Managing and Tuning your Informix IDS Server using the Sysmaster database

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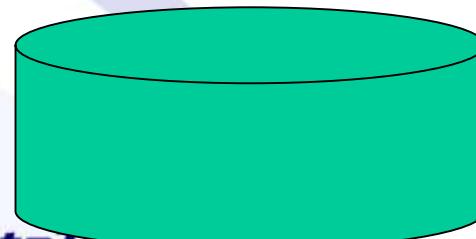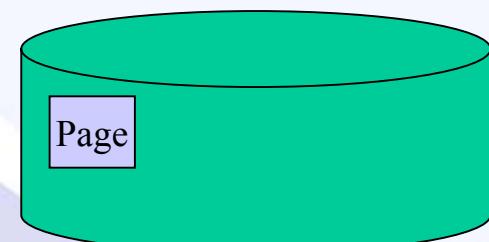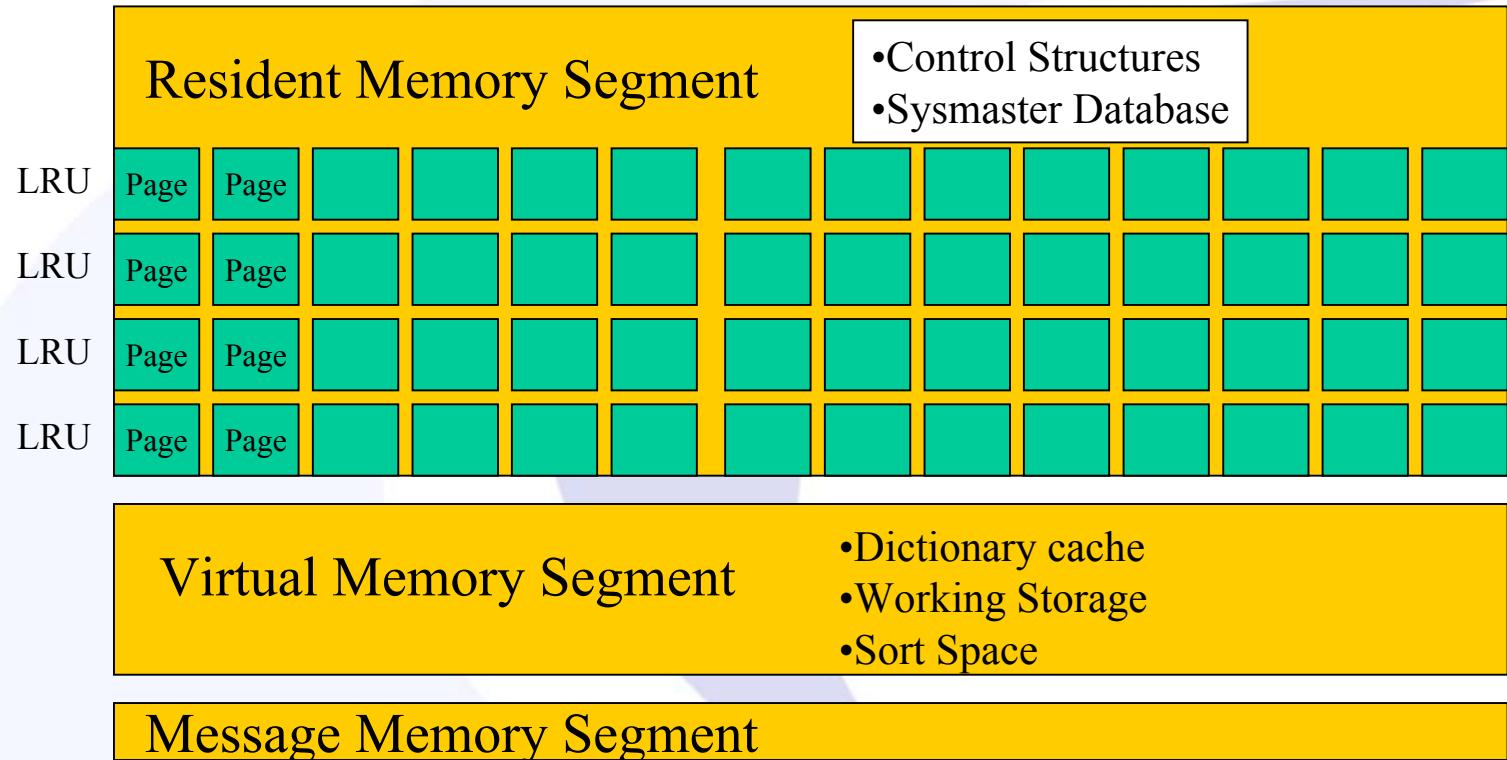
# What is the sysmaster database?

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

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What is the sysmaster database?

- Sysmaster database contains:

    - System Monitoring Tables (SMI)
        - tracks information about the Database Server

IDS Control Structures in Memory are the Sysmaster Database

Resident Memory Segment

- Control Structures
- Sysmaster Database

LRU | Page | Page |
LRU | Page | Page |
LRU | Page | Page |
LRU | Page | Page |

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

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Sysmaster database contains:

- Server information

- Dbspace & chunk information

- Database & table information

- Use session information

Key Tables in Sysmaster

Exploring the Sysmaster Database
by Lester Knutsen
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Key Tables in the Sysmaster Database

sysconfig
- cf_id: integer
- cf_name: char(18)
- cf_flags: integer
- cf_original: char(256)
- cf_effective: char(256)
- cf_default: char(256)

sysprofile
- name: char(13)
- value: integer

syslogs
- number: smallint
- uniqid: integer
- size: integer
- used: integer
- is_used: integer
- is_current: integer
- is_backed_up: integer
- is_new: integer
- is_archived: integer
- is_temp: integer
- flags: smallint

sysvpprof
- vpid: integer
- class: char(50)
- usercpu: double precision
- syscpu: double precision

sysdbspaces
- dbsnum: smallint
- name: char(18)
- owner: char(8)
- fchunk: smallint
- nchunks: smallint
- is_mirrored: integer
- is_blobspace: integer
- is_temp: integer
- flags: smallint

syschunks
- chknum: smallint
- dbsnum: smallint
- nxchknum: smallint
- chksize: integer
- offset: integer
- nfree: integer
- is_offline: integer
- is_recovering: integer
- is_blobchunk: integer
- is_inconsistent: integer
- flags: smallint
- fname: char(128)
- mfname: char(128)
- moffset: integer
- mis_offline: integer
- mis_recovering: integer
- mflags: smallint

syschkio
- chunknum: smallint
- reads: integer
- pagesread: integer
- writes: integer
- pageswritten: integer
- mreads: integer
- mpagesread: integer
- mwrites: integer
- mpageswritten: integer

sysdatabases
- name: char(18)
- partnum: integer
- owner: char(8)
- created: date
- is_logging: integer
- is_buff_log: integer
- is_ansi: integer
- is_nls: integer
- flags: smallint

systabnames
- partnum: integer
- dbsname: char(18)
- owner: char(8)
- tabname: char(18)
- collate: char(32)

sysptprof
- dbsname: char(18)
- tabname: char(18)
- partnum: integer
- lockreqs: integer
- lockwts: integer
- deadlks: integer
- lktouts: integer
- isreads: integer
- iswrites: integer
- isrewrites: integer
- isdeletes: integer
- bufreads: integer
- bufwrites: integer
- seqscans: integer
- pagreads: integer
- pagwrites: integer

sysseswts
- sid: integer
- reason: char(50)
- numwaits: integer
- cumtime: double precision
- maxtime: integer

syslocks
- dbsname: char(18)
- tabname: char(18)
- rowidlk: integer
- keynum: smallint
- type: char(4)
- owner: integer
- waiter: integer

sysextents
- dbsname: char(18)
- tabname: char(18)
- start: integer
- size: integer

syssessions
- sid: integer
- username: char(8)
- uid: smallint
- pid: integer
- hostname: char(16)
- tty: char(16)
- connected: integer
- feprogram: char(16)
- pooladdr: integer
- is_wlatch: integer
- is_wlock: integer
- is_wbuff: integer
- is_wckpt: integer
- is_wlogbuf: integer
- is_wtrans: integer
- is_monitor: integer
- is_incrit: integer
- state: integer

syssesprof
- sid: integer
- lockreqs: integer
- locksheld: integer
- lockwts: integer
- deadlks: integer
- lktouts: integer
- logrecs: integer
- isreads: integer
- iswrites: integer
- isrewrites: integer
- isdeletes: integer
- iscommits: integer
- isrollbacks: integer
- longtxs: integer
- bufreads: integer
- bufwrites: integer
- seqscans: integer
- pagreads: integer
- pagwrites: integer
- total_sorts: integer
- dsksorts: integer
- max_sortdiskspace: integer
- logspused: integer
- maxlogsp: integer

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How to manage and tune your Informix IDS Server using the sysmaster database

Objectives of this presentation:

- Performance tuning tips
- Scripts to monitor the health of your IDS server
- Explore the sysmaster database

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Monitoring and Tuning needs:

- Display information about your server configuration.
- Display key statistics – (buffer usage, waits, writes)
- Display free space available (like the unix df -k command).
- Display status and characteristics of each chunk device.
- Display blocks of free space to plan where to put large tables.
- Display I/O statistics by chunk devices.
- Display a layout of dbspace, databases, tables, and extents.
- Display table usage statistics sorted by reads, writes or locks.
- Display user session statistics sorted by reads, writes or locks.

