

AutoPilot® M6 Plug-In for IIB Statistics

Version 6.1.1

Installation and User's Guide

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Chapter 1: Introduction

Welcome to the Nastel AutoPilot IBM Integration Bus (IIB) Statistics Expert Plug-in Guide. This guide describes installation and use of the IIB statistics expert. This plug-in is designed to work with AutoPilot, its components, and other plug-ins, and run simultaneously without interference or performance degradation.

1.1 How This Guide is Organized

[Chapter 1:](#) Identifies the users and history of the document. System requirements for this plug-in are outlined. All other system and platform information is listed in the AutoPilot Installation and User's Guides.

[Chapter 2:](#) Contains a brief description of AP IIB Statistics Expert along with the statistics that are collected for message flows.

[Chapter 3:](#) Provides instruction for new installations of the AP IIB Statistics Expert Plug-in.

[Chapter 4:](#) Provides instruction for using the AP IIB Statistics Expert Plug-in.

[Chapter 5:](#) Provides a listing of AP IIB Statistics Expert metrics.

[Appendix A:](#) Provides a detailed list of all reference information required for the installation of AutoPilot.

[Appendix B:](#) Contains conventions used in AutoPilot and documents typographical conventions.

[Glossary:](#) Contains a listing of unique and common acronyms and words and their definitions.

1.2 History of This Document

Release Date:	Document Number	AutoPilot Version	Summary
July 2007	AP/WBISTAT 400.001	AP 4.0 or higher	Initial document release
November 2011	AP/WBISTAT 400.002	AP 6.0 or higher	Update for AutoPilot M6
August 2014	AP/WBISTAT 600.001	AP 6.0 or higher	General update
December 2014	AP/WBISTAT 604.001	AP 6.0 or higher	Updated version and release numbers; added description for resource statistic and status data collection (Mantis 6026, 9079, 9957)
July 2017	AP/IIBE 611.001	AP 6.0 or higher	Additional property tabs (Mantis 14726)
October 2017	AP/IIBE 611.002	AP 6.0 or higher	Updated introduction (section 2.1)
June 2018	AP/IIBE 611.003	AP 6.0 or higher	Add z/OS broker commands and errata (Mantis 17720)
May 2022	AP/IIBE 611.003.1		Updated name of document to <i>Autopilot M6 Plug-in for IBM Integration Bus (IIB) Statistics Installation and User's Guide</i>

1.2.1 User Feedback

Nastel encourages all Users and Administrators of AutoPilot to submit comments, suggestions, corrections and recommendations for improvement for all AutoPilot documentation. Please send your

comments via e-mail. Send messages to: support@nastel.com. You will receive a written response, along with status of any proposed change, update, or correction.

1.3 Related Documents

The complete listing of related and referenced documents is listed in [Appendix A](#) of this guide.

1.4 Intended Audience

The AP IIB Statistics Plug-in Guide is intended for use by installers and administrators of Nastel's AutoPilot and AutoPilot IIB Expert. There are three user groups defined for the purpose of installation and use.

- **Installer:** The installer should be familiar with Java Run Time Environment 1.6.x (JRE 1.6.x) or higher. Procedures for installing software on the target platform such as Windows and/or UNIX. Basic understanding of TCP/IP and WebSphere MQ.
- **Administrator:** The administrator should have a working knowledge of middleware, TCP/IP, and system management. The Administrator should also have an understanding of Java Runtime Environment (JRE) and TCP/IP. Installation procedures for the platform where AutoPilot is installed (for example, Windows, Linux, UNIX, etc.)
- **User:** Requires only local operating system operations knowledge and basic knowledge of AutoPilot.

1.5 System Requirements

This section defines system and platform prerequisite support requirements for AP/IIB.

1.5.1 Platforms

AP/IIB Statistics expert is compatible with the following platforms:

- Windows NT/2000 or later/XP
- Unix (Solaris, AIX, HP-UX, Linux)

1.5.2 Other Requirements

AP/IIB requires the following conditions:

- AutoPilot 6.0 or higher.
- Java Run Time Environment 1.6.x (JRE 1.6.x) or higher
- IBM WebSphere Business Integration Message Broker Suite V8 or higher
- Target operating system environment
- Installer may need administrative privileges for the target platform.
- Since communication between IIB and AutoPilot is done via WebSphere MQ it is necessary to have a proper installed WebSphere MQ client on the AutoPilot managed node hosting the expert.

1.6 Terms and Abbreviations

A list of Terms and Abbreviations used in this document is located in the [Glossary](#).

1.7 Technical Support

If you need additional technical support, you can contact Nastel Technologies by telephone or by e-mail. To contact Nastel technical support by telephone, call **(800) 963-9822 ext. 1**, if you are calling from outside the United States dial **001-516-801-2100**. To contact Nastel technical support by e-mail, send a message to support@nastel.com. To access the Nastel automated support system (user id and password required), go to <http://support.nastel.com/>. Contact your local AutoPilot Administrator for further information.

1.8 Conventions

Refer to [Appendix B](#) for conventions used in this guide.

Chapter 2: About AutoPilot/IIB Statistics Expert

2.1 Introduction

AP/IIB Statistics Expert is designed to monitor and manage your IIB environment (also known as message broker). IIB generates internal message flow accounting and statistics information which are processed by the AP/IIB Statistics Expert and integrated into the AutoPilot infrastructure. Communication from the IIB Statistics Expert to AutoPilot is through a WebSphere MQ queue via a WebSphere MQ server connection.

The IIB plugin is compatible with Version 10 and upward (using the integration API).

- The expert connects to MQ using properties on the IBM MQ tab to collect statistics information. It connects to IIB using http using properties from the IIB Options tab to collect status information (when the publish status option is selected).
- Existing WBI plugin instances are not upgraded when applying the expert. If you are migrating from V9, you will need to manually add and configure new experts for V10 instances.
- If you run in a mixed V8/V9 and V10 environment and want to collect status information from BOTH V8/V9 and V10, you will need to run the WBI expert and the IIB expert on different CEP instances that have unique lib folders due to incompatible IBM jar files. The easiest way to do this is to run them on separate servers.
- You are no longer required to use an IBM JRE to collect status information for IIB V10 and above.

2.1.1 Definitions

Broker – Routing and Transformation Engine supporting various protocols such as http, MQ, and files.

Message Flow – A specific logical flow through the message broker which may include logic, transformation, and routing.

Threads – processing threads allocated to an Execution Group which execute the message flows

Execution Group – A grouping of related message flows that provides isolation, performance allocation, and control.

Topic – A hierarchy that describes the context of a specific message.

Subscription – A request to receive posts to all or part of a topic hierarchy.

Queue Manager – A WebSphere MQ service that provides the underlying technology for Message Broker. Required even if the broker does not use WMQ Message Flows.

2.1.2 IIB Message Flow Summary

The expert can collect three distinct types of data from the broker. (See details below.)

Statistics Data

- Message Flow Statistics
- Thread Statistics
- Node Statistics
- Terminal Statistics

Resource Usage

- Execution Group Usage
- Component Usage
 - JVM, Parsers, etc.

Status Data

- Broker Status
- Execution Groups
- Message Flows

Please refer to the IBM manual for additional information regarding message flow accounting and statistics data:

http://www-01.ibm.com/support/knowledgecenter/SSKM8N_8.0.0/mapfiles/help_home_msgbroker.html.

Chapter 3: Installation & Configuration

3.1 Installation Preparation

This section contains general information related to preparing for and installing the AP/IIB Statistics Expert software.

3.1.1 Installation Materials

Installation can be performed from installation media or by download from the Nastel Resource Center.

3.1.1.1 Technical Documents

Prior to installation, review all text files and installation procedures provided on the Nastel Resource Center. It is recommended that all installation related materials are printed to allow the installer to review prior to installation, and better follow the detailed instructions within.

3.1.2 Licensing Information

A copy of the standard Licensing Agreement is imbedded in the installation software and is provided on the resource center. The formal licensing agreement has been furnished in the purchase agreement package.

3.2 Installation

This section provides instructions for installing AP/IIB Statistics Expert on the compatible platforms. Review all installation related materials prior to commencing installation procedures. Reviewing materials will allow installers to pre-determine installation options and familiarize themselves with associated requirements.

3.2.1 Before Installing AP/IIB

This procedure outlines the typical procedures for installing the AP/IIB Statistics Expert for all supported platforms.

1. WebSphere Business Integrator 8.0 or higher.
2. Ensure Performance Message Flow accounting and statistics is enabled and detail level is configured according to your needs. (This will be done in [section 3.2.3](#).)
3. AutoPilot Managed Node, where AP CEP server is installed, can access the WebSphere MQ Queue manager.
4. If the optional IIB status data is required, an IBM JRE must be available to the AutoPilot Server.

3.2.2 Installing the IIB Expert from the Nastel Resource Center

1. Download the AP/IIB Statistics Expert Plug-in from the Nastel Resource Center.
2. Save your work and logoff AutoPilot.

	NOTE:	There are no specific logoff procedures required to exit AutoPilot Console.
---	--------------	---

3. Stop the Nodes and/or Domain Servers that will be updated as specified in the AutoPilot User's Guide.
4. Copy `AP_IIB-version.pkg` into the `[AUTOPILOT_HOME]\updates` directory.

	NOTE:	AutoPilot can be installed on a Windows or a Unix machine. If Unix, substitute forward slash '/' in all directory paths.
---	--------------	--

5. At the command prompt run:

```
[AUTOPILOT_HOME]\bin\pkgman ..\updates\AP_IIB-verison.pkg
```

	NOTE:	Make sure there are no errors posted at the bottom of the screen.
---	--------------	---

6. Verify plug-in installation: `[AUTOPILOT_HOME]\bin\pkgman -info`. You should see **IIB-Plugin** in the installed library list.

3.2.3 Configuring Message Flow Accounting and Statistics Data in IIB

The message flow accounting and statistics data is generated by IIB. This functionality is turned off by default and has to be configured by the IIB administration. Please refer to the IBM IIB manual for detailed information about activation of the message flow accounting and statistics data.

3.2.3.1 Activating Statistics Collection

There are two types of data collection:

- archive
- snapshot.

Archive data is for use in longer term sampling of data; that is data you want to collect continuously for general monitoring of message flows. The user defines the data collection interval. The default is 60 minutes. To change this interval use the `mqsichangebroker` command with the `-v` parameter.

Snapshot data is the type you want to collect for a short period of time when you are troubleshooting a problem in one or more message flows. The snapshot data is collected every 20 seconds, and you cannot change this interval.

The output format must be xml when used with the expert.

