

Cheetah's Administration Enhancements

John F. Miller III
IBM

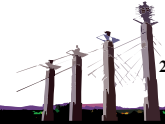
A01
Monday, April 28, 2008 • 9:30 a.m. – 10:30 a.m.

2008 IIUG Informix Conference



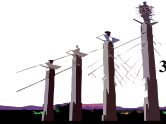
Goal

To introduce improvements in the Informix Database Servers administration infrastructure. Showing the DBA how they can leverage new and existing tools to improve their TCO. A demo of the newly updated Graphical Administration highlighting the major components.



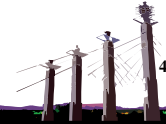
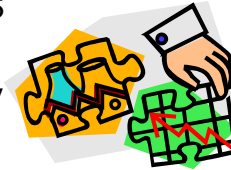
Agenda

- Introduction
- Administration Challenges
- Admin System Overview
- Featured Enhancements
 - Onstat & sysmaster
 - SQL Admin Commands
 - SQL Tracing
 - Database Scheduler
 - OpenAdmin Tool - Demo



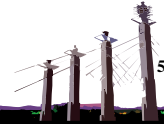
IDS Administration Challenges

- IDS lacked a programmatic administration interface, only command line was available
 - Difficult for third parties to build an IDS administration tool
 - Partners and customers can not easily integrate administration into their applications
- Repetitive DBA tasks difficult to automate
- Need for a centralized Health Center usable for both the database and applications



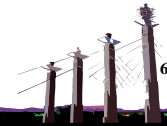
Administration Free Zone

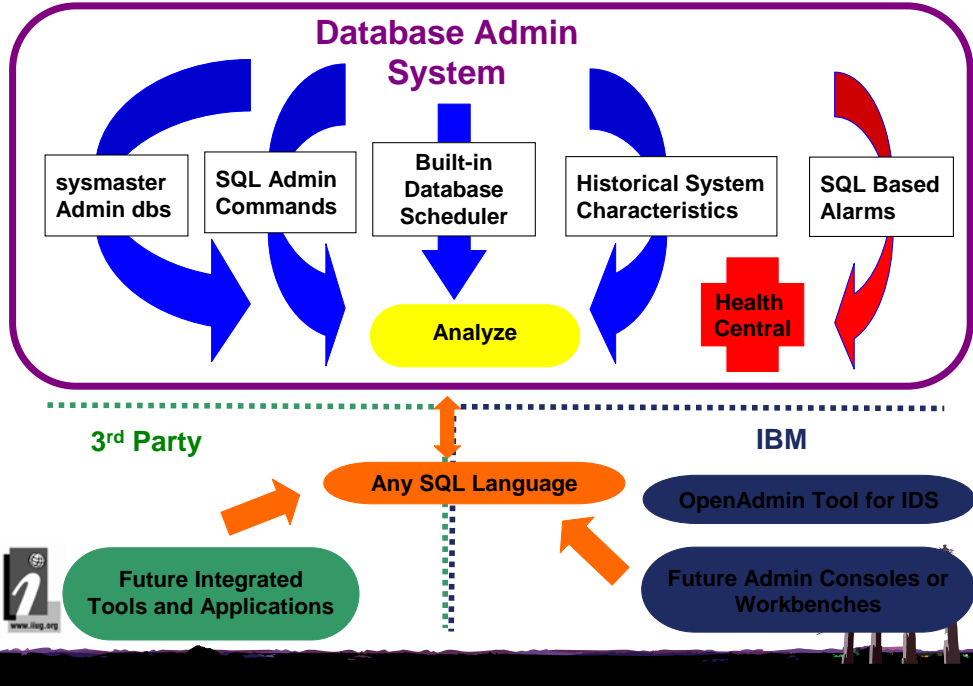
- Low Total Cost of Ownership and Deployment
- Easy Scalable Administration
- Open Admin API for customized administration
- Autonomic architecture
- Industrial strength, highly reliable - Install it, Set it up, and Forget about it.



