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BP119

Be a Lotus Domino Detective: Tackling Your Toughest Performance Issues

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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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Amy Hoerle - Introduction

- 1st "real" job was as an AS/400 administrator in 1997
- Worked on IBM Lotus Domino support team for 11 ½ years
- Specializing in Lotus products on IBM i & Windows since 1999
  - Installing, configuring, tuning, debugging and troubleshooting
- DAOS expert
- XPages development
- Author of numerous technotes, articles and "Optimizing Domino Administration" IBM Redbooks Wiki
- Blog: www.bleedyellow.com/blogs/ilotusdomino
- Twitter: iLotusDomino

Agenda

- Identifying the problem
- Resources – what to look for
- Critical detective tools
- Alleviating bottlenecks
- Example time!!

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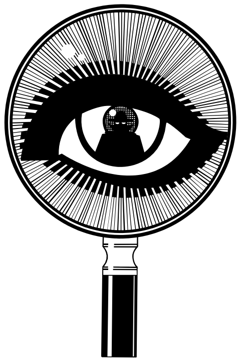
Identifying The Problem

- What is the issue?
  - How does the problem manifest itself?
  - What does the problem look like?
  - What are indicators there is a problem?
  - What is state of normalcy for:
    - CPU utilization
    - Disk I/O rates
    - Network bandwidth
    - Transactions per minute / hour
    - Client or web response times



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Identifying The Problem

- Is it repeatable?
  - Need ability to collect data to resolve the issue
  - The process of resolution is iterative
- Perceived or real?
  - Performance data collection BEFORE problems occur is critical!
- Certain users? Specific locations?
  - How pervasive is the problem?
    - Which locations or groups are having performance issues?
  - What is the pattern of slowness?
    - Daily
    - Hourly
    - Types of interfaces / connections

Identifying The Problem

- Where is the issue coming from?
  - A resource
  - Or resource management

Resource
CPU
Memory
Disk I/O
Network I/O

Resource Management
Applications
Domino Server
Operating System
Hardware

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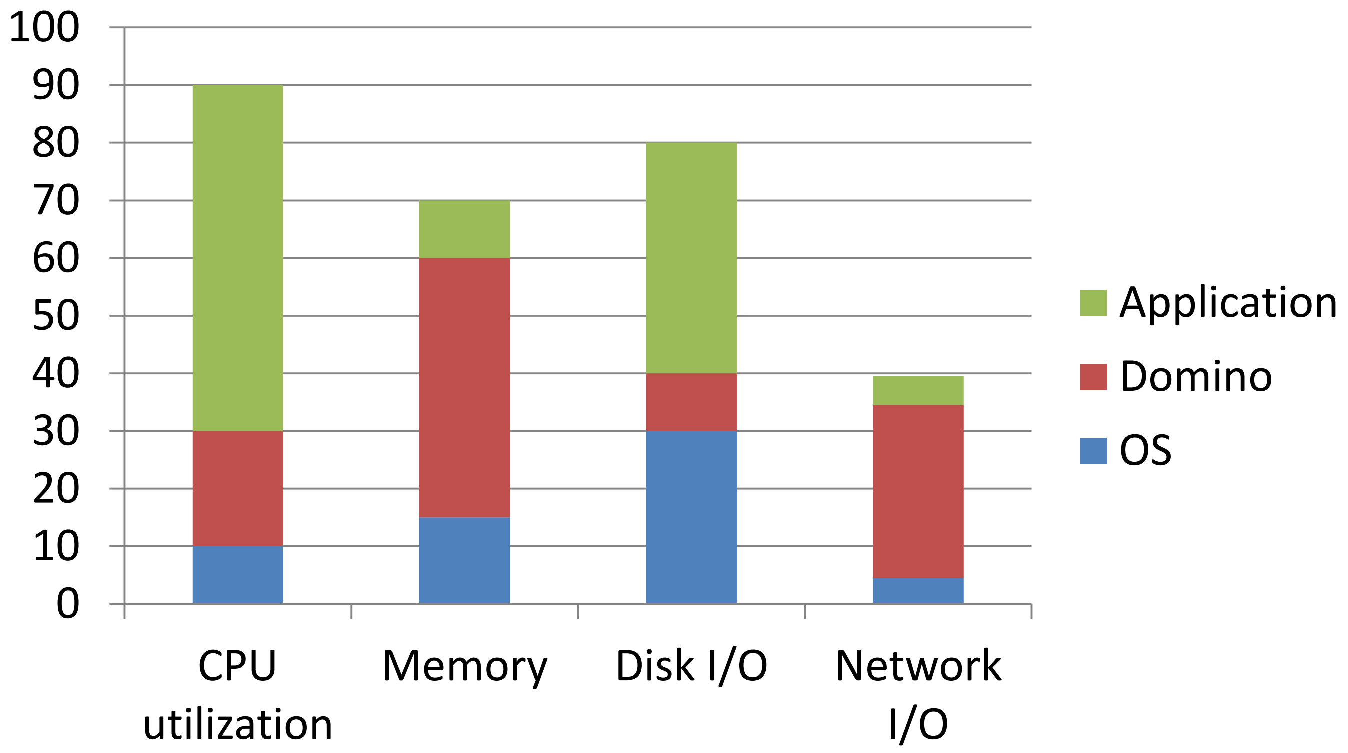
Identifying The Problem

- Critical to use a layered approach to individual resources and management of resources to isolate performance issues
  - What is the impact of each of these on the other?



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Identifying The Problem

- Is it a throughput or bandwidth issue?
  - Throughput
    - Constrained by ability to use a resource
      - A resource management issue
    - Tend to characterize OS or Domino / application issues
  - Bandwidth
    - Constrained by not having enough resources
    - Tend to characterize resource issues

- It may be a combination of the two

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CPU

- Typically an issue of over or under consumption
- How many CPUs are assigned?
  - Partial processors can be cause for concern
- How configured?
  - Physical system
  - LPAR
  - VM
- What other work is running on the server / LPAR / VM?
- Managed via:
  - Hardware
  - Operating system
  - Domino

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CPU Too High

- Finding the problem
  - Need to look at each component

Hardware	Operating System	Domino Server
Number of CPUs per system / LPAR / VM	How many applications are running? Which operating system functions are really needed? Run priority of jobs / tasks	Number of Domino servers Which tasks are consuming CPU? How many agents? Full text indexing? Temporary indexes being built?

