Troubleshoot Like A Microsoft Engineer

Tim Chapman & Denzil Ribeiro

Agenda

Introduction to SQLDiag and Diag Manager

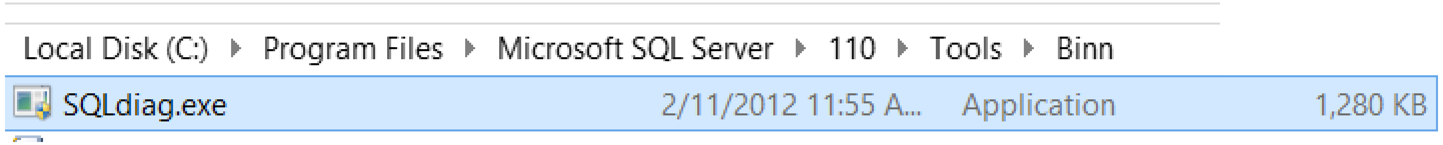
Introduction to SQL Nexus

Configuring, Collecting, and Importing Data

Analyzing the Results

SQLDiag

Command line utility that ships with SQL Server
Located in the installation Binn directory



Local Disk (C:) ▸ Program Files ▸ Microsoft SQL Server ▸ 110 ▸ Tools ▸ Binn

SQLdiag.exe	2/11/2012 11:55 A...	Application	1,280 KB

Gathers perfmon logs, error logs, profiler traces, blocking information, etc
Requires and XML configuration file

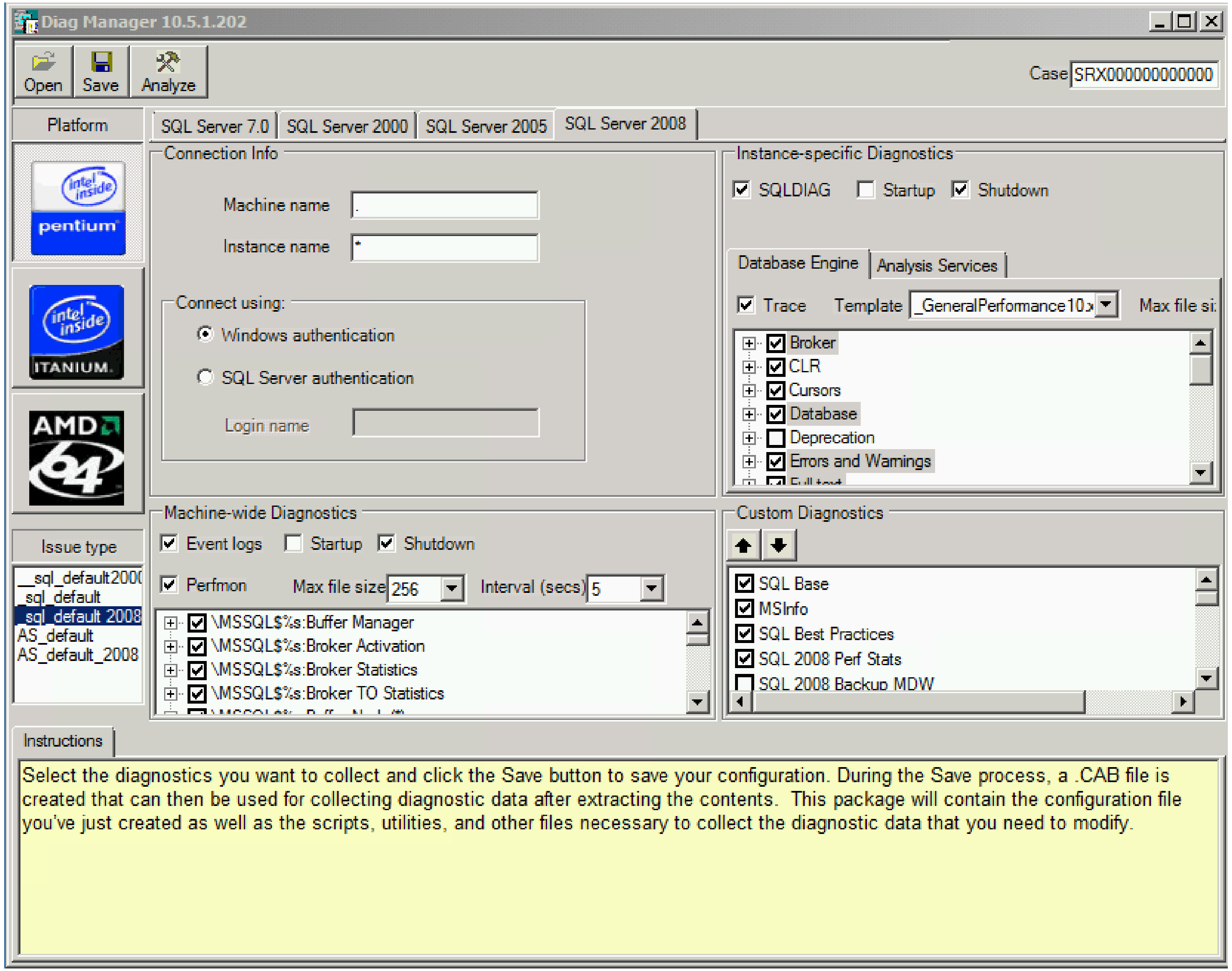
- This XML file specifies what to collect

Can add custom collectors – allows you to grab the information you need
You execute a PSSDIAG file, which in turn uses SQLDIAG under the covers

- PSSDIAG → SQLDIAG → Collectors

Diag Manager

- What I use to create a pssdiag for you
- GUI tool used to create configuration file
- Free download from [Codeplex]()
- The more you configure to trace, the more impact you may have on performance
  - I rarely use Trace



Case SRX000000000000

Connection Info

Machine name .

Instance name *

Connect using:

● Windows authentication

○ SQL Server authentication

Login name

Instance-specific Diagnostics

☑ SQLDIAG □ Startup ☑ Shutdown

Database Engine | Analysis Services

☑ Trace Template _GeneralPerformance10.x Max file si

- ☑ Broker
- ☑ CLR
- ☑ Cursors
- ☑ Database
- □ Deprecation
- ☑ Errors and Warnings
- ☑ Full text

Machine-wide Diagnostics

☑ Event logs □ Startup ☑ Shutdown

☑ Perfmon Max file size 256 Interval (secs) 5

- ☑ \MSSQL$%s:Buffer Manager
- ☑ \MSSQL$%s:Broker Activation
- ☑ \MSSQL$%s:Broker Statistics
- ☑ \MSSQL$%s:Broker TO Statistics

Custom Diagnostics

- ☑ SQL Base
- ☑ MSInfo
- ☑ SQL Best Practices
- ☑ SQL 2008 Perf Stats
- □ SQL 2008 Backup MDW

