Advanced DataTools Webcast

from the IBM Informix Champions

Informix Tutorial Configuring a New Informix Server
by Lester Knutsen

Thursday, February 27, 2020
2:00pm EDT

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Lester Knutsen

Lester Knutsen is President of Advanced DataTools Corporation and has been building large data warehouse and business systems using Informix Database software since 1983. Lester focuses on large database performance tuning, training, and consulting. Lester is a member of the IBM Gold Consultant program and was presented with one of the Inaugural IBM Information Champion awards by IBM. Lester was one of the founders of the International Informix Users Group and the Washington Area Informix User Group.

lester@advancedatatools.com
www.advancedatatools.com
703-256-0267 x102

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Webcast Guidelines

- The Webcast is being recorded. The Webcast replay and slides will be available in a few days.

- Please Mute your line. Background sounds will distract everyone.

- Use the Chat Button in the upper right to ask questions.

Chat

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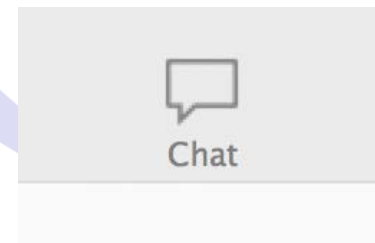
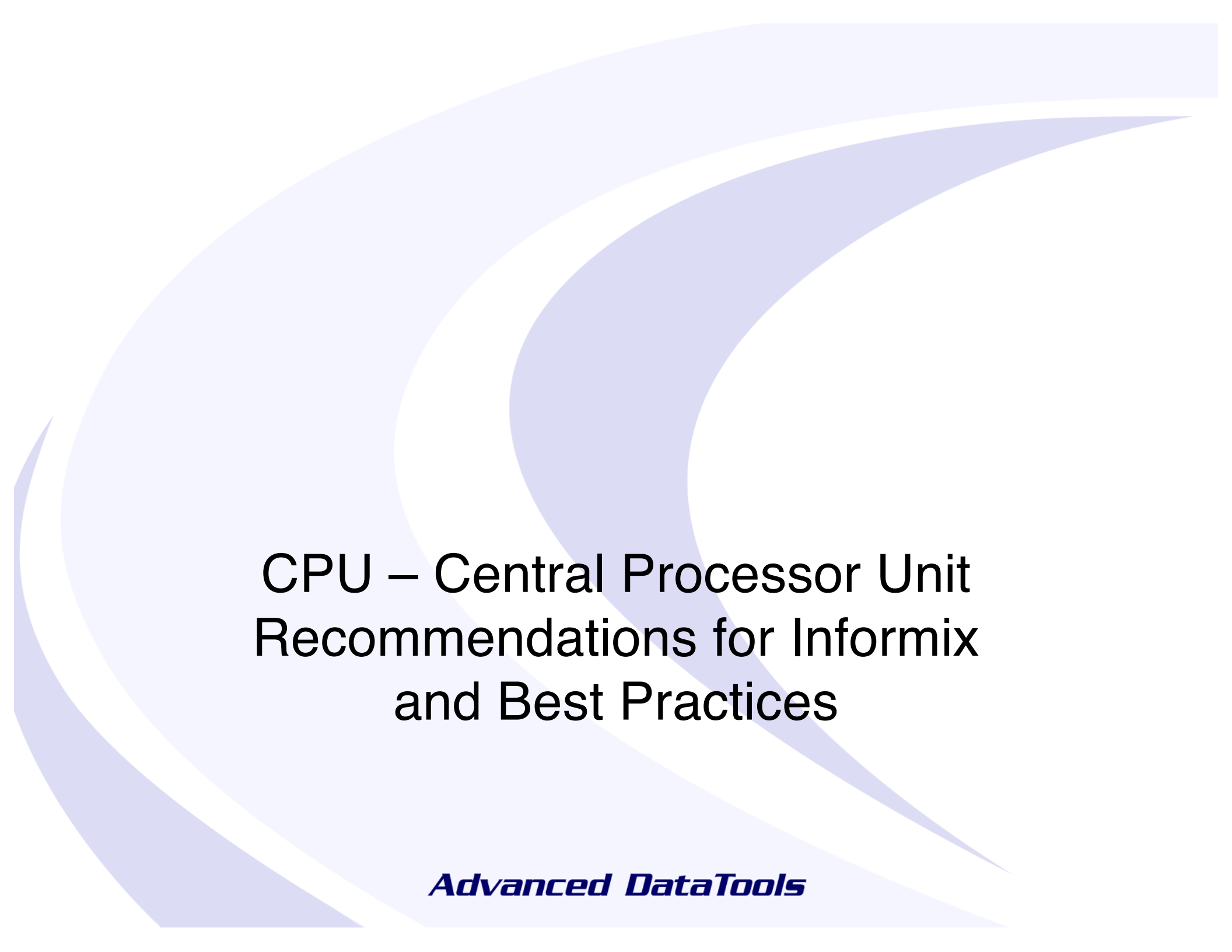# Informix Tutorial - Configuring a New Informix Server by Lester Knutsen

How to script configuring an Informix Server? This Webcast will cover everything you need to know to build using scripts a new small or large server. The Webcast will be a review of the Informix ONCONFIG file and configuring memory, CPUs, Network, and Disk for a more extensive Informix Server configuration.

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Agenda

- Demo – Script to configure an Informix Server

- CPU Recommendations and Best Practices

- Memory Recommendations and Best Practices

- ONCONFIG Recommendations and Best Practices

- Demo – Ten scripts to configure a large Informix Server

Demo – Script to configure an Informix Server

- informix.env – set the environment variables

- sqlhosts - configure the network settings

- onconfig.servername – configure the server properties

- setup.sh – initialize and configure a new server

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# CPU – Central Processor Unit Recommendations for Informix and Best Practices

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CPU Terms

- Socket = One Chip or Processor

- Cores per Socket = How many cores run on a chip. A core only runs one process at a time.

- Hyper-Threads or SMT threads per Core = Many Cores have the ability to run multiple threads. No matter how many threads run on a Core, only one thread can run at a time on a core. Hyper-Threads will appear as additional Virtual Cores.

- Chip speed is measured in gigahertz (GHz); this is the speed of a single core of your processor.

- PVU - IBM Processor Value Unit = A unit of measure used to differentiate licensing of software

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CPU Terms

- Example: 2 Sockets with 5 Cores and 2 Hyper-Threads per Core = 10 Cores and 20 Virtual Cores
- Can run 10 processes at the same time

Informix
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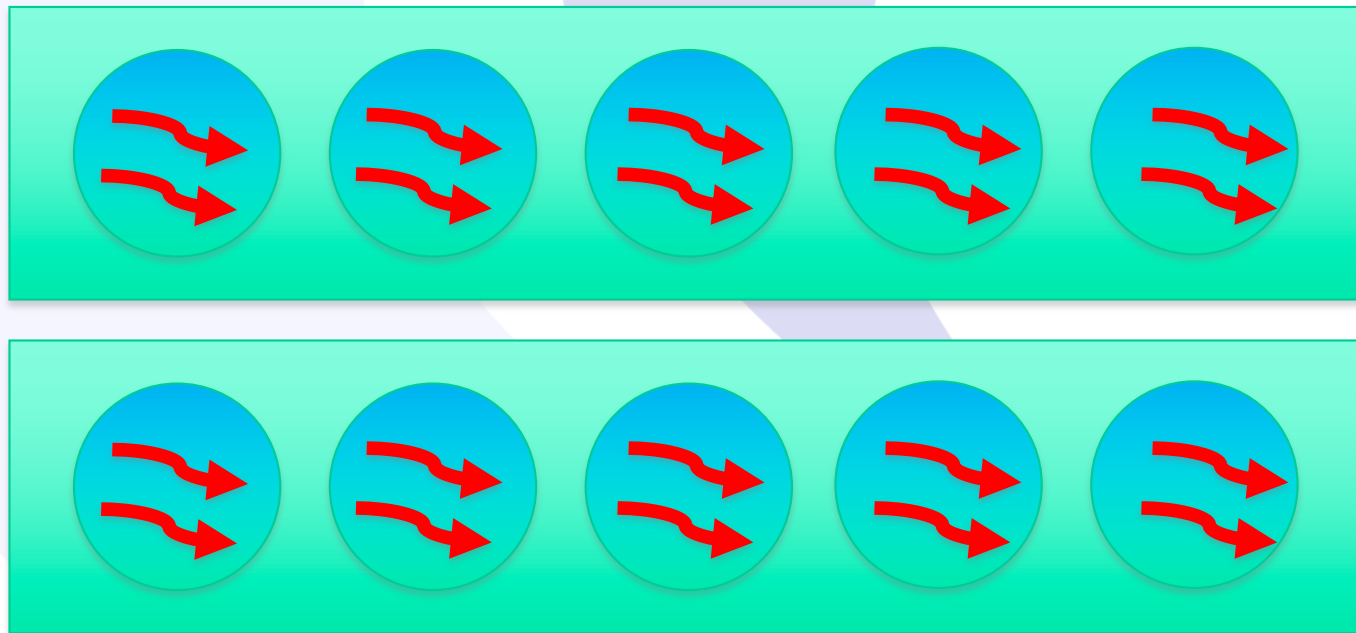
Informix CPU Best Practices

- How many Cores will be allocated for Informix? What else is running on the machine?

