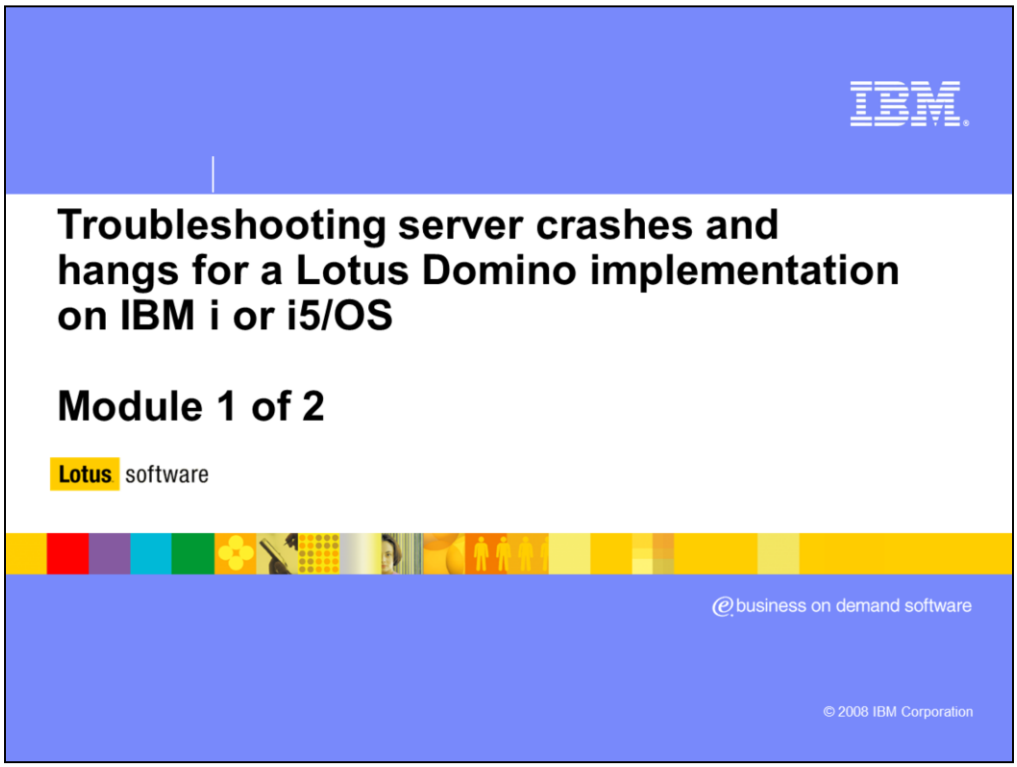


This education series consists of two modules that will introduce you to troubleshooting Domino server crashes and hangs on the IBM i or i5/OS operating system. In this module you will learn how to distinguish between a server crash and hang, how to gather the data needed to diagnose a server crash and steps to take if your server has crashed and will not restart.

Server crashes and hangs

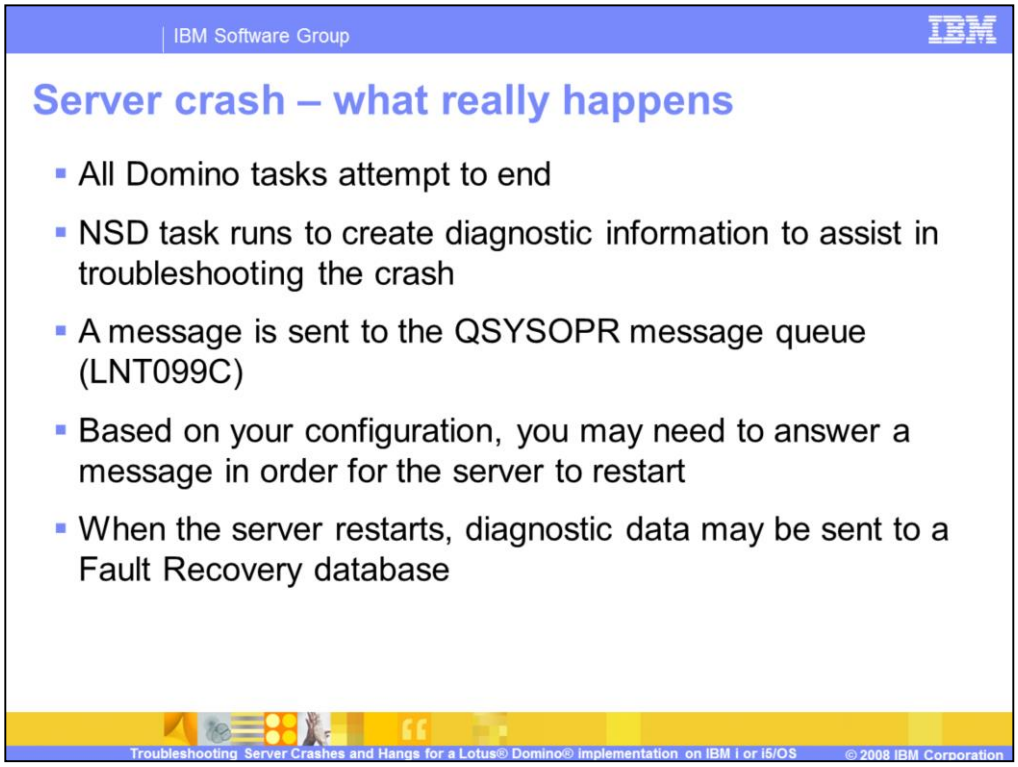
- Domino server crash
  - The moment when one of the Domino tasks ends in error, and as a result all other Domino tasks end as well. The server no longer responds to any user requests.
  - In most cases, this ending of the tasks happens in a more or less controlled way, and the Notes System Diagnostics tool (NSD) is started to dump all available data of this failing task to the NSD file.
  - Ending your Domino server immediately (*IMMED) is considered a crash.

The difference between a Domino server crash and hang is often confused. On this slide and the next you will see the definition for both a crash and a hang. The important thing to remember here is that a crash occurs when the Domino server ends abnormally or unexpectedly.

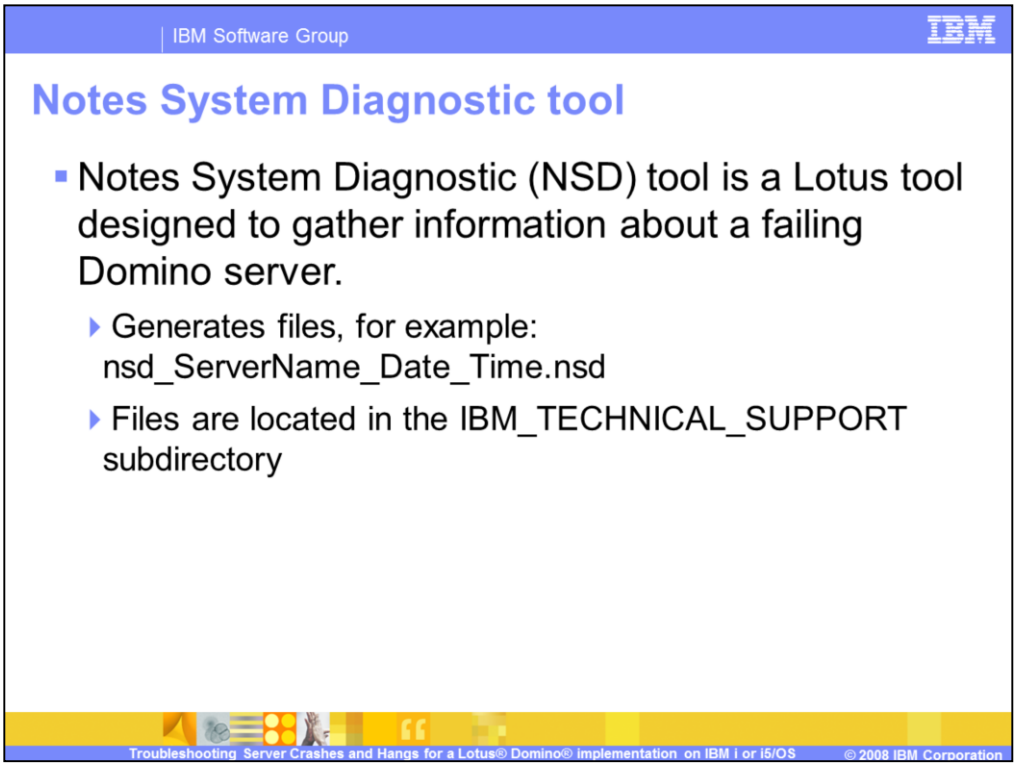
Server crashes and hangs

- Domino server hang
  - A server that becomes unresponsive to client requests and may or may not respond to console commands
  - Domino jobs are still active
  - Typically the server cannot be ended controlled when this occurs
  - Caused by resource contention

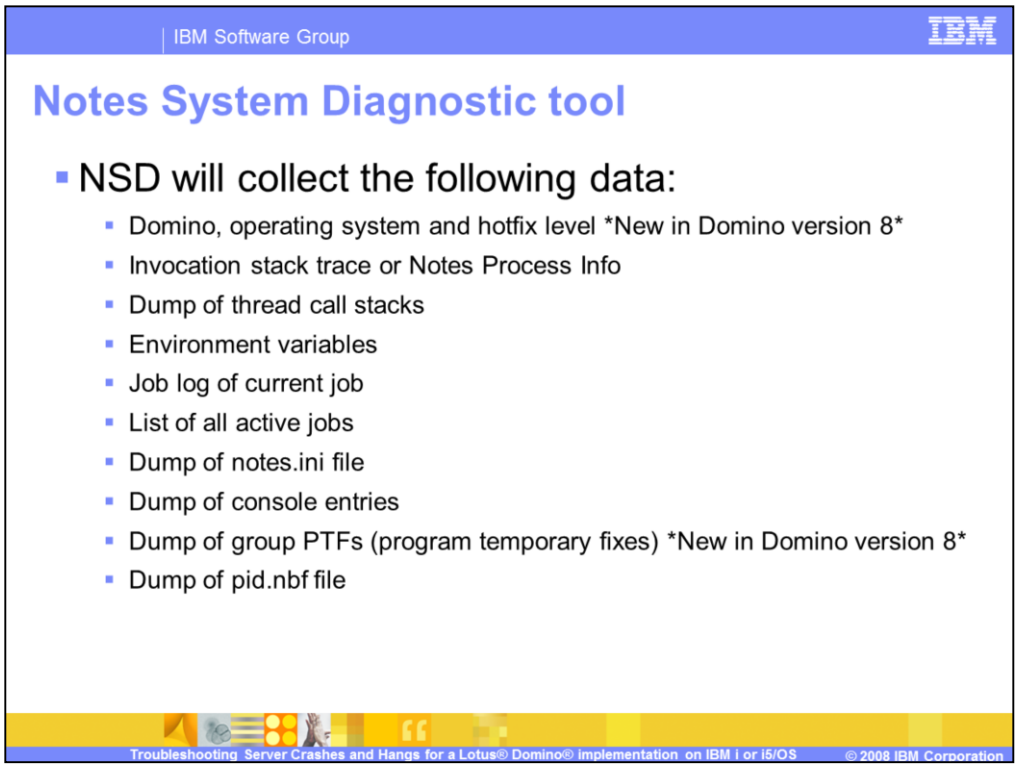
A hang is occurring if the Domino server is running, but one or more of the server tasks is not responding to user requests. In most cases the server must be ended with the *IMMED option. While ending the server with the *IMMED forces your server to crash, in this case you should debug your problem as a hang, not a crash.



