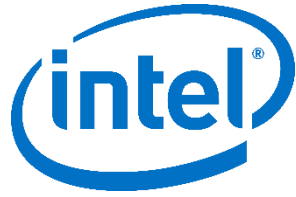




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Behind the scenes

DBS administration and installation

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Agenda

- How is DBS different from SQL/MX as you know it?
- Administration of database services
- DBS resource administration
 - Defined by InstallDBS
- DBS database administration
 - Maintained by DBS management API mxdbms
- DBS Installation
- Post-installation suggestions

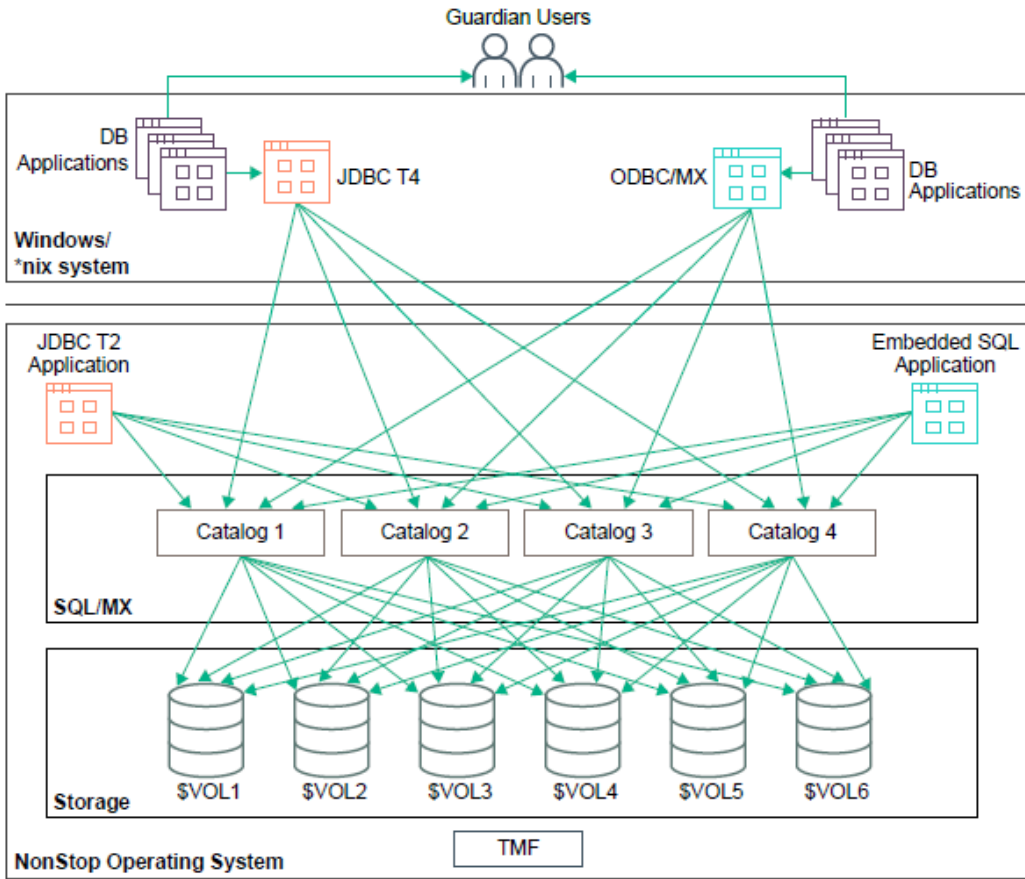


Differences-at-a-glance

Between traditional SQL/MX and DBS

What makes MXDBS different?

