



# **Informix Best Practices Getting Started with Informix**

Webcast – January 26, 2017

By

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***Advanced DataTools***

# 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 Data Champion awards by IBM. Lester was one of the founders of the International Informix Users Group and the Washington Area Informix User Group.

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# Overview

- Informix Products Overview
- Informix Architecture
  - Memory, CPU, Disk Requirements
- Planning an Informix Install
- Installing Informix
- Software Directory Structure
- Using Informix SQL
- Informix Documentation
- Informix Resources on the Web



# Informix Products Overview

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# Informix Servers History

- Informix C-ISAM
- Informix Standard Engine (SE)
- Informix OnLine 4.x and 5.x
- Informix Dynamic Server 7.x
- Informix Extended Parallel Server 8.x
- Informix Dynamic Server 9.x and 10.x
- **Current - Informix 11.x and 12.x**

# Informix 12.x Editions

- No Cost Editions
  - **IBM Informix Developer Edition**
  - IBM Informix Innovator-C Edition
- Purchase Editions
  - IBM Informix Express Edition
  - **IBM Informix Workgroup Edition**
  - IBM Advanced Workgroup Edition
  - IBM Informix Advanced Developer Edition
  - **IBM Informix Enterprise Edition**
  - IBM Informix Advanced Enterprise Edition

# Licensing Metrics

- Processor Value Unit (PVU)
- Authorized User Single Install (AUSI)
- Limited Use Virtual Server (LUVS)
- Limited Use Socket (LU Socket)
  - Only for Informix Workgroup
- Authorized User (AU)
  - Only for Informix Advanced Developer

# Connectivity/Client Products

- Informix Client Software Developer's Kit (SDK) includes
  - Informix ODBC
  - Informix ESQL
  - OAT
- Informix Enterprise Gateway
- Informix JDBC Driver/Embedded SQL
- IBM Data Server Driver (IBM Common Driver)



# DataBlade Modules and DataBlade Developer's Kit

- Informix NAG DataBlade
- Informix C-ISAM DataBlade
- Informix Data Director for Web
- Informix Geodetic DataBlade
- Informix Image Foundation DataBlade
- Informix Spatial DataBlade
- Informix TimeSeries DataBlade

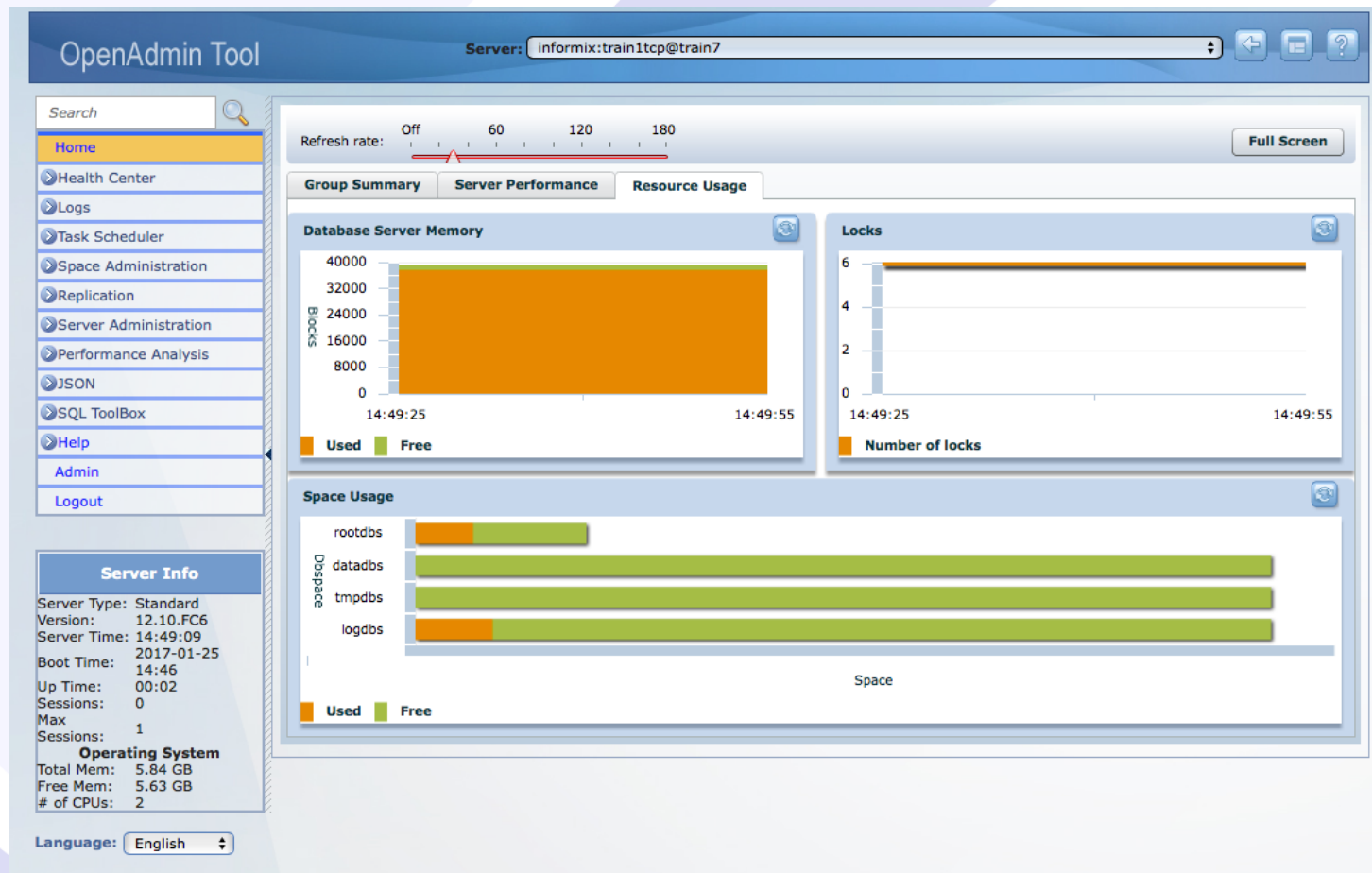
# Development Tools

- Informix ESQL/C
- Informix 4GL
- Informix SQL
- Informix Genero (4J' s)
- Java
- PHP
- Ruby on Rails
- Perl

