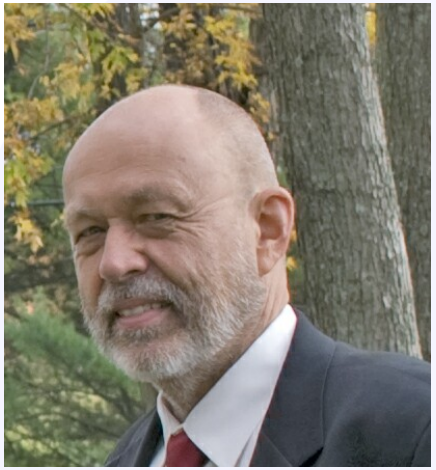
Informix Performance Tuning using:
SQLTrace, Remote DBA Monitoring and Yellowfin BI

by
Lester Knutsen and Mike Walker

Webcast on July 2, 2013

Lester Knutsen



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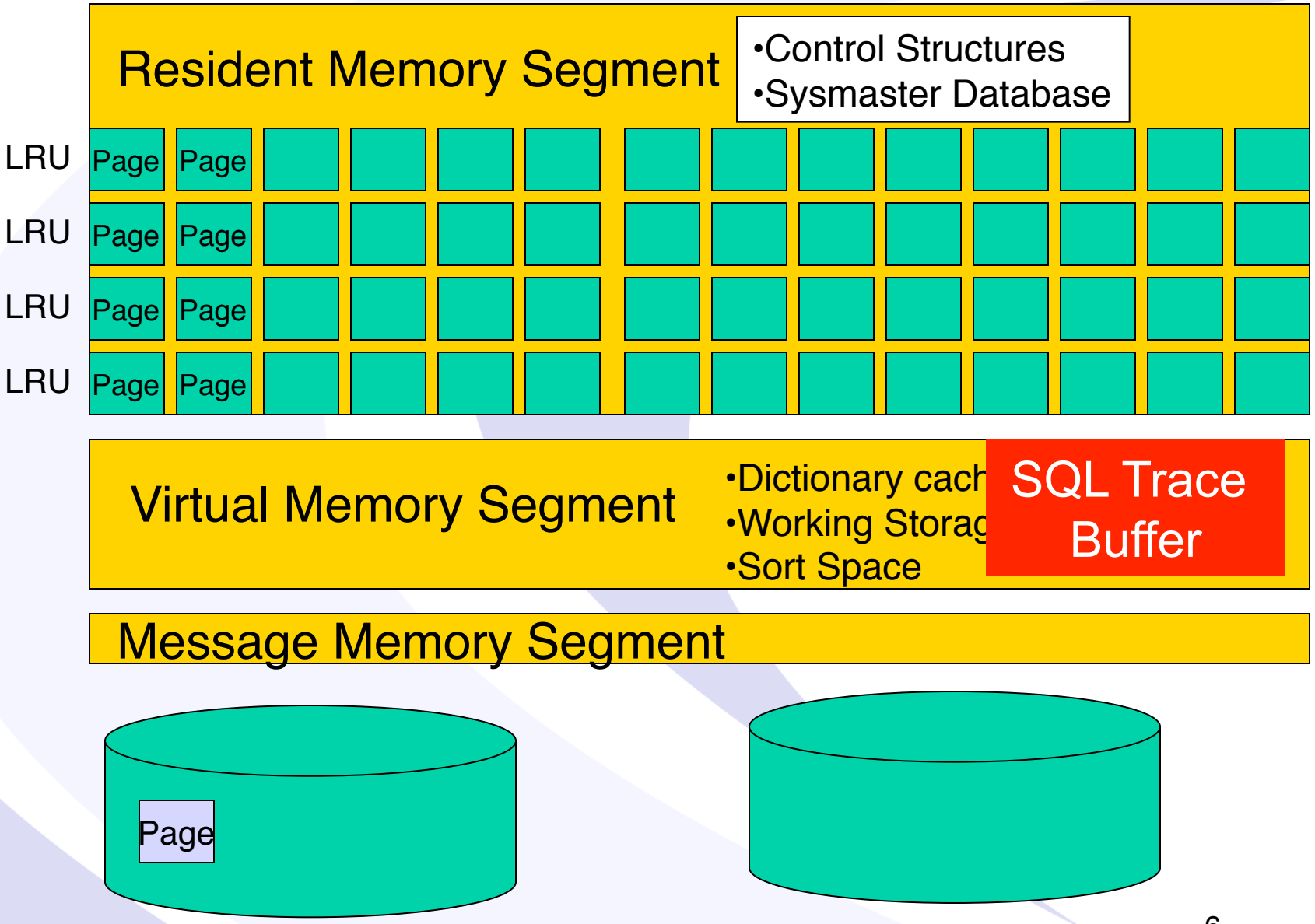
Agenda

- Using SQL Trace to monitor user sessions
- Remote DBA monitoring tips
- Monitoring Dashboard with Yellowfin BI

SQL Trace

- New Feature in Informix 11 to collect SQL statements,
  - Statistics
  - resource usage
  - performance measures
- Default is OFF

Informix Memory Structures



SQL Trace Buffer

- When SQL Trace is turned “ON” an FIFO buffer is created in the Virtual Segment of Informix Memory
- Oldest SQL data is discarded to make room for new data
- On a busy system, the buffer can fill up and turnover in seconds
- Default amount of memory is 2 MB

SQL Trace Configuration
Level - Amount of data to collect

- Off – Default - No SQL tracing
- Low – Default when On. Collects statement statistics, statement text, and statement iterators
- Medium - Collects all low-level tracing, plus table names, the database name, and stored procedure stacks
- High - Collects all of the information included in medium tracing, plus host variables

