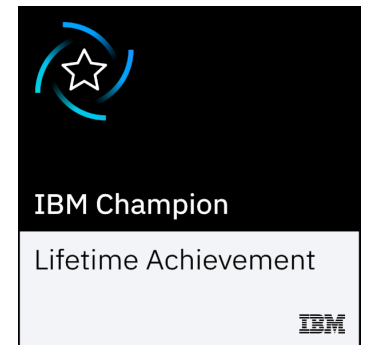


Exploring the Informix Sysmaster Database by Lester Knutsen



Informix Tech Talks by the IIUG
Thursday, 8/15/2024, 2:00 pm EST

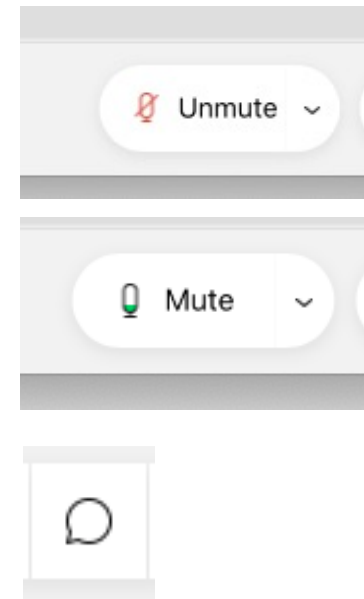


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- **The Webcast is pre-recorded.**
The replay and slides will be available on the IIUG Website
- **Please Mute your line.**
Background sounds will distract everyone
- **Use the Chat Button** to ask questions



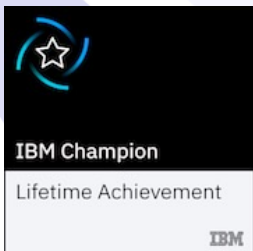
Lester Knutsen

Retired DBA



Lester Knutsen was President of Advanced DataTools Corporation and has been building and managing Informix databases systems since 1983. Lester is retired but continues sometimes to teach Informix classes and provide Performance Tuning consulting. Lester is an Informix IBM Lifetime Champion. Lester was one of the founders of the Washington Area Informix User Group and the International Informix Users Group.

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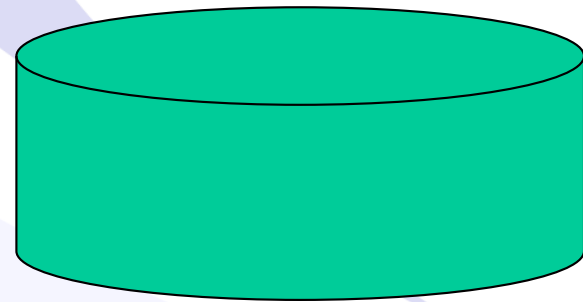
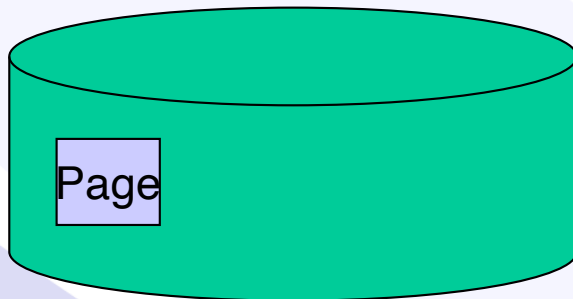
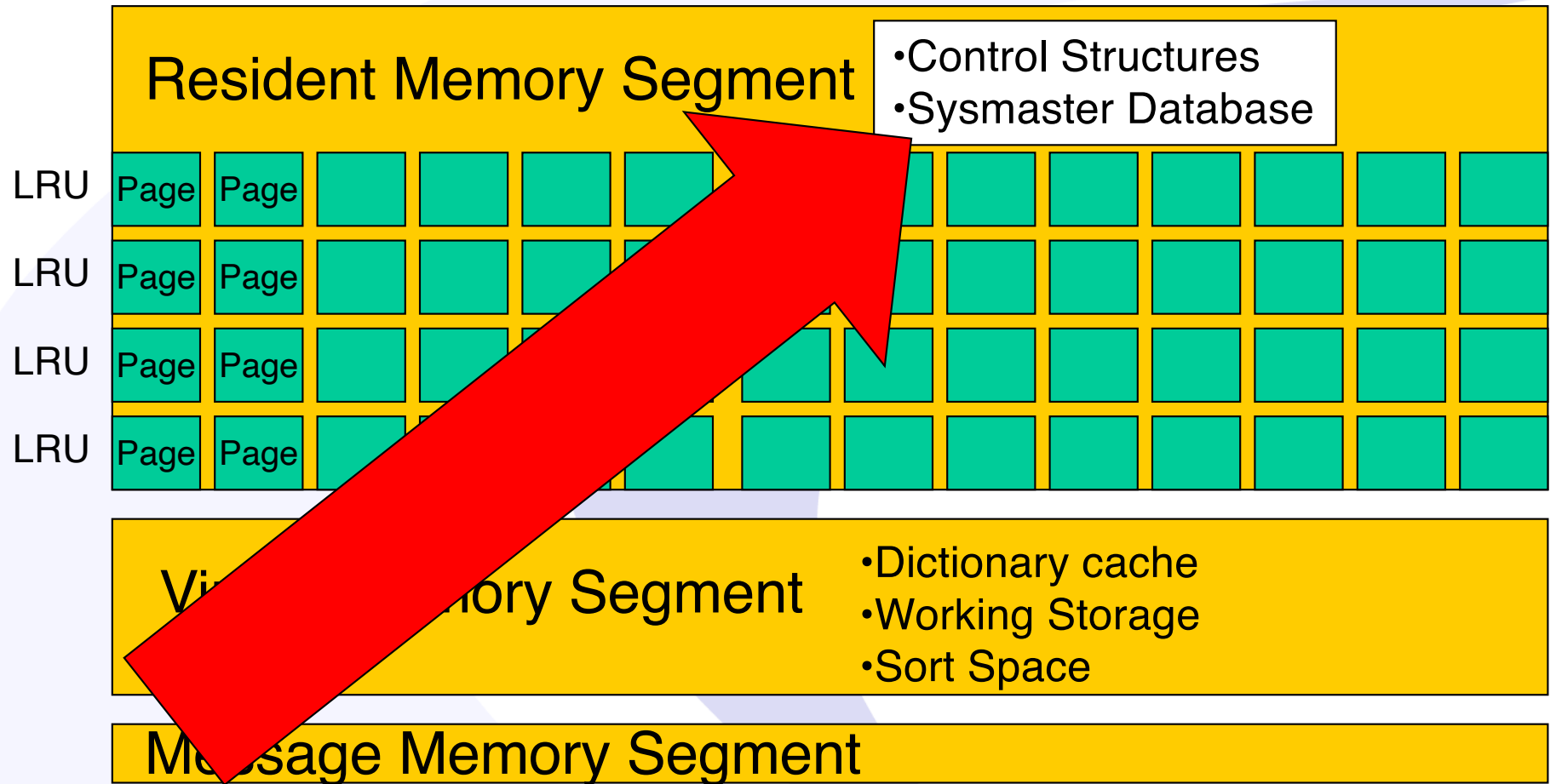
Advanced DataTools

What is the Sysmaster Database?

