Troubleshooting server crashes and hangs for a Lotus Domino implementation on IBM i or i5/OS

Module 2 of 2

Lotus software

@business on demand software

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This education series consists of two modules that will introduce you to troubleshooting Domino® server crashes and hangs on the IBM i® or i5/OS® operating system. This second module introduces you to different types of server hangs and the process used to debug server hangs. You will also see how to gather the data needed by IBM Support.
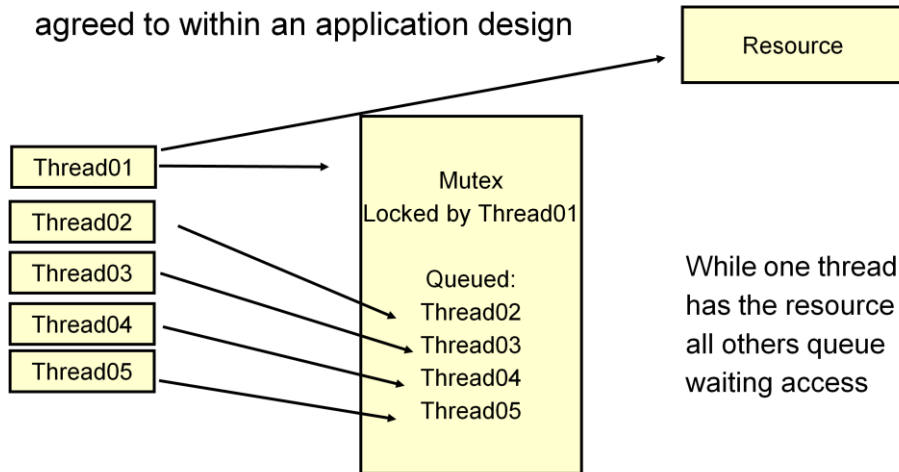
IBM

A server hang

- A server is hung when one or more tasks become unresponsive to client requests.

- A server hang is typically caused by resource contention.

- The resource causing the contention may be physical or logical.

A server is hung when one or more tasks become unresponsive to client requests. This is typically caused by resource contention. The resource may be physical such as a drive or memory or it may be logical such as a semaphore.

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Mutex

A mutex controls access to a resource as
agreed to within an application design

Resource

Thread01

Thread02

Thread03

Thread04

Thread05

Mutex
Locked by Thread01

Queued:
Thread02
Thread03
Thread04
Thread05

While one thread
has the resource
all others queue
waiting access

Semaphores are the Domino implementation of mutexes. What is a mutex?
A mutex is a way to control access to a resource in a multithreaded
environment. It is used as a locking device for a resource. If a thread wants
to use a resource which is controled by a mutex it "checks out" the resource
through the mutex. If the resource is already checked out the thread is
queued. When a mutex is freed, it will check the queue for the next thread
waiting.

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Overview of debugging a hang

1. Semaphore debug is set
   - debug_threadid=1
   - debug_show_timeout=1
   - debug_capture_timeout=10

2. Wait for problem to occur again

3. Gather information on server health through Domino console commands

4. Run DMPDOMSVRC while problem is occurring

5. Restart the Domino server

6. Collect semdebug.txt, Console log and DMPDOMSVRC output

7. Submit data to IBM Support for review.

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Most Domino server hangs are caused by a semaphore deadlock. Here is an overview of the process that you will use to gather the data needed by IBM Support to debug a Domino semaphore deadlock. In most cases these steps are followed because server jobs are running, but no activity is occurring.

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Setting semaphore debug

- **DEBUG_SHOW_TIMEOUT=1**
  - ▶ Writes the semaphore timeout to the console
  - ▶ Not written to log.nsf
- **DEBUG_CAPTURE_TIMEOUT=10**
  - ▶ Writes the semaphore timeout to the semdebug.txt file in the IBM_TECHNICAL_SUPPORT subdirectory
- **DEBUG_THREADID=1**
  - ▶ Prepends the threadid to all console entries
- **DEBUG_SEM_TIMEOUT=50000** (optional)
  - ▶ Set to a value in milliseconds.
  - ▶ When a thread has been waiting for more than time set, the thread generates a timeout
  - ▶ Default is 30000 milliseconds

Here are the debug parameters you will set when debugging a hang. Unless semaphore timeouts are occurring, these debug parameters will not generate additional logging. All of these entries, except debug_threadid, require a server restart to become active.

Enabling the console log

- ## CONSOLE_LOG_ENABLED=1

  - ▶ Enables the server to log to the console.log file

- ## CONSOLE_LOG_MAX_KBYTES=10000

  - ▶ Sets the maximum size for the Console log
  - ▶ This will set the maximum size to 10MB and will then wrap the Console log
  - ▶ Choose a value appropriate for your server based on activity level and disk space
  - ▶ Default value is 1KB, which is too small for hang debug analysis

When you debug a hang, it is important to log debug information to the Console log. You can modify your Console log settings with the ini parameters described here.