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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 hid complex data

- Some tables are large (250,000 locks)

- Unbuffered logging of temp tables

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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

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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

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Using Triggers and Stored Procedures

- Can create triggers and Stored Procedures

- Triggers will never be execute because tables do not change using normal SQL updates

- Use "polling" to check for changes

- Stored Procedures can be executed in the sysmaster database

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 IDS

- Scripts have been run on versions 7.2 to 9.4

Creating the sysmaster database
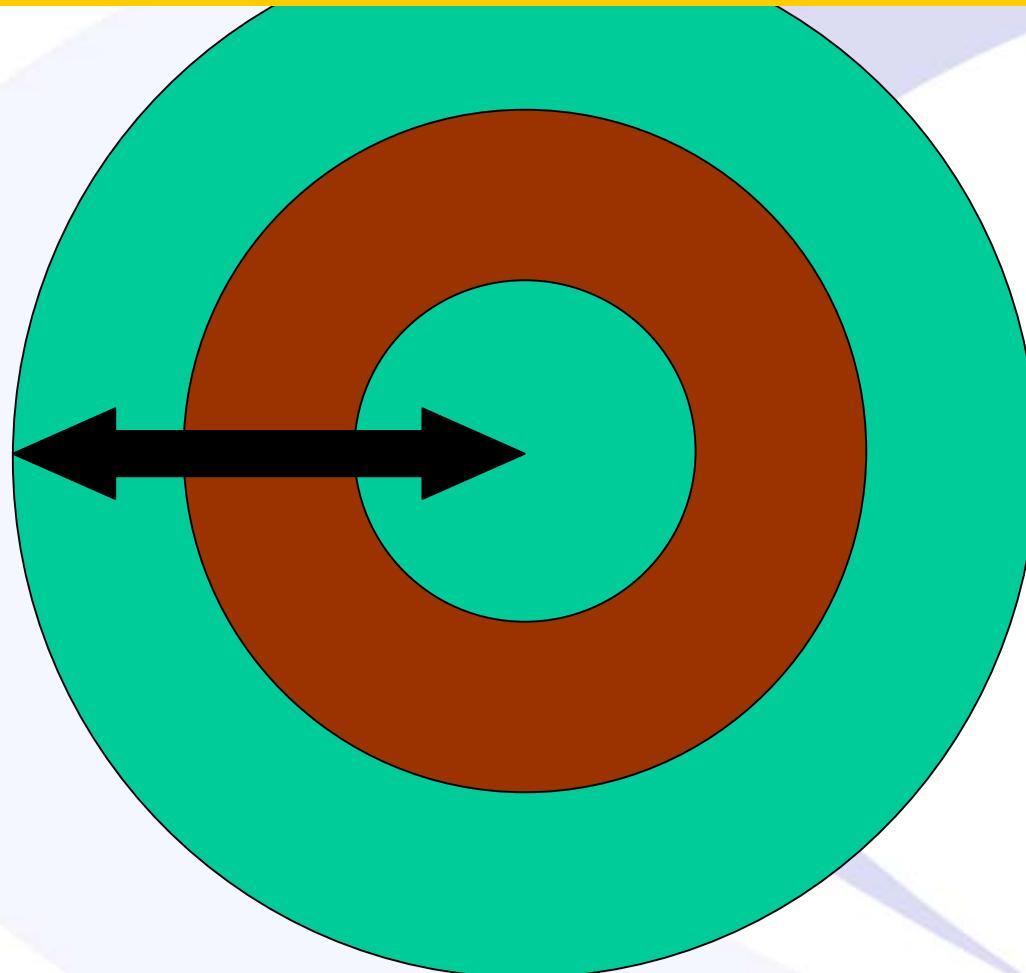
When OnLine is first initalized the sysmaster database is created using the script in $INFORMIXDIR/etc/sysmaster.sql

- Create real tables with the structures of the pseudo tables
- Copy the structure of the real tables to temp tables
- Drop the real tables
- Update the systables.partnum to point to pseudo tables in shared memory
- Create the flags_text table which has the interpretations for flags used in the tables
- Create stored procedures used in the views, two of which are interesting:
  - bitval() is a stored procedure for getting the boolean flag values
  - l2date() is a stored procedure for converting unix time() long values to dates
- Create the sysmaster views
- Create the on-archive tables and views
- This process requires 2000KB of Logical Logs

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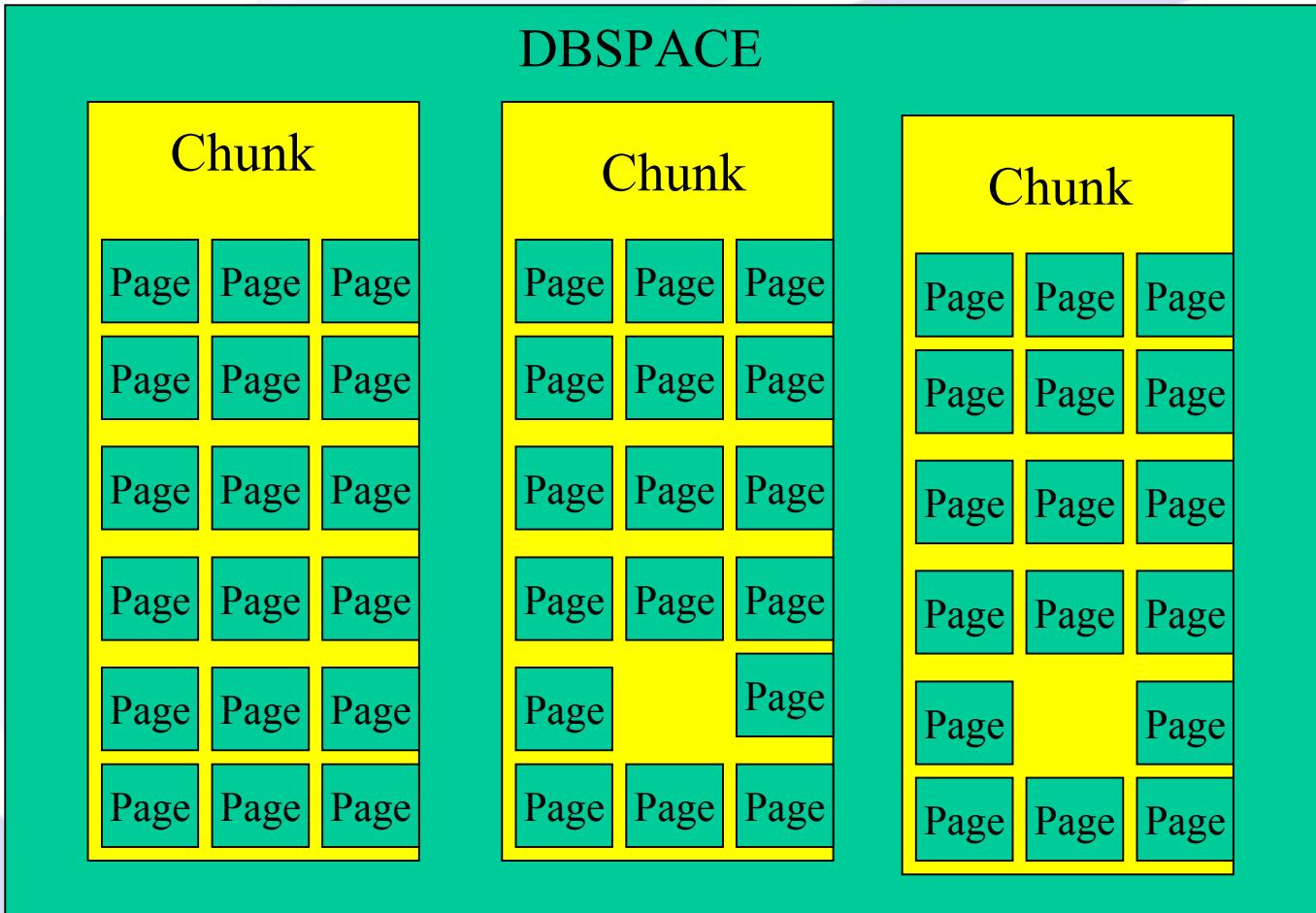
Goals of Managing and Performance Tuning

- Reduce CPU Cycles

- Reduce Disk I/O

- Reduce Memory Requirements

- Reduce Network Bandwidth

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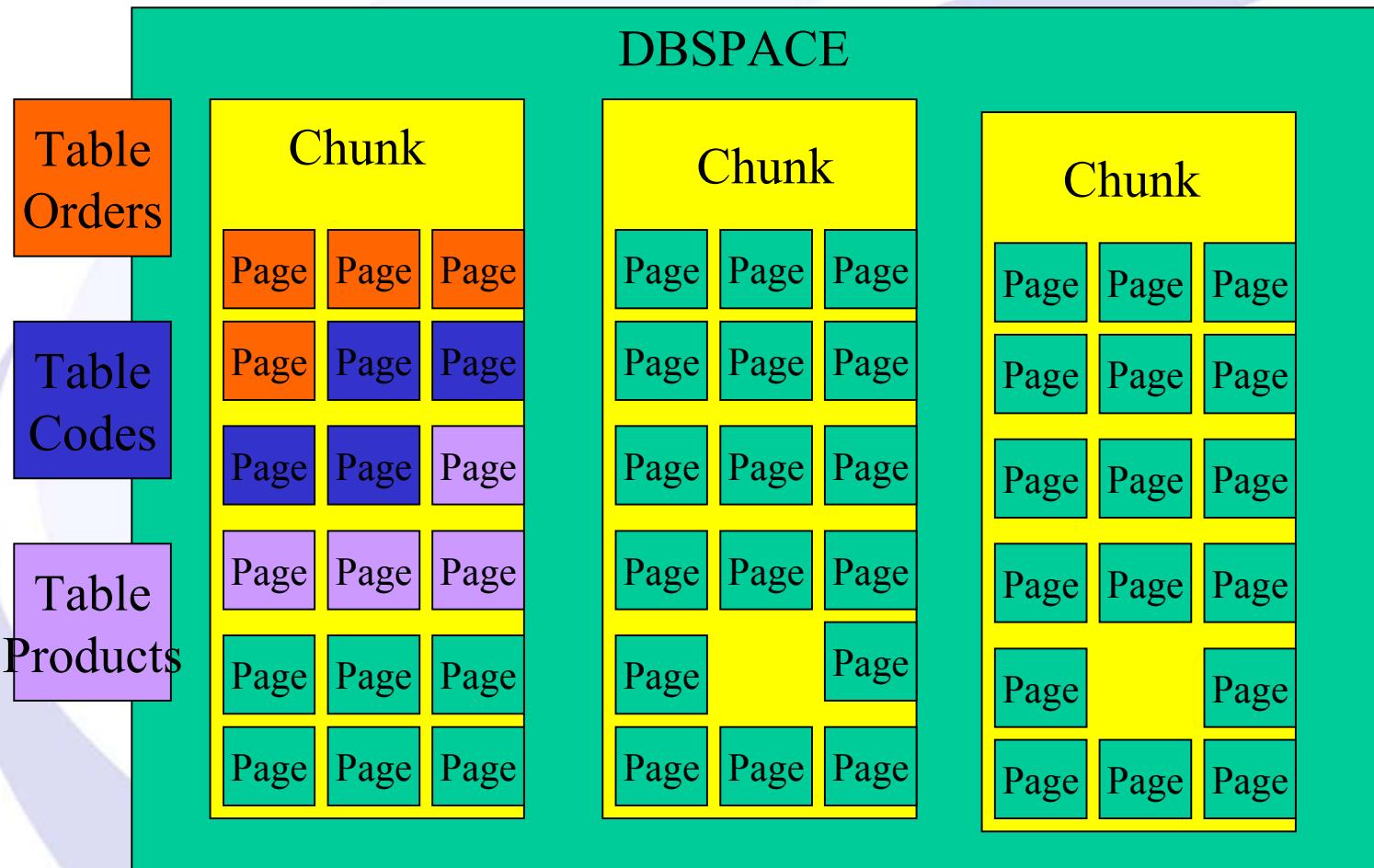
Disk Layout - The *FASTEST* location of a disk is where the disk arm has to move the least to read or write data

Disk Layout - Pages, Chunks, and Dbspaces

DBSPACE

Chunk

|		
Page	Page	Page
Page	Page	Page
Page	Page	Page
Page	Page	Page
Page	Page	Page
Page	Page	Page