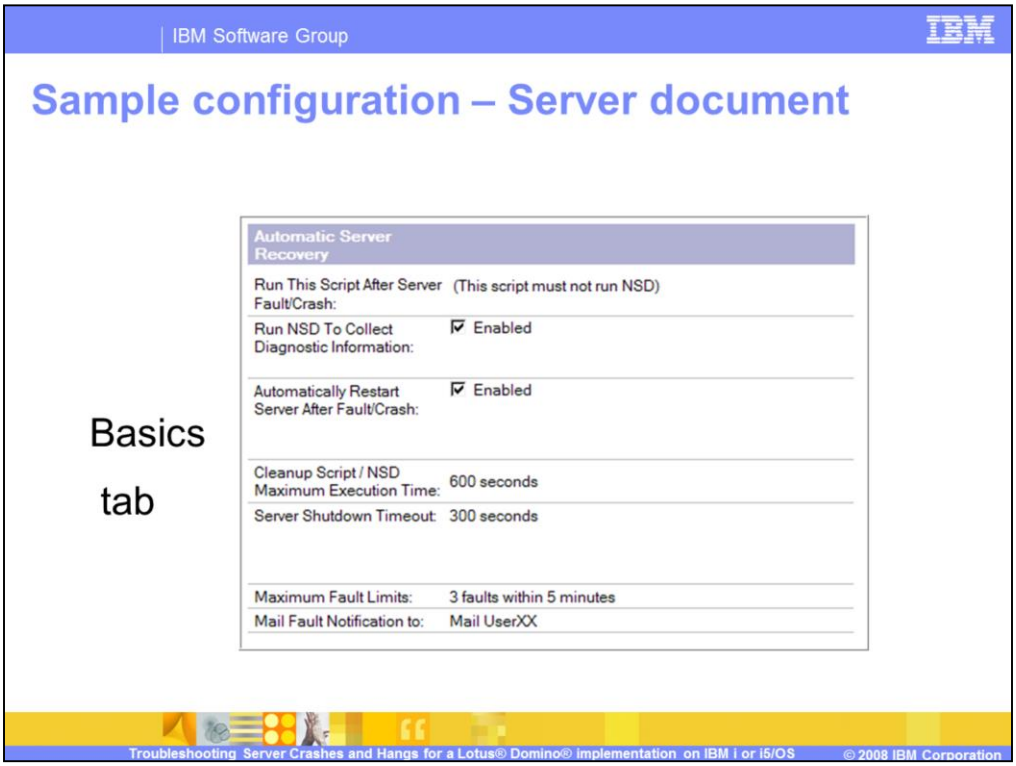
A crash is typically caused by an unhandled exception in one of the Domino server tasks. When this occurs, all of the Domino server tasks attempt to end. NSD begins to run and collect diagnostic information. A LNT099C message is sent to the IBM i or i5/OS QSYSOPR message queue to notify you of the crash. At this point the server will attempt to restart; however, if you have chosen not to restart the server automatically another message is sent to the QSYSOPR message queue stating **"**Enter a character to allow Domino job to continue". Once the server restarts the diagnostic data may be automatically sent to a Fault Recovery database. Later in this presentation you will see how to enable automatic diagnostic collection.



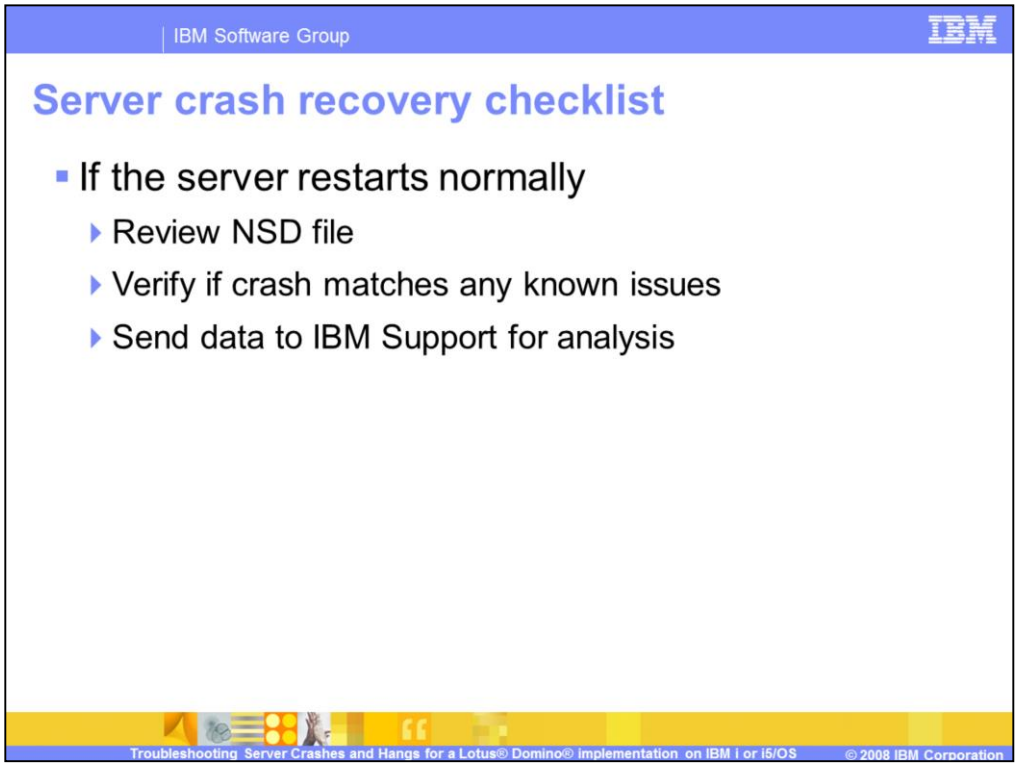
The Notes System Diagnostic tool is typically just referred to as NSD. It is the critical piece of data needed to diagnose a server crash.



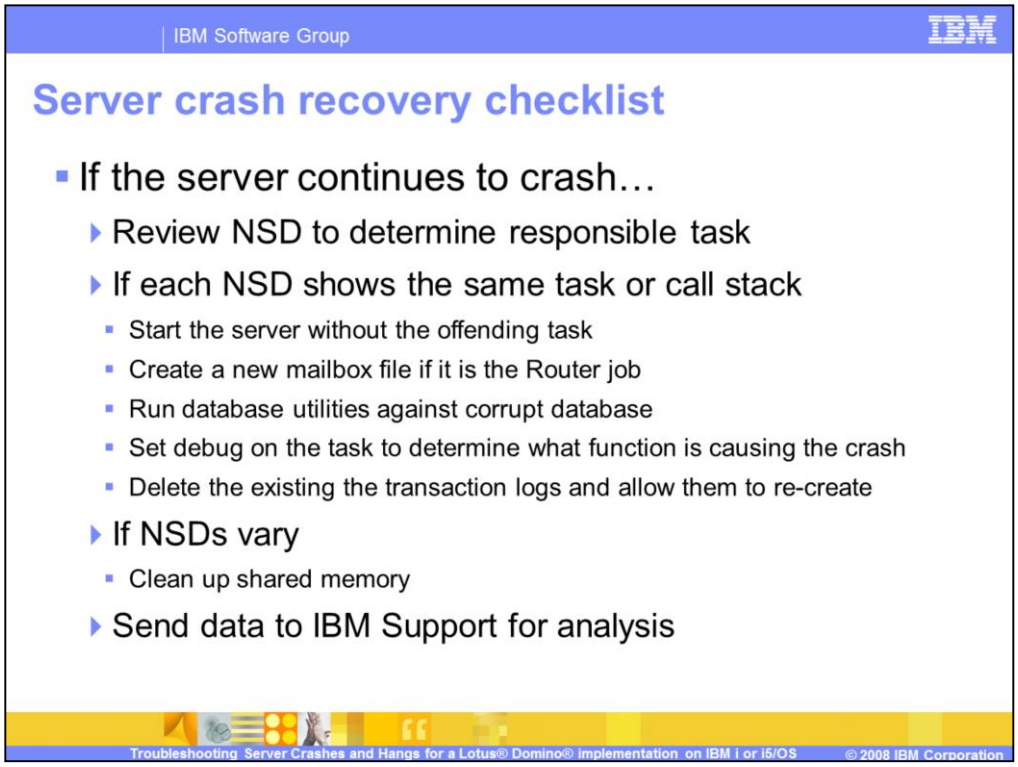
Here you can see a list of the data pieces collected in the NSD on IBM i.



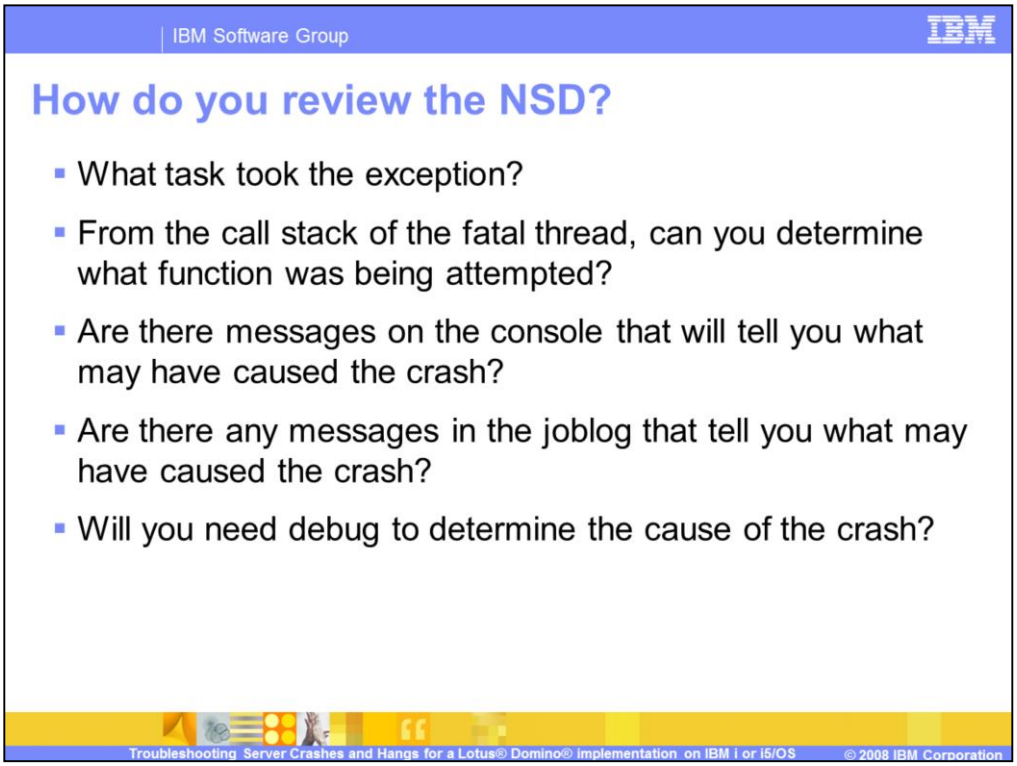
NSD is enabled by default; however, you can verify this by reviewing the Server document, Basics tab. In the Automatic Server Recovery section you can enable or disable NSD. You can also decide whether you want to automatically restart the server after a crash. You can set a maximum fault limit. By default this is three faults within five minutes. This means that if the server crashes three times within a five minute time period, the server will not automatically restart. The last setting in this section allows you to specify a user to receive an e-mail notification when a crash occurs.