SQL Trace Setting					
Low		Medium		High	
sql_id	3627211	sql_id	4345330	sql_id	4756333
sql_address	13,106,538,016	sql_address	13,022,460,376	sql_address	13,021,440,688
sql_sid	583	sql_sid	89	sql_sid	312
sql_uid	502	sql_uid	502	sql_uid	502
sql_stmttype	4	sql_stmttype	2	sql_stmttype	4
sql_stmtname	UPDATE	sql_stmtname	SELECT	sql_stmtname	UPDATE
sql_finishtime	1372775249	sql_finishtime	1372775388	sql_finishtime	1372775472
sql_begintxtim	1815720304	sql_begintxtim	1816688410	sql_begintxtim	1817240068
sql_runtime	7.58E-05	sql_runtime	2.66E-06	sql_runtime	9.21E-05
sql_pgreads	0	sql_pgreads	0	sql_pgreads	0
sql_bfreads	4	sql_bfreads	0	sql_bfreads	4
sql_rdcache	100	sql_rdcache	0	sql_rdcache	100
sql_bfidxreads	0	sql_bfidxreads	0	sql_bfidxreads	0
sql_pgwrites	0	sql_pgwrites	0	sql_pgwrites	0
sql_bfwrites	1	sql_bfwrites	0	sql_bfwrites	1
sql_wrcache	100	sql_wrcache	0	sql_wrcache	100
sql_lockreq	5	sql_lockreq	0	sql_lockreq	5
sql_lockwaits	0	sql_lockwaits	0	sql_lockwaits	0
sql_lockwttime	0	sql_lockwttime	0	sql_lockwttime	0
sql_logspace	304	sql_logspace	0	sql_logspace	296
sql_sorttotal	0	sql_sorttotal	0	sql_sorttotal	0
sql_sortdisk	0	sql_sortdisk	0	sql_sortdisk	0
sql_sortmem	0	sql_sortmem	0	sql_sortmem	0
sql_executions	1069	sql_executions	475	sql_executions	504
sql_totaltime	0.118188146	sql_totaltime	0.002672804	sql_totaltime	0.195890748
sql_avgtime	0.00011056	sql_avgtime	5.63E-06	sql_avgtime	0.000388672
sql_maxtime	0.003268819	sql_maxtime	0.001169063	sql_maxtime	0.123698502
sql_numiowait	0	sql_numiowait	0	sql_numiowait	0
sql_avgiowaits	0	sql_avgiowaits	0	sql_avgiowaits	0
sql_totaliowait	0	sql_totaliowait	0	sql_totaliowait	0
sql_rowsperse	13200.98846	sql_rowsperse	376251.0913	sql_rowsperse	10862.90852
sql_estcost	1	sql_estcost	2	sql_estcost	1
sql_estrows	1	sql_estrows	1	sql_estrows	1
sql_actualrows	1	sql_actualrows	0	sql_actualrows	1
sql_sqlerror	0	sql_sqlerror	0	sql_sqlerror	0
sql_isamerror	0	sql_isamerror	0	sql_isamerror	0
sql_isollevel	2	sql_isollevel	2	sql_isollevel	2
sql_sqlmemor	18680	sql_sqlmemor	31064	sql_sqlmemor	18680
sql_numiterat	1	sql_numiterat	1	sql_numiterat	1
sql_database	<None>	sql_database	benchmark3	sql_database	benchmark3
sql_numtables	0	sql_numtables	0	sql_numtables	0
sql_tablelist	None	sql_tablelist	customer	sql_tablelist	district
sql_statement	UPDATE district SET d	sql_statement	SELECT	sql_statement	UPDATE
sql_stmtlen	67	sql_stmtlen	212	sql_stmtlen	67
sql_stmthash	1242825219	sql_stmthash	988199070	sql_stmthash	1242825219
sql_pdq	0	sql_pdq	0	sql_pdq	0
sql_num_hvar	3	sql_num_hvar	3	sql_num_hvar	3
sql_dbspartnu	11534338	sql_dbspartnu	11534338	sql_dbspartnu	11534338
sql_aqt	None	sql_aqt	None	sql_aqt	None
sql_aqtinfo	0	sql_aqtinfo	0	sql_aqtinfo	0

SQL Trace Level differences for Low Medium and High

SQL Trace Configuration

- Number of Traces to collect - Default is 1000
- Size of data to collect – Default is 2KB
- Scope of Traces
  - Global – Default is all users
  - User – Specific user list to trace
- **onconfig.std value**

#SQLTRACE
level=low,ntraces=1000,size=2,mode=global

SQL Trace Data

- User ID of the user who ran the command
- Session ID
- Database
- Type of SQL statement
- Duration of the SQL statement execution
- Time statement completed
- Text of the SQL statement or a function call
- Database isolation level

SQL Trace Statistics

- Number of buffer reads and writes
- Number of page reads and writes
- Number of sorts and disk sorts
- Number of lock requests and waits
- Number of logical log records
- Number of index buffer reads
- Estimated number of rows
- Optimizer estimated cost
- Number of rows returned

Sysmaster Tables – View into the SQL Trace Buffer

- Syssqltrace - detailed information about a single SQL statement
- Syssqltrace_info - information about the SQL profile trace system
- Syssqltrace_iter - lists the SQL statement iterators.

Syssqltrace -1 of 2

sql_id	Unique SQL execution ID
sql_address	Address of the statement in the code block
sql_sid	Database session ID of the user running the SQL statement
sql_uid	User ID of the statement running the SQL
sql_stmttype	Statement type
sql_stmtname	Statement type displayed as a word
sql_finishtime	Time this statement completed (UNIX)
sql_begintxtime	Time this transaction started
sql_runtime	Statement execution time
sql_pgreads	Number of disk reads for this SQL statement
sql_bfreads	Number of buffer reads for this SQL statement
sql_rdcache	Percentage of time the page was read from the buffer pool
sql_bfidxreads	Number of index page buffer reads
sql_pgwrites	Number of pages written to disk
sql_bfwrites	Number of pages modified and returned to the buffer pool
sql_wrcache	Percentage of time a page was written to the buffer pool
sql_lockreq	Total number of locks required by this SQL statement
sql_lockwaits	Number of times the SQL statement waited on locks
sql_lockwttime	Time the system waited for locks during SQL statement
sql_logspace	Amount of space the SQL statement used in the logical log
sql_sorttotal	Number of sorts that ran for the statement
sql_sortdisk	Number of sorts that ran on disk
sql_sortmem	Number of sorts that ran in memory
sql_executions	Number of times the SQL statement ran
sql_totaltime	Total amount of time spent running the statement
sql_avgtime	Average amount of time spent running the statement
sql_maxtime	Maximum amount of time spent executing the SQL statement

Syssqltrace - 2 of 2

sql_numiowaits	Number of times an I/O operation had to wait
sql_avgiowaits	Average amount of time that the SQL statement had to wait
sql_totaliowaits	Amount of time that the SQL statement had to wait for I/O.
sql_rowspersec	Average number of rows (per second) produced
sql_estcost	Cost associated with the SQL statement
sql_estrows	Estimated number of rows returned for the SQL statement
sql_actualrows	Number of rows returned for the SQL statement
sql_sqlerror	SQL error number
sql_isamerror	RSAM/ISAM error number
sql_isollevel	Isolation level of the SQL statement.
sql_sqlmemory	Number of bytes needed to execute the SQL statement
sql_numiterators	Number of iterators used by the statement
sql_database	Database name
sql_numtables	Number of tables used in executing the SQL statement
sql_tablelist	List of table names directly referenced in the SQL statement.
sql_statement	SQL statement that ran

Display SQL Trace using Onstat –g his

- Shows current setting
- Shows SQL Statements
- Shows Statistics

- Detail displayed depends on Level

SQL API for SQL Trace

- execute function sysadmin:task ("set sql tracing info");
  - The task() function returns a textual message
- execute function sysadmin:admin ("set sql tracing info");
  - The admin() function returns an integer

SQL API for SQL Trace

- "set sql tracing info”
- "set sql tracing off”
- "set sql tracing resume”
- "set sql tracing suspend”
- "set sql tracing on",
  "num_traces","trace_size","level","mode”

SQL API for SQL Trace

- "set sql tracing database add",
  "database_name”
- "set sql tracing database clear”
- "set sql tracing database list”
- "set sql tracing database remove",
  "database_name”

SQL API for SQL Trace

- "set sql tracing session", "clearlofflon",
  "session_id”
- "set sql tracing user add","user_name”
- "set sql tracing user clear”
- "set sql tracing user list”
- "set sql tracing user remove”
- "set sql user tracing clear","session_id”
- "set sql user tracing off”
- "set sql user tracing on"

