

SQL Saturday – Sioux Falls, SD



#427 | SIOUX FALLS 2015

Advanced Troubleshooting Your SQL Connections

Michael Hays
Database Administrator
FirstEnergy Corp.

Thank you to our sponsors!

Rockstar Sponsor



Gold Sponsor



Silver Sponsor



Bronze Sponsor



About Me: Mike Hays

- Since 2000, I have been working with SQL Server. Cut my teeth on SQL Server 7.0.
- I also work with Oracle, DB2, Informix, & MongoDB databases.
- Email: mike@thesqlreport.com
- Blog:



Why SQL Saturday



Why connections

- About 5-10% of what I do is troubleshooting database connection issues



Objective

- A focus on troubleshooting connection issue over a TCP/IP network
- Today We'll Cover
 1. OS Utilities
 2. Configuring SQL
 3. SQL Browser
 4. Dropping Connections

What this is not:

- Fundamental understanding of networks, TCP/IP, and their ports
- Capture Network Traffic with Network Monitor or Message Analyzer
- AlwaysOn Listener
- Service Broker configuration
- Database Mirroring configuration
- Client Network Configuration
- Analysis Servers Configuration
- Configuring Encryption
- SOAP and HTTP
- (etc.)

I don't know it all....

- Be kind if you find an error....

How this works:

Question

- What is the default TCP/IP port that the SQL Server uses when the default instance is installed?

How this works:

ANSWER

Port: 1433

- The official Internet Assigned Number Authority (IANA) socket number for SQL Server

OS Utilities

Question

- What DOS command is used to display all TCP/IP connections & their ports on the server?

OS Utilities

netstat -an

ANSWER

- netstat -an | find "1433" will bring back only the line with 1433 on them

```
C:\Users\Administrator>netstat -an | find "1433"
TCP        0.0.0.0:1433          0.0.0.0:0            LISTENING
TCP        127.0.0.1:1433        127.0.0.1:49160       ESTABLISHED
TCP        127.0.0.1:49159       127.0.0.1:1433        TIME_WAIT
TCP        127.0.0.1:49160       127.0.0.1:1433        ESTABLISHED
TCP        127.0.0.1:49161       127.0.0.1:1433        TIME_WAIT
TCP        127.0.0.1:49162       127.0.0.1:1433        TIME_WAIT
TCP        192.168.0.109:1433    192.168.0.251:62727   ESTABLISHED
TCP        [::]:1433            [::]:0                LISTENING

C:\Users\Administrator>_
```

OS Utilities

- What utility in a quick & dirty way can be used to measure network latency with 4 ICMP echo request packets?

Question

OS Utilities

> ping

ANSWER

```
C:\>ping www.windmill.com
```

```
Pinging windmill.com [69.89.22.122] with 32 bytes of data:  
Reply from 69.89.22.122: bytes=32 time=99ms TTL=48  
Reply from 69.89.22.122: bytes=32 time=99ms TTL=48  
Reply from 69.89.22.122: bytes=32 time=105ms TTL=48  
Reply from 69.89.22.122: bytes=32 time=100ms TTL=48
```

```
Ping statistics for 69.89.22.122:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 99ms, Maximum = 105ms, Average = 100ms
```

OS Utilities



- How do you ping in IPv4 format when display is IPv6?

```
C:\>ping sqlsaturday

Pinging SQLSATURDAY [fe80::7d90:13f4:816c:9f3b%16] with 32 bytes of data:
Reply from fe80::7d90:13f4:816c:9f3b%16: time<1ms
Reply from fe80::7d90:13f4:816c:9f3b%16: time<1ms
Reply from fe80::7d90:13f4:816c:9f3b%16: time<1ms
Reply from fe80::7d90:13f4:816c:9f3b%16: time<1ms

Ping statistics for fe80::7d90:13f4:816c:9f3b%16:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

OS Utilities

> ping hostname -4

ANSWER

```
C:\>ping sqlsaturday -4
```

```
Pinging SQLSATURDAY [192.168.37.142] with 32 bytes of data:
```

```
Reply from 192.168.37.142: bytes=32 time<1ms TTL=128
```

```
Reply from 192.168.37.142: bytes=32 time<1ms TTL=128
```

```
Reply from 192.168.37.142: bytes=32 time<1ms TTL=128
```

```
Reply from 192.168.37.142: bytes=32 time<1ms TTL=128
```

```
Ping statistics for 192.168.37.142:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```


OS Utilities

- Poll: Do you use IPv4 or IPv6?
 - IPv4 only
 - IPv6 only
 - Both
 - Don't know or don't care

OS Utilities

Question

What

- What is a situation you would use the continuous PING? ("-t" switch)

[illegible]