A database that peeks into the shared memory structures of an INFORMIX-Dynamic Server

Script to create the Sysmaster Database:
\$INFORMIXDIR/etc/sysmaster.sql

Informix Control Structures in Memory are the Sysmaster Database



Same Data as Onstat

onstat -p

```
IBM Informix Dynamic Server Version 14.10.FC10 -- On-Line -- Up 5 days 17:47:53 -- 3743588 Kbytes
2024-07-22 11:08:58
```

```
Profile
dskreads    pagreads    bufreads    %cached    dskwrits    pagwrits    bufwrits    %cached
19317116    1139646955  4085576579  99.58      265242536  273592030  2986321451  91.12

isamtot     open        start       read        write       rewrite     delete      commit      rollbk
5096252946  852816     654133     246676456  2226728322  33723456   134957     355623     1364

gp_read     gp_write    gp_rewrt    gp_del      gp_alloc    gp_free     gp_curs
0           0           0           0           0           0           0

ovlock      ovuserthread  ovbuff      usercpu     syscpu      numckpts    flushes
0           0           853764     28464.27   5942.33    972         1229

bufwaits    lokwaits    lockreqs    deadlks     dltouts     ckpwaits    compress    seqscans
79409      556174     628305395  95          0           414         780826     19969

ixda-RA     idx-RA      da-RA       logrec-RA   RA-pgsused  lchwaits    logpgs-RA
2339516    16104     6212898    0           4717540    20979443    1153
```

```
informix@tiger6:~ train1 > █
```

Sysmaster

select * from sysprofile

```
DISPLAY: Next Restart Exit
Display next page of results.

----- sysmaster@train1 ----- Press CTRL-W for Help -----

name                value
dskreads             19317116
bufreads             4085576776
dskwrites            265242536
bufwrites            2986321451
isamtot              5096253119
isopens              852834
isstarts             654157
isreads              246676550
iswrites             2226728322
isrewrites           33723456
isdeletes            134957
iscommits            355623
isrollbacks          1364
ovlock               0
ovuser               0
ovtrans              0
latchwts             20979444
buffwts              79409
lockreqs             628305566
lockwts              556174
ckptwts              414
deadlks              95
lktouts              0
numckpts             972
plgpagewrites        10028330
plgwrites            158089
llgrecks             145636378
llgpagewrites        30408339
llgwrites            1080984
pagreads             1139646955
```

Script to Create the Sysmaster Database

```
{*****}
{*                                           *}
{* Licensed Materials - Property of IBM and/or HCL                               *}
{*                                           *}
{* IBM Informix Dynamic Server                                                    *}
{* Copyright IBM Corporation 2001, 2013                                           *}
{* (c) Copyright HCL Technologies Ltd. 2017, 2022. All Rights Reserved.          *}
{*                                           *}
{*****}
{                                           }
{ Title:      sysmaster.sql                                                         }
{ Description: create sysmaster database and SMI tables                           }
{                                           }
{ NOTE: Ensure that any changes in the schema of the "sysmaster" database        }
{       OR changes in the corresponding shared memory structure defns            }
{       are reflected *appropriately* in ALL the files below:                    }
{       rsam/sysmaster.sql.IUS,                                                  }
{       rsam/rsmem.h,                                                            }
{       rsam/rsppseudo.h and                                                    }
{       rsam/rsppseudo.c                                                         }
{                                           }
{*****}

{ Create Pseudo Tables }

set lock mode to wait;

create database sysmaster with log;

database sysmaster exclusive;
set environment delimidnt off;

{ databases }
  create table informix.sysdbspartn
  (
    partnum      integer,      { table id for systables   }
    created      integer,      { date created     }
    owner        char(32),      { user name of creator }
    name         char(128),     { database name    }
  )
"/opt/informix/etc/sysmaster.sql" [readonly] 4990L, 221574C
```


Sysmaster Documentation

<https://www.ibm.com/docs/en/informix-servers/14.10?topic=informix-sysmaster-database>

The screenshot shows the IBM Informix V14.10 documentation page for the sysmaster database. The page is divided into a left sidebar and a main content area. The sidebar contains a navigation menu with categories like 'IBM Informix V14.10 documentation', 'Administering', and 'System administration'. The main content area features a breadcrumb trail, a title 'The sysmaster database', a last updated date, and a list of topics including 'The sysmaster Database', 'The System-Monitoring Interface', and 'The System-Monitoring Interface Tables'. A search bar and a 'Show full table of contents' checkbox are also visible in the sidebar.

IBM | Documentation | Search in Informix Servers 14.10

Informix Servers <

Change version
14.10

Show full table of contents

Filter on titles

IBM Informix V14.10 documentation

- Welcome
- Product overview
- GDPR Compliance Information
- Migrating and upgrading
- Installing
- Designing databases
- Administering**
- System administration**
- List of utilities
- Administrator's Guide
- Administrator's Reference**
- Configuring and monitoring Informix**
- Database configuration parameters
- The sysmaster database**
- The sysmaster Database
- The buildsmi Script
- The bldutil.sh Script
- The System-Monitoring Interface
- Understanding the SMI Tables
- Accessing SMI tables
- SELECT statements
- Triggers and Event Alarms
- SPL and SMI Tables
- Locking and SMI Tables
- The System-Monitoring Interface Tables

All products / Informix Servers / 14.10 /

The sysmaster database

Last Updated: 2024-07-12

These topics describe the **sysmaster** database and provide reference information for the *system-monitoring interface* (SMI).

These topics include:

- A description of the **sysmaster** database
- Information about how to use SMI tables
- Descriptions of the SMI tables
- A map of the documented SMI tables

For information about the ON-Bar tables, see the *IBM® Informix® Backup and Restore Guide*.

- [The sysmaster Database](#)
- [The System-Monitoring Interface](#)
- [The System-Monitoring Interface Tables](#)

The **sysmaster** database contains many tables that you can use to monitor your system.

Parent topic:

→ [Configuring and monitoring Informix](#)

Sysmaster Database Contains:

- Server information
- Dbspace & chunk information
- Database & table information
- User session information
- Currently running SQL

Performance of Queries on Sysmaster Database

The data is in shared memory but:

- Views used by tables require disk access and may be slow
- Complex views used to hide complex data
- Some tables are large (million locks)
- Unbuffered logging of temp tables

Differences from Other Databases

- Do not update Sysmaster tables, as this may corrupt the server
- Cannot use dbschema on pseudo tables
- Cannot drop pseudo tables or the Sysmaster Database
- Triggers on Sysmaster tables never execute

Isolation Level is Dirty Read

- Data is dynamic and can change as you retrieve it (Dirty Read)
- Dynamic nature may return inconsistent results
- However, it uses Unbuffered logging and temp tables are logged

Sysmaster Database will Change

- Some undocumented tables and columns may change in future versions
- Scripts in this presentation using undocumented features may not work on all versions of Informix
- New scripts have been run on versions 12.10 and 14.10.FC1-FC10
- Sysmaster upgrades in 14.10.FC2

Disclaimer

- All scripts are experimental
- Use at your own risk
- Still under test and development
- Tested on 14.10.FC3-10 and 12.10.FC15
- May need to be updated in the future releases

Sysmaster Scripts

```
informix@tiger6:~/work/Sysmaster2023/work train1 > ls -A
AUS_last_run.sql      database_list.sql    logs_status.sql      Server_performance.sql  table_extents.sql
AWSiops.sql           database_size.sql    logs_transaction.sql  server_readahead.sql    table_info_all.sql
checkpoint_history.sql DB_index_usage.sql   logs_usage.sql        Server_sort_ratios.sql  table_info_freerows.sql
checkpoint_last.sql   DB_loop_run.sh       README.txt            server_sqlhosts.sql     table_io_statistics.sql
Checkpoint_summary.sql dbspaced_blob_free.sql Server_btr_ratio.sql   server_statics.sql      Table_performance.sql
chunk_free_list.sql   dbspaced_free.sql   server_buff_cach_ratio.sql Server_uptime.sql       Table_waste_space.sql
chunk_io_history.sql  dbspaced_io.sql     server_buff_cach_sum.sql session_list.sql        Table_with_seqscans.sql
Chunk_io.sql          DB_update_stats_info.sql server_cpu_time.sql    session_lockwait.sql   vp_profile.sql
chunk_io_stat.sql     dbwho.sh             server_licensehistory.sql session_statistics.sql  vp_statistics.sql
chunk_io_sum.sql      dbwho.sql            server_machineinfo.sql session_wait_list.sql
chunk_io_times.sql    logs_not_backup.sql  Server_memsegments.sql SQL_cost_explain.sql
chunk_layout.sql      logs_position.sql    server_onconfig.sql   table_disk_layout.sql
chunk_status.sql      logs_statistics.sql  server_performance_all.sql table_extent_plan.sql
```