- Analyze thread or process using bulk of CPU to isolate root cause of CPU consumption
- server_show_performance=1
  - Displays server performance events on the console

CPU Very Low

- What is the issue?
  - Need to look at each component

Hardware	Operating System	Domino Server
High paging / faulting High disk I/O	High paging / faulting Run priority of jobs / tasks	Semaphore locks Not enough threads

- Need to look at system as a whole to hone in where bottleneck is
- Resource management issue

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Memory

- Critical for optimal performance
- High paging and faulting can dramatically impact performance of Domino

Hardware	Operating System	Domino
Not enough memory? Problem with memory chips?	Too much disk fragmentation? Proper amount of memory for OS and applications?	Large indexes? Applications with memory leaks? Caches and buffers set properly?

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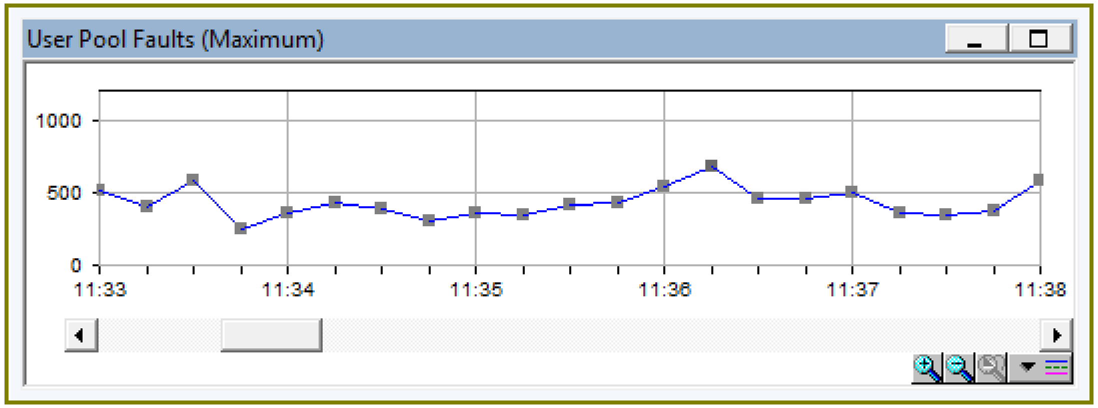
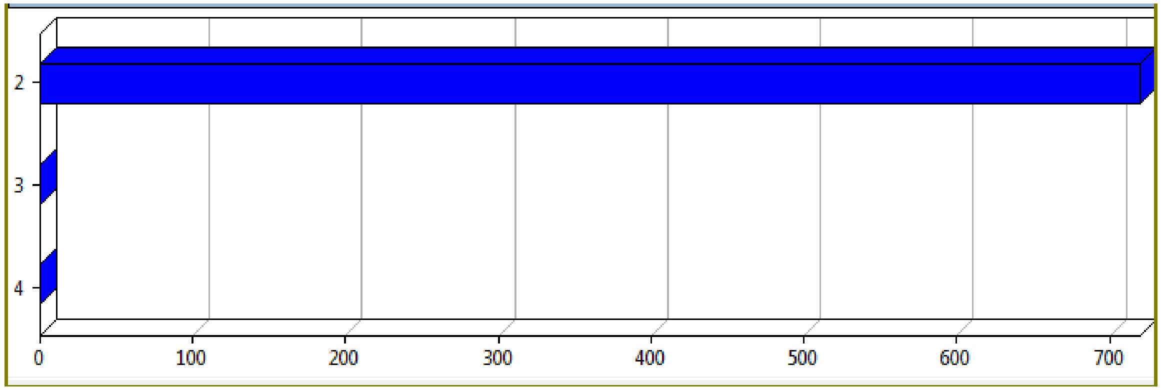
Memory

- Important to look at system level and Domino level
  - IBM i example



  - Drilling down further we see the memory pool involved is where all of the Domino servers are running



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Disk

- All aspects of disk I/O need to be examined
- Assess Domino and the operating system's impact to disk performance

Hardware	Operating System	Domino
Not enough disk space Not enough disks units Slow disk access times Raid or mirroring? SAN or DAS?	Too much disk fragmentation? Not enough free space?	Too much disk fragmentation? High paging / faulting impacting I/O? Semaphore timeouts?

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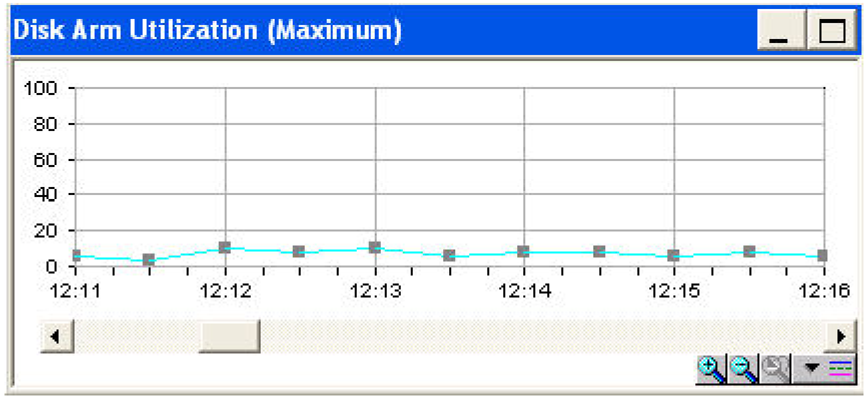
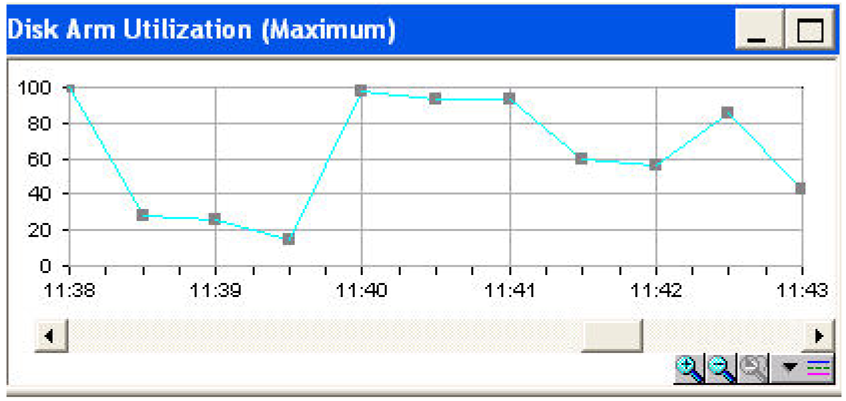
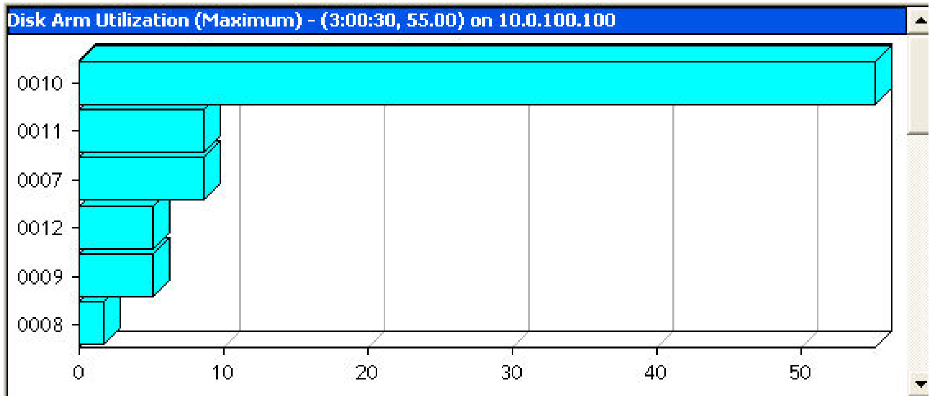
Disk

