Lotusphere 2010

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# BP204 “CSI Domino” -- Diagnostic Collection and Analysis

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# About the presenter

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  - focused on Cross-Platform C-API, Lotus Domino® Infrastructure, Administration, Integration and Troubleshooting
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# Agenda

- Introduction – What is „Serviceability“
- Diagnostic Collection / Monitoring
- Crash Analysis, Hang Analysis, Trapleaking
- Performance Analysis
- Q&A

# What is Serviceability?

- RAS = Reliability Availability Serviceability
  - RAS is the effort to improve the Lotus Domino product suite so that:
    - Client/Server doesn't crash or hang as often (Reliability)
    - Client/Server performs well, Server is available to clients (Availability)
    - The ability to quickly pin-point and fix problems (Serviceability)
- Ongoing effort in each incremental release
  - Some features are even back-ported from Lotus Domino 8 to Domino 6&7
- It's not just about NSD & Memcheck but all parts of Domino
  - Logging, Debug Options, etc
- Great help for Admins, Developers and Troubleshooters
  - Too many features and options for a single session ... but we will try ...

# Diagnostic Features in Lotus Domino

- Directory \IBM_TECHNICAL_SUPPORT
  - Single place of log files collection for all the various trace and debug options
- Automatic Data Collection / Configuration Collector
  - Server and Client mail self-acting, configuration snap-shot
- Domino Domain Monitoring (DDM)
  - Comprehensive Server Monitoring
- Dynamic Console Log
  - Log file containing all log and DEBUG information
- NSD
  - Notes System Diagnostics, Memcheck
  - Contains a lot of details about a crash, open databases, Domino and system configuration
- Fault Recovery
  - Generates NSD files and restarts servers automatically
- Memory Dumps, Trapleaking, Semaphore Debugging, ...

# Fault Recovery

- Domino Server detects crash and restarts automatically
  - Panic routine calls fault recovery code
- Enabled in Server document
  - Run NSD To Collect Diagnostic Information: Enabled
  - Automatically Restart Server After Fault/Crash: Enabled
  - Mail Fault Notification to: LocalDomainAdmins
- How does fault recovery work
  - Run NSD + memcheck if configured
  - Cleans up resources
  - Restarts Server
- Very important to enable fault recovery and NSD collection!
  - Server is back online quickly and you have diagnostic data from every crash!

# Automated Diagnostic Collection (ADC)

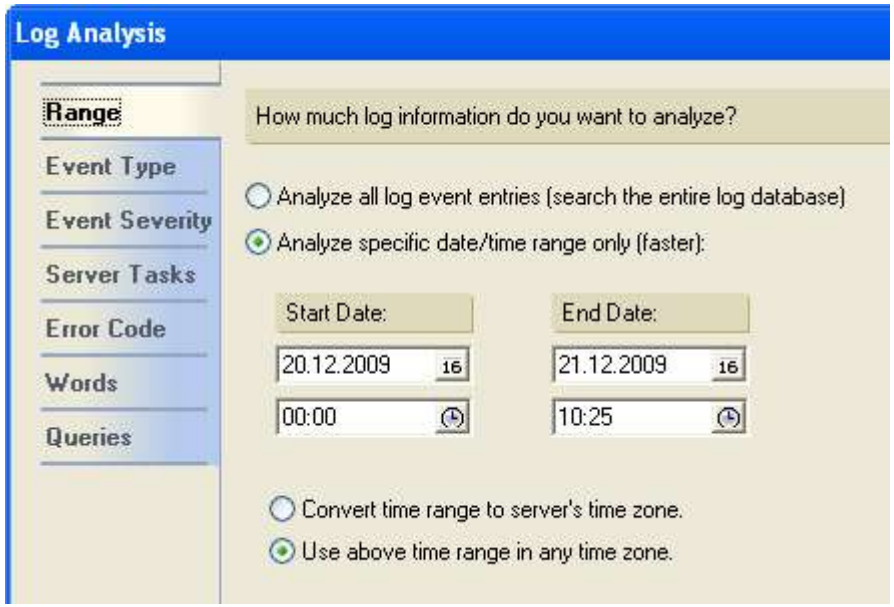
- Enables you to set up a mail-in database to collect the diagnostic information generated from the ND Client/Server crashes into central repositories.
  - Senddiag servertask runs on startup to collect information like NSDs
- Server Configuration Doc / Diagnostics Tab
  - Fault-Recovery Database (lndfr.nsf) as Mail-in Database
    - Size for diagnostic data, retention days, ...
    - Filter pattern to add to data collection (file-patterns!)
    - Enable FaultAnalyzer (since D7) for Fault Database
- Fault Recovery Database and FaultAnalyzer are typically allocated on admin server
  - „FaultAnalyzer“ Servertask
  - Used to collect annotate, categorize NSDs
  - Similar call-stacks, Same Domino releases, Client or Server
  - Have separate databases for clients / servers

