EMC Data Domain Boost® for IBM DB2®
A Technical Review

Abstract

EMC delivers Database Administrators (DBAs) complete control of DB2 backup, recovery, and offsite disaster recovery with advanced integration between EMC Data Domain Boost™ (DD Boost™) and IBM DB2®. This white paper describes the key considerations to effectively leverage DD Boost for faster, more efficient DB2 backup and recovery.

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EMC Data Domain Boost® for IBM DB2®

EMC® Data Domain® deduplication storage systems continue to revolutionize disk backup, archiving, and disaster recovery with high-speed, inline deduplication. EMC Data Domain Boost™ integration with IBM DB2® provides the industry’s first solution that gives IBM DB2® database administrators complete control of backup and disaster recovery processes with client-side deduplication. DD Boost for IBM DB2® can reduce your backup time by more than 50%, reduce the amount of data being sent by up to 99% and reduce the CPU resources required for backup. The high-speed, inline, deduplication capabilities of Data Domain systems have enabled DBAs to deal with the exponential data growth, and the reliability issues and operational inefficiencies of magnetic tape operations. Data Domain systems provide operationally superior and cost effective disaster recovery.

IBM DB2® support is included in the EMC product called EMC® Data Domain® Boost for Databases and Applications (DDBDA). It enables you to perform backups and restores of DB2, DB2, SAP HANA, or SAP with DB2 database data with a Data Domain system. You can perform DDBDA backups and restores over either an Ethernet (IP) or Fibre Channel (FC) network connection. Both environments will be described in this guide.

Introduction

The purpose of this white paper is to provide installation, configuration, backup and recovery examples and best practice guidance for DDboost for IBM DB2®. In the rest of the document IBM DB2® will be referred to as simply DB2.

Audience

This white paper is intended for IBM DB2® database administrators, systems engineers, partners and members of the EMC and partner professional services community who are looking for faster, more efficient IBM DB2® backup and recovery with complete control over IBM DB2® disaster recovery procedures.
Technical Overview

IBM provides a DB2 backup utility that is fully integrated into the DB2 engine. A user can back up DB2 data to disk or via a 3rd party vendor like EMC DDboost. Implementing DDBoost for DB2 simply requires installing the DDBoost plug-in on the DB2 server, and then the DDBoost plug-in interfaces with this backup utility.

DB2 commands are altered slightly to include the DDboost driver information. The DB2 CLI commands used to protect databases are:

- db2 backup
- db2 restore
- db2 rollforward (i.e., application of transaction logs to bring the database to a specific point in time)
- db2 recover (i.e., automated db2 restore + db2 rollforward)

Updating the VENDOROPT, LOGARCHMETH and LOGARCHOPT will ensure that the DDboost driver is used for both backups of the database and archive logs as shown below.
Distributing the Deduplication Process

Prior to DD Boost, if DB2 used a CIFS or NFS mount on the Data Domain, it would send all data, unique or redundant, to a Data Domain system for deduplication processing, as shown below. This is termed target-side deduplication.

**DD Boost Technology**
**What Gets Distributed?**

With DDBoost, DB2 servers send only unique data segments to the Data Domain system. DD Boost for DB2 significantly increases performance by distributing parts of the deduplication process to the DD Boost plug-in on the DB2 server, as shown below. This is called client-side deduplication.

**DD Boost Technology**
**What Gets Distributed?**

By sending only unique data, DD Boost decreases the load on the DB2 server since sending data is significantly more CPU and memory intensive than executing parts of the deduplication process.

In addition to performance improvements, the amount of data transferred over the network is greatly reduced.
Replication

EMC Data Domain Replicator software provides network-efficient, automated, and encrypted replication for disaster recovery, copying only unique and compressed data segments to a remote Data Domain system. MTrees are user-defined logical partitions of the Data Domain file system and they can be replicated to provide disaster recovery copies at a secondary location.

MTree replication creates periodic snapshots at the source and transmits the differences between two consecutive snapshots to the destination. At the destination Data Domain system, the latest snapshot is not exposed until all the data for that snapshot is received. This ensures the destination will always be a point-in-time image of the source Data Domain system. In addition, files will not show up out of order at the destination providing file-level consistency that simplifies disaster recovery procedures and reduces RTOs.

By simply changing the DDboost configuration file, data recovery can be enabled from the secondary Data Domain without the involvement of any Backup Server or Data Domain administrator. This ensures that the DBA has complete control of the recovery environment for both the primary and secondary locations.

DD Boost for DB2 Configurations and Capabilities

DD Boost for DB2 supports a number of commonly deployed configurations and capabilities:

1. Backup and recovery of DB2 Version 9.5 and higher.
   - Full backup, incremental and delta backup
   - Short and long-term retention of database backups

2. Backup replication for disaster recovery for DB2 databases

3. Refresh test and development instances from local or remote backup copies
   - Redirected Restore to same or other server

4. Log recovery

5. You can perform DD Boost backups and restores in a DB2 Database Partitioning Feature (DPF) environment.

6. You can perform DD Boost backups and restore in a DB2 High Availability Disaster Recovery (HADR) environment. You can start a backup on the primary node only. DB2 does not support backups on standby nodes. Other restrictions are detailed in the EMC® Data Domain® Boost for Databases and Applications and EMC ProtectPoint™ Administration Guide.

7. You can perform DD Boost backups and restores in a DB2 pureScale environment. In the active-active application cluster, multiple database servers known as member nodes operate on a single data partition. Other restrictions are detailed in the EMC® Data Domain® Boost for Databases and Applications and EMC ProtectPoint™ Administration Guide.
Installation and Configuration

Environment Being Used

The environment used in this guide was two virtual Data Domains running V5.5 and replication was one-way between ddve-01 and ddve-02. We had a V10.5 DB2 server running on RHEL V6. DDBEA was V2.

Installation

1. Installation needs root or administrator privilege
   a. On Linux
      i. rpm -i emcddbda-2.0.0.0-1.x86_64.rpm

*** Important information for completing your DDBDA installation: ***
---------------------------------------------------------------------
If you wish to grant a DBA group write access to the lockbox for registration and unregistration of the Data Domain systems, and for lockbox update, then run ddbmadmin -L.
---------------------------------------------------------------------
If you wish to use an existing lockbox in a nondefault directory, then run ddbmadmin -U as the root user after the installation to update the lockbox.
---------------------------------------------------------------------
Depending on the database or application that you want to protect with DDBDA, there might be additional post-install steps you have to perform. Refer to the installation instructions in the DDBDA administration guide.

b. On Windows
   i. Run the Windows installer, EMCDDBMA64.msi, and follow the instructions provided by the installation wizard.

Data Domain Setup

Prerequisites

1. Ensure that the following ports are open if there are firewalls:
   ✴ TCP 2049 (NFS)
   ✴ TCP 2051 (Replication)
   ✴ TCP 111 (NFS portmapper)
   ✴ TCP xxx (select a port for NFS mountd, where the default MOUNTD port is 2052)

2. From a putty session to the DD ensure that DDboost is licensed.

```
# license show
Feature licenses:
## License Key          Feature
  1 ABCD-EFGH-IJKL-MNOP  DDBOOST
```
Ethernet and Fibre Channel Setup Requirements

We first need to create a Logical Storage Unit. This is the “directory” that the DB2 backup will reside on the Data Domain. It is just a logical “bucket” because all data on the Data Domain is globally deduplicated.

The DB2 administrator needs the following parameters from the Data Domain Administrator:

- Data Domain 10Gbps DNS name or IP address
- Logical Storage Unit Name (LSU)
- DDboost Userid
- DDboost password
- Fibre Channel Service Name (if being used)

NOTE: these are all case sensitive and make note of them because you will need them in the Section Titled Configuration Files for DB2 DDboost on page 17.

In this section we will setup all these entities.

1. In the Data Domain GUI go to Data Management > DDboost > Storage Units
2. Create a separate DDboost Userid and password.
   a. With DDOS 5.5 you have the ability to use different ddboost userids for different LSUs. DB2 is utilizing its own ddboost userid called db2ddboost.
   b. With DDOS 5.4 or less, you have the ability to create only one DDboost userid and Password.
   c. It is recommended to exclude this userid from password change requirements.
      i. otherwise you will have to do the lockbox registration every time it is changed.
   d. LADP or Active Directory is not supported with the DDboost userid.
      i. They are separate protocols (CIFS and DDBOOST) and do not share authentication methods.