- The impact of uneven disk I/O
- Disk utilization was great, customer was running out of disk space



- After addition of 3 much larger drives





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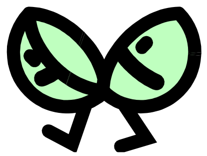
Disk Defragmentation – Are You Affected?

- Monitor split I/O per second
  - Ratio for which I/Os to disk are split into more than one I/O
  - If split I/Os > 10% of total I/O = PROBLEM!!



- Ensure operating system I/O is good before focusing on Domino I/O

1	2		3	4	5	6	Free space	
1			3	4	5	6	Free space	
1	7		3	4	5	6	Free space	
1	7	8	3	4	5	6	Free space	
1	7	8	3	4	5	6	7 extent	Free space

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Network

- One of the most difficult areas to analyze
- Need to check many things:
  - Server configuration
  - DNS configuration and availability
  - Firewall configuration
  - Host files (if being used)
  - Connection documents
- Network retransmissions are cause for concerns
  - Typically find to be an issue for users in specific locations
- Avoid ARP storms
  - Ensure each NIC has its own route
  - Prevent intelligent switches from dynamically generating route tables

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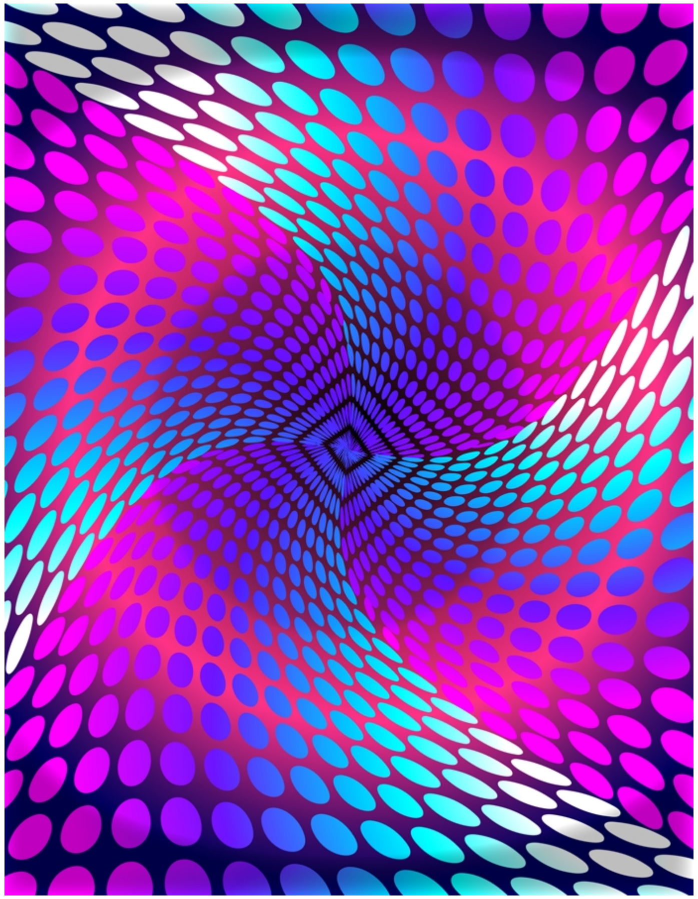
Patterns, Patterns, Patterns ….

- It's all about the patterns …



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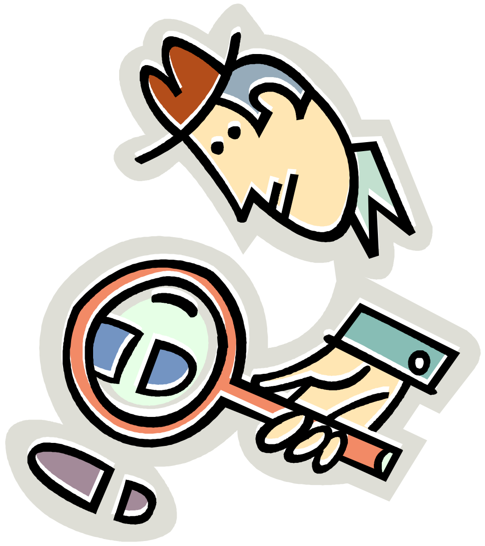
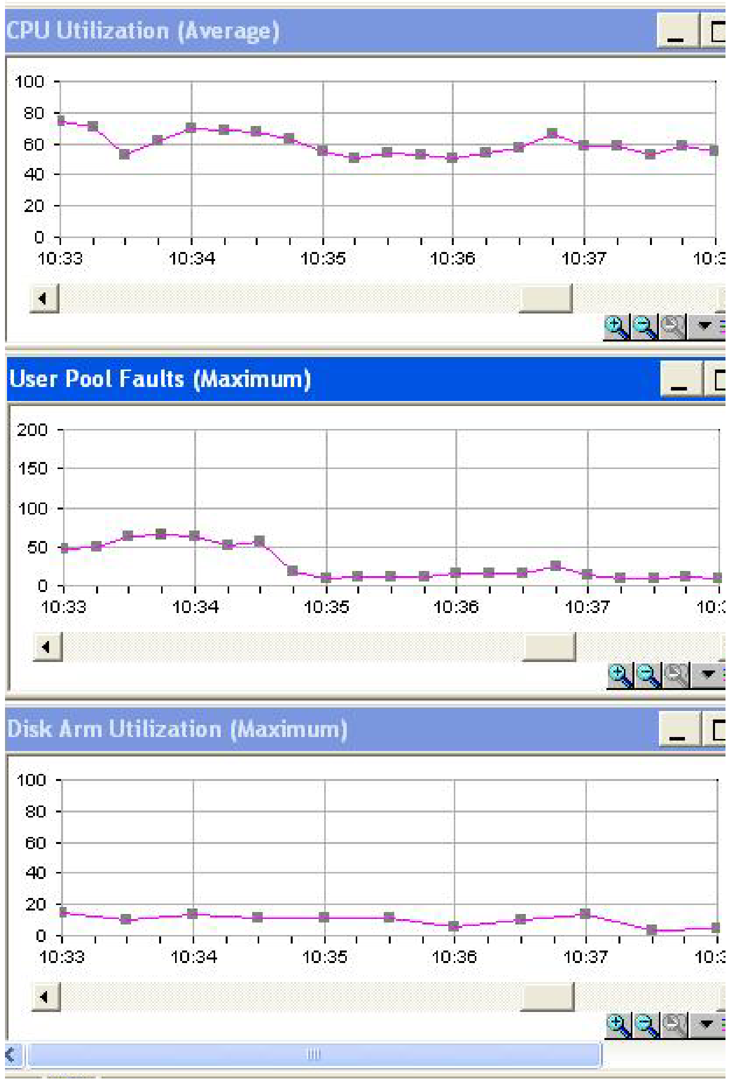
Critical Detective Tools

