Domino Performance Best Practices on the IBM i

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Agenda Key: 45AD
Session #: 460031

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Kim Greene - Introduction

- Owner of Kim Greene Consulting, Inc.
- Extensive iSeries background
- Services offered include:
  - System and application performance optimization
  - Administration
  - Upgrades
  - Troubleshooting
  - Health, performance, security, etc. checks
  - Migrations
  - Custom development
  - Enterprise integration
- Technical writer for Systems Magazine, IBM i Edition
- Blog: www.bleedyellow.com/blogs/dominodiva
- Twitter: @iSeriesDomino

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Agenda

- Cache performance tuning
- Search and indexing performance
- HTTP tuning
- Mail performance tuning
- Domino 8.x Performance on IBM i
- More on Domino 8.x performance enhancements
- Application performance
- References

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Cache Performance Tuning

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Group Cache

- Used to lookup members of groups

Default Size	Maximum Size	To View Statistics
4 MB	15 MB	Sh stat net

- Key statistics
  - NET.GroupCache.Hits = 155
    NET.GroupCache.Misses = 10
    NET.GroupCache.NumEntries = 9
    NET.GroupCache.Size = 15,360
    NET.GroupCache.Used = 2,716
- Group_Cache_Size=
  - Set in bytes

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NLCache

- Used for name lookups

Default Size	Maximum Size	To View Statistics
16 MB prior to 8.5.2 64 MB in 8.5.2	4 GB	Sh stat nlcache

- Key statistics
  - Database.NAMELookupCacheCacheSize = 16,447,205
    Database.NAMELookupCacheLookups = 1,879,903
    Database.NAMELookupCacheMaxSize = 16,777,216
    Database.NAMELookupCacheMisses = 1,362,746
- NL_Cache_Size=
  - Set in bytes

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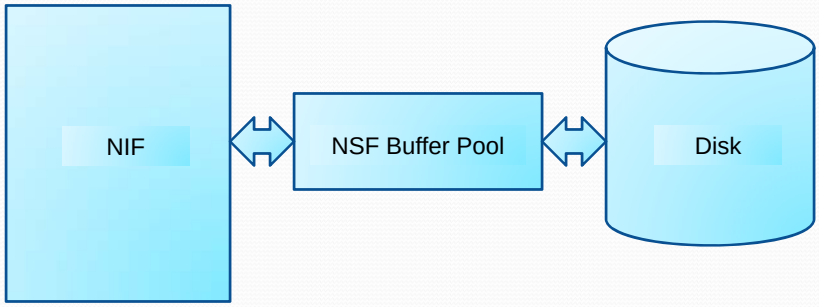
Unified Buffer Manager

- Also referred to as the NSF buffer pool
- Buffers data between the NIF and disk



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Unified Buffer Manager

Default Size	Maximum Size	To View Statistics
300 MB	1.5 GB prior to release 8 1.0 GB 8.x onward	Sh stat database

- Key statistics
  - Database.Database.BufferPool.Maximum.Megabytes = 170
  - Database.Database.BufferPool.Peak.Megabytes = 168
  - Database.Database.BufferPool.PercentReadsInBuffer = 95.44
- NSB_BUFFER_POOL_SIZE_MB=

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Database Cache

- Determines the number of databases a server can hold in its cache

Default Size	Maximum Size	To View Statistics
3x NSF buffer pool	10,000	Sh stat database

- Key statistics
  - Database.DbCache.CurrentEntries = 510
  - Database.DbCache.HighWaterMark = 714
  - Database.DbCache.MaxEntries = 510
  - Database.DbCache.OvercrowdingRejections = 8385
- NSF_DbCache_Maxentries=

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NSF Monitor Pool

- Caches event monitors such as server and user mail rules

Default Size	Maximum Size	To View Statistics
40 MB	256 MB	Sh stat database

- Key statistics
  - Database.MonitorPool.Event.Used = 52309
  - Database.MonitorPool.Monitors.Used = 1184
  - Database.MonitorPool.Size = 41943040
- NSF_MONITOR_POOL_SIZE_MB=

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Search and Indexing Performance

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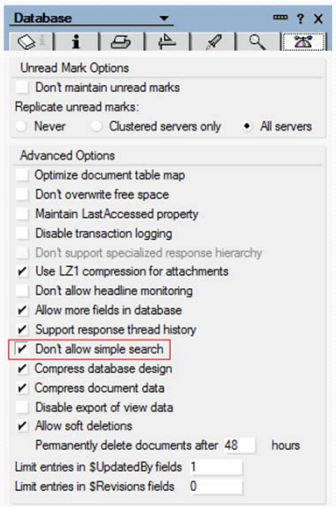
Better Control of Search

- Don't allow simple search
  - Prevents users from searching a database that is not full-text enabled
  - Doesn't prevent searches on whole server!!



