



## **Cisco Prime Network Registrar IPAM 8.3 Disaster Recovery Guide**

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# 1 Introduction

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## 1.1 Overview

*NOTE: This document describes functionality that is available only in Cisco Prime Network Registrar IPAM 8.0 and higher.*

*NOTE: This document describes Disaster Recovery support for the IPAM Executive running on supported Unix-based platform, Red Hat Linux. Disaster Recovery for the IPAM Executive is not supported on Microsoft Windows platforms.*

Environmental disasters, equipment failure, and power outages are scenarios that can completely halt a company's IT infrastructure. As part of the IPAM comprehensive Business Continuity and Disaster Recovery (DR) solution,

IPAM offers a complete set of script utilities that enables customers to easily transition to backup systems during an emergency - thus preventing negative impact to normal business operations.

*NOTE: IPAM 8.3 and later versions will not support Solaris. Refer to earlier versions of IPAM documents if you want to use IPAM with Solaris support.*

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## 1.2 Major Functions

As part of the standard installation, IPAM already provides facilities for DHCP Failover and Secondary DNS server configuration. These facilities ensure continuous operation of these critical network services. During a DR event in which the IPAM Executive is affected, the DHCP/DNS services continue to run autonomously, so end clients will continue to operate. However, if the Executive is unavailable, then configuration changes for DHCP/DNS cannot be made. To address this need, the IPAM Executive can be configured for redundancy using the DR guidelines and scripts described herein.

The following core functionality is provided with IPAM Disaster Recovery (DR) support:

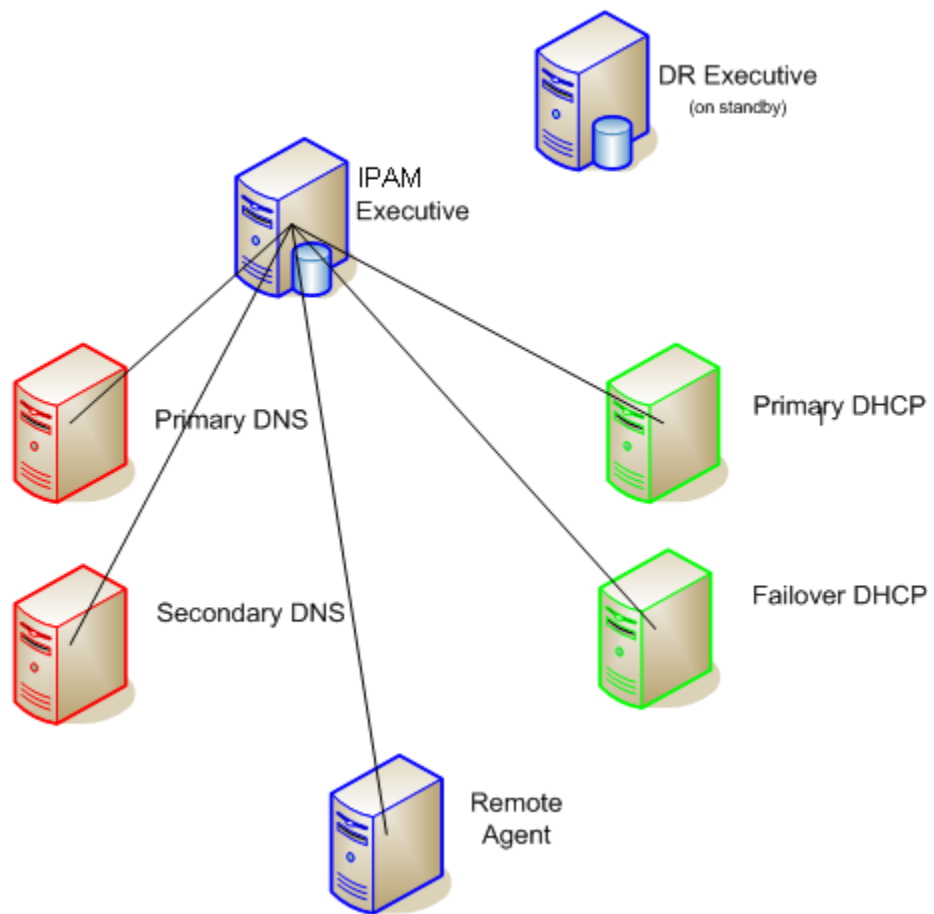
- Ability to mirror a Production Executive database
- Switch remote agents between Production and DR executives

