SQL Saturday – Sioux Falls, SD

Advanced Troubleshooting Your SQL Connections

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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:

TheSQLReport.com
Resolutions found in SQL Server, Oracle, DB2, and Informix

Why SQL Saturday

Why connections

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

Physical database not found.

OK

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>_
```

Administrator: Command Prompt

OS Utilities

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

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

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

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...
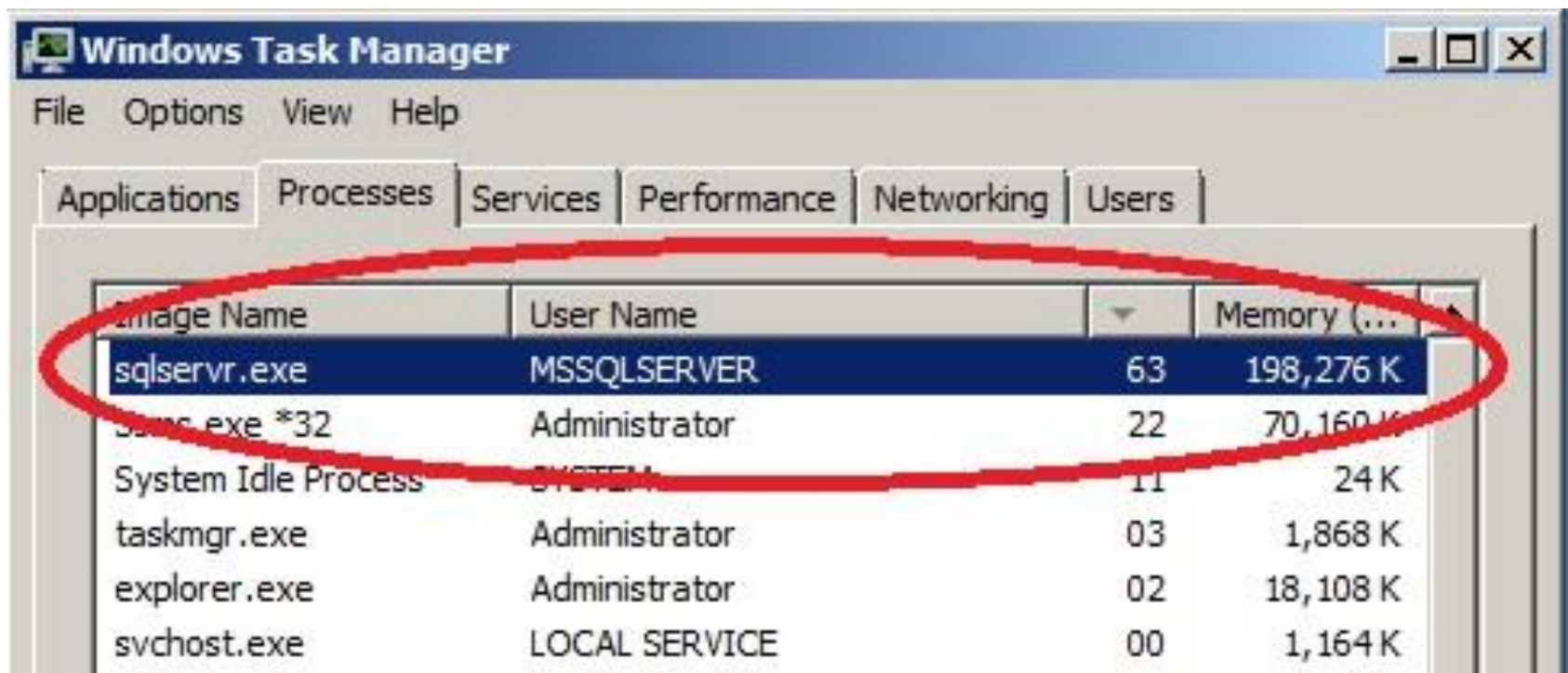
Configuring SQL

- ## 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

- 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
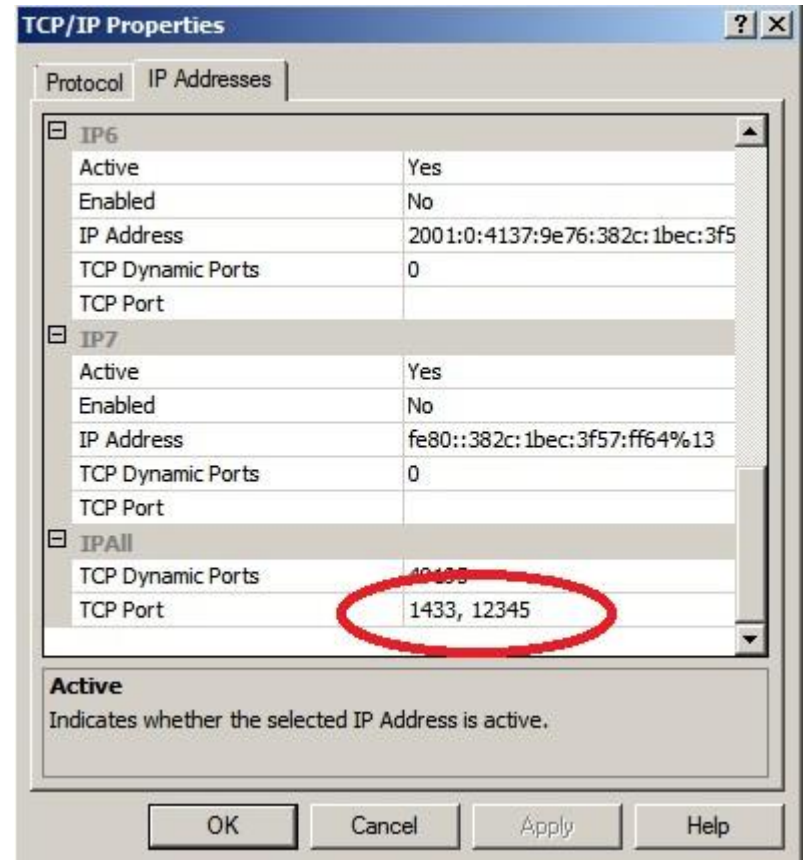
Configuring SQL

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