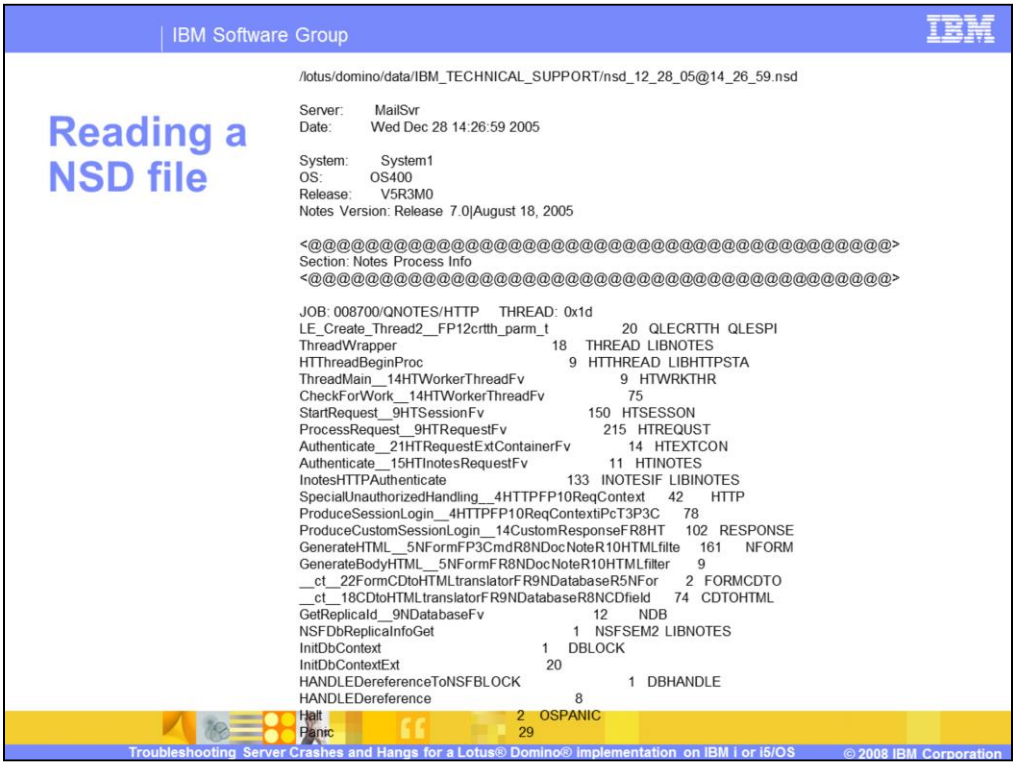
If you ever experience a server crash you may wonder what your next steps should be. This slide gives you an overview of actions you should take. You will see these steps in detail as this presentation continues.



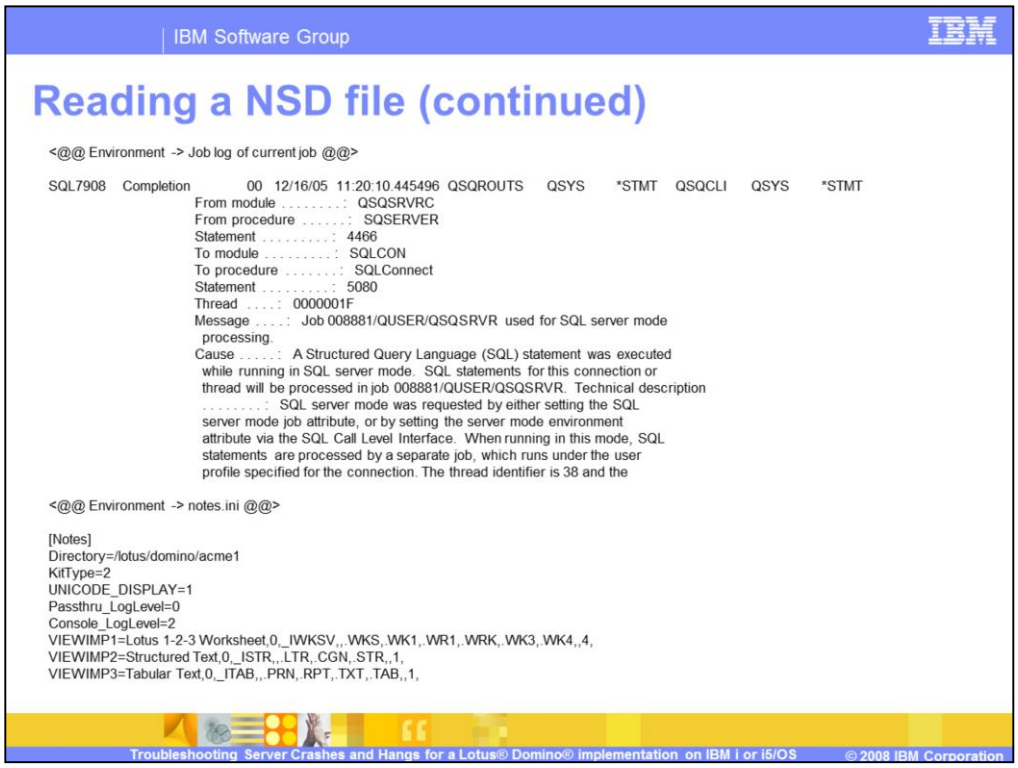
If your server does not automatically restart there are other actions you may need to take for your server to recover. You will see these steps in detail as this presentation continues.



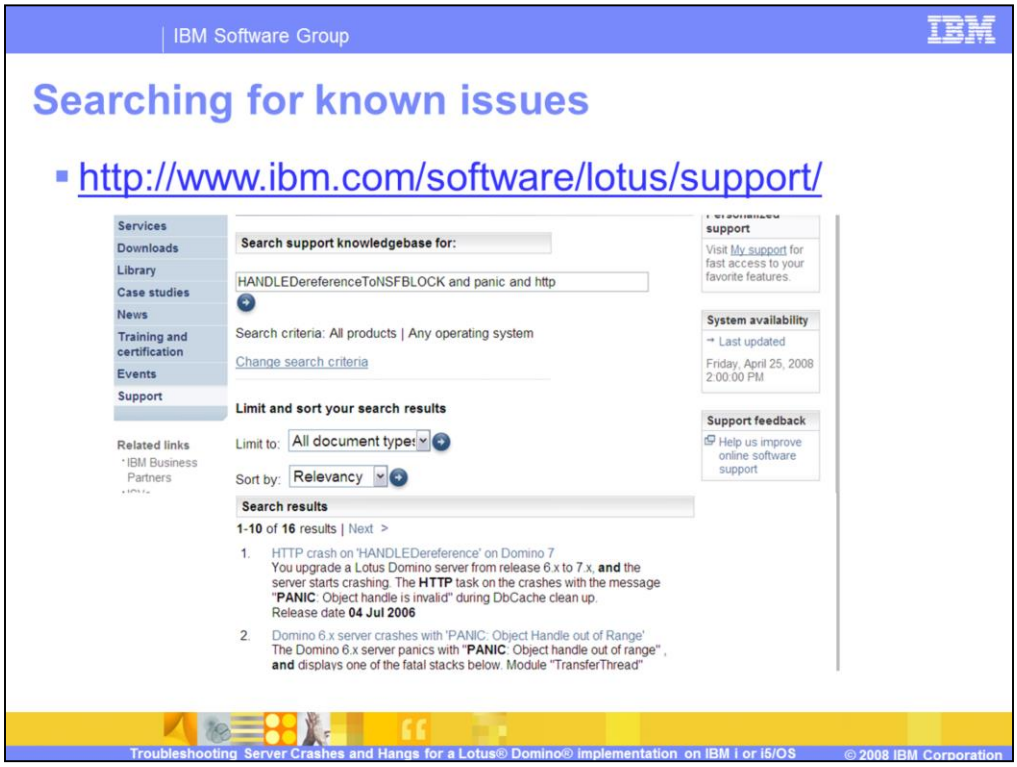
Here you can see the types of questions you should ask yourself when looking at an NSD file.



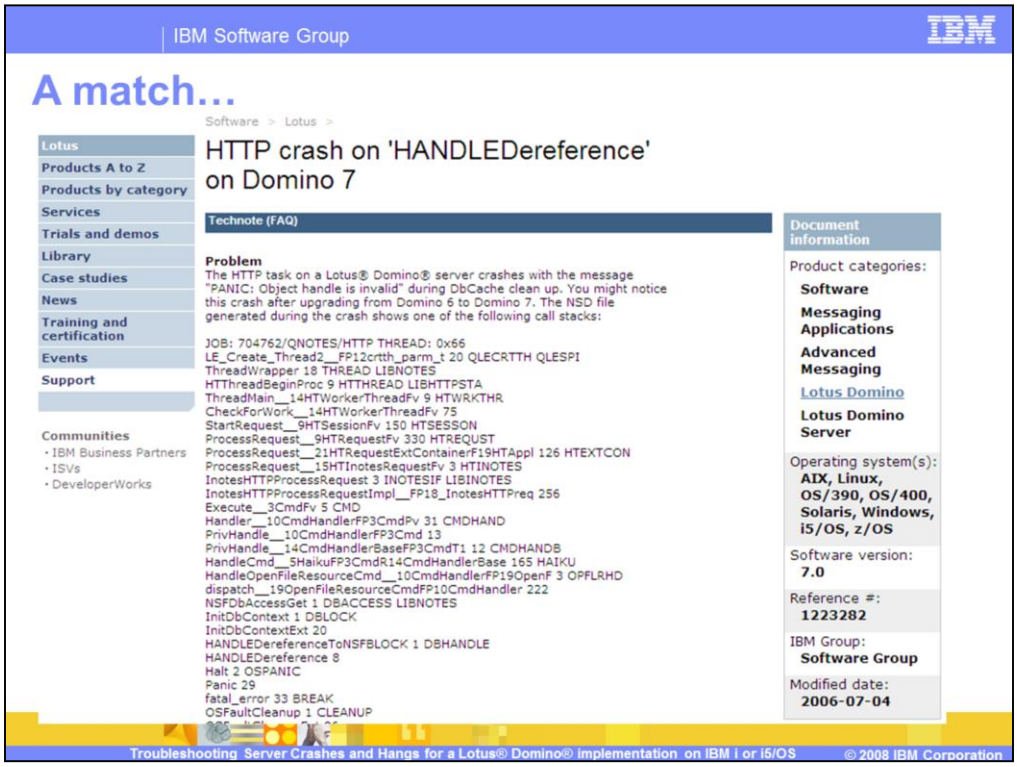
Here you can see the beginning portion of the NSD file. It starts very simple by providing the file name, the Domino server involved, the name of the physical system and the Domino and operating system release. You can then see the beginning of the Notes Process Info section. Can you see what task took the exception? In this case it is the HTTP task. Next you should review the call stack. By reading the procedure names do you have any idea what might have been occurring? In this case you can see that a user had authenticated with the server through HTTP and was trying to open a database. You get the idea that the server was generating HTML, but it is not very specific. In a case like this, you will want to search the Lotus Knowledge Base for any matching issues or for information about debugging HTTP, like HTTP thread logging. You will see more of the NSD file in a moment. While you are here, do you have any idea what you will use as a search string? You should start from the bottom of the call stack and move up when selecting a search string. In this case a good starting search is “panic” and “HANDLEDrefrerenceToNSFBLOCK and HTTP”.



