td><td>Not throttling</td></tr><tr><td>1</td><td>Throttling due to imbalanced message delivery rate (input rate exceeds output rate)</td></tr><tr><td>3</td><td>Throttling due to high in-process message count</td></tr><tr><td>4</td><td>Throttling due to process memory pressure</td></tr><tr><td>5</td><td>Throttling due to process memory pressure</td></tr><tr><td>9</td><td>Throttling due to high thread count</td></tr><tr><td>10</td><td>Throttling due to user override on delivery</td></tr></table></td></tr>
<tr><td>High database session</td><td>Indicates whether the database session is within normal limits or not for this host instance.</td><td>Number</td><td>This measure reports any one of the following values to indicate whether the database session is within normal limits or not.</td></tr>
</table>

<table>
<tr><th>Measurement</th><th>Description</th><th>Measurement Unit</th><th>Interpretation</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Value</th><th>State</th></tr>
<tr><td>0</td><td>Normal</td></tr>
<tr><td>1</td><td>Database session count exceeds threshold</td></tr>
</table>

The database session count is nothing but the number of concurrent MessageBox database connections being used. The threshold for database session count is initially set to the value specified for Database connections per CPU on the Throttling Thresholds dialog available from the Advanced page of the Host Properties dialog box. This value is auto-tuned based on the database session usage of the process. If the number of concurrent database sessions exceeds this threshold at any time, host throttling is implemented.
</td></tr>
<tr><td>High database size</td><td>Indicates whether the size of the database is within normal limits or not for this host instance.</td><td>Number</td><td>This measure indicates any one of the following values while indicating whether the size of the database is within normal limits or not.
<table>
<tr><th>Value</th><th>State</th></tr>
<tr><td>0</td><td>Normal</td></tr>
<tr><td>1</td><td>Database size has grown beyond threshold</td></tr>
</table>

Database size is represented by the</td></tr>
</table>

<table>
<tr><th>Measurement</th><th>Description</th><th>Measurement Unit</th><th>Interpretation</th></tr>
<tr><td></td><td></td><td></td><td>number of messages in the database queues that a host instance has published. This value is measured by the number of items in the queue tables for all hosts and the number of items in the spool and tracking tables. If a process is publishing to multiple queues, this counter reflects the weighted average of all the queues. If the threshold set for database size is violated, then throttling is implemented.</td></tr>
<tr><td>High in-process message count</td><td>Indicates whether the In-process message count is within normal limits or not.</td><td>Number</td><td>This measure reports any one of the following values to indicate whether the In-process message count is within normal limits or not.
<table><tr><th>Value</th><th>State</th></tr><tr><td>0</td><td>Normal</td></tr><tr><td>1</td><td>In-process message count exceeds limit</td></tr></table>
The in-process message count indicates the number of in-memory messages delivered to the XLANG engine or the outbound messaging engine that are not yet processed.</td></tr>
<tr><td>High message delivery rate</td><td>Indicates whether the message delivery rate is within normal limits or not.</td><td>Number</td><td>This measure reports any one of the following values to indicate whether the message delivery rate is within normal limits or not.
<table><tr><th>Value</th><th>State</th></tr><tr><td>0</td><td>Normal</td></tr></table></td></tr>
</table>

<table>
<tr><th>Measurement</th><th>Description</th><th>Measurement Unit</th><th>Interpretation</th></tr>
<tr><td></td><td></td><td></td><td><table><tr><th>Value</th><th>State</th></tr><tr><td>1</td><td>Message delivery rate exceeds the message processing rate</td></tr></table></td></tr>
<tr><td>High message publishing rate</td><td>Indicates whether the message publishing rate is within normal limits or not.</td><td>Number</td><td>This measure reports any one of the following values to indicate whether the message publishing rate is within normal limits or not.<table><tr><th>Value</th><th>State</th></tr><tr><td>0</td><td>Normal</td></tr><tr><td>1</td><td>Message delivery rate exceeds the message processing rate</td></tr></table></td></tr>
<tr><td>High process memory</td><td>Indicates whether the process memory is within normal limits or not.</td><td>Number</td><td>This measure reports any one of the following values to indicate whether the process memory is within normal limits or not.<table><tr><th>Value</th><th>State</th></tr><tr><td>0</td><td>Normal</td></tr><tr><td>1</td><td>Process memory exceeds threshold</td></tr></table>Process memory consumption is the maximum of the process’s working set</td></tr>
</table>

<table>
<tr><th>Measurement</th><th>Description</th><th>Measurement Unit</th><th>Interpretation</th></tr>
<tr><td></td><td></td><td></td><td>size and the total space allocated for the page file for the process. The threshold for process memory consumption s initially set to the value specified for Process memory usage on the Throttling Thresholds dialog available from the Advanced page of the Host Properties dialog box. If a percentage value is specified, it is computed based on the available memory to commit.</td></tr>
<tr><td>High system memory</td><td>Indicates whether the system memory is within normal limits or not.</td><td>Number</td><td>This measure reports any one of the following values to indicate whether the system memory is within normal limits or not.
<table><tr><th>Value</th><th>State</th></tr><tr><td>0</td><td>Normal</td></tr><tr><td>1</td><td>System memory exceeds threshold</td></tr></table></td></tr>
<tr><td>High thread count</td><td>Indicates whether the thread count is within normal limits or not for this host instance.</td><td>Number</td><td>This measure reports any one of the following values to indicate whether the thread count is within normal limits or not.
<table><tr><th>Value</th><th>State</th></tr><tr><td>0</td><td>Normal</td></tr><tr><td>1</td><td>Thread count exceeds threshold</td></tr></table>
The thread count indicates the number of threads being used in the process.</td></tr>
</table>

Measurement	Description	Measurement Unit	Interpretation
			The threshold for this count is initially set to the value specified for Threads per CPU on the Throttling Thresholds dialog available from the Advanced page of the Host Properties dialog box. This value is auto-tuned depending on the thread requirements of the current process. If the number of threads in the process exceeds this threshold value at any point in time, host throttling is implemented.
Thread count	Indicates the number of thread being used in the process.	Number	
Thread count threshold	Indicates the current threshold for the number of threads in the process.	Number	The threshold for the thread count is initially set to the value specified for Threads per CPU on the Throttling Thresholds dialog available from the Advanced page of the Host Properties dialog box. This value is auto-tuned depending on the thread requirements of the current process. If the number of threads in the process exceeds this threshold value at any point in time, host throttling is implemented.
Database size	Indicates the number of messages in the database queues that this process has published.	Number	This value is measured by the number of items in the queue tables for all hosts and the number of items in the spool and tracking tables. If a process is publishing to multiple queues, this counter reflects the weighted average of all the queues.
Database session	Indicates the number of concurrent message box database connections that is being used.	Number	
Process memory	Indicates the memory	MB	

Measurement	Description	Measurement Unit	Interpretation
usage	consumption of the process.		
Process memory usage threshold	Indicates the current threshold for the memory consumption of the process.	MB	This threshold value is initially set to the value specified for the process memory consumption on the Throttling Thresholds dialog available from the Advanced page of the Host Properties dialog box. If a percentage value is specified, the threshold value is computed based on the available memory to commit.

