

Using the
Sysmaster Database
to perform an
Informix Server Health Check
by Lester Knutsen

Exploring the Sysmaster Database

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2:00pm EST***

Advanced DataTools

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Agenda

- What is the Sysmaster Database?
- **Using the Sysmaster database to perform an Informix Health Check**
 - Monitoring your Informix Server
 - Monitoring Dbspaces and Chunks
 - Monitoring Tables and Indexes
 - Monitoring Users and Sessions
 - Monitoring SQL

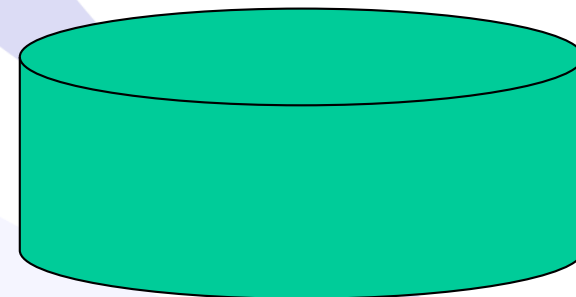
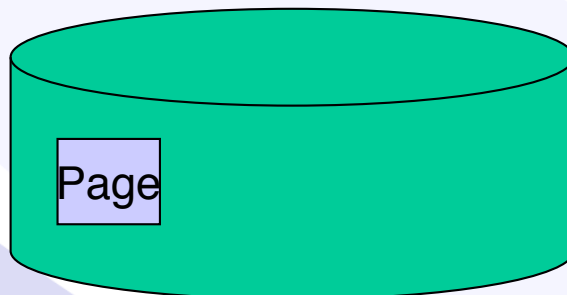
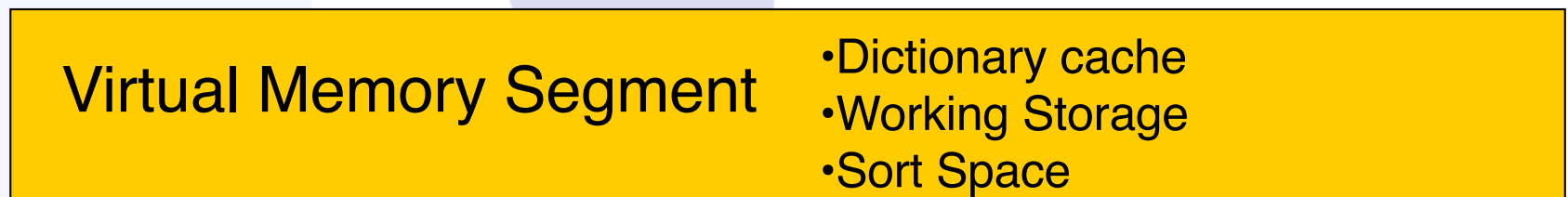
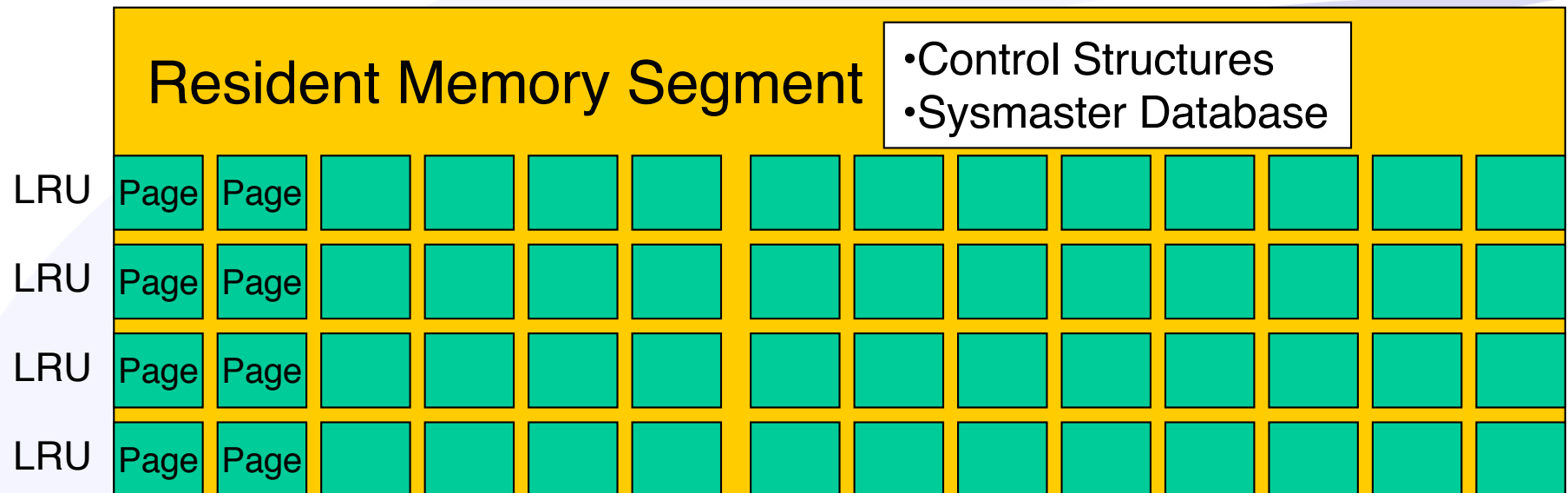
Past Presentations

- Informix Performance Tuning Using the Sysmaster Database
 - Informix Conference 2017, 2016,.... 1997
 - Webcast March 24, 2015 – 63 pages of slides and scripts
 - Webcast April 30, 2013 - 101 pages of slides and scripts
- Webcast Replay on YouTube:
 - <https://www.youtube.com/user/AdvancedDataTools/videos>
 - <http://advanceddatatools.com/Informix/Webcasts.html>

What is the Sysmaster Database?

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

Informix Control Structures in Memory are the Sysmaster Database



Sysmaster Database contains:

- Server information
- Dbospace & 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

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 may 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 11.7 and 12.X
- Sysmaster has changed in IDS 11.X and 12.X

Interesting table: flags_text

```
table flags_text
  tabname char(128), -- sysmaster table
  flags   int, -- flag
  txt     varchar(200) -- description
```

- Description of many of the Flag Numbers

Informix Health Check using the Sysmaster Database

Demo

Informix Health Check using the Sysmaster Database

Server Information:

- server_uptime.sql - Display server uptime and when the stats were last reset
- machineinfo.sql - Display information about the hardware and OS
- syslicense.sql - Display data from the license table
- licensehistory.sql - Display Informix Usages history
- server_onconfig.sql - Display boot and effective configuration parameters
- memsegments.sql - Display Memory Segments

Informix Health Check using the Sysmaster Database

- `buff_btr_ratio.sql` - Display Buffer Turnovers per hour
- `buff_cach_ratio.sql` - Display Buffer read and write cache ratios by buffer pool
- `checkpointhistory.sql` - Display checkpoint history
- `iohistory.sql` - Display chunk I/O history for the past hour
- `vp_statistics.sql` - Display VP status like `onstat -g sch`

Informix Health Check using the Sysmaster Database

DBspace and Chunks:

- `dbspace_free.sql` - Display free space in all dbspaces like Unix "`df -k`" command
- `chunkio.sql` - Display IO by chunk
- `chunklayout.sql` - Display layout of what is in a chunk
- `chunk_free_list.sql` - Display free space within a chunk

Informix Health Check using the Sysmaster Database

Database and Tables:

- database_list.sql - Display database list, owner, and logging status
- database_size.sql - Display size of database based on pages allocated
- tableinfo_freerows.sql - Display data about tables and free row space
- tableextents.sql - Display data about tables extents
- tableseqscans.sql - Display table scans
- table_io_statistics.sql - Display table IO performance
- tableinfo2016.sql - Combined table and statistics data

Informix Health Check using the Sysmaster Database

SQL, Sessions and Threads:

- sysrstcb.sqla - Display all threads
- session_statistics.sql - Display user session profile info
- session_wait_list.sql - Display session wait status

Informix Health Check – Onstat commands:

- `onstat -p > $OUTPUTDIR/onstat-p.out`
- `onstat -d > $OUTPUTDIR/onstat-d.out`
- `onstat -D > $OUTPUTDIR/onstat-D.out`
- `onstat -F > $OUTPUTDIR/onstat-F.out`
- `onstat -k > $OUTPUTDIR/onstat-k.out`
- `onstat -l > $OUTPUTDIR/onstat-l.out`
- `onstat -g sch > $OUTPUTDIR/onstat-sch.out`
- `onstat -g seg > $OUTPUTDIR/onstat-seg.out`
- `onstat -g ckp > $OUTPUTDIR/onstat-ckp.out`
- `onstat -g cpu > $OUTPUTDIR/onstat-cpu.out`
- `onstat -g buf > $OUTPUTDIR/onstat-buf.out`
- `onstat -g iof > $OUTPUTDIR/onstat-iof.out`
- `onstat -g iov > $OUTPUTDIR/onstat-iov.out`
- `onstat -g ses > $OUTPUTDIR/onstat-ses.out`