Sysmaster Scripts

Download all 58 scripts at:

<https://advanceddatatools.com/Downloads/Sysmaster.zip>

OR

<https://advanceddatatools.com/tech-info/tech-sysmaster/>

Past Presentations

- Informix Performance Tuning Using the Sysmaster Database
 - <https://advanceddatatools.com/tech-info/tech-sysmaster/>
- Informix Conference 2023,2019, 2017, 2016,..... 1997
- Webcasts Replays on our website

What Percent of Dbspace is Free?

```
-----  
-- Module: @(#)dbspace_free.sql 2.5      Date: 2013/04/10  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--      Advanced DataTools Corporation  
-- Discription: Displays free space in all dbspaces like Unix "df -k " comm  
--      Tested with Informix 11.70 and Informix 12.10  
-----
```

```
database sysmaster;
```

```
select      name[1,8] dbspace,           -- name truncated to fit on one line  
           sum(chksize) Pages_size,    -- sum of all chunks size pages  
           sum(chksize) - sum(nfree) Pages_used,  
           sum(nfree) Pages_free,      -- sum of all chunks free pages  
           round ((sum(nfree)) / (sum(chksize)) * 100, 2) percent_free  
from        sysdbspaces d, syschunks c  
where      d.dbsnum = c.dbsnum  
group by 1  
order by 1;
```

Example – Dbospace_free.sql

```
SQL: █ New Run █ Modify Use-editor Output Choose Save Info Drop Exit
Run the current SQL statements.

----- sysmaster@train1 ----- Press CTRL-W for Help -----

dbspace          pages_size      pages_used      pages_free      percent_free
-----
datab3db         20000000       10029006       9970994        49.85
datadbs          2000000        1707306        292694         14.63
logdbs           1000000        800053         199947         19.99
rootdbs          1000000        264176         735824         73.58
tmpdbs           1000000         53             999947         99.99
```

**How do you measure the
time since the Server
Statistics have been reset?**

**Required for Performance
Ratios**

Important undocumented table – Sysshmvals*

sh_mode	int, turbo mode number	sh_optstgbsnum	int, subsystem Blobspace
sh_boottime	int, boot time of day	sh_cpflag	int, TRUE => doing checkpoint
sh_pfcrltime	int, time profilers were last clr	sh_rapages	int, # pages to read ahead
sh_curttime	int, current mt_time	sh_rathreshold	int, # to start next read ahead
sh_bootstamp	int, boot time stamp	sh_lastlogfreed	int, last log (id) written to tape
sh_stamp	int, current time stamp	sh_rmdlktout	int, max timeout when distributed
sh_mainlooptcb	int, address of main thread	sh_narchivers	int, number of active archives
sh_sysflags	int, system operating flags	sh_maxpdqpriority	int, max pdqpriority
sh_maxchunks	int, size of chunk table	sh_fuzcpflag	int, fuzzy checkpoint flag
sh_maxdbspaces	int, size of dbspace table	sh_needcpsyn	int, hard checkpoint
sh_maxuserthreads	int, max # of user structures	sh_nfuzzy	int, # buffers marked fuzzy
sh_maxtrans	int, max # of trans structures	sh_nfuzzypre	int, # buffers fuzzy in last ckpt
sh_maxlocks	int, # of locks total	sh_oldestlsnuq	int, lsn of oldest update not
sh_maxlogs	int, size of log table	sh_oldestlsnpos	int, flushed to disk
sh_nbufs	int, # of buffers total	sh_builldpt	int, building DPT necessary
sh_pagesize	int, buffer size in bytes	sh_ndptentries	int, # entries in DPT
sh_nlrus	int, # of lru queues	sh_dptsize	int, size of DPT
sh_maxdirty	float, LRU max % dirty pages	sh_curmaxcons	int, max #connections in this run
sh_mindirty	float, LRU min % dirty pages	sh_ovlmaxcons	int, max #connections to server
sh_ncleaners	int, # of cleaning/flushing procs		
sh_longtx	int, # the long transaction flag		

Sysshmvls

select * from sysshmvls

```
SQL: New Run Modify Use-editor Output Choose Save Info Drop Exit
Run the current SQL statements.

----- sysmaster@train1 ----- Press CTRL-W for Help -----

sh_mode          5
sh_boottime      1721164864
sh_pfcrltime     1721164864
sh_curtime       1721661884
sh_bootstamp     0
sh_stamp         -1015320195
sh_mainlooptcb   1263831040
sh_sysflags      4099
sh_maxchunks     32766
sh_maxdbspaces   2047
sh_maxuserthreads 131072
sh_maxtrans      131072
sh_maxlocks      640000
sh_maxlogs       80
sh_nbufs         1500000
sh_pagesize      2048
sh_nlrus         16
sh_maxdirty      10.04838755775
sh_mindirty      8.373656298127
sh_ncleaners     8
sh_longtx        0
sh_cpflag        0
sh_rapages       0
sh_rathreshold   0
sh_lastlogfreed  3047
sh_rmdlktout     60
sh_narchivers    0
sh_maxpdqpriority 0
sh_curmaxcons    101
sh_ovlmaxcons    101

1 row(s) retrieved.
```

When were the Statistics Cleared?

```
-----  
-- Module: @(#)server_uptime.sql      2.0      Date: 2013/04/10  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--       Advanced DataTools Corporation  
-- Discription: Displays how long the Informix Server has been up and when the  
--               last time stats (onstat -z) were cleared.  
--               Tested with Informix 11.70 and Informix 12.10  
-----  
  
database sysmaster;  
  
select  
    current current_time,  
    DBINFO ('utc_to_datetime', sh_boottime ) boot_time,  
    DBINFO ('utc_to_datetime',sh_pfclrtime) stats_reset_time,  
    current - DBINFO ('utc_to_datetime',sh_pfclrtime) interval_since_stats_reset,  
    ( sh_curtime - sh_pfclrtime) units second seconds_since_stats_reset,  
    (ROUND (( sh_curtime - sh_pfclrtime)/60) ) minutes_since_stats_reset  
from sysshmvls;
```


AWS Calculations for IOPS and Throughput

```
-----  
-- Module: @(#)AWSIOPS.sql      version: 2.5      Date: 10/1/2021  
-- Author: Lester Knutsen      Contact: lester@advancedatools.com  
-- Copyright: Advanced DataTools Corporation - 2021  
-- Description: Use AWS Calculations for IOPS and Throughput  
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9  
-----  
  
{ ==  
AWS IOPS Calculations  
Disk reads/sec + disk writes/sec = IOPS  
Disk read bytes/sec + disk write bytes/sec = Throughput  
}  
  
database sysmaster;  
select  
    "Statics Uptime in Seconds: " metric,  
    (ROUND (( sh_curtime - sh_pfclrtime))) value -- hours_since_stats_reset  
from sysshmvals  
union all  
select  "Average Disk IOPS - Page RW per Second" metric,  
        (( select sum ( value ) from sysprofile where name in ( "dskreads", "dskwrites" ))  
         / ( select (ROUND (( sh_curtime - sh_pfclrtime))) from sysshmvals )) value  
  
from sysdual  
union all  
select  "Average Disk Throughput - Bytes per Second" metric,  
        ((( select sum ( value ) from sysprofile where name in ( "dskreads", "dskwrites" ))  
          * ( select sh_pagesize from sysshmvals ) )  
         / ( select (ROUND (( sh_curtime - sh_pfclrtime))) from sysshmvals )) value  
  
from sysdual;
```

