



# Red Hat Enterprise Linux 9

## Managing replication in Identity Management

Preparing and verifying replication environments



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## Abstract

In a Red Hat Identity Management (IdM) environment, replication enables failover and load-balancing. You can configure, verify, and stop replication between servers using the command-line, the Web UI, and Ansible Playbooks.

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# PROVIDING FEEDBACK ON RED HAT DOCUMENTATION

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# CHAPTER 1. MANAGING REPLICATION TOPOLOGY

This chapter describes how to manage replication between servers in an Identity Management (IdM) domain.

## Additional resources

- [Planning the replica topology](#)

## 1.1. EXPLAINING REPLICATION AGREEMENTS, TOPOLOGY SUFFIXES AND TOPOLOGY SEGMENTS

When you create a replica, Identity Management (IdM) creates a replication agreement between the initial server and the replica. The data that is replicated is then stored in topology suffixes and when two replicas have a replication agreement between their suffixes, the suffixes form a topology segment. These concepts are explained in more detail in the following sections:

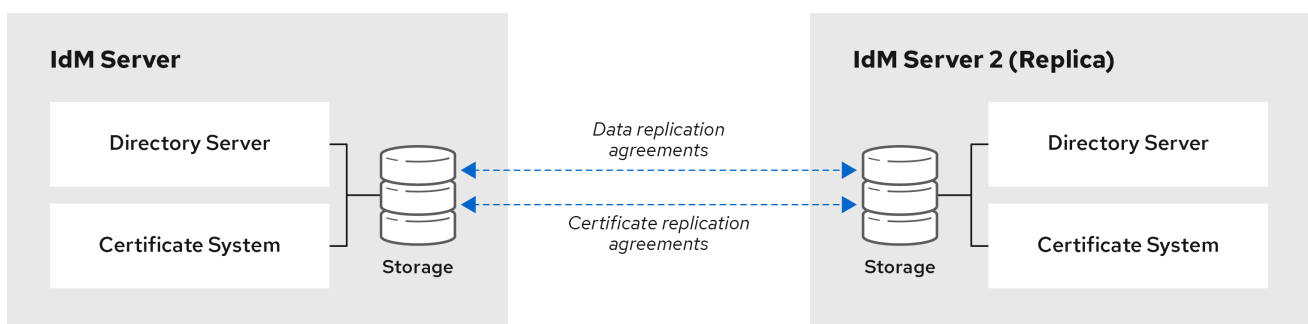
- [Replication agreements](#)
- [Topology suffixes](#)
- [Topology segments](#)

### 1.1.1. Replication agreements between IdM replicas

When an administrator creates a replica based on an existing server, Identity Management (IdM) creates a *replication agreement* between the initial server and the replica. The replication agreement ensures that the data and configuration is continuously replicated between the two servers.

IdM uses *multiple read/write replica replication*. In this configuration, all replicas joined in a replication agreement receive and provide updates, and are therefore considered suppliers and consumers. Replication agreements are always bilateral.

Figure 1.1. Server and replica agreements



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IdM uses two types of replication agreements:

#### Domain replication agreements

These agreements replicate the identity information.

#### Certificate replication agreements

These agreements replicate the certificate information.



Both replication channels are independent. Two servers can have one or both types of replication agreements configured between them. For example, when server A and server B have only domain replication agreement configured, only identity information is replicated between them, not the certificate information.

## 1.1.2. Topology suffixes

*Topology suffixes* store the data that is replicated. IdM supports two types of topology suffixes: **domain** and **ca**. Each suffix represents a separate server, a separate replication topology.

When a replication agreement is configured, it joins two topology suffixes of the same type on two different servers.

### The domain suffix: `dc=example,dc=com`

The **domain** suffix contains all domain-related data.

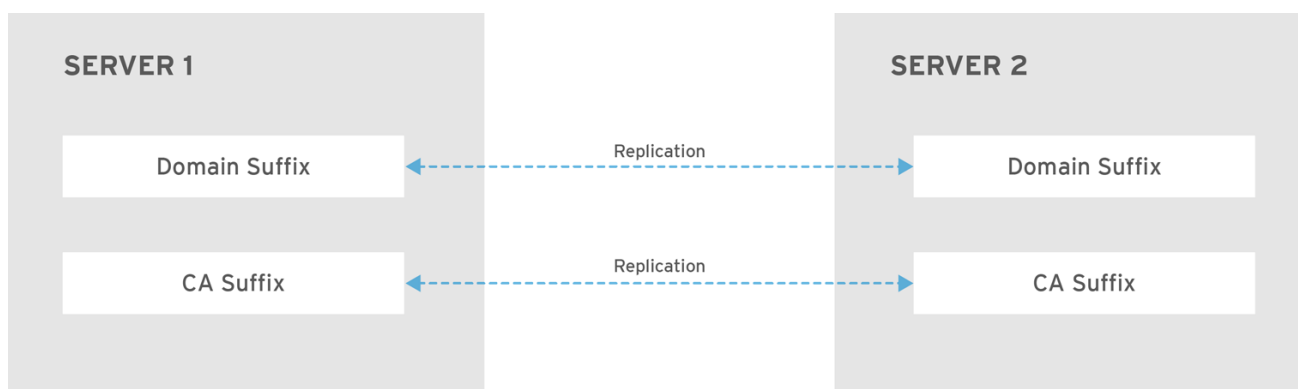
When two replicas have a replication agreement between their **domain** suffixes, they share directory data, such as users, groups, and policies.

### The ca suffix: `o=ipaca`

The **ca** suffix contains data for the Certificate System component. It is only present on servers with a certificate authority (CA) installed.

When two replicas have a replication agreement between their **ca** suffixes, they share certificate data.

Figure 1.2. Topology suffixes



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An initial topology replication agreement is set up between two servers by the **ipa-replica-install** script when installing a new replica.

### Example 1.1. Viewing topology suffixes

The **ipa topologysuffix-find** command displays a list of topology suffixes:

```

$ ipa topologysuffix-find
-----
2 topology suffixes matched
-----
Suffix name: ca
Managed LDAP suffix DN: o=ipaca

Suffix name: domain
  
```

```
Managed LDAP suffix DN: dc=example,dc=com
-----
```

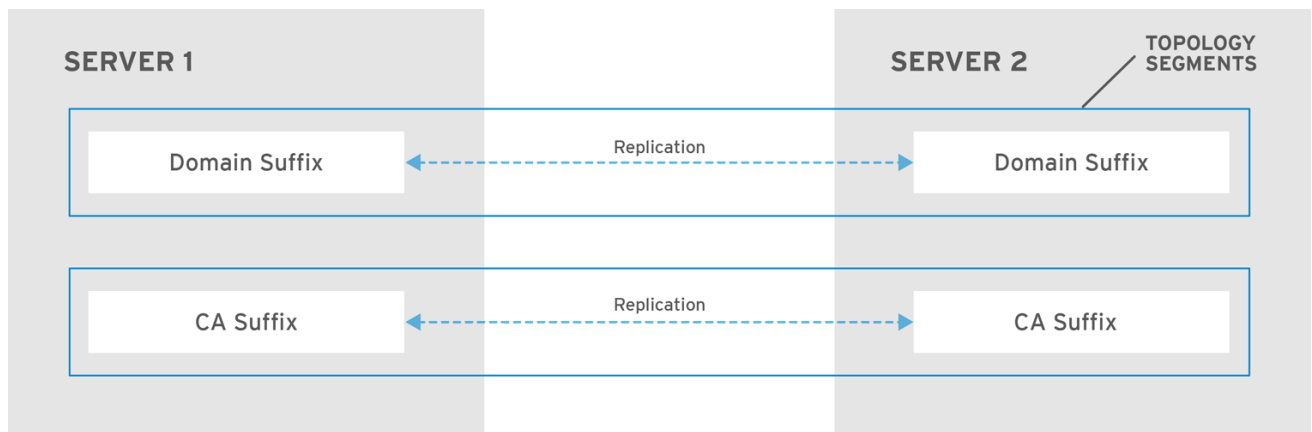
```
Number of entries returned 2
-----
```

### 1.1.3. Topology segments

When two replicas have a replication agreement between their suffixes, the suffixes form a *topology segment*. Each topology segment consists of a *left node* and a *right node*. The nodes represent the servers joined in the replication agreement.

Topology segments in IdM are always bidirectional. Each segment represents two replication agreements: from server A to server B, and from server B to server A. The data is therefore replicated in both directions.

Figure 1.3. Topology segments



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#### Example 1.2. Viewing topology segments

The **ipa topologysegment-find** command shows the current topology segments configured for the domain or CA suffixes. For example, for the domain suffix:

```
$ ipa topologysegment-find
Suffix name: domain
-----
1 segment matched
-----
Segment name: server1.example.com-to-server2.example.com
Left node: server1.example.com
Right node: server2.example.com
Connectivity: both
-----
Number of entries returned 1
-----
```

In this example, domain-related data is only replicated between two servers: **server1.example.com** and **server2.example.com**.