From the GUI, click on System Settings > Access Management > Local Users and click on Create.

You only need a User Management Role.

3. Setup a DB2 DDboost Logical Storage Unit.
   a. In this example it is called db2boost.
It is recommended to use different LSUs for different types of Data Domain Data. As you can see in the example above, Avamar, Hana, Networker, Oracle and SQL, all have their own LSU. Segregation of the LSUs provides three abilities:

i. To see the deduplication rate per data type.
ii. To replicate at a datatype level.
   a. in other words, you could have db2prod and db2dev and replicate prod and not dev.
   b. the lowest granularity for replication is the LSU.
iii. And lastly, the ability to define different userids and passwords per LSU for tighter security per datatype.

Notice that under Client we have a *. This allows any client to utilize the Data Domain if it has the correct credentials with the DDboost userid and password.
- If you wish further security, the DDboost server name can be detailed here instead of the *. This then allows only these servers to have access to the Data Domain with the correct credentials.

**Putty commands for Data Domain Setup**

```
user add db2ddboost password Password priv user
ddboost set user-name db2ddboost
ddboost enable
ddboost storage-unit create db2boost user db2ddboost
```

**Fibre Channel Only**

DD OS release 5.3 introduces the alternative transport mechanism through Fibre Channel. Although Fibre Channel is specified as a general-purpose data transport mechanism, you can use Fibre Channel solely as a transport for SCSI device access in practice. With the DD Boost-over-FC solution, the Data Domain system advertises one or more SCSI devices of the Processor type. The database server operating system discovers the devices and makes them available to applications through a generic SCSI mechanism (SCSI Generic driver on Linux, SCSI Pass-Through Interface on Windows).

To request access to a Data Domain system by using the DD Boost-over-FC transport, the application specifies the Data Domain system by using the special string DFC-dfc_server_name. dfc_server_name is the DD Boost-over-FC server...
name that is configured for the Data Domain system. The DD Boost-over-FC transport logic within the DD Boost library examines the set of generic SCSI devices available on the database server and uses SCSI commands to identify a catalog of devices which are pathnames of the SCSI devices that the database server operating system discovers.

The DD Boost-over-FC transport logic issues SCSI commands to the identified generic SCSI devices, to transfer Data Domain Boost protocol requests and responses between the library and the Data Domain system.

**Things to Note:**
- DDBoost over FC does NOT use TAPE devices. It doesn’t respond to standard tape commands. DFC devices are ‘PROCESSOR’ devices. DFC responds only to a very limited set of SCSI commands. It should not interfere with primary storage.
- The Data Domain system must have an HBA that the DD Boost-over-FC service supports.
  - This HBA cannot be shared with VTL traffic.
- Please read the compatibility guide to ensure that your operating system is supported.
- Pay attention if Powerpath is in use. If you see issues with recognizing the new DFC device(s) on the windows server disable PowerPath Migration Enabler.
- Should you use FC over IP?
  - Functionally they are the same.
  - Fibre Channel is 10 to 15% faster.
  - If you don’t need to separate your backup traffic from your production LAN, then the extra administration and cost (HBAs) are not worth implementing.

1. Make sure that you have zoned the DB2 server to the Data Domain HBA or otherwise called endpoints.
2. It is required to define DDboost Access Groups and define these paths.
   a. Go to Data Management > DDboost > Fibre Channel in the System Manager GUI.

The number of DDboost devices to be used by the group determines which devices the initiator can discover and therefore, the amount of I/O paths to the Data Domain system. The default is one, minimum is one and the maximum is 64.

3. Create a group and put one initiator in each group. This assumes that the initiators for the DB2 server have been zoned and defined (db2-02-fc-0 and db2-02-fc-1) as well as the endpoints (HBAs on the Data Domain – endpoint-fc-1 and endpoint-fc-0).
Once the Data Domain HBA’s are zoned to the Server HBA’s, you should see them at the Operating System level. This shows that there are 2 paths defined here.

**Putty commands for Data Domain Setup of Fibre**

4. From a Data Domain Putty session the following commands will do the actions that the GUI showed above:

   ```
   ddbboost option set fc enabled
   ddbboost fc dfc-server-name show
   ddbboost fc group create db2-02-fc-0
   ddbboost fc group create db2-02-fc-1
   ddbboost fc group modify db2-02-fc-0 device-set count 1 endpoint endpoint-fc-0
   ddbboost fc group modify db2-02-fc-1 device-set count 1 endpoint endpoint-fc-1
   ddbboost fc group add db2-02-fc-0 initiator “db2-02-fc-0”
   ddbboost fc group add db2-02-fc-1 initiator “db2-02-fc-1”
   ```

   This assumes that the initiators db2-02-fc-0 and db2-02-fc-1 and endpoints had already been defined.

5. And to view the information:

   ```
   ddbboost fc group show list
   ```

   ```
   EMC1314@BSG10045# ddbboost fc group show list
   DDBoost FC Group Name   # Initiators   # Devices
   ---------------------   ---------   ------
   bsg05045-fc-0          0           1
   bsg05045-fc-1          0           1
   ```

**Linux Specifics for FC**

6. EMC Support has a very nice tool called ddpconnchk which helps check the DFC status. Run the command with root authority and it will discover the DFC devices.

   ```
   ./ddpconnchk -D scan_all
   ```
a. Make sure that the new devices that you find with the ddpconnchk testing tool can be seen by the db2 userid. If not, then the device can’t be seen and DB2 backup will fail with an error SQL2062N An error occurred while accessing media "/usr/lib/ddbda/lib64/libddboostdb2.so". Reason code: "0".

In this example, we set permission for these devices for group db2iadm in which the DB2 userid was a member.

Devices:
/dev/sg65, sg63, sg4, sg3

b. Since on reboot ownership of these devices will revert to root, it is necessary to create a file in the /etc/udev/rules.d directory with the rule to set permissions on the Fibre Channel devices for the DB2 Group ID to access the devices.

Here is an example that sets the group permissions for DFC devices to Unix group "dbaiadm".

```
KERNEL=="sg[0-9]*/", ATTRS{vendor}=="EMC*", ATTRS{model}=="DataDomain DFC*", GROUP="dbaiadm"
```

Run the udevadm trigger command to set the permissions
```
# udevadm trigger
```

c. List devices to ensure the designated group has been granted read and write permissions
```
# ls -l /dev/sg*
```
```
crw-rw---- 1 root dbaiadm 21, 10 Jul 26 12:36 /dev/sg3
crw-rw---- 1 root dbaiadm 21, 11 Jul 26 12:36 /dev/sg4
crw-rw---- 1 root dbaiadm 21, 11 Jul 26 12:36 /dev/sg65
crw-rw---- 1 root dbaiadm 21, 11 Jul 26 12:36 /dev/sg63
```

d. If you can’t see them, then do a scan and the devices will be discovered. You can create a little scan tool called dfcscan.sh with these lines and run it.
```
#!/bin/ksh

for i in /sys/class/scsi_host/host*
do
echo $i
echo "" > $i/scandone
```

e. Use the ddpconnchk testing tool again to confirm device names.

7. For Windows, Open up Device Manager and rescan devices and you should see the following:
Testing Connectivity

So in conclusion, the DB2 administrator needs the following parameters from the Data Domain Administrator. In our example they are:

- Data Domain 10Gbps DNS name or IP address: ddve-01
- Logical Storage Unit Name: db2boost
- DDboost Userid: db2ddboost
- DDboost password: Password
- Fibre Channel Service Name (if being used): ddve-01

8. To confirm connectivity for either Ethernet or Fibre, run the following command with the information from above. (full command detailed in Debugging section on page 32) This tests if firewall ports are open, logical storage unit, ddboost userid and password, are correct.

```
./ddpconnchk -s data.domain.name.com -u boost_userid -p password -l lsu_name
```

For example:

```
./ddpconnchk -s ddve-01 -u db2ddboost -p Password -l db2boost
```

DDP CLIENT LIBRARY VERSION 2:6:2:5-430104
SERVER: DB2-02
-----------------------
*** BASIC CONNECTIVITY TEST, DDVE-01
Basic DDP Connectivity Test PASSED
*** CONNECT SERVER TEST, DDVE-01
DDP Connect Server Test PASSED
*** LIST SUs TEST, DDVE-01
1 SUs total
List SUs Test PASSED
*** GET SU INFO TEST, DDVE-01/DB2BOOST
0 images total
Get SU Info Test PASSED
SUCCESS: All tests completed

If this command fails, please look to the Problem Determination /Troubleshooting Section on page 33.

