IBM User Group Days

Migrating and Upgrading to Informix 14 or the Cloud

The easy way and the hard way

by Lester Knutsen

IBM Informix Champion

Thursday, **May 19,** ***2020***

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 Information 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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Migrating and Upgrading to Informix 14 or the Cloud

The easy way and the hard way

by Lester Knutsen

There are several easy procedures to upgrade and migrate Informix. We will look at the easy way (in-place upgrades, dbexport, cdr migrate, backup/restore), but sometimes they may not work for you, and you need to create a custom process. We will go over a set of procedures and scripts using HPL, external tables, and parallel unloads/loads that I have used over the last few years to migrate from small systems up through terabyte-sized databases to VMs, new hardware, and the cloud.

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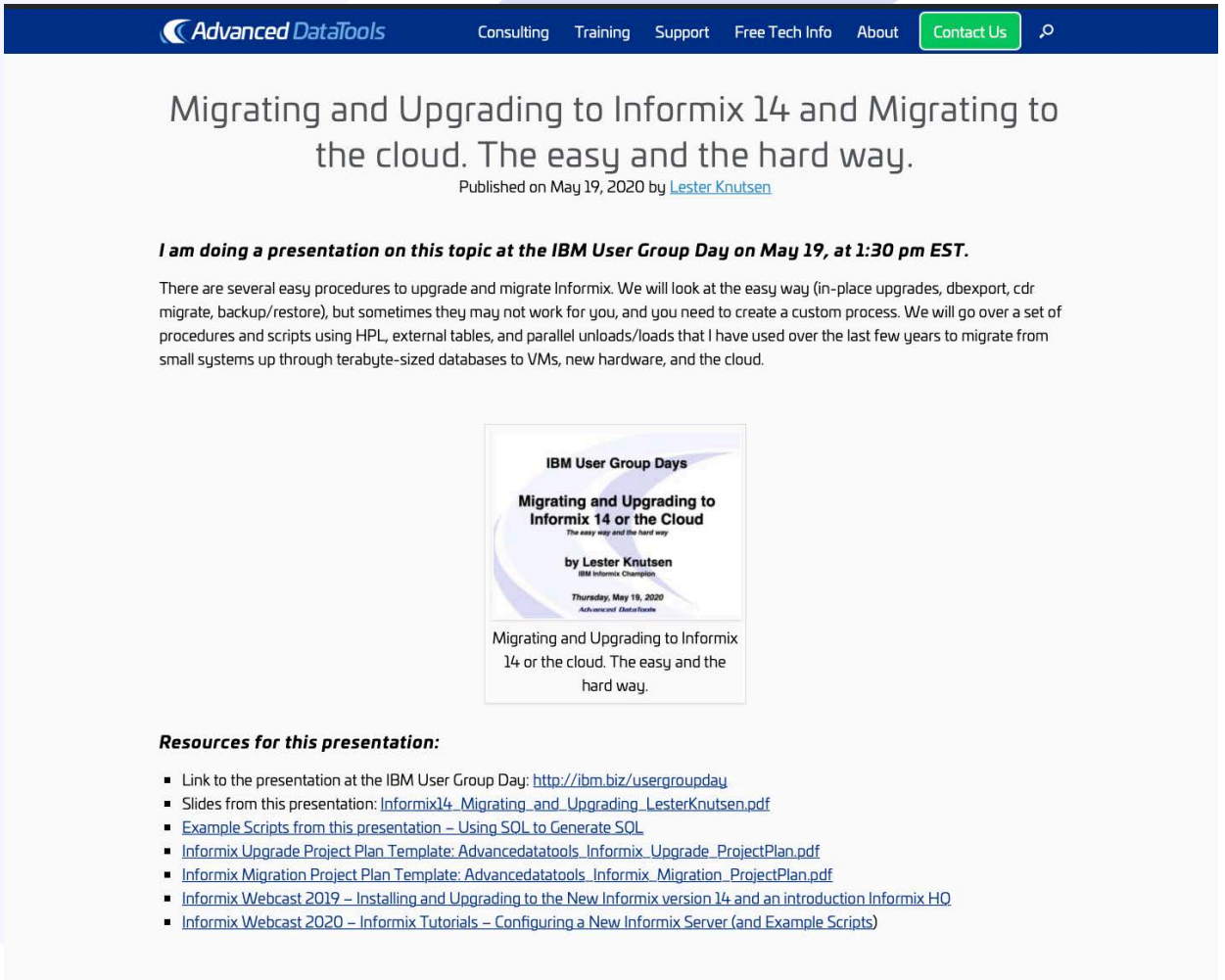
Agenda

- Upgrading to Informix 14
  - Informix Upgrade Project Plan
  - Setting up InformixHQ
- Migrating to the Cloud or Virtual Machine
  - The Easy Way
  - ***The Hard Way***
  - ***Seven Example Scripts***

Resources on Our Website

- https://advancedatatools.com/presentation/migrating-and-upgrading-to-informix-14/



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Migrating and Upgrading to Informix 14 and Migrating to the cloud. The easy and the hard way.

Published on May 19, 2020 by Lester Knutsen

I am doing a presentation on this topic at the IBM User Group Day on May 19, at 1:30 pm EST.

There are several easy procedures to upgrade and migrate Informix. We will look at the easy way (in-place upgrades, dbexport, cdr migrate, backup/restore), but sometimes they may not work for you, and you need to create a custom process. We will go over a set of procedures and scripts using HPL, external tables, and parallel unloads/loads that I have used over the last few years to migrate from small systems up through terabyte-sized databases to VMs, new hardware, and the cloud.

Migrating and Upgrading to Informix 14 or the cloud. The easy and the hard way.

Resources for this presentation:

- Link to the presentation at the IBM User Group Day: http://ibm.biz/usergroupday
- Slides from this presentation: Informix14_Migrating_and_Upgrading_LesterKnutsen.pdf
- Example Scripts from this presentation – Using SQL to Generate SQL
- Informix Upgrade Project Plan Template: Advancedatatools_Informix_Upgrade_ProjectPlan.pdf
- Informix Migration Project Plan Template: Advancedatatools_Informix_Migration_ProjectPlan.pdf
- Informix Webcast 2019 – Installing and Upgrading to the New Informix version 14 and an introduction Informix HQ
- Informix Webcast 2020 – Informix Tutorials – Configuring a New Informix Server (and Example Scripts)

Informix 14 Feature Summary

(from IBM Informix 14 Announcement)

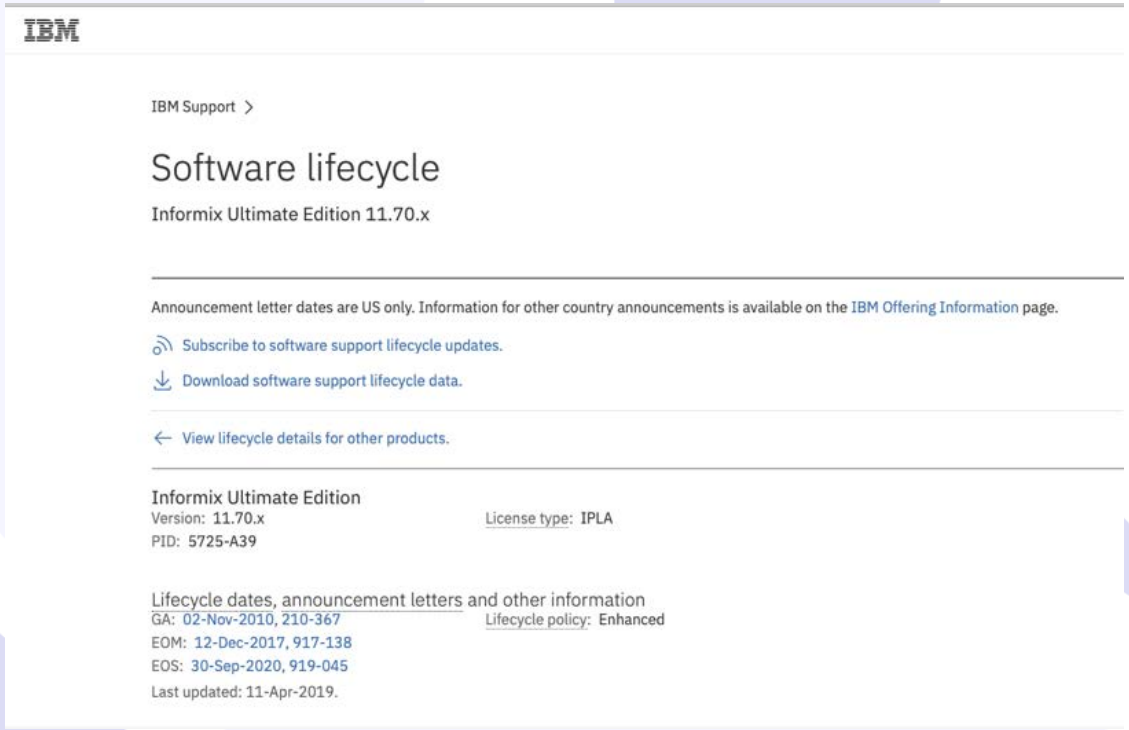
- Informix 14.10 is Faster
- More Secure
- Enhancements for Usability, Administration, and Increased Uptime
- InformixHQ
- Cloud and Containerization
- Extensibility and IoT

Upgrading to Informix 14

- Informix Upgrade Project Plan
- Setting up InformixHQ

Why Upgrade

- IBM End of Support for Informix 11.70 on 9/30/2020



Installing and Updrading Informix 14.10

- Informix Webcast 2019 – Installing and Upgrading to the New Informix version 14 and an introduction to Informix HQ by Lester Knutsen on April 30, 2019

https://advancedatatools.com/webcasts/informix-webcast-2019-installing-and-upgrading-to-the-new-informix-version-14-and-an-introduction-informix-hq/