Configuring SQL

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

Configuring SQL

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

Configuring SQL

Configuring SQL

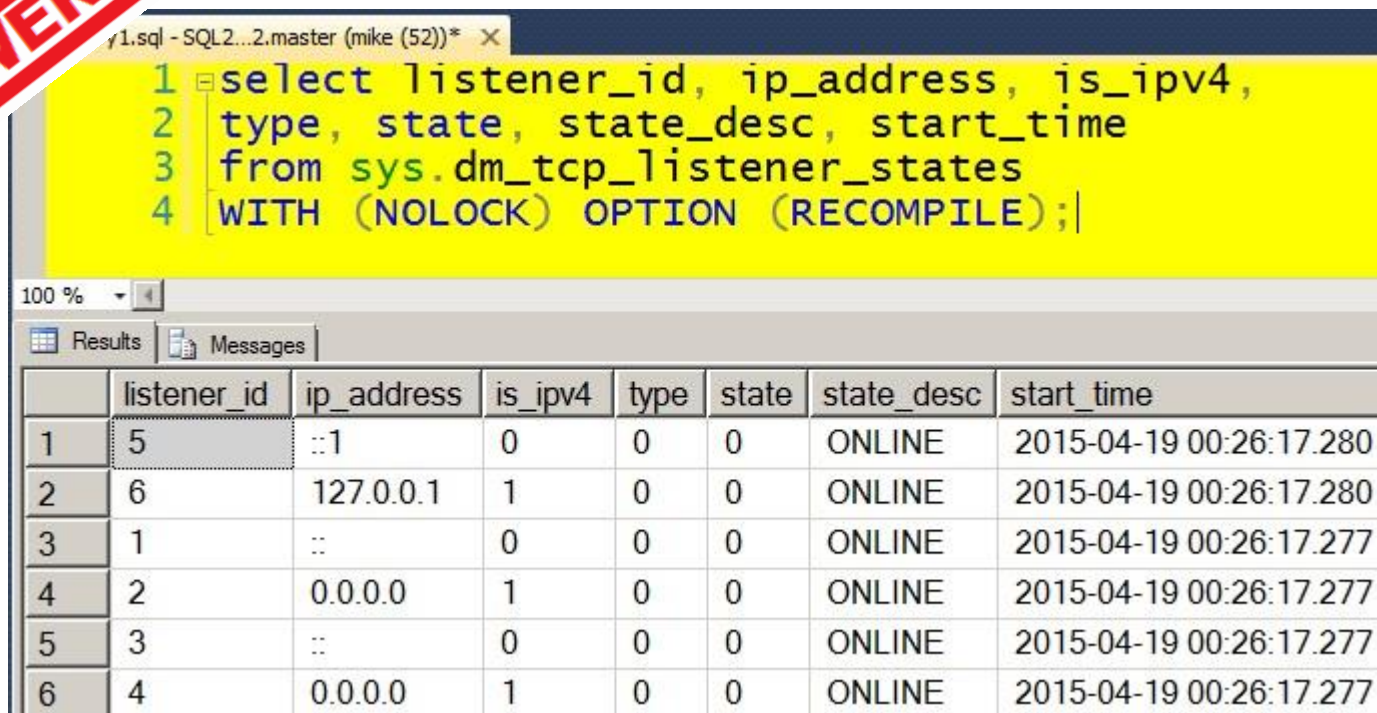- What new 2012 DMV Returns a row containing dynamic-state information for each TCP listener?

    a) **sys.dm_tcp_listener_states**
    b) **sys.dm_listener_states**
    c) **sys.dm_exec_connections**

Configuring SQL

a) **sys.dm_tcp_listener_states**

Configuring SQL