- Traditional best practice is number of physical CPU Cores minus 1

- Current CPU Cores are fast enough to handle 2-3 oninits per Core or 1 oninit per 500-1000 MHz

CPU Usage Best Practices

- How busy are your CPUs?
- Tools to monitor:
  - sar –u, vmstat, mpstat, top, prstat
- Performance Guideline for Average CPU Usage:
  - < 30 % - Good
  - 30-60% - Fair
  - > 60% - Poor
- ***Save 60% of your CPU usage to handle workload spikes or you may not be able to handle busy loads***

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Hyper-Threads or SMT Threads

- Hyper-Threads and SMT Threads may not be helpful to Informix oninit process

- Example:

Informix on AIX: Each AIX Core has 4 SMT threads, each displaying as a CPU; only the first thread is busy, the rest are idle.
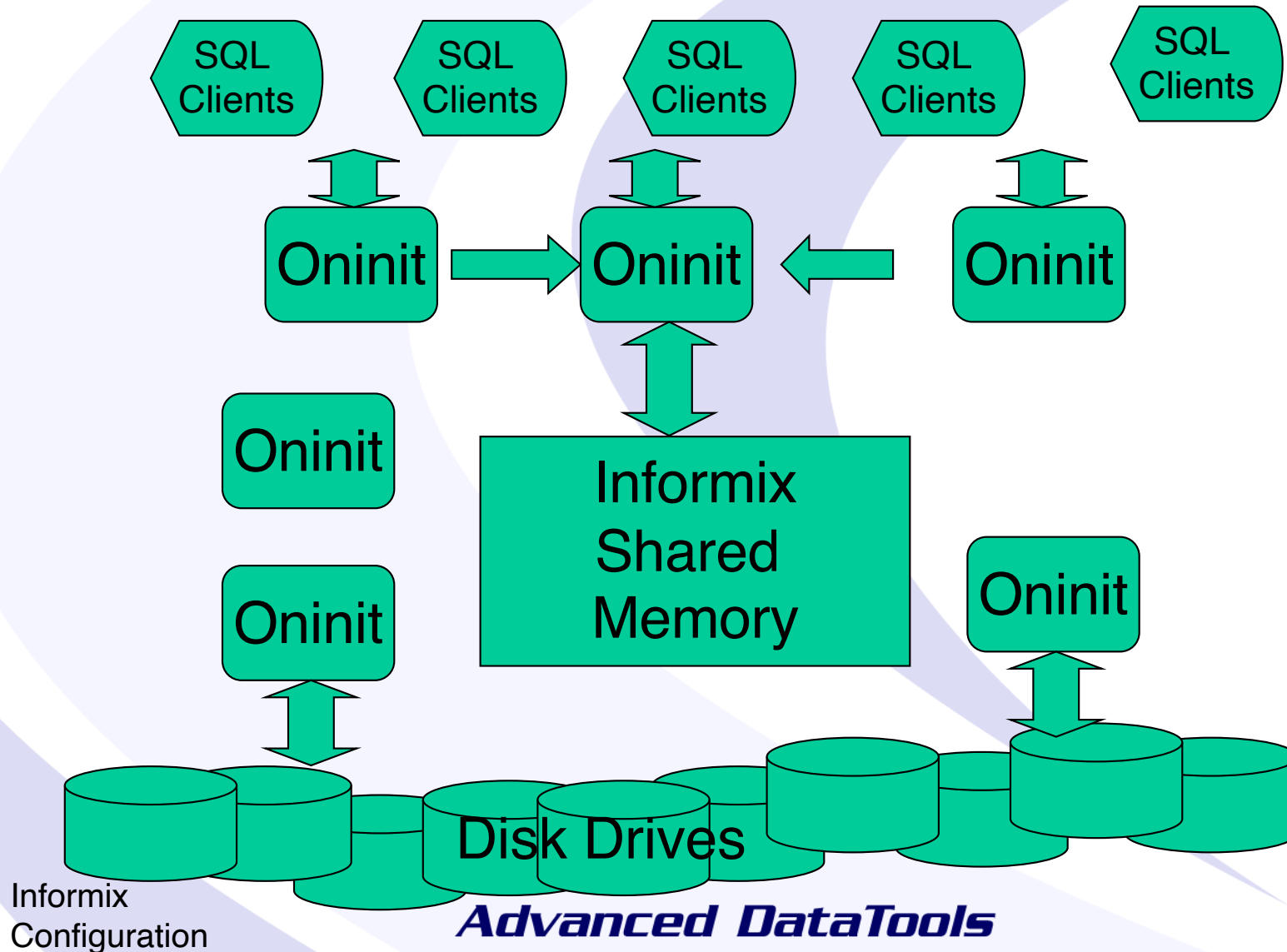
```
System configuration: lcpu=256 mode=Capped

cpu  min  maj  mpc  int   cs  ics  rq   mig lpa sysc us sy wa  id   pc
  0 2457    0    0  447  173    9   0    90  91 11091  9 34   0 57 0.34
  1    0    0    0   54    0    0   0     0   -     0  0  0   0 100 0.22
  2    0    0    0   54    0    0   0     0   -     0  0  0   0 100 0.22
  3    0    0    0   61    0    0   0     0 100     0  0  3   0 97 0.22
  4  843    0    0  665  670   66   0   539  90 10674 14 16   0 70 0.30
  5    0    0    0   60    3    1   0     4  83     5  0  4   0 96 0.23
  6    0    0    0   59    0    0   0     1 100     0  0  4   0 96 0.23
  7    0    0    0   60    3    0   0     4 100     8  0  3   0 97 0.23
  8  413    0    0  504  695   57   0   533  91 15554 16 20   0 64 0.32
  9    0    0    0   60   15    1   0    14  96    36  0  5   0 95 0.23
 10    0    0    0   95   28    2   0     4 100   145  1  2   0 97 0.23
 11    0    0    0   59    0    0   0     0 100     0  0  4   0 96 0.23
 12  466    0    0  494  648   38   0   451  91 12710 17 12   0 71 0.30
 13    0    0    0   61    0    0   0     1  88     1  0  6   0 94 0.24
 14    0    0    0   60    0    0   0     5 100     1  0  5   0 95 0.24
 15    0    0    0   54    0    0   0     2 100     1  0  0   0 100 0.23
```

Informix Configuration

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Hyper-Threads or SMT Threads Best Practices

- Test, Test and Test again; don't assume that more Hyper-Threads or SMT threads are better. Your workload will determine what is best.

- AIX – Try 2 SMT threads per Core on Power6 and Power7, 4 SMT on Power8 or Power9

- Intel – Try 2 Oninits per Core instead of 2 Hyper-Threads and 1 Oninit per Hyper-Thread

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Informix Architecture

SQL Clients

SQL Clients

SQL Clients

SQL Clients

SQL Clients

Oninit

Oninit

Oninit

Oninit

Oninit

Oninit

Informix Shared Memory

Disk Drives

Oninit Process

```
informix@train6:~ train6 > ps -ef | grep oninit
informix 22472        1  9 14:03 ?            00:00:03 oninit -v
root       22473 22472  0 14:03 ?            00:00:00 oninit -v
root       22474 22473  0 14:03 ?            00:00:00 oninit -v
root       22475 22473  0 14:03 ?            00:00:00 oninit -v
root       22476 22473  0 14:03 ?            00:00:00 oninit -v
root       22477 22473  0 14:03 ?            00:00:00 oninit -v
root       22478 22473  0 14:03 ?            00:00:00 oninit -v
root       22479 22473  0 14:03 ?            00:00:00 oninit -v
```

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Oninit Process
onstat –g sch

```
informix@train6:~ train6 > onstat -g sch

IBM Informix Dynamic Server Version 12.10.FC6 -- On-Line -- Up 00:02:12 -- 766404 Kbytes
VP Scheduler Statistics:
 vp    pid      class     semops   busy waits  spins/wait  bsy lspins
 1     22472    cpu       141      0           0           0
 2     22473    adm       0        0           0           0
 3     22474    lio       4115     0           0           0
 4     22475    pio       30       0           0           0
 5     22476    aio       7453     0           0           0
 6     22477    msc       5        0           0           0
 7     22478    fifo      2        0           0           0
 8     22479    soc       2        0           0           0
 9     22480    aio       2890     0           0           0
 10    22481    aio       187      0           0           0
 11    22482    aio       113      0           0           0
 12    22483    aio       55       0           0           0
 13    22484    aio       58       0           0           0
 14    22485    aio       41       0           0           0
 15    22486    aio       32       0           0           0
 16    22487    aio       29       0           0           0
 17    22489    aio       22       0           0           0
```

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Oninit Process Classes

- CPU - Executes all user and session threads and some system threads

- PIO - Handles physical log file when cooked disk space is used

- LIO - Handles logical log file when cooked disk space is used

- AIO - Handles disk I/O

- SHM - Performs shared memory communications

- TLI - Performs TLI network communications

- SOC - Performs socket network communications

- FIFO - Performs FIFO operations

- OPT - Handles optical disk I/O

- ADM - Executes administrative threads

- ADT - Executes auditing threads

- MSC - Handles request for system calls

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Oninit Process Automatically Started

- ## Started Automatically
  - PIO - Handles physical log file when cooked disk space is used
  - LIO - Handles logical log file when cooked disk space is used
  - FIFO - Performs FIFO operations
  - ADM - Executes administrative threads
  - MSC - Handles request for system calls

- ## Started when Auditing is on
  - ADT - Executes auditing threads

- ## Started when UDRs are called
  - Java
  - User Defined Functions

Oninit Process Controlled by VPCLASS

- ONCONFIG VPCLASS Setting
  - CPU - Executes all user and session threads and some system threads
  - AIO - Handles disk I/O

VPCLASS Options

The VPCLASS parameter allows you to:

- Designate a class of virtual processors (VPs)
- Create a user-defined VP, and specify the following information for it:
    - The number of virtual processors that the database server should start initially - optional
    - The maximum number of virtual processors allowed for this class - optional
    - The assignment of virtual processors to CPUs if processor affinity is available - optional
    - The disabling of priority aging by the operating system if the operating system implements priority aging - optional

Syntax:
- VPCLASS classname, options

CPU Oninit Configuration

- VPCLASS CPU – Configure the number of Oninit CPU VPs to start for Informix

  – VPCLASS cpu,num=<number> [,max=<max number cpu>] [,aff=<single CPU number> | <start cpu>-<end cpu> | (<start cpu>-<end cpu>/<skip amount>)]] [,noage]

- Examples for 8 Core machine:

  – VPCLASS cpu,num=4,noage

  – VPCLASS cpu,num=8,noage

  – VPCLASS cpu,num=8,aff=0,noage

  – VPCLASS cpu,num=8,aff=1-4,noage

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CPU Affinity

- Example:
  - VPCLASS cpu,num=4,aff=0-3,noage

Message in the Online Log:

15:33:12 Affinitied VP 8 to phys proc 1

15:33:12 Affinitied VP 9 to phys proc 2

15:33:12 Affinitied VP 10 to phys proc 3

15:33:12 Affinitied VP 1 to phys proc 0

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Additional CPU Best Practices

- Set MULTIPROCESSOR to 1 (Almost all machines today are multiprocessor)

- Set SINGLE_CPU_VP to 0 (Allows you to run more Oninits of CPU class as needed)

- Set NOAGE if your OS supports it

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Additional CPU Best Practices

- Set VP_MEMORY_CACHE_KB <size in KB for private cache for each CPU VP>

- Format is: <size>[,DYNAMICISTATIC] Acceptable values for <size> are: 0 (disable) or 800 through 40% of the value of SHMTOTAL

- Example:
  - VP_MEMORY_CACHE_KB 4096

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AIO Oninit Best Practices

- ## Default is
  - AUTO_AIOVPS 1 – enable automatically adding AIO VPs as needed
  - This can lead to **too many** AIO VPs writing to the same disk system

- ## Recommended
  - AUTO_AIOVPS 0
  - VPCLASS aio,num=<number of oninits you need to write to disk>

AIO Oninit Best Practices

- How many AIO Class Oninits do you need? Test, Test, Test…

  – With KAIO on – only need 2 AIO oninits.