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Full Text Index Tuning

- Spawn full-text indexing off to own thread
  - Update_Fulltext_Thread=1
  - Prevents long full text indexing operations from delaying view updates
  - By default, view updates and full text indexing are driven by the same thread

FT.Index.Count	FT.Index.Search	FT.Search.Total.Results
56,150	27,652	1,002,317

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Customer Tuning Example

- Semaphore timeouts

Semaphore Timeout	# of times occurring	Description
3A05	793	SEM_HTTP_AGENT
0266	20	NSF per-database full-text semaphore
0244	15	NSF per-database semaphore
0931	8	Task sync semaphore
03A8	2	DBCONT page zero semaphore

- Enabling Update_Fulltext_Thread=1 eliminated semaphore timeouts

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Full Text Indexing

- Take full text indexing out of Domino memory pool
  - Uses memory from OS pool
  - Frees up Domino memory
  - Notes.ini setting
    - ftg_use_sys_memory=1

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HTTP Tuning

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HTTP Tuning

- Threading model is important!!
  - High contention applications benefit from R5 threading model
    - HTTPQueueMethod=2
      - Most optimal for:
        - URLs that run application code
        - Large uploads/downloads
      - Threads work off a queue

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HTTP Tuning

- Customer example

	Default HTTP threading model	R5 threading model
# users	400	400
# errors	37 (4.6%)	0 (0%)
Max response time	103 seconds	77 seconds

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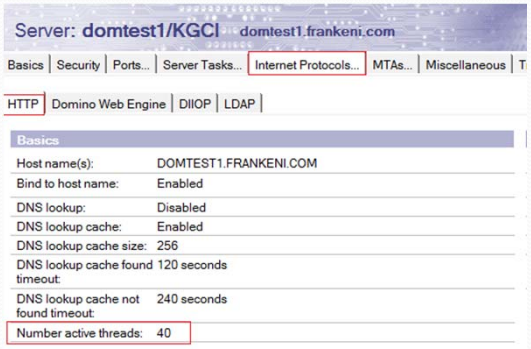
HTTP Server Threads

- Number of threads to handle web server requests

Default Size	Maximum Size	To View Statistics
40	512	Sh stat database

- Key statistic
  - Http.Workers



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Mail Performance Tuning

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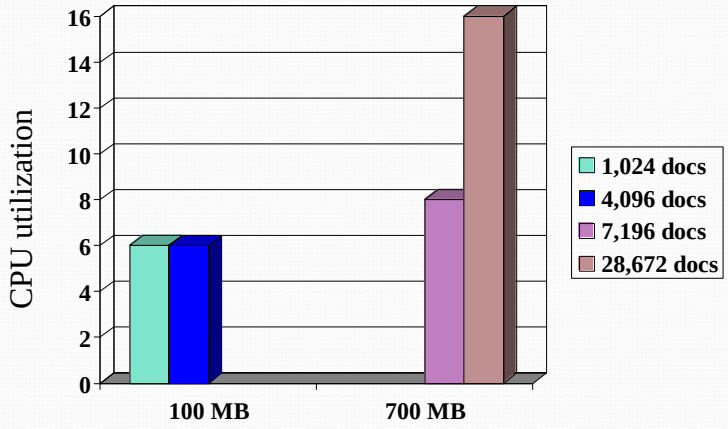
Mail Performance Tuning

