



Univention Keycloak app manual

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Univention GmbH

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INTRODUCTION

Welcome to the documentation about the Univention **Keycloak** app. The app installs [Keycloak](https://www.keycloak.org/)¹, an open source software product for single sign-on with identity and access management. Furthermore, the app adds authentication to applications and secure services.

This documentation is for system administrators who operate the **Keycloak** app from Univention App Center connected to the LDAP directory in Univention Corporate Server (UCS). It covers the following topics:

1. *Installation* (page 3)
2. *Update* (page 7)
3. *Configuration* (page 9)
4. *Database configuration* (page 27)
5. *Architecture* (page 31)
6. *Requirements and limitations* (page 33)
7. *Use cases* (page 35)
8. *Troubleshooting* (page 41)

This documentation doesn't cover the following topics:

- Usage of Keycloak itself, see the *Keycloak 22.0 Documentation* [1].
- Usage of UCS (Univention Corporate Server), see *UCS 5.0 Manual* [2].

To understand this documentation, you need to know the following concepts and tasks:

- Use and navigate in a remote shell on Debian GNU/Linux derivative Linux distributions like UCS. For more information, see *Shell and Basic Commands*² from *The Debian Administrator's Handbook*, Hertzog and Mas [3].
- Manage an app through Univention App Center³ in *UCS 5.0 Manual* [2].
- Know the concepts of SAML (Security Assertion Markup Language⁴) and OIDC (OpenID Connect⁵) and the differences between the two standards.

Your feedback is welcome and highly appreciated. If you have comments, suggestions, or criticism, please [send your feedback](https://www.univention.com/feedback/?keycloak-app=generic)⁶ for document improvement.

¹ <https://www.keycloak.org/>

² <https://www.debian.org/doc/manuals/debian-handbook/short-remedial-course.en.html#sect.shell-and-basic-commands>

³ <https://docs.software-univention.de/manual/5.0/en/software/further-software.html#computers-softwareselection>

⁴ https://en.wikipedia.org/wiki/Security_Assertion_Markup_Language

⁵ [https://en.wikipedia.org/wiki/OpenID#OpenID_Connect_\(OIDC\)](https://en.wikipedia.org/wiki/OpenID#OpenID_Connect_(OIDC))

⁶ <https://www.univention.com/feedback/?keycloak-app=generic>

INSTALLATION

You can install the **Keycloak** app like any other app with Univention App Center. The App Center only allows to install Keycloak on a UCS system with system role *Primary Directory Node* or *Backup Directory Node*. For more information, see [Primary Directory Node](#)⁷ in *UCS 5.0 Manual* [2].

UCS offers two different ways for app installation:

- With the web browser in the UCS management system
- With the command-line

For general information about Univention App Center and how to use it for software installation, see [Univention App Center](#)⁸ in *UCS 5.0 Manual* [2].

2.1 Installation with the web browser

To install Keycloak from the UCS management system, use the following steps:

1. Use a web browser and sign in to the UCS management system.
2. Open the *App Center*.
3. Select or search for *Keycloak* and open the app with a click.
4. To install Keycloak, click *Install*.
5. Leave the *App settings* in their defaults or adjust them to your preferences. For a reference, see [Settings](#) (page 13).
6. To start the installation, click *Start Installation*.

Note: To install apps, the user account you choose for login to the UCS management system must have domain administration rights, for example the username `Administrator`. User accounts with domain administration rights belong to the user group `Domain Admins`.

For more information, see [Delegated administration for UMC modules](#)⁹ in *UCS 5.0 Manual* [2].

⁷ <https://docs.software-univention.de/manual/5.0/en/domain-ldap/system-roles.html#domain-ldap-primary-directory-node>

⁸ <https://docs.software-univention.de/manual/5.0/en/software/app-center.html#software-appcenter>

⁹ <https://docs.software-univention.de/manual/5.0/en/central-management-umc/delegated-administration.html#delegated-administration>

2.2 Installation with command-line

To install the **Keycloak** app from the command-line, use the following steps:

1. Sign in to a terminal or remote shell with a username with administration rights, for example `root`.
2. Choose between default and custom settings and run the appropriate installation command.