To activate message flow statistics, that is “publish” the data, use the following command:

```
mqsichangeflowstats
```

The options set using this command remain active until modified by a subsequent **mqsichangeflowstats** command. The format of the command will be different on distributed and z/OS systems, but the data collected is the same. The command **mqsireportflowstats** can be used to display the current settings.

- To change for archive data, use the **-a** option and for snapshot, use the **-s** option. You can activate both archive and snapshot data collection.
- To change for all execution group and message flows, use **-g -j** option or can specify specific execution groups with **-e** and flows with **-f**.
- Thread (**-t**) and Node (**-n**) statistics are optional and should match expert DetailLevel settings.
- Output format must be xml (**-o xml**).

Sample commands for Windows/Unix/Linux:

```
mqsichangeflowstats Broker -s -g -j -t basic -n basic -o xml -c active
```

Activate (c active) archive data (-a) snapshot data collection (-s) for all execution groups (-g), all message flows (-j), basic thread statistics (-t basic), basic flow processing node statistics (-n basic), output statistics message format is XML capturing basic data.

```
mqsichangeflowstats Broker -a -g -j -n advanced -c active
```

Activate archive data collection (-a) for all execution groups and message flows including advanced node level statistics.

```
mqsichangeflowstats Broker -a -e EGRP -f MyFlow1 -c active -t basic
```

Activate archive data collection for execution group EGRP and only message flow MyFlow1 include basic thread statistics.

Sample commands for z/OS:

```
mqsichangeflowstats integration_node_name -a -e "EGRP2" -f MyFlow1 -c inactive
```

Turn off archiving of accounting data collection for message flow MyFlow1 in integration server (another term for execution group) EGRP2 in a given integration node (another term for a broker).

```
mqsichangeflowstats integration_node_name -s -g -j -b none
```

Turn on snapshot statistics (-s) for all message flows (-j) in all execution groups (-g) and specify that the statistics are not to be partitioned according to accounting origin data (-b none).

Sample command using SDSF on z/OS:

```
F CS71BRK,CS A=YES,G=YES,J=YES,C=ACTIVE,O=XML,T=BASIC,N=ADVANCED
```

where:

A=YES means collect archive data; use **S=YES** to collect snapshot data

G=YES means include all execution groups

J=YES means include all message flows

C=ACTIVE means turn on statistics collection; use **C=INACTIVE** to stop statistics collection

O=XML means collect statistics into an XML formatted message

T=BASIC means include message flow process thread related statistics

N=ADVANCED means include message flow node related statistics and terminal related statistics

To see the status of z/OS message flows in an execution group:

```
F CS71BRK,LIST E='EG0001'
```

3.2.3.2 Collection Data

To activate data collection, that is “subscribe” to the data, create a subscription based on the following topic structure:

```
$SYS/Broker/brokerName/StatisticsAccounting/recordType/
executionGroupLabel/messageFlowLabel
```

Example Subscriptions:

```
$SYS/Broker/Broker1/StatisticsAccounting/#
```

Subscribes to all data collected for Broker1.

```
$SYS/Broker+/StatisticsAccounting/SnapShot/#
```

Subscribes to all SnapShot data for any broker.

```
$SYS/Broker/Broker2/StatisticsAccounting+/EGRP/#
```

Subscription to data for Execution Group EGRP only for Broker2.

The resultant data is then placed on a queue for processing by an application. This queue will be referenced in the broker configuration below.

	NOTE:	The topics may be configured to be persistent and to overflow to the dead letter queue by default. This can be changed by creating a topic definition that specifies these options.
---	--------------	---

3.2.4 Configuring Resource Statistics Data in IIB

Resource statistics are resources used by execution groups. The following are examples of resource statistics usage:

- JVM
 - Identify memory resource issues
 - Frequent Garbage Collection
- Parsers
 - Identify Resource cost of a parser
 - Identify inefficient parser architecture
- Sockets
 - Traffic patterns

3.2.4.1 Activating Resource Statistics Collection

You must activate resource statistics collection; by default, collection is not active. To activate resource statistic collection, that is “publish” the data, use the following command:

```
mqsichangeresourcestats
```

Once executed, resource statistic collection is set until reset. The collection interval is fixed at 20 seconds. Data is collected for all or a specific execution group. Commands are similar for distributed and z/OS.

Sample commands:

```
mqsichangeresourcestats Broker -c active
```

Activate resource statistics data collection for all execution groups of this broker.

```
mqsichangeresourcestats Broker -e EGRP -c active
```

Activate resource statistics data collection for execution group EGRP of this broker.

```
mqsichangeresourcestats Broker -c inactive
```

Deactivate resource statistics for all message flows in all execution groups for this broker.

z/OS command in Unix file system to activate resource statistics data collection for all execution groups, all message flows:

```
/usr/lpp/wmqi/V8R0M0/bin/mqsichangeresourcestats BrokerName -c active
```

3.2.4.2 Resource Statistics Collection

The topic for each message has the following structure:

```
$SYS/Broker/broker_name/ResourceStatistics/execution_group_name
```

You can set up subscriptions for a specific execution group on a specific broker; for example:

```
$SYS/Broker/MB7BROKER/ResourceStatistics/default
```

You can also use wildcards in the subscriptions to broaden the scope of what is returned. For example, to subscribe to reports for all execution groups on all brokers, use the following values:

```
$SYS/Broker/+/ResourceStatistics/#
```

The resultant data is then placed on a queue for processing by an application. This queue will be referenced in the broker configuration below. The same queue should be used for both message flow and resource statistics data.

3.2.5 Configuring Status Data in IIB

These steps are only necessary when collecting status information which uses the broker CMP (Configuration Manager Proxy) API, renamed to IBM Integration API.

1. Copy the CMP API jar from broker to the AutoPilot library, [AUTOPILOT_HOME]/lib.

For example:

```
C:\Program Files\IBM\MQSI\8.0.0.1\classes\ConfigManagerProxy.jar
```

2. Update atpnode.lax to use an IBM JRE or JDK

For example:

Chapter 4: AutoPilot Integration

The following is required to enable AutoPilot to receive facts generated by the message flow accounting and statistics data of IIB.

1. Open AutoPilot Console.
2. Click  Deployment Tool to display Directory Viewer (if not already displayed).

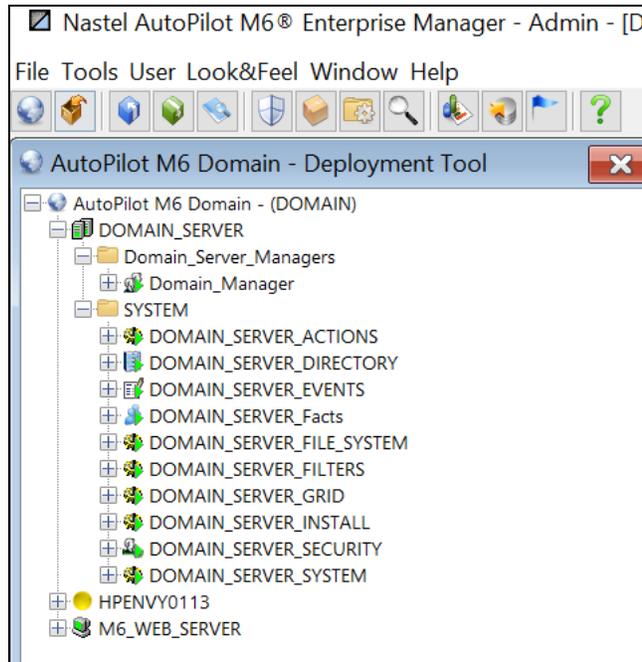


Figure 4-1. Deployment Tool and Networked Nodes

3. Right-click the AutoPilot managed node (CEP server), for example HPENVY013 in Figure 4-2, to monitor message flow.
4. Click **Deploy Expert** > **IIB Monitor** > **IIB Monitor** to open the *Create IIB Monitor* configuration screens.

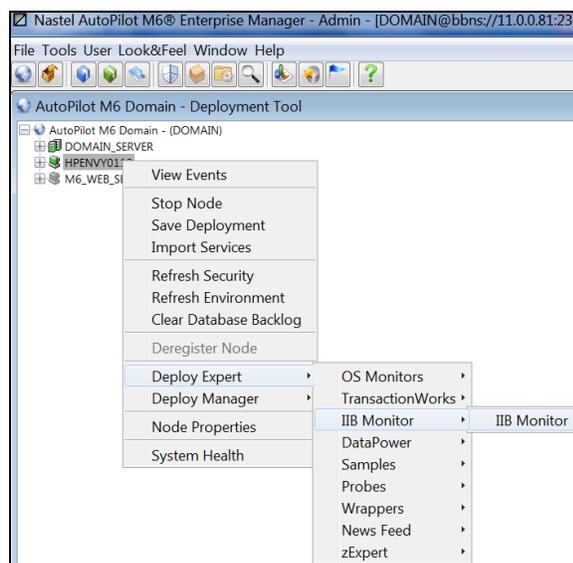


Figure 4-2. Deploy IIB Statistics Expert

5. On the **IBM MQ** tab, complete the input fields as described below. This is required to setup connection to the WebSphere MQ queue manager.

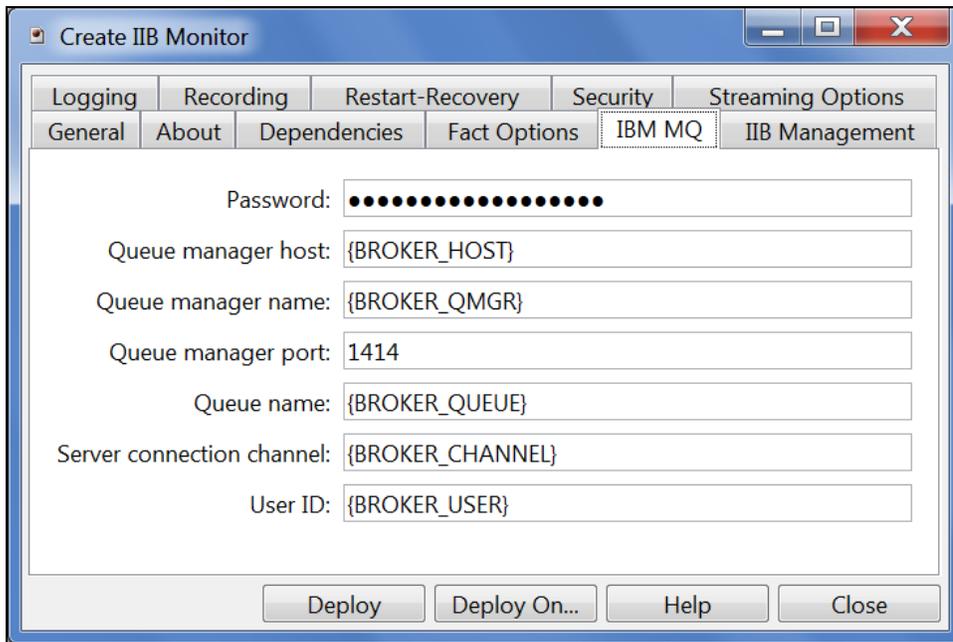


Figure 4-3. Create IIB Monitor – IBM MQ Tab

Table 4-1. IIB Monitor – IIB MQ Properties	
Property	Description
Password	User password passed to the queue manager on connect.
Queue manager host	Queue manager host
Queue manager name	Name of the queue manager to read IIB statistics messages from (WebSphere MQ server connection).
Queue manager port	Queue manager port.
Queue name	Name of the queue to read IIB statistics messages from.
Server connection channel	Name of server connection channel.
User ID	User ID passed to queue manager for user authentication, if required, for statistics and resource data collection. Note: The broker status request is issued with the user ID of the CEP server and uses the IBM Integration API, also known as the Configuration Manager Proxy, or CMP, and sometimes referred to as the IBM Integration Bus Java API.