Script to Turn ON SQL Trace

```
##  File: SQLtraceon.sh
##  Date:12/7/2012
##  Author: Art Kagel
##  Description: Turns on SQL trace with parameters

read -p "numtrace: " num
read -p "size: " sz
read -p "level: " lvl
read -p "mode/user: " usr
dbaccess -e sysadmin - <<EOF
execute function task( "set sql tracing on", "$num",
   "$sz", "$lvl", "$usr");
EOF
```

SQL Trace Demo

- Examples

Saving SQL Trace Data

- Informix 12.10 – New Task ships with the Scheduler called "Save SQL Trace”
- Copies SQL Trace data to the Sysadmin database
- Need to enable this task in the Sysadmin database
  - update ph_task set tk_enable = "f" where tk_name = "Save SQL Trace";

Saving SQL Trace Data

- Informix 12.10 – New Task ships with the Scheduler called "Save SQL Trace”
- See:
  - $INFORMIXDIR/etc/sysadmin/ sch_sqlcap.sql

Recommendations

- The Sysadmin task to turn on and off SQL trace is more flexible then the ONCONFIG
- Keep the number and size of the SQL Trace buffer small – making the buffer too big will effect Virtual Memory
- Focus on a database or a user
- Save the data for later analysis

Remote DBA Monitoring

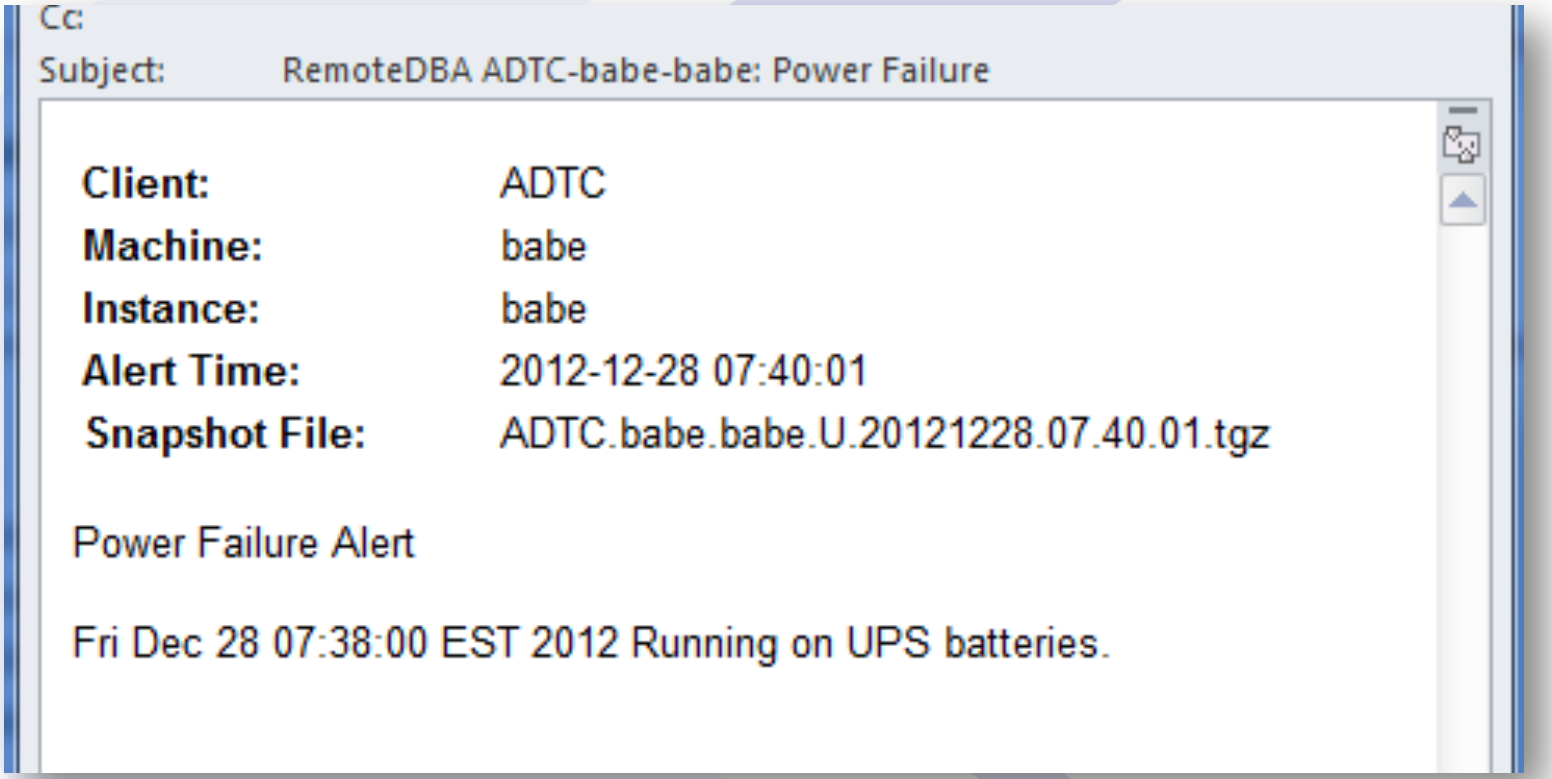
Remote Monitoring

- Scripts run on the client UNIX box at regular intervals
- Gather information on the health of the instance, mainly from sysmaster and onstat, and send back to ADTC
- Run hourly and daily
- Healthcheck files are loaded into a monitoring database on ADTC servers

Remote Monitoring

- Scripts run more frequently to look for urgent problems
- “Urgent” events trigger an email and optional text message
  - Free space in dbspace < threshold
  - HDR not running
  - Logical log backups not running
  - sysadmin:ph_alert table
  - …and more

Urgent Alerts – E-mail



Urgent Alerts – E-mail

Subject: RemoteDBA ADTC-babe-babe: Low Space Alert

Client: ADTC
Machine: babe
Instance: babe
Alert Time: 2012-07-20 18:40:01
Snapshot File: ADTC.babe.babe.U.20120720.18.40.01.tgz

A low space alert has been triggered on babe:

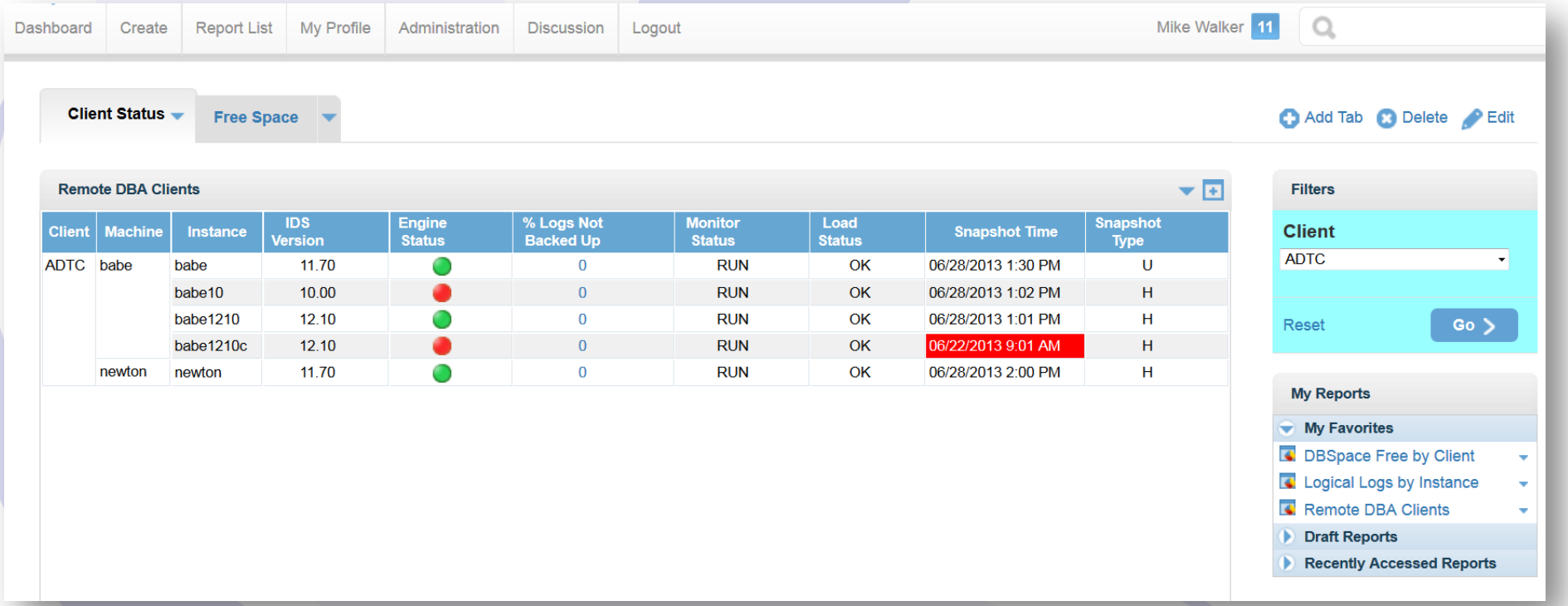
DBSpaces under free space threshold					
Space Name	**Size**	**Used**	**Free**	**% Free**	**% Threshold**
salesdbs2	5000000	4572867	427133	8.54	10.00
salesdbs3	5000000	4572867	427133	8.54	10.00
salesdbs4	5000000	4572867	427133	8.54	10.00
salesdbs5	5000000	4572867	427133	8.54	10.00
sbspace	115000	109168	5832	5.07	10.00
sbspace1	15000	14232	768	5.12	10.00

Remote Monitoring

- With the healthcheck data loaded into a database on the ADTC server, we can run queries against it
- Chose to use the Yellowfin BI tool

Yellowfin Dashboard

- Quick overview of all instances



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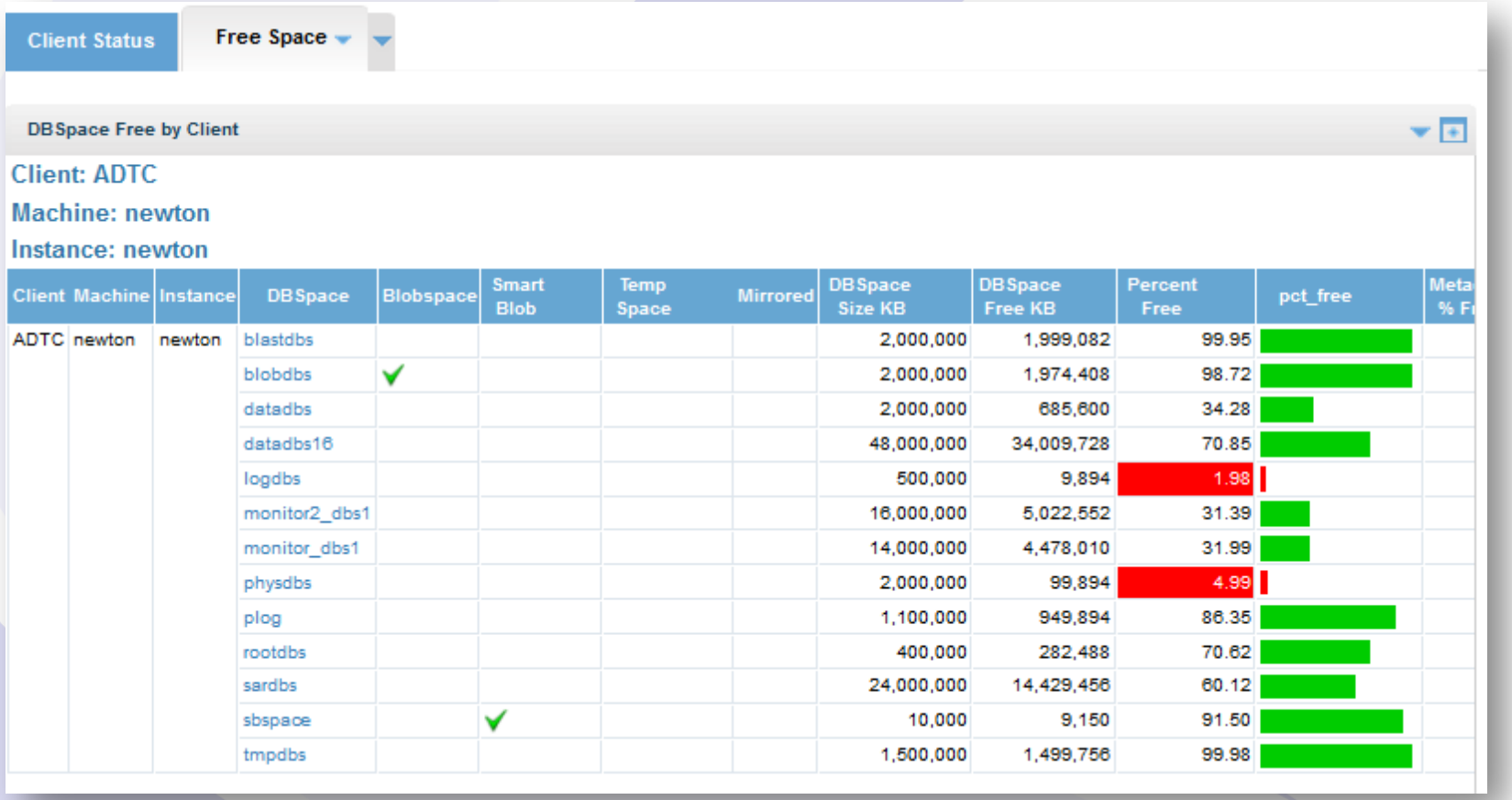
Yellowfin Dashboard