To display details for a particular segment only, use the **ipa topologysegment-show** command:

```

$ ipa topologysegment-show
Suffix name: domain
Segment name: server1.example.com-to-server2.example.com
Segment name: server1.example.com-to-server2.example.com
Left node: server1.example.com
Right node: server2.example.com
Connectivity: both

```

## 1.2. USING THE TOPOLOGY GRAPH TO MANAGE REPLICATION TOPOLOGY

The topology graph in the web UI shows the relationships between the servers in the domain. Using the Web UI, you can manipulate and transform the representation of the topology.

### Accessing the topology graph

To access the topology graph:

1. Select **IPA Server** → **Topology** → **Topology Graph**.
2. If you make any changes to the topology that are not immediately reflected in the graph, click **Refresh**.

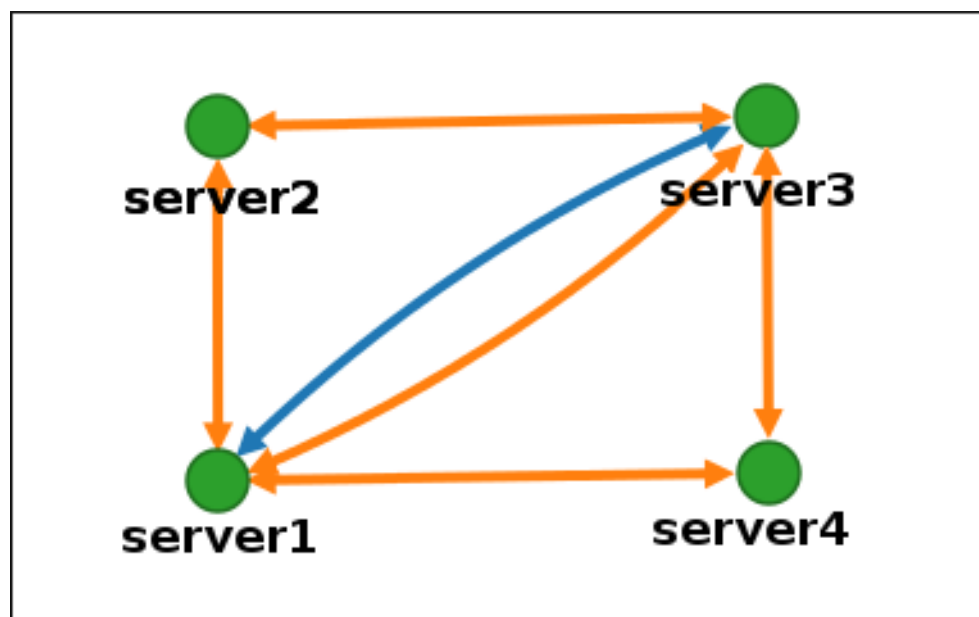
### Interpreting the topology graph

Servers joined in a domain replication agreement are connected by an orange arrow. Servers joined in a CA replication agreement are connected by a blue arrow.

### Topology graph example: recommended topology

The recommended topology example below shows one of the possible recommended topologies for four servers: each server is connected to at least two other servers, and more than one server is a CA server.

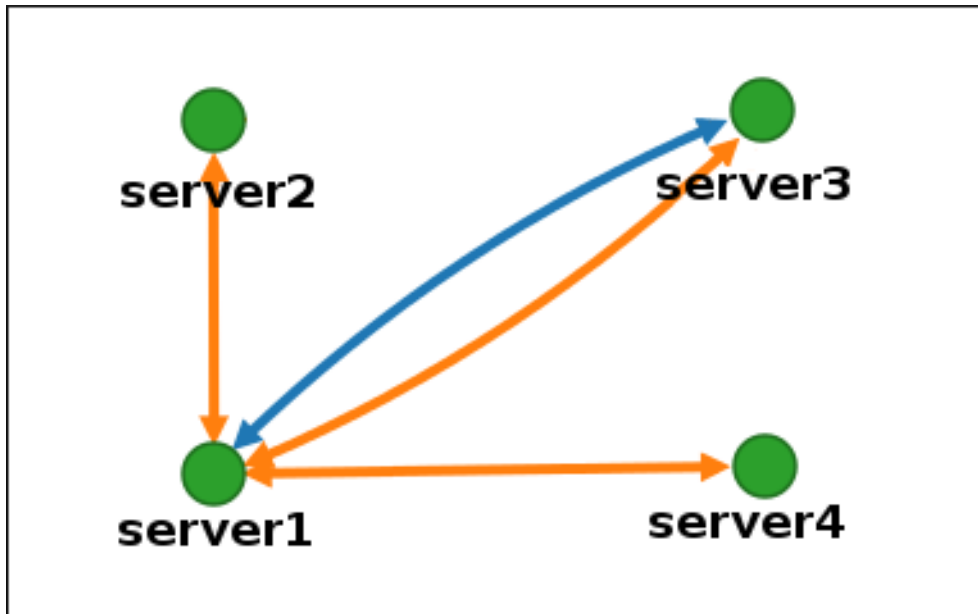
Figure 1.4. Recommended topology example



### Topology graph example: discouraged topology

In the discouraged topology example below, **server1** is a single point of failure. All the other servers have replication agreements with this server, but not with any of the other servers. Therefore, if **server1** fails, all the other servers will become isolated. Avoid creating topologies like this.

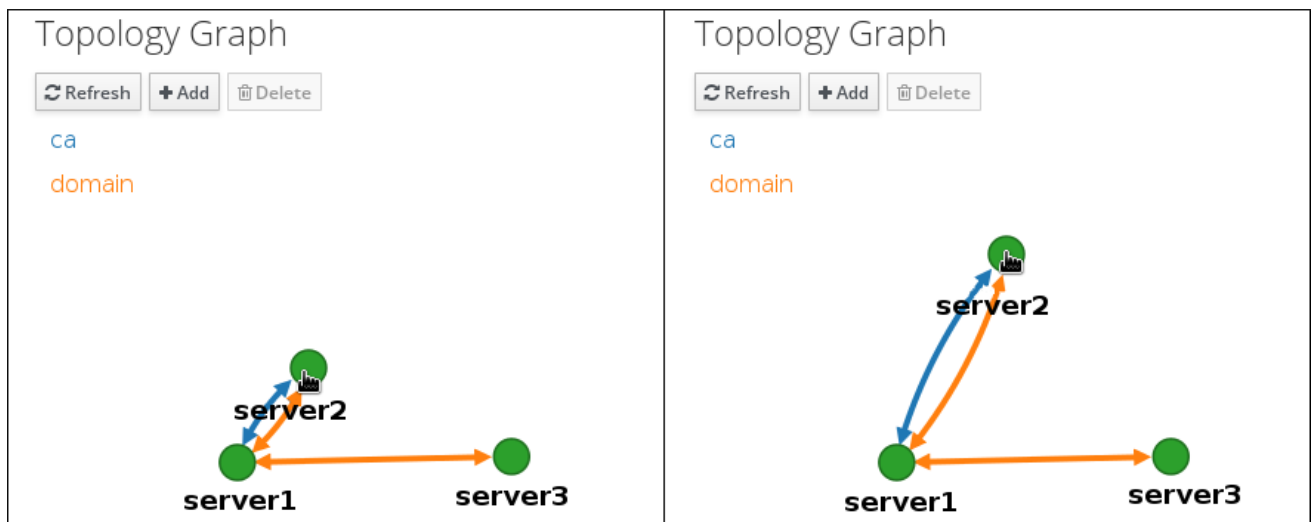
Figure 1.5. Discouraged topology example: Single Point of Failure