- On *General* screen, change the **Name** and **Brief description** to reflect the IIB Monitor Expert functionality.

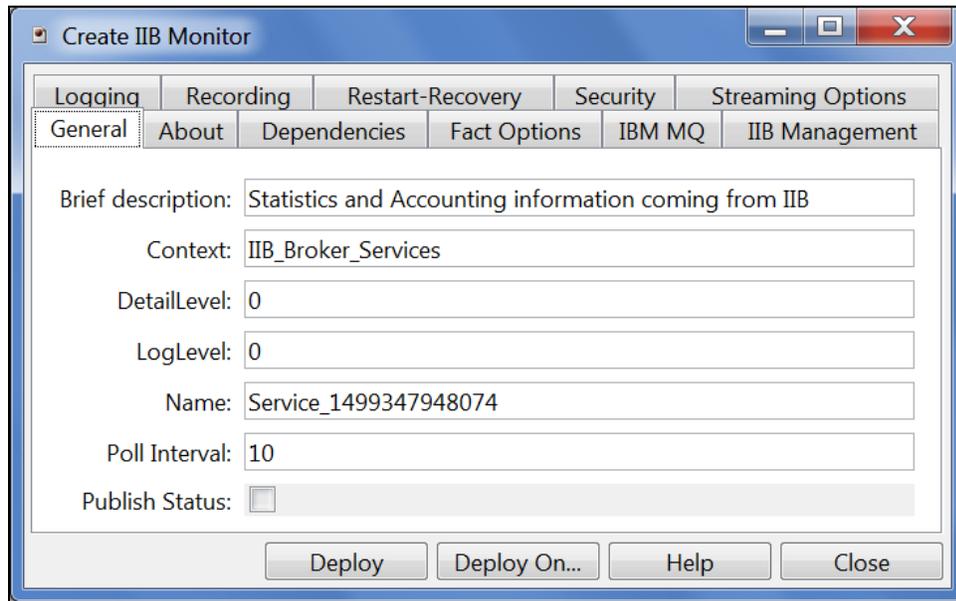


Figure 4-4. Create IIB Monitor – General Tab

- The following properties are available for the IIB Monitor expert. Review (if updating existing Expert) or configure data elements as follows:

	NOTE:	Dependencies are reserved. Leave blank unless required. Dependencies are comma delimited lists of services within a Managed Node. The lists must be available to the specified service prior to loading. The sequence of service loading is determined by the list.
---	--------------	---

Table 4-2. IIB Monitor – General Properties	
Property	Description
Brief description	Short description of the service.
Context	User defined category that will be registered in the Domain Server. Context is displayed as folder icon under each Managed Node.
DetailLevel	Detail level for message flow statistics collection: 0 only message flow statistics 1 message flow statistics + thread statistics 2 message flow statistics + thread statistics + node statistics 3 message flow statistics + thread statistics + node statistics + terminal statistics
LogLevel	Specifies the logging level - 0 in production - 1 in debug situation
Name	Name that uniquely identifies the service in the Domain Server. Enter or modify the Service Name as required, or in accordance with local guidelines. Variations of names are used when deploying services on multiple Nodes. No spaces or blanks are recommended in Service Name formats. For example IIB_Monitor.
Poll Interval	Interval in seconds to poll the message queue.
Publish Status	Include status data in published metrics (requires integration API).

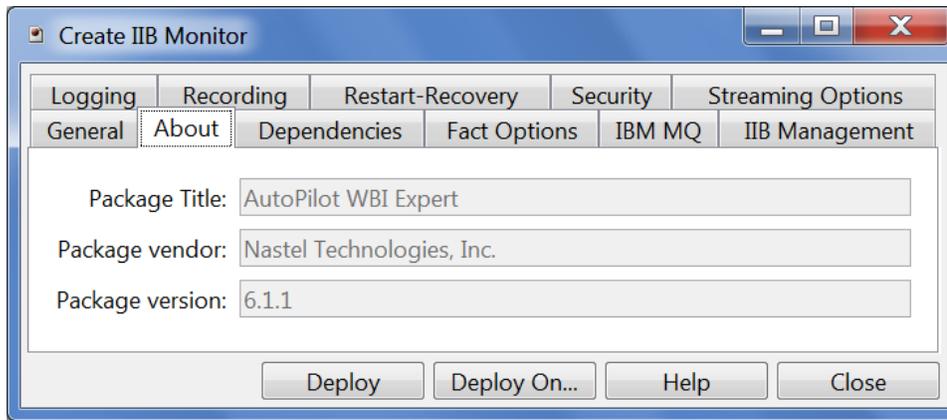


Figure 4-5. Create IIB Monitor – About Tab

Table 4-3. IIB Monitor – About Properties

Property	Description
Package Title	Implementation title of source package.
Package vendor	Name of implementation vendor.
Package version	Package version as assigned by the vendor.

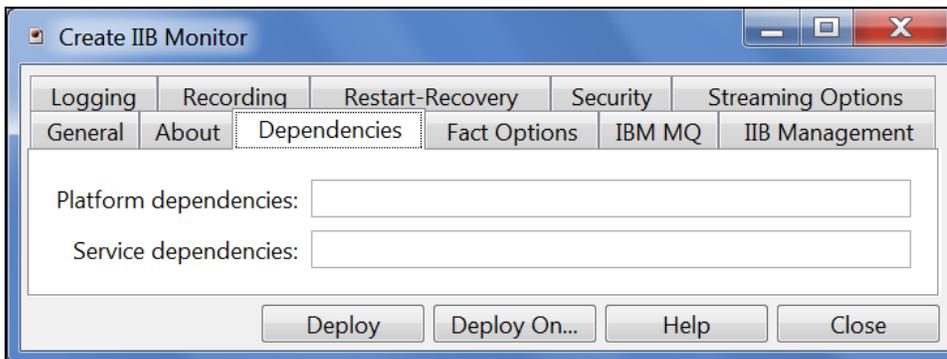


Figure 4-6. Create IIB Monitor – Dependencies Tab

Table 4-4. IIB Monitor – Dependencies Properties

Property	Description
Platform dependencies	Comma separated list of operating system platforms this expert is dependent on.
Service Dependencies	Comma separated list of services this expert is dependent on.

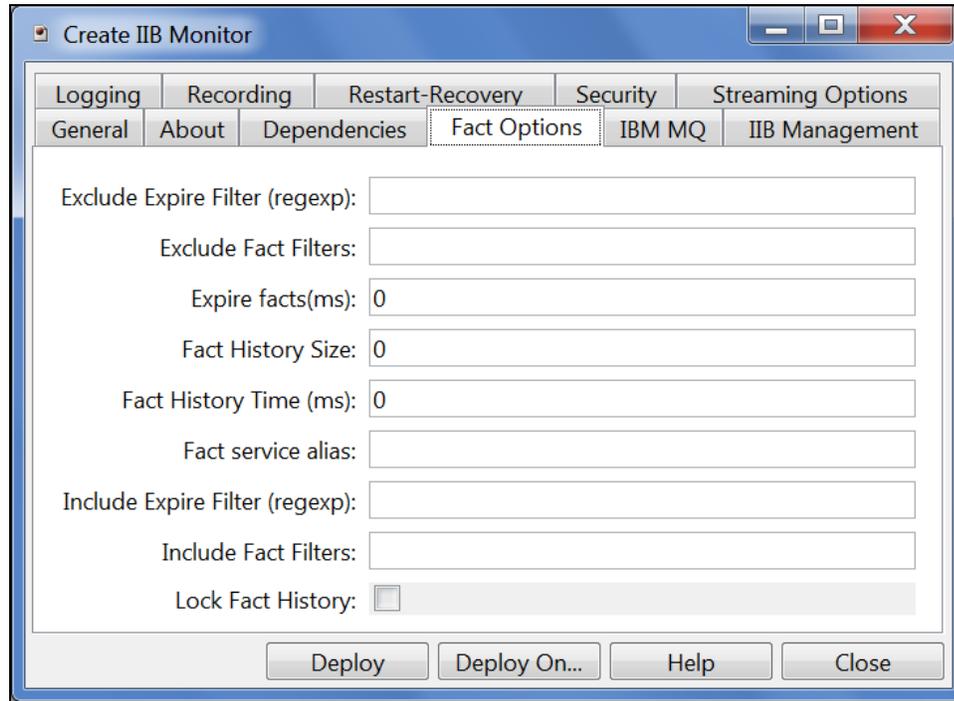


Figure 4-7. Create IIB Monitor – Fact Options Tab

Table 4-5. IIB Monitor – Fact Options Properties	
Property	Description
Exclude Expire Filter (regex)	Facts that match the specified regular expression are not expired.
Exclude Fact Filters	Comma separated list of fact paths to exclude during publishing. For example: *SYSTEM*, *FactName*
Expire facts(ms)	User-defined time in which facts that have not been updated within a specific time automatically expire (in milliseconds). The default is 0, which means never expire. However, in most applications, 0 should not be used. In cases where certain data is no longer published, if 0 is used, these facts will never expire. It is recommended that this value be 50% larger than the sample rate.
Fact History Size	Automatically maintains the specified number of samples for each published fact in memory.
Fact History Time	Automatically maintain fact history not exceeding specified time in milliseconds.
Include Fact Filters	Comma separated list of fact paths to include during publishing. For example: *SYSTEM*, *FactName*
Fact service alias	If supported by the expert, specifies the alternative service name that the expert will publish its facts under.
Include Expire Filter (regex)	Facts that match the specified regular expression are expired.
Lock Fact History	Enables/disables history collection after accumulating the first history batch up to Fact History Time or Fact History Size which ever limit is reached first. If disabled newer history samples replace older on a rolling basis.