Replication Setup

9. Lastly, if replication is required, then setup DDboost Replication via the Replication tab.
   a. Replication is done at an Mtree level.
   b. Make sure the Mtree name is the same on the secondary Data Domain.
   c. Do not create the Mtree on the secondary data domain, when you create the replication context, it will create the secondary mtree automatically for you.
In this example, three mtree replication contexts have been setup from ddve-01 to ddve-02. You can see that the context have sync’ed. If you go to your secondary Data Domain, you will see this mtree has been created as well. At this stage, no data will have been replicated because no backups have been taken yet.

10. If replication is configured, make sure that you put this information into the configuration file (on page 17) if you want a restore to automatically go to the secondary data domain if the primary Data Domain is not available.

**Putty commands for Data Domain Setup**

On the Destination Data Domain (in this example that is ddve-02)

```bash
replication add source mtree://ddve-01.brsvlab.local/data/coll/db2ddboost
destination mtree://ddve-02.brsvlab.local/data/coll/db2ddboost
```

On the Source Data Domain (in this example that is ddve-01)

```bash
replication add source mtree://ddve-01.brsvlab.local/data/coll/db2ddboost
destination mtree://ddve-02.brsvlab.local/data/coll/db2ddboost
```

And now you initialize the replication and it will create the mtree on the destination.

```bash
replication initialize mtree://ddve-02.brsvlab.local/data/coll/db2ddboost
```
Configuration Files for DB2 DDboost

DDboost for DB2 requires a Configuration file per DB2 Instance to be created. This configuration files identifies the Data Domain address, DDboost Path on the Data Domain on which you will put your backups (also called a Logical Storage Unit – LSU), the DDboost userid and the DB2 instance that you are backing up. This configuration file is used in the VENDOROPT and LOGARCHOPT parameters for the Database Instance.

Make sure that the name of your configuration file (including the @/path of config file/name of config file) is not longer than 30 characters.

1. Sample Configuration files can be found in: /opt/ddbda/config or C:\Program Files\EMC DD Boost\DA\bin\config

Sample db2.cfg configuration file

```bash
# #############################################################################
# # db2.cfg
# # All rights reserved.
# # Data Domain Boost for Databases and Applications 1.0
# # This template is designed to help users configure DB2 backup and restore
# # operations with Data Domain Boost for Databases and Applications. Additional
# # parameters may be added to the file when required.
# # Check the Data Domain Boost for Databases and Applications Administration
# # Guide for a complete list of all the supported parameters and rules for
# # editing the configuration file.
# # Make a copy of this file before making any modifications.
# # To enable a parameter, uncomment or add the parameter in the file and
# # specify its value.
# #############################################################################

# #############################################################################
# MANDATORY PARAMETERS (BACKUP AND RESTORE)
# #############################################################################

DEVICE_HOST = ddve-01
DEVICE_PATH = /db2boost
DDBOOST_USER = db2ddboost
DB2INSTANCE = db2inst1

#SOURCE_DBNAME =

# DEVICE_HOST: Specifies the Data Domain server hostname to use for
# backups and restores.
# DEVICE_PATH: Specifies the name of the Data Domain storage unit
# or a top-level directory within the storage unit to
# be used in the Data Domain Boost backup or restore.
# DDBOOST_USER: Specifies the name of the Data Domain Boost user as defined
# on the Data Domain server that is specified in
```
DEVICE_HOST.

# DB2INSTANCE: Specifies the name of the source DB2 instance used for the backup of the database or archived logs. Mandatory for a DB2 restore, recovery, and rollforward operation.

# SOURCE_DBNAME: Specifies the name of the source DB2 database used for the backup of the database or archived logs. Mandatory for a database restore to a different database and for a recovery and rollforward operation to a different database.

# CLIENT =
# LOCKBOX_PATH =
# DDBOOST_FC =
# DEVICE_FC_SERVICE =

CLIENT: Specifies the hostname of the local client that will be used to store the save sets and index entries. Set this parameter to the virtual hostname in a cluster or to the same hostname for all nodes in a DB2 DPF environment.

LOCKBOX_PATH: Specifies the pathname of the directory location of the lockbox that contains the Data Domain Boost user password.

DDBOOST_FC: FALSE (default) or TRUE. A TRUE setting specifies to use a Fibre Channel (FC) connection for the data transfer. A FALSE setting or no setting specifies to use a TCP/IP connection.

DEVICE_FC_SERVICE: Specifies the name of the FC service on the Data Domain server. The setting is mandatory when DDBOOST_FC is set to TRUE.

# DEVICE_HOST_SECONDARY =
# DEVICE_PATH_SECONDARY =
# DDBOOST_USER_SECONDARY =
# DDBOOST_FC_SECONDARY =
# DEVICE_FC_SERVICE_SECONDARY =

DEVICE_HOST_SECONDARY: Specifies the hostname of the Data Domain server where backups from the primary Data Domain server are replicated. This host will only be used for failover during restore operations.

DEVICE_PATH_SECONDARY: Specifies the name of the Data Domain storage unit or a top-level directory within the storage unit on the Data Domain server specified by DEVICE_HOST_SECONDARY that has been replicated from the primary Data Domain server. The specified storage unit will be used in the Data Domain Boost restore.

DDBOOST_USER_SECONDARY: Specifies the name of the Data Domain Boost user as defined on the Data Domain server that is specified in DEVICE_HOST_SECONDARY.

DDBOOST_FC_SECONDARY: FALSE (default) or TRUE. A TRUE setting specifies to use a Fibre Channel (FC) connection for the data transfer. A FALSE setting or no setting specifies to
use a TCP/IP connection.

# DEVICE_FC_SERVICE_SECONDARY: Specifies the name of the FC service on the Data Domain server specified by DEVICE_HOST_SECONDARY. The setting is mandatory when DDBOOST_FC_SECONDARY is set to TRUE.

### Mandatory for Backup for Ethernet

2. Using the details from the Data Domain Setup, you fill out the configuration file.

```
DEVICE_HOST=ddve-01
DEVICE_PATH=/db2boost
DDBOOST_USER=db2ddboost
DB2INSTANCE=db2inst1
```

### Mandatory for Backup for Fibre Channel

```
DEVICE_HOST=ddve-01
DEVICE_PATH=/db2boost
DDBOOST_USER=db2ddboost
DB2INSTANCE=db2inst1
DDBOOST_FC=TRUE
DEVICE_FC_SERVICE=BSG10053
```

From putty to the Data Domain, you can use this command:
```
ddboost fc dfc-server-name show
```
Mandatory For Redirect Restores

3. Source_DBNAME is required for redirected restore but is not needed in backups.

Note for Source_DBNAME:

Even if you are not redirecting a restore, the parameter will be used AND can cause issues with logging recovery.

So make sure that you put the DB name in upper case. The value of this parameter is used in xbsa indexing and is usually in upper case as input from DB2.

SOURCE_DBNAME = CUSTOMER

When the parameter is set, DDBDA (XBSA level) will use the name (in lower case) to search for the log. But the indexing done during the backup is normally done with the dbname in upper case, and this will cause a mis-match.

➢ To avoid this situation all together, don’t use the SOURCE_DBNAME or CLIENT option unless you are doing redirected restores.

4. You need to put in the client option. Make sure you put in the fully qualified name if a DNS is used. If you don’t when, you do a redirect restore the command will fail stating it can’t find the media. It will be due most likely to the fact that the client name is wrong.