- System statistics
- Domino statistics
- DDM
- NSDs
- Memory dumps
- Semaphore debug
- Call stacks
- Activity logging
- Web application tools



System Statistics

- Need tool to gather statistics for system as a whole
- Capture statistics on:
  - CPU
  - Memory
  - Disk I/O
  - Network I/O
- Some examples
  - Perfmon
  - Perfpmr
  - nmon
  - vmstat
  - Performance navigator
  - iostat
  - netstat


CPU Utilization (Average)
User Pool Faults (Maximum)
Disk Arm Utilization (Maximum)
10:33
10:34
10:35
10:36
10:37

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Domino Statistics

- Great starting point when debugging performance issues
  - Statistics collection (statrep.nsf)
    - Stats and Collect tasks
  - sh stat
- Be sure to collect platform statistics too!!
- Critical areas of focus:
  - Domino memory management
  - Cache sizes
    - Group cache
    - Name lookup cache
    - Database cache
  - Transaction rates
  - HTTP statistics
  - Mail statistics
  - Cluster and replication statistics
  - Queue depths
  - Full text indexing
- Get to know "normal"

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Domino Domain Monitoring (DDM)

- Great for determining where to focus within Domino applications
  - 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
  - Embedded probes can be used to instrument code

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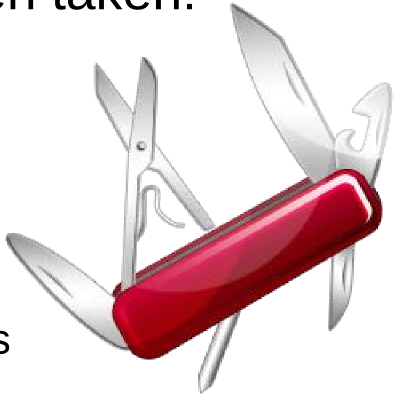
The NSD

- Provides snapshot of what’s happening on the server when taken:
  - System activity
  - Statistics
  - Configuration
  - Stack dumps
    - Shows routines or functions called for each thread in a process
  - Memcheck
    - Shows how memory is being used
    - System memory, handle, network, in-use database structures, files usage
    - Open databases and documents
  - Other important sections
    - Resource usage summary
    - NSF DB-cache



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Call Stacks

- Critical tool for understanding what is happening in a thread
- Use when suspect hidden bottleneck

```
Lib Name      Pgm Name      Mod Name      Statement     Procedure Name
  ----------    ----------    ----------    ----------    ------------------------------------------
  QSYS          QLESPI        QLECRTTH      0000000018    LE_Create_Thread2__FP12crtth_parm_t
  QSYS          QP0WPINT      QP0WSPTHR     0000000019    pthread_create_part2
  QDOMINO852    LIBNOTES      THREAD        0000000020    ThreadWrapper
  QDOMINO852    LIBHTTPSTA    HTTHREAD      0000000008    HTThreadBeginProc
  QDOMINO852    LIBHTTPSTA    HTWRKTHR      0000000010    ThreadMain__14HTWorkerThreadFv
  QDOMINO852    LIBHTTPSTA    HTEVENT       0000000002    Wait__7HTEventFUl
  QDOMINO852    LIBNOTES      OSSEM         0000000009    OSWaitEvent
  QDOMINO852    LIBNOTES      OSSEM         0000000089    WaitOnNativeSemaphore
  QDOMINO852    LIBNOTES      OSSEM         0000000018    WaitForThreadSem
  QSYS          QP0WPTHR      QP0WCOND      0000000055    pthread_cond_timedwait
  QSYS          QP0WPINT      QP0WSCOND     0000000107    wait__PthreadConditionFP7Qp0wTcbP9QpMutex
  QSYS          QP0WPINT      QP0WTCB       0000000038    blockMyThread__7Qp0wTcbFiT1
```

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Memory Dumps

- Provides details on memory contents
  - Find out where memory is allocated from a Domino perspective
- Pool allocations by process ID

```
*** Dump of Pools for ProcessID 00000229 (HTTP)
                          largest    ---- P o o l    A l l o c a t i o n s ----          Free  List  Iterations
pool      addr       size   used      free    total    skip   search  failure  success   frees    total    alloc     free  created
  1 D691E7024101BEC0 14648K 13911K 94%     71K   141179     116   141063      26   141037   139160   1757014    800200    956814
  2 FA83CEBEA3002000 14648K  6464K 44%      0b    35755       0    35755       0    35755    35175    403963    171251    232712  05/04/2009 09:31:22
3 process private memory pools
28 MB total pools size
19 MB total pools used
69.55% pool utilization
```

- Can be helpful to determine bottlenecks and memory leaks
- Memcheck
  - Good to use in combination with memory dumps
  - Provide details on Java memory utilization
  - Usage summary and top 10 sections are key

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MEMCHECK

- Notes memory usage summary

```
<@@ ------ Notes Memory -> Usage Summary -> Shared Memory Stats :: (Shared) (Time 16:26:20) ------ @@>
TYPE          : Count   SIZE     ALLOC     FREE     FRAG OVERHEAD  %used  %free
Static-DPOOL:   49 496194304 472697000  23439088     0   114034        95%     4%
VPOOL        :   82    5002704      486884     4295456     0   222108         9%    85%
POOL         :   93    5377312     2124984     2778016     0   479224        39%    51%
Overall      :   49 496194304 465623528  30512560     0   815366        93%     6%
```