Monitoring BUFFERPOOL Turnover

```
-- Module: @(#)buff_btr_ratio.sql      2.0      Date: 2013/04/10
-- Author: Lester Knutsen  Email: lester@advancedatools.com
--       Advanced DataTools Corporation
-- Discription: Display Buffer Turnovers per hour
--           Based on Art Kagels performance tuning tip on monitoring
--           how much buffer churn your server has.
--           Goal is BTR of less then 7 times per hour
--           Tested with Informix 11.70 and Informix 12.10
```

```

select
    bufsize,
    pagreads,
    bufwrites,
    nbufs,
    ((( pagreads + bufwrites ) /nbufs ) /
      ( select (ROUND ((( sh_curtime - sh_pfclrtype)/60)/60) )
        from sysshmvals ) ) BTR
from sysbufpool;
```

Show Memory Usages by Segment

```
-- Module: @(#)Server_msegments.sql 1.0 Date: 2015/03/20
-- Author: Lester Knutsen Email: lester@advancedatools.com
-- Advanced DataTools Corporation
-- Description:
-- Tested with Informix 11.70 and Informix 12.10
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9
-----

database sysmaster;

-- Summary by Memory Segments Class
select
  -- seg_class,
  case
    when seg_class = 1 then "Resident"
    when seg_class = 2 then "Virtual"
    when seg_class = 3 then "Message"
    when seg_class = 4 then "Buffer"
    else "Unknown"
  end class,
  count(*) number ,
  sum( seg_size ) total_size,
  sum( seg_blkused ) total_blkused,
  sum( seg_blkfree ) total_blkfree
from sysseglst
group by 1;

-- Detail by Memory Segment
select
  -- seg_class,
  case
    when seg_class = 1 then "Resident"
    when seg_class = 2 then "Virtual"
    when seg_class = 3 then "Message"
    when seg_class = 4 then "Buffer"
    else "Unknown"
  end class,
  seg_size,
  seg_blkused,
  seg_blkfree
from sysseglst;
```

Show Memory Usages by Segment

class	number	total_size	total_blkused	total_blkfree
Message	1	561152	136	1
Resident	1	92274688	22419	109
Buffer	2	3577741312	873472	0
Virtual	7	255131648	24620	37668

class	seg_size	seg_blkused	seg_blkfree
Resident	92274688	22419	109
Virtual	204800000	23768	26232
Buffer	3409969152	832512	0
Message	561152	136	1
Buffer	167772160	40960	0
Virtual	8388608	37	2011
Virtual	8388608	46	2002
Virtual	8388608	118	1930
Virtual	8388608	495	1553
Virtual	8388608	107	1941
Virtual	8388608	25	2023

Server Performance Ratios Dashboard

- Goal – One SQL Script to Show a Status of the Server
 - server_performance_all.sql - Displays key server profile/performance ratios
- Based on a Union of 20 SQL Scripts

Sysprofile (onstat -p)

View sysprofile: Current statistics and performance information of the server.

```
name          char(32),      --profile element name
value         int8          --current value
```

The values are re-set to 0 when Informix is shutdown and started and when the command “onstat -z” is used.

Sysprofile = onstat -p

```
IBM Informix Dynamic Server Version 12.10.FC9 -- On-Line (CKPT INP) -- Up 09:51:00 -- 14723064 Kbytes  
Blocked:CKPT
```

Profile

dskreads	pagreads	bufreads	%cached	dskwrits	pagwrits	bufwrits	%cached
1018991690	1350945127	7538138566	86.49	121620012	174286092	963734463	87.38

isamtot	open	start	read	write	rewrite	delete	commit	rollbk
10313914398	6008836	359791	1869291677	595314515	83203954	1833369	4236906	32935

gp_read	gp_write	gp_rewrt	gp_del	gp_alloc	gp_free	gp_curs
0	0	0	0	0	0	0

ovlock	ovuserthread	ovbuff	usercpu	syscpu	numckpts	flushes
0	0	0	72322.30	15949.95	373	1240

bufwaits	lokwaits	lockreqs	deadlks	dltouts	ckpwaits	compress	seqscans
12173696	5803250	6782332472	0	0	192124	4594872	10810

ixda-RA	idx-RA	da-RA	logrec-RA	RA-pgsused	lchwaits
413179008	5334094	573414996	432062	923776263	625668471

Sysprofile

name	value
dskreads	1018537991
bufreads	7522413742
dskwrites	121271673
bufwrites	961215335
isamtot	10296434334
isopens	5976171
isstarts	358703
isreads	1862764237
iswrites	593583519
isrewrites	82910755
isdeletes	1822514
iscommits	4212939
isrollbacks	32767
ovlock	0
ovuser	0
ovtrans	0
latchwts	625532480
buffwts	12154230
lockreqs	6749776961
lockwts	5769870
ckptwts	190970
deadlks	0
lktouts	0
numckpts	372
plgpagewrites	20335533
plgwrites	318371
llgreCs	289177909
llgpagewrites	34970632
llgwrites	2419517
pagreads	1350419379

Server Ratios Dashboard

```
----- sysmaster@train1 ----- P
```

metric	value
Statics Uptime in Hours:	106.050000000000
Statics Uptime in Minutes:	6363.000000000000
Read Ahead Ratio:	0.37652675893228
Total Sequential Scans:	71051.000000000000
Scans per hour:	670.292452830189
Total Sorts:	63210.000000000000
Memory Sorts:	52268.000000000000
Disk Sorts:	10942.000000000000
Max Sort Space:	150784.000000000000
Sorts per hour:	596.320754716981
Buffer Reads per hour:	258683393.594340
Buffer Writes per hour:	134273634.867925
Commits per hour:	2148.67924528302
Buffer Waits per hour:	1543.24528301887
Checkpoints per hour:	12.4433962264151
Lock Requests:	5488682520.00000
Lock Waits:	2110.000000000000
Dead Locks:	0.0000000000000000
Lock Wait Ratio	2601271.33649289
Foreground Writes (Very Bad):	2.0000000000000000
LRU Background Writes:	562075525.000000
Chunk Writes:	773271077.000000
LRU to Chunk Writes:	0.72688031625422

```
----- sysmaster@train1 ----- P
```

metric	value
Statics Uptime in Hours:	55.88333333333333
Statics Uptime in Minutes:	3353.000000000000
Read Ahead Ratio:	0.53683721871410
Total Sequential Scans:	24163.000000000000
Scans per hour:	431.482142857143
Total Sorts:	21559.000000000000
Memory Sorts:	18594.000000000000
Disk Sorts:	2965.000000000000
Max Sort Space:	150144.000000000000
Sorts per hour:	384.982142857143
Buffer Reads per hour:	127297929.017857
Buffer Writes per hour:	68602726.1071429
Commits per hour:	1282.42857142857
Buffer Waits per hour:	3123.64285714286
Checkpoints per hour:	18.8035714285714
Lock Requests:	1458102556.00000
Lock Waits:	3.0000000000000000
Dead Locks:	0.0000000000000000
Lock Wait Ratio	486034185.333333
Foreground Writes (Very Bad):	10583.000000000000
LRU Background Writes:	208151173.000000
Chunk Writes:	172388103.000000
LRU to Chunk Writes:	1.20745671759031

Scientific Method for Tuning

- **What is the Scientific Method?**
 - Ask a question - Define the Problem
 - Perform research - Observe and Measure
 - Construct a Hypothesis - Plan a Test
 - Test Your Hypothesis - Do an Experiment
 - Analyze Your Data - Draw a Conclusion
 - Communicate Results - Document Results
- **Repeat, Repeat, Repeat**

