



Hewlett Packard
Enterprise

HPE IMC APM

SQL Server Application Monitor Configuration Examples

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Development LP

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Introduction

This document provides examples for configuring APM to monitor SQL Server database servers in a data center.

APM can monitor SQL Server 2000 SP4, SQL Server 2005, SQL Server 2008, and SQL Server 2012. This document uses SQL Server 2012 as an example.

Prerequisites

Before you configure APM to monitor SQL Server 2012, complete the following configurations:

- Configure and start SQL Server.
- To obtain traffic data for application monitor reports, install an IMC probe and add the probe to APM.
- To use the SQL Server authentication type, obtain the SQL Server user name and password and make sure the user has administrator privileges.
- To use the Windows authentication type, obtain the Windows user name and password and make sure the user has SQL Server administrator privileges.

Example: Using APM to monitor SQL Server

Network requirements

As shown in [Figure 1](#), a company's data center uses a SQL Server database server to provide database services. The database server administrator intends to monitor SQL Server in APM.

Figure 1 Network diagram

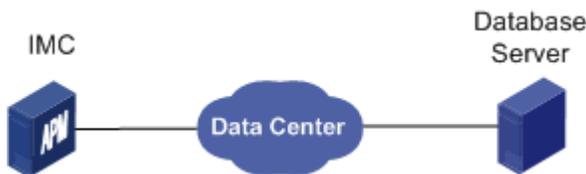


Table 1 Host addresses and software versions

Host	IP address	Software version
IMC	172.4.95.21	<ul style="list-style-type: none">• Windows Server 2008 R2• IMC PLAT 7.2 (E0403)• IMC APM 7.2 (E0401)
Database server	172.4.8.88	<ul style="list-style-type: none">• Windows Server 2012• SQL Server 2012

Adding a SQL Server application monitor

1. Log in to IMC.
2. Click the **Resource** tab.

3. From the navigation tree, select **Application Manager > Add Application**.
4. Click **SQL Server** of the **Database Server Monitor** category.
5. Configure the following monitoring parameters for the SQL Server application monitor on the host, as shown in **Figure 2**:
 - o Enter **172.4.8.88** in the **IP Address** field.
 - o The **Name** field is automatically populated with **MSSQL_172.4.8.88**.
 - o Select **SQL Server authentication** from the **Authentication Type** list.
 - o Enter the user name and password in the **Username** and **Password** fields, respectively.
 - o Use the default settings of other parameters.

Figure 2 Adding an application monitor for SQL Server

Resource > Application Monitor > Add Application > SQL Server

Add Application

IP Address *	<input type="text" value="172.4.8.88"/>	<input type="button" value="Select"/>
Name *	<input type="text" value="MSSQL_172.4.8.88"/>	
Use Template *	<input type="text" value="Disable"/>	
Description	<input type="text"/>	
Application Monitor Port *	<input type="text" value="1433"/>	
Polling Interval (min) *	<input type="text" value="5"/>	
Authentication Type *	<input type="text" value="SQL Server authentication"/>	
Username *	<input type="text" value="sa"/>	
Password *	<input type="password" value="*****"/>	
Instance Name	<input type="text"/>	
Contact *	<input type="text" value="admin"/>	?
APM Server *	<input type="text" value="127.0.0.1(MSSQL:1/20)"/>	
Related Applications	<input type="text"/>	<input type="button" value="Add"/> <input type="button" value="Delete"/>
Application Group	<input type="text"/>	<input type="button" value="Add"/> <input type="button" value="Delete"/> <input type="button" value="Add Application group"/>
Detect Application	<input checked="" type="checkbox"/>	

6. Click **OK**.
- The application monitor named **MSSQL_172.4.8.88** appears on the application monitor list, as shown in **Figure 3**.