# OPTIONAL PARAMETERS (BACKUP AND RESTORE)

CLIENT = db2-01

Create Lockbox

1. The lockbox stores the DDboost password (encrypted) so that you can connect to the DD. The configuration file must be created first because it is used in the lockbox creation.
   - Must run the lockbox creation as root or administrator
   - Configuration file must be created (as on page 17)

2. The lockbox file used by DDBDA is named ddbmadmin.lb. The default directory location of the lockbox file is as follows:
   - On UNIX or Linux: /opt/ddbda/config/lockbox, which is linked to the directory /var/opt/ddbda/lockbox
   - On Windows: C:\Program Files\EMC DD Boost\DA\config\lockbox

3. The root or administrative user must have read and write permissions to the lockbox, and all the database users must have at least the read permission to the lockbox.
   a. On Windows, the administrative user must run the ddbmadmin command to perform all the lockbox operations. The lockbox group ownership cannot be changed on Windows.
   b. On UNIX, the root user can run the ddbmadmin command to perform all the lockbox operations. If the UNIX root user assigns the lockbox group ownership to a DBA group, the group users can also run ddbmadmin to perform the following lockbox operations:
      i. Register a Data Domain system with the lockbox.
ii. Unregister a Data Domain system.
iii. Update the lockbox configuration.

C. On UNIX, only the root user can perform the following lockbox operations:
   i. Create the lockbox on the database host to be used for backups or restores.
   ii. Change the lockbox group ownership.
   iii. Grant lockbox access to a specific host.
   iv. Revoke lockbox access from a specific host.

4. If the DDboost userid or password, configuration file or Data Domain address should change, then the lockbox creation must be run again.

5. Create the lockbox
   a. ddbmadmin executable can be found in /opt/ddbda/bin or C:\Program Files\EMC DD Boost\DA\bin
   b. You need to know the db2 group id if you are not accepting the default of the root group.

```
more /etc/group

db2iadm1:x:102:
```

```
./ddbmadmin -L
```

Provide full pathname for the lockbox, or press Enter to accept the default directory (/var/opt/ddbda/lockbox):
Using the default pathname '/var/opt/ddbda/lockbox' for lockbox.

Provide a group ID for lockbox ownership, or type 0 to accept the 'root user' group as the lockbox owner: 102

Lockbox has been successfully created in the directory '/var/opt/ddbda/lockbox' with group ownership 102.

6. If you would like to check, go to /var/opt/ddbda/lockbox and confirm the group ownership.

```
[root@db2-02 lockbox]# pwd
/var/opt/ddbda/lockbox
[root@db2-02 lockbox]# ls -ltr
total 16
-rw-rw-r--. 1 root db2iadm1 3394 Jun  5 09:52 ddbmadmin.lb
-rw-rw-r--. 1 root db2iadm1  4 Jun  5 09:52 ddbmadmin.lb.FCD
-rw-rw-r--. 1 root db2iadm1 3394 Jun  5 09:52 ddbmadmin.lb.bak
-rw-rw-r--. 1 root db2iadm1  3 Jun  5 09:52 ddbmadmin.lb.bak.FCD
```

7. Now add to the lockbox the Data Domain (s) that this DB2 server will be backing up to.

```
/opt/ddbda/bin/ddbmadmin -P -z /opt/ddbda/config/db2.cfg
```

```
[root@db2-02 bin]# /opt/ddbda/bin/ddbmadmin -P -z /opt/ddbda/config/db2.cfg
Performing the registration of the device host 'ddve-01' for DD Boost user 'db2ddboost'.

Enter password:

Confirm password:

Logging in to the device host 'ddve-01' with DD Boost credentials.
libDDBoost version: major: 3, minor: 1, patch: 0, engineering: 0, build: 475365
Logging in to the device host 'ddve-01' with DD Boost credentials was successful.

Lockbox directory is '/var/opt/ddbda/lockbox'.
Device host 'ddve-01' for DD Boost user 'db2ddboost' has been registered in the lockbox.
Set VENDOROPT

8. Now it is necessary to set the DB2 backup utility parameters, VENDOROPT and LOGARCHOPT.
   a. use the configuration file that you created on Page 17.
   b. As an example for the Database called CUSTOMER using the configuration file called db2.cfg found in 
      /opt/ddbda/config.
      i. Make sure you include the “@”.
      ii. Also needs to be run with the db2 userid.

   db2 update db cfg for CUSTOMER using vendoropt @/opt/ddbda/config/db2.cfg

   ➢ Ensure that VENDOROPT has been set by running:

   db2 get db cfg for CUSTOMER | grep VENDOROPT

   ➢ db2 get db cfg for CUSTOMER | grep VENDOR

   db2inst1@db2-01:~> db2 get db cfg for CUSTOMER | grep VENDOR
   First log archive method (LOGARCHMETH1) = VENDOR:
   /usr/lib/ddbda/lib64/libddboostdb2.so
   Vendor options (VENDOROPT) = @/opt/ddbda/config/db2.cfg

9. Now set the LOGARCHOPT parameters
   a. This is required to point the log backup to the Data Domain.

Set up Automatic log backup (LOGARCHMETH)

   db2 update db cfg for CUSTOMER using logarchmeth1
   VENDOR:/usr/lib/ddbda/lib64/libddboostdb2.so logarchopt1
   @/opt/ddbda/config/db2.cfg

   ➢ Ensure that LOGARCHMETH has been set by running:

   db2 get db cfg for CUSTOMER | grep LOGARCH

   [db2inst1@db2-02 scripts]$ db2 get db cfg for CUSTOMER | grep LOGARCH
   First log archive method (LOGARCHMETH1) = VENDOR:/usr/lib/ddbda/lib64/libddboostdb2.so
   Archive compression for logarchmeth1 (LOGARCHCOMPR1) = OFF
   Options for logarchmeth1 (LOGARCHOPT1) = @/opt/ddbda/config/db2.cfg
   Second log archive method (LOGARCHMETH2) = OFF
   Archive compression for logarchmeth2 (LOGARCHCOMPR2) = OFF
   Options for logarchmeth2 (LOGARCHOPT2) =

10. Restart the DB to activate these changes.

    db2 force applications all
    db2 deactivate db CUSTOMER
    db2 activate db CUSTOMER
Setup Retention

1. Now that DB2 is controlling the retention, it is important to set the retention policies within the DB2 database such that when you run the prune history command, the correct versions will be retained.

In this example DB2 is keeping 14 versions.

```sql
db2 update db cfg for CUSTOMER using num_db_backups 14
db2 update db cfg for CUSTOMER using rec_his_retentn 14
db2 update db cfg for CUSTOMER using auto_del_rec_obj on
```

2. To view the settings:

```sql
db2 get db cfg for CUSTOMER | grep -i rec
db2 get db cfg for CUSTOMER | grep -i num_db
```

```
Log retain for recovery status = NO
Percent log file reclaimed before soft chkpt (SOFTMAX) = 0
Index re-creation time and redo index build (INDEXREC) = SYSTEM (RESTART)
Default number of loadrec sessions (DFT_LOADREC_SES) = 1
Recovery history retention (days) (REC_HIS_RETENTN) = 14
Auto deletion of recovery objects (AUTO_DEL_REC_OBJ) = ON
```

3. DB2 is in control of its history as set in point 1 and 2 above and you can view the backups for a certain DB2 database with the following command.

   a. Notice that the history will show that DDboost is being used for the backup and whether it is an online or offline backup.

   ```
   EID: 337 Location: /usr/lib/ddbda/lib64/libddboostdb2.so
   db2 list history backup all for CUSTOMER
   ```

   ```
   Op Obj Timestamp+Sequence Type Dev Earliest Log Current Log  Backup ID
   -- --- ------------------ ---- --- ------------------ ---------------
   B D 20140408094903004 N O S0000172.LOG S0000172.LOG
   ```

   Contains 8 tablespace(s):

   ```
   00001 SYSCATSPACE
   00002 USERSPACE1
   00003 IBMDB2SAMPLEREL
   00004 IBMDB2SAMPLEREL1
   00005 SYSTOOLSPACE
   00006 IBMDB2SAMPLEREL2
   00007 IBMDB2SAMPLEREL3
   00008 IBMDB2SAMPLEREL3
   ```

   Comment: DB2 BACKUP CUSTOMER ONLINE
   Start Time: 20140408094903
End Time: 20140408094904
Status: A
---------------------------------------------------------------
EID: 337 Location: /usr/lib/ddbda/lib64/libddboostdb2.so

4. To control the size of the history file and the number of backups contained on the Data Domain, it is necessary to prune the DB2 history with the prune command. Based on what you set for the parameters in point 1, the prune command will leave only 14 days of backups, as in this example, in your history list.

db2 prune history and delete

Multiple versions

5. If it is necessary to save backups beyond 14 days, you can use the UPDATE HISTORY command in DB2. For more information please look to the IBM manual found at:


Command syntax

```bash
>>-UPDATE HISTORY----FOR--object-part+++WITH------------------------
    '-EID--eid--------'

>+++LOCATION--new-location--DEVICE TYPE--new-device-type++++>
   +COMMENT--new-comment-----------------------------------
   '-STATUS--new-status-----------------------------------'

STATUS new-status

Specifies a new status for an entry. Only backup entries can have their status updated. Valid values are:

A
Active. The backup image is on the active log chain. Most entries are active.