# Domino Domain Monitoring (DDM)

- Comprehensive Monitoring
  - ddm.nsf contains focused monitoring results
  - Detailed error messages including names of resources
  - Suggestions for problem solution including actions!
- Based on the foundation build by event monitoring
  - Event categorization and severity defined in events4.nsf
- Additional build in probes into the code
  - Replication (detailed reporting for failing replication)
  - Agent Manager (long running agents, high memory/CPU usage, ...)
- You can also leverage statistics and platform statistics
- Helps to get focused information from all Domino servers in a central location
  - Build-in workflow to assign issues and keep track what has been already solved
- DDM would be a whole presentation of its own

# Analysis Tools

- Domino Admin Client contains analysis Tools
  - Located in Server/Analysis Tab
    - Cluster Analysis
    - Log Analysis




- You should regularly analyze server logs in addition to daily DDM checks

- Activity logging can also help for troubleshooting
  - Needs to be enabled in Server Config Document

# HTTP Diagnostic

- domlog.nsf
  - Response time in each request
  - Allows to filter requests (request-types etc, configured in the server doc)
- Tell http dump config
  - Writes HTTP config to IBM_TECHNICAL_SUPPORT/httpcfg.txt
- tell http debug session on|off
  - Session debug logs
- tell http debug thread on|off
  - Thread debug logs.
- Tell http debug postdata on|off
  - Post data to debug logs.
- Tell http debug responsedata on|off
  - Logging of response content to
- Tell http debug outputio on|off
  - logging of network output tracing

# NSD

- Only invoked automatically when fault recovery is enabled on server
  - 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...

- 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!!!
    - Caution: Windows2003 Server SP1 or higher required for detaching from running processes!

- Invoked at server startup to take a snapshot of the current environment
  - Sysinfo NSD contains all details of your configuration

# 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

- Executable & Library Files
- Data Directory Full Listing
- Local Disks
- Memory Usage
- Network Stats
- Active Connections, Ethernet Stats, Active Routes, Protocol Stats
- Core File (in some cases)
- Sometimes NSD invokes a memory dump
- OS-Specific information
  - Installed software, Configuration, etc

# NSD Update Strategy

- NSD & Memcheck are updated in each release
- Changes are incorporated into new releases and are available for older Domino releases thru special hotfix installer
- NSD/Memcheck Code is build independent from Domino release
  - See TN #1233676 - NSD Fix List and NSD Update Strategy
  - See TN #4013182 - Updated NSD for Domino releases
    - Contains FTP download links
- You should keep NSD up to date!
- Too many details to list on a single slide ...
  - Improvements and fixes in each dot release or fixpack

# Run NSD as a Service

- New Feature in Lotus Notes/Domino 8 allows NSD to run as a service
  - Avoids issues with OS level users not having proper access to subdirectories or ability to attach to system processes
  - One instance of NSD will run in background continuously as a service
  - When a crash occurs, or NSD is run manually, dynamically created instance of NSD will proxy the request to start NSD Service
  - Specially important also on Citrix environments or other clients with limited OS level access

- Details in Domino 8 Admin Help and NSD HTML help
  - nsd
    - -svcinst | –svcuninst
    - -svcstart | -svcstop
    - -svclog | -svcreport
    - If NSD service is started it is used automatically

# Why Server Freeze and Server Panic?

- Lotus 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 ...
  - Currupt Memory-Handle or other Handles can have impact on other running tasks and result in corrupted databases

