IBM

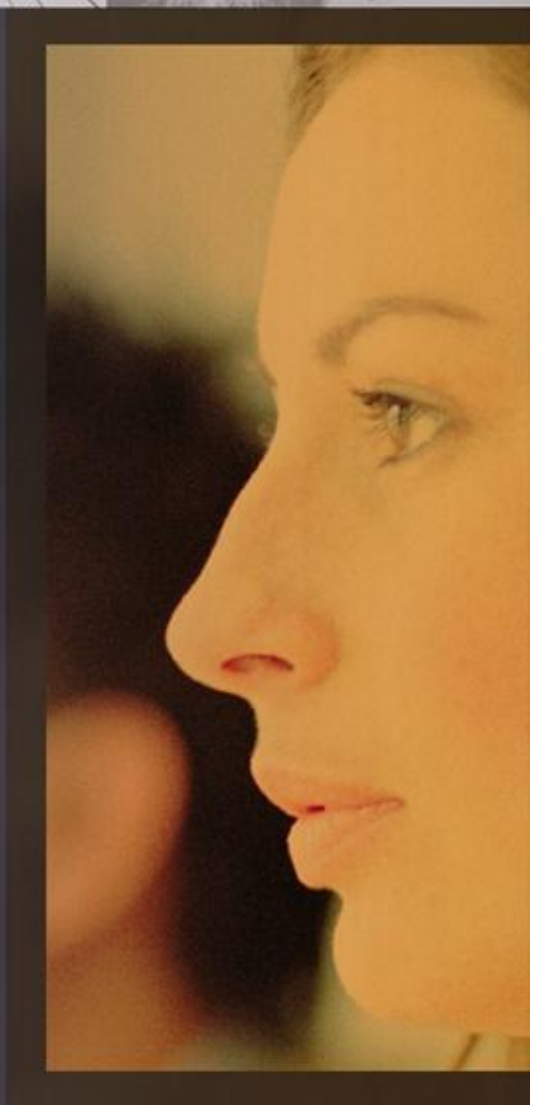
THE WORKPLACE FOR
!NNOVATION

BP106 Best Practices: RIP and NSD Analysis

Automatic Diagnostic Collection and then?

Daniel Nashed
Nash!Com

Peter Birett
Advisory Software Support Specialist
EMEA Support Engineering Team (SET)
IBM Lotus software



Lotus software

Speaker Introduction

- Daniel Nashed
  - http://www.nashcom.de
  - Member of The Penumbra Group
  - Domino Infrastructure Consulting & Troubleshooting
  - strong cross platform C-API and Domino on Unix/Linux focus
- Peter Birett
  - IBM SWG Lotus Support since May 1998
  - Advisory Software Engineer
  - member of EMEA SET (Support Engineer Team)
    - highest level of support

Agenda

- Introduction
- Server Crashes
  - RIP Analysis
  - ADC and Dynamic Console log
  - NSD Analysis
- Troubleshooting Domino using NSD
  - Collecting Information with NSD
  - Best Practices NSD
  - Analyzing Server Hangs
- Q&A

Focus of this presentation

- We will mainly cover NSD for Domino 6.5.x on Win32 and Unix/Linux
  - many enhancements introduced in NSD and ADC step by step between late R5 and D6.5
  - some of the features might not be available in earlier releases
  - we recommend to update to 6.0.3 or 6.5 (6.5.1 ships this week)
    - Best support for diagnostic tools
- ADC = Automatic Data Collection - a rush through
  - best chance for detailed coverage is from Shane Kilmon's RAS presentation in the Customer Care lab Wednesday at 4:30 pm
- We will mainly provide Best Practices and Tips for Server Crashes, Server Hangs and general Troubleshooting using NSD for Domino 6 and RIP for Domino 5

RIP Introduction - R5

- A crash represents the inability of the Domino Server program to continue execution.
- RIP = Rest In Peace
- QNC = Quincy
- QNC must be registered as a Just in Time (JIT) Debugger
  - QNC appends several crashes into <NotesData>\Notes.RIP
  - can contain a long lasting history of several crashes
  - might also contain non-Domino crashes due to system wide JIT
  - upgrades in R5.x code stream should be checked whether QNC is still registered as JIT

RIP File Requires Annotation

- Using SYM files specific for each version
  - TN #1102340 Availability of SYM Files for Annotating Notes.RIP Files
- For an eventual HotFix installed - updated SYM file required
- Annotator requires DOS window environment variable QNCMAP
  - `Set QNCMAP=d:\sym\v5.0.12\w32`
  - `ant.exe notes.rip > notes.ant`
- Note: SYM format changed with 5.0.11 -> requires version 4 of ant.exe
  - TN #4004196 points to ftp download (backward compatible)

