SQL Doctor®

Version 3.5

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SQL Doctor Home

IDERA SQL Doctor is your one-stop source for identifying and resolving SQL Server performance problems. SQL Doctor includes a robust, yet light-weight analysis engine that not only checks your SQL Server configuration for potential problems and the health of your databases. At the end of the analysis detailed, specific recommendations are provided that will improve your SQL Server performance.

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SQL Doctor Release Notes

IDERA SQL Doctor provides performance tuning recommendations and health checks for your SQL Server environment.

To get a quick glimpse into the newest features, fixed issues, and known issues in this release of SQL Doctor, review the following sections of the Release Notes:

- Learn about key new features in this release
- Review issues fixed by this release
- Review previous features and fixed issues
- View a list of any known issues

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New features and fixed issues

SQL Doctor provides the following new features and fixed issues.

3.5 New features

Reviewed and enhanced recommendations

SQL Doctor 3.5 comes with new and enhanced recommendations to improve your SQL Server performance. In addition, links within recommendations associated to online content have been reviewed and updated for this release.

Full support for SQL Server 2014

SQL Doctor 3.5 fully supports monitoring of SQL Server 2014 instances.

SQL Server 2016 experimental support

SQL Doctor 3.5 is SQL Server 2016 compatible. This version of SQL Doctor is not certified against newer builds of SQL Server and should not be used with these builds in a production environment. IDERA provides experimental support while you use your installation in a testing environment to ensure the features you rely most are working as or better than expected.

Help documentation

SQL Doctor Help (User Guide and Release Notes) is now wiki-hosted and available at **wiki.idera.com > SQL Doctor**.

3.5 Fixed issues

General

- An issue preventing some users with system administration permissions from adding a SQL Server instance for analysis in SQL Doctor no longer occurs.

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Previous features and fixed issues

This build includes many fixed issues, including the following updates from previous releases.

3.1 New features

SQL Doctor no longer part of the SQL Toolbox

With this release, SQL Doctor is independent of the SQL Toolbox. New installations of SQL Doctor no longer require you to install SQL Toolbox.

Check for updates to SQL Doctor

SQL Doctor now allows you to quickly check for updates to the product from within the user interface. You can check for new versions of SQL Doctor by clicking **Help > Check for Updates**.

SQL Server 2012 support

SQL Doctor 3.1 fully supports the use of SQL Server 2012.

3.1 Fixed issues

- This release fixes two broken links provided by SQL Doctor when displaying recommendations.
- Two issues preventing some users from properly activating and verifying SQL Doctor licenses in their environment is fixed.
- Column sizing and alignment is improved in this release.
- Users no longer receive an unhandled object reference when attempting to view details for a recommendation to address a blocking condition.
- The SDR-Q6 "Inconsistent procedure execution times" recommendation now appears only when a very sizable difference exists in the number of reads between executions of a stored procedure. The recommendation informs the user that they should test to see if different stored procedure parameters are causing different execution plans.
- This release improves the recommendation provided when SQL Doctor displays "No join predicate detected" for a query that contains explicit joins. The recommendation now displays the estimated cost of the missing join predicate, suggests that the user adjust the query, and provides the approximate performance improvement percentage.
- An issue with a recommendation attempting to use invalid text columns in an index no longer occurs.
- SQL Doctor now displays the correct unit of measure for the Unit Allocation Size.
- SQL Doctor now supports Page Life Expectancy counters on NUMA systems.
- The SDR-D11 "Inconsistent procedure execution times" recommendation now appears only when a very sizable difference exists in the number of reads between executions of a stored procedure. The recommendation informs the user that they should test to see if different stored procedure parameters are causing different execution plans.
- SQL Doctor no longer generates recommendations for its own hypothetical indexes.

3.0 New features

Redesigned user interface

A new dashboard provides a summary of all previously executed server analyses, with instant access to the corresponding recommendations.

New Server Overview

The Server Overview displays a summary of key SQL Server metrics, warns you of issues that need to be addressed, and provides quick findings based on your current server health.

New analysis for Query Plan Statistics

Tune your query plans by viewing real-time query plan performance metrics and quick findings along side the T-SQL code.

New analysis for Wait Stat Statistics

Identify and fix any bottlenecks by viewing real-time statistics and quick findings for waits on your server.

New analysis for Session Statistics

Track session performance by viewing the commands, wait times, elapsed times, affected databases, and much more.

More crucial server information

Keep tabs on your processes, network interface cards, processors, cache, memory, physical and logical disk performance, disk partitions and system properties.

SQL Server 2012 compatible with experimental support

SQL Doctor 3.0 is SQL Server 2012 compatible. This version of SQL Doctor is not certified against newer builds of SQL Server and should not be used with these builds in a production environment. IDERA provides experimental support while you use your installation in a testing environment to ensure the features you rely on most are working as, or better than, expected.

3.0 Fixed issues

There are no fixed customers issues in this release.

2.0.1 New features

Improved the user experience with enhanced recommendation content and layout.

2.0 New features

New backup recommendations

The server analysis now checks the age and location of your database backups and, if needed, provides information about how you can ensure your backup data sets are both recent and easily accessible.

New wait statistics recommendations

The server analysis now checks the following wait statistics:

- **CXPACKET**. This typically occurs when a query is parallelized and the parallel threads are not given equal amounts of work. One thread may require more time to complete, which results in "cxpacket" waits for the remaining threads which are "waiting" for the longest running thread to complete.
- **ASYNC_NETWORK_IO**. This typically occurs when a client application that is not efficiently processing results from SQL Server over the network. This results in an increase in async_network_io waits because SQL Server is waiting for the client application to process the result set.
- **PAGEIOLATCH**. This typically occurs when SQL Server waits for a data page to be read from disk into memory. This can be an indication of contention on the same pages by concurrent selects, inserts, updates and deletes, which can be magnified by IO subsystem performance issues, insufficient memory, missing indexes, out of date statistics or inefficient queries.

New index recommendations

The server analysis now checks the following index configurations:

- **Overlapping indexes**. This typically occurs when one or more indexes contain the same data in some key columns and included columns. Although these indexes are not identical, maintaining these separate indexes can incur unnecessary performance overhead for data modifications on the database.
- **Non-clustered index key matches clustered index key**. This typically occurs when a non-clustered index contains the same key columns as the clustered index. Although these indexes are not technically duplicates, the non-clustered index rarely provides a data access advantage over the clustered index. SQL Server will maintain both indexes, creating performance overhead for data modifications which and increasing the database size.

Undo scripts

Now, when you perform a DDL or DML optimization from within SQL Doctor, you can run an undo script that reverts any changes that were made by the original optimization script.

Selective category analysis

Easily direct SQL Doctor to a specific area of concern for analysis, such as memory, disk, network, security, processor, and deadlocks.

Recommendation state persistence

Remember where you left off by flagging recommendations and returning to them later for follow-up.

Diagnose queries

Evaluate any query to obtain recommendations that improve its performance without running a full server analysis

1.1.1 New features

System Specific Resources

Resources included with recommendations are now applicable to the operating system and SQL Server version being analyzed.

1.1.1 Fixed issues

- The server analysis is now able to analyze sysjobhistory tables that contain a very large number of rows.

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Known issues

IDERA strives to ensure our products provide quality solutions for your SQL Server needs. The following known issues are described in this section. If you need further assistance with any issue, please contact IDERA customer support.

Known issues in this release include:

- Average Percent Disk Time data may not be collected on Windows Server 2008 and Vista computers. You can resolve this known WMI issue by installing a Microsoft Windows Hotfix. To apply this hotfix, go to http://support.microsoft.com/kb/961435.
- When you used Windows Task Manager to set the processor affinity for the target SQL Server instance, SQL Doctor is unable to generate recommendations based on the CPU core affinity settings.

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Welcome to SQL Doctor

SQL Doctor minimizes costly server downtime by proactively alerting administrators to problems and enabling rapid diagnosis and resolution.

This wiki helps you understand SQL Doctor characteristics and provides step-by-step help on how to use all its features.

Need help using SQL Doctor? See the following sections:

- View SQL Doctor requirements
- Analyze your SQL Server instance
- Check the recommendations list
- View the recommendation details

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What is SQL Doctor?

SQL Doctor is a revolutionary technology that analyzes the performance of SQL Server and provides recommendations for improving performance. Furthermore, SQL Doctor targets some of the most common areas of SQL Server performance problems, such as queries, server configuration, security, database objects, memory, and more. It is a must-have tool for quality assurance, database administrators, analysts, developers, and individuals who are tasked with maintaining and improving SQL Server performance.

- Provides an unparalleled analysis of SQL Server performance
- Generates prioritized performance optimization recommendations
- Offers access to educational, performance-tuning resources
- Performs both real-time and scheduled health check ups
- Stores historical analysis recommendations

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Find answers

This documentation set includes a comprehensive online Help system as well as additional resources that support you as you install and use the product. You can also search the IDERA Solutions knowledge base, available at the IDERA Customer Service Portal (http://www.idera.com/support/faq).

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Contact IDERA

Please contact IDERA with your questions and comments. We look forward to hearing from you. For support around the world, please contact us or your local partner.

For a complete list of our partners, please visit our IDERA website.

