



# Replicated Database Operator's Guide

## Introduction

Replicated Database (RepDB) is a database synchronization software application for Explorer Controllers (ECs) and Digital Transport Adaptor Control Systems (DTACS). This application allows replication of the system database, in real time, from a primary server to a secondary server, as well as the syncing of key system files.

## Audience

This guide is intended for operators or system administrators who will be operating or managing RepDB in EC System Release (SR) 8.0 and DTACS SR 5.0 system environments.

## Required Skills and Expertise

System operators or engineers need the following skills:

- Advanced knowledge of Linux
- Experience with the Linux vi editor. The Linux vi editor is not intuitive. The instructions provided in this guide are no substitute for an advanced working knowledge of vi.
- The ability to review and edit log files
- Extensive DBDS system expertise

## Related Documents

- *SR 8.0 Installation and Migration Guide* (TP-00140)
- *DTACS 5.0 Installation and Migration Guide* (TP-00108)

**Note:** RepDB installation and configuration procedures are located in each of these guides.

## Document Version

This is the first formal release of this document

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## Overview

The RepDB package consists of the following two components:

- The IBM Informix Dynamic Server Data Replication for the database
- The rsync utility – A fast and versatile remote file-copying tool for user-defined files

The data replication component allows a copy of the Informix database to be maintained on another server. When the data replication component is active on a system, data is copied between a primary database server and a secondary database server. The primary database server continuously replicates data between itself and the secondary server by sending copies of the logical-log transactions to the secondary database server.

The remote file copying component allows a copy of user-defined files to be maintained on another server. When RepDB is enabled, remote file copying becomes active as a cron entry is added to the root crontab file. According to the cron entry, files and directories are periodically synchronized from the primary server to the secondary server.

### Advantages of RepDB

The following are some of the advantages of enabling the Replicated Database on a system:

- Service-impacting events are reduced on the primary server by allowing third-party database query tools to access the secondary database server.
- The secondary server provides a flexible platform for developing new tools. Furthermore, if the secondary server has access to the Digital Broadband Delivery System (DBDS), the secondary server can be used by third-party tools that require both database and network access.
- The secondary server, at the operator's command, can be converted to the primary server, if needed.

### Limitations of the Replicated Database

RepDB includes the following inherent limitations:

- The Replicated Database is read-only. The Replicated Database cannot be used for database backups because a database backup is considered a write process.
- There is a minor time delay between changes made to the primary database and those changes being reflected on the secondary server.
- Automatic failover – the ability to re-route users and applications to the Replicated Database with minimal interruption – is not supported. Failover requires manual intervention.

## Overview

- Regular backups of the primary database server are still required. Database corruption in the primary server, if it occurs, will be copied to the secondary server while the Replicated Database is active.

## Accessing the root and dncs User Accounts

### Important:

- Role-Based Access Control is no longer supported in EC 8.0 nor DTACS 5.0. Please follow the steps below to switch between different user accounts.
- The `ecadmin` user is used in examples for all Cisco DBDS documents pertaining to EC 8.0.
- The `dtacsadmin` user is used in examples for all Cisco DBDS documents pertaining to DTACS 5.0.
- Commands run as **root** user are shown with a `#` symbol.

#### Example:

```
[root@berlin ~]#
```

- Commands run as **admin**, **dncs**, or any **Administrator** user are shown with a `$` symbol.

#### Example:

```
[admin@berlin ~]$  
[ecadmin/dtacsadmin@berlin ~]$  
[dncs@berlin ~]$
```

Once the EC or DTACS application installation is complete, you can only log in with the `admin` or an `Administrator` user account.

The `admin` account is created by default during the installation, and is granted privileges to access the root user account, as root login is not permitted. These privileges allow the `admin` user to execute root commands by preceding the command with "sudo". For example, if you want to modify a network configuration file, the command will resemble the following:

**Command Example:** Executing a root command as Admin user:

```
[admin@berlin ~]$ sudo vi /etc/sysconfig/  
network-scripts/ifcfg-eth0
```

As `admin` user, you can also change to the root user account by entering the following command.

**Important:** For any procedure in this guide that states "As root user", you must be logged into a terminal window as `admin` user and switch to the root user.

**Command Syntax:** Changing to root user:

```
[admin@berlin ~]$ sudo -i
```

Any *Administrator* account that you create using the useradmin script has privileges to log into the EC/DTACS from a terminal window. Administrator accounts do not have privileges to access the root user account, but should be used to access the dncs user account.