- Keep mail files below 500 MB



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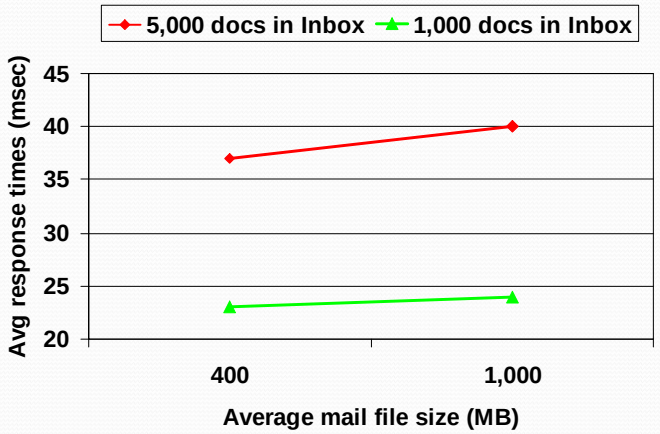
Mail Performance Tuning

- Size of inbox impacts end user response time



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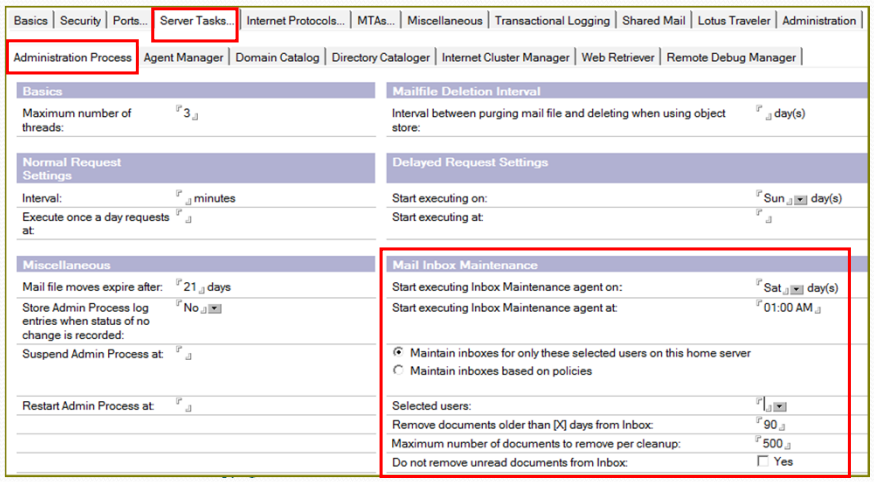
Mail Performance Tuning

- Use Inbox maintenance agent



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Number of Mail.Box Files

- Mail.Mailbox.Accesses
- Mail.Mailbox.AccessConflicts
  - Want a lower percentage of conflicts (2% or less)
    - Mail.Mailbox.AccessConflicts / Mail.Mailbox.Accesses = < 0.02

Mail Delivery Statistic	Original	After Tuning
Mail.Mailbox.AccessConflicts	1151	8
Mail.Mailbox.Accesses	3877	3023
Server.MailBoxes	2	4

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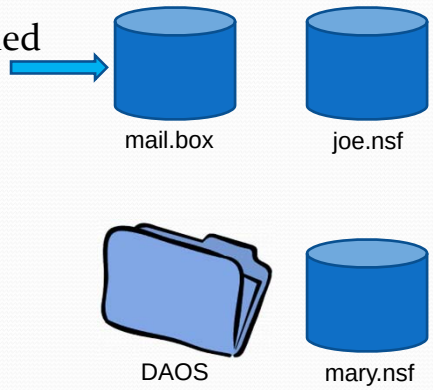
DAOS on Mail.Box

- Mail.box not DAOS enabled
  - On mail submission
    1. Deposited in mail.box



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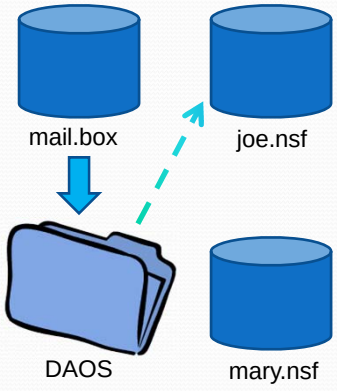
DAOS on Mail.Box

- Mail.box not DAOS enabled
  - On mail submission
    1. Deposited in mail.box
  - On delivery to Joe
    2. Read from mail.box
    3. Written to DAOS & saved
    4. Ticket written to joe.nsf