Who?	How?
Sales	713.523.4433 1.877.GO.IDERA (464.3372) (only in the United States and Canada)
Sales Email	sales@idera.com
Support	713.523.4433 1.877.GO.IDERA (464.3372) (only in the United States and Canada)
Website	www.idera.com

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Using Help

The IDERA wiki includes a comprehensive online Help system as well as additional resources that support you as you install and use IDERA products. You can also search multiple IDERA Support Solutions, available in the Knowledge Base at idera.force.com

Additionally, IDERA helps you by providing:

- 24/7 technical support for critical issues.
- Availability to report cases and access a web-based customer portal for update status.
- Access to our Knowledge Center where you can find FAQs, How To's, Best Practices, and Webcasts.

This wiki includes the following Web browser minimum requirements:

- Internet Explorer 8.0
- Mozilla Firefox 4
- Google Chrome 6

You can access the IDERA Help system through the **Help** icon on the top right section of your window or by pressing F1 on the section where you need more information.

You can print a help topic from the wiki using the Print function in your browser.

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Document conventions

Idera documentation uses consistent conventions to help you identify items throughout the library.

Convention	Specifying
Bold	Window items
Italics	• Book and CD titles • Variable names • New terms
Fixed Font	• File and directory names • Commands and code examples • Text typed by you
Straight brackets, as in [value]	Optional command parameters
Curly braces, as in {value}	Required command parameters
Logical OR, as in value 1 | value 2	Exclusively command parameters where only one of the options can be specified

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About IDERA

IDERA is a leading provider of application and server management solutions. We have a wide variety of performance management products for Microsoft SQL Server, and award-winning server backup solutions for both managed service providers and enterprise customers. IDERA products install in minutes and start solving server problems immediately, giving administrators more time, reduced overhead and expenses, and increased server performance and reliability. We are a Microsoft Gold Certified partner, headquartered in Houston, Texas, with offices in Asia Pacific, Australia, New Zealand, Europe, Africa, and Latin America. So we're everywhere your IT needs are.

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Our tools are engineered to scale from managing a single server to enterprise deployments with thousands of servers. IDERA products combine ease of use with a design that installs in minutes, configures in hours, and deploys worldwide in days. To learn more about IDERA products, visit the IDERA Web site at www.idera.com.

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Get started

SQL Doctor is designed to help you identify, understand, and fix problems with your SQL Server performance. SQL Server performance problems are presented as ranked recommendations that focus on helping you with real problems you are experiencing.

The following tasks are associated with using SQL Doctor:

- Add the SQL Server instances you want to analyze. You can use Windows or SQL Server authentication to connect to your SQL Server instance.
- Start a full analysis to diagnose the problems your system is experiencing.
- View a list of the SQL Doctor recommendations with short descriptions, arranged by impact. This list can be sorted to fit your needs and even printed or exported.
- Double-click a recommendation in the recommendations list to see a detailed explanation of the recommendation and, where applicable, view or even execute an optimization script to fix the issue.
- Get a real-time overview of your enterprise health or individual server health.
- View the results from past analysis and the recommendations that are associated.
- Schedule an analysis to occur on your SQL Server instance on a daily or weekly time period.

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Product requirements

You can easily and quickly install SQL Doctor on any computer that meets or exceeds the following hardware, software, and permissions requirements. Consider the following requirements when installing SQL Doctor in a typical environment.

Type	Requirement
CPU	2.0 GHz or higher
Memory	1 GB
32-bit Operating System	- Windows Server 2008 SP3+ - Windows Server 2008 R2 - Windows Server 2003 SP3 - Windows XP SP2+ - Windows Vista SP1+ - windows 7 SP1+ - Windows 8 - Windows 2012 - Windows 10 .Net 3.5, .Net 4.0, and MDAC 2.8
64-bit Operating System	- Windows Server 2008 SP3+ (x64) - Windows Server 2008 R2+ (x64) - Windows Server 2003 SP3 - Windows XP Professional (x64) - Windows Vista Business and Enterprise (x64) - windows 7 SP1+ (x64) - Windows 8 (x64) - Windows 2012 - Windows 10 .Net 3.5, .Net 4.0, and MDAC 2.8
Client Browser	Internet Explorer 7.0 or later
SQL Server Standard or Enterprise Edition	- SQL Server 2005 SP1 or later - SQL Server 2008 RTM or later - SQL Server 2008 R2 or later - SQL Server 2012 - SQL Server 2014
OLE Automation Enabled	By default, SQL Doctor uses WMI to collect data for the analysis. However, you can choose to use OLE automation instead. For more information, see SQL Doctor and OLE automation.

Permissions	SQL Doctor requires that the Windows account or SQL login used to connect to the analyzed SQL Server instance has `sysadmin` privileges on this instance.

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How to install SQL Doctor

You can install SQL Doctor on any computer that meets or exceeds the product requirements.
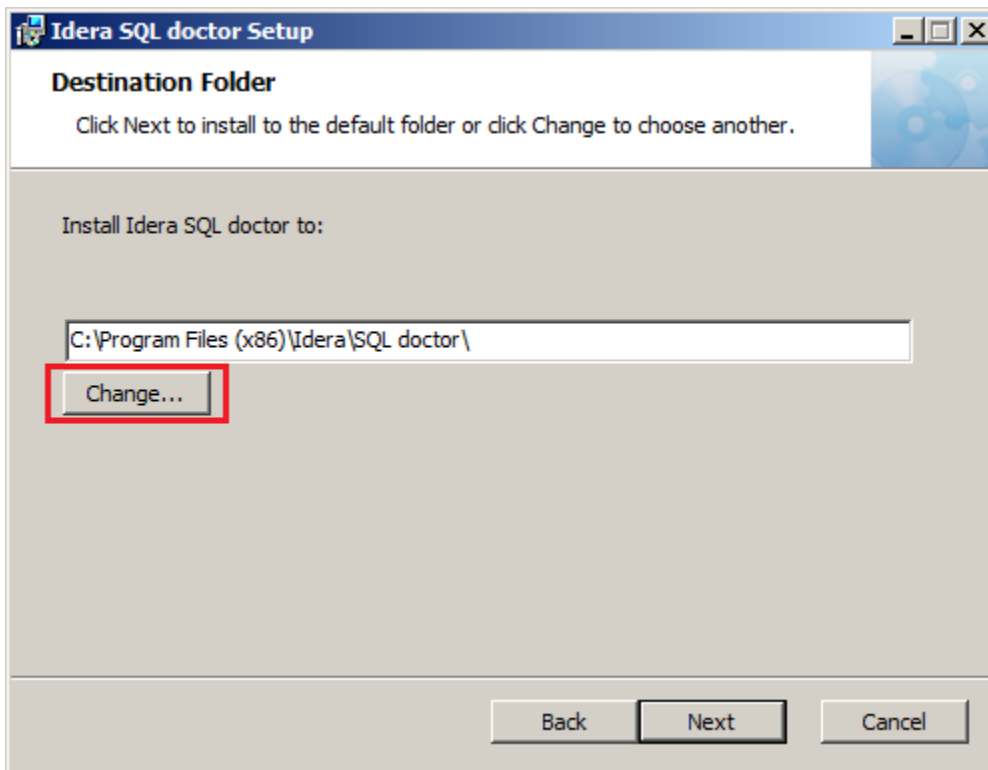
To install SQL Doctor:

1. Log in with an administrator account to the computer on which you want to install SQL Doctor.
2. Download and install the SQL Doctor installation kit.
3. Run the `IderaSQLdoctorInstallationKit`.
4. On the SQL doctor Installation window of the setup program, click **Next**.
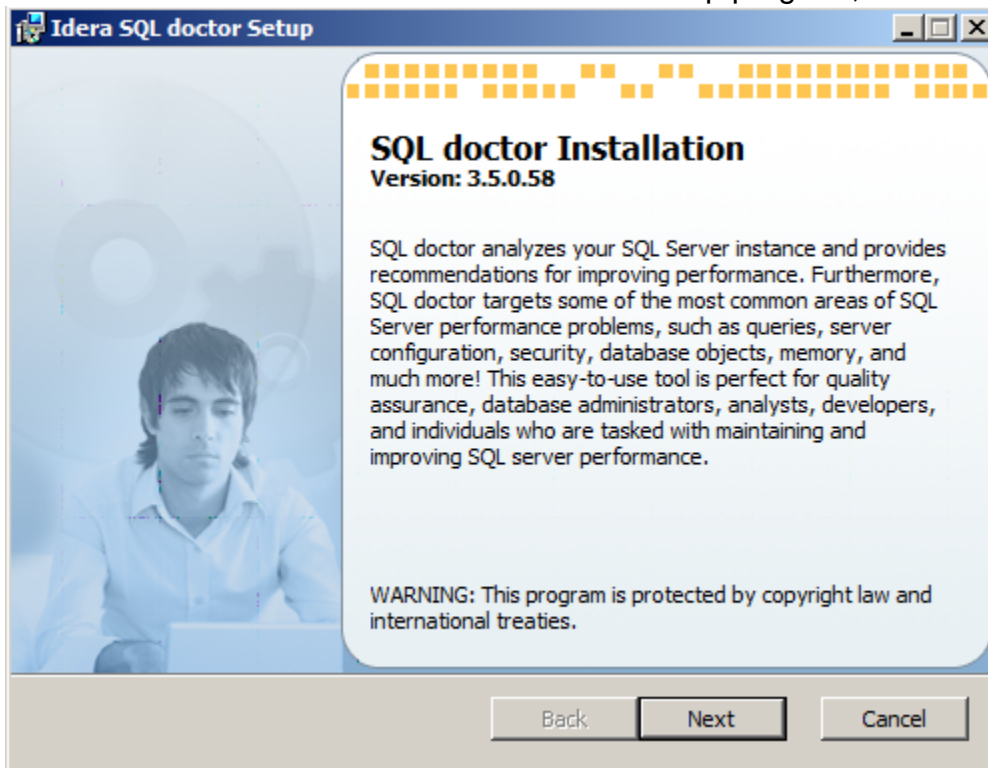
5. Review the license agreement. To accept this license agreement, check the **I accept the terms in the License Agreement** box, and then click **Next**.
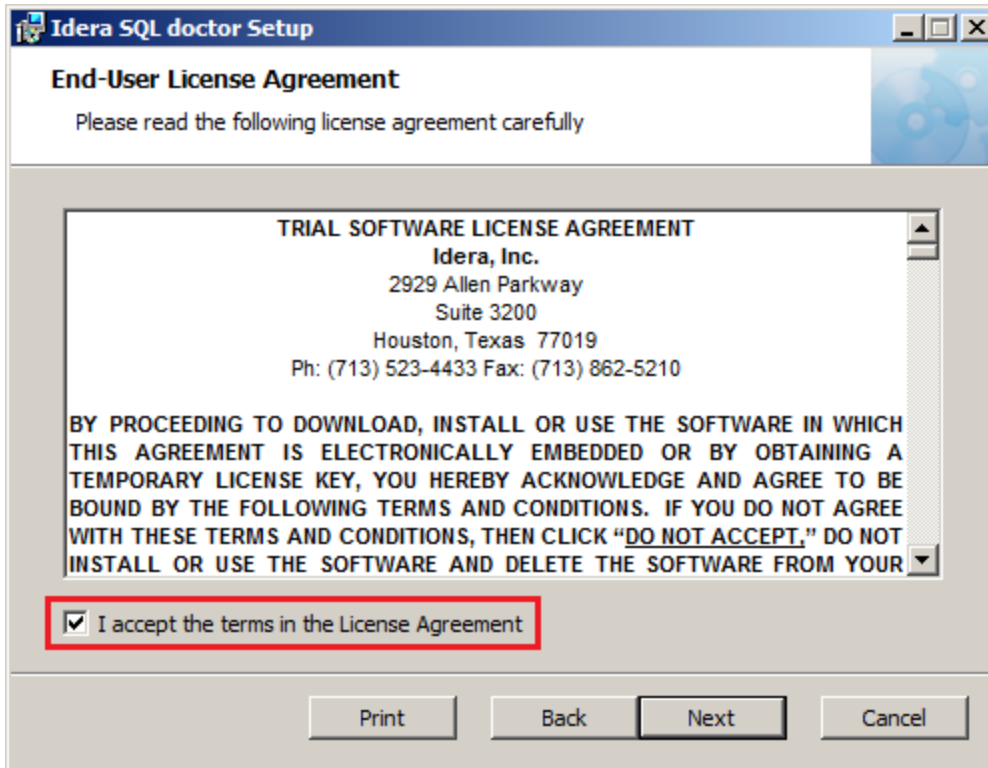
6. Select the destination folder. You can use the default install location or specify the path for the new destination (**Change**). For your first install, we recommend using the default location. Then click **Next** to continue with the installation.

7. Click **Install** to begin the SQL Doctor installation.
8. Click **Finish** to exit the Idera SQL doctor Setup wizard.

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SQL Doctor and OLE automation

OLE automation allows SQL Doctor to collect system counters that are not stored in SQL Server. These system counters include many that are vital to the SQL Doctor analysis engine. SQL Doctor requires that you enable OLE automation for the duration of an analysis.

OLE automation is turned off by default on all servers running SQL Server 2005 or later. However, when you choose to use OLE automation for data collection, SQL Doctor enables OLE automation for the length of the analysis, and then immediately disable it when done.

To configure SQL Doctor to use OLE automation, click **Edit > General Settings** and select **Advanced Connection Settings**.

For more information about how SQL Server uses OLE automation, see the Ole Automation Objects in Transact-SQL article on MSDN.

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Check for SQL Doctor updates

IDERA periodically releases updates to SQL Doctor. You can check for updated versions from within SQL Doctor by clicking **Help > Check for Updates**. This link directs you to the version control page on the IDERA Web site. You can get a list of updates for each version of SQL Doctor on the Version History tab of the product page.

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Configure your deployment

You can configure the SQL Doctor settings for each registered server. The following configuration options are available:

Add Server

Add a SQL Server instance to analyze performance issues

The Add Server window lets you register a SQL Server instance with SQL Doctor and set up the basic options you need to get started with an analysis.

Server Settings

Change general server settings

The General Settings tab lets you select the location where you want to store the results of your analysis, the credentials that you want SQL Doctor to use when connecting to your server, and additional data collection options.

Block specific recommendations

The Block Recommendations tab lets you select the recommendations you no longer want to receive.

Block specific databases

The Block Databases tab lets you select the databases to block from generating recommendations.

Remove Server

Remove server

The Remove Server window lets you unregister one or more SQL Server instances from SQL Doctor.

Analyze Server

Schedule an analysis

The Schedule analysis link lets you create or edit the analysis schedule for a SQL Server instance.

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Add a server to analyze

Use the Add Server window to register a SQL Server instance with SQL Doctor. By adding a server to SQL Doctor, you can schedule when analyses are performed, as well as run analyses on an as-needed basis.

To run an analysis on your SQL Server instance, you must specify either system administration level SQL Server credentials or be currently logged in to a Windows account with system administrator level credentials on the SQL Server instance you want to analyze.

Access the Add Server window

To access the Add Server window, click **Add Server** on the SQL Doctor toolbar.

Add a server to SQL Doctor

To add a server:

1. Click **Add Server** on the SQL Doctor toolbar.
2. On the Add Server window, select the SQL Server instance you want to add.
3. *If this instance is being used as a production server*, check **Production Server**.
4. *If this instance has OLTP enabled*, check **Online Transaction Processing (OLTP)**.
5. Choose the type of authentication this server requires, and then specify the appropriate Windows user account or SQL login credentials. By default, SQL Doctor uses the credentials of your currently logged on Windows account to access the target server. Ensure the specified account has the required permissions.
6. Click **Add**.

> ⚠ Click **Advanced Connection Settings** on the Add Server window to configure how SQL Doctor collects performance counters from your instance.

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Change general settings

The General Settings tab of the Server Settings window lets you configure basic settings for the selected SQL Server instance. You can choose different settings for each server that you have registered with SQL Doctor.

Access the General Settings tab of the Server Settings window

You can access the General Settings tab of the Server Settings window by clicking **Edit > General Settings**.

Available settings on the General Settings tab

The General Settings tab allows you to manage the following settings:

Store your analysis results

SQL Doctor stores the overall analysis summary information along with all the individual recommendations. Additionally, vital metric data is stored and compared against subsequent analysis data to see if changes have occurred that are negatively affecting SQL Server performance. Browse for and then select the location where you want to store your analysis results.

Enter your connection credentials

You can configure SQL Doctor to use either Windows or SQL Server Authentication to connect to the selected instance.

Select your analysis options

When performing an analysis, SQL Doctor takes into account whether the instance is a production server or has online transaction processing (OLTP) enabled. Specify whether you want SQL Doctor to use these options when analyzing the selected server.

Select your performance collection options

You can configure SQL Doctor to use either OLE automation or WMI to collect performance metrics from the selected instance. To configure the connection settings you want SQL Doctor to use for this server, click **Advanced Connection Settings**. Be sure to test your collection settings before you start the analysis.

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Configure Advanced Connection Settings

The Advanced Connection Settings window of the SQL Doctor allows you to input options for how you want to collect performance counters.
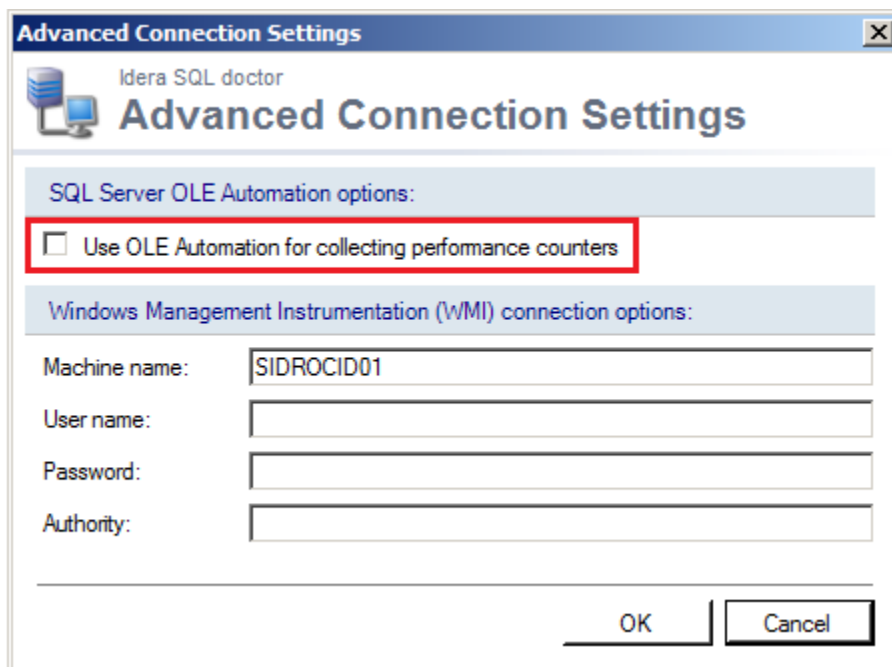
Access the Advanced Connection Settings window

You can access the Advanced Connection Settings window by clicking **Advanced Connection Settings** in the Add Server window or by selecting **Edit > General Settings** and clicking the corresponding link.