# Informix Administration Tools

- Command Line Utilities
- Open Admin Tool  
<http://www.openadmintool.org/>
- Server Studio  
<http://serverstudio.com/>

# Open Admin Tool - OAT





# Informix Architecture

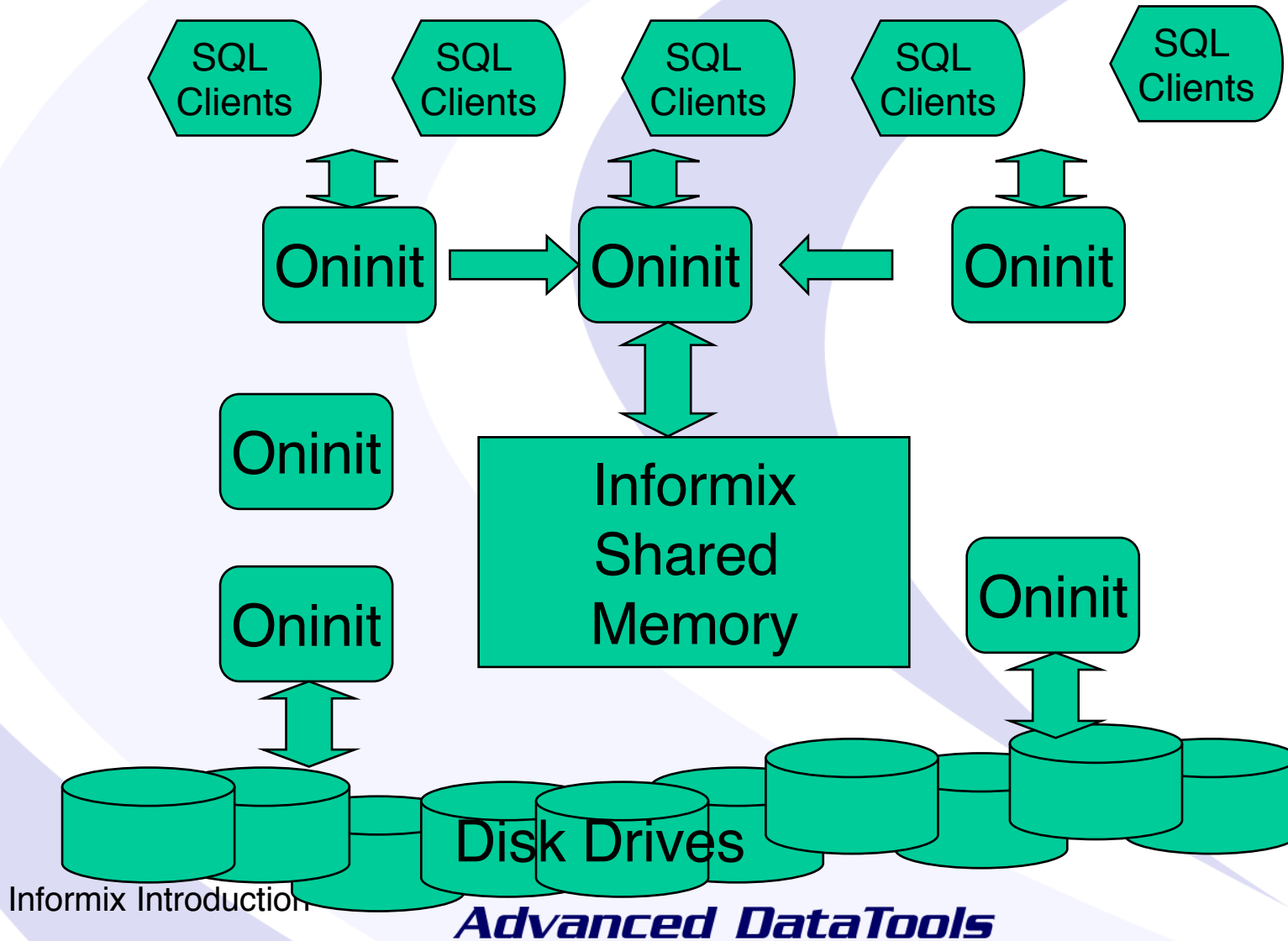
## Memory, CPU, Disk Requirements

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# Informix Architecture

- SQL Client process
- Server process – (oninit)
- Shared Memory
- Disk space – (dbspace)

# Informix Architecture



# 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
```



# 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
```