Solutions

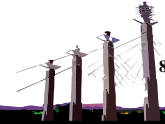
- Improvements to onstat
- Improved sysmaster database
- SQL Admin Commands
- SQL Query Tracing and Profiling
- Database Scheduler
- Health Management System
- OpenAdmin Tool for IDS (aka OAT)





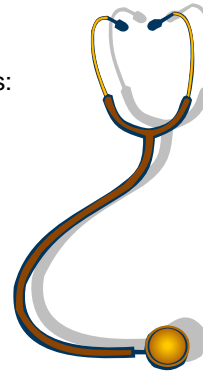
Laying the Foundation for Improvements

- A new database (sysadmin) for
 - Administrative functions
 - Alert System
 - Data collection
- Different methods for collecting information
- Additional information required to present in a way DBAs can understand



Improve Information for sysmaster and onstat

- Improve the display of information in the following areas:
 - Improved Thread Wait Information
 - Detailed Checkpoint Information
 - User/Server Environment Information
 - Online & onbar log files
 - Network Information (IO counts and times)
 - MGM Information
 - SQL Generic Cache Profiles
 - SQL Statement History



Make the information clear for the DBA to understand



New Sysmaster Tables

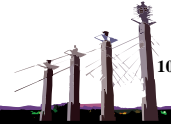
- New Tables

- syscheckpoint
- sysenvses
- sysenv
- sysonlineog
- sysbaract_log
- sysnetworkio
- sysdual
- syssqltrace
- syssqltrace_itr
- syssqltrace_info
- sysnetglobal
- sysnetclienttype
- [syslicenseinfo](#)
- [sysmachinfo](#)
- [syssqltrace_hvar](#)
- [MACH 11 Tables](#)



- Tables Modified

- systcblst
- sysscblst
- sysrstcb
- [sysvplist](#)



Current onstat -g ath

- Remove/Reduce the number of thread status of “sleeping forever”
- Give the DBA a clear picture of what is happening

```
Threads:
tid   tcb           rstcb        prty status                vp-class  name
2     10bbf36a8     0            2    sleeping forever       3lio     lio vp 0
3     10bc12218     0            2    sleeping forever       4pio     pio vp 0
4     10bc31218     0            2    sleeping forever       5aio     aio vp 0
5     10bc50218     0            2    sleeping forever       6msc     msc vp 0
6     10bc7f218     0            2    sleeping forever       7aio     aio vp 1
7     10bc9e540     10b231028    4    sleeping secs: 1       1cpu     main_loop()
8     10bc12548     0            2    running                 1cpu     tlitcpoll
9     10bc317f0     0            3    sleeping forever       1cpu     tlitcplst
10    10bc50438     10b231780    2    sleeping forever       1cpu     flush_sub(0)
11    10bc7f740     0            2    sleeping forever       8aio     aio vp 2
12    10bc7fa00     0            2    sleeping forever       9aio     aio vp 3
13    10bd56218     0            2    sleeping forever       10aio    aio vp 4
14    10bd75218     0            2    sleeping forever       11aio    aio vp 5
15    10bd94548     10b231ed8    3    sleeping forever       1cpu     aslogflush
16    10bc7fd00     10b232630    1    sleeping secs: 26      1cpu     btscanner 0
32    10c738ad8     10b233c38    4    sleeping secs: 1       1cpu     onmode_mon
50    10c0db710     10b232d88    2    cond wait netnorm     1cpu     sqlexec
```

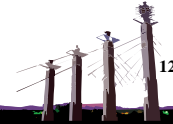


Improved onstat -g ath

```

Threads:
tid    tcb          rstcb      prty status          vp-class      name
2      10bbf36a8    0          2      IO Idle          3lio          lio vp 0
3      10bc12218    0          2      IO Idle          4pio          pio vp 0
4      10bc31218    0          2      running          5aio          aio vp 0
5      10bc50218    0          2      IO Idle          6msc          msc vp 0
6      10bc7f218    0          2      running          7aio          aio vp 1
7      10bc9e540    10b231028  4      sleeping secs: 1 1cpu          main_loop()
8      10bc12548    0          2      running          1cpu          tlitcpoll
9      10bc317f0    0          3      sleeping forever 1cpu          tlitcplst
10     10bc50438    10b231780  2      IO Wait          1cpu          flush_sub(0)
11     10bc7f740    0          2      IO Idle          8aio          aio vp 2
12     10bc7fa00    0          2      IO Idle          9aio          aio vp 3
13     10bd56218    0          2      IO Idle          10aio         aio vp 4
14     10bd75218    0          2      IO Idle          11aio         aio vp 5
15     10bd94548    10b231ed8  3      sleeping forever 1cpu          aslogflush
16     10bc7fd00    10b232630  1      sleeping secs: 34 1cpu          btscanner 0
32     10c738ad8    10b233c38  4      sleeping secs: 1 1cpu          onmode_mon
50     10c0db710    10b232d88  2      IO Wait          1cpu          sqlexec

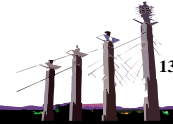
```