I
Inactive. Backup images that no longer correspond to the current log sequence, also called the current log chain, are flagged as inactive.

E
Expired. Backup images that are no longer required, because there are more than NUM_DB_BACKUPS active images, are flagged as expired.

D
Deleted. Backup images that are no longer available for recovery should be marked as having been deleted.

X
Do not delete. Recovery database history records file entries that are marked DB2HISTORY_STATUS_DO_NOT_DELETE will not be pruned by calls to the PRUNE HISTORY command, running the ADMIN_CMD procedure with PRUNE HISTORY, calls to the db2Prune API, or automated recovery database history records pruning. You can use the DB2HISTORY_STATUS_DO_NOT_DELETE status to protect key recovery file entries from being pruned and the recovery objects associated with them from being deleted. Only log files, backup images, and load copy images can be marked as DB2HISTORY_STATUS_DO_NOT_DELETE.
Backup Samples

As a reminder, make sure that the name of your configuration file (including the @/path of config file/name of config file) is not longer than 30 characters in total.

Via 10G

db2 backup db CUSTOMER online load /usr/lib/ddbda/lib64/libddboostdb2.so open 2 sessions options @/opt/ddbda/config/db2.cfg
   - only backs up the 1st partition

db2 backup db CUSTOMER ON ALL DBPARTITIONNUMS online load /usr/lib/ddbda/lib64/libddboostdb2.so open 2 sessions options @/opt/ddbda/config/db2.cfg dedup_device
   - going to back up all 4 partitions

Or by Tablespace:

db2 backup database CUSTOMER tablespace (syscatspace, userspace1) online load/usr/lib/ddbda/lib64/libddboostdb2.so open 2 session options @/opt/ddbda/config/db2.cfg dedup_device

db2 update db cfg for CUSTOMER using TRACKMOD ON

db2 "backup db CUSTOMER online incremental load /usr/lib/ddbda/lib64/libddboostdb2.so open 4 sessions options @/opt/ddbda/config/db2.cfg dedup_device"

db2 "backup db CUSTOMER ON ALL DBPARTITIONNUMS online incremental load /usr/lib/ddbda/lib64/libddboostdb2.so open 2 sessions options @/opt/ddbda/config/db2.cfg dedup_device"

Backup via FC

For Fibre Channel, you need to use the configuration file that contains the FC information as shown on page 19.

db2 "backup db CUSTOMER online load /usr/lib/ddbda/lib64/libddboostdb2.so open 4 sessions options @/opt/ddbda/config/db2.fc.cfg dedup_device"
   - only backs up the 1st partition

db2 "backup db CUSTOMER ON ALL DBPARTITIONNUMS online load /usr/lib/ddbda/lib64/libddboostdb2.so open 2 sessions options @/opt/ddbda/config/db2.fc.cfg dedup_device"
   - going to back up all 4 partitions
Restoring Samples

DB2 Sample Full Restore

db2 restore database CUSTOMER load /usr/lib/ddbda/lib64/libddboostdb2.so open 2 sessions options @/opt/ddbda/config/db2.cfg

db2 rollforward database CUSTOMER to end of logs and complete

Rollforward Status

Input database alias = CUSTOMER
Number of members have returned status = 1

Member ID = 0
Rollforward status = not pending
Next log file to be read =
Log files processed = S0000283.LOG - S0000284.LOG
Last committed transaction = 2015-05-14-16.12.13.000000 UTC

DB20000I  The ROLLFORWARD command completed successfully.

DB2 Log Recovery to OverFlow Disk

db2 restore db CUSTOMER load /usr/lib/ddbda/lib64/libddboostdb2.so open 1 sessions options @/opt/ddbda/config/db2.cfg taken at 20150515103444  LOGTARGET '/db2_log/rest_logs'

db2 "rollforward database CUSTOMER to end of logs and complete OVERFLOW LOG PATH (/db2_log/rest_logs) noretrieve"

DB2 Redirect Restore

1. For Redirect Restores

You need to put in the client option.

CLIENT = db2-01

2. And you need the SOURCE_DBNAME

Make sure that you put the DB name in upper case. The value of this parameter is used in xbsa indexing and is usually in upper case as input from DB2.

SOURCE_DBNAME = CUSTOMER

3. If in a real disaster recovery (DR) situation and you need to recover one DB2 server to another one, you need to have the CLIENT option listed in the configuration file and it must be set to the source DB2 server. What is important to understand is if this is a real DR situation and you then need to start backing up from the secondary DB2 server (in our example db2-01), the CLIENT option now can cause an issue BECAUSE it still has the primary
DB2 server name (db2-02) listed in it. This will cause the secondary DB2 server to backup into the primary DB server’s directory on the Data Domain.

a. So to avoid this situation in the DR environment, it is best to have two sets of configuration files so that you use one for DR redirected restore and then another one for production DR backup. The DR Backup would not use the CLIENT option OR you would have changed it to the DR Backup Server’s name (db2-01).

b. Another mtree can also be setup for DR backup and that would avoid this CLIENT option situation as well.

Configuration files for redirect restore

Redirect restore CUSTOMER backup from db2-02 to RR-CUST on db2-01

```
restore db CUSTOMER load /usr/lib/ddbda/lib64/libddboostdb2.so open 2 sessions options @/opt/ddbda/config/db2rr.cfg taken at 20140515084127 into RR-CUST newlogpath /home/db2inst1/rr-cust replace existing redirect without rolling forward without prompting
```

SQL1277W A redirected restore operation is being performed. Table space configuration can now be viewed and table spaces that do not use automatic storage can have their containers reconfigured.

DB20000I The RESTORE DATABASE command completed successfully.

```
db2rr.cfg
DEVICE_HOST =ddve-01
DEVICE_PATH=/db2ddboost
DDBOOST_USER=db2boost
DB2INSTANCE=db2inst1
SOURCE_DBNAME =CUSTOMER
CLIENT =db2-02
```

- Then run the rollforward.
- After the rollforward, ensure that you update the LOGARCHOPT to the new configuration file that is used by the redirected server. This configuration file does not need the SOURCE_DBNAME or CLIENT parameter.

```
db2 update db cfg for TEST using logarchopt1 @/home/db2inst2/ddbda_db2.restore.cfg
```

Redirected restore for logs

This example restores the logs via DDboost to an overflow local disk location on db2-02 and then applies the logs from there.

```
db2 restore db CUSTOMER load /usr/lib/ddbda/lib64/libddboostdb2.so open 2 sessions options @/opt/ddbda/config/db2.cfg taken at 2014030103444 LOGTARGET '/db2_log/db2adm1s/rest_logs'
```

```
db2 "rollforward database CUSTOMER to end of logs and complete OVERFLOW LOG PATH (/db2_log/db2adm1s/rest_logs) noretrieve"
```
Data Domain Commands

1. To list the clients that have accessed the Data Domain via DDboost
   a. shows the version of the plug-in that is being used

   **ddboost show connections**

```
sysadmin@ddve-01# ddboost show connections
Active Clients: 0

Client      Idle Plugin Version Application Version Encrypted OS Version Transport
------------ --------- -------------- -------------- ------ ----------------- -------
*           none      2.6.2.0-410681 Linux 3.0.76-0.11-default x86_64 Data D
sysadmin    YES       3.0.0.1-430231 Microsoft Windows Server 2012 (build 9200), 64-bit
            YES       Network 8.2.0.0.Build.445 (445) NO Unavailable Unavailable
```

2. **ddboost client show config**

```
sysadmin@ddve-01# ddboost clients show config
Client Encryption Strength Authentication Mode
------- --------------- -------------------
* none none
```

3. To show the statistics of DDboost
   a. This command will show on the far left the backup data that the DB2 server thinks it is sending and the second from the left is the post-comp amount, in other words, the actual data that DDboost is sending. The Backup Conn is the number of open sessions that were set in the DB2 backup command and the Restore Conn is the number of open sessions that were set in the DB2 restore command.