**Important:** Do not access the dncs user account using the root user account.

To switch to the dncs user, type the following command from the terminal window where you are logged in as an Administrative user.

**Important:** For any procedure that states "As dncs user", you need to execute this command from the terminal window where you are logged in with your Administrator account.

**Command Syntax:** Changing to the dncs user:

```
[ecadmin/dtacsadmin@berlin ~]$ sudo su - dncs
```

**Overview:**

Terminal Window Logged in as:	Use Account to change to:	Command to execute:
admin	root	sudo -i
[Administrator] <b>Example:</b> ecadmin, dtacsadmin	dncs	sudo su - dncs

## Failover and Recovery

This section provides instructions and information for failing over to the secondary server in the event a failure occurs to the primary server. Procedures are also included to place the recovered (repaired) server back online as the new secondary server.

*Failover* is the term used to describe the case when one computer takes over for another computer which has just failed, or has been taken out of service for maintenance. Failover involves powering off the failed server, deactivating and disabling the Replicated Database on both servers (if possible), and switching over to the secondary server.

*Recovery* is a term used when the failed system can be brought back online. This occurs when planned failovers are executed and in cases where the server can be repaired.

### Time to Complete the Failover

Our engineers estimate that the failover to the secondary server can be completed within 45 to 60 minutes. During this time, the operator will be unable to add new set-tops to the system, set up any new services, or make any system changes.

### Unplanned Failover on the Primary Server

In most cases, a failure of this type will leave the primary server completely inoperable. In this case, complete the following steps.

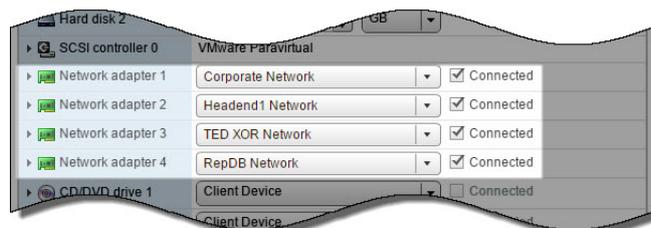
#### Failing Over to the Secondary Server

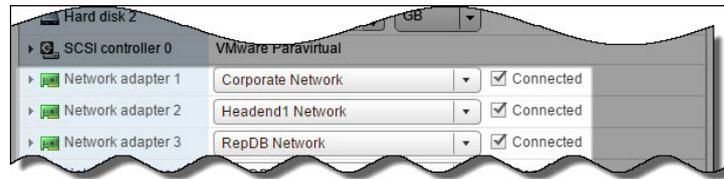
Complete the following procedure if a catastrophic failure of the primary server requires you to failover to the secondary server.

**Note:** In this example, HOSTB is the primary server.

- 1 Power off the failed *primary* server.
- 2 From the vSphere Web UI, right-click the working server (secondary) and select **Edit Settings**.
- 3 Click the **Connect** box for all network adapters.

EC:



**DTACS:**

- 4 Click **OK**. The server is reconfigured.
- 5 As **root** user on the working server (*secondary*), type the following command and press **Enter**. This will start the failover process and promote the secondary server to the primary server.

```
[root@berlin ~]# /opt/cisco/repdb/failover
```

```
[root@berlin repdb]# ./failover
INFO: Tue Jun 20 09:20:19 EDT 2017
INFO: Checking environment...
INFO: Primary: HOSTB
INFO: Primary IP:172.16.3.132
INFO: Secondary: HOSTA
INFO: Secondary IP:172.16.3.131
INFO: Executing Host: HOSTA
INFO: Pre-checks complete.
Disable repdb on HOSTA and continue? (y/n): y
```

- 6 When prompted to disable RepDB on the *secondary* server, type **y** and press **Enter**. Disabling of RepDB begins and the current system is checked to ensure that Informix is in a Read-Only (Sec) mode.

**Results:**

- RepDB is disabled.
- Informix is stopped and restarted.
- Informix database is updated to On-Line.
- A **Please reboot this host to complete the failover process** message displays.

- 7 Enter the following command to reboot the system.
 

```
[root@berlin ~]# reboot
```
- 8 Does this server have a unique IP address for the corporate network (eth0)?
  - If **yes**, go to the next step.
  - If **no**, go to Step 13.
- 9 From the vSphere Web UI, right-click the server (VM) and select **Power On**.
- 10 Right-click the server again and select **Open Console**. A new tab in the browser opens.
- 11 Open the `/etc/hosts` file in a text editor and update the IP address for the corporate network entry.
- 12 Save and close the file. You can log into the server from a terminal window.
- 13 From a terminal window, log into the server as **admin** user.