- Top 10 memory block usage

```
<@@ ------ Notes Memory -> Usage Summary -> Top 10 Memory Block Usage -> Memhandles By Size :: (Shared) (Time 16:26:20) ------ @@>
Type  TotalSize     Count   Typename
------------------------------------------------------------
0x82cd  417243136      106  BLK_UBMBUFFER
0x82cc    8140800      106  BLK_UBMBCB
0x8252    4194322        4  BLK_NSF_POOL
0x8a05    3000000        1  BLK_NET_SESSION_TABLE
0x8439    2919518      313  BLK_BPOOL_PERPROCESS_INFO
0x834a    2621442        3  BLK_GB_CACHE
0x841c    2004708      116  BLK_VARRAY_CHUNK
0x826d    1048576        1  BLK_NSF_DIRMANPOOL
0x8252    1048576        1  BLK_NSF_POOL
x8311    1048576        1  BLK_NIF_POOL
```

Semaphore Debug

- Semaphore defined
  - Software switch that ensures the synchronization of execution of tasks to ensure one process has completed before another begins
- Semaphore timeout
  - Occurs when a resource has been locked for too long
    - By default, this is 30 seconds
- Enable semaphore debug to determine root cause of problem
  - DEBUG_THREADID=1
    - Helpful to identify process or thread holding a semaphore
  - DEBUG_CAPTURE_TIMEOUT=1
  - DEBUG_SHOW_TIMEOUT=1
  - DEBUG_SEM_TIMEOUT=X
    - Use to specify how long a semaphore must timeout before being reported
- What to look for
  - Slow processes
  - Databases with long locks

Activity Logging and Activity Trends

- Records user activity by:
  - Person
  - Database
  - Access protocol
- Enabled in the configuration document
- Great for debugging performance slowdowns and CPU spikes
  - Activity recorded allows determination if:
    - Specific application caused CPU spike or performance slowdown
    - Spike in user activity is cause of CPU spike or performance slowdown
- A great way to:
  - Compare workloads across servers
  - Compare user activity over time

Web Application Tools

- tell http show thread state
  - Determine what forms, views or agents are associated with HTTP requests
- Example usage
  - Agents
    - Is it an issue with agent concurrency?
  - Forms
    - What type of lookups are being done?
      - Lookup source can have dramatic impact on performance
        - Profile document lookup compared to pulled from view in external database
  - Views
    - Which views are being used?
    - How large are the views?
    - How frequently should a view be updated?
    - What is the view update setting?
    - Is enough memory available for the view
      - Need 2 times the view size for optimal view rebuild time

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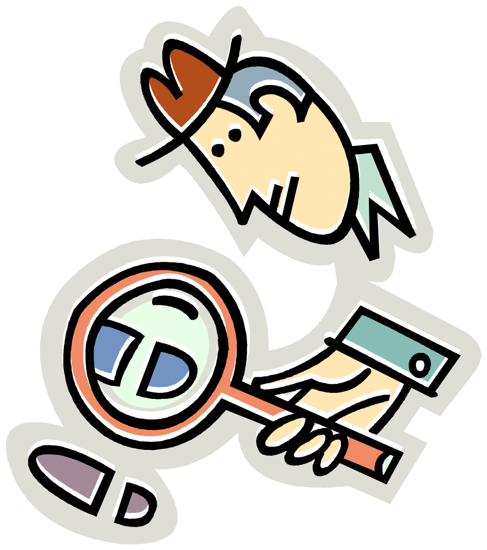
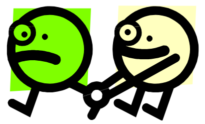
Alleviating Bottlenecks

- Critical things to remember:
  - Relieving bottleneck in one area, may cause new bottleneck to appear
  - Resolution of an issue may be dependent on what appears to be a totally unrelated area
  - It’s an iterative process



Domino Configuration – Where to Look For Bottlenecks

- Number of worker threads and concurrent thread processing
  - Server threads
    - Number of servers threads available for processing
      - Server.Users.Peak
      - Server.WorkThreads
        - Need sufficient threads for number of users
    - Default size: Server_Pool_Tasks * # of NRPC ports
  - Server_Max_Concurrent_Trans
    - Controls number of threads allowed to execute at the same time
    - Default size: 20
  - Server_Pool_Tasks
    - Controls number of threads in IOCP thread pool
    - Check these statistics:
      - Server.ConcurrentTasks
      - Server.ConcurrentTasks.Waiting
        - Should be no waiting
    - Default size: Server_Max_Concurrent_Trans * 2



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Domino Configuration – Where to Look For Bottlenecks

- Unified Buffer Manager
  - Critical Domino buffer pool, buffers data between disk and the NIF
  - Statistics to watch:
    - Database.Database.BufferPool.Maximum.Megabytes
    - Database.Database. BufferPool.Peak.Megabytes
    - Database.Database.BufferPool.PercentReadsInBuffer
      - >= 95% is desired
      - < 90% is issue
  - Modify via:
    - NSB_BUFFER_POOL_SIZE_MB=xxx

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Domino Configuration – Where to Look For Bottlenecks

- Database Cache
  - Where Domino stores information about databases being accessed
  - Allows Domino to read database information from cache rather than physical disk
  - Statistics to watch:
    - Database.DbCache.CurrentEntries
    - Database.DbCache.HighWaterMark
    - Database.DbCache.MaxEntries
    - Database.DbCache.OvercrowdingRejections
      - Should be 0 on a healthy server
  - Modify via:
    - NSF_DbCache_Maxentries=xxx