  – With KAIO off (default), it depends on how many processes can write to a disk at the same time.

  – Never need more than twice the number of active chunks.

  – Most hard disks can handle up to 8 AIO oninits.

  – SSD disks may handle more AIO oninits.

AIO Oninit Best Practice Examples

- 1 Disk and 24 Chunks
  - VPCLASS aio,num=8

- 6 Disks and 24 Chunks (12 active)
  - VPCLASS aio,num=24

Oninit Processes Controlled by NETTYPE

- ## ONCONFIG NETTYPE Setting
  - SHM - Performs shared memory communications
  - TLI - Performs TLI network communications
  - SOC - Performs socket network communications

NETTYPE Configuration

- NETTYPE <protocol>,<number of oninit process>, <number of connections per oninit>, <Type of Oninit – CPU or NET>

- Examples:
  - NETTYPE ipcshm,1,50,CPU
  - NETTYPE soctcp,4,250,NET

NETTYPE Configuration Best Practices

- Configure Shared Memory Connection to run on NETTYPE type CPU and Network Connections to run on NETTYPE NET.

- Configure 200-300 Connections per Oninit process.

- Example:
  - NETTYPE ipcshm,1,50,CPU – Shared Memory with 50 connections
  - NETTYPE soctcp,4,250,NET – Network with 1000 connections

Memory Recommendations for Informix and Best Practices

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Informix Memory Best Practices

- How much memory is available on the machine?

- How much is used by the Operating System and other applications?

- How much will be assigned to Informix?

- ***DO NOT allow the machine to Swap memory to disk as this will SLOW everything down***

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Informix Memory Classes

- R – Resident Memory Segment

- B – Buffer Pool Segment for data

- V – Virtual Memory Segment for Working Storage

- M – Message Segment for communications between clients

Informix 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

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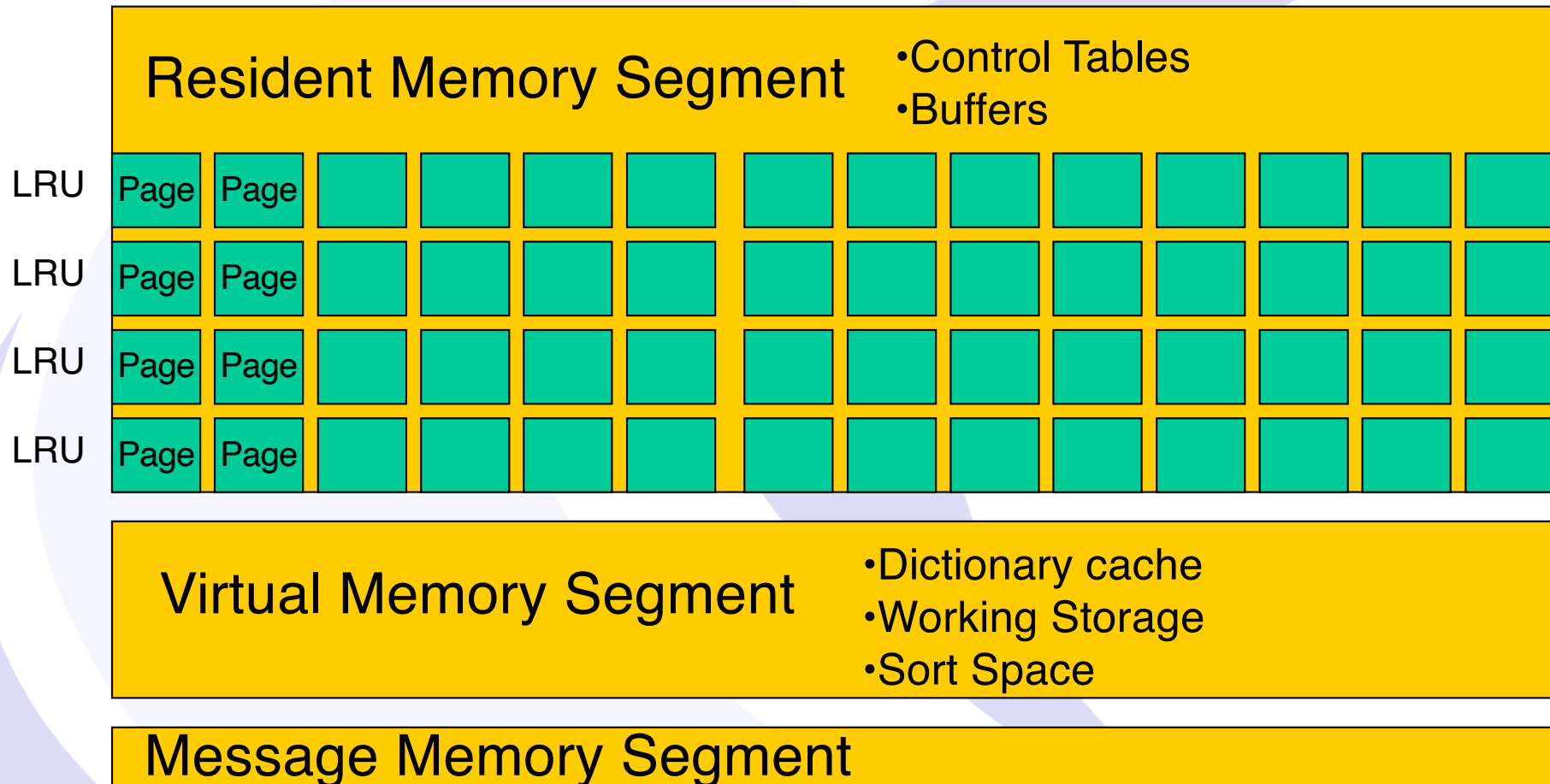
Page Gets Read into Memory by a Select

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

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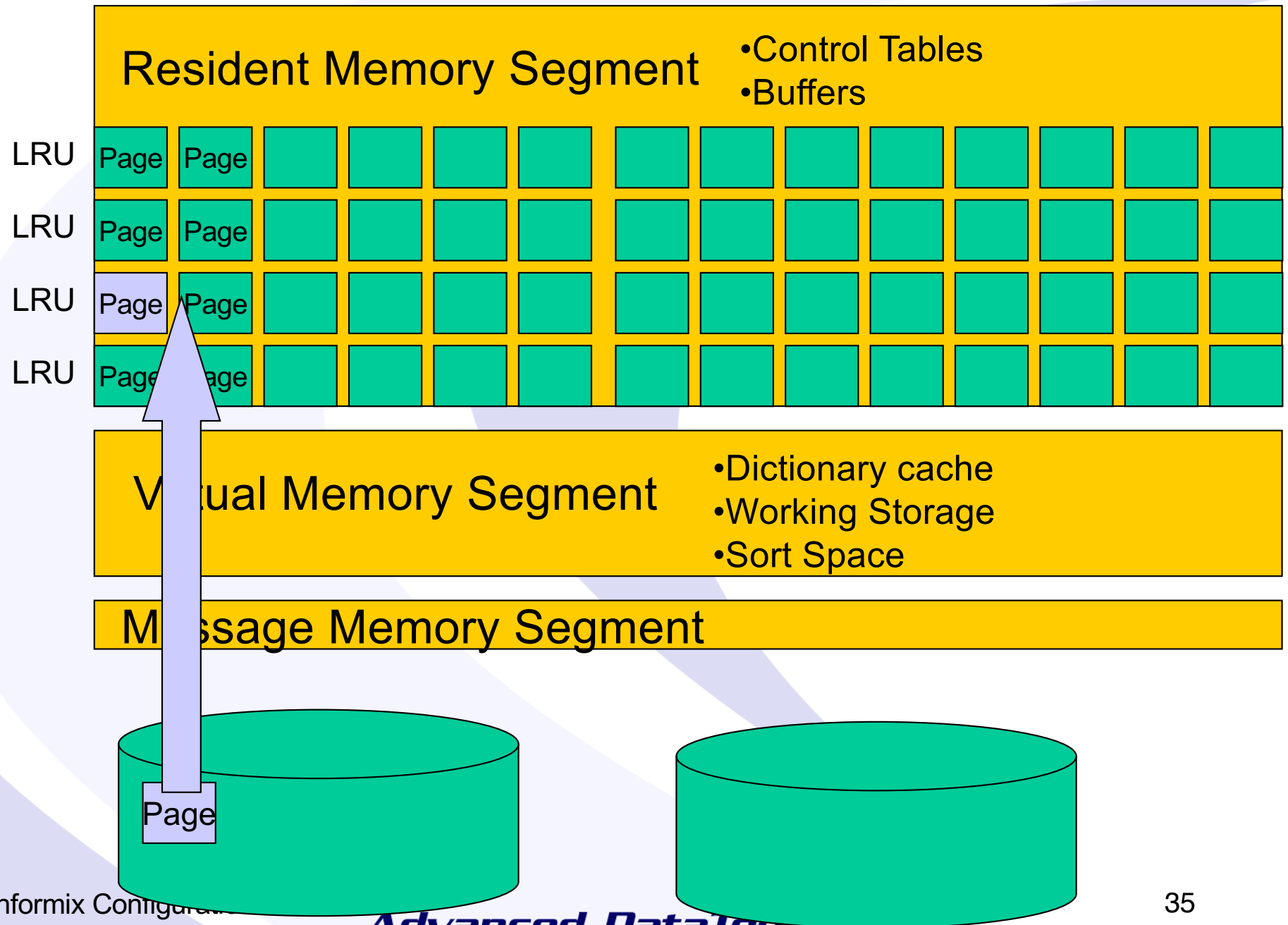
When all Buffers are full, Least Recently Used (LRU) Page is discarded to make room for more data.

