



Red Hat Enterprise Linux 8

Installing Identity Management

Getting started using Identity Management

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Abstract

This documentation collection provides instructions on how to install Identity Management on Red Hat Enterprise Linux 8 (RHEL) and how to upgrade to it from RHEL 7.

Table of Contents

PROVIDING FEEDBACK ON RED HAT DOCUMENTATION	6
PART I. INSTALLING IDENTITY MANAGEMENT	7
CHAPTER 1. PREPARING THE SYSTEM FOR IDM SERVER INSTALLATION	8
1.1. HARDWARE RECOMMENDATIONS	8
1.2. CUSTOM CONFIGURATION REQUIREMENTS FOR IDM	8
1.2.1. IPv6 requirements in IdM	8
1.3. HOST NAME AND DNS REQUIREMENTS FOR IDM	8
1.4. PORT REQUIREMENTS FOR IDM	12
Opening the required ports	12
1.5. INSTALLING PACKAGES REQUIRED FOR AN IDM SERVER	13
CHAPTER 2. INSTALLING AN IDM SERVER: WITH INTEGRATED DNS, WITH AN INTEGRATED CA AS THE ROOT CA	16
2.1. INTERACTIVE INSTALLATION	16
2.2. NON-INTERACTIVE INSTALLATION	18
CHAPTER 3. INSTALLING AN IDM SERVER: WITH INTEGRATED DNS, WITH AN EXTERNAL CA AS THE ROOT CA	20
3.1. INTERACTIVE INSTALLATION	20
3.2. TROUBLESHOOTING: EXTERNAL CA INSTALLATION FAILS	23
What this means:	23
To fix the problem:	23
CHAPTER 4. INSTALLING AN IDM SERVER: WITH INTEGRATED DNS, WITHOUT A CA	25
4.1. CERTIFICATES REQUIRED TO INSTALL AN IDM SERVER WITHOUT A CA	25
4.2. INTERACTIVE INSTALLATION	26
CHAPTER 5. INSTALLING AN IDM SERVER: WITHOUT INTEGRATED DNS, WITH AN INTEGRATED CA AS THE ROOT CA	29
5.1. INTERACTIVE INSTALLATION	29
5.2. NON-INTERACTIVE INSTALLATION	30
CHAPTER 6. UNINSTALLING AN IDM SERVER	32
CHAPTER 7. RENAMING AN IDM SERVER	33
CHAPTER 8. PREPARING THE SYSTEM FOR IDM CLIENT INSTALLATION	34
8.1. DNS REQUIREMENTS FOR IDM CLIENTS	34
Additional resources	34
8.2. PORT REQUIREMENTS FOR IDM CLIENTS	34
8.3. PACKAGES REQUIRED TO INSTALL AN IDM CLIENT	34
8.3.1. Installing ipa-client packages from the idm:client stream	34
8.3.2. Installing ipa-client packages from the idm:DL1 stream	35
CHAPTER 9. INSTALLING AN IDM CLIENT: BASIC SCENARIO	36
9.1. PREREQUISITES	36
9.2. AN OVERVIEW OF THE IDM CLIENT INSTALLATION OPTIONS	36
9.3. INSTALLING A CLIENT BY USING USER CREDENTIALS: INTERACTIVE INSTALLATION	36
9.4. INSTALLING A CLIENT BY USING A ONE-TIME PASSWORD: INTERACTIVE INSTALLATION	38
9.5. INSTALLING A CLIENT: NON-INTERACTIVE INSTALLATION	40
9.6. REMOVING PRE-IDM CONFIGURATION AFTER INSTALLING A CLIENT	41
9.7. TESTING AN IDM CLIENT	41
9.8. CONNECTIONS PERFORMED DURING AN IDM CLIENT INSTALLATION	42

9.9. IDM CLIENT'S COMMUNICATIONS WITH THE SERVER DURING POST-INSTALLATION DEPLOYMENT	42
9.9.1. SSSD communication patterns	43
9.9.2. Certmonger communication patterns	45
CHAPTER 10. INSTALLING AN IDM CLIENT WITH KICKSTART	46
10.1. INSTALLING A CLIENT WITH KICKSTART	46
10.2. KICKSTART FILE FOR CLIENT INSTALLATION	46
10.3. TESTING AN IDM CLIENT	47
CHAPTER 11. RE-ENROLLING AN IDM CLIENT	48
11.1. CLIENT RE-ENROLLMENT IN IDM	48
11.1.1. What happens during client re-enrollment	48
11.2. RE-ENROLLING A CLIENT BY USING USER CREDENTIALS: INTERACTIVE RE-ENROLLMENT	48
11.3. RE-ENROLLING A CLIENT BY USING THE CLIENT KEYTAB: NON-INTERACTIVE RE-ENROLLMENT	49
11.4. TESTING AN IDM CLIENT	49
CHAPTER 12. UNINSTALLING AN IDM CLIENT	51
12.1. UNINSTALLING AN IDM CLIENT	51
CHAPTER 13. RENAMING IDM CLIENT SYSTEMS	52
13.1. PREREQUISITES	52
13.2. UNINSTALLING AN IDM CLIENT	53
13.3. RENAMING THE HOST SYSTEM	53
13.4. RE-INSTALLING AN IDM CLIENT	53
13.5. RE-ADDING SERVICES, RE-GENERATING CERTIFICATES, AND RE-ADDING HOST GROUPS	54
CHAPTER 14. PREPARING THE SYSTEM FOR IDM REPLICA INSTALLATION	55
14.1. REPLICA VERSION REQUIREMENTS	55
14.2. METHODS FOR DISPLAYING IDM SOFTWARE VERSION	55
CHAPTER 15. INSTALLING AN IDM REPLICA	57
15.1. PREREQUISITES FOR INSTALLING A REPLICA ON AN IDM CLIENT	57
15.2. PREREQUISITES FOR INSTALLING A REPLICA ON A SYSTEM OUTSIDE THE IDM DOMAIN	58
15.3. INSTALLING AN IDM REPLICA WITH INTEGRATED DNS	59
15.4. INSTALLING AN IDM REPLICA WITH A CA	59
15.5. INSTALLING AN IDM REPLICA WITHOUT A CA	60
15.6. INSTALLING AN IDM HIDDEN REPLICA	61
15.7. TESTING AN IDM REPLICA	61
15.8. CONNECTIONS PERFORMED DURING AN IDM REPLICA INSTALLATION	62
CHAPTER 16. UNINSTALLING AN IDM REPLICA	63
CHAPTER 17. INSTALLING THE IDM HEALTHCHECK TOOL	64
17.1. HEALTHCHECK IN IDM	64
17.1.1. Modules are Independent	64
17.1.2. Two output formats	64
17.1.3. Results	64
17.1.4. Running IdM Healthcheck	65
17.2. INSTALLING IDM HEALTHCHECK	65
17.3. ADDITIONAL RESOURCES	65
CHAPTER 18. INSTALLING AN IDENTITY MANAGEMENT SERVER USING AN ANSIBLE PLAYBOOK	67
18.1. ANSIBLE AND ITS ADVANTAGES FOR INSTALLING IDM	67
Advantages of using Ansible to install IdM	67
18.2. IDM SERVER INSTALLATION USING AN ANSIBLE PLAYBOOK	67

Overview	67
18.3. INSTALLING THE ANSIBLE-FREEIPA PACKAGE	68
18.4. ANSIBLE ROLES LOCATION IN THE FILE SYSTEM	68
18.5. DEPLOYING AN IDM SERVER WITH AN INTEGRATED CA AS THE ROOT CA USING AN ANSIBLE PLAYBOOK	69
18.5.1. Setting the parameters for a deployment with an integrated CA as the root CA	69
18.5.2. Deploying an IdM server with an integrated CA as the root CA using an Ansible playbook	70
18.6. DEPLOYING AN IDM SERVER WITH AN EXTERNAL CA AS THE ROOT CA USING AN ANSIBLE PLAYBOOK	71
18.6.1. Setting the parameters for a deployment with an external CA as the root CA	71
18.6.2. Deploying an IdM server with an external CA as the root CA using an Ansible playbook	73
CHAPTER 19. INSTALLING AN IDENTITY MANAGEMENT REPLICA USING AN ANSIBLE PLAYBOOK ...	75
19.1. ANSIBLE AND ITS ADVANTAGES FOR INSTALLING IDM	75
Advantages of using Ansible to install IdM	75
19.2. IDM REPLICA INSTALLATION USING AN ANSIBLE PLAYBOOK	75
Overview	75
19.3. INSTALLING THE ANSIBLE-FREEIPA PACKAGE	76
19.4. ANSIBLE ROLES LOCATION IN THE FILE SYSTEM	76
19.5. SETTING THE PARAMETERS OF THE IDM REPLICA DEPLOYMENT	77
19.5.1. Specifying the base, server and client variables for installing the IdM replica	77
19.5.2. Specifying the credentials for installing the IdM replica using an Ansible playbook	79
19.6. DEPLOYING AN IDM REPLICA USING AN ANSIBLE PLAYBOOK	80
CHAPTER 20. INSTALLING AN IDENTITY MANAGEMENT CLIENT USING AN ANSIBLE PLAYBOOK	82
20.1. ANSIBLE AND ITS ADVANTAGES FOR INSTALLING IDM	82
Advantages of using Ansible to install IdM	82
20.2. IDM CLIENT INSTALLATION USING AN ANSIBLE PLAYBOOK	82
Overview	82
20.3. INSTALLING THE ANSIBLE-FREEIPA PACKAGE	83
20.4. ANSIBLE ROLES LOCATION IN THE FILE SYSTEM	83
20.5. SETTING THE PARAMETERS OF THE IDM CLIENT DEPLOYMENT	84
20.5.1. Setting the parameters of the inventory file for the autodiscovery client installation mode	84
20.5.2. Setting the parameters of the inventory file when autodiscovery is not possible during client installation	86
20.5.3. Checking the parameters in the install-client.yml file	88
20.5.4. Authorization options for IdM client enrollment using an Ansible playbook	89
20.6. DEPLOYING AN IDM CLIENT USING AN ANSIBLE PLAYBOOK	90
20.7. TESTING AN IDENTITY MANAGEMENT CLIENT AFTER ANSIBLE INSTALLATION	91
PART II. INTEGRATING IDM AND AD	92
CHAPTER 21. INSTALLING TRUST BETWEEN IDM AND AD	93
21.1. SUPPORTED VERSIONS OF WINDOWS SERVER	93
21.2. HOW THE TRUST WORKS	93
21.3. AD ADMINISTRATION RIGHTS	94
21.4. ENSURING SUPPORT FOR COMMON ENCRYPTION TYPES IN AD AND RHEL	94
21.5. PORTS REQUIRED FOR COMMUNICATION BETWEEN IDM AND AD	95
21.6. CONFIGURING DNS AND REALM SETTINGS FOR A TRUST	97
21.6.1. Unique primary DNS domains	98
21.6.2. Configuring DNS zones in the IdM Web UI	99
21.6.3. Configuring DNS forwarding in AD	101
21.6.4. Verifying the DNS configuration	102
21.7. SETTING UP A TRUST	103

21.7.1. Preparing the IdM server for the trust	103
21.7.2. Setting up a trust agreement using the command line	105
21.7.3. Setting up a trust agreement in the IdM Web UI	106
21.7.4. Verifying the Kerberos configuration	107
21.7.5. Verifying the trust configuration on IdM	108
21.7.6. Verifying the trust configuration on AD	109
21.8. REMOVING THE TRUST USING THE IDM WEB UI	110
PART III. MIGRATING IDM FROM RHEL 7 TO RHEL 8 AND KEEPING IT UP-TO-DATE	112
CHAPTER 22. MIGRATING IDM FROM RHEL 7 TO 8	113
22.1. PREREQUISITES FOR MIGRATING IDM FROM RHEL 7 TO 8	113
22.2. INSTALLING THE RHEL 8 REPLICA	114
22.3. MOVING THE CA RENEWAL MASTER TO RHEL 8	115
22.4. STOPPING CRL GENERATION ON RHEL 7 IDM CA MASTER	116
22.5. STARTING CRL GENERATION ON THE NEW RHEL 8 IDM CA MASTER	117
22.6. STOPPING AND DECOMMISSIONING THE RHEL 7 SERVER	117
CHAPTER 23. UPDATING AND DOWNGRADING IDM	119

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PART I. INSTALLING IDENTITY MANAGEMENT

CHAPTER 1. PREPARING THE SYSTEM FOR IDM SERVER INSTALLATION

The following sections list the requirements to install an Identity Management (IdM) server. Before the installation, make sure your system meets these requirements.

1.1. HARDWARE RECOMMENDATIONS

RAM is the most important hardware feature to size properly. Make sure your system has enough RAM available. Typical RAM requirements are:

- For 10,000 users and 100 groups: at least 3 GB of RAM and 1 GB swap space
- For 100,000 users and 50,000 groups: at least 16 GB of RAM and 4 GB of swap space

For larger deployments, it is more effective to increase the RAM than to increase disk space because much of the data is stored in cache.

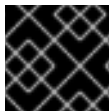


NOTE

A basic user entry or a simple host entry with a certificate is approximately 5–10 kB in size.

1.2. CUSTOM CONFIGURATION REQUIREMENTS FOR IDM

Install an Identity Management (IdM) server on a clean system without any custom configuration for services such as DNS, Kerberos, Apache, or Directory Server.



IMPORTANT

IdM currently does not support the FIPS mode on RHEL 8 systems.

The IdM server installation overwrites system files to set up the IdM domain. IdM backs up the original system files to **/var/lib/ipa/sysrestore/**. When an IdM server is uninstalled at the end of the lifecycle, these files are restored.

1.2.1. IPv6 requirements in IdM

The IdM system must have the IPv6 protocol enabled in the kernel. If IPv6 is disabled, then the CLDAP plug-in used by the IdM services fails to initialize.



NOTE

IPv6 does not have to be enabled on the network.

1.3. HOST NAME AND DNS REQUIREMENTS FOR IDM

This section lists the host name and DNS requirements for server and replica systems. It also shows how to verify that the systems meet the requirements.

The requirements in this section apply to all Identity Management (IdM) servers, those with integrated DNS and those without integrated DNS.



WARNING

DNS records are vital for nearly all IdM domain functions, including running LDAP directory services, Kerberos, and Active Directory integration. Be extremely cautious and ensure that:

- You have a tested and functional DNS service available
- The service is properly configured

This requirement applies to IdM servers with **and** without integrated DNS.

Verify the server host name

The host name must be a fully qualified domain name, such as **server.example.com**.

The fully qualified domain name must meet the following conditions:

- It is a valid DNS name, which means only numbers, alphabetic characters, and hyphens (-) are allowed. Other characters, such as underscores (_), in the host name cause DNS failures.
- It is all lower-case. No capital letters are allowed.
- It does not resolve to the loopback address. It must resolve to the system's public IP address, not to **127.0.0.1**.

To verify the host name, use the **hostname** utility on the system where you want to install:

```
# hostname
server.idm.example.com
```

The output of **hostname** must not be **localhost** or **localhost6**.

Verify the forward and reverse DNS configuration

1. Obtain the IP address of the server.
 - a. The **ip addr show** command displays both the IPv4 and IPv6 addresses. In the following example, the relevant IPv6 address is **2001:DB8::1111** because its scope is global:

```
[root@server ~]# ip addr show
...
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
state UP group default qlen 1000
link/ether 00:1a:4a:10:4e:33 brd ff:ff:ff:ff:ff:ff
inet 192.0.2.1/24 brd 192.0.2.255 scope global dynamic eth0
    valid_lft 106694sec preferred_lft 106694sec
inet6 2001:DB8::1111/32 scope global dynamic
    valid_lft 2591521sec preferred_lft 604321sec
inet6 fe80::56ee:75ff:fe2b:def6/64 scope link
    valid_lft forever preferred_lft forever
...
```

2. Verify the forward DNS configuration using the **dig** utility.

- a. Run the command **dig +short server.example.com A**. The returned IPv4 address must match the IP address returned by **ip addr show**:

```
[root@server ~]# dig +short server.example.com A
192.0.2.1
```

- b. Run the command **dig +short server.example.com AAAA**. If it returns an address, it must match the IPv6 address returned by **ip addr show**:

```
[root@server ~]# dig +short server.example.com AAAA
2001:DB8::1111
```



NOTE

If **dig** does not return any output for the AAAA record, it does not indicate incorrect configuration. No output only means that no IPv6 address is configured in DNS for the system. If you do not intend to use the IPv6 protocol in your network, you can proceed with the installation in this situation.

3. Verify the reverse DNS configuration (PTR records). Use the **dig** utility and add the IP address.

If the commands below display a different host name or no host name, the reverse DNS configuration is incorrect.

- a. Run the command **dig +short -x IPv4_address**. The output must display the server host name. For example:

```
[root@server ~]# dig +short -x 192.0.2.1
server.example.com
```

- b. If the command **dig +short -x server.example.com AAAA** in the previous step returned an IPv6 address, use **dig** to query the IPv6 address too. The output must display the server host name. For example:

```
[root@server ~]# dig +short -x 2001:DB8::1111
server.example.com
```



NOTE

If **dig +short server.example.com AAAA** in the previous step did not display any IPv6 address, querying the AAAA record does not output anything. In this case, this is normal behavior and does not indicate incorrect configuration.

**WARNING**

If a reverse DNS (PTR record) search returns multiple host names, **httpd** and other software associated with IdM may show unpredictable behavior. Red Hat strongly recommends configuring only one PTR record per IP.

Verify the standards-compliance of DNS forwarders (required for integrated DNS only)

Ensure that all DNS forwarders you want to use with the IdM DNS server comply with the Extension Mechanisms for DNS (EDNS0) and DNS Security Extensions (DNSSEC) standards. To do this, inspect the output of the following command for each forwarder separately:

```
$ dig +dnssec @IP_address_of_the_DNS_forwarder . SOA
```

The expected output displayed by the command contains the following information:

- status: **NOERROR**
- flags: **ra**
- EDNS flags: **do**
- The **RRSIG** record must be present in the **ANSWER** section

If any of these items is missing from the output, inspect the documentation for your DNS forwarder and verify that EDNS0 and DNSSEC are supported and enabled. In the latest versions of the BIND server, the **dnssec-enable yes;** option must be set in the **/etc/named.conf** file.

Example of the expected output produced by **dig**:

```
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 48655
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags: do; udp: 4096

;; ANSWER SECTION:
. 31679 IN SOA a.root-servers.net. nstld.verisign-grs.com. 2015100701 1800 900 604800 86400
. 31679 IN RRSIG SOA 8 0 86400 20151017170000 20151007160000 62530 . GNVz7SQs [...]
```

Verify the /etc/hosts file

Verify that the **/etc/hosts** file fulfills one of the following conditions:

- The file does not contain an entry for the host. It only lists the IPv4 and IPv6 localhost entries for the host.
- The file contains an entry for the host and the file fulfills all the following conditions:
 - The first two entries are the IPv4 and IPv6 localhost entries.

- The next entry specifies the IdM server IPv4 address and host name.
- The **FQDN** of the IdM server comes before the short name of the IdM server.
- The IdM server host name is not part of the localhost entry.

The following is an example of a correctly configured **/etc/hosts** file:

```
127.0.0.1 localhost.localdomain localhost
::1 localhost6.localdomain6 localhost6
192.0.2.1 server.example.com server
2001:DB8::1111 server.example.com server
```

1.4. PORT REQUIREMENTS FOR IDM

Identity Management (IdM) uses a number of [ports](#) to communicate with its services. These ports must be open and available for incoming connections to the IdM server for IdM to work. They must not be currently used by another service or blocked by a [firewall](#).

Table 1.1. IdM ports

Service	Ports	Protocol
HTTP/HTTPS	80, 443	TCP
LDAP/LDAPS	389, 636	TCP
Kerberos	88, 464	TCP and UDP
DNS	53	TCP and UDP (optional)
NTP	123	UDP (optional)

In addition, ports 8080, 8443, and 749 must be free as they are used internally. Do not open these ports and instead leave them blocked by a firewall.

Table 1.2. firewalld services

Service name	For details, see:
freeipa-ldap	/usr/lib/firewalld/services/freeipa-ldap.xml
freeipa-ldaps	/usr/lib/firewalld/services/freeipa-ldaps.xml
dns	/usr/lib/firewalld/services/dns.xml

Opening the required ports

1. Make sure the **firewalld** service is running.

- To find out if **firewalld** is currently running:

```
# systemctl status firewalld.service
```

- To start **firewalld** and configure it to start automatically when the system boots:

```
# systemctl start firewalld.service
# systemctl enable firewalld.service
```

2. Open the required ports using the **firewall-cmd** utility. Choose one of the following options:

- a. Add the individual ports to the firewall by using the **firewall-cmd --add-port** command. For example, to open the ports in the default zone:

```
# firewall-cmd --permanent --add-port=
{80/tcp,443/tcp,389/tcp,636/tcp,88/tcp,88/udp,464/tcp,464/udp,53/tcp,53/udp,123/udp}
```

- b. Add the **firewalld** services to the firewall by using the **firewall-cmd --add-service** command. For example, to open the ports in the default zone:

```
# firewall-cmd --permanent --add-service={freeipa-ldap,freeipa-ldaps,dns}
```

For details on using **firewall-cmd** to open ports on a system, see the **firewall-cmd(1)** man page.

3. Reload the **firewall-cmd** configuration to ensure that the change takes place immediately:

```
# firewall-cmd --reload
```

Note that reloading **firewalld** on a system in production can cause DNS connection time outs. If required, to avoid the risk of time outs and to make the changes persistent on the running system, use the **--runtime-to-permanent** option of the **firewall-cmd** command, for example:

```
# firewall-cmd --runtime-to-permanent
```

4. **Optional.** To verify that the ports are available now, use the **nc**, **telnet**, or **nmap** utilities to connect to a port or run a port scan.



NOTE

Note that you also have to open network-based firewalls for both incoming and outgoing traffic.

1.5. INSTALLING PACKAGES REQUIRED FOR AN IDM SERVER

In RHEL8, the packages necessary for installing an Identity Management (IdM) server are shipped as a module. The IdM server module stream is called the **DL1** stream, and you need to enable this stream before downloading packages from this stream. The following procedure shows how to download the packages necessary for setting up the IdM environment of your choice.

Prerequisites

- You have a newly installed RHEL system.

- You have made the required repositories available:
 - If your RHEL system is not running in the cloud, you have registered your system with the Red Hat Subscription Manager (RHSM). For details, see [Registration, attaching, and removing subscriptions in the Subscription Manager command line](#). You have also enabled the **BaseOS** and **AppStream** repositories that IdM uses:

```
# subscription-manager repos --enable=rhel-8-for-x86_64-baseos-rpms
# subscription-manager repos --enable=rhel-8-for-x86_64-appstream-rpms
```

For details on how to enable and disable specific repositories using RHSM, see [Configuring options in Red Hat Subscription Manager](#).

- If your RHEL system is running in the cloud, skip the registration. The required repositories are already available via the Red Hat Update Infrastructure (RHUI).
- You have not previously enabled an IdM module stream.