OS Utilities

ANSWER

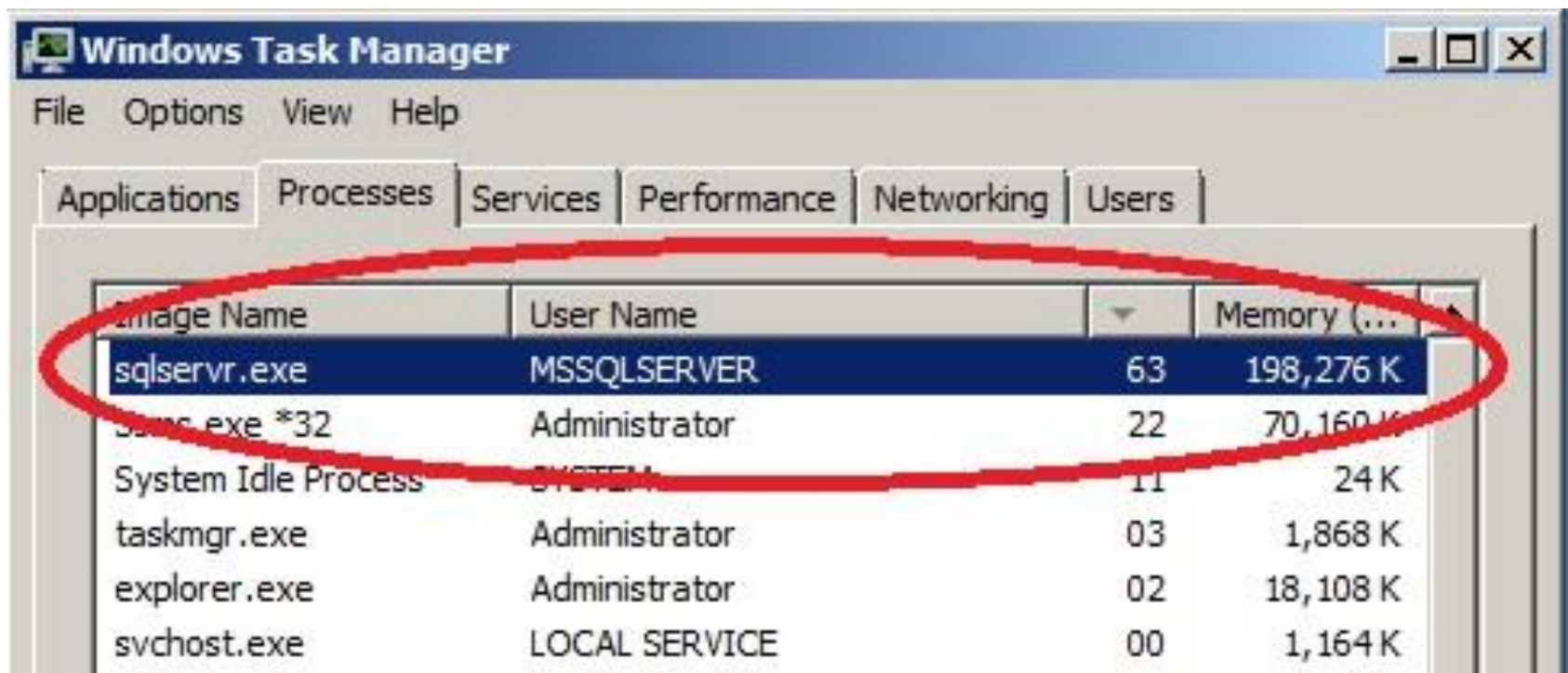
- Use “ping -t” when rebooting your server

OS Utilities

- 5 Operating System Utilities for Troubleshooting Connection Issues
 - PING
 - IPCONFIG
 - NETSTAT
 - NSLOOKUP
 - TRACERT

Configuring SQL

■ How SQL Server Listens...



Configuring SQL

■ Default Instance

- Installed with static port 1433
- No dynamic port are assigned by default

■ Named Instance

- Installed with dynamic port assigned at startup
- Dynamic Port (range between 49152 to 65535)
- No static port are assigned by default

Configuring SQL

Question

- Where does SQL Server log its network startup information?

Configuring SQL

Network settings are logged on startup in the SQL Server Error Log

ANSWER

```
exec sp_readerrorlog
go
```

100 %

Results Messages

	LogDate	ProcessInfo	Text
29	2013-02-12 20:40:21.220	spid19s	Starting up database 'AdventureWorks2012'.
30	2013-02-12 20:40:21.270	spid9s	The resource database build version is 11.00.1440. This is an informational message only. No user action is required.
31	2013-02-12 20:40:21.570	spid12s	A self-generated certificate was successfully loaded for encryption.
32	2013-02-12 20:40:21.570	spid12s	Server is listening on ['any' <ipv6> 1433].
33	2013-02-12 20:40:21.570	spid12s	Server is listening on ['any' <ipv4> 1433].
34	2013-02-12 20:40:21.580	spid12s	Server is listening on ['any' <ipv6> 49195].
35	2013-02-12 20:40:21.580	spid12s	Server is listening on ['any' <ipv4> 49195].
36	2013-02-12 20:40:21.580	spid12s	Server local connection provider is ready to accept connection on [\\.\pipe\SQLLocal\HOMETEST].
37	2013-02-12 20:40:21.580	spid12s	Server local connection provider is ready to accept connection on [\\.\pipe\MSSQL\$HOMETEST\sql\query].
38	2013-02-12 20:40:21.580	Server	Server is listening on [::1 <ipv6> 64801].
39	2013-02-12 20:40:21.580	Server	Server is listening on [127.0.0.1 <ipv4> 64801].
40	2013-02-12 20:40:21.580	Server	Dedicated admin connection support was established for listening locally on port 64801.
41	2013-02-12 20:40:21.580	spid12s	The SQL Server Network Interface library could not register the Service Principal Name (SPN) [MSSQLSvc/WIN-6T...
42	2013-02-12 20:40:21.580	spid12s	The SQL Server Network Interface library could not register the Service Principal Name (SPN) [MSSQLSvc/WIN-6T...
43	2013-02-12 20:40:21.580	spid12s	SQL Server is now ready for client connections. This is an informational message; no user action is required.

Query executed successfully.