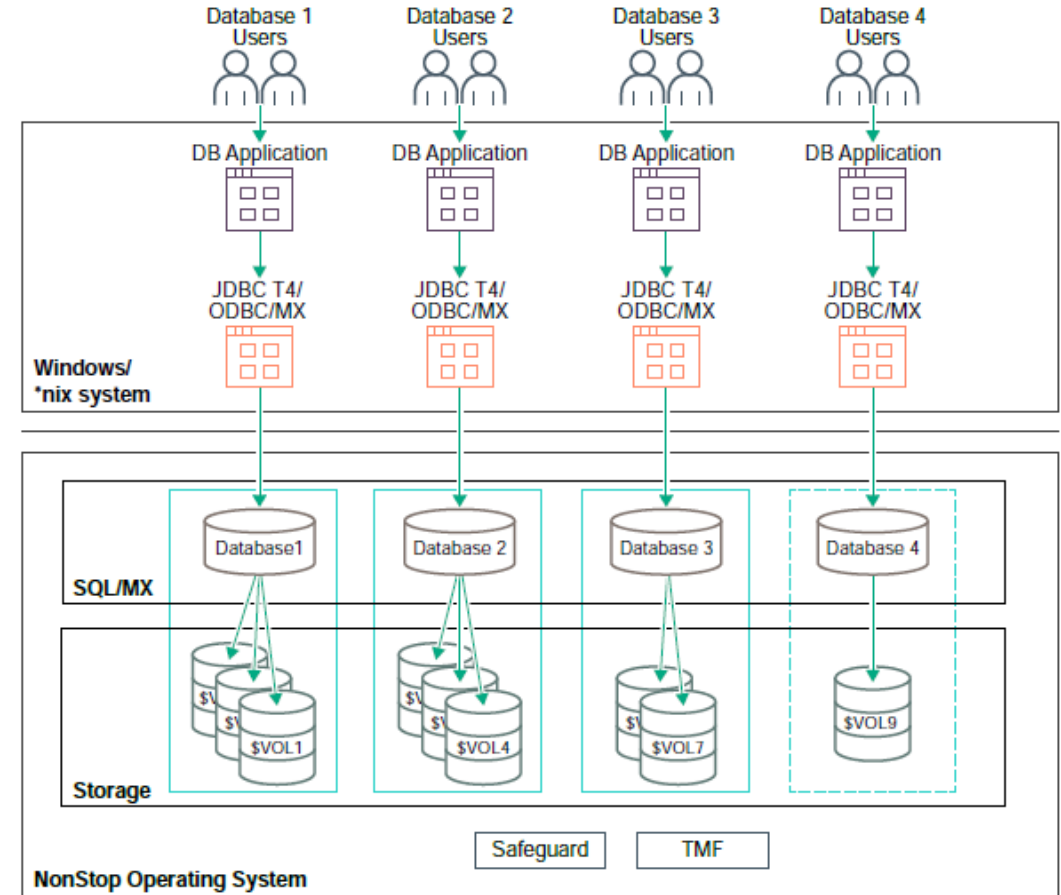
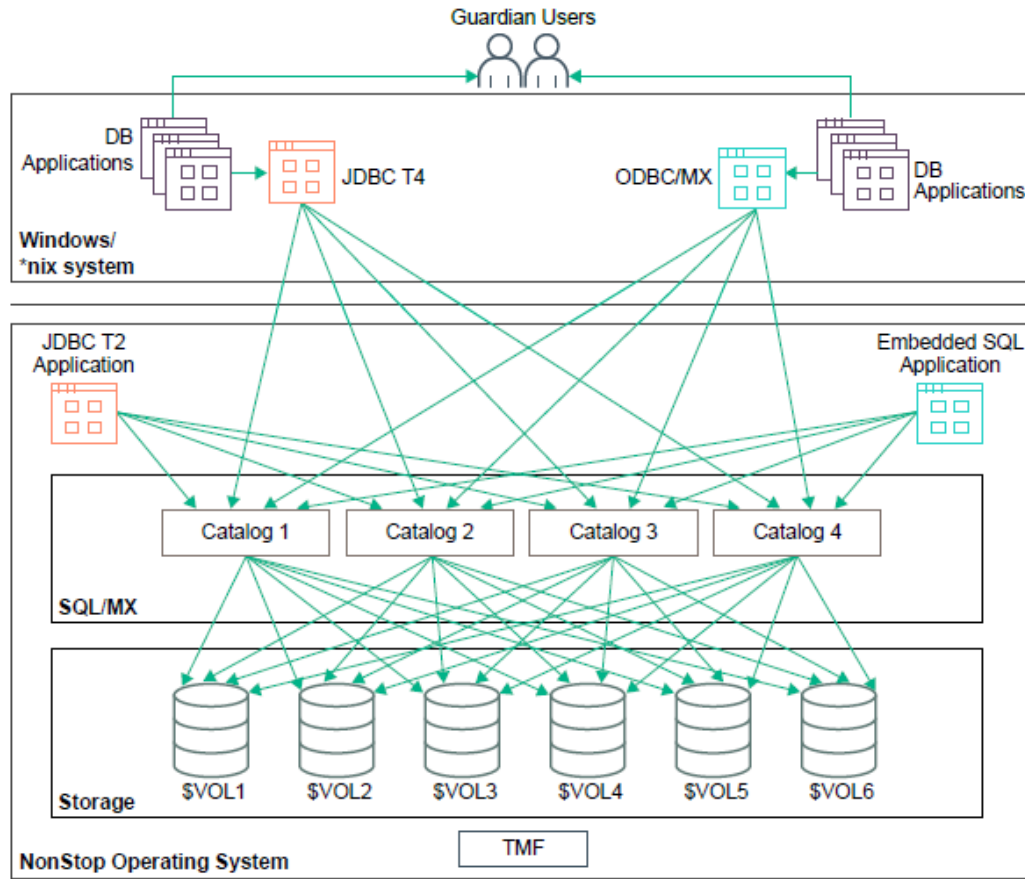
Overview of traditional SQL/MX access