New onstat -g cpu

```
Thread CPU Info:
tid   name      vp      Last Run      CPU Time      #scheds      status
2     lio vp 0   3lio*   02/12 13:28:03 129.2453     7448     IO Idle
3     pio vp 0   4pio*   02/12 13:28:03 14.6759      428      IO Idle
4     aio vp 0   5aio*   02/12 13:28:03 35.5862     6800     IO Idle
5     msc vp 0   6msc*   02/11 23:57:05  8.1349      568      IO Idle

16    aio vp 4   11aio*  02/12 13:28:03 16.3634     1198     IO Idle
17    aio vp 5   12aio*  02/12 13:28:03 15.8946     119      IO Idle
18    aslogflush lcpu     02/12 13:39:48  0.5008     94383    sleeping secs: 1
19    btscanner_0 lcpu     02/12 13:38:55  0.3053     3514     sleeping secs: 58
20    onmode_mon lcpu     02/12 13:39:48  0.6606     94385    sleeping secs: 1
41    dbScheduler lcpu*    02/12 13:35:26  0.9059     555      sleeping secs: 38
42    dbWorker1 lcpu     02/12 13:25:25 18.4765     5206     sleeping forever
43    dbWorker2 lcpu     02/12 13:25:25 13.2069     3299     sleeping forever
46    bf_priosweep() lcpu     02/12 13:38:04  0.3248     314      cond wait bp_cond
236   sqlxec lcpu     02/11 16:10:43  0.0549     185      cond wait sm_read
```



CPU Efficiency onstat -g glo

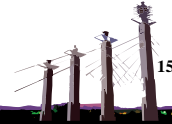
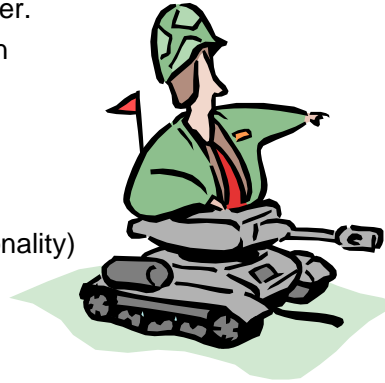
Individual virtual processors:

vp	pid	class	usercpu	syscpu	total	Thread	Eff
1	3070	cpu	44.41	1.11	45.52	127.12	35%
2	3072	adm	0.20	0.33	0.53	0.00	0%
3	3073	lio	0.12	0.33	0.45	129.26	0%
4	3074	pio	0.03	0.10	0.13	14.58	0%
5	3075	aio	0.08	0.24	0.32	35.50	0%
6	3076	msc	0.05	0.02	0.07	8.04	0%
7	3077	aio	0.03	0.06	0.09	17.64	0%
8	3079	soc	0.42	0.26	0.68	NA	NA
9	3081	aio	0.04	0.08	0.12	22.26	0%
10	3082	aio	0.03	0.07	0.10	21.94	0%
11	3083	aio	0.04	0.06	0.10	16.37	0%
12	3084	aio	0.02	0.06	0.08	15.49	0%
		tot	45.47	2.72	48.19		



SQL Admin Commands

- A set of User Defined Routines (UDRs) to administer the Informix database server.
- The major categories of administration include:
 - Space Management
 - Configuration Management
 - Routine task maintenance
 - System Validation (oncheck functionality)
- Feature Benefits
 - SQL Based Administration
 - Remote Administration
 - Tracking of command execution and results in a system table