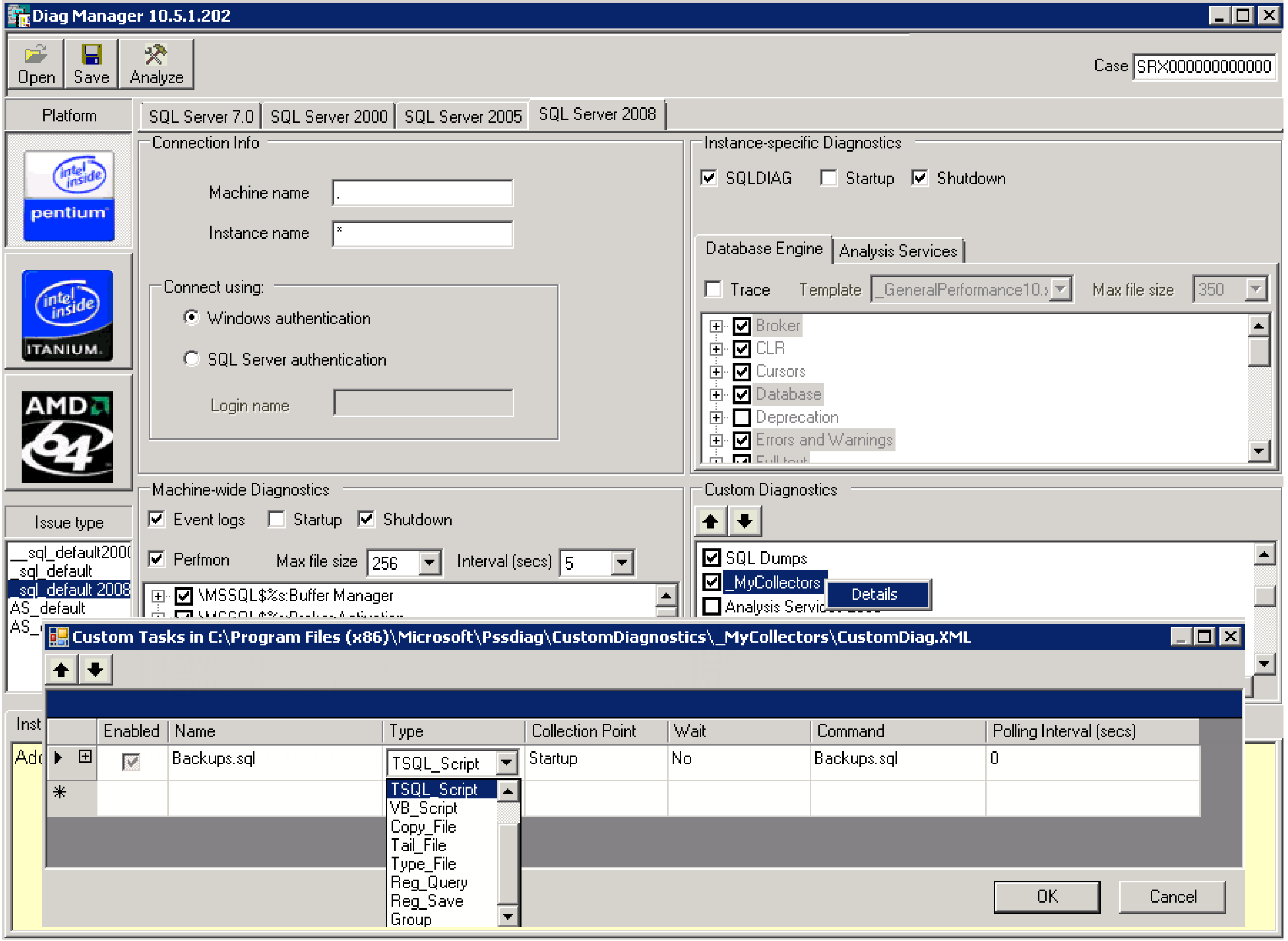
Issue type:

- __sql_default200
- sql_default
- sql_default 2008
- AS_default
- AS_default_2008

Select the diagnostics you want to collect and click the Save button to save your configuration. During the Save process, a .CAB file is created that can then be used for collecting diagnostic data after extracting the contents. This package will contain the configuration file you've just created as well as the scripts, utilities, and other files necessary to collect the diagnostic data that you need to modify.

Capturing Custom Data Collections

- This is the *REAL* power of using Diag Manager & SQL Nexus
- Diag Manager can capture any scripts you specify and SQL Nexus can import them into a database
- Once imported, you can run your own diagnostic scripts to find problems
  - More on this later…



Diag Manager 10.5.1.202

Case SRX000000000000

Connection Info

Machine name: .

Instance name: *

Connect using:

● Windows authentication

○ SQL Server authentication

Login name:

Instance-specific Diagnostics

☑ SQLDIAG □ Startup ☑ Shutdown

□ Trace Template _GeneralPerformance10.x Max file size 350

☑ Broker
☑ CLR
☑ Cursors
☑ Database
□ Deprecation
☑ Errors and Warnings
☑ Full text

Machine-wide Diagnostics

☑ Event logs □ Startup ☑ Shutdown

☑ Perfmon Max file size 256 Interval (secs) 5

☑ \MSSQL$%s:Buffer Manager

Custom Diagnostics

☑ SQL Dumps
☑ _MyCollectors
□ Analysis Servic

Issue type

sql_default2000
sql_default
sql_default 2008
AS_default
AS_

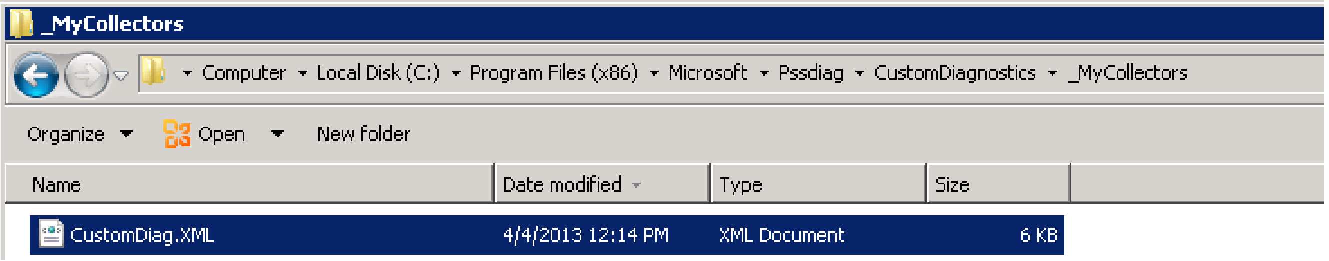
Custom Tasks in C:\Program Files (x86)\Microsoft\Pssdiag\CustomDiagnostics_MyCollectors\CustomDiag.XML

Enabled	Name	Type	Collection Point	Wait	Command	Polling Interval (secs)
☑	Backups.sql	TSQL_Script	Startup	No	Backups.sql	0

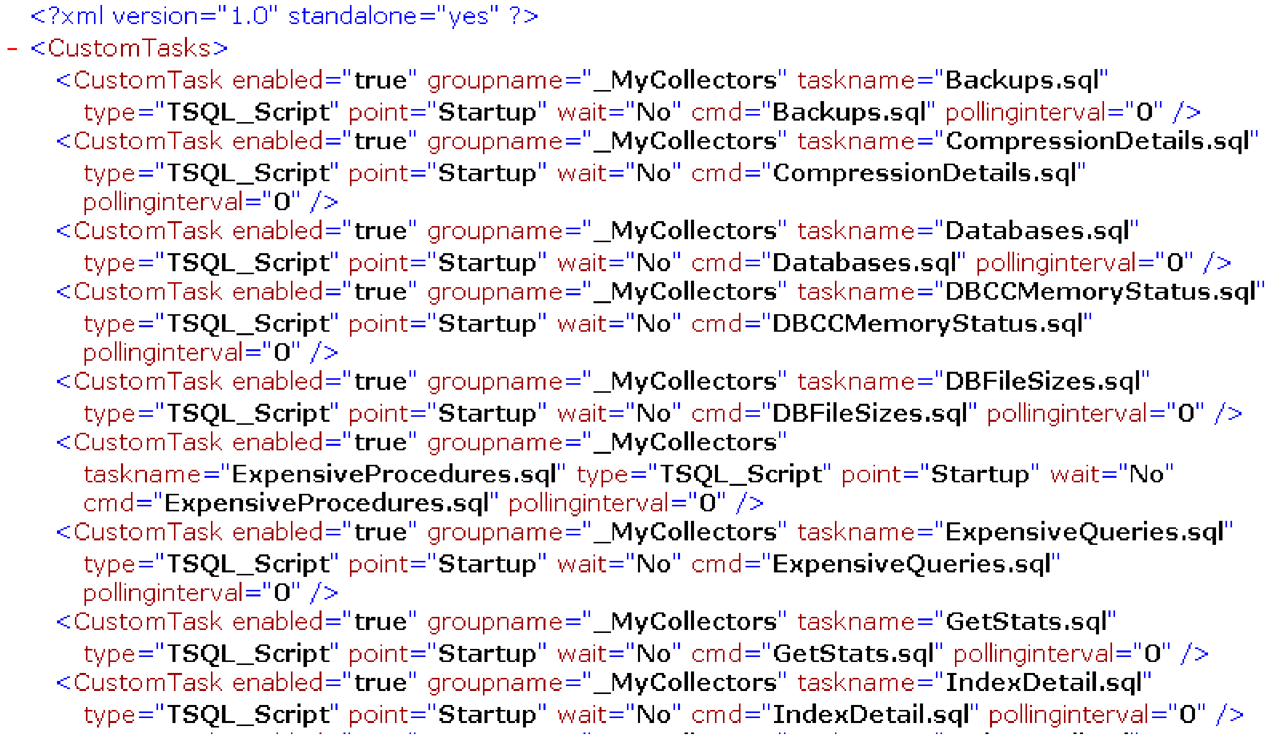
TSQL_Script
VB_Script
Copy_File
Tail_File
Type_File
Reg_Query
Reg_Save
Group