RIP Header: OS, Application & Version

```
************************************************
*          Quincy for Win32  Rev 2.00          *
*  Copyright 1995-7, Lotus Development Corp.   *
*              All rights reserved             *
*          Abnormal Termination Report         *
************************************************
Portions Copyright (C) 1985-1993 Microsoft Corp. All rights
reserved.

Quincy has detected the following fatal exception
Please report this crash to the vendor of the faulting
application:
App: D:\ND5\D5012e\nnshcrash.exe (PID=0xB40) ""
When: 1/7/2004 @ 23:56:3.669
Exception Number: 0xC0000005 (access violation)
Exception Flags:  0x00000000 (continuable)
Notes Build: Release 5.0.12  |February 13, 2003
Hotfixes:
 none...
```

shows the OS

which application causes the crash and when

Notes version. for annotation allocate correct SYM files

RIP System Info & Tasks

- ----- System Information -----
- Computer Name: PBIRETT-T21
- User Name: PBirett
- Number of Processors: 1
- Processor Type: Intel Pentium
- Windows Version: NT 5.0 (Build 2195) - Service Pack 4
- Current Build: 2195
- Current Type: Uniprocessor Free
- Registered Organization: de.IBM.com/Lotus
- Registered Owner: Peter Birett
-
- ----- Task List -----
- PID Task Name
- 0xA60 D:\ND5\D5012e\nserver.exe 02-13-103 10:34:10 Size: 45109
- 0x878 D:\ND5\D5012e\nrouter.exe 02-11-103 19:17:22 Size: 258101
- 0x7D0 D:\ND5\D5012e\namgr.exe 02-11-103 18:58:52 Size: 69683
- 0x244 D:\ND5\D5012e\namgr.exe 02-11-103 18:58:52 Size: 69683
- 0x7B8 D:\ND5\D5012e\namgr.exe 02-11-103 18:58:52 Size: 69683
- 0xB40 D:\ND5\D5012e\nnshcrash.exe 01-06-104 23:52:33 Size: 78596
- 0x71C D:\ND5\D5012e\qnc.exe 02-11-103 19:17:20 Size: 122929

OS with patch, CPU, computer name, OS User-ID

which Domino or 3rd party application were in memory

RIP Stack Back Trace: Raw and Annotated

```
0012FA18  32203430 34303A33 2036323A 42502020  |04 23:04:26   PB|
0012FA28  20724369 203A6873 74656C67 69732073  |iCrash:  lets si|
0012FA38  52206E67 69626275 203A6873 6D6F4427  |gn Rubbish: 'Dom|
0012FA48  446F6E69 694C7269 2D5C6B6E 6E616C42  |inoDirLink\-Blan|
0012FA58  6E2E2D6B 0A276673 00000000 00000000  |k-.nsf'.........|
---------- Stack Back Trace ----------
Stopped at 77FA144B (0001:0002044B in dll\ntdll.dbg)  Base=0x77f80000 RVA=0
    ** Unable to open file: ntdll.SYM or ntdll.S32 or ntdll.MPN
0012FBF4  0012FC08 010015D1 88880137 0000000A  |........7.......|
0012FC04  00000006 0012FC24 01003B06 0000000A  |....$....;......|

Called from 010015D1 (0001:000005D1 in D:\ND5\D5012e\nnotes.dll)  Base=0x0100
    -> _OSLockReadSem@4+0001
0012FC08  0012FC24 01003B06 0000000A 0012FC20  |$....;...... ...|
0012FC18  0012FC2C 00000006 01767900 0012FC3C  |,........yv.<...|

Called from 01003B06 (0001:00002B06 in D:\ND5\D5012e\nnotes.dll)  Base=0x01000000 RVA=0x00001000
    -> _AllocDBlock@12+0116
0012FC24  0012FC3C 01003B31 017C79A0 0000003A  |<...1;...y|.:...|
0012FC34  00000006 0012FC80 0012FC58 0100B7BE  |........X.......|
```

ASCII column might point to NSF,view, agent & action been in access, not neccessarily the root coause of crash