## Failover and Recovery

- 14 As **root** user, type the following command and press **Enter**. The output should indicate that the database as **On-Line** with a data replication state set to **off**.

```
[root@berlin ~]# onstat -g dri
```

```
[root@berlin repdb]# onstat -g dri
IBM Informix Dynamic Server Version 12.10.FC8W1 -- On-Line -- Up 2 days 18:01:11 -- 20024824 Kbytes
tes
Data Replication at 0x857ba028:
┌ Database is "On-Line"
Type      State      Paired server      Last DR CKPT (id/pg)  Supports Proxy Writes
-----
standard  off          ── Indicates RepDB
                                     is disabled (off)
                                     17 / 14
                                     NA
DRINTERVAL 5
DRTIMEOUT  15
DRAUTO     0
DRLOSTFOUND /opt/cisco/informix/server/cisco/etc/dr.lostfound
DRIDXAUTO  0
ENCRYPT_HDR 1
Backlog    4
```

- 15 From a browser window, type the following command to access the EC/DTACS Web UI.

### Command Syntax:

```
https://[EC/DTACS IP address]
```

### Example:

```
https://192.168.69.2
```

- 16 Verify system functionality.
- 17 Is Regionalization enabled on your system?
- If **no**, you have completed this procedure.
  - If **yes**, go to the next step.
- 18 From the EC/DTACS Web UI, click the **Navigation** icon, , and select **System Provisioning > Regionalization Configuration**.
- 19 Verify that the **Registration Status** is **Registered** and that the **Status Comment** is **Successfully Updated ECS**.

Registration Status	Registered
Status Comment	Successfully Updated ECS.
Last Updated Time	2017-03-21T13:39:41-04:00

**Important:** If the EC/DTACS server has a unique corporate IP address, and if the Registration Status is **DUPLICATE**, click **Retry**. The Regionalization Configuration updates with the appropriate IP addresses and the status changes to **Registered**.

- 20 Log into the ECS Web UI ([https://\[VCS Console IP\]](https://[VCS Console IP])) and press **Enter**. The Home window displays.

### Command Syntax:

```
https://[VCS Console IP]
```

### Example:

```
https://192.16.3.3
```

- 21 From the **Home** window, verify the following:
  - A **Service Name** called **cisco.vcs.ec/cisco.vcs.dtacs** exists.
  - The **Address** column for the Service Name points to the IP address of the EC/DTACS.
  - The **Status** for this entry **UP**.
- 22 Click the **Navigation** icon, , and select **Control Plane > ECS Dashboard** and drill down to the EC/DTACS server.
- 23 Verify that the EC/DTACS server is displayed in the list with the following icon, .

### Recovering From an Unplanned Failover

Refer to one of the following documents to clone the primary server into a secondary server. Once it is cloned, refer to one of the following installation and migration documents to configure RepDB.

- *Explorer Controller 8.0 Installation and Migration Guide*
- *DTACS 5.0 Installation and Migration Guide*

### Planned Failover

There may be instances where you want to purposely failover to the secondary server, such as:

- To validate and confirm failover in the event of a disaster recovery situation
- To perform maintenance or upgrades that require a shutdown of the primary server

### Executing a Planned Failover

Complete the following steps to execute a planned failover on your RepDB system.

#### Notes:

- In this example, HOSTA is the primary server and HOSTB is the secondary server.
- System processes will be shutdown
- The operator will be unable to add new set-tops to the system, set up any new services, or make any system changes.
- Video services are not affected for existing subscribers. MPEG streams that are already set up and configured will not be interrupted.



- 4 On HOSTA (i.e. the host where you executed the switchover), type the following command and press **Enter** to shutdown the server.
 

```
[root@berlin repdb]# shutdown -h now
```
- 5 Once the system shuts down, complete the following steps to reconfigure the network adapters on HOSTB.
 

**For ECs and DTACS:**

  - a From the vSphere Web UI, right-click HOSTB and select **Edit Settings**.
  - b Click **Connected** for all network adapters.
  - c Click **OK** to reconfigure HOSTB.
- 6 From the **root** window for HOSTB, type the following command and press **Enter** to reboot the server.
 

```
[root@berlin repdb]# reboot
```
- 7 Does your server have a unique IP address for the corporate network (eth0)?
  - If **yes**, go to the next step.
  - If **no**, go to Step 12.
- 8 From the vSphere Web Client, right-click the appropriate server (VM) and select **Open Console**.
- 9 Log into the system as **admin** user.
- 10 As **root** user, open the **/etc/hosts** files in a text editor and update the IP address for the corporate network.
- 11 Save and close the file.
 