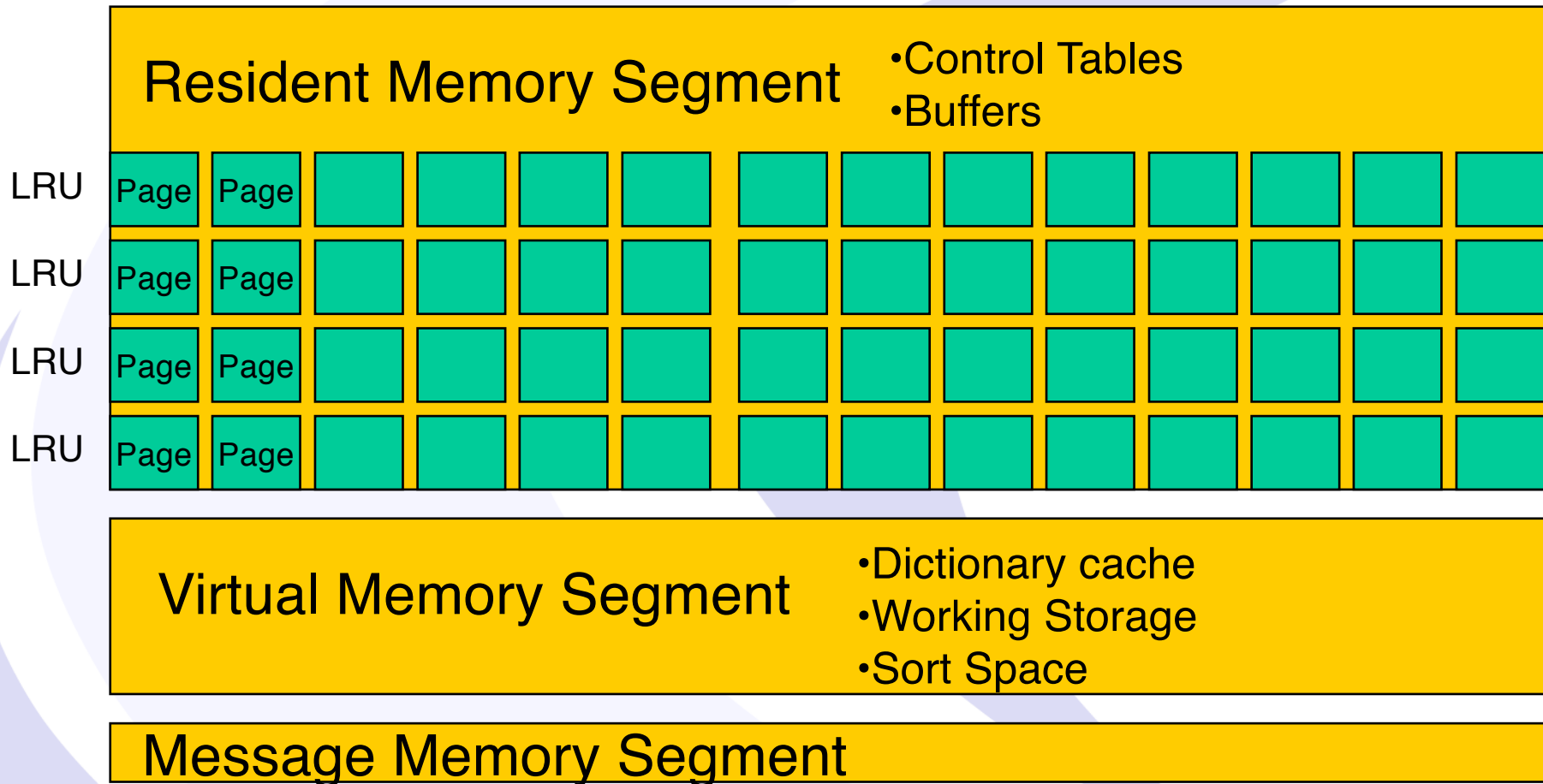
```
VP Scheduler Statistics:
```

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

# Oninit Process - Class

- 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

# Informix Shared Memory



# 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

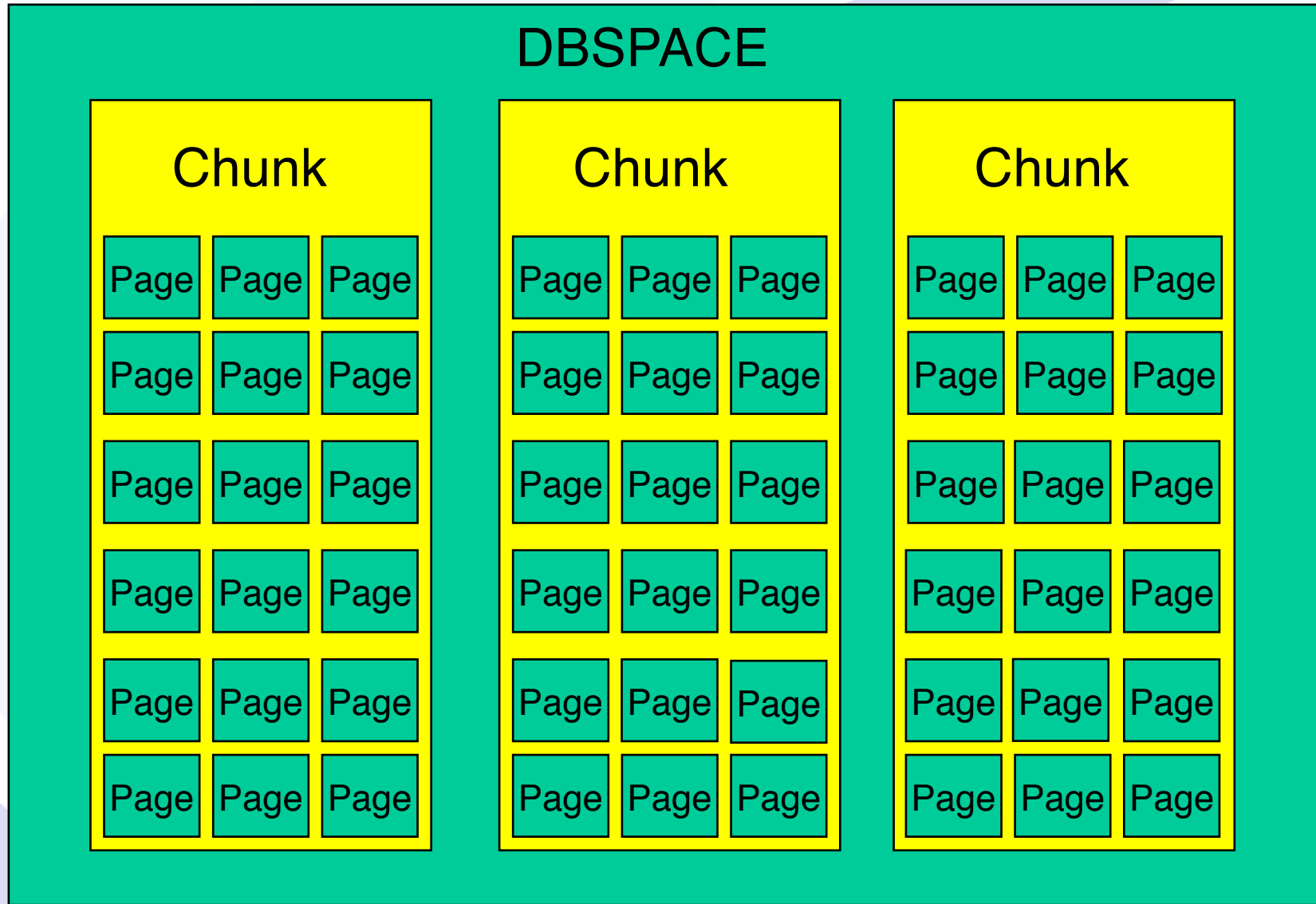
# Memory Classes

- 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 Disk Space

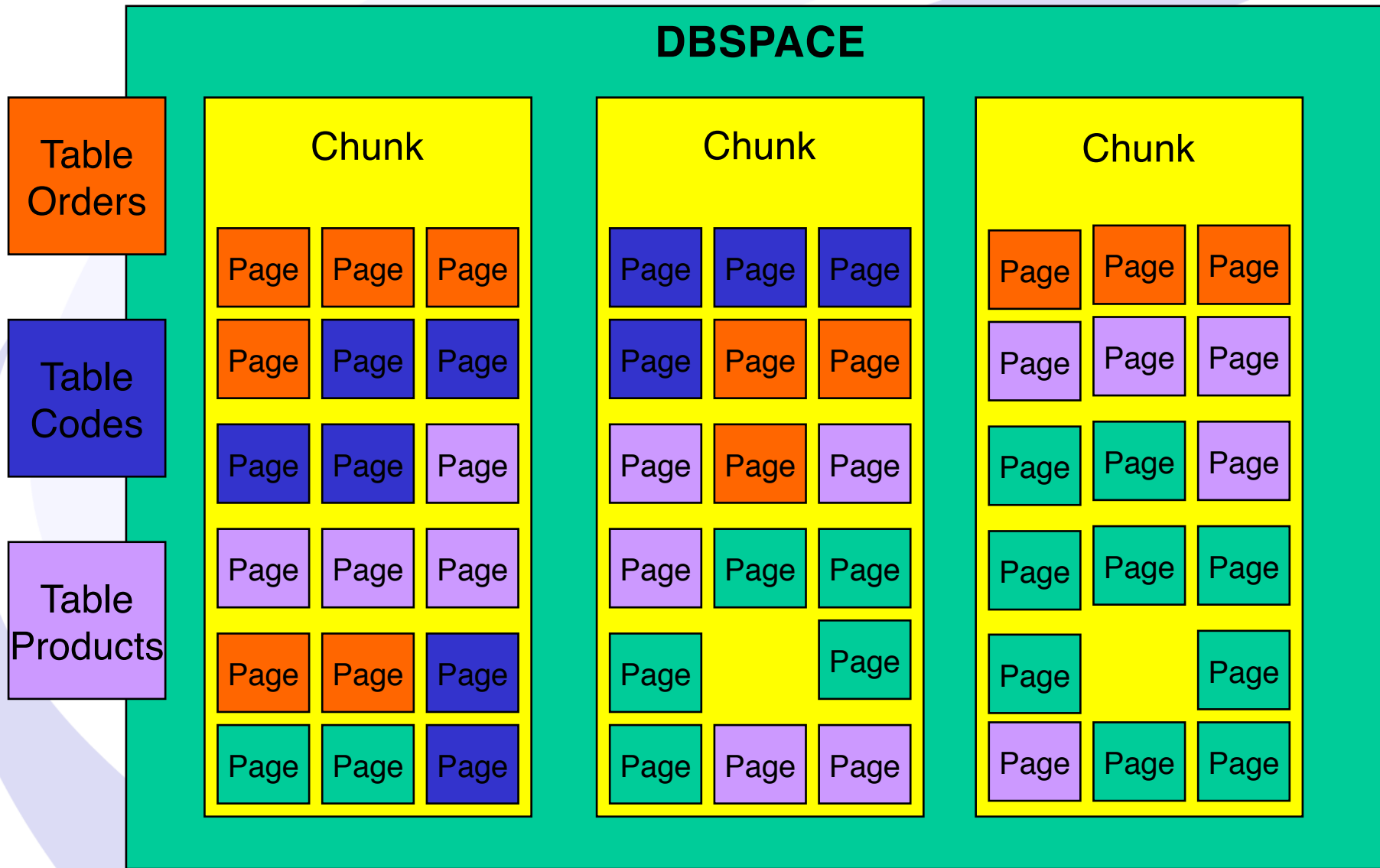
- Dbspace – Logical container of Chunks
- Chunk – Physical container
  - Raw Disk – Informix direct access to disk
  - Cooked Disk – Informix accesses disk through OS filesystem
- Page – I/O Block: 2K, 4K, 8K, 16K
- Tablespace – All pages assigned to a table
- Extent – Set of contiguous pages

# Disk Layout - Pages, Chunks, and Dbspaces



# Disk Layout - Tables and Extents

Too many extents will slow disk access





# Informix Dbspace

## onstat -d

```
informix@train7:~ train1 > onstat -d
```

```
IBM Informix Dynamic Server Version 12.10.FC6 -- On-Line -- Up 00:01:47 -- 156824 Kbytes
```

### Dbspaces

address	number	flags	fchunk	nchunks	pgsize	flags	owner	name
44be0028	1	0x20001	1	1	2048	N BA	informix	rootdbs
44d101c8	2	0x20001	2	1	2048	N BA	informix	logdbs
44d10408	3	0x20001	3	1	2048	N BA	informix	datadbs
44d10648	4	0x2001	4	1	2048	N TBA	informix	tmpdbs

```
4 active, 2047 maximum
```