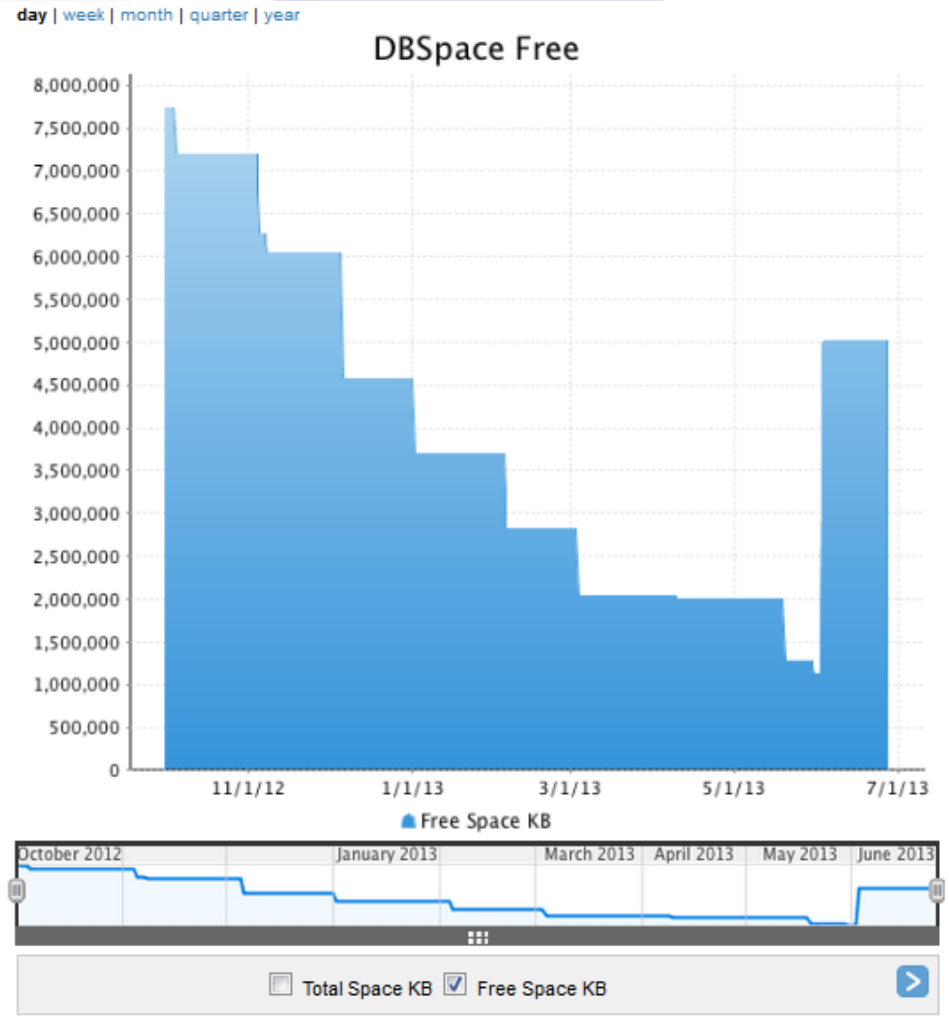
- View the DBSpace usage



Client	Machine	Instance	DBSpace	Blobspace	Smart Blob	Temp Space	Mirrored	DBSpace Size KB	DBSpace Free KB	Percent Free	pct_free	Meta % F
ADTC	newton	newton	blastdbs					2,000,000	1,999,082	99.95		
			blobdbs	✓				2,000,000	1,974,408	98.72		
			datadbs					2,000,000	685,600	34.28		
			datadbs16					48,000,000	34,009,728	70.85		
			logdbs					500,000	9,894	1.98		
			monitor2_dbs1					16,000,000	5,022,552	31.39		
			monitor_dbs1					14,000,000	4,478,010	31.99		
			physdbs					2,000,000	99,894	4.99		
			plog					1,100,000	949,894	86.35		
			rootdbs					400,000	282,488	70.62		
			sardbs					24,000,000	14,429,456	60.12		
			sbspace		✓			10,000	9,150	91.50		
			tmpdbs					1,500,000	1,499,756	99.98		

Yellowfin Dashboard

- Drill through to view the space used over time



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Yellowfin E-mail

- Can also email reports from Yellowfin based on a schedule or on specified conditions.
- Easy way to check on all of the servers without having to go and check

Yellowfin E-mail

To: Mike Walker

Status of ADTC Informix Instances

Remote DBA Clients

Client list and current status

Filters

Client Equal to ADTC And status Equal to A

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Client	Machine	Instance	IDS Version	Engine Status	% Logs Not Backed Up	Monitor Status	Load Status	Snapshot Time	Snapshot Type
ADTC	babe	babe	11.70		0	RUN	OK	06/28/2013 3:10 PM	U
		babe10	10.00		0	RUN	OK	06/28/2013 3:02 PM	H
		babe1210	12.10		0	RUN	OK	06/28/2013 3:01 PM	H
		babe1210c	12.10		0	RUN	OK	06/22/2013 9:01 AM	H
	newton	newton	11.70		0	RUN	OK	06/28/2013 3:00 PM	H
Not for Re-Sale Licence									

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Healthcheck Emails

- Daily emails are distributed with pertinent healthcheck information, with areas of concern highlighted
- Contains
  - Current status
  - Comparison against previous month
  - Information to identify potential performance bottlenecks

Healthcheck Email

- Daily Alerts

Machine Uptime: 8 days 08:33
Instance Uptime: 6 days 07:22

Summary of Events over the last 24 hours			
	Green	Yellow	Red
Info	-	6	-
Warning	-	-	40
Error	-	-	-

Events over the last 24 hours						
Type	Color	Time	Object Type	Name	Message	Count
WARNING	RED	2013-06-27 15:52:10	SERVER	sbspace1	Dbspace [sbspace1] has never had a level 0 backup. Recommend taking a level 0 backup immediately.	1
WARNING	RED	<various>	SERVER	<various>	Dbspace is overdue for a level 0 backup	38
INFO	YELLOW	<various>	DATABASE	<various>	Found table(s) in database which need statistics updated	6
WARNING	RED	<various>	SERVER	<various>	Dbspace is overdue for backup	1

Healthcheck Email

Last Archive (265 days ago)		
Level 0	Level 1	Level 2
2012-10-05 16:57:34	n/a	n/a

All DBSpaces included in last backup? NO

DBSpaces NOT included in the last backup			
DBSpace	Level 0	Level 1	Level 2
plogdbs	n/a	n/a	n/a
xxx_dw_dbs	n/a	n/a	n/a
xxx_dw_idx	n/a	n/a	n/a
informix_schemadbs	n/a	n/a	n/a

DBSpaces <= Minimum Free Space				
Space Name	Size (MB)	Free (MB)	% Free	% Threshold
salesdbs8	4000	40	1.00	1.00