# 2 System Configuration

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## 2.1 Production Server Configuration

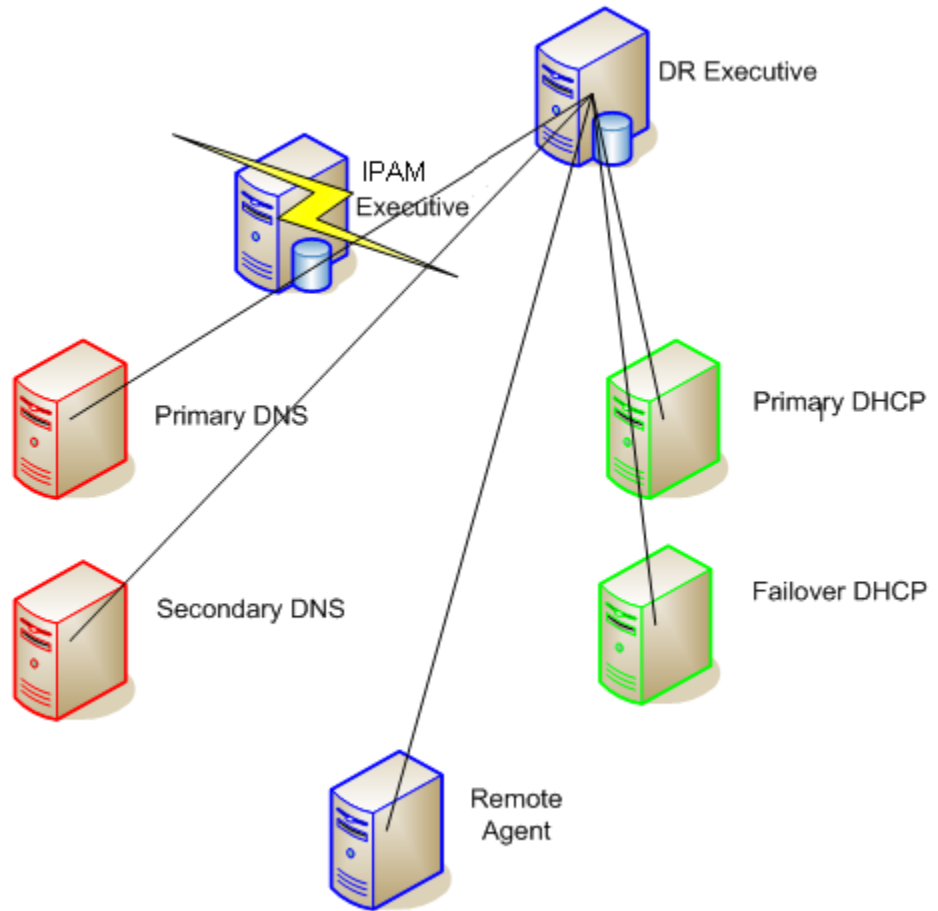
During normal operations, the Production Executive database is being mirrored on the DR Executive at regular intervals.



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## 2.2 Disaster Recovery (DR) Event Configuration

During a Disaster Recovery event or exercise, the IPAM Executive server is cut off from the main network. Redundant systems are brought online and the DR Executive box will assume the place of the unreachable Production Executive.



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## 2.3 Replication of data from Production to DR Executive

### 2.3.1 Database replication

For installations which use the MySQL database provided with IPAM, replication is accomplished using a custom script that dumps the IPAM database from the Production Executive and copies the exported data to the DR Executive. This data is then loaded into the separate instance of MySQL running on the DR Executive.