Figure 3 Viewing the application monitor list

Resource > Application Monitor ★ Add to My Favorites Help

Query application:

Name	Application Type	Speed(bps)	Traffic(I)	Traffic(O)	Availability	Health	Status	Associate	Restart Server	Modify	Delete
ATX_172.3.0.51	ADX	-	-	-	Available	Healthy	Managed				
JRT_192.168.40.150	JavaRuntime	-	-	-	Available	Healthy	Managed				
MSSQL_172.4.8.88	SQL Server	-	-	-	Available	Healthy	Managed				
Oracle_172.4.95.21	Oracle	-	-	-	Available	Healthy	Managed				

Configuring global thresholds for the SQL Server application monitor

1. Click the **Resource** tab.
2. From the navigation tree, select **Application Manager > Configurations**.
3. Click **Threshold Configuration**.
The threshold configuration page appears.
4. Click the **Global Threshold** tab.
5. Click **Database Server Monitor** next to **Application Category**.
6. Click **SQL Server** next to **Application Type**.

The list displays all SQL Server indexes for which you can configure thresholds, as shown in [Figure 4](#).

Figure 4 Global threshold list

The screenshot shows the 'Global Threshold' configuration page. It includes a navigation menu with 'Add', 'Refresh', and 'Back' buttons. Below the menu, there are filters for 'Application Category' (set to 'Database Server Monitor') and 'Application Type' (set to 'SQL Server'). The main table lists various SQL Server performance metrics with their respective threshold configurations.

Application Type	Application Unit	Index	Threshold Condition	Enable Level-1 Thres	Level-1 Threshold	Trigger Times	Enable Level-2 Thres	Level-2 Threshold	Trigger Times	Modify	Delete
SQL Server	Database Details	Log File Usage Ratio	Greater than or eq...	Disable	30.00%	1	Disable	70.00%	1		
SQL Server	Lock Details	Lock Requests/sec	Greater than or eq...	Disable	300,000.00	1	Disable	700,000.00	1		
SQL Server	Lock Details	Lock Waits/sec	Greater than or eq...	Disable	500.00	1	Disable	1,000.00	1		
SQL Server	Lock Details	Lock Timeouts/sec	Greater than or eq...	Disable	30.00	1	Disable	70.00	1		
SQL Server	Lock Details	Number of Deadlo...	Greater than or eq...	Disable	30.00	1	Disable	70.00	1		
SQL Server	Lock Details	Average Wait Time	Greater than or eq...	Disable	30.00ms	1	Disable	70.00ms	1		
SQL Server	Buffer Details	Cache Hit Ratio	Greater than or eq...	Disable	30.00%	1	Disable	70.00%	1		
SQL Server	Buffer Management	Buffer Hit Ratio	Greater than or eq...	Disable	30.00%	1	Disable	70.00%	1		
SQL Server	Connection Time	Connection Time	Greater than or eq...	Disable	500.00ms	1	Disable	1,000.00ms	1		

This example describes threshold settings of the **Average Wait Time** parameter.

7. Click the **Modify** icon for the **Average Wait Time** parameter.
The **Modify Threshold** page appears.
8. Configure the following parameters, as shown in [Figure 5](#):
 - o Select **Enable** from the **Enable Level-1 Threshold** list.
 - o Set a level-1 threshold value in the **Threshold** field.
 - o Set an alarm trigger frequency in the **Trigger Times** field.
 - o Select **Enable** from the **Enable Level-2 Threshold** list.
 - o Set a level-2 threshold value in the **Threshold** field.
 - o Set an alarm trigger frequency in the **Trigger Times** field.

APM generates a level-1 or level-2 threshold alarm when the **Average Wait Time** meets the number of times specified by **Trigger Times** for the level-1 or level-2 threshold.