Procedure

1. Enable the **idm:DL1** stream:

```
# yum module enable idm:DL1
```

2. Switch to the RPMs delivered through the **idm:DL1** stream:

```
# yum distro-sync
```

3. Choose one of the following options, depending on your IdM requirements:

- To download the packages necessary for installing an IdM server without an integrated DNS:

```
# yum module install idm:DL1/server
```

- To download the packages necessary for installing an IdM server with an integrated DNS:

```
# yum module install idm:DL1/dns
```

- To download the packages necessary for installing an IdM server that has a trust agreement with Active Directory:

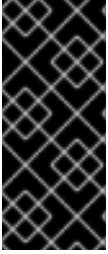
```
# yum module install idm:DL1/adtrust
```

- To download the packages from multiple profiles, for example the **adtrust** and **dns** profiles:

```
# yum module install idm:DL1/{dns,adtrust}
```

- To download the packages necessary for installing an IdM client:

```
# yum module install idm:DL1/client
```



IMPORTANT

When switching to a new module stream once you have already enabled a different stream and downloaded packages from it, you need to first explicitly remove all the relevant installed content and disable the current module stream before enabling the new module stream. Trying to enable a new stream without disabling the current one results in an error. For details on how to proceed, see [Switching to a later stream](#).



WARNING

While it is possible to install packages from modules individually, be aware that if you install any package from a module that is not listed as "API" for that module, it is only going to be supported by Red Hat in the context of that module. For example, if you install **bind-dyndb-ldap** directly from the repository to use with your custom 389 Directory Server setup, any problems that you have will be ignored unless they occur for IdM, too.

CHAPTER 2. INSTALLING AN IDM SERVER: WITH INTEGRATED DNS, WITH AN INTEGRATED CA AS THE ROOT CA

Installing a new Identity Management (IdM) server with integrated DNS has the following advantages:

- You can automate much of the maintenance and DNS record management using native IdM tools. For example, DNS SRV records are automatically created during the setup, and later on are automatically updated.
- You can have a stable connection with the rest of the Internet by setting up global forwarders during the installation of the IdM server. Global forwarders are also useful for trusts with Active Directory.
- You can set up a DNS reverse zone to prevent emails from your domain to be considered spam by email servers outside of the IdM domain.

Installing IdM with integrated DNS has certain limitations:

- IdM DNS is not meant to be used as a general-purpose DNS server. Some of the advanced DNS functions are not supported.

This chapter describes how you can install a new IdM server with an integrated certificate authority (CA) as the root CA.



NOTE

The default configuration for the **ipa-server-install** command is an integrated CA as the root CA. If no CA option, for example **--external-ca** or **--ca-less** is specified, the IdM server is installed with an integrated CA.

2.1. INTERACTIVE INSTALLATION

During the interactive installation using the **ipa-server-install** utility, you are asked to supply basic configuration of the system, for example the realm, the administrator's password and the Directory Manager's password.

The **ipa-server-install** installation script creates a log file at **/var/log/ipaserver-install.log**. If the installation fails, the log can help you identify the problem.

Procedure

1. Run the **ipa-server-install** utility.

```
# ipa-server-install
```

2. The script prompts to configure an integrated DNS service. Enter **yes**.

```
Do you want to configure integrated DNS (BIND)? [no]: yes
```

3. The script prompts for several required settings and offers recommended default values in brackets.
 - To accept a default value, press **Enter**.

- To provide a custom value, enter the required value.

Server host name [server.example.com]:
Please confirm the domain name [example.com]:
Please provide a realm name [EXAMPLE.COM]:



WARNING

Plan these names carefully. You will not be able to change them after the installation is complete.

4. Enter the passwords for the Directory Server superuser (**cn=Directory Manager**) and for the Identity Management (IdM) administration system user account (**admin**).

Directory Manager password:
IPA admin password:

5. The script prompts for DNS forwarders.

Do you want to configure DNS forwarders? [yes]:

- To configure DNS forwarders, enter **yes**, and then follow the instructions on the command line. The installation process will add the forwarder IP addresses to the **/etc/named.conf** file on the installed IdM server.
 - For the forwarding policy default settings, see the **--forward-policy** description in the **ipa-dns-install(1)** man page.
- If you do not want to use DNS forwarding, enter **no**.
With no DNS forwarders, your environment will be isolated, and names from other DNS domains in your infrastructure will not be resolved.

6. The script prompts to check if any DNS reverse (PTR) records for the IP addresses associated with the server need to be configured.

Do you want to search for missing reverse zones? [yes]:

If you run the search and missing reverse zones are discovered, the script asks you whether to create the reverse zones along with the PTR records.

Do you want to create reverse zone for IP 192.0.2.1 [yes]:
Please specify the reverse zone name [2.0.192.in-addr.arpa.]:
Using reverse zone(s) 2.0.192.in-addr.arpa.



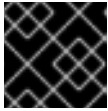
NOTE

Using IdM to manage reverse zones is optional. You can use an external DNS service for this purpose instead.

7. Enter **yes** to confirm the server configuration.

Continue to configure the system with these values? [no]: yes

8. The installation script now configures the server. Wait for the operation to complete.
9. After the installation script completes, add DNS delegation from the parent domain to the IdM DNS domain. For example, if the IdM DNS domain is **ipa.example.com**, add a name server (NS) record to the **example.com** parent domain.



IMPORTANT

Repeat this step each time after an IdM DNS server is installed.

2.2. NON-INTERACTIVE INSTALLATION



NOTE

The **ipa-server-install** installation script creates a log file at **/var/log/ipaserver-install.log**. If the installation fails, the log can help you identify the problem.

Procedure

1. Run the **ipa-server-install** utility with the options to supply all the required information. The minimum required options for non-interactive installation are:
 - **--realm** to provide the Kerberos realm name
 - **--ds-password** to provide the password for the Directory Manager (DM), the Directory Server super user
 - **--admin-password** to provide the password for **admin**, the Identity Management (IdM) administrator
 - **--unattended** to let the installation process select default options for the host name and domain name

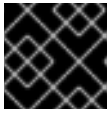
To install a server with integrated DNS, add also these options:

- **--setup-dns** to configure integrated DNS
- **--forwarder** or **--no-forwarders**, depending on whether you want to configure DNS forwarders or not
- **--auto-reverse** or **--no-reverse**, depending on whether you want to configure automatic detection of the reverse DNS zones that must be created in the IdM DNS or no reverse zone auto-detection

For example:

```
# ipa-server-install --realm EXAMPLE.COM --ds-password DM_password --admin-
password admin_password --unattended --setup-dns --forwarder 192.0.2.1 --no-
reverse
```

2. After the installation script completes, add DNS delegation from the parent domain to the IdM DNS domain. For example, if the IdM DNS domain is ***ipa.example.com***, add a name server (NS) record to the **example.com** parent domain.



IMPORTANT

Repeat this step each time after an IdM DNS server is installed.

Additional resources

- For a complete list of options accepted by **ipa-server-install**, run the **ipa-server-install --help** command.

CHAPTER 3. INSTALLING AN IDM SERVER: WITH INTEGRATED DNS, WITH AN EXTERNAL CA AS THE ROOT CA

Installing a new Identity Management (IdM) server with integrated DNS has the following advantages:

- You can automate much of the maintenance and DNS record management using native IdM tools. For example, DNS SRV records are automatically created during the setup, and later on are automatically updated.
- You can have a stable connection with the rest of the Internet by setting up global forwarders during the installation of the IdM server. Global forwarders are also useful for trusts with Active Directory.
- You can set up a DNS reverse zone to prevent emails from your domain to be considered spam by email servers outside of the IdM domain.

Installing IdM with integrated DNS has certain limitations:

- IdM DNS is not meant to be used as a general-purpose DNS server. Some of the advanced DNS functions are not supported.

This chapter describes how you can install a new IdM server with an external certificate authority (CA) as the root CA.

3.1. INTERACTIVE INSTALLATION

During the interactive installation using the **ipa-server-install** utility, you are asked to supply basic configuration of the system, for example the realm, the administrator's password and the Directory Manager's password.

The **ipa-server-install** installation script creates a log file at **/var/log/ipaserver-install.log**. If the installation fails, the log can help you identify the problem.

This procedure describes how to install a server:

- with integrated DNS
- with an external certificate authority (CA) as the root CA

Prerequisites

- Decide on the type of the external CA you use (the **--external-ca-type** option). See the **ipa-server-install(1)** man page for details.
- Alternatively, decide on the **--external-ca-profile** option allowing an alternative Active Directory Certificate Services (AD CS) template to be specified. For example, to specify an AD CS installation-specific object identifier:

```
[root@server ~]# ipa-server-install --external-ca --external-ca-type=ms-cs --external-ca-profile=1.3.6.1.4.1.311.21.8.8950086.10656446.2706058.12775672.480128.147.7130143.4405632:1
```

Procedure

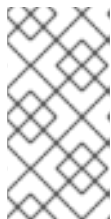
1. Run the `ipa-server-install` utility with the `--external-ca` option.

```
# ipa-server-install --external-ca
```

If you are using the Microsoft Certificate Services CA, use also the `--external-ca-type` option. For details, see the `ipa-server-install` (1) man page.

2. The script prompts to configure an integrated DNS service. Enter **yes** or **no**. In this procedure, we are installing a server with integrated DNS.

```
Do you want to configure integrated DNS (BIND)? [no]: yes
```



NOTE

If you want to install a server without integrated DNS, the installation script will not prompt you for DNS configuration as described in the steps below. See [Chapter 5, *Installing an IdM server: Without integrated DNS, with an integrated CA as the root CA*](#) for details on the steps for installing a server without DNS.

3. The script prompts for several required settings and offers recommended default values in brackets.

- To accept a default value, press **Enter**.
- To provide a custom value, enter the required value.

```
Server host name [server.example.com]:
Please confirm the domain name [example.com]:
Please provide a realm name [EXAMPLE.COM]:
```



WARNING

Plan these names carefully. You will not be able to change them after the installation is complete.

4. Enter the passwords for the Directory Server superuser (**cn=Directory Manager**) and for the Identity Management (IdM) administration system user account (**admin**).

```
Directory Manager password:
IPA admin password:
```

5. The script prompts for DNS forwarders.

```
Do you want to configure DNS forwarders? [yes]:
```

- To configure DNS forwarders, enter **yes**, and then follow the instructions on the command line. The installation process will add the forwarder IP addresses to the `/etc/named.conf` file on the installed IdM server.

- For the forwarding policy default settings, see the **--forward-policy** description in the **ipa-dns-install(1)** man page.
 - If you do not want to use DNS forwarding, enter **no**.
With no DNS forwarders, your environment will be isolated, and names from other DNS domains in your infrastructure will not be resolved.
6. The script prompts to check if any DNS reverse (PTR) records for the IP addresses associated with the server need to be configured.

Do you want to search for missing reverse zones? [yes]:

If you run the search and missing reverse zones are discovered, the script asks you whether to create the reverse zones along with the PTR records.

Do you want to create reverse zone for IP 192.0.2.1 [yes]:
Please specify the reverse zone name [2.0.192.in-addr.arpa]:
Using reverse zone(s) 2.0.192.in-addr.arpa.



NOTE

Using IdM to manage reverse zones is optional. You can use an external DNS service for this purpose instead.

7. Enter **yes** to confirm the server configuration.

Continue to configure the system with these values? [no]: yes

8. During the configuration of the Certificate System instance, the utility prints the location of the certificate signing request (CSR): **/root/ipa.csr**:

...

Configuring certificate server (pki-tomcatd): Estimated time 3 minutes 30 seconds

[1/8]: creating certificate server user

[2/8]: configuring certificate server instance

The next step is to get **/root/ipa.csr** signed by your CA and re-run **/sbin/ipa-server-install** as:
/sbin/ipa-server-install --external-cert-file=/path/to/signed_certificate --external-cert-file=/path/to/external_ca_certificate

When this happens:

- a. Submit the CSR located in **/root/ipa.csr** to the external CA. The process differs depending on the service to be used as the external CA.
- b. Retrieve the issued certificate and the CA certificate chain for the issuing CA in a base 64-encoded blob (either a PEM file or a Base_64 certificate from a Windows CA). Again, the process differs for every certificate service. Usually, a download link on a web page or in the notification email allows the administrator to download all the required certificates.



IMPORTANT

Be sure to get the full certificate chain for the CA, not just the CA certificate.

- c. Run **ipa-server-install** again, this time specifying the locations and names of the newly-issued CA certificate and the CA chain files. For example:

```
# ipa-server-install --external-cert-file=/tmp/servercert20170601.pem --external-cert-file=/tmp/cacert.pem
```

9. The installation script now configures the server. Wait for the operation to complete.

NOTE

The **ipa-server-install --external-ca** command can sometimes fail with the following error:

```
ipa      : CRITICAL failed to configure ca instance Command '/usr/sbin/pkispawn -s CA -f /tmp/configuration_file' returned non-zero exit status 1
Configuration of CA failed
```

This failure occurs when the ***_proxy** environmental variables are set. For a solution of the problem, see [Section 3.2, “Troubleshooting: External CA installation fails”](#).

3.2. TROUBLESHOOTING: EXTERNAL CA INSTALLATION FAILS

The **ipa-server-install --external-ca** command fails with the following error:

```
ipa      : CRITICAL failed to configure ca instance Command '/usr/sbin/pkispawn -s CA -f /tmp/configuration_file' returned non-zero exit status 1
Configuration of CA failed
```

The **env|grep proxy** command displays variables such as the following:

```
# env|grep proxy
http_proxy=http://example.com:8080
ftp_proxy=http://example.com:8080
https_proxy=http://example.com:8080
```

What this means:

The ***_proxy** environmental variables are preventing the server from being installed.

To fix the problem:

1. Use the following shell script to unset the ***_proxy** environmental variables:

```
# for i in ftp http https; do unset ${i}_proxy; done
```

2. Run the **pkidestroy** utility to remove the unsuccessful certificate authority (CA) subsystem installation:

```
# pkidestroy -s CA -i pki-tomcat; rm -rf /var/log/pki/pki-tomcat /etc/sysconfig/pki-tomcat /etc/sysconfig/pki/tomcat/pki-tomcat /var/lib/pki/pki-tomcat /etc/pki/pki-tomcat /root/ipa.csr
```

3. Remove the failed Identity Management (IdM) server installation:

```
# ipa-server-install --uninstall
```

4. Retry running **ipa-server-install --external-ca**.

CHAPTER 4. INSTALLING AN IDM SERVER: WITH INTEGRATED DNS, WITHOUT A CA

Installing a new Identity Management (IdM) server with integrated DNS has the following advantages:

- You can automate much of the maintenance and DNS record management using native IdM tools. For example, DNS SRV records are automatically created during the setup, and later on are automatically updated.
- You can have a stable connection with the rest of the Internet by setting up global forwarders during the installation of the IdM server. Global forwarders are also useful for trusts with Active Directory.
- You can set up a DNS reverse zone to prevent emails from your domain to be considered spam by email servers outside of the IdM domain.

Installing IdM with integrated DNS has certain limitations:

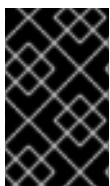
- IdM DNS is not meant to be used as a general-purpose DNS server. Some of the advanced DNS functions are not supported.

This chapter describes how you can install a new IdM server without a certificate authority (CA).

4.1. CERTIFICATES REQUIRED TO INSTALL AN IDM SERVER WITHOUT A CA

This section lists:

- the certificates required to install an Identity Management (IdM) server without a certificate authority (CA)
- the command-line options used to provide these certificates to the **ipa-server-install** utility



IMPORTANT

You cannot install a server or replica using self-signed third-party server certificates because the imported certificate files must contain the full CA certificate chain of the CA that issued the LDAP and Apache server certificates.

The LDAP server certificate and private key

- **--dirsrv-cert-file** for the certificate and private key files for the LDAP server certificate
- **--dirsrv-pin** for the password to access the private key in the files specified in **--dirsrv-cert-file**

The Apache server certificate and private key

- **--http-cert-file** for the certificate and private key files for the Apache server certificate
- **--http-pin** for the password to access the private key in the files specified in **--http-cert-file**

The full CA certificate chain of the CA that issued the LDAP and Apache server certificates

- **--dirstv-cert-file** and **--http-cert-file** for the certificate files with the full CA certificate chain or a part of it

You can provide the files specified in the **--dirstv-cert-file** and **--http-cert-file** options in the following formats:

- Privacy-Enhanced Mail (PEM) encoded certificate (RFC 7468). Note that the Identity Management installer accepts concatenated PEM-encoded objects.
- Distinguished Encoding Rules (DER)
- PKCS #7 certificate chain objects
- PKCS #8 private key objects
- PKCS #12 archives

You can specify the **--dirstv-cert-file** and **--http-cert-file** options multiple times to specify multiple files.

The certificate files to complete the full CA certificate chain (not needed in some environments)

- **--ca-cert-file** for the file or files containing the CA certificate of the CA that issued the LDAP, Apache Server, and Kerberos KDC certificates. Use this option if the CA certificate is not present in the certificate files provided by the other options.

The files provided using **--dirstv-cert-file** and **--http-cert-file** combined with the file provided using **--ca-cert-file** must contain the full CA certificate chain of the CA that issued the LDAP and Apache server certificates.

The Kerberos key distribution center (KDC) PKINIT certificate and private key (optional)

- **--pkinit-cert-file** for the Kerberos KDC SSL certificate and private key
- **--pkinit-pin** for the password to access the Kerberos KDC private key in the files specified in **--pkinit-cert-file**
- **--no-pkinit** for disabling pkinit setup steps

If you do not provide the PKINIT certificate, **ipa-server-install** configures the IdM server with a local KDC with a self-signed certificate.

Additional resources

- For details on what the certificate file formats these options accept, see the **ipa-server-install(1)** man page.

4.2. INTERACTIVE INSTALLATION

During the interactive installation using the **ipa-server-install** utility, you are asked to supply basic configuration of the system, for example the realm, the administrator's password and the Directory Manager's password.

The **ipa-server-install** installation script creates a log file at **/var/log/ipaserver-install.log**. If the installation fails, the log can help you identify the problem.

Procedure

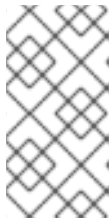
1. Run the **ipa-server-install** utility and provide all the required certificates. For example:

```
[root@server ~]# ipa-server-install \
--http-cert-file /tmp/server.crt \
--http-cert-file /tmp/server.key \
--http-pin secret \
--dirsrv-cert-file /tmp/server.crt \
--dirsrv-cert-file /tmp/server.key \
--dirsrv-pin secret \
--ca-cert-file ca.crt
```

See [Section 4.1, “Certificates required to install an IdM server without a CA”](#) for details on the provided certificates.

2. The script prompts to configure an integrated DNS service. Enter **yes** or **no**. In this procedure, we are installing a server with integrated DNS.

```
Do you want to configure integrated DNS (BIND)? [no]: yes
```



NOTE

If you want to install a server without integrated DNS, the installation script will not prompt you for DNS configuration as described in the steps below. See [Chapter 5, Installing an IdM server: Without integrated DNS, with an integrated CA as the root CA](#) for details on the steps for installing a server without DNS.

3. The script prompts for several required settings and offers recommended default values in brackets.

- To accept a default value, press **Enter**.
- To provide a custom value, enter the required value.

```
Server host name [server.example.com]:
Please confirm the domain name [example.com]:
Please provide a realm name [EXAMPLE.COM]:
```



WARNING

Plan these names carefully. You will not be able to change them after the installation is complete.

4. Enter the passwords for the Directory Server superuser (**cn=Directory Manager**) and for the Identity Management (IdM) administration system user account (**admin**).

```
Directory Manager password:
IPA admin password:
```

5. The script prompts for DNS forwarders.

Do you want to configure DNS forwarders? [yes]:

- To configure DNS forwarders, enter **yes**, and then follow the instructions on the command line. The installation process will add the forwarder IP addresses to the **/etc/named.conf** file on the installed IdM server.
 - For the forwarding policy default settings, see the **--forward-policy** description in the **ipa-dns-install(1)** man page.
- If you do not want to use DNS forwarding, enter **no**.
With no DNS forwarders, your environment will be isolated, and names from other DNS domains in your infrastructure will not be resolved.

6. The script prompts to check if any DNS reverse (PTR) records for the IP addresses associated with the server need to be configured.

Do you want to search for missing reverse zones? [yes]:

If you run the search and missing reverse zones are discovered, the script asks you whether to create the reverse zones along with the PTR records.

Do you want to create reverse zone for IP 192.0.2.1 [yes]:
Please specify the reverse zone name [2.0.192.in-addr.arpa]:
Using reverse zone(s) 2.0.192.in-addr.arpa.



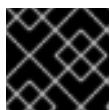
NOTE

Using IdM to manage reverse zones is optional. You can use an external DNS service for this purpose instead.

7. Enter **yes** to confirm the server configuration.

Continue to configure the system with these values? [no]: yes

8. The installation script now configures the server. Wait for the operation to complete.
9. After the installation script completes, add DNS delegation from the parent domain to the IdM DNS domain. For example, if the IdM DNS domain is **ipa.example.com**, add a name server (NS) record to the **example.com** parent domain.



IMPORTANT

Repeat this step each time after an IdM DNS server is installed.

CHAPTER 5. INSTALLING AN IDM SERVER: WITHOUT INTEGRATED DNS, WITH AN INTEGRATED CA AS THE ROOT CA

This chapter describes how you can install a new Identity Management (IdM) server without integrated DNS.

5.1. INTERACTIVE INSTALLATION

During the interactive installation using the **ipa-server-install** utility, you are asked to supply basic configuration of the system, for example the realm, the administrator's password and the Directory Manager's password.

The **ipa-server-install** installation script creates a log file at **/var/log/ipaserver-install.log**. If the installation fails, the log can help you identify the problem.

This procedure installs a server:

- Without integrated DNS
- With integrated Identity Management (IdM) certificate authority (CA) as the root CA, which is the default CA configuration

Procedure

1. Run the **ipa-server-install** utility.

```
# ipa-server-install
```

2. The script prompts to configure an integrated DNS service. Press **Enter** to select the default **no** option.

```
Do you want to configure integrated DNS (BIND)? [no]:
```

3. The script prompts for several required settings and offers recommended default values in brackets.
 - To accept a default value, press **Enter**.
 - To provide a custom value, enter the required value.

```
Server host name [server.example.com]:  
Please confirm the domain name [example.com]:  
Please provide a realm name [EXAMPLE.COM]:
```

**WARNING**

Plan these names carefully. You will not be able to change them after the installation is complete.

4. Enter the passwords for the Directory Server superuser (**cn=Directory Manager**) and for the IdM administration system user account (**admin**).

Directory Manager password:
IPA admin password:

5. Enter **yes** to confirm the server configuration.

Continue to configure the system with these values? [no]: yes

6. The installation script now configures the server. Wait for the operation to complete.

5.2. NON-INTERACTIVE INSTALLATION

This procedure installs a server:

- Without integrated DNS
- With integrated Identity Management (IdM) certificate authority (CA) as the root CA, which is the default CA configuration

**NOTE**

The **ipa-server-install** installation script creates a log file at **/var/log/ipaserver-install.log**. If the installation fails, the log can help you identify the problem.

Procedure

1. Run the **ipa-server-install** utility with the options to supply all the required information. The minimum required options for non-interactive installation are:
 - **--realm** to provide the Kerberos realm name
 - **--ds-password** to provide the password for the Directory Manager (DM), the Directory Server super user
 - **--admin-password** to provide the password for **admin**, the IdM administrator
 - **--unattended** to let the installation process select default options for the host name and domain name

For example:

```
# ipa-server-install --realm EXAMPLE.COM --ds-password DM_password --admin-  
password admin_password --unattended
```

-

Additional resources

- For a complete list of options accepted by **ipa-server-install**, run the **ipa-server-install --help** command.

CHAPTER 6. UNINSTALLING AN IDM SERVER

As an administrator, you can remove an Identity Management (IdM) server from the topology.