**Note:** You can now close the Console window and log in from a terminal window as stated in the next step.
- 12 From a terminal window, log into the server as **admin** user.
- 13 As **root** user on an EC, enter the following commands to restart the Apache and Tomcat services.
 

**Note:** If this is a DTACS server, go to Step 15.

```
[root@berlin ~]# service tomcat restart
[root@berlin ~]# service httpd-dnscsws restart
[root@berlin ~]# service httpd restart
```
- 14 Enter the following commands to verify that the Apache and Tomcat services are running. A message stating that the service is running will appear.
 

```
[root@berlin ~]# service tomcat status
[root@berlin ~]# service httpd-dnscsws status
[root@berlin ~]# service httpd status
```

**Note:** If any service fails to restart, please contact Cisco Services.
- 15 As **dnscs** user, type one of the following sets of commands to start system processes.
  - **EC:**

```
[dnscs@berlin ~]$ dnscsStart
[dnscs@berlin ~]$ appStart
```
  - **DTACS:**

```
[dnscs@berlin ~]$ dtacsStart
```

## Failover and Recovery

- 16 As **ecadmin/dtacsadmin**, log into the EC/DTACS Web UI and verify that processes are starting and eventually are all green.
- 17 Was the EC/DTACS server regionalized to an ECS?
  - If **yes**, go to the next step to verify that the EC/DTACS is still registered post-switchover.
  - If **no**, go to 23.
- 18 From the EC/DTACS Web UI, click the **Navigation** button, , and then select **System Provision > Regionalization Configuration**. The Regionalization Configuration Web UI opens.
- 19 Verify that the registration status is **Registered** and that the **Status Comment** is **Successfully Updated ECS**.

Registration Status	Registered
Status Comment	Successfully Updated ECS.
Last Updated Time	2017-03-21T13:39:41-04:00
- 20 Log into the VCS Console on the ECS 3.0 Web UI where the server is registered.
- 21 Click the **Navigation** button, , and select **Control Plane > ECS Dashboard**.
- 22 Verify that the EC/DTACS server is displayed in the list with the following icon, .

**Note:** This icon indicates that the EC/DTACS server is online.
- 23 Verify system functionality on the EC/DTACS system.

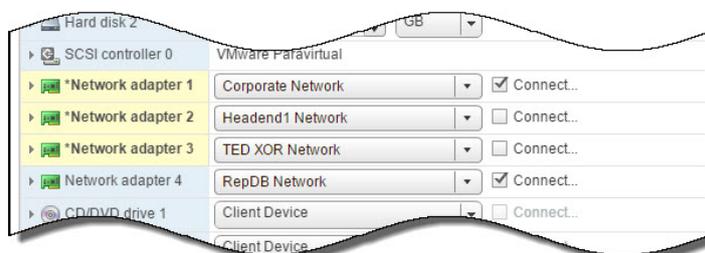
### Recovering From a Planned Failover

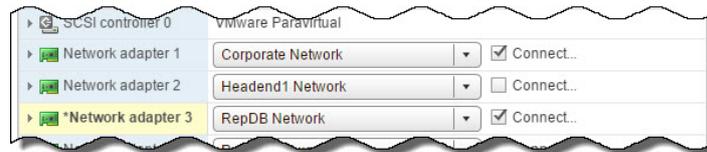
Complete the following procedure if you had executed a planned switchover and want to bring the powered down server back up.