Example output generated by debug

- 0000ti="0057C394-85257042" sq="00196188" THREAD [**507178**:180429:00123-**0000003E**] WAITING FOR SEM 0x0931 **Task sync semaphore** (@D2195D06628A07C0) (OWNER=**507176**:180429:**0000004F**) FOR 30000 ms

Here is an example of the output generated by the semaphore debug settings. What does this mean?

In this example, Job 507178 thread 3E is waiting for the task sync semaphore currently being used by job 507176 thread 4F. If this continues, you should collect the Domino server call stacks to determine what thread 4F is doing. To gather the thread call stacks run the DMPDOMSVRC utility.

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Console commands to run during a hang

- Show server

- Show tasks

- Show stats

- Show users debug

- Show transactions

If the Domino server will respond to commands during the hang, you should run the commands listed here. These commands generate output that is very helpful for IBM Support.

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DMPDOMSVRC

- DMPDOMSVRC = Dump Domino Server Call Stacks
  - ▶ Tool used to dump call stacks for the server or server task
  - ▶ Use when the Domino server is unresponsive
  - ▶ Ships with Domino 6.5.5, 7.0 or higher!
  - ▶ Located in the QDOMINOXXX library, where XXX represents your Domino version
  - ▶ Example:

  QDOMINO801/DMPDOMSVRC   Server_Name

Once you discover the hang condition or at any time you have concerns about the functions being performed by the Domino server, you can use the DMPDOMSVRC tool. This tool ships with Domino 6.5.5, 7.0 and later versions. DMPDOMSVRC will dump the call stacks for all of the Domino server tasks. You should always run this tool before you end any of the Domino server tasks.

DMPDOMSVRC output

Server. . . . . . : Server1

Path to pid.nbf . : /notes/data/pid.nbf

Lines to read . . : 22

Time. . . . . . . : 2005/08/15 22:34:09.060

         :

1 8176 8173 SERVER   - Job: 325557/QNOTES/SERVER

1 8177 8176 EVENT [SERVER]   - Job: 325558/QNOTES/EVENT

1 8195 8186 AMGR   - Job: 325576/QNOTES/AMGR

1 8180 8176 COLSRV400 [SERVER]   - Job: 325561/QNOTES/COLSRV400

1 8181 8176 UPDATE [SERVER]   - Job: 325562/QNOTES/UPDATE

1 14387 8176 HTTP [SERVER]   - Job: 331983/QNOTES/HTTP

1 8183 8176 IMAP [SERVER]   - Job: 325564/QNOTES/IMAP

DMPDOMSVRC creates several files. First you will have one file that will show you the contents of the pid.nbf file. The pid.nbf file is the file used by the Domino server to track all active server tasks.

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DMPDOMSVRC Output

Dump Job Call Stacks

\#

\#\# Thread: 0000000000000007 (1/77)   PID: 8176   Job: **325557/QNOTES/SERVER**   Time: 2005/08/15 22:34:09.205

\#

|

|

Lib Name	Pgm Name	Mod Name	Statement	Procedure Name
QSYS	QP0ZPCP2	QP0ZPCP2	0000000008	_CXX_PEP__Fv
QSYS	QP0ZPCPN	QP0ZPCPN	0000000235	Qp0zNewProcess
QSYS	QP0ZPCPN	QP0ZPCPN	0000000187	InvokeTargetPgm__FP11qp0z_pcp_cb
QSYS	SERVER	SERVER	0000000006	_CXX_PEP__Fv
QSYS	SERVER	SERVER	0000000011	main
QDOMINO700	SERVER	MAIN		_C_pep

The remaining files DMPDOMSVRC creates are the call stacks for each task. In this example you can see the call stacks for the server task.

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Other types of hangs

- Out of control paging and faulting
  - ▶ Insufficient memory
  - ▶ Improper memory tuning
- Disk thrashing
  - ▶ Possible causes are unbalanced disks, failing disks or high paging rates
- Network or port binding problems
  - ▶ Are current IBM i TCP PTFs applied?
  - ▶ Is a backup running against an active Domino server?
- CPU spin
  - ▶ Possible causes are excessive view rebuilds, corrupted views or documents
- A system that is too small to handle the workload

Not all hangs are Domino code defects. If you are experiencing a serious performance problem, it may mask itself as a Domino server hang.