Source: SQL/MX Database Services Manual.

What makes MXDBS different?

Comparing to SQL/MX with DBS



Administration of Database Services

- SQL/MX DBS is all about sharing resources
- And makes sure not to share too much
 - Isolate environments that need to be isolated
 - Have more protection enforced than usual on a NonStop system
 - Automation rather than manual DBA actions
- DBS administration includes
 - Database users – coordinated with Safeguard
 - DBS-specific user information
 - User privileges
 - Including privilege groups
 - Storage that can be used
 - CPUs that can be used
 - Databases defined in DBS

User and database isolation

Feature	SQL/MX	SQL/MX DBS
User creation	Manual via TACL/Safecom	Automatic
User access to shell or TACL	Yes	No
Read system metadata	Yes	No, only access via views in the INFORMATION_SCHEMA
Read other user metadata	Yes	No
Access other user's data	If granted	If granted
Access other database data	n/a (use grant/revoke)	If database shared and if granted
Reference data in other catalog in DDL	Yes	No
Access to storage	All volumes unless Safeguard restricted	Only to assigned volumes

Administration of resources and databases

SQL/MX DBS Resources

Defined when installDBS is executed

- Defines the TENANT group and TENANT.ADMIN user
- The OSS home directory for DBS data
- Safeguard file-sharing groups
- Safeguard user-groups for database users
- Which TMF audited volumes are used exclusively
 - These volumes will be Safeguard-owned by the TENANT.ADMIN user
 - No other users can access these volumes
 - Once assigned to a database, only the DB users can access these volumes
- MXCS Services and ports
 - Persistent process DBS_MGMT_MXOAS (\$ZAS01, port 2000)
 - Persistent process DBS_ACCESS_MXOAS (\$ZAS02, port 2100)
- TENANT.ADMIN password

SQL/MX DBS Resources in system metadata

- Catalog `NONSTOP_SQLMX_node`
 - version 3500 or higher
- Schema `SYSTEM_DBS_SCHEMA`
- Tables
 - `DBS_CPUs` CPUs in the system that can be used by DBS
 - `DBS_GLOBALS` Global information (Guardian group and user ID for tenant admin)
 - `DBS_PLATFORM_USERS` List of users created by installDBS
 - `DBS_SERVICES` The two services defined for DBS
 - `DBS_SFG_GROUPS` Safeguard groups
 - `DBS_VOLUMES` Volumes allocated for DBS use

SQL/MX DBS Administration

Maintained by the functions of mxdbms

- Functions select resources from the DBS resource pool and assign them to specific databases
- Function: **db-create**
 - Storage (volumes) , CPU assignments, assigns external names to internal user IDs
 - Use Safeguard to assign volume protection to database users
 - Creates data source definitions and store them in metadata
- Function: **db-delete**
 - Releases volumes back to the DBS storage pool
 - Removes data source definitions
 - Return Safeguard ownership to tenant administrator
- Function: **db-add-user, db-remove-user, db-user-change-access**
 - Maintain membership of users to privilege-groups