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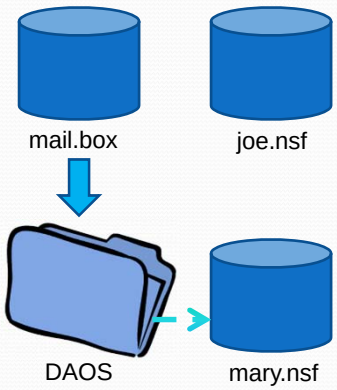
    1. Deposited in mail.box
  - On delivery to Joe
    2. Read from mail.box
    3. Written to DAOS & saved
    4. Ticket written to joe.nsf
  - On delivery to Mary
    5. Read from mail.box
    6. Written to DAOS & discarded
    7. Ticket written to mary.nsf



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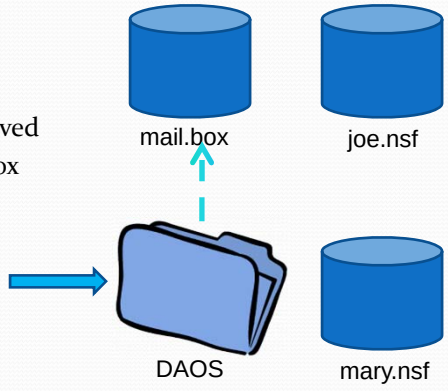
DAOS on Mail.Box

- Mail.box DAOS enabled
  - On mail submission
    1. Written to DAOS and saved
    2. Ticket written to mail.box



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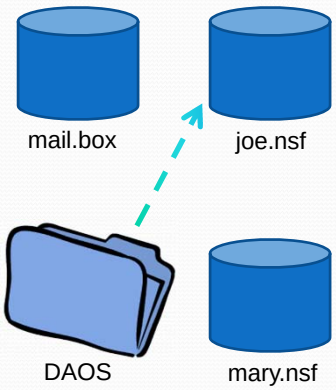
  - On delivery to Joe
    2. Ticket written to joe.nsf



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DAOS on Mail.Box

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  - On mail submission
    1. Written to DAOS and saved
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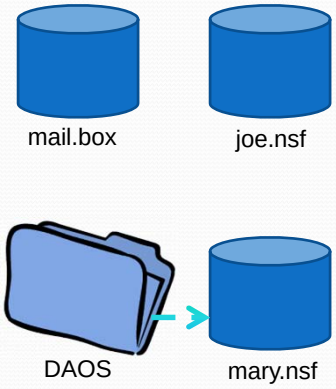
  - On delivery to Joe
    3. Ticket written to joe.nsf
  - On delivery to Mary
    4. Ticket written to mary.nsf



Clustered Server Tuning

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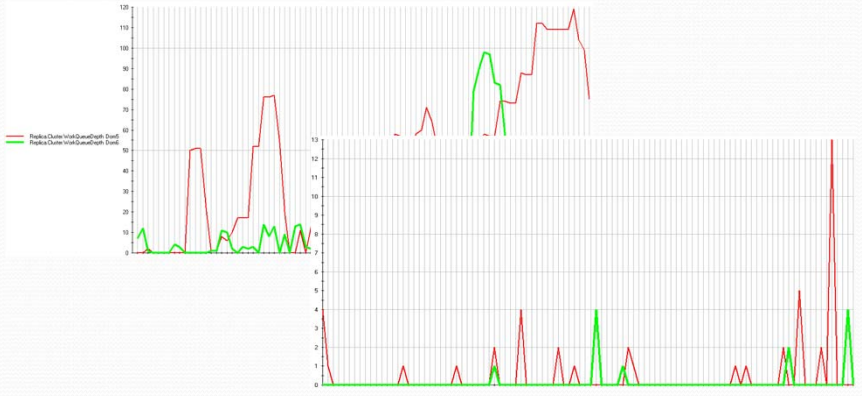
Cluster/Replicator Queue Depth

- Impact of increasing Cluster Replicators from 1 to 3



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Server Availability Index (SAI)

- Equal to the percentage of the total server capacity that is still available
- Use SERVER_TRANSINFO_RANGE to improve your SAI
  - Use SH AI to determine the right value
  - Use sh ai when servers are experiencing a heavy load
  - It is like you need to tell Domino how fast your server/hardware is.
- Very useful when looking to control Load Balancing in Clustered environments
  - Server_Availability_Threshold will indicate when to send the request to the other server in the cluster
- It can also be used on non-clustered servers to understand health of the server

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Memory Tuning

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Memory Tuning

- Goals:
  - Non-database faults/second <= 100 per processor
  - PercentReadsInBuffer >= 95%