Chunk

Page	Page	Page
Page	Page	Page
Page	Page	Page
Page	Page	Page
Page		Page
Page	Page	Page

Chunk

Page	Page	Page
Page	Page	Page
Page	Page	Page
Page	Page	Page
Page		Page
Page	Page	Page

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Disk Layout - Tables and Extents

Disk Layout -Tables and Extents

Too many extents will slow disk access
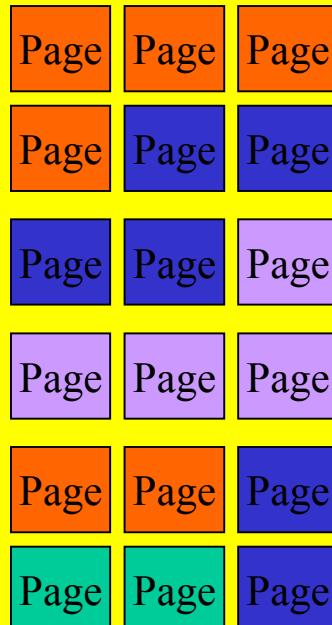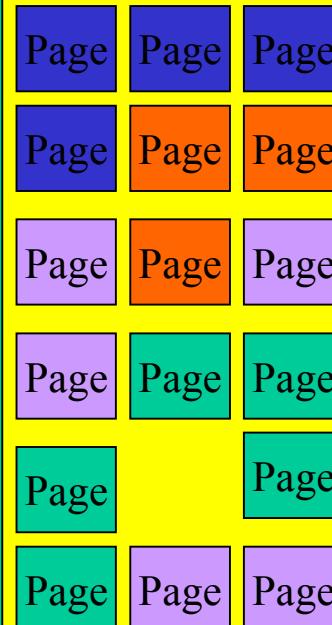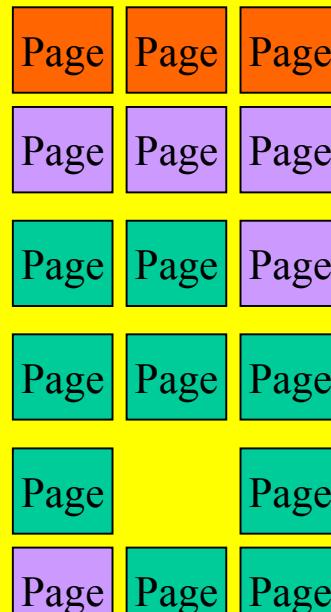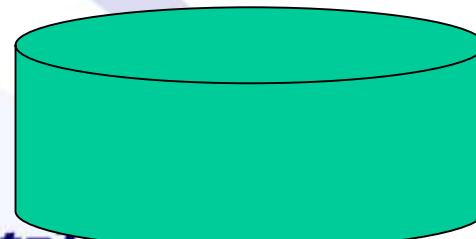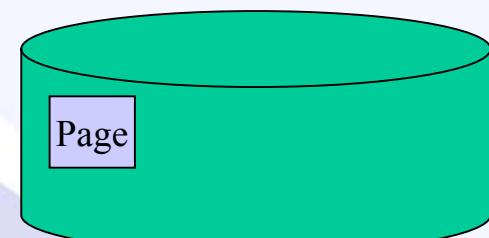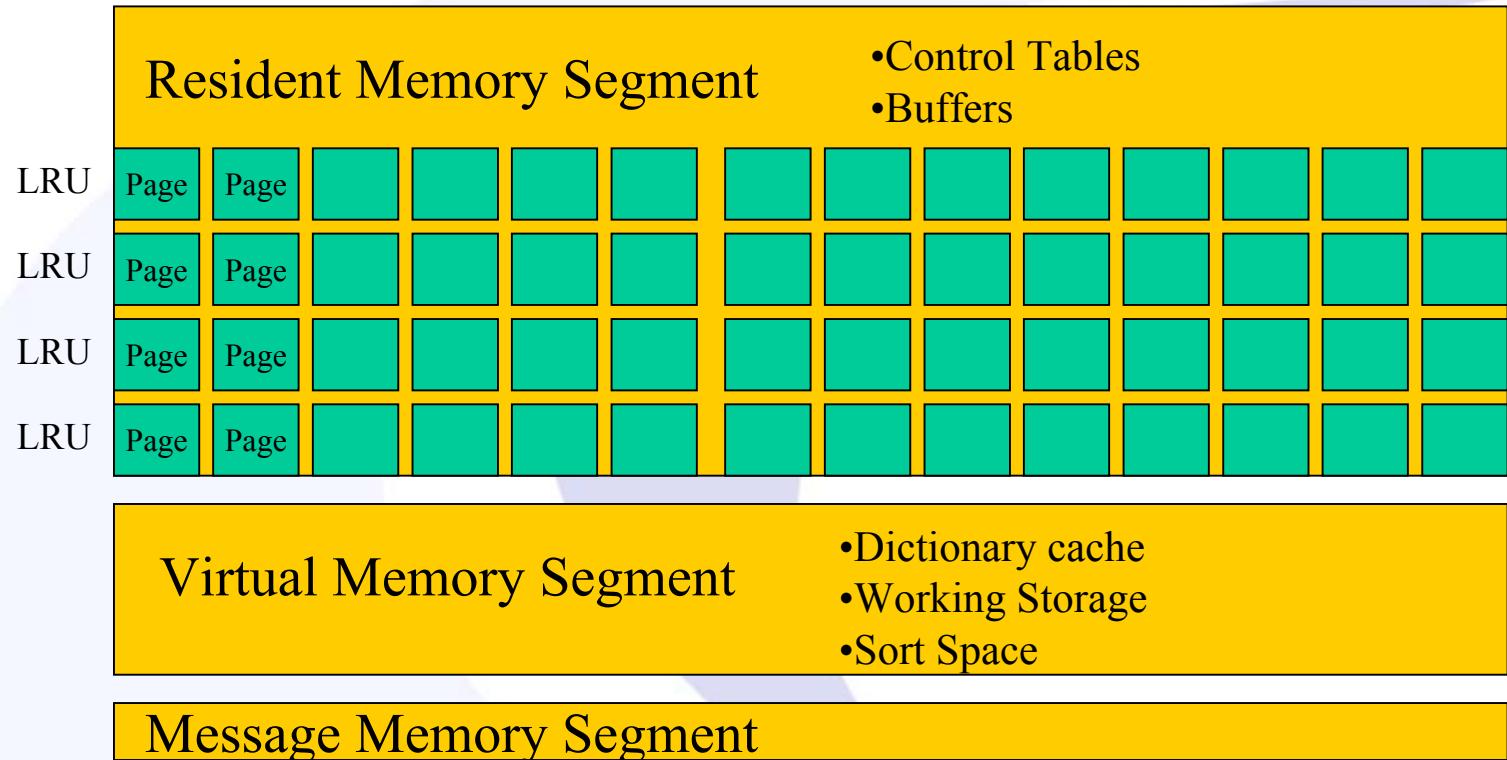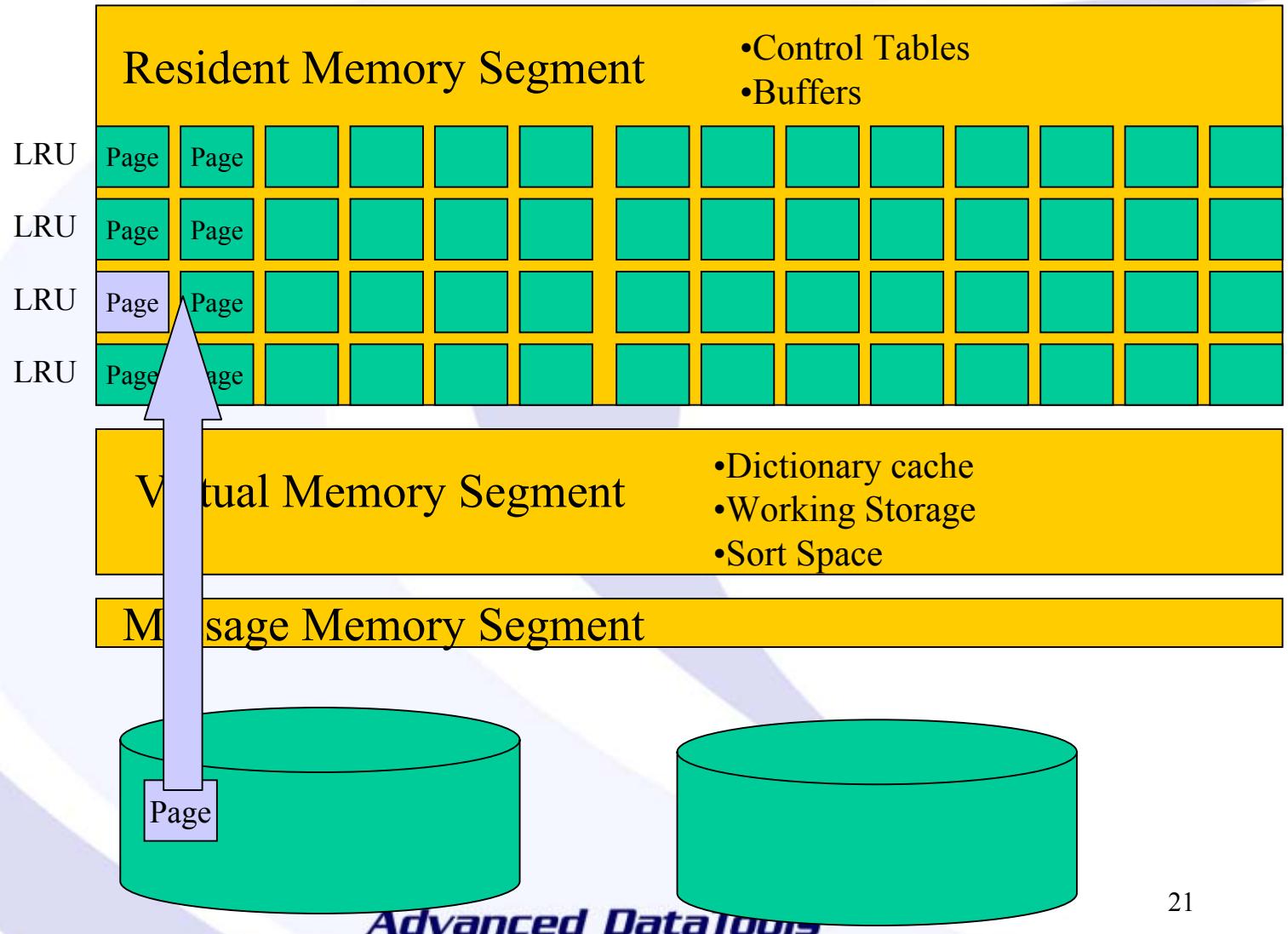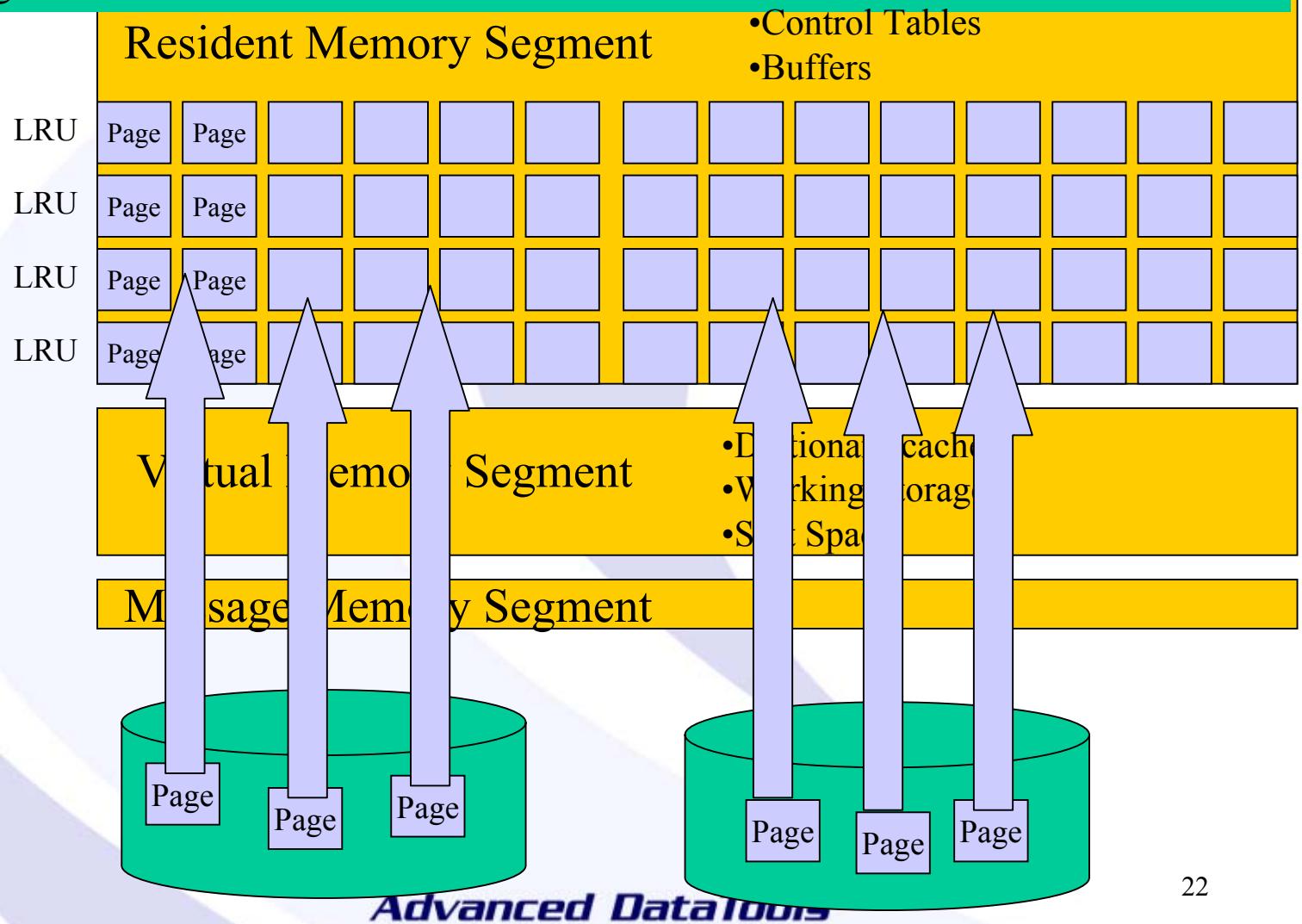
# Informix IDS Shared Memory