This procedure describes how you can uninstall an example server named **server.idm.example.com**.

Prerequisites

- Before uninstalling a server that serves as a certificate authority (CA), key recovery authority (KRA), or DNS server, make sure these services are running on another server in the domain.



WARNING

Removing the last server that serves as a CA, KRA, or DNS server seriously disrupts the Identity Management (IdM) functionality.

Procedure

1. On all the servers in the topology that have a replication agreement with **server.idm.example.com**, use the **ipa server-del** command to delete the replica from the topology:

```
[root@another_server ~]# ipa server-del server.idm.example.com
```

2. On **server.idm.example.com**, use the **ipa-server-install --uninstall** command:

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

```
...
```

```
Are you sure you want to continue with the uninstall procedure? [no]: yes
```

3. Make sure all name server (NS) DNS records pointing to **server.idm.example.com** are deleted from your DNS zones. This applies regardless of whether you use integrated DNS managed by IdM or external DNS.

CHAPTER 7. RENAMING AN IDM SERVER

You cannot change the host name of an existing Identity Management (IdM) server. However, you can replace the server with a replica of a different name.

Procedure

1. Install a new replica that will replace the existing server, ensuring the replica has the required host name and IP address. For details, see [Chapter 15, *Installing an IdM replica*](#).



IMPORTANT

If the server you are uninstalling is a certificate revocation list (CRL) master server, make another server the CRL master server before proceeding. For details how this is done in the context of a migration procedure, see [Stopping CRL generation on RHEL 7 and redirecting CRL requests to RHEL 8](#) and [Starting CRL generation on RHEL 8](#).

2. Stop the existing IdM server instance.

```
[root@old_server ~]# ipactl stop
```

3. Uninstall the existing server as described in [Chapter 6, *Uninstalling an IdM server*](#).

CHAPTER 8. PREPARING THE SYSTEM FOR IDM CLIENT INSTALLATION

This chapter describes the conditions your system must meet to install an Identity Management (IdM) client.

8.1. DNS REQUIREMENTS FOR IDM CLIENTS

Client installer by default tries to search for **_ldap._tcp.DOMAIN** DNS SRV records for all domains that are parent to its hostname. For example, if a client machine has a hostname **client1.idm.example.com**, the installer will try to retrieve an IdM server hostname from **_ldap._tcp.idm.example.com**, **_ldap._tcp.example.com** and **_ldap._tcp.com** DNS SRV records, respectively. The discovered domain is then used to configure client components (for example, SSSD and Kerberos 5 configuration) on the machine.

However, the hostnames of IdM clients are not required to be part of the primary DNS domain. If the client machine hostname is not in a subdomain of an IdM server, pass the IdM domain as the **--domain** option of the **ipa-client-install** command. In that case, after the installation of the client, both SSSD and Kerberos components will have the domain set in their configuration files and will use it to autodiscover IdM servers.

Additional resources

- For details on DNS requirements in IdM, see [Section 1.3, “Host name and DNS requirements for IdM”](#).

8.2. PORT REQUIREMENTS FOR IDM CLIENTS

Identity Management (IdM) clients connect to a number of ports on IdM servers to communicate with their services.

On IdM client, these ports must be open *in the outgoing direction*. If you are using a firewall that does not filter outgoing packets, such as **firewalld**, the ports are already available in the outgoing direction.

Additional resources

- For information about which specific ports are used, see [Section 1.4, “Port requirements for IdM”](#).

8.3. PACKAGES REQUIRED TO INSTALL AN IDM CLIENT

In RHEL8, the packages necessary for installing an Identity Management (IdM) client are shipped as a module. Two IdM streams provide IdM client packages:

- the **idm:client** stream. For details, see [Section 8.3.1, “Installing ipa-client packages from the idm:client stream”](#).
- the **idm:DL1** stream. For details, see [Section 8.3.2, “Installing ipa-client packages from the idm:DL1 stream”](#).

8.3.1. Installing ipa-client packages from the idm:client stream

The **idm:client** stream is the default stream of the **idm** module. Use this stream to download the IdM

client packages if you do not need to install server components on your machine. Using the **idm:client** stream is especially recommended if you need to consistently use IdM client software that is supported long-term, provided you do not need server components, too.



IMPORTANT

When switching to the **idm:client** stream after you previously enabled the **idm:DL1** stream and downloaded packages from it, you need to first explicitly remove all the relevant installed content and disable the **idm:DL1** stream before enabling the **idm:client** stream. Trying to enable a new stream without disabling the current one results in an error. For details on how to proceed, see [Switching to a later stream](#).

Procedure

- To download the packages necessary for installing an IdM client:

```
# yum module install idm
```

8.3.2. Installing ipa-client packages from the idm:DL1 stream

The **idm:DL1** stream needs to be enabled before you can download packages from it. Use this stream to download the IdM client packages if you need to install IdM server components on your machine.



IMPORTANT

When switching to the **idm:DL1** stream after you previously enabled the **idm:client** stream and downloaded packages from it, you need to first explicitly remove all the relevant installed content and disable the **idm:client** stream before enabling the **idm:DL1** stream. Trying to enable a new stream without disabling the current one results in an error. For details on how to proceed, see [Switching to a later stream](#).

Procedure

1. To switch to the RPMs delivered through the **idm:DL1** stream:

```
# yum module enable idm:DL1
# yum distro-sync
```

2. To download the packages necessary for installing an IdM client:

```
# yum module install idm:DL1/client
```

CHAPTER 9. INSTALLING AN IDM CLIENT: BASIC SCENARIO

The following sections describe how to configure a system as an Identity Management (IdM) client by using the **ipa-client-install** utility. Configuring a system as an IdM client enrolls it into an IdM domain and enables the system to use IdM services on IdM servers in the domain.

Several options are available for a basic installation:

- For installing a client interactively using privileged user’s credentials, see [Section 9.3, “Installing a client by using user credentials: Interactive installation”](#).
- For installing a client interactively using a one-time password, see [Section 9.4, “Installing a client by using a one-time password: Interactive installation”](#).
- For installing a client noninteractively using either a privileged user’s credentials, a one-time password or a keytab from previous enrollment, see [Section 9.5, “Installing a client: Non-interactive installation”](#).

9.1. PREREQUISITES

Before you start installing the IdM client, make sure that you have met all the prerequisites. See [Chapter 8, *Preparing the system for IdM client installation*](#).

9.2. AN OVERVIEW OF THE IDM CLIENT INSTALLATION OPTIONS

To install an Identity Management (IdM) client successfully, you must provide credentials that can be used to enroll the client. The following authentication methods are available:

- The credentials of a user authorized to enroll clients. This is the default option expected by **ipa-client-install**.
 - To provide the credentials of an authorized user directly to **ipa-client-install**, use the **--principal** and **--password** options. See [Section 9.3, “Installing a client by using user credentials: Interactive installation”](#) for a detailed procedure.
- A random, one-time password pre-generated on the server:
 - To use this authentication method, add the **--random** option to **ipa-client-install** option. See [Section 9.4, “Installing a client by using a one-time password: Interactive installation”](#) for a detailed procedure.
- The client principal from the previous enrollment:
 - This option is available if the system was previously enrolled as an IdM client. To use this authentication method, add the **--keytab** option to **ipa-client-install**. See [Chapter 11, *Re-enrolling an IdM client*](#) for details.

Additional resources

- For details on the options accepted by **ipa-client-install**, see the **ipa-client-install(1)** man page.

9.3. INSTALLING A CLIENT BY USING USER CREDENTIALS: INTERACTIVE INSTALLATION

This procedure describes installing an Identity Management (IdM) client interactively by using the credentials of an authorized user to enroll the system into the domain.

Prerequisites

- Ensure you have the credentials of a user authorized to enroll clients into the IdM domain. This could be, for example, a **hostadmin** user with the Enrollment Administrator role.

Procedure

1. Run the **ipa-client-install** utility on the system that you want to configure as an IdM client.

```
# ipa-client-install
```

Add the **--enable-dns-updates** option to update the DNS records with the IP address of the client system if either of the following conditions applies:

- The IdM server the client will be enrolled with was installed with integrated DNS
- The DNS server on the network accepts DNS entry updates with the GSS-TSIG protocol

```
# ipa-client-install --enable-dns-updates
```

Enabling DNS updates is useful if your client:

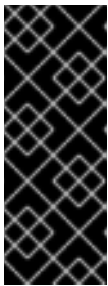
- has a dynamic IP address issued using the Dynamic Host Configuration Protocol
 - has a static IP address but it has just been allocated and the IdM server does not know about it
2. The installation script attempts to obtain all the required settings, such as DNS records, automatically.
 - If the SRV records are set properly in the IdM DNS zone, the script automatically discovers all the other required values and displays them. Enter **yes** to confirm.

```
Client hostname: client.example.com
Realm: EXAMPLE.COM
DNS Domain: example.com
IPA Server: server.example.com
BaseDN: dc=example,dc=com
```

```
Continue to configure the system with these values? [no]: yes
```

- To install the system with different values, enter **no**. Then run **ipa-client-install** again, and specify the required values by adding command-line options to **ipa-client-install**, for example:
 - **--hostname**
 - **--realm**
 - **--domain**
 - **--server**

- If the script fails to obtain some settings automatically, it prompts you for the values.



IMPORTANT

The fully qualified domain name must be a valid DNS name:

- Only numbers, alphabetic characters, and hyphens (-) are allowed. For example, underscores are not allowed and can cause DNS failures.
- The host name must be all lower-case. No capital letters are allowed.

3. The script prompts for a user whose identity will be used to enroll the client. This could be, for example, a **hostadmin** user with the Enrollment Administrator role:

```
User authorized to enroll computers: hostadmin
Password for hostadmin@EXAMPLE.COM:
```

4. The installation script now configures the client. Wait for the operation to complete.

```
Client configuration complete.
```

Additional resources

- For details on how the client installation script searches for the DNS records, see the **DNS Autodiscovery** section in the **ipa-client-install(1)** man page.

9.4. INSTALLING A CLIENT BY USING A ONE-TIME PASSWORD: INTERACTIVE INSTALLATION

This procedure describes installing an Identity Management (IdM) client interactively by using a one-time password to enroll the system into the domain.

Prerequisites

1. On a server in the domain, add the future client system as an IdM host. Use the **--random** option with the **ipa host-add** command to generate a one-time random password for the enrollment.

```
$ ipa host-add client.example.com --random
```

```
-----
Added host "client.example.com"
-----
```

```
Host name: client.example.com
Random password: W5YpARl=7M.n
Password: True
Keytab: False
Managed by: server.example.com
```



NOTE

The generated password will become invalid after you use it to enroll the machine into the IdM domain. It will be replaced with a proper host keytab after the enrollment is finished.

Procedure

1. Run the **ipa-client-install** utility on the system that you want to configure as an IdM client. Use the **--password** option to provide the one-time random password. Because the password often contains special characters, enclose it in single quotes (').

```
# ipa-client-install
```

Add the **--enable-dns-updates** option to update the DNS records with the IP address of the client system if either of the following conditions applies:

- The IdM server the client will be enrolled with was installed with integrated DNS
- The DNS server on the network accepts DNS entry updates with the GSS-TSIG protocol

```
# ipa-client-install --password 'W5YpARl=7M.n' --enable-dns-updates
```

Enabling DNS updates is useful if your client:

- has a dynamic IP address issued using the Dynamic Host Configuration Protocol
 - has a static IP address but it has just been allocated and the IdM server does not know about it
2. The installation script attempts to obtain all the required settings, such as DNS records, automatically.
 - If the SRV records are set properly in the IdM DNS zone, the script automatically discovers all the other required values and displays them. Enter **yes** to confirm.

```
Client hostname: client.example.com
Realm: EXAMPLE.COM
DNS Domain: example.com
IPA Server: server.example.com
BaseDN: dc=example,dc=com
```

```
Continue to configure the system with these values? [no]: yes
```

- To install the system with different values, enter **no**. Then run **ipa-client-install** again, and specify the required values by adding command-line options to **ipa-client-install**, for example:
 - **--hostname**
 - **--realm**
 - **--domain**
 - **--server**
- If the script fails to obtain some settings automatically, it prompts you for the values.



IMPORTANT

The fully qualified domain name must be a valid DNS name:

- Only numbers, alphabetic characters, and hyphens (-) are allowed. For example, underscores are not allowed and can cause DNS failures.
- The host name must be all lower-case. No capital letters are allowed.

3. The installation script now configures the client. Wait for the operation to complete.



Client configuration complete.

Additional resources

- For details on how the client installation script searches for the DNS records, see the **DNS Autodiscovery** section in the **ipa-client-install(1)** man page.

9.5. INSTALLING A CLIENT: NON-INTERACTIVE INSTALLATION

For a non-interactive installation, you must provide all required information to the **ipa-client-install** utility using command-line options. The following sections describe the minimum required options for a non-interactive installation.

Options for the intended authentication method for client enrollment

The available options are:

- **--principal** and **--password** to specify the credentials of a user authorized to enroll clients
- **--random** to specify a one-time random password generated for the client
- **--keytab** to specify the keytab from a previous enrollment

For details, see [Section 9.2, “An overview of the IdM client installation options”](#).

The option for unattended installation

The **--unattended** lets the installation run without requiring user confirmation.

If the SRV records are set properly in the IdM DNS zone, the script automatically discovers all the other required values. If the script cannot discover the values automatically, provide them using command-line options, such as:

- **--hostname** to specify a static host name for the client machine



IMPORTANT

The fully qualified domain name must be a valid DNS name:

- Only numbers, alphabetic characters, and hyphens (-) are allowed. For example, underscores are not allowed and can cause DNS failures.
- The host name must be all lower-case. No capital letters are allowed.

- **--server** to specify the host name of the IdM server the client will be enrolled with

- **--domain** to specify the DNS domain name of the IdM server the client will be enrolled with
- **--realm** to specify the Kerberos realm name

An example of a basic **ipa-client-install** command for non-interactive installation:

```
# ipa-client-install --password 'W5YpARl=7M.n' --unattended
```

An example of an **ipa-client-install** command for non-interactive installation with more options specified:

```
# ipa-client-install --password 'W5YpARl=7M.n' --domain example.com --server
server.idm.example.com --unattended
```

Additional resources

- For a complete list of options accepted by **ipa-client-install**, see the **ipa-client-install(1)** man page.

9.6. REMOVING PRE-IDM CONFIGURATION AFTER INSTALLING A CLIENT

The **ipa-client-install** script does not remove any previous LDAP and System Security Services Daemon (SSSD) configuration from the **/etc/openldap/ldap.conf** and **/etc/sss/sss.conf** files. If you modified the configuration in these files before installing the client, the script adds the new client values, but comments them out. For example:

```
BASE dc=example,dc=com
URI ldap://ldap.example.com

#URI ldaps://server.example.com # modified by IPA
#BASE dc=ipa,dc=example,dc=com # modified by IPA
```

To apply the new Identity Management (IdM)} configuration values:

1. Open **/etc/openldap/ldap.conf** and **/etc/sss/sss.conf**.
2. Delete the previous configuration.
3. Uncomment the new IdM configuration.
4. Server processes that rely on system-wide LDAP configuration might require a restart to apply the changes. Applications that use **openldap** libraries typically import the configuration when started.

9.7. TESTING AN IDM CLIENT

The Command-Line Interface informs you that the **ipa-client-install** was successful, but you can also do your own test.

To test that the Identity Management (IdM) client can obtain information about users defined on the server, check that you are able to resolve a user defined on the server. For example, to check the default **admin** user:

```
[user@client ~]$ id admin
uid=1254400000(admin) gid=1254400000(admins) groups=1254400000(admins)
```

To test that authentication works correctly, **su** to a root user from a non-root user:

```
[user@client ~]$ su -
Last login: Thu Oct 18 18:39:11 CEST 2018 from 192.168.122.1 on pts/0
[root@client ~]#
```

9.8. CONNECTIONS PERFORMED DURING AN IDM CLIENT INSTALLATION

Table 9.1, “Requests performed during an IdM client installation” lists the operations performed by **ipa-client-install**, the Identity Management (IdM) client installation tool.

Table 9.1. Requests performed during an IdM client installation

Operation	Protocol used	Purpose
DNS resolution against the DNS resolvers configured on the client system	DNS	To discover the IP addresses of IdM masters; (optionally) to add A/AAAA and SSHFP records
Requests to ports 88 (TCP/TCP6 and UDP/UDP6) on an IdM replica	Kerberos	To obtain a Kerberos ticket
JSON-RPC calls to the IdM Apache-based web-service on discovered or configured IdM masters	HTTPS	IdM client enrollment; retrieval of CA certificate chain if LDAP method fails; request for a certificate issuance if required
Requests over TCP/TCP6 to ports 389 on IdM servers, using SASL GSSAPI authentication, plain LDAP, or both	LDAP	IdM client enrollment; identity retrieval by SSSD processes; Kerberos key retrieval for the host principal
Network time protocol (NTP) discovery and resolution (optionally)	NTP	To synchronize time between the client system and an NTP server

9.9. IDM CLIENT’S COMMUNICATIONS WITH THE SERVER DURING POST-INSTALLATION DEPLOYMENT

The client side of Identity Management (IdM) framework is implemented with two different applications:

- the **ipa** command-line interface (CLI)
- the browser-based web UI

The browser-based web UI is optional.

[Table 9.2, “CLI post-installation operations”](#) shows the operations performed by the CLI during an IdM client post-installation deployment. [Table 9.3, “webUI post-installation operations”](#) shows the operations performed by the web UI during an IdM client post-installation deployment.

Two daemons run on the IdM client, the **System Security Services Daemon (SSSD)** and **certmonger**. [Section 9.9.1, “SSSD communication patterns”](#) and [Section 9.9.2, “Certmonger communication patterns”](#) describe how these daemons communicate with the services available on the IdM and Active Directory servers.

Table 9.2. CLI post-installation operations

Operation	Protocol used	Purpose
DNS resolution against the DNS resolvers configured on the client system	DNS	To discover the IP addresses of IdM masters
Requests to ports 88 (TCP/TCP6 and UDP/UDP6) and 464 (TCP/TCP6 and UDP/UDP6) on an IdM replica	Kerberos	To obtain a Kerberos ticket; change a Kerberos password; authenticate to the IdM Web UI
JSON-RPC calls to the IdM Apache-based web-service on discovered or configured IdM masters	HTTPS	any ipa utility usage

Table 9.3. webUI post-installation operations

Operation	Protocol used	Purpose
JSON-RPC calls to the IdM Apache-based web-service on discovered or configured IdM masters	HTTPS	To retrieve the IdM web UI pages

9.9.1. SSSD communication patterns

The System Security Services Daemon (SSSD) is a system service to access remote directories and authentication mechanisms. If configured on an Identity Management IdM client, it connects to the IdM server, which provides authentication, authorization and other identity and policy information. If the IdM server is in a trust relationships with Active Directory (AD), SSSD also connects to AD to perform authentication for AD users using the Kerberos protocol. By default, SSSD uses Kerberos to authenticate any non-local user. In special situations, SSSD might be configured to use the LDAP protocol instead.

The SSSD can be configured to communicate with multiple servers. [Table 9.4, “Communication patterns of SSSD on IdM clients when talking to IdM servers”](#) and [Table 9.5, “Communication patterns of SSSD on IdM servers acting as trust agents when talking to Active Directory Domain Controllers”](#) show common communication patterns for SSSD in IdM.

Table 9.4. Communication patterns of SSSD on IdM clients when talking to IdM servers

Operation	Protocol used	Purpose
DNS resolution against the DNS resolvers configured on the client system	DNS	To discover the IP addresses of IdM masters
Requests to ports 88 (TCP/TCP6 and UDP/UDP6), 464 (TCP/TCP6 and UDP/UDP6), and 749 (TCP/TCP6) on an Identity Management replica and Active Directory domain controllers	Kerberos	To obtain a Kerberos ticket; to change a Kerberos password
Requests over TCP/TCP6 to ports 389 on IdM servers, using SASL GSSAPI authentication, plain LDAP, or both	LDAP	To obtain information about IdM users and hosts, download HBAC and sudo rules, automount maps, the SELinux user context, public SSH keys, and other information stored in IdM LDAP
(optionally) In case of smart-card authentication, requests to the Online Certificate Status Protocol (OCSP) responder, if it is configured. This often is done via port 80, but it depends on the actual value of the OCSP responder URL in a client certificate.	HTTP	To obtain information about the status of the certificate installed in the smart card

Table 9.5. Communication patterns of SSSD on IdM servers acting as trust agents when talking to Active Directory Domain Controllers

Operation	Protocol used	Purpose
DNS resolution against the DNS resolvers configured on the client system	DNS	To discover the IP addresses of IdM masters
Requests to ports 88 (TCP/TCP6 and UDP/UDP6), 464 (TCP/TCP6 and UDP/UDP6), and 749 (TCP/TCP6) on an Identity Management replica and Active Directory domain controllers	Kerberos	To obtain a Kerberos ticket; change a Kerberos password; administer Kerberos remotely
Requests to ports 389 (TCP/TCP6 and UDP/UDP6) and 3268 (TCP/TCP6)	LDAP	To query Active Directory user and group information; to discover Active Directory domain controllers

Operation	Protocol used	Purpose
(optionally) In case of smart-card authentication, requests to the Online Certificate Status Protocol (OCSP) responder, if it is configured. This often is done via port 80, but it depends on the actual value of the OCSP responder URL in a client certificate.	HTTP	To obtain information about the status of the certificate installed in the smart card

9.9.2. Certmonger communication patterns

Certmonger is a daemon running on Identity Management (IdM) masters and IdM clients to allow a timely renewal of SSL certificates associated with the services on the host. The [Table 9.6, “Certmonger communication patterns”](#) shows the operations performed by IdM client’s **certmonger** utility on IdM masters.

Table 9.6. Certmonger communication patterns

Operation	Protocol used	Purpose
DNS resolution against the DNS resolvers configured on the client system	DNS	To discover the IP addresses of IdM masters
Requests to ports 88 (TCP/TCP6 and UDP/UDP6) and 464 (TCP/TCP6 and UDP/UDP6) on an IdM replica	Kerberos	To obtain a Kerberos ticket
JSON-RPC calls to the IdM Apache-based web-service on discovered or configured IdM masters	HTTPS	To request new certificates
Access over port 8080 (TCP/TCP6) on the IdM master	HTTP	To obtain an Online Certificate Status Protocol (OCSP) responder and certificate status
(on the first installed server or on the server where certificate tracking has been transferred) Access over port 8443 (TCP/TCP6) on the IdM master	HTTPS	To administer the Certificate Authority on the IdM master (only during IdM master and replica installation)

CHAPTER 10. INSTALLING AN IDM CLIENT WITH KICKSTART

A Kickstart enrollment automatically adds a new system to the Identity Management (IdM) domain at the time Red Hat Enterprise Linux is installed.

10.1. INSTALLING A CLIENT WITH KICKSTART

This procedure describes how to use a Kickstart file to install an Identity Management (IdM) client.

Prerequisites

- Do not start the **sshd** service prior to the kickstart enrollment. Starting **sshd** before enrolling the client generates the SSH keys automatically, but the Kickstart file in [Section 10.2, “Kickstart file for client installation”](#) uses a script for the same purpose, which is the preferred solution.

Procedure

1. Pre-create the host entry on the IdM server, and set a temporary password for the entry:

```
$ ipa host-add client.example.com --password=secret
```

The password is used by Kickstart to authenticate during the client installation and expires after the first authentication attempt. After the client is successfully installed, it authenticates using its keytab.