WIN-6T8OUGLHQBC\HOMETEST (1... WIN-6T8OUGLHQBC

Configuring SQL

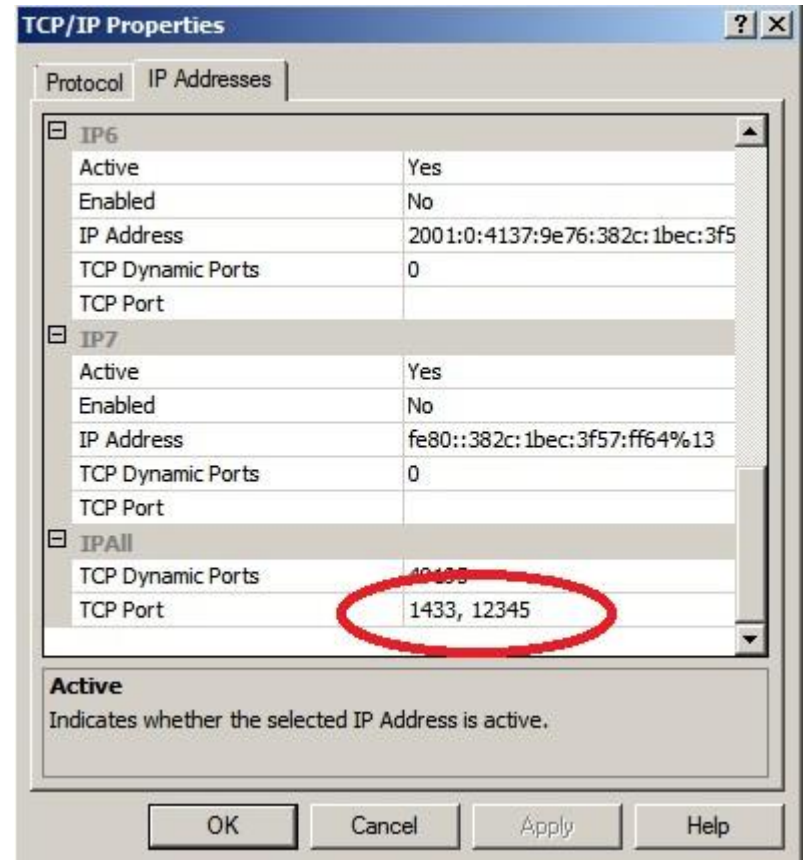


- Can SQL Server listen on more than one static port?

Configuring SQL

- Yes, the ports need to be separated by a comma

ANSWER



Configuring SQL

- On IP Addresses tab, if enabled is configured to NO, why can I still connect to SQL Server on that IP

IP2	
Active	Yes
Enabled	No
IP Address	192.168.0.109
TCP Dynamic Ports	0
TCP Port	

Question

Configuring SQL

TCP/IP Properties

Protocol | IP Addresses

General

Enabled	Yes
Keep Alive	30000
Listen All	Yes

Listen All will override the individual IP addresses

Enabled
Enable or disable TCP/IP protocol for this server instance

OK Cancel Apply Help

TCP/IP Properties

Protocol | IP Addresses

IP1

Active	Yes
Enabled	No
IP Address	fe80::c424:f36f:d10f:ee7b%11
TCP Dynamic Ports	0
TCP Port	

IP2

Active	Yes
Enabled	No
IP Address	192.168.0.109
TCP Dynamic Ports	0
TCP Port	

IP3

Active	Yes
Enabled	No
IP Address	:::1

Active
Indicates whether the selected IP Address is active.

OK Cancel Apply Help

ANSWER

Configuring SQL

- What new 2012 DMV Returns a row containing dynamic-state information for each TCP listener?