Resident Memory Segment • Control Tables
• Buffers

LRU	Page	Page												
LRU	Page	Page												
LRU	Page	Page												
LRU	Page	Page												

Virtual Memory Segment • Dictionary cache
• Working Storage
• Sort Space

Message Memory Segment

Page

20
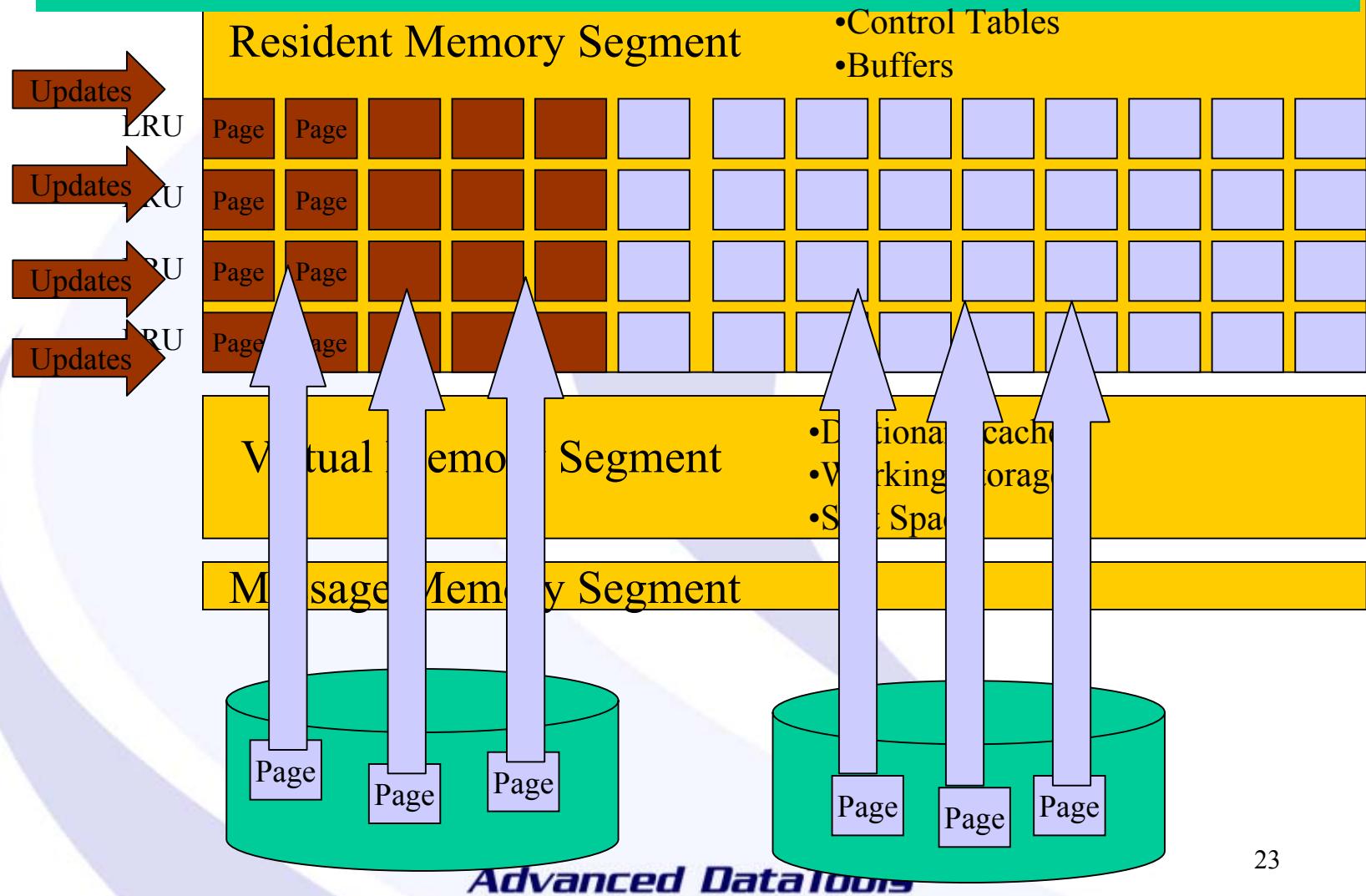
Page Gets Read into Memory by a Select

Resident Memory Segment

- Control Tables
- Buffers

LRU | Page | Page | | | | | | | | | | | | |
LRU | Page | Page | | | | | | | | | | | | |
LRU | Page | Page | | | | | | | | | | | | |
LRU | Page | age | | | | | | | | | | | | |

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page

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When all Buffers are full, Least Recently Used (LRU) Page is discarded to make room for more Data

Resident Memory Segment

- Control Tables
- Buffers

LRU | Page | Page | | | | | | | | | | | | | |
LRU | Page | Page | | | | | | | | | | | | | |
LRU | Page | Page | | | | | | | | | | | | | |
LRU | Page | Page | | | | | | | | | | | | | |

Virtual Memory Segment

- Dictional cache
- Working orag
- Sort Spac

Message Memory Segment

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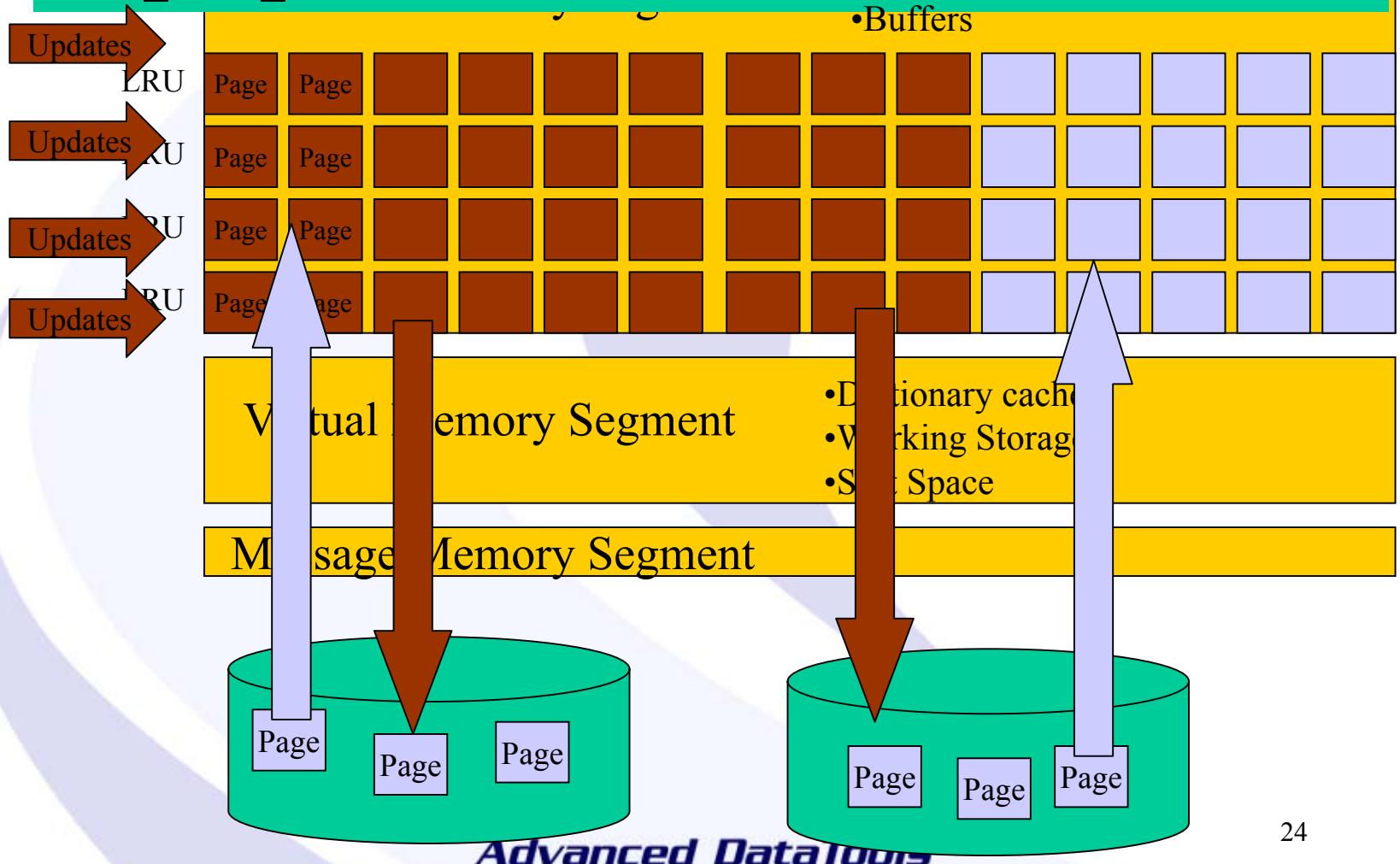
When a user updates a page, it is marked as dirty and must be written out to disk before it is discarded.