- Lotus Domino "halts" the Server or Client with a PANIC or Freeze to avoid further damage
  - Freezing all tasks / threads
  - Diagnostics and Recycle Routines are called to restart

# What can cause server crashes?

- Design Elements / LotusScript/Java™
- Third Party code
- Corrupt data
  - Corrupt documents, etc ...
- Memory Management issues
  - Overwrites, handle locking, memory leaks)
- Insufficient Memory
  - Often caused by „Memory Leaks“

# First Steps Analyzing a 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 lines on console.log is helpful in most of the cases
    - Included in current versions of NSD as a separate section

- 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

# 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

- Find open databases
  - You can find open databases by matching the physical/virtual thread-ID with the memcheck section

# More Information about Open Files/Documents

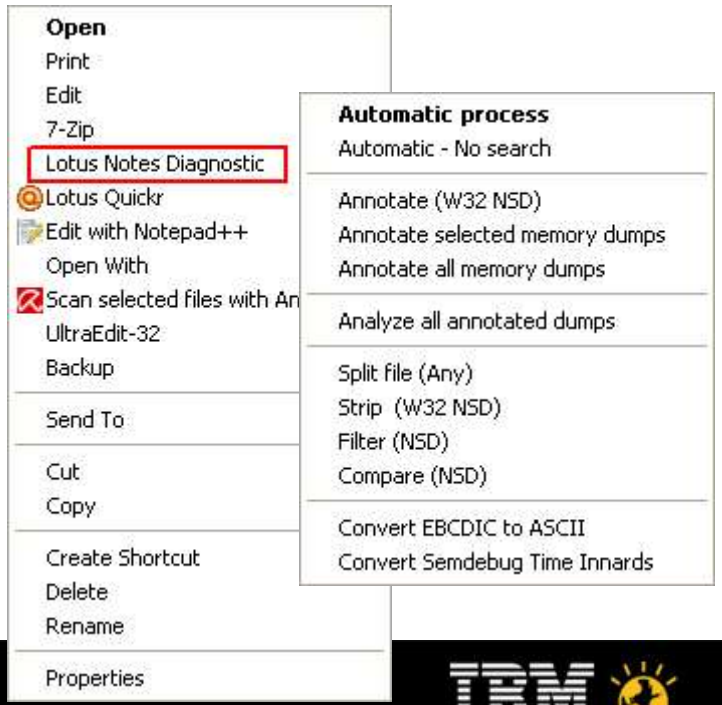
- Check "Resource Usage Summary" section
  - Lists all open DBs for every thread .. with handles and users
- Check "Open Database Table" section
  - Other open databases in the same task at the same time
- Check "NSF DB-Cache" section
  - Databases open in Cache
- Check "Open Documents" section
  - Open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

# Lotus Notes Diagnostics

- Tool to annotate NSDs, semdebug files, memory dumps etc
- Current Version 2.8 downloadable from IBM
  - http://www.ibm.com/support/docview.wss?rs=899&uid=swg24019151
- Can be used to annotate crash NSDs

- Ships with notes database, plugs into Explorer

- Very helpful tool
  - Helps you to find crashing call-stack and categorizes the various NSD sections
  - Also matches the data section of the thread in memcheck
  - But you still have to know much about the background to interpret the results



# 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
  - Unix/Linux: ChildDied Signal on also kicks in fault-recovery
  - If process monitor notices a sub-process not cleanly terminated fault-recovery is also invoked
- Must be treated as a crash
  - Background: Could cause major problems like semaphore hangs, resources that are not cleaned up etc...
- Troubleshooting:
  - Start/stop task debugging: **debug_initterm=1**
    - Logs start/stop of tasks

# Next Steps

- Customer can only fix data problems, check/add server resources (e.g. memory) or install later versions
- IBM 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 their source code
  - Take care: NSD also contains some sensitive information about your system and users.
  - Check the NSD before sending it to external people
  - Add-On Applications on Windows need to have own Domino formatted “SYM” files for call-stack annotation in NSD