### Customizing the topology view

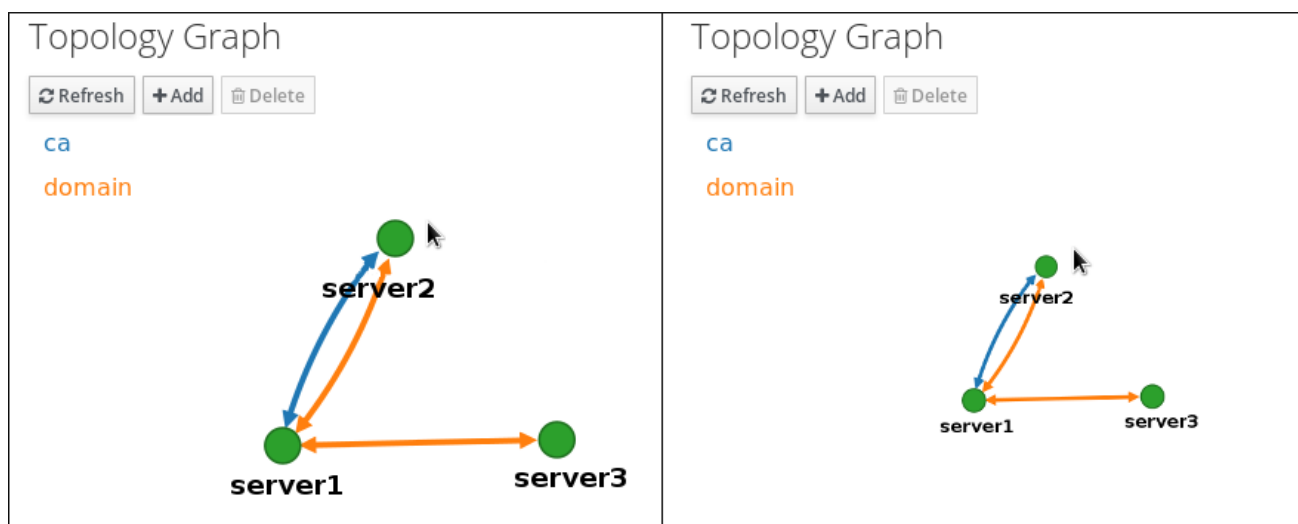
You can move individual topology nodes by dragging the mouse:

Figure 1.6. Moving topology graph nodes



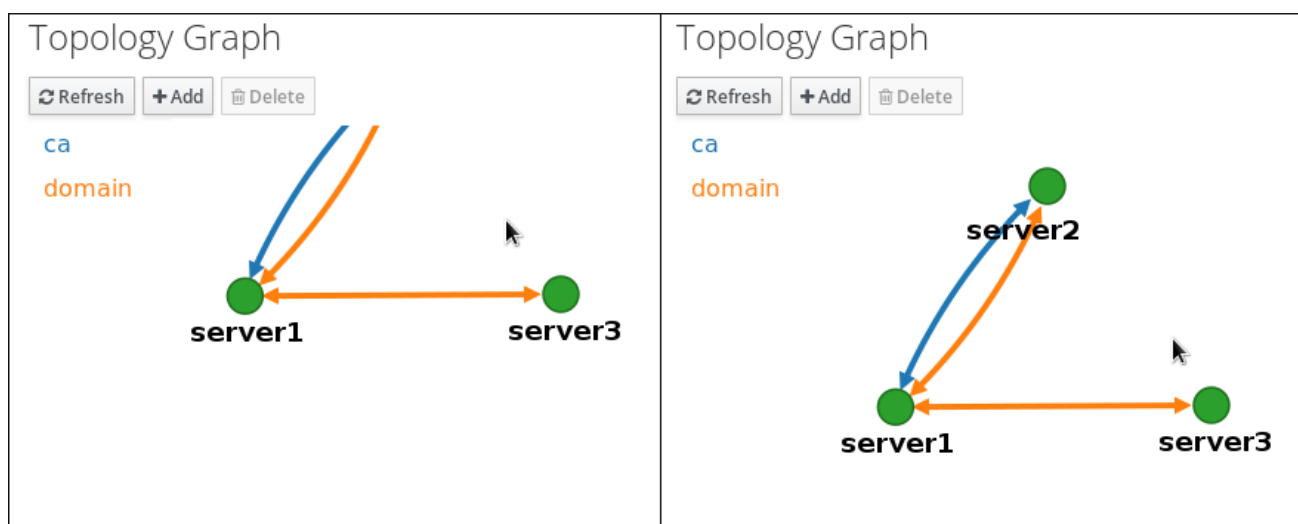
You can zoom in and zoom out the topology graph using the mouse wheel:

Figure 1.7. Zooming the topology graph



You can move the canvas of the topology graph by holding the left mouse button:

Figure 1.8. Moving the topology graph canvas



### 1.3. SETTING UP REPLICATION BETWEEN TWO SERVERS USING THE WEB UI

Using the Web interface of Identity Management (IdM) you can choose two servers and create new replication agreement between them.

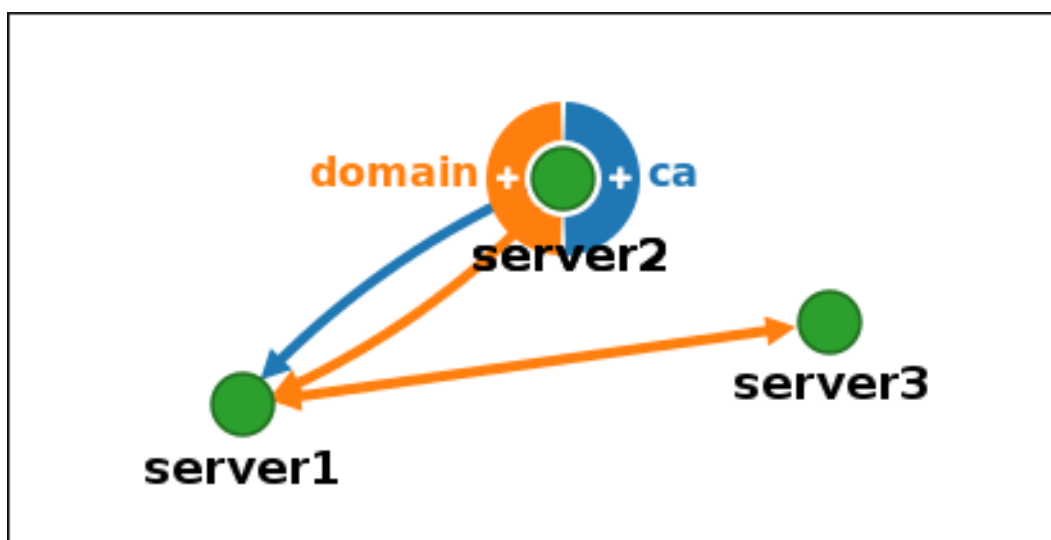
#### Prerequisites

- You have the IdM administrator credentials.

#### Procedure

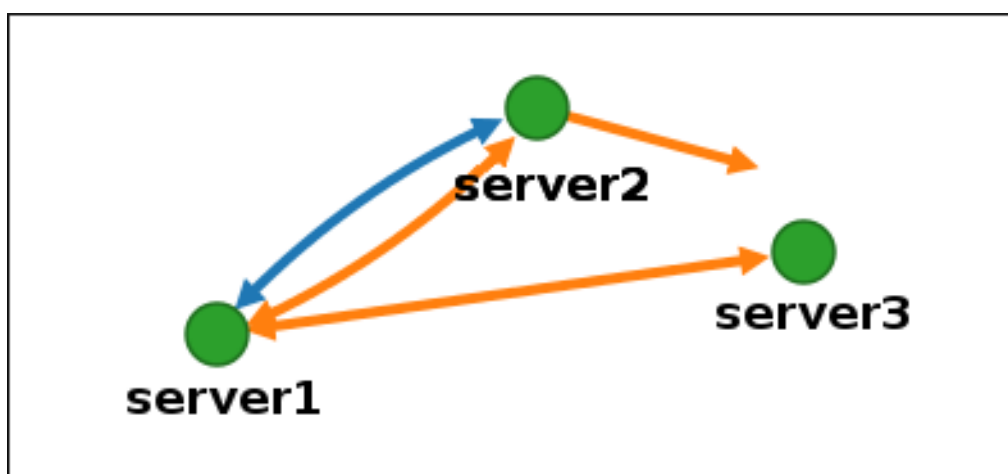
1. In the topology graph, hover your mouse over one of the server nodes.

Figure 1.9. Domain or CA options



2. Click on the **domain** or the **ca** part of the circle depending on what type of topology segment you want to create.
3. A new arrow representing the new replication agreement appears under your mouse pointer. Move your mouse to the other server node, and click on it.