Figure 5 Modifying thresholds

Resource > Configurations > Threshold Management > Modify Threshold

Application Type *	SQL Server
Application Unit *	Lock Details
Index *	Average Wait Time
Threshold Type	Number
Threshold Condition *	Greater than or equal to
Unit	ms
Level-1 Threshold	
Enable Level-1 Threshold *	Enable
Threshold *	20
Trigger Times *	1
Level-2 Threshold	
Enable Level-2 Threshold *	Enable
Threshold *	60
Trigger Times *	1

OK Cancel

9. Click **OK**.

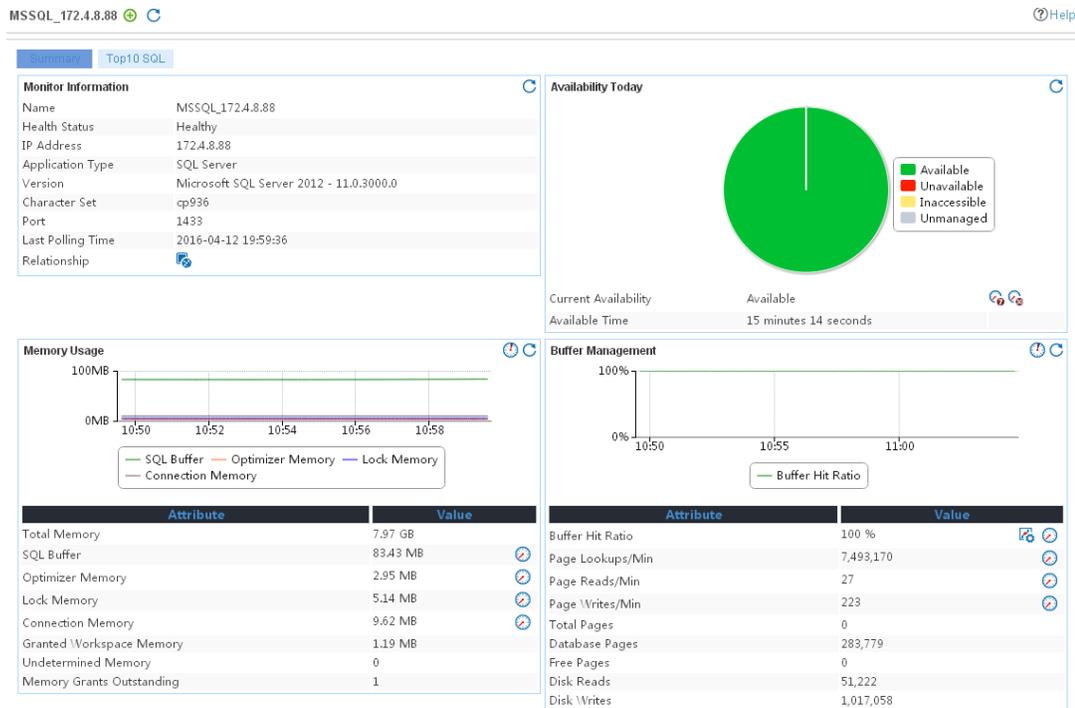
Verifying the configuration

Viewing the SQL Server application monitor report

1. Click the **Resource** tab.
2. From the navigation tree, select **Application Management > Application Monitor**.
The application monitor list displays all application monitors.
3. Click **MSSQL_172.4.8.88** to display the report.

Figure 6 shows part of the SQL Server application monitor report. The report contains index values obtained from the most recent polling of the application.