Admin Commands – Two New UDRs

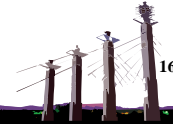
- Two UDRs called *task* & *admin* are part of the sysadmin database
- They perform exactly the same, only the return code is different
 - *task()* UDR returns a character string describing the return status

```
EXECUTE FUNCTION task('create dbspace', 'dbspace2', '/CHUNKS/dbspace2');  
(expression) created dbspace number 2 named dbspace2
```

- *admin()* UDR returns a integer return status which is a link to the *command_history* table

```
EXECUTE FUNCTION admin('create dbspace', 'dbspace2', '/CHUNKS/dbspace2');  
(expression) 107
```

- Both UDRS log all executions into a table called *command_history* in the *sysadmin* database



SQL Admin Commands - Parameters

- Environment Variable Expansion
 - A pathname may start with an environment variable.
 - The environment variable may only exist in the server's environment
- Unit Extensions
 - All offsets and sizes can be provided with unit extensions
 - The extensions are case insensitive
 - Default is KB
 - PB, TB, GB, MB, KB, B



SQL Admin Commands – EXAMPLE

```
EXECUTE FUNCTION  
    admin('create dbspace','dbs2','$INFORMIXDIR/dbspace2','20MB`'  
(expression)          108
```

```
SELECT * FROM command_history WHERE cmd_number IN (108);
```

```
cmd_number      108  
cmd_exec_time   2005-11-17 16:26:15  
cmd_user        informix  
cmd_hostname    olympia.vernco.com  
cmd_executed    create dbspace  
cmd_ret_status  0  
cmd_ret_msg     created dbspace number 2 named dbspace2
```



DBA Constant Struggle

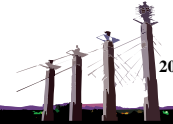
Identifying Performance Bottlenecks in SQL Statements

- Current methods for examination
 - Set explain
 - Looking at database objects accessed by the SQL for inefficiency
- Lack of simplicity in the process
- Hard to build a repeatable process



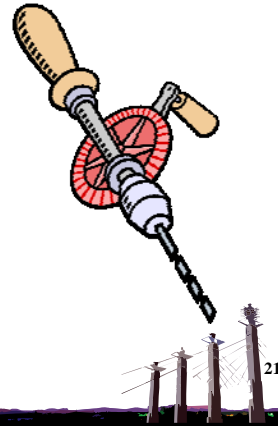
Questions DBAs like to ask?

- How long did a SQL statements take?
- How many resources of each category did a statement take?
 - Disk I/O
 - Memory
 - CPU
- How long and how many times did we wait on each resource?
 - Locks
 - Disk I/O



SQL Query Drill Down Feature

- Provide consolidated detail information about SQL statements through all layers
- Information available through
 - Onstat
 - sysmaster database
 - OpenAdmin Tool for IDS (aka OAT)
- Dynamically configurable
- Global and User Tracing modes
- Find the slowest query with only three clicks of the mouse



Controlling SQL Query Drill Down

- ONCONFIG variable SQLTRACE
 - Level =[off,low,med,high]
 - Ntraces=[number of traces]
 - Size=[size of each trace buffer in KB]
 - Mode=[global|user]

```
SQLTRACE level=low,ntraces=2000,size=1,mode=global
```

- Turn off SQL Tracing for session id 147

```
execute function task("SET SQL USER TRACING OFF",147);
```



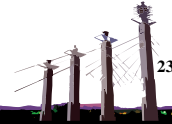
Controlling SQL Query Drill Down

- Dynamically enable or modify SQL Tracing
 - Trace 2000 SQL statements
 - Trace 1024 bytes of data for each SQL statement

```
execute function task("SET SQL TRACING ON",2000,1);
```