Resident Memory Segment

- Control Tables
- Buffers

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

Virtual Memory Segment

- Dictionary cache
- Working storage
- Sort Space

Message Memory Segment

Page Page Page

Page Page Page

Informix Configuration

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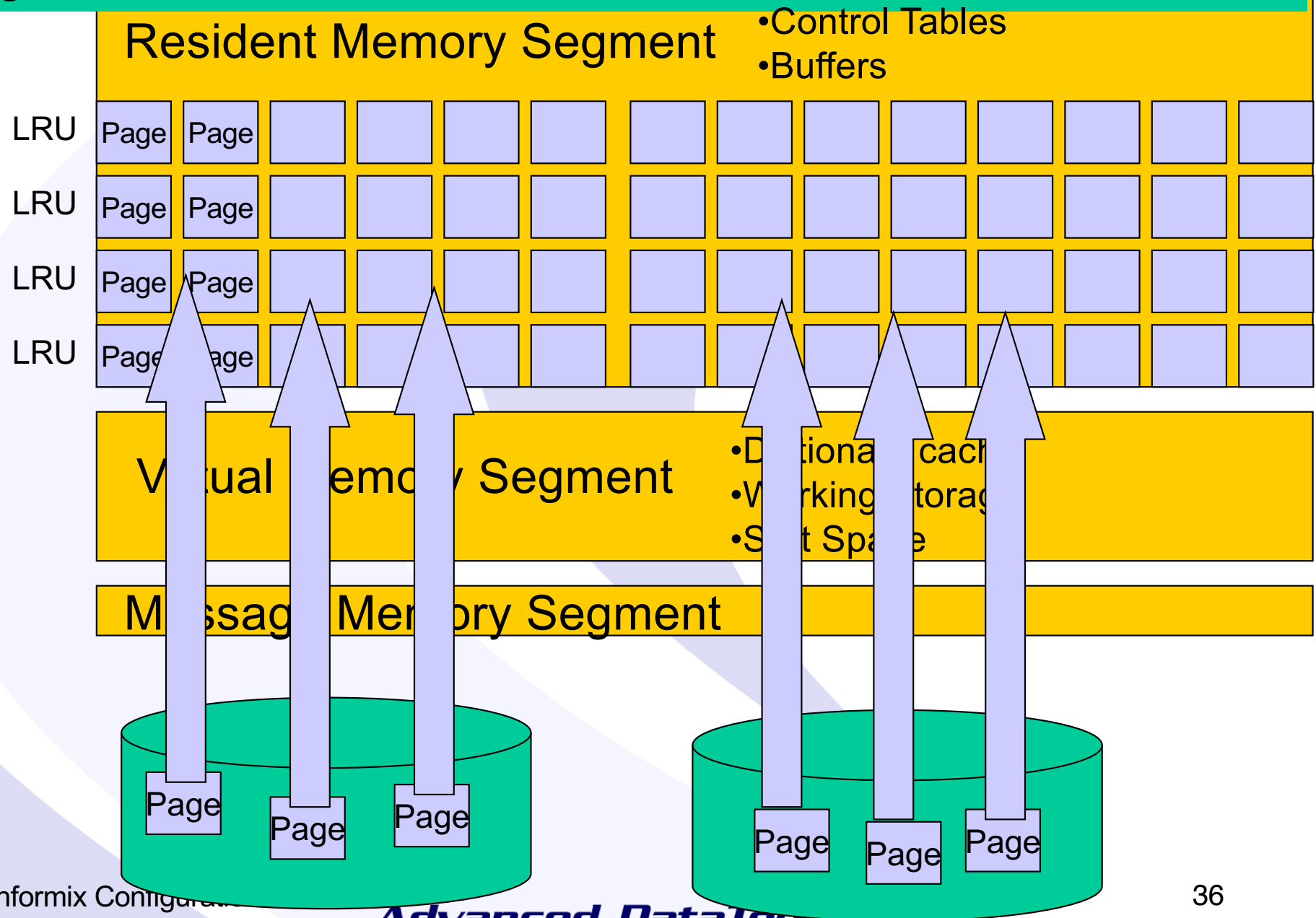
When a user updates a page, it is marked as dirty and must be written out to disk before it is discarded.

Resident Memory Segment

•Control Tables
•Buffers

Updates

LRU | Page | Page

Updates RU | Page | Page

RU | Page | Page

RU | Page | age

Updates

Updates

Virtual Memory Segment

•Dictionary cache
•Working storage
•Sort Space

Message Memory Segment

Page

Page

Page

Page

Page

Page

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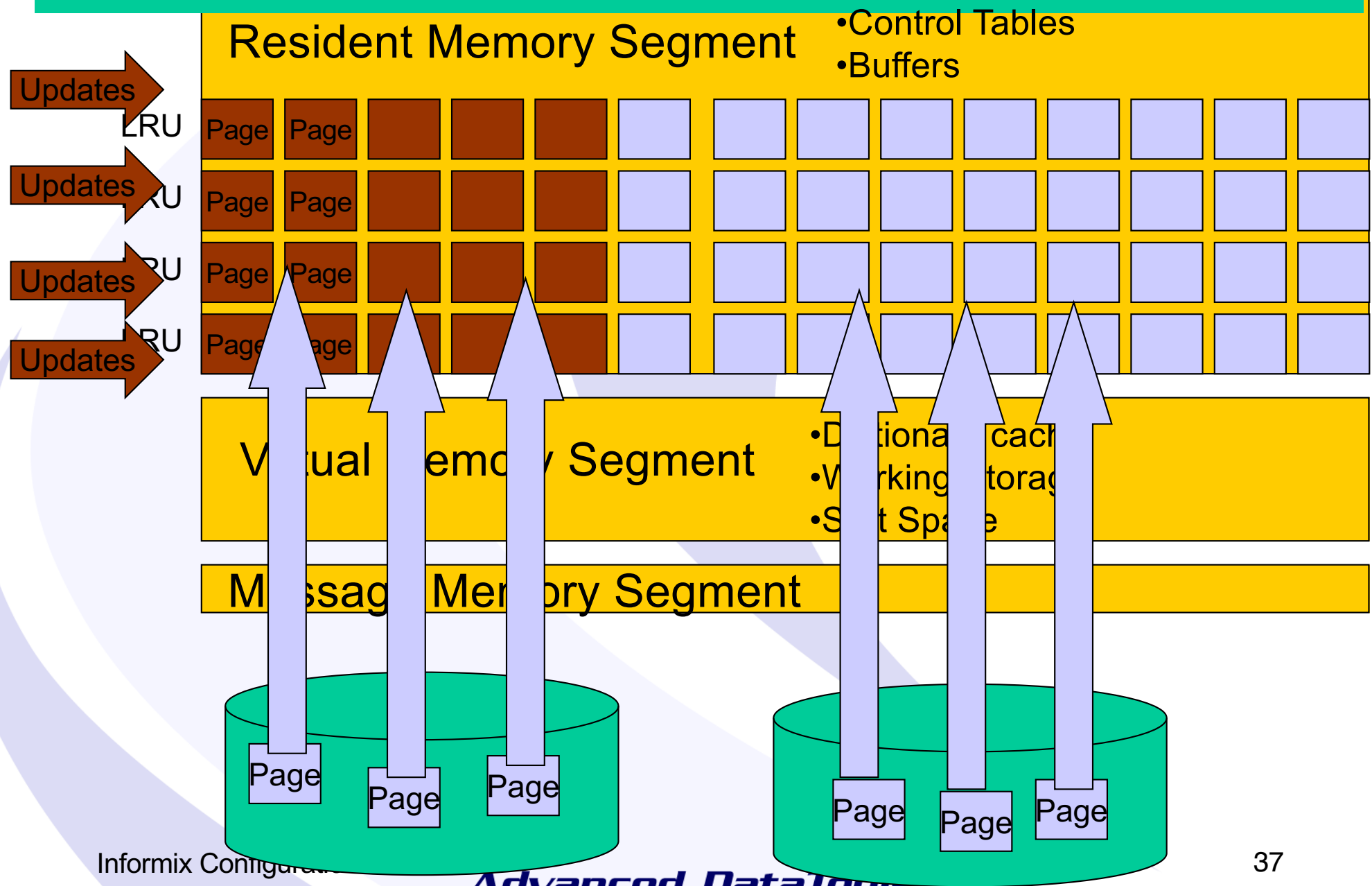
LRU Queues manage writing data to disk in the background when there is idle time based on LRU_MAX_DIRTY and LRU_MIN_DIRTY ONCONFIG values.

Updates

LRU | Page | Page

Updates

LRU | Page | Page

Updates

LRU | Page | Page

Updates

LRU | Page | age

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page
Page
Page

Page
Page
Page

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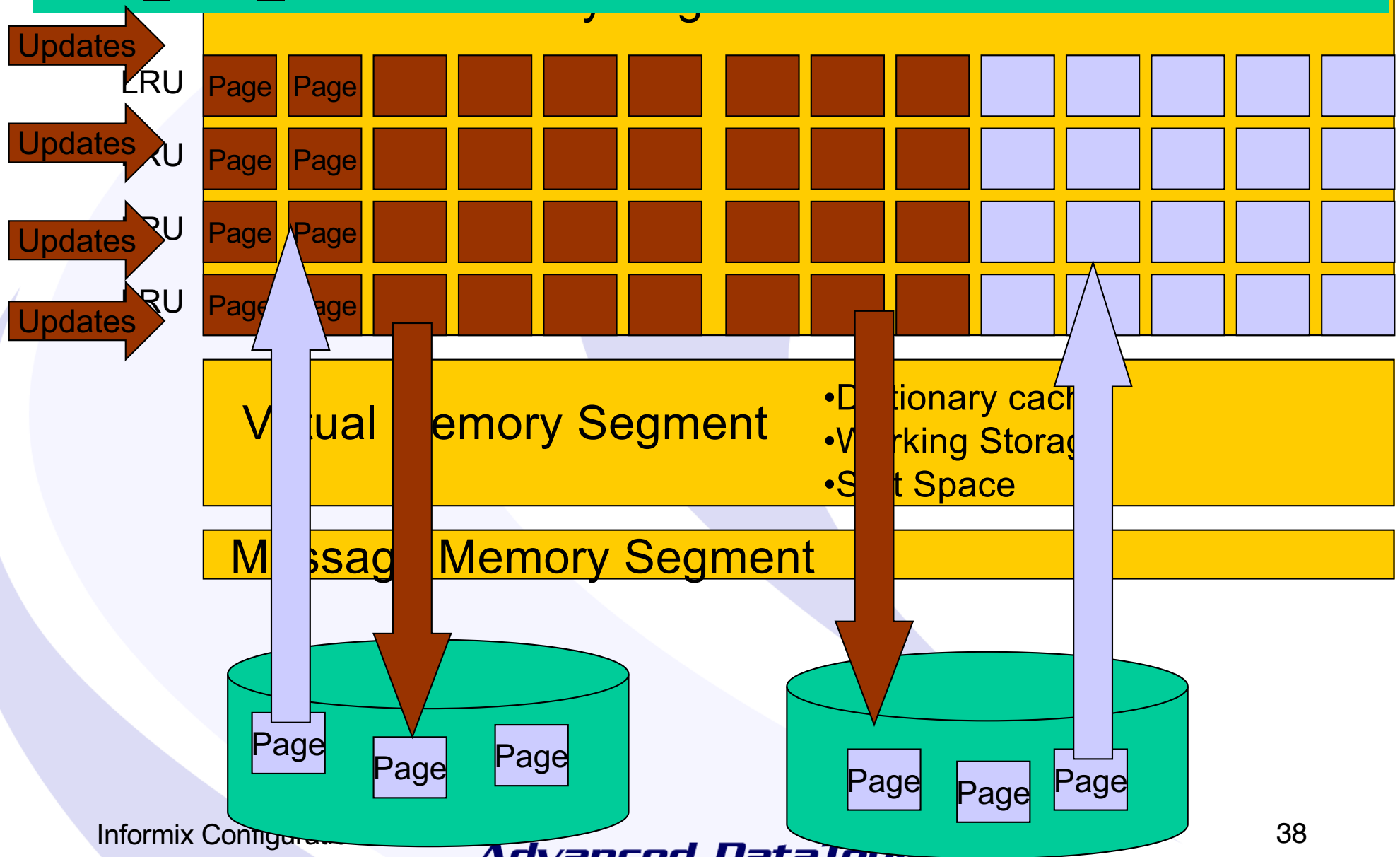
When all buffers are Dirty, the server must STOP all processing and perform a Foreground Write.