*For installations which use Oracle, please contact your Oracle database administrator for information regarding Oracle database replication.*

#### 2.3.1.1 `$INCHOME/etc/default.dbmover`

This file contains the default options for the DBMover script, including the IP address of the Production Executive, login credentials, and the name of the MySQL database to be copied.

*Note that the MySQL user defined in this file must have sufficient privileges to remotely access the Production IPAM database. This can be accomplished via the following commands on the Production IPAM Executive:*

- `> $INCHOME/mysql/bin/mysql -uroot -pincr00t`
- `mysql> GRANT SELECT on incontrol.* to incadmin@'backupexec.com' IDENTIFIED BY 'incadmin';`

Where the name preceding the `@` symbol is the mysql user configured in the `default.dbmover` file, `'backupexec.com'` is the fully-qualified hostname or IP address of the DR Executive, and `'incadmin'` is the password corresponding to the mysql user configured in the `default.dbmover` file.

#### 2.3.1.2 `$INCHOME/etc/dbmover.sh`

This script remotely retrieves a database from a primary system and loads it into a local database. Either this script or the `dbmover-wrapper.sh` script should be configured to run periodically on the DR Executive using the 'cron' utility available on supported platforms. The frequency in which the script should be run is dependent upon the frequency in which the Production Executive's IPAM database is changed. It is recommended that the DBMover script is run *at least* once daily.

*Note the `dbmover-wrapper.sh` script must be updated w/ valid email addresses for the 'to' and 'from' sections and a smtp domain name.*

### **2.3.1.3 *\$INCHOME/etc/dbmover-wrapper.sh***

This script adds functionality to dbmover.sh by testing for errors and sending an alert if it detects there were problems transferring data from the Production Executive to the DR Executive. Either this script or the dbmover.sh script should be run periodically.

## **2.3.2 Startup and status scripts**

The IPAM installation includes two scripts used frequently by administrators to start and stop the IPAM services and to check the status of the currently running services.

### **2.3.2.1 *\$INCHOME/etc/default.incontrol***

This file contains entries for each of the IPAM services, specifying which individual services are started/stopped when the *\$INCHOME/etc/incontrol* start/stop script is run. It is important for the DR Executive has a copy of this file from the Production Executive, so that the same environment can be duplicated on the DR machine.

Any time the *default.incontrol* file is modified on the Production Executive for any reason the updated file must be copied to *\$INCHOME/etc/default.incontrol.primary* on the DR Executive. This file is required for the automated *PromoteExec* script that is utilized during a DR scenario.

### **2.3.2.2 *\$INCHOME/etc/incstatus***

This script is used to check which IPAM services are running on the system. Generally, this file is kept in sync with the *default.incontrol* file above. That is, when a new service is added or removed from starting/stopping in *default.incontrol*, it is also added or removed from the list of services that are checked by the *incstatus* script.

Any time the *incstatus* file is modified on the Production Executive for any reason the updated file must be copied to *\$INCHOME/etc/incstatus.primary* on the DR Executive. This file is required for the automated *PromoteExec* script that is utilized during a DR scenario.



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## 2.4 Other Considerations

### 2.4.1 License Key

In a DR scenario, the same license key that is used for Primary IPAM Executive can be used for the DR Executive server also.

### 2.4.2 DNS Listener

If you run the DNS Listener on your IPAM production Executive, then you will want to start the DNS Listener on the DR Executive upon failover. Additionally, when configuring the master DNS servers which are transferring updates to the DNS Listener, you should include the IP addresses of both the Production Executive and the DR Executive in the 'also-notify' access match lists for the dynamic zones that are to be updated.

# 3 DR Configuration Options

This section details the options for Disaster Recovery (DR) of IPAM Executive services.