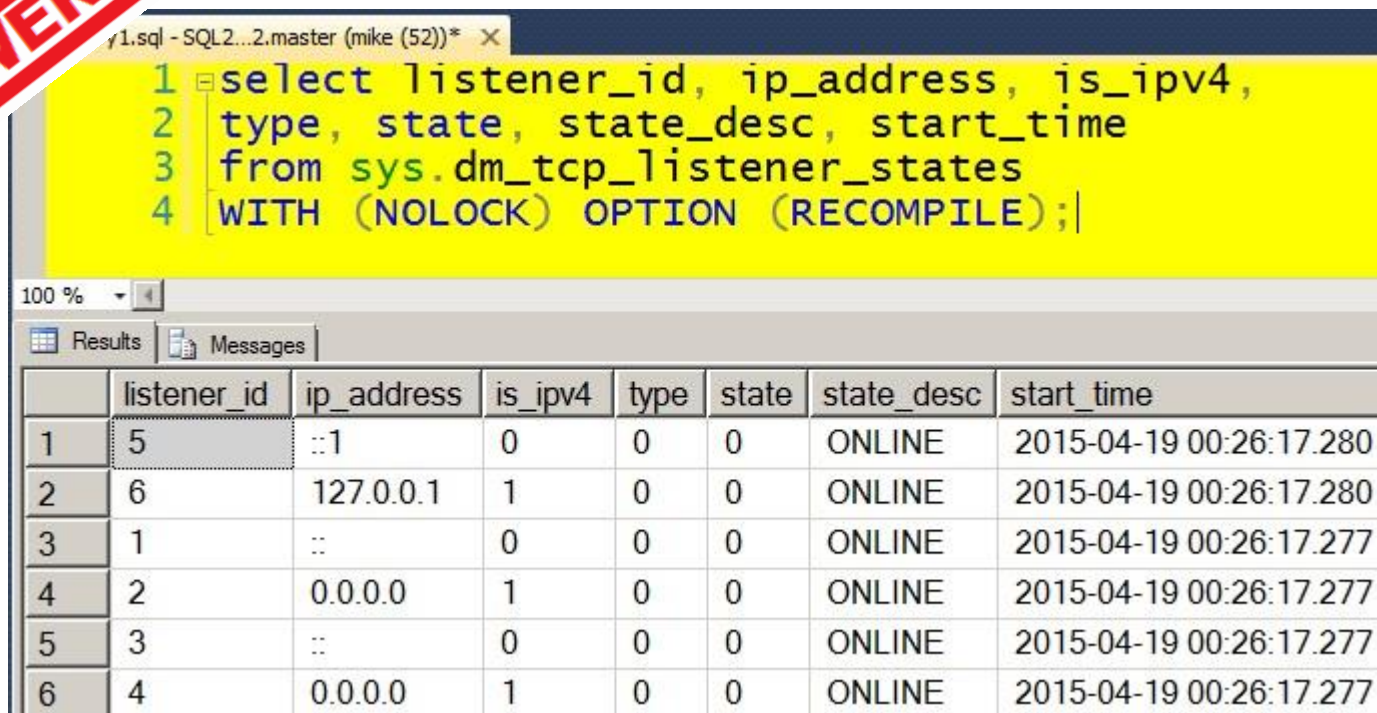
Question

- a) `sys.dm_tcp_listener_states`
- b) `sys.dm_listener_states`
- c) `sys.dm_exec_connections`

Configuring SQL

■ a) sys.dm_tcp_listener_states

ANSWER



The screenshot shows a SQL Server Enterprise Manager window with a query executed in the 'Query Editor'. The query is a SELECT statement from the system view sys.dm_tcp_listener_states. The results are displayed in a table with 8 columns: listener_id, ip_address, is_ipv4, type, state, state_desc, and start_time. The results show 6 rows of listener information.

```
1 select listener_id, ip_address, is_ipv4,  
2 type, state, state_desc, start_time  
3 from sys.dm_tcp_listener_states  
4 WITH (NOLOCK) OPTION (RECOMPILE);
```

	listener_id	ip_address	is_ipv4	type	state	state_desc	start_time
1	5	::1	0	0	0	ONLINE	2015-04-19 00:26:17.280
2	6	127.0.0.1	1	0	0	ONLINE	2015-04-19 00:26:17.280
3	1	::	0	0	0	ONLINE	2015-04-19 00:26:17.277
4	2	0.0.0.0	1	0	0	ONLINE	2015-04-19 00:26:17.277
5	3	::	0	0	0	ONLINE	2015-04-19 00:26:17.277
6	4	0.0.0.0	1	0	0	ONLINE	2015-04-19 00:26:17.277

Configuring SQL

```
1 select listener_id,  
2 CASE ip_address when ':::' THEN 'IPv6 Default All'  
3           when '0.0.0.0' THEN 'IPv4 Default All'  
4           ELSE ip_address END AS 'IP_ADDRESS',  
5 CASE is_ipv4 when 1 THEN 'IPv4' ELSE 'IPv6' END AS 'IP_TYPE',  
6 port,  
7 type_desc,  
8 state_desc,  
9 start_time  
10 from sys.dm_tcp_listener_states  
11 WITH (NOLOCK) OPTION (RECOMPILE);
```

100 %

Results Messages

	listener_id	IP_ADDRESS	IP_TYPE	port	type_desc	state_desc	start_time
1	1	IPv6 Default All	IPv6	1433	TSQL	ONLINE	2015-05-04 00:11:29.707
2	2	IPv4 Default All	IPv4	1433	TSQL	ONLINE	2015-05-04 00:11:29.707
3	3	IPv6 Default All	IPv6	49168	TSQL	ONLINE	2015-05-04 00:11:29.707
4	4	IPv4 Default All	IPv4	49168	TSQL	ONLINE	2015-05-04 00:11:29.707

Configuring SQL

- What DMV Returns information about the connections established to this instance of SQL Server and the details of each connection?
 - a) `sys.dm_exec_requests`
 - b) `sys.dm_exec_sessions`
 - c) `sys.dm_exec_connections`



Configuring SQL

ANSWER

■ c) sys.dm_exec_connections

SQLQuery1.sql - WIN-...Administrator (55)* X

```
select session_id, connect_time, net_transport, protocol_type,  
       net_packet_size, client_net_address, client_tcp_port, local_net_address, local_tcp_port  
from sys.dm_exec_connections
```

100 %

Results Messages

	session_id	connect_time	net_transport	protocol_type	net_packet_size	client_net_address	client_tcp_port	local_net_address	local_tcp_port
1	51	2013-02-18 16:50:34.957	Shared memory	TSQL	8000	<local machine>	NULL	NULL	NULL
2	52	2013-02-18 16:57:09.607	TCP	TSQL	4096	127.0.0.1	49167	127.0.0.1	12345
3	53	2013-02-18 16:57:20.103	TCP	TSQL	4096	127.0.0.1	49170	127.0.0.1	12345
4	54	2013-02-18 16:53:41.440	Shared memory	TSQL	4096	<local machine>	NULL	NULL	NULL
5	55	2013-02-18 16:53:56.883	Shared memory	TSQL	4096	<local machine>	NULL	NULL	NULL
6	56	2013-02-18 16:56:31.290	TCP	TSQL	4096	127.0.0.1	49160	127.0.0.1	1433
7	57	2013-02-18 16:56:37.640	TCP	TSQL	4096	127.0.0.1	49163	127.0.0.1	1433
8	58	2013-02-18 17:00:35.293	Shared memory	TSQL	8000	<local machine>	NULL	NULL	NULL
9	59	2013-02-18 17:03:12.027	TCP	TSQL	4096	192.168.0.251	63686	192.168.0.109	12345
10	NULL	2013-02-18 17:02:11.607	TCP	TSQL	4096	192.168.0.1	3352	192.168.0.109	1433

Configuring SQL



- Can you telnet to SQL Server?