- Turn off SQL Tracing

```
execute function task("SET SQL TRACING OFF");
```



SQL Query Drill Down - onstat

```

Database:          sysadmin
Statement text:
SELECT MAX(run_task_seq) FROM ph_run A, ph_task B WHERE A.run_task_id = ?
AND A.run_task_id = B.tk_id AND A.run_time + B.tk_delete < CURRENT

Iterator/Explain
=====
  ID  Left  Right  Est Cost  Est Rows  Num Rows  Type
  ---  ---  ---  ---  ---  ---  ---
   3    0    0        1         1         1  Index Scan
   4    0    0       19        545         1  Index Scan
   2    3    4       20         5         1  Nested Join
   1    2    0        1         1         1  Group

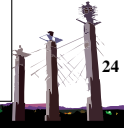
Statement information:
Sess_id  User_id  Stmt Type          Finish Time      Run Time
  21      0      SELECT              10:51:11         0.0023

Statement Statistics:
Page      Buffer      Read      Buffer      Page      Buffer      Write
Read      Read      % Cache  IDX Read  Write     Write     % Cache
  0         77       100.00   0         0         0         0.00

Lock      Lock      LK Wait   Log      Num      Disk      Memory
Requests  Waits     Time (S)  Space    Sorts    Sorts     Sorts
  0         0        0.0000   0.000 B  0        0         0

Total      Total      Avg      Max      Avg      I/O Wait  Avg Rows
Executions Time (S)   Time (S) Time (S)  IO Wait   Time (S)  Per Sec
  220      78.8463   0.3584   1.9557   0.000000 0.000000  439.9908

Estimated Estimated Actual   SQL      ISAM      Isolation  SQL
Cost      Rows     Rows    Error    Error     Level     Memory
  20        1        1       0        0         DR        41552
    
```



Built-in Database Scheduler

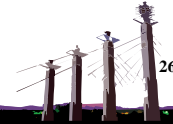
- Ability to schedule SQL, Stored procedures or a UDR
- The schedule entities are called “tasks”
- There are different types of tasks
 - Tasks
 - Sensor
 - Startup Task
 - Startup Sensor
- Tasks are driven by the data inside a table called ***ph_task***

- Sensors are a specialized task designed to collection information
 - Easy to add and configure
 - Collect information and stores it in database tables

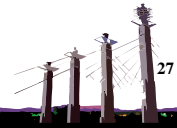


Why use Tasks and Sensors?

- A way of ensuring routine jobs get completed
- Periodically check and/or analyze collected data to ensure the data server is operating efficiently
- Sensors provide a simple way of collecting information
 - Easy to add a new sensor
 - Provide a portable way of collecting information without using the operating system.



Admin Console



What is OpenAdmin Tool for IDS?

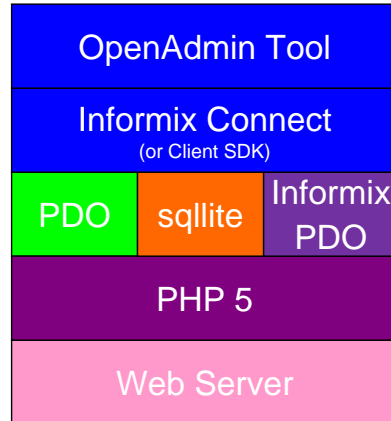
- OAT is a web-based administration tool for the IBM Informix Database Server V11 and moving forward
- A single OAT installation can administer one or more data servers
- No additional software is needed on the data server



The OAT Stack

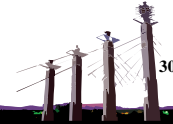
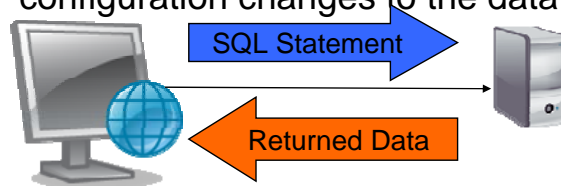


- Components which are required to run OpenAdmin Tool for IDS
- 100% Free
- Available from various sources
 - Individual pieces
 - Bundles
 - Zend Core for IBM
 - XAMPP

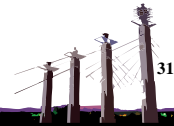
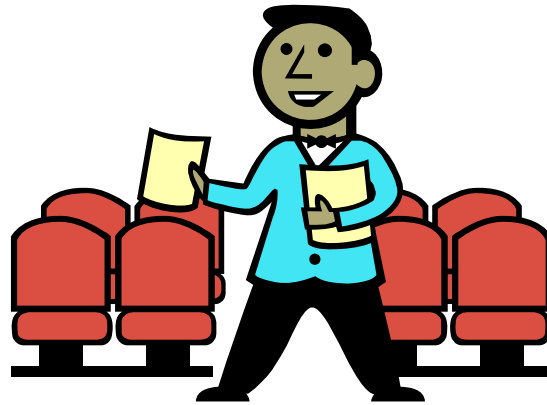