   **ddboost show stats interval 2**

```
Backup         Post-comp         Network         Restore          Network      Backup   Restore
KB/s           Written KB/s      In KB/s          KB/s           Out KB/s      Conn     Conn
--------------- --------------- --------------- --------------- --------------- ------- -------
91,488         1,608           1,609           0               0               1       0
79,808         535            536            0               0               2       0
60,343         35             35             0               0               2       0
46,694         11             11             0               0               2       0
```
4. Show compression per mtree
   a. This command is very good to see how deduplication and backup amounts change over a monthly period.

   sysadmin@ddve-01# mtree show compression /data/col1/db2boost daily-detailed

   From: 2015-05-02 12:00 To: 2015-06-05 12:00

<table>
<thead>
<tr>
<th></th>
<th>Pre-Comp</th>
<th>Post-Comp</th>
<th>Global-Comp Factor</th>
<th>Local-Comp Factor</th>
<th>Total-Comp Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Comp</td>
<td>(GiB)</td>
<td>(GiB)</td>
<td>Factor</td>
<td>Factor</td>
<td>Factor (Reduction %)</td>
</tr>
<tr>
<td>Written:</td>
<td>Last 34 days</td>
<td>9.9</td>
<td>0.0</td>
<td>61.8x</td>
<td>3.2x</td>
</tr>
<tr>
<td>Last 24 hrs</td>
<td>86.1</td>
<td>86.1</td>
<td>86.1</td>
<td>86.1</td>
<td></td>
</tr>
</tbody>
</table>

Key:
Pre-Comp = Data written before compression
Post-Comp = Storage used after compression
Global-Comp Factor = Pre-Comp / (Size after de-dupe)
Local-Comp Factor = (Size after de-dupe) / Post-Comp
Total-Comp Factor = Pre-Comp / Post-Comp
Reduction % = ((Pre-Comp - Post-Comp) / Pre-Comp) * 100

5. List the Fibre Channell Statistics

   scsitarget endpoint show stats count 25

   04/03 09:28:05
<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Ctrl/s</th>
<th>Read/s</th>
<th>Read MiB/s</th>
<th>Write/s</th>
<th>Write MiB/s</th>
</tr>
</thead>
</table>
6. List the Fibre Channel Endpoints/HBAs on the Data Domain

```bash
scsitarget endpoint show list
```

```
vanded@BSG10051# scsitarget endpoint show list
Endpoint        System Address   Transport      Enabled   Status
------------    ---------------    -------------    --------   -------
endpoint-fc-0   5a               FibreChannel     Yes       Online
endpoint-fc-1   5b               FibreChannel     Yes       Online
```

7. Show Data Domain statistics for the Fibre Channel
a. Shows specifically the fibre channel endpoint on the data domain that the data is going through

```bash
scsitarget endpoint show stats endpoint-fc-0 count 5
```

8. Disable a Fibre Channel HBA or endpoint

```bash
scsitarget endpoint disable endpoint-fc-1
```

```
vanded@BSG10053# scsitarget endpoint disable endpoint-fc-1
Endpoint 'endpoint-fc-1' successfully disabled.
```

9. System show performance on the DDR will output the number of streams running on the Data Domain and other performance indicators.
Debugging and Problem Determination

1. DDBEA generates operation and debug logs.

2. The default logging locations are:
   a. Unix/Linux: /opt/ddbda/logs
   b. Windows: c:\program files\EMC DD Boost Modules\DDBEA\logs
ddbmadmin.messages.log
   libddboostdb2_default.log
   ddboost_db2.messages.log
   xbsa.messages

3. There are debug levels that can be set in the configuration file.

   DIAGNOSTIC_DEST = d:\temp
   DEBUG_LEVEL = 9
   DPRINTF = TRUE/FALSE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default and valid values</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEBUG_LEVEL</td>
<td>Specifies whether the software writes debug messages to the debug log file, located in the directory specified by the DIAGNOSTIC_DEST parameter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: Use this parameter for debugging purposes with assistance from EMC Technical Support only.</td>
<td></td>
</tr>
<tr>
<td>DIAGNOSTIC_DEST</td>
<td>Specifies the directory location of the debug logs generated when the DEBUG_LEVEL parameter is set to 9.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: The operational logs generated during normal product operations are not affected by this parameter setting.</td>
<td></td>
</tr>
<tr>
<td>DPRINTF</td>
<td>Specifies whether the software writes additional debug messages to the debug log file.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: On Windows, this parameter is ignored for a DB2 multi session restore with the DEBUG_LEVEL parameter set to 9.</td>
<td></td>
</tr>
</tbody>
</table>

4. For DB2, the log is found in db2diag.log (under <db2_instance_home>/sqlib/db2dump).
**Testing tool – ddpconnchk.exe**

**Available from EMC Support**

**Usage**

```
Usage
-----

ddpconnchk
-s <server_name/ip>    # For primary server
-u <username>
-p <passwd>
-l <su_name>          # NOTE: Optional. Default for extended tests:

DDPCONNCHK_SU_SRC
-S <server_addr/ip>   # For destination server (opt-dup target)
-U <username>
-P <passwd>          # NOTE: will prompt if -U but not -P is specified
-L <su_name>        # NOTE: Optional. Default for extended tests:

DDPCONNCHK_SU_DST
-T optdup | writeimage # Select extended test
-i <image_size in k/m/g> # NOTE: Optional. Default 256KB. Max 5 GB. Only
                        # for extended tests
-n <num_streams>     # NOTE: Optional. Default 1. Only for extended
                        # tests
-v                    # Verbose output. Sets log level to DDP_INFO
-B                    # Use builtin DDP API (not libDDBoost)
```

```
/ddpconnchk -s data domain.name.com -u boost_u -p IBM DB2® -l ddboost -T writeimage -i 1G -n 10

-s - the data domain
-u is the DDBoss userid
-p is the DDBoss password
-T - puts in a test file to be sent to the DD
-n - number of streams
-i - is the size of the file so 1G is good.
-l - the LSU that you are sending the data to

It doesn’t create anything at all. Just generates a filestream to the DD and calculates the performance that can be expected.
```

```
/ddpconnchk -s ddve-01 -l db2ddboost -u db2boost -p Password -T writeimage -i 1G -n 10

SERVER: ddve-01
----------
*** BASIC CONNECTIVITY TEST, ddve-01
Basic DDP Connectivity TEST PASSED

*** CONNECT SERVER TEST, ddve-01
DDP Connect Server TEST PASSED

*** LIST SUs TEST, ddve-01
   5 SUs total
List SUs TEST PASSED

*** GET SU INFO TEST, ddve-01/db2ddboost
   5 images scanned. There may be more images in the storage-unit
```
Get SU Info TEST PASSED

*** EXTENDED TEST: WRITE IMAGE, ddve-01/db2ddboost/1073741824
Cumulative Write Throughput: 146.29 MB/s
Cumulative Read Throughput: 128.00 MB/s

WRITE IMAGE PASSED
SUCCESS: All TESTs completed

Problem Determination Hints and Tips

1. Error: Unable to log in to the device host 'ddve-01' with DD Boost credentials when creating the lockbox.
   a. Try ssh [ddboost userid]@[data domain address]

   [root@db2-02 bin]# ssh db2ddboost@ddve-01
   Data Domain OS
   Password:
   Last login: Tue Nov 18 19:31:23 EST 2014 from db2-01.brsvlab.local on pts/0

   Welcome to Data Domain OS 5.5.0.4-430231
   ----------------------------------------
   ** NOTICE: There are 3 outstanding alerts. Run "alerts show current"
   ** to display outstanding alert(s).

2. Ensure that the following ports are open in a firewall enable DD Boost backups and optimized duplication.
   • Try telnet'ing to the DD with these sockets and see if they work.
     ➢ TCP 2049 (NFS)
     ➢ TCP 2051 (Replication)
     ➢ TCP 111 (NFS portmapper)
     ➢ TCP xxx (select a port for NFS mountd, where the default MOUNTD port is 2052)

3. Can the backup script find the libraries?
   • ldd libddobk.so
   • ldd libDDBoost.so
   • If not found, what library is in the path? If not in the path, then create a link.
   • You may have to export the library as well.