### Chunks

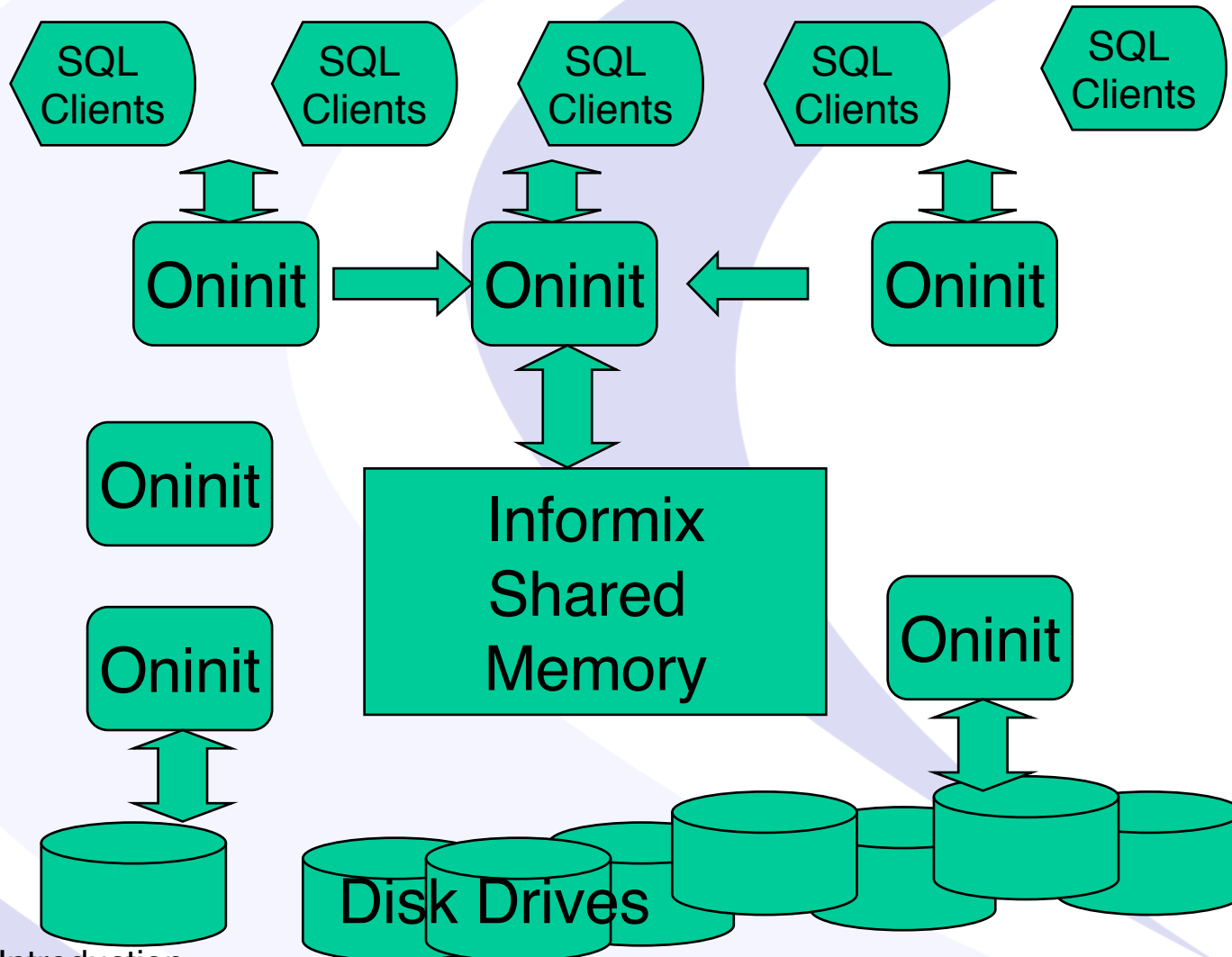
address	chunk/dbs	offset	size	free	bpages	flags	pathname
44be0268	1 1	0	200000	132338		PO-B--	/informixchunks/train1/rootdbs
45c0c028	2 2	0	1000000	909947		PO-B--	/informixchunks/train1/logdbs
45c0d028	3 3	0	1000000	999947		PO-B--	/informixchunks/train1/datadbs
45c33028	4 4	0	1000000	999947		PO-B--	/informixchunks/train1/tmpdbs

```
4 active, 32766 maximum
```

NOTE: The values in the "size" and "free" columns for DBspace chunks are displayed in terms of "pgsize" of the DBspace to which they belong.

```
Expanded chunk capacity mode: enabled
```

# Informix User Sessions



# Informix User Sessions

## onstat -u

```
informix@train7:~ train1 > onstat -u
```

```
IBM Informix Dynamic Server Version 12.10.FC6 -- On-Line -- Up 00:18:30 -- 156824 Kbytes
```

### Userthreads

address	flags	sessid	user	tty	wait	tout	locks	nreads	nwrites
44cca028	---P--D	1	informix	-	0	0	0	29	112
44cca8e8	---P--F	0	informix	-	0	0	0	0	2339
44ccb1a8	---P--F	0	informix	-	0	0	0	0	1
44ccb8e8	---P--F	0	informix	-	0	0	0	0	1
44ccc328	---P--F	0	informix	-	0	0	0	0	4
44cccbe8	---P--F	0	informix	-	0	0	0	0	0
44ccd4a8	---P--F	0	informix	-	0	0	0	0	0
44ccd68	---P--F	0	informix	-	0	0	0	0	0
44cce628	---P--F	0	informix	-	0	0	0	0	0
44ccee8	---P---	9	informix	-	0	0	0	0	0
44ccf7a8	---P--B	10	informix	-	0	0	0	1583	0
44cd0068	Y--P--D	11	informix	-	45c26f30	0	0	2106	0
44cd0928	---P--D	12	informix	-	0	0	0	0	0
44cd1aa8	---P--D	16	informix	-	0	0	0	0	0
44cd2c28	---P--D	17	informix	-	0	0	0	2	0
44cd34e8	---P--D	18	informix	-	0	0	0	0	0
44cd3da8	---P--D	19	informix	-	0	0	0	0	0
44cd4668	---P---	31	informix	-	0	0	1	347	1948
44cd4f28	---P---	30	informix	-	0	0	2	335	84
44cd57e8	---P---	29	informix	-	0	0	1	6	0
44cd60a8	---P---	32	informix	-	0	0	1	981	5942
44cd83a8	Y--P--D	77	informix	-	4410bd40	0	0	0	0