```sql
select listener_id,
CASE ip_address when '::' THEN 'IPv6 Default All'
                when '0.0.0.0' THEN 'IPv4 Default All'
                ELSE ip_address END AS 'IP_ADDRESS',
CASE is_ipv4 when 1 THEN 'IPv4' ELSE 'IPv6' END AS 'IP_TYPE',
port,
type_desc,
state_desc,
start_time
  from sys.dm_tcp_listener_states
  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**

Question

Configuring SQL

- c) sys.dm_exec_connections


```
SQLQuery1.sql - WIN-...\Administrator (55))*  ×
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

Question

- Can you telnet to SQL Server?

Configuring SQL

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

Command Prompt - telnet 192.168.0.109 1433

Configuring SQL

DEMO
(with SQL Server 2012 Express)

Configuring SQL

- 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

Question

- 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
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Query executed successfully.

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

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....
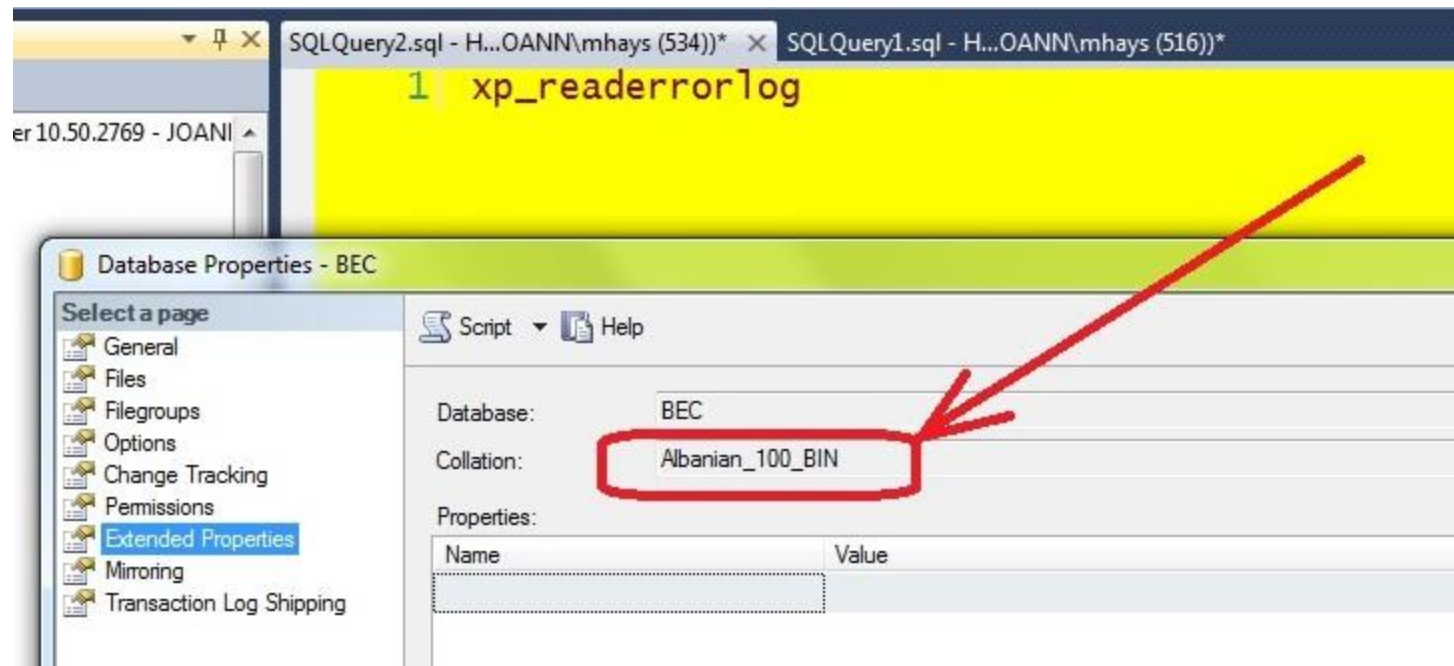
SQL Browser

Dynamic Ports & SQL Server Browser

SQL Browser

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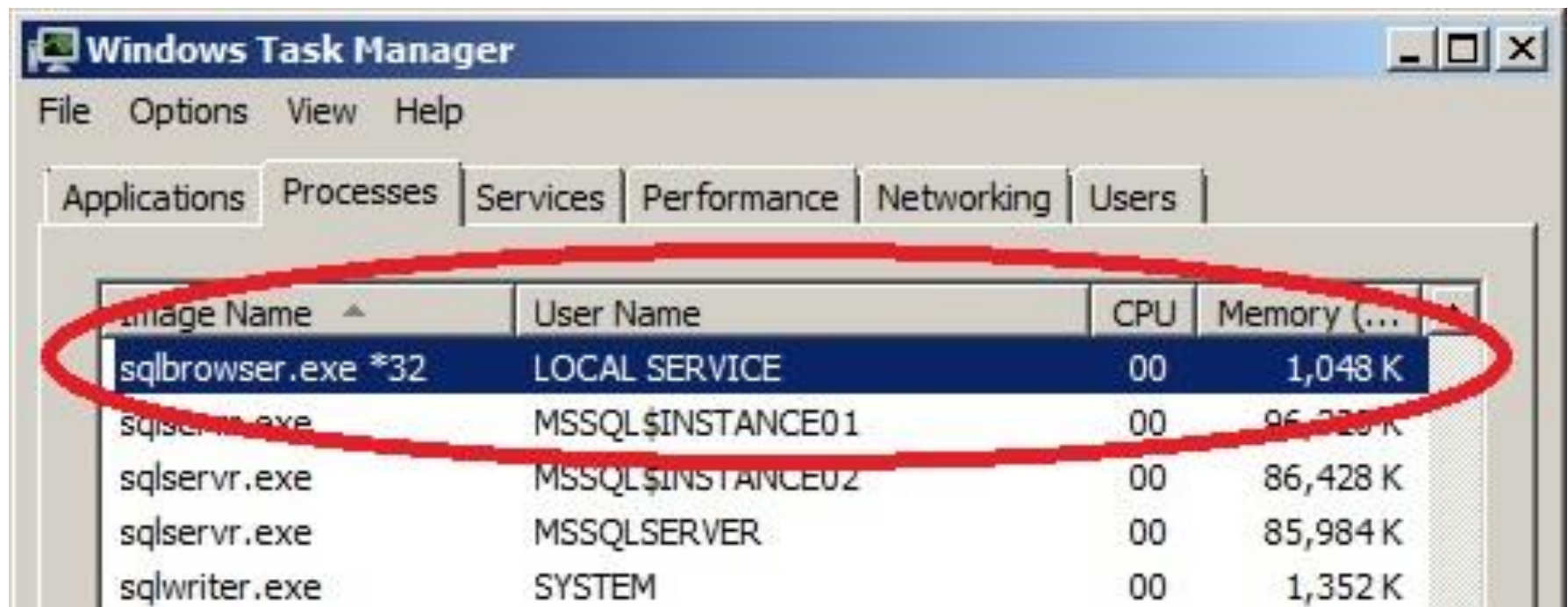
Question

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.
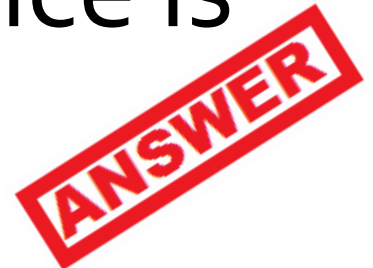
ANSWER

SQL Browser

SQL Browser

- SQL Server Browser works like a building receptionist