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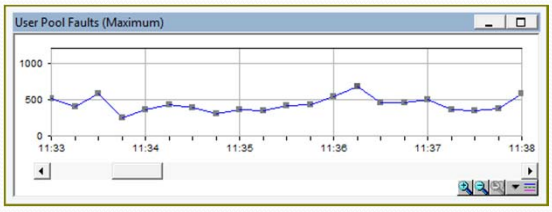
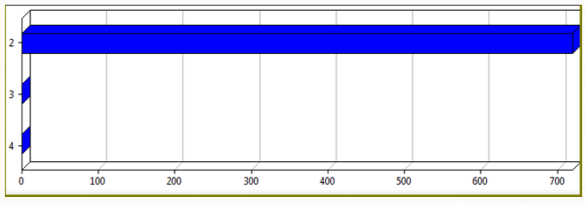
Memory Tuning

- Very high faulting rates on the System i server



- Details revealed



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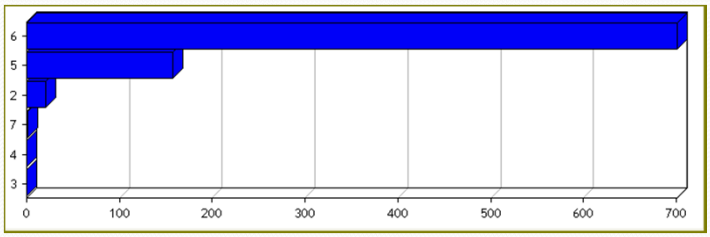
Memory Tuning

- With each Domino server in its own memory pool
  - Isolates memory demands of individual servers



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Faulting Query

- Which jobs are causing all the faulting?
  - Query Detailed in KB article: 1237473
  1) Select file 'QAPMJOBL'
  2) Select and sequence field display values

Assign value of	To field	Field description
10	INTNUM	Interval number
20	DTETIM	Interval date and time
30	JBNAME	Job name
40	JBTFLT	Job total page faults
50	JBXRFR	Job stream file reads
60	JBXRFW	Job stream file writes

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Faulting Query

3) Select sort fields

```
                              Select Sort Fields

Type sort priority (0-999) and A (Ascending) or D (Descending) for
  the names of up to 32 fields, press Enter.

Sort
Prty A/D  Field          Text                                    Len  Dec
          INTNUM         Interval number                           5    0
          DTETIM         Interval date and time                   12
          JBNAME           Job name                               16
  10   D  JBTFLT         Total page faults                        11    0
          JBXRFR         Stream file reads                        11    0
          JBXRFW         Stream file writes                       11    0

                                                                 Bottom
F3=Exit            F5=Report       F11=Display names only   F12=Cancel
F13=Layout         F18=Files       F20=Renumber             F24=More keys
```


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Faulting Query

- Sample results

Job Name	Subsystem	Total Page Faults	Stream File Reads	Stream File Writes
Update	APP02	215,443	437,451	2,436,236
Update	APP02	74,805	66,354	84,944
Update	APP02	72,679	57,312	289,068
Update	APP02	62,649	54,805	47,094
Update	APP01	45,332	54,588	61,472
Update	APP02	43,929	68,659	70,067
Update	APP01	43,100	66,639	66,875

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Are you Wasting Memory?

- Pool size minimums and maximums are used by automatic performance adjustor (QPFRADJ)
  - Adjusting minimums allows memory to be better utilized
- Check minimum size of memory pools
  - *INTERACT
    - Uses 5% by default
  - *SPOOL
    - Uses 1% by default

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WRKSHRPOOL

Work with Shared Pools

System: KIMDEMO

Main storage size (M) . : 2057.40

Type changes (if allowed), press Enter.

		-----Size %-----		-----Faults/Second-----		
Pool	Priority	Minimum	Maximum	Minimum	Thread	Maximum
*MACHINE	1	6.55	100	10.00	.00	10.00
*BASE	1	5.18	100	5.00	.50	200
*INTERACT	2	5.00	100	10.00	2.00	100
*SPOOL	2	1.00	100	5.00	1.00	100
*SHRPOOL1	2	1.00	100	10.00	2.00	100
*SHRPOOL2	2	1.00	100	10.00	2.00	100
*SHRPOOL3	2	1.00	100	10.00	2.00	100
*SHRPOOL4	2	1.00	100	10.00	2.00	100
*SHRPOOL5	2	1.00	100	10.00	2.00	100
*SHRPOOL6	2	1.00	100	10.00	2.00	100

More...