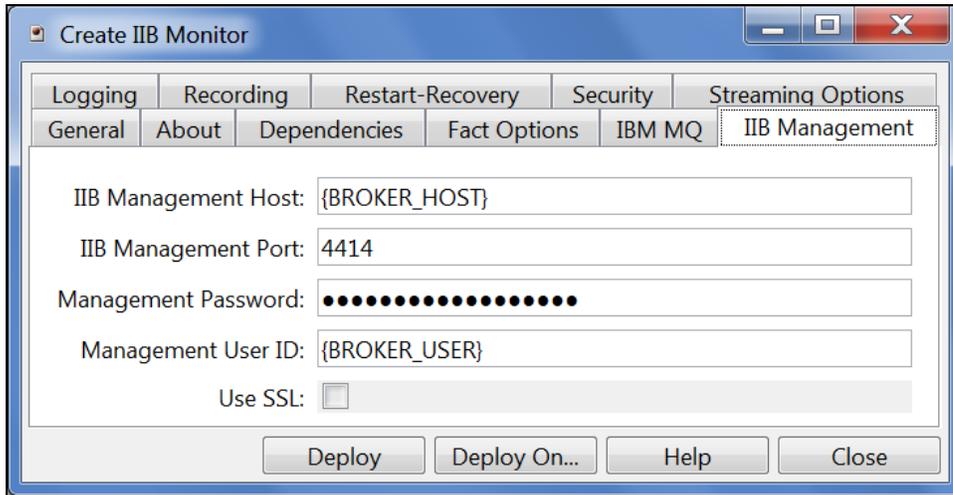


Figure 4-8. Create IIB Monitor – IIB Management Tab

Table 4-6. IIB Monitor – IIB Management Properties

Property	Description
IIB Management Host	Host name for the IIB management server.
IIB Management Port	Listener port for the IIB management server.
Management Password	Password used when connecting to the IIB management server.
Management User ID	User ID used when connecting to the IIB management server.
Use SSL	Use SSL when connecting to the IIB management server.

	NOTE:	<p>This tab is used to configure broker status requests. The status collection is dependent on the broker Integration API version and the broker version. Broker version 10 and higher uses an HTTP protocol for the API transport layer and is not dependent on presence of MQ. Because of that, the Integration API version 10 and later transparently converts client application MQ API calls to HTTP calls. Lower version brokers, such as 8 and 9, are MQ dependent and the associated Integration API does not change MQ API calls. If the AutoPilot CEP node has Integration API v10 installed and you are using a V8 or V9 broker which does not use HTTP, then the broker status requests from the IIB Expert on the CEP node will fail. (Refer to section 2.1.)</p>
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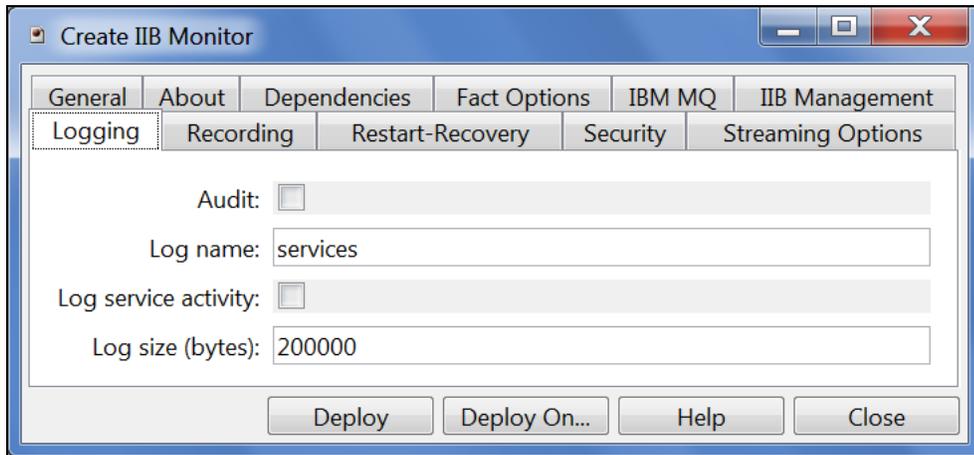


Figure 4-9. Create IIB Monitor –Logging Tab

Table 4-7. IIB Monitor – Logging Properties	
Property	Description
Audit	Enable/Disable service audit trace. Default is disabled.
Log Name	Log name associated with the service. The default name is Services, but may be changed as required. (Example: Task_Progress_Process_Log)
Log service activity	Enable/Disable service activity trace. Default is disabled.
Log size (bytes)	Log size in bytes. Real log size is the maximum value of the server.log.size and logsize.

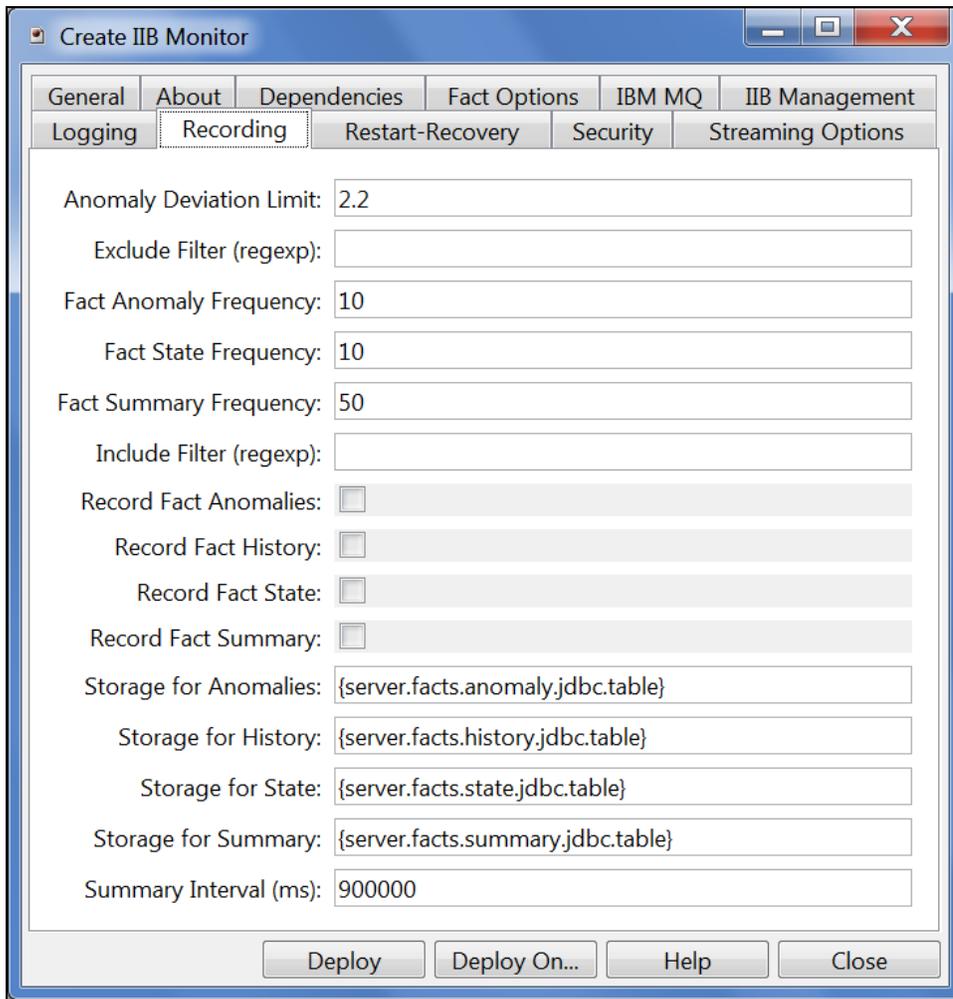


Figure 4-10. Create IIB Monitor – Recording Tab

Table 4-8. IIB Monitor – Recording Properties

Property	Description
Anomaly Deviation Limit	The number of standard deviations from the mean at which the value is considered an anomaly. For example, a value of 2.2 is 2.2 standard deviations. Requires fact recording to be configured (although not actually recording).
Exclude Filter (regexp)	A regular expression filter to exclude certain facts from being written to the database. Facts have the format <code>expert\class\instance\leaf=value</code> such as in the example <code>Servers\Linux\Serv7\processes=40</code> .
Fact Anomaly Frequency	The frequency of fact updates at which anomaly calculation is done. A value of 10 indicates every 10 th sample. A value of 1 would analyze every fact update to determine if it was an anomaly.
Fact State Frequency	If Record Fact State is enabled, the value entered here specifies how often the Fact State is updated.
Fact Summary Frequency	If Record Fact Summary is enabled, used to write an intermediate summary record every X th update to the fact during the Summary Interval. In this example, every 50 th update to the fact an intermediate summary record is recorded. This is done to avoid waiting 15 minutes for a summary record to appear in the summary table.
Include Filter (regexp)	A regular expression filter to include certain facts being written to the database. Same format as described for the exclude filter.

Table 4-8. IIB Monitor – Recording Properties	
Property	Description
Record Fact Anomalies	If enabled, records every fact anomaly into the Anomaly database. The exclude/include filters are respected. Requires fact recording to be configured (although not actually recording).
Record Fact History	If enabled, records every fact change into the History database. The exclude/include filters are respected. To define database tables and set AutoPilot options, refer to <i>AutoPilot M6 User's Guide with Service Update 8</i> , section 4.5.4.1.
Record Fact State	If enabled, records the last value published (current state) into the state database and restores that value when the CEP Server is stopped and restarted. The exclude/include filters are respected. To define database tables and set AutoPilot options, refer to <i>AutoPilot M6 User's Guide</i> , section 4.5.4.1.
Record Fact Summary	If enabled, records summary record at the interval designated in the Summary Interval (ms) field into the Summary database. The exclude/include filters are respected. To define database tables and set AutoPilot options, refer to <i>AutoPilot M6 User's Guide</i> , section 4.5.4.1.
Storage for Anomalies	Database table where the Fact Anomalies data is stored.
Storage for History	Database table where the Fact History data is stored.
Storage for State	Database table where the Fact State data is stored.
Storage for Summary	Database table where the Fact Summary data is stored.
Summary Interval (ms)	If Record Fact Summary is enabled, designates the interval of time in ms for which baseline numbers for each numeric fact are computed. Summary Interval is only in affect when CEP instance is running in record mode (ATPNODE –record). Default 900000 is 15 minutes, which means maintain a baseline of statistics for each numeric fact for a period of 15 minutes and write a record to the database. At the end of interval fact statistics is reset and the baseline collection starts again.