SQL/MX DBS administration in system metadata

- Catalog *NONSTOP_SQLMX_node*
- Schema *SYSTEM_DBS_SCHEMA* and *SYSTEM_SECURITY_SCHEMA*
- Tables
 - *ALL_DATABASES*
 - *DATABASE_CPUS* Which CPUs are used by this DB (based on volumes)
 - *DATABASE_DS* Data source name and Database UID
 - *DATABASE_PRIVILEGE_GROUPS*
 - *DATABASE VOLUMES* Volumes assigned to the database
- Tables in *SYSTEM_SECURITY_SCHEMA*
 - *DATABASE_USERS* Users defined on the system at time of InstallDBS and DBS reserved user IDs
 - *DATABASE_USERS_EXT* External user names referring to NonStop user IDs

SQL/MX DBS information in each database

System metadata made available using views

- Catalog Every SQL/MX DBS database catalog
- Schema INFORMATION_SCHEMA
- Views
 - DB_CPUS Which CPUs are used by this DB (based on volumes)
 - DB_DS Data source name and Database UID
 - DB_PRIVILEGE_GROUPS
 - DB_SCHEMAS Schemas defined in this database
 - DB_STORAGE Volumes assigned to the database
 - DB_USERS Database users



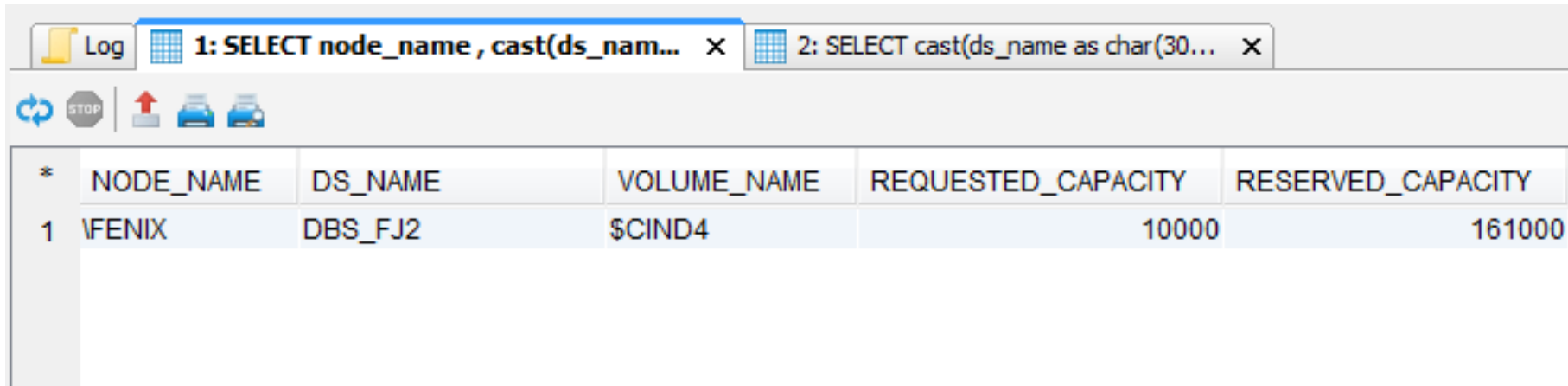
Some useful system metadata queries

Examples to be executed by DBAs

Example metadata queries

View DBS databases and their volumes

```
SET SCHEMA SYSTEM_DBS_SCHEMA; -- Note: need to set catalog to your node
SELECT node_name
, cast(ds_name as char(30)) ds_name
, volume_name
, requested_capacity
, reserved_capacity FROM DATABASE_DS
NATURAL JOIN
      DATABASE_VOLUMES
ORDER BY 1,2,3;
```