All Chunks Online & Consistent? YES

All Logical Logs backed up? YES

Data Replication Status: Not Configured/Disabled

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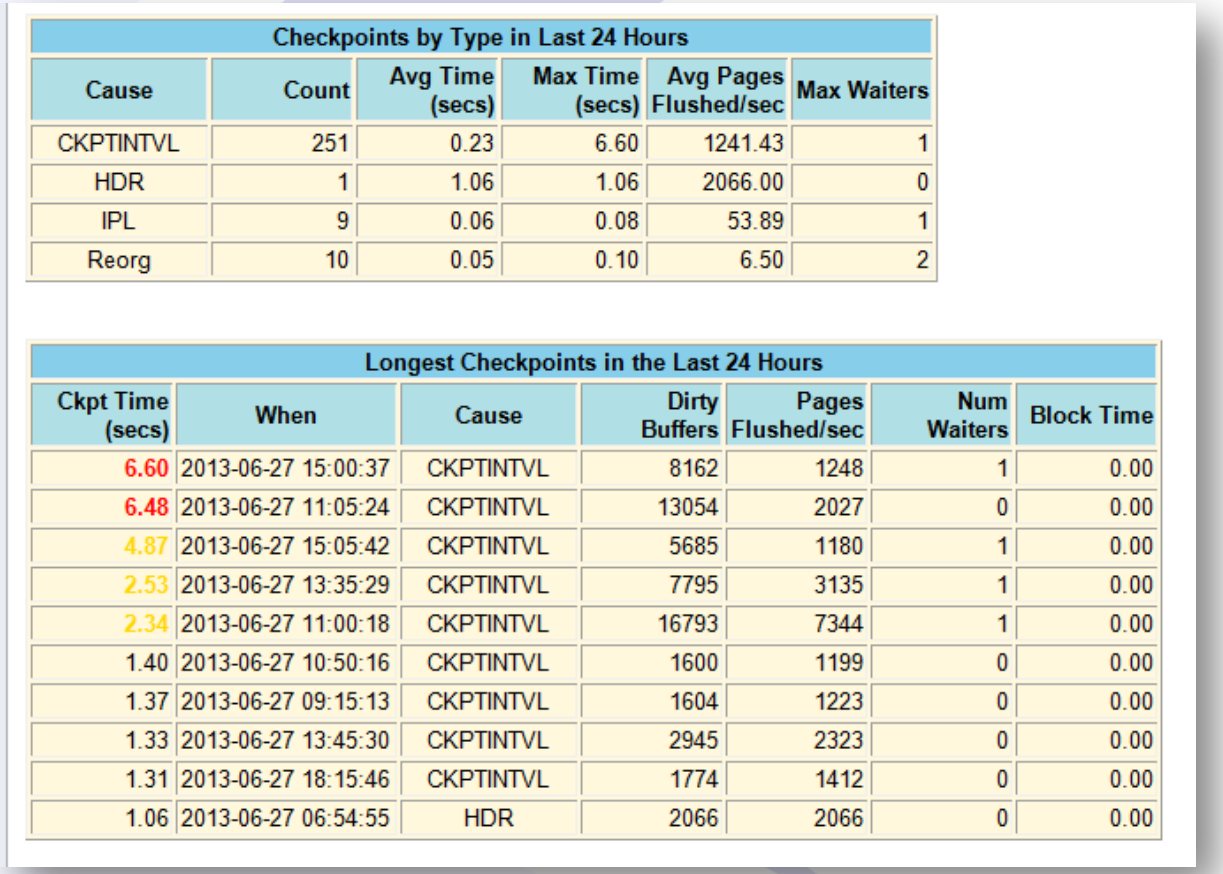
Healthcheck Email

- Performance metrics

Metrics over last 30 days						
Metric	Current	Range	Average	Previous Average	Warning Threshold	Critical Threshold
Read Cache	99.93	99.44 - 99.93	99.88	99.91	< 95.00	< 90.00
Write Cache	86.24	86.24 - 92.78	90.70	92.86	< 90.00	< 85.00
Buffer Wait Ratio %	0.06	0.01 - 0.06	0.03	0.01	> 7.00	> 10.00
Readahead Utilization %	15.33	0.16 - 51.77	9.90	0.18	< 99.50	< 95.00
Lock Wait Ratio %	0.0	0.0 - 0.0	0.0	0.0	> 1.00	> 5.00
Sequential Scan Rate %	6.03	1.36 - 12.84	3.44	1.28	> 5.00	> 10.00

Healthcheck Email

- Checkpoint Information



Checkpoints by Type in Last 24 Hours

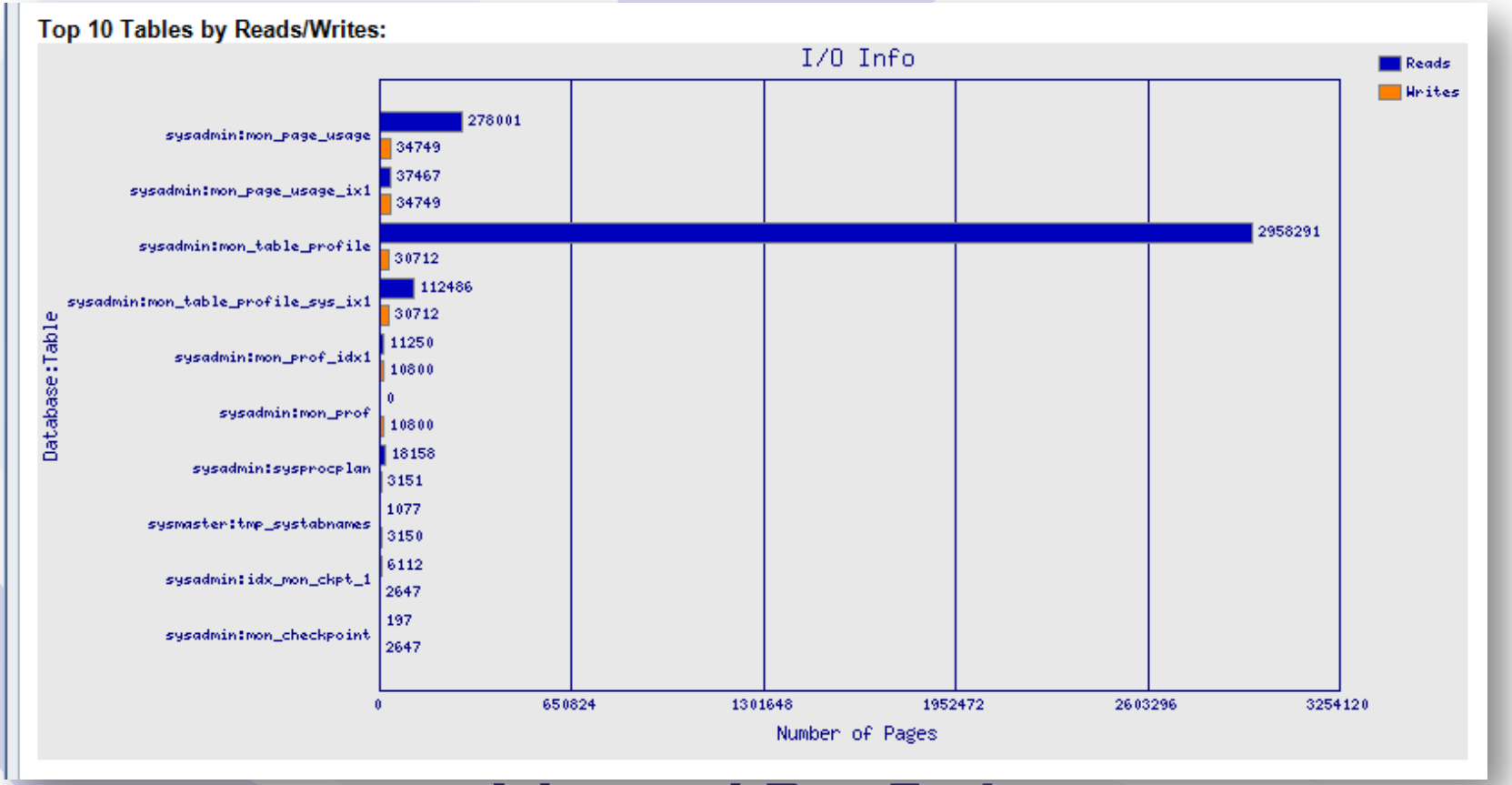
Cause	Count	Avg Time (secs)	Max Time (secs)	Avg Pages Flushed/sec	Max Waiters
CKPTINTVL	251	0.23	6.60	1241.43	1
HDR	1	1.06	1.06	2066.00	0
IPL	9	0.06	0.08	53.89	1
Reorg	10	0.05	0.10	6.50	2