All the Scripts

```
informix@bigvm:/home/informix/sysmaster2017> ls
blob space_free.sql      dbspace_free.sql      server_ratios2.sql     syssqexplain.sql
buff_btr_ratio.sql      dbwho.sh              server_readahead.sql   table_disk_layout.sql
buff_cach_ratio.sql     dbwho.sql             server_statics.sql     table_extent_plan.sql
buff_cach_sum.sql       index_usage.sql       server_uptime.sql      tableextents.sql
checkpointhistory.sql   iohistory.sql         session_list.sql       tableinfo2016.sql
chunk_free_list.sql     licensehistory.sql    session_locks.sql      tableinfo_freerows.sql
chunkio.sql            logicallogs.sql       session_lockwait.sql   table_io_statistics.sql
chunk_io_stat.sql       log_position.sql      session_statistics.sql  tableseqscans.sql
chunk_io_sum.sql        log_statistics.sql    session_wait_list.sql  table_with_extents.sql
chunklayout.sql         log_transaction.sql   smiversion.sql         table_with_seqscans.sql
chunk_status.sql        machineinfo.sql       sqlhosts.sql           vpcpustats.sql
database_list.sql       memsegments.sql       sql_statistics.sql     vp_profile.sql
database_size.sql       README.txt            syslicense.sql         vp_statistics.sql
dbspace_blob_free.sql   server_onconfig.sql   sysrstcb.sql
informix@bigvm:/home/informix/sysmaster2017> 
```

Server Configuration and Statistics Tables

- sysmachineinfo - Hardware and OS
- syslicenseinfo - Informix usages
- sysfeatures - Features used
- sysconfig - ONCONFIG File
- sysshmvals - System values
- sysprofile - Server statistics

Server Configuration and Statistics Tables

- Memory
 - sysseglst
 - sysbuffpool
 - Memory Segments
 - Buffer Pool
- CPUs
 - sysvplst
 - sysvpprof
 - sysrstcb
 - Virtual Processors
 - Virtual Processors
 - Running Threads

Server Configuration and Statistics Tables

- syslogs
- syslogfil
- syscheckpoint
- sysiohistory
- sysenv
- sysenvses
- sysonlineolog
- Logical Logs
- Logical Logs
- Checkpoints
- Disk I/O
- Server Environment
- User Environment
- Message Log

What is the Hardware and OS?

```
-----  
-- Module: @(#)machineinfo.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  
-----  
  
database sysmaster;  
  
select * from sysmachineinfo;
```

What is the Hardware and OS?

```
os_name          Darwin
os_release       16.5.0
os_nodename       Joy.local
os_version        Darwin Kernel Version 16.5.0: Fri Mar  3 16:52:33 PST 2017;
                  root:xnu-3789.51.2~3/RELEASE_X86_64
os_machine       x86_64
os_num_procs      8
os_num_olprocs    8
os_pagesize       4096
os_mem_total      17179869184
os_mem_free       3537784832
os_open_file_lim  32768
os_shmmax         2147483648
os_shmmin         1
os_shmids         512
os_shmnumsegs     512
os_semmap
os_semid          87381
os_semnum         87381
os_semundo        87381
os_semnumperid
os_semops
os_semundoperproc 10
os_semundosize
os_semmaxvalue
```

What Informix features are used? Table: Syslicenseinfo*

version	char(12),	-- Informix version
week	smallint,	-- Week
year	smallint,	-- Year
max_cpu_vps	smallint,	-- Max number of cpu vps
max_vps	smallint,	-- Max number of vps
max_conns	integer,	-- Max # of user connected
max_sec_conns	integer,	-- Max # of secondary user
max_sds_conns	integer,	-- Max # of sds users
max_sds_clones	smallint,	-- Max # of sds clones
max_rss_clones	smallint,	-- Max # of rss clones
total_size	integer,	-- max disk space (MB)
total_size_used	integer,	-- max disk space used (MB)
max_memory	integer,	-- Max memory allocated (MB)
max_memory_used	integer,	-- Max memory used (MB)
feature_flags	integer,	-- Feature Flags
feature_flags2	integer	-- Feature Flags2

What Informix Features are used? View: Sysfeatures

```
create view sysfeatures (                                { Internal Use Only                                }
    week, year, version, max_cpu_vps, max_vps,
    max_conns, max_sec_conns, max_sds_clones, max_rss_clones,
    total_size, total_size_used,
    max_memory, max_memory_used, is_primary, is_secondary,
    is_sds, is_rss, is_er, is_pdq )
AS
select  week, year, version, max_cpu_vps, max_vps,
        max_conns, max_sec_conns, max_sds_clones, max_rss_clones,
        format_units(total_size, 'M'),
        format_units(total_size_used, 'M'),
        format_units(max_memory, 'M'),
        format_units(max_memory_used, 'M'),
        decode(bitand(feature_flags, 1), 0, 0, 1),
        decode(bitand(feature_flags, 2), 0, 0, 1),
        decode(bitand(feature_flags, 8), 0, 0, 1),
        decode(bitand(feature_flags, 4), 0, 0, 1),
        decode(bitand(feature_flags, 16), 0, 0, 1),
        decode(bitand(feature_flags, 512), 0, 0, 1)
from syslicenseinfo
```

What Informix Features are used?

```
-- Module: @(#)licensehistory.sql      1.0      Date: 2015/03/20
-- Author: Lester Knutsen  Email: lester@advancedatatools.com
--       Advanced DataTools Corporation
-- Description:
--       Tested with Informix 11.70 and Informix 12.10
-----
database sysmaster;

select  year, week, version, max_cpu_vps, max_conns, max_memory
from syslicenseinfo;
```

What Informix Features are used? View: Sysfeatures

year	week	version	max_cpu_vps	max_conns	max_memory
2015	12	12.10.FC4	4	8	5417
2015	11	12.10.FC4	4	9	5417
2015	10	11.70.UC3	4	6	2837
2015	9	11.70.UC3	4	5	2837
2015	8	11.70.UC3	4	7	2837
2015	7	11.70.UC3	4	7	2837
2015	6	11.70.UC3	4	2	2837
2015	5	11.70.UC3	4	2	2837
2015	4	11.70.UC3	4	2	2837
2015	3	11.70.UC3	4	2	2837
2015	2	11.70.UC3	4	3	2837
2015	1	11.70.UC3	4	2	2837
2014	52	11.70.UC3	4	1	2837
2014	51	11.70.UC3	4	4	3032
2014	50	11.70.UC3	4	6	3032
2014	49	11.70.UC3	4	7	3032
2014	48	11.70.UC3	4	6	3032

Sysconfig (onstat -c)

View sysconfig: Configuration information from the Informix server. This information was read from the ONCONFIG file when the server was started.

```
cf_id          integer, -- unique numeric identifier
cf_name        char(128), -- config parameter name
cf_flags       integer, -- flags, 0 = in view sysconfig
cf_original    char(513), -- boottime value in ONCONFIG
cf_effective   char(513), -- value effectively in use
cf_default     char(513) -- value by default
```

What is the current server configuration?

```
-----  
-- Module: @(#)server_onconfig.sql      2.4      Date: 2013/04/10  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--      Advanced DataTools Corporation  
-- Discription: displays effective configuration paramaters  
--      Tested with Informix 11.70 and Informix 12.10  
-----
```

```
database sysmaster;  
  
select  cf_name parameter,  
        cf_original boot_value,  
        cf_effective effective_value  
from    sysconfig
```

SQL output

parameter	ROOTNAME
boot_value	rootdbs
effective_value	rootdbs

parameter	ROOTPATH
boot_value	/informixchunks/vmdb/rootdbs
effective_value	/informixchunks/vmdb/rootdbs

parameter	ROOTOFFSET
boot_value	0
effective_value	0

Interesting 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_curtime	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_buillddpt	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		

DBINFO with sysmaster

Time of Server startup:

```
Select DBINFO ('utc_to_datetime', sh_boottime )  
from sysshmvals;
```

Time Statistics were last cleared (onstat -z) or startup:

```
Select DBINFO ('utc_to_datetime', sh_pfclrtime)  
from sysshmvals;
```

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 sysshmvals;
```

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

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

Sysprofile – Profile Names

dskreads	ovlock	llgreys	rapgs_used
bufreads	ovuser	llgpagewrites	seqscans
dskwrites	ovtrans	llgwrites	totalsorts
bufwrites	latchwts	pagreads	memsorts
isamtot	buffwts	pagwrites	disksorts
isopens	lockreqs	flushes	maxsortspace
isstarts	lockwts	compress	ll_niowaits
isreads	ckptwts	fgwrites	ll_iowait_ms
iswrites	deadlks	lruwrites	num_cpu_reac
isrewrites	lktouts	chunkwrites	num_ready
isdeletes	numckpts	btradata	ll_nbfwaits
iscommits	plgpagewrites	btraidx	ll_bfwait_ms
isrollbacks	plgwrites	dpra	

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

Server Statistics Ratios