22 active, 128 total, 28 maximum concurrent



# Planning an Informix Install

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# Planning an Informix Install

## Prep Questions

- What directory will the Informix Software be installed in?
  - /opt/informix12
  - /local\_apps/informix12.10
- What are the name(s) of the Informix Serve?
  - Train1- for shared memory connections
  - Train1tcp – for network connections

# Planning an Informix Install

## Prep Questions

- How much memory is required and will be allocated to Informix?
  - BUFFERPOOL
  - SHMVIRTSIZE
  - SHMADD

# Planning an Informix Install

## Prep Questions

- How much disk space is required and will be allocated for Informix?
  - Rootdbs
  - Logical Logs
  - Physical Logs
  - Temp data space
  - Data space
  - Index space
  - Blob dbspace
  - Smart Blob dbspace

# Planning an Informix Install

## Prep Questions

- Will you use Raw or Cooked space?
- Where will the space be located?
- Best Practices
  - Use symbolic links
  - /informixchunks/servername/dbchunks
  - Use non journaled filesystems for cooked space
  - Use Ext2 filesystems for Linux



# Planning an Informix Install

## Prep Questions

- How many CPU's will be allocated for Informix?
  - Traditional Best Practices is number of physical CPU CORE-1
  - Current CPU CORE are fast enough to handle 2-3 oninits per CORE

# Planning an Informix Install

## Prep Questions

- What are the protocols users will connect to Informix with?
  - Shared Memory
  - TCP Sockets
  - DRDA
  - REST
- What tcp ports will be used for network connections?

# Planning an Informix Install

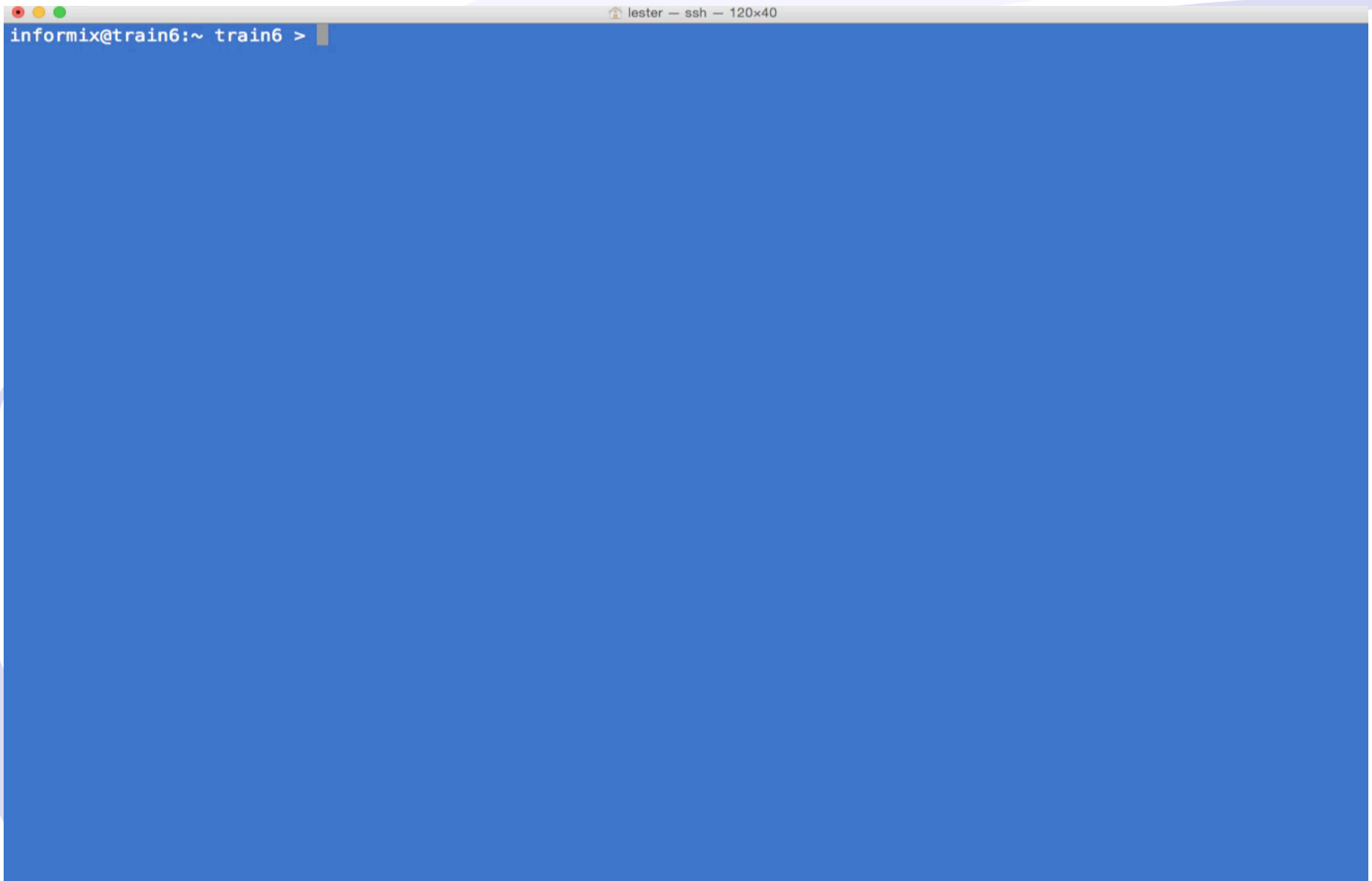
## Prep Questions

- Will the Open Admin Tool OAT be installed?
  - Admin login
  - Ports



# Installing Informix Demo

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# Software Directory Structure

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# Software Directory Structure

The following are some of the important directories found under \$INFORMIXDIR:

- **bin** - Informix binaries and executable files. This directory must be included in your path.
- **demo** - Demonstration files and source code. Use the demo programs to copy these files to your own directory.
- **etc** - Informix configuration files
- **incl** - Library files used by Informix software and compilers
- **msg** - Error messages and text message files
- **release** - Release notes and documentation. This contains the latest information and updates.