Figure 6 SQL Server application monitor report



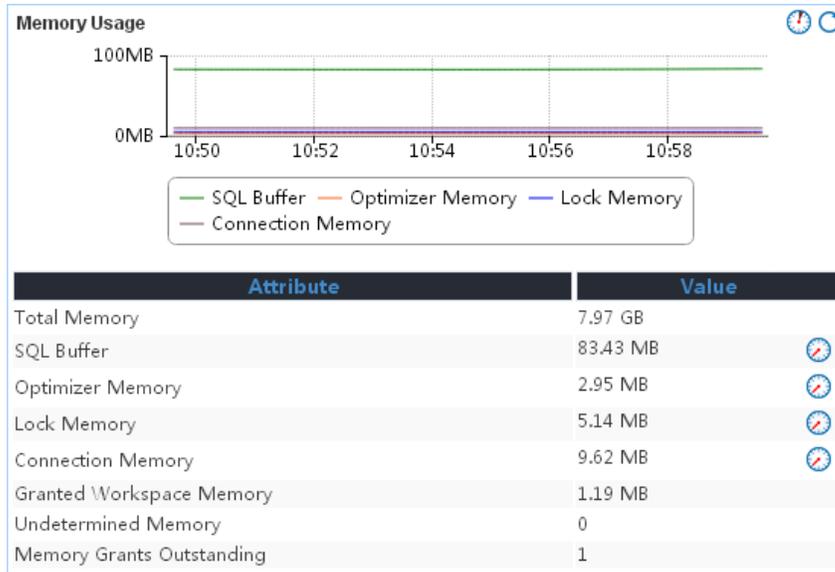
The following information describes some fields in the report.

Memory Usage

The **Memory Usage** area contains the following fields, as shown in [Figure 7](#):

- **Total Memory**—Total size of the dynamic memory used by the SQL Server application.
- **SQL Buffer**—Size of the dynamic memory used by the SQL Server application for SQL cache. Click the **History Record** icon to view the history graph of the SQL buffer.
- **Optimizer Memory**—Size of the dynamic memory used by the SQL Server application to query optimization. Click the **History Record** icon to view the history graph of the optimizer memory.
- **Lock Memory**—Size of the dynamic memory used by the SQL Server application for locks. Click the **History Record** icon to view the history graph of the lock memory.
- **Connection Memory**—Size of the dynamic memory used by the SQL Server application to maintain connections. Click the **History Record** icon to view the history graph of the connection memory.
- **Granted Workspace Memory**—Size of the dynamic memory that the SQL Server application allocated for processes to perform operations, such as hashing, sorting, copying, and creating indexes.
- **Undetermined Memory**—Number of processes that were waiting for the permissions to use the workspace memory.
- **Memory Grants Outstanding**—Number of processes that were permitted to use the workspace memory.

Figure 7 Memory Usage area

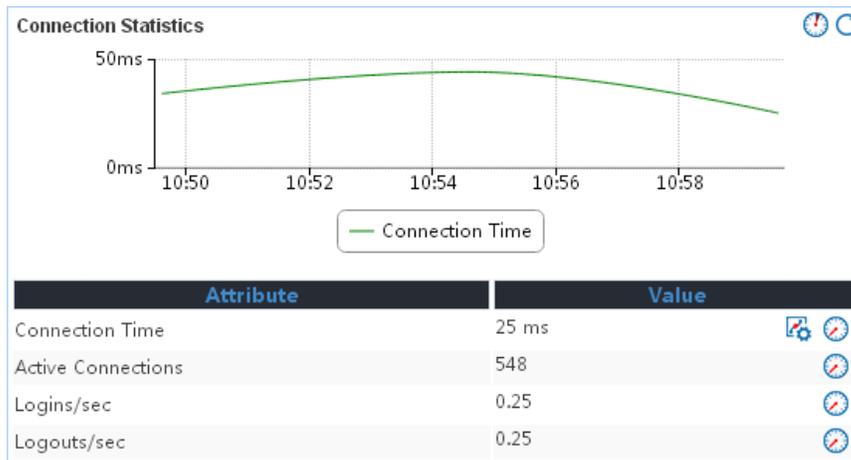


Connection Statistics

The **Connection Statistics** area contains the following fields, as shown in [Figure 8](#):

- **Connection Time**—Time consumed when APM established the connection with the SQL Server application.
 - Click the **Set Threshold** icon  to set alarm thresholds for the connection time.
 - Click the **History Record** icon  to view the history graph of the connection time.
- **Active Connections**—Number of connections between the SQL Server application and its users. Click the **History Record** icon  to view the history graph of active connections.
- **Logins/sec**—Number of newly established connections per second. Click the **History Record** icon  to view the history graph of logins per second.
- **Logouts/sec**—Number of terminated connections per second. Click the **History Record** icon  to view the history graph of logouts per second.