Command
===>
F3=Exit F4=Prompt F5=Refresh F9=Retrieve F11=Display text
F12=Cancel

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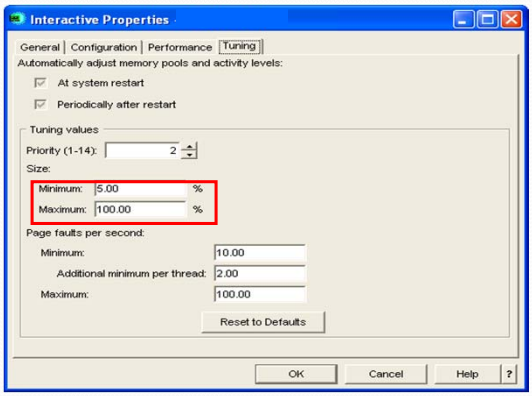
iSeries Navigator

- Work Management -> Memory Pools -> Active pools
- Right click pool -> select 'Properties'
- Tuning tab



Domino 8 Performance on IBM i

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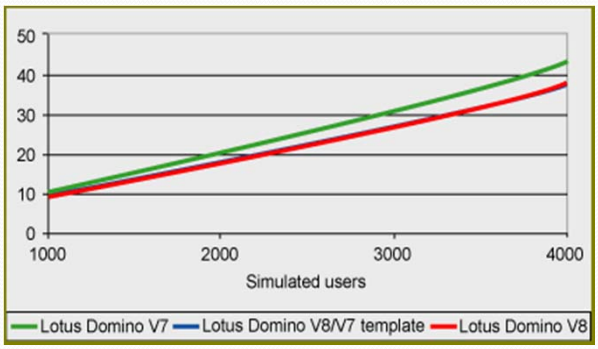
CPU

- 13% reduction for release 8



- Additional 13% reduction for release 8.5

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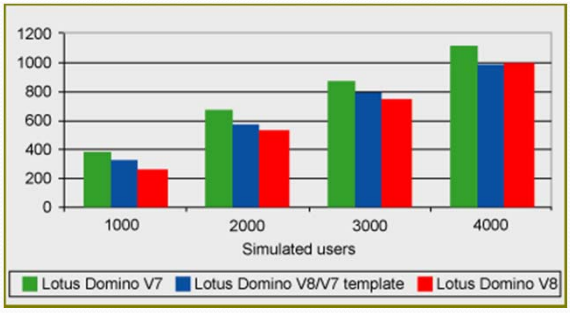
Disk – Release 8

- Up to 30% improvement for write performance



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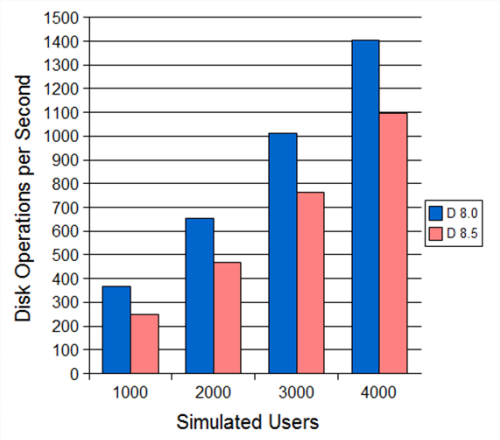
Disk – Release 8.5

- Up to 22% reduction in I/O operations



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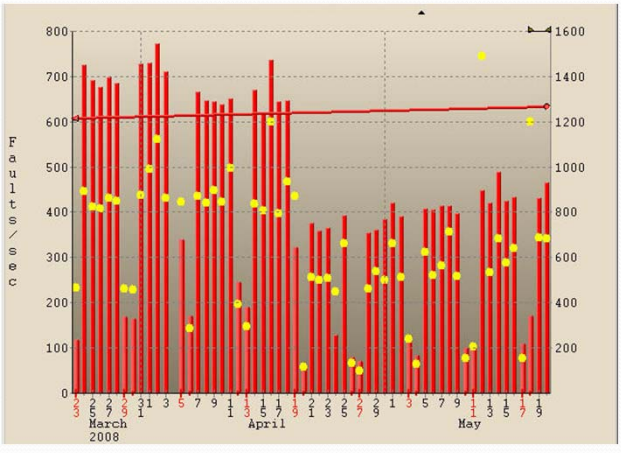
Memory