Configuring SQL

- Yes, the connection is established but the cursor will only blink

ANSWER



Configuring SQL

DEMO
(with SQL Server 2012 Express)

Configuring SQL

Question

- Is this dynamic port enabled?

IP2	
Active	Yes
Enabled	Yes
IP Address	192.168.0.109
TCP Dynamic Ports	
TCP Port	1433

Configuring SQL

- No, TCP Dynamic Ports – Blank, if dynamic ports are not enabled. To use dynamic ports, set to “0”.

IP2	
Active	Yes
Enabled	Yes
IP Address	192.168.0.109
TCP Dynamic Ports	0
TCP Port	1433

ANSWER

Configuring SQL



- How do I find the dynamic port numbers a SQL Server instance is listening on?

Configuring SQL

Dynamic ports are logged on instance startup

ANSWER

```
exec sp_readerrorlog
go
```

100 %

Results Messages

	LogDate	ProcessInfo	Text
29	2013-02-12 20:40:21.220	spid19s	Starting up database 'AdventureWorks2012'.
30	2013-02-12 20:40:21.270	spid9s	The resource database build version is 11.00.1440. This is an informational message only. No user action is required.
31	2013-02-12 20:40:21.570	spid12s	A self-generated certificate was successfully loaded for encryption.
32	2013-02-12 20:40:21.570	spid12s	Server is listening on ['any' <ipv6> 1433].
33	2013-02-12 20:40:21.570	spid12s	Server is listening on ['any' <ipv4> 1433].
34	2013-02-12 20:40:21.580	spid12s	Server is listening on ['any' <ipv6> 49195].
35	2013-02-12 20:40:21.580	spid12s	Server is listening on ['any' <ipv4> 49195].
36	2013-02-12 20:40:21.580	spid12s	Server local connection provider is ready to accept connection on [\\.\pipe\SQLLocal\HOMETEST].
37	2013-02-12 20:40:21.580	spid12s	Server local connection provider is ready to accept connection on [\\.\pipe\MSSQL\$HOMETEST\sql\query].
38	2013-02-12 20:40:21.580	Server	Server is listening on [::1 <ipv6> 64801].
39	2013-02-12 20:40:21.580	Server	Server is listening on [127.0.0.1 <ipv4> 64801].
40	2013-02-12 20:40:21.580	Server	Dedicated admin connection support was established for listening locally on port 64801.
41	2013-02-12 20:40:21.580	spid12s	The SQL Server Network Interface library could not register the Service Principal Name (SPN) [MSSQLSvc/WIN-6T...
42	2013-02-12 20:40:21.580	spid12s	The SQL Server Network Interface library could not register the Service Principal Name (SPN) [MSSQLSvc/WIN-6T...
43	2013-02-12 20:40:21.580	spid12s	SQL Server is now ready for client connections. This is an informational message; no user action is required.

Query executed successfully. WIN-6T8OUGLHQB\HOMETEST (1... WIN-6T8OUGLHQB

Configuring SQL



- Which wait stat would identify a poorly responding application?
 - A. async_network_io
 - B. writelog
 - C. backupio