New Installer

- One binary - multiple edition installers
  - Advanced Enterprise Edition (aee)
  - Advanced Developer Edition (ade)
  - Advanced Enterprise Time Limited Edition (aetl)
  - Enterprise Edition (ee)
  - Time Limited Edition (tl)
  - Workgroup Edition (we)
  - Express Edition (e)
  - Innovator-C Edition (ie)
  - Developer Edition (de)

Informix Edition Installer

- Run the Informix edition installer to switch the 14.10 Informix installation from one edition to another
- Requires Java 1.8.0 to install
- java -jar ee_edition.jar -i <consolelgui>
- The ids_install or iwa_install installer will invoke the edition installer for you in the same directory as ids_install

Install Changes

- New InformixHQ software included
  - $INFORMIXDIR/hq
- No JBDC directory
- ClientSDK not included
- ESQL not included
- Connection Manager not included
- Must download and install the Informix SDK separately

Upgrade Project Plan Preparation

1. Create a new directory for the Informix 14 software
2. Install the Informix Software
3. Create new ONCONFIG and sqlhosts files
4. Re-compile any UDRs
5. Check and fix “in-place alters”

In-Place Alters

- Informix uses in-place alters to speed up database schema changes whenever possible
- New rows adopt the new schema definition, old rows do not change, therefore conversion is faster
- Recommend resolving in-place alters before an upgrade

In-Place Alter Example
Alter char(15) to char(30)

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

----------------------- benchmark1@train1 ------ Press CTRL-W for Help --------


-- Alter zip table to create an inplace alter

info columns for zip;

alter table zip modify city     char(30);

info columns for zip;
```

In-Place Alter Example 711 pages at oldest version of table

```
TBLspace Usage Report for benchmark1:informix.zip

   Type                Pages      Empty  Semi-Full       Full  Very-Full
   --------------- ---------- ---------- ---------- ---------- ----------
   Free                    84
   Bit-Map                  1
   Index                    0
   Data (Home)            711
                  ----------
   Total Pages            796

   Unused Space Summary

       Unused data slots                          51

   Home Data Page Version Summary

                Version                          Count

                      0 (oldest)                   711
                      1 (current)                    0
```

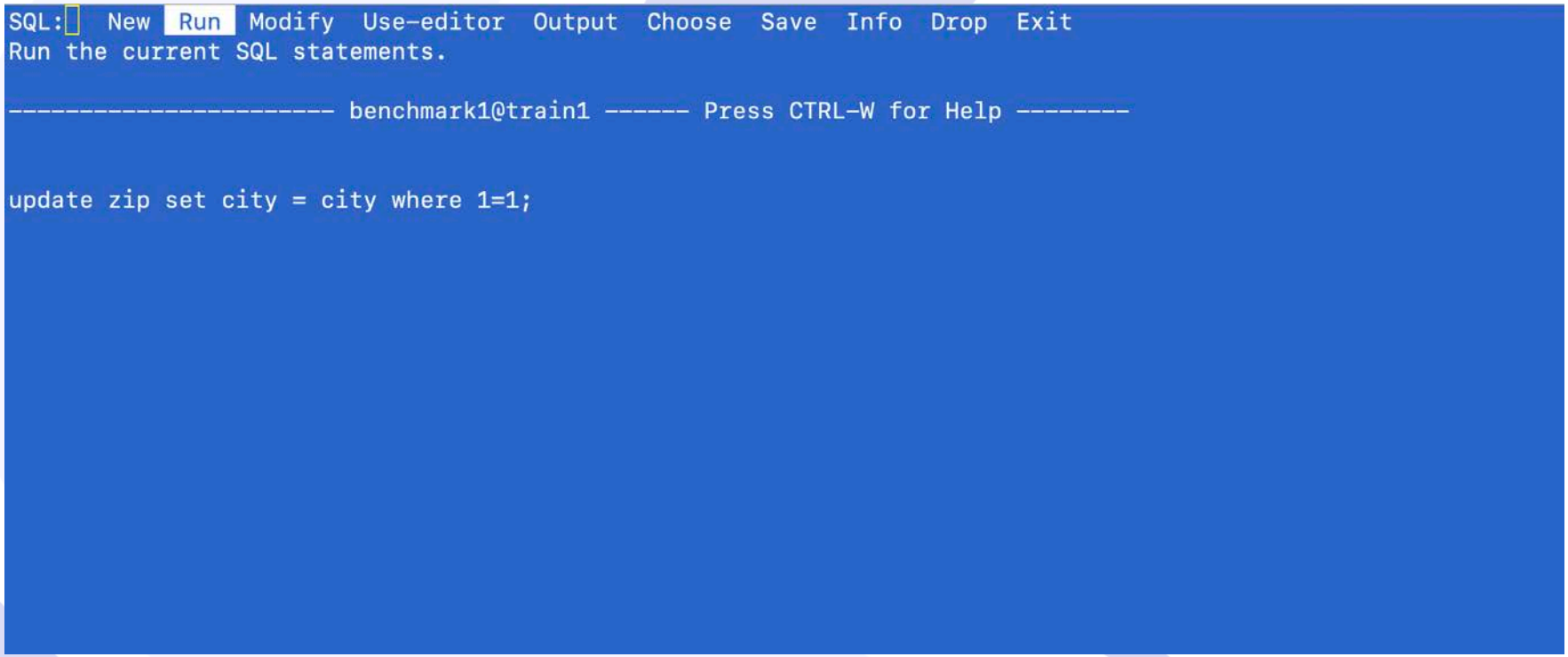
In-Place Alter Example
Insert 1 row

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

----------------------- benchmark1@train1 ------ Press CTRL-W for Help --------

insert into zip ( zip, city, state, price )
values  ( 99999, "NEW CITY WITH LONG NAME", "NS", 0 );

select * from zip where zip = 99999;
```

In-Place Alter Example
711 pages old version
1 page new version

```
TBLspace Usage Report for benchmark1:informix.zip

   Type                Pages      Empty  Semi-Full       Full  Very-Full
   ---------------- ---------- ---------- ---------- ---------- ----------
   Free                    83
   Bit-Map                  1
   Index                    0
   Data (Home)            712
                     ----------
   Total Pages            796

   Unused Space Summary

       Unused data slots                          91

   Home Data Page Version Summary

                Version                          Count

                      0 (oldest)                   711
                      1 (current)                    1
```

In-Place Alter Example
Fix with dummy update



In-Place Alter Example
All rows at current version

```
TBLspace Usage Report for benchmark1:informix.zip

    Type                 Pages      Empty  Semi-Full       Full  Very-Full
    --------------- ---------- ---------- ---------- ---------- ----------
    Free                   225
    Bit-Map                  1
    Index                    0
    Data (Home)           1058
                     ----------
    Total Pages           1284

    Unused Space Summary

        Unused data slots                          1479

    Home Data Page Version Summary

                Version                              Count

                      0 (oldest)                         0
                      1 (current)                     1058
```

Verify Data Pages

6. Verify integrity of Data Pages
   - Check Reserved Pages
     - oncheck –pr or oncheck -cc
   - Check Extents
     - oncheck –ce
   - Check System Catalog Tables
     - oncheck –cc <database name>
   - Check Data and Indexes
     - oncheck –cDI <Database name>
   - Check Smart Large Objects
     - oncheck –cs <Sbspace name>
     - oncheck –cS <Sbspace name>

Rollback Contingency Plan

7. Perform Level 0 Backup
8. Validate the Backup
9. Create a Rollback Contingency Plan

Perform Upgrade

1. Ensure No User Access and Stop All Daily Processing
2. Bring Server to Single User Mode
3. Completely Shutdown the Informix Server
4. Create Symbolic Link to New Software
5. Check the ONCONFIG and sqlhosts File

Perform Upgrade

6. Start the Informix Server (new version) and allow it to perform the internal upgrade
7. Finish the upgrade and monitor progress – bring the Server online to multi-user mode
8. Test the installation

Perform Upgrade

9. Update Statistics Low on All Databases
10. Update Statistics for Procedures and Functions
11. Update Statistics High on All Databases
12. Enable User Access

Post Upgrade Processing

1. Test the Upgrade
2. Update Statistics High on All Databases (if this was not done earlier)
3. Enable Daily Processing and Ensure Users Can Connect
4. Perform Level 0 Backup