```
-- Module: @(#)server_ratios.sql      1.0      Date: 2017/04/01
-- Author: Lester Knutsen  Email: lester@advanceddatatools.com
--      Advanced DataTools Corporation
-- Discription: Displays key server profile/performance ratios
--      The list of names is all the values in Informix 12.10
--      Tested with Informix 12.10
-----

database sysmaster;

-- Read Ahead ratio
select
    "Read Ahead Ratio",
    (( select value  rapgs_used from sysprofile where name = 'rapgs_used') /
      (( select value  btradata from sysprofile where name = 'btradata' ) +
        ( select value  btraidx from sysprofile where name = 'btraidx' ) +
        ( select value  dpra from sysprofile where name = 'dpra' ))) Read_Ahead_Ratio
from sysdual;

-- Sequence Scans
select  "Total Scans:", value
from sysprofile
where name in ( "seqscans" );

select
    "Scans per hour: ",
    ( Value / ( select (ROUND ((( sh_curtime - sh_pfclrtype)/60)/60) )
                from sysshmvals ))
from sysprofile
where name in ( "seqscans" );
```

Server Statistics Ratios

```
-- Sort Information
select name, value
from sysprofile
where name in ( "totalsorts", "memsorts", "disksorts", "maxsortspace" );

select "Sorts per hour:",
      ( Value / ( select (ROUND ((( sh_curtime - sh_pfclrtype)/60)/60) )
                  from sysshmvals ))
from sysprofile
where name in ( "totalsorts" );

-- Buffer Ratios per hour
select "Buffer Reads per hour:",
      ( Value / ( select (ROUND ((( sh_curtime - sh_pfclrtype)/60)/60) )
                  from sysshmvals ))
from sysprofile
where name in ( "bufreads" );

select "Buffer Writes per hour:",
      ( Value / ( select (ROUND ((( sh_curtime - sh_pfclrtype)/60)/60) )
                  from sysshmvals ))
from sysprofile
where name in ( "bufwrites" );
```

Server Statistics Ratios

```
-- Transaction commits per hour
select "Commits per hour:",
      ( Value / ( select (ROUND ((( sh_curtime - sh_pfclrtype)/60)/60) )
                  from sysshmvals ))
from sysprofile
where name in ( "iscommits" );

select "Buffer Waits per hour:",
      ( Value / ( select (ROUND ((( sh_curtime - sh_pfclrtype)/60)/60) )
                  from sysshmvals ))
from sysprofile
where name in ( "buffwts" );

select "Checkpoints per hour:",
      ( Value / ( select (ROUND ((( sh_curtime - sh_pfclrtype)/60)/60) )
                  from sysshmvals ))
from sysprofile
where name in ( "ckptwts" );

-- Lock Information
select name, value
from sysprofile
where name in ( "lockreqs", "lockwts", "deadlks" );

select
      "Lock Wait Ratio",
      case when ( ( select value lockwts from sysprofile where name = 'lockwts' ) <> 0 )
            then (( select value lockreqs from sysprofile where name = 'lockreqs' ) /
                  ( select value lockwts from sysprofile where name = 'lockwts' ))
            else 0
      end case
from sysdual;

-- Write Types
select name, value
from sysprofile
where name in ( "fgwrites", "lruwrites", "chunkwrites");
```

Server Ratios Output -1

```
(constant)          read_ahead_ratio
Read Ahead Ratio 0.93128205510243
1 row(s) retrieved.
```

```
(constant)          value
Total Scans:         10876
1 row(s) retrieved.
```

```
(constant)          (expression)
Scans per hour:      1087.600000000000
1 row(s) retrieved.
```



Lots of Scans

Server Ratios Output -2

name	value
totalsorts	8096
memsorts	7606
disksorts	490
maxsortspace	1870816

4 row(s) retrieved.

(constant)	(expression)
------------	--------------

Sorts per hour: 809.600000000000

1 row(s) retrieved.



Most Sorts are
in Memory

Server Ratios Output -3

```
Buffer Reads per hour: 759445415.000000
```

```
1 row(s) retrieved.
```

```
(constant) (expression)
```

```
Buffer Writes per hour: 98282110.1000000
```

```
1 row(s) retrieved.
```

```
(constant) (expression)
```

```
Commits per hour: 430257.700000000
```

```
1 row(s) retrieved.
```

```
(constant) (expression)
```

```
Buffer Waits per hour: 1224977.40000000
```

```
1 row(s) retrieved.
```

```
(constant) (expression)
```

```
Checkpoints per hour: 19672.4000000000
```

X 2K Buffers = 1.4 TB

x 2K Buffers = 187 GB

327 checkpoints a minute

Server Ratios Output -4

name	value
lockreqs	6867216789
lockwts	5895301
deadlks	0

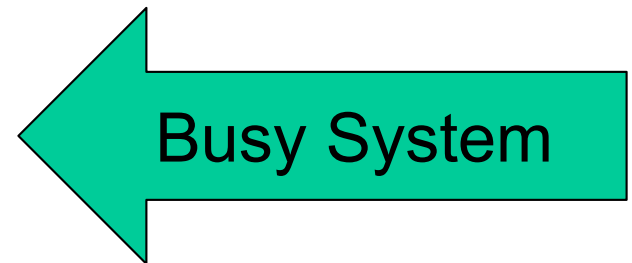
3 row(s) retrieved.

(constant)	case
Lock Wait Ratio	1164.86279309572

1 row(s) retrieved.

name	value
fgwrites	0
lruwrites	0
chunkwrites	119907082

3 row(s) retrieved.



What is the Memory Usage?

Table: Sysseglst

seg_address	int8,	-- address of segment structure
seg_next	int8,	-- pointer to next segment
seg_prev	int8,	-- pointer to prev segment
seg_class	smallint,	-- segment class
seg_size	int8,	-- size of this segment
seg_osshmid	integer,	-- id of this OS segment in this seg
seg_osmaxsize	int8,	-- size of maximum OS segment in this seg
seg_osshmkey	integer,	-- shmkey for first OS segment
seg_procid	integer,	-- process id of creator
seg_userid	smallint,	-- usr id of creator
seg_shmaddr	int8,	-- address of segment
seg_ovhd	int8,	-- amount of overhead bytes
seg_lock	int8,	-- lock to synchronise bitmap access
seg_nextid	integer,	-- segment id of next seg
seg_bmapsz	int8,	-- size of block map
seg_blkused	int8,	-- no. of used blocks in segment
seg_blkfree	int8	-- no. of free blocks in segment

What is the Memory Usage?

```
-- Module: @(#)memsegments.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
-----

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;
```

What is the Memory Usage?

```
-- 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 sysseg1st;
```

What is the Memory Usage?

class	number	total_size	total_blkused	total_blkfree
Message	1	561152	136	1
Resident	1	31289344	7639	0
Buffer	3	5958115328	1454618	0
Virtual	1	1048576000	20679	235321

class	seg_size	seg_blkused	seg_blkfree
Resident	31289344	7639	0
Virtual	1048576000	20679	235321
Buffer	4292870144	1048064	0
Buffer	5337088	1303	0
Buffer	1659908096	405251	0
Message	561152	136	1

Sysbuffpool

indx	integer,	index into buffer pool list
address	int8,	address of buffer pool structure
bufsize	integer,	buffer page size in bytes
nbufs	integer,	number of buffers in buffer pool
buff_header	int8,	address of buffer headers
nlrus	smallint,	number of LRUs
mindirty	float,	pct of dirty pages cleaning stops
maxdirty	float,	pct of dirty pages cleaning starts
dskreads	int8,	number of physical block reads
pagreads	int8,	number of pages read from disk
bufreads	int8,	number of buffer cache reads
dskwrites	int8,	number of physical block writes
pagwrites	int8,	number of pages written to disk
bufwrites	int8,	number of buffer cache writes
bufwrites_sinceckpt	int8,	number of buffer cache writes since last checkpoint
bufwaits	int8,	number of buffer waits
ovbuff	int8,	number of buffer pool overflows
flushes	int8,	number of buffer flush calls
fgwrites	int8,	number of foreground writes
lruwrites	int8,	number of lru writes
chunkwrites	int8,	number of chunk writes
lru_time_total	float,	time spent cleaning LRUs
lru_calls	int8	number of times LRU cleaning invoked

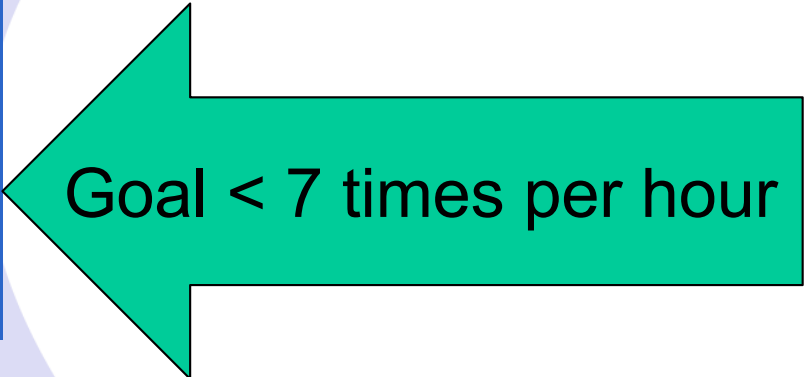
What is the Buffer Turnover Ratio?