Resident Memory Segment

- Control Tables
- Buffers

All Activity is Blocked

Updates

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

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page   Page   Page

Page   Page   Page

Informix Configuration

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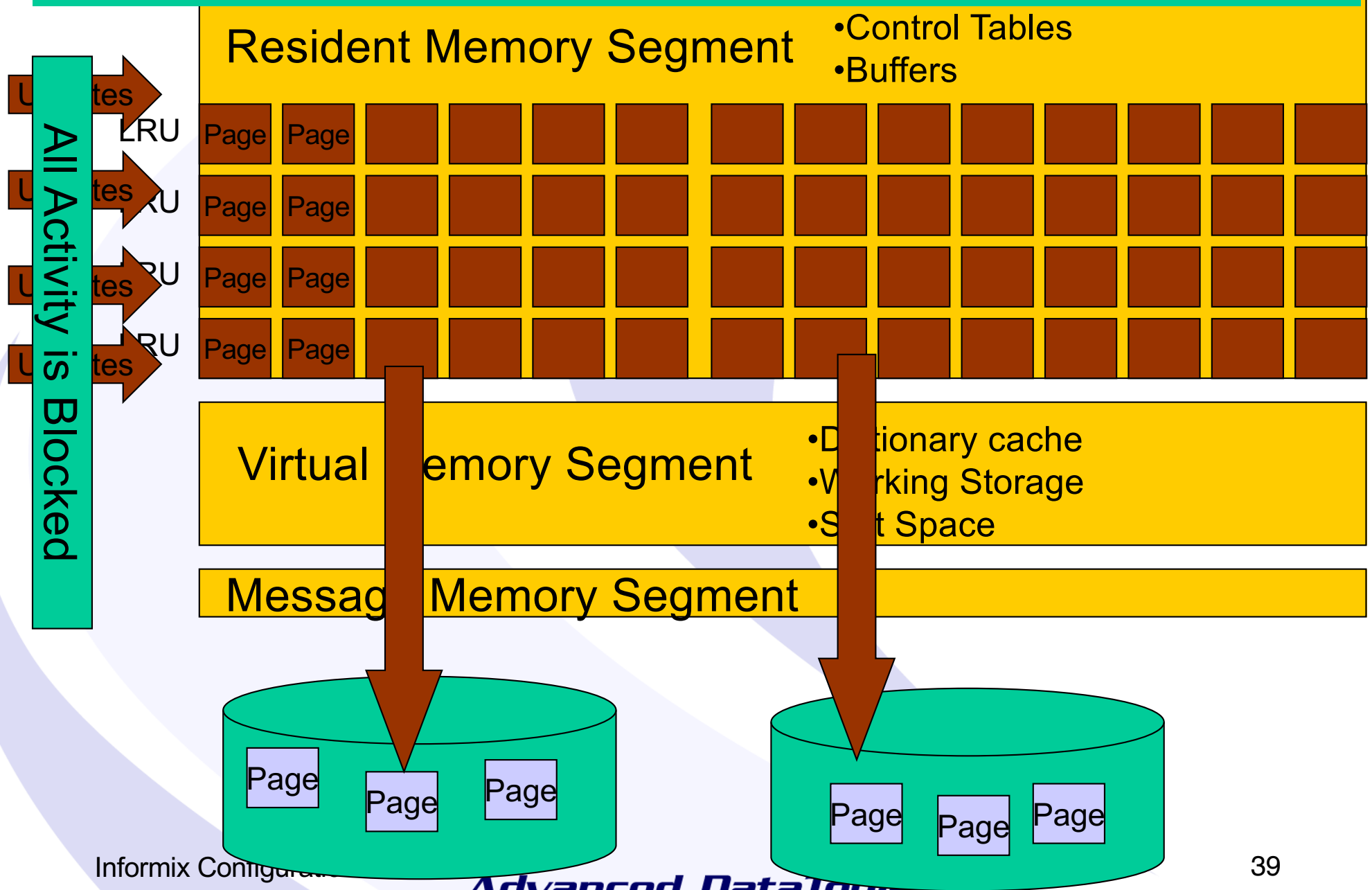
When a buffer is written to disk, it is marked as clean and may be discarded if needed.

Resident Memory Segment

- Control Tables
- Buffers

Updates

LRU Page Page

Updates RU Page Page

Updates RU Page Page

Updates RU Page age

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page Page Page

Page Page Page

Informix Configuration

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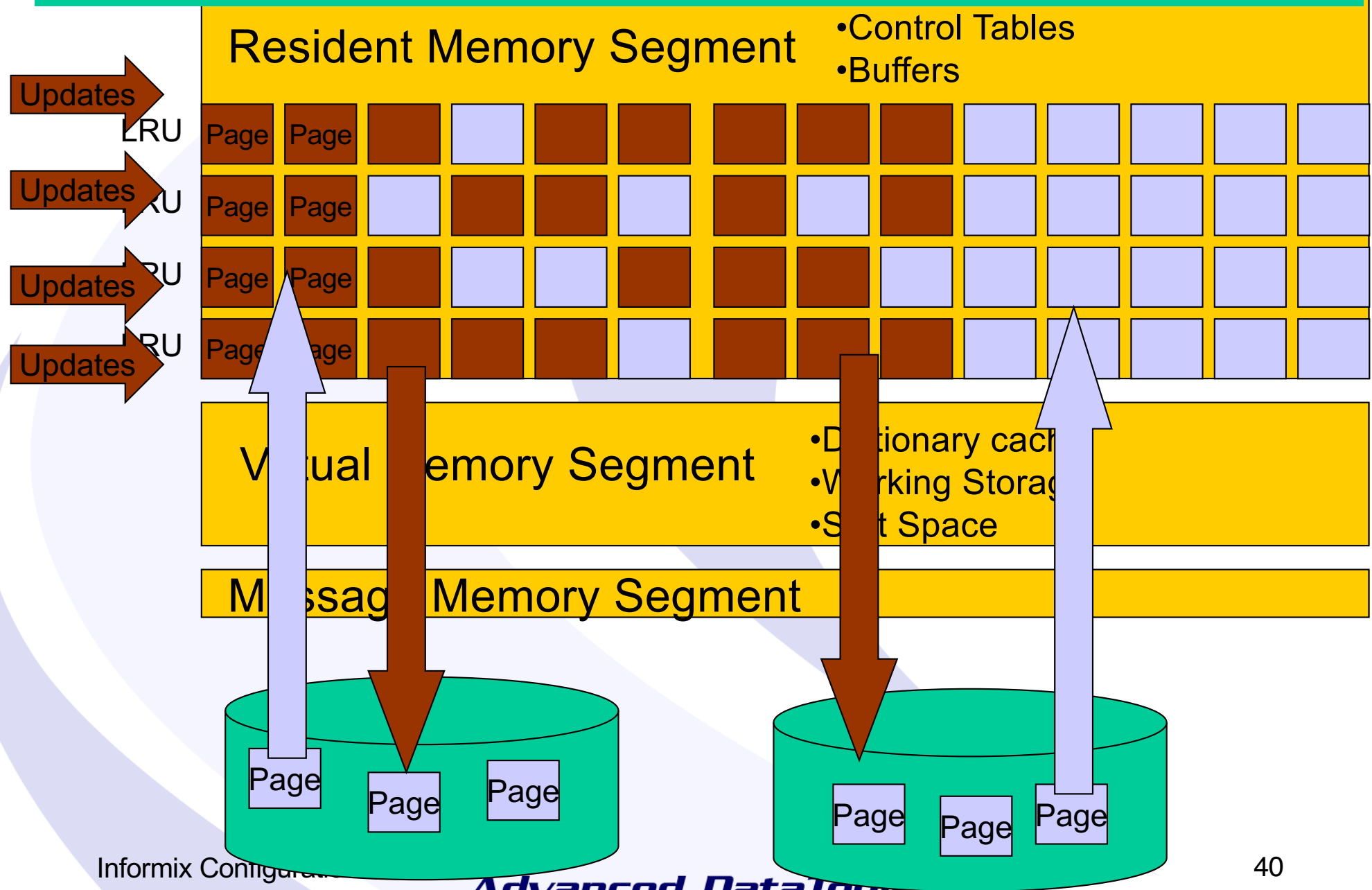
Checkpoint writes all Dirty Buffers to Disk.