Capturing Custom Data Collections

- Custom Collections are added to the CustomDiag.XML file in the _MyCollectors folder
- It is usually quicker to modify this XML file to add collections than it is through the UI


_MyCollectors
Computer ▸ Local Disk (C:) ▸ Program Files (x86) ▸ Microsoft ▸ Pssdiag ▸ CustomDiagnostics ▸ _MyCollectors
Organize
Open
New folder

Name	Date modified	Type	Size
CustomDiag.XML	4/4/2013 12:14 PM	XML Document	6 KB



```
  <?xml version="1.0" standalone="yes" ?>
- <CustomTasks>
    <CustomTask enabled="true" groupname="_MyCollectors" taskname="Backups.sql"
      type="TSQL_Script" point="Startup" wait="No" cmd="Backups.sql" pollinginterval="0" />
    <CustomTask enabled="true" groupname="_MyCollectors" taskname="CompressionDetails.sql"
      type="TSQL_Script" point="Startup" wait="No" cmd="CompressionDetails.sql"
      pollinginterval="0" />
    <CustomTask enabled="true" groupname="_MyCollectors" taskname="Databases.sql"
      type="TSQL_Script" point="Startup" wait="No" cmd="Databases.sql" pollinginterval="0" />
    <CustomTask enabled="true" groupname="_MyCollectors" taskname="DBCCMemoryStatus.sql"
      type="TSQL_Script" point="Startup" wait="No" cmd="DBCCMemoryStatus.sql"
      pollinginterval="0" />
    <CustomTask enabled="true" groupname="_MyCollectors" taskname="DBFileSizes.sql"
      type="TSQL_Script" point="Startup" wait="No" cmd="DBFileSizes.sql" pollinginterval="0" />
    <CustomTask enabled="true" groupname="_MyCollectors"
      taskname="ExpensiveProcedures.sql" type="TSQL_Script" point="Startup" wait="No"
      cmd="ExpensiveProcedures.sql" pollinginterval="0" />
    <CustomTask enabled="true" groupname="_MyCollectors" taskname="ExpensiveQueries.sql"
      type="TSQL_Script" point="Startup" wait="No" cmd="ExpensiveQueries.sql"
      pollinginterval="0" />
    <CustomTask enabled="true" groupname="_MyCollectors" taskname="GetStats.sql"
      type="TSQL_Script" point="Startup" wait="No" cmd="GetStats.sql" pollinginterval="0" />
    <CustomTask enabled="true" groupname="_MyCollectors" taskname="IndexDetail.sql"
      type="TSQL_Script" point="Startup" wait="No" cmd="IndexDetail.sql" pollinginterval="0" />
```

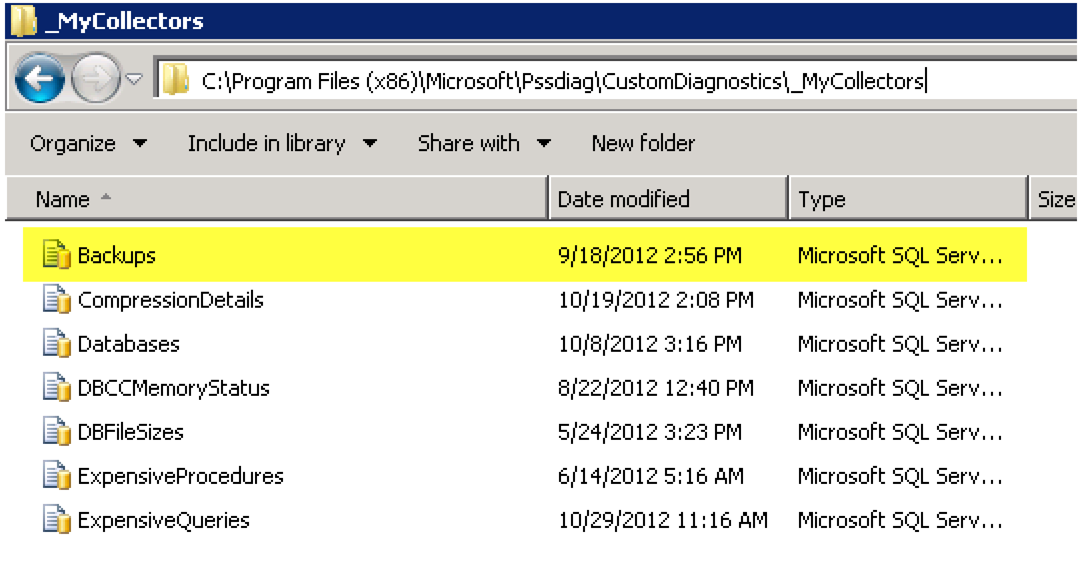
Diag Manager Custom Collection

Add your SQL scripts to the _MyCollectors DiagManager folder

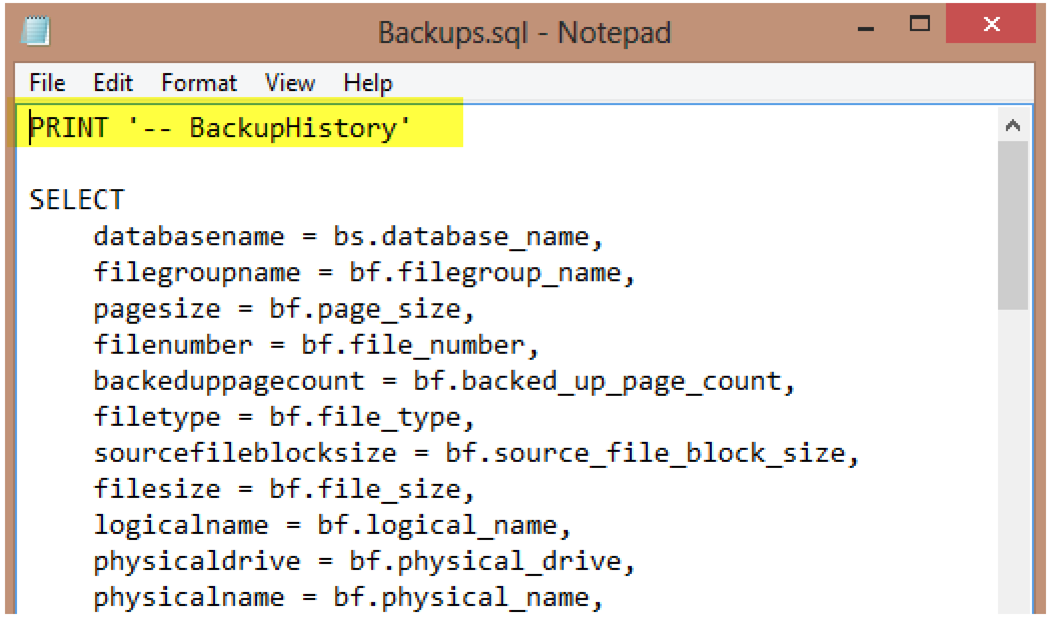
- C:\Program Files (x86)\Microsoft\Pssdiag\CustomDiagnostics_MyCollectors