further annotation possible with MSDN check build OS

annotation uncovers function names

Call Stack, Annotation Summary

- **Summary of RIP:**

  -> _OSLockReadSem@4+0001

  -> _AllocDBlock@12+0116

  -> _AllocDBlock@12+0141

  -> _UBMPinExtended@8+050E

  -> _NSFNoteCreateClone@8+00FA

  -> _NSFNoteUpdateExtended2@20+0007

  -> _ProcessCHARSETINFO@4+07E8

  -> _ProcessCHARSETINFO@4+07C5

  -> _openhandle_crash_sub_routine+00E3 <-

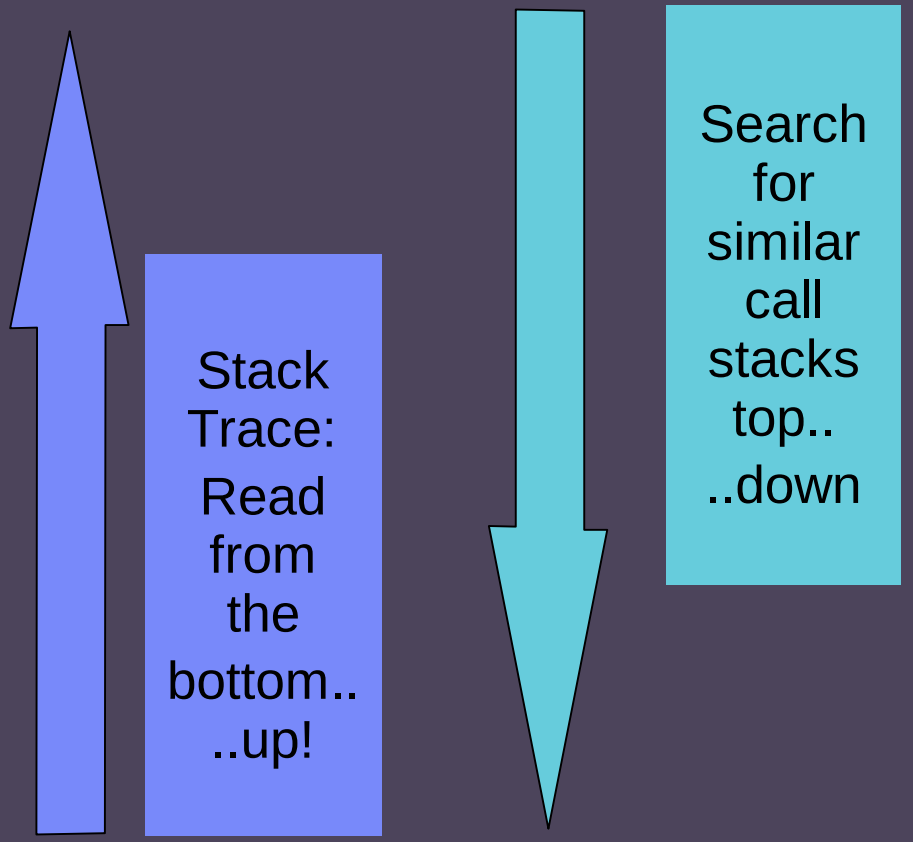
  -> _AddInMain@12+0194 <-

  -> _NotesMain@8+002F <-

  -> _main+0106 <-

  -> _main+0016 <-

  -> _mainCRTStartup+00E9 <



Construction of FT search string :

OSLockReadSem & AllocDBlock & NSFNoteCreateClone & NoteUpdateExtended2

Summary: RIP Files

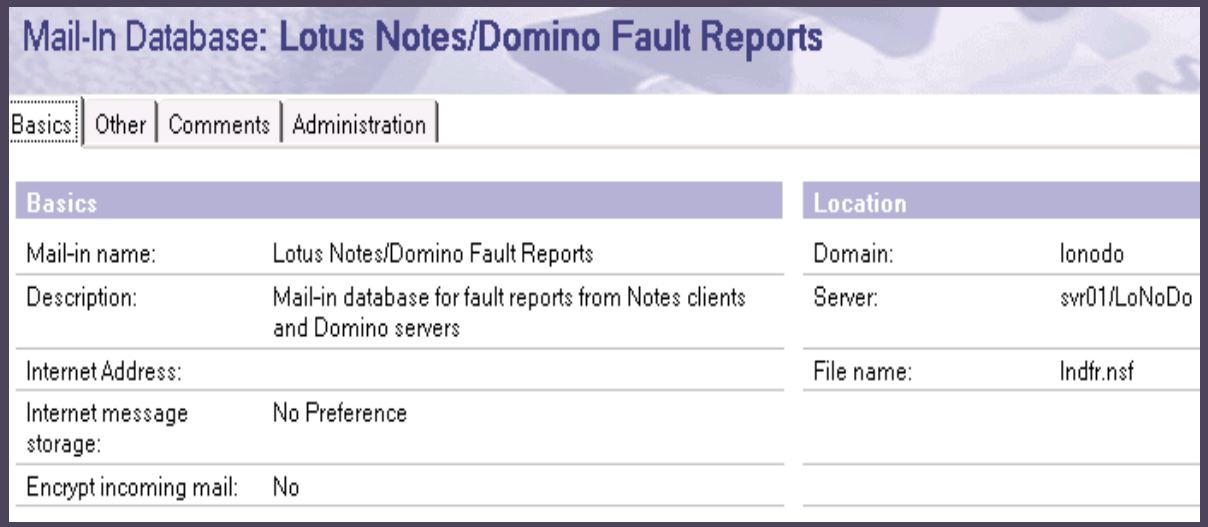
- RIP file may not always be created at time of crash
- Other crashes besides Notes/Domino may create RIP files
- Wrong version of QNC registered is difficult to notice
- "Stopped at" and "Called from" are not always annotated
- ASCII strings are often, but not always, meaningful
- PIDs in Task List help sort out multiple crashes minutes apart
- Multiple Threads in a RIP annotated call-stack are not separated
- Note: Annotation summaries miss a lot, IBM Lotus Support always needs the full `Notes.RIP` file

New Features in Domino 6

- Directory \IBM_TECHNICAL_SUPPORT
  - single place of log files collection
- Automatic Data Collection
  - Server and Client mail self-acting
- Configuration Collector
  - Server and Config docs get exported at each modification
- Dynamical Console Log
  - reduces log size, doesn't trace from server startup to shutdown
- Fault Recovery
  - generates NSD files and restarts servers automatically
- NSD for Win32
  - Notes System Diagnostics

ADC Implementation (Step 1)

- Mail-In NSF with advance template
  "Lotus Notes/Domino Fault Report" (lndfr.nsf)
- Mail-In doc