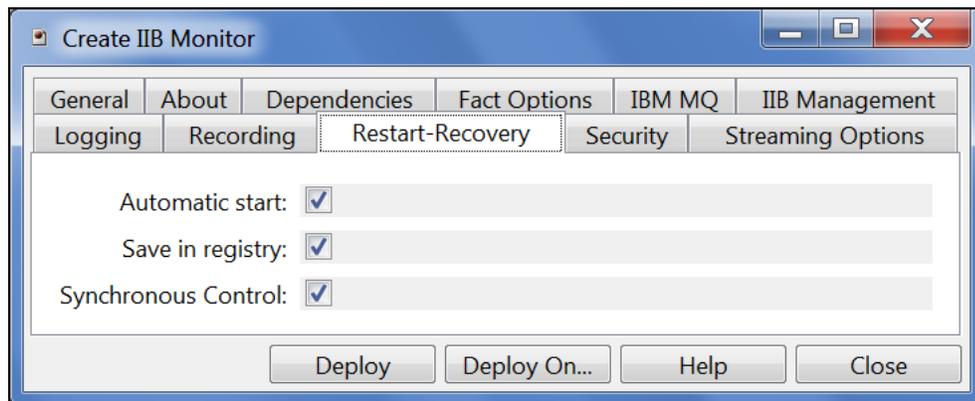


Figure 4-11. Create IIB Monitor – Restart-Recovery Tab

Table 4-9. IIB Monitor – Restart-Recovery Properties	
Property	Description
Automatic Start	Enable/disable automatic start.
Save in Registry	Persistent services are saved in Registry.xml file. Default is enabled.
Synchronous Control	Enable/Disable synchronous service initiation.

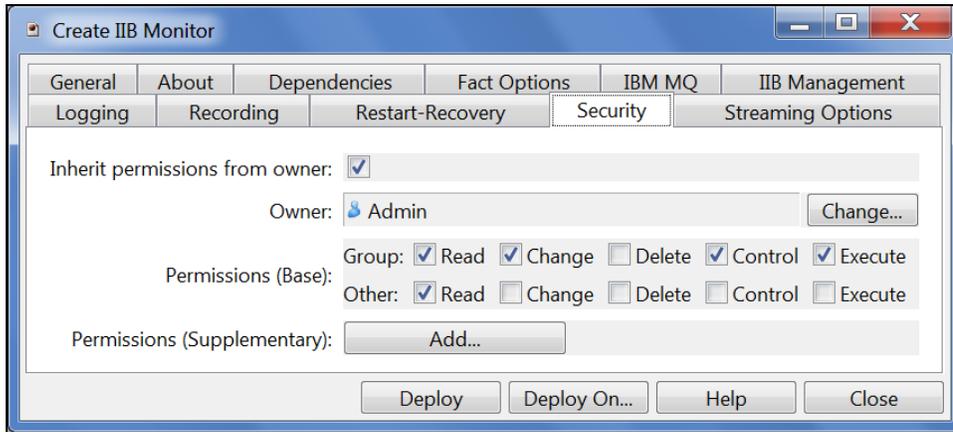


Figure 4-12. Create IIB Monitor – Security Tab

Table 4-10. IIB Monitor – Security Properties

Property	Description	
Inherit Permission from Owner	Enable/disable inherit permission from owner’s permission masks. Default is enabled.	
Owner	User that owns the object.	
Permissions (Base)	Permissions for users in the same group and users in other groups. Enable/disable as required.	
	Group:	Others:
Read	Group members may read/view attributes of an object.	Other users may read/view attributes of an object.
Change	Group members may change the attributes of an object.	Other users may change the attributes of an object.
Delete	Group members may delete the object.	Other users may delete the object.
Control	Group members may execute control actions such as start, stop, and disable.	Other users may execute control actions such as start, stop, and disable.
Execute	Group members may execute operational commands on the object.	Other users may execute operational commands on the object.
Permissions (Supplementary)	Adds additional users and groups.	

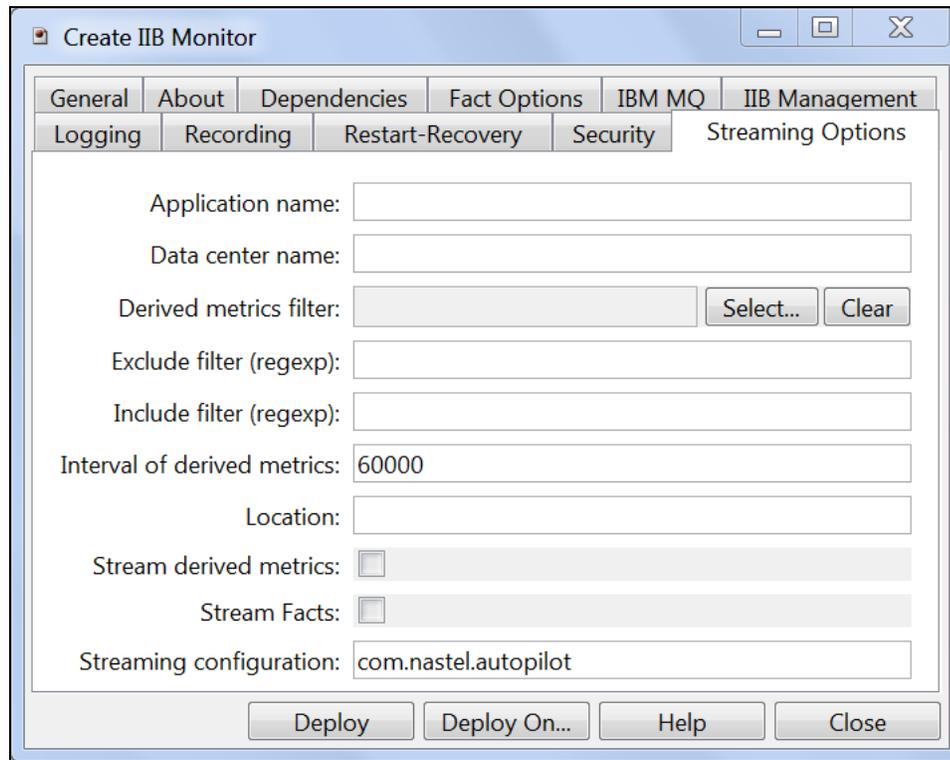


Figure 4-13. Create IIB Monitor – Streaming Options Tab

Table 4-11. IIB Monitor – Streaming Options Properties	
Property	Description
Application name	Application name
Data center name	Data center name
Derived metrics filter	Click Select to select an existing filter or create a new one.
Exclude filter (regex)	Ignore facts that match specified regular expression; that is, do not stream facts that match the regex.
Include filter (regex)	Only stream the facts that match specified regular expression.
Interval of derived metrics	Time interval, in milliseconds, to send fact derived metrics.
Location	Sets server location if different from the default.
Stream derived metrics	Enable/disable derived metrics streaming.
Stream Facts	Enable/disable fact streaming.
Streaming configuration	Indicates where the data streams. The default is com.nastel.autopilot .

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Chapter 5: AP/IIB Statistics Expert Metrics

This section describes the AP/IIB Statistics Expert metrics collected by the expert coming from the IIB statistics messages. They are published as facts and are available under each expert. Once published, these facts can be included in one or more AutoPilot Business views for validation, automation, notifications, logging and alerts. The specific facts may vary slightly by version of broker and options selected during configuration.

5.1 Message Flow Statistics Facts

Each message flow produces a set of statistics, which are published by AutoPilot as the following facts:

Table 5-1. Message Flow Statistics Facts	
Property	Description
AccountingOrigin	Accounting origin
BrokerLabel	Broker name
BrokerUUID	Broker universal unique identifier
CPUTimeWaitingForInputMessage	Total CPU time spent waiting for input messages in microseconds
ElapsedTimeWaitingForInputMessage	Total elapsed time spent waiting for input messages in microseconds
EndDate	Interval end date
EndTime	Interval end time
ExecutionGroupName	Execution group name
ExecutionGroupUUID	Execution group universal unique identifier
MaximumCPUTime	Maximum CPU time spent processing an input message in microseconds
MaximumElapsedTime	Maximum elapsed time spent processing an input message in microseconds
MaximumSizeOfInputMessages	Maximum input message size in bytes
MessageFlowName	Message flow name
MinimumCPUTime	Minimum CPU time spent processing an input message in microseconds
MinimumElapsedTime	Minimum elapsed time spent processing an input message in microseconds
MinimumSizeOfInputMessages	Minimum message input size in bytes
NumberOfThreadsInPool	Number of threads in pool
StartDate	Interval start date
StartTime	Interval start time
TimesMaximumNumberOfThreadsReached	Number of times the maximum number of threads is reached
TotalCPUTime	Total CPU time spent processing input messages in microseconds
TotalElapsedTime	Total elapsed time spent processing input messages in microseconds
TotalInputMessages	Total number of messages processed

Table 5-1. Message Flow Statistics Facts	
Property	Description
TotalNumberOfBackouts	Number of transaction backouts
TotalNumberOfCommits	Number of transaction commits
TotalNumberOfErrorsProcessingMessages	Number of errors processing a message
TotalNumberOfMessagesWithErrors	Number of messages that contain errors
TotalNumberOfMQErrors	Number of MQGET errors (MQInput node)
TotalNumberOfTimeOutsWaitingForRepliesToAggregateMessages	Number of timeouts processing a message (AggregateReply node only)
TotalSizeOfInputMessages	Total size of input messages in bytes