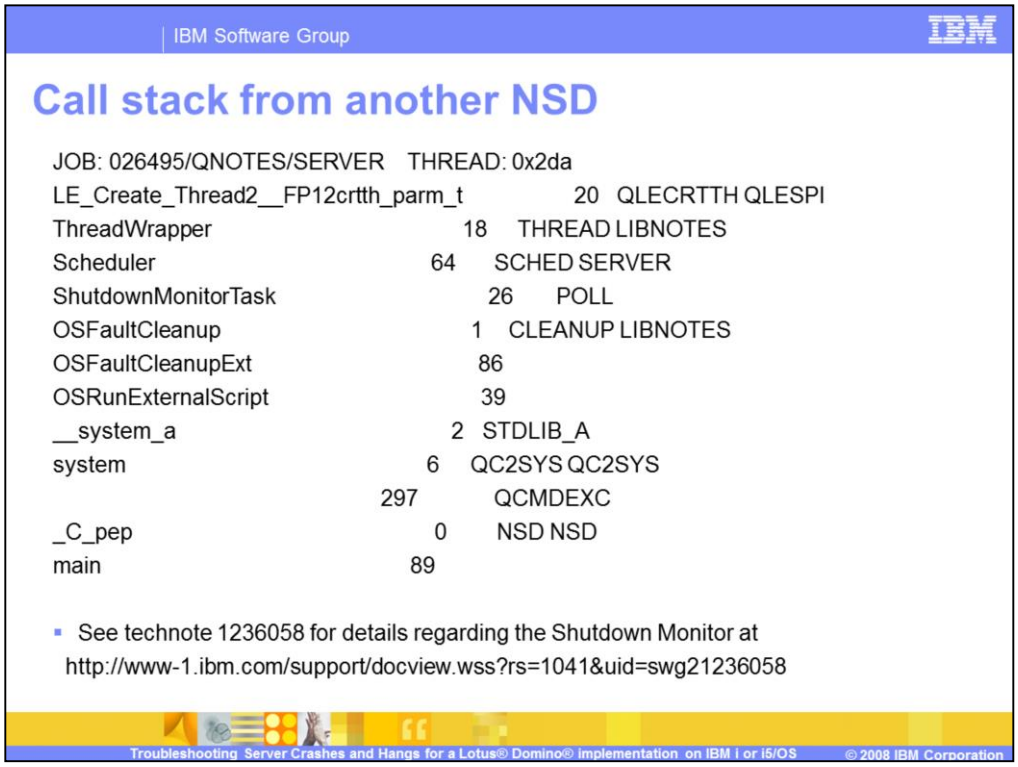
In this slide you can see more of the NSD file. It is always a good idea to review the Job log. In this example you can see the end of the Job log. In this case the last message posted is SQL7908. That is a normal message which you can ignore. You can also see the beginning of the notes.ini file.



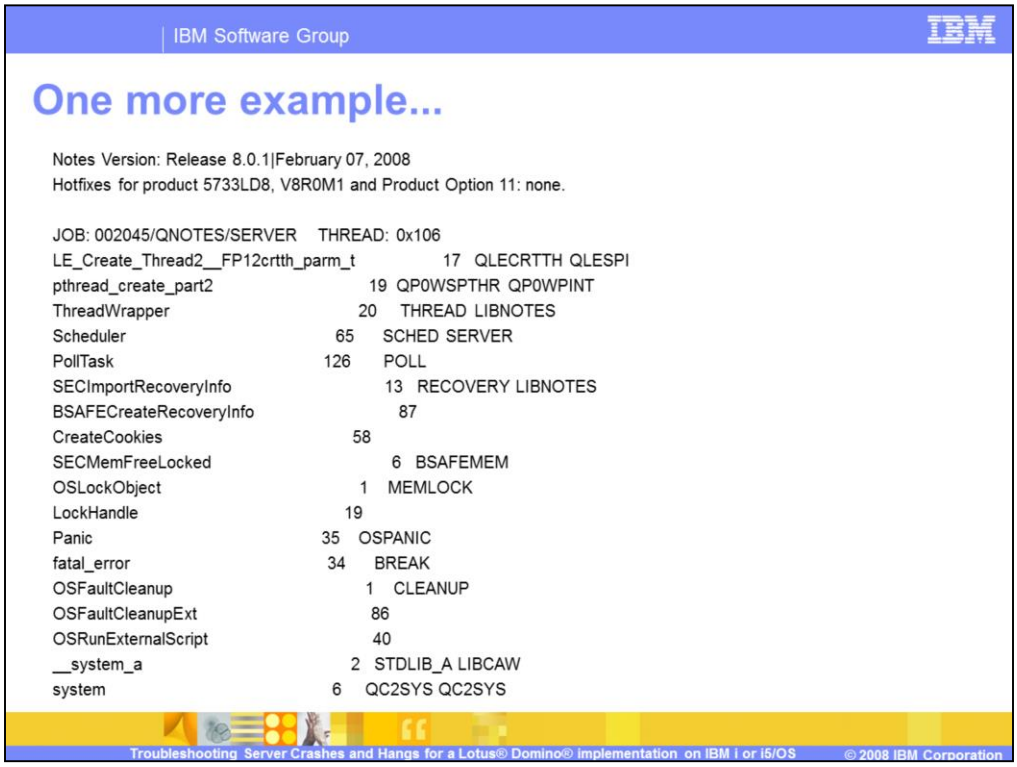
Once you have reviewed the NSD file you will want to search for known issue. Based in the call stack you reviewed earlier you decided to search on HANDLEDereferenceToNSFBLOCK and panic and HTTP. You can see that the search string yielded 16 results.



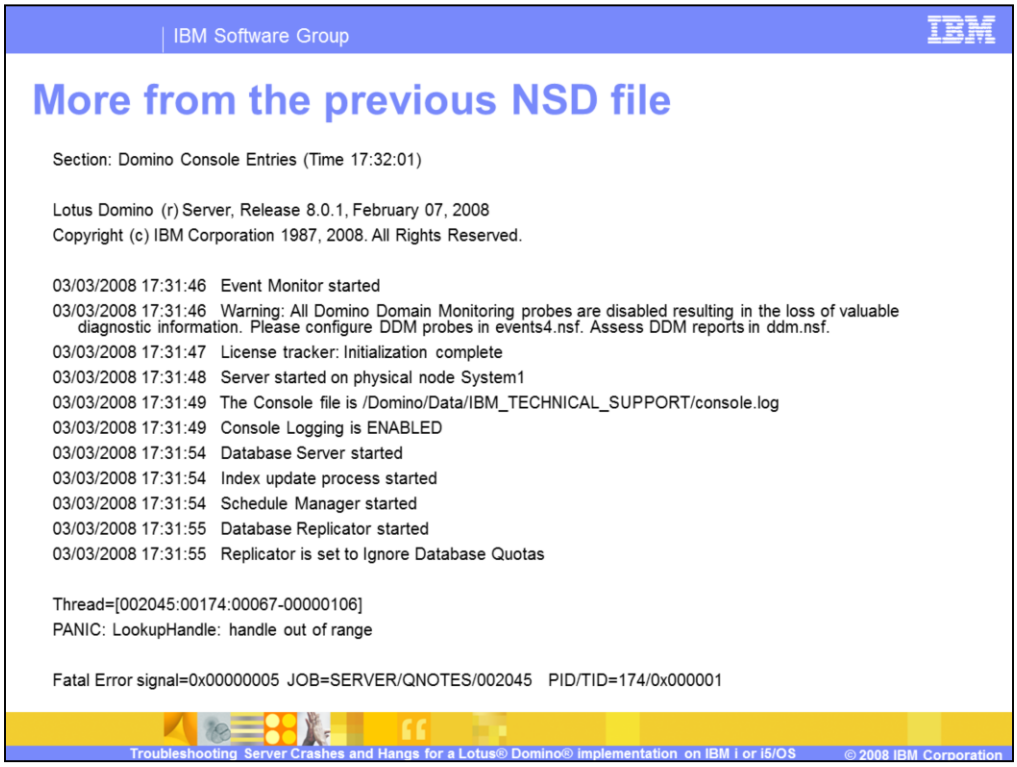
In this case you can open the first document and see that it is a match for the issue. Only a small portion of the document is shown here. If you were to look at the complete document you will see that this issue has been resolved in Domino version 7.0.1.