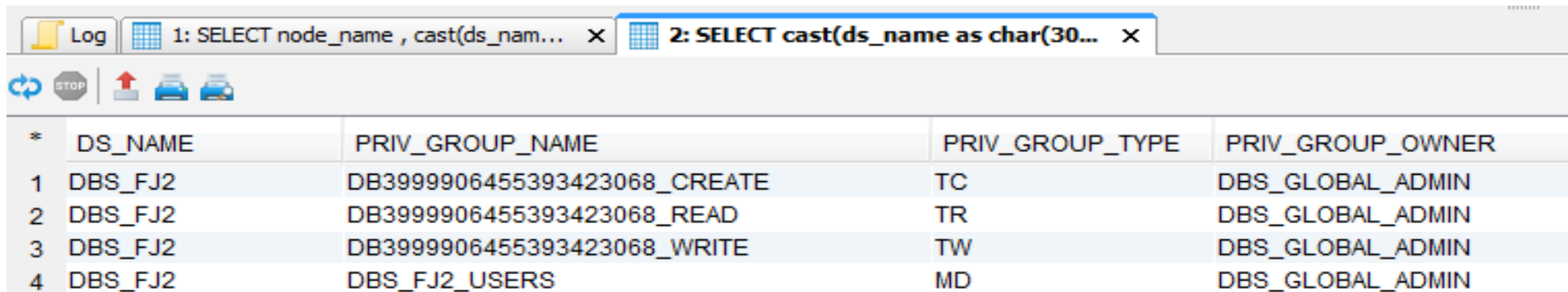
The screenshot shows a database query interface with two tabs. The first tab is titled "1: SELECT node_name, cast(ds_name as char(30)) ds_name, volume_name, requested_capacity, reserved_capacity FROM DATABASE_DS NATURAL JOIN DATABASE_VOLUMES ORDER BY 1,2,3;". The second tab is titled "2: SELECT cast(ds_name as char(30)) ds_name, volume_name, requested_capacity, reserved_capacity FROM DATABASE_DS NATURAL JOIN DATABASE_VOLUMES ORDER BY 1,2,3;". The interface displays a table with the following data:

*	NODE_NAME	DS_NAME	VOLUME_NAME	REQUESTED_CAPACITY	RESERVED_CAPACITY
1	WFENIX	DBS_FJ2	\$CIND4	10000	161000

Example metadata queries

View databases and their privilege groups

```
SET SCHEMA SYSTEM_DBS_SCHEMA; -- Note: need to set catalog to your node
SELECT cast(ds_name as char(30)) ds_name
, CAST (priv_group_name AS CHAR(50)) priv_group_name
, priv_group_type
, CAST(EXT.EXTERNAL_USER_NAME AS CHAR(30)) priv_group_owner
FROM          DATABASE_DS
NATURAL JOIN DATABASE_PRIVILEGE_GROUPS
NATURAL JOIN SYSTEM_SECURITY_SCHEMA.PRIVILEGE_GROUPS PG
JOIN SYSTEM_SECURITY_SCHEMA.DATABASE_USERS_EXT EXT ON PG.PRIV_GROUP_OWNER = EXT.USERID
ORDER BY 1,2;
```