Select your advanced connection settings

You can configure SQL Doctor to use either SQL Server OLE Automation or Windows Management Instrumentation (WMI) for collecting performance metrics from the selected instance.

SQL Server Automation

To use SQL Server OLE automation, check the **Use OLE Automation for collecting performance counters** box and then click **OK**.

Windows Management Instrumentation

To use WMI for collection, type the user name and password in the appropriate fields. The **Authority** field is optional when setting your WMI namespace security. Then click **OK** to close the Advanced Connection Settings window.

> ⊘ For more information about WMI connection, see the following Microsoft tip at http://techn et.microsoft.com/en-us/library/ee692772.aspx#EEAA.

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Block recommendations

The Block Recommendations tab of the Server Settings window lists all available SQL Doctor recommendations and indicates whether they are blocked. This list is server-specific, and can be customized per your unique diagnostic needs.

> (i) To reduce analysis "noise," consider blocking recommendations for changes that you do not plan to make in your environment. Blocking a recommendation removes the recommendation from all future analyses results for this registered instance.

Access the Block Recommendations tab of the Server Settings window

You can access the Block Recommendations tab of the Server Settings window by clicking **Edit > Blocked Recommendations**.

Block and unblock your recommendations

To block recommendations from appearing in your analysis:

1. Access the Block Recommendations tab of the Server Settings window by clicking **Edit > Blocked Recommendations**.
2. Check the **Block** box next to each of the recommendations you want to block from future analyses.
3. Click **OK**.

To unblock recommendations to include them in your analysis:

1. Access the Block Recommendations tab of the Server Settings window by clicking **Edit > Blocked Recommendations**.
2. Scroll down the list of blocked recommendations and find the recommendation you want to unblock.
3. Clear the **Block** box next to the recommendation.
4. Click **OK**.

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Block objects

The Block Objects window allows you to confirm that you want to block the selected recommendation or group of recommendations. Select the recommendation that you want to block form appearing in the recommendations list, and then click **Save Changes** to confirm.

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Block databases

The Block Databases tab of the Server Settings window lets you block SQL Server databases from being included in scheduled, ad-hoc, or real-time analyses. When a database is blocked, SQL Doctor does not return recommendations for it, and the database is not listed under the **Dat abases** node in the navigation pane.

Access the Block Databases tab of the Server Settings window

You can access the Block Databases tab of the Server Settings window by clicking **Edit > Blocked Databases**.

Block and unblock your databases

To block databases from appearing in your analysis:

1. Access the Block Databases tab of the Server Settings window by clicking **Edit > Blocked Databases**.
2. Check the **Block** box next to each of the databases you want to block from future analyses.
3. Click **OK**.

To unblock databases to include them in your analysis:

1. Access the Block Databases tab of the Server Settings window by clicking **Edit > Blocked Databases**.
2. Scroll down the list of blocked databases and find the database you want to unblock.
3. Clear the **Block** box next to the database.
4. Click **OK**.

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Remove a server from SQL Doctor

Use the Remove Server window to unregister the selected SQL Server instance from SQL Doctor. The unregistered server no longer appears in the server tree and is no longer available for future analyses. Any scheduled analyses are stopped.

> ⓘ Be aware that, when you remove a server, all previous analysis results are deleted from the Repository and are no longer available for historical reference later.

Access the Remove Server window

You can access the Remove Server window by clicking **Remove Server**.

Remove a server from SQL Doctor

To remove a server:

1. Click **Remove Server** on the SQL Doctor toolbar.
2. On the Remove Server window, check the box for the SQL Server instance you want to remove.
3. Click **Remove**.

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Schedule analysis

The Schedule Analysis window allows you to schedule a regular SQL Doctor analysis on your SQL Server instance. Scheduled analyses are an important way to track the health of your SQL Server environment. To get the most out of SQL Doctor, IDERA recommends that you schedule the analysis to run during busy periods or during times your SQL Server users are experiencing problems.

By default, SQL Doctor performs a full analysis for five minutes, using the general settings defined for the target SQL Server instance. A full analysis collects and examines performance metrics from all available analysis categories.

> ⓘ SQL Doctor allows you to schedule a future analysis on a single SQL Server instance. You can perform manual analyses on an unlimited number of SQL Server instances.

Access the Schedule Analysis window

You can access the Schedule Analysis window by clicking **Edit > Schedule Analysis** or by clicking **Schedule Analysis** on the right side of the SQL Doctor toolbar.

Schedule an analysis

To schedule an analysis:

1. Access the Schedule Analysis window by clicking **Schedule Analysis** on the right side of the SQL Doctor toolbar.
2. On the Schedule Analysis window, click **Run a routine checkup of my SQL Server** to enable scheduling.
3. Select the target SQL Server instance using the **Server Name** drop-down option.
4. Choose to run the analysis either daily or weekly using the **Recurrence** drop-down option.
5. Select the time you want the analysis to start using the local time of the SQL Doctor computer. For best results, select a time when the SQL Server instance is busy.
6. Specify the total **Duration** (in minutes) that you want SQL Doctor to take collecting and analyzing data from this server.
7. Click **OK**.

To cancel a scheduled analysis:

1. Access the Schedule Analysis window by clicking **Schedule Analysis** on the right side of the SQL Doctor toolbar.
2. On the Schedule Analysis window, select the target SQL Server instance using the **Server Name** drop-down option.
3. Clear the **Run a routine check of my SQL Server** check box.
4. Click **OK**. SQL Doctor displays a message alerting you that you are disabling the scheduled analysis checkup for a server.
5. Click **Yes**.

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Set the Server Overview warning thresholds

Use the Server Overview Defaults window to configure when you want SQL Doctor to warn you about the health status of your servers.

You can set the maximum threshold values for several crucial server properties and statistics. SQL Doctor applies these thresholds to all SQL Server instances in your environment, and assesses the real-time health of each server accordingly.

To see the current health of a particular server, routinely check its Server Overview.

Access the Server Overview Defaults window

You can access the Server Overview Defaults window by clicking **Edit > Server Overview Defaults**.

Use the Server Overview Defaults window settings

Most Recent Analysis

Triggers a warning if there is no analysis performed in the entered number of days.

Recommendations

Triggers a warning if the number of recommendations in the most recent analysis exceeds the entered number of recommendations.

Priority

Triggers a warning if the recommendation priority meets or exceeds the selected level.

CPU Usage

Triggers a warning if the CPU usage exceeds the entered percentage.

Memory Available

Triggers a warning if the memory available dips below the entered amount in megabytes (MB).

Blocking Processes

Triggers a warning if the number of blocking processes (by SPID) exceeds the entered amount.

Network Retransmits

Triggers a warning if the network retransmits exceeds the entered percentage.

Disk Space

Triggers a warning if the free space available on the disk dips below the entered percentage.

Recent Full Backups

Triggers a warning if there is no full backup performed in the entered number of days.

Recent Log Backups

Triggers a warning if there is no log backup performed in the entered number of days.

Failed Jobs

Triggers a warning if any job fails in the entered number of past hours.

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Manage your SQL Doctor license

By default, SQL Doctor installs with a limited-time trial license key that is valid for the computer on which you have installed the product. When you decide to move from a trial implementation of SQL Doctor to a production version, contact and obtain a license key from IDERA.

Using the IDERA Licensing Console, you can:

- Register your license for SQL Doctor
- Choose how to activate your license
- Manually activate your license
- Deactivate your license
- Extend your trial period

SQL Doctor checks for a valid license each time you start the product. A valid license is a trial or production key that is registered for the computer on which you have installed SQL Doctor. If your license expires, you can no longer access SQL Doctor.

Access the licensing console

You can access the licensing module from the **Help** menu by clicking **Manage License**. This option opens the Licensing Console.

About the trial license

By default, SQL Doctor installs with a limited-time trial license key that is valid for the computer on which you have installed the tool.

When you decide to move from a trial implementation of SQL Doctor to a production version, contact and obtain a license key from IDERA.

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Register your software

Use the Register Your Software window to start the license activation process and begin using this product. Once your software is registered, you have 14 days to complete the license activation. You can continue using all the product features during that 2-week period.

After your product registration is expired, you can no longer use the product, but can still activate a valid production license online or manually.

Access the Register Your Software window

The Licensing Console automatically opens when you start SQL Doctor. To access the Register Your Software window, click **Register**. The Licensing Console displays the Register Your Software window.

Use the Register Your Software window

Use the following fields to register your software:

Name

Type your full name.

Organization

Optional. Type the name of your company, business unit, or department.

License Key

Type or copy and paste the product license key.

Activate Automatically

Select this option to allow the licensing engine to automatically activate your registered license key the next time you are online. This option requires an active Internet connection.

Buy Now

Launches the IDERA e-commerce Web site, where you can purchase multiple licenses for this product.

Learn more about activation

Click **Tell me more** to learn more about how activation works.

Register

Click **Register** to submit your information and register this product with IDERA. This action starts the license activation process by sending your license key and company information to IDERA.

Trial

Click **Trial** to run the product in trial mode, allowing you to continue evaluating this product.

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Choose how to activate your license

Use the Activate Your Software window to choose how and when you want to complete the activation process. Activate your license as soon as possible after registering your software.

Once your software is registered, you have 14 days to complete the license activation. You can continue using all the product features during that 2-week period. After your product registration expires, you can no longer use the product.