4. Using the correct NIC card?

<table>
<thead>
<tr>
<th>Port</th>
<th>Speed</th>
<th>Duplex</th>
<th>Supp Speeds</th>
<th>Hardware Address</th>
<th>Physical</th>
<th>Link Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ethMa</td>
<td>1000Mb/s</td>
<td>full</td>
<td>10/100/1000</td>
<td>00:60:16:68:39:30</td>
<td>Copper</td>
<td>yes</td>
</tr>
<tr>
<td>eth4a</td>
<td>10Gb/s</td>
<td>full</td>
<td>10000</td>
<td>00:60:16:5b:a4:7e</td>
<td>Fiber</td>
<td>yes</td>
</tr>
<tr>
<td>eth4b</td>
<td>10Gb/s</td>
<td>full</td>
<td>10000</td>
<td>00:60:16:5b:a4:7f</td>
<td>Fiber</td>
<td>yes</td>
</tr>
</tbody>
</table>

If using ifgroups, then you can use the management port. It will be routed to the DDboost ifgroup network card automatically. SISL continues to go through the management port so it is wise to go directly to the 10Gbps NIC. Management port and ifgroups should be in a different subnet.

5. Can’t access media error when you do a backup?
   a. Check to make sure all the parameters in the Configuration file are correct.
      i. Logical Storage Unit = path
ii. Make sure you have the @ infront of the options parameter for the DB2 command
iii. Make sure the userid is correct
iv. If FC, does the DB2 userid have access to the DFC devices?

6. Can’t access media error when you do a restore?
   a. Using the correct configuration file?
   b. Is the SOURCE_DBNAME set and is it in capital letters?
   c. Do you have the CLIENT name set and is it defined for the DB2 server that did the backup?

7. Check the db2diag.log file.
   a. found <db2_instance_home>/sqlib/db2dump

8. SQL1268N Roll-forward recovery stopped due to error SQL2062

Best Practices

1. Create a different Mtree for longterm retention.
   a. Use the config file that would direct this type of backup to that mtree.
2. Do not have a DDboost userid that requires the password to be changed.
3. Open the same number of sessions that you are using today
   a. Be aware of the number of streams for the Data Domain
   b. Each node in the DB2 server will start up that number of streams so you can quickly use up the available streams on the Data Domain
4. Don’t compress if you can although row compression with DB2 can be deduplication friendly depending on the change rate. For example if you have a 10TB database and only 4 of the 50 tables are changing regularly, you will continue to see reasonable deduplication rates.
   b. Where you wouldn’t use dedup_device is if you have one very large tablespace and many small ones. dedup_device will prevent the tablespace from being broken up and spread over the open sessions.
      i. You will still get very good deduplication rate even if you don’t use this parameter.
5. Configuration parameters must have the “client definition” defined to be able to recover to a different Server.
   a. See page 11 for an example in setup DB2 DDboost Direct and FC.docx
6. DDboost is case-sensitive.
   a. The SOURCE_NAME is capitalized.
   b. DDboost userid and Device Path – spell exactly as setup.
7. DDboost is self-indexing so that means DDboost will understand where the backups are on the secondary Data Domain.
8. If you put the archive logs on the Data domain, the Failover archive log location should be set to a NAS drive so that backup can continue for the archive logs when the Data Domain is not available.
9. Create more tablespaces, spread tables to more tablespaces - to leverage parallelism & more # of streams
10. For redirect restores to another server:
    a. Install DDboost
    b. Ensure lockbox is registered in secondary site
    c. Look to the samples in the enclosed document named setup DB2 DDboost Direct and FC.docx
11. Create a different Mtree for different data types
12. For replication make sure the mtree on the secondary Data domain has the same name as the mtree on the primary.
13. To ensure a good deduplication rate, have at least 14 versions.
14. If you use a NFS or CIFS mount to the DDboost mtree, make sure it is Read Only.
15. If in a real disaster recovery (DR) situation and you need to recover one DB2 server to another one, you need to have the CLIENT option listed in the configuration file and it must be set to the source DB2 server. What is important to understand is if this is a real DR situation and you then need to start backing up from the secondary DB2 server (in our example db2-01), the CLIENT option now can cause an issue BECAUSE it still has the primary DB2 server name (db2-02) listed in it. This will cause the secondary DB2 server to backup into the primary DB server’s directory on the Data Domain.
   a. So to avoid this situation in the DR environment, it is best to have two sets of configuration files so that you use one for DR redirected restore and then another one for production DR backup. The DR Backup would not use the CLIENT option or you would have changed it to the DR Backup Server’s name (db2-01).
   b. Another mtree can also be setup for DR backup and that would avoid this CLIENT option situation as well.
17. Lockbox internally stores 7 system values to identify a host, and for DDBDA, at least 4 of them must match. Eventually the threshold falls below 4 (making lockbox inaccessible), so to avoid such cases, it is recommended to run ddbmadmin -U command (to update the system values in the lockbox for a host) periodically, or after each system restart.
18. Set Retention Policies within DB2
   a. db2 update db cfg for test using num_db_backups 2
   b. db2 update db cfg for test using rec_his_retentn 2
   c. db2 update db cfg for test using auto_del_rec_obj on
   d. Make sure that Delete and Expiration is done before the Garbage collection on the Data Domain
      i. Default Tuesday at 6am – DD Garbage collection

**Mounting the DDboost Mtree**

It is possible to create a NFS mount on the DDboost Mtree. This can be used to see backups that have been created. It is important to realize that the DDboost functionality does not require a mounted mtree and this can expose your backups to accidental deletion. Best practice is to make all mounts Read Only.

Windows will damage the ACLs on the DDboost LSU if R/W.

A DDBDA backup consists of backup save sets, where a save set is a collection of one or more saved files created during the backup session. A save file is an operating system file or block of data, the simplest object that you can back up or restore. A backup creates one or more save files within a save set. The number of sessions will determine the number of save sets created. These save sets can be viewed via the NFS mount.

As an example, you need to enable NFS on the mtree called /data/col1/db2boost from the Data Domain Management Console.
Once that is done, you can mount the mtree to your DB2 server.

mount ddve-01:/data/coll/db2boost db2boost

The directory structure is as follows:

- mount point name
- DB2 server names
- 27
- Database Instance Name
- Database Name
- NODE#
- DBIMG and DB2LOG

So as in this example it would like this:
If you go into the DBIMG, you will see the backup you have done in saveset format.

**ddbmadmin tool**

The ddbmadmin tool will provide reporting capabilities without the need of the NFS discussed above.

You can use the ddbmadmin program to perform any of the following operations:

- Display all the clients for a specified device path on the Data Domain system.
- Display information about the backup save sets.
- Display information about the save files.
- Delete the save sets created during a specified time interval.
- Upgrade the SAP Oracle backup index from DDBDA 1.0 to DDBDA 2.0.
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-b <em>start_time</em></td>
<td>Optional. Specifies the start of the time range, in a date and time format. “Date and time format used with the ddbmadmin command options” on page 79 provides details on the supported date and time formats for <em>start_time</em>. Without this option, the earliest backup time is used by default for the start of the time range.</td>
</tr>
<tr>
<td>-c</td>
<td>Optional. Specifies to run a deletion in a noninteractive mode. Without this option, the deletion is interactive by default.</td>
</tr>
<tr>
<td>-d</td>
<td>Specifies to perform a deletion of one or more backup save sets created during the specified time range.</td>
</tr>
<tr>
<td>-D 9</td>
<td>Generates debugging information during the command operation. The option is used to troubleshoot operational issues.</td>
</tr>
<tr>
<td>-e <em>end_time</em></td>
<td>Mandatory with other options except the -i and -u options. Specifies the end of the time range, in a date and time format. “Date and time format used with the ddbmadmin command options” on page 79 provides details on the supported date and time formats for <em>end_time</em>. Without this option, the latest backup time is used by default for the end of the time range.</td>
</tr>
<tr>
<td>-f</td>
<td>Specifies to display information about the backup save files created during the specified time range.</td>
</tr>
<tr>
<td>-i</td>
<td>Specifies to display all the clients for the device path of the DEVICE_PATH parameter in the DDBDA configuration file.</td>
</tr>
<tr>
<td>-n <em>application</em></td>
<td>Mandatory with all other options except the -i option. Specifies the application name to use for the deletion, display, or upgrade operation. A valid <em>application</em> value is <em>db2</em>, <em>oracle</em>, <em>saphana</em>, or <em>saporacle</em>.</td>
</tr>
<tr>
<td>-s</td>
<td>Specifies to display information about the backup save sets created during the specified time range.</td>
</tr>
<tr>
<td>-u</td>
<td>Specifies to upgrade a SAP Oracle backup index from the DDBDA 1.0 to DDBDA 2.0 index format. The backup namespace used in the index is changed from “backup” in DDBDA 1.0 to “saporacle” in DDBDA 2.0.</td>
</tr>
</tbody>
</table>
1. Delete saveset 139214103