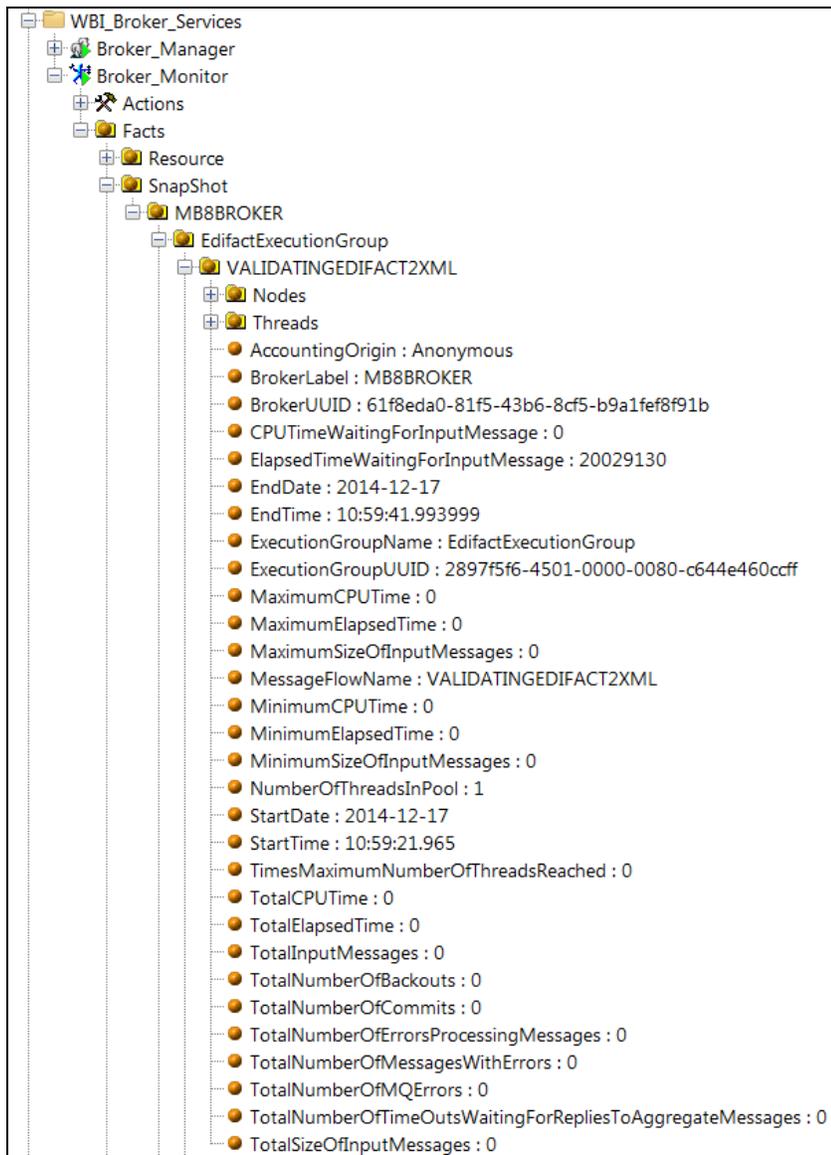


Figure 5-1. Message Flow Statistics Facts

5.2 Thread Statistics Facts

The thread statistics are disabled by default in the IIB Statistics Expert. To include the thread statistics, the Parameter DetailLevel in the General tab has to be set to the integer value “2” (without quotation marks). Each set of thread statistics for a message flow result in publishing the following facts:

Property	Description
CPUTimeWaitingForInputMessage	Total CPU time spent waiting for input messages in microseconds.
ElapsedTimeWaitingForInputMessage	Total elapsed time spent waiting for input messages in microseconds.
MaximumSizeOfInputMessages	Maximum size of input messages in bytes.
MinimumSizeOfInputMessages	Minimum size of input messages in bytes.
Number	Relative thread number in pool.
TotalCPUTime	Total CPU time spent processing input messages in microseconds.
TotalElapsedTime	Total elapsed time spent processing input messages in microseconds.
TotalSizeOfOutputMessages	Total size of output messages in bytes.
TotalNumberOfInputMessages	Total number of messages processed by thread.

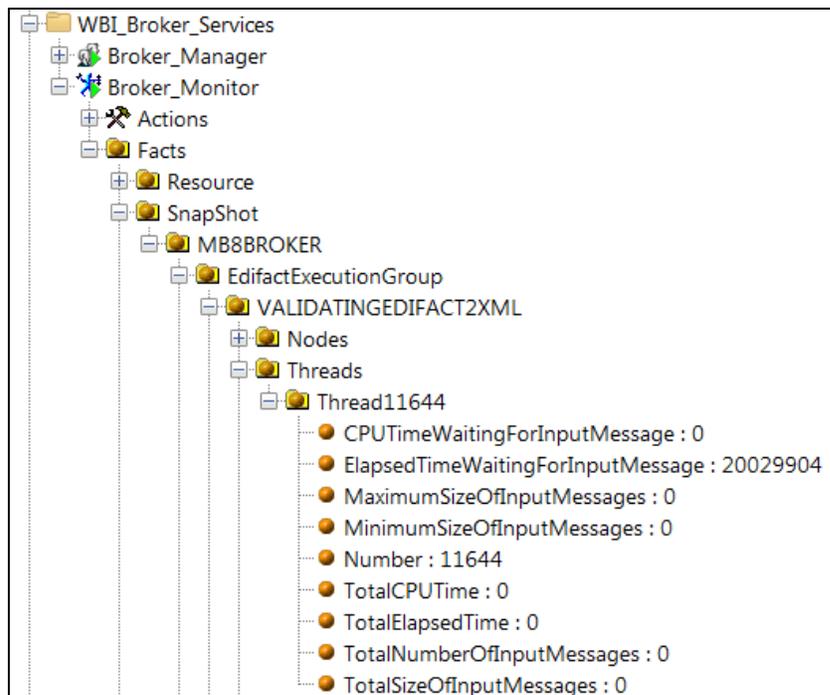


Figure 5-2. Thread Statistics Facts

5.3 Node Statistics Facts

An IIB message flow node is a processing step in a message flow. It can be a built-in node, a user-defined node, or a subflow node. A message flow node receives a message, performs a set of actions against the message, and optionally passes the original message, and none or more other messages, to the next node in the message flow. There are many message flow node types, including WebSphere MQ (e.g., MQInput, MQOutput, MQReply, MQGet), Web Services (e.g., SOAPInput, SOAPInput), Transformation (e.g., Compute, Mapping), Routing, Database, and Java, File.

The node statistics are disabled by default in the IIB Statistics Expert. To include the node statistics, the parameter DetailLevel in the General tab has to be set to the integer value “1” (without quotation marks). Each set of node statistics for a message flow result in the publishing of the following facts:

Property	Description
CountOfInvocations	Total number of messages processed by this node
Label	Name of node (Label)
MaximumCPUTime	Maximum CPU time spent processing input messages in microseconds
MaximumElapsedTime	Maximum elapsed time spent processing input messages in microseconds
MinimumCPUTime	Minimum CPU time spent processing input messages in microseconds
MinimumElapsedTime	Minimum elapsed time spent processing input messages in microseconds
NumberOfInputTerminals	Number of input terminals
NumberOfOutputTerminals	Number of output terminals
TotalCPUTime	Total CPU time spent processing input messages in microseconds
TotalElapsedTime	Total elapsed time spent processing input messages in microseconds
Type	Type of node

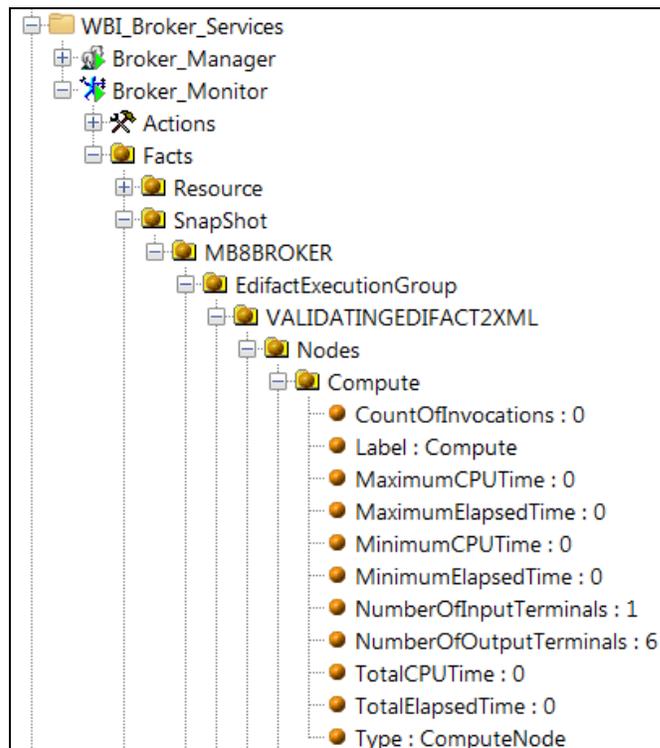


Figure 5-3. Node Statistics Facts

5.4 Terminal Statistics Facts

The terminal statistics are disabled by default in the IIB Statistics Expert. To include the terminal statistics, the parameter DetailLevel in the General tab has to be set to the integer value “3” (without quotation marks). Terminals refer to the input and output terminals or connector points on the input and output side of a message flow processing box, like wiring connection points for chips on a printed circuit board. Each terminal on a message flow node, results in a set of statistics being published as the following facts:

Table 5-4. Terminal Statistics Published Facts	
Property	Description
CountOfInvocations	Number of times that a message is propagated through this terminal
Label	Terminal name (e.g., failure, in, out1)
Type	Terminal type (input or output)

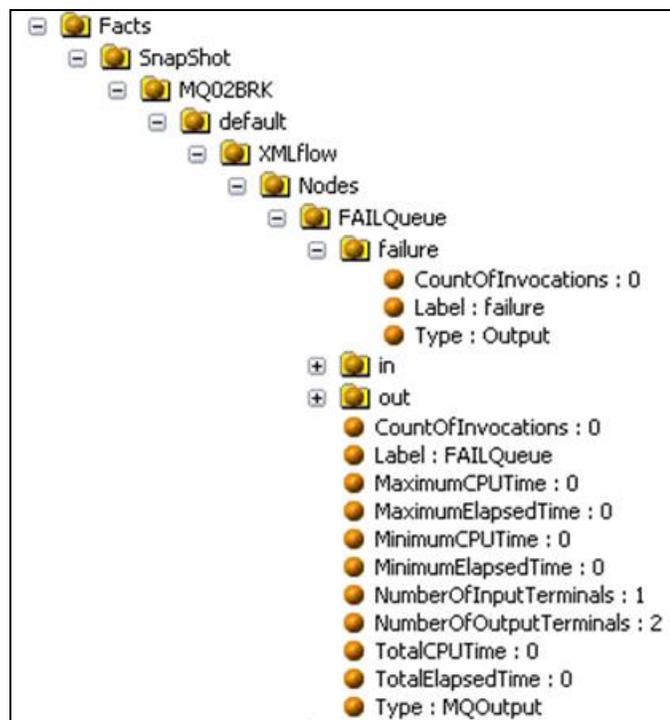


Figure 5-4. Terminal Statistics Facts

5.5 Status Published Facts

Each status statistic publishes the following facts. Drill down to view additional status facts for items in the tree.

	<p>NOTE:</p>	<p>The status collection is dependent on the broker Integration API version and the broker version. Broker version 10 and higher uses an HTTP protocol for the API transport layer and is not dependent on presence of MQ. Because of that, the Integration API version 10 and later transparently converts client application MQ API calls to HTTP calls. Lower version brokers, such as 8 and 9, are MQ dependent and the associated Integration API does not change MQ API calls. If the AutoPilot CEP node has Integration API v10 installed and you are using a V8 or V9 broker which does not use HTTP, then the broker status requests from the broker status requests from the IIB Expert on the CEP node will fail. (Refer to section 2.1.)</p>
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Property	Description
broker_name	Name of the broker.
broker_status	State of the broker.
build	The internal build identifier for the broker.
desc	The description assigned to the broker at creation.
mode	The execution options in effect for the broker.
osarch	Type of OS architecture.
osname	Name of operating system.
version	Version of the broker.