Benchmark Worksheet

Benchmark Worksheet

Lab: Benchmark 2

Date: 11/28/2017

Run #	Changes	Total Time	CPU % (usercpu + syscpu)	Disk I/O (pagreads + pagwrits)	Buffer I/O (bufreads + bufwrits)	Memory Used	Comments
1	BASELINE	17m49.455s	651.43	6494677	30566862	687428	buffers=250000
2	BUFFERPOOL=125000	8m37.551s	322.88	1402911	22158499	2933444	buffers=1250000
3	SHMVIRT SIZE 200000	8m36.411s	327.43	1402927	22168298	2982836	One SHMVIRT Segment
4	LOCKS 640000	5m20.191s	123.7	1402942	22180898	3067708	Resident Segment increased
5	RESIDENT -1	5m11.777s	107.3	680186	19748667	3070500	
6	VPCLASS cpu,num=4,noag	5m5.403s	108.79	1403024	22205882	3070500	
7	VP_MEMORY_CACHE_KB	5m6.878s	108.57	1403389	22223989	3070500	
8	PHYSBUFF 512 LOGBUFF	3m20.977s	78.13	673413	21319488	3072548	
9	DIRECT_IO 1	3m27.670s	77.58	665103	19944711	3072548	
10	PLOG and LOG	4m11.27s	86.68	1795234	22266939	3072548	
11	SAME	4m13.798s	88.15	1133695	20665709	3236388	
12	SAME no Server restart	3m38.265s	172.32	3439465	42449726	3236388	
13	SQL changes - run1	2m16.111s	27.96	2321957	7626794	3236388	
14	SQL changes - run2	3m17.596s	94.72	2172403	13550781	3236388	
15	SQL changes - run3	0m21.523s	9	486110	3738464	3236388	
16							
17							
18							
19							
20							

Key Metrics for Tuning

```
real    590m16.824s
user    0m0.040s
sys     0m0.008s

IBM Informix Dynamic Server Version 14.10.FC3 -- On-Line -- 09:55:00 -- 4408904 Kbytes

Profile
dskreads  pagreads  bufreads  %cached  dskwrits  pagwrits  bufwrits  %cached
135662    137436    12217396  100.00   3158796   4171669   8263397   61.77

isamtot   open      start     read     write    rewrite   delete    commit   rollbk
26538791  59495    154488   7272863  1507243  1914195   641       7458     0

gp_read   gp_write  gp_rewrt  gp_del   gp_alloc gp_free   gp_curs
0         0         0         0         0         0         0

ovlock    ovuserthr ovbuff    usercpu  syscpu   numckpts  flushes
0         0         0         35903.43 52.30    121       124

bufwaits  lokwaits  lockreqs  deadlks  dltouts  ckpwaits  compress  seqscans
163       0         61080286  217 0     0         6         34362    101419

ixda-RA   idx-RA    da-RA     logrec-RA RA-pgsused lchwaits
900       144       108919    2       109062    12056
```

Displays Selected Server Performance Ratios

```
-- Module: @(#)server_performance.sql  1.0    Date: 2021/09/01
-- Author: Lester Knutsen  Email: lester@advancedatools.com
--        Advanced DataTools Corporation
-- Discription: Displays key server profile/performance ratios
--           Tested with Informix 12.10 and Informix 14.10
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9
-----

database sysmaster;

select
    "Statics Uptime in Minutes: " metric,
    (ROUND (( sh_curtime - sh_pfclrttime)/60)) value -- hours_since_stats_reset
from sysshmvals

-- CPU Time
union all
select
    "Total CPU Time:" metric,
    (sum(usecs_user) + sum(usecs_sys) ) total_cpu
from sysvplst
union all
select "Total Disk IO - Page RW" metric,
    ( select sum ( value ) from sysprofile where name in ( "dskreads", "dskwrites")) total_disk_IO
from sysdual

union all
select "Total Buffer IO - Buffer RW" metric,
    ( select sum ( value ) from sysprofile where name in ( "bufreads", "bufwrites")) total_buff_IO
from sysdual

-- Memory
union all
select "Total Memory" metric,
    sum( seg_size ) total_size
from sysseglst
```

Checkpoints and Logs Performance

- `checkpoint_summary.sql`
- `logs_not_backup.sql`
- `logs_usage.sql`

Checkpoint Performance

- What is a summary of my Checkpoint Performance?
 - Checkpoint_summary.sql
- What are the details of the last 10 Checkpoints?
 - Checkpoint_last.sql

Checkpoint Performance Summary

```
-----  
-- Module: @(#)checkpoint_summary.sql    1.0    Date: 2019/09/01  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--       Advanced DataTools Corporation  
-- Description:  
--       Tested with Informix 12.10 and Informix 14.10  
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9  
-----  
  
database sysmaster;  
  
-- unload to checkpoint_summary.uld  
select  
    type,  
    count(*) num_checkpoints,  
    max ( dbinfo( "utc_to_datetime", clock_time)) last_checkpoint,  -- Clock time of the checkpoint  
    max ( crit_time ) max_sec_crit_time, -- Fractional seconds spent in critical sections  
    sum ( crit_time ) sum_sec_crit_time, -- Fractional seconds spent in critical sections  
    max ( flush_time ) max_sec_flush_time, -- Fractional seconds spent flushing dirty pages during the checkpoint  
    sum ( flush_time ) sum_sec_flush_time, -- Fractional seconds spent flushing dirty pages during the checkpoint  
    max ( cp_time ) max_checkpoint_time, -- Duration of the checkpoint in fractional seconds  
    sum ( cp_time ) sum_checkpoint_time, -- Duration of the checkpoint in fractional seconds  
    max ( n_dirty_buffs ) max_dirty_buffs, -- Number of dirty buffers at the beginning of the checkpoint  
    sum ( n_dirty_buffs ) sum_dirty_buffs, -- Number of dirty buffers at the beginning of the checkpoint  
    max ( n_crit_waits ) max_crit_waits, -- Number of processes that had to wait for the checkpoint  
    sum ( n_crit_waits ) sum_crit_waits, -- Number of processes that had to wait for the checkpoint  
    max ( tot_crit_wait ) max_crit_sec, -- Total time all processes waited for the checkpoint - fractional seconds  
    sum ( tot_crit_wait ) sum_crit_sec, -- Total time all processes waited for the checkpoint - fractional seconds  
    max ( block_time ) max_block_time, -- Longest any process had to wait for the checkpoint - fractional seconds  
    sum ( block_time ) sum_block_time -- Longest any process had to wait for the checkpoint - fractional seconds  
from syscheckpoint  
group by 1  
order by 1 ;
```


Checkpoint_summary.sql

```
----- sysmaster@train1 -----  
  
type                Blocking  
num_checkpoints     8  
last_checkpoint     2019-09-24 21:07:41  
max_sec_crit_time   1.725911e-05  
sum_sec_crit_time   7.05932528e-05  
max_sec_flush_time  0.001612641024  
sum_sec_flush_time  0.00474524459  
max_checkpoint_ti+  0.004824562211  
sum_checkpoint_ti+  0.014854903223  
max_dirty_buffs     52  
sum_dirty_buffs     141  
max_crit_waits      1  
sum_crit_waits      3  
max_crit_sec        0.003520003761  
sum_crit_sec        0.00634974786  
max_block_time      0.00  
sum_block_time      0.00
```

```
----- sysmaster@train1 -----  
  
type                Non-Blocking  
num_checkpoints     20  
last_checkpoint     2019-09-24 20:32:15  
max_sec_crit_time   3.04870461e-05  
sum_sec_crit_time   0.000438870645  
max_sec_flush_time  63.46445248515  
sum_sec_flush_time  92.86006797244  
max_checkpoint_ti+  63.48626005307  
sum_checkpoint_ti+  93.01298011093  
max_dirty_buffs     251943  
sum_dirty_buffs     436956  
max_crit_waits      1  
sum_crit_waits      3  
max_crit_sec        36.72768298873  
sum_crit_sec        36.74681120340  
max_block_time      36.72765214286  
sum_block_time      46.15479190084
```

Logical Log Performance

- For HDR Planning – How much data will be going to the Secondary Servers?
- What is my Log turnover rate?
- Do I have enough Logs?
- Are the Logs too small or too big?
- Goal – Enough Logs for 4 days
- Goal – Turnover 12 to 24 Logs per hour