2. Create a Kickstart file with the contents described in [Section 10.2, “Kickstart file for client installation”](#). Make sure that network is configured properly in the Kickstart file using the **network** command.
3. Use the Kickstart file to install the IdM client.

10.2. KICKSTART FILE FOR CLIENT INSTALLATION

This section describes the contents of a kickstart file that you can use to install an Identity Management (IdM) client.

The **ipa-client** package in the list of packages to install

Add the **ipa-client** package to the `%packages` section of the kickstart file. For example:

```
%packages
...
ipa-client
...
```

Post-installation instructions for the IdM client

The post-installation instructions must include:

- An instruction for ensuring SSH keys are generated before enrollment
- An instruction to run the **ipa-client-install** utility, while specifying:
 - All the required information to access and configure the IdM domain services

- The password which you set when pre-creating the client host on the IdM server. in [Section 10.1, “Installing a client with Kickstart”](#).

For example, the post-installation instructions for a kickstart installation that uses a one-time password and retrieves the required options from the command line rather than via DNS can look like this:

```
%post --log=/root/ks-post.log

# Generate SSH keys; ipa-client-install uploads them to the IdM server by default
/usr/libexec/openssh/sshd-keygen rsa

# Run the client install script
/usr/sbin/ipa-client-install --hostname=client.example.com --domain=EXAMPLE.COM --enable-
dns-updates --mkhomedir -w secret --realm=EXAMPLE.COM --server=server.example.com
```

Optionally, you can also include other options in the Kickstart file, such as:

- For a non-interactive installation, add the **--unattended** option to **ipa-client-install**.
- To let the client installation script request a certificate for the machine:
 - Add the **--request-cert** option to **ipa-client-install**.
 - Set the system bus address to **/dev/null** for both the **getcert** and **ipa-client-install** utility in the Kickstart **chroot** environment. To do this, add these lines to the post-installation instructions in the Kickstart file before the **ipa-client-install** instruction:

```
# env DBUS_SYSTEM_BUS_ADDRESS=unix:path=/dev/null getcert list
# env DBUS_SYSTEM_BUS_ADDRESS=unix:path=/dev/null ipa-client-install
```

10.3. TESTING AN IDM CLIENT

The Command-Line Interface informs you that the **ipa-client-install** was successful, but you can also do your own test.

To test that the Identity Management (IdM) client can obtain information about users defined on the server, check that you are able to resolve a user defined on the server. For example, to check the default **admin** user:

```
[user@client ~]$ id admin
uid=1254400000(admin) gid=1254400000(admins) groups=1254400000(admins)
```

To test that authentication works correctly, **su** to a root user from a non-root user:

```
[user@client ~]$ su -
Last login: Thu Oct 18 18:39:11 CEST 2018 from 192.168.122.1 on pts/0
[root@client ~]#
```

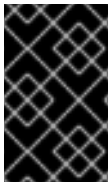
CHAPTER 11. RE-ENROLLING AN IDM CLIENT

11.1. CLIENT RE-ENROLLMENT IN IDM

This section describes how to re-enroll an Identity Management (IdM) client.

If a client machine has been destroyed and lost connection with the IdM servers, for example due to the client's hardware failure, and you still have its keytab, you can re-enroll the client. In this scenario, you want to get the client back in the IdM environment with the same hostname.

During the re-enrollment, the client generates a new Kerberos key and SSH keys, but the identity of the client in the LDAP database remains unchanged. After the re-enrollment, the host has its keys and other information in the same LDAP object with the same **FQDN** as previously, before the machine's loss of connection with the IdM servers.



IMPORTANT

You can only re-enroll clients whose domain entry is still active. If you uninstalled a client (using **ipa-client-install --uninstall**) or disabled its host entry (using **ipa host-disable**), you cannot re-enroll it.

You cannot re-enroll a client after you have renamed it. This is because in IdM, the key attribute of the client's entry in LDAP is the client's hostname, its **FQDN**. As opposed to re-enrolling a client, during which the client's LDAP object remains unchanged, the outcome of renaming a client is that the client has its keys and other information in a different LDAP object with a new **FQDN**. Thus the only way to rename a client is to uninstall the host from IdM, change the host's hostname, and install it as an IdM client with a new name. For details on how to rename a client, see [Chapter 13, Renaming IdM client systems](#).

11.1.1. What happens during client re-enrollment

During re-enrollment, IdM:

- Revokes the original host certificate
- Creates new SSH keys
- Generates a new keytab

11.2. RE-ENROLLING A CLIENT BY USING USER CREDENTIALS: INTERACTIVE RE-ENROLLMENT

This procedure describes re-enrolling an Identity Management (IdM) client interactively by using the credentials of an authorized user.

1. Re-create the client machine with the same host name.
2. Run the **ipa-client-install --force-join** command on the client machine:

```
# ipa-client-install --force-join
```

3. The script prompts for a user whose identity will be used to re-enroll the client. This could be, for example, a **hostadmin** user with the Enrollment Administrator role:

User authorized to enroll computers: **hostadmin**
 Password for **hostadmin@EXAMPLE.COM**:

Additional resources

- For a more detailed procedure on enrolling clients by using an authorized user's credentials, see [Section 9.3, "Installing a client by using user credentials: Interactive installation"](#).

11.3. RE-ENROLLING A CLIENT BY USING THE CLIENT KEYTAB: NON-INTERACTIVE RE-ENROLLMENT

Prerequisites

- Back up the original client keytab file, for example in the **/tmp** or **/root** directory.

Procedure

This procedure describes re-enrolling an Identity Management (IdM) client non-interactively by using the keytab of the client system. For example, re-enrollment using the client keytab is appropriate for an automated installation.

1. Re-create the client machine with the same host name.
2. Copy the keytab file from the backup location to the **/etc/** directory on the re-created client machine.
3. Use the **ipa-client-install** utility to re-enroll the client, and specify the keytab location with the **-keytab** option:

```
# ipa-client-install --keytab /etc/krb5.keytab
```



NOTE

The keytab specified in the **--keytab** option is only used when authenticating to initiate the enrollment. During the re-enrollment, IdM generates a new keytab for the client.

11.4. TESTING AN IDM CLIENT

The Command-Line Interface informs you that the **ipa-client-install** was successful, but you can also do your own test.

To test that the Identity Management (IdM) client can obtain information about users defined on the server, check that you are able to resolve a user defined on the server. For example, to check the default **admin** user:

```
[user@client ~]$ id admin
uid=1254400000(admin) gid=1254400000(admins) groups=1254400000(admins)
```

To test that authentication works correctly, **su** to a root user from a non-root user:

```
[user@client ~]$ su -
```

```
Last login: Thu Oct 18 18:39:11 CEST 2018 from 192.168.122.1 on pts/0
```

```
[root@client ~]#
```

CHAPTER 12. UNINSTALLING AN IDM CLIENT

As an administrator, you can remove an Identity Management (IdM) client from the environment.

12.1. UNINSTALLING AN IDM CLIENT

Uninstalling a client removes the client from the Identity Management (IdM) domain, along with all of the specific IdM configuration of system services, such as System Security Services Daemon (SSSD). This restores the previous configuration of the client system.

Procedure

1. Enter the **ipa-client-install --uninstall** command:

```
[root@client ~]# ipa-client-install --uninstall
```

2. Remove the DNS entries for the client host manually from the server:

```
[root@server ~]# ipa dnsrecord-del
Record name: old-client-name
Zone name: idm.example.com
No option to delete specific record provided.
Delete all? Yes/No (default No): yes
-----
Deleted record "old-client-name"
```

3. For each identified keytab other than **/etc/krb5.keytab**, remove the old principals:

```
[root@client ~]# ipa-rmkeytab -k /path/to/keytab -r EXAMPLE.COM
```

4. On an IdM server, remove the client host entry from the IdM LDAP server. This removes all services and revokes all certificates issued for that host:

```
[root@server ~]# ipa host-del client.idm.example.com
```



IMPORTANT

Removing the client host entry from the IdM LDAP server is crucial if you think you might re-enroll the client in the future, with a different IP address or a different hostname.

CHAPTER 13. RENAMING IDM CLIENT SYSTEMS

The following sections describe how to change the host name of an Identity Management (IdM) client system.



WARNING

Renaming a client is a manual procedure. Do not perform it unless changing the host name is absolutely required.

Renaming an IdM client involves:

1. Preparing the host. For details, see [Section 13.1, “Prerequisites”](#)
2. Uninstalling the IdM client from the host. For details, see [Section 13.2, “Uninstalling an IdM client”](#)
3. Renaming the host. For details, see [Section 13.3, “Renaming the host system”](#)
4. Installing the IdM client on the host with the new name. For details, see [Section 13.4, “Re-installing an IdM client”](#)
5. Configuring the host after the IdM client installation. For details, see [Section 13.5, “Re-adding services, re-generating certificates, and re-adding host groups”](#)

13.1. PREREQUISITES

Before uninstalling the current client, make note of certain settings for the client. You will apply this configuration after re-enrolling the machine with a new host name.

- Identify which services are running on the machine:
 - Use the **ipa service-find** command, and identify services with certificates in the output:
- In addition, each host has a default *host* service which does not appear in the **ipa service-find** output. The service principal for the host service, also called a *host principal*, is **host/old-client-name.example.com**.
- For all service principals displayed by **ipa service-find old-client-name.example.com**, determine the location of the corresponding keytabs on the **old-client-name.example.com** system:

```
# find / -name "*.keytab"
```

Each service on the client system has a Kerberos principal in the form *service_name/host_name@REALM*, such as **ldap/old-client-name.example.com@EXAMPLE.COM**.

- Identify all host groups to which the machine belongs.

```
# ipa hostgroup-find old-client-name.example.com
```

13.2. UNINSTALLING AN IDM CLIENT

Uninstalling a client removes the client from the Identity Management (IdM) domain, along with all of the specific IdM configuration of system services, such as System Security Services Daemon (SSSD). This restores the previous configuration of the client system.

Procedure

1. Enter the **ipa-client-install --uninstall** command:

```
[root@client ~]# ipa-client-install --uninstall
```

2. Remove the DNS entries for the client host manually from the server:

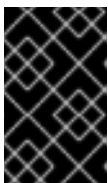
```
[root@server ~]# ipa dnsrecord-del
Record name: old-client-name
Zone name: idm.example.com
No option to delete specific record provided.
Delete all? Yes/No (default No): yes
-----
Deleted record "old-client-name"
```

3. For each identified keytab other than **/etc/krb5.keytab**, remove the old principals:

```
[root@client ~]# ipa-rmkeytab -k /path/to/keytab -r EXAMPLE.COM
```

4. On an IdM server, remove the client host entry from the IdM LDAP server. This removes all services and revokes all certificates issued for that host:

```
[root@server ~]# ipa host-del client.idm.example.com
```



IMPORTANT

Removing the client host entry from the IdM LDAP server is crucial if you think you might re-enroll the client in the future, with a different IP address or a different hostname.

13.3. RENAMING THE HOST SYSTEM

Rename the machine as required. For example:

```
# hostnamectl set-hostname new-client-name.example.com
```

You can now re-install the Identity Management (IdM) client to the IdM domain with the new host name.

13.4. RE-INSTALLING AN IDM CLIENT

Install an client on your renamed host following the procedure described in [Chapter 9, *Installing an IdM client: Basic scenario*](#).

13.5. RE-ADDING SERVICES, RE-GENERATING CERTIFICATES, AND RE-ADDING HOST GROUPS

1. On the Identity Management (IdM) server, add a new keytab for every service identified in [Section 13.1, "Prerequisites"](#).

```
[root@server ~]# ipa service-add service_name/new-client-name
```

2. Generate certificates for services that had a certificate assigned in [Section 13.1, "Prerequisites"](#). You can do this:
 - Using the IdM administration tools
 - Using the **certmonger** utility
3. Re-add the client to the host groups identified in [Section 13.1, "Prerequisites"](#).

CHAPTER 14. PREPARING THE SYSTEM FOR IDM REPLICA INSTALLATION

The following sections list the requirements to install an Identity Management (IdM) replica. Before the installation, make sure your system meets these requirements.

A system where you want to install a replica must meet the general requirements for servers: [Chapter 1, *Preparing the system for IdM server installation*](#)

For additional requirements specific to replicas, see: [Section 14.1, “Replica version requirements”](#)

14.1. REPLICA VERSION REQUIREMENTS

Red Hat Enterprise Linux (RHEL) 8 replicas only work with Identity Management (IdM) masters running on RHEL 7.4 and later. Before introducing IdM replicas running on RHEL 8 into an existing deployment, upgrade all IdM servers to RHEL 7.4 or later, and change the domain level to 1.

In addition, the replica must be running the same or later version of IdM. For example:

- The master server is installed on Red Hat Enterprise Linux 8 and uses the IdM 4.x packages.
- You must install the replica also on Red Hat Enterprise Linux 8 or later and use IdM version 4.x or later.

This ensures that configuration can be properly copied from the server to the replica.

For details on how to display the IdM software version, see [Section 14.2, “Methods for displaying IdM software version”](#).

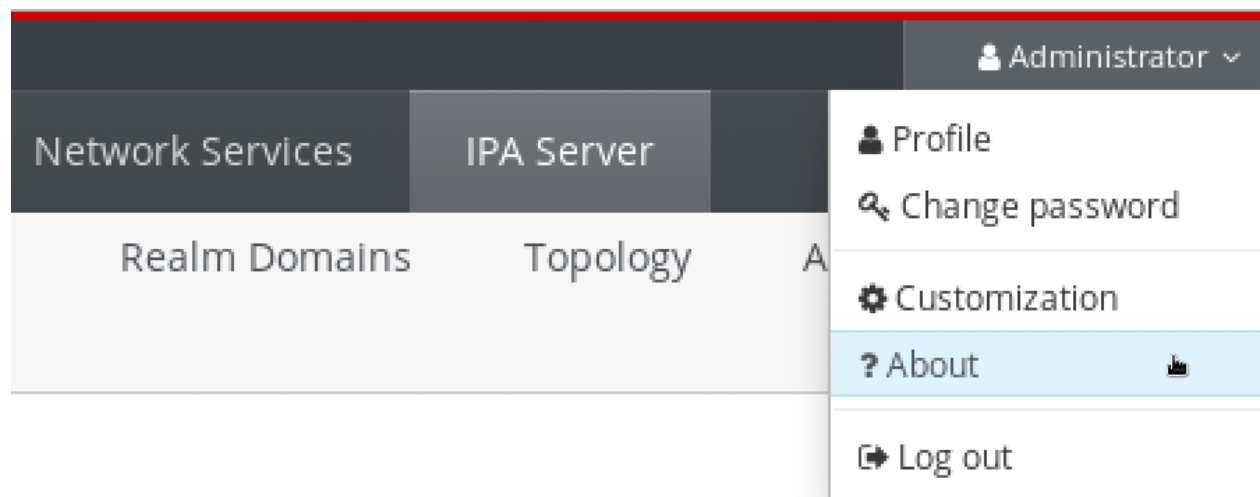
14.2. METHODS FOR DISPLAYING IDM SOFTWARE VERSION

You can display the IdM version number with:

- the IdM WebUI
- **ipa** commands
- **rpm** commands

Displaying version through the WebUI

In the IdM WebUI, the software version can be displayed by choosing **About** from the username menu at the top-right.



Displaying version with **ipa** commands

From the command line, use the **ipa --version** command.

```
[root@server ~]# ipa --version
VERSION: 4.8.0, API_VERSION: 2.233
```

Displaying version with **rpm** commands

If IdM services are not operating properly, you can use the **rpm** utility to determine the version number of the **ipa-server** package that is currently installed.

```
[root@server ~]# rpm -q ipa-server
ipa-server-4.8.0-11.module+el8.1.0+4247+9f3fd721.x86_64
```

CHAPTER 15. INSTALLING AN IDM REPLICA

The following sections describe how to install an Identity Management (IdM) replica based on an existing server. The replica installation process copies the configuration of the existing server, and installs the replica based on that configuration.



NOTE

Install one IdM replica at a time. The installation of multiple replicas at the same time is not supported.

Before installing a replica, the target system must be authorized for enrollment in the IdM domain. See:

- [Section 15.1, “Prerequisites for installing a replica on an IdM client”](#)
- [Section 15.2, “Prerequisites for installing a replica on a system outside the IdM domain”](#)

For the replica installation procedures, see:

- [Section 15.3, “Installing an IdM replica with integrated DNS”](#)
- [Section 15.5, “Installing an IdM replica without a CA”](#)

After the installation, see:

- [Section 15.7, “Testing an IdM replica”](#)

15.1. PREREQUISITES FOR INSTALLING A REPLICA ON AN IDM CLIENT

When installing a replica on an existing client, choose one of the following authorization methods.

A privileged user’s credentials

Choose this method to authorize the replica installation by providing a privileged user’s credentials:

- Log in as the privileged user before running the **ipa-replica-install** utility. The default privileged user is **admin**:

```
$ kinit admin
```

- Let Identity Management (IdM) prompt you for the credentials interactively. This is the default behavior.

The ipaservers host group

Choose this method to authorize the replica installation by adding the client to the **ipaservers** host group. Membership in **ipaservers** grants the machine elevated privileges analogous to the administrator’s credentials.

To add the client as a member of **ipaservers**:

```
$ kinit admin
```

```
$ ipa hostgroup-add-member ipaservers --hosts replica.example.com
Host-group: ipaservers
```

Description: IPA server hosts

Member hosts: server.idm.example.com, client.example.com

Number of members added 1

15.2. PREREQUISITES FOR INSTALLING A REPLICA ON A SYSTEM OUTSIDE THE IDM DOMAIN

When you run the **ipa-replica-install** utility on a system that has not yet been enrolled in the Identity Management (IdM) domain, **ipa-replica-install** first enrolls the system as a client and then installs the replica components.

When installing a replica on a system outside the IdM domain, choose one of the following authorization methods.

A privileged user's credentials

Using this method, the replica installation is authorized by providing a privileged user's credentials. The default privileged user is **admin**.

To use this method, add the principal name and password options (**--principal admin --admin-password password**) to **ipa-replica-install** directly during the installation.

A random password generated on an IdM server

Using this method, the replica installation is authorized by providing a random password for one-time enrollment.

To generate the random password for the future replica and add the future replica system to the **ipaservers** host group, use these commands on any server in the domain:

1. Log in as the administrator.

```
$ kinit admin
```

2. Add the new machine as an IdM host. Use the **--random** option with the **ipa host-add** command to generate a random one-time password to be used for the replica installation.

```
$ ipa host-add replica.example2.com --random
```

```
-----  
Added host "replica.example2.com"  
-----
```

```
Host name: replica.example2.com  
Random password: W5YpARl=7M.n  
Password: True  
Keytab: False  
Managed by: server.example.com
```

The generated password will become invalid after you use it to enroll the machine into the IdM domain. It will be replaced with a proper host keytab after the enrollment is finished.

3. Add the machine to the **ipaservers** host group.

```
$ ipa hostgroup-add-member ipaservers --hosts replica.example2.com  
Host-group: ipaservers
```

Description: IPA server hosts
 Member hosts: server.example.com, replica.example2.com

 Number of members added 1

Membership in **ipaservers** grants the machine elevated privileges required to set up the necessary server services.

15.3. INSTALLING AN IDM REPLICA WITH INTEGRATED DNS

This procedure describes installing a replica:

- With integrated DNS
- Without a certificate authority (CA) in an Identity Management (IdM) environment in which a CA is already installed. The replica will forward all certificate operations to the IdM server with a CA installed.

Procedure

1. Run **ipa-replica-install** with these options:

- **--setup-dns** to configure the replica as the DNS server
- **--forwarder** to specify a forwarder, or **--no-forwarder** if you do not want to use any forwarders. To specify multiple forwarders for failover reasons, use **--forwarder** multiple times.

For example, to set up a replica with an integrated DNS server that forwards all DNS requests not managed by the IdM servers to the DNS server running on IP 192.0.2.1:

```
# ipa-replica-install --setup-dns --forwarder 192.0.2.1
```



NOTE

The **ipa-replica-install** utility accepts a number of other options related to DNS settings, such as **--no-reverse** or **--no-host-dns**. For more information about them, see the **ipa-replica-install(1)** man page.

2. After the installation completes, add a DNS delegation from the parent domain to the IdM DNS domain. For example, if the IdM DNS domain is **ipa.example.com**, add a name server (NS) record to the **example.com** parent domain.



IMPORTANT

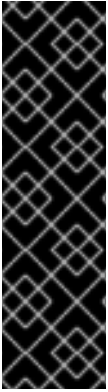
Repeat this step each time after you installed an IdM DNS server.

15.4. INSTALLING AN IDM REPLICA WITH A CA

This procedure describes installing a replica:

- Without integrated DNS

- With a certificate authority (CA)



IMPORTANT

When configuring a replica with a CA, the CA configuration of the replica must mirror the CA configuration of the master server.

For example, if the server includes an integrated Identity Management (IdM) CA as the root CA, the replica must also be installed with an integrated CA as the root CA. No other CA configuration is available in this case.

The inclusion of the **--setup-ca** option in the **ipa-replica-install** command takes care of copying the CA configuration of the initial server.

Procedure

1. Run **ipa-replica-install** with the **--setup-ca** option.

```
# ipa-replica-install --setup-ca
```

2. Add the newly created IdM DNS service records to your DNS server:

- a. Export the IdM DNS service records into a file in the **nsupdate** format:

```
$ ipa dns-update-system-records --dry-run --out dns_records_file.nsupdate
```

- b. Submit a DNS update request to your DNS server using the **nsupdate** utility and the **dns_records_file.nsupdate** file. For more information, see [Updating External DNS Records Using nsupdate](#) in RHEL 7 documentation. Alternatively, refer to your DNS server documentation for adding DNS records.

15.5. INSTALLING AN IDM REPLICA WITHOUT A CA

This procedure describes installing a replica:

- Without integrated DNS
- Without a certificate authority (CA) by providing the required certificates manually. The assumption here is that the master server was also installed without a CA.



IMPORTANT

You cannot install a server or replica using self-signed third-party server certificates because the imported certificate files must contain the full CA certificate chain of the CA that issued the LDAP and Apache server certificates.

Procedure

- Run **ipa-replica-install**, and provide the required certificate files by adding these options:
 - **--dirsrv-cert-file**
 - **--dirsrv-pin**

- **--http-cert-file**
- **--http-pin**

For details about the files that are provided using these options, see [Section 4.1, “Certificates required to install an IdM server without a CA”](#).

For example:

```
# ipa-replica-install \
  --dirsrv-cert-file /tmp/server.crt \
  --dirsrv-cert-file /tmp/server.key \
  --dirsrv-pin secret \
  --http-cert-file /tmp/server.crt \
  --http-cert-file /tmp/server.key \
  --http-pin secret
```



NOTE

Do not add the **--ca-cert-file** option. The **ipa-replica-install** utility takes this part of the certificate information automatically from the master server.

15.6. INSTALLING AN IDM HIDDEN REPLICA

A hidden (unadvertised) replica is an IdM server that has all services running and available. However, it has no SRV records in DNS, and LDAP server roles are not enabled. Therefore, clients cannot use service discovery to detect these hidden replicas.

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

Procedure

- To install a hidden replica, use the following command:

```
ipa-replica-install --hidden-replica
```

Note that the command installs a replica without DNS SRV records and with disabled LDAP server roles.

You can also change the mode of existing replica to hidden. For details, see [Demotion and promotion of hidden replicas](#).

15.7. TESTING AN IDM REPLICA

After creating a replica, check if the replica replicates data as expected. You can use the following procedure.