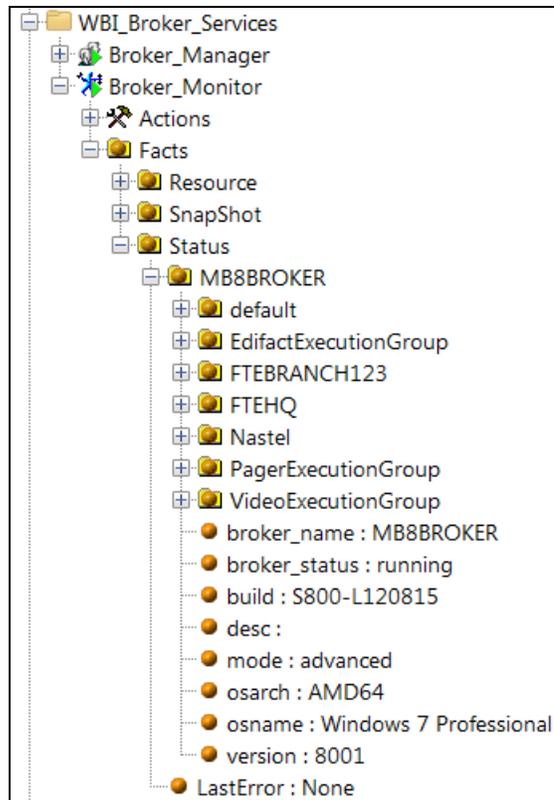


Figure 5-5. Status Published Facts

5.6 Resource Published Facts

Each resource statistic publishes the following facts. Drill down to view additional resource info for items in the tree (CICS, etc.).

Table 5-6. Resource Published Facts	
Property	Description
brokerLabel	The broker name.
brokerUUID	The broker unique identifier.
collectionStartDate	The start date of the collection interval.
collectionStartTime	The start time of the collection interval.
endDate	The end date of the collection interval.
endTime	The end time of the collection interval.
executionGroupName	The execution group name.
executionGroupUUID	The execution group unique identifier.
StartDate	The date the execution group was last started.
StartTime	The time the execution group was last started
timezone	The time zone of the collection interval.

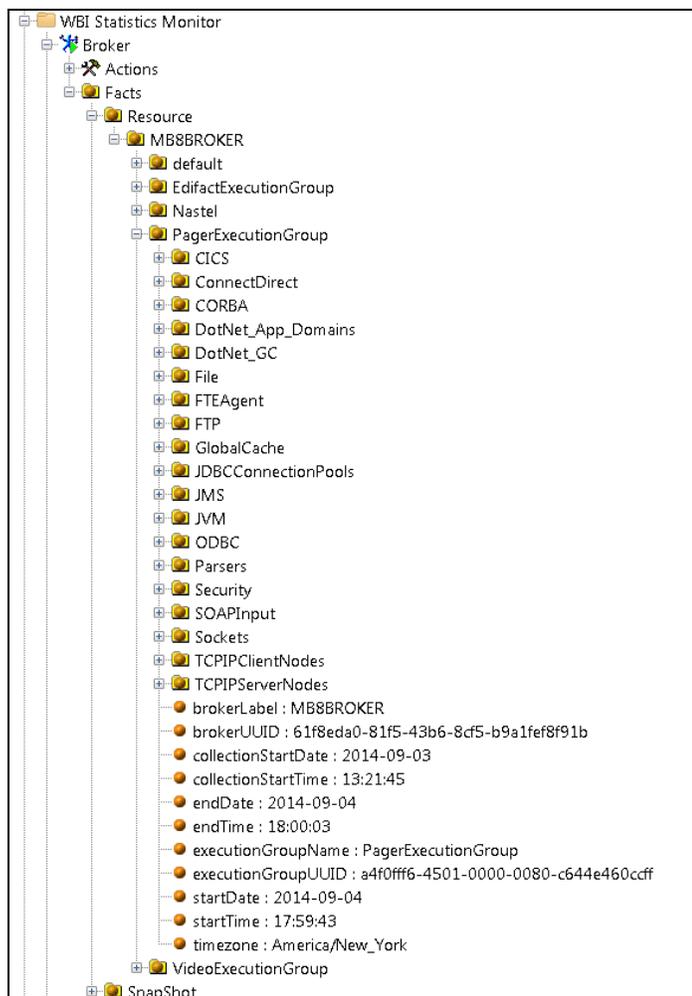


Figure 5-6. Resource Published Facts

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Appendix A: References

A.1 Nastel Documentation

Document Number (or higher)	Title
M6/INS 623.001	<i>AutoPilot M6 Installation Guide</i>
M6/USR 624.001	<i>AutoPilot M6 User's Guide</i>
M6WMQ 600.003	<i>AutoPilot M6 Plug-in for WebSphere MQ</i>
M6WMQ/ADM 658.001	<i>AutoPilot M6 for WebSphere MQ Administrator's Guide</i>
M6WMQ/INS 658.001	<i>AutoPilot M6 for WebSphere MQ Installation Guide</i>
M6/OSM 600.002	<i>AutoPilot M6 Operating System Monitors Installation and User's Guide</i>
AP/TEMS 110.003	<i>AutoPilot Plug-in for TIBCO EMS</i>
AP/OR 100.005	<i>AutoPilot/Oracle Plug-in Guide</i>
AP/IT JMX 430.001	<i>AutoPilot/JMX Plug-in Guide</i>

A.2 IBM Documentation

SC33-1872 WebSphere MQ Intercommunications

SC33-1369 WebSphere MQ MQSC Command Reference

SC34-5456 WebSphere MQ Using Java

http://www-947.ibm.com/support/entry/portal/documentation_expanded_list/websphere/websphere_message_broker?productContext=-2089662493

<http://www.ibm.com/software/ts/mqseries/support/summary/javasupp.html>

<http://www-03.ibm.com/software/products/en/ibm-integration-bus>

<http://www.eclipse.org>

http://www-01.ibm.com/support/knowledgecenter/SSKM8N/mapfiles/product_welcome.html

<ftp://ftp.software.ibm.com/software/integration/wbibrokers/docs>

A.3 Java™

<http://www.oracle.com/technetwork/java/javase/tech/javamanagement-140525.html>

<http://www8.hp.com/us/en/products/servers/hp-ux.html#.VItJNmx0yos>

<http://www.oracle.com/technetwork/java/index.html>

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Appendix B: Conventions

B.1 Typographical Conventions

Convention	Description
Blue/Underlined	Used to identify links to referenced material or websites. Example: support@nastel.com
Bold Print	Used to identify topical headings, glossary entries, and to identify toggle or buttons used in procedural steps. Example: Click EXIT .
<i>Italic Print</i>	Used to place emphasis on a title, menu, screen name, or other categories.
Monospaced Bold	Used to identify keystrokes/data entries, file names, directory name etc.
<i>Monospaced italic</i>	Used to identify variables in an address location. Example: [C:\AutoPilot_Home]\documents. Where the portion of the address in the brackets [] is variable.
Monospaced Text	Used to identify addresses, commands, scripts etc.
Normal Text	Typically used for general text throughout the document.
Table Text	Table text is generally a smaller size to conserve space. 10, 9, and 8 point type is used in tables throughout the AutoPilot product family of documents

B.2 Naming Conventions

Naming conventions have been adjusted to accommodate IBM's re-naming of MQSeries products to WebSphere MQ.

Nastel has adapted AutoPilot products to reflect IBM's product naming changes. In the redesign of AutoPilot, we have also better defined many elements within the AutoPilot product line.

Old Name	New Name
AutoPilot/MQSI	AutoPilot for WebSphere MQI
MQSeries Plug-in for AutoPilot	WebSphere MQ Plug-in for AutoPilot
MQControl	AutoPilot for WebSphere MQ
MQSeries	WebSphere MQ (IBM)

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Glossary

Application: A logical collection of software components that perform a business function, running on a specific server.

AutoPilot M6: Nastel Technologies' Enterprise Application Management Platform. AutoPilot M6 is designed to monitor and control distributed IT services such as application servers, middleware, user applications, workflow engines, brokers, Service Oriented Architecture (SOA) and Enterprise Service Bus (ESB) based applications and their impact on business services.

AutoPilot M6 for WMQ: Nastel Technologies' WebSphere MQ management solution. Re-designated as M6 for WMQ with release 6.0, prior releases retain the AP-WMQ or MQControl trademark.

AutoPilot M6 Web: AutoPilot M6 Web is a browser-based interface that provides monitoring and operational control over managed resources and applications. It allows users to monitor health, recover from a failure, view historical performance graphs and visualize impacts of a failure.

AutoPilot M6/WebSphere Message Queue Integrator (AP/WMQI): Formerly AP/MQSI

AutoPilot/Message Tracking (AP/MT): Nastel's AutoPilot/Message Tracking plug-in that enables AutoPilot/IT to intercept message exits and forward the statistical data to an AutoPilot expert.

AutoPilot TransactionWorks (AP/TW): Nastel Technologies' transaction and application performance monitoring product.

AutoPilot/WebSphere (AP/WS): AutoPilot/WebSphere plug-in enables AutoPilot to monitor and manage eBusiness applications for continuous operations in addition to its standard features.

BCI: *See* Byte Code Instrumentation

Binary Large Object (BLOB): A collection of binary data stored as a single entity in a database management system. Blobs are typically images, audio or other multimedia objects, though sometimes binary executable code is stored as a blob. Database support for blobs is not universal.

BLOB: *See* Binary Large Object.

BSV: *See* Business View.

Business Transaction: A collection of related transactions that comprise a user-defined business function (e.g. purchase a book, return merchandise, purchase stock). Each of the business activities may be comprised of various workloads.

Business View (BSV): A collection of rules that define a desired state of an eBusiness environment. Business Views can be tailored to present information in the form most suited to a given user, as defined by the user.

Byte Code Instrumentation (BCI): The process of adding small portions of Java byte code around methods of a Java class. The added code performs tasks such as time spent or CPU utilization within the monitored class.

CEP (Complex Event Processing) Server: A container that can host any number of AutoPilot services such as experts, managers, policies, etc. (Called managed node prior to AutoPilot M6 Service Update 6.)

Client: Any programming component that uses the AutoPilot infrastructure; for example, the AutoPilot Console.

Common Object Request Broker Architecture (CORBA): A standard defined by the Object Management Group that enables software components written in multiple computer languages and running on multiple computers to work together. It can be invoked from a Web browser using CGI scripts or applets.