SQL Browser

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

Question

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

ANSWER

- 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
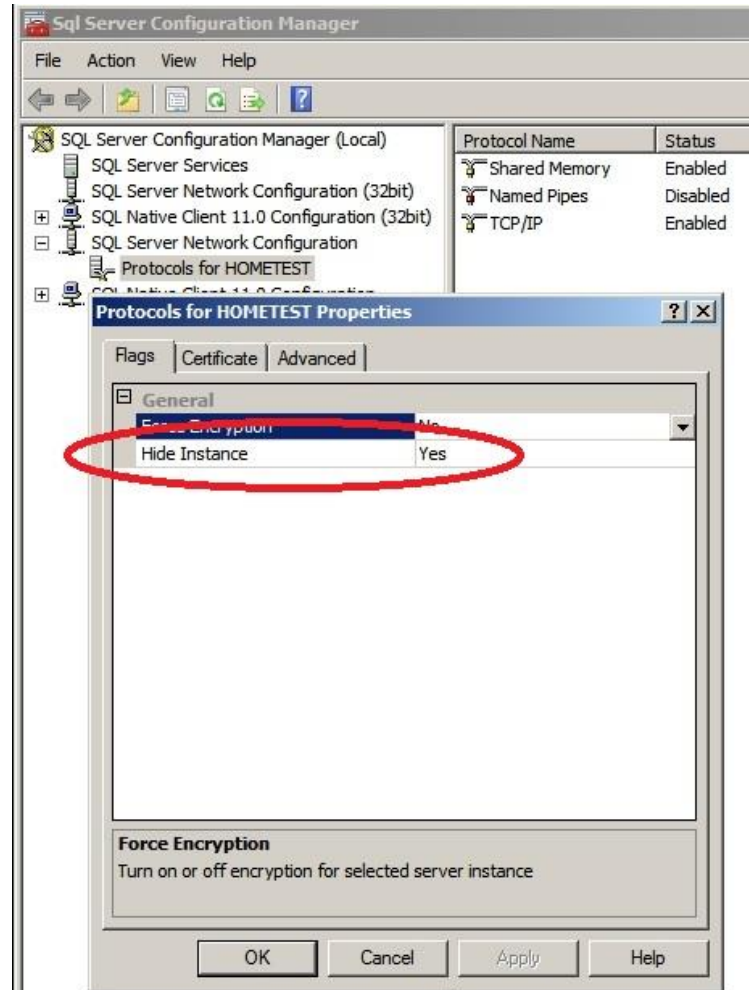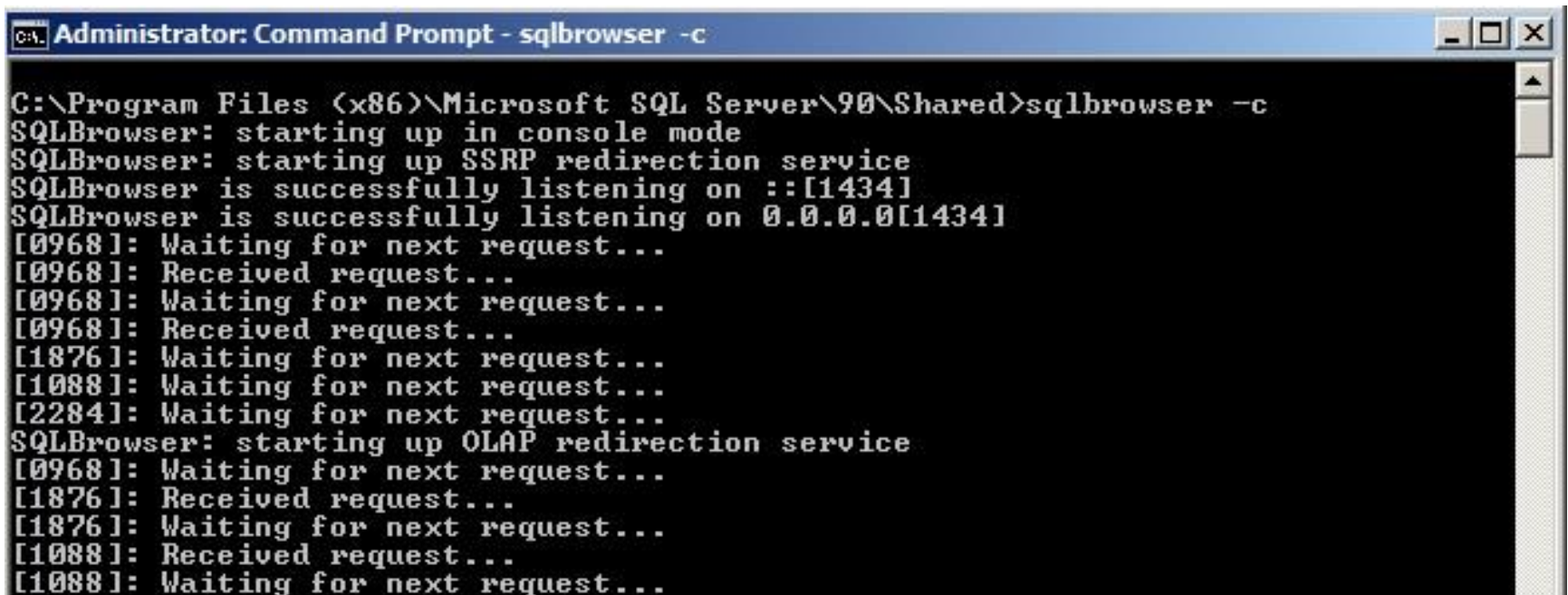
SQL Browser

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

Question

SQL Browser

- sqlbrowser –c from the command-line

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
    - **<u>HOWEVER!!!!!</u>**

Dropping Connections

Dropping Connections

Dropping Connections

- Whiteboard

Final Review

- OS Utilities

- Configuring SQL

- SQL Browser

- Dropping Connections

Any Questions?

- From Mike Hays -> Thank you