Longest Checkpoints in the Last 24 Hours

Ckpt Time (secs)	When	Cause	Dirty Buffers	Pages Flushed/sec	Num Waiters	Block Time
6.60	2013-06-27 15:00:37	CKPTINTVL	8162	1248	1	0.00
6.48	2013-06-27 11:05:24	CKPTINTVL	13054	2027	0	0.00
4.87	2013-06-27 15:05:42	CKPTINTVL	5685	1180	1	0.00
2.53	2013-06-27 13:35:29	CKPTINTVL	7795	3135	1	0.00
2.34	2013-06-27 11:00:18	CKPTINTVL	16793	7344	1	0.00
1.40	2013-06-27 10:50:16	CKPTINTVL	1600	1199	0	0.00
1.37	2013-06-27 09:15:13	CKPTINTVL	1604	1223	0	0.00
1.33	2013-06-27 13:45:30	CKPTINTVL	2945	2323	0	0.00
1.31	2013-06-27 18:15:46	CKPTINTVL	1774	1412	0	0.00
1.06	2013-06-27 06:54:55	HDR	2066	2066	0	0.00

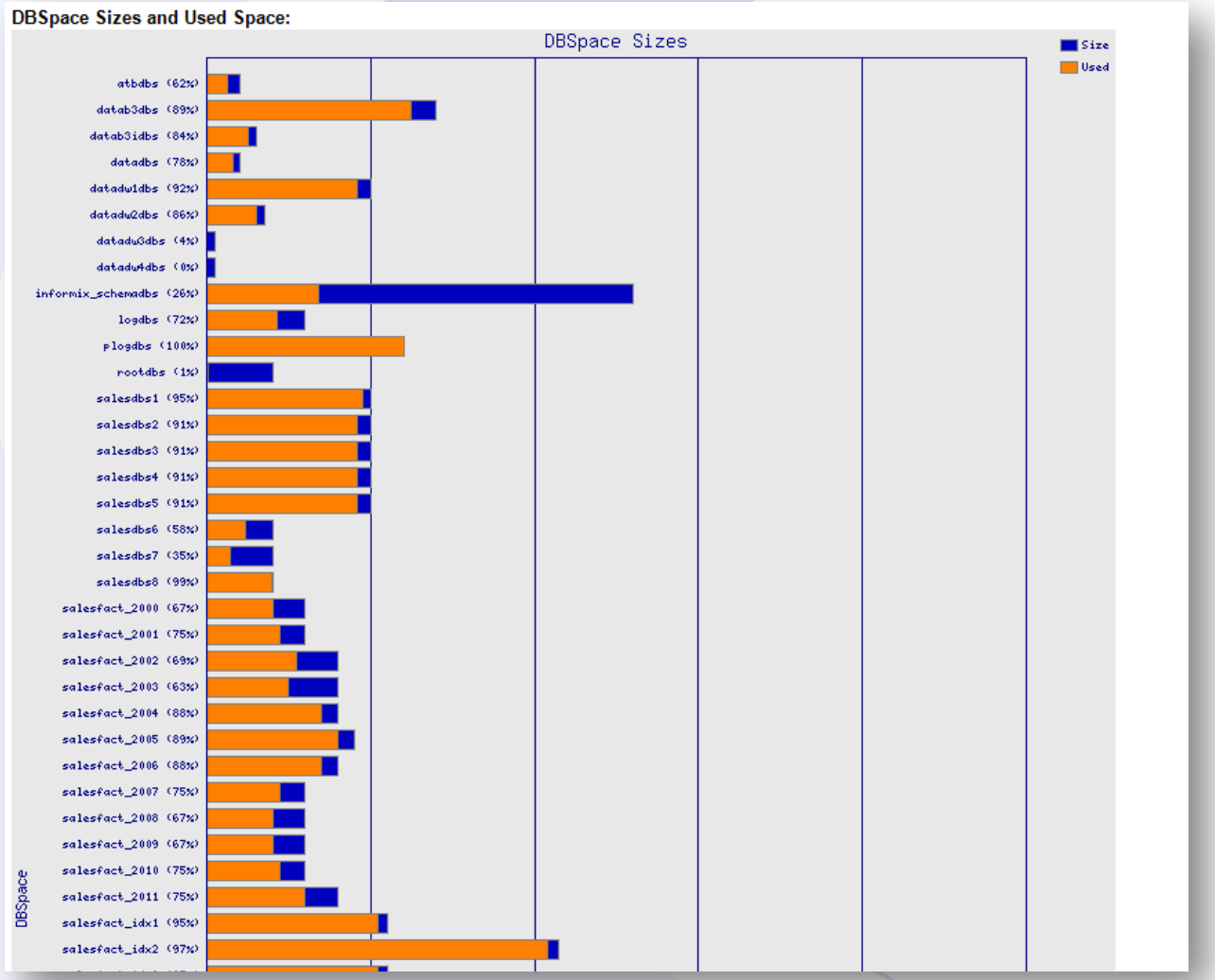
Healthcheck Email

- Heavily used tables



Healthcheck Email

- DBSpace Use



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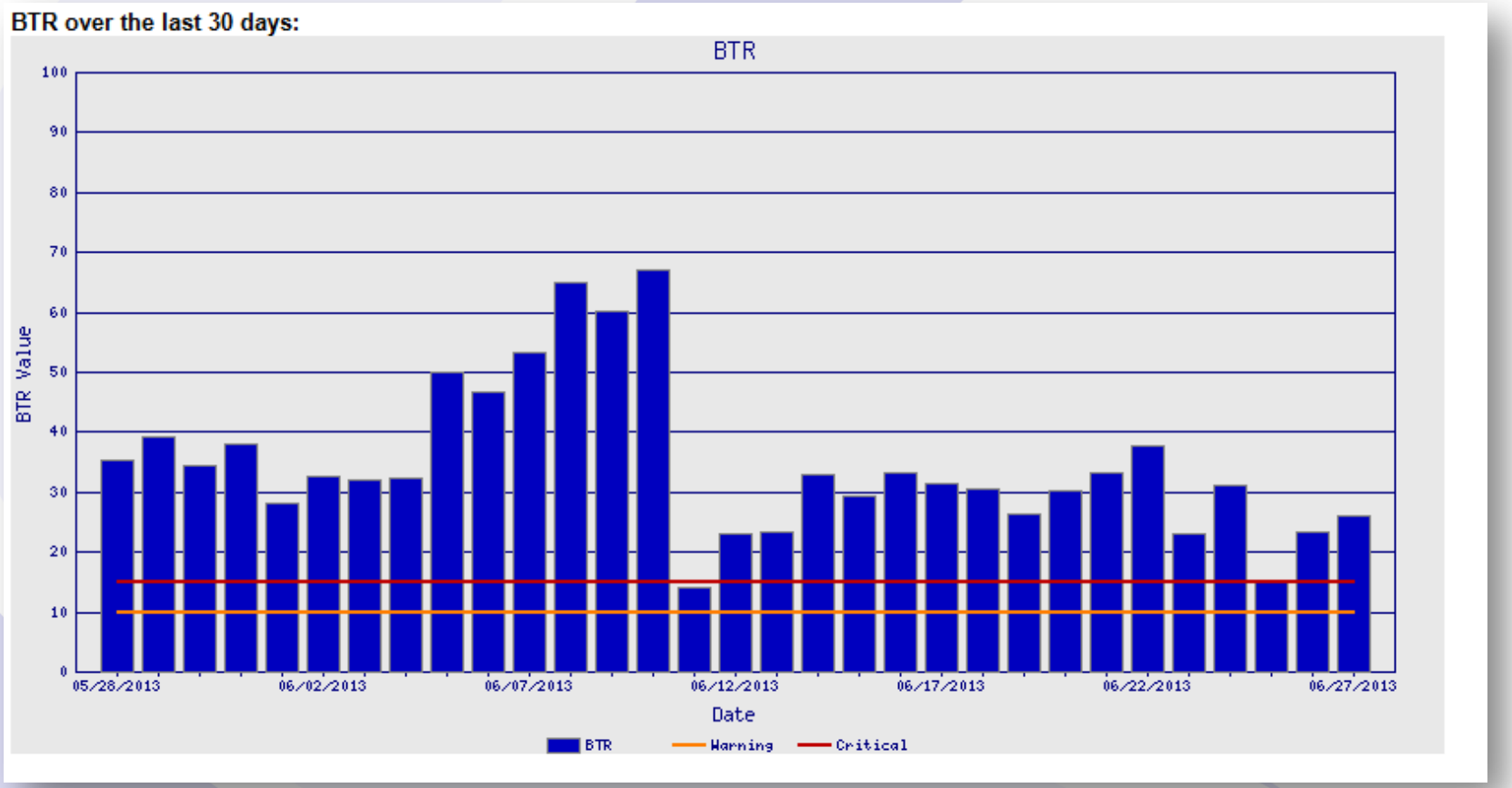
Healthcheck Email