Make sure the resultsets have a tag that uniquely identifies them

- We will use this tag to import the data into SQL Nexus


_MyCollectors
C:\Program Files (x86)\Microsoft\Pssdiag\CustomDiagnostics_MyCollectors
Organize
Include in library
Share with
New folder

Name	Date modified	Type	Size
Backups	9/18/2012 2:56 PM	Microsoft SQL Serv...	
CompressionDetails	10/19/2012 2:08 PM	Microsoft SQL Serv...	
Databases	10/8/2012 3:16 PM	Microsoft SQL Serv...	
DBCCMemoryStatus	8/22/2012 12:40 PM	Microsoft SQL Serv...	
DBFileSizes	5/24/2012 3:23 PM	Microsoft SQL Serv...	
ExpensiveProcedures	6/14/2012 5:16 AM	Microsoft SQL Serv...	
ExpensiveQueries	10/29/2012 11:16 AM	Microsoft SQL Serv...	



```
PRINT '-- BackupHistory'

SELECT
    databasename = bs.database_name,
    filegroupname = bf.filegroup_name,
    pagesize = bf.page_size,
    filenumber = bf.file_number,
    backeduppagecount = bf.backed_up_page_count,
    filetype = bf.file_type,
    sourcefileblocksize = bf.source_file_block_size,
    filesize = bf.file_size,
    logicalname = bf.logical_name,
    physicaldrive = bf.physical_drive,
    physicalname = bf.physical_name,
```

DEMO – Collect Data

Configure a collection with Diag Manager

Show custom collectors

Start a collection

Show Data being collected

Review collection error logs

Stop a collection

SQL Nexus

Tool used to import and report on SQLDiag output

Allows you to develop custom collections and reports

Available on Codeplex: http://sqlnexus.codeplex.com/

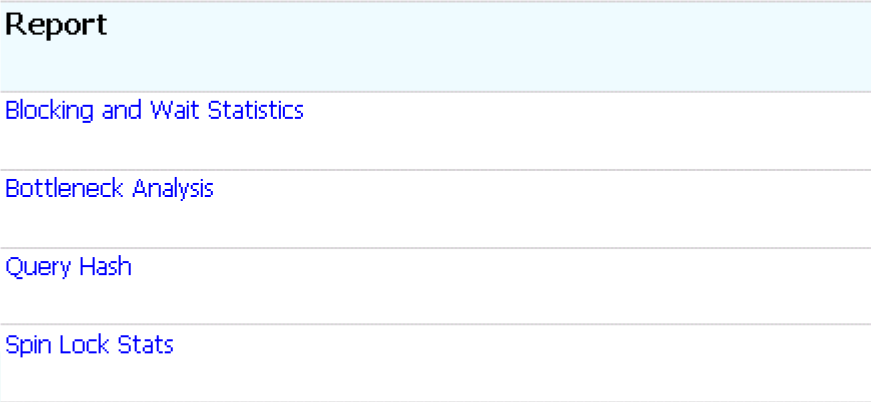
- This means that the source code is available

RML Utilities must be installed prior to installing SQL Nexus

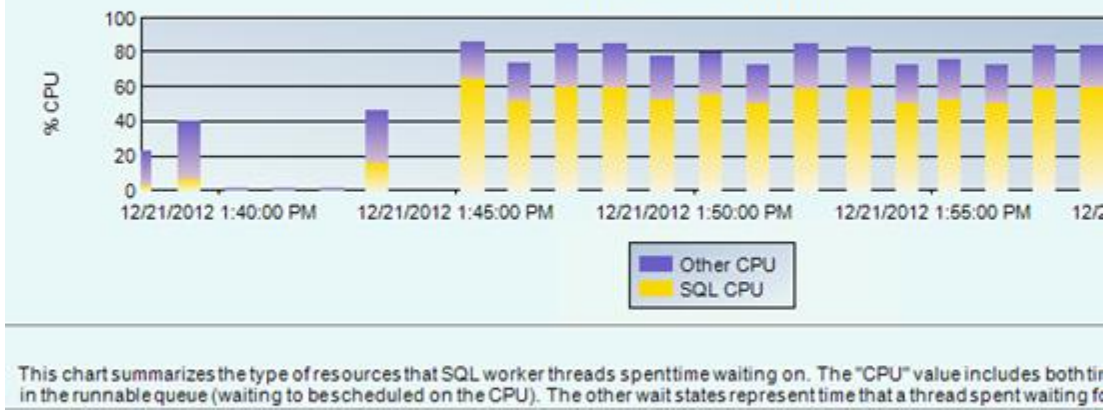
- RML Utilities for SQL Server (x86) – http://www.microsoft.com/en-us/download/details.aspx?id=8161
- RML Utilities for SQL Server (x64) – http://www.microsoft.com/en-us/download/details.aspx?id=4511

SQL Nexus Reports

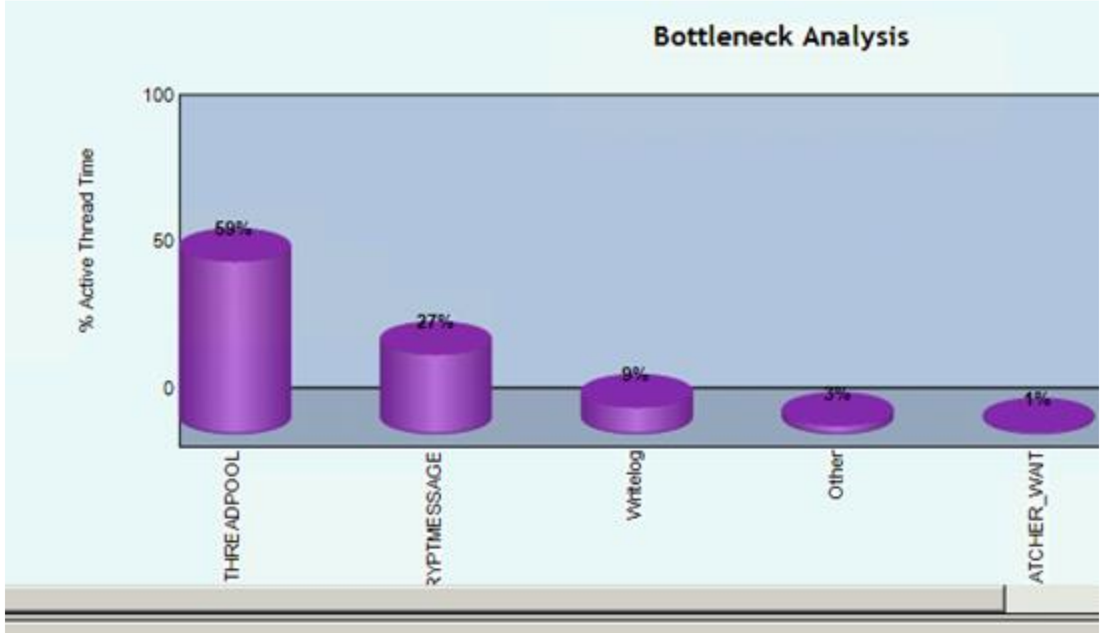
Built-in reports provide a nice GUI for blocking, wait statistics, resource utilization, etc.