5.1.3 BT File Receive Adapter Test

The file receive adapter is used to read messages from files and submit them to the server. The receive adapter reads the file and creates a BizTalk message object, so that BizTalk server can process the message. While reading from the file, the adapter locks the file to ensure that no modifications can be made to the file content. The file receive adapter does not pick up read-only files or system files.

This test reports how efficient the file receive adapter on each host instance is. The test monitors the inflow of messages to the file receive adapter, measures the load on the adapter, and reveals how well the adapter handled the load; lock failures encountered by the adapter while attempting to read files are also revealed by this test, so that reasons for the same can be diagnosed.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.

Parameters	Description
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Bytes received	Indicates the total number of bytes received by the file receive adapter on this host instance.	Bytes	The counter is incremented after a message is completely read by the adapter from the file system.
Bytes received	Indicates the rate at which bytes were received by the file receive adapter on this host instance.	Bytes/Sec	
Messages received	Indicates the number of messages received by the file receive adapter on this host instance.	Number	The counter is incremented after a message is completely read by the file receive adapter from the file system.
Messages received	Indicates the rate at which messages were received by the file receive adapter on this host instance.	Msgs/Sec	The counter applies only to messages that have been completely read by the file receive adapter from the file system. Ideally, the value of this measure should be high. A low value indicates that the file receive adapter is not reading files quickly. Further investigation may be required to diagnose the root-cause of the slowdown.
Lock failures	Indicates the number of times the file receive adapter on this host instance failed to lock the	Number	Ideally, the value of this measure should be 0. A non-zero value indicates a lock failure. This in turn implies that the adapter could not

Measurement	Description	Measurement Unit	Interpretation
	file.		prevent changes from being made to one/more files that were being read.

5.1.4 BT File Send Adapter Test

The File send adapter transmits messages from the message box database to a specified destination address (URL). You define the URL, which is a file path and file name, by using wildcard characters related to the message context properties. The File send adapter resolves the wildcard characters to the actual file name before writing the message to the file.

When writing a message to a file, the File send adapter gets the message content from the body part of the BizTalk message object. The File send adapter ignores other message parts in the BizTalk Message object. After the File adapter writes the message to a file, it deletes the message from the MessageBox database. The File adapter writes files to the file system either directly or by using the file system cache, which can improve performance, particularly for large files.

This test monitors the outflow of data and messages from the file send adapter on each host instance and reports the load on the adapter and the slowdowns (if any) suffered by the adapter while processing the load.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Bytes sent	Indicates the total number of bytes sent by the file send adapter on this host instance.	Bytes	The counter is incremented only for messages that have been completely written to file system.
Bytes sent	Indicates the rate at which bytes were sent by the file send adapter on this host instance.	Bytes/Sec	The counter applies only to messages that have been completely written to file system.
Messages sent	Indicates the number of messages sent by the file send adapter on this host instance.	Number	The counter is incremented only for messages that have been completely written to file system.
Messages sent	Indicates the rate at which messages were sent by the file send adapter on this host instance.	Msgs/Sec	The counter applies only to messages that have been completely written to file system. Ideally, the value of this measure should be high. A low value indicates that the file send adapter is experiencing delays while writing files to the file system. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.5 BT FTP Receive Adapter Test

The FTP receive adapter enables you to move data from an FTP server to BizTalk Server.

Key features of the FTP receive adapter are:

- Pulling files from the FTP server on demand
- Running polls based on a configurable schedule
- Polling the FTP server and sending data directly to BizTalk Server

- Specifying the FTP server as an IP address, port, password, and host name
- Guaranteed file delivery

The FTP receive adapter also works with the BizTalk Administration console and BizTalk Explorer to configure and administer each receive function, which is composed of the following configuration items:

- Poll interval to run an FTP command (for example, 60 minutes).
- Information with which to route the document to a specific BizTalk send port or receive location.

The FTP receive adapter does not support receiving files from a partitioned data set.

With the help of this test, you can measure the current load on the FTP receive adapter for each host instance of the BizTalk server, and isolate bottlenecks in load processing.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Bytes received	Indicates the total number of bytes received by the	Bytes	The counter is incremented after a message is completely read by the

Measurement	Description	Measurement Unit	Interpretation
	FTP receive adapter on this host instance.		FTP receive adapter from the FTP server.
Bytes received	Indicates the rate at which bytes were received by the FTP receive adapter on this host instance.	Bytes/Sec	The counter applies only to messages that have been completely read by the FTP receive adapter from the FTP server.
Messages received	Indicates the number of messages received by the FTP receive adapter on this host instance.	Number	The counter applies only to messages that have been completely read by the FTP receive adapter from the FTP server. This measure is a good indicator of the load on the FTP receive adapter.
Messages received	Indicates the rate at which messages were received by the FTP receive adapter on this host instance.	Msgs/Sec	The counter applies only to messages that have been completely read by the FTP receive adapter from the FTP server. Ideally, a value of this measure should be high. A low value indicates that the FTP receive adapter is experiencing delays while moving files and data from the FTP server to the BizTalk server. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.6 BT FTP Send Adapter Test

The FTP send adapter enables you to move data from BizTalk Server to an FTP server.

Key features of the FTP send adapter are:

- Ability to run sends on demand
- Guaranteed delivery

With the help of this test, you can measure the current load on the FTP send adapter for each host instance of the BizTalk server, and isolate bottlenecks in load processing.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Bytes sent	Indicates the total number of bytes sent by the FTP send adapter on this host instance.	Bytes	The counter is incremented only for messages that have been written to the destination FTP server.
Bytes sent	Indicates the rate at which bytes were sent by the FTP send adapter on this host instance.	Bytes/Sec	The counter applies only to messages that have been written to the destination FTP server.
Messages sent	Indicates the number of messages sent by the FTP send adapter on this host instance.	Number	The counter is incremented only for messages that have been written to the destination FTP server.
Messages sent	Indicates the rate at which messages were sent by the FTP send adapter on this host instance.	Msgs/Sec	The counter applies only to messages that have been written to destination FTP server. Ideally, a value of this measure should be high. A low value indicates that the FTP send adapter is experiencing

Measurement	Description	Measurement Unit	Interpretation
			delays while writing files to the destination FTP server. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.7 BT Http Receive Adapter Test

The HTTP adapter is used to exchange information between the BizTalk server and an application by means of the HTTP protocol. HTTP is the primary protocol for inter-business message exchange. Applications can send messages to a server by sending HTTP POST or HTTP GET requests to a specified HTTP URL. The HTTP receive adapter is an Internet Information Services (IIS) Internet Server Application Programming Interface (ISAPI) extension that the IIS process hosts, and controls the receive locations that use the HTTP adapter. The receive location for the HTTP receive adapter is a distinct URL configured through BizTalk Explorer.