**Note:** In this procedure HOSTB is the active server and HOSTA is the server that is powered off.

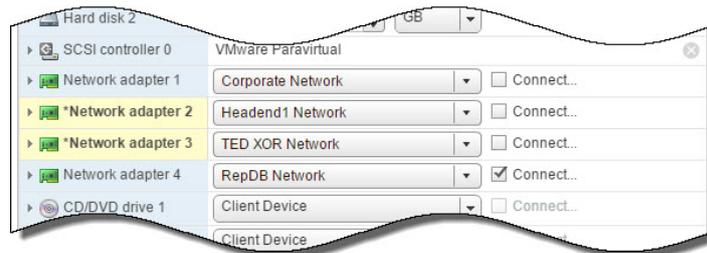
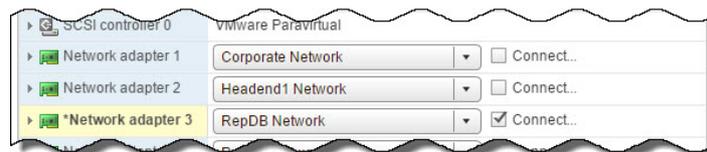
- 1 From the vSphere Web UI, right-click the server that is shutdown (e.g. HOSTA) and select **Edit Settings**.
- 2 Does this server have a unique IP address for the corporate network (eth0)?
  - If **yes**, uncheck the **Connect** boxes as shown in the following examples (EC = Network adapter 2 and Network adapter 3; DTACS = Network adapter 2).

EC:



**DTACS:**

- If **no**, uncheck the **Connect** box for all adapters *except* for the RepDB Network adapter for (EC = Network adapter 4; DTACS = Network adapter 3).

**EC:****DTACS:**

- 3 Click **OK**. The VM is reconfigured.
- 4 Right-click the HOSTA VM again and select **Power On**.
- 5 From a terminal window, log into HOSTA as **admin** user.
- 6 As **root** user, enter the following command on HOSTA to verify that the network interfaces are correctly mapped.
 

```
[root@berlin ~]# ls -ltr /etc/sysconfig/network-scripts/ifcfg*
```
- 7 Verify that HOSTA and HOSTB can successfully ping each other.
- 8 Go to *Enabling RepDB* in one of the following documents to configure RepDB.
  - *SR 8.0 Installation and Migration Guide*
  - *DTACS 5.0 Installation and Migration Guide*

## Unplanned Downtime on Both Servers

In the event that both the primary and secondary servers are both in a state such that a failover cannot be performed, a new primary server must be restored from a backup. Refer to *Explorer Controller Backup and Restore User Guide* (part number TP-00138) for instructions on restoring the primary server from a backup.

After the server has been restored, refer to the procedures in one of the following installation guides to clone it into a secondary server and to set up Replicated Database.

- *Explorer Controller 8.0 Installation and Migration Guide*
- *DTACS 5.0 Installation and Migration Guide*

## Advanced Features for Data Replication

This section describes the process for pausing (temporarily disabling) data replication and/or remote file copying.

**Important:** Be sure to disable data replication only on the primary server when pausing.

### Pausing Data Replication

Notes:

- Data replication can only be resumed if transactions are available on disk. If they are not available on disk, data replication can only be activated by backing up the primary database and restoring it to the secondary database.
  - Prior to disabling data replication, perform a system check on the primary and secondary hosts. For example, check server processes, ping various devices and check the status of Informix servers.
- 1 As **root** on the **primary** server, type the following command.

```
[root@berlin ~]# onstat -g dri
```

Results:

- The state of Informix should be on.
- Data replication should look similar to the following example.

```
IBM Informix Dynamic Server Version 12.10.FC4W1XR -- On-Line (Prim) -- Up 00:25:37 -- 200
24820 Kbytes

Data Replication at 0x856ed028:
Type          State      Paired server      Last DR CKPT (id/pg)  Supports Proxy
Writes
primary ← on      HOSTBDbServer      13 / 11              NA
DRINTERVAL    5
DRTIMEOUT     15
DRAUTO        0
DRLOSTFOUND   /opt/cisco/informix/server/cisco/etc/dr.lostfound
DRIDXAUTO     0
ENCRYPT_HDR    1
Backlog       5
Last Send     2017/03/17 10:46:45
Last Receive  2017/03/17 10:46:45
Last Ping     2017/03/17 10:46:36
Last log page applied(log id,page): 13,293
```

## Advanced Features for Data Replication

- Repeat Step 1 on the *secondary* server. The output should resemble the following.

```
IBM Informix Dynamic Server Version 12.10.FC4W1XK -- Read-Only (Sec) -- Up 00:16:17 -- 20
024820 Kbytes

Data Replication at 0x856f2028:
  Type      State      Paired server      Last DR CKPT (id/pg)      Supports Proxy
Writes
  HDR Secondary on          HOSTADbServer          13 / 11          N
  DRINTERVAL 5
  DRTIMEOUT 15
  DRAUTO 0
  DRLOSTFOUND /opt/cisco/informix/server/cisco/etc/dr.lostfound
  DRIDXAUTO 0
  ENCRYPT_HDR 1
  Backlog 0
  Last Send 2017/03/17 10:52:55
  Last Receive 2017/03/17 10:52:55
  Last Ping 2017/03/17 10:52:43
  Last log page applied(log id,page): 0,0
```