Resident Memory Segment

- Control Tables
- Buffers

Updates																
LRU	Page	Page														
Updates	Page	Page														
Updates	Page	Page														
Updates	Page	Page														

Virtual Memory Segment

- Dictionary cache
- Working storage
- Sort Space

Message Memory Segment

Page Page Page Page Page Page
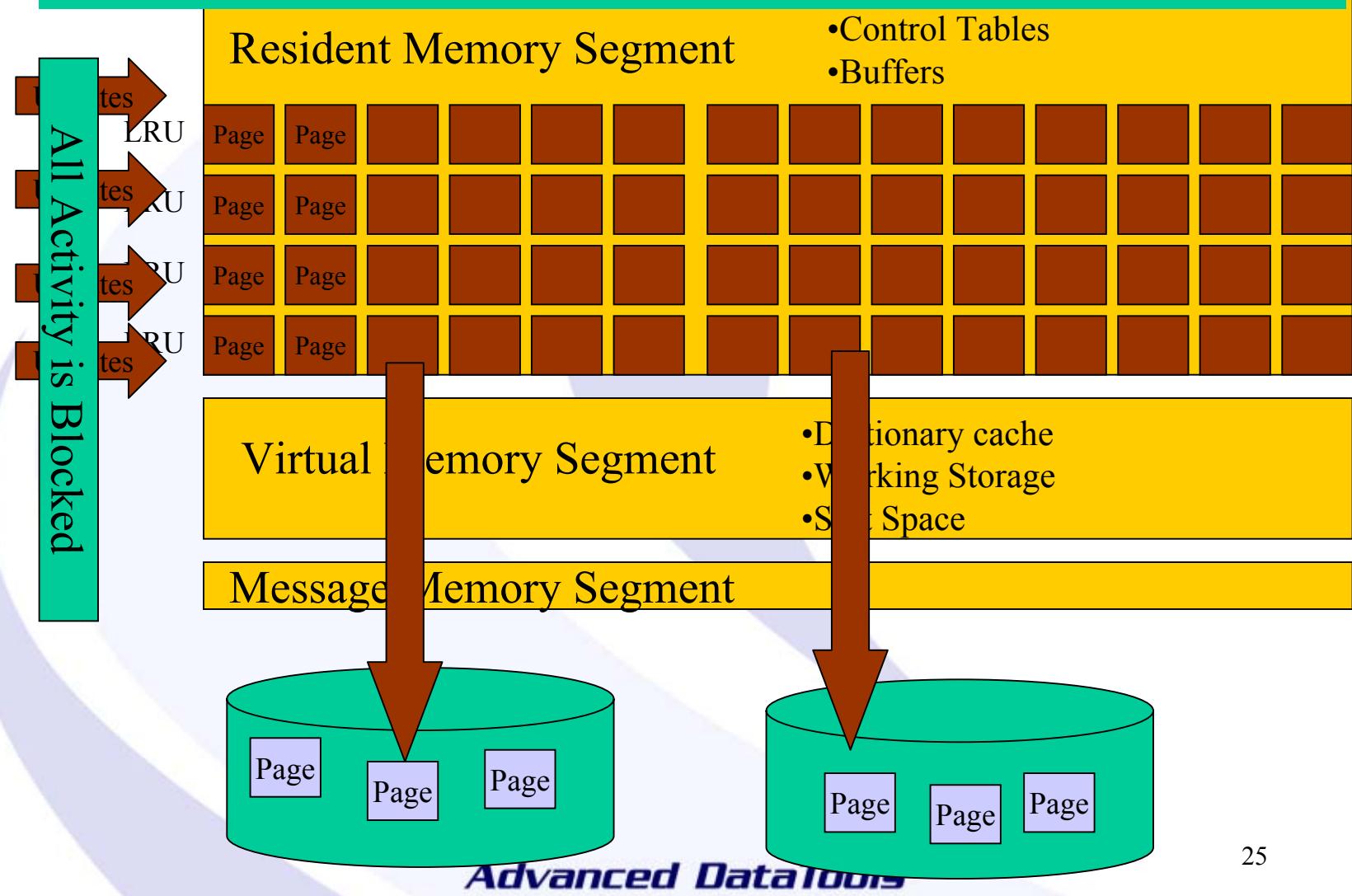
LRU Queues manage writing data to disk in the background when there is idle time based on LRU_MAX_DIRTY and LRU_MIN_DIRTY ONCONFIG values

- Control Tables
- Buffers

Updates

LRU

Updates

LRU

Page	Page
Page	Page
Page	Page
Page	Page

Updates

Updates

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page

Page

Page

Page

Page

Page
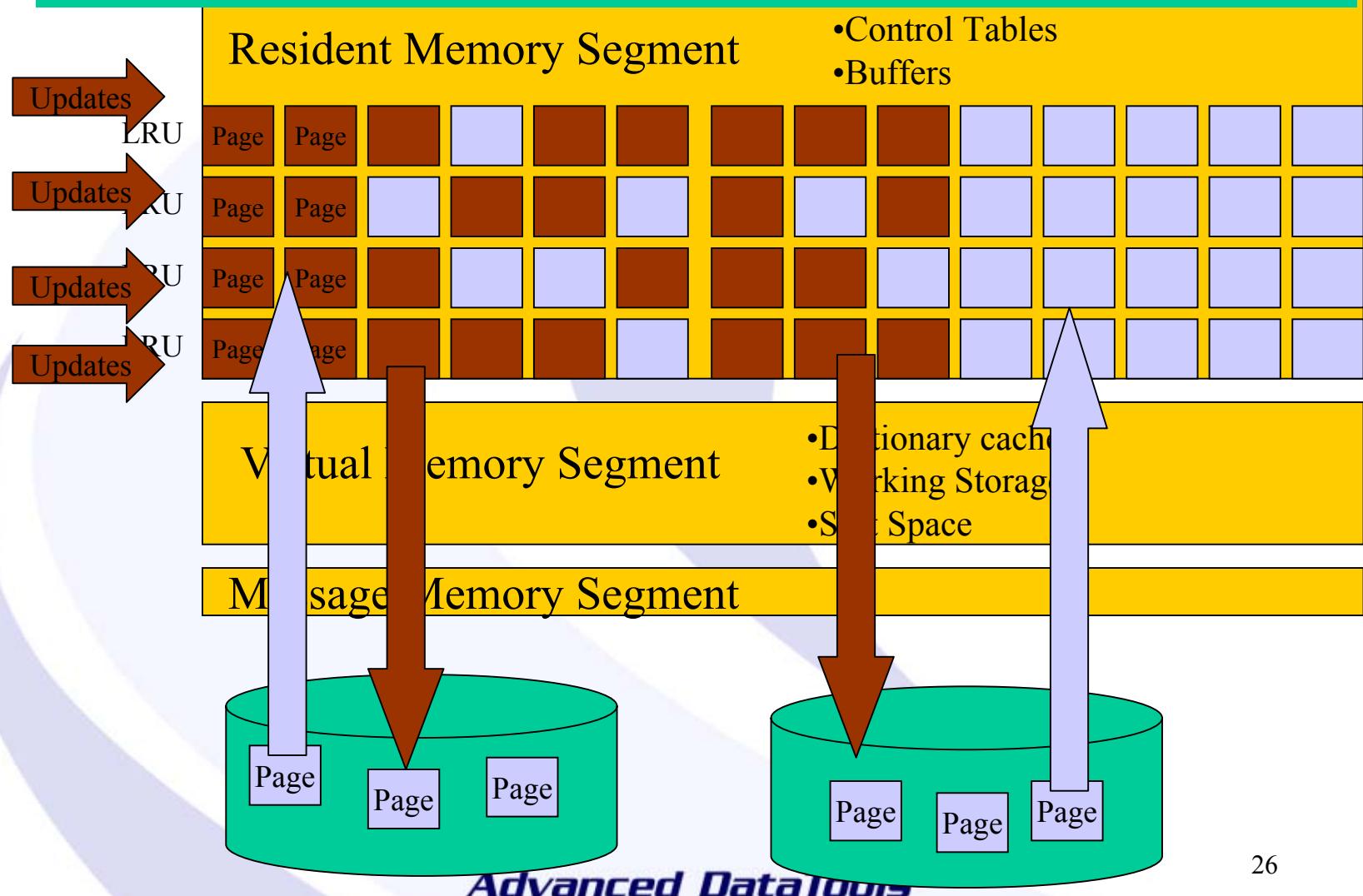
Advanced DataTools
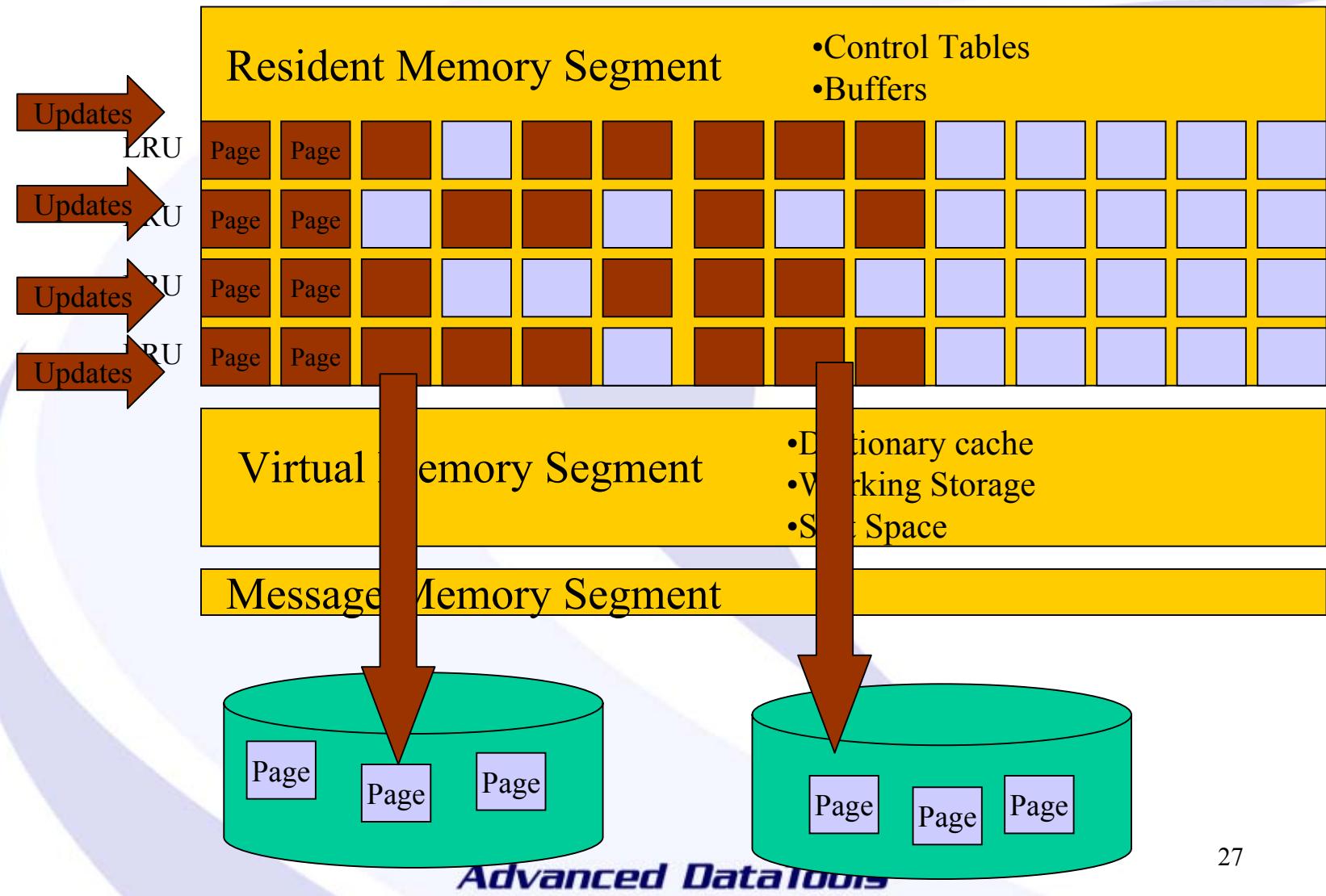
When all buffers are Dirty, the server must STOP all processing and perform a Foreground Write