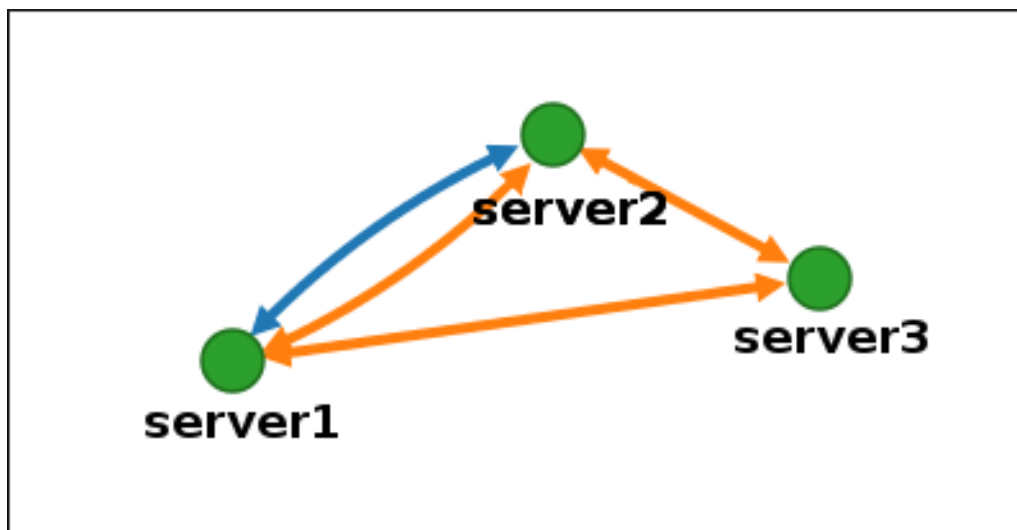
Figure 1.10. Creating a new segment



4. In the **Add topology segment** window, click **Add** to confirm the properties of the new segment.

The new topology segment between the two servers joins them in a replication agreement. The topology graph now shows the updated replication topology:

Figure 1.11. New segment created



## 1.4. STOPPING REPLICATION BETWEEN TWO SERVERS USING THE WEB UI

Using the web interface of Identity Management (IdM) you can remove a replication agreement from servers.

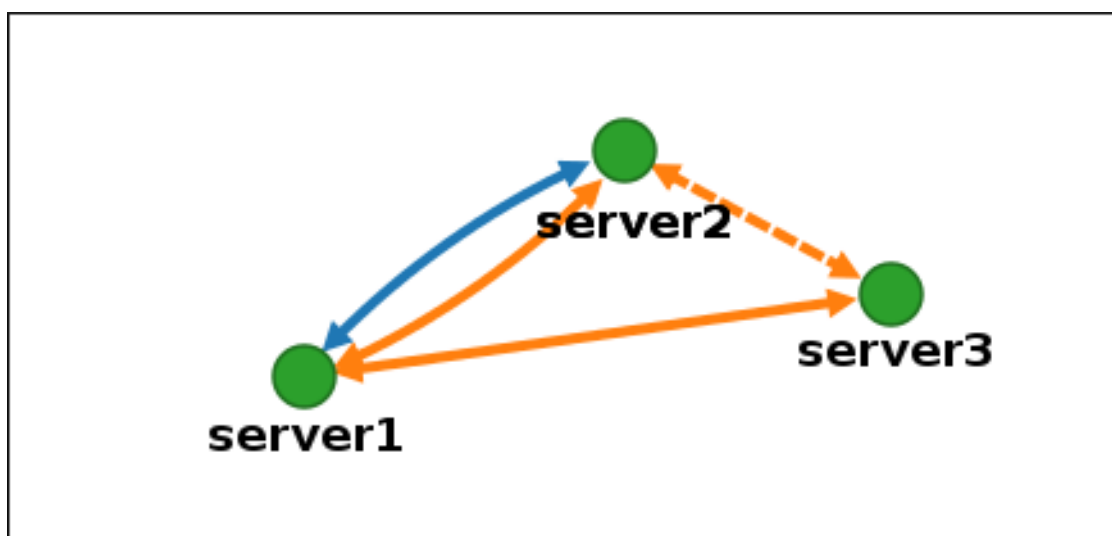
### Prerequisites

- You have the IdM administrator credentials.

### Procedure

1. Click on an arrow representing the replication agreement you want to remove. This highlights the arrow.

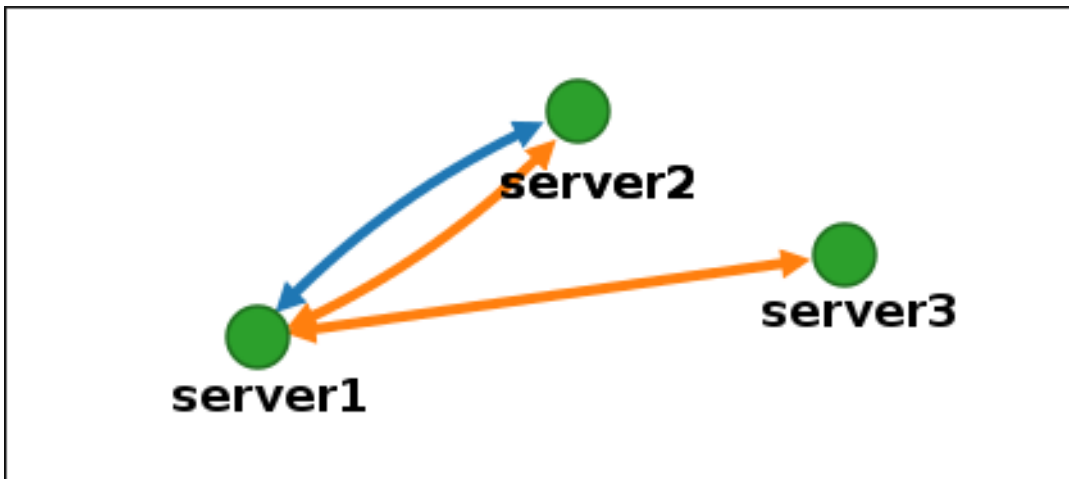
Figure 1.12. Topology segment highlighted



2. Click **Delete**.
3. In the **Confirmation** window, click **OK**.

IdM removes the topology segment between the two servers, which deletes their replication agreement. The topology graph now shows the updated replication topology:

Figure 1.13. Topology segment deleted



## 1.5. SETTING UP REPLICATION BETWEEN TWO SERVERS USING THE CLI

You can configure replication agreements between two servers using the **ipa topologysegment-add** command.

### Prerequisites

- You have the IdM administrator credentials.

### Procedure

1. Use the **ipa topologysegment-add** command to create a topology segment for the two servers. When prompted, provide:
  - the required topology suffix: **domain** or **ca**
  - the left node and the right node, representing the two servers
  - optionally, a custom name for the segment

For example:

```

$ ipa topologysegment-add
Suffix name: domain
Left node: server1.example.com
Right node: server2.example.com
Segment name [server1.example.com-to-server2.example.com]: new_segment
-----
Added segment "new_segment"
-----
Segment name: new_segment
Left node: server1.example.com
Right node: server2.example.com
Connectivity: both
  
```

Adding the new segment joins the servers in a replication agreement.



2. *Optional.* Use the **ipa topologysegment-show** command to verify that the new segment is configured.

```
$ ipa topologysegment-show
Suffix name: domain
Segment name: new_segment
Segment name: new_segment
Left node: server1.example.com
Right node: server2.example.com
Connectivity: both
```

## 1.6. STOPPING REPLICATION BETWEEN TWO SERVERS USING THE CLI

You can terminate replication agreements from command line using the **ipa topology segment-del** command.

### Prerequisites

- You have the IdM administrator credentials.

### Procedure

1. To stop replication, you must delete the corresponding replication segment between the servers. To do that, you need to know the segment name.  
If you do not know the name, use the **ipa topologysegment-find** command to display all segments, and locate the required segment in the output. When prompted, provide the required topology suffix: **domain** or **ca**. For example:

```
$ ipa topologysegment-find
Suffix name: domain
-----
8 segments matched
-----
Segment name: new_segment
Left node: server1.example.com
Right node: server2.example.com
Connectivity: both

...

-----
Number of entries returned 8
-----
```

2. Use the **ipa topologysegment-del** command to remove the topology segment joining the two servers.

```
$ ipa topologysegment-del
Suffix name: domain
Segment name: new_segment
```

```
-----
Deleted segment "new_segment"
-----
```

Deleting the segment removes the replication agreement.

3. *Optional.* Use the **ipa topologysegment-find** command to verify that the segment is no longer listed.

```
$ ipa topologysegment-find
Suffix name: domain
-----
7 segments matched
-----
Segment name: server2.example.com-to-server3.example.com
Left node: server2.example.com
Right node: server3.example.com
Connectivity: both
...
-----
Number of entries returned 7
-----
```

## 1.7. REMOVING SERVER FROM TOPOLOGY USING THE WEB UI

You can use Identity Management (IdM) web interface to remove a server from the topology.

### Prerequisites

- You have the IdM administrator credentials.
- The server you want to remove is **not** the only server connecting other servers with the rest of the topology; this would cause the other servers to become isolated, which is not allowed.
- The server you want to remove is **not** your last CA or DNS server.