HTTP hangs

- Use **tell http show thread state** command
- Hangs involving HTTP may be due to several issues:

  ▸ Excessive agent executions or agent hangs

  ▸ Too much traffic on the server (as determined from Domino statistics which indicate the number of requests serviced for an interval)

  ▸ Wait state for Java application or Websphere-hosted application

  ▸ Trying to run multiple Web agents concurrently without enabling this setting in the Server document

  ▸ For additional information, refer to technote 7010969 - "Collecting data for HTTP hang or performance issues on a Lotus Domino server" at
  http://www.ibm.com/support/docview.wss?rs=463&uid=swg27010969

If you are experiencing a hang involving the HTTP task, there are additional things to consider. Using the "tell http show thread state" command will give you information on what each thread in the HTTP job is doing.

Gathering data for IBM Support

- Typically, IBM Support requests for debug output involves one of the following items:
  - ▶ Console.log
  - ▶ Data logged in the IBM_TECHNICAL_SUPPORT directory
    - NSDs
    - Semdebug.txt
  - ▶ Sametime Diagnostic Data (stdiagzip)
  - ▶ Spooled files generated by QNOTES
  - ▶ Spooled files generated by DMPDOMSVRC tool

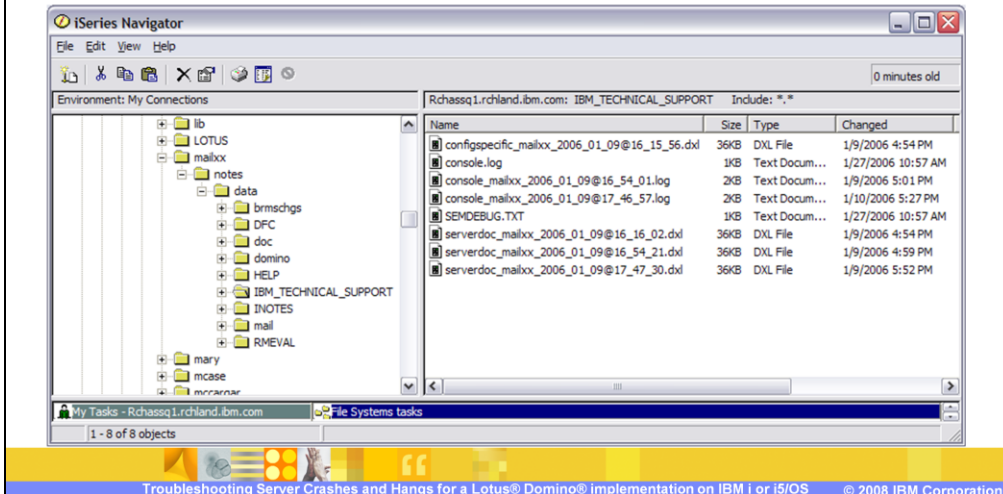After the initial hang analysis has been performed, you may be asked to supply data to IBM Support.

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Accessing a console.log that is in use by the server

- End console logging
  - ▶ At the Domino console: **Stop consolelog**
- Copy the file using Qshell
  - ▶ At the IBM i command line: **STRQSH**
  - ▶ **cd /notes/data/IBM_TECHNICAL_SUPPORT**
  - ▶ **cp console.log console1.log**
  - ▶ Use iSeries® Navigator to retrieve the new file

- For additional details see technote 1265422 at

http://www.ibm.com/support/docview.wss?rs=1041&uid=swg21265422

If you want to submit a Console Log file from an active server, you must create a copy of the file using the process described here. If you have already restarted the server, the console.log file is automatically renamed during server startup. The date and time contained in the name of the console.log files will be the date and time the server was started. These old Console Log files are not locked and can be easily retrieved using iSeries Navigator.

To gather NSDs, Console Log files and other debug data from the IBM_TECHNICAL_SUPPORT directory you can use iSeries Navigator. You will navigate to "File Systems", "Integrated File System", "Root". From there you can select your data directory and the IBM_TECHNICAL_SUPPORT subdirectory. You can then drag any needed files to your desktop.

Accessing spooled files through iSeries Navigator

Basic Operations > Printer Output

Press F11 to select QNOTES as the user

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If you have spooled files that you want to submit to support you can access iSeries Navigator Printer output. By pressing F11 you can select which user's output to view. The user you need to specify depends on the data you are trying to retrieve. DMPDOMSVRC data are listed under the user profile who submitted the DMPDOMSVRC command. Joblogs and other miscellaneous Domino failures are listed under the QNOTES user profile.

Additional resources

- Technote #1094630 - "Semaphores and Semaphore Timeouts"

  http://www.ibm.com/support/docview.wss?rs=0&uid=swg21094630

- Technote #1248903 - "Collecting data for a Domino server hang on i5/OS"

  http://www.ibm.com/support/docview.wss?rs=899&uid=swg21248903

- developerWorks® article - "Troubleshooting Lotus Domino hangs and crashes"

  http://www.ibm.com/developerworks/lotus/library/domino-server-crashes/

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