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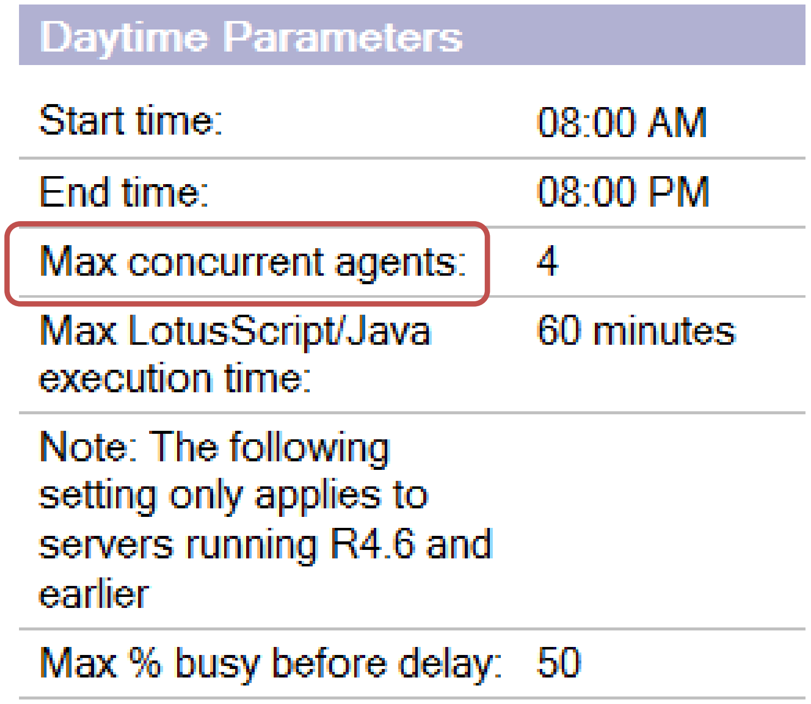
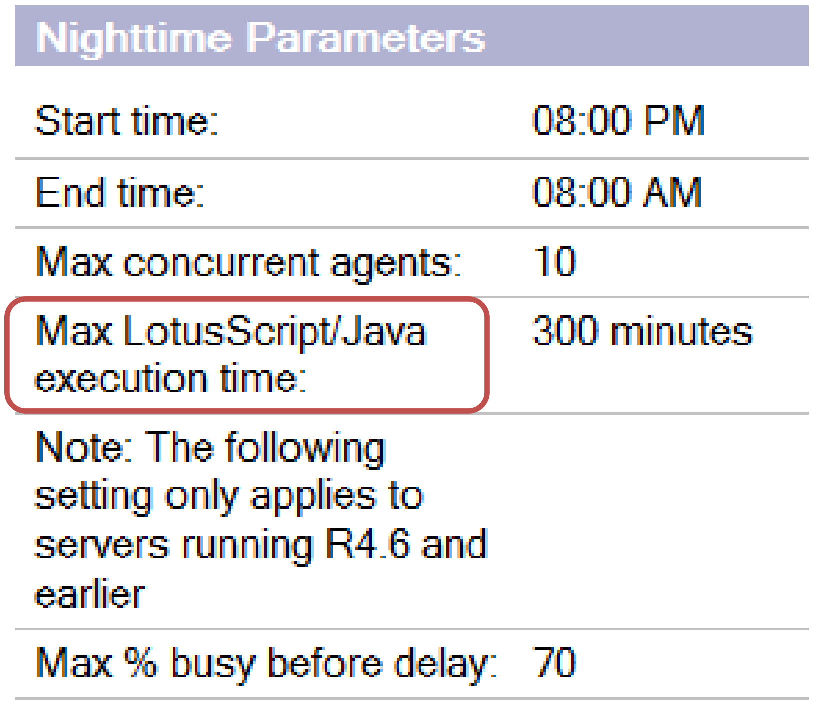
Domino Configuration – Where to Look For Bottlenecks

- Agent manager settings
  - Max concurrent agents
  - Max LotusScript/Java execution time



Daytime Parameters	
Start time:	08:00 AM
End time:	08:00 PM
Max concurrent agents:	4
Max LotusScript/Java execution time:	60 minutes
Note: The following setting only applies to servers running R4.6 and earlier	
Max % busy before delay:	50



Nighttime Parameters	
Start time:	08:00 PM
End time:	08:00 AM
Max concurrent agents:	10
Max LotusScript/Java execution time:	300 minutes
Note: The following setting only applies to servers running R4.6 and earlier	
Max % busy before delay:	70

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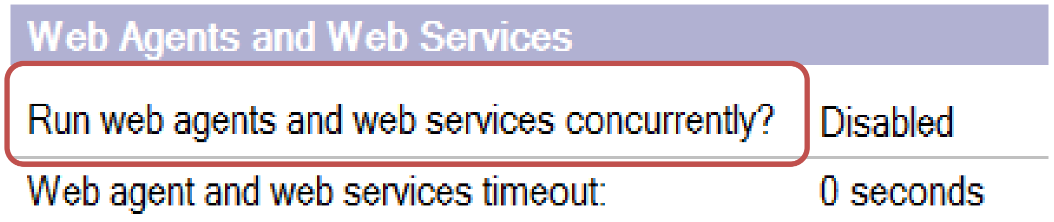
Domino Configuration – Where to Look for Bottlenecks

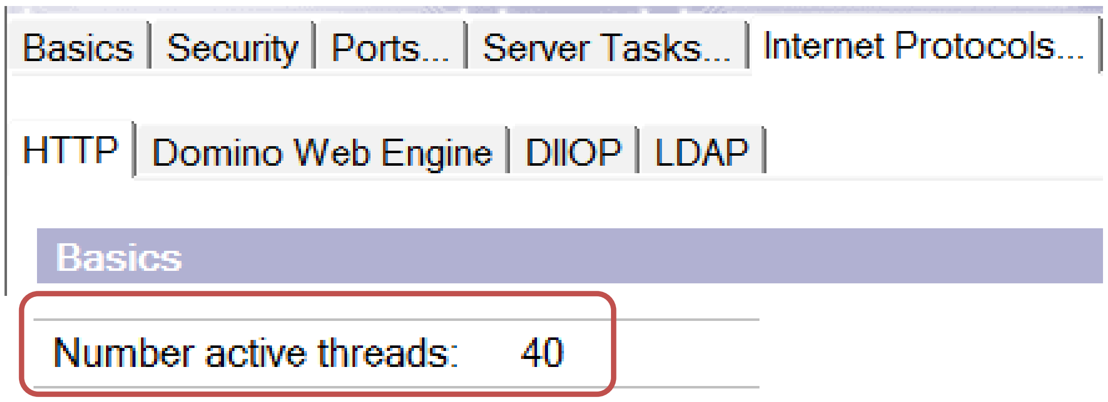
- Web agent settings
  - Run web agents and web services concurrently?
    - Set to 'Disabled' by default
    - Can dramatically impact web applications



Web Agents and Web Services

Run web agents and web services concurrently?	Disabled
Web agent and web services timeout:	0 seconds

- Number of HTTP threads
  - Http.PeakConnections
  - Http.Workers



Basics

Number active threads:	40

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Example 1

- Scenario
  - New IBM i LPAR
  - Three new Domino servers running on the LPAR
  - Very slow performance on all 3 Domino servers
    - All types of operations were slow
      - Opening databases, sending emails, working with applications, …
- Detective steps
  - Checked CPU utilization
    - Less than 10%
  - Checked memory utilization
    - Very low faulting rates
  - Checked disk utilization
    - Less than 5%
  - Checked network
    - Response times as expected
  - Checked Domino statistics
    - Nothing stood out

Example 1 (cont'd)

- What we know
  - There are ample hardware resources available
  - But they're not being used!
  - Domino through put is bottlenecked
  - What would cause that??
- Next steps
  - Checked number of threads available for processing in memory pool Domino was running in
    - BINGO!!
    - Not enough threads with default settings
- Resolution
  - Increased number of threads
  - Domino performance increased dramatically
  - CPU utilization increased