```
-----  
-- 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  
-- The Error - 1202: An attempt was made to divide by zero. happens when  
-- the server has been up less then one hour  
-----
```

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

What is the Buffer Turnover Ratio?

bufsize	2048
pagreads	1362751795
bufwrites	1032596400
nbufs	3000000
btr	79.8449398333333



Goal < 7 times per hour

New - What percent of I/O is from buffers?

```
-----  
-- Module: @(#)buff_cach_ratio.sql      2.0      Date: 2013/04/10  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--      Advanced DataTools Corporation  
-- Discription: Display Buffer read and write cach ratios by buffer pool  
--      Tested with Informix 11.70 and Informix 12.10  
-----
```

```
select bufsize,  
       dskreads,  
       pagreads,  
       bufreads,  
       round ((( 1 - ( dskreads / bufreads ) ) *100 ), 2) read_cach,  
       dskwrites,  
       pagwrites,  
       bufwrites,  
       round ((( 1 - ( dskwrites / bufwrites ) ) *100 ), 2) write_cach  
from sysbufpool;
```

SQL Output

bufsize	2048
dskreads	1027372190
pagreads	1363813385
bufreads	7856892742
read_cach	86.92
dskwrites	127046795
pagwrites	182067393
bufwrites	1033707148
write_cach	87.71

Informix Oninit CPU Usage?

Table: Sysvplst*

pid	integer,	-- VP id
address	int8,	-- address of VP struct
pid	integer,	-- unix process id
usecs_user	float,	-- number of usecs of user time
usecs_sys	float,	-- number of usecs of system time
scputimep	int8,	-- ptr to saved cputime (tms)
rcputimep	int8,	-- ptr to reset cputime (tms)
class	integer,	-- class of VP
classname	char(19),	-- classname of VP
readyqueue	int8,	-- ptr to ready queue tab (TCB_Q)
num_ready	integer,	-- number of ready threads
flags	integer,	-- VP flags
next	int8,	-- next in idle list
prev	int8,	-- prev in idle list
semid	integer,	-- semid for this VP
lock	int8,	-- VP protection
total_semops	int8,	-- Total times VP slept on a semop
total_busy_wts	int8,	-- Total VP busy waits
total_yields	int8,	-- Total VP yields
total_spins	int8,	-- Total spins while busy waiting

Informix Oninit CPU Usage?

Table: Sysvplst*

Continued:

steal_attempts	int8,	--
steal_attempts_suc	int8,	--
idle_search	int8,	--
idle_search_suc	int8,	--
vp_poll_scheds	int8,	--
vp_mt_naps	int8,	--
vp_cache_size	int8,	-- size of the vp cache
vp_cache_allocs	int8,	--
vp_cache_miss	int8,	--
vp_cache_frees	int8,	--
vp_cache_drain	int8,	--
vp_cache_nblocks	int8,	-- current number of blocks
thread_run	float,	-- total thread run time on vp
thread_idle	float,	-- total time running idle thread
thread_poll_idle	float	-- inline poll thread idle time

Sysvpprof (onstat -g)

View sysvpprof: Current statistics on Informix Virtual Processors

vpid	integer, -- VP id
txt	char(128)-- VP class name
usecs_user	float, -- unix secs of CPU user time
usecs_sys	float -- unix secs of CPU system time

Oninit CPU Usage

```
-----  
-- Module: @(#)vpprof.sql      2.3      Date: 2013/04/10  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--      Advanced DataTools Corporation  
-- Discription: Displays VP status  
--      Tested with Informix 11.70 and Informix 12.10  
-----
```

```
database sysmaster;  
  
select  
    vpid,  
    pid,  
    txt[1,5] class,  
    round( usecs_user, 2) usercpu,  
    round( usecs_sys, 2) syscpu  
from sysvplst a, flags_text b  
where a.class = b.flags  
and   b.tabname = "sysvplst"
```

Oninit CPU Usage

vpid	pid class	usercpu	syscpu
1	2499 cpu	9300.64	1597.76
2	2500 adm	1.14	3.32
3	2501 lio	24.10	141.24
4	2502 pio	3.66	53.43
5	2503 aio	219.64	443.00
6	2504 msc	0.00	0.00
8	2506 cpu	17180.62	1246.36
9	2507 cpu	10779.89	996.25
10	2508 cpu	7921.13	826.57
11	2509 cpu	6542.53	751.89
12	2510 cpu	6026.70	713.78
13	2511 cpu	5865.98	697.33
14	2512 cpu	5788.90	692.20
15	2513 soc	210.51	358.49
16	2514 soc	209.95	358.19
17	2515 soc	214.26	363.17
18	2516 soc	211.28	360.55
19	2517 aio	302.51	554.97
20	2518 aio	666.18	1085.20
21	2519 aio	576.49	788.52

What threads are running?

Table: sysrstcb

- RSAM Thread Control Block
- Everything you want to know about all running threads....
- `Select * from sysrstcb`

What threads are running?

Table: sysrstcb

Some of the fields in Sysrstcb

uid	integer,	-- user id
username	char(32),	-- user name
sid	integer,	-- session id
tid	integer,	-- thread id
lkwait	int8,	-- waiting for this lock
lkwttype	integer,	-- lock type waiting for
bfwait	int8,	-- waiting for this buffer
bfwtflag	smallint,	-- buffer wait type flag
txwait	int8,	-- waiting for this transaction
txsus	int8,	-- suspended transaction
nreads	integer,	-- number of reads
nwrites	integer,	-- number of writes
nlocks	integer,	-- number of locks currently held
lkwaittime	float,	-- time spent waiting on locks
iowaittime	float,	-- time spent waiting on disk io
upf_niowaits	integer,	-- Number of disk IO waits
upf_idxbufreads	integer	-- Number of index buffer reads

What is the Disk I/O and History? Table: Sysiohistory

address	bigint,
gfd	int,
iskaio	int,
open_mode	int,
open_time	bigint,
path	char(256),
minute	int,
time	bigint,
total_read_ops	bigint,
total_read_time	float,
read_ops_minute	bigint,
read_time_minute	float,
avg_read_time_minute	float,
total_write_ops	bigint,
total_write_time	float,
write_ops_minute	bigint,
write_time_minute	float,
avg_write_time_minute	float,
total_lseek_time	float,
lseek_time_minute	float

Contains last hour of I/O history

Checkpoint History

Table: Syscheckpoint

intvl	int,	-- checkpoint interval
type	char(12),	-- checkpoint type
caller	char(10),	-- caller
clock_time	int,	-- time of day of ckpt
crit_time	float,	-- time spent in wait4critex
flush_time	float,	-- time spent flushing pages to disk
cp_time	float,	-- time from cpkt_pending to done
n_dirty_bufs	int,	-- number of dirty buffers
plogs_per_sec	int,	-- avg # pages plogged
llogs_per_sec	int,	-- avg # pages logged
dskflush_per_sec	int,	-- avg # pages dskflushed
ckpt_logid	int,	-- LSN of ckpt
ckpt_logpos	int,	-- LSN of ckpt
physused	int,	-- total pages plogged in ckpt
logused	int,	-- total pages llogged in ckpt
n_crit_wait	int,	-- # of crit section waiters
tot_crit_wait	float,	-- total time spent waiting for crit
longest_crit_wait	float,	-- longest crit wait
block_time	float	-- blocked time

Syslogs (onstat -l)

View syslogs: Logical logs status

Number	smallint,	logfile number
Uniqid	integer,	logfile uniqid
Size	integer,	pages in logfile
Used	integer,	pages used in logfile
is_used	integer,	1 for used, 0 for free
is_current	integer,	1 for current
is_backed_up	integer,	1 for backedup
is_new	integer,	1 for new
is_archived	integer,	1 for archived
is_temp	integer,	1 for temp
Flags	smallint	logfile flags

Where are the Logical Logs?

```
select      name dbspace,
            chunk chunknum,
            hex(address) address,
            a.number,
            a.uniqid,
            a.offset,
            a.size,
            a.used,
            a.flags,
            bitval(a.flags, '0x1') used,
            bitval(a.flags, '0x2') current,
            bitval(a.flags, '0x4') backedup,
            bitval(a.flags, '0x8') new,
            bitval(a.flags, '0x10') archived,
            bitval(a.flags, '0x20') temp,
            bitval(a.flags, '0x40') dropped,
            DBINFO ('utc_to_datetime', filltime ) timefull
from syslogfil a, syschunks c, sysdbspaces d
where a.chunk = c.chknum
and c.dbsnum = d.dbsnum
```

What is the status of the logical logs?