For installation with default settings, run:

```
$ univention-app install keycloak
```

To pass customized settings to the app during installation, run the following command:

```
$ univention-app install --set $SETTING_KEY=$SETTING_VALUE keycloak
```

Caution: Some settings don't allow changes after installation. To overwrite their default values, set them before the installation. For a reference, see *Settings* (page 13).

2.3 Initial Keycloak configuration

The first installation of the **Keycloak** app in the UCS domain creates an administrative user named *admin*, whose password is written to */etc/keycloak.secret*. With this user, the initial configuration of *Keycloak* is created.

To not overwrite custom settings, subsequent installations of the **Keycloak** app on additional UCS systems in the domain don't create the initial configuration.

Factory reset of the configuration

For a *factory reset* of the configuration, delete the realm *UCS* in the *Keycloak Admin Console*.

Warning: Beware, your installation loses all custom configuration settings, custom services providers and other changes to the realm *UCS*.

After you deleted the realm *UCS*, create the initial configuration with the following command:

```
$ univention-keycloak --binduser=admin --bindpwdfile=/etc/keycloak.secret init
```

2.4 Sign in to Keycloak Admin Console

After a successful installation, signed in domain administrator users see the tile *Keycloak* on the UCS Portal, that directs them to the *Keycloak Admin Console*.

The URL has the following scheme: `https://ucs-ss0-ng.$domainname/admin/`. The *\$domainname* is your UCS domain name.

Example:

<https://ucs-ss0-ng.example.com/admin/>

Note: All users in the Domain Admins, for example the domain user Administrator, can also sign in to the Keycloak Admin Console.

2.5 Fetch metadata for service provider configuration

OIDC (OpenID Connect) and SAML (Security Assertion Markup Language) both offer machine readable information to the services that want to use the authentication services in Keycloak. This information is the metadata discovery documents.

In the Keycloak Admin Console you can find them at *realm settings* ▶ *UCS* ▶ *Endpoints*. At the endpoints you see *OpenID Endpoint Configuration* and *SAML 2.0 Identity Provider Metadata*. To view the metadata discovery documents, click the endpoint entries.

With the following commands you can obtain the URLs to the metadata information. Some services comfortably take the URL and configure the authentication automatically.

To download the metadata information for OIDC, run the following command:

```
$ wget "https://$(ucr get keycloak/server/sso/fqdn)/realms/ucs/.well-known/openid-configuration"
```

To download the metadata information for SAML, run the following command:

```
$ wget "https://$(ucr get keycloak/server/sso/fqdn)/realms/ucs/protocol/saml/descriptor"
```


You can update the **Keycloak** app like any other app with Univention App Center or the command line tool **univention-app**.

This chapter covers additional points to consider before and during the update process.

3.1 Configuration migration during Keycloak app updates

Some updates of the **Keycloak** app require a migration of the domain wide Keycloak configuration, because every Keycloak service in the UCS domain uses the same, shared configuration.

By default, the **Keycloak** app migrates the configuration during the app update process. Some changes may conflict with older versions of the **Keycloak** app. Therefore, make sure that all **Keycloak** app instances on all UCS systems in the domain have the same version.

Tip: You can deactivate the automatic configuration migration during the app update process. Set the value of the UCR variable `keycloak/auto-migration` to `false`.

You can manually migrate the configuration of the **Keycloak** app on all UCS system, **after** you updated the app on all UCS systems to the same version. Use the following command:

```
$ univention-keycloak upgrade-config
```

CONFIGURATION

The **Keycloak** app offers various configuration options.

To change settings after installation, sign in to the UCS management system with a username with administration rights and go to *App Center* ▶ *Keycloak* ▶ *Manage Installation* ▶ *App Settings*. On the appearing *Configure Keycloak* page, you can change the settings and apply them to the app with a click on *Apply Changes*.

The App Center then *reinitializes* the Docker container for the Keycloak app. *Reinitialize* means the App Center throws away the running Keycloak Docker container and creates a fresh Keycloak Docker container with the just changed settings.

4.1 Use Keycloak for login to UCS Portal

The **Keycloak** app can take over the role of the *SAML IDP* for the UCS Portal. And the portal can use Keycloak for user authentication.

Warning: The LDAP server will not recognize SAML tickets that the *simpleSAMLphp* based identity provider issued after you restart it. Users will experience invalidation of their existing sessions.

For more information about production use, see *Installation on UCS* (page 33).