OAT Data Server Interaction

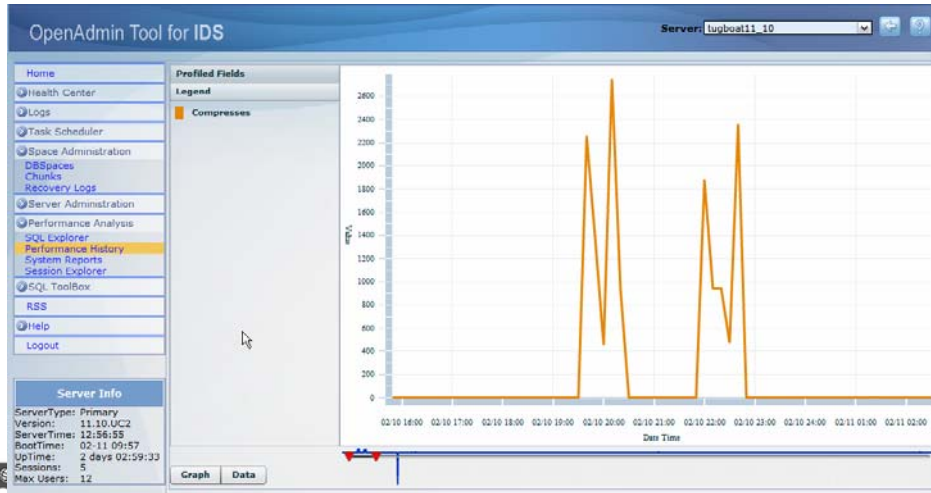
- OAT accesses the data server using only standard SQL statements
 - Uses the existing sysmaster database to retrieve performance and monitoring data
 - Utilizes the SQL Admin API to make configuration changes to the data server



Live Demo



Performance History Graph



DBSpace Explorer



Query Drill Down

Statement Type
Transaction Time
Frequency
SQL Tracing Admin
SQL Profile

SQL Profile

1. Sort	
Cost	1
Rows estimated	1
Rows processed	1
Elapsed Time	0.0388

2. Seq Scan	
Table	ph_task
Cost	8
Rows estimated	1
Rows processed	13
Elapsed Time	0.0103

Session ID	User ID	Statement Type	PDQ	Statement Completion Time	Response Time
25	200	SELECT	0	2008-02-13 15:12:49	0.0010357 Sec

Database: *SELECT FIRST 1 (+first_rows) tk_id, tk_sequence, tk_result_table, tk_execute, tk_delete, tk_start_time, tk_stop_time, tk_next_execution, tk_frequency, tk_attributes, tk_type, tk_name, tk_db, (tk_next_execution - CURRENT)::INTERVAL SECOND(9) TO SECOND::char(20)::integer as tm_rem, (decode(tk_sunday, '1,1,0') + decode(tk_monday, '1,2,0') + decode(tk_tuesday, '1,4,0') + decode(tk_wednesday, '1,8,0') + decode(tk_thursday, '1,16,0') + decode(tk_friday, '1,32,0') + decode(tk_saturday, '1,64,0'))::integer as tm_days FROM ph_task WHERE tk_id NOT IN (?,?,?,?,?,?,?) AND tk_next_execution IS NOT NULL AND tk_enable ORDER BY tk_next_execution, tk_priority *

Statement Statistics						
Page Reads	Buffer Reads	Reads Cache	Data Buffer Reads	Index Buffer Reads	Page Writes	Buffer Writes
0	39	100.00 %	39	0	0	0.00 %
Lock Requests	# Lock Waits	Lock Wait Time (S)	Log Space	Disk Sorts	Memory Sorts	Number of Tables
0	0	0	0.000 B	0	0	2
Total Executions	Total Executions Time (S)	Average Execution Time (S)	Maximum Execution Time (S)	Number of IO Wait	IO Wait Time (S)	Average IO Wait (S)
36	0.10855	0.00301	0.00299	0	0.00000	0.00000
Estimated Cost	Estimated Rows	Actual Rows	SQL Error	ISAM Error	Isolation Level	SQL Memory
8	1	1	0	0	1	80.2 KB