Resident Memory Segment

- Control Tables
- Buffers

Updates

LRU Page Page

Updates LRU Page Page

Updates LRU Page Page

Updates LRU Page Page

Virtual Memory Segment

- Dictionary cache
- Working Storage
- Sort Space

Message Memory Segment

Page Page Page

Page Page Page

Advanced DataTools
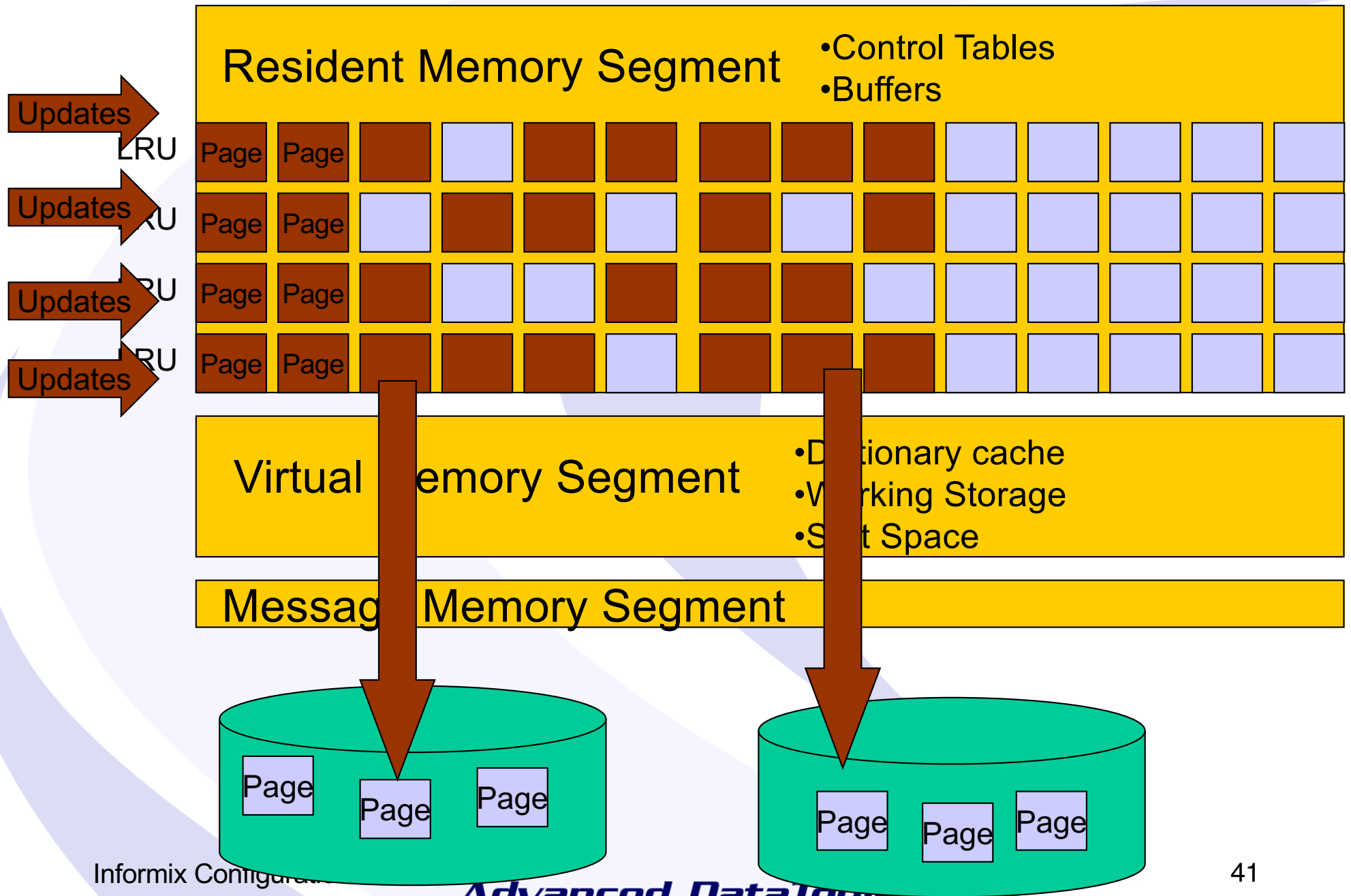
After a Checkpoint, all Buffers are clean and the cycle starts over again.

Resident Memory Segment

- Control Tables
- Buffers

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

Virtual Memory Segment

- Dictionary Cache
- Working Storage
- Sort Space

Message Memory Segment

Page Page Page

Page Page Page

Informix Shared Memory onstat –g seg

```
informix@train6:~ train6 > onstat -g seg

IBM Informix Dynamic Server Version 12.10.FC6 -- On-Line -- Up 00:30:00 -- 766404 Kbytes

Segment Summary:
id          key         addr          size          ovhd      class blkused  blkfree
32769       525c4801    44000000      4911104       495784    R     1199     0
65538       525c4802    444af000      33439744      393384    V     8030     134
98307       525c4803    46493000      562749440     1         B     137390   0
131076      525c4804    67d41000      166359040     1         B     40615    0
163845      525c4805    71be8000      561152        7848      M     136      1
196614      525c4806    71c71000      8388608       99720     V     1529     519
294919      525c4807    72471000      8388608       99720     V     25       2023
Total:      -           -             784797696     -         -     188924   2677

    (* segment locked in memory)
No reserve memory is allocated
```

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ONCONFIG Memory Configuration Settings

- BUFFERPOOL
- SHMVIRTSIZE
- SHMADD
- LOCKS

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BUFFERPOOL Best Practices

- More Buffers - the better and *faster* your database will perform.

- Goal is to put all the active data into Memory Buffers.

- Goal is to prevent high Memory Buffers Turnover (Art Kagel's rule – less than 8 times per hour).

- Always leave the default BUFFERPOOL line in the ONCONFIG.

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BUFFERPOOL Settings

- The BUFFERPOOL configuration parameter consists of two lines in the onconfig.std file, as shown in this example for a UNIX platform:

BUFFERPOOL default,lrus=8,buffers=5000,lru_min_dirty=50,lru_max_dirty=60
BUFFERPOOL size=2K,buffers=5000,lrus=8,lru_min_dirty=50,lru_max_dirty=60

- The top line specifies the default values that are used if you create a dbspace with a page size that does not already have a corresponding buffer pool created at startup.

- The next line below the default line specifies the database server's default values for a buffer pool, which are based on the database server's default page size.

- When you add a dbspace with a different page size with the onspaces utility, or when you add a new buffer pool with the onparams utility, a new line is appended to the BUFFERPOOL configuration parameter in the ONCONFIG file. The page size for each buffer pool must be a multiple of the system's default page size.

BUFFERPOOL Examples

- 3 GB Memory for Buffers – Linux OLTP System
  - BUFFERPOOL size=2k,buffers=1500000,lrus=32,lru_min_dirty=10,lru_max_dirty=20

- 12 GB Memory for Buffers – AIX OLTP System
  - BUFFERPOOL size=4k,buffers=3000000,lrus=128,lru_min_dirty=1,lru_max_dirty=2

- 48 GB Memory for Buffers – Solaris Data Warehouse
  - BUFFERPOOL size=2K,buffers=24000000,lrus=128,lru_min_dirty=60,lru_max_dirty=70

- 15 GB Memory for 4K Buffers and 12.8 GB for 16K Buffers
  - BUFFERPOOL size=4K,buffers=60000000,lrus=256,lru_min_dirty=0.1,lru_max_dirty=0.2
  - BUFFERPOOL size=16K,buffers=800000,lrus=256,lru_min_dirty=20,lru_max_dirty=30

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Memory LRU Settings

- AUTO_LRU_TUNING - Enables (1) or disables (0)

- BUFFERPOOL LRU Settings
  - lrus=<Number of LRU QUEUES>,
  - lru_max_dirty=<Percent dirty to START cleaning>
  - lru_min_dirty=<Percent dirty to STOP cleaning>

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Memory LRU Best Practices

- Enable AUTO_LRU_TUNING for turnkey or embedded systems.

- Disable AUTO_LRU_TUNING for high performance systems where you do not want CHECKPOINTS to write a huge amount of data to disk and slow everything down.

Memory LRU Settings

- LRU Settings for AUTO_LRU_TUNING Disabled
  - lrus=<Number of LRU QUEUES>,
  - lru_max_dirty=<Percent dirty to START cleaning>
  - lru_min_dirty=<Percent dirty to STOP cleaning>

SHMVIRTSIZE Best Practices

- Controls the size of the Informix Virtual Memory Workspace, which can grow if needed.

- Best practice is to set it large enough so it does not need to grow.

  - Monitor with onstat –g seg

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Informix Shared Memory onstat –g seg

```
informix@train6:~ train6 > onstat -g seg

IBM Informix Dynamic Server Version 12.10.FC6 -- On-Line -- Up 00:30:00 -- 766404 Kbytes

Segment Summary:
id          key          addr              size            ovhd       class blkused  blkfree
32769       525c4801     44000000          4911104         495784     R     1199     0
65538       525c4802     444af000          33439744        393384     V     8030     134
98307       525c4803     46493000          562749440       1          B     137390   0
131076      525c4804     67d41000          166359040       1          B     40615    0
163845      525c4805     71be8000          561152          7848       M     136      1
196614      525c4806     71c71000          8388608         99720      V     1529     519
294919      525c4807     72471000          8388608         99720      V     25       2023
Total:      -            -                 784797696       -          -     188924   2677

    (* segment locked in memory)
No reserve memory is allocated
```

Additional Memory Setting

- RESIDENT - Controls whether shared memory is resident. Acceptable values are:
    - 0 off (default)
    - 1 lock the resident segment only
    - n lock the resident segment and the next n-1 virtual segments, where n < 100
    - -1 lock all resident and virtual segments

- SHMADD - The size, in KB, of additional virtual shared memory segments

LOCKS Memory Settings

- LOCKS – The number of LOCKS when Informix Starts. This determines the amount of Memory initially set for LOCKS. Can be dynamically added when needed.

- Dynamically adding LOCKS can cause a performance degradation.

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LOCKS Memory Settings

- To monitor, look at the last line of:

    – onstat –k

```
IBM Informix Dynamic Server Version 12.10.FC6 -- On-Line -- Up 02:34:23 -- 165016 Kbytes

Locks
address          wtlist          owner          lklist          type     tblsnum  rowid
44199028         0               44cd4668       0                   S      100002   204
4423f068         0               44cd4f28       0                   S      100002   204
442e50a8         0               44cd57e8       0                   S      100002   204
442e5130         0               44cd57e8       442e50a8        HDR+S      100002   201
4438b0e8         0               44cd60a8       0               HDR+S      100002   204
 5 active, 80000 total, 16384 hash buckets, 2 lock table overflows
```

   – This shows 2 lock table overflows.
   – This system requires 80,000 locks.

LOCK Best Practices

- LOCK Table Overflows will slow performance and should be avoided.

- LOCK Table Overflows are a major contributor to SHMVIRT Memory additions.

- Set your LOCK setting to a value that is the largest number required.