Logical Log Performance

```
-----  
-- Module: @(#)logs_usage.sql 2.0 Date: 2019/09/01  
-- Author: Lester Knutsen Email: lester@advancedatools.com  
-- Advanced DataTools Corporation  
-- Description: Calculates how many logs and log pages used in the past 8 days.  
-- Tested with Informix 12.10 and Informix 14.10  
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9  
-----  
  
database sysmaster;  
  
-- unload to log_usage.uld  
select "Logs for last 7 days",  
       count(*) logs_used,  
       sum( size ) log_pages_used,  
       dbinfo('utc_to_datetime', min( filltime ) ) start_time,  
       dbinfo('utc_to_datetime', max( filltime ) ) end_time,  
       (dbinfo('utc_to_datetime', max( filltime ) ) - dbinfo('utc_to_datetime', min( filltime ) )) total_time,  
       (( max( filltime ) ) - ( min( filltime ) )) total_secs,  
       ((( max( filltime ) ) - ( min( filltime ) )) /60 ) total_minutes,  
       ((( ( max( filltime ) ) - ( min( filltime ) )) /60 ) /60 ) total_hours,  
       ( count(*) / ((( ( max( filltime ) ) - ( min( filltime ) )) /60 ) /60 )) logs_per_hour,  
       ( sum(size) / ((( ( max( filltime ) ) - ( min( filltime ) )) /60 ) /60 )) pages_per_hour  
from syslogfil  
where filltime > 0  
and ( dbinfo('utc_to_datetime', ( filltime ) ) > ( current - 7 units day ));
```

Logical Log Not Backed up

```
-----  
-- Module: @(#)logs_not_backup.sql    1.0    Date: 2019/09/01  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--        Advanced DataTools Corporation  
-- Description:  
--        Tested with Informix 12.10 and Informix 14.10  
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9  
-----  
  
database sysmaster;  
  
-- select * from syslogs;  
-- This query should normally only return the current log (is_current = 1)  
-- and possibly the log with the previous unqid to the current one if you  
-- happen to catch it just as it filled and didn't get backed up yet.  
-- If more than those last two unquids are returned, then something is amiss.  
  
-- unload to logs_not_backup.uld  
select unqid, is_current, is_used, is_backed_up, is_new  
from syslogs  
where is_used = 1  
      and is_new = 0  
      and is_temp = 0  
      and is_pre_dropped = 0  
      and is_backed_up != 1  
order by unqid;
```

Logs_not_backup.sql

```
----- sysmaster@train1 ----- Press CTRL-W for H  
  
  uniqid  is_current  is_used  is_backed_up  is_new  
  7271    1          1         0             0
```

Show Users and which Logs they are using-logs_position.sql

username	sid	tx_logbeg	tx_loguniq	tx_logpos
informix	852	31139	31139	25211060
informix	869	31139	31139	25231440
informix	934	0	0	0
informix	937	31139	31139	24725044
informix	951	0	0	0
informix	860	0	0	0
informix	921	31139	31139	25121228
informix	955	0	0	0
informix	923	31139	31139	24982656
informix	860	0	0	0
informix	913	0	0	0
informix	864	0	0	0
informix	909	0	0	0
informix	950	0	0	0
informix	873	0	0	0
informix	946	31139	31139	25212348
informix	902	0	0	0
informix	901	0	0	0
informix	931	0	0	0
informix	912	31139	31139	24995756
informix	942	31139	31139	24621172
informix	907	31139	31139	25056192
informix	889	31139	31139	25208292

DbSPACE and Chunks Performance Scripts

- `dbspace_free.sql`
- `chunk_io.sql`
- `dbspace_io.sql`

DBspace and Chunks Performance

- Started with a script to measure dbspace free
- Added Summary of underlying Chunk IO
- Added Ratios
 - Real read ahead
 - Pages per read/write operation
 - Pages read per minute
 - Pages write per minute
 - Percent of Total IO
- Data from syschktab and sysdbstab

Dbpaceio.sql

```
current_time          2023-01-31 12:18:05.000
stats_reset_time      2023-01-23 11:55:19
minutes_since_sta+    11543
dbspace               tmp3dbs
pagesize              2048
num_chunks            1
size_sys_pages        1000000
free_pages            999947
size_kb               2000000
free_kb               1999894
pagereads             1133
pagewrites            3010
num_reads             96
num_writes            557
usecs_readtime        822.9473712101
usecs_writetime       6147.077034593
pages_per_read        11.802083333333333
pages_per_writes      5.40394973070018
pages_read_per_mi+    0.09815472580785
pages_write_per_m+    0.26076409945421
read_percent          0.00
write_percent         0.00
```

Session Performance and Monitoring Scripts

- `session_lockwait.sql`
- `session_statistics.sql`
- `session_wait_list.sql`

Displays User Session Profile info

- session_statistics.sql

```
username  informix
sid       42
lockreqs  6132777
bufreads  164089089
bufwrites 303812

username  informix
sid       43
lockreqs  6939395
bufreads  126226004
bufwrites 517732

username  informix
sid       886
lockreqs  10567488
bufreads  5249040
bufwrites 278452
```

Displays only Locks with Other Users Waiting

- session_lockwait.sql

```
dblname benchmark3
tabname warehouse
type X
ownersid 952
ownername informix
waitsid 901
waitname informix

dblname benchmark3
tabname 105_25
type X
ownersid 925
ownername informix
waitsid 944
waitname informix

dblname benchmark3
tabname district
type X
ownersid 863
ownername informix
waitsid 881
waitname informix
```

Displays User Session Waits and Status

- session_wait_list.sql

```
-- Module: @(#)session_wait_list.sql    2.3    Date: 2013/04/10
-- Author: Lester Knutsen  Email: lester@advancedatools.com
--       Advanced DataTools Corporation
-- Description: Displays session status
--       Tested with Informix 11.70 and Informix 12.10
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9
```

```
database sysmaster;
select
    sid,
    username,
    is_wlatch,
    is_wlock,
    is_wbuff,
    is_wckpt,
    is_wlogbuf,
    is_wtrans,
    is_monitor,
    is_incrit
from    sysessions
where   ( is_wlatch != 0 )
or      ( is_wlock != 0 )
or      ( is_wbuff != 0 )
or      ( is_wckpt != 0 )
or      ( is_wlogbuf != 0 )
or      ( is_wtrans != 0 )
or      ( is_monitor != 0 )
or      ( is_incrit != 0 )
order by username
```

Displays User Session Waits and Status

- session_wait_list.sql

```
sid          959
username    informi
is_wlatch   0
is_wlock    1
is_wbuff    0
is_wckpt    0
is_wlogbuf  0
is_wtrans   0
is_monitor  0
is_incrit   0

sid          958
username    informix
is_wlatch   0
is_wlock    0
is_wbuff    0
is_wckpt    0
is_wlogbuf  0
is_wtrans   0
is_monitor  0
is_incrit   1

sid          956
username    informix
is_wlatch   0
is_wlock    1
is_wbuff    0
is_wckpt    0
is_wlogbuf  0
is_wtrans   0
is_monitor  0
is_incrit   0
```

Table Performance Scripts

- table_extent_plan.sql
- table_info_all.sql
- table_info_freerows.sql
- table_io_statistics.sql
- table_performance.sql
- table_waste_space.sql
- table_with_seqscans.sql

Table Performance and Information

- `table_info_all.sql`
- Everything you want to know about your tables
- Load results into an Excel Worksheet
- Updated to exclude System tables and Indexes

Questions about Tables

- What tables fit on a page?
- What tables have free space before a new extent?
- How big are the tables?
- What tables have the most lock activity?
- What tables have the most I/O activity?
- What tables have sequential scans?
- What is the buffer read % by table?
- What tables could be partitioned?