To configure the UCS portal to use Keycloak for authentication, run the following steps on the system where you installed Keycloak:

1. Set the UCR variable `umc/saml/idp-server` to the URL `https://ucs-ss0-ng.$domainname/realms/ucs/protocol/saml/descriptor`, for example `https://ucs-ss0-ng.example.org/realms/ucs/protocol/saml/descriptor`. This step tells the portal to use Keycloak as IDP.

Sign in to the UCS management system and then go to *System* ▶ *Univention Configuration Registry* and search for the variable `umc/saml/idp-server` and set the value as described before.

Open a shell on the UCS system as superuser `root` where you installed Keycloak and run the following command:

```
$ ucr set \
umc/saml/idp-server=\
"https://ucs-ss0-ng.$(hostname -d)/realms/ucs/protocol/saml/descriptor"
```

2. Modify the portal to use SAML for login:

In the UCS management system go to *Domain* ▶ *Portal* ▶ *login-saml*. On the tab *General* in the section *Advanced* activate the *Activated* checkbox.

Open a shell on the UCS system as superuser `root` where you installed Keycloak and run the following command:

```
$ udm portals/entry modify \
--dn "cn=login-saml,cn=entry,cn=portals,cn=univention,$(ucr get ldap/base)" \
--set activated=TRUE
```

3. To activate the changes, restart the LDAP server `slapd` within a maintenance window.

In the UCS management system go to *System* ▶ *System Services*. Search for `slapd` and click to select the service. Then click *Restart*.

Open a shell on the UCS system as superuser `root` where you installed Keycloak and run the following command:

```
$ service slapd restart
```

Note: If you don't restart the LDAP server, you will see the following message in `/var/log/syslog`:

```
slapd[...]: SASL [conn=...] Failure: SAML assertion issuer https://ucs-sso-ng.
$domainname/realms/ucs is unknown
```

By default the **Keycloak** app creates a *SAML SP* (client) for every UCS Portal server. You can see the list of existing *SAML SP* clients with the following command:

```
$ univention-keycloak saml/sp get --json
[
  "https://ucs1.example.com/univention/saml/metadata",
  "https://ucs2.example.com/univention/saml/metadata",
  ...
]
```

If the *SAML SP* for a particular UCS Portal server doesn't exist, you can create it in **Keycloak** with the command:

```
$ FQDN="the fqdn of the UCS Portal server"
$ univention-keycloak saml/sp create \
--metadata-url="https://$FQDN/univention/saml/metadata" \
--umc-uid-mapper
```

4.2 Import of user attributes from UCS to Keycloak

Keycloak uses the LDAP directory of the UCS domain as backend for the user accounts. During the authentication process certain user attributes are imported into **Keycloak**. These attributes can be used later on in so called *Attribute Mappers* to pass additional information through the SAML assertion or OIDC token to services (e.g. *displayName*).

By default the **Keycloak** app is configured to import the following user attributes:

LDAP attribute	Keycloak attribute
uid	username
uid	uid
entryUUID	entryUUID
lastname	lastName
mailPrimaryAddress	email
givenName	firstName
createTimestamp	createTimestamp
modifyTimestamp	modifyTimestamp

It is possible to configure the import of additional LDAP user attributes to **Keycloak**, for example

```
$ univention-keycloak user-attribute-ldap-mapper create description
```

to import the LDAP user attribute description to the **Keycloak** attribute description.

With the following command you get a list of all the currently configured **Keycloak** user attributes.

```
$ univention-keycloak user-attribute-ldap-mapper get --user-attributes
```

4.3 Keycloak as OpenID Connect provider

The **Keycloak** app can serve as an OpenID Connect provider (*OIDC Provider*). The following steps explain how to configure an OIDC relying party (*OIDC RP*) to use Keycloak for authentication:

1. *Keycloak Admin Console* (page 4).
2. Navigate to *UCS realm* ▶ *Clients* ▶ *Create*.
3. Specify the `client-id` for the client application (*OIDC RP*). Use the same `client-id` in the configuration of the client application.
4. Select `openid-connect` in the *Client Protocol* drop-down list.
5. Enter the *root URL*, the endpoint URL of the client application (*OIDC RP*).
6. Click *Save*.
7. Finally, the administrator can review the URL settings and customize them, if necessary.

For more information, see *Keycloak Server Administration Guide: OIDC clients* [4].