# Server 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 report that other Domino server tasks have slowed down
- No 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 (FT file-filters)
- General: OS-level calls which do not return to the calling Domino code
- Network issues (DNSLookup, port problems)

# How to troubleshoot Server Hangs?

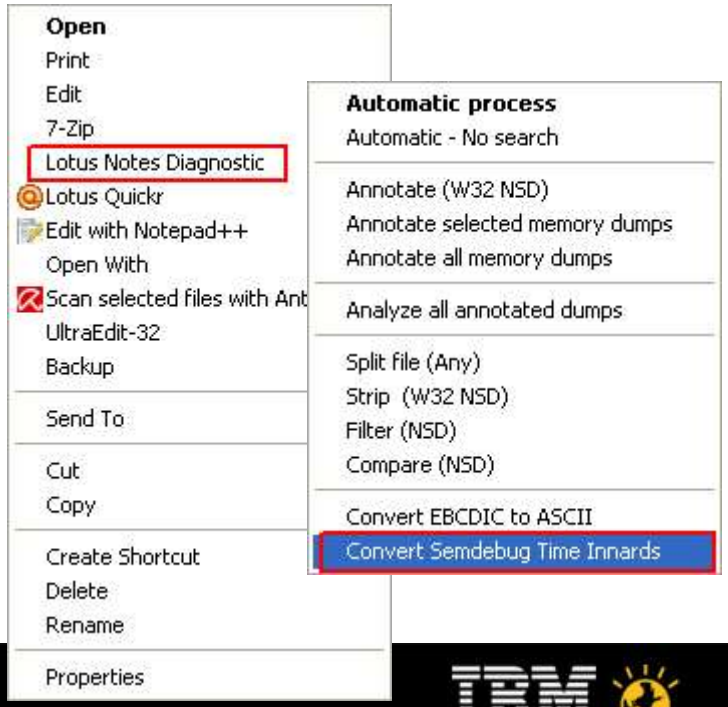
- Check call-stacks for specific calls
  - e.g. a large number of Semaphore Calls, SpinLock Calls
- Use Semaphore Debugging
  - DEBUG_SHOW_TIMEOUT=1
  - DEBUG_CAPTURE_TIMEOUT=10
  - DEBUG_THREADID=1
  - Optional: DEBUG_SEM_TIMEOUT=X
    - (in milliseconds, default 30000)
- Run 3 nsd -nomemcheck in short sequence
  - plus one full NSD
- „Show stat Sem.Timeouts“ to check semaphores
  - Only works with semaphore debugging enabled and only gives you a quick summary

# Analyzing Semaphore logs

- semdebug.txt in IBM_TECHNICAL_SUPPORT
  - contains semaphores locked for more than 30 seconds
  - Information about process/thread, semaphore, time, ...
  - Also contains information who is currently holding the semaphore
  - But just the process/thread.id – You have to annotate on your own via NSD
  - What is always important is the call-stack of the process requesting and olding the semaphoere
  - Can only be done thru NSD

- Example:
  - ti="0025CA9C-C1257353" sq="00004CE8"
    THREAD [28208:00241-169659312]
    WAITING FOR SEM 0x0931 Task sync semaphore
    (@0F7711A4) (OWNER=28208:158743472) FOR 5000 ms

- ti is the internal repesentation of the timedate
  - You can use LND to annotate the ti values



# Memory Consumption / Memory Leaks

- Domino has only a certain amount of addressable memory for
  - Shared Memory
  - Local Process memory
- The limit depends on the platform
- Combination of shared memory + local process memory is the limiting factor
  - For 32bit the total limit is 4GB at most
  - The larger part of memory used is shared memory
- You can run into peek memory situations
- Or run into memory leaks
  - Memory not released when the application does not need it
    - Certain Memory type (block) grows beyond reasonable numbers

# Memory Dumps

- Domino uses an own Memory Management Layer
  - Different Memory types
  - Pooled memory (DPOOLS)
  - Direct memory allocations
- Memory is managed by Domino
  - Allocated Pool memory will be freed to Domino Memory Manager not Operating system
  - Memory Allocation can be tracked and troubleshooted
- Local and Shared Memory
  - Shared Memory for all Servertasks
  - Local Process Memory per tasks
- Different memory block types for each part of the server
  - Each block type (BLK_xxx) can be tracked separately