```
-- List Logical Logs
select
    uniqid,
    used      size_used,
    is_used,
    is_current,
    is_backed_up,
    is_archived
from syslogs
order by uniqid
```

Syscheckpoint table

Intvl	Internal sequence number of the checkpoint
Type	Type of checkpoint, Blocking or Non-Blocking
Caller	Reason for checkpoint, CKPTINT, Physical Log, Logical Log, User
clock_time	Time of checkpoint (System time)
crit_time	Time spent performing checkpoint
flush_time	Time spent flushing pages to disk
cp_time	Time spent from checkpoint pending start to complete
n_dirty_buffs	Number of dirty pages to flush
plogs_per_sec	Average number of pages in physical log per second
llogs_per_sec	Average number of pages in logical log per second
dskflush_per_sec	Average number of disk pages flushed per second
ckpt_logid	Logical Log Id of checkpoint
ckpt_logpos	Logical Log position of checkpoint
Physused	Physical Log pages used
Logused	Logical Log pages used
n_crit_waits	Number of critical waiters threads
tot_crit_wait	Time of critical waiters
longest_crit_wait	Longest Time of critical waiters
block_time	Time checkpoint blocked threads

Sysenv and Sysenvses Tables

Sysenv

env_id	Unique numeric identifier
env_name	Environment variable name
env_value	Environment variable value

Sysenvses

envses_sid	Session ID of user
envses_id	Unique numeric identifier
envses_name	Environment variable name
envses_value	Environment variable value

Sysonlineolog (onstat -m)

<code>offset</code>	Offset into the online log file
<code>next_offset</code>	Offset to the end of the record in the online log file
<code>line</code>	Online log message text

Dbospace and Chunk tables:

- sysdbspaces - DB Spaces
- syschunks - Chunks
- syschkio - I/O by Chunk
- syschfree* - Free Space by Chunk

Dbspaces and Chunks SQL

- `dbspace_free.sql`
- `chunkio.sql`
- `chunklayout.sql`
- `chunk_free_list.sql`

Sysdbspaces (onstat -d)

View sysdbspaces: List all dbspaces on the server

dbsnm	smallint, -- dbspace number,
name	char(128), -- dbspace name,
owner	char(32), -- dbspace owner,
pagesize	int, -- page size in Informix 10.X
Fchunk	smallint, -- first chunk in dbspace,
nchunks	smallint, -- number of chunks in dbspace,
is_mirrored	bitval, -- dbspace mirrored, 1=Yes, 0=No
is_blobspace	bitval, -- dbspace a blob space, 1=Yes
is_temp	bitval, -- dbspace temp, 1=Yes, 0=No
flags	smallint -- dbspace flags

Syschunks (onstat -d)

View syschunks: Lists all chunks on the server

chknum	smallint, -- chunk number
dbsnum	smallint, -- dbspace number
nxchknum	smallint, -- number of next chunk
pagesize	smallint, -- page size in Informix 10.X
chksize	integer, -- pages in chunk
offset	int8, -- pages offset into device
nfree	integer, -- free pages in chunk
is_offline	bitval, -- chunk offline, 1=Yes, 0=No
is_recovering	bitval, -- chunk recovering, 1=Yes
is_blobchunk	bitval, -- chunk blobchunk, 1=Yes
is_inconsistent	bitval, -- chunk inconsistent, 1=Yes

Syschunks (continued)

flags	smallint, -- flags converted by bitval
fname	char(256), -- device pathname
mfname	char(256), -- mirror device pathname
moffset	integer, -- pages offset into mirror
mis_offline	bitval, -- mirror chunk offline, 1=Yes
mis_recovering	bitval, -- mirror chunk recovering,
mflags	smallint mirror chunk flags

Syschkio (onstat -D)

View syschkio: Lists I/O statistics by chunk

chunknum	smallint, -- chunk number
reads	integer, -- number of read ops
pagesread	integer, -- number of pages read
writes	integer, -- number of write ops
Pageswritten	integer, -- number of pages written
mreads	integer, -- number of mirror read ops
mpagesread	integer, -- number of mirror pages read
mwrites	integer, -- number of mirror write ops
mpageswritten	integer -- number of mirror pages written

Note - Underlying undocumented table has read and write time by chunk - see table syschktab_fast

Syschfree*

Table syschfree: Lists free space on a chunk

chknum	integer, -- chunk number
extnum	integer, -- extent number in chunk
start	integer, -- physical addr of start
leng	integer -- length of extent

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 chuncks 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;
```

What Percent of Dbospace is Free?

dbspace	pages_size	pages_used	pages_free	percent_free
batchdbs	5000000	139993	4860007	97.20
datadbs	5000000	4062867	937133	18.74
index16d	500000	228	499772	99.95
indexdbs	5000000	849353	4150647	83.01
logdbs	1500100	1250053	250047	16.67
plogdbs	1500100	1250053	250047	16.67
rootdbs	1000000	12319	987681	98.77
tmp1dbs	500000	53	499947	99.99
tmp2dbs	500000	53	499947	99.99
tmp3dbs	500000	53	499947	99.99
tmp4dbs	500000	53	499947	99.99

Where is my Free Space?

```
-----  
-- Module:  @(#)chunk_free_list.sql      2.5      Date: 2013/04/10  
-- Author:  Lester Knutsen   Email: lester@advancedatools.com  
--          Advanced DataTools Corporation  
-- Discription: Displays free space within a chunk  
--          Tested with Informix 11.70 and Informix 12.10  
-----
```

```
database sysmaster;
```

```
select  
    name dbspace,    -- dbspace name  
    f.chknum,        -- chunk number  
    f.extnum,        -- extent number of free space  
    f.start,         -- starting address of free space  
    f.leng free_pages -- length of free space  
from    sysdbspaces d, syschunks c, syschfree f  
where d.dbsnum = c.dbsnum  
and    c.chknum = f.chknum  
order by dbspace, chknum, extnum
```

What is the I/O by Chunk?

```
-- Module: @(#)chunkio.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
-----

database sysmaster;

select
    name dbspace,
    chknum,
    pagesread,
    pageswritten,
    readtime,
    writetime,
    round( pagesread / ( select sum( pagesread )
                        from sysmaster:syschktab ) , 2) read_percent,
    round( pageswritten / ( select sum( pageswritten )
                        from sysmaster:syschktab ) , 2) write_percent
from    sysmaster:syschktab c, sysmaster:sysdbstab d
where   c.dbsnum = d.dbsnum
order by 1, 2 desc;
```

What is on each Chunk?

```
-----  
-- Module: @(#)chunklayout.sql  1.0      Date: 2015/03/20  
-- Author: Lester Knutsen  Email: lester@advancedatatools.com  
--       Advanced DataTools Corporation  
-- Description:  
--       Tested with Informix 11.70 and Informix 12.10  
-----
```

```
database sysmaster;  
select  dbinfo ("DBSPACE", pe_partnum ) dbspace,  
        pe_chunk          chunknum,  
        pe_offset         ext_start,  
        dbsname           database,  
        tabname           partname,  
        pe_partnum        partnum,  
        pe_extnum         extnum,  
        pe_size           ext_size  
from    sysptnext b, outer systabnames a  
where   a.partnum = b.pe_partnum  
order by 2, 3
```

What is the status of Chunks?

```
select      name dbspace,          -- dbspace name
            d.dbsnum,              -- dbspace num
            is_mirrored,           -- dbspace is mirrored 1=Yes 0=No
            is_blobspace,         -- dbspace is blobspace 1=Yes 0=No
            is_temp,              -- dbspace is temp 1=Yes 0=No
            chunknum chunknum,    -- chunk number
            fname device,         -- dev path
            offset dev_offset,    -- dev offset
            is_offline,           -- Offline 1=Yes 0=No
            is_recovering,        -- Recovering 1=Yes 0=No
            is_blobchunk,         -- Blobspace 1=Yes 0=No
            is_inconsistent,      -- Inconsistent 1=Yes 0=No
            chksize Pages_size,   -- chunk size in pages
            nfree Pages_free,     -- chunk free pages
            mfname mirror_device, -- mirror dev path
            mis_recovering_offse  -- mirror recovering 1=Yes 0=No
from        sysdbspaces d, syschunks c
where       d.dbsnum = c.dbsnum
order by   dbsnum, dbspace, chunknum
```

Database & table information tables:

- sysdatabases - Databases
- systabnames - Tables
- systabextents - Tables extents
- sysptprof - Tables I/O
- systabinfo* - Tables information

Tables and Indexes

- table_disk_layout.sql
- tableextents.sql
- table_with_seqscans.sql
- tableinfo2016.sql
- Index_usage.sql

Sysdatabases

View sysdatabases: List of databases on the server.

name	char(128), -- database name
partnum	integer, -- table id for systables
owner	char(32), -- user name of creator
created	integer, -- date created
is_logging	bitval, -- unbuffered logging, 1=Yes, 0=No
is_buff_log	bitval, -- buffered logging, 1=Yes, 0=No
is_ansi	bitval, -- ANSI mode database, 1=Yes, 0=No
is_nls	bitval, -- NLS support, 1=Yes, 0=No
flags	smallint -- logging flags