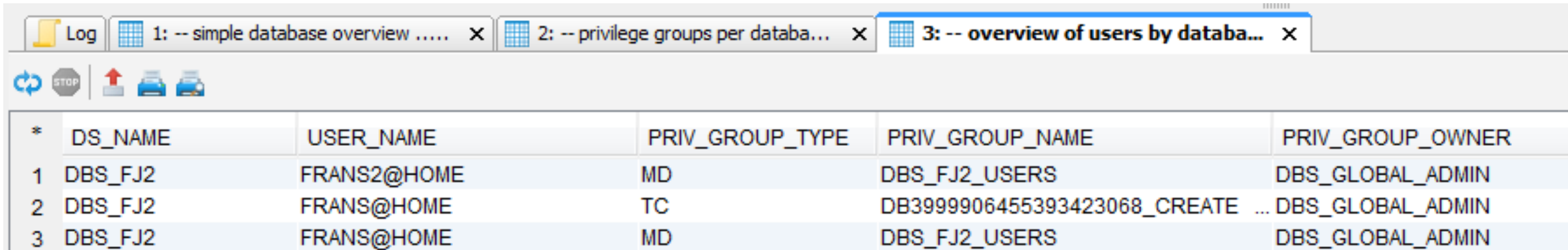


*	DS_NAME	PRIV_GROUP_NAME	PRIV_GROUP_TYPE	PRIV_GROUP_OWNER
1	DBS_FJ2	DB3999906455393423068_CREATE	TC	DBS_GLOBAL_ADMIN
2	DBS_FJ2	DB3999906455393423068_READ	TR	DBS_GLOBAL_ADMIN
3	DBS_FJ2	DB3999906455393423068_WRITE	TW	DBS_GLOBAL_ADMIN
4	DBS_FJ2	DBS_FJ2_USERS	MD	DBS_GLOBAL_ADMIN

Example metadata queries

View databases and their users

```
SET SCHEMA SYSTEM_DBS_SCHEMA; -- Note: need to set catalog to your node
SELECT CAST(DS_NAME AS CHAR(30)) DS_NAME
, CAST(EXT2.EXTERNAL_USER_NAME AS CHAR(40)) USER_NAME
, DB_PG.PRIV_GROUP_TYPE
, CAST (PG.PRIV_GROUP_NAME AS CHAR(50)) PRIV_GROUP_NAME
, CAST(EXT.EXTERNAL_USER_NAME AS CHAR(40)) PRIV_GROUP_OWNER FROM DATABASE_DS DB
JOIN DATABASE_PRIVILEGE_GROUPS DB_PG ON DB.DB_UID = DB_PG.DB_UID
JOIN SYSTEM_SECURITY_SCHEMA.PRIVILEGE_GROUPS PG ON DB_PG.PRIV_GROUP_UID = PG.PRIV_GROUP_UID
JOIN SYSTEM_SECURITY_SCHEMA.DATABASE_USERS_EXT EXT ON PG.PRIV_GROUP_OWNER = EXT.USERID
JOIN SYSTEM_SECURITY_SCHEMA.PRIVILEGE_GROUP_MEMBERSHIP PGM ON PGM.PRIV_GROUP_UID = PG.PRIV_GROUP_UID
JOIN SYSTEM_SECURITY_SCHEMA.DATABASE_USERS_EXT EXT2 ON PGM.USERID = EXT2.USERID
ORDER BY 1,2;
```



*	DS_NAME	USER_NAME	PRIV_GROUP_TYPE	PRIV_GROUP_NAME	PRIV_GROUP_OWNER
1	DBS_FJ2	FRANS2@HOME	MD	DBS_FJ2_USERS	DBS_GLOBAL_ADMIN
2	DBS_FJ2	FRANS@HOME	TC	DB3999906455393423068_CREATE ...	DBS_GLOBAL_ADMIN
3	DBS_FJ2	FRANS@HOME	MD	DBS_FJ2_USERS	DBS_GLOBAL_ADMIN

DBS Installation

Prepare to install

- System metadata must be version 3500 or higher
- Define the general configuration parameters
 - Store these in a file called GeneralConfix.txt
- Define the volumes to be assigned to DBS
 - Store these in a file called VolumeConfig.txt
- Define the TENANT.ADMIN password

- Note that you do not have to specify TMF configuration details
 - Audit trail and Auxiliary Audit trails are part of TMF and is not specific to DBS
 - Consider assigning an AUX volume per processor

- See the examples in the SQLMX Database Services Manual

General Configuration

- Use a sample GeneralConfig.txt as the basis
- The configuration uses shell variables to set the environment
 - Example: export DATABASE_OSS_HOME="/mxdbdata"
- Note the escaped \$ in \ZAS01
- Do not define too many file-sharing groups to reduce installDBS execution time

```
~> cat /usr/tandem/sqlmx/dbs/GeneralConfig.txt
export DATABASE_ADMIN_GROUP=100
export DATABASE_ADMIN_USER=TENANT.ADMIN
export DATABASE_OSS_HOME="/mxdbdata"
export DATABASE_FSGROUP_PREFIX=DBS_FS_GROUP
export DATABASE_USER_GROUP_PREFIX=DBS
export DATABASE_MGMT_PORT=2000
export DATABASE_MGMT_PORT_RANGE=60
export DATABASE_MGMT_GENERIC_PROCESS=DBS_MGMT_MXOAS
export DATABASE_MGMT_PROCESS_NAME=\ZAS01
export DATABASE_MGMT_DS_NAME=DBS_MGMT_DS
export DATABASE_ACCESS_PORT=2100
export DATABASE_ACCESS_GENERIC_PROCESS=DBS_ACCESS_MXOAS
export DATABASE_ACCESS_PROCESS_NAME=\ZAS02
export DATABASE_FILE_SHARING_GROUPS=1001-1020
export DATABASE_USER_GROUPS=101-120
export DATABASE_USER_INITIAL_PW=
export DATABASE_ACCESS_PORT_RANGE=60000
export DATABASE_MGMT_HOST_NAME=FENIX
export DATABASE_ACCESS_HOST_NAME=FENIX
export DATABASE_CPUS="0 1"
```