New in version 19.0.1-ucs1: **univention-keycloak** added. For more information about the usage, see the `--help` option.

As an alternative the app **Keycloak** offers a command line tool. For usage, see the following example:

```
$ univention-keycloak oidc/op/cert get \
--as-pem \
--output "$SOMEFILENAME"
$ univention-keycloak oidc/rp create \
--app-url="https://$(hostname -f)/${MYAPP_URL}/" "${MYAPP_CLIENT_ID}"
```

The option group `oidc/rp` offers additional options like `--client-secret`.

Note: If the administrator chooses *Confidential* as *Access Type* on the client configuration page, Keycloak offers an additional *Credentials* tab with the credentials.

4.4 Keycloak as SAML Identity Provider

New in version 19.0.1-ucs1: **univention-keycloak** added. For more information about the usage, see the `--help` option.

The **Keycloak** app can serve as an *SAML IDP*.

For apps that want to act as a *SAML SP*, you need to add a `client` configuration in Keycloak through the *Keycloak Admin Console* (page 4). For more information about how to create a SAML client configuration, see *Keycloak Server Administration Guide: Creating a SAML client* [5].

As an alternative the app **Keycloak** offers a command line tool. For usage, see the following example:

```
$ univention-keycloak saml/idp/cert get \  
--as-pem --output "$SOMEFILENAME"  
$ univention-keycloak saml/sp create \  
--metadata-url "https://$(hostname -f)/$METADATA-URL-OF-THE-APP"
```

The option group `saml/sp` offers additional options like `--client-signature-required`.

Note: If the administrator chooses `Confidential` as *Access Type* on the client configuration page, Keycloak offers an additional *Credentials* tab with the credentials.

4.5 Backup and restore

Administrators can create a backup of the **Keycloak** app data. The data comprises information for example about the realm, clients, groups, and roles. To create a backup, run the *export* action as in the following steps:

```
$ univention-app shell keycloak /opt/keycloak/bin/kc.sh export \  
--db=$(ucr get kc/db/kind) \  
--db-driver=$(ucr get kc/db/driver) \  
--transaction-xa-enabled=$(ucr get kc/db/xa) \  
--dir /var/lib/univention-appcenter/apps/keycloak/data/myexport
```

In this example `myexport` is a freely chosen directory name.

To restore the backup into the app **Keycloak**, run the *import* action as in the following step:

```
$ univention-app shell keycloak /opt/keycloak/bin/kc.sh import \  
--db=$(ucr get kc/db/kind) \  
--db-driver=$(ucr get kc/db/driver) \  
--transaction-xa-enabled=$(ucr get kc/db/xa) \  
--dir /var/lib/univention-appcenter/apps/keycloak/data/myexport
```

Warning: **Keycloak** defines the scope of exported data and may not contain every configuration option the program offers.

4.6 Multiple installations in the domain

Administrators can install the app **Keycloak** on several nodes in a UCS domain to increase availability and provide failover using the default DNS name `ucs-sso-ng. $(hostname -d)`. The default installations in the domain don't require any interaction from the administrator. This will also provide session synchronization between all **Keycloak** installations on the domain.

Note: If the **Keycloak** app is installed on multiple systems in the domain and updates are available, make sure to update the app on all systems so that all instances of the app in the domain are on the same version.

4.7 Two-factor authentication for Keycloak

Warning: The two-factor capability is a built-in **Keycloak** feature that is not integrated into the UCS identity management or user lifecycle. More sophisticated integration needs to be added individually.

New in version 19.0.1-ucs1:

- Added functionality to enable 2FA (Two-Factor Authentication) to **univention-keycloak**. For more information about the usage, see the `--help` option.

The app **Keycloak** offers a 2FA option. 2FA is an authentication method that grants users access to a service after they sign in with a password and a OTP (one-time password) randomly generated by a third-party OTP password generator like *FreeOTP* or *Google Authenticator*.

2FA increases the protection for user data, because users need to provide two pieces: knowledge (password) and something in the users' possession (the OTP). It also increase the security of the system by avoiding account locking on known accounts because of malicious attacks. For more information, see [Wikipedia: Multi-factor authentication](#)¹⁰.

After you activate 2FA for a group of users, Keycloak asks those users for their OTP on each login. To simplify the configuration process, you can use a command-line tool to enable 2FA.

To activate or deactivate 2FA for a user group, follow the instructions in the next sections.