Using this test, you can monitor the flow of messages to and from the HTTP receive adapter for each host instance on the BizTalk server. In the process, you can determine the current workload of the HTTP receive adapter of a host instance, and evaluate the load processing ability of that adapter.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Messages received	Indicates the total number of HTTP requests received by the HTTP receive adapter on this host instance.	Number	The counter is incremented after a request message is completely read by the HTTP receive adapter from the HTTP client.
Messages received	Indicates the rate at which the HTTP requests are received by the HTTP receive adapter on this host instance.	Msgs/Sec	The counter applies only to request messages that have been completely read by the HTTP receive adapter from the HTTP client. Ideally, the value of this measure should be high. A low value indicates that the HTTP receive adapter is experiencing delays while accepting requests from the HTTP client. Further investigation may be required to diagnose the root-cause of the slowdown.
Messages sent	Indicates the total number of HTTP responses sent by the HTTP receive adapter on this host instance.	Number	The counter is incremented only for response messages that have been successfully sent to HTTP clients.
Messages sent	Indicates the rate at which messages were sent by the FTP send adapter on this host instance on this host instance.	Number	The counter applies only to response messages that have been successfully sent to HTTP clients. Ideally, the value of this measure should be high. A low value indicates that the HTTP receive adapter is experiencing delays while responding to requests from HTTP clients. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.8 BT Http Send Adapter Test

The HTTP send adapter gets messages from BizTalk Server and sends them to a destination URL on an HTTP POST request. The HTTP send adapter gets the message content from the body part of the BizTalk Message object. The HTTP send adapter ignores all other parts of the BizTalk Message object.

Using this test, you can monitor the flow of messages to and from the HTTP send adapter for each host instance on the BizTalk server. In the process, you can determine the current workload of the HTTP send adapter of a host instance, and evaluate the load processing ability of that adapter.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Messages received	Indicates the total number of HTTP response messages received by the HTTP send adapter on this host instance.	Number	The counter is incremented after a response message is completely read by the HTTP send adapter from HTTP servers.

Measurement	Description	Measurement Unit	Interpretation
Messages received	Indicates the rate at which HTTP response messages are received by the HTTP send adapter on this host instance.	Msgs/Sec	The counter applies only to response messages that have been completely read by the HTTP send adapter. Ideally, the value of this measure should be high. A low value indicates that the HTTP send adapter is experiencing delays while receiving messages from the BizTalk server. Further investigation may be required to diagnose the root-cause of the slowdown.
Messages sent	Indicates the total number of HTTP requests sent by the HTTP send adapter on this host instance to the destination URL.	Number	The counter is incremented only for request messages that have reached the destination URL.
Messages sent	Indicates the rate at which HTTP requests were sent by the HTTP send adapter on this host instance to the destination URL.	Msgs/Sec	The counter applies only to request messages that have reached the destination URL. Ideally, the value of this measure should be high. A low value indicates that the HTTP send adapter is experiencing delays while sending messages to the destination URL on an HTTP POST request. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.9 BT Messaging Latency Test

One of the key services provided by the BizTalk server messaging engine is the mechanism for communicating across the applications that a business process uses. As the first steps towards enabling this communication, the messaging engine receives messages from a source application through a receive adapter. The message is then processed through a receive pipeline and delivered

into a database called the MessageBox. Depending upon the nature of the messages delivered to the MessageBox, the messaging engine dispatches the messages to their appropriate orchestrations; each orchestration then takes whatever action the business process requires. The result of this processing is typically another message, produced by the orchestration and saved in the MessageBox. This message, in turn, is processed by a send pipeline, and sent out to the application for which it is destined, using a send adapter.

The health of the messaging engine relies heavily on how quickly messages are processed at each step of the electronic data exchange that has been described above. Administrators should be promptly notified of even the slightest of latencies in this communication, so that they can take the measures to curb it before it causes a significant delay in the delivery of messages to the target. The Messaging latency test serves this purpose.

The test closely observes the time taken by the messaging engine to send a message to the MessageBox and to send a message in the MessageBox to the target destination, and proactively alerts administrators to delays; this way, administrators will not only be able to promptly detect latencies experienced by the messaging engine, but will also be able to pin-point where the delay originated - while delivering messages to the MessageBox? or while delivering messages to the destination application?

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Inbound Latency	Indicates the time taken by the messaging engine to receive a document from the receive adapter and publish it to the MessageBox.	Secs	Ideally, the value of this measure should be low. A very high value is indicative of a slowdown while publishing documents to the MessageBox.
Outbound Latency	Indicates the time taken by the messaging engine to receive a document from the MessageBox and send it to the adapter.	Secs	Ideally, the value of this measure should be low. A very high value is indicative of a slowdown in publishing documents to the destination.
Request-Response Latency	Indicates the total time taken by the messaging engine to process a request document from the adapter and send back a response document to the adapter.	Secs	Ideally, the value of this measure should be low. A very high value is indicative of delays in communication across applications.

5.1.10 BT Msmq Receive Adapter Test

With the BizTalk Server Adapter for MSMQ (the MSMQ adapter), you can send and receive messages to Microsoft Message Queuing (also known as MSMQ) queues using Microsoft BizTalk Server. The MSMQ adapter works with transactional and non-transactional, public and private, and local and remote queues. Additionally, the MSMQ adapter provides large (greater than 4 MB) message support and gives you access to Message Queuing features such as messaging over HTTP and multi-cast messaging. The key features of the MSMQ adapter are:

- Can be configured to deliver messages in order.
- Provides large message support by breaking the message into parts, accumulating the parts in memory, and delivering the parts in order to the destination (more memory intensive than MSMQT).
- Provides better performance than MSMQT.

- Enables other non-BizTalk applications to use MSMQ services at the same time on the same computer.
- Requires intermediate storage of MSMQ queues. Inbound messages are written to the MSMQ queue and then picked up from the MSMQ queue by the MSMQ adapter.

By continuously tracking the messages and data received and processed by the MSMQ receive adapter for every host instance on the BizTalk server, administrators can receive an overview of the load on the adapter, and will be able to accurately judge its processing ability. This test does just that.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Bytes received	Indicates the total number of bytes received by the MSMQ receive adapter on this host instance.	Bytes	The counter is incremented after a message is completely read by the MSMQ receive adapter from the source queue.
Bytes received	Indicates the rate at which bytes were received by the MSMQ receive adapter on	Bytes/Sec	The counter applies only to messages that have been completely read by the MSMQ receive adapter from the

Measurement	Description	Measurement Unit	Interpretation
	this host instance.		source queue.
Messages received	Indicates the number of messages received by the MSMQ receive adapter on this host instance.	Number	The counter is incremented after a message is completely read by the MSMQ receive adapter from the source queue. This measure is a good indicator of the load on the MSMQ receive adapter.
Messages received	Indicates the rate at which messages were received by the MSMQ receive adapter on this host instance.	Msgs/Sec	The counter applies only to messages that have been completely read by the MSMQ receive adapter from the source queue. Ideally, the value of this measure should be high. A low value indicates that the MSMQ receive adapter is experiencing delays while reading messages from the source queue. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.11 BT Msmq Send Adapter Test

With the BizTalk Server Adapter for MSMQ (the MSMQ adapter), you can send and receive messages to Microsoft Message Queuing (also known as MSMQ) queues using Microsoft BizTalk Server. The MSMQ adapter works with transactional and non-transactional, public and private, and local and remote queues. Additionally, the MSMQ adapter provides large (greater than 4 MB) message support and gives you access to Message Queuing features such as messaging over HTTP and multi-cast messaging. The key features of the MSMQ adapter are:

- Can be configured to deliver messages in order.
- Provides large message support by breaking the message into parts, accumulating the parts in memory, and delivering the parts in order to the destination (more memory intensive than MSMQT).
- Provides better performance than MSMQT.