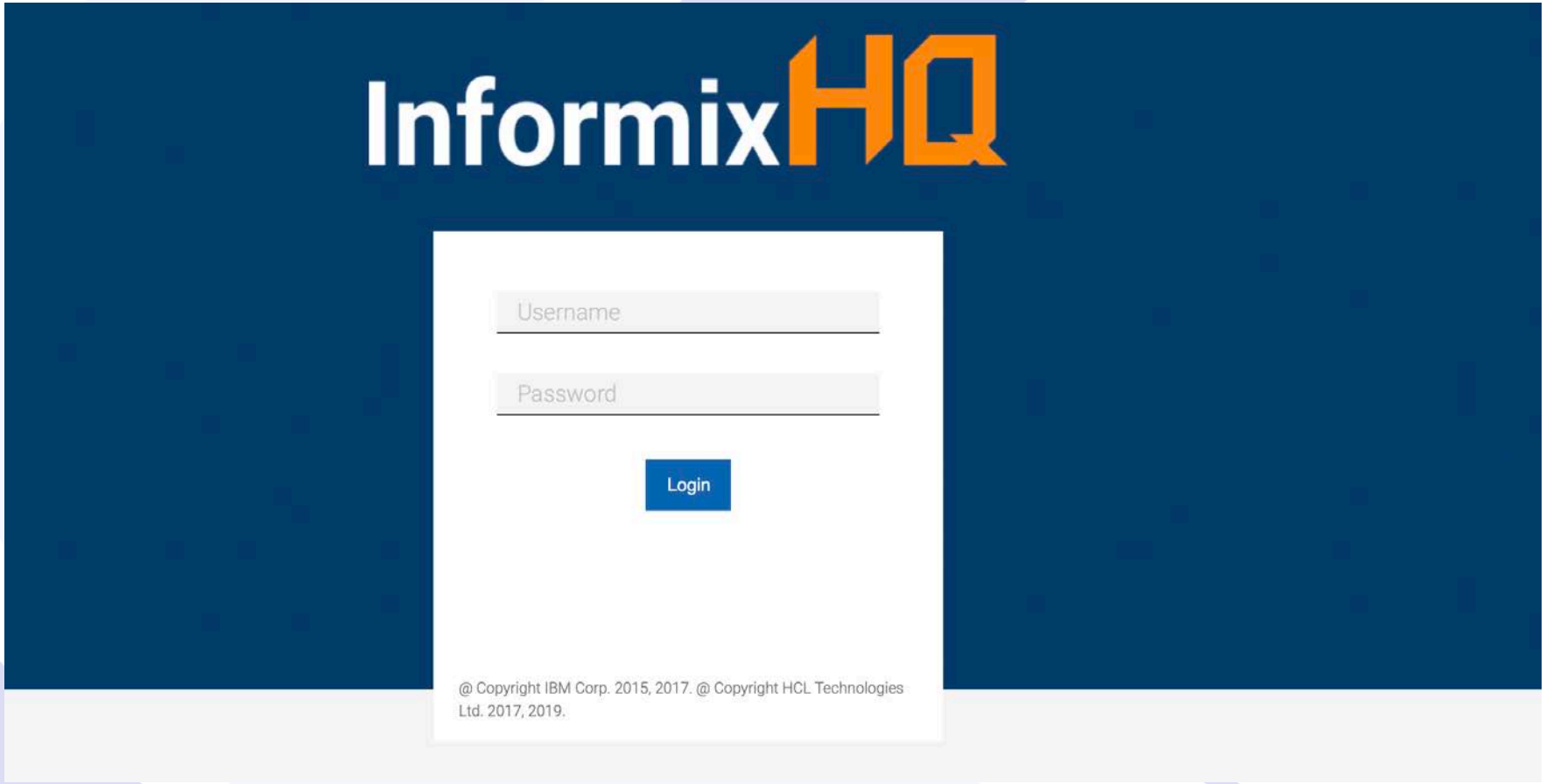
Post Upgrade Processing

5. Verify Integrity of Data Pages
   - Check Reserved Pages
     - oncheck –pr or oncheck -cc
   - Check Extents
     - oncheck –ce
   - Check System Catalog Tables
     - oncheck –cc <database name>
   - Check Data and Indexes
     - oncheck –cDI <Database name>
   - Check Smart large objects
     - oncheck –cs <Sbspace name>
     - oncheck –cS <Sbspace name>

Simple In-Place Upgrade Demo

- Install Informix 14.X
- Shutdown Informix 12.X
  - onmode -yuk
- Change $INFORMIXDIR
  - rm /opt/Informix
  - ln -s /opt/informix14.10.FC3/ /opt/informix
- Copy ONCONFIG and SQLHOSTS
  - cd /opt/informix/etc/
  - cp /opt/informix12.10.FC13/etc/sqlhosts
  - cp /opt/informix12.10.FC13/etc/$ONCONFIG .
- Startup Informix 14.X
  - oninit -vw
- Monitor Conversion
  - tail -F /opt/informix/train1_online.log

InformixHQ


InformixHQ
Username
Password
Login
@ Copyright IBM Corp. 2015, 2017. @ Copyright HCL Technologies Ltd. 2017, 2019.

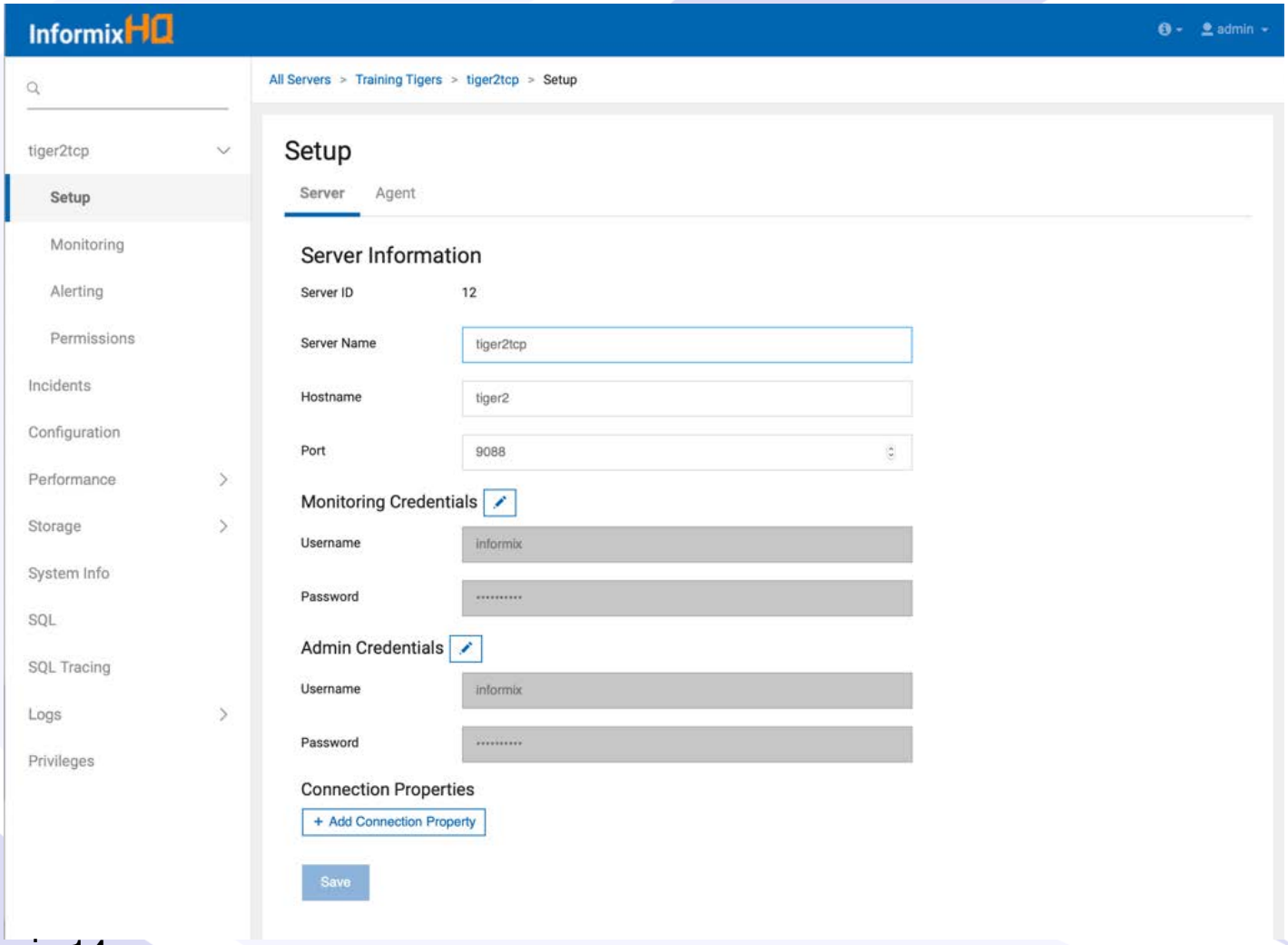
InformixHQ

- Modern web console for visualizing, monitoring, and managing your Informix server instances
- InformixHQ Guide:
  - https://www.ibm.com/support/knowledgecenter/en/SSGU8G_14.1.0/com.ibm.ifxhq.doc/informixhq.htm