There are three configurations of the Production and DR Executives that can support a DR scenario:

1. DR Executive assumes the IP of Production Executive
2. Production and DR Executive use different IPs
3. Production and DR Executives share a SAN/NAS or mirrored database and share a virtual IP

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## 3.1 DR Executive assumes the IP of the Production Executive

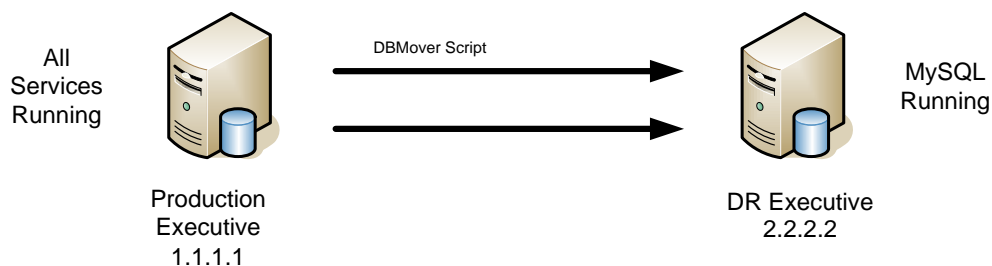


Figure 1. Server configuration prior to DR Event

As shown in Figure 1, the Production Executive database will be backed up on a regular basis onto the DR Executive using the DBMover script. Only the MySQL database service is running on the DR Executive. When the Production Exec fails, the DR Exec assumes the Production Executive’s IP address and starts all services using a script as shown in Figure 2. **Note: For this scenario to succeed a VLAN needs to be in place or the DR Executive needs to be on the same subnet.** All deployed agents will continue to point to the same IP address as before so no agent-side changes are required.

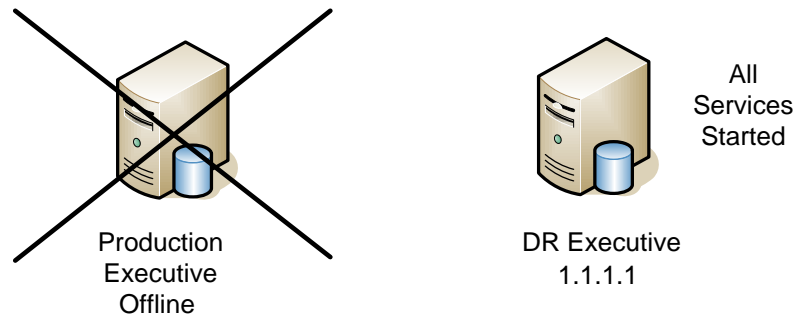


Figure 2. DR Executive Online

### 3.1.1 Prerequisites

The following prerequisites must be met in order to support a DR event or exercise under this scenario.

#### 3.1.1.1 Installation of the DR Executive

During the installation of the IPAM software on the DR Executive, you should enter the IP address of the Production Executive when prompted for the IP address of the system and executive on the initial setup screen. This will minimize the number of changes that are required during a DR event or exercise.

#### 3.1.1.2 Only MySQL database is running on DR Executive

The only IPAM service that should be running on the DR Executive during normal operations is the MySQL database. This is required for the DBMover script to keep the IPAM database updated from the Production Executive.

The DemoteExec.sh script provided in the `$INCHOME/etc/support` directory of the IPAM installation handles reconfiguration of the active services:

```
> $INCHOME/etc/support/DemoteExec.sh
```

#### 3.1.1.3 Updated copies of default.incontrol and incstatus

As indicated previously, you must keep current copies of the `default.incontrol` and `incstatus` files from the Production Executive on the DR Executive. Both files are located in `$INCHOME/etc`. When copied to the DR Executive, they must be named `default.incontrol.primary` and `incstatus.primary`, respectively.

## **3.1.2 Disaster Recovery Procedure**

This section describes the procedure necessary to initiate a DR event or exercise under this scenario.

### **3.1.2.1 Change the IP of the DR Executive**

#### **3.1.2.1.1 Linux**

Change the IP address and associated parameters, including netmask and gateway, for the network interface using the accepted method of defining IP addressing information on that platform. For example, on Red Hat this can be done using `system-config-network`. The IP address must be set to the IP address of the failed Production Executive, which must be offline.