Configuring SQL

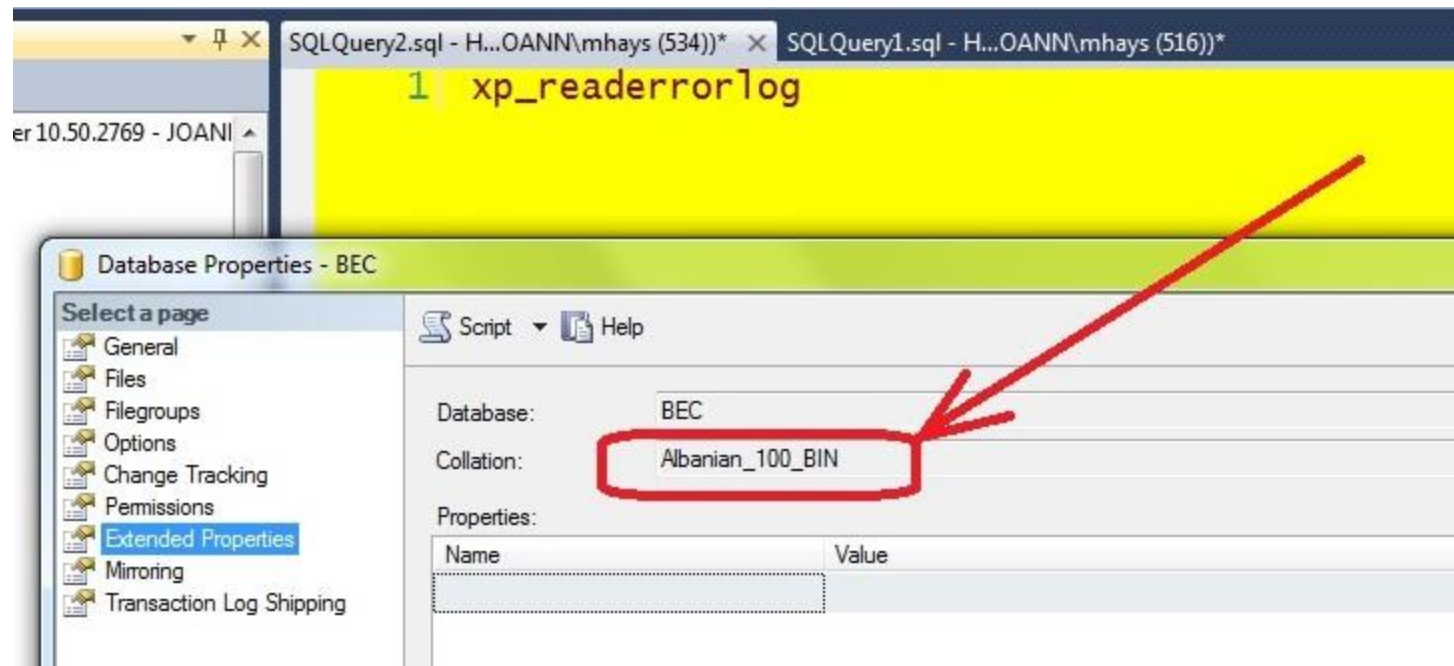
ASYNC_NETWORK_IO

ANSWER

WaitType	Wait_S	Resource_S	Signal_S	WaitCount	Percentage	AvgWait_S	AvgRes_S	AvgSig_S
ASYNC_NETWORK_IO	2208023.29	2204825.39	3197.9	32397956	43.82	0.0682	0.0681	0.0001
CXPACKET	972084.65	955543.04	16541.61	441654240	19.29	0.0022	0.0022	0
PAGEIOLATCH_SH	903676.03	902063.92	1612.11	19774498	17.93	0.0457	0.0456	0.0001
SOS_SCHEDULER_YIELD	265441.55	144.13	265297.43	82454523	5.27	0.0032	0	0.0032
PAGEIOLATCH_EX	128147.57	128048.61	98.96	12353683	2.54	0.0104	0.0104	0
BACKUPIO	88797.28	87964.82	832.45	4501301	1.76	0.0197	0.0195	0.0002
LCK_M_RS_S	69099.86	69097.35	2.5	25094	1.37	2.7536	2.7535	0.0001
SQLTRACE_FILE_BUFFER	63791.16	63760.01	31.15	63362	1.27	1.0068	1.0063	0.0005
OLEDB	57657.56	57657.56	0	559784870	1.14	0.0001	0.0001	0
ASYNC_IO_COMPLETION	56831.04	56830.78	0.26	514	1.13	110.5662	110.5657	0.0005

Configuring SQL

- Sometime You Can't Win....



SQL Browser

Dynamic Ports & SQL Server Browser



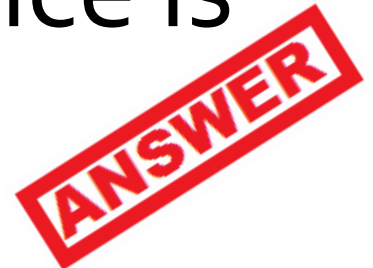
SQL Browser

- My program knows the name of my instance, how does it find the port number?

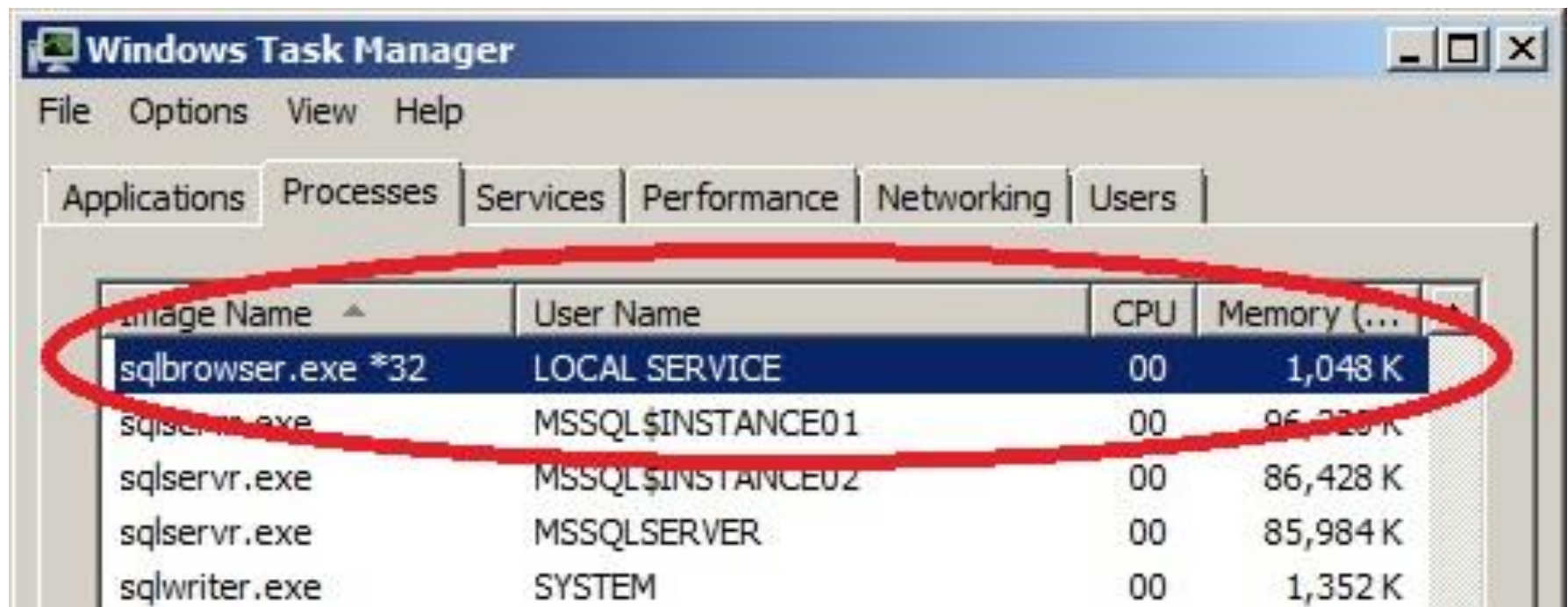
Question

SQL Browser

- The program sends a UDP request to port 1434.
- The SQL Server Browser replies to the request with the port number the named instance is listening on.