Resident Memory Segment

- Control Tables
- Buffers

All Activity is Blocked

Updates	LRU	Page	Page
Updates	RU	Page	Page
Updates	RU	Page	Page
Updates	RU	Page	Page

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page Page Page

Page Page Page

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25
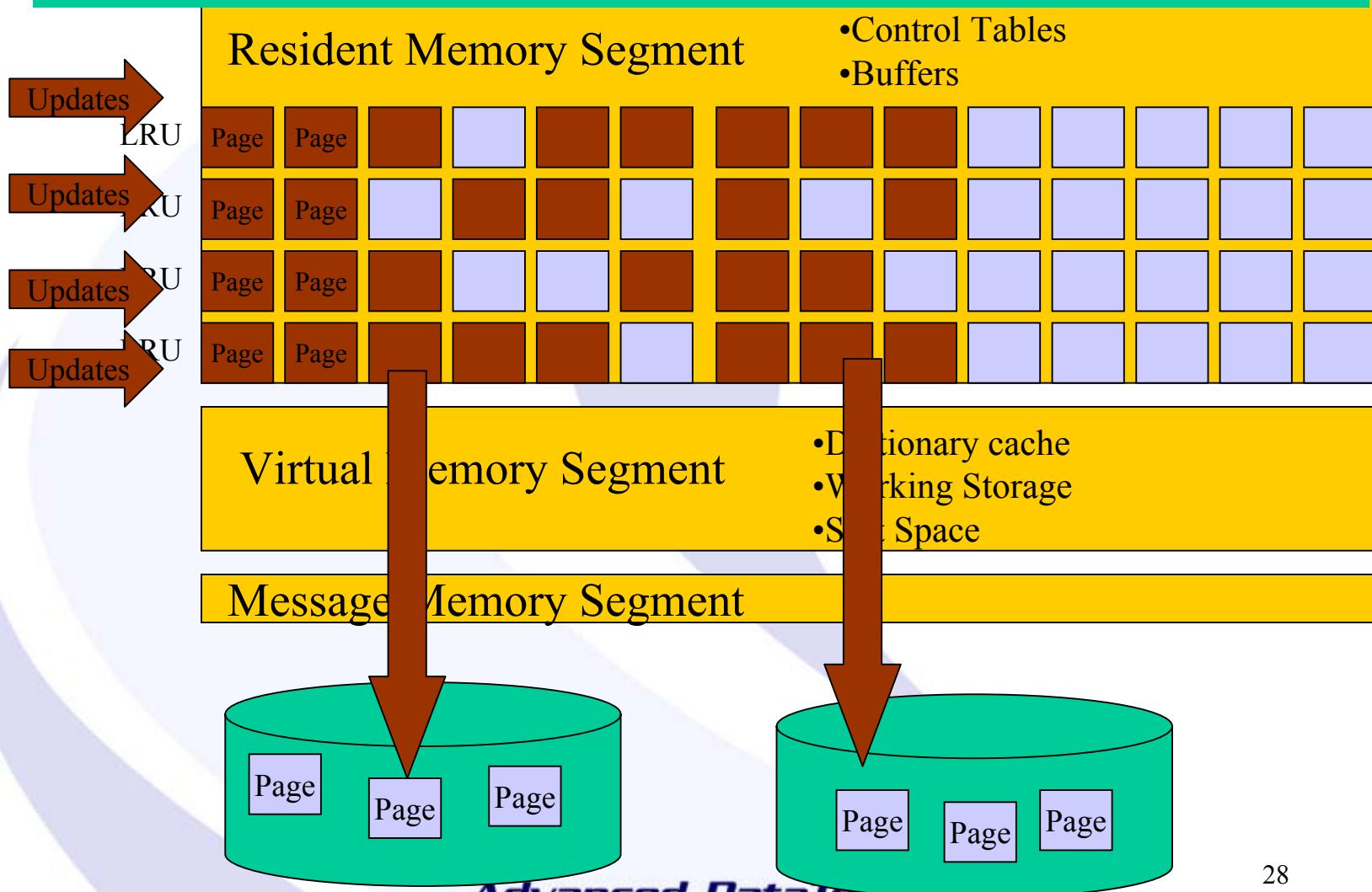
When a buffer is written to disk, it is marked as clean and may be discarded if needed.

Resident Memory Segment
- Control Tables
- Buffers

Updates

LRU | Page | Page
Updates

XU | Page | Page
Updates

RU | Page | Page
Updates

RU | Page | Page

Virtual Memory Segment
- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page
Page   Page

Page   Page   Page

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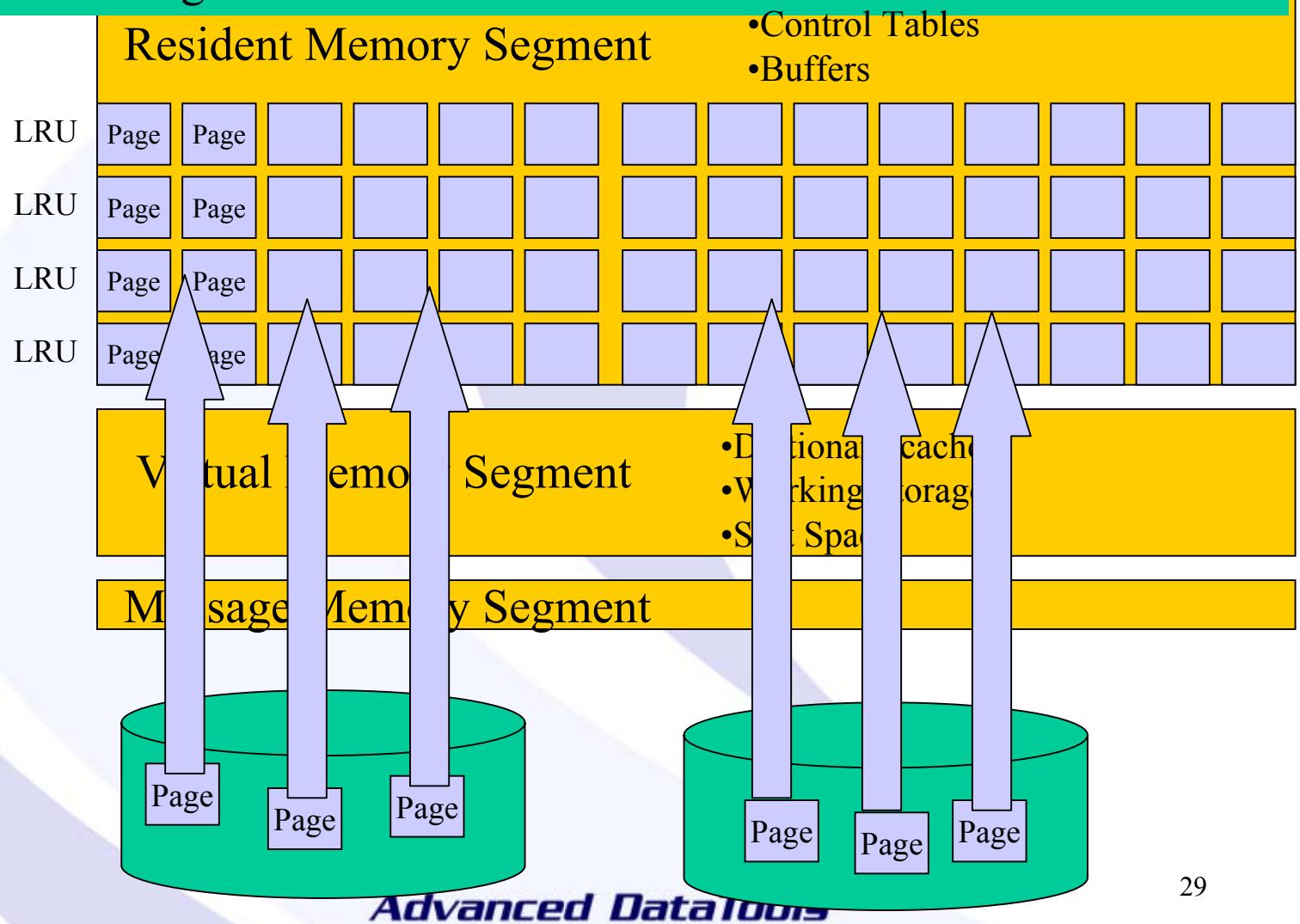
A Standard (7.X) Checkpoint writes all Dirty Buffers to Disk