### WARNING

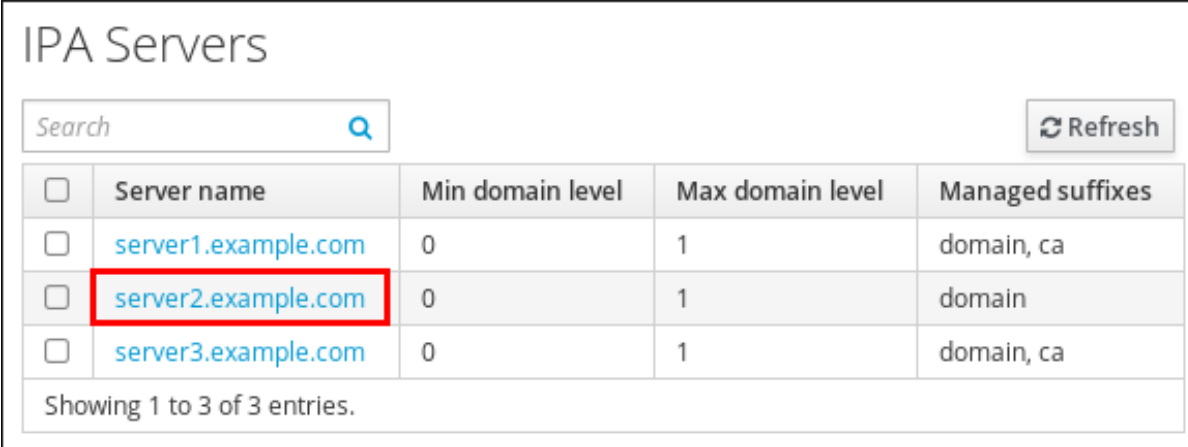
Removing a server is an irreversible action. If you remove a server, the only way to introduce it back into the topology is to install a new replica on the machine.

### Procedure

To remove a server from the topology without uninstalling the server components from the machine:

1. Select **IPA Server** → **Topology** → **IPA Servers**.
2. Click on the name of the server you want to delete.

Figure 1.14. Selecting a server



<input type="checkbox"/>	Server name	Min domain level	Max domain level	Managed suffixes
<input type="checkbox"/>	server1.example.com	0	1	domain, ca
<input type="checkbox"/>	server2.example.com	0	1	domain
<input type="checkbox"/>	server3.example.com	0	1	domain, ca

Showing 1 to 3 of 3 entries.

3. Click **Delete Server**.

## 1.8. REMOVING SERVER FROM TOPOLOGY USING THE CLI

You can use the command line interface to remove a server from the topology.

### Prerequisites

- You have the IdM administrator credentials.
- The server you want to remove is **not** the only server connecting other servers with the rest of the topology; this would cause the other servers to become isolated, which is not allowed
- The server you want to remove is **not** your last CA or DNS server.



### IMPORTANT

Removing a server is an irreversible action. If you remove a server, the only way to introduce it back into the topology is to install a new replica on the machine.

### Procedure

To remove **server1.example.com**:

1. On another server, run the **ipa server-del** command to remove **server1.example.com**. The command removes all topology segments pointing to the server:

```
[user@server2 ~]$ ipa server-del
Server name: server1.example.com
Removing server1.example.com from replication topology, please wait...
-----
Deleted IPA server "server1.example.com"
-----
```

2. *Optional:* on **server1.example.com**, run the **ipa server-install --uninstall** command to uninstall the server components from the machine.

```
[root@server1 ~]# ipa server-install --uninstall
```

## 1.9. VIEWING SERVER ROLES ON AN IDM SERVER USING THE WEB UI

Based on the services installed on an IdM server, it can perform various *server roles*. For example:

- CA server
- DNS server
- Key recovery authority (KRA) server.

For a complete list of the supported server roles, see [IPA Server → Topology → Server Roles](#).



### NOTE

- Role status **absent** means that no server in the topology is performing the role.
- Role status **enabled** means that one or more servers in the topology are performing the role.

Figure 1.15. Server roles in the web UI

Server Roles	
	<a href="#">Refresh</a>
Role name	Role status
<a href="#">AD trust agent</a>	absent
<a href="#">AD trust controller</a>	absent
<a href="#">CA server</a>	enabled

## 1.10. VIEWING SERVER ROLES ON AN IDM SERVER USING THE CLI

Based on the services installed on an IdM server, it can perform various *server roles*. For example:

- CA server
- DNS server
- Key recovery authority (KRA) server.

You can view which servers perform which roles in the topology using the following commands.

- The **ipa config-show** command displays all CA servers and the current CA renewal server:

```
$ ipa config-show
...
IPA masters: server1.example.com, server2.example.com, server3.example.com
IPA CA servers: server1.example.com, server2.example.com
IPA CA renewal master: server1.example.com
```

- The **ipa server-show** command displays a list of roles enabled on a particular server. For example, for a list of roles enabled on *server.example.com*:

```
$ ipa server-show
Server name: server.example.com
...
Enabled server roles: CA server, DNS server, KRA server
```

- The **ipa server-find --servrole** searches for all servers with a particular server role enabled. For example, to search for all CA servers:

```
$ ipa server-find --servrole "CA server"
-----
2 IPA servers matched
-----
Server name: server1.example.com
...
Server name: server2.example.com
...
-----
Number of entries returned 2
-----
```

## 1.11. PROMOTING A REPLICA TO A CA RENEWAL SERVER AND CRL PUBLISHER SERVER

If your IdM deployment uses an embedded certificate authority (CA), one of the IdM CA servers acts as the CA renewal server, a server that manages the renewal of CA subsystem certificates. One of the IdM CA servers also acts as the IdM CRL publisher server, a server that generates certificate revocation lists. By default, the CA renewal server and CRL publisher server roles are installed on the first server on which the system administrator installed the CA role using the **ipa-server-install** or **ipa-ca-install** command.

### Prerequisites

- You have the IdM administrator credentials.

## 1.12. DEMOTING OR PROMOTING HIDDEN REPLICAS

### Procedure

After a replica has been installed, you can configure whether the replica is hidden or visible.

For details about hidden replicas, see [The hidden replica mode](#).

If the replica is a CA renewal server, move the service to another replica before making this replica hidden.

For details, see

### Procedure

- To hide the replica, enter:

```
# ipa server-state replica.idm.example.com --state=hidden
```

-

Alternatively, you can make the replica visible with the following command:

```
# ipa server-state replica.idm.example.com --state=enabled
```

To view a list of all the hidden replicas in your topology, enter:

```
# ipa config-show
```

If all of your replicas are enabled, the command output does not mention hidden replicas

## CHAPTER 2. PREPARING YOUR ENVIRONMENT FOR MANAGING IDM USING ANSIBLE PLAYBOOKS

As a system administrator managing Identity Management (IdM), when working with Red Hat Ansible Engine, it is good practice to do the following:

- Create a subdirectory dedicated to Ansible playbooks in your home directory, for example `~/MyPlaybooks`.
- Copy and adapt sample Ansible playbooks from the `/usr/share/doc/ansible-freeipa/*` and `/usr/share/doc/rhel-system-roles/*` directories and subdirectories into your `~/MyPlaybooks` directory.
- Include your inventory file in your `~/MyPlaybooks` directory.

Using this practice, you can find all your playbooks in one place and you can run your playbooks without invoking root privileges.



### NOTE

You only need **root** privileges on the managed nodes to execute the **ipaserver**, **ipareplica**, **ipaclient** and **ipabackup ansible-freeipa** roles. These roles require privileged access to directories and the **dnf** software package manager.

Follow this procedure to create the `~/MyPlaybooks` directory and configure it so that you can use it to store and run Ansible playbooks.

### Prerequisites

- You have installed an IdM server on your managed nodes, `server.idm.example.com` and `replica.idm.example.com`.
- You have configured DNS and networking so you can log in to the managed nodes, `server.idm.example.com` and `replica.idm.example.com`, directly from the control node.
- You know the IdM **admin** password.

### Procedure

1. Create a directory for your Ansible configuration and playbooks in your home directory:

```
$ mkdir ~/MyPlaybooks/
```

2. Change into the `~/MyPlaybooks/` directory:

```
$ cd ~/MyPlaybooks
```

3. Create the `~/MyPlaybooks/ansible.cfg` file with the following content:

```
[defaults]
inventory = /home/your_username/MyPlaybooks/inventory
```

```
[privilege_escalation]
become=True
```

4. Create the `~/MyPlaybooks/inventory` file with the following content:

```
[eu]
server.idm.example.com

[us]
replica.idm.example.com

[ipaserver:children]
eu
us
```

This configuration defines two host groups, **eu** and **us**, for hosts in these locations. Additionally, this configuration defines the **ipaserver** host group, which contains all hosts from the **eu** and **us** groups.

5. [Optional] Create an SSH public and private key. To simplify access in your test environment, do not set a password on the private key:

```
$ ssh-keygen
```

6. Copy the SSH public key to the IdM **admin** account on each managed node:

```
$ ssh-copy-id admin@server.idm.example.com
$ ssh-copy-id admin@replica.idm.example.com
```

These commands require that you enter the IdM **admin** password.