# Memory Dumps

- You can dump memory
  - Run server -m
  - Or „show memory dump“
- Memory Dump contains
  - Shared/Local Process memory
  - Block Codes
  - Size
- Can be used to determine memory bottlenecks and leaks
- Memcheck output also provides details about memory
  - Check the „**Top 10**“ Sections in NSD as a quick info about memory allocations

# Memcheck Top 10 Memory Section

- There is a TOP 10 Memory section for shared memory
- And a TOP 10 local memory section per servertask

```
 <@@ ------ Notes Memory -> Usage Summary -> Top 10 Memory Block Usage -> Memhandles By Size
:: (Shared) (Time 15:05:03) ------ @@>

   Type  TotalSize      Count    Typename
 ---------------------------------------------------------
 0x82cd  535330816        136  BLK_UBMBUFFER
 0x8472   15733654          1  BLK_DTRACE
 0x82cc    9922560        136  BLK_UBMBCB
 0x8252    5242880          5  BLK_NSF_POOL
 0x834a    3670464          4  BLK_GB_CACHE
 0x8a05    3300000          1  BLK_NET_SESSION_TABLE
 0x83e4    2097152          2  BLK_LKMGR_POOL
 0x8311    2097152          2  BLK_NIF_POOL
 0x93ad    1260162        138  BLK_VA_UNKDESC
 0x826d    1048576          1  BLK_NSF_DIRMANPOOL
```

# Memory Trap Leak Debugging

- Once you figured out about a problematic Memory Block Type you can enable Trap Leak Debugging
  - Debug_Trapleaks=**0x3A45**
  - Debug_Trapleaks_ShowStack=1
  - DEBUG_SHOWLEAKS=1
  - DEBUG_DUMP_FULL_HANDLE_TABLE=1
  - DEBUG_DUMP_BLOCKCODES=1
  - **DEBUG_TRAPLEAKS_NEW=1**
    - Summarzies call-stacks
- Checks Memory allocations and dumps call-stacks
  - when task is shutdown (local memory)
  - when server is shutdown (shared memory)

# Backup Memory Limitations

- It's not always a memory leak
- Shared Memory is limited to 2 – 3 GB depending on platform / configuration
  - For very large databases, the Backup Context can consume a lot of memory and overflows shared memory
  - Sample Crash Callstack
    - @[ 8] 0x6017aca8 nnotes.Panic@4+520 (60bb0c4f)
    - @[ 9] 0x6017ad2c nnotes.Halt@4+28 (107)
    - **@[10] 0x60103e95 nnotes.AccessAllProtected@0+85 ()**
    - **@[11] 0x600469fe nnotes.AccessAll@8+46 (1,1)**
    - @[12] 0x60047a83 nnotes.ProcessGlobalEvent@4+19 (1512ee4)
- Limit the amount of backup memory used
  - Block Type: 0x02e9 check TN #1211241 for details
  - Notes.ini
    - NSF_Backup_Memory_Constrained=1 (defaults to 20 MB)
    - NSF_Backup_Memory_Limit=200000000 (reasonable size: 200 MB)

# Lotus Domino Statistics

- Valuable resource of information
  - Combines Domino Statistics and Platform statistics
  - Platform statistics depend on the OS platform but are sort of unified between platforms
    - Check events4.nsf for a description of each platform stat on each platform
  - You should collect Server stats at least every 15 minutes (default is 90 minutes)
  - Configure statistic events for important stats with the right thresholds
    - Keep long term data to compare current and historic data
  - You can also leverage SNMP to query stats
    - Limitation: Only works for one partition per OS instance on all platforms
  - C-API allows you to add own stats and also some Domino Probes generate own stats
- For a whole session about logging and statistics check
  - Lotusphere 2008 / BP112 In the Land of the Blind, Logs Make You King
    - http://www.nashcom.de/lotusphere