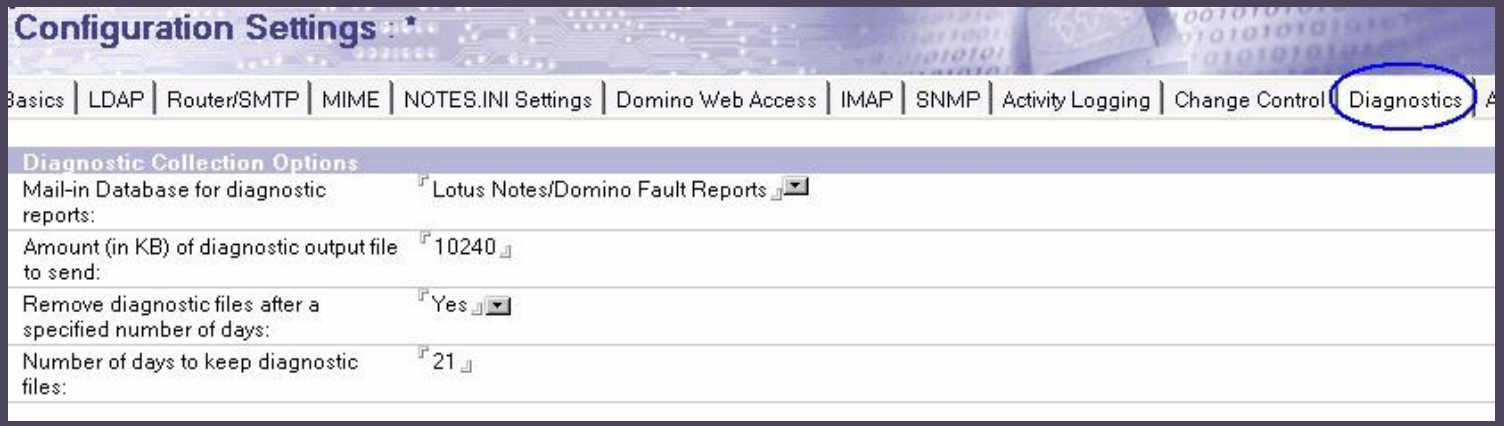
Mail-In Database: Lotus Notes/Domino Fault Reports

Basics | Other | Comments | Administration

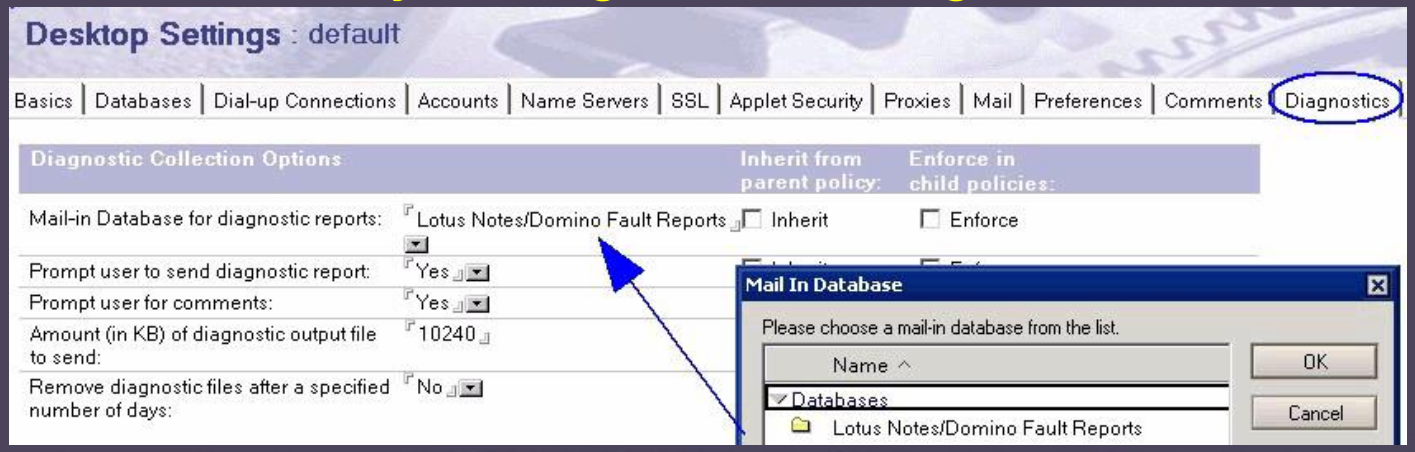
Basics		Location	
Mail-in name:	Lotus Notes/Domino Fault Reports	Domain:	lonodo
Description:	Mail-in database for fault reports from Notes clients and Domino servers	Server:	svr01/LoNoDo
Internet Address:		File name:	lndfr.nsf
Internet message storage:	No Preference		
Encrypt incoming mail:	No		

ADC Implementation (Step2)

- Server -> Configuration doc -> new 'Diagnostic' tab



- Client -> Policy Settings doc -> 'Diagnostic' tab



ADC Enabling fault recovery (Step 3)

- **Default**

Fault Recovery	
Run This Script After Server Fault/Crash:	
Run NSD To Collect Diagnostic Information:	☑ Enabled
Automatically Restart Server After Fault/Crash:	☐ Enabled
Cleanup Script / NSD Maximum Execution Time:	300 seconds