- Track the Buffer Turnover



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- Extent Information

Extent Information (tables >= 10 extents/fragment)								
Database	Table	Starting Fragments	Starting Extents	Starting Extents per Fragment	Ending Fragments	Ending Extents	Ending Extents per Fragment	% Change
sysadmin	mon_prof	n/a	n/a	n/a	1	18	18	0.0
sysadmin	mon_chunk	n/a	n/a	n/a	1	15	15	0.0
sysadmin	mon_prof_idx1	n/a	n/a	n/a	1	14	14	0.0
sysadmin	sysprocbody	n/a	n/a	n/a	1	13	13	0.0

Healthcheck Email

- DBSpace Sizes and Change

DBSpace Size							
DBSpace	Start Size (KB)	Start Free (KB)	Start Free %	Ending Size (KB)	Ending Free (KB)	Ending Free %	Change %
plogdbs	12000000	94	0.00	12000000	94	0.00	0.00
salesdbs8	4000000	39894	1.00	4000000	39894	1.00	0.00
salesfact_idx2	21500000	700150	3.26	21500000	700150	3.26	0.00
salesfact_idx6	21500000	700150	3.26	21500000	700150	3.26	0.00
salesfact_idx4	14000000	628630	4.49	14000000	628630	4.49	0.00
salesdbs1	10000000	496504	4.97	10000000	496504	4.97	0.00
salesfact_idx5	11000000	600022	5.45	11000000	600022	5.45	0.00
salesfact_idx1	11000000	600022	5.45	11000000	600022	5.45	0.00
salesfact_idx3	11000000	600022	5.45	11000000	600022	5.45	0.00
datadw1dbs	10000000	803532	8.04	10000000	803532	8.04	0.00
salesdbs3	10000000	854266	8.54	10000000	854266	8.54	0.00
salesdbs4	10000000	854266	8.54	10000000	854266	8.54	0.00
salesdbs2	10000000	854266	8.54	10000000	854266	8.54	0.00
salesdbs5	10000000	854266	8.54	10000000	854266	8.54	0.00
datab3dbs	14000000	1536282	10.97	14000000	1536282	10.97	0.00
salesfact_2005	9000000	999978	11.11	9000000	999978	11.11	0.00
salesfact_2004	8000000	999978	12.50	8000000	999978	12.50	0.00
salesfact_2006	8000000	999978	12.50	8000000	999978	12.50	0.00
salesidx3	600000	81292	13.55	600000	81292	13.55	0.00
datadw2dbs	3500000	481062	13.74	3500000	481062	13.74	0.00
datab3idbs	3000000	477174	15.91	3000000	477174	15.91	0.00
salesproductdbs2	500000	99894	19.98	500000	99894	19.98	0.00
salesproductdbs1	500000	99894	19.98	500000	99894	19.98	0.00
salesproductdbs4	500000	99894	19.98	500000	99894	19.98	0.00
salesproductdbs5	500000	99894	19.98	500000	99894	19.98	0.00
salesproductdbs3	500000	99894	19.98	500000	99894	19.98	0.00

Healthcheck Email

- Sequential Scans & Lock Waits

Sequential Scans (over 1,000 KB/hour) [Period: 150.47 hours]						
Database	Table	Size (KB)	Number of Rows	Number of Scans	Total Rows Scanned	KB Scanned/Hour
sysadmin	mon_chunk	4604	35770	150	5365500	4590
sysadmin	mon_config	256	514	2583	1327662	4395
sysadmin	ph_task	64	52	4724	245648	2009
sales	books	299894	15124745	1	15124745	1993
sysadmin	mon_iohist	1264	32879	156	5129124	1310

** No reportable lock wait information **

Advanced DataTools Remote DBA Services

Services Provided with Standard, Premium, and Customized Support

Description of Service	Standard	Premium	Customized
On call support during business hours (8:00AM – 5:00 PM EST)	X	X	X
On call support 24 X 7		X	X
Annual Health Check Report	X	X	
Semi-Annual Health Check Report		X	X
Proactive approach to resolving system issues	X	X	X
5 remote service hours per month	X		X
10 remote service hours per month		X	X
Analysis and monitoring of systems, daily diagnosis of stats provided	X	X	X
Analysis and monitoring of systems, hourly diagnosis of stats provided		X	X
Monthly Service Status Report	X	X	X
Advanced System Monitoring			X
Maintenance Window Service			X
Active DBA Service			X
Customized Support Plan			X
Review of Current Environment			X
Review of Current Software Licenses			X
Review of Backup and Recovery			X

Next Webcast

- Date: July 9th, 2013
- Time: 2:00pm EST

Fastest Informix DBA Contest 2013

Fastest Informix DBA Contest 2013

- This year the Fastest Informix DBA Contest will be held over the web so anyone, anywhere in the world can participate.
- The challenge will be a combination of OLTP and batch. Who can get the most transactions per minute in an OLTP benchmark and at the same time run a batch billing job and generate the most bills.
- Contest details and challenge will be posted June 9, 2013. Watch here for more details.

http://www.advancedatatools.com/Informix/index.html

Informix Training in 2013

- July 15-18, 2013
  - **Advanced Informix Performance Tuning**
- September 9-12, 2013
  - **Informix for Database Administrators**
- October 28-31, 2013 –
  - **Advanced Informix Performance Tuning**
- All courses can be taken online on the web from your desk or at our training center in Virginia.
- We guarantee to *NEVER* cancel a course and will teach a course as long as one student is registered!

Questions?

Send follow-up questions to
lester@advancedatatools.com

Thank You

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For more information:

http://www.advancedatatools.com