# Using Informix SQL

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# Connecting to Informix

Informix uses four environment variables:

- **INFORMIXDIR**
  - Points to the directory where Informix products are installed.
- **PATH**
  - \$INFORMIXDIR/bin must be added to the PATH for executables to be found.
- **INFORMIXSERVER**
  - Points to the name of the Informix Database Server the user will access.
- **ONCONFIG**
  - Points to the server configuration file. This is only required when OnLine is started and for DBA functions. This is not used by end users.

# Example Environment Variables

```
INFORMIXDIR=/opt/informix
export INFORMIXDIR
PATH=$INFORMIXDIR/bin:$PATH
export PATH
INFORMIXSERVER=train1
export INFORMIXSERVER
ONCONFIG=onconfig.train1
export ONCONFIG
```

# Informix SQL Tools

- Dbaccess (dbaccess)
  - Part of the database engine
  - Includes all new features of the engine release
  - Does NOT include ACE Reports and Perform Forms
- INFORMIX-SQL (isql)
  - Separate stand-alone product
  - Separate purchase
  - Does not include all new features of current engine release
  - Includes ACE Report Writer
  - Includes Perform Form Screens

# Dbaccess Main Commands

```
DBACCESS:  Query-language  Connection  Database  Table  Session  Exit  
Use SQL query language.
```

```
----- Press CTRL-W for Help -----
```

- Query-Language - Use SQL query language
- Connection - Connect or disconnect from a database environment
- Database - Select, create, info, drop, or close a database
- Table - Create, alter, or drop a database table
- Session - Retrieve information about the current DB-Access session
- Exit - Exit DBACCESS

# Dbaccess SQL

```
SQL:  New  Run  Modify  Use-editor  Output  Choose  Save  Info  Drop  Exit
Enter new SQL statements using SQL editor.
```

```
----- stores7@train1 ----- Press CTRL-W for Help -----
```

- New - Create new SQL statements using the Informix built-in editor
- Run - Execute SQL statement
- Modify - Changes SQL statement using the Informix built-in editor
- User editor - Create or modify SQL statements using selected editor
- Output - Output results of SQL statement to printer, file or pipe
- Choose - Select SQL statements saved in current directory
- Save - Save current SQL statement in a file in the current directory
- Info - Display information about tables in the database
- Drop - Delete SQL files in current directory

# Dbaccess SQL Built-in Editor

- ESC - Done editing, return to menu
- CTRL-A - Toggle between Typeover/Insert mode
- CTRL-R - Redraw screen
- CTRL-X - Delete current character
- CTRL-D - Delete rest of current line

# Dbaccess Command Line

- **dbaccess <database name>**
  - Starts dbaccess using selected database
  - dbaccess stores7
- **dbaccess -<first letter of menu option>**
  - Starts dbaccess in select menu options.
- **dbaccess <database name> -<first letter of menu>**
  - Starts dbaccess using selected database in the selected menu option
  - dbaccess stores7 -qi
  - This starts dbaccess using the stores7 database and goes into the Query, Info menu option.

# Dbaccess Command Line

- **dbaccess <database name> <sql script name>**
  - Executes SQL script using the selected database
- **dbaccess - -**
  - Starts dbaccess, SQL in interactive option with no menus. This is useful for writing shell scripts
- **dbaccess -v**
  - Displays version number and serial number
- **dbaccess -e <database> <script>**
  - Echo sql statements as they are executed
- **dbaccess -ansi**
  - Provides warnings when Informix extensions to ANSI SQL are used



# Displaying Error Messages - finderr

**Usage: finderr msgnum [msgnum2 ...]**

- finderr searches the file of error message explanations distributed with Informix products and copies the text of one or more error messages to the standard output.
- If an unsigned number is given, a negative sign is assumed.
- Examples:
  - finderr 327 (looks for message number -327)
  - finderr -327 (looks for message number -327)
  - finderr +1234 (looks for message number 1234)
  - finderr -233 107 113 134 143 144 +1541 | more

# Informix Command Line Utilities

- ONSTAT - shows shared memory and server statistics
- ONCHECK - checks and repairs disk space
- ONMODE - changes Server's operating mode
- ONLOG - logical log debugging tool
- ONINIT - initialize and start up the database server
- ONSPACES - configure dbspaces and chunks
- ONPARAMS - configure logs
- ONTAPE - backup and restore utility
- ONLOAD - loads databases and tables
- ONUNLOAD - unloads databases and tables



# Informix Documentation

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# Documentation

- All documentation is available online at:

<http://www.ibm.com/software/data/informix/pubs/library/>

<http://www.ibm.com/support/knowledgecenter/SSGU8G/welcomelfxServers.html>

- IBM Informix Dynamic Server v12.10  
Information Center

[http://www.ibm.com/support/knowledgecenter/SSGU8G\\_12.1.0/com.ibm.welcome.doc/welcome.htm](http://www.ibm.com/support/knowledgecenter/SSGU8G_12.1.0/com.ibm.welcome.doc/welcome.htm)

# Key Administrator Manuals

- Getting Started with Informix Dynamic Server
  - This manual provides an overview of the Informix database server and SQL API environment, summarizes important features of Informix Dynamic Server, and provides a road map to help you use the documentation set.
- Administrator's Guide for Informix Dynamic Server
  - This manual is both a user guide and a reference manual to the features of Informix Dynamic Server. It is intended to help you understand, configure, and use your database server.
- Informix Administrator's Reference
  - This manual provides reference material for Informix Dynamic Server. It provides the syntax of database server utilities such as onmode and onstat, and comprehensive descriptions of configuration parameters, the sysmasters tables, and logical-log records.
- Informix Backup and Restore Guide
  - This manual explains the concepts and methods that you need to understand when you use the ON-Bar utility to back up and restore data.
- Performance Guide for Informix Dynamic Server
  - This guide provides information on how to configure and operate Dynamic Server to achieve optimum performance.