#### **3.1.2.2 Promote the DR Executive to Production status**

Promoting the DR Executive to Production status involves updating the `default.incontrol` and `incstatus` files on the DR Executive from copies of these files from the Production Executive (see section 3.1.1.3). This configures the DR Executive to start all services required for normal operation.

#### **3.1.2.2.1 Linux**

In order to “promote” the DR Executive so that it may become the Production IPAM Executive, you must run the `PromoteExec.sh` script provided in the `$INCHOME/etc/support` directory of the IPAM installation:

```
> $INCHOME/etc/support/PromoteExec.sh
```

#### **3.1.2.3 Restart the DR Executive IPAM services**

#### **3.1.2.3.1 Linux**

Run the `incontrol` script to restart all services on the DR Executive:

```
> $INCHOME/etc/incontrol restart
```

## **3.1.3 Return to Normal**

This section describes the procedure necessary to return to normal operation where the Production Executive is in use, and the DR Executive is in standby mode.

### **3.1.3.1 Change the IP of the DR Executive**

Follow the same procedure described above to change the IP of the DR Executive back to its original IP.

### 3.1.3.2 Stop IPAM Services on DR Executive

#### 3.1.3.2.1 Linux

Run the incontrol script to stop all services on the DR Executive:

```
> $INCHOME/etc/incontrol stop
```

#### 3.1.3.3 Demote the DR Executive to standby status

Revert the DR Executive to standby by running the “demote” script which will configure the system to start only MySQL:

```
> $INCHOME/etc/support/DemoteExec.sh
```

### 3.1.3.4 Start IPAM Services on DR Executive

#### 3.1.3.4.1 Linux

Run the incontrol script to start all services on the DR Executive:

```
> $INCHOME/etc/incontrol start
```

#### 3.1.3.5 Copy the DR Executive database

The DR Executive database will need to be copied back to the Production Executive Database if changes were made while the Production server was offline. If no changes were made, this step can be skipped.

1. Log into the DR Executive via SSH.
2. Dump the contents of the IPAM database to a file.
3. Copy the dump file over to the Production Executive and place in the /tmp directory.
4. Log into the Production Executive via SSH.
5. Drop the old IPAM database and import the copy from the DR Executive.

```
> $INCHOME/mysql/bin/mysqldump -uincadmin -  
pincadmin incontrol > dr_db_dump.sql  
  
mysql> drop database incontrol;  
mysql> create database incontrol;  
mysql> use incontrol;  
mysql> source /tmp/dr_db_dump.sql  
mysql> exit
```

### **3.1.3.6 Restart IPAM Services on Production Executive**

#### **3.1.3.6.1 Linux**

Run the incontrol script to restart all services on the Production Executive:

```
> $INCHOME/etc/incontrol restart
```

---

## 3.2 Production and DR Executive use different IPs

In this DR scenario the failed Production Executive is replaced by the DR Executive, but the machines maintain separate IP addresses because they are not on the same subnet or there is no VLAN in place and no virtual IP technology is used. All deployed Agents are configured with the IP addresses of both the production and DR executive using a “failover” setup.