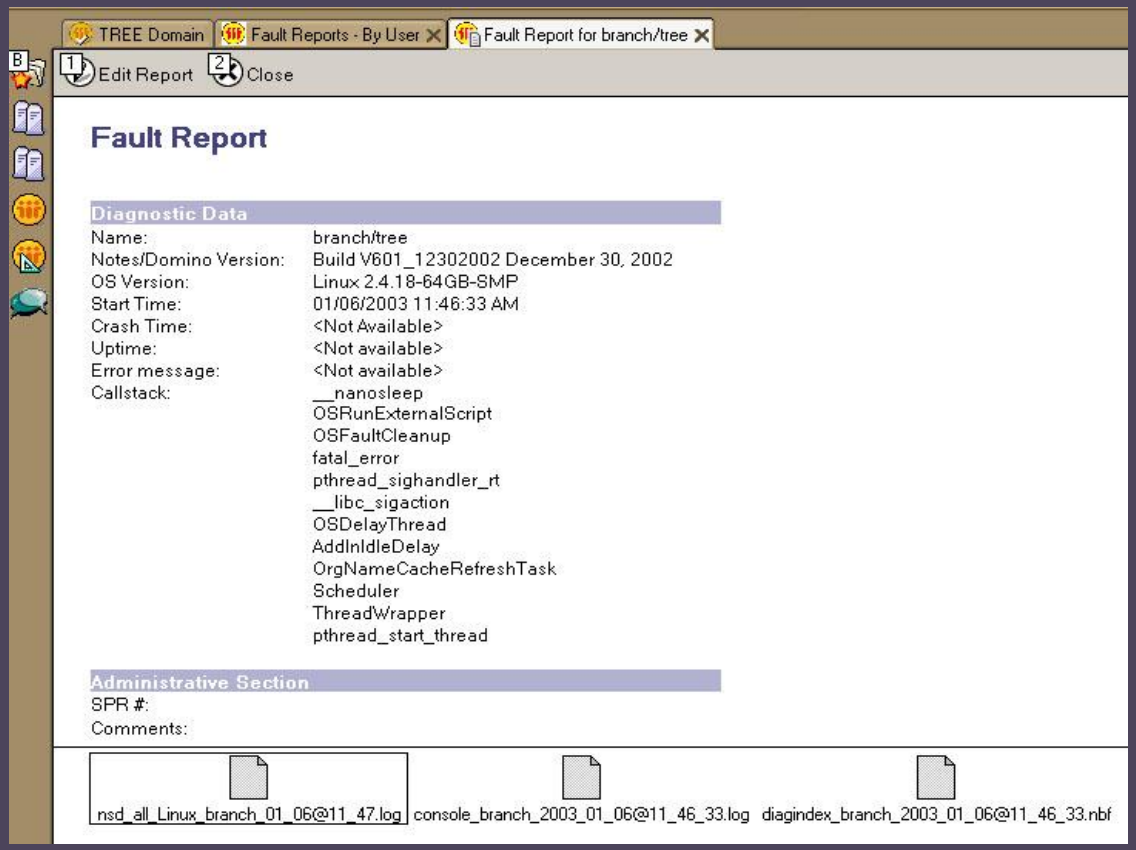
ADC enabled

Fault Recovery	
Run This Script After Server Fault/Crash:	
Run NSD To Collect Diagnostic Information:	☑ Enabled
Automatically Restart Server After Fault/Crash:	☑ Enabled
Cleanup Script / NSD Maximum Execution Time:	300 seconds
Maximum Fault Limits:	3 faults within 5 minutes
Mail Fault Notification to:	LocalDomainAdmins

introduced 6.0.3/6.5

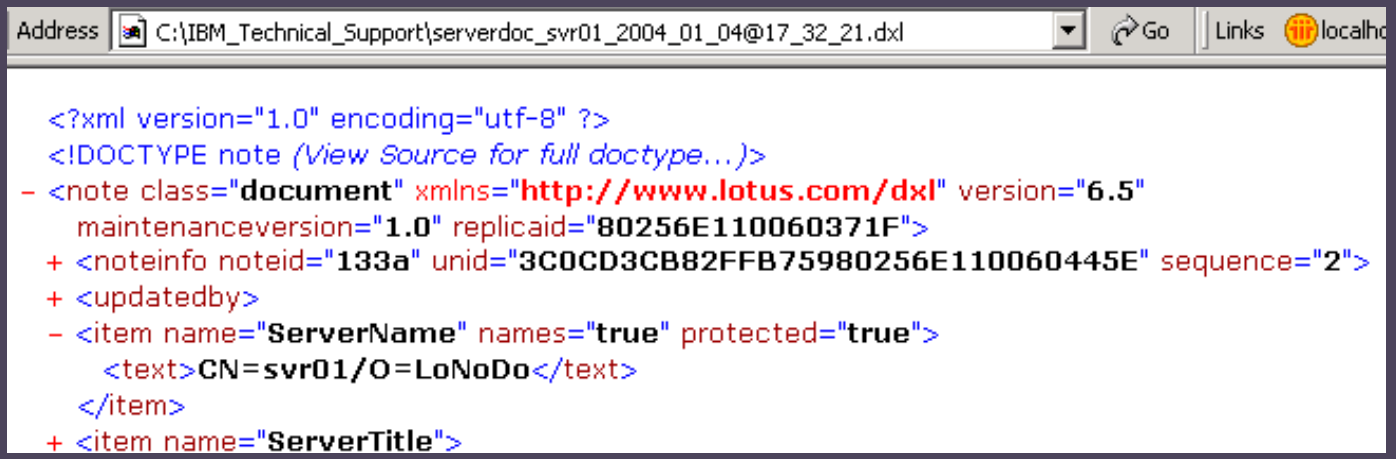
- **Fault Recovery can be forced by `FaultRecoveryFromINI=1`**

ADC Sample Fault Report:



Configuration Collector

- Provides snapshots of how a Domino server is configured
  - 6.5 Server
  - within server console: `save noteid <noteid>`
  - 6.5.1 saves configdoc & serverdoc at startup and each change



Each Domino Release has it own XMLSchema

<!DOCTYPE note SYSTEM 'C:\Lotus\Domino\xmlschemas\domino_6_5_1.dtd'>

Tune size of \IBM_TECHNICAL_SUPPORT

- New in 6.0.3 / 6.5
  - `MAX_CONFIG_FILES=10`
    - 10 = default, of each type
    - checked at start, oldest will be deleted
  - `MAX_NSDINFO_FILES=10`
  - `DISABLE_SAVESERVERCONFIG=[0|1]`
  - `DISABLE_SAVENSDCONFIG=[0|1]`

- Also see XOR-table for Auto-enabled Collect in TN #1139663 What is the 'Configuration Collector' in Domino 6.5?