Procedure

1. Create a user on the new replica:

```
[admin@new_replica ~]$ ipa user-add test_user
```

2. Make sure the user is visible on another replica:

```
[admin@another_replica ~]$ ipa user-show test_user
```

15.8. CONNECTIONS PERFORMED DURING AN IDM REPLICA INSTALLATION

Table 15.1, “Requests performed during an IdM replica installation” lists the operations performed by **ipa-replica-install**, the Identity Management (IdM) replica installation tool.

Table 15.1. Requests performed during an IdM replica installation

Operation	Protocol used	Purpose
DNS resolution against the DNS resolvers configured on the client system	DNS	To discover the IP addresses of IdM masters
Requests to ports 88 (TCP/TCP6 and UDP/UDP6) on the discovered IdM masters	Kerberos	To obtain a Kerberos ticket
JSON-RPC calls to the IdM Apache-based web-service on the discovered or configured IdM masters	HTTPS	IdM client enrollment; replica keys retrieval and certificate issuance if required
Requests over TCP/TCP6 to port 389 on the IdM server, using SASL GSSAPI authentication, plain LDAP, or both	LDAP	IdM client enrollment; CA certificate chain retrieval; LDAP data replication
Requests over TCP/TCP6 to port 22 on IdM server	SSH	To check if the connection is working
(optionally) Access over port 8443 (TCP/TCP6) on the IdM master	HTTPS	To administer the Certificate Authority on the IdM master (only during IdM master and replica installation)

CHAPTER 16. UNINSTALLING AN IDM REPLICA

As an administrator, you can remove an Identity Management (IdM) server from the topology.

This procedure describes how you can uninstall an example server named **server.idm.example.com**.

Prerequisites

- Before uninstalling a server that serves as a certificate authority (CA), key recovery authority (KRA), or DNS server, make sure these services are running on another server in the domain.



WARNING

Removing the last server that serves as a CA, KRA, or DNS server seriously disrupts the Identity Management (IdM) functionality.

Procedure

1. On all the servers in the topology that have a replication agreement with **server.idm.example.com**, use the **ipa server-del** command to delete the replica from the topology:

```
[root@another_server ~]# ipa server-del server.idm.example.com
```

2. On **server.idm.example.com**, use the **ipa-server-install --uninstall** command:

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

```
...
```

```
Are you sure you want to continue with the uninstall procedure? [no]: yes
```

3. Make sure all name server (NS) DNS records pointing to **server.idm.example.com** are deleted from your DNS zones. This applies regardless of whether you use integrated DNS managed by IdM or external DNS.

CHAPTER 17. INSTALLING THE IDM HEALTHCHECK TOOL

This section describes the IdM Healthcheck tool and how to install it.

Prerequisites

- The Healthcheck tool is only available on RHEL 8.1 or later.

17.1. HEALTHCHECK IN IDM

The Healthcheck tool in Identity Management (IdM) helps find issues that may impact the health of your IdM environment.



NOTE

The Healthcheck tool is a command line tool that can be used without Kerberos authentication.

17.1.1. Modules are Independent

Healthcheck consists of independent modules which test for:

- Replication issues
- Certificate validity
- Certificate Authority infrastructure issues
- IdM and Active Directory trust issues
- Correct file permissions and ownership settings

17.1.2. Two output formats

Healthcheck generates the following outputs:

- Human-readable output
- Machine-readable output in JSON format

The output destination for both human and JSON is standard output by default. You can specify a different destination with the **--output-file** option.

17.1.3. Results

Each Healthcheck module returns one of the following results:

SUCCESS

configured as expected

WARNING

not an error, but worth keeping an eye on or evaluating

ERROR

not configured as expected

CRITICAL

not configured as expected, with a high possibility for impact

17.1.4. Running IdM Healthcheck

Healthcheck can be run:

- Manually

```
[root@master ~]# ipa-healthcheck
```

For all options, see the man page: **man ipa-healthcheck**.

- Automatically using [log rotation](#).

17.2. INSTALLING IDM HEALTHCHECK

Procedure

- Install the **ipa-healthcheck** package:

```
[root@master ~]# dnf install ipa-healthcheck
```

Verification steps

- Use the **--failures-only** option to have **ipa-healthcheck** only report errors. A fully-functioning IdM installation returns an empty result of [].

```
[root@master ~]# ipa-healthcheck --failures-only  
[]
```

Additional resources

- Use **ipa-healthcheck --help** to see all supported arguments.

17.3. ADDITIONAL RESOURCES

See the following sections of [Configuring and managing Identity Management](#) for examples of using IdM Healthcheck.

- [Checking services](#)
- [Verifying your IdM and AD trust configuration](#)
- [Verifying certificates](#)
- [Verifying system certificates](#)
- [Checking disk space](#)
- [Verifying permissions of IdM configuration files](#)

- [Checking replication](#)

CHAPTER 18. INSTALLING AN IDENTITY MANAGEMENT SERVER USING AN ANSIBLE PLAYBOOK

18.1. ANSIBLE AND ITS ADVANTAGES FOR INSTALLING IDM

Ansible is an automation tool used to configure systems, deploy software, and perform rolling updates. Ansible includes support for Identity Management (IdM), and you can use Ansible modules to automate installation tasks such as the setup of an IdM server, replica, client, or an entire IdM topology.

Advantages of using Ansible to install IdM

The following list presents advantages of installing Identity Management using Ansible in contrast to manual installation.

- You do not need to log into the managed node.
- You do not need to configure settings on each host to be deployed individually. Instead, you can have one inventory file to deploy a complete cluster.
- You can reuse an inventory file later for management tasks, for example to add users and hosts. You can reuse an inventory file even for such tasks as are not related to IdM.

18.2. IDM SERVER INSTALLATION USING AN ANSIBLE PLAYBOOK

The following sections describe how to configure a system as an IdM server by using [Ansible](#). Configuring a system as an IdM server establishes an IdM domain and enables the system to offer IdM services to IdM clients. The deployment is managed by the **ipaserver** Ansible role.



NOTE

Before installing an IdM server using Ansible, ensure that you understand [Ansible](#) and IdM concepts. Ensure that you understand the following terms that are used in this chapter:

- Ansible roles
- Ansible nodes
- Ansible inventory
- Ansible tasks
- Ansible modules
- Ansible plays and playbooks

Overview

The installation consists of the following parts:

1. [Installing the ansible-freeipa package](#);
2. [Deploying an IdM server with an integrated CA using an Ansible playbook](#) ;
3. [Deploying an IdM server with an external CA using an Ansible-playbook](#) .

18.3. INSTALLING THE ANSIBLE-FREEIPA PACKAGE

Prerequisites

On the **managed node**:

- Ensure that the managed node is a Red Hat Enterprise Linux 8 system with a static IP address and a working package manager.

On the **controller**:

- Ensure that the controller is a Red Hat Enterprise Linux system with a valid subscription. If this is not the case, see the official Ansible documentation [Installation guide](#) for alternative installation instructions.
- Ensure that you can reach the managed node over the **SSH** protocol from the controller. Check that the managed node is listed in the **/root/.ssh/known_hosts** file of the controller.

Procedure

Run the following procedure on the Ansible controller.

1. Enable the required repository:

```
# subscription-manager repos --enable ansible-2.8-for-rhel-8-x86_64-rpms
```

2. Install Ansible:

```
# yum install ansible
```

3. Install the IdM Ansible roles:

```
# yum install ansible-freeipa
```

The roles are installed to the **/usr/share/ansible/roles/** directory.

18.4. ANSIBLE ROLES LOCATION IN THE FILE SYSTEM

By default the **ansible-freeipa** roles are installed to the **/usr/share/ansible/roles/** directory. The structure of the **ansible-freeipa** package is as follows:

- The **/usr/share/ansible/roles/** directory stores the **ipaserver**, **ipareplica**, and **ipacient** roles on the Ansible controller. Each role directory stores examples, a basic overview, the licence and documentation about the role in a README.md Markdown file.

```
[root@server]# ls -l /usr/share/ansible/roles/
ipaclient
ipareplica
ipaserver
```

- The **/usr/share/doc/ansible-freeipa/** directory stores the documentation about individual roles and the topology in README.md Markdown files. It also stores the **playbooks/** subdirectory (see below).

```
[root@server]# ls -l /usr/share/doc/ansible-freeipa/
```



```
playbooks
README-client.md
README.md
README-replica.md
README-server.md
README-topology.md
```

- The `/usr/share/doc/ansible-freeipa/playbooks/` directory stores the example playbooks:

```
[root@server]# ls -l /usr/share/doc/ansible-freeipa/playbooks/
install-client.yml
install-cluster.yml
install-replica.yml
install-server.yml
uninstall-client.yml
uninstall-cluster.yml
uninstall-replica.yml
uninstall-server.yml
```

18.5. DEPLOYING AN IDM SERVER WITH AN INTEGRATED CA AS THE ROOT CA USING AN ANSIBLE PLAYBOOK

18.5.1. Setting the parameters for a deployment with an integrated CA as the root CA

Complete this procedure to configure the inventory file for installing an IdM server with an integrated CA as the root CA.

Procedure

1. Open the inventory file for editing. Specify the fully-qualified domain names (**FQDN**) of the host you want to use as an IdM server. Ensure that the **FQDN** meets the following criteria:
 - Only alphanumeric characters and hyphens (-) are allowed. For example, underscores are not allowed and can cause DNS failures.
 - The host name must be all lower-case.
2. Specify the IdM domain and realm information.
3. Specify if you want the IdM server to have an integrated DNS and if you want it to use forwarders from the `/etc/resolv.conf` file.
4. Specify the passwords for **admin** and for the **Directory Manager**. Use the Ansible Vault to store the password, and reference the Vault file from the playbook file. Alternatively and less securely, specify the passwords directly in the inventory file.

Example of an inventory file with the required server information (excluding the passwords)

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

[ipaserver:vars]
ipaserver_domain=idm.example.com
```

```
ipaserver_realm=IDM.EXAMPLE.COM
ipaserver_setup_dns=yes
ipaserver_auto_forwarders=yes
[...]
```

Example of an inventory file with the required server information (including the passwords)

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

[ipaserver:vars]
ipaserver_domain=idm.example.com
ipaserver_realm=IDM.EXAMPLE.COM
ipaserver_setup_dns=yes
ipaserver_auto_forwarders=yes
ipaadmin_password=MySecretPassword123
ipadm_password=MySecretPassword234

[...]
```

Example playbook to set up an IdM server using admin and Directory Manager passwords stored in an Ansible Vault file

```
---
- name: Playbook to configure IPA server
  hosts: ipaserver
  become: true
  vars_files:
    - playbook_sensitive_data.yml

  roles:
    - role: ipaserver
      state: present
```

Example playbook to set up an IdM server using admin and Directory Manager passwords from an inventory file

```
---
- name: Playbook to configure IPA server
  hosts: ipaserver
  become: true

  roles:
    - role: ipaserver
      state: present
```

For details on installing the IdM server and the available options, see [Part I, “Installing Identity Management”](#).

18.5.2. Deploying an IdM server with an integrated CA as the root CA using an Ansible playbook

Complete this procedure to deploy an IdM server with an integrated certificate authority (CA) as the root CA using an Ansible playbook.

Procedure

- Run the **ansible-playbook** command with the name of the playbook file, for example **install-server.yml**. Specify the inventory file with the **-i** option:

```
$ ansible-playbook -v -i <path_to_inventory_directory>/hosts
<path_to_playbooks_directory>/install-server.yml
```

Specify the level of verbosity by using the **-v**, **-vv**, or **-vvv** option.

You can view the output of the Ansible playbook script on the command-line interface (CLI). The following output shows that the script has run successfully as 0 tasks have failed:

```
PLAY RECAP
server.idm.example.com : ok=18  changed=10  unreachable=0  failed=0  skipped=21
rescued=0  ignored=0
```

You have installed an IdM server on your host using an Ansible playbook.

18.6. DEPLOYING AN IDM SERVER WITH AN EXTERNAL CA AS THE ROOT CA USING AN ANSIBLE PLAYBOOK

18.6.1. Setting the parameters for a deployment with an external CA as the root CA

Complete this procedure to configure the inventory file for installing an IdM server with an external CA as the root CA.

Procedure

1. Open the inventory file for editing. Specify the fully-qualified domain names (**FQDN**) of the host you want to use as an IdM server. Ensure that the **FQDN** meets the following criteria:
 - Only alphanumeric characters and hyphens (-) are allowed. For example, underscores are not allowed and can cause DNS failures.
 - The host name must be all lower-case.
2. Specify the IdM domain and realm information.
3. Specify if you want the IdM server to have an integrated DNS and if you want it to use forwarders from the **/etc/resolv.conf** file.
4. Specify the passwords for **admin** and for the **Directory Manager**. Use the Ansible Vault to store the password, and reference the Vault file from the playbook file. Alternatively and less securely, specify the passwords directly in the inventory file.

Example of an inventory file with the required server information (excluding the passwords)

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

```
[ipaserver:vars]
ipaserver_domain=idm.example.com
ipaserver_realm=IDM.EXAMPLE.COM
ipaserver_setup_dns=yes
ipaserver_auto_forwarders=yes
[...]
```

Example of an inventory file with the required server information (including the passwords)

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

[ipaserver:vars]
ipaserver_domain=idm.example.com
ipaserver_realm=IDM.EXAMPLE.COM
ipaserver_setup_dns=yes
ipaserver_auto_forwarders=yes
ipaadmin_password=MySecretPassword123
ipadm_password=MySecretPassword234

[...]
```

5. Create a playbook for the first step of the installation. Enter instructions for generating the certificate signing request (CSR) and copying it from the controller to the managed node.

Figure 18.1. Example playbook to set up an IdM server with an externally signed CA using admin and Directory Manager passwords stored in an Ansible Vault file: First step

```
---
- name: Playbook to configure IPA server Step 1
  hosts: ipaserver
  become: true
  vars_files:
    - playbook_sensitive_data.yml
  vars:
    ipaserver_external_ca: yes

  roles:
    - role: ipaserver
      state: present

  post_tasks:
    - name: Copy CSR /root/ipa.csr from node to "{{ groups.ipaserver[0] +
      '-ipa.csr' }}"
      fetch:
        src: /root/ipa.csr
        dest: "{{ groups.ipaserver[0] + '-ipa.csr' }}"
        flat: yes
```

6. Create another playbook for the final step of the installation.

Figure 18.2. Example playbook to set up an IdM server with an externally signed CA using admin and Directory Manager passwords stored in an Ansible Vault file: Final step

```
---
- name: Playbook to configure IPA server step -1
  hosts: ipaserver
  become: true
  vars_files:
  - playbook_sensitive_data.yml
  vars:
    ipaserver_external_cert_files: "/root/chain.crt"

  pre_tasks:
  - name: Copy "{{ groups.ipaserver[0] + '-chain.crt' }}" to /root/chain.crt
    on node
    copy:
      src: "{{ groups.ipaserver[0] + '-chain.crt' }}"
      dest: "/root/chain.crt"
      force: yes

  roles:
  - role: ipaserver
    state: present
```

For details on the options available to you when installing an IdM server with an externally signed CA, see [Chapter 3, *Installing an IdM server: With integrated DNS, with an external CA as the root CA*](#).

18.6.2. Deploying an IdM server with an external CA as the root CA using an Ansible playbook

Complete this procedure to deploy an IdM server with an external certificate authority (CA) as the root CA using an Ansible playbook.

Procedure

1. Run the **ansible-playbook** command with the name of the playbook file that contains instructions for the first step of the installation, for example **install-server-step1.yml**. Specify the inventory file with the **-i** option:

```
$ ansible-playbook -v -i <path_to_inventory_directory>/host.server
<path_to_playbooks_directory>/install-server-step1.yml
```

Specify the level of verbosity by using the **-v**, **-vv** or **-vvv** option.

You can view the output of the Ansible playbook script on the command-line interface (CLI). The following output shows that the script has run successfully as 0 tasks have failed:

```
PLAY RECAP
server.idm.example.com : ok=18  changed=10  unreachable=0  failed=0  skipped=21
rescued=0  ignored=0
```

2. Locate the **ipa.csr** certificate signing request file on the controller and submit it to the external CA.
3. Place the IdM CA certificate signed by the external CA in the controller file system so that the playbook in the next step can find it.
4. Run the **ansible-playbook** command with the name of the playbook file that contains instructions for the final step of the installation, for example **install-server-step2.yml**. Specify the inventory file with the **-i** option:

```
$ ansible-playbook -v -i <path_to_inventory_directory>/host.server  
<path_to_playbooks_directory>/install-server-step2.yml
```

You have installed an IdM server with an externally signed CA on your host using an Ansible playbook.

CHAPTER 19. INSTALLING AN IDENTITY MANAGEMENT REPLICA USING AN ANSIBLE PLAYBOOK

19.1. ANSIBLE AND ITS ADVANTAGES FOR INSTALLING IDM

Ansible is an automation tool used to configure systems, deploy software, and perform rolling updates. Ansible includes support for Identity Management (IdM), and you can use Ansible modules to automate installation tasks such as the setup of an IdM server, replica, client, or an entire IdM topology.

Advantages of using Ansible to install IdM

The following list presents advantages of installing Identity Management using Ansible in contrast to manual installation.

- You do not need to log into the managed node.
- You do not need to configure settings on each host to be deployed individually. Instead, you can have one inventory file to deploy a complete cluster.
- You can reuse an inventory file later for management tasks, for example to add users and hosts. You can reuse an inventory file even for such tasks as are not related to IdM.

19.2. IDM REPLICA INSTALLATION USING AN ANSIBLE PLAYBOOK

The following sections describe how to configure a system as an IdM replica by using [Ansible](#).

Configuring a system as an IdM replica enrolls it into an IdM domain and enables the system to use IdM services on IdM servers in the domain.

The deployment is managed by the **ipareplica** Ansible role. The role can use the autodiscovery mode for identifying the IdM servers, domain and other settings. However, if you deploy multiple replicas in a tier-like model, with different groups of replicas being deployed at different times, you must define specific servers or replicas for each group.



NOTE

Before installing an IdM replica using Ansible, ensure that you understand [Ansible](#) and IdM concepts. Ensure that you understand the following terms that are used in this chapter:

- Ansible roles
- Ansible nodes
- Ansible inventory
- Ansible tasks
- Ansible modules
- Ansible plays and playbooks

Overview

The installation consists of the following parts:

1. [Installing the ansible-freeipa package](#);

2. [Setting the parameters of the IdM replica deployment](#) , namely:
 - [Specifying the base, server and client variables for installing the IdM replica](#) ;
 - [Specifying the credentials for installing the IdM replica using an Ansible playbook](#) ;
3. [Deploying an IdM replica using an Ansible playbook](#) .

19.3. INSTALLING THE ANSIBLE-FREEIPA PACKAGE

Prerequisites

On the **managed node**:

- Ensure that the managed node is a Red Hat Enterprise Linux 8 system with a static IP address and a working package manager.

On the **controller**:

- Ensure that the controller is a Red Hat Enterprise Linux system with a valid subscription. If this is not the case, see the official Ansible documentation [Installation guide](#) for alternative installation instructions.
- Ensure that you can reach the managed node over the **SSH** protocol from the controller. Check that the managed node is listed in the **/root/.ssh/known_hosts** file of the controller.

Procedure

Run the following procedure on the Ansible controller.

1. Enable the required repository:

```
# subscription-manager repos --enable ansible-2.8-for-rhel-8-x86_64-rpms
```

2. Install Ansible:

```
# yum install ansible
```

3. Install the IdM Ansible roles:

```
# yum install ansible-freeipa
```

The roles are installed to the **/usr/share/ansible/roles/** directory.

19.4. ANSIBLE ROLES LOCATION IN THE FILE SYSTEM

By default the **ansible-freeipa** roles are installed to the **/usr/share/ansible/roles/** directory. The structure of the **ansible-freeipa** package is as follows:

- The **/usr/share/ansible/roles/** directory stores the **ipaserver**, **ipareplica**, and **ipaclient** roles on the Ansible controller. Each role directory stores examples, a basic overview, the licence and documentation about the role in a README.md Markdown file.

```
[root@server]# ls -l /usr/share/ansible/roles/  
ipaclient
```



```
ipareplica
ipaserver
```

- The **/usr/share/doc/ansible-freeipa/** directory stores the documentation about individual roles and the topology in README.md Markdown files. It also stores the **playbooks/** subdirectory (see below).

```
[root@server]# ls -l /usr/share/doc/ansible-freeipa/
playbooks
README-client.md
README.md
README-replica.md
README-server.md
README-topology.md
```

- The **/usr/share/doc/ansible-freeipa/playbooks/** directory stores the example playbooks:

```
[root@server]# ls -l /usr/share/doc/ansible-freeipa/playbooks/
install-client.yml
install-cluster.yml
install-replica.yml
install-server.yml
uninstall-client.yml
uninstall-cluster.yml
uninstall-replica.yml
uninstall-server.yml
```

19.5. SETTING THE PARAMETERS OF THE IDM REPLICA DEPLOYMENT

Before you deploy a target host as an IdM replica, configure the following settings:

- [Specify the base, server and client variables for installing the IdM replica.](#)
- [Specify the credentials for installing the IdM replica using an Ansible playbook.](#)

19.5.1. Specifying the base, server and client variables for installing the IdM replica

Complete this procedure to configure the inventory file for installing an IdM replica.

Procedure

1. Open the inventory file for editing. Specify the fully-qualified domain names (**FQDN**) of the hosts to become IdM replicas. The **FQDNs** must be valid DNS names:
 - Only numbers, alphabetic characters, and hyphens (-) are allowed. For example, underscores are not allowed and can cause DNS failures.
 - The host name must be all lower-case.

Example of a simple inventory hosts file with only the replicas' FQDN defined

```
[ipareplicas]
replica1.idm.example.com
replica2.idm.example.com
```

```
replica3.idm.example.com
[...]
```

If the IdM master server is already deployed and the SRV records are set properly in the IdM DNS zone, the script automatically discovers all the other required values.

- Optionally, provide additional information in the inventory file based on which of the following scenarios is closest to yours:

- **Scenario 1**

If you want to avoid autodiscovery and have all replicas listed in the **[ipareplicas]** section use a specific IdM server, set the server in the **[ipaservers]** section of the inventory file.

Example inventory hosts file with the FQDN of the IdM server and replicas defined

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

[ipareplicas]
replica1.idm.example.com
replica2.idm.example.com
replica3.idm.example.com
[...]
```

- **Scenario 2**

Alternatively, if you want to avoid autodiscovery but want to deploy specific replicas with specific servers, set the servers for specific replicas individually in the **[ipareplicas]** section in the inventory file.

Example inventory file with a specific IdM server defined for a specific replica

```
[ipaservers]
server.idm.example.com
replica1.idm.example.com

[ipareplicas]
replica2.idm.example.com
replica3.idm.example.com ipareplica_servers=replica1.idm.example.com
```

In the example above, **replica3.idm.example.com** uses the already deployed **replica1.idm.example.com** as its master server.

- **Scenario 3**

If you are deploying several replicas in one batch and time is a concern to you, multitier replica deployment can be useful for you. Define specific groups of replicas in the inventory file, for example **[ipareplicas_tier1]** and **[ipareplicas_tier2]**, and design separate plays for each group in the **install-replica.yml** playbook.