### Additional resources

- See [Installing an Identity Management server using an Ansible playbook](#) .
- See [How to build your inventory](#) .



## CHAPTER 3. USING ANSIBLE TO MANAGE THE REPLICATION TOPOLOGY IN IDM

You can maintain multiple Identity Management (IdM) servers and let them replicate each other for redundancy purposes to mitigate or prevent server loss. For example, if one server fails, the other servers keep providing services to the domain. You can also recover the lost server by creating a new replica based on one of the remaining servers.

Data stored on an IdM server is replicated based on replication agreements: when two servers have a replication agreement configured, they share their data. The data that is replicated is stored in the topology **suffixes**. When two replicas have a replication agreement between their suffixes, the suffixes form a topology **segment**.

This chapter describes how to use **Red Hat Ansible Engine** to manage IdM replication agreements, topology segments, and topology suffixes. The chapter contains the following sections:

- [Using Ansible to ensure a replication agreement exists in IdM](#)
- [Using Ansible to ensure replication agreements exist between multiple IdM replicas](#)
- [Using Ansible to check if a replication agreement exists between two replicas](#)
- [Using Ansible to verify that a topology suffix exists in IdM](#)
- [Using Ansible to re-initialize an IdM replica](#)
- [Using Ansible to ensure a replication agreement is absent in IdM](#)

### 3.1. USING ANSIBLE TO ENSURE A REPLICATION AGREEMENT EXISTS IN IDM

Data stored on an Identity Management (IdM) server is replicated based on replication agreements: when two servers have a replication agreement configured, they share their data. Replication agreements are always bilateral: the data is replicated from the first replica to the other one as well as from the other replica to the first one.

Follow this procedure to use an Ansible playbook to ensure that a replication agreement of the **domain** type exists between **server.idm.example.com** and **replica.idm.example.com**.

#### Prerequisites

- Ensure that you understand the recommendations for designing your IdM topology listed in [Guidelines for connecting IdM replicas in a topology](#) .
- You know the IdM **admin** password.
- You have configured your Ansible control node to meet the following requirements:
  - You are using Ansible version 2.14 or later.
  - You have installed the **ansible-freeipa** package on the Ansible controller.
  - The example assumes that in the `~/MyPlaybooks/` directory, you have created an [Ansible inventory file](#) with the fully-qualified domain name (FQDN) of the IdM server.

- The example assumes that the **secret.yml** Ansible vault stores your **ipadmin\_password**.
- The target node, that is the node on which the **ansible-freeipa** module is executed, is part of the IdM domain as an IdM client, server or replica.

## Procedure

1. Navigate to your `~/MyPlaybooks/` directory:

```
$ cd ~/MyPlaybooks/
```

2. Copy the **add-topologysegment.yml** Ansible playbook file located in the `/usr/share/doc/ansible-freeipa/playbooks/topology/` directory:

```
$ cp /usr/share/doc/ansible-freeipa/playbooks/topology/add-topologysegment.yml
add-topologysegment-copy.yml
```

3. Open the **add-topologysegment-copy.yml** file for editing.
4. Adapt the file by setting the following variables in the **ipatopologysegment** task section:
  - Set the **ipadmin\_password** variable to the password of the IdM **admin**.
  - Set the **suffix** variable to either **domain** or **ca**, depending on what type of segment you want to add.
  - Set the **left** variable to the name of the IdM server that you want to be the left node of the replication agreement.
  - Set the **right** variable to the name of the IdM server that you want to be the right node of the replication agreement.
  - Ensure that the **state** variable is set to **present**.

This is the modified Ansible playbook file for the current example:

```
---
- name: Playbook to handle topologysegment
  hosts: ipaserver

  vars_files:
  - /home/user_name/MyPlaybooks/secret.yml
  tasks:
  - name: Add topology segment
    ipatopologysegment:
      ipadmin_password: "{{ ipadmin_password }}"
      suffix: domain
      left: server.idm.example.com
      right: replica.idm.example.com
      state: present
```

5. Save the file.
6. Run the Ansible playbook. Specify the playbook file, the file storing the password protecting the **secret.yml** file, and the inventory file:

```
$ ansible-playbook --vault-password-file=password_file -v -i inventory add-topologysegment-copy.yml
```

### Additional resources

- See [Explaining Replication Agreements, Topology Suffixes, and Topology Segments](#) .
- See the **README-topology.md** file in the `/usr/share/doc/ansible-freeipa/` directory.
- See the sample playbooks in the `/usr/share/doc/ansible-freeipa/playbooks/topology` directory.

## 3.2. USING ANSIBLE TO ENSURE REPLICATION AGREEMENTS EXIST BETWEEN MULTIPLE IDM REPLICAS

Data stored on an Identity Management (IdM) server is replicated based on replication agreements: when two servers have a replication agreement configured, they share their data. Replication agreements are always bilateral: the data is replicated from the first replica to the other one as well as from the other replica to the first one.

Follow this procedure to ensure replication agreements exist between multiple pairs of replicas in IdM.

### Prerequisites

- Ensure that you understand the recommendations for designing your IdM topology listed in [Connecting the replicas in a topology](#) .
- You know the IdM **admin** password.
- You have configured your Ansible control node to meet the following requirements:
  - You are using Ansible version 2.14 or later.
  - You have installed the **ansible-freeipa** package on the Ansible controller.
  - The example assumes that in the `~/MyPlaybooks/` directory, you have created an [Ansible inventory file](#) with the fully-qualified domain name (FQDN) of the IdM server.
  - The example assumes that the **secret.yml** Ansible vault stores your **ipadmin\_password**.
- The target node, that is the node on which the **ansible-freeipa** module is executed, is part of the IdM domain as an IdM client, server or replica.

### Procedure

1. Navigate to your `~/MyPlaybooks/` directory:

```
$ cd ~/MyPlaybooks/
```

2. Copy the **add-topologysegments.yml** Ansible playbook file located in the `/usr/share/doc/ansible-freeipa/playbooks/topology/` directory:

```
$ cp /usr/share/doc/ansible-freeipa/playbooks/topology/add-topologysegments.yml add-topologysegments-copy.yml
```

3. Open the **add-topologysegments-copy.yml** file for editing.
4. Adapt the file by setting the following variables in the **vars** section:
  - Set the **ipaadmin\_password** variable to the password of the IdM **admin**.
  - For every topology segment, add a line in the **ipatopology\_segments** section and set the following variables:
    - Set the **suffix** variable to either **domain** or **ca**, depending on what type of segment you want to add.
    - Set the **left** variable to the name of the IdM server that you want to be the left node of the replication agreement.
    - Set the **right** variable to the name of the IdM server that you want to be the right node of the replication agreement.
5. In the **tasks** section of the **add-topologysegments-copy.yml** file, ensure that the **state** variable is set to **present**.

This is the modified Ansible playbook file for the current example:

```
---
- name: Add topology segments
  hosts: ipaserver
  gather_facts: false

  vars:
    ipaadmin_password: "{{ ipaadmin_password }}"
    ipatopology_segments:
      - {suffix: domain, left: replica1.idm.example.com , right: replica2.idm.example.com }
      - {suffix: domain, left: replica2.idm.example.com , right: replica3.idm.example.com }
      - {suffix: domain, left: replica3.idm.example.com , right: replica4.idm.example.com }
      - {suffix: domain+ca, left: replica4.idm.example.com , right: replica1.idm.example.com }

  vars_files:
    - /home/user_name/MyPlaybooks/secret.yml
  tasks:
    - name: Add topology segment
      ipatopologysegment:
        ipaadmin_password: "{{ ipaadmin_password }}"
        suffix: "{{ item.suffix }}"
        name: "{{ item.name | default(omit) }}"
        left: "{{ item.left }}"
        right: "{{ item.right }}"
        state: present
        #state: absent
        #state: checked
        #state: reinitialized
      loop: "{{ ipatopology_segments | default([]) }}"
```

6. Save the file.
7. Run the Ansible playbook. Specify the playbook file, the file storing the password protecting the **secret.yml** file, and the inventory file:

```
$ ansible-playbook --vault-password-file=password_file -v -i inventory add-topologysegments-copy.yml
```

### Additional resources

- See [Explaining Replication Agreements, Topology Suffixes, and Topology Segments](#) .
- See the **README-topology.md** file in the `/usr/share/doc/ansible-freeipa/` directory.
- See the sample playbooks in the `/usr/share/doc/ansible-freeipa/playbooks/topology` directory.