Dynamic Console Log

- toggle for current server session
  - `start consolelog` and `stop consolelog`
- `show server` indicates status of dynamic console log

```
> sh server
Lotus Domino (r) Server (Build V651_12292003 for Windows/32) 01/08/2004 08:32:51 PM
Server name:            svr01/LoNoDo
Server directory:      C:\Lotus\Domino\Data
Partition:               C.Lotus.Domino.Data
...
Fault Recovery:         Not Enabled
Activity Logging:       Not Enabled
Server Controller:      Not Enabled
Diagnostic Directory:   C:\IBM_TECHNICAL_SUPPORT
Console Logging:        Not Enabled
Console Log File:       C:\IBM_TECHNICAL_SUPPORT\console.log
```

NSD Introduction

- NSD = Notes System Diagnostics
- Has been around for years in Domino on Unix, S/390 and AS/400
- Optional available for Win32 in late R5 code-stream
- Replaces RIP in Domino 6 for Win32
  - not a Just in Time (JIT) Debugger
  - it will be invoked automatically if Server/Client crashes
  - or you can manually invoke it for troubleshooting
- NSD provides a huge collection of system diagnostics information on Domino and Operating System level
  - used by Admins, Developers and Support for Troubleshooting

NSD for Domino 5 on Win32

- Optional available since R5.0.9
  - could replace QNC/RIP as a Just In Time Debugger in R5
  - can be installed via `nsd -i` (see TN #7003599 for details)
  - starts automatically when the server crashes
  - should only be used in R5 on IBM support recommendation
  - it is still limited in R5 and most troubleshooters still use RIP in R5
  - but it's already available on Client and Servers
    - `nsd -kill` can be used to recycle a hanging or crashed Notes Clients and Servers

NSD for Domino 6 on Win32

- Installed by default and invoked automatically by the Fault Recovery routines in Domino 6
  - check server document for options for Fault Recovery and ADC
  - check D6 policies to enable for Notes Clients
  - it is not installed as the JIT debugger any more to avoid side effects
  - D6 Installation disables RIP and NSD as JIT debugger
- Provides a lot of Domino and System Information
- Also used for troubleshooting Server and Client crashes and hangs
  - Caution: You need Win2003 Server or WinXP to analyze call-stacks without recycling the Server/Client afterwards

NSD for Unix/Linux in Domino 5 & 6

- Only invoked automatically when fault recovery is enabled in D6
  - there are also ways to automate fault recovery on Unix in R5
- Can be started manually if server has already crashed but not yet recycled
- Can also be used to terminating a hanging server (nsd -kill)
  - e.g. remove shared memory, semaphores and other resources...
  - manual restart without OS-recycle possible
- Can be used on running servers for troubleshooting and server hang diagnostics
  - does not crash a running server
    - if you have the right OS patchlevels!!!

Why Server Freeze and Server Panic?

- Domino uses shared memory to allocate global resources to share between tasks and Domino core for different sub-systems
  - NIF, NSF, ... e.g. views are stored in memory ...
- If Memory-Handle or other Handles are corrupt this can have impact on other running tasks and result in corrupted databases
  - Domino "halts" the Server or Client with a PANIC or Freeze

Example:

TID=[13426:00002-00001]/K-TID=35613

PANIC: LookupHandle: handle not allocated

Fatal Error signal = 0x0000000B PID/TID/K-TID = 13426/1/35613

Freezing all server threads ...

  - Diagnostics and Recycle Routines are called to restart

First Steps Analyzing a Server/Client Crash

- Find the crashing thread
  - "Fatal" is the most common indication of the crashing task
  - If you don't find fatal, look for "Panic", "Access Violation" or "Segmentation Fault", "Signal" messages on Unix/Linux
  - Tip: Last line on `console.log` is helpful in most of the cases
- Analyze the calls in the call-stack
  - It is helpful to know about the C-API toolkit (SDK) to understand function names and parameters involved
    - not all function calls are exposed
    - but the SDK (C-API Toolkit) gives you a good idea what to look for

What can cause server crashes?

- Design elements
- LotusScript/Java
- Non-core/Third Party code (DECS/LEI, Oracle, DB2, JDBC, etc.)
- Corrupt data (relatively infrequent)
- Memory Management issues (overwrites, handle locking, memory leaks)
- Insufficent Memory

Demo Servercrash

- Problem
  - Invalid Memory Pointer
  - Invalid Handle
- Find open databases
- Check the Call-Stack
- Find parameters and possible reasons
- Check system environment

Reproducible Call-Stack/Bug?

- Best case scenario: Reproducible call-stack on independent machines which does not occur on boxes with other releases
- But we are not always that lucky ...
  - if the call stack is similar at the end of the stack it could be a low-level API problem
  - if the call stack is similar at the higher level of the stack always in the same Servertask it could be the Servertask
  - if you see EM_BEFORE, EM_AFTER it might be an Extension-Manager problem
  - if it is always the same database it might be a data problem

How to find affected databases?