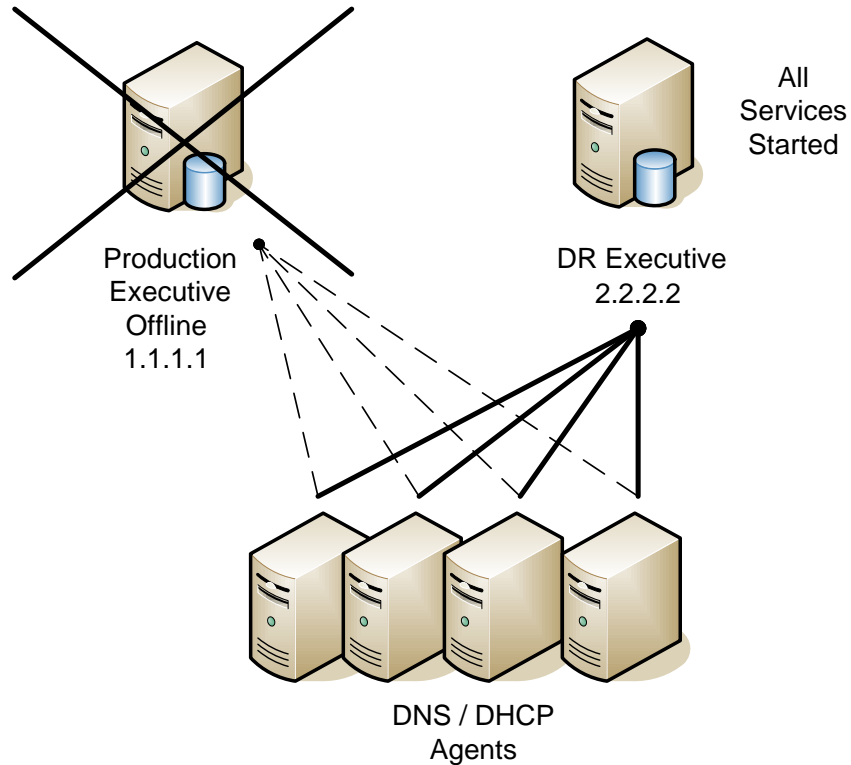


Figure 1. Agents “failover” from Production to DR Executive

### 3.2.1 Prerequisites

The following prerequisites must be met in order to support a DR event or exercise under this scenario.

### 3.2.1.1 IPAM 8.0 or Above Environment

This DR scenario is supported for IPAM installations running in 8.0 and above. That is, the IPAM Executive and *all* remote Agents must be running IPAM 8.0 or higher.

### 3.2.1.2 Remote Agent Configuration

#### 3.2.1.2.1 Linux

In order to support “failover” from the Production Executive to the DR Executive when different IP addresses are used, two files must be edited on each remote Agent, to define both IP addresses and the failover configuration.

*Please note that although some of the property name=value pairs below appear on multiple lines in this document, they must appear on one line in the actual configuration files.*

#### 1. \$INCHOME/classes/jndi.properties

Replace

```
connection.ActiveMqConnectionFactory.url = ssl://1.1.1.1:61617
```

With

```
connection.ActiveMqConnectionFactory.url =  
failover://(ssl://1.1.1.1:61617,ssl://2.2.2.2:61617)?randomize=false
```

#### 2. \$INCHOME/activemq/conf/activemq.xml

Replace

```
<networkConnector name="incx-broker" uri="static://(ssl://1.1.1.1:61617)"/>
```

With

```
<networkConnector name="incx-broker"  
uri="static://(failover://(ssl://1.1.1.1:61617,ssl://2.2.2.2:61617)?ran  
domize=false)"/>
```

*After modifying these files on the Agent, all IPAM services must be restarted on the Agent machine.*

### 3.2.1.3 Only MySQL database is running on DR Executive

The only IPAM service that should be running on the DR Executive during normal operations is the MySQL database. This is required for the DBMover script to keep the IPAM database updated from the Production Executive. This can be accomplished using the DemoteExec.sh script provided in the \$INCHOME/etc/support directory of the IPAM installation:

```
> $INCHOME/etc/support/DemoteExec.sh
```



#### **3.2.1.4 Updated copies of default.incontrol and incstatus**

As indicated previously, you must keep current copies of the default.incontrol and incstatus files from the Production Executive on the DR Executive. Both files are located in \$INCHOME/etc. When copied to the DR Executive, they must be named default.incontrol.primary and incstatus.primary, respectively, and located in \$INCHOME/etc.

### **3.2.2 Disaster Recovery Procedure**

This section describes the procedure necessary to initiate a DR event or exercise under this scenario.

#### **3.2.2.1 Promote the DR Executive to Production status**

Promoting the DR Executive to Production status involves updating the default.incontrol and incstatus files on the DR Executive from copies of these files from the Production Executive (see section 3.3.1.3). This configures the DR Executive to start all services required for normal operation. In addition, the promote operation will update the IPAM database with the IP address of the DR Executive for the Executive and Task Manager IP address System Properties, and IP address of the Executive Agent.