# Client Clocking

- Can be used to track Notes Client/Server Transactions (NRPC)
  - Logs
    - transaction name
    - transaction data
    - response time (ms)
    - bytes send, received
- Example:
  - (15-78 [15]) OPEN_NOTE(REPC1256B16:0072BCBE-NT00000E3E,00400020): 0 ms. [52 +1454=1506]
- Enable on client via
  - client_clock=1
  - debug_console=1
    - Enables a debug text window -- never close this manual, causes a crash
  - debug_outfile=c:\debug_notes.log
    - Writes a debug log file

# Selected Transaction Types

| | |
|---|---|
| START_SERVER | Start User Session |
| OPEN_DB/CLOSE_DB | Open/Close a database |
| OPEN_NOTE/NIF_OPEN_NOTE | Open a Note |
| UPDATE_NOTE | Update a Note – there is no close transaction |
| OPEN_COLLECTION/ CLOSE_COLLECTION | Open/Close a view/folder collection |
| READ_ENTRIES | Reads data from a view/folder |
| UPDATE_COLLECTION | Updates a view/folder collection |
| FIND_BY_KEY | Finds notes in a view/folder collection |
| FINDDESIGN_NOTES | Finds design notes |
| SEARCH | Search operation with formula |
| GET_MODIFIED_NOTES | Find table of modified notes |
| GET_ALLFOLDERCHANGES_RQST | Get changes in all folders<br>Unread count in mail folders |

# Selected Transaction Types

| | |
|---|---|
| NAME_LOOKUP | Lookup information in Domino Directory |
| ALLOC_UPDATE_OBJECT | Create or update an object |
| READ_OBJECT | Read data from an object |
| WRITE_OBJECT | Write data to an object |
| READ REPLICATION HISTORY | Read Replication History |
| DB_INFO_GET | Get database info buffer |
| GET_NOTE_INFO | Get Note information |
| DB_MODIFIED_TIME | Get the modified date of DB |
| DB_REPLINFO_GET | Get Replication info |
| POLL_DEL_SEQNUM | Get Delivery Sequence Number |
| DB_GETSET_DEL_SEQNUM | Get or set Delivery Sequence Number |
| GET_SPECIAL_NOTE_ID | Get a special Note-ID by number |

# Nagle Algorithm on Unix/Linux

- The Nagle Algorithm (John Nagle) is designed to optimize small packets (like for telnet sessions)
  - Small packets are combined to larger packets – when the next packet to client is sent
  - In case of Domino this can cause delays because individual transactions might be delayed
    - The wait time is up to 200 ms!
    - Notes transactions are serialized, no other packets need to be send to client at the same time
  - The Nagle Algorithm should be disabled for Domino on all Unix/Linux platforms
    - Disabled by default in 8.5, Previous releases, notes.ini setting: **debug_pd_nagle_off=1**

- Example: 1000 Note Open Transactions
  - With Nagle Algorithm
    - Average: **62 ms**
  - Disabled Nagle Algorithm
    - Average: **5 ms**
  - Results in detail / Response time distribution
    - Before / After -->

```
[   0] ->  547
[  15] ->   55
[  16] ->  102
[  31] ->   23
...
[ 203] ->   15
[ 218] ->   71
[ 219] ->   48
[ 234] ->   59
[ 249] ->   12
[ 250] ->   15
[ 265] ->   10
...
```

```
[   0] ->  658
[  15] ->  125
[  16] ->  192
[  31] ->   15
[  32] ->    5
[  47] ->    3
[  62] ->    1
[  78] ->    1
```

# Current Issue: Broken Design Collection

- Domino has an internal design cache in each database to find design notes
  - Used by NIFFindDesignNoteExt (Transaction: FINDDESIGN_NOTES)
- In some odd cases the design cache breaks
  - Without the design cache the client tries to find design elements the “old style” by opening and searching the design collection.
  - This causes quite a bit overhead – specially for WAN connections
- Design Collections is discarded when the internal cache table overflows
  - Happens when 40 or more design elements have the same name
    - This happens regularly with private on first use folders/view
    - Only work-around: Avoid private on first use folders/views and remove existing folders
  - Reference: SPR #RSTN7K2EM4, TN #1322578 Performance degradation using "Private on First Use" views or folders