- Enables other non-BizTalk applications to use MSMQ services at the same time on the same computer.
- Requires intermediate storage of MSMQ queues. Inbound messages are written to the MSMQ queue and then picked up from the MSMQ queue by the MSMQ adapter.

By continuously tracking the messages and data sent by the MSMQ send adapter for every host instance on the BizTalk server, administrators can receive an overview of the load on the adapter, and will be able to accurately judge its processing ability. This test does just that.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Bytes sent	Indicates the total number of bytes sent by the MSMQ send adapter on this host instance.	Bytes	The counter is incremented only for messages that have reached the destination queue.
Bytes sent	Indicates the rate at which bytes were sent by the MSMQ send adapter on	Bytes/Sec	The counter applies only to messages that have reached the destination queue.

Measurement	Description	Measurement Unit	Interpretation
	this host instance.		
Messages sent:	Indicates the number of messages sent by the MSMQ send adapter on this host instance.	Number	The counter is incremented only for messages that have reached the destination queue.
Messages sent	Indicates the rate at which messages were sent by the MSMQ send adapter on this host instance.	Msgs/Sec	The counter applies only to messages that have reached the destination queue. Ideally, the value of this measure should be high. A low value indicates that the MSMQ send adapter is experiencing delays while sending messages to the destination queue. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.12 BT Pop3 Adapter Test

The Post Office Protocol 3 (POP3) adapter is used to retrieve data from a server that houses POP3 mailboxes into a BizTalk Server by means of the POP3 protocol. The POP3 adapter consists of only one adapter, a receive adapter. This receive adapter controls the receive locations that use the POP3 adapter.

The POP3 receive adapter retrieves e-mail from a specified mailbox on a specified POP3 server. By default, the POP3 receive adapter applies MIME processing to the e- mail messages that it downloads and submits these messages to BizTalk Server as multipart BizTalk messages. The POP3 receive adapter can receive and process e-mail in the following formats:

- Plain text
- MIME encoded
- MIME encrypted
- MIME encoded and signed
- MIME encrypted and signed

To monitor the session and message load on the POP3 adapter so that, overload conditions and processing bottlenecks are accurately identified, use the **POP3 adapter** test.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Active sessions	Indicates the number of open POP3 connections that the POP3 adapter on this host instance is currently managing.	Number	This is a good indicator of the session load on the adapter.
Bytes received	Indicates the total number of bytes downloaded by the POP3 adapter on this host instance from a mail server.	Bytes	This is a good indicator of the data load on the adapter.
Bytes received	Indicates the rate at which bytes that the POP3 adapter on this host instance downloaded from	Bytes/Sec	A consistent decrease in this value could indicate a processing bottleneck.

Measurement	Description	Measurement Unit	Interpretation
	a mail server.		
Messages received	Indicates the number of messages that the POP3 adapter on this host instance downloaded from the mail server.	Number	This is a good indicator of the load on the adapter.
Messages received	Indicates the rate at which the POP3 adapter on this host instance downloaded messages from the mail server.	Msgs/Sec	A consistent decrease in this value could indicate a processing bottleneck.

5.1.13 BT SMTP Adapter Test

The Simple Mail Transfer Protocol (SMTP) adapter is used to exchange information between a BizTalk Server and other applications by means of the SMTP protocol. BizTalk Server can send messages to other applications by creating an e-mail message and delivering it to a specified e-mail address. The SMTP adapter consists of only one adapter, a send adapter. The send adapter controls the send ports that use the SMTP adapter. Internally, the SMTP send adapter creates an SMTP-based e-mail message and sends it to a target e-mail address. The target e-mail address is a property of the SMTP adapter. The SMTP send adapter gets messages from the server and posts them to an SMTP server that sends them to e-mail recipients.

Using this test, you can figure out how quickly the SMTP send adapter sends out messages to other applications, and thus promptly detect slowdowns in message delivery.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.

Parameters	Description
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Messages sent	Indicates the total number of messages sent by the SMTP adapter on this host instance to the target e-mail address.	Number	The counter is incremented only for messages that have been transmitted to the SMTP server.
Messages sent	Indicates the rate at which messages were sent by the SMTP adapter on this host instance to the target e-mail address.	Msgs/Sec	The counter applies only to messages that have been transmitted to the SMTP server. Ideally, the value of this measure should be high. A low value indicates that the SMTP send adapter is experiencing delays while sending messages to the target e-mail address. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.14 BT Soap Receive Adapter Test

The SOAP adapter enables you to publish orchestrations as Web services and consume external Web services. The SOAP adapter consists of two adapters — a send adapter and receive adapter.

The SOAP receive adapter is used to receive Web service requests. The SOAP receive adapter creates a BizTalk Message object, and promotes the associated properties to the message context.

This test enables you to determine the web service request load on the SOAP receive adapter at any given point in time, and helps you assess the processing capability of the adapter.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Messages received	Indicates the total number of messages that are received by the SOAP receive adapter on this host instance.	Number	The counter is incremented after a request message is completely read by the adapter from the SOAP client.
Messages received	Indicates the rate at which the messages are received by the SOAP receive adapter on this host instance.	Msgs/Sec	The counter applies only to request messages that have been completely read by the adapter from the SOAP client. Ideally, the value of this measure should be high. A consistent decrease in this value indicates that the SOAP receive adapter is experiencing delays while reading messages from the

Measurement	Description	Measurement Unit	Interpretation
			SOAP client. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.15 BT Soap Send Adapter Test

The SOAP send adapter is used to call a web service. The SOAP send adapter reads the message context on the BizTalk Message object to get the proxy name and calls the associated external Web service proxy.

Monitor the load on the SOAP send adapter and be proactively alerted to processing bottlenecks in the adapter with the help of the **Soap send adapter** test.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Messages sent	Indicates the total number of messages that are sent	Number	The counter is incremented only for messages that have reached the

Measurement	Description	Measurement Unit	Interpretation
	by the SOAP send adapter on this host instance.		destination URL.
Messages sent	Indicates the rate at which the messages are sent by the SOAP sent adapter on this host instance.	Msgs/Sec	The counter applies only to messages that have reached the destination URL. Ideally, the value of this measure should be high. A consistent decrease in this value indicates that the SOAP send adapter is experiencing delays while writing messages to the destination URL. Further investigation may be required to diagnose the root-cause of the slowdown.

5.1.16 BT Sql Receive Adapter Test

The SQL adapter exchanges data between the BizTalk Server and a SQL Server database. You can use the SQL adapter to poll data from one or more data tables and transmit the data as one or more XML messages to BizTalk Server. You can also use the SQL adapter to move large amounts of data to or from the SQL Server database as part of a BizTalk Server messaging or orchestration solution. In addition, you can use the SQL adapter to insert, update, and delete data in SQL Server tables by using SQL updategrams or by invoking stored procedures.The SQL adapter consists of two adapters—a receive adapter and a send adapter.

The SQL receive adapter is a polling adapter that periodically polls for SQL result sets.