Base Tables

- **Systabnames** – Basic Table Information
- **Systabinfo** – undocumented
- **Sysptprof** – Performance Information

Show Tables with Most Sequential Scans

```
-- Module: @(#)table_with_seqscans.sql  2.3      Date: 2020/01/01
-- Author: Lester Knutsen  Email: lester@advancedatools.com
--       Advanced DataTools Corporation
-- Description: Find tables with sequential scans
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9

-----

database sysmaster;

select  first 100
        dbsname database,
        tabname table,
        partnum partnumber,
        ti_npdata  table_size_pages,
        sum(seqscans) total_scans,
        (ti_npdata * (sum(seqscans))) total_pages_scanned
from    sysptprof, systabinfo
where   sysptprof.partnum = systabinfo.ti_partnum
and seqscans > 0
and tabname not in ( select tabname from systables where tabid < 100 )
and dbsname not in ( "sysmaster", "sysadmin" , "sysuser", "sysutils" )
group  by 1, 2, 3, 4
order  by 6 desc
~
```

Show Tables with Most Sequential Scans

```
database      benchmark1
table         benchmark
partnumber    3145797
table_size_pages 418980
total_scans   6
total_pages_scanned 2513880
```

```
database      benchmark1
table         zip
partnumber    3145802
table_size_pages 711
total_scans   2021
total_pages_scanned 1436931
```

```
database      benchmark2
table         bills
partnumber    3145874
table_size_pages 605280
total_scans   1
total_pages_scanned 605280
```

Show Tables with Wasted Space - table_waste_space.sql

```
database      benchmark3
tablename     customer
dbspace       datab3dbs
partnum       5242979
row_size      684
page_size     2048
pages_used    2000519
pages_data    2000022
pages_free    3387
num_rows      6000000
rowfit        Row smaller then pagesize
rows_per_page 2
kb_used_per_page 1376
kb_waste_per_page 644
kb_waste_per_table 1288014168

database      benchmark1
tablename     benchmark
dbspace       datadbs
partnum       3145797
row_size      3534
page_size     2048
pages_used    838168
pages_data    418980
pages_free    79183
num_rows      418980
rowfit        Row larger then pagesize
rows_per_page 0
kb_used_per_page 0
kb_waste_per_page 2020
kb_waste_per_table 846339600
```

Show Tables with Free Row Space: table_info_freerows.sql

```
database      benchmark4
tabname       bmsql_new_order
dbspace       datab4dbs
partnum       6291530
row_size      12
num_columns   0
num_indexes   0
num_extents   28
page_size     2048
pages_total   7168
pages_used    7168
pages_data    2178
pages_free    0
num_rows      172078
rowfit        Row smaller the pagesize
rows_per_page 168
free_rows     0
create_date   2022-05-25 11:21:48
```

Show Proposed Extent Sizing Plan: table_extent_plan.sql

```
-----  
-- Module: @(#)table_extent_plan2.sql  1.0      Date: 2023/01/01  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--         Advanced DataTools Corporation  
-- Description:  
--         Tested with Informix 11.70 and Informix 12.10  
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9  
-----  
--         if you growth factor is greater the 20% per year make the nessary  
--         changes.  
-----  
  
database sysmaster;  
  
select  ( dbinfo('dbspace', partnum )) dbspace,  
        dbsname database,  
        owner,  
        tabname,  
        ti_nextns      num_extents,  
        ti_pagesize    pagesize,  
        round ( ti_npdata * ti_pagesize /1024 )  current_size_kb,  
        round ( ti_fextsiz * ti_pagesize /1024 ) current_extent_kb,  
        round ( ti_nextsiz * ti_pagesize /1024 ) current_next_kb,  
        -- Proposed Size 1.2 x current size  
        round ( ti_npdata * ti_pagesize * 1.2 /1024 ) proposed_extent_kb,  
        -- Proposed Growth at .2 x current size  
        round ( ti_npdata * ti_pagesize * .2 /1024 ) proposed_next_kb  
from systabnames, systabinfo  
where ti_partnum = partnum  
and   dbsname not in ("sysmaster", "sysuser", "sysutils", "sysadmin")  
order by num_extents desc;
```

Show proposed extent sizing plan: table_extent_plan.sql

```
dbspace      datab4dbs
database     benchmark4
owner        informix
tablename    bmsql_order_line
num_extents  50
pagesize     2048
current_size_kb 2197690
current_extent_kb 16
current_next_kb 262144
proposed_extent_kb 2637228
proposed_next_kb 439538
```

```
dbspace      datab4dbs
database     benchmark4
owner        informix
tablename    bmsql_customer
num_extents  49
pagesize     2048
current_size_kb 2000214
current_extent_kb 16
current_next_kb 262144
proposed_extent_kb 2400257
proposed_next_kb 400043
```


Monitoring Index Performance and Usage

- `DB_index_usage.sql`
- `DB_loop_run.sh`

Index Performance and Usage

- When was my index last used?
 - Oncheck –pt database:table
- What is the ratio of index reads to writes?
- The more reads, the more efficiently an index is used..

We will Use Data from 3 Sources

- Sysmaster database
- Sysadmin database
- System Tables in each database

- Important to join between Sysmaster and Systables database using table partno to avoid duplicate data

How to Monitor Index Usage

Compare reads and writes on an index by partition ...fewer reads indicates the index may not be needed unless it is a constraint

```
-- #####
-- ## Module: @(#)DB_index_usage.sql      2.0      Date: 08/25/2019
-- ## Author: Lester Knutsen  Email: lester@advancedatools.com
-- ##          Advanced DataTools Corporation
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9
-- #####

-- Execute this query in a user database
-- Connect to the database you want the info from - Not Sysmaster

-- unload to index_usage.uld
select
    t.tabname,
    i.indexname,
    bufreads,
    bufwrites,
    case
        when bufwrites = 0 then bufreads
        when bufreads = 0 then 0
        else ( bufreads /bufwrites )
    end ratio
from    systables t, sysfragments i, outer sysmaster:sysptprof p
where   t.tabid = i.tabid
and     i.fragtype = "I"
and     i.partn = p.partnum
and     t.tabid > 99;
```

New - How to Monitor Index Usage

```
tabname      state
indexname    idx_state_1
bufreads     15
bufwrites    11
ratio        1.3636363636363636
```

```
tabname      zip
indexname    idx_zip_1
bufreads     630617
bufwrites    931
ratio        677.354457572503
```

```
tabname      benchmark
indexname    idx_benchmark_1
bufreads     214154
bufwrites    4614
ratio        46.4139575205895
```



Poor Index Usage



Great Index Usage



Good Index Usage

DB_loop_run.sh - Script to create a list of databases and loop through a script for each database

```
#####  
## Module: @(#)DB_loop_run.sh      2.0      Date: 01/01/2019  
## Author: Lester Knutsen  Email: lester@advancedatools.com  
##          Advanced DataTools Corporation  
## Description: Runs the same script for all database on the server  
#####  
  
DD=`date +%Y%m%d%H%M%S`\  
LOG=Logfile$DD.log  
  
## Create a log file to capture stdout and stderr  
echo "Log file: $LOG"  
echo "Script to run: $1"  
{  
echo $INFORMIXSERVER  
  
dbaccess sysmaster - <<EOF 2>&1  
-- create a list of database names that can be used in a loop  
unload to database_list.x delimiter " "  
select trim(name)  
       from sysdatabases  
       where name not in ( "sysmaster", "sysadmin", "sysuser", "sysutils" )  
EOF  
  
for db in `cat database_list.x`  
do  
echo "Results for: $db"  
dbaccess $db $1 2>&1  
done  
  
rm database_list.x  
} 2>&1 | tee $LOG
```

Monitoring AUS and Update Statistics

- AUS_last_run.sql
- DB_update_stats_info.sql

Update Statistics Status

- When did Automatic Update Status Last Run?
- When did Update Status Last Run for all database and tables