- Reduction in paging/faulting



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Network Bandwidth

- 8-10% improvement in release 8
  - Design change to cache more documents
    - Release 7 = 42 entries
    - Release 8 = 50 entries
  - Better user experience during page scrolling

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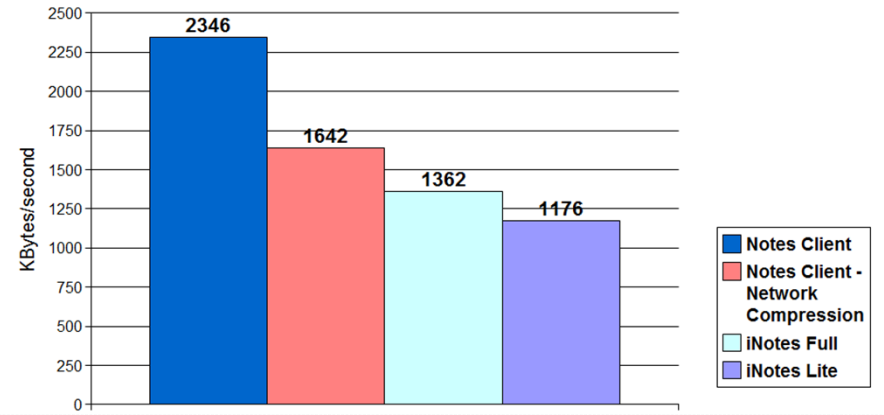
Network Bandwidth

- Release 8.5



More on Domino 8 Performance Enhancements

Database and View Enhancements

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Database Performance Improvements

- Compress database design
  - Compresses design objects in a database
    - Mail files now start at 8 MB, not 18 MB
- Compress document data
  - Reduces size of all documents in a database
  - Real-life example:
    - www.bleedyellow.com/blogs/jonesy/entry/domino_8_0_1_compression
    - 533 mail files

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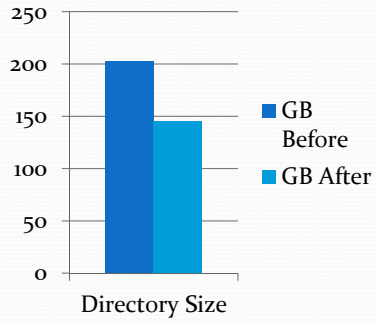
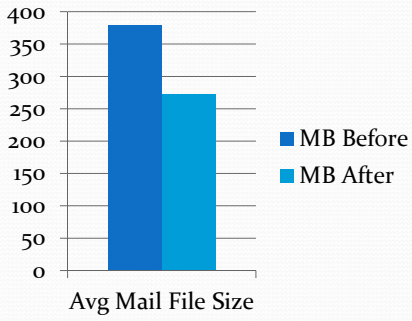
Database Performance Improvements

- Compress document data





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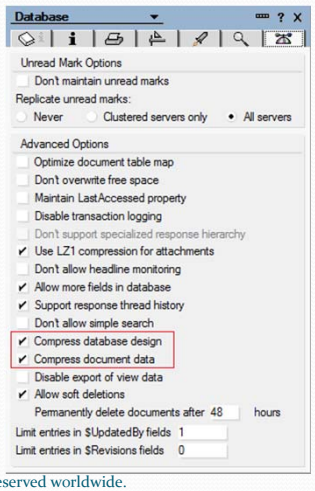
Database Performance Improvements

- Enabling '*compress database design*' and '*compress document data*'
  1) Create_R85_Databases=1
  2) Enable database property
  3) Copy style compact (-C)



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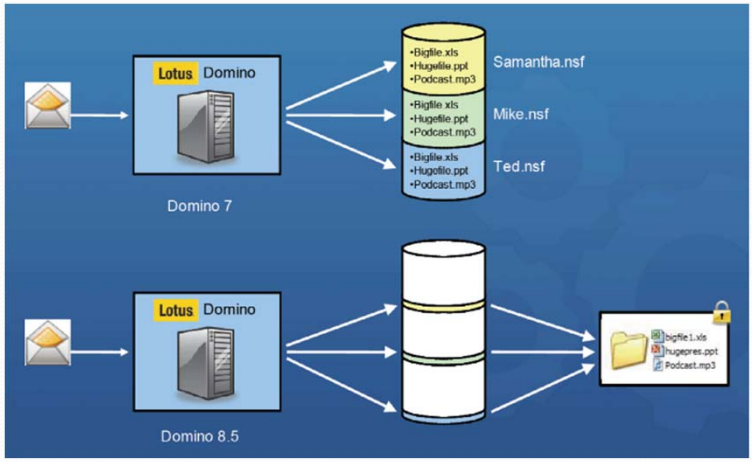
Database Performance Improvements