This test monitors the load on the **SQL Receive Adapter** and proactively alerts you to potential overload conditions.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Messages received	Indicates the total number of messages that are read by the SQL receive adapter from the SQL server.	Number	A high value could indicate an overload condition.
Messages received	Indicates the rate at which the messages are read by the SQL receive adapter from the SQL server.	Msgs/Sec	A consistent decrease in the value of this measure points you to current/potential bottlenecks in the processing of messages.

5.1.17 BT SQL Send Adapter Test

The SQL adapter exchanges data between the BizTalk Server and a SQL Server database. You can use the SQL adapter to poll data from one or more data tables and transmit the data as one or more XML messages to BizTalk Server. You can also use the SQL adapter to move large amounts of data to or from the SQL Server database as part of a BizTalk Server messaging or orchestration solution. In addition, you can use the SQL adapter to insert, update, and delete data in SQL Server tables by using SQL updategrams or by invoking stored procedures. The SQL adapter consists of two adapters - a receive adapter and a send adapter.

The SQL send adapter is used to send dynamically created updategrams or dynamically invoked stored procedures to SQL Server. An updategram is an XML fragment that inserts, updates, or deletes data in a SQL Server database by mapping XML nodes against database tables and

columns. SQL Server returns an optional response document after the updategram completes, which contains the success status of the update. If a failure occurs during the update, the SQL adapter throws an exception that the BizTalk Messaging Engine handles. When the SQL send adapter is configured to invoke a stored procedure, it returns any results in the form of a single XML-formatted record set.

This test monitors the load on the SQL Send Adapter and proactively alerts you to potential overload conditions and processing bottlenecks.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Messages sent	Indicates the total number of messages that are sent by the SQL send adapter to the destination SQL table in the SQL server database.	Number	
Messages sent	Indicates the rate at which the messages are sent by	Msgs/Sec	A consistent decrease in the value of this measure points you to

Measurement	Description	Measurement Unit	Interpretation
	the SQL send adapter to the destination SQL table in the SQL server database.		current/potential bottlenecks in the processing of messages.

5.1.18 Send Ports Test

A send port is the location to which Microsoft BizTalk Server sends messages or from which BizTalk Server receives messages. It also provides the technology that BizTalk Server uses to implement the communication action. The name of the port uniquely identifies the location. If too many ports are stopped/enlisted, then the messages on the BizTalk server may take a longer time to be processed and processing overheads may be noticed in the available send ports. To avoid such processing overheads and ensure balanced load on the send ports, it is mandatory to monitor the send ports on the BizTalk servers. The Send Ports test helps administrators in this regard.

This test monitors the Send ports in the BizTalk server and reports the number of send port, send ports that were stopped/unenlisted and the send ports that were stopped/unenlisted during the last measurement period.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Stopped ports DD	Set this flag to Yes if you want to enable the Detailed Diagnosis of the Total Stopped ports measure reported by this test. By default, this flag is set to No.
Unlimited ports DD	Set this flag to Yes if you want to enable the detailed diagnosis of the Total enelimited ports measure reported by this test. By default, this flag is set to No.

Parameters	Description
DD Frequency	Refers to the frequency with which detailed diagnosis measures are to be generated for this test. The default is *1:1*. This indicates that, by default, detailed measures will be generated every time this test runs, and also every time the test detects a problem. You can modify this frequency, if you so desire. Also, if you intend to disable the detailed diagnosis capability for this test, you can do so by specifying *none* against DD frequency.
Detailed Diagnosis	To make diagnosis more efficient and accurate, the eG Enterprise suite embeds an optional detailed diagnostic capability. With this capability, the eG agents can be configured to run detailed, more elaborate tests as and when specific problems are detected. To enable the detailed diagnosis capability of this test for a particular server, choose the **On** option. To disable the capability, click on the **Off** option. The option to selectively enable/disable the detailed diagnosis capability will be available only if the following conditions are fulfilled: • The eG manager license should allow the detailed diagnosis capability • Both the normal and abnormal frequencies configured for the detailed diagnosis measures should not be 0.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Total ports	Indicates the total number of send ports available on the BizTalk server.	Number	
Total stopped ports	Indicates the total number of send ports that were stopped on the BizTalk server.	Number	A low value is desired for this measure. If too many send ports are stopped, then the load may increase manifold on the send ports that are currently capable of receiving the messages leading to congestion of the ports. The detailed diagnosis of this measure if enabled, lists the send ports that were stopped.

5.1.19 Receive Ports Test

A send port is the location to which Microsoft® BizTalk® Server sends messages or from which BizTalk Server receives messages. It also provides the technology that BizTalk Server uses to implement the communication action. The name of the port uniquely identifies the location. If too many ports are stopped/enenlisted, then the messages on the BizTalk server may take a longer time to be processed and processing overheads may be noticed in the available send ports. To avoid such processing overheads and ensure balanced load on the send ports, it is mandatory to monitor the send ports on the BizTalk servers. The Send Ports test helps administrators in this regard.

This test monitors the Send ports in the BizTalk server and reports the number of send port, send ports that were stopped/unenlisted and the send ports that were stopped/unenlisted during the last measurement period.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Receive ports DD	Set this flag to **Yes** if you want to enable the Detailed Diagnosis of the Total Receive ports measure reported by this test. By default, this flag is set to **No**.
DD Frequency	Refers to the frequency with which detailed diagnosis measures are to be generated for this test. The default is *1:1*. This indicates that, by default, detailed measures will be generated every time this test runs, and also every time the test detects a problem. You can modify this frequency, if you so desire. Also, if you intend to disable the detailed diagnosis capability for this test, you can do so by specifying *none* against DD frequency.
Detailed Diagnosis	To make diagnosis more efficient and accurate, the eG Enterprise suite embeds an optional detailed diagnostic capability. With this capability, the eG agents can be configured to run detailed, more elaborate tests as and when specific problems are

Parameters	Description
	detected. To enable the detailed diagnosis capability of this test for a particular server, choose the **On** option. To disable the capability, click on the **Off** option. The option to selectively enable/disable the detailed diagnosis capability will be available only if the following conditions are fulfilled: • The eG manager license should allow the detailed diagnosis capability • Both the normal and abnormal frequencies configured for the detailed diagnosis measures should not be 0.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Total Receive ports	Indicates the total number of Receive ports available on the BizTalk instance.	Number	The detailed diagnosis of this measure if enabled, lists the Receive ports on the BizTalk instance.
Recently disable ports	Indicates the number of Receive ports that were disabled during the last measurement period.	Number	A low value is desired for this measure. If too many send ports are stopped, then the load may increase manifold on the send ports that are currently capable of receiving the messages leading to congestion of the ports. The detailed diagnosis of this measure if enabled, lists the send ports that were stopped.

5.2 The Message Box Layer

The heart of the publish/subscribe engine in Microsoft BizTalk Server is the MessageBox database. The MessageBox is made up of two components: one or more Microsoft SQL Server databases and the Messaging Agent. The SQL Server database provides the persistence store for many things including messages, message parts, message properties, subscriptions, orchestration state, tracking data, host queues for routing, and others. The BizTalk Server group may have one or more MessageBox databases into which it publishes messages and from which subscribers to those messages extract messages.