Aus_last_run.sql

```
----- benchmark3@train1 ----- Press CTRL-W for Help
```

db	table	level	when
benchmark1	state	l	2019-09-24 01:01:16
benchmark1	state	H	2019-09-24 01:01:16
benchmark1	benchmark	l	2019-09-24 01:01:16
benchmark1	benchmark	H	2019-09-24 01:01:16
benchmark2	state	l	2019-09-24 01:01:21
benchmark2	state	H	2019-09-24 01:01:21
benchmark2	customer	l	2019-09-24 01:01:21
benchmark2	customer	H	2019-09-24 01:01:21
benchmark2	product	l	2019-09-24 01:01:21
benchmark2	product	H	2019-09-24 01:01:21
benchmark2	bills	l	2019-09-24 01:01:21
benchmark2	bills	H	2019-09-24 01:01:21

DB_update_stats_info.sql

```
tabname      customer
low_update   2019-09-21 01:11:02.00000
column       customer_number
update       09/21/2019
mode         H
updttime     2019-09-21 01:11:02.00000
updduration  0:00:00.02175
maxseqno     9

tabname      product
low_update   2019-09-21 01:11:02.00000
column       product_number
update       09/21/2019
mode         H
updttime     2019-09-21 01:11:02.00000
updduration  0:00:00.00001
maxseqno     1

tabname      state
low_update   2019-09-21 01:11:02.00000
column       state
update       09/21/2019
mode         H
updttime     2019-09-21 01:11:02.00000
updduration  0:00:00.00002
maxseqno     2
```

What are the most Costly SQL queries running?

- `SQL_cost_explain.sql`
- **Warning – May cause Assert Failures in 14.10.FC3 and some other versions**

The Most Costly SQL Running

- Collect a snapshot of currently running SQL and save it (once an hour)
- Summarize and review the results
- Show the Top 10 most Expensive SQL queries on your system

What is the Most Expensive SQL Running?

- Use SQL Trace – Real time capture of the cost of what is running (this is a separate presentation)
- Use the view Syssqexplain to capture what is running now
- Script: SQL_cost_explain.sql

What is the Most Expensive SQL Running?

- Documented View - Syssqexplain
- Based on internal table Syssdblock and Sysconblock

View: Syssexplain

```
{ Show sqexplain information }
create view informix.syssexplain (          { Internal Use Only          }
    sqx_sessionid, sqx_sdbno, sqx_iscurrent, sqx_executions,
    sqx_cumtime, sqx_bufreads, sqx_pagereads, sqx_bufwrites,
    sqx_pagewrites, sqx_totsorts, sqx_dsksorts, sqx_sortspmax,
    sqx_conbno, sqx_ismain, sqx_selflag, sqx_estcost, sqx_estrows,
    sqx_seqscan, sqx_srtscan, sqx_autoindex, sqx_index, sqx_remsql,
    sqx_mrgjoin, sqx_dynhashjoin, sqx_keyonly, sqx_tempfile,
    sqx_tempview, sqx_secthread, sqx_sqlstatement)
as
select sdb_sessionid, sdb_sdbno, sdb_iscurrent, sdb_executions,
    sdb_cumtime, sdb_bufreads, sdb_pagereads, sdb_bufwrites,
    sdb_pagewrites, sdb_totsorts, sdb_dsksorts, sdb_sortspmax,
    cbl_conbno, cbl_ismainblock, ft.txt, cbl_estcost, cbl_estrows,
    cbl_seqscan, cbl_srtscan, cbl_autoindex, cbl_index, cbl_remsql,
    cbl_mrgjoin, cbl_dynhashjoin, cbl_keyonly, cbl_tempfile,
    cbl_tempview, cbl_secthread, cbl_stmt
from sys_sdblock, outer ( sysconblock, flags_text ft )
    where sdb_sessionid == cbl_sessionid
        and sdb_sdbno      == cbl_sdbno
        and ft.tabname     == 'sqltype'
        and ft.flags       == cbl_selflag
;
```

Internal Table: Sysconblock

```
{ Conblock }
create table informix.sysconblock           { Internal Use Only
(
  cbl_sessionid    integer,                { session id                }
  cbl_sdbno        integer,                { position in sdblock array }
  cbl_conbno       smallint,              { position in conblock list }
  cbl_ismainblock  char(1),               { main block for statement? }
  cbl_selflag      smallint,              { see cb_selflag (SQ_*)    }
  cbl_estcost      integer,               { see cb_estcost          }
  cbl_estrows      integer,              { see cb_estsize          }
  cbl_flags        integer,              { see cb_flags            }
  cbl_flags2       integer,              { see cb_flags2           }
  cbl_seqscan      smallint,             { # of SEQUENTIAL SCANS   }
  cbl_srtscan      smallint,             { # of SORT SCANS         }
  cbl_autoindex    smallint,             { # of AUTOINDEX PATHS   }
  cbl_index        smallint,             { # of INDEX PATHS        }
  cbl_remsql       smallint,             { # of REMOTE PATHS       }
  cbl_mrgjoin      smallint,             { # of MERGE JOINS        }
  cbl_dynhashjoin  smallint,             { # of DYNAMIC HASH JOINS }
  cbl_keyonly      smallint,             { # of (Key-Only)s        }
  cbl_tempfile     smallint,             { # of Temporary Files    }
  cbl_tempview     smallint,             { # of Temp Tables For View }
  cbl_secthread    smallint,             { # of Secondary Threads  }
  cbl_stmt         char(32000)           { current statement        }
);
```


What is the most expensive SQL running? - SQL_cost_explain.sql

```
-- Module: @(#)SQL_cost_explain.sql    1.0    Date: 2019/09/01
-- Author: Lester Knutsen  Email: lester@advancedatools.com
--       Advanced DataTools Corporation
-- Description:
-- Tested with Informix 12.10 and Informix 14.10
-- Update: 1/20/2023 - Tested on Informix 14.10.FC9
-- Warning - May cause Assert Failures in 14.10.FC3 and some other versions
-----

database sysmaster;

create table if not exists mysqlexplainstats (
    mys_username    char(32),
    mys_sessionid   integer,
    mys_conbno      smallint,
    mys_iscurrent   char(1),
    mys_estcost     integer,
    mys_estrows     integer,
    mys_sqlstatement lvarchar
);

insert into mysqlexplainstats (
    mys_username,
    mys_sessionid,
    mys_conbno,
    mys_iscurrent,
    mys_estcost,
    mys_estrows,
    mys_sqlstatement
)

select  username,
        sqx_sessionid,
        sqx_conbno,
        sqx_iscurrent,
        sqx_estcost,
        sqx_estrows,
        sqx_estrows,
        trim(sqx_sqlstatement)
from    syssqexplain, syssqtblst
where   sqx_sessionid = sid
and     sqx_sqlstatement is not NULL
and     sqx_sqlstatement[1] != " ";

-- Now Sumarize the data by Estimated cost and number of executions
-- unload to sql_explain_sum.uld
```

Output of SQL_cost_explain.sql

```
sqlstatement      INSERT INTO order_line (ol_o_id, ol_d_id, ol_w_id, ol_number,
                    ol_i_id, ol_supply_w_id, ol_quantity, ol_amount, ol_dist_in
                    fo) VALUES (?, ?, ?, ?, ?, ?, ?, ?, ?, ?)
sum_estcost       759986400
count_executions  200

sqlstatement      INSERT INTO OORDER (o_id, o_d_id, o_w_id, o_c_id, o_entry_d,
                    o_ol_cnt, o_all_local) VALUES (?, ?, ?, ?, ?, ?, ?)
sum_estcost       861629
count_executions  200

sqlstatement      INSERT INTO history (h_c_d_id, h_c_w_id, h_c_id, h_d_id, h_w_
                    id, h_date, h_amount, h_data) VALUES (?, ?, ?, ?, ?, ?, ?, ?)
sum_estcost       680436
count_executions  200

sqlstatement      INSERT INTO NEW_ORDER (no_o_id, no_d_id, no_w_id) VALUES ( ?,
                    ?, ?)
sum_estcost       205058
count_executions  200
```

Questions?



Please ask your questions in the Chat!

Thank You



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Thank You

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