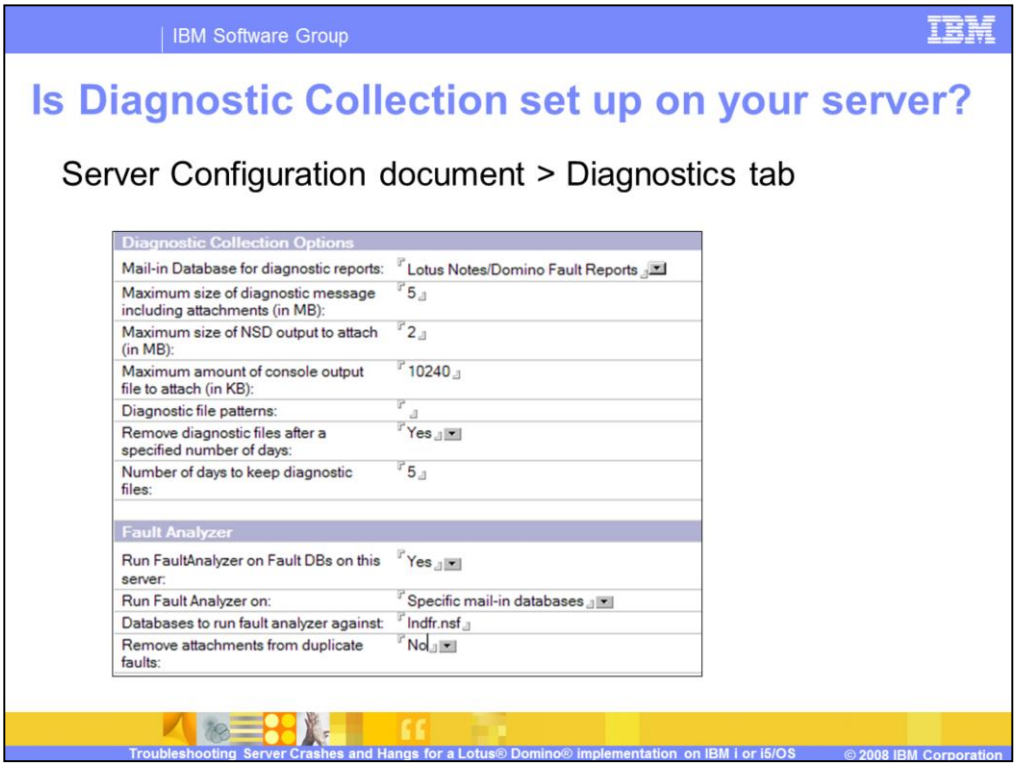
Here is another example call stack from a NSD file. In this case you can see that the Server task was responsible for the crash. Reviewing the call stack you can see that the Shutdown Monitor Task was involved. This is actually a normal stack and will occur anytime the server does not shut down before the allotted time. You will find the server shut down timeout defined on the Basics tab of the Server document. By default it is set to 300 seconds or 5 minutes.



Here is another NSD file. Can you tell what task caused the crash? It is the Server job. Any idea what you might use for a search string? Try SECMemFreeLocked, CreateCookies or BSAFECreateRecoveryInfo.

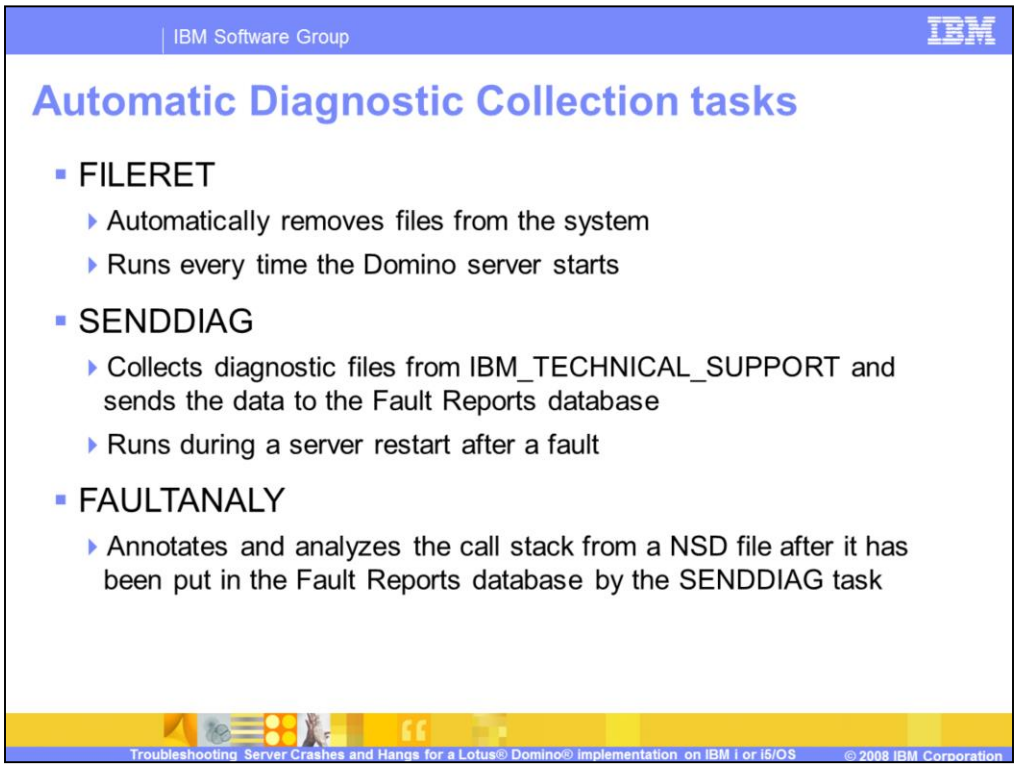


Reviewing the Console entries from this NSD file gives you the idea that the server did not run long before the crash. In cases like this it is a good idea to check to see if additional NSD files are present as this may be a secondary problem caused by a previous crash. Cleaning up shared memory is also a good idea. You will see how to clean up shared memory later in this presentation.



In the previous examples of NSD files, you saw snapshots of the native NSD from the server's IBM_TECHNICAL_SUPPORT subdirectory. There is another way to collect and view NSD files. This is done using Diagnostic Collection and the Fault Recovery database.

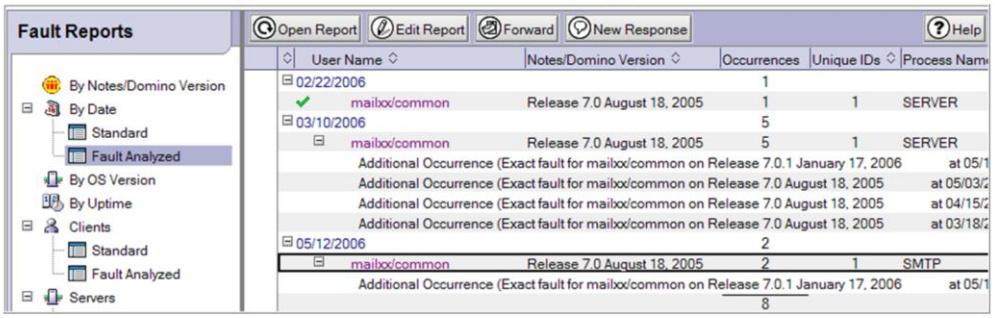
Diagnostic collection is configured in the Server's Configuration document. You should enable Diagnostic Collection to gather NSDs and other relevant information when the Domino sever crashes. You enable Diagnostic Collection by choosing a mail-in database for diagnostic reports. You can create this database or you can let the server create the default database named "Lotus Notes/Domino Fault Reports" as shown here. You can run allow Fault Analyzer to run to see detailed information regarding the crash. Fault Analyzer groups similar crashes together. At a minimum, enable the option to "Remove diagnostic files after a specified number of days" so the IBM_TECHNICAL_SUPPORT directory is cleaned up for you.



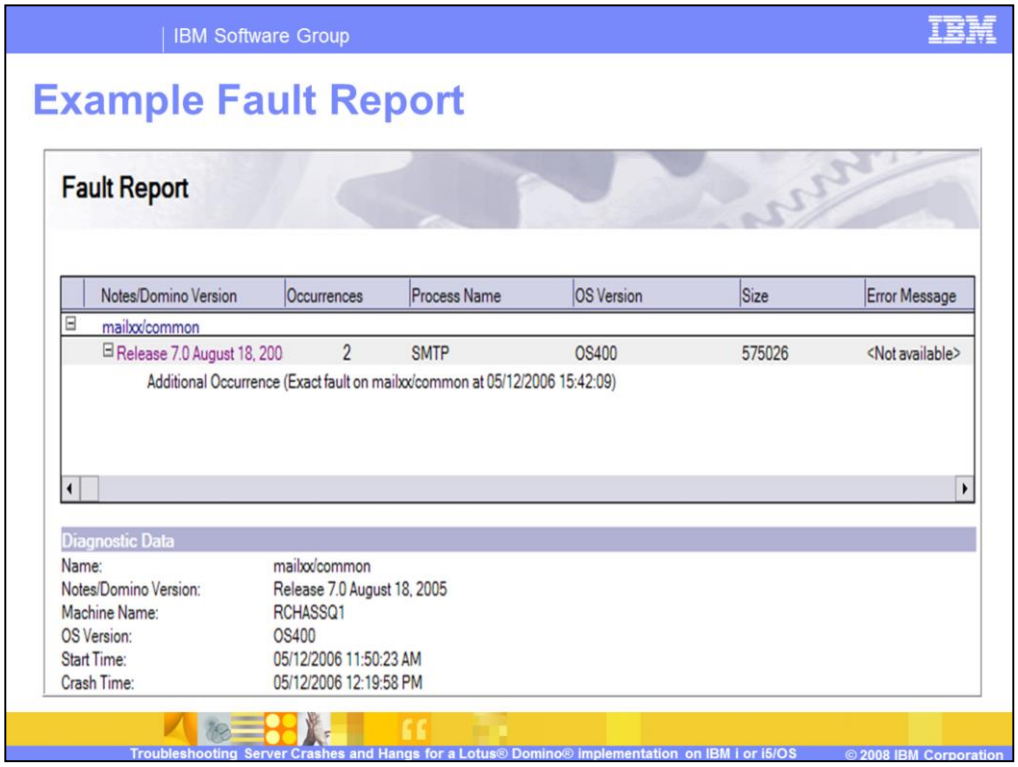
Once you enable Diagnostic Collection you may see the following tasks running on your Domino server: FILERET, SENDDIAG and FAULTANALY. FILERET automatically removes files from the system while SENDDIAG sends diagnostic files to the Faults Reports database if you have it configured. Optionally the FAULTANALY task will analyze the call stack for you and group similar crashes together.