## 3.3. USING ANSIBLE TO CHECK IF A REPLICATION AGREEMENT EXISTS BETWEEN TWO REPLICAS

Data stored on an Identity Management (IdM) server is replicated based on replication agreements: when two servers have a replication agreement configured, they share their data. Replication agreements are always bilateral: the data is replicated from the first replica to the other one as well as from the other replica to the first one.

Follow this procedure to verify that replication agreements exist between multiple pairs of replicas in IdM.

### Prerequisites

- Ensure that you understand the recommendations for designing your Identity Management (IdM) topology listed in [Connecting the replicas in a topology](#) .
- You know the IdM **admin** password.
- You have configured your Ansible control node to meet the following requirements:
  - You are using Ansible version 2.14 or later.
  - You have installed the **ansible-freeipa** package on the Ansible controller.
  - The example assumes that in the `~/MyPlaybooks/` directory, you have created an [Ansible inventory file](#) with the fully-qualified domain name (FQDN) of the IdM server.
  - The example assumes that the **secret.yml** Ansible vault stores your **ipadmin\_password**.
- The target node, that is the node on which the **ansible-freeipa** module is executed, is part of the IdM domain as an IdM client, server or replica.

### Procedure

1. Navigate to your `~/MyPlaybooks/` directory:

```
$ cd ~/MyPlaybooks/
```

2. Copy the **check-topologysegments.yml** Ansible playbook file located in the `/usr/share/doc/ansible-freeipa/playbooks/topology/` directory:

```
$ cp /usr/share/doc/ansible-freeipa/playbooks/topology/check-topologysegments.yml
check-topologysegments-copy.yml
```

3. Open the **check-topologysegments-copy.yml** file for editing.
4. Adapt the file by setting the following variables in the **vars** section:
  - Set the **ipaadmin\_password** variable to the password of the IdM **admin**.
  - For every topology segment, add a line in the **ipatopology\_segments** section and set the following variables:
    - Set the **suffix** variable to either **domain** or **ca**, depending on the type of segment you are adding.
    - Set the **left** variable to the name of the IdM server that you want to be the left node of the replication agreement.
    - Set the **right** variable to the name of the IdM server that you want to be the right node of the replication agreement.
5. In the **tasks** section of the **check-topologysegments-copy.yml** file, ensure that the **state** variable is set to **present**.  
This is the modified Ansible playbook file for the current example:

```
---
- name: Add topology segments
  hosts: ipaserver
  gather_facts: false

  vars:
    ipaadmin_password: "{{ ipaadmin_password }}"
    ipatopology_segments:
      - {suffix: domain, left: replica1.idm.example.com, right: replica2.idm.example.com }
      - {suffix: domain, left: replica2.idm.example.com , right: replica3.idm.example.com }
      - {suffix: domain, left: replica3.idm.example.com , right: replica4.idm.example.com }
      - {suffix: domain+ca, left: replica4.idm.example.com , right:
        replica1.idm.example.com }

  vars_files:
    - /home/user_name/MyPlaybooks/secret.yml
  tasks:
    - name: Check topology segment
      ipatopologysegment:
        ipaadmin_password: "{{ ipaadmin_password }}"
        suffix: "{{ item.suffix }}"
        name: "{{ item.name | default(omit) }}"
        left: "{{ item.left }}"
        right: "{{ item.right }}"
        state: checked
      loop: "{{ ipatopology_segments | default([]) }}"
```

6. Save the file.
7. Run the Ansible playbook. Specify the playbook file, the file storing the password protecting the **secret.yml** file, and the inventory file:

```
$ ansible-playbook --vault-password-file=password_file -v -i inventory check-topologysegments-copy.yml
```

### Additional resources

- For more information about the concept of topology agreements, suffixes, and segments, see [Explaining Replication Agreements, Topology Suffixes, and Topology Segments](#) .
- See the **README-topology.md** file in the `/usr/share/doc/ansible-freeipa/` directory.
- See the sample playbooks in the `/usr/share/doc/ansible-freeipa/playbooks/topology` directory.

## 3.4. USING ANSIBLE TO VERIFY THAT A TOPOLOGY SUFFIX EXISTS IN IDM

In the context of replication agreements in Identity Management (IdM), topology suffixes store the data that is replicated. IdM supports two types of topology suffixes: **domain** and **ca**. Each suffix represents a separate back end, a separate replication topology. When a replication agreement is configured, it joins two topology suffixes of the same type on two different servers.

The **domain** suffix contains all domain-related data, such as users, groups, and policies. The **ca** suffix contains data for the Certificate System component. It is only present on servers with a certificate authority (CA) installed.

Follow this procedure to use an Ansible playbook to ensure that a topology suffix exists in IdM. The example describes how to ensure that the **domain** suffix exists in IdM.

### Prerequisites

- You know the IdM **admin** password.
- You have configured your Ansible control node to meet the following requirements:
  - You are using Ansible version 2.14 or later.
  - You have installed the **ansible-freeipa** package on the Ansible controller.
  - The example assumes that in the `~/MyPlaybooks/` directory, you have created an [Ansible inventory file](#) with the fully-qualified domain name (FQDN) of the IdM server.
  - The example assumes that the **secret.yml** Ansible vault stores your **ipadmin\_password**.
- The target node, that is the node on which the **ansible-freeipa** module is executed, is part of the IdM domain as an IdM client, server or replica.

### Procedure

1. Navigate to your `~/MyPlaybooks/` directory:

```
$ cd ~/MyPlaybooks/
```

2. Copy the **verify-topologysuffix.yml** Ansible playbook file located in the `/usr/share/doc/ansible-freeipa/playbooks/topology/` directory:

-

```
$ cp /usr/share/doc/ansible-freeipa/playbooks/topology/verify-topologysuffix.yml
verify-topologysuffix-copy.yml
```

- Open the **verify-topologysuffix-copy.yml** Ansible playbook file for editing.
- Adapt the file by setting the following variables in the **ipatopologysuffix** section:
  - Set the **ipaadmin\_password** variable to the password of the IdM **admin**.
  - Set the **suffix** variable to **domain**. If you are verifying the presence of the **ca** suffix, set the variable to **ca**.
  - Ensure that the **state** variable is set to **verified**. No other option is possible.

This is the modified Ansible playbook file for the current example:

```
---
- name: Playbook to handle topologysuffix
  hosts: ipaserver

  vars_files:
  - /home/user_name/MyPlaybooks/secret.yml
  tasks:
  - name: Verify topology suffix
    ipatopologysuffix:
      ipaadmin_password: "{{ ipaadmin_password }}"
      suffix: domain
      state: verified
```

- Save the file.
- Run the Ansible playbook. Specify the playbook file, the file storing the password protecting the **secret.yml** file, and the inventory file:

```
$ ansible-playbook --vault-password-file=password_file -v -i inventory verify-
topologysuffix-copy.yml
```

#### Additional resources

- See [Explaining Replication Agreements, Topology Suffixes, and Topology Segments](#) .
- See the **README-topology.md** file in the **/usr/share/doc/ansible-freeipa/** directory.
- See the sample playbooks in the **/usr/share/doc/ansible-freeipa/playbooks/topology** directory.

### 3.5. USING ANSIBLE TO REINITIALIZE AN IDM REPLICA

If a replica has been offline for a long period of time or its database has been corrupted, you can reinitialize it. reinitialization refreshes the replica with an updated set of data. reinitialization can, for example, be used if an authoritative restore from backup is required.





## NOTE

In contrast to replication updates, during which replicas only send changed entries to each other, reinitialization refreshes the whole database.

The local host on which you run the command is the reinitialized replica. To specify the replica from which the data is obtained, use the **direction** option.

Follow this procedure to use an Ansible playbook to reinitialize the **domain** data on **replica.idm.example.com** from **server.idm.example.com**.

### Prerequisites

- You know the IdM **admin** password.
- You have configured your Ansible control node to meet the following requirements:
  - You are using Ansible version 2.14 or later.
  - You have installed the **ansible-freeipa** package on the Ansible controller.
  - The example assumes that in the `~/MyPlaybooks/` directory, you have created an [Ansible inventory file](#) with the fully-qualified domain name (FQDN) of the IdM server.
  - The example assumes that the `secret.yml` Ansible vault stores your **ipadmin\_password**.
- The target node, that is the node on which the **ansible-freeipa** module is executed, is part of the IdM domain as an IdM client, server or replica.