Figure 8 Connection Statistics area

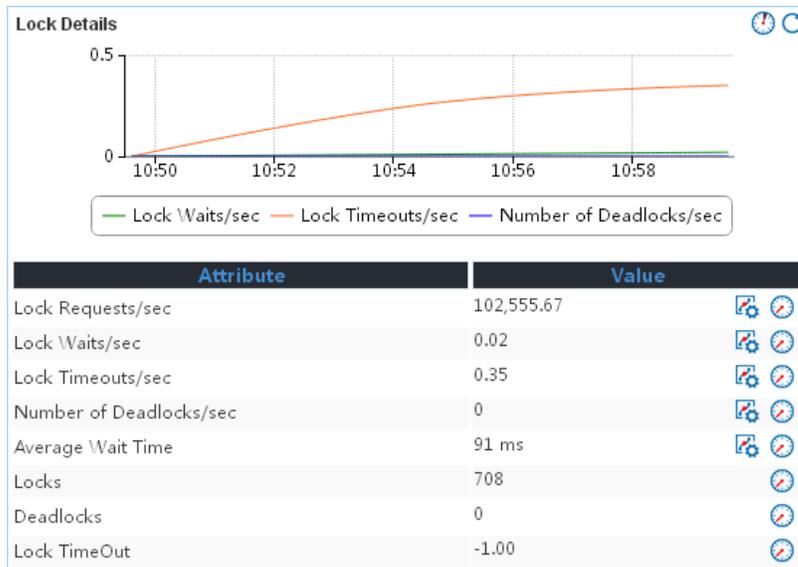


Lock Details

The **Lock Details** area contains the following fields, as shown in [Figure 9](#):

- **Lock Requests/sec**—Number of lock requests and the lock conversions received by the SQL Server application per second.
 - Click the **Set Threshold** icon  to set alarm thresholds for the lock requests per second.
 - Click the **History Record** icon  to view the history graph of the lock requests per second.
- **Lock Waits/sec**—Number of waiting lock requests per second.
 - Click the **Set Threshold** icon  to set alarm thresholds for the lock waits per second.
 - Click the **History Record** icon  to view the history graph of the lock waits per second.
- **Lock Timeouts/sec**—Number of lock requests that timed out per second.
 - Click the **Set Threshold** icon  to set alarm thresholds for the lock timeouts per second.
 - Click the **History Record** icon  to view the history graph of the lock timeouts per second.
- **Number of Deadlocks/sec**—Number of lock requests that resulted in deadlocks per second.
 - Click the **Set Threshold** icon  to set alarm thresholds for the number of deadlocks per second.
 - Click the **History Record** icon  to view the history graph of the number of deadlocks per second.
- **Average Wait Time**—Average waiting time for each lock request.
 - Click the **Set Threshold** icon  to set alarm thresholds for the average wait time.
 - Click the **History Record** icon  to view the history graph of the average wait time.

Figure 9 Lock Details area



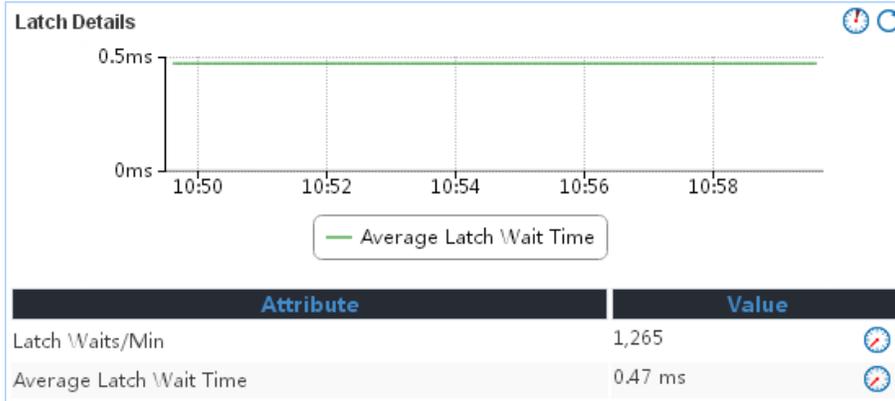
Latch Details

The **Latch Details** area contains the following fields, as shown in [Figure 10](#):

- **Latch Waits/Min**—Number of waiting latch requests per second. Click the **History Record** icon  to view the history graph of the latch waits per minute.