> ⓘ You can activate one license per computer at a time. That is, each installation of the tool requires a unique license key.

Access the Activate Your Software window

The Licensing Console automatically opens when you start SQL Doctor.

To access the Register Your Software window

1. Click **Register**.
2. On the Register Your Software window, type the required information.
3. Click **Register**. The Licensing Console displays the Activate Your Software window.

Use the Activate Your Software window

Use the following fields to activate your software:

Activate online now

Connects to the IDERA Web site and confirms that you have entered a valid license key. No additional action is needed. This action requires an Internet connection.

Activate manually

Allows you to activate your license over the phone or through email. Use this option when you do not have Internet access from the computer on which you installed the software.

Activate later

Allows you to activate your license at a later time. The product license remains registered with IDERA.

Cancel

Stops the license process at this step. The next time you start the product, the Licensing Console prompts you to activate your license.

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Activate your license manually

Use the Activate Manually window to manually activate your license key when the target computer on which SQL Doctor is installed does not have Internet access or is otherwise offline. Use the provided buttons to copy the necessary information and then email or call IDERA Licensing to activate this license.

Access the Activate Manually window

The Licensing Console automatically opens when you start SQL Doctor.

To access the Activate Manually window

1. Click **Register**.
2. On the Register Your Software window, type the required information.
3. Click **Register**.
4. On the Activate Your Software window, click the option to activate your license manually.

Manually activating your license

1. Use the provided buttons to copy the license key and machine code.
2. Email or phone IDERA Licensing, and provide the Licensing Representative with the information you copied in Step 1. IDERA Licensing provides you with an activation code.
3. Type the activation code in the corresponding field on this window.

Use the Activate Manually window

Use the following fields to manually activate your software:

Copy license key and machine code to email IDERA

Click **Copy to Email** to open a new email message, pre-populated with the license key and machine code, that you can immediately send to IDERA Licensing to start the manual activation process.

Copy license key and machine code for your records

Click **Copy to Clipboard** to copy your license information and then paste it into an application such as Microsoft Word.

Return to the previous activation window

Click **Go Back** to return to the Activate Your License window and choose a different activation route.

Complete the license activation

Click **Activate** to complete the license activation process and begin using this product in production.

Cancel

Stops the license process at this step. The next time you start the product, the Licensing Console prompts you to activate your license.

Activation Code

Allows you to enter the activation code provided by IDERA Licensing.

Machine Code

Displays the serial number of the computer on which you have installed the registered product.

Machine ID

Displays the corresponding ID number for this computer.

License Key

Displays the license key you entered when you registered the product.

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Deactivate your license

Use the Deactivate License window to disable the currently active license key. You can deactivate the product license when you want to:

- Un-install the tool. You can re-install this tool on the same computer later.
- Migrate your installation from one computer to another. After migrating this tool to another computer, the system prompts you to complete the license activation process for the installation on the new computer.

To immediately deactivate the product license for this tool, click **Deactivate**.

> ⓘ Deactivation requires Internet access. If the computer does not have Internet access or is otherwise unavailable, contact IDERA Licensing to deactivate the license manually.

Access the Deactivate License window

The Licensing Console automatically opens when you start SQL Doctor.

To access the Deactivate License window

1. Navigate to the Help menu.
2. Click **Deactivate License**.

Use the Deactivate License window

Use the following fields to deactivate your software:

Cancel

Stops deactivation. You can continue to use this license key for the product installation on this computer.

Deactivate this license

Deletes the license key and activation information for the product installation on this computer. If you do not use this license key for another installation on a different computer, you can later re-install the product on this computer and re-activate the license key.

Learn more about activation

Click **Tell me more** to learn more about how activation works.

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Extend your trial period

Use the Extend License Use Period window to add more time to your trial period for this specific tool. You can extend your trial only after the original time period expires, and you can only extend your trial license once.

If your trial key has not yet expired, or if you previously extended your key, the Licensing Console returns an error.

Access the Extend License Use Period window

The Licensing Console automatically opens when you start SQL Doctor. Click **Extend Trial** to access the Extend License Use Period window.

Use the Extend License Use Period window

Use the following fields to extend the trial license period for your software:

Copy license key and limit code to clipboard

Click **Copy to Clipboard** to copy your trial license information and then paste it into an application such as Microsoft Word.

Return to the previous trial license window

Click **Go Back** to return to the main licensing window and choose a different action.

Extend your trial license online

Connects to the IDERA Web site, validates that your current trial license has expired, and then adds seven more days to the total trial time period. This action requires an Internet connection.

Extend your trial license manually

Email your trial license information to IDERA Licensing, asking for a trial extension code, and then type that code into the **Extend Time** field.

Extend Time

Allows you to enter the new trial license key provided by Idera.

Limit Code

Displays the trial identification code.

License Key

Displays the trial license key.

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Analyze your SQL Server instance

The Analysis Wizard allows you to fine tune the type of analysis you want to perform on the target server. Note that analysis of the collected data may take several additional minutes and does not begin until the collection process is complete.

Access the Analysis Wizard

You can access the Analysis Wizard by clicking **Analyze Server**.

Analyze a SQL Server instance

To use the Analysis Wizard to analyze a SQL Server instance:

1. Click **Analyze Server**. SQL Doctor displays the Analysis Wizard.
2. On the Select SQL instance tab, select the SQL Server instance you want to analyze, and then click **Next**. If the instance does not appear in the list, verify that the instance is registered.
3. On the Select categories tab, check the box for each category you want to include in the analysis. *If you want more information about a category*, select the category and SQL Doctor displays additional detail in the **Category Description** area.
4. After selecting the appropriate analysis categories, click **Next**.
5. On the Filters tab, complete the following fields:
   - *If you want to analyze the workload from a specific location*, type the name of the application using wild card characters (%) if necessary. *If you want to limit your analysis to only one database*, select the appropriate database from the list.
   - Type the number of minutes you want SQL Doctor to spend collecting data. By default, SQL Doctor spends five minutes on this task.
6. Click **Finish**. SQL Doctor analyzes the selected instance.

View your analysis results

Once your analysis is complete, you can review your results by:

- Viewing the highest priority performance recommendations
- Viewing individual recommendation details for answers on how to fix the problem

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Select performance categories

When configuring your analysis, you can select any combination of performance categories to focus the analysis. Each category contains a set of performance metrics and their related recommendations. By picking a category, you are identifying which SQL Server areas concern you most.

Based on the chosen categories, SQL Doctor polls your target SQL Server instance to gather the appropriate metrics and determine which recommendations match the server's current performance issues. The more categories you pick, the longer the analysis needs to run to ensure all relevant data has been collected and thoroughly analyzed.

Access the Analysis Wizard

You can access the Select categories tab of the Analysis Wizard by clicking **Analyze Server**, selecting the appropriate SQL Server instance, and clicking **Next**.

On the Select categories tab, you can select one or more of the following performance categories for use in the detailed analysis:

Blocking Processes

Detects any processes that are blocking other processes.

Database Configuration

Identifies which database configuration settings improve SQL Server performance.

Deadlocks

Detects any deadlocks on the SQL Server instance.

Disk

Detects whether disk settings and associated problems are affecting SQL Server performance.

Disaster Recovery

Detects any database and transaction log backup issues such as failures or skips, overdue integrity checks, and corruption issues.

Index Optimization

Determines whether index settings or problems with the indexes themselves are negatively affecting SQL Server performance.

Long Running Jobs

Identifies any long-running jobs.

Memory

Examines the server memory settings and determines whether they affect performance.

Network

Detects network problems or configuration settings that affect SQL Server performance.

Open Transactions

Identifies any long-running open transactions and determines whether the associated T-SQL code needs corrections to improve performance.

Processor

Detects processor problems and associated configuration settings.

Query Optimization

Detects query problems that negatively affect your SQL Server performance.

Security

Identifies non-optimal security settings on the SQL Server instance.

Server Configuration

Detects server configuration settings that can decrease the performance of your SQL Server instance.

Wait Stats

Identifies any waits that are affecting SQL Server performance.

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Choose database or application

When configuring your analysis, you can choose which database or application workload you want to include in the analysis. Picking a database or application allows you to further fine tune the analysis results.

You can also set the amount of time (duration, in minutes) that you want SQL Doctor to spend collecting data for your analysis. When setting the analysis duration, select a number of minutes that is proportionate to the criticality of the performance issue you are experiencing. For example, if you are experiencing a serious performance issue and you select more than one performance category to analyze, you may want to run the analysis for at least 15 minutes to ensure that you collect enough data. The more data SQL Doctor can collect for a given analysis, the greater likelihood that the resultant recommendations accurately identify and resolve the issue.

Access the Analysis Wizard

You can access the Filters tab of the Analysis Wizard by clicking **Analyze Server**, completing the Select SQL instance and Select categories tabs, and then clicking **Next**.

Select the appropriate options, and then click **Finish**.

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Get the analysis status

The Analysis Status window displays the progress of the SQL Doctor analysis of your server. The analysis process can take as little as three minutes and in very busy, large environments it can take 30 minutes or more.

In general, a longer analysis provides a better indication of the health of your SQL Server environment.

Analysis type

Type of analysis, which is based on the answers you provided on the user interview.

Start time

Time on the local computer when the analysis began.

Time elapsed

Length of time the analysis required.

Current status

Description of what the analysis is working on. In general, the message displayed here lists the database or object currently being analyzed.

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Resolve performance issues

When an analysis is complete, SQL Doctor provides a priority-ranked list of recommendations that help you resolve the issues that are most affecting the performance of your SQL Server instance.