# Borken Design Collection Client_Clock Data Example

```
(3-299 [309]) OPEN_COLLECTION(REPC1256E62:004B8651-NTFFFF0020,0000,0000): 0 ms. [42+34=76]
(4-299 [310]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0ms. [76+65148=65224]
(5-299 [311]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 16 ms. [76+65388=65464]
(6-299 [312]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0ms. [76+63918=63994]
(7-299 [313]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0ms. [76+65506=65582]
(8-299 [314]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0ms. [76+65498=65574]
(9-299 [315]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 15 ms. [76+64920=64996]
(10-299 [316]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0 ms. [76+63688=63764]
(11-299 [317]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0 ms. [76+64522=64598]
(12-299 [318]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0 ms. [76+65402=65478]
(13-299 [319]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0 ms. [76+65478=65554]
(14-299 [320]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 16 ms. [76+65296=65372]
(15-299 [321]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0 ms. [76+65238=65314]
(16-299 [322]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0 ms. [76+65386=65462]
(17-299 [323]) READ_ENTRIES(REPC1256E62:004B8651-NTFFFF0020): 0 ms. [76+9480=9556]
(18-299 [324]) CLOSE_COLLECTION(REPC1256E62:004B8651-NTFFFF0020): 0 ms. [12+0=12]
```

```
((2-507 [330]) FINDDESIGN_NOTES: 31 ms. [42+16=58]
```

# Server_Clock & Show Trans

- The server keeps track of all transactions
  - Also used for LOADMON (part of SAI calculation)
- You can display transaction summary via "**show trans**"
  - And reset the summary counters via "**show trans reset**"
- Or you can display transactions via console log via **server_clock=1**
- **Server_clock=1** has some limitations
  - Only shows transaction information but no user or database information
  - **38965515 ms 'OPEN_DB' 0 ms (0 ms NETIO) TCPIP 000403B1 Rcvd 0 Sent 216**
- New server_clock options have been introduced in Domino 8.5.1
  - Have first been implemented thru hotfixes for SAI troubleshooting and finally helped fixing SAI :-)

# Additional Server_Clock in Domino 8.5.1

- Server_Clock=2
  - Will dump more information
  - Username, Database, IP Address, and if transaction is used for LOADMON (Lm 1)

```
 39255671 ms 'OPEN_DB' 0 ms (0 ms NETIO) TCPIP 000403B1 Rcvd 0 Sent 254
User 'Daniel Nashed/NashCom/DE' Db 'acl.nsf' Ip '192.168.100.3' Lm 1
```

- Server_Clock=3, DEBUG_TRANSACTION_TIME=n
  - Dumps only transaction taking longer than the specified time
  - Can help to reduce the number of transactions dumped and only lists “slower” transactions
  - For example:  5000 ms
    - Take care: But some transaction like open view collections might take longer than 5 seconds without indicating a problem

# SAI and LOADMON

- **Domino uses a module called "LoadMon"**
  - Routine calculating speed of 12 selected transactions
  - Checks current transaction performance, summarizes and compares them with previous intervals and minimum values (RunningAvgTime & MinAvgTransTime)
  - Unit: microseconds

- OPEN_DB
- OPEN_NOTE
- CLOSE_DB
- DB_INFO_GET
- DB_REPLINFO_GET
- GET_OBJECT_SIZE
- READ_OBJECT
- GET_SPECIAL_NOTE_ID
- DB_READ_HIST
- DB_WRITE_HIST
- SERVER_AVAILABLE_LITE
- NIF_OPEN_NOTE

# Expansion Factor (XF)

- XF is calculated based on the performance values of current transactions in relation to minimum time for a transaction
  - It's the number of times the current transactions take longer than the minimum transaction time
  - XF values for different transactions build a overall XF
  - This XF is computed and converted into AI based on a Range to scale the XF
- SAI is calculated based on XF and the transinfo range (n)
- SAI = 100 * (1 - log (XF) / log (2) / n)
  - Notes.ini Server_Transinfo_Range n is 6 by default and specifies the maximum Expansion Factor of a Domino Server. The XF is calculated 2 raised to the power n (64 by default)