- **Average Latch Wait Time**—Average waiting time (in millisecond) for latch requests. Click the **History Record** icon  to view the history graph of the average latch wait time.

Figure 10 Latch Details area



Database Details

The **Database Details** area contains the following fields, as shown in [Figure 11](#):

- **Database**—Name of the running database in the SQL server application. "**_Total**" indicates statistics for all databases.
- **Size**—Disk space for the database.
- **Transactions**—Number of transactions that the database started per minute.
- **Active Transactions**—Number of active transactions of the database.
- **Log File**—Disk space for the database log files.
- **Log Files Used**—Size of used log files in the database.
- **Log Files Usage Ratio**—Usage ratio of the log files in the database. **Log Files Usage Ratio = Log Files Used/Log Files x 100%**. Click the **Set Threshold** icon  to set alarm thresholds for the log file usage.
- **Log Writes**—Times of writing the log to the log file per minute.
- **Log Write Waits**—Number of logs that were waiting to be written to the log files.
- **Log Write Wait Time**—Calculated waiting time before the log was written to the log file.

Figure 11 Database Details area

Database	Size	Used Size	Free Size	Database Usage Ratio	Data File Size	Data File Path	Data File Number	Transactions	Active Transactions
acdm_db	64.00 MB	27.02 MB	36.98 MB	42.22 %	48.00 MB	E:\jmc_DataBase	3	0	0
alam_db	105.63 MB	63.51 MB	42.12 MB	60.12 %	48.00 MB	E:\jmc_DataBase	3	0	0
apm_config	64.00 MB	19.33 MB	44.67 MB	30.20 %	48.00 MB	E:\jmc_DataBase	3	0	0
apme_db	1.32 GB	1.12 GB	208.28 MB	84.62 %	736.62 MB	E:\jmc_DataBase	3	0	0
bims_db	256.00 MB	68.60 MB	187.40 MB	26.80 %	192.00 MB	E:\jmc_DataBase	3	0	0
bsm_db	81.31 MB	50.62 MB	30.69 MB	62.26 %	48.00 MB	E:\jmc_DataBase	3	0	0
cmdb_new_db	64.00 MB	19.06 MB	44.94 MB	29.78 %	48.00 MB	E:\jmc_DataBase	3	0	0
config_db	471.94 MB	452.35 MB	19.59 MB	95.85 %	414.31 MB	E:\jmc_DataBase	3	0	0
dam	1,024.00 MB	277.38 MB	746.62 MB	27.09 %	768.00 MB	E:\jmc_DataBase	3	0	0
ead	1,024.00 MB	355.04 MB	668.96 MB	34.67 %	768.00 MB	E:\jmc_DataBase	3	0	0

Top 10 SQL By Execution Durations

The **Top 10 SQL By Execution Durations** contains the following fields, as shown in [Figure 12](#):

- **SQL**—SQL statement whose execution duration reaches top 10 among all SQL statements.

- **Cumulative Execution Duration**—Total duration of SQL statement parse and execution.
- **Cumulative CPU Time**—Total CPU duration of SQL statement parse and execution.
- **Logical Reads**—Number of logical reads for the SQL statements.
- **Physical Reads**—Number of physical reads for the SQL statements.
- **Executions**—Number of executions for the SQL statement.