Report
Blocking and Wait Statistics
Bottleneck Analysis
Query Hash
Spin Lock Stats



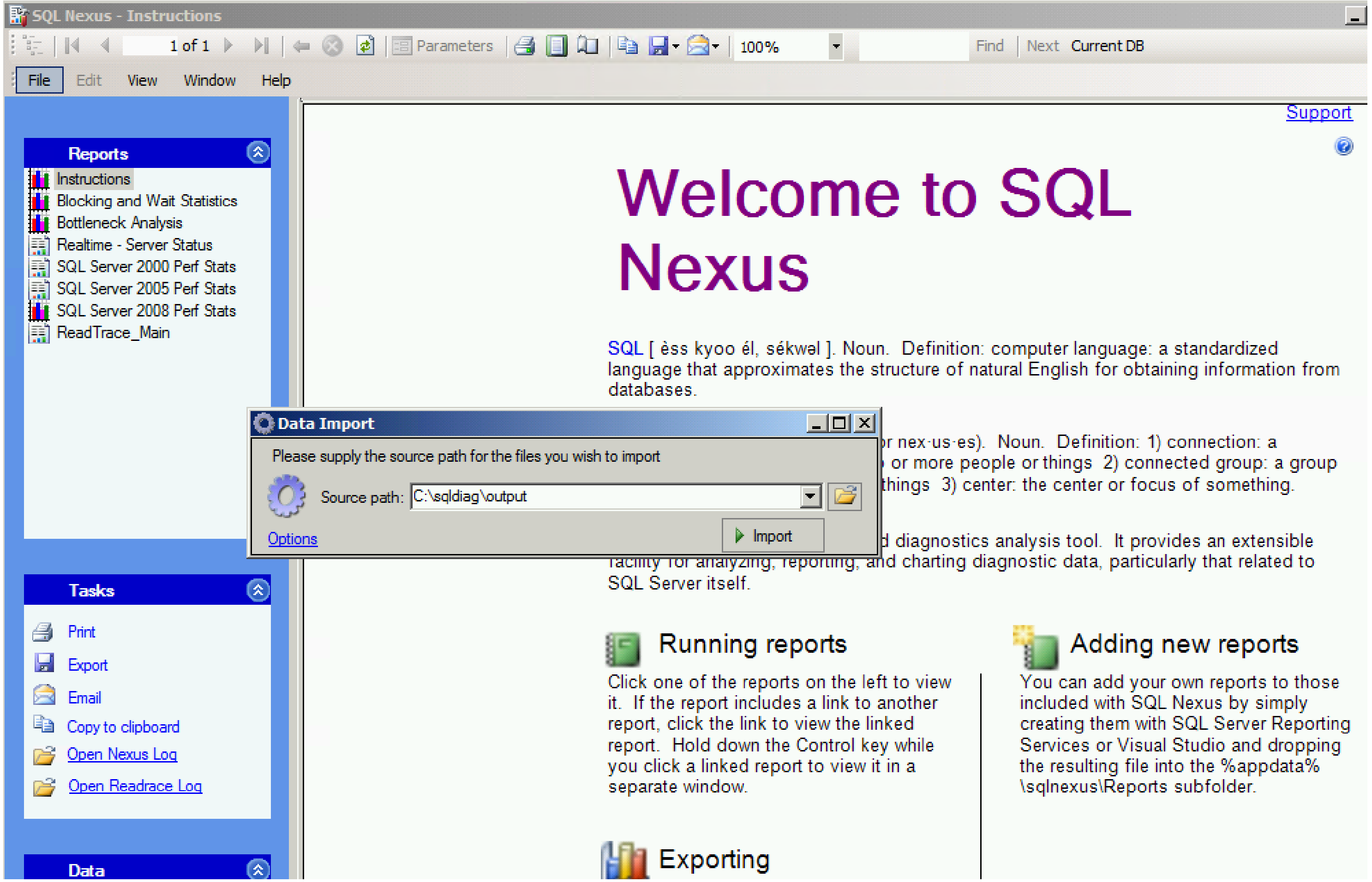
This chart summarizes the type of resources that SQL worker threads spent time waiting on. The "CPU" value includes both ti
in the runnable queue (waiting to be scheduled on the CPU). The other wait states represent time that a thread spent waiting fo



Demo – Import Data into SQL Nexus

Explore Import Options

Import the data



Welcome to SQL Nexus

SQL [èss kyoo él, sékwəl]. Noun. Definition: computer language: a standardized language that approximates the structure of natural English for obtaining information from databases.

…r nex·us·es). Noun. Definition: 1) connection: a … or more people or things 2) connected group: a group … things 3) center: the center or focus of something.

…d diagnostics analysis tool. It provides an extensible facility for analyzing, reporting, and charting diagnostic data, particularly that related to SQL Server itself.

Please supply the source path for the files you wish to import

Source path: C:\sqldiag\output

Running reports

Click one of the reports on the left to view it. If the report includes a link to another report, click the link to view the linked report. Hold down the Control key while you click a linked report to view it in a separate window.

Adding new reports

You can add your own reports to those included with SQL Nexus by simply creating them with SQL Server Reporting Services or Visual Studio and dropping the resulting file into the %appdata%\sqlnexus\Reports subfolder.

Exporting

SQL Nexus Custom Diagnostics

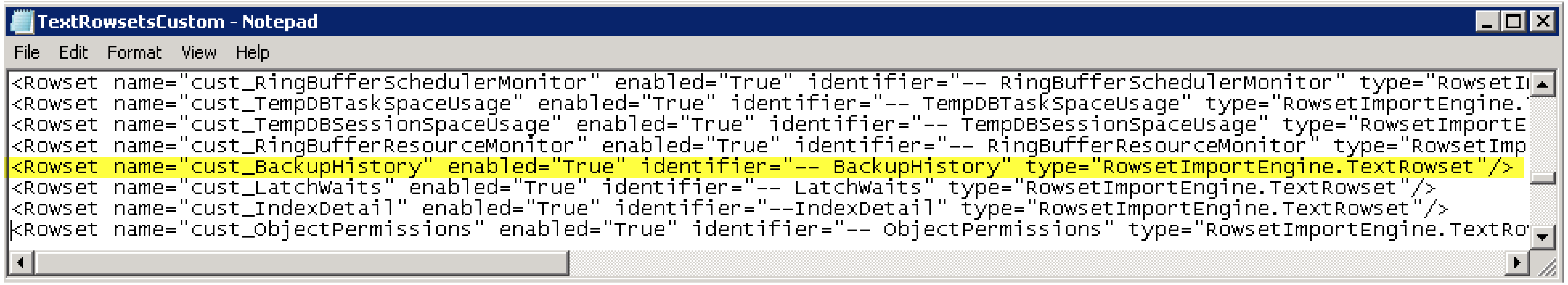
SQL Nexus uses a custom import process that you can take advantage of

By modifying a XML configuration file, you can have SQL Nexus import your custom data collection from PSSDiag

Add the name of the rowset in the TextRowsetsCustom.xml file

- Located where you installed SQL Nexus

Tip: You must have entered something in your custom data collection to identify the rowset so SQL Nexus can import it



```
<Rowset name="cust_RingBufferSchedulerMonitor" enabled="True" identifier="-- RingBufferSchedulerMonitor" type="RowsetI
<Rowset name="cust_TempDBTaskSpaceUsage" enabled="True" identifier="-- TempDBTaskSpaceUsage" type="RowsetImportEngine.
<Rowset name="cust_TempDBSessionSpaceUsage" enabled="True" identifier="-- TempDBSessionSpaceUsage" type="RowsetImportE
<Rowset name="cust_RingBufferResourceMonitor" enabled="True" identifier="-- RingBufferResourceMonitor" type="RowsetImp
<Rowset name="cust_BackupHistory" enabled="True" identifier="-- BackupHistory" type="RowsetImportEngine.TextRowset"/>
<Rowset name="cust_LatchWaits" enabled="True" identifier="-- LatchWaits" type="RowsetImportEngine.TextRowset"/>
<Rowset name="cust_IndexDetail" enabled="True" identifier="--IndexDetail" type="RowsetImportEngine.TextRowset"/>
<Rowset name="cust_ObjectPermissions" enabled="True" identifier="-- ObjectPermissions" type="RowsetImportEngine.TextRo
```