- On the primary server, change to the following directory and type this command to pause data replication. The following confirmation message appears.

```
[root@berlin ~]# cd /opt/cisco/repdb
[root@berlin repdb]# ./RepDb -d
```

- When prompted, type *y* to confirm the request. Data replication is disabled on the primary host.

```
Do you wish to DISABLE Database Replication? (Y/N): y
Disabling database replication on HOSTA
Successfully disabled Database Replication on HOSTA.
Waiting for transition to either Quiescent or On-Line mode.
Completed all tasks.
Database Replication has been DISABLED for the primary server.
```

- Type the following command to verify that data replication has been turned off on the primary server and that its Type is standard.

**Note:** The `onstat -m` command outputs the message log file, `/opt/cisco/informix/server/cisco/log/online.log`.

```
[root@berlin repdb]# onstat -m
03/17/17 14:41:00 DR: Turned off on primary server
03/17/17 14:41:00 DR: Cannot connect to secondary server
03/17/17 14:41:01 DR: new type = standard
03/17/17 14:41:01 SCHAPI: dbutil threads is already running.
03/17/17 14:41:01 SCHAPI: dbScheduler threads is already running.
```

## Disabling Data Replication

There may be times when achieving certain operational goals requires that either data replication and/or remote file copying be deactivated, such as system upgrades which require both servers to be deactivated.

Disabling data replication on both the primary server and secondary server deactivates data replication. However, disabling data replication on the secondary server is the distinction between just disabling during pause and resume and completely deactivating. Activating data replication after deactivation requires that you begin with a backup of the primary database and then restore it to the secondary server. Complete these steps to disable the data replication component of the Replicated Database software.

- 1 As **root** user on the *primary* server, type the following command.
- 2 When prompted, type **y**. Data replication is disabled.
- 3 Type the following command to verify that data replication is disabled and that the new type is "standard".

```
[root@berlin repdb]# onstat -m
```

```
04/11/17 15:51:56 DR: Turned off on primary server
04/11/17 15:51:56 DR: Cannot connect to secondary server
04/11/17 15:51:57 DR: new type = standard
04/11/17 15:51:57 SCHAPI: dbutil threads is already running.
04/11/17 15:51:57 SCHAPI: dbScheduler threads is already running.
```

Indicates RepDb is disabled

- 4 Repeat Steps 1 through 3 on the *secondary* server.

## Deactivating Data Replication

There may be instances when you need to deactivate the Replicated Database environment, such as during system upgrades.

Complete these steps to deconfigure the Replicated Database.

- 1 Is the Replicated Database already disabled?
  - If **yes**, go to step 2.
  - If **no**, follow the instructions in *Disabling Data Replication* (on page 17) and then return to Step 2 of this procedure.

- 2 As **root** user on the *primary* server, type the following command. The **Are you sure you wish to continue?** message appears.

```
[root@berlin repdb]# ./setupRepDbEnv -D
```

- 3 When prompted to confirm the request, type **y**.

### Results:

- The Replicated Database configuration is removed from the database on the primary server.
- The hosts.equiv file is moved to the hosts.equiv.dbrep file.
- The hosts.equiv.dbrep file is moved to the hosts.equiv file.

## Advanced Features for Data Replication

- 4 As **root** user on the *secondary* server, type the following command.  

```
[root@berlin repdb]# ./setupRepDbEnv -D
```
- 5 When prompted to confirm the request, type **y**. The Replicated Database configuration is removed from the database on the secondary server.

## Reconfigure the Replicated Database

Complete the following procedures to reconfigure the Replicated Database

**Important:** You will only use this procedure if you have previously deactivated the Replicated Database.

- 1 As **root** user on the *primary* server, type the following command to re-enable RepDB.  

```
[root@berlin repdb]# ./configRepDb
```
- 2 Respond to the prompts to configure RepDB on both the primary and secondary servers.

**Important:** For assistance, go to *Configure RepDB* in one of the following documents.

- *Explorer Controller 8.0 Installation and Migration Guide*
- *DTACS 5.0 Installation and Migration Guide*



## For Information

### If You Have Questions

If you have technical questions, contact Cisco Services for assistance. Follow the menu options to speak with a service engineer.



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