SQL Browser



Windows Task Manager

File Options View Help

Applications Processes Services Performance Networking Users

Image Name	User Name	CPU	Memory (K)
sqlbrowser.exe *32	LOCAL SERVICE	00	1,048 K
sqlservr.exe	MSSQL\$INSTANCE01	00	86,428 K
sqlservr.exe	MSSQL\$INSTANCE02	00	86,428 K
sqlservr.exe	MSSQLSERVER	00	85,984 K
sqlwriter.exe	SYSTEM	00	1,352 K

SQL Browser

- SQL Server Browser works like a building receptionist



SQL Browser

- What was the first incarnation of the SQL Server Browser?



SQL Browser

- SQL Server 2000 – SQL Server Resolution Protocol (SSRP)
- In SQL Server 2005 – SQL Server Browser service replaced SSRP



SQL Browser

Question

- Which port number will the browser return, dynamic or static number?

SQL Browser



- Dynamic port number is returned first, then the static number if a dynamic number is not available

SQL Browser

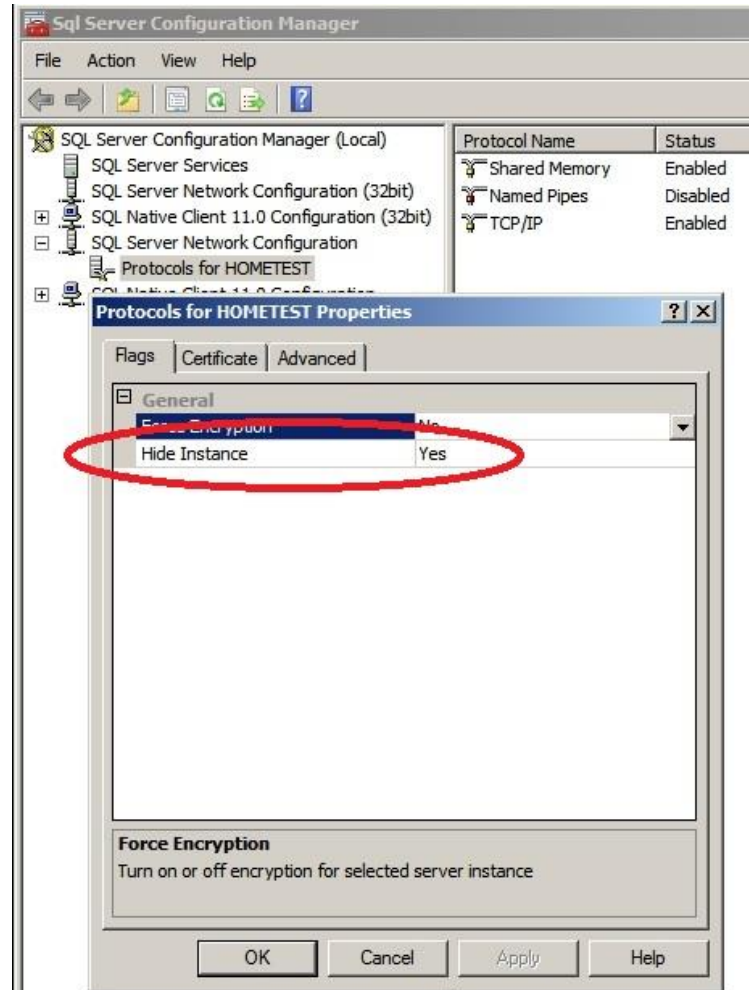
Question

- Can SQL Server hide from its Browser Service?