### Procedure

1. Navigate to your `~/MyPlaybooks/` directory:

```
$ cd ~/MyPlaybooks/
```

2. Copy the **reinitialize-topologysegment.yml** Ansible playbook file located in the `/usr/share/doc/ansible-freeipa/playbooks/topology/` directory:

```
$ cp /usr/share/doc/ansible-freeipa/playbooks/topology/reinitialize-topologysegment.yml reinitialize-topologysegment-copy.yml
```

3. Open the **reinitialize-topologysegment-copy.yml** file for editing.
4. Adapt the file by setting the following variables in the **ipatopologysegment** section:
  - Set the **ipadmin\_password** variable to the password of the IdM **admin**.
  - Set the **suffix** variable to **domain**. If you are reinitializing the **ca** data, set the variable to **ca**.
  - Set the **left** variable to the left node of the replication agreement.
  - Set the **right** variable to the right node of the replication agreement.
  - Set the **direction** variable to the direction of the reinitializing data. The **left-to-right** direction means that data flows from the left node to the right node.

- Ensure that the **state** variable is set to **reinitialized**.  
This is the modified Ansible playbook file for the current example:

```
---
- name: Playbook to handle topologysegment
  hosts: ipaserver

  vars_files:
  - /home/user_name/MyPlaybooks/secret.yml
  tasks:
  - name: Reinitialize topology segment
    ipatopologysegment:
      ipadmin_password: "{{ ipadmin_password }}"
      suffix: domain
      left: server.idm.example.com
      right: replica.idm.example.com
      direction: left-to-right
      state: reinitialized
```

5. Save the file.
6. Run the Ansible playbook. Specify the playbook file, the file storing the password protecting the **secret.yml** file, and the inventory file:

```
$ ansible-playbook --vault-password-file=password_file -v -i inventory reinitialize-
topologysegment-copy.yml
```

#### Additional resources

- See [Explaining Replication Agreements, Topology Suffixes, and Topology Segments](#) .
- See the **README-topology.md** file in the `/usr/share/doc/ansible-freeipa/` directory.
- See the sample playbooks in the `/usr/share/doc/ansible-freeipa/playbooks/topology` directory.

## 3.6. USING ANSIBLE TO ENSURE A REPLICATION AGREEMENT IS ABSENT IN IDM

Data stored on an Identity Management (IdM) server is replicated based on replication agreements: when two servers have a replication agreement configured, they share their data. Replication agreements are always bilateral: the data is replicated from the first replica to the other one as well as from the other replica to the first one.

Follow this procedure to ensure a replication agreement between two replicas does not exist in IdM. The example describes how to ensure a replication agreement of the **domain** type does not exist between the **replica01.idm.example.com** and **replica02.idm.example.com** IdM servers.

#### Prerequisites

- Ensure that you understand the recommendations for designing your IdM topology listed in [Connecting the replicas in a topology](#)
- You know the IdM **admin** password.

- You have configured your Ansible control node to meet the following requirements:
  - You are using Ansible version 2.14 or later.
  - You have installed the **ansible-freeipa** package on the Ansible controller.
  - The example assumes that in the `~/MyPlaybooks/` directory, you have created an **Ansible inventory file** with the fully-qualified domain name (FQDN) of the IdM server.
  - The example assumes that the **secret.yml** Ansible vault stores your **ipadmin\_password**.
- The target node, that is the node on which the **ansible-freeipa** module is executed, is part of the IdM domain as an IdM client, server or replica.

## Procedure

1. Navigate to your `~/MyPlaybooks/` directory:

```
$ cd ~/MyPlaybooks/
```

2. Copy the **delete-topologysegment.yml** Ansible playbook file located in the `/usr/share/doc/ansible-freeipa/playbooks/topology/` directory:

```
$ cp /usr/share/doc/ansible-freeipa/playbooks/topology/delete-topologysegment.yml
delete-topologysegment-copy.yml
```

3. Open the **delete-topologysegment-copy.yml** file for editing.
4. Adapt the file by setting the following variables in the **ipatopologysegment** task section:
  - Set the **ipadmin\_password** variable to the password of the IdM **admin**.
  - Set the **suffix** variable to **domain**. Alternatively, if you are ensuring that the **ca** data are not replicated between the left and right nodes, set the variable to **ca**.
  - Set the **left** variable to the name of the IdM server that is the left node of the replication agreement.
  - Set the **right** variable to the name of the IdM server that is the right node of the replication agreement.
  - Ensure that the **state** variable is set to **absent**.

This is the modified Ansible playbook file for the current example:

```
---
- name: Playbook to handle topologysegment
  hosts: ipaserver

  vars_files:
  - /home/user_name/MyPlaybooks/secret.yml
  tasks:
  - name: Delete topology segment
    ipatopologysegment:
      ipadmin_password: "{{ ipadmin_password }}"
      suffix: domain
```

```
left: replica01.idm.example.com  
right: replica02.idm.example.com:  
state: absent
```

5. Save the file.
6. Run the Ansible playbook. Specify the playbook file, the file storing the password protecting the `secret.yml` file, and the inventory file:

```
$ ansible-playbook --vault-password-file=password_file -v -i inventory delete-  
topologysegment-copy.yml
```

#### Additional resources

- See [Explaining Replication Agreements, Topology Suffixes, and Topology Segments](#) .
- See the `README-topology.md` file in the `/usr/share/doc/ansible-freeipa/` directory.
- See the sample playbooks in the `/usr/share/doc/ansible-freeipa/playbooks/topology` directory.

### 3.7. ADDITIONAL RESOURCES

- See [Planning the replica topology](#) .
- See [Installing an IdM replica](#) .

## CHAPTER 4. DEMOTING OR PROMOTING HIDDEN REPLICAS

After a replica has been installed, you can configure whether the replica is hidden or visible.

For details about hidden replicas, see [The hidden replica mode](#).

If the replica is a CA renewal server, move the service to another replica before making this replica hidden.

For details, see

### Procedure

- To hide the replica, enter:

```
# ipa server-state replica.idm.example.com --state=hidden
```

Alternatively, you can make the replica visible with the following command:

```
# ipa server-state replica.idm.example.com --state=enabled
```

To view a list of all the hidden replicas in your topology, enter:

```
# ipa config-show
```

If all of your replicas are enabled, the command output does not mention hidden replicas

## CHAPTER 5. CHECKING IDM REPLICATION USING HEALTHCHECK

You can test Identity Management (IdM) replication using the Healthcheck tool.

For details, see [Healthcheck in IdM](#).

### 5.1. REPLICATION HEALTHCHECK TESTS

The Healthcheck tool tests the Identity Management (IdM) topology configuration and searches for replication conflict issues.

To list all tests, run the **ipa-healthcheck** with the **--list-sources** option:

```
# ipa-healthcheck --list-sources
```

The topology tests are placed under the **ipahealthcheck.ipa.topology** and **ipahealthcheck.ds.replication** sources:

#### IPATopologyDomainCheck

This test verifies:

- Whether topology is not disconnected and there are replication paths between all servers.
- If servers do not have more than the recommended number of replication agreements. If the test fails, the test returns errors, such as connection errors or too many replication agreements.

If the test succeeds, the test returns the configured domains.



#### NOTE

The test runs the **ipa topologysuffix-verify** command for both the domain and ca suffixes (assuming the Certificate Authority is configured on this server).

#### ReplicationConflictCheck

The test searches for entries in LDAP matching **(&!(objectclass=nstombstone)(nsds5ReplConflict=\*))**.



#### NOTE

Run these tests on all IdM servers when trying to check for issues.

For more information on resolving LDAP replication conflicts, see [Solving common replication problems](#).

### 5.2. SCREENING REPLICATION USING HEALTHCHECK

Follow this procedure to run a standalone manual test of an Identity Management (IdM) replication topology and configuration using the Healthcheck tool.

The Healthcheck tool includes many tests, therefore, you can shorten the results with:

- Replication conflict test: **--source=ipahealthcheck.ds.replication**
- Correct topology test: **--source=ipahealthcheck.ipa.topology**

## Prerequisites

- You must perform Healthcheck tests as the **root** user.

## Procedure

- To run Healthcheck replication conflict and topology checks, enter:

```
# ipa-healthcheck --source=ipahealthcheck.ds.replication --
source=ipahealthcheck.ipa.topology
```

Four different results are possible:

- **SUCCESS** – the test passed successfully.

```
{
  "source": "ipahealthcheck.ipa.topology",
  "check": "IPATopologyDomainCheck",
  "result": "SUCCESS",
  "kw": {
    "suffix": "domain"
  }
}
```

- **WARNING** – the test passed but there might be a problem.
- **ERROR** – the test failed.

```
{
  "source": "ipahealthcheck.ipa.topology",
  "check": "IPATopologyDomainCheck",
  "result": "ERROR",
  "uuid": "d6ce3332-92da-423d-9818-e79f49ed321f",
  "when": "20191007115449Z",
  "duration": "0.005943",
  "kw": {
    "msg": "topologysuffix-verify domain failed, server2 is not connected
(server2_139664377356472 in MainThread)"
  }
}
```

- **CRITICAL** – the test failed and it affects the IdM server functionality.

## Additional resources

- See **man ipa-healthcheck**.