4.7.1 Activate two-factor authentication for domain administrators

1. Open a shell on the UCS system as superuser `root` where you installed Keycloak and run the following command:

```
$ univention-keycloak 2fa enable --group-2fa "Domain Admins"
```

2. The next time a user belonging to the `Domain Admins` group tries to sign in, Keycloak forces them to configure the 2FA following the instructions given during the login.

4.7.2 Deactivate two-factor authentication for domain administrators

1. *Sign in to Keycloak Admin Console* (page 4).
2. Navigate to *UCS realm* ▶ *Groups*.
3. Select `Domain Admins` in the list and click *Edit*.
4. Navigate to *Role Mappings* on the tabs.
5. Remove `2FA role` from *Assigned roles*.

4.8 Settings

The following references show the available settings within the **Keycloak** app. Univention recommends to keep the default values.

Keycloak has a lot more possibilities for configuration and customization. For more information, consult *Keycloak 22.0 Documentation* [1].

¹⁰ https://en.wikipedia.org/wiki/Multi-factor_authentication

keycloak/log/level

Configures the verbosity of log messages in Keycloak.

Possible values

ALL, DEBUG, ERROR, FATAL, INFO, OFF, TRACE, WARN.

For a detailed description of the log level values, see *Keycloak documentation: Configuring logging* [6].

Required	Default value	Set
Yes	INFO	Installation and app configuration

keycloak/java/opts

Defines the options that the Keycloak app appends to the *java* command.

Required	Default value	Set
Yes	<code>-server -Xms1024m -Xmx1024m</code>	Installation and app configuration

keycloak/server/sso/fqdn

Defines the FQDN to the identity provider in your environment's UCS domain. Defaults to `ucs-sso-ng.$domainname`. Please note that uppercase letters in this setting can lead to problems regarding the Keycloak admin console.

Required	Default value	Set
No	<code>ucs-sso-ng.\$domainname</code>	Installation and app configuration

keycloak/server/sso/autoregistration

If set to `true` (default), the joinscript of the Keycloak app registers a name server entry for the hostname of the identity provider defined in *keycloak/server/sso/fqdn* (page 14).

Possible values:

`true` or `false`

Required	Default value	Set
Yes	<code>true</code>	Installation and app configuration

keycloak/server/sso/virtualhost

If set to `true` (default) the UCS system will create a dedicated apache virtual host configuration for the Keycloak server FQDN.

Possible values:

`true` or `false`

Required	Default value	Set
Yes	<code>true</code>	Installation and app configuration

keycloak/apache/config

If set to `true` (default) the UCS system will create an apache configuration for Keycloak.

Possible values:

`true` or `false`

Required	Default value	Set
Yes	true	Installation and app configuration

keycloak/federation/remote/identifier

This property stores the name of the UDM property that stores the unique identifier of the remote IAM objects. It is only used for ad hoc federation.

Required	Default value	Set
No	univentionObjectIdentifier	Installation and app configuration

keycloak/federation/source/identifier

This property stores the name of the UDM property that stores the remote source of an IAM objects. It is only used for ad hoc federation.

Required	Default value	Set
No	univentionSourceIAM	Installation and app configuration

keycloak/database/connection

This is a setting for the **PostgreSQL** database, the default database for Keycloak on the UCS system. The setting specifies the IP addresses from which the database can receive connections. The default value is 0.0.0.0, meaning that every IP address can connect to the database.

Required	Default value	Set
No	None	Installation and app configuration

kc/db/url

Specifies the database JDBC URL (for example `jdbc:postgresql://dbhost/keycloak`) to connect Keycloak. Defaults to `jdbc:postgresql://fqdn:5432/keycloak`.

Required	Default value	Set
No	<code>jdbc:postgresql://fqdn:5432/keycloak</code>	Installation and app configuration

kc/db/username

Specifies the database username. Defaults to `keycloak`.

Required	Default value	Set
No	<code>keycloak</code>	Installation and app configuration

kc/db/kind

Specifies the kind of database. Defaults to `postgres`. You find the available values at *Configuring the database* [7].

Required	Default value	Set
No	<code>postgres</code>	Installation and app configuration

kc/db/password

Specifies the password to connect to the database.