DEMO – Import Custom Data

Show the XML configuration file

View the collections

Import data

Show tables for custom diagnostics

Performance Analysis of Logs (PAL) Tool

Free tool used to analyzer Perfmon logs

Allows you to set custom thresholds or use thresholds already configured for your workload

- There is a SQL Server workload that looks at SQL Server counters

Available on Codeplex: http://pal.codeplex.com/

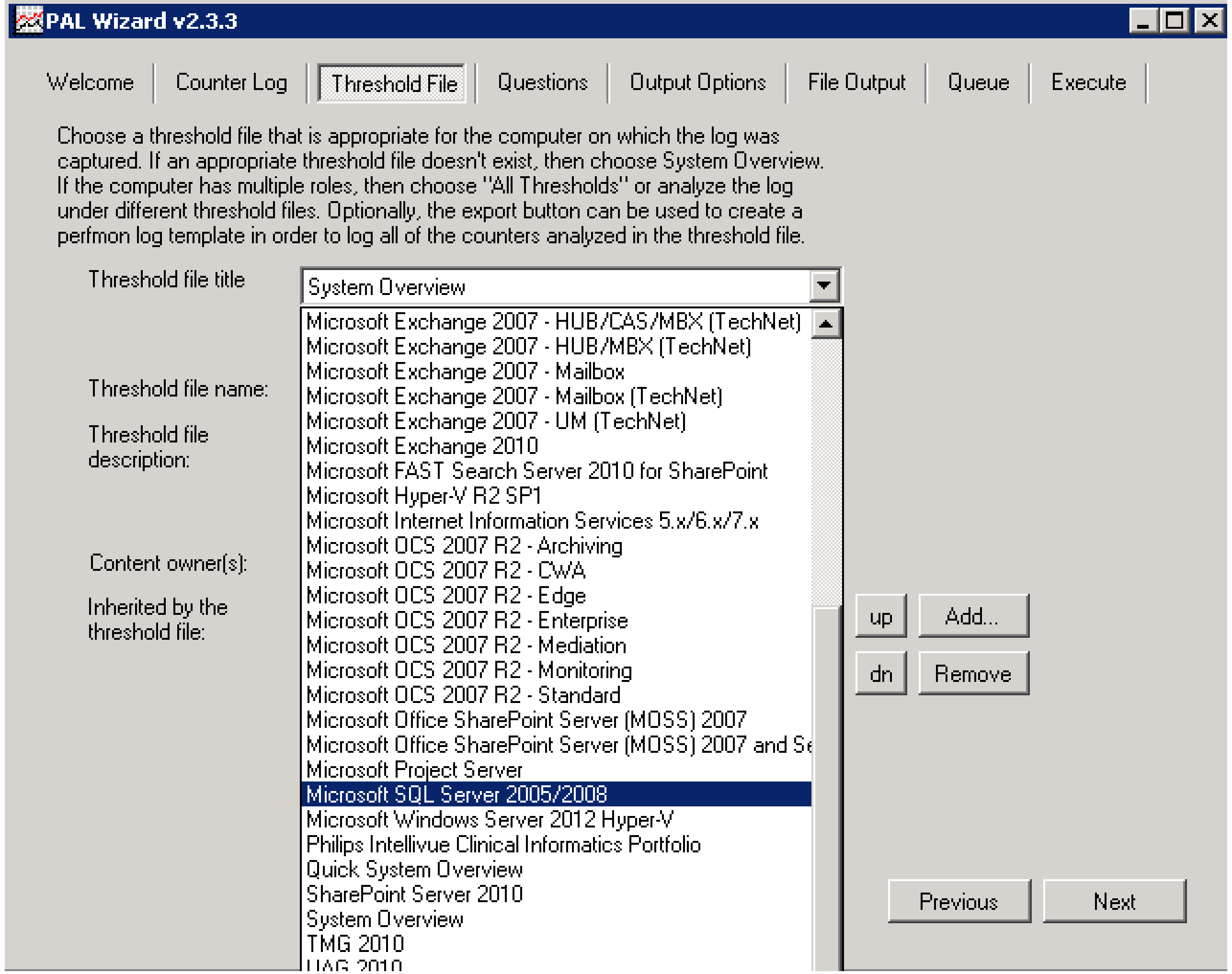
Does take some analysis time, so be prepared to wait if you need to analyze a lot of perfmon information

The PAL Wizard

Answer each option carefully as it will impact the output report

Choose the SQL Server 2005/2008 Threshold Option

Use the ThresholdFile tab to create a perfmon counter template file to easily collect the data



Choose a threshold file that is appropriate for the computer on which the log was captured. If an appropriate threshold file doesn't exist, then choose System Overview. If the computer has multiple roles, then choose "All Thresholds" or analyze the log under different threshold files. Optionally, the export button can be used to create a perfmon log template in order to log all of the counters analyzed in the threshold file.

Threshold file title: System Overview

Threshold file name:

Threshold file description:

Content owner(s):

Inherited by the threshold file:

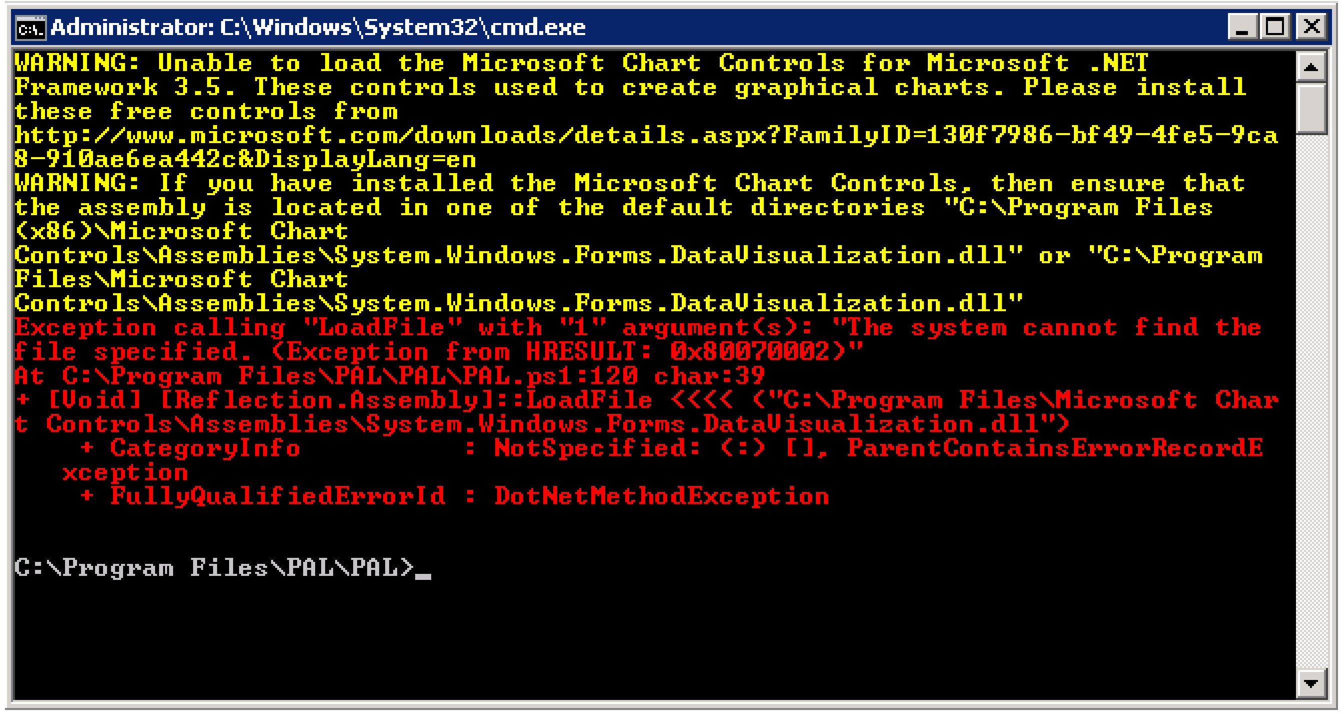
Microsoft Exchange 2007 - HUB/CAS/MBX (TechNet)
Microsoft Exchange 2007 - HUB/MBX (TechNet)
Microsoft Exchange 2007 - Mailbox
Microsoft Exchange 2007 - Mailbox (TechNet)
Microsoft Exchange 2007 - UM (TechNet)
Microsoft Exchange 2010
Microsoft FAST Search Server 2010 for SharePoint
Microsoft Hyper-V R2 SP1
Microsoft Internet Information Services 5.x/6.x/7.x
Microsoft OCS 2007 R2 - Archiving
Microsoft OCS 2007 R2 - CWA
Microsoft OCS 2007 R2 - Edge
Microsoft OCS 2007 R2 - Enterprise
Microsoft OCS 2007 R2 - Mediation
Microsoft OCS 2007 R2 - Monitoring
Microsoft OCS 2007 R2 - Standard
Microsoft Office SharePoint Server (MOSS) 2007
Microsoft Office SharePoint Server (MOSS) 2007 and Se
Microsoft Project Server
Microsoft SQL Server 2005/2008
Microsoft Windows Server 2012 Hyper-V
Philips Intellivue Clinical Informatics Portfolio
Quick System Overview
SharePoint Server 2010
System Overview
TMG 2010
UAG 2010