Volume Configuration

- See example VolumeConfig.txt
- Easy to create from tmfcom
 - Info datavols as basis
 - Keep the volumes you want to assign to DBS

```
~> cat /usr/tandem/sqlmx/dbs/VolumeConfig.txt
$CIND3      Mat      Online   Started
$CIND4      Mat      Online   Started
$CIND5      Mat      Online   Started
$CIND6      Mat      Online   Started
```

Installation

– First run the validation

– Need SUPER.SUPER to validate and install

```
– # cd /usr/tandem/sqlmx/dbs
```

```
– # ../bin/installDBS -validateonly -vols VolumeConfig.txt -config  
  GeneralConfig.txt
```

– When no errors are reported run the installation

```
– # ../bin/installDBS -vols VolumeConfig.txt -config GeneralConfig.txt -adminPW  
  xyzzy
```

– Create a database to verify

```
– # ../bin/mxdbs db-create dbs_test 10 test_user Welcome-1234
```

– Remember to use a different password than listed here

Post install

- Create a small test database to verify all is working
 - As super.super
 - Or sudo as shown in the example
- Create a download area and symbolic links to client software
 - Makes is easier to download and install software for clients
 - Example: mxcreatelinks script
- Setup ssh for easy access to mxdbms from client servers or workstations

```
/usr/tandem/sqlmx> sudo bin/mxdbms db-create  
dbms_test 10 test_user Welcome-1234  
Hewlett Packard Enterprise NonStop(TM) SQL/MX  
DBS Client 3.5.1  
(c) Copyright 2016, 2017 Hewlett Packard  
Enterprise Development LP.  
  
db-create command started.  
  
MXCS Service Host      : FENIX  
MXCS Service Port     : 2100  
Datasource Name       : DBS_TEST  
Initial Schema Name   : DEFAULT_SCHEMA  
OSS Directory         : DB1002  
  
--- mxdbms operation complete.  
  
/usr/tandem/sqlmx> sudo bin/mxdbms db-delete  
dbms_test
```



Post installation

Setup ssh for tenant.admin

Setup ssh for mxdbms (client side)

- SSH can be used to allow running remote commands without entering passwords
- Requires public keys to be exchanged between client / host
- Here is an example

Running on Cygwin:

```
~> ssh-keygen -t rsa -b 2048 -C "frans@nsx09"
```

```
Generating public/private rsa key pair.
```

```
Enter file in which to save the key (/cygdrive/c/frans/.ssh/id_rsa):
```

```
Created directory '/cygdrive/c/frans/.ssh'.
```

```
Enter passphrase (empty for no passphrase):
```

```
Enter same passphrase again:
```

```
Your identification has been saved in /cygdrive/c/frans/.ssh/id_rsa.
```

```
Your public key has been saved in /cygdrive/c/frans/.ssh/id_rsa.pub.
```

```
The key fingerprint is:
```

```
SHA256:3lZaB9ct9nX0LpEEGbD80OrtpbmUOCx6uuToYdqb3IE frans@nsx09
```

And create the public key as follows

```
~> ssh-keygen -E md5 -lf /cygdrive/c/frans/.ssh/id_rsa.pub
```

```
2048 MD5:8e:73:f3:47:8c:c3:d5:46:eb:68:3d:29:11:63:83:c1 frans@nsx09  
(RSA)
```

```
~> cat .ssh/config
```

```
Host nsk-nsx09
```

```
    User frans
```

```
Host mx-nsx09 (I use this to access the system for DBS)
```

```
    Hostname nsk-nsx09
```

```
    User tenant.admin
```