Example inventory file with replica tiers defined

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

[ipareplicas_tier1]
```

```
replica1.idm.example.com
```

[ipareplicas_tier2]

```
replica2.idm.example.com \
```

```
ipareplica_servers=replica1.idm.example.com,server.idm.example.com
```

The first entry in **ipareplica_servers** will be used as the master. The second entry will be used as a fallback option. When using multiple tiers for deploying IdM replicas, you must have separate tasks in the playbook to first deploy replicas from tier1 and then replicas from tier2:

Example of a playbook file with different plays for different replica groups

```
---
- name: Playbook to configure IPA replicas (tier1)
  hosts: ipareplicas_tier1
  become: true

  roles:
    - role: ipareplica
      state: present

- name: Playbook to configure IPA replicas (tier2)
  hosts: ipareplicas_tier2
  become: true

  roles:
    - role: ipareplica
      state: present
```

19.5.2. Specifying the credentials for installing the IdM replica using an Ansible playbook

Complete this procedure to configure the authorization for installing the IdM replica.

Procedure

1. Specify the **password of a user authorized to deploy replicas** for example the IdM **admin**.
 - Red Hat recommends using the Ansible Vault to store the password, and referencing the Vault file from the playbook file, for example **install-replica.yml**:

Example playbook file using principal from inventory file and password from an Ansible Vault file

```
- name: Playbook to configure IPA replicas
  hosts: ipareplicas
  become: true
  vars_files:
    - playbook_sensitive_data.yml

  roles:
    - role: ipareplica
      state: present
```

For details how to use Ansible Vault, see the official [Ansible Vault](#) documentation.

- Less securely, provide the credentials of **admin** directly in the inventory file. Use the **ipaadmin_password** option in the **[ipareplicas:vars]** section of the inventory file. The inventory file and the **install-replica.yml** playbook file can then look as follows:

Example inventory hosts.replica file

```
[...]
[ipareplicas:vars]
ipaadmin_password=Secret123
```

Example playbook using principal and password from inventory file

```
- name: Playbook to configure IPA replicas
  hosts: ipareplicas
  become: true

  roles:
    - role: ipareplica
      state: present
```

- Alternatively but also less securely, provide the credentials of another user authorized to deploy a replica directly in the inventory file. To specify a different authorized user, use the **ipaadmin_principal** option for the user name, and the **ipaadmin_password** option for the password. The inventory file and the **install-replica.yml** playbook file can then look as follows:

Example inventory hosts.replica file

```
[...]
[ipareplicas:vars]
ipaadmin_principal=my_admin
ipaadmin_password=my_admin_secret123
```

Example playbook using principal and password from inventory file

```
- name: Playbook to configure IPA replicas
  hosts: ipareplicas
  become: true

  roles:
    - role: ipareplica
      state: present
```

Additional resources

- For details on the options accepted by the **ipareplica** Ansible role, see the **/usr/share/ansible/roles/ipareplica/README.md** Markdown file.

19.6. DEPLOYING AN IDM REPLICA USING AN ANSIBLE PLAYBOOK

Complete this procedure to use an Ansible playbook to deploy an IdM replica.

Procedure

- To install an IdM replica using an Ansible playbook, use the **ansible-playbook** command with the name of the playbook file, for example **install-replica.yml**. Specify the inventory file with the **-i** option:

```
$ ansible-playbook -v -i <path_to_inventory_directory>/hosts.replica  
  <path_to_playbooks_directory>/install-replica.yml
```

Specify the level of verbosity by using the **-v**, **-vv** or **-vvv** option.

Ansible informs you about the execution of the Ansible playbook script. The following output shows that the script has run successfully as 0 tasks have failed:

```
PLAY RECAP  
 replica.idm.example.com : ok=18  changed=10  unreachable=0  failed=0  skipped=21  
 rescued=0  ignored=0
```

You have now installed an IdM replica.

CHAPTER 20. INSTALLING AN IDENTITY MANAGEMENT CLIENT USING AN ANSIBLE PLAYBOOK

20.1. ANSIBLE AND ITS ADVANTAGES FOR INSTALLING IDM

Ansible is an automation tool used to configure systems, deploy software, and perform rolling updates. Ansible includes support for Identity Management (IdM), and you can use Ansible modules to automate installation tasks such as the setup of an IdM server, replica, client, or an entire IdM topology.

Advantages of using Ansible to install IdM

The following list presents advantages of installing Identity Management using Ansible in contrast to manual installation.

- You do not need to log into the managed node.
- You do not need to configure settings on each host to be deployed individually. Instead, you can have one inventory file to deploy a complete cluster.
- You can reuse an inventory file later for management tasks, for example to add users and hosts. You can reuse an inventory file even for such tasks as are not related to IdM.

20.2. IDM CLIENT INSTALLATION USING AN ANSIBLE PLAYBOOK

The following sections describe how to configure a system as an Identity Management (IdM) client by using [Ansible](#). Configuring a system as an IdM client enrolls it into an IdM domain and enables the system to use IdM services on IdM servers in the domain.

The deployment is managed by the **ipaclient** Ansible role. By default, the role uses the autodiscovery mode for identifying the IdM servers, domain and other settings. The role can be modified to have the Ansible playbook use the settings specified, for example in the inventory file.



NOTE

Before installing an IdM client using Ansible, ensure that you understand [Ansible](#) and IdM concepts. Ensure that you understand the following terms that are used in this chapter:

- Ansible roles
- Ansible nodes
- Ansible inventory
- Ansible tasks
- Ansible modules
- Ansible plays and playbooks

Overview

The installation consists of the following parts:

1. [Installing the ansible-freeipa package](#);

2. [Setting the parameters of the IdM client deployment](#) to correspond to your deployment scenario:
 - Setting the parameters of the inventory file [for the autodiscovery client installation mode](#);
 - Setting the parameters of the inventory file [for when autodiscovery is not possible during client installation](#);
3. [Checking the parameters in install-client.yml](#);
4. [Deploying an IdM client using an Ansible playbook](#) ;
5. [Testing an Identity Management client after installation](#) .

20.3. INSTALLING THE ANSIBLE-FREEIPA PACKAGE

Prerequisites

On the **managed node**:

- Ensure that the managed node is a Red Hat Enterprise Linux 8 system with a static IP address and a working package manager.

On the **controller**:

- Ensure that the controller is a Red Hat Enterprise Linux system with a valid subscription. If this is not the case, see the official Ansible documentation [Installation guide](#) for alternative installation instructions.
- Ensure that you can reach the managed node over the **SSH** protocol from the controller. Check that the managed node is listed in the **/root/.ssh/known_hosts** file of the controller.

Procedure

Run the following procedure on the Ansible controller.

1. Enable the required repository:

```
# subscription-manager repos --enable ansible-2.8-for-rhel-8-x86_64-rpms
```

2. Install Ansible:

```
# yum install ansible
```

3. Install the IdM Ansible roles:

```
# yum install ansible-freeipa
```

The roles are installed to the **/usr/share/ansible/roles/** directory.

20.4. ANSIBLE ROLES LOCATION IN THE FILE SYSTEM

By default the **ansible-freeipa** roles are installed to the **/usr/share/ansible/roles/** directory. The structure of the **ansible-freeipa** package is as follows:

- The **/usr/share/ansible/roles/** directory stores the **ipaserver**, **ipareplica**, and **ipaclient** roles on the Ansible controller. Each role directory stores examples, a basic overview, the licence and documentation about the role in a README.md Markdown file.

```
[root@server]# ls -l /usr/share/ansible/roles/
ipaclient
ipareplica
ipaserver
```

- The **/usr/share/doc/ansible-freeipa/** directory stores the documentation about individual roles and the topology in README.md Markdown files. It also stores the **playbooks/** subdirectory (see below).

```
[root@server]# ls -l /usr/share/doc/ansible-freeipa/
playbooks
README-client.md
README.md
README-replica.md
README-server.md
README-topology.md
```

- The **/usr/share/doc/ansible-freeipa/playbooks/** directory stores the example playbooks:

```
[root@server]# ls -l /usr/share/doc/ansible-freeipa/playbooks/
install-client.yml
install-cluster.yml
install-replica.yml
install-server.yml
uninstall-client.yml
uninstall-cluster.yml
uninstall-replica.yml
uninstall-server.yml
```

20.5. SETTING THE PARAMETERS OF THE IDM CLIENT DEPLOYMENT

Before you deploy a target host as an IdM client, configure the [deployment instructions](#) on the control node. Additionally, configure the target host parameters depending on which of the following options you are planning:

- [Using the autodiscovery client installation mode](#)
- [Specifying the FQDN of the IdM server and the domain or realm information](#).

20.5.1. Setting the parameters of the inventory file for the autodiscovery client installation mode

To install an Identity Management client using an Ansible playbook, provide the following information in an inventory file, for example **inventory/hosts**:

- the information about the host
- the authorization for the task

The inventory file can be in one of many formats, depending on the inventory plugins you have. The **INI-like** format is one of Ansible's defaults and is used in the examples below.

Procedure

1. Specify the fully-qualified hostname (**FQDN**) of the host to become an IdM client. The fully qualified domain name must be a valid DNS name:
 - Only numbers, alphabetic characters, and hyphens (-) are allowed. For example, underscores are not allowed and can cause DNS failures.
 - The host name must be all lower-case. No capital letters are allowed.
If the SRV records are set properly in the IdM DNS zone, the script automatically discovers all the other required values.

Example of a simple inventory hosts file with only the client FQDN defined

```
[ipaclients]
client.idm.example.com
[...]
```

2. Specify the credentials for enrolling the client. The following authentication methods are available:
 - The **password of a user authorized to enroll clients** This is the default option.
 - Red Hat recommends using the Ansible Vault to store the password, and referencing the Vault file from the playbook file, for example **install-client.yml**, directly:

Example playbook file using principal from inventory file and password from an Ansible Vault file

```
- name: Playbook to configure IPA clients with username/password
  hosts: ipaclients
  become: true
  vars_files:
  - playbook_sensitive_data.yml

  roles:
  - role: ipaclient
    state: present
```

- Less securely, provide the credentials of **admin** using the **ipaadmin_password** option in the **[ipaclients:vars]** section of the **inventory/hosts** file. Alternatively, to specify a different authorized user, use the **ipaadmin_principal** option for the user name, and the **ipaadmin_password** option for the password. The **inventory/hosts** inventory file and the **install-client.yml** playbook file can then look as follows:

Example inventory hosts file

```
[...]
[ipaclients:vars]
ipaadmin_principal=my_admin
ipaadmin_password=Secret123
```

Example Playbook using principal and password from inventory file

```
- name: Playbook to unconfigure IPA clients
  hosts: ipaclients
  become: true

  roles:
    - role: ipaclient
      state: true
```

- The **client keytab** from the previous enrollment if it is still available:
 - This option is available if the system was previously enrolled as an Identity Management client. To use this authentication method, uncomment the **#ipaclient_keytab** option, specifying the path to the file storing the keytab, for example in the **[ipaclient:vars]** section of **inventory/hosts**.
- A **random, one-time password** (OTP) to be generated during the enrollment. To use this authentication method, use the **ipaclient_use_otp=yes** option in your inventory file. For example, you can uncomment the **ipaclient_use_otp=yes** option in the **[ipaclients:vars]** section of the **inventory/hosts** file. Note that with OTP you must also specify one of the following options:
 - The **password of a user authorized to enroll clients** for example by providing a value for **ipaadmin_password** in the **[ipaclients:vars]** section of the **inventory/hosts** file.
 - The **admin keytab**, for example by providing a value for **ipaadmin_keytab** in the **[ipaclients:vars]** section of **inventory/hosts**.

Additional resources

- For details on the options accepted by the **ipaclient** Ansible role, see the **/usr/share/ansible/roles/ipaclient/README.md** README file.

20.5.2. Setting the parameters of the inventory file when autodiscovery is not possible during client installation

To install an Identity Management client using an Ansible playbook, provide the following information in an inventory file, for example **inventory/hosts**:

- the information about the host, the IdM server and the IdM domain or the IdM realm
- the authorization for the task

The inventory file can be in one of many formats, depending on the inventory plugins you have. The **INI-like** format is one of Ansible's defaults and is used in the examples below.

Procedure

1. Specify the fully-qualified hostname (**FQDN**) of the host to become an IdM client. The fully qualified domain name must be a valid DNS name:
 - Only numbers, alphabetic characters, and hyphens (-) are allowed. For example, underscores are not allowed and can cause DNS failures.
 - The host name must be all lower-case. No capital letters are allowed.

2. Specify other options in the relevant sections of the **inventory/hosts** file:

- the **FQDN** of the servers in the **[ipaservers]** section to indicate which IdM server the client will be enrolled with
- one of the two following options:
 - the **ipacient_domain** option in the **[ipaclients:vars]** section to indicate the DNS domain name of the IdM server the client will be enrolled with
 - the **ipacient_realm** option in the **[ipaclients:vars]** section to indicate the name of the Kerberos realm controlled by the IdM server

Example of an inventory hosts file with the client FQDN, the server FQDN and the domain defined

```
[ipaclients]
client.idm.example.com

[ipaservers]
server.idm.example.com

[ipaclients:vars]
ipacient_domain=idm.example.com
[...]
```

3. Specify the credentials for enrolling the client. The following authentication methods are available:

- The **password of a user authorized to enroll clients** This is the default option.
 - Red Hat recommends using the Ansible Vault to store the password, and referencing the Vault file from the playbook file, for example **install-client.yml**, directly:

Example playbook file using principal from inventory file and password from an Ansible Vault file

```
- name: Playbook to configure IPA clients with username/password
  hosts: ipaclients
  become: true
  vars_files:
    - playbook_sensitive_data.yml

  roles:
    - role: ipacient
      state: present
```

- Less securely, provide the credentials of **admin** using the **ipaadmin_password** option in the **[ipaclients:vars]** section of the **inventory/hosts** file. Alternatively, to specify a different authorized user, use the **ipaadmin_principal** option for the user name, and the **ipaadmin_password** option for the password. The **install-client.yml** playbook file can then look as follows:

Example inventory hosts file

```
[...]
```

```
[ipaclients:vars]
ipaadmin_principal=my_admin
ipaadmin_password=Secret123
```

Example Playbook using principal and password from inventory file

```
- name: Playbook to unconfigure IPA clients
  hosts: ipaclients
  become: true

  roles:
    - role: ipaclient
      state: true
```

- The **client keytab** from the previous enrollment if it is still available:
 - This option is available if the system was previously enrolled as an Identity Management client. To use this authentication method, uncomment the **ipaclient_keytab** option, specifying the path to the file storing the keytab, for example in the **[ipaclient:vars]** section of **inventory/hosts**.
- A **random, one-time password** (OTP) to be generated during the enrollment. To use this authentication method, use the **ipaclient_use_otp=yes** option in your inventory file. For example, you can uncomment the **#ipaclient_use_otp=yes** option in the **[ipaclients:vars]** section of the **inventory/hosts** file. Note that with OTP you must also specify one of the following options:
 - The **password of a user authorized to enroll clients** for example by providing a value for **ipaadmin_password** in the **[ipaclients:vars]** section of the **inventory/hosts** file.
 - The **admin keytab**, for example by providing a value for **ipaadmin_keytab** in the **[ipaclients:vars]** section of **inventory/hosts**.

Additional resources

- For details on the options accepted by the **ipaclient** Ansible role, see the **/usr/share/ansible/roles/ipaclient/README.md** README file.

20.5.3. Checking the parameters in the install-client.yml file

The **install-client.yml** playbook file contains instructions for the IdM client deployment.

- Open the file and check if the instructions in the playbook correspond to what you are planning for your deployment. The contents typically look like this:

```
---
- name: Playbook to configure IPA clients with username/password
  hosts: ipaclients
  become: true

  roles:
    - role: ipaclient
      state: present
```

This is what the individual entries mean:

- The **hosts** entry specifies the section of the **inventory/hosts** file where the ansible script searches the **FQDNs** of the hosts on which the **ipa-client-install** script shall be run.
- The **become: true** entry specifies that root's credentials will be invoked during the execution of the **ipa-client-install** script.
- The **role: ipaclient** entry specifies the role that will be installed on the host: in this case, it is the ipa client role.
- The **state: present** entry specifies that the client should be installed rather than uninstalled (**absent**).

20.5.4. Authorization options for IdM client enrollment using an Ansible playbook

This referential section presents individual authorization options for IdM client enrollment with examples of inventory and playbook files.

Table 20.1. Authorization options for IdM client enrollment using Ansible

Authorization option	Note	Example inventory file	Example install-client.yml playbook file
Password of a user authorized to enroll a client: Option 1	Password stored in Ansible vault	<pre>[ipaclients:vars] [...]</pre>	<pre>- name: Playbook to configure IPA clients with username/password hosts: ipaclients become: true vars_files: - playbook_sensitive_data.yml roles: - role: ipaclient state: present</pre>
Password of a user authorized to enroll a client: Option 2	Password stored in inventory file	<pre>[ipaclients:vars] ipaadmin_password=Secret123</pre>	<pre>- name: Playbook to configure IPA clients hosts: ipaclients become: true roles: - role: ipaclient state: true</pre>

Authorization option	Note	Example inventory file	Example <code>install-client.yml</code> playbook file
A random, one-time password (OTP): Option 1	OTP + administrative password	<pre>[ipaclients:vars] ipaadmin_password=Secret123 ipaclient_use_otp=yes</pre>	<pre>- name: Playbook to configure IPA clients hosts: ipaclients become: true roles: - role: ipaclient state: true</pre>
A random, one-time password (OTP): Option 2	OTP + an administrative keytab	<pre>[ipaclients:vars] ipaadmin_keytab=/tmp/admin.keytab ipaclient_use_otp=yes</pre>	<pre>- name: Playbook to configure IPA clients hosts: ipaclients become: true roles: - role: ipaclient state: true</pre>
The client keytab from the previous enrollment		<pre>[ipaclients:vars] ipaclient_keytab=/tmp/krb5.keytab</pre>	<pre>- name: Playbook to configure IPA clients hosts: ipaclients become: true roles: - role: ipaclient state: true</pre>

20.6. DEPLOYING AN IDM CLIENT USING AN ANSIBLE PLAYBOOK

Complete this procedure to use an Ansible playbook to deploy an IdM client in your IdM environment.

Procedure

- To install an IdM client using an Ansible playbook, use the **ansible-playbook** command with the name of the playbook file, for example **install-client.yml**. Specify the inventory file with the **-i** option:

```
$ ansible-playbook -v -i inventory/hosts install-client.yml
```

Specify the level of verbosity by using the **-v**, **-vv** or **-vvv** option.

Ansible informs you about the execution of the Ansible playbook script. The following output shows that the script has run successfully as no tasks have failed:

PLAY RECAP

client1.idm.example.com : ok=18 changed=10 unreachable=0 failed=0 skipped=21 rescued=0 ignored=0

**NOTE**

Ansible uses different colors to provide different types of information about the running process. You can modify the default colors in the **[colors]** section of the **/etc/ansible/ansible.cfg** file:

```
[colors]
[...]
#error = red
#debug = dark gray
#deprecate = purple
#skip = cyan
#unreachable = red
#ok = green
#changed = yellow
[...]
```

You have now installed an IdM client on your host using an Ansible playbook.

20.7. TESTING AN IDENTITY MANAGEMENT CLIENT AFTER ANSIBLE INSTALLATION

The command-line interface (CLI) informs you that the **ansible-playbook** command was successful, but you can also do your own test.

To test that the Identity Management client can obtain information about users defined on the server, check that you are able to resolve a user defined on the server. For example, to check the default **admin** user:

```
[user@client1 ~]$ id admin
uid=1254400000(admin) gid=1254400000(admins) groups=1254400000(admins)
```

To test that authentication works correctly, **su -** as another already existing IdM user:

```
[user@client1 ~]$ su - idm_user
Last login: Thu Oct 18 18:39:11 CEST 2018 from 192.168.122.1 on pts/0
[idm_user@client1 ~]$
```

PART II. INTEGRATING IDM AND AD

CHAPTER 21. INSTALLING TRUST BETWEEN IDM AND AD

This chapter aims to help you create a trust between the Identity Management IdM server and Active Directory (AD), where both servers are located in the same forest.

Prerequisites

- First, read the [Planning a cross-forest trust between Identity Management and Active Directory](#) document.
- AD is installed with a domain controller on it.
- The IdM server is installed and running.
 - For details, see [Installing Identity Management](#).
- Both the AD server and the IdM server must have their clocks in sync because Kerberos requires max 5 mins delay in communication.
- Unique NetBIOS names for each of the servers placed in the trust because the NetBIOS names are critical for identifying the Active Directory domain.
 - The NetBIOS name of an Active Directory or IdM domain is usually the first part of the corresponding DNS domain. If the DNS domain is **ad.example.com**, the NetBIOS name is typically **AD**. However, it is not required. Important is that the NetBIOS name is just one word without periods. The maximum length of a NetBIOS name is 15 characters.
- The IdM system must have the IPv6 protocol enabled in the kernel.
 - If IPv6 is disabled, then the CLDAP plug-in used by the IdM services fails to initialize.

21.1. SUPPORTED VERSIONS OF WINDOWS SERVER

You can establish a trust relationship with Active Directory (AD) forests that use the following forest and domain functional levels:

- Forest functional level range: Windows Server 2008 – Windows Server 2016
- Domain functional level range: Windows Server 2008 – Windows Server 2016

Identity Management (IdM) supports the following operating systems:

- Windows Server 2008
- Windows Server 2008 R2
- Windows Server 2012
- Windows Server 2012 R2
- Windows Server 2016
- Windows Server 2019

21.2. HOW THE TRUST WORKS

The trust between Identity Management IdM and Active Directory (AD) is established on the Cross-realm Kerberos trust. This solution uses the Kerberos capability to establish trusts between different identity sources. Therefore, all AD users can:

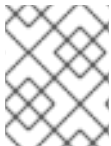
- Log in to access Linux systems and resources.
- Use single sign-on (SSO).

All IdM objects are managed in IdM in the trust.

All AD objects are managed in AD in the trust.

In complex environments, a single IdM forest can be connected to multiple AD forests. This setup enables better separation of duties for different functions in the organization. AD administrators can focus on users and policies related to users while Linux administrators have full control over the Linux infrastructure. In such a case, the Linux realm controlled by IdM is analogous to an AD resource domain or realm but with Linux systems in it.

From the perspective of AD, Identity Management represents a separate AD forest with a single AD domain. When cross-forest trust between an AD forest root domain and an IdM domain is established, users from the AD forest domains can interact with Linux machines and services from the IdM domain.



NOTE

In trust environments, IdM enables you to use ID views to configure POSIX attributes for AD users on the IdM server.

21.3. AD ADMINISTRATION RIGHTS

When you want to build a trust between AD (Active Directory) and IdM (Identity Management), you will need to use an AD administrator account with appropriate AD privileges.

Such an AD administrator must be a member of one of the following groups:

- Enterprise Admin group in the AD forest
- Domain Admins group in the forest root domain for your AD forest

Related information

- For details about Enterprise Admins, see [Enterprise Admins](#).
- For details about Domain Admins, see [Domain Admins](#).
- For details about AD trust, see [How Domain and Forest Trusts Work](#).

21.4. ENSURING SUPPORT FOR COMMON ENCRYPTION TYPES IN AD AND RHEL

By default, Identity Management establishes a cross-realm trust with support for RC4, AES-128, and AES-256 Kerberos encryption types.

RC4 encryption has been deprecated and disabled by default in RHEL 8, as it is considered less secure than the newer AES-128 and AES-256 encryption types. In contrast, Active Directory (AD) user credentials and trusts between AD domains support RC4 encryption and they might not support AES

encryption types.

Without any common encryption types, communication between IdM and AD child domains might not work, or some AD accounts might not be able to authenticate. To remedy this situation, modify one of the following configurations:

- **Enable AES encryption support in Active Directory (recommended option)** To ensure trusts between AD domains in an AD forest support strong AES encryption types, see the following Microsoft article: [AD DS: Security: Kerberos "Unsupported etype" error when accessing a resource in a trusted domain](#)
- **Enable RC4 support in IdM** To enable support for the deprecated RC4 encryption type, use the **update-crypto-policies** command to enable the **AD-SUPPORT** cryptographic subpolicy in addition to the **DEFAULT** cryptographic policy in RHEL. Enter the following command on every IdM trust controller, trust agent, and client where authentication against AD Domain Controllers takes place:

```
[root@host ~]# update-crypto-policies --set DEFAULT:AD-SUPPORT
```

Additional resources

- For more information on working with RHEL cryptographic policies, see [Using system-wide cryptographic policies](#) in the Security Hardening guide.
- For more information on IdM trust agents and trust controllers, see [Trust controllers and trust agents](#) in the Planning Identity Management guide.

21.5. PORTS REQUIRED FOR COMMUNICATION BETWEEN IDM AND AD

To enable communication between Active Directory (AD) domain controllers and Identity Management (IdM) servers, you must open ports on their firewalls.

Table 21.1. Ports required for an AD trust

Service	Port	Protocol
Endpoint resolution portmapper	135	TCP
NetBIOS-DGM	138	TCP and UDP
NetBIOS-SSN	139	TCP and UDP
Microsoft-DS	445	TCP and UDP
Dynamic RPC	49152-65535	TCP
AD Global Catalog	3268	TCP
LDAP	389	TCP and UDP



NOTE

The TCP port 389 is not required to be open on IdM servers for trust, but it is necessary for clients communicating with the IdM server.

To open ports, you can use the following methods:

- Firewall service – you can enable the particular ports or enable the following services which includes the ports:
 - FreeIPA trust setup
 - FreeIPA with LDAP
 - Kerberos
 - DNS

For details, see [Controlling ports using CLI](#).



NOTE

The **freeipa-trust** Firewall service currently includes an RPC port range of **1024-1300**, but this range has been updated to **49152-65535** in Windows Server 2008 and later. The **freeipa-trust** Firewall service will be updated to reflect this new range, and this issue is tracked in [Bug 1850418 - update freeipa-trust.xml definition to include correct dynamic RPC range](#).

Until that bug has been resolved, manually open the TCP port range **49152-65535** in addition to enabling the **freeipa-trust** Firewall service.

- The RHEL web console, which is a UI with firewall settings based on firewall.

Service	TCP	UDP
Cockpit	9090	
DHCPv6 Client		546
DNS	53	53
FreeIPA trust setup	135, 138-139, 389, 445, 1024-1300, 3268	138-139, 389, 445
FreeIPA with LDAP	80, 443, 88, 464, 389	88, 464, 123
FreeIPA with LDAPS	80, 443, 88, 464, 636	88, 464, 123
Kerberos	88	88

For details about firewall configuration through the web console, see [Enabling services on the firewall using the web console](#).



NOTE

The **FreeIPA Trust Setup** service currently includes an RPC port range of **1024-1300**, but this range has been updated to **49152-65535** in Windows Server 2008 and later. The **FreeIPA Trust Setup** firewall service definition will be updated, and this issue is tracked in [Bug 1850418 - update freeipa-trust.xml definition to include correct dynamic RPC range](#).

Until that bug has been resolved, manually open the TCP port range **49152-65535** in addition to enabling the **FreeIPA Trust Setup** service in the RHEL web console.

Table 21.2. Ports required by IdM servers in a trust

Service	Port	Protocol
Kerberos	88, 464	TCP and UDP
LDAP	389	TCP
DNS	53	TCP and UDP

Table 21.3. Ports required by IdM clients in an AD trust

Service	Port	Protocol
Kerberos	88	UDP and TCP



NOTE

The **libkrb5** library uses UDP and falls back to the TCP protocol if the data sent from the Key Distribution Centre (KDC) is too large. Active Directory attaches a Privilege Attribute Certificate (PAC) to the Kerberos ticket, which increases the size and requires to use the TCP protocol. To avoid the fall-back and resending the request, by default, SSSD in Red Hat Enterprise Linux 7.4 and later uses TCP for user authentication. If you want to configure the size before libkrb5 uses TCP, set the **udp_preference_limit** in the **/etc/krb5.conf** file. For details, see the **krb5.conf(5)** man page.

Additional resources

- For more information on the Dynamic RPC port range in Windows Server 2008 and later, see [The default dynamic port range for TCP/IP has changed since Windows Vista and in Windows Server 2008](#).

21.6. CONFIGURING DNS AND REALM SETTINGS FOR A TRUST

Before you connect Identity Management (IdM) and Active Directory (AD) in a trust, you need to ensure that servers see each other and resolve domain names correctly. This scenario describes configuring DNS to allow using domain names between:

- One primary IdM server using integrated DNS server and Certification Authority.

- One AD Domain Controller.

DNS settings require:

- Configuring DNS zones in the IdM server
- Configuring conditional DNS forwarding in AD
- Verifying correctness of the DNS configuration

21.6.1. Unique primary DNS domains

In Windows, every domain is a Kerberos realm and a DNS domain at the same time. Every domain managed by the domain controller needs to have its own dedicated DNS zone. The same applies when Identity Management (IdM) is trusted by Active Directory (AD) as a forest. AD expects IdM to have its own DNS domain. For the trust setup to work, the DNS domain needs to be dedicated to the Linux environment.

Each system must have its own unique primary DNS domain configured. For example:

- ***ad.example.com*** for AD and ***idm.example.com*** for IdM
- ***example.com*** for AD and ***idm.example.com*** for IdM
- ***ad.example.com*** for AD and ***example.com*** for IdM

The most convenient management solution is an environment where each DNS domain is managed by integrated DNS servers, but it is possible to use any other standard-compliant DNS server as well.

Kerberos realm names as upper-case versions of primary DNS domain names

Kerberos realm names must be the same as the primary DNS domain names, with all letters uppercase. For example, if the domain names are ***ad.example.com*** for AD and ***idm.example.com*** for IdM, the Kerberos realm names are required to be ***AD.EXAMPLE.COM*** and ***IDM.EXAMPLE.COM***.

DNS records resolvable from all DNS domains in the trust

All machines must be able to resolve DNS records from all DNS domains involved in the trust relationship.

No overlap between IdM and AD DNS domains

Machines joined to IdM can be distributed over multiple DNS domains. DNS domains containing IdM clients must not overlap with DNS domains containing machines joined to AD. The primary IdM DNS domain must have proper SRV records to support AD trusts.

You can acquire a list of the required SRV records specific to your system setup by running the following command:

```
$ ipa dns-update-system-records --dry-run
```

The generated list can look for example like this:

IPA DNS records:

```
_kerberos-master._tcp.idm.example.com. 86400 IN SRV 0 100 88 server.idm.example.com.  
_kerberos-master._udp.idm.example.com. 86400 IN SRV 0 100 88 server.idm.example.com.  
_kerberos._tcp.idm.example.com. 86400 IN SRV 0 100 88 server.idm.example.com.  
_kerberos._tcp.idm.example.com. 86400 IN SRV 0 100 88 server.idm.example.com.
```

```

_kerberos.idm.example.com. 86400 IN TXT "IDM.EXAMPLE.COM"
_kpasswd._tcp.idm.example.com. 86400 IN SRV 0 100 464 server.idm.example.com.
_kpasswd._udp.idm.example.com. 86400 IN SRV 0 100 464 server.idm.example.com.
_ldap._tcp.idm.example.com. 86400 IN SRV 0 100 389 server.idm.example.com.
_ipa-ca.idm.example.com. 86400 IN A 192.168.122.2

```

For other DNS domains that are part of the same IdM realm, it is not required for the SRV records to be configured when the trust to AD is configured. The reason is that AD domain controllers do not use SRV records to discover KDCs but rather base the KDC discovery on name suffix routing information for the trust.

21.6.2. Configuring DNS zones in the IdM Web UI

This section describes how to add a new DNS forward zone to the Identity Management (IdM) server.

DNS forward zones enables you to forward DNS queries for a specific zone to a different DNS server.

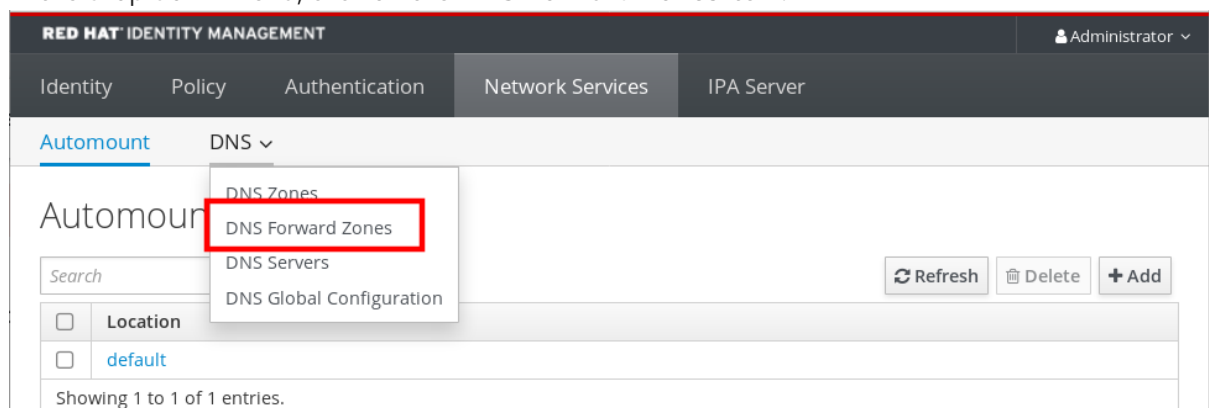
For example, on your IdM server, you want to forward queries for the Active Directory (AD) domain.

Prerequisites

- Access to the IdM Web UI with a user account which have administrator rights.
- Correctly configured DNS server.

Procedure

1. Log in to the IdM Web UI with administrator privileges. For details, see [Accessing the IdM Web UI in a web browser](#).
2. Click on the **Network Services** tab.
3. Click on the **DNS** tab.
4. In the drop down menu, click on the **DNS Forward Zones** item.



5. Click on the **Add** button.
6. In the **Add DNS forward zone** dialog box, add a zone name.
7. In the **Zone forwarders** item, click on the **Add** button.
8. In the **Zone forwarders** field, add the IP address of the server for which you want to create the new forward zone.

9. Click on the **Add** button.

Add DNS forward zone ✕

☒ **Zone name ***

☐ **Reverse zone**
IP network

Zone forwarders *

Forward policy ☒ **Forward first** ☐ **Forward only** ☐ **Forwarding disabled**

Skip overlap check ⓘ ☐

* Required field

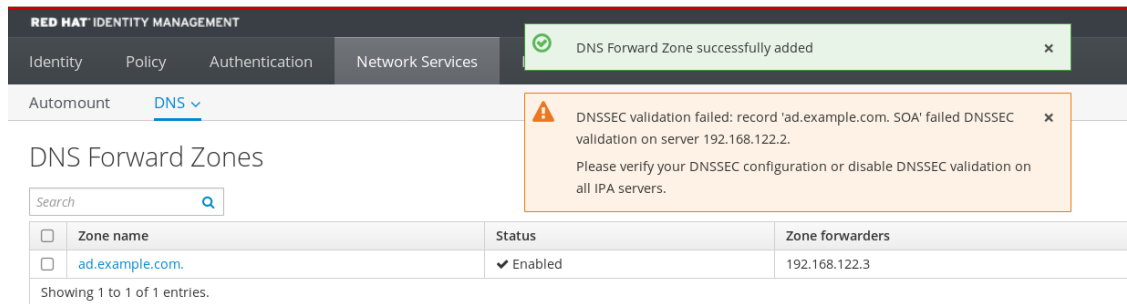
The forwarded zone has been added to the DNS settings and you can verify it in the DNS Forward Zones settings. The Web UI informs you about success with the following pop-up message: **DNS Forward Zone successfully added.**

You can perform the same procedure in the command line with the following command:

```
# ipa dnsforwardzone-add $AD_DOMAIN --forwarder=$AD_IP_ADDR --forward-policy=only
```


NOTE

The Web UI can display a warning about DNSSEC validation failure after adding a new forward zone to the configuration.



DNSSEC (Domain Name System Security Extensions) secures DNS data with a digital signature to protect DNS from attacks. The DNSSEC service is enabled by default in the IdM server. The warning appeared because the remote DNS server didn't also use the DNSSEC. Now, you can:

- Enable DNSSEC on the remote DNS server.
- Disable the DNSSEC validation in the `/etc/named.conf` file saved in the IdM server:

```
dnssec-validation no;
```

After saving the configuration change, do not forget to restart the `ipactl` service:

```
# ipactl restart
```

The warning will not appear again.

To verify that the dns zone has been created successfully, use the **nslookup** command with the name of the remote DNS server:

```
$ nslookup ad.example.com
Server:      192.168.122.2
Address:     192.168.122.2#53

No-authoritative answer:
Name:       ad.example.com
Address:    192.168.122.3
```

If the domain forwarding is configured correctly, **nslookup** will show you an IP address of the remote DNS server.

21.6.3. Configuring DNS forwarding in AD

This section describes how to set up a DNS forwarding in Active Directory (AD) for the Identity Management (IdM) server.

Prerequisites

- Windows Server with AD installed.
- DNS port open on both servers.

Procedure

1. Log in to the Windows Server.
2. Open **Server Manager**.
3. Open **DNS Manager**.
4. In **Conditional Forwarders**, add a new conditional forwarder with:
 - The IdM server IP address
 - A fully qualified domain name, for example, ***server.idm.example.com***
5. Save the settings.

21.6.4. Verifying the DNS configuration

Before configuring trust, verify that the Identity Management (IdM) and Active Directory (AD) servers can resolve themselves and each other.

Prerequisites

- You need to be logged in with sudo permissions.

Procedure

1. Run a DNS query for the Kerberos over UDP and LDAP over TCP service records.

```
[admin@server ~]# dig +short -t SRV _kerberos._udp.idm.example.com.  
0 100 88 server.ipa.example.com.
```

```
[admin@server ~]# dig +short -t SRV _ldap._tcp.idm.example.com.  
0 100 389 server.idm.example.com.
```

The commands are expected to list all IdM servers.

2. Run a DNS query for the TXT record with the IdM Kerberos realm name. The obtained value is expected to match the Kerberos realm you specified when installing IdM.

```
[admin@server ~]# dig +short -t TXT _kerberos.idm.example.com.  
"IDM.EXAMPLE.COM"
```

If the previous steps did not return all the expected records, update the DNS configuration with the missing records:

- If your IdM environment uses an integrated DNS server, enter the **ipa dns-update-system-records** command without any options to update your system records:

```
[admin@server ~]$ ipa dns-update-system-records
```

- If your IdM environment does not use an integrated DNS server:

1. On the IdM server, export the IdM DNS records into a file:

```
[admin@server ~]$ ipa dns-update-system-records --dry-run --out
dns_records_file.nsupdate
```

The command creates a file named **dns_records_file.nsupdate** with the relevant IdM DNS records.

2. Submit a DNS update request to your DNS server using the **nsupdate** utility and the **dns_records_file.nsupdate** file. For more information, see [Updating External DNS Records Using nsupdate](#) in RHEL 7 documentation. Alternatively, refer to your DNS server documentation for adding DNS records.
3. Verify that IdM is able to resolve service records for AD with a command that runs a DNS query for Kerberos over UDP and LDAP over TCP service records:

```
[admin@server ~]# dig +short -t SRV _kerberos._udp.dc._msdcs.ad.example.com.
0 100 88 addc1.ad.example.com.
```

```
[admin@server ~]# dig +short -t SRV _ldap._tcp.dc._msdcs.ad.example.com.
0 100 389 addc1.ad.example.com.
```

21.7. SETTING UP A TRUST

This section describes how to configure the Identity Management (IdM)/Active Directory (AD) trust on the IdM side using the command line.

Prerequisites

- DNS correctly configured. Both IdM and AD servers must be able to resolve each other names. For details, see [Configuring DNS and realm settings for a trust](#).
- Having supported versions of AD and IdM deployed. For details, see [Supported versions of Windows Server](#).
- Obtained a Kerberos ticket. For details, see [Using kinit to log in to IdM manually](#).

21.7.1. Preparing the IdM server for the trust

Before you can establish a trust with AD and if you want to set up Samba on an IdM client, you must prepare the IdM domain using the **ipa-adtrust-install** utility on an IdM server. However, even if both situations apply, you must run **ipa-adtrust-install** only once on an IdM master.

Prerequisites

- IdM is installed.

Procedure

1. Install the required packages:

```
[root@ipaserver ~]# yum install ipa-server ipa-server-trust-ad samba-client
```

2. Authenticate as the IdM administrative user:

```
[root@ipaserver ~]# kinit admin
```

3. Run the **ipa-adtrust-install** utility:

```
[root@ipaserver ~]# ipa-adtrust-install
```

The DNS service records are created automatically if IdM was installed with an integrated DNS server.

If IdM was installed without an integrated DNS server, **ipa-adtrust-install** prints a list of service records that must be manually added to DNS before you can continue.

4. The script prompts you that the **/etc/samba/smb.conf** already exists and will be rewritten:

```
WARNING: The smb.conf already exists. Running ipa-adtrust-install will break your existing Samba configuration.
```

```
Do you wish to continue? [no]: yes
```

5. The script prompts you to configure the **slapi-nis** plug-in, a compatibility plug-in that allows older Linux clients to work with trusted users:

```
Do you want to enable support for trusted domains in Schema Compatibility plugin?
This will allow clients older than SSSD 1.9 and non-Linux clients to work with trusted users.
```

```
Enable trusted domains support in slapi-nis? [no]: yes
```

6. When prompted, enter the NetBIOS name for the IdM domain or press **Enter** to accept the name suggested:

```
Trust is configured but no NetBIOS domain name found, setting it now.
Enter the NetBIOS name for the IPA domain.
Only up to 15 uppercase ASCII letters, digits and dashes are allowed.
Example: EXAMPLE.
```

```
NetBIOS domain name [IDM]:
```

7. You are prompted to run the SID generation task to create a SID for any existing users:

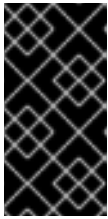
```
Do you want to run the ipa-sidgen task? [no]: yes
```

When the directory is first installed, at least one user (the IdM administrator) exists and as this is a resource-intensive task, if you have a high number of users, you can run this at another time.

8. **(Optional)** By default, the Dynamic RPC port range is defined as **49152-65535** for Windows Server 2008 and later. If you need to define a different Dynamic RPC port range for your environment, configure Samba to use different ports and open those ports in your firewall settings. The following example sets the port range to **55000-65000**.

```
[root@ipaserver ~]# net conf setparm global 'rpc server dynamic port range' 55000-65000
[root@ipaserver ~]# firewall-cmd --add-port=55000-65000/tcp
[root@ipaserver ~]# firewall-cmd --runtime-to-permanent
```

9. Make sure that DNS is properly configured, as described in [Verifying the DNS configuration for a trust](#).



IMPORTANT

Every time you run **ipa-adtrust-install**, Red Hat strongly recommends you to verify the DNS configuration as described in [Verifying the DNS configuration for a trust](#) every time after running **ipa-adtrust-install**, especially if IdM or AD do not use integrated DNS servers.

10. Restart the **ipa** service:

```
[root@ipaserver ~]# systemctl restart ipa
```

11. Use the **smbclient** utility to verify that Samba responds to Kerberos authentication from the IdM side:

```
[root@ipaserver ~]# smbclient -L server.idm.example.com -k
lp_load_ex: changing to config backend registry
Sharename      Type      Comment
-----
IPC$           IPC       IPC Service (Samba 4.10.4)
...
```

21.7.2. Setting up a trust agreement using the command line

This section describes on how to set up the trust agreement using the command line. The Identity Management (IdM) server allows you to configure three types of trust agreements:

- One-way trust – default option. One-way trust enables Active Directory (AD) users and groups to access resources in IdM, but not the other way around. The IdM domain trusts the AD forest, but the AD forest does not trust the IdM domain.
- Two-way trust – Two-way trust enables AD users and groups to access resources in IdM. However, the two-way trust in IdM does not give the users any additional rights compared to the one-way trust solution in AD. Both solutions are considered equally secure because of default cross-forest trust SID filtering settings.
 - To create the two-way trust, add the following option to the command: **--two-way=true**
- External trust for a trust relationship between domains that are in different forests.
 - To create the external trust, add the following option to the command: **--external=true**

In this section, the steps below shows you how to create a one-way trust agreement.

Prerequisites

- User name and password of a Windows administrator.
- You have [prepared the IdM server for the trust](#).

Procedure

1. Create a trust agreement for the AD domain and the IdM domain by using the **ipa trust-add** command:

```
[root@server ~]# ipa trust-add --type=ad ad_domain_name --admin ad_admin_username --password
```

The **ipa trust-add** command configures the IdM server as a trust controller by default.

21.7.3. Setting up a trust agreement in the IdM Web UI

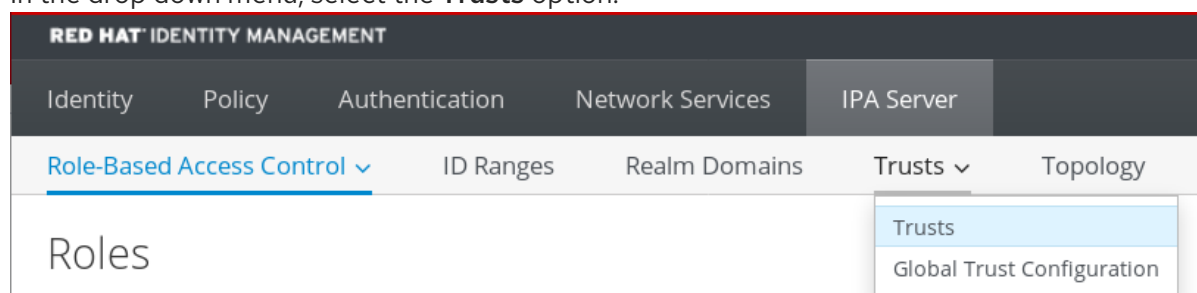
This section describes how to configure the Identity Management (IdM)/Active Directory (AD) trust agreement on the IdM side using the IdM Web UI.

Prerequisites

- DNS is correctly configured. Both IdM and AD servers must be able to resolve each other names.
- Supported versions of AD and IdM are deployed.
- You have obtained a Kerberos ticket.
- Before creating a trust in the Web UI, prepare the IdM server for the trust as described in: [Preparing the IdM server for the trust](#).
- You need to be logged in as an IdM administrator.

Procedure

1. Log in to the IdM Web UI with administrator privileges. For details, see [Accessing the IdM Web UI in a web browser](#).
2. In the IdM Web UI, click the **IPA Server** tab.
3. In the **IPA Server** tab, click the **Trusts** tab.
4. In the drop down menu, select the **Trusts** option.



5. Click the **Add** button.
6. In the **Add Trust** dialog box, enter the name of the Active Directory domain.
7. In the **Account** and **Password** fields, add the administrator credentials of the Active Directory administrator.

Add trust

Domain *

Two-way trust ⓘ ☐

External trust ⓘ ☐

Establish using

☒ Administrative account

Account *

Password *

8. [Optional] Select **Two-way trust**, if you want to enable AD users and groups to access resources in IdM. However, the two-way trust in IdM does not give the users any additional rights compared to the one-way trust solution in AD. Both solutions are considered equally secure because of default cross-forest trust SID filtering settings.

9. [Optional] If your domains are in different forests, select **External trust**.

10. Click **Add**.

If the trust has been successfully added to the IdM server, you can see the green pop-up window in the IdM Web UI. It means that the:

- Domain name exists
- User name and password of the Windows Server has been added correctly.

RED HAT IDENTITY MANAGEMENT

Trust successfully added. Established and verified

Identity Policy Authentication

Role-Based Access Control ▾ ID Ranges Realm Domains **Trusts ▾** Topology API Browser Configuration

Trusts

Search

<input type="checkbox"/>	Realm name
<input type="checkbox"/>	AD.EXAMPLE.COM

Showing 1 to 1 of 1 entries.

Now you can continue to test the trust connection and Kerberos authentication.

21.7.4. Verifying the Kerberos configuration

To verify the Kerberos configuration, test if it is possible to obtain a ticket for an Identity Management (IdM) user and if the IdM user can request service tickets.

Procedure

1. Request a ticket for an Active Directory (AD) user:

```
[root@ipaserver ~]# kinit user@AD.EXAMPLE.COM
```

2. Request service tickets for a service within the IdM domain:

```
[root@server ~]# kvno -S host server.idm.example.com
```

If the AD service ticket is successfully granted, there is a cross-realm ticket-granting ticket (TGT) listed with all of the other requested tickets. The TGT is named `krbtgt/IPA.DOMAIN@AD.DOMAIN`.