- DAOS saves on disk space and I/O



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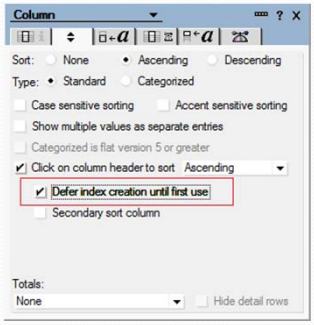
View Performance Option

- On-demand column collations
  - Reduces overhead associated with indexes
  - Indexes built on-demand
    - Built over column first time user sorts on column



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Transaction Logging

- Transaction logging improvements
  - Required for DAOS
  - Up to 50% CPU reduction in 8.5

Application Performance

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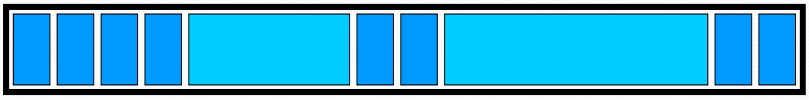
Mixing Applications and Mail

- Where do you deploy applications?
  - Mail server
  - Application server
- Understand impact of updates
  - Update task works off queue
  - FIFO
  - Can get erratic performance



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Lotus Enterprise Integrator (LEI)

- Think data types aren't important?
  - Think again!!
- Customer example
  - *Replication Conflict* Action: Update at Connector B; Mismatch in field 'QTYSHP'; Record Key values: WHRLW3="G956105388117"

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Lotus Enterprise Integrator (LEI)

- What happens during replication?

DB2	Notes	
70.000	70	Replication conflict
3.600	3.6	Replication conflict
1.000	1	Replication conflict
1142.756	1142.756	OK, skipped
94.050	78.8	Replication conflict

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Lotus Enterprise Integrator (LEI)

- How do we fix this?
  - Change the field types to match
  - Original field types
    - DB2
      - Packed
      - Field length 11,3
    - Notes
      - Type = Number
      - Number format = Decimal
      - Decimal places = **varying**
  - New field types
    - DB2
      - Packed
      - Field length 11,3
    - Notes
      - Type = Number
      - Number format = Decimal
      - Decimal places = **3 fixed**

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- Now what do the data types look like?

DB2	Notes	
70.000	70.000	➡ OK, skipped
3.600	3.600	➡ OK, skipped
1.000	1.000	➡ OK, skipped
1142.756	1142.756	➡ OK, skipped
94.050	78.800	➡ Replication conflict

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- End result?
  - Original replication time
    - 1.5 hours
  - New replication time
    - 12 minutes

* Number of records replicated = ~200,000

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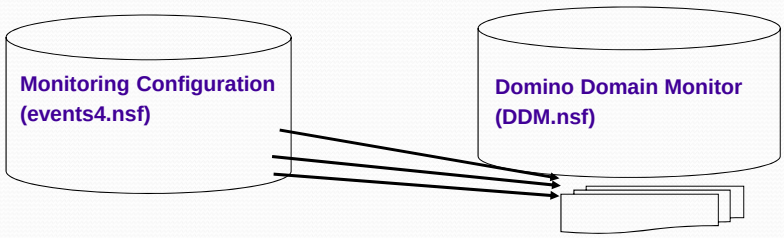
Domino Domain Monitoring (DDM)



Used for all Domino domain monitoring configuration

Domino domain monitoring probes generate Event report documents that get consolidated and reported into the new DDM database

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Domino Domain Monitoring (DDM)

- Use probes to monitor performance
  - Probe type = Application Code
  - Probe subtypes
    - Agents behind schedule
    - Agents evaluated by CPU usage
    - Agents evaluated by memory usage
    - Long running agents

Processes to probe = **AMGR** or **HTTP**

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References

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Questions