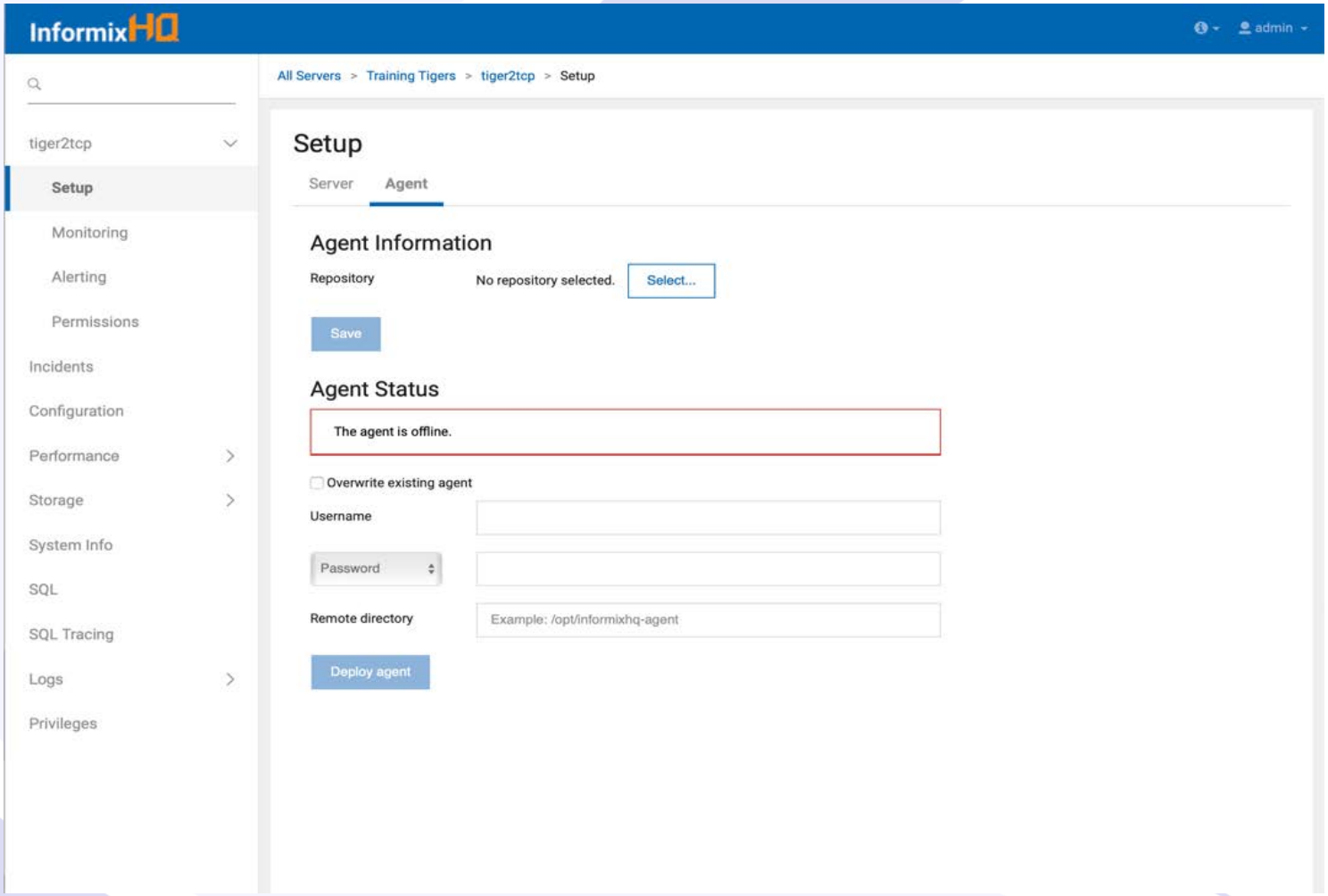
Setting up InformixHQ Server

- Set up InformixHQ Server Properties File
  - Example:
    - informixhq-server-example.properties
- Start the Server
  - Example:
    - java -jar informixhq-server.jar informixhq-server.properties

Adding an Informix Server to HQ



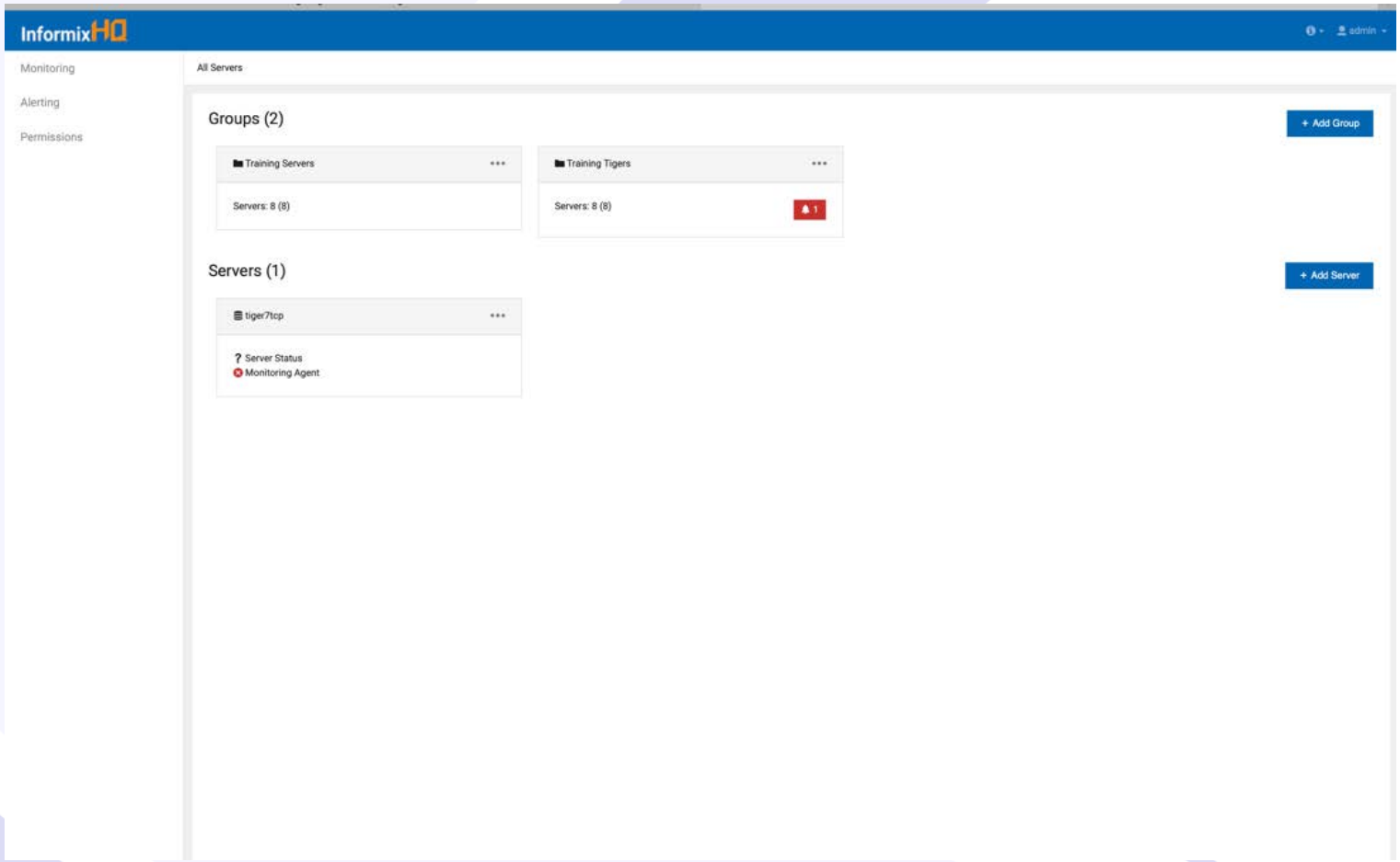
InformixHQ – Deploy Agent



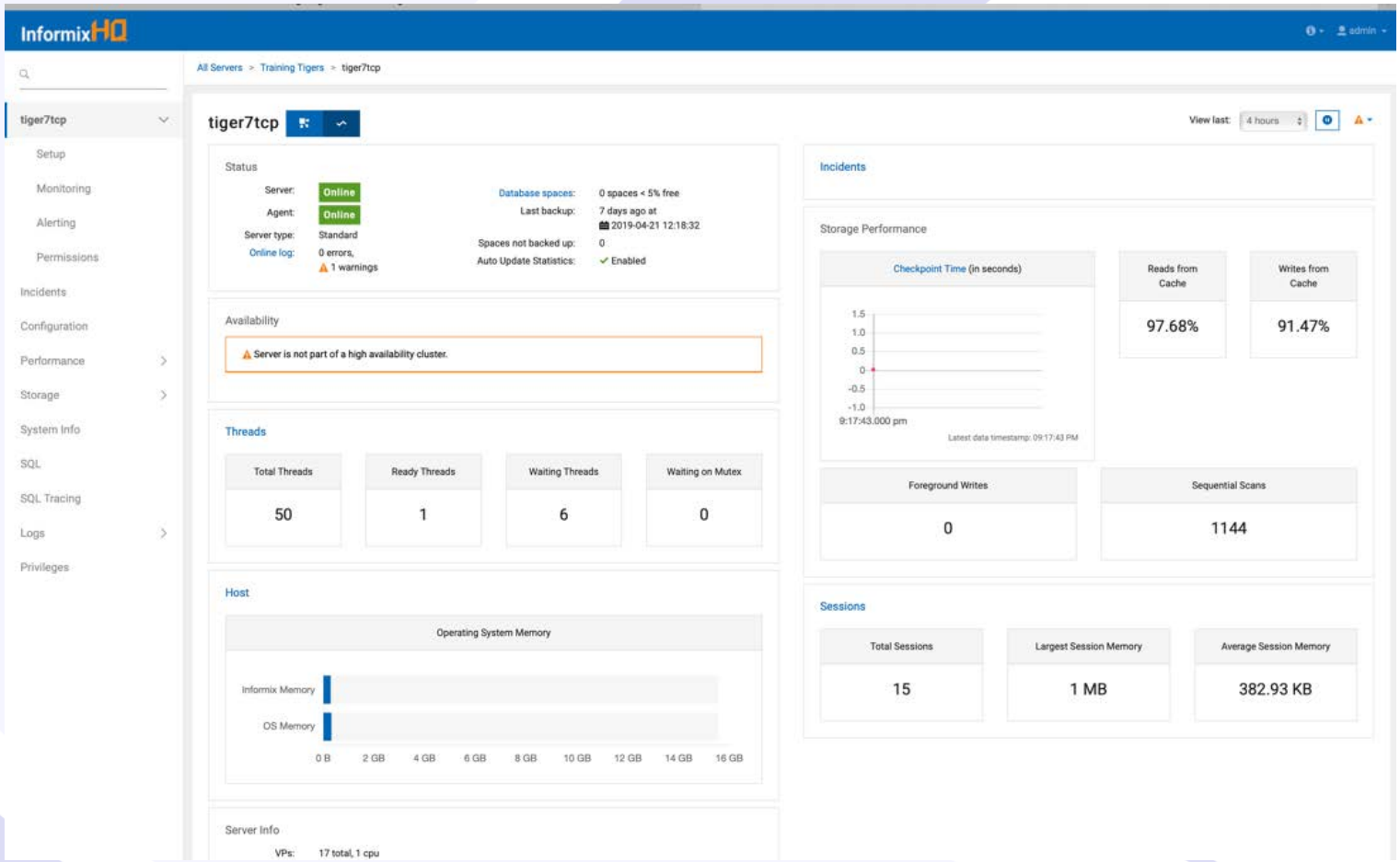
Setting up InformixHQ Client

- Set up InformixHQ Agent Properties
  - Example:
    - informixhq-agent-example.properties
- Start the Agent
  - Example:
    - java -jar informixhq-agent.jar agent.properties