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Informix ONCONFIG File Recommendations and Best Practices

Advanced DataTools

Basic (Minimum) Informix ONCONFIG Setup and Configuration

ROOTPATH	/PATH/rootdbs
ROOTSIZE	400000
MSGPATH	/PATH/trainX_online.log
CONSOLE	/PATH/trainX_console.log
TAPEDEV	/dev/null
LTAPEDEV	/dev/null
SERVERNUM	<Your Server number goes here>
DBSERVERNAME	<Informix Server Name>
DBSERVERALIASES	<Informix Server Alias Name>
NETTYPE	ipcshm,1,50,CPU
NETTYPE	soctcp,1,50,NET

Informix
Configuration

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Basic Informix ONCONFIG Setup and Configuration

- ROOTPATH – full path location to your rootdbs
    - ROOTPATH /informixchunks/train1/rootdbs

- ROOTSIZE – Size of your rootdbs in KB
    - ROOTSIZE 2000000

- File must be owned by Informix and belong to the Informix group

- File Permissions must be read/write by user and group Informix only

Basic Informix ONCONFIG Setup and Configuration

- MSGPATH – Full path to the location of the Informx Message log file

  – MSGPATH $INFORMIXDIR/train1_online.log

- CONSOLE – Full path to the location of the Informx Console log file

  – CONSOLE $INFORMIXDIR/train1_console.log

Basic Informix ONCONFIG Setup and Configuration

- Set Ontape Backups to a directory
  - TAPEDEV /home/informix/backups/servername/archive
  - LTAPEDEV /home/informix/backups/servername/logs

- Directory must be owned by Informix and belong to the Informix group

- Permissions must be read/write by user and group Informix only

Basic Informix ONCONFIG Setup and Configuration

- SERVERNUM – Must be a unique number for each instance on a machine

- DBSERVERNAME – the Server Name
  - The connections INFORMIXSERVER

- DBSERVERALIAS – the Server Alias Name for other (Network Connections)
  - The connections INFORMIXSERVER

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Basic Informix ONCONFIG Setup and Configuration

- NETTYPE – The Network settings for your Server

ONCONFIG Setting

- The following is a review of critical ONCONFIG Settings

Rootdbs – Set before Initialization


```
################################################################
# Root Dbspace Configuration Parameters
################################################################
# ROOTNAME      - The root dbspace name to contain reserved pages and
#                 internal tracking tables.
# ROOTPATH      - The path for the device containing the root dbspace
# ROOTOFFSET    - The offset, in KB, of the root dbspace into the
#                 device. The offset is required for some raw devices.
# ROOTSIZE      - The size of the root dbspace, in KB.  The value of
#                 200000 allows for a default user space of about
#                 100 MB and the default system space requirements.
# MIRROR        - Enable (1) or disable (0) mirroring
# MIRRORPATH    - The path for the device containing the mirrored
#                 root dbspace
# MIRROROFFSET  - The offset, in KB, into the mirrored device
#
# Warning: Always verify ROOTPATH before performing
#          disk initialization (oninit -i or -iy) to
#          avoid disk corruption of another instance
################################################################

ROOTNAME rootdbs
ROOTPATH /Users/informix/informixchunks/benchmark6/rootdbs
ROOTOFFSET 0
ROOTSIZE 4000000
MIRROR 0
MIRRORPATH
MIRROROFFSET 0
```

Physical and Logical Logs: Use onparams to set after initialization


```
##################################################################
# Physical Log Configuration Parameters
##################################################################
# PHYSFILE              - The size, in KB, of the physical log on disk.
#                         If RTO_SERVER_RESTART is enabled, the
#                         suggested formula for the size of PHSYFILE
#                         (up to about 1 GB) is:
#                             PHYSFILE = Size of BUFFERS * 1.1
# PLOG_OVERFLOW_PATH   - The directory for extra physical log files
#                         if the physical log overflows during recovery
#                         or long transaction rollback
# PHYSBUFF             - The size of the physical log buffer, in KB
##################################################################

PHYSFILE          5000000
PLOG_OVERFLOW_PATH  $INFORMIXDIR/tmp
PHYSBUFF 128


##################################################################
# Logical Log Configuration Parameters
##################################################################
# LOGFILES       - The number of logical log files
# LOGSIZE        - The size of each logical log, in KB
# DYNAMIC_LOGS   - The type of dynamic log allocation.
#                  Acceptable values are:
#                  2 Automatic. The server adds a new logical log to the
#                    root dbspace when necessary.
#                  1 Manual. The server notifies the DBA to add new logical
#                    logs when necessary.
```

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Long Transactions – Change default to 50%


```
# Long Transaction Configuration Parameters
####################################################################
# If The server cannot roll back a long transaction, the server hangs
# until more disk space is available.
#
# LTXHWM        - The percentage of the logical logs that can be
#                 filled before a transaction is determined to be a
#                 long transaction and is rolled back
# LTXEHWM       - The percentage of the logical logs that have been
#                 filled before the server suspends all other
#                 transactions so that the long transaction being
#                 rolled back has exclusive use of the logs
#
# When dynamic logging is on, you can set higher values for
# LTXHWM and LTXEHWM because the server can add new logical logs
# during long transaction rollback. Set lower values to limit the
# number of new logical logs added.
#
# If dynamic logging is off, set LTXHWM and LTXEHWM to
# lower values, such as 50 and 60 or lower, to prevent long
# transaction rollback from hanging the server due to lack of
# logical log space.
#
# When using Enterprise Replication, set LTXEHWM to at least 30%
# higher than LTXHWM to minimize log overruns.
####################################################################

LTXHWM 50
LTXEHWM 60
```

Temp DBSpace – Set after initialization

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INFORMIXSERVER
Server Names

Advanced DataTools

Nettype – Communications Settings

Network Configuration

DBSERVERNAME - Name of default
database server (INFORMIXSERVER)

DBSERVERALIASES - List of alternate
dbservernames (INFORMIXSERVER)

NETTYPE   - How to configure poll
thread(s) on oninit processes

NETTYPE
protocol,poll_threads,connections,VP_class

VPCLASS - CPU Settings


```
##################################################################
# CPU-Related Configuration Parameters
##################################################################
# MULTIPROCESSOR      - Specifies whether the computer has multiple
#                       CPUs. Acceptable values are: 0 (single
#                       processor), 1 (multiple processors or
#                       multi-core chips)
# VPCLASS cpu         - Configures the CPU VPs. The format is:
#                       VPCLASS cpu, num=<number of CPU VPs>,
#                       [,max=<maximum number for class>]
#                       [,aff=<single CPU number> | <start cpu>-<end cpu> |
#                       ( <start cpu>-<end cpu>/<skip amount> ) ]
#                       [,noage]
#                       for example:
#                       num=4,aff=(1-10/3) means assign 4 CPU VPs to processors
#                       1,4,7,10
# VP_MEMORY_CACHE_KB  - Specifies the amount of private memory
#                       blocks of your CPU VP, in KB, that the
#                       database server can access and whether
#                       the memory changes dynamically (default).
#                       Format is: <size>[,DYNAMIC|STATIC]
#                       Acceptable values for <size> are:
#                       0 (disable)
#                       800 through 40% of the value of SHMTOTAL
# SINGLE_CPU_VP       - Optimizes performance if the server runs with
#                       only one CPU VP. Acceptable values are:
#                       0 multiple CPU VPs
#                       Any nonzero value (optimize for one CPU VP)
##################################################################
```

Informix
Configuration

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Additional CPU Settings


```
#                          multi-core chips)
# VPCLASS cpu          - Configures the CPU VPs. The format is:
#                          VPCLASS cpu, num=<number of CPU VPs>,
#                          [,max=<maximum number for class>]
#                          [,aff=<single CPU number> | <start cpu>-<end cpu> |
#                          ( <start cpu>-<end cpu>/<skip amount> ) ]
#                          [,noage]
#                          for example:
#                          num=4,aff=(1-10/3) means assign 4 CPU VPs to processors
#                          1,4,7,10
# VP_MEMORY_CACHE_KB   - Specifies the amount of private memory
#                          blocks of your CPU VP, in KB, that the
#                          database server can access and whether
#                          the memory changes dynamically (default).
#                          Format is: <size>[,DYNAMIC|STATIC]
#                          Acceptable values for <size> are:
#                          0 (disable)
#                          800 through 40% of the value of SHMTOTAL
# SINGLE_CPU_VP        - Optimizes performance if the server runs with
#                          only one CPU VP. Acceptable values are:
#                          0 multiple CPU VPs
#                          Any nonzero value (optimize for one CPU VP)
#####################################################################

MULTIPROCESSOR 1
VPCLASS cpu,num=8,noage
VP_MEMORY_CACHE_KB 8095
SINGLE_CPU_VP 0
```

Informix
Configuration

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Auto Tuning – Off or On?

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Auto Tuning

```
# RA_PAGES & RA_THRESHOLD have been replaced with AUTO_READAHEAD.
#
# AUTO_READAHEAD mode[,readahead_cnt]
#     mode                0 = Disable      (Not recommended)
#                         1 = Passive      (Default)
#                         2 = Aggressive   (Not recommended)
#     readahead_cnt       Optional         Range 4-4096
#                         readahead_cnt allows for tuning the # of
#                         pages that automatic readahead will request
#                         to be read ahead. When not set, the default
#                         is 128 pages.
#
#     Notes:
#     The threshold for starting the next readahead request, which
#     used to be known as RA_THRESHOLD, is always set to 1/2 of the
#     readahead_cnt. RA_THRESHOLD is deprecated and no longer used.
#
# If RA_PAGES & AUTO_READAHEAD are not present in the ONCONFIG file,
# AUTO_READAHEAD will default to the value of AUTO_TUNE.
#
# If RA_PAGES is present in the ONCONFIG file and AUTO_READAHEAD is
# not, the server will set AUTO_READAHEAD to AUTO_TUNE,RA_PAGES
#
##################################################################

AUTO_TUNE 1


##################################################################
```

Informix
Configuration

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Auto Tuning

The screen shows:

```
#                   pages that automatic readahead will request
#                   to be read ahead. When not set, the default
#                   is 128 pages.
#
#     Notes:
#     The threshold for starting the next readahead request, which
#     used to be known as RA_THRESHOLD, is always set to 1/2 of the
#     readahead_cnt. RA_THRESHOLD is deprecated and no longer used.
#
# If RA_PAGES & AUTO_READAHEAD are not present in the ONCONFIG file,
# AUTO_READAHEAD will default to the value of AUTO_TUNE.
#
# If RA_PAGES is present in the ONCONFIG file and AUTO_READAHEAD is
# not, the server will set AUTO_READAHEAD to AUTO_TUNE,RA_PAGES
#
####################################################################

AUTO_TUNE 0
AUTO_AIOVPS      0
AUTO_CKPTS       0
AUTO_REPREPARE   0
AUTO_STAT_MODE   0
AUTO_READAHEAD   0
AUTO_LRU_TUNING 0


####################################################################
# AIO and Cleaner-Related Configuration Parameters
####################################################################
# VPCLASS aio  - Configures the AIO VPs. The format is:
```

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Disk I/O

```
# AIO and Cleaner-Related Configuration Parameters
################################################################
# VPCLASS aio   - Configures the AIO VPs. The format is:
#                 VPCLASS aio,num=<#>[,max=<#>][,aff=<#>][,noage]
#                 Example:
#                 VPCLASS aio,num=1
# CLEANERS      - The number of page cleaner threads
# DIRECT_IO     - Specifies whether direct I/O is used for cooked
#                 files used for dbspace chunks.
#                 Acceptable values are:
#                 0 Disable
#                 1 Enable direct I/O
#                 2 Enable concurrent I/O
################################################################

CLEANERS 8
DIRECT_IO 0

################################################################
# Lock-Related Configuration Parameters
################################################################
# LOCKS              - The initial number of locks when the server starts.
#                      Dynamic locking can add extra locks if needed.
# DEF_TABLE_LOCKMODE - The default table lock mode for new tables.
#                      Acceptable values are ROW and PAGE (default).
################################################################

LOCKS 200000
DEF_TABLE_LOCKMODE page
```