Resident Memory Segment
- Control Tables
- Buffers

Updates → LRU

Updates → LRU

Updates → LRU

Updates → LRU

Virtual Memory Segment
- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

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A Fuzzy (9.21) Checkpoint flags all Dirty Buffers and writes them to Disk in the background without blocking activity

Resident Memory Segment

- Control Tables
- Buffers

Updates

Updates

Updates

Updates

LRU — Page | Page
RU — Page | Page
RU — Page | Page
RU — Page | Page

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page | Page | Page

Page | Page | Page

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After a Checkpoint, all Buffers are Clean and the cycle Starts over again

Resident Memory Segment

- Control Tables
- Buffers

LRU	Page	Page													
LRU	Page	Page													
LRU	Page	Page													
LRU	Page	Page													

Virtual Memory Segment

- Dictional Cache
- Working Storage
- Sort Space

Message Memory Segment

Page Page Page

Page Page Page

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Server configuration and statistics tables:

- sysconfig   - ONCONFIG File
- sysdri   - Data Replication
- syslogs   - Logical Logs
- sysprofile   - Server Statistics
- sysvpprof   - Virtual Processors

Sysconfig (onstat -c)

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

cf_id	integer,	unique numeric identifier
cf_name	char(18),	config parameter name
cf_flags	integer,	flags, 0 = in view sysconfig
cf_original	char(256),	value in ONCONFIG at boottime
cf_effective	char(256),	value effectively in use
cf_default	char(256)	value by default

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What is the current server configuration?

```
select
   cf_name                           parameter,
   cf_effective[1,58]                        effective_value
from            sysconfig
```

SQL output

parameter	effective_value
ROOTNAME	rootdbs
ROOTPATH	/u3/dev/rootdbs1
DBSERVERNAME	train1
MIRRORPATH	/u3/dev/rootdbsm1
PHYSDBS	rootdbs
MSGPATH	/u3/informix7/online1.log
CONSOLE	/u3/informix7/console1.log
TAPEDEV	/dev/null
LTAPEDEV	/dev/null
ROOTOFFSET	0
ROOTSIZE	400000

Sysdri (onstat -g dri)

View sysdri: Data replication state and configuration information.

type	char(50),	DR server type
state	char(50),	DR state
name	char(20),	DR server name
intvl	integer,	DR buffer flush interval
timeout	integer,	DR network timeout
lostfound	char(128)	DR lost+found pathname

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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 backuped
is_new	integer,	1 for new
is_archived	integer,	1 for archived
is_temp	integer,	1 for temp
flags	smallint	logfile flags

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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
```

SQL output

uniqid	size_used	is_used	is_current	is_backed_up	is_archived
32	1000	1	0	1	1
33	1000	1	0	1	1
34	1000	1	0	1	1
35	1000	1	0	1	0
36	1000	1	0	1	0
37	1000	1	0	1	0
38	1000	1	0	1	0
39	1000	1	0	1	0
40	1000	1	0	1	0
41	1000	1	0	1	0
42	1000	1	0	1	0

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Sysprofile (onstat -p)

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

name   char(16),   profile element name

value   integer   current value

The values are re-set to 0 when IDS is shutdown and
  started and when the command "onstat -z" is used.

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Sysprofile – Profile Names

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

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Sysprofile - onstat -p

```
Informix Dynamic Server Version 9.30.TC2-- On-Line -- Up 00:10:24 –
   58496 Kbytes
Profile
dskreads pagreads bufreads %cached dskwrits pagwrits bufwrits %cached
350      372      2108     83.40   10       11       1        0.00
isamtot  open     start    read     write    rewrite  delete   commit
   rollbk
2839     94       122      457      0        0        0        0
   0
gp_read  gp_write gp_rewrt gp_del   gp_alloc gp_free  gp_curs
2        0        0        0        0        0        2
ovlock   ovuserthread ovbuff    usercpu  syscpu    numckpts flushes
0        0            0        3.93     0.87     2        6
bufwaits lokwaits lockreqs deadlks  dltouts  ckpwaits compress seqscans
67       0        966      0        0        0        0        4
ixda-RA  idx-RA   da-RA    RA-pgsused lchwaits
5        0        247      252        0
```

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What are some of the key server statistics?

-- Select key Profile values

select name, value from sysprofile

where name in

   ("ovlock", "ovuser", "ovtrans", "latchwts", "buffwts", "lockwts", "ckptwts", "deadlks", "lktouts", "fgwrites", "lruwrites", "chunkwrites")

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SQL output

name	value
ovlock	0
ovuser	0
ovtrans	0
latchwts	41
buffwts	1617
lockwts	0
ckptwts	12
deadlks	0
lktouts	0
fgwrites	1190
lruwrites	21430
chunkwrites	4648

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What percent of I/O is from buffers?

```
-- Get % read cached
select  dr.value dskreads, br.value bufreads,
     round ((( 1 - ( dr.value / br.value )) *100 ), 2) cached
from sysprofile dr, sysprofile br
where dr.name = "dskreads"
and   br.name = "bufreads";
-- Get % write cached
select  dw.value dskwrites, bw.value bufwrites,
     round ((( 1 - ( dw.value / bw.value )) *100 ), 2) cached
from sysprofile dw, sysprofile bw
where dw.name = "dskwrites"
and   bw.name = "bufwrites"
```

SQL output

dskreads	bufreads	cached
29209	1489235	98.04

dskwrites	bufwrites	cached
56228	414748	86.44

Sysvpprof (onstat -g)

View sysvpprof: Current statistics on IDS Virtual Processors

vpid	integer,	VP id
txt	char(50)	VP class name
usecs_user	float,	number of unix secs of user time
usecs_sys	float	number of unix secs of system time

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What is the status of the virtual processors?

```
-- Select VP Statistics
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"
```

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SQL output

vpid	pid class	usercpu	syscpu
1	295 cpu	309.26	23.58
2	296 adm	0.14	0.36
3	297 lio	0.27	5.57
4	298 pio	0.15	1.49
5	299 aio	5.00	46.16
6	300 msc	0.04	0.24
7	301 aio	4.65	43.75
8	302 tli	0.14	0.30
9	305 pio	0.22	1.56

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Dbspace & chunk tables:

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

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Sysdbspaces (onstat -d)

View sysdbspaces: List all dbspaces on the server

dbsnum	smallint,	dbspace number,
name	char(18),	dbspace name,
owner	char(8)	dbspace owner,
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, 0=No
is_temp	bitval,	dbspace temp, 1=Yes, 0=No
flags	smallint	dbspace flags

Advanced DataTools

Syschunks (onstat -d)

View syschunks: Lists all chunks on the server

chknum   smallint,   chunk number
dbsnum   smallint,   dbspace number
nxchknumsmallint, number of next chunk in dbspace
chksize   integer,   pages in chunk
offset   integer,   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, 0=No
is_blobchunk   bitval,   chunk blobchunk, 1=Yes, 0=No

Advanced DataTools

Syschunks (continued)

is_inconsistent	bitval,	chunk inconsistent, 1=Yes, 0=No
flags	smallint,	chunk flags converted by bitval
fname	char(128),	device pathname
mfname	char(128),	mirror device pathname
moffset	integer,	pages offset into mirror device
mis_offline	bitval,	mirror chunk offline, 1=Yes, 0=No
mis_recovering	bitval,	mirror chunk recovering,
		1=Yes, 0=No
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

Advanced DataTools

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

Advanced DataTools

How much dbspace is free?

```
-- dbsfree.sql
select      d.dbsnum,
            name dbspace,
            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
and         d.is_blobspace = 0
group by 1, 2
order by 1;
```

SQL output

dbspace	pages_size	pages_used	pages_free	percent_free
rootdbs	20000	5653	14347	71.74
logsdbs	12500	12053	447	3.58
datadbs	25000	6722	18278	73.11
tmpdbs	12500	53	12447	99.58

Advanced DataTools

How much blobspace is free?

```
-- blobfree.sql
select
            name dbspace,
            sum(chksize)            Size_in_Pages,          -- sum of all chuncks size pages
            sum(nfree)              Num_free_blob_page   -- sum of all chunks free
                                                                                  pages
from        sysdbspaces d, syschunks c
where       d.dbsnum = c.dbsnum
and         d.is_blobspace = 1
group by 1
order by 1
```

SQL output

dbspace	size_in_pages	num_free_blob_page
blobdbs	10000	2497

Advanced DataTools

Where are blocks of free dbspace?

```
-- chkflist.sql
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, free_pages desc
```

Advanced DataTools

SQL output

dbspace	chknum	extnum	start	free_pages
datadbs	4	0	3	12497
datadbs	3	31	9107	3393
datadbs	3	15	1921	976
datadbs	3	13	1705	160
datadbs	3	30	6069	160
datadbs	3	25	5429	128
datadbs	3	19	4853	96
datadbs	3	29	5909	96
datadbs	3	24	5333	64
datadbs	3	26	5621	64

Advanced DataTools

What chunks have the most I/O?