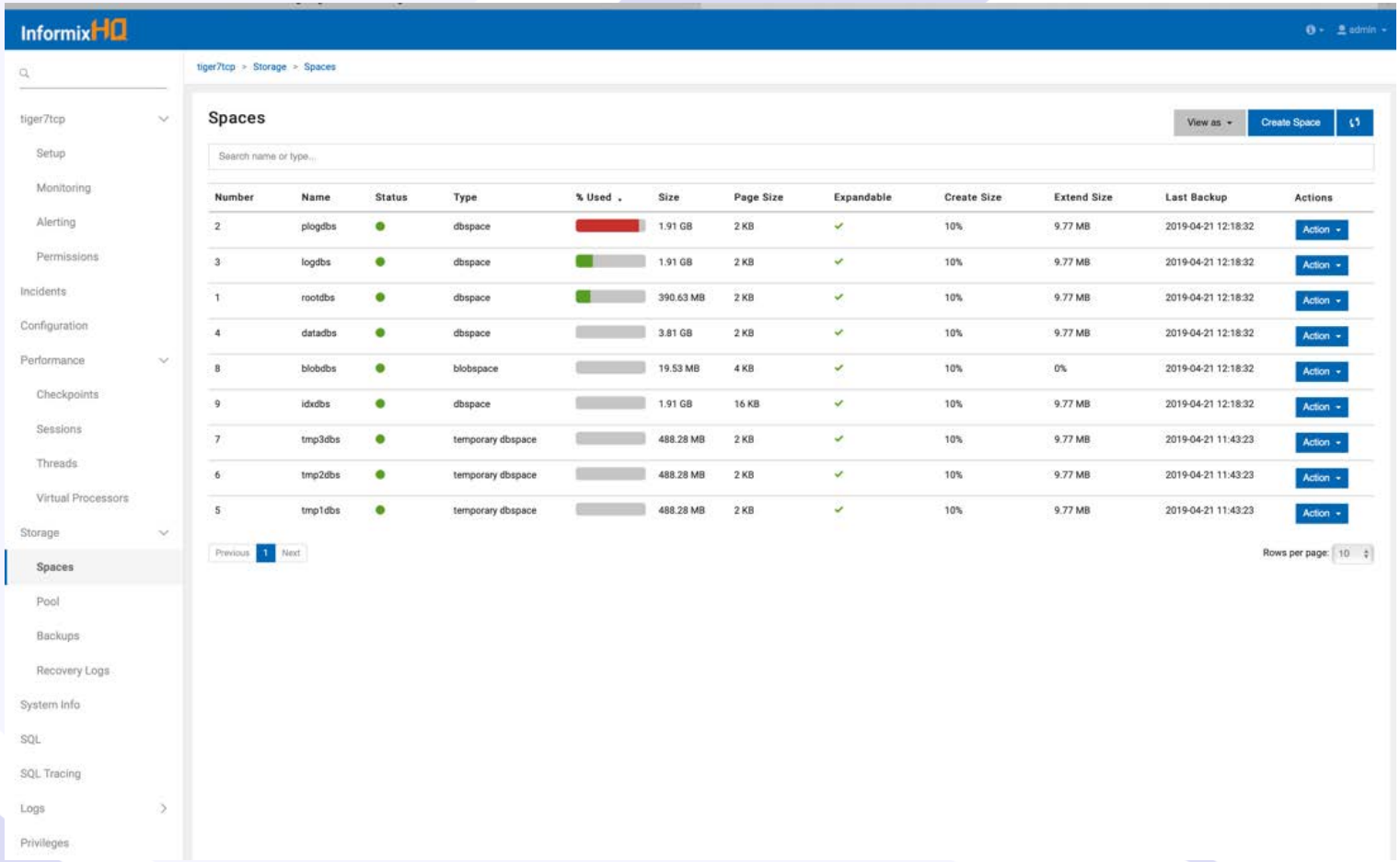
InformixHQ - Servers



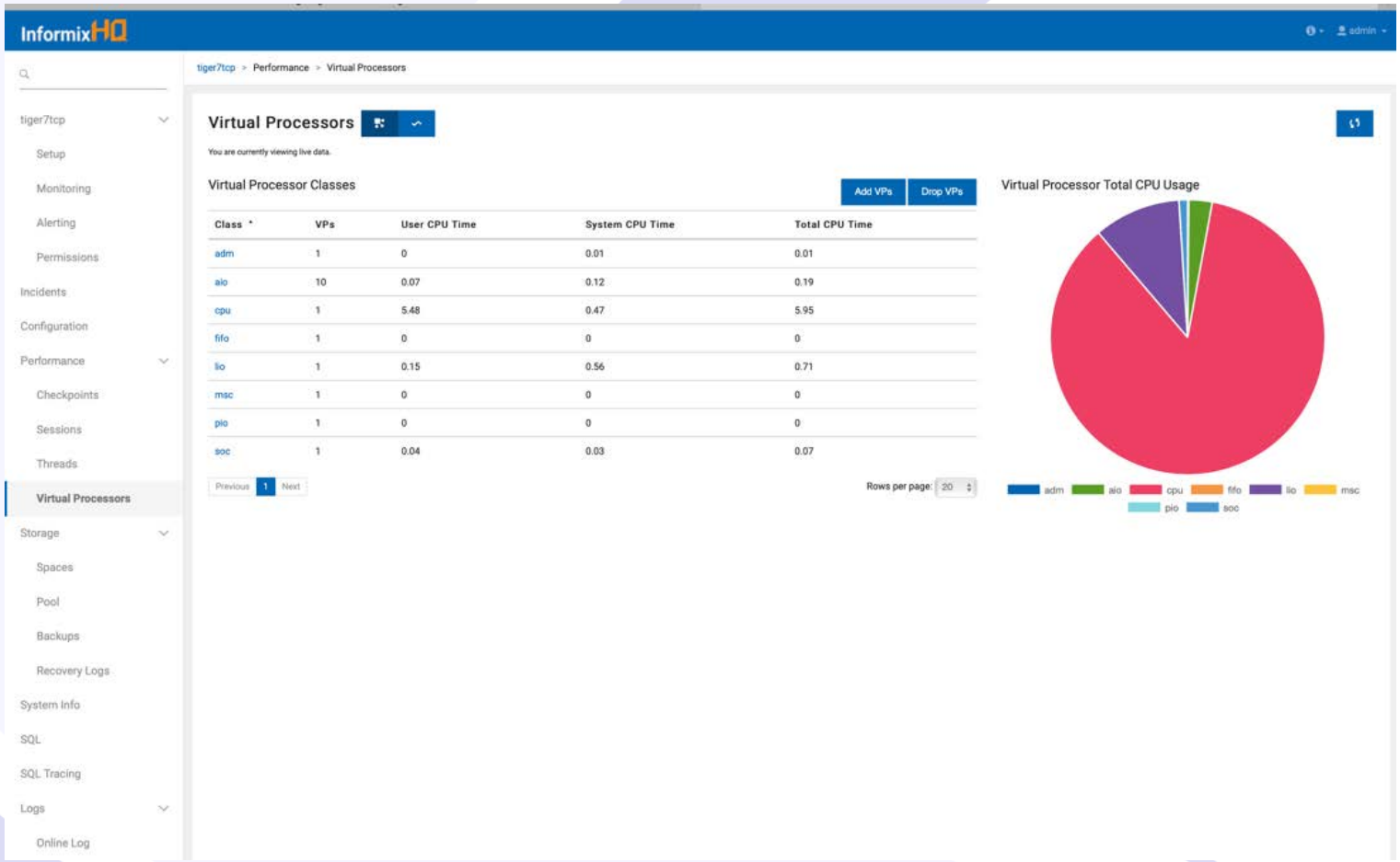
InformixHQ - Server



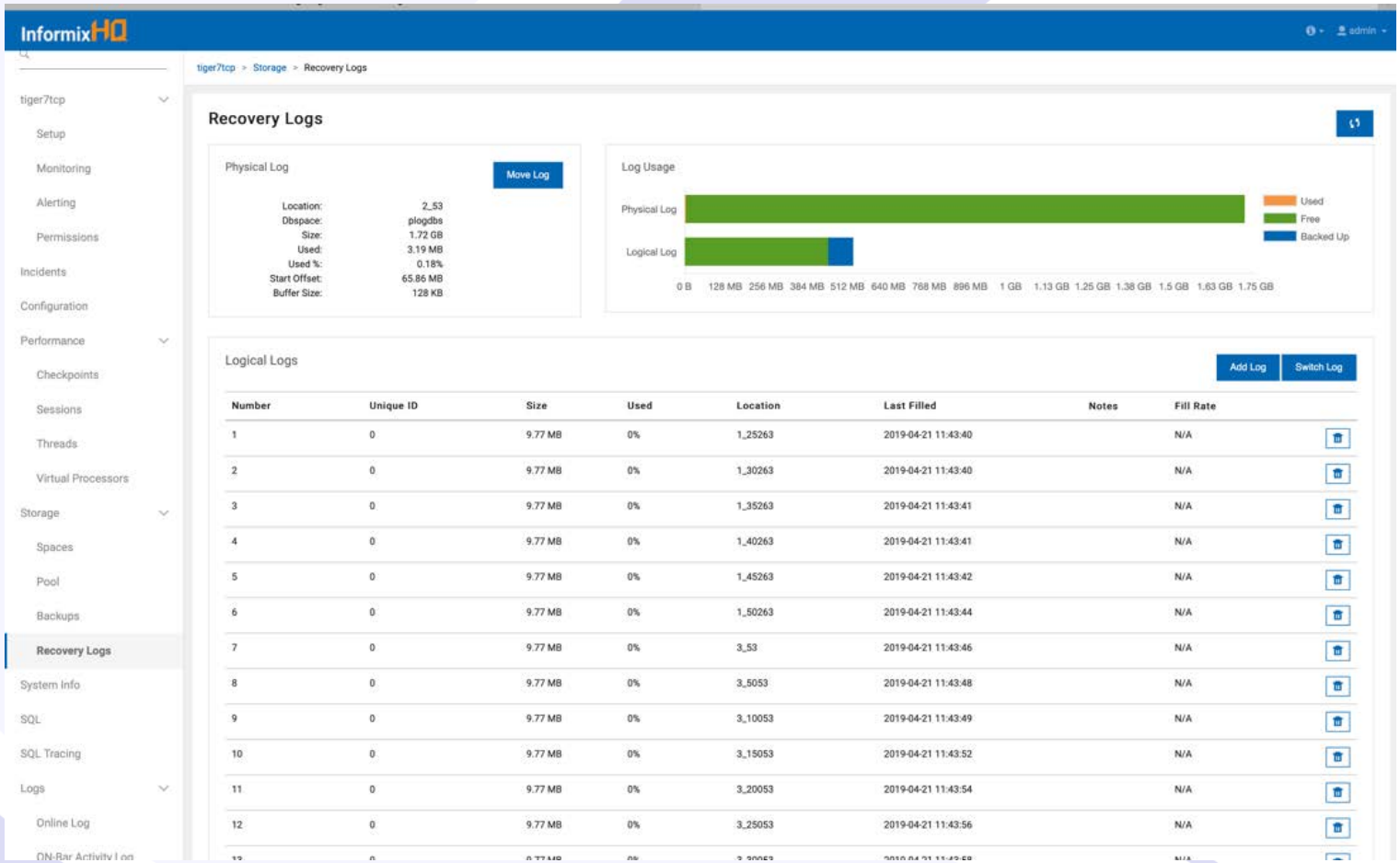
InformixHQ – Monitor DBspaces



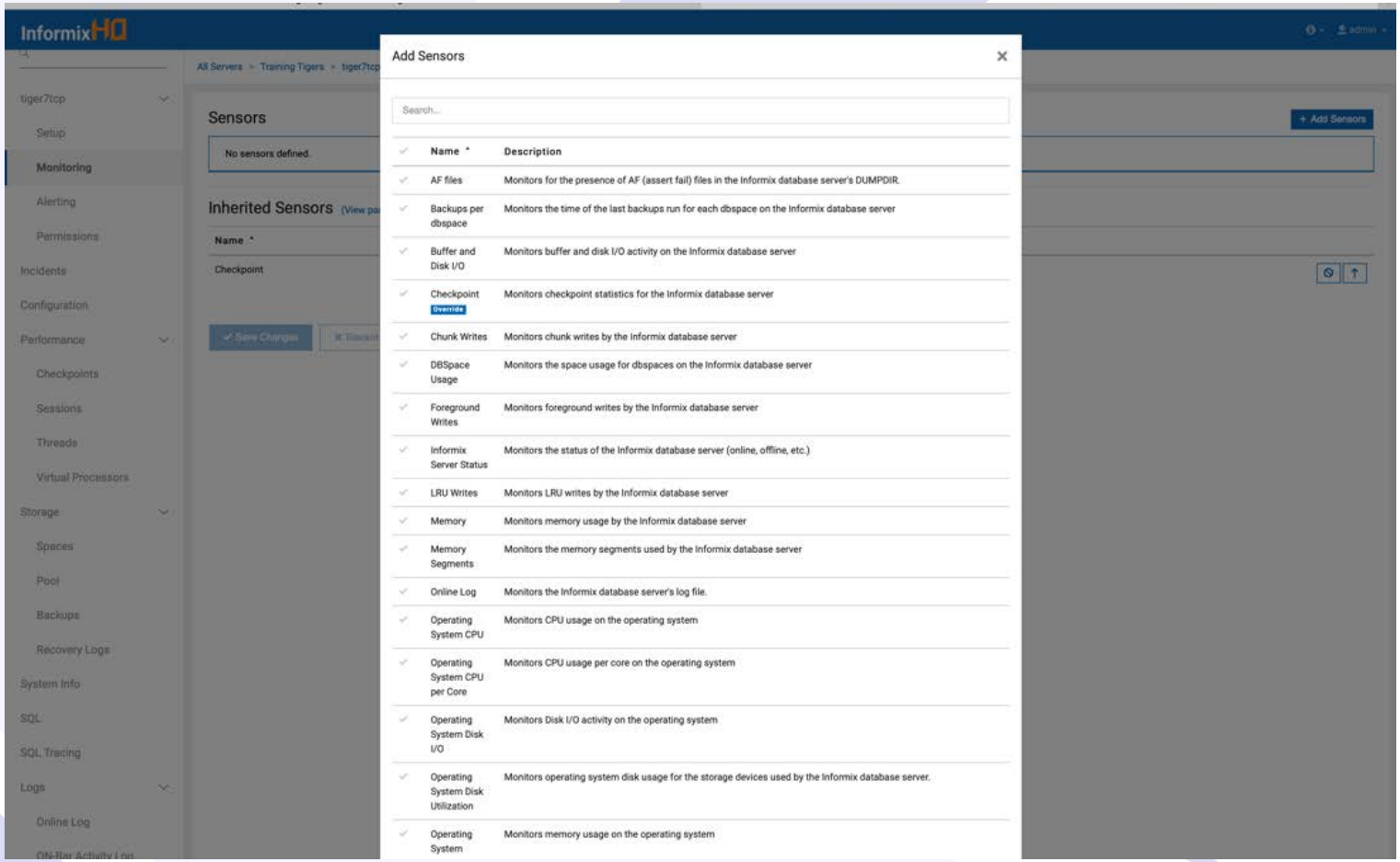
InformixHQ – Monitor Oninits