SQL Browser

- Yes, in the Protocol properties, under the Flags tab

ANSWER



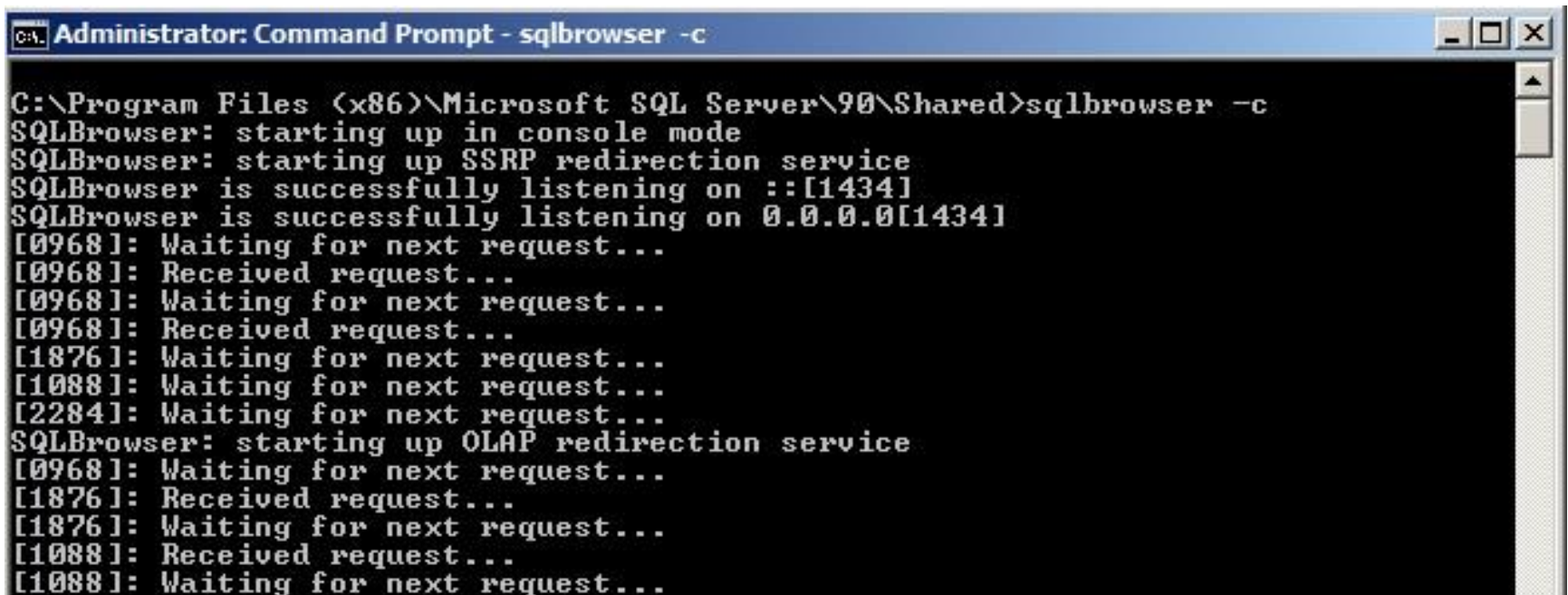
SQL Browser

- What is the switch to start the SQL Server Browser in console mode?

Question

SQL Browser

- sqlbrowser -c from the command-line



```
Administrator: Command Prompt - sqlbrowser -c

C:\Program Files (x86)\Microsoft SQL Server\90\Shared>sqlbrowser -c
SQLBrowser: starting up in console mode
SQLBrowser: starting up SSRP redirection service
SQLBrowser is successfully listening on ::[1434]
SQLBrowser is successfully listening on 0.0.0.0[1434]
[0968]: Waiting for next request...
[0968]: Received request...
[0968]: Waiting for next request...
[0968]: Received request...
[1876]: Waiting for next request...
[1088]: Waiting for next request...
[2284]: Waiting for next request...
SQLBrowser: starting up OLAP redirection service
[0968]: Waiting for next request...
[1876]: Received request...
[1876]: Waiting for next request...
[1088]: Received request...
[1088]: Waiting for next request...
```

ANSWER

Dropping Connections

- Does SQL Server drop connections?

Question

Dropping Connections

- Yes
 - When session has not authenticated with in one minute
 - When shutting down
 - Maybe a couple of more reason that I may have not thought of
 - HOWEVER!!!!!!

Dropping Connections

```
1 SELECT @@SPID
2 go
3
4 SELECT @@SERVERNAME
5 go
6
7 SELECT GETDATE()
8 go
```

100 %

Results

72
(1 row(s) affected)

VISALIA|
(1 row(s) affected)

2015-04-23 14:31:13.780
(1 row(s) affected)

Dropping Connections

```
1 SELECT GETDATE()  
2 go  
3  
4 sp_who2
```

100 %

Results Messages

(No column name)

1 2015-04-24 05:34:42.353

	SPID	Status	L...	Ho...	BlkBy	DB...	Command	CPUTime	DiskIO	LastBatch	ProgramName	SPID	REQUESTID
35	64	sleeping	V...	V...	.	V...	AWAITING COMMAND	431238	8351	04/24 05:11:08	Microsoft SQ...	64	0
36	65	sleeping	V...	V...	.	V...	AWAITING COMMAND	42248	2594	04/24 05:11:08	Microsoft SQ...	65	0
37	66	sleeping	V...	V...	.	V...	AWAITING COMMAND	102631	1614	04/24 05:11:08	Microsoft SQ...	66	0
38	67	sleeping	V...	V...	.	V...	AWAITING COMMAND	0	0	04/24 05:11:08	Microsoft SQ...	67	0
39	68	sleeping	V...	V...	.	V...	AWAITING COMMAND	32	0	04/24 05:11:08	Microsoft SQ...	68	0
40	69	sleeping	V...	V...	.	V...	AWAITING COMMAND	180270	3637	04/24 05:11:08	Microsoft SQ...	69	0
41	70	sleeping	V...	V...	.	V...	AWAITING COMMAND	301044	4062	04/24 05:11:08	Microsoft SQ...	70	0
42	71	sleeping	J...	D...	.	m...	AWAITING COMMAND	0	0	04/23 14:23:54	Microsoft SQ...	71	0
43	72	sleeping	J...	D...	.	m...	AWAITING COMMAND	0	0	04/23 14:31:13	Microsoft SQ...	72	0
44	73	RSNNAB...	J...	D...	.	m...	SELECT INTO	63	2	04/24 05:34:42	Microsoft SQ...	73	0

Dropping Connections

- Whiteboard

Final Review

- OS Utilities
- Configuring SQL
- SQL Browser
- Dropping Connections

Any Questions?

- From Mike Hays -> Thank you