The database provides some of the logic related to routing messages and fulfilling subscriptions. The Message Agent, however, is the component that encapsulates and abstracts the database component and is the interface used by BizTalk Server to interact with the MessageBox. The Message Agent is a Component Object Model (COM) component that provides interfaces for publishing messages, subscribing to messages, retrieving messages, and so on. This interface is the only mechanism used by other BizTalk Server components, including the adapter framework and orchestrations, to interact with the MessageBox.

Using the tests mapped to this layer you can monitor the health of the BizTalk server MessageBox and the efficiency of the SQL Server agent jobs.

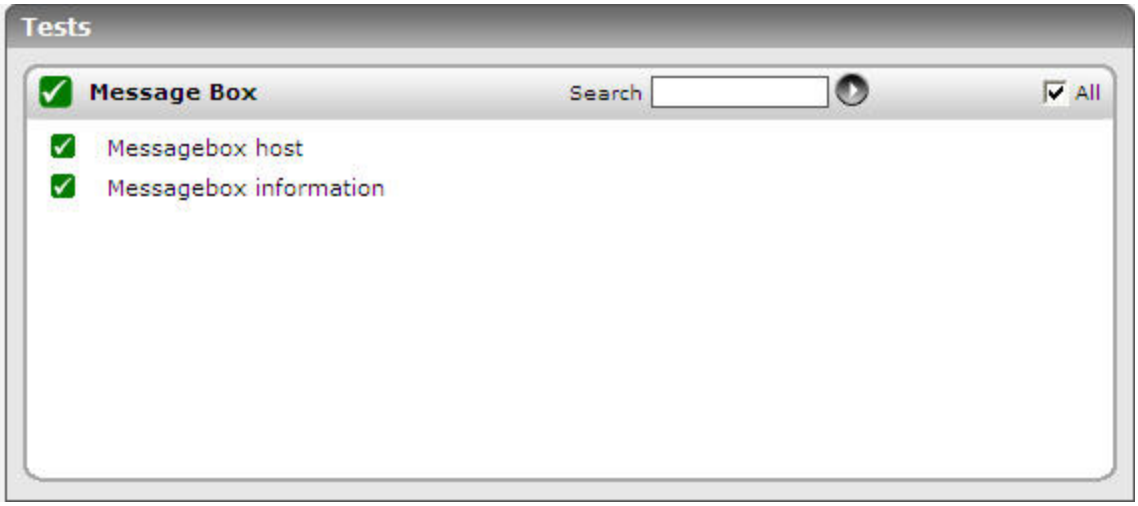

Figure 5.5: The tests mapped to the Message Box layer

5.2.1 BT Messagebox Host Test

The first time you configure a BizTalk server, the following set of tables are created in the MessageBox database for a BizTalkServerApplicationHost:

- The BizTalkApplicationQ
- The BizTalkServerApplicationQ_Suspended
- The BizTalkServerApplicationQ_Scheduled
- The InstanceStateMessageReferences_BizTalkServerApplication

BizTalk uses these tables to keep references of all the messages that are “live” in the system . That is: Messages with active subscriptions, suspended messages, and awaiting messages associated to each host.

The word references implies that the host tables are only pointers to the Spool table, but the real messages itself are saved in another set of tables (messageparts, parts and fragments).

This test monitors the number of message references in the host queue tables, and proactively alerts administrators to the following:

- A sudden/consistent increase in the length of the host queues
- Too many message references in the suspended queue

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Message references in Instance Queue	Indicates the number of message references in the instance state queue of this host instance.	Number	The State Queue table holds the list of messages that have been processed by an instance but will be needed later. When an orchestration uses the State Queue, it is usually because the orchestration performed some operations on a message, persisted the message, and might need the message later. This is normal

Measurement	Description	Measurement Unit	Interpretation
			operation, and you should take this into account when determining correct sizing of the State Queue
Instances of Host Queue	Indicates the number of instances of the host queue for this host instance.	Number	
Messages in Host Queue	Indicates the number of messages in the host queue of this host instance.	Number	Generally, this queue should not grow too large. The length of the queue indicates the number of messages waiting to be processed. A large number means you could have a backlog.
Suspended Messages in Host Queue	Indicates the number of suspended messages for this host instance.	Number	When a message gets suspended it remains in the message box until resume or terminate actions occurs. So, if the suspended queue keeps growing, the performance of the BizTalk server will continue to get affected. A suspended message can be due, for example, to parsing errors, serialization errors, failed transmissions, or the inability to find a subscription.

5.2.2 BT Messagebox Information Test

The BizTalk server includes certain SQL agent jobs to assist administrators in managing the BizTalk server databases.

Using this test, you can monitor the time taken to perform each of these SQL agent jobs so that, jobs that took too long to complete can be instantly identified.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Dead Processes Cleanup	Indicates the time taken by the MessageBox_ DeadProcesses_Cleanup_ BizTalkMsgBoxDb job for this host instance to complete.	Secs	This job detects when a BizTalk Server host instance (NT service) has stopped and releases all work that was being done by that host instance so that it can be worked on by another host instance.
Cleanup Messages	Indicates the time taken by the MessageBox_ Message_Cleanup_ BizTalkMsgBoxDb job for this host instance to complete its work.	Secs	This job removes all messages that are no longer being referenced by any subscribers in the BizTalk MessageBox (BizTalkMsgBoxDb) database tables. **Note:** This is an unscheduled job which is started by the MessageBox_Message_ ManageRefCountLog_ BizTalkMsgBoxDb job. Do not manually start this job.
Total Instances	Indicates the total number of host instances that exist within a message box.	Number	

Measurement	Description	Measurement Unit	Interpretation
Cleanup Message Parts	Indicates the time taken by the MessageBox_Parts_ Cleanup_ BizTalkMsgBoxDb job for this host instance to complete its work.	Secs	This job removes all message parts that are no longer being referenced by any messages in the BizTalk MessageBox (BizTalkMsgBoxDb) database tables. All messages are made up of one or more message parts, which contain the actual message data.
Spool Size	Indicates the size of the spool that is available on a particular message box in this host instance.	Number	The primary measure of sustainability over time is that a backlog is not allowed to grow indefinitely. In other words, over time, there must be a balance between the high and low peak throughput levels so that the MessageBox database is able to maintain a constant and manageable average backlog. The primary measure of backlog is the depth of the spool table. The message bodies are handled via a set of tables represented by the spool table. The Spool can start growing for multiple reasons. One reason for Spool growth is if the application queues are growing. Application queues host in-flight transition data. They could grow due to various reasons like downstream bottlenecks and/or resource contention. If the application queues are small and the Spool is still large, verify that the purge jobs are keeping up. Ensure that the SQL-Agent Service is running and then verify that the following jobs are successfully completing: • MessageBox_Message_Cleanup_