```
-- chkio.sql
select      name[1,10] dbspace, -- truncated to fit 80 char screen line
            chknum,   "Primary" chktype,
            reads,        writes,
            pagesread,              pageswritten
from        syschktab c, sysdbstab d         where      c.dbsnum = d.dbsnum
union all
select      name[1,10]   dbspace,
            chknum,   "Mirror"   chktype,
            reads,        writes,
            pagesread,              pageswritten
from        sysmchktab c, sysdbstab d      where      c.dbsnum = d.dbsnum
order by 1,2,3;
```

SQL output

dbspace	chknum	chktype	reads	writes	pagesread	pageswritten
blobdbs	6	Primary	21	3	31	10
datadbs	3	Primary	2082	31	9087	31
datadbs	4	Primary	5	0	7	0
logsdbs	2	Primary	176	996	1347	11704
rootdbs	1	Mirror	11616	26196	22499	30102
rootdbs	1	Primary	13340	26111	22271	30102
tmpdbs	5	Primary	13	2	13	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
       chknum chunknum,        -- chuck 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,     - chuck 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
```

Advanced DataTools

SQL output

dbspace	rootdbs
dbsnum	1
is_mirrored	1
is_blobspace	0
is_temp	0
chunknum	1
device	/u3/dev/rootdbs1
dev_offset	0
is_offline	0
is_recovering	0
is_blobchunk	0
is_inconsistent	0
pages_size	20000
pages_free	14355
mirror_device	/u3/dev/rootdbsm1
mirror_offset	0

Advanced DataTools

Database & table information tables:

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

Sysdatabases

View sysdatabases: List of databases on the server.

name	char(18),	database name
partnum	integer,	table id for systables
owner	char(8),	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

Advanced DataTools

Systabnames

Table systabnames: All tables on the server.

partnum	integer,	table id for table
dbsname	char(18),	database name
owner	char(8),	table owner
tabname	char(18),	table name
collate	char(32)	collation associated with NLS DB

Sysextents (oncheck -pe)

View sysextents: Tables and each extent on the server.

dbsname	char(18),	database name
tabname	char(18),	table name
start	integer,	physical address for this extent
size	integer	size of this extent

Sysptprof

View sysptprof: Tables IO profile.

dbsname	char(18),	database name
tabname	char(18),	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

Sysptprof (continued)

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

Advanced DataTools

Systabinfo* (continued)

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

Advanced DataTools

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

Advanced DataTools

What tables have extents?

```
-- tabextents.sql
select      dbsname,
            tabname,
            count(*)            num_of_extents,
            sum( pe_size )      total_size
from        systabnames, sysptnext
where       partnum = pe_partnum
group by 1, 2
order by 3 desc, 4 desc;
```

Advanced DataTools

SQL output

dbsname	tabname	num_of_extents	total_size
zip7	zip	50	1168
zip_lk	zip	27	1544
rootdbs	TBLSpace	8	400
sysmaster	syscolumns	6	56
datadbs	TBLSpace	4	200
sysmaster	sysviews	3	24
sysmaster	sysprocbody	3	24
sysmaster	systables	3	24
extentdb1	extent_sizes	2	24
sysutils	sysprocbody	2	16
sysmaster	sysconstraints	2	16
stores2	sysprocbody	2	16

Advanced DataTools

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;
```

Advanced DataTools

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SQL output

dbsname	zip7
tabname	zip
num_of_extents	50
current_pages_used	1168
proposed_ext_size	2803
proposed_next_size	467
dbsname	zip_lk
tabname	zip
num_of_extents	27
current_pages_used	1544
proposed_ext_size	3706
proposed_next_size	618

Advanced DataTools

What tables have the most I/O?

```
-- tabprofile.sql
select
    dbsname,
    tabname,
    -- uncomment the following lines as needed to show specific values
    isreads,          -- bufreads,              -- pagreads
    iswrites,         -- bufwrites,             -- pagwrites
    lockreqs          -- lockwts,               -- deadlks
from        sysptprof
order by isreads desc; -- change this sort to whatever you need to monitor.
```

SQL output

dbsname	tabname	isreads	iswrites	lockreqs
zip	zip	41898	41898	830
sysmaster	systables	11402	0	67187
sysmaster	sysusers	10276	315	51373
sysmaster	sysviews	2653	0	15919
sysmaster	sysprocauth	2212	0	13272
zip_lk	zip	1399	0	1
sysmaster	sysprocedures	1108	0	6649
sysmaster	syscolumns	872	0	5182
sysmaster	sysdatabases	538	3	1469
sysmaster	flags_text	450	0	2546
zip	systables	101	34	239
sysmaster	systabauth	86	0	536

Advanced DataTools

User session information tables:

- syssessions   - Session data

- syssesprof   - User statistics

- syslocks   - Locks

- syseswts   - Wait times

Syssessions
(onstat -g ses)

View syssessions: User session and connection information.

sid	integer,	Session id number
username	char(8),	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 session pool

Advanced DataTools

Syssessions (continued)

is_wlatch   integer, Flag 1=Yes, 0=No, wait on latch

is_wlock   integer, Flag 1=Yes, 0=No, wait on lock

is_wbuff   integer, Flag 1=Yes, 0=No, wait on buffer

is_wckpt   integer, Flag 1=Yes, 0=No, wait on checkpoint

is_wlogbuf   integer, Flag 1=Yes, 0=No, wait on log buffer

is_wtrans   integer, Flag 1=Yes, 0=No, wait on a transaction

is_monitor   integer, Flag 1=Yes, 0=No, a monitoring process

is_incrit   integer, Flag 1=Yes, 0=No, in crtical section

state   integer Flags

Syssesprof
(onstat -g ses)

View sysyesprof: 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 records written
isreads	decimal(16,0),	Reads
iswrites	decimal(16,0),	Writes
isrewrites	decimal(16,0),	Rewrites
isdeletes	decimal(16,0),	Deletes

Advanced DataTools

Syssesprof (continued)

iscommits	decimal(16,0),	Commits
isrollbacks	decimal(16,0),	Rollbacks
longtxs	decimal(16,0),	Long transactions
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

Advanced DataTools

Syslocks (onstat -k)

View syslocks: Active locks on server.

dbsname	char(18),	Database name
tabname	char(18),	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

Advanced DataTools

Syslocks – Type of Locks

B - byte lock

IS - intent shared lock

S - shared lock

XS - repeatable read shared key

U - update lock

IX - intent exclusive lock

SIX - shared intent exclusive

X - exclusive lock

XR - repeatable read exclusive

Syseswts

View syseswts: Wait status and times on objects.

sid	integer,	Session ID
reason	char(50),	Description of reason for wait
numwaits	integer,	Number of waits for this reason
cumtime	float,	Cumulative wait time for this reason
maxtime	integer	Max wait time for this reason

Example SQL: dbwho.sql

```
select    sysdatabases.name database,              -- Database Name
          syssessions.username,                    -- User Name
          syssessions.hostname,                    -- Workstation
          syslocks.owner sid                              -- Informix Session
     ID
from      syslocks, sysdatabases , outer syssessions
where     syslocks.tabname = "sysdatabases"       -- Locks sysdatabases
and               syslocks.rowidlk = sysdatabases.rowid          -- Join to
     database
and       syslocks.owner = syssessions.sid        -- Use session ID
order by 1;
```

Advanced DataTools

Dbwho shell script

```
#!/bin/sh
# Program: dbwho    Description: List database, user and workstation of all db users
echo "Generating list of users by database ..."
dbaccess sysmaster - <<EOF
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;
EOF
```

Advanced DataTools

List all Active Sessions

```
 -- sessions.sql
select  sid,
        username,
        pid,
        hostname,
        l2date(connected) startdate -- convert unix time to date
from    syssessions
```

Sample Output

```
    sid username            pid       hostname        startdate
     47 lester             11564     merlin          07/14/1997
```

List Users Waiting on Resources

```
-- seswait.sql
select      username,
            is_wlatch, -- blocked waiting on a latch
            is_wlock,  -- blocked waiting on a locked record or table
            is_wbuff,  -- blocked waiting on a buffer
            is_wckpt,  -- blocked waiting on a checkpoint
            is_incrit  -- session is in a critical section of transaction (e.g writting to disk)
from    syssessions
order by username;
Sample Output
username  is_wlatch  is_wlock  is_wbuff          is_wckpt  is_incrit
lester        0            1        0          0          0
lester        0            0        0          0          0
lester        0            0        0          0          0
```

Advanced DataTools

Monitor Resource Usage by User

```
-- sesprof.sql
select     username,
           syssesprof.sid,
           lockreqs,
           bufreads,
           bufwrites
from       syssesprof, syssessions
where    syssesprof.sid = syssessions.sid
order by bufreads desc
```

Advanced DataTools

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Display all Locks using Base Sysmaster Tables (1 of 2)

```
-- locks.sql
select  dbsname,
        b.tabname,
        rowidr,
        keynum,
        e.txt      type,
        d.sid      owner,
        g.username ownername,
        f.sid      waiter,
        h.username waitname
from    syslcktab a,
        systabnames b,
        systxptab c,
        sysrstcb              d,
        sysscblst g,
        flags_text e,
        outer ( sysrstcb f , sysscblst h  )                    Continued on next slide …..
```

Advanced DataTools

Display all Locks (2 of 2)

```
Continued from previous slide

where   a.partnum = b.partnum
and     a.owner = c.address
and     c.owner = d.address
and     a.wtlist = f.address
and     d.sid = g.sid
and     e.tabname = 'syslcktab'
and     e.flags = a.type
and     f.sid = h.sid
into temp A;

select      *
from        A;
```

Advanced DataTools

Some Undocumented Extras...

Some Key systrans fields

tx_id	integer	pointer to transaction table
tx_logbeg	integer	transaction starting logical log
tx_loguniq	integer	transaction current logical log number

Display Transactions and Logs

```
-- txlogpos.sql
select      t.username,
            t.sid,
            tx_logbeg,
            tx_loguniq,
            tx_logpos
from        systrans x, sysrstcb t
where       tx_owner = t.address
```

SQL Output

username	sid	tx_logbeg	tx_loguniq	tx_logpos
informix	1	0	16	892952
lester	53	0	0	0
informix	12	0	0	0

Display Transactions and Logs (1 of 3)

```
-- logstat.sql
-- select transaction data into a temp table
select  tx_logbeg,  tx_loguniq
from    systrans
into temp b;
-- count how may transactions begin in each log
select tx_logbeg, count(*) cnt
from B
where tx_logbeg > 0
group by tx_logbeg
into temp C;
```

Advanced DataTools

Display Transactions and Logs (2 of 3)

```
-- count how many transactions currently are in each log
select tx_loguniq, count(*) cnt
from B
where tx_loguniq > 0
group by tx_loguniq
into temp D;
```

Display Transactions and Logs (3 of 3)

```
-- join data from counts with syslogs
select    uniqid,
          size,
          is_backed_up,      -- 0 = no, 1 = yes log is backed up
          is_archived,       -- 0 = no, 1 = yes log is on last archive
          c.cnt  tx_beg_cnt,
          d.cnt  tx_curr_cnt
from      syslogs, outer c, outer D
where     uniqid = c.tx_logbeg
and       uniqid = d.tx_loguniq
order by uniqid
```

Advanced DataTools

Display Transactions and Logs
SQL Output

SQL Output

uniqid	size	is_backed_up	is_archived	tx_beg_cnt	tx_curr_cnt
10	500	1	1		
11	500	1	1		
12	500	1	1		
13	500	1	1		
14	500	1	1		
15	500	1	1		
16	500	0	1	1	2
16	500	0	1	1	2

Advanced DataTools

Display Current SQL

```
-- syssql.sql

select  username,
     sqx_sessionid,
     sqx_conbno,
     sqx_sqlstatement
from syssqexplain, sysscblst
where   sqx_sessionid = sid
```

Current SQL Output

```
username         lester
sqx_sessionid    55
sqx_conbno       2
sqx_sqlstatement  select username,sqx_sessionid, sqx_conbno, sqx_sqlstatement
                                from syssqexplain, sysscblst
                                where   sqx_sessionid = sid


username         lester
sqx_sessionid    51
sqx_conbno       0
sqx_sqlstatement  update items set total_price = 300 where item_num = 1
```

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Advanced DataTools