Fault Reports database

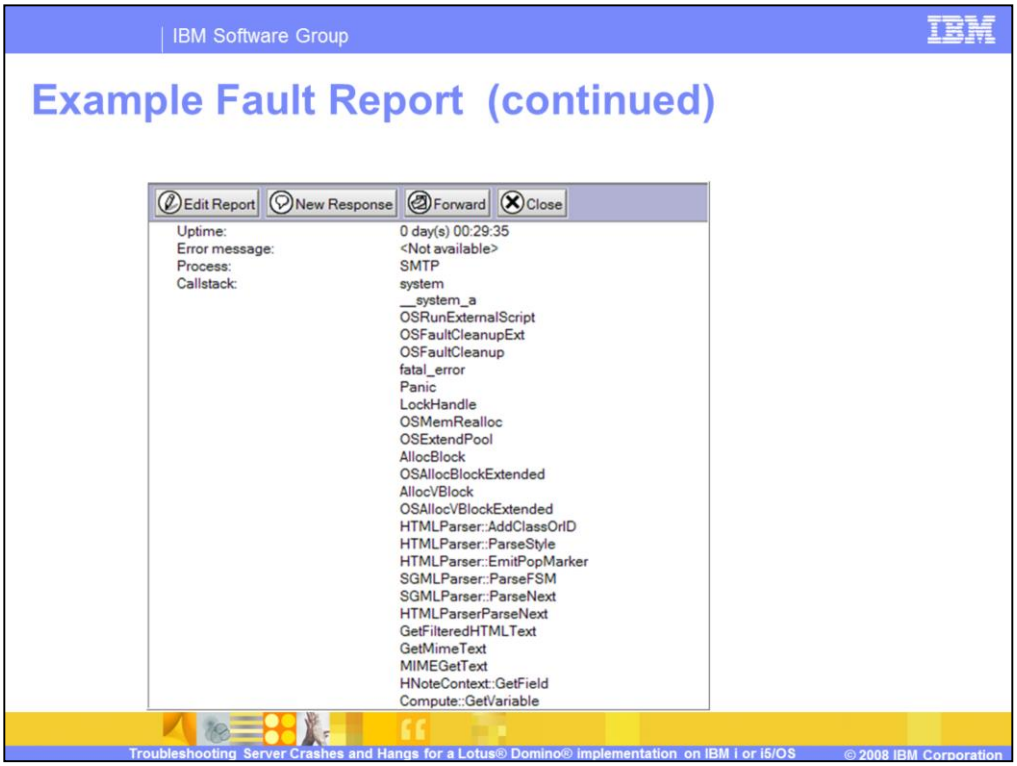
- Use to easily see when the Domino server has crashed and the status of the crash.
- Use to easily forward data to IBM Support



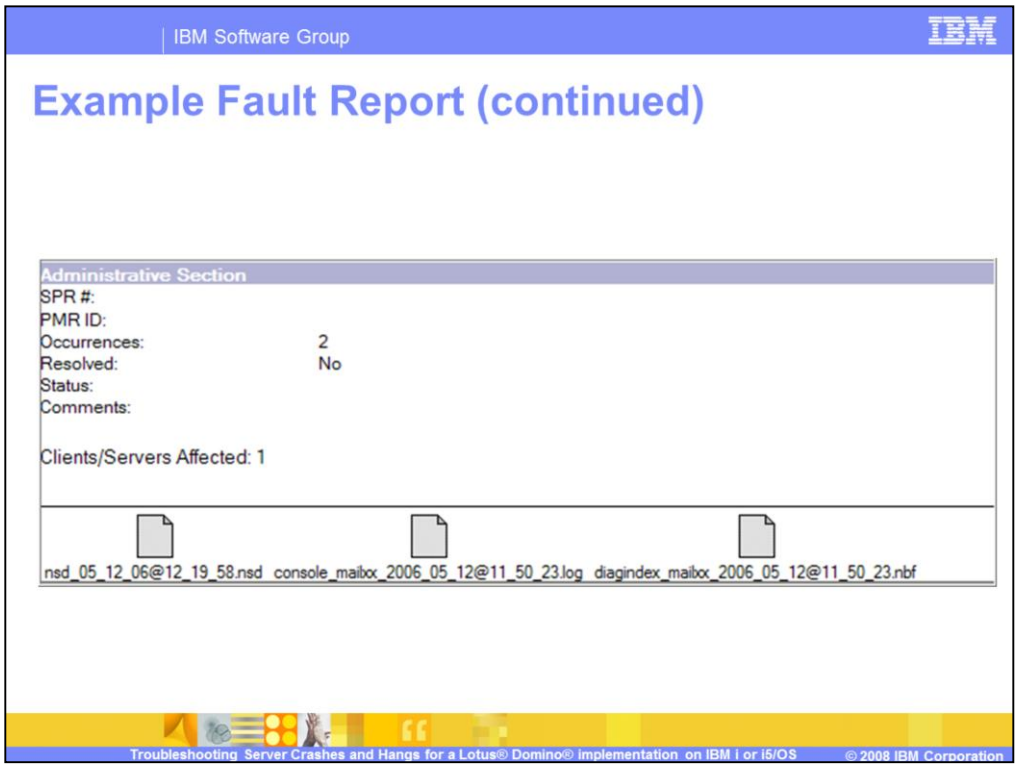
Here is an example of the Fault Reports database after the Fault Analyzer task, faultanaly, has run. You can see that each crash event is reported in the database and all similar crashes have been grouped together.



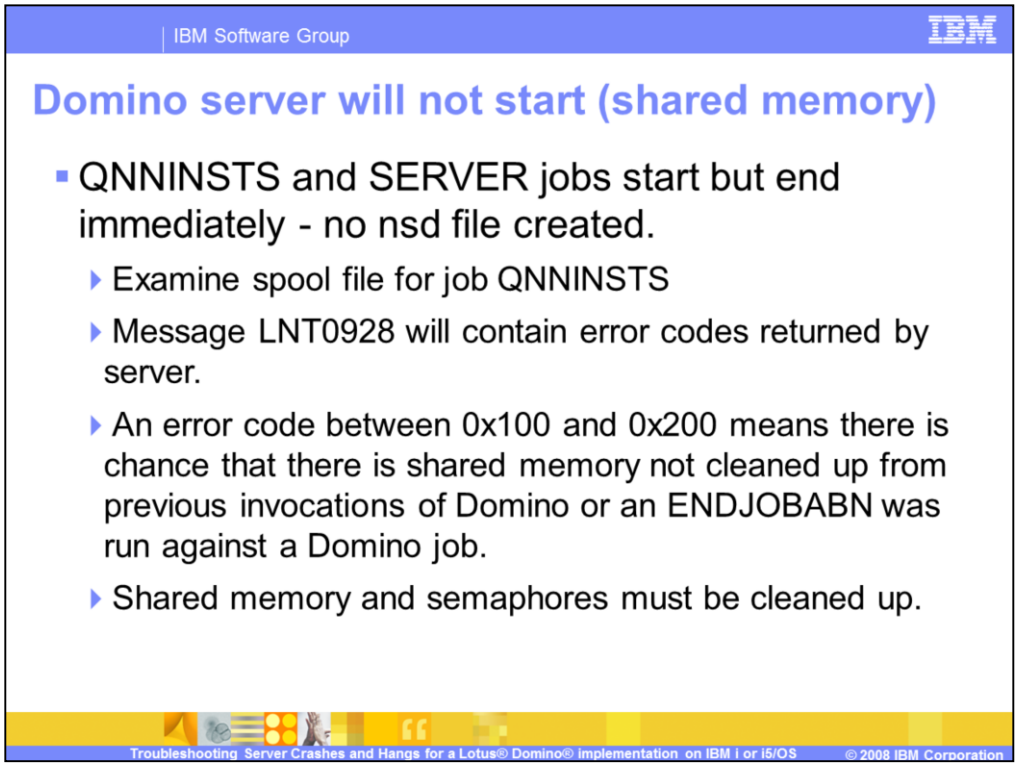
You can open the fault report to see additional information. Here you can see the initial screen in the Fault Reports database. Additional details are provided regarding the Domino and operating system release and the time of the crash.



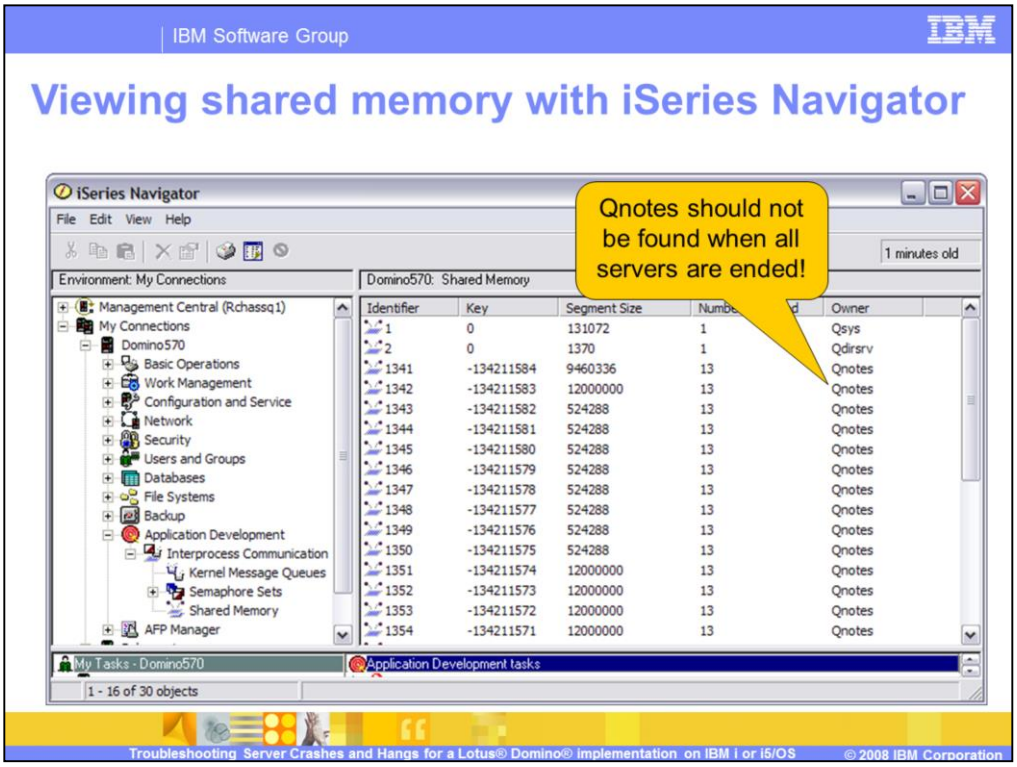
The fault report also contains the call stack of the fatal thread (the thread that caused the crash). One thing you may notice here is that the call stack is reversed compared to the raw NSD. This means that the first procedure called is the last procedure listed in the call stack.



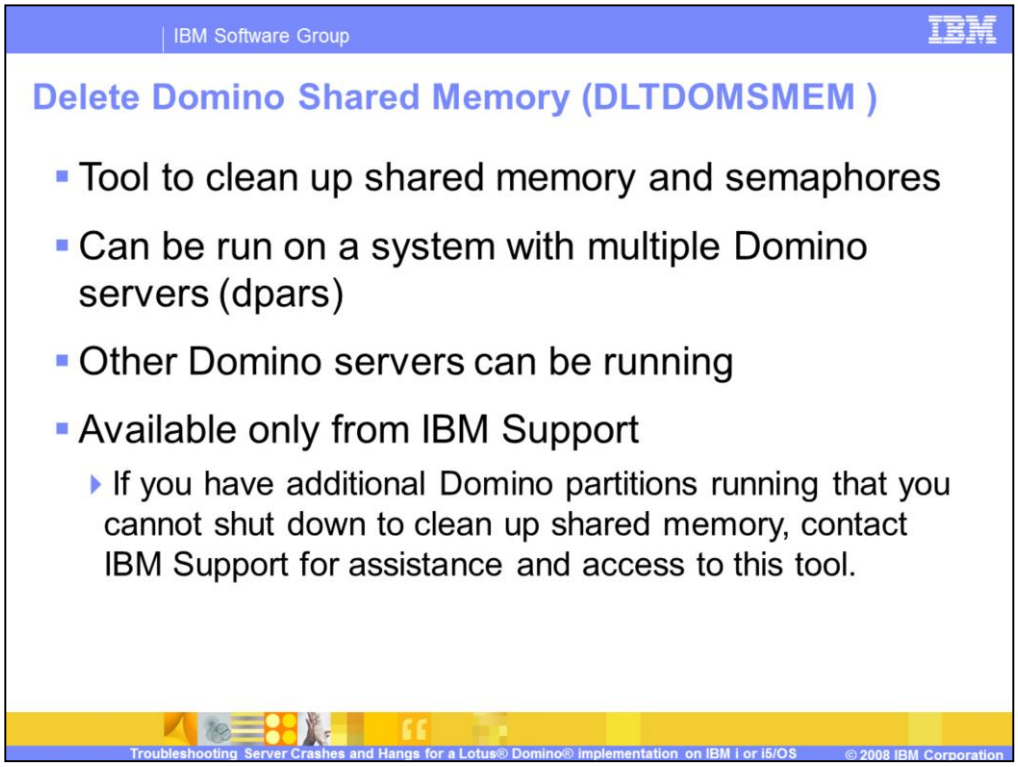
Use the Administrative section of the fault report to track the SPR number, PMR number and release that resolves the problem. The last part of the fault report is the attachments. Notice the NSD file and Console logs are automatically attached. If you have an EBCDIC viewer on your system, you can double click to open and view the raw files. Alternately, you can forward the document to lotus_support@ecurep.ibm.com and the PMR number as your subject to have them reviewed by IBM Support.