MS Chart Controls for PAL

The MS Chart Controls are required to execute PAL

- PAL will install fine without them
- http://www.microsoft.com/en-us/download/details.aspx?id=14422

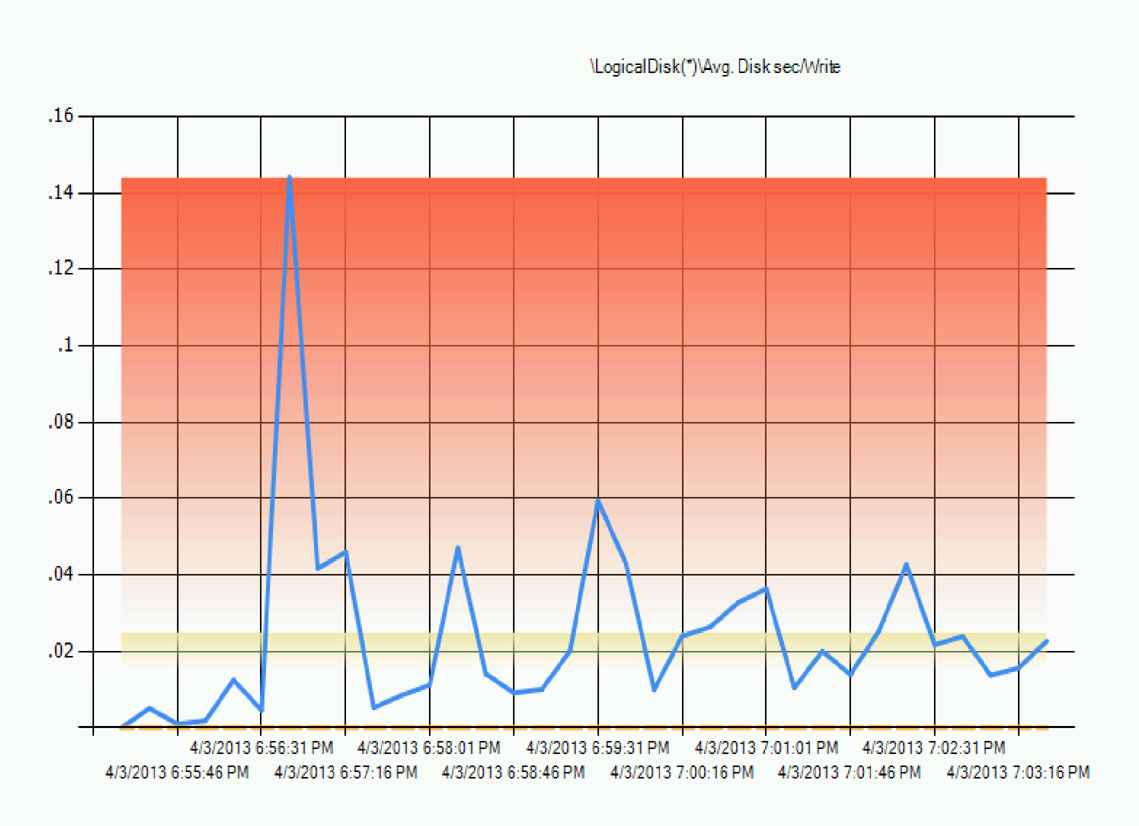
- You’ll receive this error if the controls are not installed.



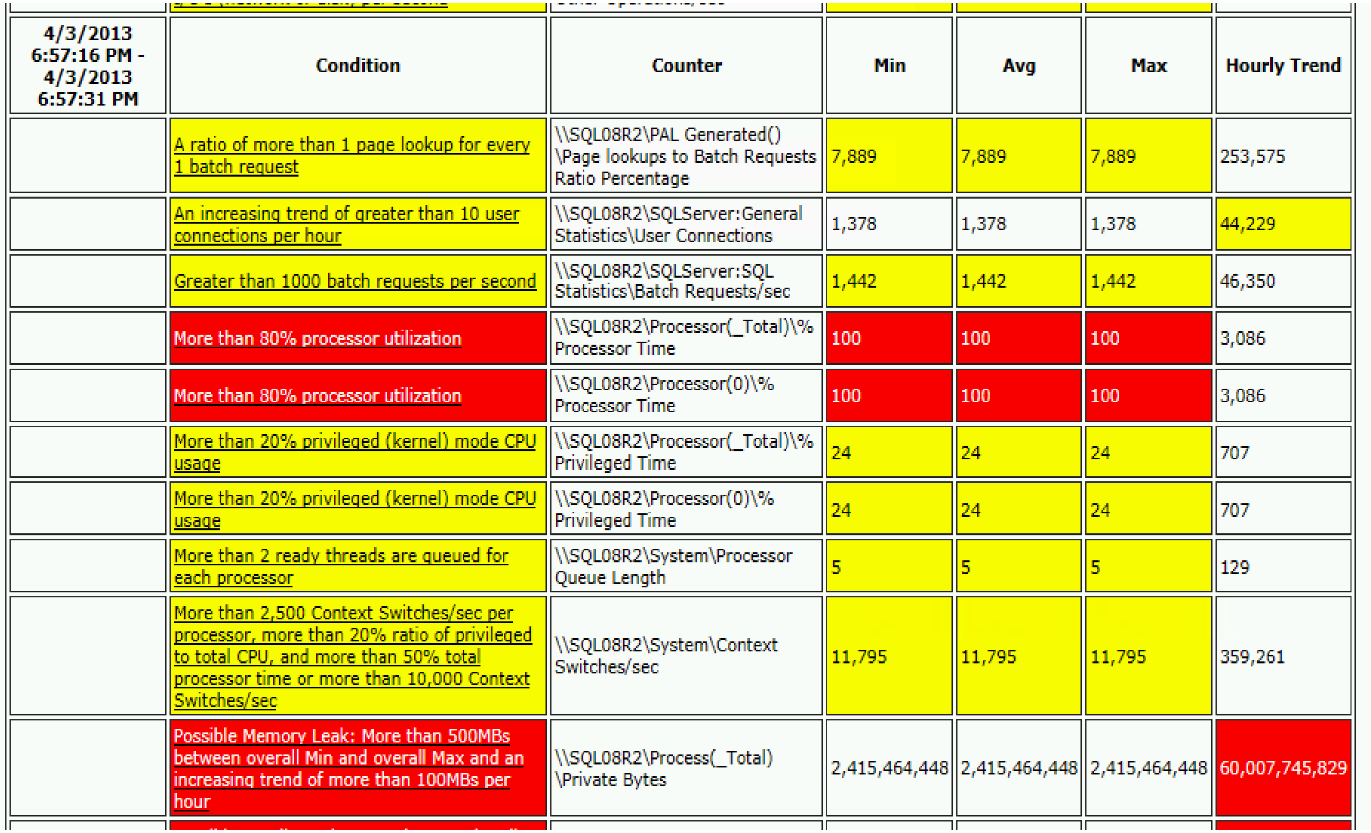
```
WARNING: Unable to load the Microsoft Chart Controls for Microsoft .NET
Framework 3.5. These controls used to create graphical charts. Please install
these free controls from
http://www.microsoft.com/downloads/details.aspx?FamilyID=130f7986-bf49-4fe5-9ca
8-910ae6ea442c&DisplayLang=en
WARNING: If you have installed the Microsoft Chart Controls, then ensure that
the assembly is located in one of the default directories "C:\Program Files
(x86)\Microsoft Chart
Controls\Assemblies\System.Windows.Forms.DataVisualization.dll" or "C:\Program
Files\Microsoft Chart
Controls\Assemblies\System.Windows.Forms.DataVisualization.dll"
Exception calling "LoadFile" with "1" argument(s): "The system cannot find the
file specified. (Exception from HRESULT: 0x80070002)"
At C:\Program Files\PAL\PAL\PAL.ps1:120 char:39
+ [Void] [Reflection.Assembly]::LoadFile <<<< ("C:\Program Files\Microsoft Char
t Controls\Assemblies\System.Windows.Forms.DataVisualization.dll")
    + CategoryInfo          : NotSpecified: (:) [], ParentContainsErrorRecordE
   xception
    + FullyQualifiedErrorId : DotNetMethodException


C:\Program Files\PAL\PAL>_
```