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Example 2

- Initial scenario
  - Recent upgrade of operating system (V5R4 -> V6R1)
  - Recent upgrade of Domino (7.0.3 -> 8.5.2)
  - Core application slow
  - End users complaining about response times
- Detective steps
  - Analyzed server performance (CPU, memory, disk)
    - No bottlenecks found
  - Analyzed notes.ini file
    - Found ‘PercentAvailSysResources’ set on server
      - Obsolete in Domino 8.x
- Next steps
  - Removed ‘PercentAvailSysResources’
  - Restarted Domino server
    - Performance improves, Domino is utilizing memory much better

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Example 2 (cont'd)

- Scenario after initial tuning
  - Performance great majority of time
  - Intermittent poor response times
- Detective steps
  - Ensured system performance monitor still active
  - Analyzed system performance data
  - Analyzed call stacks
  - Enabled semaphore debug
  - Enabled Domino statistic collection
  - Analyzed semaphore debug
  - Analyzed Domino statistics
  - Analyzed call stacks while performance issue occurred again

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Example 2 (cont'd)

- What we know
  - Large number of semaphore timeouts reported on the Domino server console
  - Number of active threads for HTTP task spikes from average of 25 threads to maximum of 512 threads
  - Faulting in Domino memory pool spikes when problem occurs
  - Server appears to be choking itself spending more time trying to check to see if it can now take its turn to process a request than performing actual work
  - Accesses to the Agent log database causing semaphore timeouts
- Resolution
  - Reduced size of Agent log database
  - Reduced number of HTTP threads to 100
  - Moved ODBC connection processing jobs (QSQSRVR) to separate memory pool
  - Overall throughput improved dramatically
  - No server performance complaints
  - HTTP requests average 55 ms (previously were 150 ms)

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Example 3

- Scenario
  - Taking 3-4 seconds to tab from field to field in application for remote users
- Detective steps
  - Enable client_clock=1
  - Analyzed output

```
584-150 [584]) OPEN_NOTE(REP86257959:00A51F20-NT00000796,00400000): 828 ms.
[48+64376=64424]
(585-150 [585]) READ_ENTRIES(REP86257959:00A51F20-NT00000796): 1062 ms. [76+55104=55180]
(586-152 [586]) DB_MODIFIED_TIME: 78 ms. [14+68=82]
(587-152 [587]) OPEN_NOTE(REP86257959:00A51F20-NT00000796,00400000): 813 ms.
[48+64376=64424]
(588-152 [588]) READ_ENTRIES(REP86257959:00A51F20-NT00000796): 844 ms. [76+55104=55180]
(589-153 [589]) DB_MODIFIED_TIME: 78 ms. [14+68=82]
(590-153 [590]) OPEN_NOTE(REP86257959:00A51F20-NT00000796,00400000): 828 ms.
[48+64376=64424]
(591-154 [591]) READ_ENTRIES(REP86257959:00A51F20-NT00000796): 812 ms. [76+55104=55180]
(592-155 [592]) DB_MODIFIED_TIME: 109 ms. [14+68=82]
```

  - See a pattern here??

Business. Made Social.

Example 3 (cont'd)

- What we know
  - Same database and "note" is being opened and read from over and over

```
584-150 [584]) OPEN_NOTE(REP86257959:00A51F20-NT00000796,00400000): 828 ms.
[48+64376=64424]
(585-150 [585]) READ_ENTRIES(REP86257959:00A51F20-NT00000796): 1062 ms.
[76+55104=55180
```

- Next steps
  - Use Find Note to identify note and analyze form design
- What we know
  - One view opened repeatedly
  - Found computed field doing lookup
  - Found form property "Automatically refresh fields" set on form
- Resolution
  - Changed form property
  - Changed view involved in lookup to not rebuild more than once an hour
  - Dramatically improved performance

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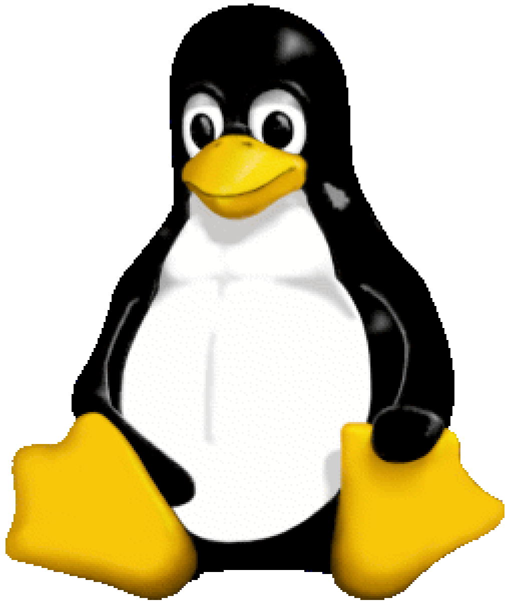
Please remember to fill out your evaluations!!

Linuxfest Returns to Lotusphere!