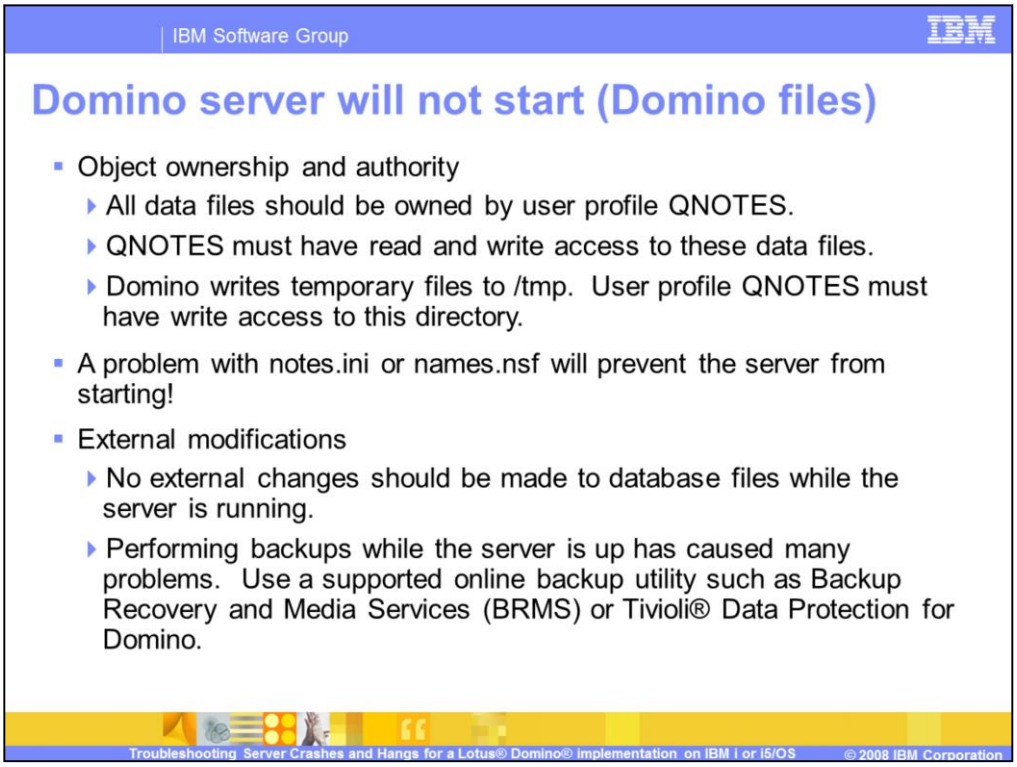
Under normal conditions when the server crashes it will immediately restart. However, there are cases where the server may not restart. In this case you will typically see the QNNINSTS and the SERVER jobs start, but end immediately. In this case you should examine the Job log for the QNNINSTS job to see what error is occurring. Many times you will find that shared memory or semaphores were orphaned because of the crash. You can end all Domino servers and use iSeries® Navigator to clean up shared memory and semaphores.



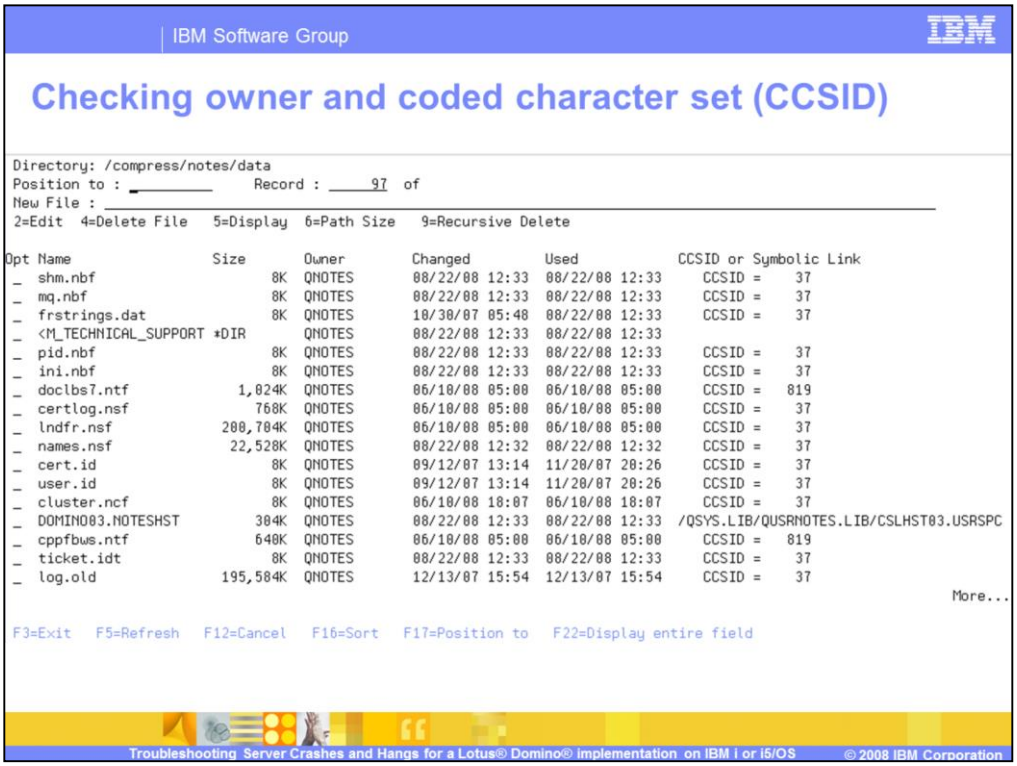
You can easily view shared memory and semaphores from iSeries Navigator. Note that you must have the Application Development component installed. If you do not see this option, you can choose to install Additional Components or perform a selective setup. When all Domino servers are ended, you should not be able to find any entries owned by QNOTES in “Semaphore Sets” or “Shared Memory”. In this example, you can select all entries owned by Qnotes and press the Delete key to remove them. Again, you must end all Domino servers before deleting these entries.



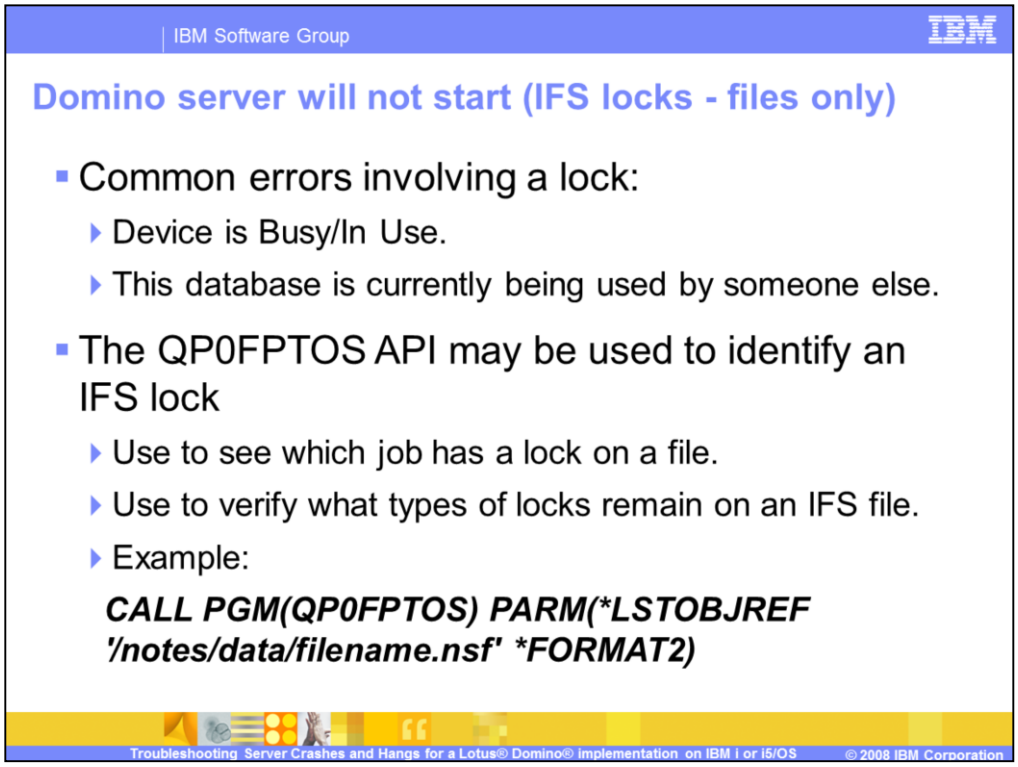
If you have multiple Domino servers running on one System i or one logical partition (lpar) ending all servers to clean up shared memory may not be an option for you. In this case, the Delete Domino Shared Memory (dltdomsmem) tool may be useful for you. This tool will clean up shared memory for one specific Domino server and not affect any other Domino servers. Note that this tool will clean up only Domino shared memory. Any memory allocated by a third-party product, Sametime® or Lotus Enterprise Integrator (LEI) is not cleaned up by this tool.



When a server does not start properly, it is important to review the Domino files. All files in the Data directory must be owned by the QNOTES user profile. It is always a good idea to check the integrity of the notes.ini file after a crash. In some cases the notes.ini or names.nsf file becomes corrupted by a crash and must be manually fixed or replaced. A process outside of Domino can also prevent the server from starting. No external changes should be made to a Domino database while the server is running. You should also ensure that if you are running a backup with the server active that your backup method is an approved online backup such as BRMS or Tivoli Data Protection for Domino.