##### **3.2.2.1.1 Linux**

In order to “promote” the DR Executive so that it may become the Production IPAM Executive, you must run the PromoteExec.sh script provided in the \$INCHOME/etc/support directory of the IPAM installation:

```
> $INCHOME/etc/support/PromoteExec.sh
```

#### **3.2.2.2 Restart the DR Executive IPAM services**

##### **3.2.2.2.1 Linux**

Run the incontrol script to restart all services on the DR Executive:

```
> $INCHOME/etc/incontrol restart
```

### **3.2.3 Return to Normal**

This section describes the procedure necessary to return to normal operation where the Production Executive is in use, and the DR Executive is in standby mode.

### 3.2.3.1 Stop IPAM Services on DR Executive

#### 3.2.3.1.1 Linux

Run the incontrol script to stop all services on the DR Executive:

```
> $INCHOME/etc/incontrol stop
```

#### 3.2.3.2 Demote the DR Executive to standby status

Revert the DR Executive to standby by running the “demote” script which will configure the system to start only MySQL:

```
> $INCHOME/etc/support/DemoteExec.sh
```

### 3.2.3.3 Start IPAM Services on DR Executive

#### 3.2.3.3.1 Linux

Run the incontrol script to start all services on the DR Executive:

```
> $INCHOME/etc/incontrol start
```

#### 3.2.3.4 Copy the DR Executive database

The DR Executive database will need to be copied back to the Production Executive Database if changes were made while the Production server was offline. If no changes were made, this step can be skipped.

1. Log into the DR Executive via SSH.
2. Dump the contents of the IPAM database to a file.
3. Copy the dump file over to the Production Executive and place in the /tmp directory.
4. Log into the Production Executive via SSH.
5. Drop the old IPAM database and import the copy from the DR Executive.

```
> $INCHOME/mysql/bin/mysqldump -uincadmin -  
pincadmin incontrol > dr_db_dump.sql  
  
mysql> drop database incontrol;  
mysql> create database incontrol;  
mysql> use incontrol;  
mysql> source /tmp/dr_db_dump.sql  
mysql> exit
```

6. Update the Executive IP address in selected tables in the IPAM database.

```
> $INCHOME/etc/support/ChangeExecIP.sh  
<Production Exec IP>
```

### **3.2.3.5 Restart IPAM Services on Production Executive**

#### **3.2.3.5.1 Linux**

Run the incontrol script to restart all services on the Production Executive:

```
> $INCHOME/etc/incontrol restart
```

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### 3.3 Production and DR Executives share a SAN/NAS or mirrored database and share a virtual IP

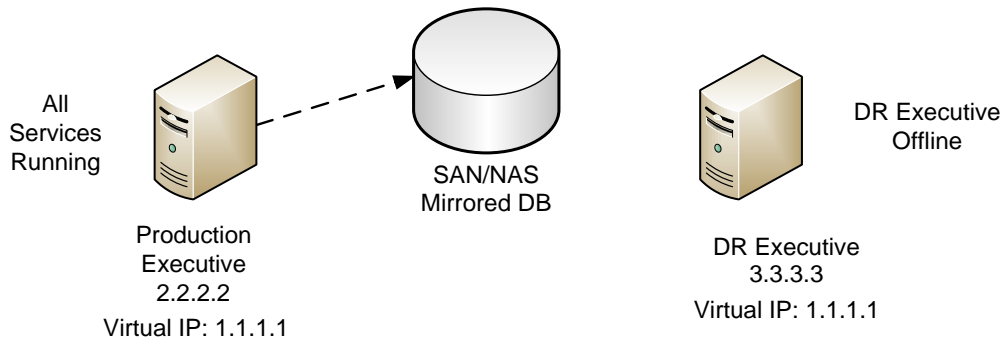


Figure 3. Server configuration prior to DR Event

All communications to the Executive occur over the virtual IP address, which is configured on both the Production and DR Executives. As shown in Figure 3, the database resides on a SAN/NAS or otherwise mirrored database that is accessible by both the Production and DR Executives. The DR Executive remains offline during normal operations. When the Production Executive fails, the DR Executive is brought online, and all IPAM services are started. The DR Executive takes over the virtual IP address previously used by the Production Executive. All deployed agents will continue to point to the same, virtual, IP address as before so no agent-side changes are required.