PAL Output

Graphs show thresholds



- Alerts summarized in time slices

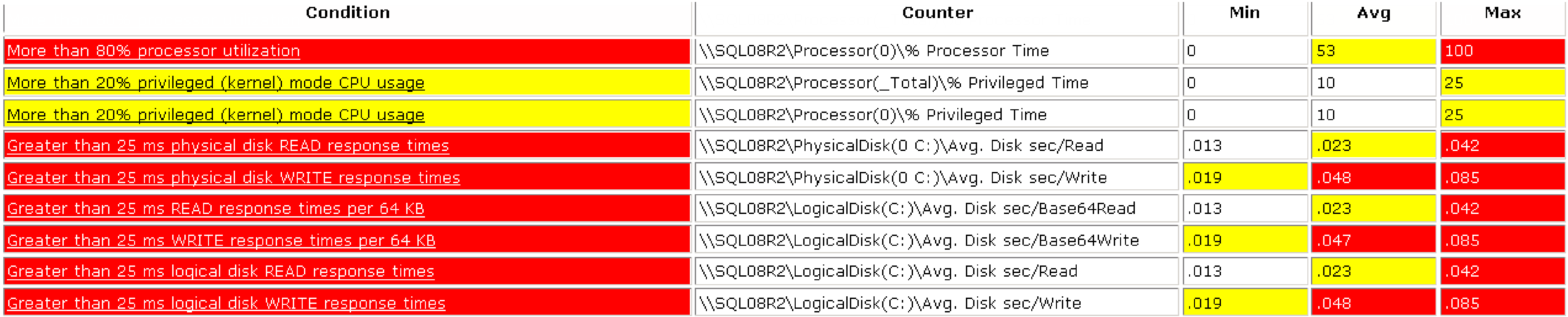


4/3/2013 6:57:16 PM - 4/3/2013 6:57:31 PM	Condition	Counter	Min	Avg	Max	Hourly Trend
	A ratio of more than 1 page lookup for every 1 batch request	\\SQL08R2\PAL Generated()\Page lookups to Batch Requests Ratio Percentage	7,889	7,889	7,889	253,575
	An increasing trend of greater than 10 user connections per hour	\\SQL08R2\SQLServer:General Statistics\User Connections	1,378	1,378	1,378	44,229
	Greater than 1000 batch requests per second	\\SQL08R2\SQLServer:SQL Statistics\Batch Requests/sec	1,442	1,442	1,442	46,350
	More than 80% processor utilization	\\SQL08R2\Processor(_Total)\% Processor Time	100	100	100	3,086
	More than 80% processor utilization	\\SQL08R2\Processor(0)\% Processor Time	100	100	100	3,086
	More than 20% privileged (kernel) mode CPU usage	\\SQL08R2\Processor(_Total)\% Privileged Time	24	24	24	707
	More than 20% privileged (kernel) mode CPU usage	\\SQL08R2\Processor(0)\% Privileged Time	24	24	24	707
	More than 2 ready threads are queued for each processor	\\SQL08R2\System\Processor Queue Length	5	5	5	129
	More than 2,500 Context Switches/sec per processor, more than 20% ratio of privileged to total CPU, and more than 50% total processor time or more than 10,000 Context Switches/sec	\\SQL08R2\System\Context Switches/sec	11,795	11,795	11,795	359,261
	Possible Memory Leak: More than 500MBs between overall Min and overall Max and an increasing trend of more than 100MBs per hour	\\SQL08R2\Process(_Total)\Private Bytes	2,415,464,448	2,415,464,448	2,415,464,448	60,007,745,829

PAL Output

The output is color coded to let you know the areas to focus on

- You do have some control over this through the threshold files
- Not everything in red actually means something
  - You must know what to look for



Condition	Counter	Min	Avg	Max
More than 80% processor utilization	\\SQL08R2\Processor(0)\% Processor Time	0	53	100
More than 20% privileged (kernel) mode CPU usage	\\SQL08R2\Processor(_Total)\% Privileged Time	0	10	25
More than 20% privileged (kernel) mode CPU usage	\\SQL08R2\Processor(0)\% Privileged Time	0	10	25
Greater than 25 ms physical disk READ response times	\\SQL08R2\PhysicalDisk(0 C:)\Avg. Disk sec/Read	.013	.023	.042
Greater than 25 ms physical disk WRITE response times	\\SQL08R2\PhysicalDisk(0 C:)\Avg. Disk sec/Write	.019	.048	.085
Greater than 25 ms READ response times per 64 KB	\\SQL08R2\LogicalDisk(C:)\Avg. Disk sec/Base64Read	.013	.023	.042
Greater than 25 ms WRITE response times per 64 KB	\\SQL08R2\LogicalDisk(C:)\Avg. Disk sec/Base64Write	.019	.047	.085
Greater than 25 ms logical disk READ response times	\\SQL08R2\LogicalDisk(C:)\Avg. Disk sec/Read	.013	.023	.042
Greater than 25 ms logical disk WRITE response times	\\SQL08R2\LogicalDisk(C:)\Avg. Disk sec/Write	.019	.048	.085

Analyzing the PAL Results

When to Use Which Tool?

PAL is great for overall system performance

- Benchmark
- Get acquainted with a workload
- Long duration

PSSDIAG/Nexus

- More targeted performance analysis
- Need to view SQL internal resources (waits, blocking chains, query plans)
- Short timespan for collection

Now What?

Look at Bottleneck Analysis

Review Performance Counters

Identify Expensive Queries

Dig in to the Nexus database

Look at solving the biggest bottleneck first then collect data again