Files used by the Domino server must be owned by QNOTES and must have a coded character set (CCSID) that Domino can read. For the notes.ini and template files this will be 819. For Domino databases this should be 37. To quickly and easily see the owner and CCSID values for all files in the server's Data directory, you can use the Edit File (EDTF) command as shown on this slide.



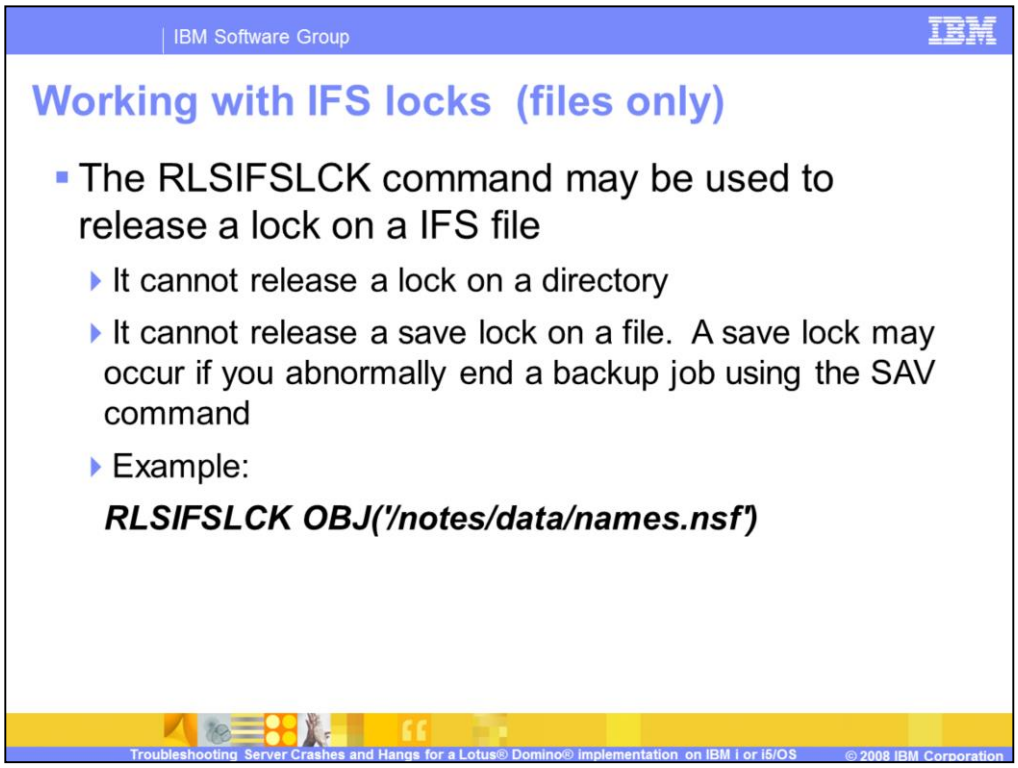
It is also possible for a Domino server crash to leave a lock on a file. If you see an error like “Device is Busy/In Use” or “This database is currently being used by someone else”, then you have a lock issue. You can use the QP0FPTOS API to identify the lock. An example of the proper syntax is shown on this slide.

Example QP0FPTOS output

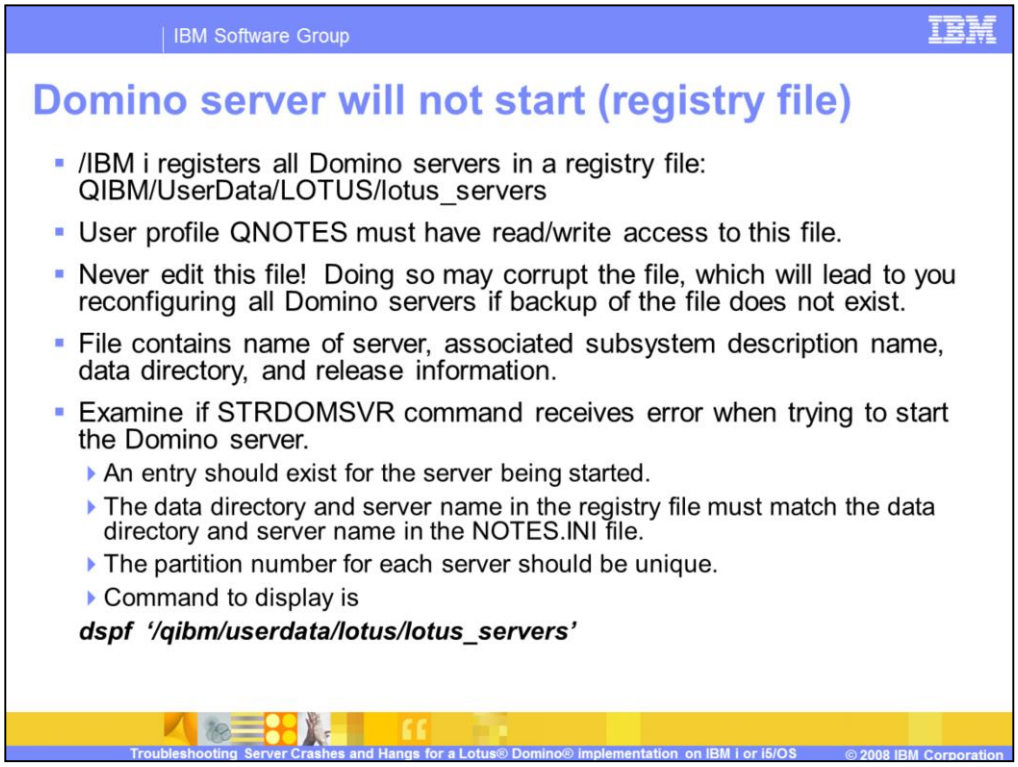
List Object References (QP0FPTOS *LSTOBJREF *FORMAT2)
Object . . . . . : /notes/data/names.nsf
Use Count . . . . . : 2
The object does have references.
Number of jobs . . . . . : 2
Number of jobs available . . : 2
Simple Reference Types (# of references):
Read Only 0
Write Only 0
Read/Write 2
Execute 0
Share with Readers Only 0
Share with Writers Only 0
Share with Readers and Writers 2
Share with neither Readers nor Writers 0
Attribute Lock 0
Save Lock 0
Internal Save Lock 0
Link Changes Lock 0
Checked Out 0
Extended Reference Types (# of job's with references):
Read Only, Share with Readers Only 0
Read Only, Share with Writers Only 0
Read Only, Share with Readers and Writers 0
Write Only, Share with Writers Only 0
Write Only, Share with Readers and Writers 0
Write Only, Share with neither Readers nor Writers 0
Read/Write, Share with Readers and Writers 2
Read/Write, Share with neither Readers nor Writers 0
Write Only, Share with neither Readers nor Writers 0
Read/Write, Share with Readers Only 0
Read/Write, Share with Writers Only 0
Read/Write, Share with Readers and Writers 2
Read/Write, Share with neither Readers nor Writers 0
Execute, Share with Readers Only 0
Execute, Share with Writers Only 0
Execute, Share with Readers and Writers 0
Execute, Share with neither Readers nor Writers 0
Execute/Read Only, Share with Readers Only 0
Execute/Read Only, Share with Writers Only 0
Execute/Read Only, Share with Readers and Writers 0
Execute/Read Only, Share with neither Readers nor Writers 0
Attribute Lock 0
Save Lock 0
Internal Save Lock 0
Link Changes Lock 0
Current Directory 0
Root Directory 0
File Server Reference 0
File Server Working Directory 0
Checked Out 0
Jobs using the object:

Job. . . . . : 025482/QNOTES/EVENT

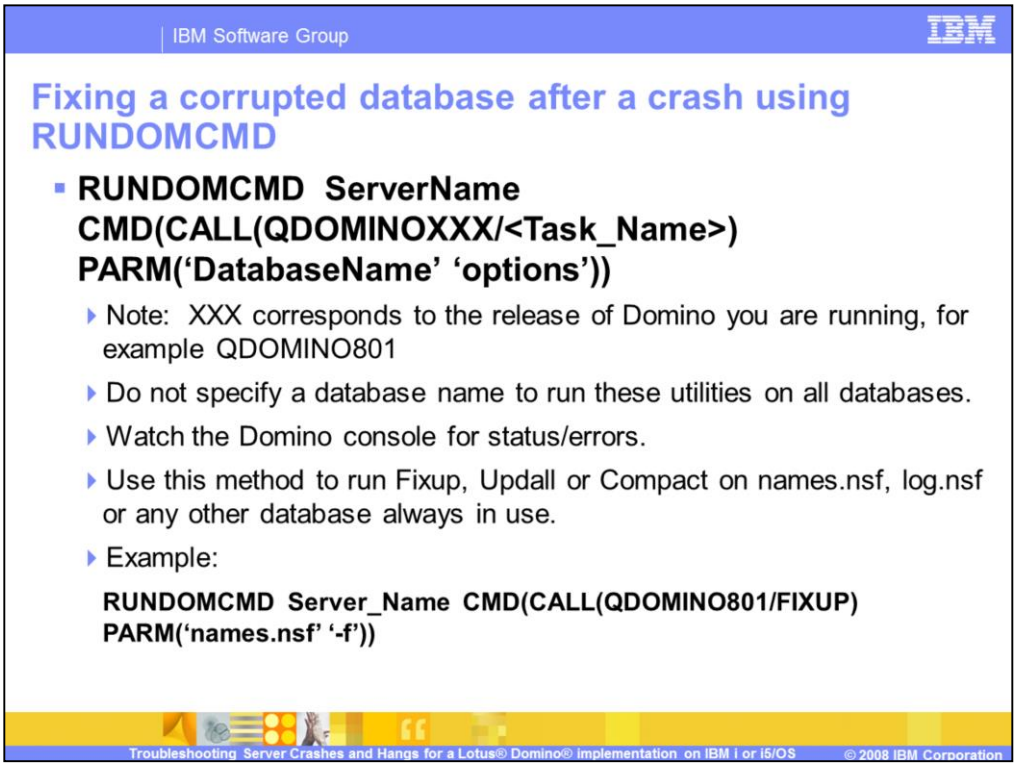
Here is an example of the output received from the QP0FPTOS API. You can see that there are many different types of locks. While it is not important for you to be able to recognize each type, it is important to be able to see if any locks exist and if any of those locks are a save lock. The entries in bold show you the object that was dumped, the number of jobs that have a lock on this file and the types of locks. Here you can see that there are read and write locks on this file, but no save locks.



Once you confirm an object lock is present, you can then use the RLSIFSLCK command to release the lock. Note that the RLSIFSLCK command will release locks only against a file. It will not work on a directory. It will also not work on save locks. An IPL is required to release those type of locks.



A problem with this file may prevent a server from starting!



If a database was not properly updated and closed before the server ended database corruption can occur. In this case running Fixup against the database suspected of being corrupt or the entire server may resolve the problem. If you suspect a problem with a view or full-text index, you can use RUNDOMCMD to run the Updall task. If you suspect a problem with the database UNK table or just want to compact the database with the server down, you can use the same syntax for the Compact task.

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