# Issues with SAI and LOADMON

- SAI was broken until Lotus Domino 8.5
  - There have been a couple of issues with LOADMON. The last one known has been fixed in D8.5
- SAI calculation on fast servers still might not work for you out of the box
  - LOADMON uses micro seconds
    - On a fast server at idle times transactions can take only a couple of micro seconds
    - Compared to normal performance e.g. 1 ms this can result in very high **XF**
    - Causes a low **SAI** for normal performing servers
- Tuning: D8.5 Set range of minimum and maximum values
  - notes.ini: **Server_MinPossibleTransTime**=1500
  - notes.ini: **Server_MaxPossibleTransTime**=20000000
  - Important: You have to delete loadmon.ncf when the server is shutodwn to delete old minimum values
- If LOADMON is configured correctly SAI can help to measure performance
  - E.g. Set the **Server_MinPossibleTransTime** to your expected response time

# More LoadMon Notes.ini Settings

- SERVER_TRANSINFO_MAX (default 5 / max 60)
  - number of statistics collections stored in LoadMon
- SERVER_TRANSINFO_UPDATE_INTERVAL (default 15)
  - interval for statistics capturing & calculation
- SERVER_MIN_TRANS (default 5)
  - minimum transactions needed for a statistic value to be valid
- SERVER_TRANSINFO_NORMALIZE (default 3000)
- SERVER_TRANSINFO_HTTP_NORMALIZE (12000)
  - used to initialize empty statistics (zero in loadmon.ncf) on startup in Domino

# Debugging LoadMon

- debug_loadmon=1
  - Enables LoadMon Debugging, writes additional information to server console
  - Loadmon: Domino AI = 100, XF = 1
  - Adds additional 46 statistics counters (server.loadmon.*)
- loadmon.ncf
  - loadmon.ncf in Domino data directory stores last information from loadmon before server is shutdown
  - loaded on server start to initialize statistics counters

# Lotus Domino 8.5 I/O Statistics

- Domino records I/O data per process and database
  - Process Name, Database Name
  - NumFileWrites, NumFileReads
  - MBWritten, MBRead = MB written/read
  - NoteOpens, ProfileNoteOpens, DesignNoteOpens
  - NTUpdateAdd, NTUpdateUpdate, NTUpdateDelete
  - NTUpdateExpiredSoftDeletes, ProfileNoteUpdates, DesignNoteUpdates
- Provides detailed information about I/O operations in CSV Format
  - Show iostat writes a file into the IBM_TECHNICAL_SUPPORT directory

```
> sh iostat
[0AA4:0007-05DC] IOSTAT dumped to file C:\Lotus\Domino85\data\IBM_TECHNICAL_SUPP
ORT\iostat_nsh-d85-win-01_2009_12_20@11_15_18.csv
^
```

```
"nupdate","",327,6056,1,17,648,19,481,0,11,0,0,0,11
"","C:\Lotus\Domino85\data\statrep.nsf",1351,32266,10,160,8314,0,4406,183,35,0,0,0,142
```

# Summary

- There are a lot of diagnostic features in Lotus Notes/Domino
  - Some features are designed for crash and failure analysis
    - There is much more than just NSD and Fault Recovery
  - Domino 8.x also has many features to troubleshoot performance issues on client and server side
- A 60 minute session can only give you ideas what to look into
  - Many areas could be a complete separate session
  - This session should give you ideas what to look for
  - And to help understand why IBM support is asking for certain data
- Not all troubleshooting information is easy to understand
    - Some is build from developers for developers ...

# Links and Resources

- Technotes
  - TN #7007508 - Knowledge Collection: NSD for Notes Domino release 6 and 7
    - Many of those documents are still relevant for Domino 8.x/8.5.x
  - TN #4013182 - Updated NSD for Domino releases

- Lotus Developer Domain
  - http://www.ibm.com/developerworks/lotus

- Also check Knowledge Base and Fixlist Database

# Q&A

- I hope you enjoyed the session
- Please fill out your evaluations!
- Questions?
- Presentation Updates
  - http://www.nashcom.de/lotusphere
- Contact
  - nsh@nashcom.de
  - http://www.nashcom.de
  - http://blog.nashcom.de

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