   /home/db2inst1/software/ddbindexadmin -d 1392141035 -n db2 -z
   @/opt/ddbda/config/db2.cfg

2. Find the savesets associated with the DB2 history.
   a. First use the list history command with DB2.

   db2 list history backup all for CUSTOMER

   List History File for CUSTOMER

   Number of matching file entries = 1

   Op Obj Timestamp+Sequence Type Dev Earliest Log Current Log  Backup ID
   --- --- ------------------ --- --- ------------------ --- --- ------------------ --- --- ---
   B D 20150605181312002 N O S0000018.LOG S0000018.LOG

   Contains 3 tablespace(s):

   00001 SYSCATSPACE
   00002 USERSPACE1
   00003 SYSTOOLSPACE

   Comment: DB2 BACKUP CUSTOMER ONLINE
   Start Time: 20150605181312
   End Time: 20150605181359
   Status: A

   EID: 81 Location: /usr/lib/ddbda/lib64/libddboostdb2.so
b. Then using the ddbadmin tool:

```
[root@db2-02 bin]# ./ddbmadmin -f -v -n db2 -b "06/05/2015 06:13:00 PM" -e "06/05/2015 06:13:59 PM" db2 -z /opt/ddbda/config/db2.cfg
3:ddbmadmin:The parameter 'DB2INSTANCE' is being ignored.
libDDBoost version: major: 3, minor: 1, patch: 0, engineering: 0, build: 475365
/CUSTOMER/NODE0000:/DB_BACKUP.20150605181312.2, application = db2 (27), date = 1433542393
Fri 05 Jun 2015 06:13:13 PM EDT.
version=1, objectowner= DB2, objectname=/CUSTOMER/NODE0000 /DB_BACKUP.20150605181312.2, date=1433542393
Fri 05 Jun 2015 06:13:13 PM EDT.
```

Save set information:

```
Record file = /db2boost/db2-02.brsvlab.local/27/.DB2INST1/CUSTOMER/NODE0000/DBIMG/index/1433542392.rec.
client = db2-02.brsvlab.local, date and time = 06/05/2015 06:13:12 PM, size = 141204676,
ssid = 1433542392, name = DB2:/CUSTOMER/NODE0000
ssid=65b44d43-00000001-00000000-55721efb-55721ef8-52709756 (1433542392), date and
time=06/05/2015 06:13:12 PM (1433542392), host=db2-02.brsvlab.local,
name=DB2:/CUSTOMER/NODE0000, continuedfrom=0, level=full, sflags=0, size=141204676,
files=1, insert=06/05/2015, create=06/05/2015, complete=06/05/2015, browse=forever,
retent=forever, clientid=0, attrs=
*ACTUAL_HOST: db2-02.brsvlab.local;
*ss data domain backup cloneid: 1433542392;
*ss data domain dedup statistics: "v1:1433542392:1416584256:39439749:10157616";
index subspace: DB2INST1/CUSTOMER/NODE0000/DBIMG;
record file name: /db2boost/db2-02.brsvlab.local/27/.DB2INST1/CUSTOMER/NODE0000/DBIMG/index/1433542392.rec;
, clones=0
```

The DB2 sequence number is **20150605181312** and the corresponding saveset name that DDboost uses is **1433542393**. With a further option, you can see what file on the DD refers to this number. It is highlighted below.

```
[root@db2-02 bin]# ./ddbmadmin -s -v -n db2 -b "06/05/2015 06:13:00 PM" -e "06/05/2015 06:13:59 PM" db2 -z /opt/ddbda/config/db2.cfg
3:ddbmadmin:The parameter 'DB2INSTANCE' is being ignored.
libDDBoost version: major: 3, minor: 1, patch: 0, engineering: 0, build: 475365
Save set information:
```

Record file = /db2boost/db2-02.brsvlab.local/27/.DB2INST1/CUSTOMER/NODE0000/DBIMG/index/1433542392.rec.
client = db2-02.brsvlab.local, date and time = 06/05/2015 06:13:12 PM, size = 141204676,
ssid = 1433542392, name = DB2:/CUSTOMER/NODE0000
ssid=65bdad43-00000001-00000000-55721efb-55721ef8-52709756 (1433542392), date and
time=06/05/2015 06:13:12 PM (1433542392), host=db2-02.brsvlab.local,
name=DB2:/CUSTOMER/NODE0000, continuedfrom=0, level=full, sflags=0, size=141204676,
files=1, insert=06/05/2015, create=06/05/2015, complete=06/05/2015, browse=forever,
retent=forever, clientid=0, attrs=
*ACTUAL_HOST: db2-02.brsvlab.local;
```
*ss data domain backup cloneid: 1433542392;
*ss data domain dedup statistics: "v1:1433542393:1162322064:14872389:4692778";
index subspace: DB2INST1/CUSTOMER/NODE0000/DBIMG;
record file name: /db2boost/db2-02.brsvlab.local/27./DB2INST1/CUSTOMER/NODE0000/DBIMG/index/1433542393.rec;
clones=0
Total number of save sets = 2.

Handy DB2 Commands

http://pic.dhe.ibm.com/infocenter/db2luw/v9r8/nav/3_4_2_4

1. **To Connect to a DB**
   
   db2 connect to CUSTOMER

2. **Query DB2 Instance Name**
   
   db2inst1@db2-01:~> db2ilist
db2inst1

3. **Backup from CLI**
   
   db2 backup db CUSTOMER online load /usr/lib/libnsrdb2.so options @/nsr/apps/config/db2.cfg dedup_device

4. **Restore**
   
   db2 restore database CUSTOMER load /usr/lib/libnsrdb2.so open 2 sessions options @/nsr/apps/config/db2.cfg
then Rollforward

   db2 rollforward database CUSTOMER to end of logs and complete

5. **List History**
   
   db2 list history backup since 20141016170000 for CUSTOMER

Lists all backups and restore since yyyymmddhhmmss (so this is listing all backups since Oct 16, 2014 at 5 oclock).

6. **Prune History**
   
   db2 prune history 201501111842

Where 201501111842 is a timestamp that you want to delete up to.

Op Obj Timestamp+Sequence Type Dev Earliest Log Current Log Backup ID
-- --- ----------------- --- ----------------- ---------------
B  D  20150111184230001  N  O  S0000019.LOG  S0000019.LOG

--------------------------------------------------------------------
Contains 3 tablespace(s):

00001 SYSCATSPACE
00002 USRSPACE1
00003 SYSTOOLSPACE

--------------------
Comment: DB2 BACKUP CUSTOMER ONLINE
Start Time: 20150111184230
End Time: 20150111184328
Status: A
--------------------

EID: 47 Location: /usr/lib/libnsrdb2.so

7. checking vendoropt configuration
db2 get db cfg for CUSTOMER | grep VENDOR

8. checking logs configuration
db2 get db cfg for CUSTOMER | grep LOG

9. List the DBs
db2 list db directory

10. List history of backups for a particular DB
db2 list history backup all for <database>

11. Disconnect from Database
db2 disconnect CUSTOMER

12. If the restore is pending, then do the following:
db2 restore database CUSTOMER continue

13. To determine the size of the DB
db2 connect to CUSTOMER

   Database Connection Information
   
   Database server = DB2/LINUXX8664 10.5.5
   SQL authorization ID = DB2INST1
   Local database alias = CUSTOMER

   db2 "call get_dbsize_info(?,?,?,1)"
Value of output parameters

--------------------------
Parameter Name : SNAPSHOTTIMESTAMP
Parameter Value : 2015-05-22-10.48.38.239964

Parameter Name : DATABASESIZE
Parameter Value : 2552860672

Parameter Name : DATABASECAPACITY
Parameter Value : 54181138432

Conclusion

I hope this whitepaper has been helpful and if you would like to provide feedback, it will be gladly received at deborah.vanpetegem@emc.com.