```
[root@server ~]# klist
Ticket cache: KEYRING:persistent:0:krb_ccache_hRtox00
Default principal: user@AD.EXAMPLE.COM
```

```
Valid starting    Expires          Service principal
03.05.2016 18:31:06 04.05.2016 04:31:01 host/server.idm.example.com@IDM.EXAMPLE.COM
renew until 04.05.2016 18:31:00
03.05.2016 18:31:06 04.05.2016 04:31:01 krbtgt/IDM.EXAMPLE.COM@AD.EXAMPLE.COM
renew until 04.05.2016 18:31:00
03.05.2016 18:31:01 04.05.2016 04:31:01 krbtgt/AD.EXAMPLE.COM@AD.EXAMPLE.COM
renew until 04.05.2016 18:31:00
```

The **localauth** plug-in maps Kerberos principals to local System Security Services Daemon (SSSD) user names. This allows AD users to use Kerberos authentication and access Linux services, which support GSSAPI authentication directly.

21.7.5. Verifying the trust configuration on IdM

Before configuring trust, verify that the Identity Management (IdM) and Active Directory (AD) servers can resolve themselves and each other.

Prerequisites

- You need to be logged in with administrator privileges.

Procedure

1. Run a DNS query for the MS DC Kerberos over UDP and LDAP over TCP service records.

```
[root@server ~]# dig +short -t SRV _kerberos._udp.dc._msdcs.idm.example.com.
0 100 88 server.idm.example.com.
```

```
[root@server ~]# dig +short -t SRV _ldap._tcp.dc._msdcs.idm.example.com.
0 100 389 server.idm.example.com.
```

These commands list all IdM servers on which **ipa-adtrust-install** has been executed. The output is empty if **ipa-adtrust-install** has not been executed on any IdM server, which is typically before establishing the first trust relationship.

2. Run a DNS query for the Kerberos over UDP and LDAP over TCP service records to verify that IdM is able to resolve service records for AD:


```
[root@server ~]# dig +short -t SRV _kerberos._udp.dc._msdcs.ad.example.com.
0 100 88 addc1.ad.example.com.
```

```
[root@ipaserver ~]# dig +short -t SRV _ldap._tcp.dc._msdcs.ad.example.com.
0 100 389 addc1.ad.example.com.
```

21.7.6. Verifying the trust configuration on AD

After configuring the trust, verify that:

- The Identity Management (IdM)-hosted services are resolvable from the Active Directory (AD) server.
- AD services are resolvable from the AD server.

Prerequisites

- You need to be logged in with administrator privileges.

Procedure

1. On the AD server, set the **nslookup.exe** utility to look up service records.

```
C:\>nslookup.exe
> set type=SRV
```

2. Enter the domain name for the Kerberos over UDP and LDAP over TCP service records.

```
> _kerberos._udp.idm.example.com.
_kerberos._udp.idm.example.com.    SRV service location:
  priority      = 0
  weight        = 100
  port         = 88
  svr hostname  = server.idm.example.com
> _ldap._tcp.ipa.example.com
_ldap._tcp.idm.example.com    SRV service location:
  priority      = 0
  weight        = 100
  port         = 389
  svr hostname  = server.idm.example.com
```

3. Change the service type to TXT and run a DNS query for the TXT record with the IdM Kerberos realm name.

```
C:\>nslookup.exe
> set type=TXT
> _kerberos.idm.example.com.
_kerberos.idm.example.com.    text =

    "IDM.EXAMPLE.COM"
```

4. Run a DNS query for the MS DC Kerberos over UDP and LDAP over TCP service records.

```

C:\>nslookup.exe
> set type=SRV
> _kerberos._udp.dc._msdcs.idm.example.com.
_kerberos._udp.dc._msdcs.idm.example.com.    SRV service location:
    priority = 0
    weight = 100
    port = 88
    svr hostname = server.idm.example.com
> _ldap._tcp.dc._msdcs.idm.example.com.
_ldap._tcp.dc._msdcs.idm.example.com.    SRV service location:
    priority = 0
    weight = 100
    port = 389
    svr hostname = server.idm.example.com

```

The command is expected to list all IdM servers on which the **ipa-adtrust-install** utility has been executed. For details about **ipa-adtrust-install**, see [Preparing the IdM server for the trust](#). Note that the output is empty if **ipa-adtrust-install** has not been executed on any IdM server, which is typically before establishing the first trust relationship.

5. Verify that AD services are resolvable from the AD server.

```

C:\>nslookup.exe
> set type=SRV

```

6. Enter the domain name for the Kerberos over UDP and LDAP over TCP service records.

```

> _kerberos._udp.dc._msdcs.ad.example.com.
_kerberos._udp.dc._msdcs.ad.example.com.    SRV service location:
    priority = 0
    weight = 100
    port = 88
    svr hostname = addc1.ad.example.com
> _ldap._tcp.dc._msdcs.ad.example.com.
_ldap._tcp.dc._msdcs.ad.example.com.    SRV service location:
    priority = 0
    weight = 100
    port = 389
    svr hostname = addc1.ad.example.com

```

21.8. REMOVING THE TRUST USING THE IDM WEB UI

This section describes how to remove the Identity Management (IdM)/Active Directory (AD) trust on the IdM side using the IdM Web UI.

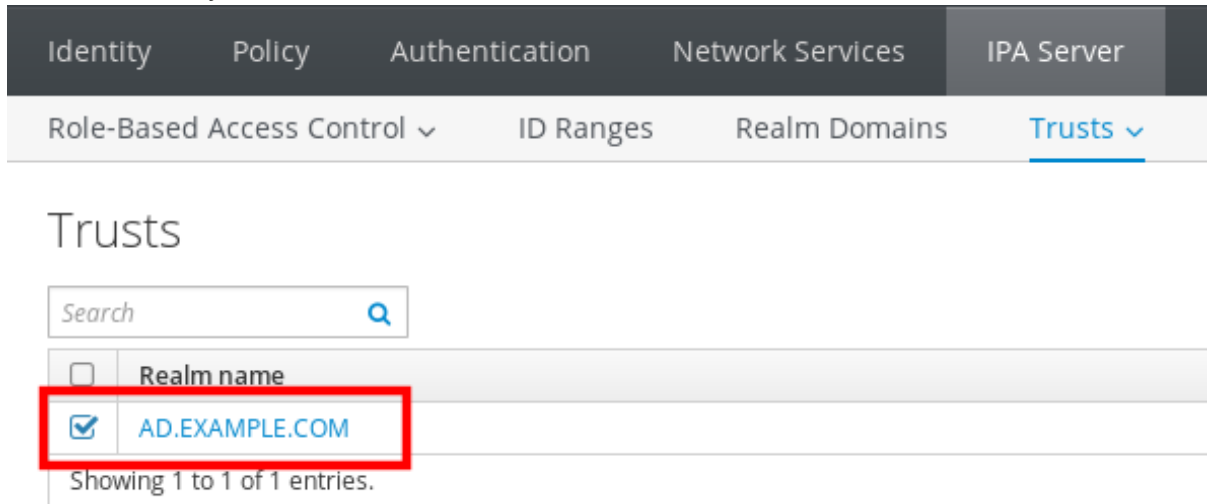
Prerequisites

- You have obtained a Kerberos ticket. For details, see [Logging in to IdM in the Web UI: Using a Kerberos ticket](#).

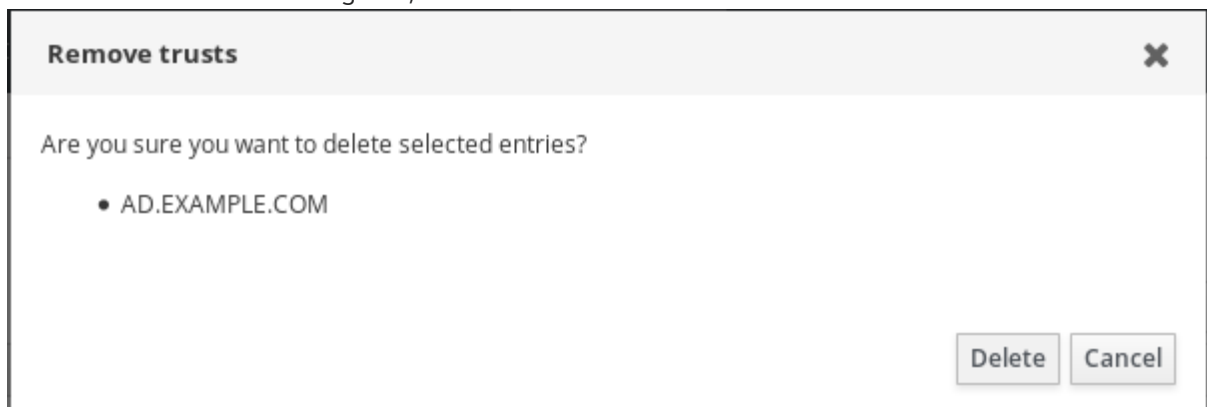
Procedure

1. Log in to the IdM Web UI with administrator privileges. For details, see [Accessing the IdM Web UI in a web browser](#).

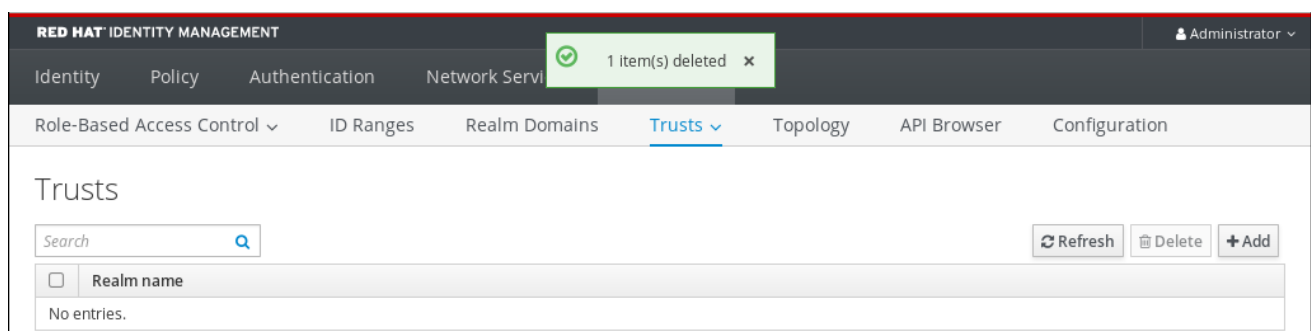
2. In the IdM Web UI, click the **IPA Server** tab.
3. In the **IPA Server** tab, click the **Trusts** tab.
4. Select the trust you want to remove.



5. Click the **Delete** button.
6. In the **Remove trusts** dialog box, click **Delete**.



If the trust is successfully deleted, the Web UI displays a green pop-up with the text:



PART III. MIGRATING IDM FROM RHEL 7 TO RHEL 8 AND KEEPING IT UP-TO-DATE

CHAPTER 22. MIGRATING IDM FROM RHEL 7 TO 8

This procedure describes how to migrate all Identity Management (IPA) data and configuration from a Red Hat Enterprise Linux (RHEL) 7 server to a RHEL 8 server. The migration procedure includes:

1. Installing an IdM server on the RHEL 8 system. For details, see [Section 22.2, “Installing the RHEL 8 Replica”](#).
2. Making the RHEL 8 server the certificate authority (CA) renewal master. For details, see [Section 22.3, “Moving the CA renewal master to RHEL 8”](#).
3. Stopping the generation of the certificate revocation list (CRL) on the RHEL 7 server and redirecting CRL requests to RHEL 8. For details, see [Section 22.4, “Stopping CRL generation on RHEL 7 IdM CA master”](#).
4. Starting the generation of the CRL on the RHEL 8 server. For details, see [Section 22.5, “Starting CRL generation on the new RHEL 8 IdM CA master”](#).
5. Stopping and decommissioning the original RHEL 7 CA master. For details, see [Section 22.6, “Stopping and decommissioning the RHEL 7 server”](#).

In the following procedures:

- **rhel8.example.com** is the RHEL 8 system that will become the new CA master.
- **rhel7.example.com** is the original RHEL 7 CA master. To identify which Red Hat Enterprise Linux 7 server is the master CA server, run the following command on any IdM server:

```
[root@rhel7 ~]# ipa config-show | grep "CA renewal master"
IPA CA renewal master: rhel7.example.com
```

If your IdM deployment is CA-less, any IdM server running on RHEL 7 can be **rhel7.example.com**.



NOTE

Complete the steps in sections [21.3](#), [21.4](#), and [21.5](#) only if your IdM deployment uses an embedded certificate authority (CA).

22.1. PREREQUISITES FOR MIGRATING IDM FROM RHEL 7 TO 8

On **rhel7.example.com**:

1. Upgrade the system to the latest RHEL 7 version.
2. Update the **ipa-*** packages to their latest version:

```
[root@rhel7 ~]# yum update ipa-*
```

**WARNING**

When upgrading multiple Identity Management (IdM) servers, wait at least 10 minutes between each upgrade.

When two or more servers are upgraded simultaneously or with only short intervals between the upgrades, there is not enough time to replicate the post-upgrade data changes throughout the topology, which can result in conflicting replication events.

On **rhel8.example.com**:

1. Make sure the **rhel8.example.com** system meets the requirements listed in [Chapter 1, Preparing the system for IdM server installation](#).
2. Make sure that the replica is part of the domain for which the IdM DNS server is authoritative.
3. Update the **ipa-*** packages to their latest version:

```
[root@rhel8 ~]# yum update ipa-*
```

Related information

- For details on using the **yum** utility, see the **yum(8)** manual pages.

22.2. INSTALLING THE RHEL 8 REPLICA

1. List which server roles are present in your RHEL 7 environment:

```
[root@rhel7 ~]# ipa server-role-find --status enabled
```

```
-----  
4 server roles matched  
-----
```

```
Server name: rhel7.example.com  
Role name: CA server  
Role status: enabled
```

```
Server name: replica7.example.com  
Role name: DNS server  
Role status: enabled
```

```
Server name: rhel7.example.com  
Role name: DNS server  
Role status: enabled
```

```
Server name: rhel7.example.com  
Role name: NTP server  
Role status: enabled
```

```
[... output truncated ...]
```

2. Install the Identity Management IdM server on **rhel8.example.com** as a replica of the IdM RHEL 7 server, including all the server roles present on your **rhel7.example.com**. To install all the roles from the example above, use these options with the **ipa-replica-install** command:

- **--setup-ca** to set up the Certificate System component
 - **--setup-dns** and **--forwarder** to configure an integrated DNS server and set a forwarder to take care of DNS queries that go outside the IdM domain
- To set up an IdM server with the ip address of 192.0.2.1 which uses a forwarder with the ip address of 192.0.2.20:

```
[root@rhel8 ~]# ipa-replica-install --setup-ca --ip-address 192.0.2.1 --setup-dns --forwarder 192.0.2.20
```

You do not need to specify the RHEL 7 IdM server because if DNS is working correctly, **rhel8.example.com** will find it using DNS autodiscovery.

3. After the installation completes, verify that the IdM services are running on **rhel8.example.com**:

```
[root@rhel8 ~]# ipactl status
Directory Service: RUNNING
[... output truncated ...]
ipa: INFO: The ipactl command was successful
```

4. Verify that **rhel7.example.com** and **rhel8.example.com** certificate authorities (CAs) are both configured as master servers:

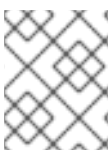
```
[root@rhel8 ~]$ kinit admin
[root@rhel8 ~]$ ipa-csreplica-manage list
rhel7.example.com: master
rhel8.example.com: master
```

5. Optionally, to display details about the replication agreement between **rhel7.example.com** and **rhel8.example.com**:

```
[root@rhel8 ~]# ipa-csreplica-manage list --verbose rhel8.example.com
Directory Manager password:

rhel7.example.com
last init status: None
last init ended: 1970-01-01 00:00:00+00:00
last update status: Error (0) Replica acquired successfully: Incremental update succeeded
last update ended: 2019-02-13 13:55:13+00:00
```

22.3. MOVING THE CA RENEWAL MASTER TO RHEL 8



NOTE

Complete the steps in this section only if your IdM deployment uses an embedded certificate authority (CA).

On **rhel8.example.com**, configure **rhel8.example.com** as the new CA renewal master:

- Configure **rhel8.example.com** to handle CA subsystem certificate renewal:

```
[root@rhel8 ~]# ipa config-mod --ca-renewal-master-server rhel8.example.com
...
IPA masters: rhel7.example.com, rhel8.example.com
IPA CA servers: rhel7.example.com, rhel8.example.com
IPA NTP servers: rhel7.example.com, rhel8.example.com
IPA CA renewal master: rhel8.example.com
```

The output confirms that the update was successful.

22.4. STOPPING CRL GENERATION ON RHEL 7 IDM CA MASTER



NOTE

Complete the steps in this section only if your IdM deployment uses an embedded certificate authority (CA).

This section describes how to stop the generation of the Certificate Revocation List (CRL) on the **rhel7.example.com** master CA using the **ipa-crlgen-manage** command.

Prerequisites

- You must be logged in as root.

Procedure

1. Optionally, check if **rhel7.example.com** is generating the CRL:

```
[root@rhel7 ~]# ipa-crlgen-manage status
CRL generation: enabled
Last CRL update: 2019-10-31 12:00:00
Last CRL Number: 6
The ipa-crlgen-manage command was successful
```

2. Stop generating CRL on the **rhel7.example.com** server:

```
[root@rhel7 ~]# ipa-crlgen-manage disable
Stopping pki-tomcatd
Editing /var/lib/pki/pki-tomcat/conf/ca/CS.cfg
Starting pki-tomcatd
Editing /etc/httpd/conf.d/ipa-pki-proxy.conf
Restarting httpd
CRL generation disabled on the local host. Please make sure to configure CRL generation on
another master with ipa-crlgen-manage enable.
The ipa-crlgen-manage command was successful
```

3. Optionally, check if the **rhel7.example.com** server stopped generating CRL:

```
[root@rhel7 ~]# ipa-crlgen-manage status
```

The **rhel7.example.com** server stopped generating CRL. The next step is to enable CRL generation on **rhel8.example.com**.

22.5. STARTING CRL GENERATION ON THE NEW RHEL 8 IDM CA MASTER



NOTE

Complete the steps in this section only if your IdM deployment uses an embedded certificate authority (CA).

Prerequisites

- You must be logged in as root on the **rhel8.example.com** machine.

Procedure

- To start generating CRL on **rhel8.example.com**, use the **ipa-crlgen-manage enable** command:

```
[root@rhel8 ~]# ipa-crlgen-manage enable
Stopping pki-tomcatd
Editing /var/lib/pki/pki-tomcat/conf/ca/CS.cfg
Starting pki-tomcatd
Editing /etc/httpd/conf.d/ipa-pki-proxy.conf
Restarting httpd
Forcing CRL update
CRL generation enabled on the local host. Please make sure to have only a single CRL
generation master.
The ipa-crlgen-manage command was successful
```

- To check if CRL generation is enabled, use the **ipa-crlgen-manage status** command:

```
[root@rhel8 ~]# ipa-crlgen-manage status
CRL generation: enabled
Last CRL update: 2019-10-31 12:10:00
Last CRL Number: 7
The ipa-crlgen-manage command was successful
```

22.6. STOPPING AND DECOMMISSIONING THE RHEL 7 SERVER

- Make sure that all, even the latest data is correctly migrated from **rhel7.example.com** to **rhel8.example.com**. For example:

- Add a new user on **rhel7.example.com**:

```
[root@rhel7 ~]# ipa user-add random_user
First name: random
Last name: user
```

- Check that the user has been replicated to **rhel8.example.com**:

```
[root@rhel8 ~]# ipa user-find random_user
-----
1 user matched
-----
```

```
User login: random_user
First name: random
Last name: user
```

2. Stop all service on **rhel7.example.com** to force domain discovery to the new **rhel8.example.com** server.

```
[root@rhel7 ~]# ipactl stop
Stopping CA Service
Stopping pki-ca: [ OK ]
Stopping HTTP Service
Stopping httpd: [ OK ]
Stopping MEMCACHE Service
Stopping ipa_memcached: [ OK ]
Stopping DNS Service
Stopping named: . [ OK ]
Stopping KPASSWD Service
Stopping Kerberos 5 Admin Server: [ OK ]
Stopping KDC Service
Stopping Kerberos 5 KDC: [ OK ]
Stopping Directory Service
Shutting down dirsrv:
    EXAMPLE-COM... [ OK ]
    PKI-IPA... [ OK ]
```

After this, the **ipa** utility will contact the new server through a remote procedure call (RPC).

3. Remove the RHEL 7 server from the topology by executing the removal commands on the RHEL 8 server. For details, see [Chapter 6, Uninstalling an IdM server](#).

CHAPTER 23. UPDATING AND DOWNGRADING IDM

You can use the **yum** utility to update the Identity Management (IdM) packages on the system.

- To update all IdM packages that are relevant for your profile and that have updates available:

```
# yum upgrade ipa-*
```

- Alternatively, to install or update packages to match the latest version available for your profile from any enabled repository:

```
# yum distro-sync ipa-*
```

After you update the IdM packages on at least one server, all other servers in the topology receive the updated schema, even if you do not update their packages. This ensures that any new entries which use the new schema can be replicated among the other servers.

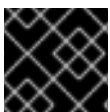


WARNING

When updating multiple IdM servers, wait at least 10 minutes after updating one server before updating another server. However, the actual time required for a server's successful update depends on the topology deployed, the latency of the connections, and the number of changes generated by the update.

When two or more servers are updated simultaneously or with only short intervals between the upgrades, there is not enough time to replicate the post-upgrade data changes throughout the topology, which can result in conflicting replication events.

Downgrading IdM packages manually is not supported. Use **yum distro-sync** to update and downgrade packages in modules.



IMPORTANT

Do not run the **yum downgrade** command on any of the **ipa-*** packages.

Related information

- For details on using the **yum** utility, see the **yum(8)** manual pages.