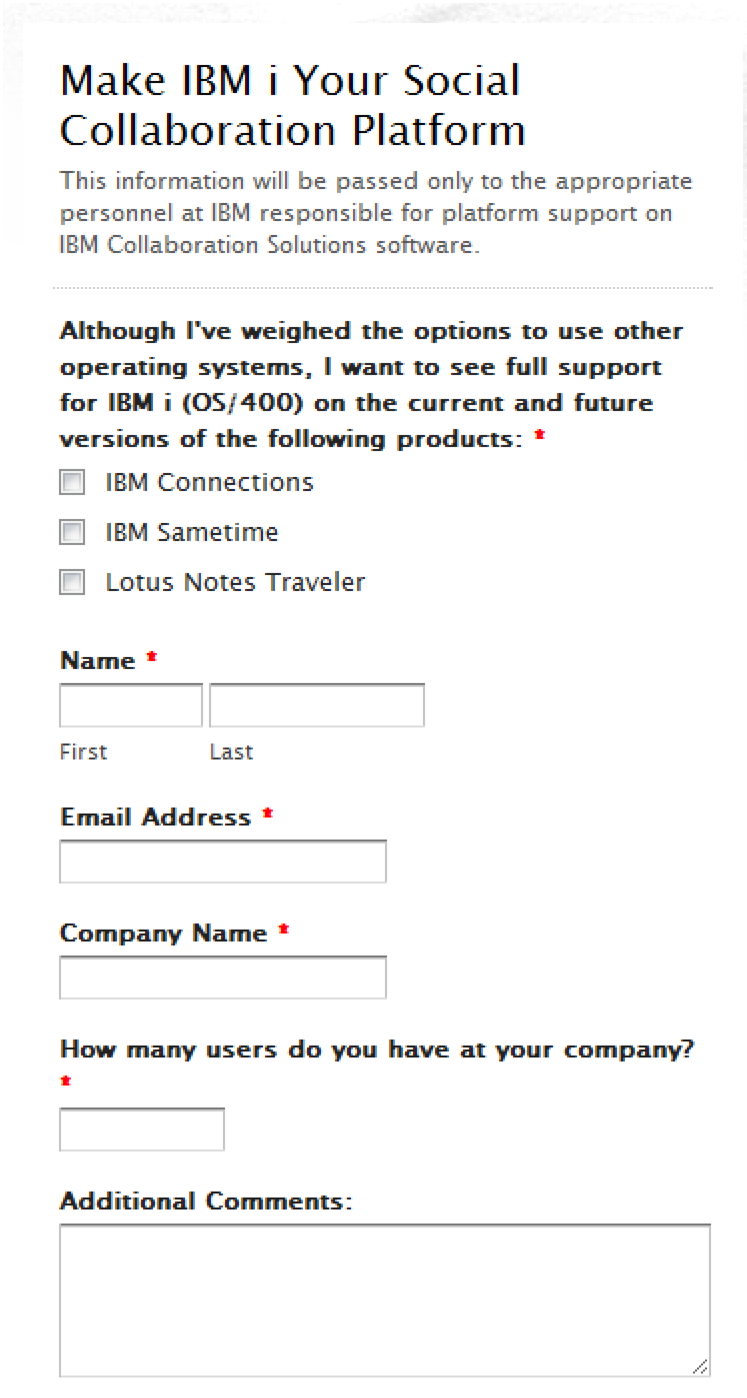


By Popular Demand, Linuxfest is at LS12

What:	*Linuxfest* III
When:	Thursday, 19 Jan
Where:	**Dolphin, Europe 6**
Time:	12:30 - 1:30 pm
Other:	Bring your box lunch!

We're not in the program guide, so mark your calendar

Lotusphere2012



Make IBM i Your Social Collaboration Platform

This information will be passed only to the appropriate personnel at IBM responsible for platform support on IBM Collaboration Solutions software.

Although I've weighed the options to use other operating systems, I want to see full support for IBM i (OS/400) on the current and future versions of the following products: *

- [ ] IBM Connections
- [ ] IBM Sametime
- [ ] Lotus Notes Traveler

Name *

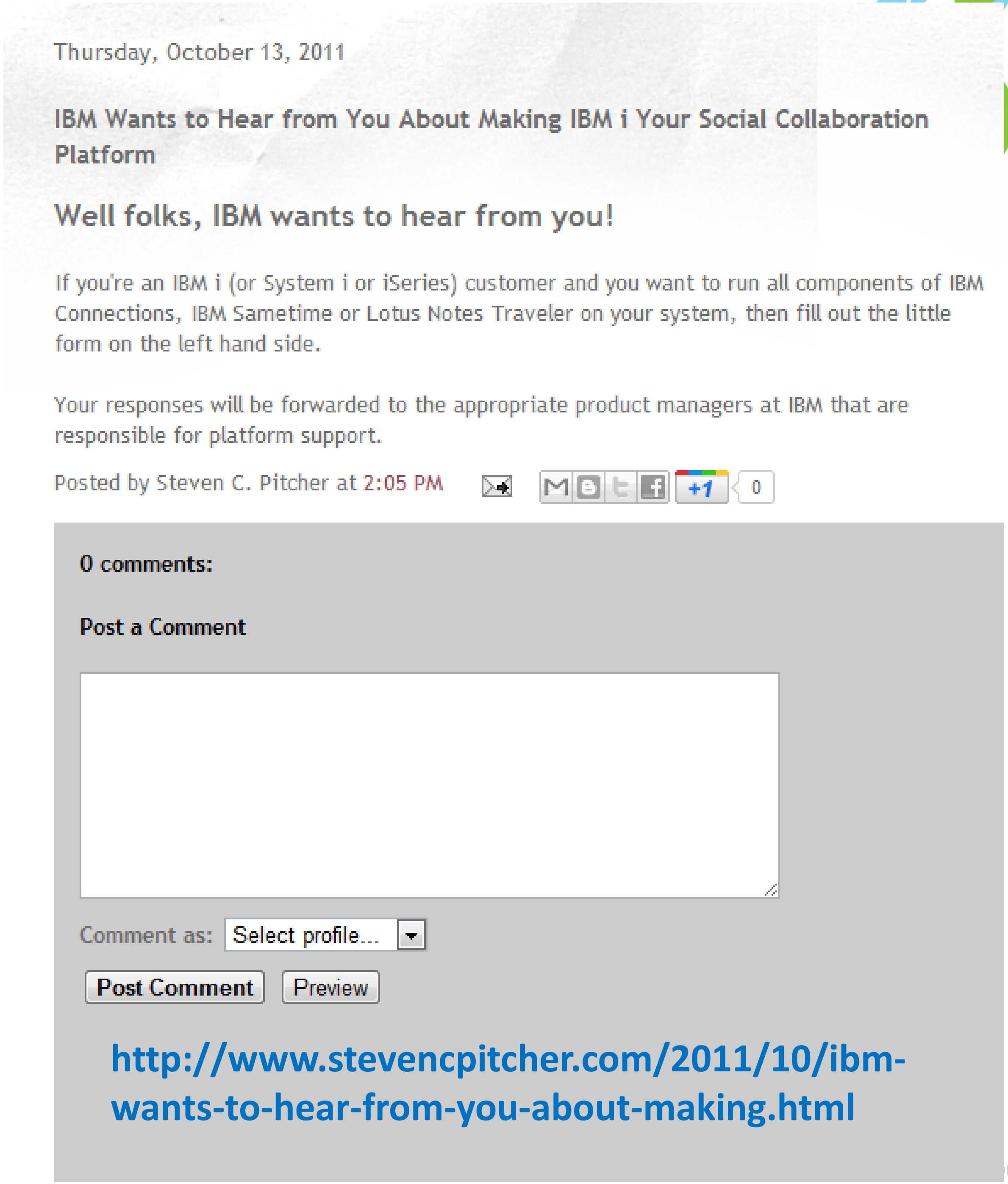
First Last

Email Address *

Company Name *

How many users do you have at your company? *

Additional Comments:



Thursday, October 13, 2011

IBM Wants to Hear from You About Making IBM i Your Social Collaboration Platform

Well folks, IBM wants to hear from you!

If you're an IBM i (or System i or iSeries) customer and you want to run all components of IBM Connections, IBM Sametime or Lotus Notes Traveler on your system, then fill out the little form on the left hand side.

Your responses will be forwarded to the appropriate product managers at IBM that are responsible for platform support.

Posted by Steven C. Pitcher at 2:05 PM

0 comments:

Post a Comment

Comment as: Select profile...

http://www.stevencpitcher.com/2011/10/ibm-wants-to-hear-from-you-about-making.html