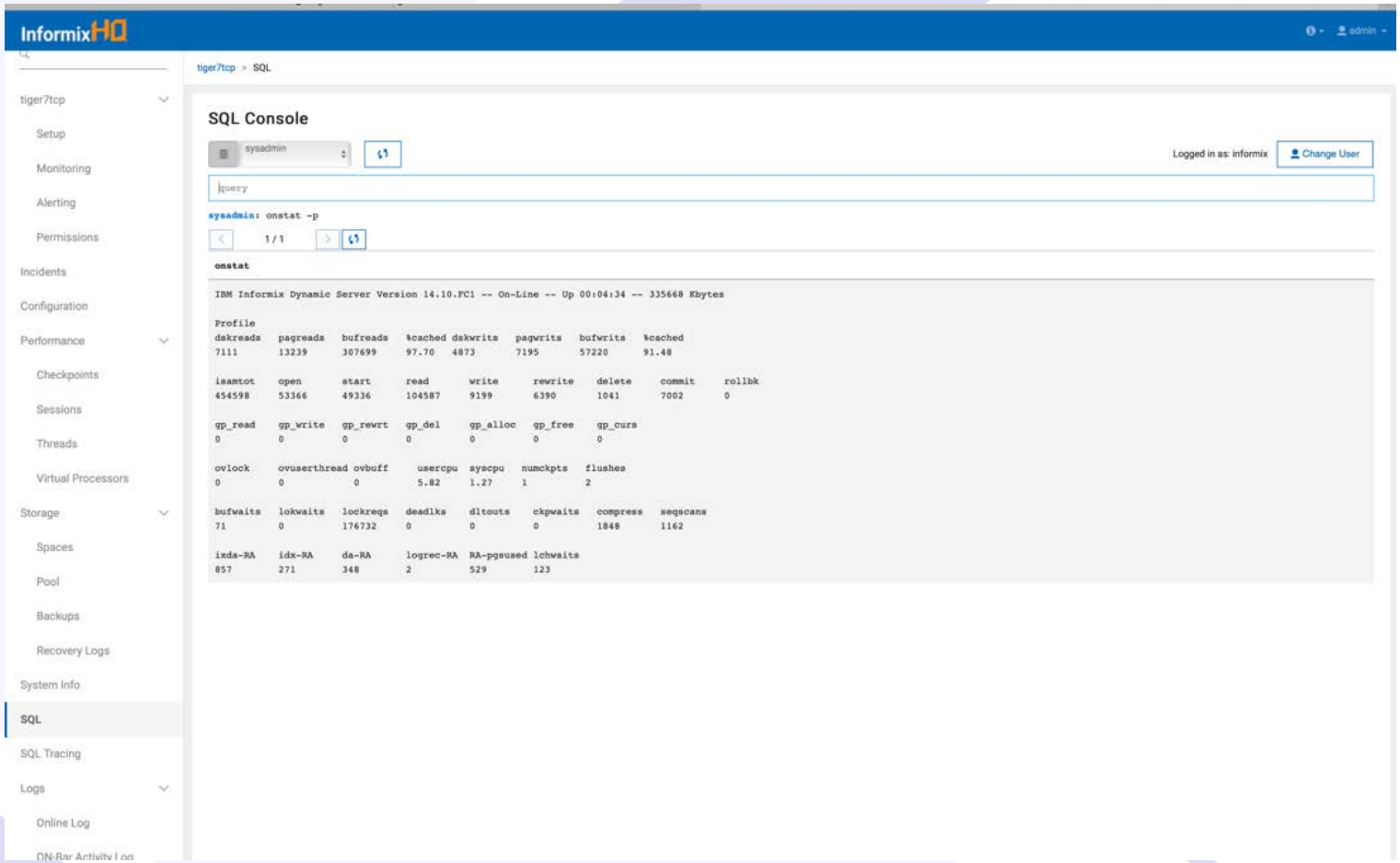
InformixHQ – Monitor Logs



InformixHQ – Set Up Alerts



InformixHQ – SQL Commands



Migrating to the Cloud or a Virtual Machine

- The Easy Way
  - dbexport/dbimport
  - backup/restore
  - ifxclone
  - cdr migrate server
  - myexport
- The Hard Way