- Search the Call-Stack for Database Handles and NoteIDs
  - e.g. NSFNoteOpen(DBHANDLE hDb, NOTEID NoteID, WORD flags, NOTEHANDLE *hNote);
  - a handle (DBHANDLE) is represented by a hex number in the call stack
    - can be found in open database list
    - take care: Handle number in open database list is decimal !
  - a NOTEID is also a hex value which identifies a Note in a Database

More Information about Open Files/Documents

Lotusphere 2004

- Check "Open Database Table" section for other open databases in the same task at the same time
- Check "Resource Usage Summary" section which clearly lists all open DBs for every thread .. with handles and users
- Check "NSF DB-Cache" section for Databases open in Cache
- Check "Open Documents" section for open Documents with matching database handles

Abnormal Process Termination -- also a crash

- Server task simply disappears from the OS process list with no errors produced (very rare)
- Domino Server console indicates the task is still running
- Task cannot be shutdown cleanly from console
- Must be treated as a crash
- Due to an unhandled exception or signal
- Users unable to connect (since task no longer running)

Next Steps

- Customer can only fix data problems, check/add server resources (e.g. memory) or install later versions
- Support can look into SPR database and find matching call-stacks
  - Support needs all information available in IBM_TECHNICAL_SUPPORT directory - (please ZIP files!)
  - every new version of Domino provides more diagnostic information (NSD, ADC, ...)
- Development or 3rd party software vendor can identify new problems and look into source code
- Take care: NSD also contains some sensitive information about your system and users.
  - check the NSD before sending it to external people

NSD for Windows vs UNIX - Key Differences

- W32: Executable file, UNIX: a shell script & executables
- Uses Windows Process Status API, Win32 API
- Same Application Exception Debugger interface in R5 used by QNC
  - `nsd -i -auto` to install and set Auto=1 in Registry
  - uses `\%windir%\NOTESNSD.INI` to track INI files
- In D6 automatically called by fault recovery routines
- If invoked manually on Win32
  - stays active in a window `nsd>` , and accepts additional commands
  - can't be terminated on Win32 without terminating Notes/Domino (until Win2003 and WinXP)
  - `help` shows available commands

How to run NSD manually on Win32

- Switch to the directory containing the `notes.ini`
- Start `nsd.exe` with no options to invoke NSD interactive
  - will collect some information and prompt `nsd>`
- Type in `dump` to get the call-stacks of the running processes
- Type `detach` if you are running on WinXP or Win2003 Server
- Or type `quit -f` in D6 or first `kill` to cleanup all Servertasks before typing `quit` in R5
- Anytime type `help` for more options

Best Practices NSD

- NSD collects much more data (memcheck and system data) and therefore takes longer to complete
  - Tip: with minimized DOS-window runs faster
- If memcheck isn't necessary run `nsd -nomemcheck`
- NSD is normally 1-10MB (up to 50MB in rare scenarios on servers)
- Client NSDs are much smaller
- Allows to cleanup after a crash and restart it without OS reboot
  - `nsd -kill` must be called from the location of your notes.ini
  - also works for Notes Clients in R5 :-)
- Make sure `Directory=...` is your first notes.ini entry after `[Notes]` to avoid problems with memcheck, other diagnostic tools

NSD Command Line Options

- NSD has many useful options
- Some depend on release and platform
  - you can always use `nsd -?` to get help
  - most important options
  - `-kill` --> cleanup processes and resources of current partition
  - `-dumpandkill` --> dump all and cleanup current partition
  - `-[no]info` --> only/don't check system infos
  - `-[no]memcheck` --> only/don't run memcheck
  - `-[no]lsof` --> only/don't check for open files
  - `-[no]perf` --> only/don't check performance info

NSD filenames & Locations

- NSD filenames looks like:
  - **nsd_all**_<platform>_<hostname>_<date>@<time>.log (default)
  - **ps**_<platform>_<hostname>_<date>@<time>.log
  - **kill**_<platform>_<hostname>_<date>@<time>.log
  - **sysinfo**_<platform>_<hostname>_<date>@<time>.log
  - **memcheck**_<platform>_<hostname>_<date>@<time>.log
- Location:
  - notesdata (prior 5.0.11)
  - notesdata\IBM_TECHNICAL_SUPPORT (case sensitive on UNIX !)
  - LogFile_Dir=directoryname
  - Set W32 environment Notes_LogFile_Dir for manually nsd

Major Sections of an NSD in Detail

- Header: Version and System
- Process Table / Active Users
- Call-Stacks of running Processes
- MEMCHECK: - Notes / Domino Memory Analyzer
- Shared memory handles and blocks
- Open Databases, Open Documents
- Performance Data
- notes.ini
- User OS-level Environment

Major Sections of an NSD in Detail (cont.)