A quick finding provides a real-time analysis of your current SQL Server performance, allowing you to address issues right now as they happen.

You can get quick findings on a server-by-server basis. Use the left pane navigation tree to select the server you want to analyze now, and then review the data on the Server Overview view.

> ⓘ To see the latest analysis results across all registered servers, navigate to the All Servers tab on the Dashboard view.

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Check analysis history across servers

The **Analysis History** tab on the SQL Doctor dashboard allows you to access the results of every analysis stored by SQL Doctor for your registered SQL Server instances. Analyses are ordered by start time per the local computer running the SQL Doctor console, and include:

- the name of the analyzed server
- time stamp when the analysis started
- total time the analysis ran (duration in minutes)
- type of analysis performed
- total number of recommendations found
- highest priority recommendation associated with the analysis

View recommendations

You can view the list of recommendations found for a specific analysis by double-clicking the analysis you want to investigate.

Delete an analysis

You can delete an analysis by selecting one or more analyses from the list, and then clicking **Delete**. This action permanently removes the corresponding analysis data from the SQL Doctor Repository.

You can specify how long you want to keep your analyses before SQL Doctor deletes them. By default, SQL Doctor stores each analysis in the Repository database for 30 days. To change this setting, click the **Keep history for 30 days** link. Keep in mind that this setting is a global setting that applies to all analyses performed on all registered SQL Server instances.

SQL Doctor also allows you to schedule an analysis to run daily or weekly at the specified time. To automate your analyses, click **Schedule analysis** on the SQL Doctor toolbar.

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Check all analyses for server

The **All Analyses** view lists every available analysis performed on the selected SQL Server instance. Analyses are ordered by start time (per the local computer running the SQL Doctor Console) and include:

- time stamp when the analysis started
- total time the analysis ran (duration in minutes)
- type of analysis performed
- total number of recommendations found
- highest priority recommendation associated with the analysis

Access the All Analyses view

You can access the All Analyses view for a SQL Server instance by expanding the directory tree for the instance, and then selecting **All Analyses**.

View recommendations

You can view the list of recommendations found for a specific analysis by double-clicking the analysis you want to investigate.

Delete an analysis

You can delete an analysis by selecting one or more analyses from the list, and then clicking **Delete**. This action permanently removes the corresponding analysis data from the SQL Doctor Repository.

You can specify how long you want to keep your analyses before SQL Doctor deletes them. By default, SQL Doctor stores each analysis in the Repository database for 30 days. To change this setting, click the **Keep history for 30 days** link. Keep in mind that this setting is a global setting that applies to all analyses performed on all registered SQL Server instances.

SQL Doctor also allows you to schedule an analysis to run daily or weekly at the specified time. To automate your analyses, click **Schedule analysis** on the SQL Doctor toolbar.

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Check the recommendations list

The **Recommendations** view provides a list of performance recommendations based on the analysis SQL Doctor ran using your specific criteria. These recommendations result from a full analysis. You can also view quick findings for currently-occurring issues.

By default, SQL Doctor lists recommendations by priority. The priority of a recommendation is determined by the performance gain you receive from making the suggested change, how relevant it is the parameters you specified when configuring the analysis, and the confidence SQL Doctor has in the recommendation.

Highest priority recommendation

Lowest priority recommendation
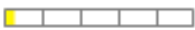
Use the left pane navigation tree to narrow the recommendations by:

- Applications targeted in your analysis
- Performance categories you selected
- Databases on the server
- Logins at the server or database level
- Frequency that specific recommendations were found
- Prioritized recommendations
- Workstations associated with this server

Flag recommendations to investigate later

Flagging a recommendation allows you to mark it for follow-up action. Use flags to identify recommendations that require further investigation or that you want to optimize at a later time. When you flag a recommendation, this flagged state is saved to the analysis file, allowing you easily find the recommendation later.

To flag recommendations, click the **Flag** icon next to the recommendation you want to flag.

Block a recommendation from appearing in future analyses

Select each recommendation you want to block, and then click **Block** on the **Recommendations** toolbar menu. Once a recommendation is blocked, it does not appear in any future analysis you run. For more information, see Block Recommendations.

Export analysis results

You can either export the results to Excel or email the results to specific people.

1. Select the recommendations you want to include in your export.
2. Select either **Export** or **Email** on the **Recommendations** toolbar menu.

Use Show me the problem and Optimize script

SQL Doctor allows you the opportunity perform the following actions, when applicable:

Show me the problem

Opens a SQL Viewer window displaying the problematic part of the SQL script that generated the recommendation.

Optimize Script

Opens the Optimize Now window, displaying the SQL script used to fix the detected problem. Click **Run** to fix the problem.

Undo Script

Opens the Undo Optimization window, displaying the SQL script used to undo the previously executed optimization. Click **Run** to undo the previous optimization.

Click a recommendation in the list to open the Recommendation Details window.

Schedule the next analysis

You can schedule an analysis to run automatically on a daily or weekly timeframe. To schedule the next analysis, click **Schedule analysis** on the SQL Doctor toolbar.

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Implicit conversion recommendation

It is common for implicit data type conversions to be performed throughout TSQL. Implicit conversion occurs when data from one object is moved to, compared with, or combined with data from another object of a different data type. Generally, implicit conversions cause an unnoticeable performance impact on query performance so most TSQL developers do not worry about the data type mismatches that lead to the implicit conversion.

The lack of attention to data type mismatches can have a significant negative impact on query performance. One case in particular is when the data type mismatch leads to an implicit conversion being performed on a column used in a search predicate. This implicit conversion prevents the use of an index seek and ensures that an index scan or table scan is performed to satisfy the query predicate. In this case the implicit conversion is caused by the query optimizer by seeing the column with the implicit conversion as an expression rather than a column.

For example see the following implicit conversion occurring in a search predicate and the result:

```
use AdventureWorks;
select EmployeeID from HumanResources.Employee
    where NationalIDNumber = 253022876;
```
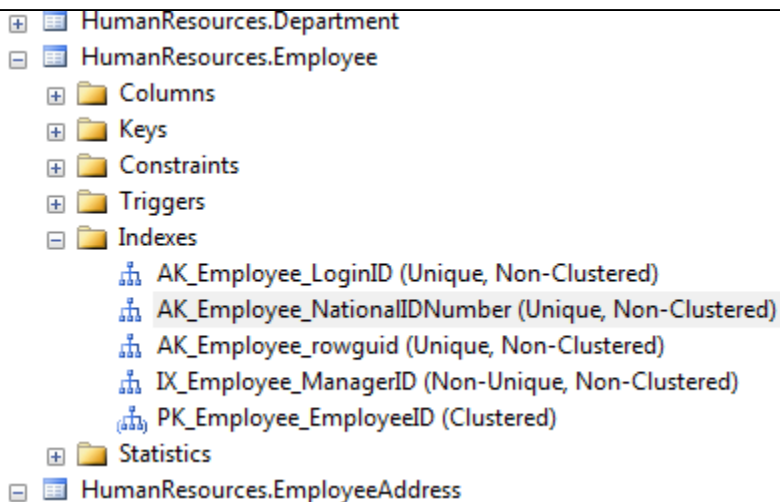

You would expect an index seek to occur on the 'AK_Employee_NationalIDNumber' index; however, the execution plan clearly shows that an index scan is performed instead of an index seek.
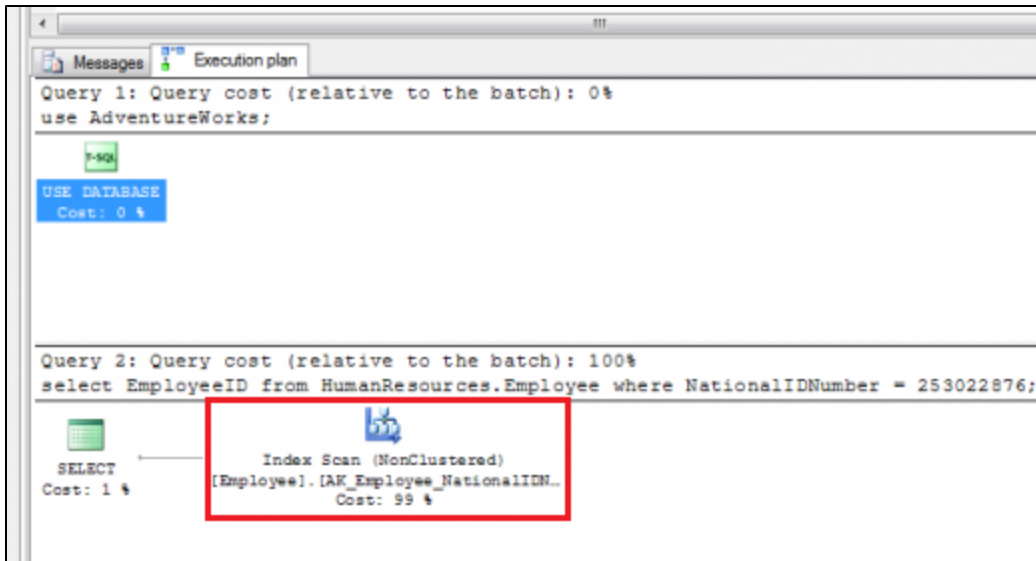
To determine the cause of having an index scan, mouse over the index scan operation of the execution plan to display the tooltip containing additional details:


Under the 'Predicate' section of the tooltip see that the 'CONVERT_IMPLICIT(int,[AdventureWorks].[HumanResources].[Employee].[NationalIDNumber] ,0)=(253022876)' implicit conversion is being performed on the 'NationalIDNumber' column. This column value is being converted because the data type of the column mismatch the data type of the literal value being used in the compare. To resolve the data mismatch, change the data type of the literal value to match the data type of the column:

```
use AdventureWorks;
select EmployeeID from HumanResources.Employee
    where NationalIDNumber = '253022876';
```

The new execution plan for the updated TSQL is the following:
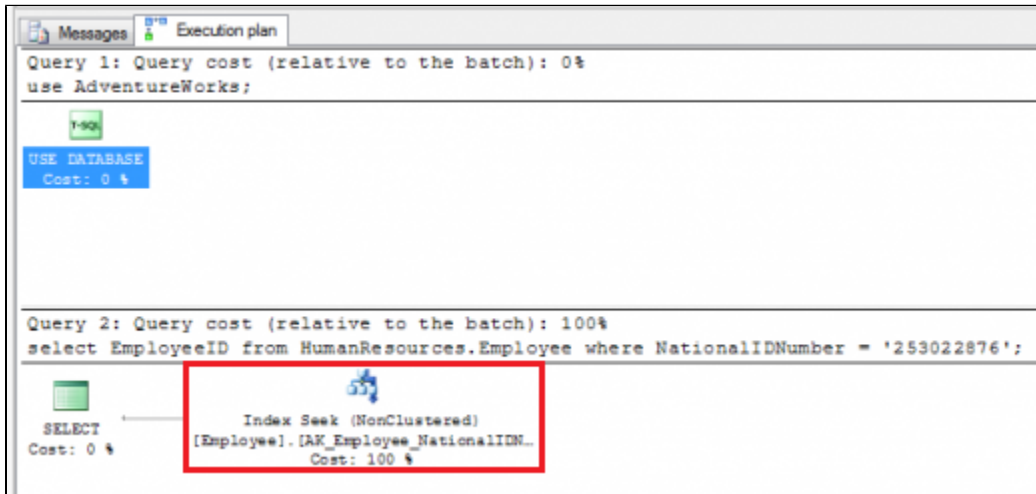
Note that the index scan is replaced by an index seek operation, optimizing successfully the query.

Use SQL Doctor to identify implicit conversions

IDERA SQL Doctor collects and analyzes your heaviest TSQL to help you identify implicit conversions along with other problems that impact query performance. The following is the resulting recommendation generated by SQL Doctor for the example presented above (SDR-Q36 – Implicit conversion on a column may be causing index suppression):
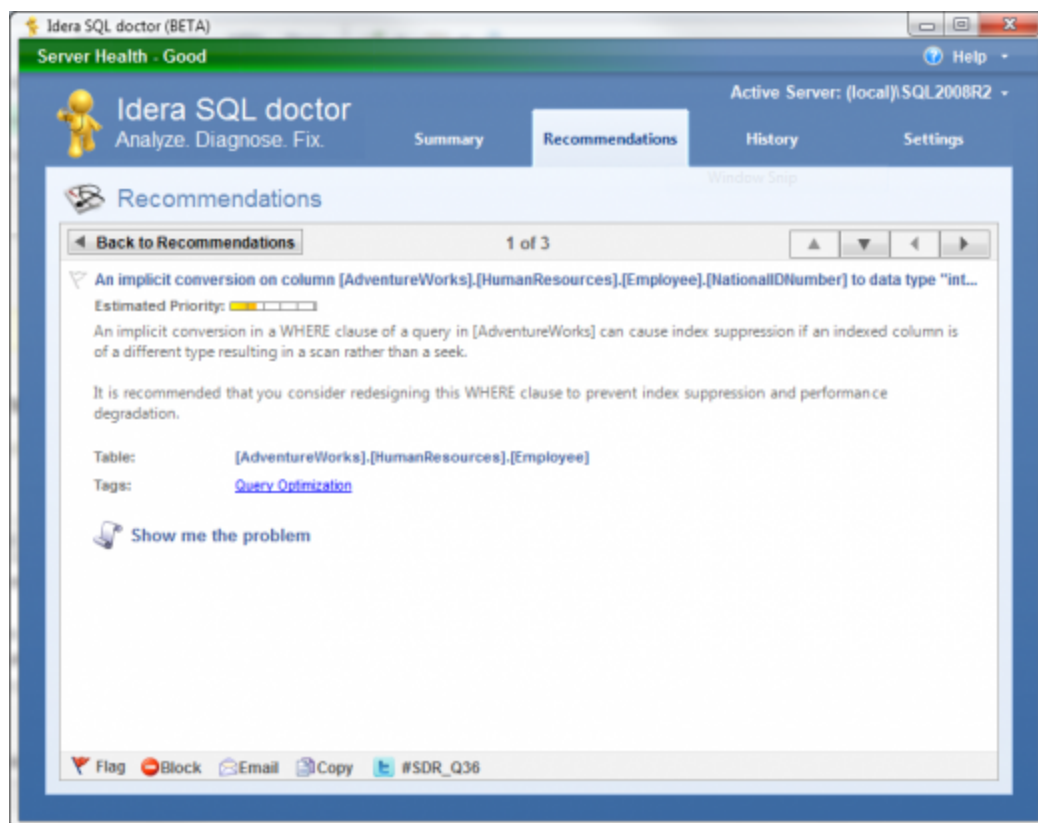
You can click **Show me the problem** on the Recommendations window to display the TSQL.

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Diagnose individual queries

The **Diagnose Queries** window helps you save time by analyzing the queries you care about without having to wait for a full analysis to complete. When SQL Doctor diagnoses a query, you receive performance recommendations without actually executing it.

When you click the diagnose button, SQL Doctor parses the T-SQL and bases the analysis and resultant recommendations on the estimated execution plans of the database selected.

> ⓘ The analyzed query is never executed on the target server or database.

Access the Diagnose Queries window

To open the Diagnose Queries window, click the Diagnose Queries button on the SQL Doctor toolbar.

Diagnose your queries

To diagnose your queries:

1. Click **Diagnose Queries**.
2. Use the **Server** and **Database** drop-down lists to select the SQL Server instance and database on which this query either currently runs or runs in the future.
3. Type a query in the space provided or copy and paste a query from your T-SQL files.

> ⓘ To validate the syntax of your query, use a tool like SQL Server Management Studio. SQL Doctor may be unable to generate estimated execution plans for queries that contain bad syntax.

4. Click **Diagnose**.

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Get a quick overview of enterprise health

Use the **All Servers** tab on the Dashboard view to quickly see the overall health of each registered server, based on the last analysis run. From this tab, you can also access quick links to the common tasks for a server such as updating the SQL Doctor settings, reviewing wait stats, or analyzing a query.

SQL Doctor displays the registered server status in its own pane, with links to the corresponding tasks.

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Get a quick overview of server health

Use the console tree to navigate to the Server Overview view and quickly see the overall health of this specific registered server, as of the last refresh.

This overview provides:

- A server health checklist that highlights where performance issues may be happening right now
- Real-time, key performance metrics for each major area of the server
- Quick findings based on the values of the key metrics so you can immediately start troubleshooting performance problems

Each health checklist provides the current value of specific server properties and statistics, such as how much memory is available and how old the last database backup is, and warns you when a property or statistic exceeds the defined threshold. You can customize any of these thresholds to match the performance requirements for your servers.

ⓘ For optimal performance, this view requires OLE automation to be enabled on the SQL Server instance.

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Get quick findings

Like recommendations, quick findings can provide expert advice on how to fix an issue and tune your overall server performance.

Unlike recommendations generated by a full analysis, quick findings are real-time. Each finding is based on a quick (and, therefore, limited) look at key performance metrics. Quick findings point you in the correct direction and give you crucial troubleshooting information when you need it most. However, to get a thorough review of your server performance, routinely perform a full analysis.

You can see quick findings for the following database and performance metrics:

- Query plans
- Queries
- Sessions
- Wait stats

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View query plan stats and findings

The Query Plan Stats view identifies all queries that are either scheduled or currently running on the selected SQL Server instance, as of the last refresh. This view also displays key performance metrics for these queries and any quick findings that would help improve your query performance.

These query performance metrics are collected from the Dynamic Management View (DMV) sys.dm_exec_query_stats. For more information about individual metrics, see the corresponding Microsoft Developer Network (MSDN) article (http://msdn.microsoft.com/en-us/library/ms189741. aspx).

However, the **Query** column displays the T-SQL code executed by the query, and the **Count** col umn reports how many times the query was run.

Access the Query Plan Stats view

You can access the Query Plan Stats view for a SQL Server instance by expanding the directory tree for the instance, and then selecting **Query Plan Stats**.

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View query details and findings

Use the **Query Details** window to identify which T-SQL code in your query is possibly causing performance issues and needs optimization.

This displays the full query, highlighting the suspect areas of your code. SQL Doctor then displays the performance metrics and quick findings associated with this specific query. This detailed information helps you narrow down your troubleshooting steps and obtain an immediate increase in server performance.

Access the Query Details window

To access the Query Details window, double-click a query while viewing your Query Plan Stats.

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View session data and findings

The Sessions view identifies all sessions that are currently active on the selected SQL Server instance, as of the last refresh, as well as their key performance metrics and any quick findings that would help improve your session performance.

These session performance metrics are collected from the Dynamic Management View (DMV) sys.dm_exec_requests. For more information about individual metrics, see the corresponding Microsoft Developer Network (MSDN) article (http://msdn.microsoft.com/en-us/library/ms177648. aspx).