Figure 12 Top 10 SQL By Execution Durations area

SQL	Cumulative Execution Duration	Cumulative CPU Time	Logical Reads	Physical Reads	Executions
SELECT [historypro0_][DBID_][DBID1_5123_][historypro0_][DBVERSION_][DBVERSION2_5123_][historypro0_][ID_][ID3_5123_][historypro0_][PROCDEFID_][PROCDEFID4_5123_][historypro0_][KEY_][KEY5_5123_][historypro0_][START_][START6_5123_][historypro0_][END_][END7_5123_][historypro0_][DURATION_][DURATION8_5123_][historypro0_][STATE_][STATE9_5123_][historypro0_][ENDACTIVITY_][ENDACT10_5123_][historypro0_][NEXTID_][NEXTIDx11_5123_] FROM [JBPM4_HIST_PROINST] [historypro0_] WHERE [historypro0_][ID_]=@P1	1,312.14 s	1,308.64 s	50,940,356	437	25,764
select count(*) as col_0_0_ from tbl_fw_rule_control fvmrulecon0_ where fvmrulecon0_endtime <= @P0	108.29 s	107.85 s	0	0	8,071,095
select processins0_id as id5150_ processins0_executionid as executio2_5150_ processins0_state as state5150_ processins0_isdraft as isdraft5150_ processins0_componentid as componen5_5150_ processins0_componentkey as componen6_5150_ processins0_componentvalue as componen7_5150_ processins0_description as descrip8_5150_ processins0_titleclassif_id as titlecla9_5150_ processins0_dispeuid as dispexuid5150_ processins0_service_id as service11_5150_ processins0_incident_source as incident12_5150_ from tbl_jbpm_processinstance processins0_ where processins0_componentid=@P0 and processins0_componentkey=@P1 and processins0_componentvalue=@P2	98.44 s	97.76 s	4,610,819	0	996
select count(*) as col_0_0_ from tbl_jbpm_processinstance processins0_ where processins0_componentid=@P0 and processins0_componentkey=@P1 and processins0_componentvalue=@P2	97.84 s	97.09 s	4,610,819	0	996
select count(*) as col_0_0_ from tbl_jbpm_process_taskexecute taskexecut0_ where taskexecut0_executionid=@P0	91.38 s	90.70 s	3,569,724	0	996
select taskexecut0_id as id5151_ taskexecut0_processid as processid5151_ taskexecut0_taskid as taskid5151_ taskexecut0_taskname as taskname5151_ taskexecut0_executionid as executio5_5151_ taskexecut0_executeaccount as executea6_5151_ taskexecut0_issaved as issaved5151_ from tbl_jbpm_process_taskexecute taskexecut0_ where taskexecut0_executionid=@P0	91.31 s	90.66 s	3,569,724	0	996
select count(*) as col_0_0_ from tbl_jbpm_process_taskexecute taskexecut0_ where taskexecut0_taskid=@P0	48.83 s	48.60 s	3,569,724	0	996
select taskexecut0_id as id5151_ taskexecut0_processid as processid5151_ taskexecut0_taskid as taskid5151_ taskexecut0_taskname as taskname5151_ taskexecut0_executionid as executio5_5151_ taskexecut0_executeaccount as executea6_5151_ taskexecut0_issaved as issaved5151_ from tbl_jbpm_process_taskexecute taskexecut0_ where taskexecut0_taskid=@P0	48.82 s	48.64 s	3,569,724	0	996
select processins0_id as id5150_ processins0_executionid as executio2_5150_ processins0_state as state5150_ processins0_isdraft as isdraft5150_ processins0_componentid as componen5_5150_ processins0_componentkey as componen6_5150_ processins0_componentvalue as componen7_5150_ processins0_description as descrip8_5150_ processins0_titleclassif_id as titlecla9_5150_ processins0_dispeuid as dispexuid5150_ processins0_service_id as service11_5150_ processins0_incident_source as incident12_5150_ from tbl_jbpm_processinstance processins0_ where processins0_executionid=@P0	47.85 s	47.63 s	4,610,842	28	996
select count(*) as col_0_0_ from tbl_jbpm_processinstance processins0_ where processins0_executionid=@P0	47.84 s	47.65 s	4,610,842	0	996

Viewing a threshold alarm

1. Open the SQL Server application monitor report.

When a threshold alarm is generated, the health status of the SQL Server application monitor changes, and the **Monitor Information** area displays the unrecovered alarm, as shown in [Figure 13](#).