Dbexport and Dbimport

- To unload a whole database
- Creates ASCII files with all the data and the schema
- Portable to other systems
- Locks the database during an export
- Database may be exported to a directory or tape

Backup/Restore

- Same Operating System
- Same Version of Informix
- Using Ontape or OnBar
- Perform a Backup
- Perform a Restore
- Roll Forward the Logs

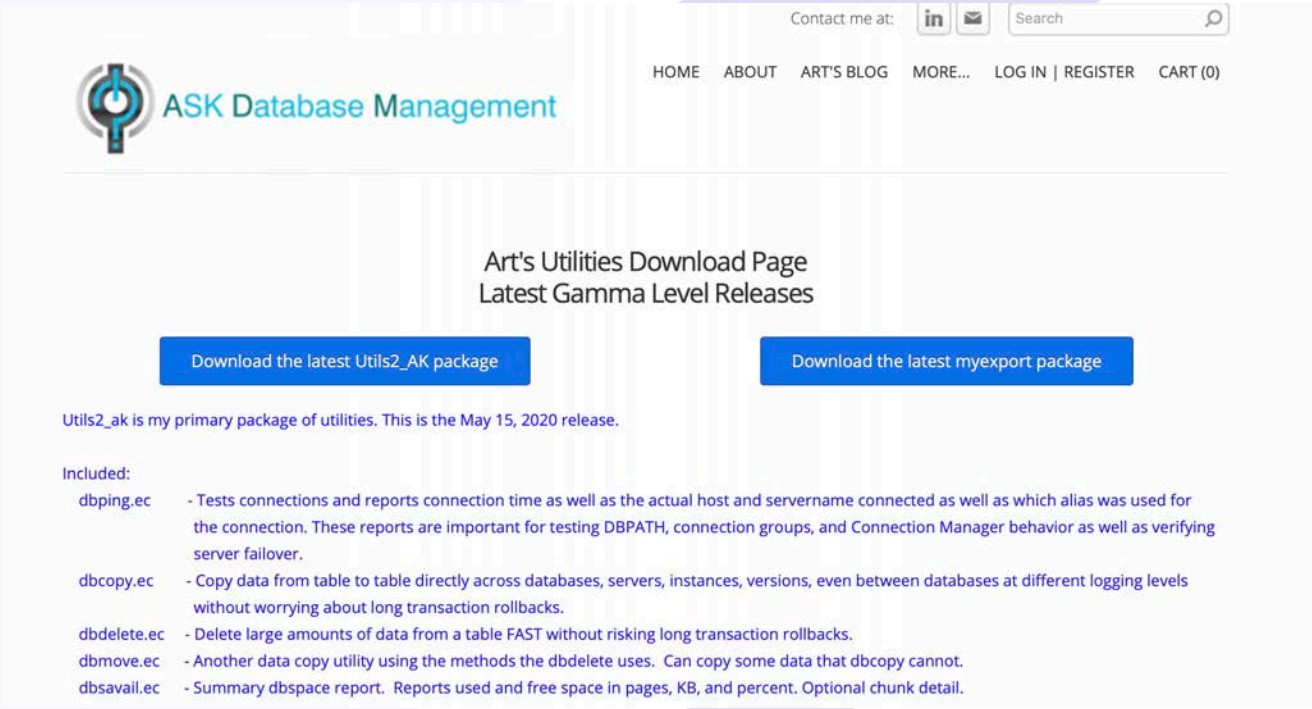
CDR Migrate Server

- Enterprise Replication – New Command
  - Automates data migration between two or more servers
  - Automates setting up of Enterprise Replication between two servers
  - Creates storage spaces using storage pool
  - Migrate schema and data in parallel
  - Synchronizes data using ER
  - ***No Down Time***
- IBM Informix Documentation Guide - https://www.ibm.com/support/knowledgecenter/SSGU8G_14.1.0/com.ibm.erep.doc/ids_erp_cdr_migrate_server.htm

Ifxclone Utility

- **ifxclone** utility to create a server clone from a snapshot of an existing database server
- IBM Informix Documentation Guide - https://www.ibm.com/support/knowledgecenter/SSGU8G_12.1.0/com.ibm.adref.doc/ids_adr_1093.htm

Myexport by Art Kagel



- Myexport is my replacement for dbexport and dbimport. These scripts optionally use external tables or the Informix High Performance Loader to unload and load data much faster than dbexport/dbimport without locking the database. Options include parallel export and import, NOVALIDATE data loading, constraint filtering, user selected isolation level, running dostats after the load, compressed unload files, dbexport & dbimport compatibility, dbspace mapping.
- https://www.askdbmgt.com/my-utilities.html

The Hard Way

- Migrating to different Server Hardware or Operating Systems
  - AIX to Red Hat on the Cloud
  - Solaris or HPUX to the Cloud or VM
- Need to Restructure Large Tables or Update Partitioning
- Database Code Set Change
- Minimize Down Time – Need to Parallelize the Process

Project Plan: Migration VM or Cloud

- Build a Project Plan
- First – Test Migrate Scripts in Single Thread
  - Goal is to execute and unit test each script in single thread runs
- Second – Test Migrate Scripts in Parallel
  - Goal is to stress test all scripts in parallel and validate production times
- Third – Final Production Server Migration

Build a Project Plan

Project Plan: Migration from Old Server to VM Linux Informix

Update 2/17/2020

Row Num	Tasks	Description	Estimated hours	Staff Category	Planned Start Date	Finished Date	Complete Date	Assigned To	Complete Status	Status Comments
1	1. Migration Project Planning									
2		Review the current Informix Server Configurations	8	Principal DBA						
		Run informixcheck.sh scrip to collect data		Principal DBA						
		Load the data into Excel Worksheets		Principal DBA						
		Identify Job Streams for Parallel loads based on usage		Principal DBA						
		Identify ONCONFIG changes for New Server		Principal DBA						
3		Plan New Linux VM Configurations	16	Principal DBA						
		Identify and plan VM Configuration Settings		Principal DBA						
		Identify and Size the Filesystems		Principal DBA						
		Identify and Size the Space for Informix DBSpaces		Principal DBA						
		Identify the Kernal Configuration Changes		Principal DBA						
		Identify the temp filesystem for Import/Export Data		Principal DBA						
		Identify and define the Backup method		Principal DBA						
		Identify Linux software to install and additional packages		Principal DBA						
		Identify and define printers to install		Principal DBA						
		Identify and define the ports for Informix Connections		Principal DBA						
4	2. Migrate First Test/Development - Goal is to run and unit test all scripts in single thread run									
5		Develop scripts to export and import data and capture QA metrics	16	Principal DBA						
		Create onpload jobs scripts for the unload - 1 per table		Principal DBA						
		Create onpload job streams script		Principal DBA						
		Create the external table scripts for the load - 1 per table		Principal DBA						
		Create the load job stream		Principal DBA						
		Create the QA scripts to count rows and sum key dollar amounts		Principal DBA						
		Create script - createdb		Principal DBA						
		Create script - create_tables		Principal DBA						
		Create script - create_tables_large_parallel		Principal DBA						
		Create script - create_external		Principal DBA						
		Create script - create_permissions		Principal DBA						
		Create script - create_procedures		Principal DBA						
		Create script - create_synonyms		Principal DBA						
		Create script - create_triggers		Principal DBA						
		Create script - create_indexes		Principal DBA						
		Create script - create_indexes_large_parallel		Principal DBA						
		Create the create and load job stream		Principal DBA						
6		Export the data from the Informix Server and capture QA metrics	16	Senior DBA						
		Restore a backup of production on to a test system		MN Sysadmin						

Webcast: Configure a New Server - Target

- Informix Tutorials – Configuring a New Informix Server Presented by Lester Knutsen on February 27, 2020
- https://advancedatatools.com/webcasts/informix-tutorial-configuring-a-new-informix-server/

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

Define Parallel Job Streams

- How many Large Tables > 2 GB?
- Tables that require special Partitioning?
- How many CPUs and CPU VPs are available?
- Limit Parallel Jobs to number of CPU VPs
- Limit PDQ Priority based on number of Jobs
- Divide tables and indexes into two groups
  - Normal Tables and Indexes < 2 GB
  - Parallel Tables and Indexes > 2GB

Webcast: Re-Organizing and Partitioning Tables

- Informix Webcast 2018 – Automatic Informix Range Interval Partitioning and Rolling Windows to Organize your data
- https://advancedatatools.com/webcasts/informix-webcast-2018-automatic-informix-range-interval-partitioning-and-rolling-windows-to-organize-your-data/