Server Info

ServerType: Primary
Version: 11.50.F
ServerTime: 15:15:28
BootTime: 02-13 13:32
UpTime: 01:23:22
Sessions: 4
Max Users: 2
Operating System
Total Mem: 7.78 GB
Free Mem: 145 MB
of CPU: 4

MACH Explorer



OpenAdmin Tool for IDS Server: serv1

Home | Health Center | Logs | Admin Command | Online Messages | OnBar Activity | Task Scheduler | Space Administration | DBSpaces | Chunks | Recovery Logs | Server Administration | **MACH** | Configuration | System Validation | User Privileges | Virtual Processors | Auto Update Statistics | Performance Analysis | SQL Explorer | Performance History | System Reports | Session Explorer | SQL Toolbox | Databases | Schema Browser | SQL Editor | RSS | Help | Logout

Find Clusters | Add SDS | Connection Manager

Clusters

- Cluster 1
- Cluster 2**

Cluster Topology

Server	Type	Server Status	Connection Status	Workload	Lag Time	
serv1	Primary	Active	Connected	0.03	0.0000	Modify
serv1_rec	HDR	Active	Connected	0.00	0.0022	Modify
hurray	SDS	Active	Connected	0.04	0.0003	Modify
iani	SDS	Active	Connected	0.00	0.0003	Modify
serv1_sds5	SDS	Active	Connected	0.00	0.0003	Modify

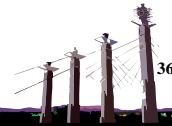
Server Info
 ServerType: Primary
 Version: 11.50.FC1
 ServerTime: 17:01:14
 BootTime: 02-04 11:04

New sysmaster table sysmachineinfo

OpenAdmin Tool for IDS

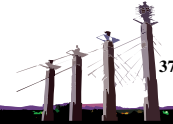
<ul style="list-style-type: none"> Home Health Center Logs Task Scheduler Space Administration Server Administration Performance Analysis SQL Explorer Performance History System Reports Session Explorer SQL ToolBox RSS Help Logout 	<p>Computer Information</p> <p>Host Name: idas OS Name: Linux OS Release: 2.6.9-34.ELsmp OS Version: #1 SMP Fri Feb 24 16:56:28 EST 2006 Computer Type: x86_64 Computer Total Memory: 7.78 GB Computer Free Memory: 243 MB Processors: 4 OS Pagesize: 4096 Maximum Open Files per Process: 32768</p> <p>Shared Memory Information</p> <p>Shmmx: 33554432 Shmmn: 1 Shmids: 4096 Shmnumsegs: 2097152</p> <p>Semaphore Information</p> <p>Semmap: Semids: 18496787 Semnum: 1295314224 Semundo: 1295314224 Semnumperid: 250 Semops: 1295314256 Semundoperproc: 0 Semundosize: 20 Semmaxvalue: 32767</p>
---	--

<p>Server Info</p> <p>ServerType: Primary Version: 11.50.F ServerTime: 11:45:43 BootTime: 02-11 11:24 UpTime: 2 days 00:20:56 Sessions: 6 Max Users: 3</p>



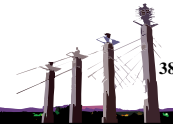
Recent Improvements in OpenAdmin

- Dynamic Reconfiguration
- Onconfig analyzer and recommendation
- Historical Data Graphs
- Data/Index Checking
- Memory Statistics
- Switching between server
- Task Scheduler improvements
- Menu Highlighting and restructuring
- MACH 11 start/stop server
- Read only access to server.
- Redesigned Help system
- Simple installer
- MACH 11 connection manager wizard
- Improved documentation and FAQ
- Auto Update Statistics



Other New Administration Features

- Alarm Message in the ph_alert table
- Database Scheduler does day of week
- SQL Trace Improvements
 - The iterator table
 - Part numbers of all scan iterators
 - Time spent running iterators
 - Add table called syssqltrace_hvar
 - Contains host variables
- Improved Index Usage



Questions ???