Figure 13 Monitor information

MSSQL_172.4.8.88  

Summary Top10 SQL

Monitor Information	
Name	MSSQL_172.4.8.88
Health Status	Critical
IP Address	172.4.8.88
Application Type	SQL Server
Version	Microsoft SQL Server 2012 - 11.0.3000.0
Character Set	cp936
Port	1433
Last Polling Time	2016-04-12 20:27:28
Relationship	
Last 5 Unrecovered Alarm	
2016-04-12 20:27:49	Application monitor (MSSQL_172.4.8.88) Average Wait Time is in level-2 threshold range: 60.0ms, and current value is 327ms; application type is (SQL Server).

2. Click the alarm information to view alarm details, as shown in [Figure 14](#).

Figure 14 Alarm details

 Alarm Details

Alarm Details																			
Name	Level-2 Threshold Alarm of Application Management																		
Level	 Critical																		
OID	1.3.6.1.4.1.25506.4.2.13.2.6.2																		
Alarm at	2016-04-12 20:27:49																		
Alarm Source	NMS(127.0.0.1) More Alarms...																		
Type	 IMC																		
Alarm Category	MSSQL_172.4.8.88/Application Management Alarm																		
Recovery Status	 Unrecovered																		
Acknowledgement Status	 Unacknowledged																		
Description	Application monitor (MSSQL_172.4.8.88) Average Wait Time is in level-2 threshold range: 60.0ms, and current value is 327ms; application type is (SQL Server).																		
Alarm Cause	Application monitor is in level-2 alarm threshold range. Possible reason: 1. Improper level-2 threshold; 2. The server is over-loaded.																		
Remediation Suggestion	1. Improper level-2 threshold value. Please adjust the value; 2. The server is over-loaded. Please check whether resource-intensive services exist or upgrade the hardware of the server.																		
Hold Info																			
Maintenance Experience																			
Note	-- [Modify]																		
Evaluation Dept.	-- [Modify]																		
Alarm Parameter	<table border="1"> <thead> <tr> <th>Parameter Name</th> <th>Parameter Value</th> </tr> </thead> <tbody> <tr> <td>*APM Monitor ID</td> <td>25</td> </tr> <tr> <td>APM Monitor Name</td> <td>MSSQL_172.4.8.88</td> </tr> <tr> <td>*APM Monitor Type</td> <td>SQL Server</td> </tr> <tr> <td>*Device IP</td> <td>172.4.8.88</td> </tr> <tr> <td>Alarm Description</td> <td>327ms > threshold: 60.0ms</td> </tr> <tr> <td>*APM Item Name</td> <td>Average Wait Time</td> </tr> <tr> <td>APM Threshold Value</td> <td>60.0ms</td> </tr> <tr> <td>APM Current Value</td> <td>327ms</td> </tr> </tbody> </table>	Parameter Name	Parameter Value	*APM Monitor ID	25	APM Monitor Name	MSSQL_172.4.8.88	*APM Monitor Type	SQL Server	*Device IP	172.4.8.88	Alarm Description	327ms > threshold: 60.0ms	*APM Item Name	Average Wait Time	APM Threshold Value	60.0ms	APM Current Value	327ms
Parameter Name	Parameter Value																		
*APM Monitor ID	25																		
APM Monitor Name	MSSQL_172.4.8.88																		
*APM Monitor Type	SQL Server																		
*Device IP	172.4.8.88																		
Alarm Description	327ms > threshold: 60.0ms																		
*APM Item Name	Average Wait Time																		
APM Threshold Value	60.0ms																		
APM Current Value	327ms																		