Setup ssh for mxdbms (server side)

- Need to add myself to the ssh configuration of the target system
- With this key, I can access the system as user frans and as user TENANT.ADMIN without having to enter a password
- Ideal for automated processes
- Here is an example

```
Running on NonStop (NSX09)
~> sudo gtacl -p sshcom \ $zss0
SSHCOM T0801L02_20JAN2017_ACC - 2017-04-14 07:25:14.773
OPEN $zss0
% mode daemon
mode daemon
OK, switched to daemon mode
% alter user frans , publickey fjongma4 fingerprint
8e:73:f3:47:8c:c3:d5:46:eb:68:3d:29:11:63:83:c1
alter user frans , publickey fjongma4 fingerprint
8e:73:f3:47:8c:c3:d5:46:eb:68:3d:29:11:63:83:c1
OK, user frans altered
% alter user tenant.admin , publickey fjongma4 fingerprint
8e:73:f3:47:8c:c3:d5:46:eb:68:3d:29:11:63:83:c1
alter user tenant.admin , publickey fjongma4 fingerprint
8e:73:f3:47:8c:c3:d5:46:eb:68:3d:29:11:63:83:c1
OK, user tenant.admin altered
info user frans, detail

USER                KEYS SYSTEM-USER          LAST-MODIFIED LAST-LOGON
STATUS
frans                1 frans                    14Apr17,07:17 14Apr17,04:08
THAWED
```



Post installation

mxcreatelinks

Purpose of mxcreatelinks

Creates OSS symbolic links to installation files in Guardian

```
/usr/tandem/sqlmx/downloads> ls -g
total 6
lrwxrwxrwx 1 SUPER 26 Dec 17 17:59 mxdmWin32ex.zip      -> /G/system/zmxodbc/mxdm32ex
lrwxrwxrwx 1 SUPER 26 Dec 17 17:59 mxdmWin64ex.zip      -> /G/system/zmxodbc/mxdm64ex
lrwxrwxrwx 1 SUPER 26 Dec 17 17:59 odbcHPUX64.tar      -> /G/system/zmxodbc/odbc64hi
lrwxrwxrwx 1 SUPER 26 Dec 17 17:59 odbcLinux32.tar     -> /G/system/zmxodbc/lodbc64
lrwxrwxrwx 1 SUPER 25 Dec 17 17:59 odbcLinux64.tar     -> /G/system/zmxodbc/lodbc64
lrwxrwxrwx 1 SUPER 25 Dec 17 17:59 odbcWin32.exe       -> /G/system/zmxodbc/tdmodbc
lrwxrwxrwx 1 SUPER 25 Dec 17 17:59 odbcWin32_unicode.exe -> /G/system/zmxodbc/odbcw32
lrwxrwxrwx 1 SUPER 26 Dec 17 17:59 odbcWin64.exe       -> /G/system/zmxodbc/nsodbc64
lrwxrwxrwx 1 SUPER 25 Dec 17 17:59 odbcWin64_unicode.exe -> /G/system/zmxodbc/odbcw64
lrwxrwxrwx 1 SUPER 26 Dec 17 17:59 rmxci.zip          -> /G/system/zmxodbc/t0774zip
lrwxrwxrwx 1 SUPER 26 Dec 17 17:59 t4DriverSoftware.tar -> /G/system/zmxodbc/t1249tar
lrwxrwxrwx 1 SUPER 24 Dec 17 17:59 vqpWin32.exe       -> /G/system/zmxtools/mxvqp
```

Other thoughts

- Consider a separate EMS collector for the DBS data sources
 - Prior to running InstallDBS, change the script to add specific EMS collectors for DBS MXCS.
 - Release 3.6 allows MXOAS as process pairs.

Summary

- Reviewed the differences between DBS and common SQL/MX
- DBS uses new metadata to keep track of its users
 - External user IDs map to Guardian user IDs
 - The use of privilege groups
- How to configure resources for DBS installation
- Some tips



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Thank you

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