# Key SQL Manuals

- Informix Guide to Database Design and Implementation
  - This manual provides information to help you design, implement, and manage your Informix databases. It includes data models that illustrate different approaches to database design and shows you how to use Structured Query Language (SQL) to implement and manage your databases.
- Informix Guide to SQL: Reference
  - This guide provides information on the following topics: Informix databases, data types, system catalog tables, environment variables, and the stores\_demo demonstration database. It also contains a glossary.
- Informix Guide to SQL: Syntax
  - This guide provides detailed descriptions of the syntax for all Informix SQL and SPL statements.
- Informix Guide to SQL: Tutorial
  - This guide provides a tutorial on SQL, as implemented by Informix products. It describes the basic ideas and terms that are used when you work with a relational database.



# Informix Resources on the Web

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# Informix Resources from IBM

- Informix Documentation

[http://www.ibm.com/support/knowledgecenter/SSGU8G\\_12.1.0/com.ibm.welcome.doc/welcome.htm](http://www.ibm.com/support/knowledgecenter/SSGU8G_12.1.0/com.ibm.welcome.doc/welcome.htm)

- Compare the Informix Version 12 editions by Carlton Doe, IBM

<http://www.ibm.com/developerworks/data/library/techarticle/dm-0801doe/>

- The Informix and IoT Roadshows by Carlton Doe, IBM

<https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/North%20America%20Informix%20Events>



# Informix Resources - IIUG

- The International Informix User Group
  - <http://www.iiug.org>
  - Membership is FREE
- IIUG 2017 – The Premier Informix Event  
April 23 – 27, 2017
  - <http://iiug2017.org>

# Informix Resources

- **Advanced DataTools Tech Info**
  - <http://advanceddatatools.com/TechInfo/index.html>
- **Advanced DataTools Webcast**
  - <http://advanceddatatools.com/Informix/Webcasts.html>

# Next Webcast

## Informix Best Practices

- Informix Configuration, ONCONFIG, CPUs, and Memory
  - Thursday, February 23, 2017 at 2:00pm EST
- Disks and Database Space Layout
  - Thursday, March 30, 2017 at 2:00pm EST
- Backup, Recovery, and High Availability Disaster Recovery
  - Thursday, April 20, 2017 at 2:00pm EST

Please register for each webcast here at:

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

# Informix Training in 2017

- April 10-13, 2017
  - **Informix for Database Administrators**
- July 10-13, 2017
  - **Advanced Informix Performance Tuning**
- September 18-21, 2017
  - **Informix for Database Administrators**
- All courses can be taken online on the web from your desk or at our training center in Virginia.
- We guarantee to *NEVER* cancel a course and will teach a course as long as one student is registered!

# Best Practices Summary

- Install each version of Informix in a separate directory. Use links to change current production version  
**\$INFORMIXDIR**

```
root@train6:/opt train6 > ls -l
total 4
drwxrwxr-x 1 informix informix 448 Oct 14 2015 ifxsdk
lrwxrwxrwx 1 root      root      22 Jan 26 08:55 informix -> /opt/informix12.10.FC6
drwxr-xr-x 1 informix informix 384 May 18 2015 informix12.10.FC4
drwxr-xr-x 1 informix informix 384 Oct 12 2015 informix12.10.FC5
drwxr-xr-x 1 informix informix 390 Oct 31 14:03 informix12.10.FC6
drwxr-xr-x 1 informix informix 844 Jan 25 16:51 informix12.10.FC8
```

# Best Practices Summary

- Use the INFORMIXSERVER name as part of the:
  - ONCONFIG=onconfig.\$INFORMIXSERVER
  - Location of chunks
  - Location of Backups and Logs
- Use Symbolic links to devices so you can move and change them by changing the link

# Best Practices Summary

- Use non journeled filesystems for cooked space
- Use Ext2 filesystems for Linux
- Create an informixXX.XX.XX.env file for each version and then use informix.env for the main production one file
- Download the Informix documentation so you have it available when offline
- Future Webcasts - more Best Practices on Configuration, ONCONFIG, CPUs, Memory, Disk and Dbspace Layout, Backup, Recovery and High Availability

# Questions?



Send follow-up questions to  
[lester@advanceddatatools.com](mailto:lester@advanceddatatools.com)

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## ***Informix Support and Training from the Informix Champions!***

Advanced DataTools is an Advanced Level IBM Informix Data Management Partner, and has been an authorized Informix partner since 1993. We have a long-term relationship with IBM, we have priority access to high-level support staff, technical information, and Beta programs. Our team has been working with Informix since its inception, and includes 8 Senior Informix Database Consultants, 4 IBM Champions, 2 IIUG Director's Award winners, and an IBM Gold Consultant. We have Informix specialists Lester Knutsen and Art Kagel available to support your Informix performance tuning and monitoring requirements!

- ***Informix Remote DBA Support Monitoring***
- ***Informix Performance Tuning***
- ***Informix Training***
- ***Informix Consulting***
- ***Informix Development***

**Free Informix Performance Tuning Webcast replays at:**  
<http://advancedatools.com/Informix/Webcasts.html>

Call: (800) 807-6732 x101 or Email: [info@advancedatools.com](mailto:info@advancedatools.com)  
Web: <http://www.advancedatools.com>

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# Thank You

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