Systabnames

Table systabnames: All tables on the server.

partnum	integer, -- table id for table
dbname	char(128), -- database name
owner	char(32), -- table owner
tabname	char(128), -- table name
collate	char(32) -- collation associated with NLS DB

Sysexts (oncheck -pe)

View sysexts: Tables and each extent on the server.

dbname	char(128), -- database name
tablename	char(128), -- table name
Start	integer, -- extent physical address
size	integer -- size of this extent

Sysptprof

View sysptprof: Tables IO profile.

dbname	char(128), -- database name
tabname	char(128), -- table name
partnum	integer, -- partnum for this table
lockreqs	integer, -- lock requests
lockwts	integer, -- lock waits
deadlks	integer, -- deadlocks
lktouts	integer, -- lock timeouts
isreads	integer, -- reads
iswrites	integer, -- writes
isrewrites	integer, -- rewrites
isdeletes	integer, -- deletes
bufreads	integer, -- buffer reads
bufwrites	integer, -- buffer writes
seqscans	integer, -- sequential scans
pagreads	integer, -- disk reads
pagwrites	integer-- disk writes

Systabinfo*

View systabinfo: Table information

ti_partnum	integer, -- table's partnum
ti_flags	smallint, -- partition flags
ti_rowsize	smallint, -- rowsize (max for variable)
ti_ncols	smallint, -- number of varchar or blob columns
ti_nkeys	smallint, -- number of indexes
ti_nextns	smallint, -- number of extents
ti_created	integer, -- date created
ti_serialv	integer, -- current serial value
ti_fextsiz	integer, -- first extent size (in pages)
ti_nextsiz	integer, -- next extent size (in pages)
ti_nptotal	integer, -- number of pages allocated
ti_npused	integer, -- number of pages used
ti_npdata	integer, -- number of data pages
ti_octptnm	integer, -- OCT partnum (optical blobs only)
ti_nrows	integer -- number of data rows

What databases are on the server?

```
-- dblist.sql
select
-- use dbinfo function to convert partnum to
  dbspace
  dbinfo("DBSPACE",partnum) dbspace,
  name database,
  owner,
  is_logging,
  is_buff_log
from sysdatabases
order by dbspace, name;
```

SQL output

dbspace	database	owner	is_logging	is_buff_log
datadbs	extentdb2	usr2	0	0
datadbs	zip1	usr1	0	0
datadbs	zip_lk	lester	0	0
rootdbs	extentdb	lester	0	0
rootdbs	extentdb1	usr1	0	0
rootdbs	onpload	lester	1	0
rootdbs	stores1	usr1	0	0
rootdbs	stores2	usr2	0	0
rootdbs	stores7	informix	0	0
rootdbs	sysmaster	informix	1	0

What is the size of my databases?

```
select  dbsname,  
        sum( pe_size ) total_pages  
from systabnames, sysptnext  
where partnum = pe_partnum  
group by 1  
order by 2 desc
```

What tables need to be reorganized?

```
-----  
-- Module:  @(#)tableextents.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  
-----  
  
database sysmaster;  
  
select ( dbinfo('dbspace', ti_partnum )) dbspace,  
       dbsname database,  
       owner,  
       tabname,  
       ti_partnum      partnum,  
       ti_pagesize     pagesize,  
       ti_nptotal      total_pages,  
       ti_npused       used_pages,  
       ti_npdata       data_pages,  
       ti_nextns       num_extents  
from systabnames, systabinfo  
where ti_partnum = partnum  
order by 10 desc;
```

How calculate new extent sizes?

```
-- tabextprop.sql
select  dbsname,
        tabname,
        count(*) num_of_extents,
        sum (pe_size ) current_pages_used,
        round (sum (pe_size )
                * 2 { Your systems page size in KB }
                * 1.2 { Add 20% Growth factor })
        Proposed_ext_size, { First Extent Size in KB }
        round (sum (pe_size )
                * 2 { Your systems page size in KB }
                * .2 { Estimated 20% Yearly Growth })
        Proposed_next_size { Next Extent Size in KB }
from    systabnames, sysptnext
where   partnum = pe_partnum
group by 1, 2
order by 3 desc, 4 desc;
```

SQL output

dbname	zip7
tablename	zip
num_of_extents	50
current_pages_used	1168
proposed_ext_size	2803
proposed_next_size	467

dbname	zip_lk
tablename	zip
num_of_extents	27
current_pages_used	1544
proposed_ext_size	3706
proposed_next_size	618

What tables have the most I/O?

```
-- tabprofile.sql
select
  dbname,
  tablename,
  DBINFO ( 'dbspace', partnum ),
  lockreqs, lockwts, deadlks, lktouts,
  isreads, iswrites, isrewrites, isdeletes,
  bufreads, bufwrites, seqscans, pagreads,
  pagwrites
from sysptprof
order by isreads desc;
-- change this sort to whatever you need to
   monitor.
```

What tables have sequential scans?

```
-----  
-- Module: @(#)table_with_seqscans.sql  2.1      Date: 2013/04/10  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--      Advanced DataTools Corporation  
-- Discription: Displays tables with sequence scans  
--      Tested with Informix 11.70 and Informix 12.10  
-----  
  
database sysmaster;  
□  
select  dbsname,  
        tabname,  
        ti_npdata  pages_used,  
        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  
order   by 5 desc
```

What is the table layout on disk?

```
-----  
-- Module: @(#)tablayout.sql      2.5      Date:2013/04/10  
-- Author: Lester Knutsen  Email: lester@advancedatools.com  
--      Advanced DataTools Corporation  
-- Discription: Displays tables and extents  
--      Tested with Informix 11.70 and Informix 12.10  
-----
```

```
database sysmaster;
```

```
select dbinfo( "DBSPACE" , pe_partnum ) dbspace,  
       dbsname,  
       tabname,  
       -- pe_phys      start,  -- use this for IDS < 9.40  
       pe_offset      start,  -- use this for IDS >= 9.40  
       pe_size size  
from   sysptnext, outer systabnames  
where  pe_partnum = partnum  
order by dbspace, start;
```

Index Usage

```
-- #####
-- ## Module: @(#)index_usage.sql      2.0      Date: 01/01/2015
-- ## Author: Lester Knutsen  Email: lester@advancedatools.com
-- ##           Advanced DataTools Corporation
-- #####

select
    a.tabname,
    b.idxname,
    bufreads,
    bufwrites,
    case
        when bufwrites = 0 then bufreads
        when bufreads = 0 then 0
        else ( bufreads /bufwrites )
    end ratio
from   systables a, sysindexes b,  outer sysmaster:sysptprof p
where  a.tabid = b.tabid
and    p.tabname = b.idxname
and    a.tabid > 99;
```

All Table Info

- *Everything you want to know about your tables*
- *Load results into an Excel Worksheet*
- *Example*

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

All the Information about a Table

```
-- Module: @(#)tableinfo2016.sql 1.0      Date: 2016/04/01
-- Author: Lester Knutsen      Email: lester@advanceddatatools.com
-- Description: Advanced DataTools Corporation
-- Description: New Table Information Script - Unload the output to a file
-- and the load the results into a worksheet for analysis
-- Tested with Informix 11.70 and Informix 12.10
-----

database sysmaster;

-- unload to tableinfo2016.uld
select
  systabnames.dbsname      database,
  systabnames.tabname      tabname,
  ( dbinfo('dbspace', ti_partnum ) ) dbspace,
  systabnames.partnum,
  ti_rowsize      row_size,
  ti_ncols      num_columns,
  ti_nkeys      num_indexes,
  ti_nextns      num_extents,
  ti_pagesize      page_size,
  ti_nptotal      pages_total,
  ti_npused      pages_used,
  ti_npdata      pages_data,
  (ti_nptotal - ti_npused ) pages_free,
  ti_nrows      num_rows,
  case
    when ( (ti_pagesize +4) -24) < ti_rowsize      then "Row larger then pagesize"
    else "Row smaller the pagesize"
  end rowfit,
  case
    when ti_rowsize > 0 then
      trunc ((ti_pagesize -24) / ti_rowsize )
    else 0
  end rows_per_page,
  case
    when ti_rowsize > 0 then
      ( trunc ((ti_pagesize -24) / ti_rowsize ) ) * (ti_nptotal - ti_npused )
    else 0
  end free_rows,
  DBINFO ('utc_to_datetime', ti_created ) create_date,
  lockregs,
  lockwts,
  deadlks,
  lktouts,
  isreads,
  iswrites,
  isrewrites,
  isdeletes,
  bufreads,
  bufwrites,
  seqscans,
  pagreads,
  pagwrites,
  ( bufreads + bufwrites ) total_io,
  case
    when pagreads > 0 then
      ( pagreads / bufreads )
    else 0
  end buff_read_percent,
  case
    when pagwrites > 0 then
      ( pagwrites / bufwrites )
    else 0
  end buff_write_percent,
  (( ti_npdata * seqscans ) * ti_pagesize ) total_bytes_scanned
from systabnames, systabinfo, outer sysptprof
where  systabinfo.ti_partnum = systabnames.partnum
and    systabinfo.ti_partnum = sysptprof.partnum
and    systabnames.dbsname not in ( "sysmaster", "sysuser", "sysutils", "sysadmin" )
and    ti_npdata > 0 -- remove partitions with no data pages
order by total_io desc;
```