Dissect DBschema

- Run DBschema –d –ss database to a file and then ...
- Split the result file into 9 separate SQL scripts
  1. SQL to create most tables (Normal Tables)
  2. SQL to create selected large tables for Parallel Loads
  3. SQL to create External tables
  4. SQL to create permissions
  5. SQL to create procedures and functions
  6. SQL to create synonyms
  7. SQL to create triggers
  8. SQL to create most indexes (Normal Indexes)
  9. SQL to create selected large table indexes for Parallel builds

Unloading the Data

- Create External Tables
- Lock the Database for the unloads
- Unload all tables < 2 GB in one job stream
- Unload all tables > 2 GB in parallel job streams
- Run QA Script to check the data (the database should be locked)

Building the New Database

- Create the database in selected Dbspace with No Logging - createdb.sql
- Create all the normal tables - create_tables.sql
- Create the large tables for parallel loads - create_tables_large_parallel.sql
- Create the External Tables to load from - create_external.sql
- Load the Normal base tables - load base tables.sql
- Run Parallel Load Jobs for the large tables - load large tables.sql
- Create the Permissions - create_permissions.sql
- Create Procedures and Functions - create_procedures.sql
- Create Synonyms - create_synonyms.sql
- Create Triggers - create_triggers.sql
- Create Indexes for normal tables - create_indexes.sql
- Run Parallel Index creation jobs - create_indexes_large_parallel.sql
- **Turn Database Logging On when done!**

Checking the Data

- Check Row counts
- Sum One Key Metrics per table
- Save the data in a table so you can automatically compare it on both servers

Example Scripts
Using SQL to Generate SQL

1-tabselect.sql - Identify Large Tables (>2GB)

2-mk_external_tables.sql - Make External Tables

3-mk_drop_external_tabels.sql - Drop External Tables

4-mk_unloads.sql - Make SQL to Unload the Database

5-mk_loads.sql - Make SQL to Load the Database

6-mk_truncate.sql - Make SQL to Truncate Tables (for Testing)

7-mk_qa_loads.sql - Make SQL to QA the Data (Row counts and Sums)

Script - Identify Large Tables (>2GB)

```
-------------------------------------------------------------------------------
-- Module: @(#)tableselect.sql  1.0     Date: 2019/04/01
-- Author: Lester Knutsen  Email: lester@advancedatatools.com
--         Advanced DataTools Corporation
-- Description: New Table Information Script - Unload the output to a file
--      Tested with Informix 11.70 and Informix 12.10, 14.10
-------------------------------------------------------------------------------

database sysmaster;

unload to all_tableinfo.uld
select
        systabnames.dbsname      database,
        systabnames.tabname      tabname,
        ( dbinfo('dbspace', ti_partnum )) dbspace,
        systabnames.partnum,
        ti_rowsize   row_size,
        ti_pagesize  page_size,
        ti_nptotal   pages_total,
        ti_npused       pages_used,
        ti_npdata       pages_data,
        ( ti_npdata * ti_pagesize ) total_bytes
from systabnames, systabinfo, outer sysptprof
where   systabinfo.ti_partnum = systabnames.partnum
and     systabinfo.ti_partnum = sysptprof.partnum
and     systabnames.dbsname not in ( "sysmaster", "sysuser", "sysutils", "sysadmin" )
and     systabnames.tabname not in ( select tabname from systables where tabid <=99 )
and     ti_npdata > 0 -- remove partitions with no data pages
and     ( ti_npdata * ti_pagesize ) > 1000000000
order by total_bytes desc;
```

Script – Make External Tables

```
-- ###############################################################################
-- ## Module: @(#)mk_external_tables.sql      1.0     Date: 02/14/2018
-- ## Author: Lester Knutsen  Email: lester@advancedatatools.com
-- ##         Advanced DataTools Corporation
-- ###############################################################################

-- ###############################################################################
-- Run this for each database you need to migrate
-- ###############################################################################

unload to "create_external_tables.sql"
delimiter ";"
select "create external table _ext_" || trim(tabname) || " sameas " || trim(tabname) || " " ||
"using ( " ||
"DATAFILES('DISK:/tmp/" || trim(tabname) || ".uld'), " ||
"FORMAT 'INFORMIX'," ||
"REJECTFILE '/tmp/" || trim(tabname) || ".reject'" ||
") "
from systables
where tabid > 99
and tabtype ="T";
```

Script – Drop External Tables

```
-- ###############################################################
-- ## Module: @(#)mk_drop_external_tables.sql      1.0     Date: 02/14/2018
-- ## Author: Lester Knutsen  Email: lester@advancedatatools.com
-- ##         Advanced DataTools Corporation
-- ###############################################################


-- ###############################################################
-- Run this for each database you need to migrate
-- ###############################################################

unload to "drop_external_tables.sql"
delimiter ";"
select "drop table " || trim(tabname)
from systables
where tabid > 99
and tabtype ="E"
and tabname matches "_ext_*";
```

Script – Make SQL to Unload the Database

```
-- ##############################################################################
-- ## Module: @(#)mk_unloads.sql      1.0     Date: 02/14/2018
-- ## Author: Lester Knutsen  Email: lester@advancedatatools.com
-- ##         Advanced DataTools Corporation
-- ##############################################################################

output to "unload_small_tables.sql" without headings
select "insert into _ext_" || trim(tabname) || " select * from " || trim(tabname) || ";"
from systables
where tabid > 99
and tabtype ="T"
and tabname in ( select tabname
                 from sysmaster:systabnames, sysmaster:systabinfo
                 where sysmaster:systabinfo.ti_partnum = sysmaster:systabnames.partnum
                 and ( ti_npdata * ti_pagesize ) < 1000000000
                 and dbsname = ( select dbinfo('dbname') from systables where tabid =1 ))
;


output to "unload_big_tables.sql" without headings
select "insert into _ext_" || trim(tabname) || " select * from " || trim(tabname) || ";"
from systables
where tabid > 99
and tabtype ="T"
and tabname in ( select tabname
                 from sysmaster:systabnames, sysmaster:systabinfo
                 where sysmaster:systabinfo.ti_partnum = sysmaster:systabnames.partnum
                 and ( ti_npdata * ti_pagesize ) >= 1000000000
                 and dbsname = ( select dbinfo('dbname') from systables where tabid =1 ))
;
```

Script – Make SQL to Load the Database

```
-- ###############################################################################
-- ## Module: @(#)mk_loads.sql      1.0     Date: 02/14/2018
-- ## Author: Lester Knutsen  Email: lester@advancedatatools.com
-- ##         Advanced DataTools Corporation
-- ###############################################################################

output to "load_small_tables.sql" without headings
select "insert into " || trim(tabname) || " select * from _ext_" || trim(tabname) || ";"
from systables
where tabid > 99
and tabtype ="T"
and tabname in ( select tabname
                 from sysmaster:systabnames, sysmaster:systabinfo
                 where sysmaster:systabinfo.ti_partnum = sysmaster:systabnames.partnum
                 and ( ti_npdata * ti_pagesize ) < 1000000000
                 and dbsname = ( select dbinfo('dbname') from systables where tabid =1 ))
;

output to "load_bigl_tables.sql" without headings
select "insert into " || trim(tabname) || " select * from _ext_" || trim(tabname) || ";"
from systables
where tabid > 99
and tabtype ="T"
and tabname in ( select tabname
                 from sysmaster:systabnames, sysmaster:systabinfo
                 where sysmaster:systabinfo.ti_partnum = sysmaster:systabnames.partnum
                 and ( ti_npdata * ti_pagesize ) >= 1000000000
                 and dbsname = ( select dbinfo('dbname') from systables where tabid =1 ))
;
```

Script – Make SQL to Truncate Tables (for Testing)

```
-- ###############################################################
-- ## Module: @(#)mk_truncate.sql      1.0     Date: 02/14/2018
-- ## Author: Lester Knutsen  Email: lester@advancedatatools.com
-- ##         Advanced DataTools Corporation
-- ###############################################################

output to "truncat_table.sql" without headings
select "truncate  " || trim(tabname) || ";"
from systables
where tabid > 99
and tabtype ="T"
;
```

Script – Make SQL for QA (Row counts and Sums)

```
-- ## Module: @(#)mk_qa_check.sql      1.0     Date: 02/14/2018
-- ## Author: Lester Knutsen  Email: lester@advancedatatools.com
-- ##         Advanced DataTools Corporation
-- ################################################################################

-- Create a table to identify one decimal column per table to sum for QA
drop table if exists tmp_key_columns;
create temp table tmp_key_columns(
               t_name  varchar(128),
               t_id    integer,
               c_name  varchar(128)
               );

-- Identify all tables and any decimal columns
insert into tmp_key_columns
select unique tabname, systables.tabid, syscolumns.colname
from systables, outer syscolumns
where  systables.tabid = syscolumns.tabid
and systables.tabid > 99
and syscolumns.coltype = 5
and tabtype = "T";

-- Update any columns which are null
update tmp_key_columns set c_name = "0" where c_name is null;

-- Identify one decimal column per table
select t_name, t_id, max (c_name) c_name
from tmp_key_columns
group by 1, 2
into temp tmp_key_columns2 ;

-- Build a QA script to count rows and sum the decimal columns
output to "qa_data_check.sql" without headings
select "select '" || trim(tabname) || "', count(*), sum( " ||
       trim((select c_name from tmp_key_columns2 where t_id = tabid) )
       || " ) from " || trim(tabname) || ";"
from systables
where tabid > 99
and tabtype ="T";
```

Questions?

Send follow-up questions to
Lester@advancedatatools.com

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