Measurement	Description	Measurement Unit	Interpretation
			BizTalkMessageBoxDb • MessageBox_Parts_Cleanup_ BizTalkMessageBoxDb One reason for this is if the SQL-Server machine is experiencing severe CPU contention, impacting the ability of the purge jobs to keep up due to CPU starvation.
Tracked Messages	Indicates the time taken by the DTA Purge and Archive job of this host instance to complete its execution.	Secs	This job automatically archives data in the BizTalk Tracking (BizTalkDTADb) database and purges obsolete data.
Tracking Data Size	Indicates the size of the data table that is tracked from the message available for this host instance.	Number	As BizTalk Server processes more and more data on your system, the BizTalk Tracking (BizTalkDTADb) database continues to grow in size. Unchecked growth decreases system performance and may generate errors in the Tracking Data Decode Service (TDDS). In addition to general tracking data, tracked messages can also accumulate in the MessageBox database, causing poor disk performance. This implies that ideally the value of this measure should be low. By archiving and purging data from the BizTalk Tracking database, you can maintain a healthy system, as well as keep your tracking data archived for future use.
Tracking Spool Cleanup	Indicates the time taken to purge inactive spools in the tracking database tables so as to free database space.	Secs	

5.3 The Orchestration Engine Layer

An orchestration is a flexible, powerful tool for representing an executable business process based on XLANG/s language. At run time, the BizTalk Orchestration Engine executes XLANG/s files that are produced by BizTalk Orchestration Designer. Orchestration Designer is a rich graphical tool for visually designing business processes. It generates XLANG/s files that have an .odx extension and contain additional visualization information in their headers and custom attribute information in their bodies.

The primary functions of the orchestration engine are:

- Persistence
- Hosting the .NET components
- Transactions
- Large message support
- Runtime validation
- Load throttling

Using the tests mapped to the **Orchestration Engine** layer you can monitor the orchestrations, the BAM interceptor, and the tracking data decode service offered by the Orchestration engine.

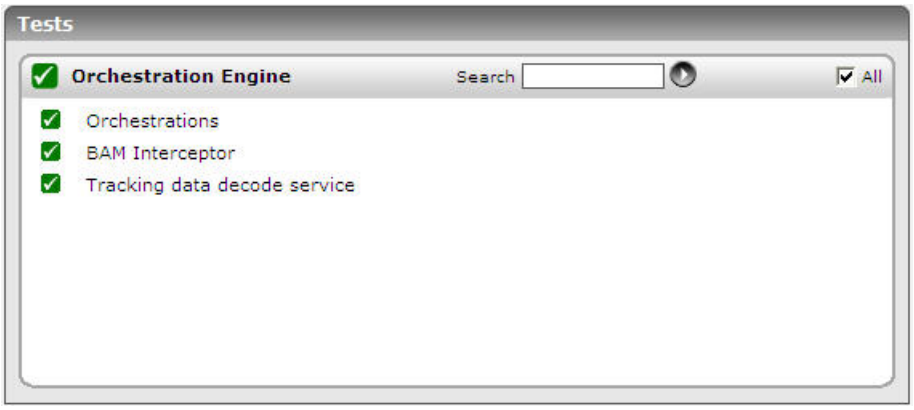

Figure 5.6: The tests mapped to the Orchestration Engine layer

5.3.1 BT Orchestrations Test

Orchestrations are executable business processes that can subscribe to (receive) and publish (send) messages through the MessageBox database. In addition, orchestrations can construct new messages. Messages are received using the subscription and routing infrastructure.

When subscriptions are filled for orchestrations, a new instance is activated and the message is delivered, or in the case of instance subscriptions, the instance is rehydrated if necessary and the message is then delivered. When messages are sent from an orchestration, they are published to the MessageBox in the same manner as a message arriving on a receive location with the appropriate properties getting inserted into the database for use in routing.

Messages that are constructed in an orchestration must be placed in the MessageBox database and referenced by the orchestration instance, but they should not be published because they have not yet been sent. The XLANG/s subservice makes calls to the Message Agent API to insert messages directly. This allows the orchestration engine to insert the message body into the MessageBox and have it directly associated with the running orchestration instance. The persistence of the constructed message in the MessageBox database is coordinated with persistence points in the orchestration as an additional optimization of database operations.

This test helps you determine the number of orchestrations that were created on each host instance, and also tracks the status of these orchestrations over time, thereby promptly alerting you when too many orchestrations are suspended or discarded. The test also tracks the memory usage of the orchestrations, and alerts you if excessive memory is being consumed.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for each host instance on the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Idle orchestrations	Indicates the number of idle orchestration instances currently hosted by this host instance.	Number	This refers to orchestrations that are not making progress but are not dehydratable, as when the orchestration is blocked waiting for a receive, listen, or delay in an atomic transaction.
Orchestrations created	Indicates the number of orchestration instances that were created since this host instance was started.	Number	
Orchestrations created	Indicates the rate at which the orchestration instances were created on this host instance.	Orchestrations / Sec	
Running orchestrations	Indicates the number of orchestration instances that are currently executing on this host instance.	Number	
Orchestrations completed	Indicates the number of orchestration instances that were completed since this host instance was started.	Number	
Orchestration completion rate	Indicates the rate at which the orchestration instances are completed.	Orchestrations/Sec	A high value is desired for this measure. A low value or a steady decline in the value of this measure could indicate an execution bottleneck.
Orchestrations discarded	Indicates the number of orchestration instances discarded from memory since this host instance was started.	Number	An orchestration can be discarded if the engine fails to persist in its state.

Measurement	Description	Measurement Unit	Interpretation
Orchestrations discarded	Indicates the rate at which orchestrations instances were discarded from the memory of this host instance.	Orchestrations/Sec	
Orchestrations suspended	Indicates the number of orchestration instances that are suspended since this host instance was started.	Number	All failures encountered in orchestrations appear as exceptions. If an orchestration does not include any CatchException shape for an exception, the exception causes the orchestration to be Suspended, but not resumable. This means that message and service instance tracking, or a WMI script, cannot recover the instance. However, you can save all messages associated with the Suspended (not Resumable) instance using tracking (or WMI script) for diagnostic and manual retry. To diagnose the problem, use the Orchestration Debugger to see the last shape executed before the instance was suspended. You can also view exception details using the Orchestration Debugger.
Orchestrations suspended	Indicates the rate at which orchestrations were suspended on this host instance.	Orchestrations/Sec	
Orchestrations rehydrated	Indicates the number of orchestration instances that were rehydrated since this host instance was started.	Number	Rehydration is the process of deserializing the last running state of an orchestration from the database. The orchestration engine can be triggered to rehydrate an orchestration instance by the receipt

Measurement	Description	Measurement Unit	Interpretation
			of a message or by the expiration of a time-out specified in a Delay shape. It then loads the saved orchestration instance into memory, restores its state, and runs it from the point where it left off.
Orchestrations rehydrated	Indicates the rate at which orchestrations instances were rehydrated on this host instance.	Orchestrations/Sec	
Orchestrations dehydrated	Indicates the number of orchestration instances that were dehydrated since this host instance was started.	Number	Dehydration is the process of serializing the state of an orchestration into a SQL Server database. The orchestration engine might determine that an orchestration instance has been idle for a relatively long period of time. It calculates thresholds to determine how long it will wait for various actions to take place, and if those thresholds are exceeded, it dehydrates the instance. This can occur under the following circumstances: • When the orchestration is waiting to receive a message, and the wait is longer than a threshold determined by the engine. • When the orchestration is "listening" for a message, as it does when you use a Listen shape, and no branch is triggered before a threshold determined by the engine. The only exception to this is when the Listen shape contains an activation receive. • When a delay in the orchestration is longer than a threshold determined by the engine.