Current User Session Information

- syssessions
 - Status of Session
- sys sesprof
 - Performance statistics
- syslocks
 - Locks
- syseswts
 - Wait times

View: Sysessions (onstat -q ses)

```
{ Active sessions }
  create view informix.syssessions ( sid, username, uid, pid,
                                     hostname, tty, connected, feprogram,
                                     pooladdr,
                                     is_wlatch, is_wlock, is_wbuff, is_wckpt,
                                     is_wlogbuf, is_wtrans, is_monitor, is_incrit,
                                     state
                                   )
    as
  select a.sid, a.username, a.uid, a.pid,
         a.hostname, a.ttyerr, a.connected, a.progname, a.poolp,
         bitval(b.flags, '0x2'), bitval(b.flags, '0x4'),
         bitval(b.flags, '0x8'), bitval(b.flags, '0x10'),
         bitval(b.flags, '0x1000'), bitval(b.flags, '0x40000'),
         bitval(b.flags, '0x80'), bitval(b.flags, '0x100'), b.flags
  from sysscb1st a, sysrstcb b
  where a.address = b.scb
        and bitval(b.flags, '0x80000') = 1; { primary thread }
grant select on informix.syssessions to public as informix;
```

View: Sysessions (onstat -g ses)

User session and connection information

sid	integer,	-- Session id number
username	char(32),	-- User name
uid	smallint,	-- User unix id
pid	integer,	-- User process id
hostname	char(16),	-- Hostname
tty	char(16),	-- TTY port
connected	integer,	-- Time user connected
feprogram	char(16),	-- Program name
pooladdr	integer,	-- Pointer to private pool

View: Sysessions (continued)

User session and connection information

is_wlatch	integer,	-- Flag 1=Wait on latch
is_wlock	integer,	-- Flag 1=Wait on lock
is_wbuff	integer,	-- Flag 1=Wait on buffer
is_wckpt	integer,	-- Flag 1=Wait on checkpoint
is_wlogbuf	integer,	-- Flag 1=Wait on log buffer
is_wtrans	integer,	-- Flag 1=Wait on a transaction
is_monitor	integer,	-- Flag 1=A monitoring process
is_incrit	integer,	-- Flag 1=In critical section
State	integer	-- Flags

View: Sysstesprof (onstat -g ses)

```
{ Session activity profile }
create view informix.sysstesprof(sid, lockreqs, locksheld, lockwts,
                                deadlks, lktouts, logrecs, isreads,
                                iswrites, isrewrites, isdeletes, iscommits,
                                isrollbacks, longtxs, bufreads, bufwrites,
                                seqscans, pagreads, pagwrites, total_sorts,
                                dsksorts, max_sortdiskspace, logspused, maxlogsp )
as
select sid, sum( upf_rqlock), sum(nlocks), sum(upf_wtlock), sum(upf_deadlk),
              sum(upf_lktouts), sum(upf_lgreys), sum(upf_isread),
              sum(upf_iswrite), sum(upf_isrwrite), sum(upf_isdelete),
              sum(upf_iscommit), sum(upf_isrollback), sum(upf_longtxs),
              sum(upf_bufreads), sum(upf_bufwrites), sum(upf_seqscans),
              sum(nreads), sum(nwrites), sum(upf_totsorts),
              sum(upf_dsksorts), sum(upf_srtspmax), sum(upf_logspuse),
              sum(upf_logspmax)
from sysrstcb
  where sid > 0
  group by sid;
```

View: Sys sesprof (onstat -g ses)

User session performance statistics

sid	integer, -- Session Id
lockreqs	decimal(16,0), -- Locks requested
locksheld	decimal(16,0), -- Locks held
Lockwts	decimal(16,0), -- Locks waits
Deadlks	decimal(16,0) -- Deadlocks detected
Lktouts	decimal(16,0), -- Deadlock timeouts
Logrecs	decimal(16,0), -- Logical Log written
Isreads	decimal(16,0), -- Reads
iswrites	decimal(16,0), -- Writes
isrewrites	decimal(16,0), -- Rewrites
isdeletes	decimal(16,0), -- Deletes
iscommits	decimal(16,0), -- Commits
isrollbacks	decimal(16,0), -- Rollbacks
longtxs	decimal(16,0), -- Long transactions

View: Sysstesprof (continued)

bufreads	decimal(16,0),	-- Buffer reads
bufwrites	decimal(16,0),	-- Buffer writes
seqscans	decimal(16,0),	-- Sequential scans
pagreads	decimal(16,0),	-- Page reads
pagwrites	decimal(16,0),	-- Page writes
total_sorts	decimal(16,0),	-- Total sorts
dsksorts	decimal(16,0),	-- Sorts to disk
max_sortdiskspace	decimal(16,0),	-- Max space used by a sort
logspused	decimal(16,0),	-- Current log bytes used
maxlogsp	decimal(16,0)	-- Max bytes of logical logs used

View: Syslocks (onstat -k)

```
{ Locks (keep for 6.0 compatibility) }
  create view informix.syslocks (dbname, tabname, rowidlk, keynum, type,
                                owner, waiter)
    as
    select dbname, b.tabname, rowidr, keynum, e.txt[1,4], d.sid, f.sid
      from syslcktab a, systabnames b, systxptab c, sysrstcb d,
           flags_text e, outer sysrstcb f
     where a.partnum = b.partnum
           and a.owner = c.address
           and c.owner = d.address
           and a.wtlist = f.address
           and e.tabname = 'syslcktab'
           and e.flags = a.type;
  grant select on informix.syslocks to public as informix;

{ Locks }
  create view informix.syslocktab ( lk_id, lk_addr, lk_same, lk_wtlist, lk_owner,
                                   lk_list, lk_type, lk_flags, lk_bsize, lk_keynum,
                                   lk_rowid, lk_partnum, lk_kvobj, lk_dipnum,
                                   lk_grtime )
    as select indx, address, same, wtlist, owner, list, type, flags, bsize,
           keynum, rowidr, partnum, rowidn, dipnum, grtime from syslcktab;
  grant select on informix.syslocktab to public as informix;
```

Syslocks (onstat -k)

View syslocks: Active locks on server

dbname	char(128), -- Database name
tablename	char(128), -- Table name
rowidlk	integer, -- Rowid for index key lock
Keynum	smallint, -- Key number of index key lock
owner	integer, -- Session ID of lock owner
Waiter	integer, -- Session ID of first waiter
type	char(4), -- Type of Lock

View: Syssewts – How long has a session been waiting?

```
{ Session Waits profile }  
  create view informix.syssewts (sid, reason, numwaits, cumtime, maxtime)  
  as  
  select a.sid, c.txt, b.wnum, b.wcumtime, b.wmaxtime  
    from sysrstcb a, systwaits b, flags_text c  
   where a.tid = b.tid  
        and b.wreason = c.flags  
        and c.tabname = 'systwaits';  
grant select on informix.syssewts to public as informix;
```

View: Syssewts – How long has a session been waiting?

- Need to turn on WSTATS in the ONCONFIG file

```
#####  
# Statistic Configuration Parameters  
#####  
# QSTATS  - Enables (1) or disables (0) the collection of queue  
#           statistics that can be viewed with onstat -g qst  
# WSTATS  - Enables (1) or disables (0) the collection of wait  
#           statistics that can be viewed with onstat -g wst  
#####  
  
QSTATS 0  
WSTATS 0
```

Example SQL: dbwho.sql

```
-- Module: @(#)dbwho.sql      2.5      Date: 2013/04/10
-- Author: Lester Knutsen   Email: lester@advancedatools.com
--           Advanced DataTools Corporation
-- Discription: Displays who is using what database
--           Tested with Informix 11.70 and Informix 12.10
-----
```

```
database sysmaster;
```

```
select
```

```
    sysdatabases.name database,
    syssessions.username,
    syssessions.hostname,
    syslocks.owner sid
```

```
from  syslocks, sysdatabases , outer syssessions
```

```
where syslocks.rowidlk = sysdatabases.rowid
```

```
and   syslocks.tabname = "sysdatabases"
```

```
and   syslocks.owner = syssessions.sid
```

```
order by 1;
```

List all Active Sessions

```
-- Module: @(#)session_list.sql 2.3      Date: 2013/04/10
-- Author: Lester Knutsen  Email: lester@advancedatools.com
--      Advanced DataTools Corporation
-- Discription: Displays short list of user sessions
--      Tested with Informix 11.70 and Informix 12.10
```

```
database sysmaster;

select  sid,
        username,
        pid,
        hostname,
        l2date(connected) startdate
from    sysessions
```

Monitor Resource Usage by User

```
-- Module: @(#)session_statistics.sql  2.3      Date: 2013/04/10
-- Author: Lester Knutsen  Email: lester@advancedatools.com
--        Advanced DataTools Corporation
-- Discription: Displays user session profile info.
--        Tested with Informix 11.70 and Informix 12.10
-----

database sysmaster;

-- Most of the following columns are commented out so this will
-- display on a 80 column screen.

select  username,
        sysstesprof.sid,
        lockreqs,
        -- locksheld,
        -- lockwts,
        -- deadlks,
        -- lktouts,
        -- logrecs,
        -- isreads,
        -- iswrites,
        -- isrewrites,
        -- isdeletes,
        -- iscommits,
        -- isrollback,
        -- longtxs,
        bufreads,
        bufwrites
        -- seqscans,
        -- pagreads,
        -- pagwrites,
        -- total_sorts,
        -- dsksorts,
        -- max_sortdiskspace,
        -- logspused,
        -- maxlogsp
from    sysstesprof, sysstessions
where   sysstesprof.sid = sysstessions.sid
order by bufreads desc
```

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: syssqexplain.sql

What is the most expensive SQL running?