Access the Sessions view

You can access the Sessions view for a SQL Server instance by expanding the directory tree for the instance, and then selecting **Sessions**.

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View wait stats and findings

The Waits view identifies all waits that occurred on the selected SQL Server instance, as of the last refresh, as well as their key performance metrics and any quick findings that would help decrease the number of waits and improve your overall server performance.

These statistics and findings represent the state of waits on this server during the specified time range. The time range spans from the reset time to the last refresh time. To change the reset time to your current time, click **Reset**.

Although the metric descriptions and categories are provided by SQL Doctor, the performance metrics are collected from the Dynamic Management View (DMV) sys.dm_os_wait_stats. For more information about individual metrics, see the corresponding Microsoft Developer Network (MSDN) article (http://msdn.microsoft.com/en-us/library/ms179984.aspx).

Access the Waits view

You can access the Waits view for a SQL Server instance by expanding the directory tree for the instance, and then selecting **Waits**.

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Parallelism and CXPACKET waits

CXPACKET waits occur when a parallel query is executed and one or more threads have to wait on one of the other threads to complete. SQL Server parallelizes a query by dividing each query operation into equal sized sets and by splitting up these sets into multiple threads targeting specific processors for parallel processing. Because not all the threads complete at exactly the same time, the server experiences CXPACKET waits.

> ⚠ Parallel queries require extra overhead to coordinate the parallel processing along with the initialization, synchronization, and termination of the parallel plan. *If you have a parallel query execution* , you will have CXPACKET waits.

High CXPACKET waits

CXPACKET waits are of concern only if they are in excess. High CXPACKET waits indicate that some performance tuning is necessary on a specific query or the whole SQL Server.

The causes for experiencing high CXPACKET in your SQL Server can be any of the following:

- Out of data statistics causing SQL Server to incorrectly divide the query into equal sized sets.
- Fragmented indexes causing slower I/O speeds that impact one thread over the others.
- Client applications processing result sets inefficiently.
- Hyper-threading that causes SQL Server to process threads on hyper-threaded cores instead of only physical cores.
- CPU pressure.
- Memory pressure.
- Incorrect configuration of the Max degree of parallelism server option.
- Incorrect configuration of the Cost threshold for parallelism server option.

If you experience high CXPACKET waits in your OLTP server, it is generally due to one or more of the following:

- Missing indexes
- Out of data statistics
- Missing search predicate
- Function used on a column in a search predicate

Keep CXPACKET waits under control

Use the following process to keep regular maintenance of your index and statistics and to control CXPACKET waits:

1. Enable Auto Create Statistics and Auto Update Statistics database properties options in all databases.
2. Rebuild all indexes.
3. Perform an UPDATE STATISTICS on all stats objects with the FULLSCAN.
4. Disable Hyper-threading.
5. Set the Max Degree of Parallelism server configuration option to a number smaller than the number of physical processor cores.
6. Set the Cost Threshold for Parallelism server configuration option not too low.

Identify the cause for experiencing CXPACKET waits

You can review the query plans from the plan cache to identify queries that can be parallelized. Use the following links to find scripts for viewing your query plans:

- Can you dig it? - Parallelism in the plan cache
- Find query plans that may utilize parallelism

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CXPACKET waits for OLTP servers

OLTP servers have fast running transactions that should be never parallelized and therefore never cause CXPACKET waits. If you tune your queries properly, verify that the index usage is correct, and perform index and statistics maintenance when necessary, CXPACKET waits should not be of concern. If you experience high CXPACKET waits, try the following:

- Increase the Cost threshold for parallelism server configuration option until the waits are under control.
- Use the 'OPTION (MAXDOP 1)' query hint to prevent parallelism when you identify specific queries that cause the CXPACKET waits.
- Set the Max degree of parallelism server configuration option to half the number of physical processors on the server up to a max of eight. This configuration prevents a query from monopolizing all of the processors at the detriment of other activity on the server. As a last resort, set the Max degree of parallelism server configuration option to 1 to prevent any query parallelism.

CXPACKET waits for non-OLTP servers

CXPACKET waits for non-OLTP servers (Reporting, OLAP, Hybrid-OLTP, etc.) are indicators that parallelism takes place.

CXPACKET waits indicate that:

- Queries may need to be tuned
- Indexes may need to be added and/or correctly tuned for the workload
- Index reorganization/rebuilding may be needed
- Statistics may be out of date

Configure your server options for parallelism

Max degree of parallelism

Leave the Max degree of parallelism server configuration option at zero. Note that this configuration may be acceptable for non-OTPL Servers. You can also consider setting the Max degree of parallelism server configuration option at half the number of physical processors on the server up to a max of eight.

Cost threshold for parallelism

Set the Cost threshold for parallelism server configuration option at the default setting of 5.

Identify what is causing CXPACKET waits
To identify the responsible for CXPACKET waits in your SQL Server, run the following query:

```
select

    t.wait_type,

    t.wait_duration_ms,
```

```sql
        t.session_id,
        t.resource_description,
        s.program_name,
        b.sql_handle,
        b.statement_start_offset,
        b.statement_end_offset,
        [statement_text]=SUBSTRING(st.text, (b.statement_start_offset/2)+1,
                                ((CASE b.statement_end_offset
                                    WHEN-1 THEN DATALENGTH(st.text)
                                      ELSE b.statement_end_offset
                                 END - b.statement_start_offset)/2) + 1),
        st.text

        from sys.dm_os_waiting_tasks t
        left join sys.dm_exec_requests b
        left join sys.dm_exec_sessions s on b.session_id = s.session_id
        on t.waiting_task_address = b.task_address
        outer apply sys.dm_exec_sql_text (b.sql_handle) st
        where b.sql_handle is not null and t.wait_type = 'CXPACKET';
```

To identify the responsible for CXPACKET waits and also display the execution plan, run the following modified script:

```sql
select
        t.wait_type,
        t.wait_duration_ms,
        t.session_id,
        t.resource_description,
        s.program_name,
        qp.query_plan,
        b.statement_start_offset,
        b.statement_end_offset,
        [statement_text]=SUBSTRING(st.text, (b.statement_start_offset/2)+1,
                                ((CASE b.statement_end_offset
                                        WHEN -1 THEN DATALENGTH(st.text)
                                          ELSE b.statement_end_offset
                                 END - b.statement_start_offset)/2) + 1),
```

```
        st.text

        from sys.dm_os_waiting_tasks t
        left join sys.dm_exec_requests b
        left join sys.dm_exec_sessions s on b.session_id = s.session_id
        on t.waiting_task_address = b.task_address
        outer apply sys.dm_exec_sql_text (b.sql_handle) st
        cross apply sys.dm_exec_query_plan(b.plan_handle) qp
        where b.sql_handle is not null and t.wait_type = 'CXPACKET'
```

After running the query, click the **ShowPlan** link in the query_plan column to display the execution plan. Review the plan to see if the query in question needs additional tuning.

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Show me the problem

The **Show me the problem** button launches the SQL Viewer window with the SQL text associated with the recommendation highlighted. Click **Copy** to copy the SQL text to the clipboard so you can view the text in a text editor or in SQL Server Management Services.

Access the Show me the problem

To access the Show me the problem window, view the list of recommendations for a SQL Server instance. Select the appropriate row, and then click **Show me the problem**.

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Show me how to optimize performance

The **Optimize Now** window displays the script that used to enact the recommended change. Review the script, and then either click the **Run** button to initiate the optimization or click **Cancel** to return to the recommendation you were viewing.

You can also copy the script to Notepad or another text editor to examine the code and research other options further before making the change.

If you need to cancel out of the optimization, keep in mind it may take a few minutes for the process to stop.

Access the Optimize Now window

To access the Optimize Now window, view the list of recommendations for a SQL Server instance. Select the appropriate row, and then click **Optimize Script**.

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Undo previously applied optimization

The **Undo Optimization** window displays the script that is used to enact the recommended change. Review the script and either click the **Run** button to initiate the undo or click **Cancel** to return to the recommendation you were viewing. The undo script can be copied to clipboard and used at a later time.

Executing the undo script on a recommendation that is not already optimized can harm your SQL Server environment. Before executing the undo script, be sure that the corresponding optimization is performed.

Access the Undo Optimization window

To access the Undo Optimization window, select the row of the recommendation that you previously optimized, and then click **Undo Script**.

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View recommendation details

The **Recommendation Details** window provides detailed information about your recommendation, in many cases this includes the actual metrics involved, databases, tables, or applications involved.

The following actions are available on every recommendation details window:

Flag

Allows you to flag the recommendation. Use this flag to identify or group recommendations that require further troubleshooting. The flag state is preserved in the recommendation history, so you can return to this list of recommendations later and see which ones still need attention.

Block

Disallow this recommendation from appearing in subsequent analysis results.

Copy

Copy the recommendation text to clipboard to use in other applications.

Email

Send the contents of this recommendation in an email message.

Export

Saves the selected recommendations to a Microsoft Excel spreadsheet.

Use Show me the problem and Optimize Script

SQL Doctor allows you the opportunity perform the following actions, when applicable:

Show me the problem

Opens a SQL Viewer window displaying the problematic part of the SQL script that generated the recommendation.

Optimize Script

Opens the Optimize Now window, displaying the SQL script used to fix the detected problem. Click **Run** to fix the problem.

Undo Script

Opens the Undo Optimization window, displaying the SQL script used to undo the previously executed optimization. Click **Run** to undo the previous optimization.

Click a recommendation in the list to open the Recommendation Details window.

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