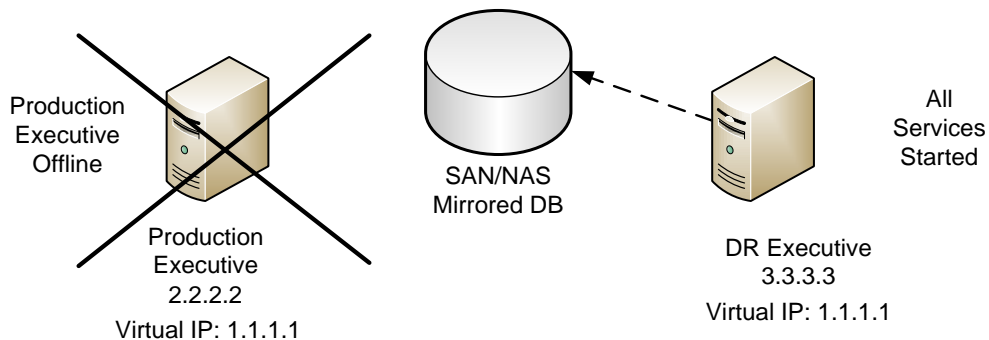


Figure 4. DR Executive Online

### 3.3.1 Prerequisites

The following prerequisites must be met in order to support a DR event or exercise under this scenario.

#### 3.3.1.1 **Configure Virtual IP address on Production and DR Executives**

Select a single, virtual IP address that is routable to both the Production and DR Executives. Configure this virtual IP address, in addition to each machine's "real" IP address, on the network interface connected to the management subnet. The management subnet is the segment in which the IPAM Agents are connected. Configure the virtual IP address using the accepted method of defining IP addressing information on that platform. For example, on Red Hat this can be done using `system-config-network`.

#### 3.3.1.2 **Installation of IPAM on Production and DR Executives**

During the installation of the IPAM software on both the Production and DR Executive, you should enter the *virtual* IP address when prompted for the IP address of the system and executive on the initial setup screens.

#### 3.3.1.3 **Updated copies of default.incontrol and incstatus**

*If the IPAM Executive software is installed and running directly from shared storage device, this prerequisite is not required. This is required if only the database itself is mirrored.*

As indicated previously, you must keep current copies of the `default.incontrol` and `incstatus` files from the Production Executive on the DR Executive. Both files are located in `$/INCHOME/etc`. When copied to the DR Executive, they must be named `default.incontrol.primary` and `incstatus.primary`, respectively.

### 3.3.2 Disaster Recovery Procedure

This section describes the procedure necessary to initiate a DR event or exercise under this scenario.

#### 3.3.2.1 **Bring the DR Executive online**

Enable the IP connectivity of the DR Executive by either physically connecting it to the network, or by enabling the switch port to which it is connected.

### **3.3.2.2 Start all IPAM services on the DR Executive**

#### **3.3.2.2.1 Linux**

Run the incontrol script to start all services on the DR Executive:

```
> $INCHOME/etc/incontrol start
```

### **3.3.3 Return to Normal**

This section describes the procedure necessary to return to normal operation where the Production Executive is online, and the DR Executive is offline.

#### **3.3.3.1 Take the DR Executive offline**

Disable the IP connectivity of the DR Executive by either physically disconnecting it from the network, or by disabling the switch port to which it is connected.

#### **3.3.3.2 Bring the Production Executive online**

Enable the IP connectivity of the Production Executive by either physically connecting it to the network, or by enabling the switch port to which it is connected.

#### **3.3.3.3 Start IPAM Services on Production Executive**

##### **3.3.3.3.1 Linux**

Run the incontrol script to start all services on the Production Executive:

```
> $INCHOME/etc/incontrol start
```