- Executable & Library Files
- Data Directory Full Listing
- Local Disks
- Memory Usage
- Network Stats
- Active Connections, Ethernet Stats, Active Routes, Protocol Stats
- Core File (on Unix systems)

Details UNIX NSD

- NSD on Unix used platform system information and performance tools (NSD is binary and shell-script)
- Important sections
  - VMSTAT table
    - System Resource, CPU usage, Run-Queue, Wait-Queue, Page In/Out ...
  - special UNIX System Information
    - OS/Security/Resource Limits (etc/limits ...)
    - Solaris /etc/system (6.5.1)
    - OS Level Semaphores and Shared Memory
    - Patches
- For more Information check last years BP Unix/Linux session

Server Hang and Hang Symptoms

- Server (or specific task) is still running, but client receives error messages "Server not Responding"
- No error is produced on the console but an error may be written to log.nsf
- Console does not accept keyboard commands
- Servertask will not shutdown cleanly
- User reports that other Domino server tasks have slowed down
- No RIP/NSD is generated and no Fault Recovery

What can cause hangs?

- LotusScript/Java (looping logic in code)
- Semaphore issues (deadlocks, low level looping)
- Permanent unavailability of a particular resource
- Third Party code (such as a connection to a RDBMS)
- Network issues (DNSLookup, port problems)
- General: OS-level calls which do not return to the calling Domino code
  - example: AIX filesystem sizeinfo for NFS filesystems (fixed in D6)
- CPU spins (such as continuous NIF updates)
- * Extreme performance issues

How to troubleshoot Server Hangs?

- Check call-stacks for specific calls
  - e.g. a large number Semaphore Calls, SpinLock Calls
- Use Semaphore Debugging
  - DEBUG_SHOW_TIMEOUT=1
  - DEBUG_CAPTURE_TIMEOUT=1
  - DEBUG_THREADID=1
- Run 3 full NSDs in short sequence

JIT & NSD for C-API Developers

- In D6 Fault Recovery automatically kicks in (with different options)
- A notes.ini setting `ApiDeveloper=1` allows to debug Notes/Domino applications with JIT debugger from Visual Studio
- Visual Studio automatically registers as the default JIT Debugger
  [HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\AeDebug]
  "Auto"="1"
  "Debugger"="\"D:\M$VS\msdev.exe\" -p %ld -e %ld -g "
- You can query the settings of JIT with `nsd -qjit`

SYM File Support for Add-On Products

- Domino uses a special SYM file format integrated into one large SYM file
- Domino 6.5.1 will be able to read SYM files for individual binaries
  - for previous versions keep debugging code in your applications to get proper annotated call-stack for 3rd party products
- Microsoft mapsym can only be used to generate sym files for Notes RIP in R5
  - Lotus Development (Iris) Tool Map2iSym will be part of the Lotus C-API Toolkit for Domino 6.5.1
    - ability for NSD to integrate 3rd party "Domino family products"
  - starting 6.5.1 NSD will also work for the extended products running with Domino

Session Summary

- Many benefits using NSD
- SYM files still need to be in place on Win32 (installed by default)
- NSD provides verbose details about system, server and memory
- Useful for Troubleshooting of Crashes, Hangs and Performance Issues
- Same tool on UNIX (both will get closer in design in each release)
- NSD is a powerful tool used by Customers, Support and Developers
  - not all sections are easy to understand
  - some information is more "developer style"
- NSD, Fault Recovery and other Diagnostic tools make your server more reliable, efficient and the time to fix a problem can be reduced significantly

NSD Technotes for Further Reference

- 7003599 Using NSD for Domino Servers and Notes Clients on NT, 2000 and XP
- 4003878 NSD and Memcheck for Windows - Selected Versions
- 1086330 Memcheck: What Is It and How Does it Work?
- 1096859 Tip for Improving Performance of NSD for Windows
- 1099789 NSD 1.8 & Below for W32 Do Not Like Spaces in Path Names
- 1138705 Where Is NSD Output Created in Domino 6.x on Windows Platforms?
- 1087796 How To Avoid Memory Dumps Being Overwritten on a Domino Server
- 1091820 How to Use the nsd.sh UNIX Diagnostic Shell Script
- 1101733 NSD is Not Running from a UNIX Shell Script
- 1098070 Running NSD on AIX Does Not Find Debugger
- 1088459 HTTP Thread No. from AS/400 NSD Does Not Match REQ Files
- 1100917 How to Use NSD.sh as a Diagnostic Tool on the S/390Platform

References and Pointers

- **Lotus Developers Domain** http://www.lotus.com/ldd/today.nsf
  - **Domino 6 server availability** by Jim Rouleau
  - **Domino Console** by Mallareddy Karra
  - **Sandbox: Utilities to crash client and server for all platforms**

- **Lotus Knowledge Base**
  - **1085072 What is Dynamic Debug Outfile in D6?**
  - **1085850 What Is the Automatic Diagnostic Data Collection Tool?**

- **UltraEdit -- inexpensive, awesome editor we use for Win32 and Unix NSDs**
  - http://www.ultraedit.com

Special thanks

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  - Jim Rouleau
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  - Michael Alexander
  - Marc Luescher

Other Sessions

- ID206 Lotus Domino Platform Reliability, Availability and Serviceability by P. Sohn & J. Rouleau
- RAS in depth presentation by Shane Kilmon
  Customer Care lab, Wednesday at 4:30 pm

- ID203: Lotus Domino Monitoring Capabilities -- Now and Future
- ID301: The 6.5.1 Releases: Integrated, Tested, Improved

- BOF106: Lotus Engineering Test, Product Introduction and Technical Support, and Development Executives share their Strategy on World Class Support

Q&A and Contact Details

- Q& A

- Updated presentation and last year's BP Unix/Linux Session downloadable from

  http://www.nashcom.de/lotusphere

- Peter.Birett@de.ibm.com
- Daniel.Nashed@nashcom.de