Informix
Configuration

Advanced DataTools

Memory Settings

Memory Settings


```
# SHMVIRT_ALLOCSEG - Controls when the server adds a memory segment and
#                    the alarm level if the memory segment cannot
#                    be added.
#                    For the first field, acceptable values are:
#                    - 0 Disabled
#                    - A decimal number indicating the total percentage
#                      of virtual memory used before a segment is added
#                    - The total KB virtual memory remaining when a segment
#                      is added
#                    For the second field, specify an alarm level
#                    from 1 (non-event) to 5 (fatal error).
# SHMNOACCESS        - A list of up to 10 memory address ranges
#                    that the server cannot use to attach shared memory.
#                    Each address range is the start and end memory
#                    address in hex format, separated by a hyphen.
#                    Use a comma to separate each range in the list.
##################################################################

RESIDENT 0
SHMBASE 0x200000000L
SHMVIRTSIZE  1024000
SHMADD 8192
EXTSHMADD 8192
SHMTOTAL 0
SHMVIRT_ALLOCSEG 0,3
SHMNOACCESS


##################################################################
# Checkpoint and System Block Configuration Parameters
```

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Locks

```
# AIO and Cleaner-Related Configuration Parameters
###############################################################
# VPCLASS aio   - Configures the AIO VPs. The format is:
#                 VPCLASS aio,num=<#>[,max=<#>][,aff=<#>][,noage]
#                 Example:
#                 VPCLASS aio,num=1
# CLEANERS      - The number of page cleaner threads
# DIRECT_IO     - Specifies whether direct I/O is used for cooked
#                 files used for dbspace chunks.
#                 Acceptable values are:
#                 0 Disable
#                 1 Enable direct I/O
#                 2 Enable concurrent I/O
###############################################################

CLEANERS 8
DIRECT_IO 0


###############################################################
# Lock-Related Configuration Parameters
###############################################################
# LOCKS              - The initial number of locks when the server starts.
#                      Dynamic locking can add extra locks if needed.
# DEF_TABLE_LOCKMODE - The default table lock mode for new tables.
#                      Acceptable values are ROW and PAGE (default).
###############################################################

LOCKS 200000
DEF_TABLE_LOCKMODE page
```

Informix
Configuration

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Buffer Pool


```
# TENANT_LIMIT_CONNECTIONS count  1        64k        0 (off)    Reject connection
#####################################################################

######################################################################
# Buffer pool and LRU Configuration Parameters
######################################################################
# BUFFERPOOL       - Specifies the default values for buffers and LRU
#                    queues in each buffer pool. Each page size used
#                    by a dbspace has a buffer pool and needs a
#                    BUFFERPOOL entry. The onconfig.std file contains
#                    two initial entries: a default entry from which
#                    to base new page size entries on, and an entry
#                    for the operating system default page size.

#                    When you add a dbspace with a different page size,
#                    IDS adds a BUFFERPOOL entry to the onconfig file
#                    with values that are the same as the default
#                    BUFFERPOOL entry, except that the default
#                    keyword is replaced by size=Nk, where N is the
#                    new page size. With interval checkpoints, these
#                    values can now be set higher than in previous
#                    versions of IDS in an OLTP environment.
######################################################################

## Set BUFFERPOOL to 2GB
BUFFERPOOL default,buffers=10000,lrus=8,lru_min_dirty=50.00,lru_max_dirty=60.50
BUFFERPOOL size=4k,buffers=1000000,lrus=8,lru_min_dirty=50,lru_max_dirty=60
BUFFERPOOL size=16k,buffers=100000,lrus=8,lru_min_dirty=50,lru_max_dirty=60
~
```

Informix
Configuration

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Memory Configuration - Bufferpool

Informix IDS Shared Memory

Resident Memory Segment

2K Page

Page	Page
Page	Page
Page	Page
Page	Page

8K Page

Page	Page
Page	Page
Page	Page
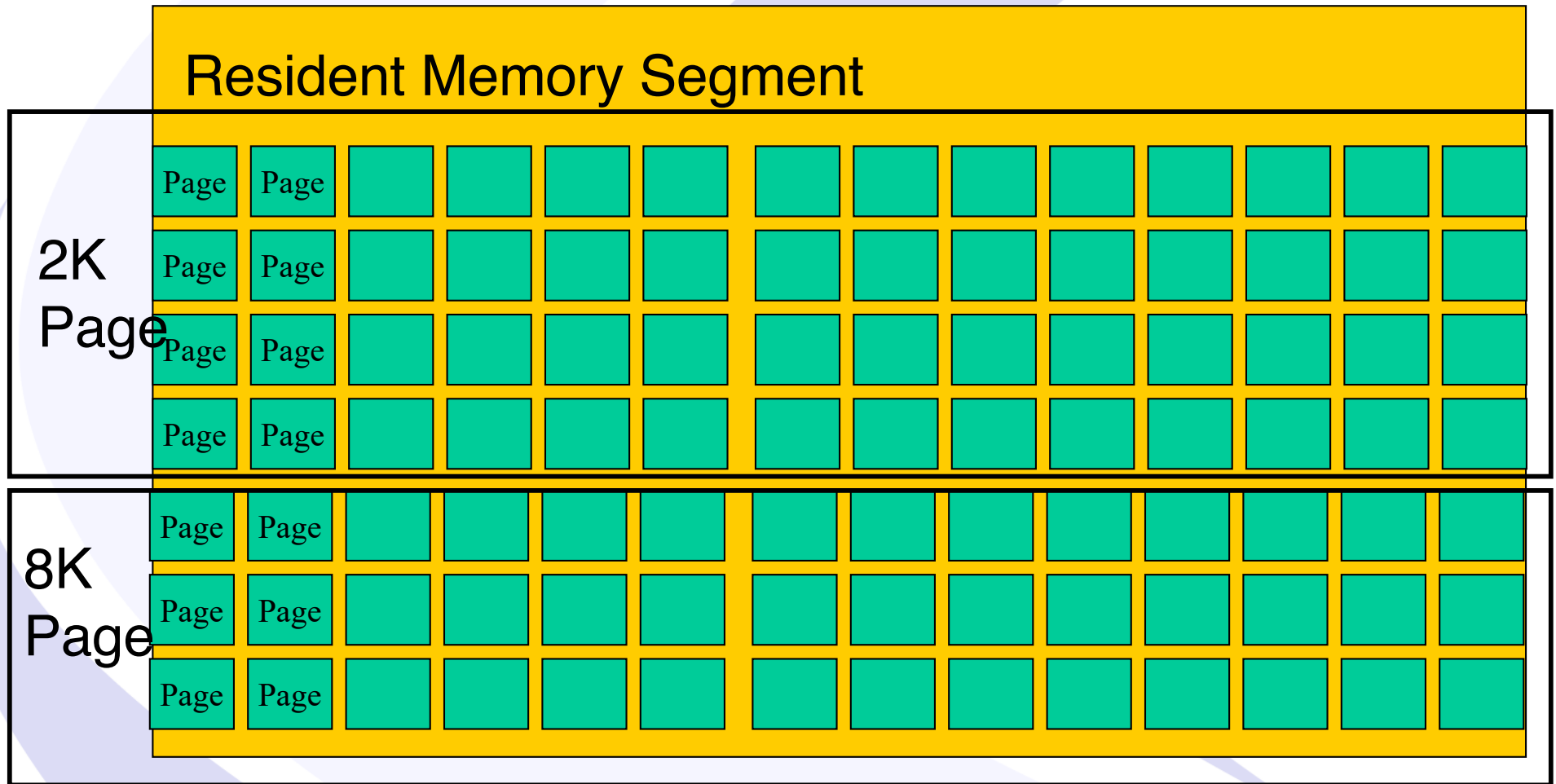
Demo – Ten scripts to configure a large Informix Server

- 01makerootdbs.sh   - create directories and links for all dbspaces
- 02setupServer.sh   - initialize the server and rootdbs
- 03makeplogdbs.sh   - move the physical log to a new dbspace
- 04makelogsdbs.sh   - create two dbspaces for logical logs
- 05makeaddlogs.sh   - create the logical logs
- 06maketempdbs.sh   - create the temp dbspaces
- 07makesysadmindbs.sh - create and move the sysadm dbspace
- 08makedatadbs.sh   - create the dbspaces for data
- 09makeindexdbs.sh   - create the dbspaces for indexes
- 10extendablechunks.sh - make the dbspaces and chunks extendable
- cleanup.sh   - remove everything and start over
- informix.env   - set the Informix environment variables
- onconfig.newserver   - configure the server properties
- sqlhosts   - configure the network settings

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Questions?

Send follow-up questions to
Lester@advancedatatools.com

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International Informix User Group:
http://www.iiug.org

IBM Informix Community

http://www.iiug.org/community

This replaced Informix-List

Free Informix Tutorials Webcasts

from the IBM Informix Champions

A step by step guide to using Informix Database Servers

➢ **Getting Started with Informix by Lester Knutsen on January 30th, <u>Replay on website</u>**
This Webcast is a step-by-step guide to installing and getting up and running with a basic Informix Server. We will introduce using InformixHQ, the IBM Informix Knowledge Center, and how to find resources to get started with Informix.

➢ **Configuring a New Informix Server by Lester Knutsen on February 27th, <u>Replay on website</u>**
This Webcast will be an introduction to the Informix ONCONFIG file and configuring memory, CPUs, network, and disk for a more extensive Informix Server.

➢ **Managing Informix Disk Space - March 19, 2020 at 2:00 pm EDT**

➢ **Managing Informix Logs - April 30, 2020 at 2:00 pm EDT**

➢ **Informix Backup, Recovery, and High Availability - May 28, 2020 at 2:00 pm EDT**

➢ **Connecting Users to Informix Servers - June 25, 2020 at 2:00 pm EDT**

➢ **Creating Databases and Tables in Informix - July 23, 2020 at 2:00 pm EDT**

➢ **Basic Informix Server Monitoring - August 20, 2020 at 2:00 pm EDT**

Registration and more information: **https://advancedatatools.com/tech-info/next-webcasts/**

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We have the course for you!

➢ **May 18-21, 2020 - Informix for Database Administrators**

➢ **July 6-9, 2020 - Advanced Informix Performance Tuning**

➢ **October 5-8, 2020 - Informix for Database Administrators**

More information and registration at:
https://advancedatatools.com/training/

Attend classes online on the web or in person at our training center in Virginia. All you need is a web browser to connect to our WebEx training system, and an SSH client (like Putty) to connect to our training lab for hands-on exercises.

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Informix 14 Training

© Lester Knutsen 2018

Each student in class will have a server running Informix 14.10 with:
- 8 CPU Cores
- 16 GB RAM
- 1 SSD Disk
- 1-4 Disks

Class size is limited to 8 students.

Attend online or in person!

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