Measurement	Description	Measurement Unit	Interpretation
			The engine dehydrates the instance by saving the state, and frees up the memory required by the instance. By dehydrating dormant orchestration instances, the engine makes it possible for a large number of long-running business processes to run concurrently on the same computer. This implies that the larger the number and rate of dehydrations minimal will be the use of system resources.
Orchestrations dehydrated	Indicates the rate at which orchestration instances were dehydrated on this host instance.	Orchestrations/Sec	
Pending messages	Indicates the number of received messages for which receipt has not yet been acknowledged to the message box from the orchestration.	Number	A very large value could indicate a processing bottleneck.
Pending work items	Indicates the number of code execution blocks that are scheduled for execution in the orchestration.	Number	
Failure connections	Indicates the number of attempted database connections that has failed since this host instance was started.	Number	Ideally, the value of this measure should be 0.
Database transactions	Indicates the number of database transactions performed since the host instance was started.	Number	
Transactions / Sec	Indicates the rate of database transactions performed by the orchestrations hosted by this host instance.	Trans/Sec	

Measurement	Description	Measurement Unit	Interpretation
Current Orchestrations Instances	Indicates the number of orchestration instances currently hosted by this host instance.	Number	
Private memory	Indicates the allocated private memory for this host instance.	MB	This is the current size of memory that this process has allocated that cannot be shared with other processes.
Virtual memory	Indicates the reserved virtual memory for this host instance.	MB	This is the current size of the virtual address space the process is using. Use of virtual address space does not necessarily imply corresponding use of either disk or main memory pages. Virtual space is finite, and the process can limit its ability to load libraries.
Total physical memory	Indicates the percentage of total physical memory used on this host instance.	Percent	The dehydration behavior of BizTalk Server depends entirely on how much memory is available and how much memory is being used. The dehydration behavior is different with different amounts of memory and differences in memory use between 32-bit and 64-bit hosts.

5.3.2 BT Tracking Data Decode Service Test

This test reveals the processing power of the TDDS by reporting the number of batches, events, and records it processes, and also sheds light on failures experienced by the TDDS while processing.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Total Failed Batches	Indicates the total number of batches that the TDDS has failed to process on this host instance.	Number	
Total Failed Events	Indicates the total number of batches that the TDDS has failed to process on this host instance.	Number	Ideally, this value should be 0.
Total Events	Indicates the total number of events that are processed by the TDDS since you started it on this host instance.	Number	
Total Records	Indicates the total number of records that are processed by the TDDS since you started it on this host instance.	Number	

The BAM Event Bus Service, also known as the Tracking Data Decode Service (TDDS), processes tracking data (streams) stored in a source database and persists that data in such a way that it is easy to query it at a later date. The BAM Event Bus service moves Business intelligence data to the BAM Primary Import database and BizTalk Health Monitoring data to the DTA database.

5.3.3 BT BAM Interceptor Test

Information workers need flexibility in looking at and evaluating business processes. A purchasing manager might need to see how many POs are approved and denied each day, for example, while a sales manager might want an hourly update on what products are being ordered. Meeting these diverse needs requires a general framework for tracking what's going on with a particular business process. This is exactly what the Business Activity Monitoring (BAM) component in Microsoft BizTalk Server provides.

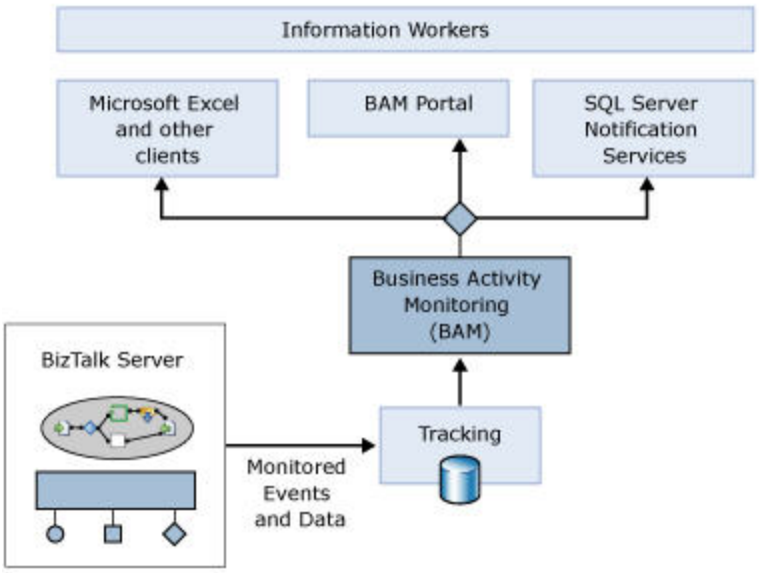

Figure 5.7: How does BAM work?

As the figure above illustrates, the BAM component allows monitoring of events and data produced by a BizTalk application. This information is made accessible using SOAP-callable Web services, and it can be accessed in several different ways, as follows:

- Through Microsoft Excel or other desktop clients, such as a custom dashboard application.
- Using a BAM portal, a component in BizTalk Server that enables business users to examine and configure BAM information.
- Through SQL Server Notification Services, allowing BAM information to be delivered as notifications.

The BAM Interceptor is an object that lets you instrument your application to capture data of interest. Using this test, you can monitor the BAM interceptors, and swiftly spot the failure of BAM events.

Target of the test : A BizTalk Server 2010

Agent deploying the test : An internal agent

Outputs of the test : One set of results for the BizTalk server being monitored

Configurable parameters for the test

Parameters	Description
Test period	This indicates how often should the test be executed.
Host	The host for which this test is to be configured.
Port	The port at which the host listens to.
Ispassive	If this parameter is set to **Yes**, then it means that, by default, all BizTalk servers being monitored by the eG system are the passive servers of a BizTalk cluster. No alerts will be generated if the servers are not running. Measures will be reported as "Not applicable" by the agent if the servers are not up.

Measurements made by the test

Measurement	Description	Measurement Unit	Interpretation
Total Failed Events	Indicates the total number of failed BAM events that occured during data flush.	Number	

About eG Innovations

eG Innovations provides intelligent performance management solutions that automate and dramatically accelerate the discovery, diagnosis, and resolution of IT performance issues in on-premises, cloud and hybrid environments. Where traditional monitoring tools often fail to provide insight into the performance drivers of business services and user experience, eG Innovations provides total performance visibility across every layer and every tier of the IT infrastructure that supports the business service chain. From desktops to applications, from servers to network and storage, from virtualization to cloud, eG Innovations helps companies proactively discover, instantly diagnose, and rapidly resolve even the most challenging performance and user experience issues.

eG Innovations is dedicated to helping businesses across the globe transform IT service delivery into a competitive advantage and a center for productivity, growth and profit. Many of the world's largest businesses use eG Enterprise to enhance IT service performance, increase operational efficiency, ensure IT effectiveness and deliver on the ROI promise of transformational IT investments across physical, virtual and cloud environments.

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