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

What is the most expensive SQL running?

```
-----  
-- Module: @(#)syssqexplain.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  
-----
```

```
database sysmaster;  
  
select  
    sqx_estcost,  
    sqx_sqlstatement  
from    syssqexplain  
into    temp A;  
  
select  
    sqx_sqlstatement sqlstatement,  
    sum(sqx_estcost) sum_estcost,  
    count(*)          count_executions  
from A  
group by 1  
order by 2 desc;
```

View: Syssqexplain

```
{ Show sqexplain information }
create view informix.syssqexplain (          { 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 syssdblock, 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        }
);
```

Internal Table: Syssdbblock

```
create table informix.syssdbblock          { Internal Use Only
(
  sdb_sessionid      integer,      { session id          }
  sdb_sdbno          integer,      { position in array   }
  sdb_iscurrent       char(1),      { current statement?  }
  sdb_name           char(128),     { front-end's name for statement }
  sdb_id             smallint,      { back-end's id for statement }
  sdb_flags          integer,      { defined below       }
  sdb_executions      integer,      { total # of executions }
  sdb_cumtime        float,         { total cumulative execution time }
  sdb_bufreads       integer,      { total # of buffers read }
  sdb_pagereads       integer,      { total # of pages read from disk }
  sdb_bufwrites       integer,      { total # of buffers written }
  sdb_pagewrites      integer,      { total # of pages written }
  sdb_tot sorts      integer,      { total # of sorts performed }
  sdb_dsk sorts      integer,      { total # of sorts requiring disk io }
  sdb_sortspmax       integer,      { max disk space required by a sort }
  sdb_cb             int8,          { conblock for statement }
  sdb_cblist         int8,          { list of all cb's in statement }
  sdb_heap           int8,          { memory heap for this statement }
  sdb_partnum        integer,      { part num for temp blob table }
  sdb_isfd           smallint,      { file descriptor for the table }
  sdb_recnum         integer,      { row for blob descriptors }
  sdb_sqerrno        smallint,      { for fetching, if rows need to be }
  sdb_sqiserrno      smallint,      { returned to the user first, but }
  sdb_sqoffset       integer,      { need to set the error in the next }
  sdb_errstr         char(64),      { fetch statement     }
  sdb_ntables        integer,      { number of table descriptors }
  sdb_sqttab         int8,          { thread specific tab info }
  sdb_asynch_sqerrno integer,      { error reported by asynch thread }
  sdb_asynch_sqiserr integer,      { error reported by asynch thread }
  sdb_pool           int8,          { statement memory pool }
  sdb_mutex          int8,          { misc lock (to check sd_sqerrno) }
  sdb_tgcblist       int8,          { list of cbs to be use to build }
  sdb_pdq_prio_req   smallint,      { requested priority }
  sdb_pdq_priority   smallint,      { currently allowed pdq_priority }
  sdb_max_scans      integer        { currently allowd # scans }
);
```

Questions?



Send follow-up questions to
lester@advanceddatatools.com

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Next Webcast

Informix Best Practices

- **Informix Query Performance Tuning Basics - by Mike Walker**
 - Thursday, October 26, 2017 at 2:00pm EST
- **Schema Design Tips - by Art Kagel**
 - Thursday, November 30, 2017 2:00pm EST
- **Next New Webcast – by Tom Beebe**
 - Thursday, December 14, 2017 2:00pm EST

Please register for each webcast here at:

<http://advanceddatatools.com/Informix/NextWebcast.html>

Informix Training 2018

– Advanced Informix Performance Tuning

- February 5-8, 2018

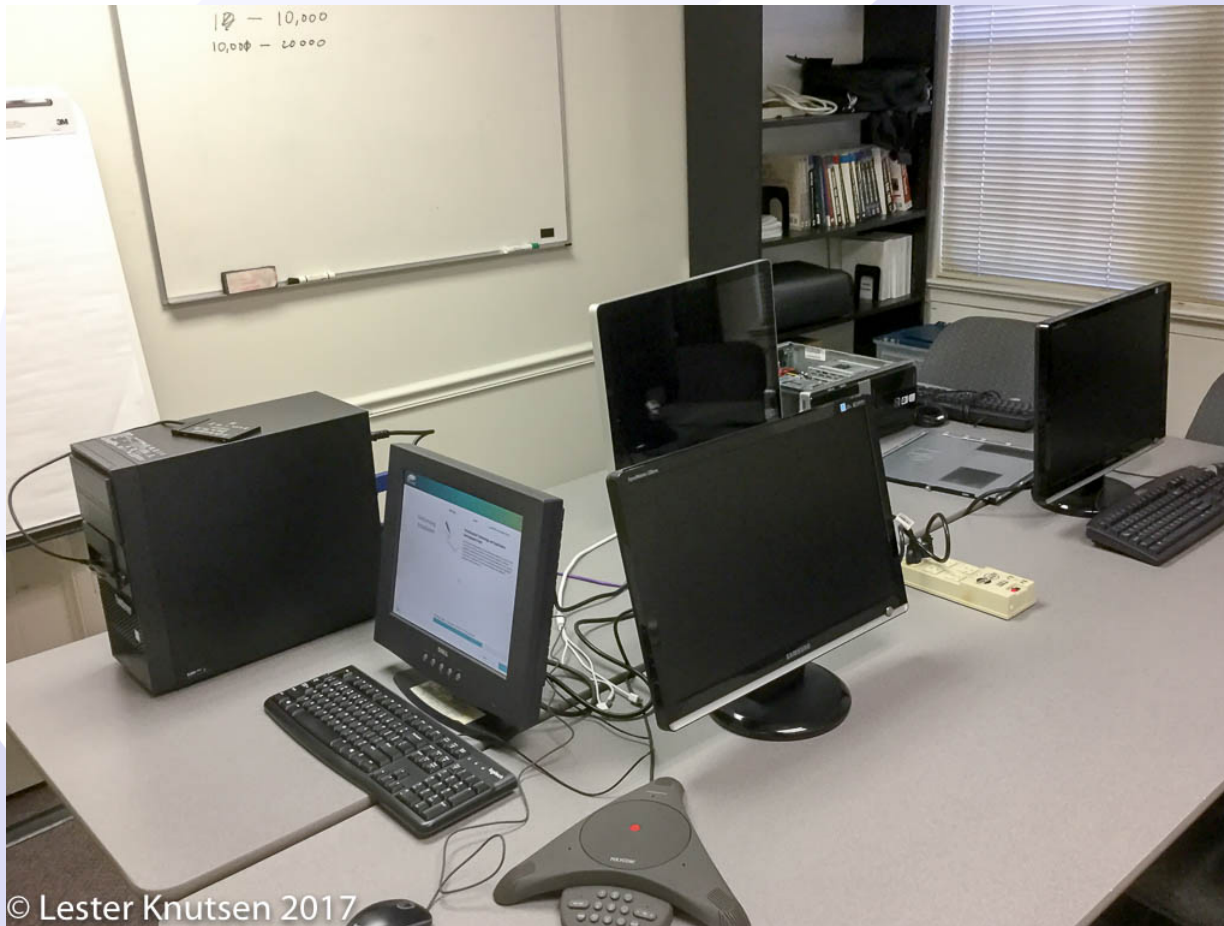
– Informix for Database Administrators

- April 23-26, 2018

- 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!
- Please register early as the last two courses have filled up and we have not been able to accommodate everyone.

<http://advanceddatatools.com/Training/InformixTraining.html>

Coming Soon New Training Servers



- Each Student in class will have a server running Informix with:
- 8 Cores
 - 8 – 62 GB RAM
 - 1 SSD Disk
 - 1-4 more disks

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Thank You

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For more information:

<http://www.advanceddatatools.com>

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