Composite Application: A collection of applications that collaborate or communicate with each other (have related sessions).

Console: The console acts as the graphical interface for AutoPilot.

Contacts: A subordinate to a given Manager or Expert.

CORBA: *See* Common Object Request Broker Architecture.

Data Source Name (DSN): The logical name that is used by Open Database Connectivity (ODBC) to refer to the drive and other information that is required to access data. The name is used by Internet Information Services (IIS) for a connection to an ODBC data source, (Example: Microsoft SQL Server database). The ODBC tool in Control Panel is used to set the DSN. When ODBC DSN entries are used to store the connection string values externally, you simplify the information that is needed in the connection string. This makes changes to the data source completely transparent to the code itself.

Data Space: A range of up to two gigabytes of contiguous virtual storage addresses that a program can directly manipulate. Unlike an address space, a data space can hold only data; it does not contain common areas or system data or programs.

Decision Support System (DSS): An AutoPilot-based service designed to monitor, store, and display any event information generated by AutoPilot enabled middleware and applications.

Deploy: To put to use, to position for use or action.

Domain Server: A specialized managed node that maintains the directory of managed nodes, experts etc. The domain server is also capable of hosting experts, managers etc

DSN: *See* Data Source Name.

DSS: *See* Decision Support System.

Event: An *Event* is something that happens to an object. Events are logged by AutoPilot and are available for use by AutoPilot Policies or the user.

EVT: Event Log file extension (for example: `sample.evt`).

Expert: Services that monitor specific applications such as an applications server, Web server or specific components within the applications (example, channels in MQSeries). Experts generate facts.

Fact: Single pieces of data that has a unique name and value. One or more facts are used to determine the health of the object, application or server.

Graphical User Interface (GUI): A type of environment that represents programs, files, and options by means of icons, menus, and dialog boxes on the screen. The user can select and activate these options by pointing and clicking with a mouse or, often, with the keyboard. Because the graphical user interface provides standard software routines to handle these elements and report the user's actions (such as a mouse click on a particular icon or at a particular location in text, or a key press); applications call these routines with specific parameters rather than attempting to reproduce them from scratch.

GUI: *See* Graphical User Interface.

HAQS: *See* High Availability Queuing Service.

Heap: In Java programming, a block of memory that the Java virtual machine uses at run time to store Java objects. Java heap memory is managed by a garbage collector, which automatically de-allocates Java objects that are no longer in use

High Availability Queuing Service (HAQS): A component of AutoPilot consisting of two policies that provide automatic queue fail-over for WebSphere MQ applications, provide high availability of WebSphere MQ resources such as queues and channels, and ensure automatic recovery of WebSphere MQ channels.

IIS: *See* Internet Information Services.

Independent Software Vendor (ISV): A business term for companies specializing in making or selling software, usually for niche markets.

Initial Program Load (IPL): The process of loading system programs and preparing a system to run applications.

Interactive System Productivity Facility (ISPF): An IBM licensed program that serves as a full-screen editor and dialog manager. Used for writing application programs. It provides a means of generating standard screen panels and interactive dialogues between the application programmer and terminal user.

Internet Information Services (IIS): Microsoft's brand of Web server software, utilizing HTTP to deliver World Wide Web documents. It incorporates various functions for security, allows CGI programs, and also provides for Gopher and FTP services.

IPL: *See* Initial Program Load.

ISPF: *See* Interactive System Productivity Facility.

ISV: *See* Independent Software Vendor.

Java: A platform-independent, object-oriented programming language developed and made available by Sun Microsystems.

Java Database Connectivity (JDBC): Provides universal data access from the Java programming language. Using the JDBC 2.0 API, you can access virtually any data source, from relational databases to spreadsheets and flat files. JDBC technology also provides a common base on which tools and alternate interfaces can be built. The *JDBC Test Tool* that was developed by Merant and Sun Microsystems may be used to test drivers, to demonstrate executing queries and getting results, and to teach programmers about the JDBC API.

Java Developer's Kit (JDK): A set of software tools developed by Sun Microsystems, Inc., for writing Java applets or applications. The kit, which is distributed free, includes a Java compiler, interpreter, debugger, viewer for applets, and documentation.

Java Management Extensions (JMX): An open technology for management and monitoring that can be deployed wherever management and monitoring are needed. By design, this standard is suitable for adapting legacy systems, implementing new management and monitoring solutions and plugging into those of the future.

Java Messaging Service (JMS): a Java Message Oriented Middleware API for sending messages between two or more clients.

Java Platform, Enterprise Edition (Java EE): The industry standard for developing portable, robust, scalable and secure server-side Java applications. Building on the solid foundation of Java SE, Java EE provides Web services, component model, management, and communications APIs that make it the industry standard for implementing enterprise class service-oriented architecture (SOA) and Web 2.0 applications.

Java Naming and Directory Interface (JNDI): Unified interface to multiple naming and directory services for applications based on Java technology.

Java Run-time Environment (JRE): The minimum core Java required to run Java programs.

Java Server Pages (JSP): Technology that enables rapid development of Web-based applications that are platform independent. Java Server Pages technology separates the user interface from content generation enabling designers to change the overall page layout without altering the underlying dynamic content. Java Server Pages technology is an extension of the Java Servlet technology.

Java Virtual Machine (JVM): The “virtual” operating system that Java-written programs run. The JVM is a hardware- and operating system-independent abstract computing machine and execution environment. Java programs execute in the JVM where they are protected from malicious programs and have a small compiled footprint.

JCL: *See* Job Control Language.

JDBC: *See* Java Database Connectivity.

JDK: *See* Java Developer's Kit.

JMS: *See* Java Messaging Service.

JMX: *See* Java Management Extensions.

JNDI: *See* Java Naming and Directory Interface.

Job Control Language (JCL): A control language that is used to identify a job to an operating system and to describe the job's requirements.

JRE: *See* Java Run-time Environment.

JSP: *See* Java Server Pages.

JVM: *See* Java Virtual Machine.

Logical Unit of Work (LUW): A collection of operations and messages within a session that should be considered to be a single unit of work (all or nothing property). These are generally delimited by BEGIN/COMMIT calls.

LUW: *See* Logical Unit of Work.

Managed Node: Containers that are capable of hosting any number of AutoPilot services, such as experts, managers, policies etc.

Manager: Managers are the home or container for policies. All business views must reside on managers, and manager must be deployed prior to deploying a business view or policy.

Message: A physical message being transported through the TPN.

Message-Oriented Middleware (MOM): A category of inter-application communication software that relies on asynchronous message passing as opposed to a request/response metaphor.

Message Queue Interface (MQI): Part of IBM's Networking Blueprint. It is a method of program-to-program communication suitable for connecting independent and potentially non-concurrent distributed applications.

MOM: *See* Message-Oriented Middleware.

MQI: *See* Message Queue Interface.

MQSeries: IBM's message queuing product. Renamed by IBM as WebSphere MQ.

Naming Service: A common server records "names" of objects and associates them with references, locations and properties.

Object Request Broker (ORB): In object-oriented programming, software that serves as an intermediary by transparently enabling objects to exchange requests and responses.

ORB: *See* Object Request Broker.

Orbix: CORBA product distributed by IONA Technologies.

Package Manager: The command line utility that allows users to list, install, uninstall, verify, and update AutoPilot installation on any Managed Node.

PKGMAN: *See* Package Manager Utility included in AutoPilot products.

Policy/Business Views: A collection of one or more sensors. Business views are used to visually present the health and status of the different systems as well as automatically issue remedial actions.

Resource: An entity on which transactions are executed or a medium of exchange. Examples include queue, DB table, file, JMS topic.

Resource Manager: An entity that is managing a collection of resources. Examples include a WMQ Queue Manager, Application Server, Database Server.

Sensor: A rule that is used to determine the health of an object or application based on one or more facts. Actions can then be issued, based on the health.

Server: A physical or virtual node within a TPN that hosts all transaction processing activity.

Service Level Agreement (SLA): A formal written agreement made between two parties: the service provider and the service recipient. The SLA itself defines the basis of understanding between the two parties for delivery of the service itself. The document can be quite complex, and sometimes underpins a formal contract. The contents will vary according to the nature of the service itself, but usually includes a number of core elements, or clauses.

Service-Oriented Architecture (SOA): An evolution of distributed computing and modular programming. SOAs build applications out of software services. Services are relatively large, intrinsically unassociated units of functionality, which have no calls to each other embedded in them. They typically implement functionalities most humans would recognize as a service, such as filling out an online application for an account, viewing an online bank statement, or placing an online book or airline ticket order. Instead of services embedding calls to each other in their source code, protocols are defined which describe how one or more services can talk to each other. This architecture then relies on a business process expert to link and sequence services, in a process known as orchestration, to meet a new or existing business system requirement.

Session: A specific period of execution of an application. Examples include the interval during which a database or queue manager connection is active.

Simple Mail Transfer Protocol (SMTP): A TCP/IP protocol for sending messages from one computer to another on a network. This protocol is used on the Internet to route e-mail. *See also* communications protocol, TCP/IP.

SLA: *See* Service Level Agreement.

SMTP: *See* Simple Mail Transfer Protocol.

SOA: *See* Service-Oriented Architecture.

TCP/IP: *See* Transmission Control Protocol/Internet Protocol.

Time Sharing Option (TSO): An option of the MVS operating system that provides interactive time sharing from remote terminals.

TPN: *See* Transaction Processing Network.

Transaction: A group of activities targeted at achieving a common goal or a task. Collection of related sessions and LUWs.

Transmission Control Protocol/Internet Protocol (TCP/IP): A protocol developed by the Department of Defense for communications between computers. It is built into the UNIX system and has become the de facto standard for data transmission over networks, including the Internet.

Transaction Processing Network (TPN): A collection of servers engaged in transaction processing activity

TSO: *See* Time Sharing Option.

Virtual Machine: Software that mimics the performance of a hardware device, such as a program that allows applications written for an Intel processor to be run on a Motorola chip. *Also see* Java Virtual Machine.

WebLogic: A Java EE compatible application server platform which enables support for multiple programming models, which includes advanced administration tools and is the ideal foundation for Service Oriented Architecture (SOA).

WebSphere MQ: IBM's message queuing product, formally known as MQSeries.

Websphere_MQ_Manager: A specialized manager capable of hosting one or more WebSphere MQ specific policies, apart from the regular policies.

Wireless Application Protocol (WAP): An open global specification that is used by most mobile telephone manufacturers. WAP determines how wireless devices utilize Internet content and other services. WAP enables devices to link diverse systems contents and controls.

Write to Operator (WTO): An optional user-coded service that allows a message to be written to the system console operator informing the operator of errors and unusual system conditions that may need to be corrected.

WTO: *See* Write to Operator.