Required	Default value	Set
No	None	Installation and app configuration

ucs/self/registration/check_email_verification

Controls if the login is denied for unverified, self registered user accounts. For more information, see [Account verification](#)¹¹ in the *UCS 5.0 Manual* [2].

Required	Default value	Set
No	False	Installation and app configuration

keycloak/login/messages/en/accountNotVerifiedMsg

English error message for a self-registered user account that isn't verified yet. The error message supports HTML format.

Required	Default value	Set
No	See default value in Listing 4.1 after the table.	Installation and app configuration

Listing 4.1: Default value for *keycloak/login/messages/en/accountNotVerifiedMsg* (page 16)

```
'Your account is not verified.<br>You must <a id="loginSelfServiceLink" href=
->"https://${hostname}.${domainname}/univention/selfservice/#/selfservice/
->verifyaccount" target="_blank">verify your account</a> before you can login.
-><br/>'
```

keycloak/login/messages/de/accountNotVerifiedMsg

German error message for a self-registered user account that isn't verified yet. The error message supports HTML format.

Required	Default value	Set
No	See default value in Listing 4.2 after the table.	Installation and app configuration

Listing 4.2: Default value for *keycloak/login/messages/de/accountNotVerifiedMsg* (page 16)

```
'Konto nicht verifiziert.<br>Sie m\u00FCssen Ihr <a id="loginSelfServiceLink"
->href="https://${hostname}.${domainname}/univention/selfservice/#/selfservice/
->verifyaccount" target="_blank">Konto verifizieren</a>, bevor Sie sich
->einloggen k\u00F6nnen.<br/>'
```

keycloak/csp/frame-ancestors

Additional entries to the `frame-ancestors` directive of the Keycloak virtual host. The space separated list of sources can have multiple values can be used. For example, `https://portal.external.com https://*.remote.de`. For more information, see *CSP: frame-ancestors* in Mozilla Foundation [8].

¹¹ <https://docs.software-univention.de/manual/5.0/en/user-management/user-self-service.html#user-management-password-changes-by-users-selfregistration-account>

Required	Default value	Set
No	None	Installation and app configuration

keycloak/apache2/ssl/certificate

Sets the absolute path to the SSL certificate file for the **Apache web server** module `mod_ssl` of the Keycloak virtual host. The web server needs the certificate in the PEM format.

The web server uses the UCS certificate from `/etc/univention/ssl/ucs-sso-ng.$domainname/cert.pem`, if the UCR variable has no value.

Required	Default value	Set
No	<code>/etc/univention/ssl/ucs-sso-ng.\$domainname/cert.pem</code>	Installation and app configuration

keycloak/apache2/ssl/key

Sets the absolute path to the private RSA/DSA key of the SSL certificate file for the **Apache web server** module `mod_ssl` of the Keycloak virtual host. The web server needs the certificate in the PEM format.

The web server uses the UCS private key from `/etc/univention/ssl/ucs-sso-ng.$domainname/private.key`, if the UCR variable has no value.

Required	Default value	Set
No	<code>/etc/univention/ssl/ucs-sso-ng.\$domainname/private.key</code>	Installation and app configuration

keycloak/apache2/ssl/ca

Sets the absolute path to the certificate of the certificate authority (CA) for the **Apache web server** module `mod_ssl` of the Keycloak virtual host. The web server needs the certificate in the PEM format.

The web server uses the UCS CA from `/etc/univention/ssl/ucsCA/CAcert.pem`, if the UCR variable has no value.

Required	Default value	Set
No	<code>/etc/univention/ssl/ucsCA/CAcert.pem</code>	Installation and app configuration

keycloak/cookies/samesite

This setting sets the SameSite attribute in all the cookies of Keycloak. Possible values are `Lax`, `Strict` and the default value `None`.

Required	Default value	Set
No	None	Installation and app configuration

keycloak/server/sso/path

This setting sets the path used to access Keycloak at the end of the Keycloak URL.

Required	Default value	Set
No	/	Installation and app configuration

keycloak/password/change/endpoint

This setting sets the endpoint for the password change. Per default, the local Univention Management Console Server is used.

Required	Default value	Set
No	None	Installation and app configuration

keycloak/login/messages/en/accessDeniedMsg

This setting sets the access denied message during login in English. This setting only has effect, if you have configured Keycloak for application specific access restriction as described in *Restrict access to applications* (page 22).

Required	Default value	Set
No	See default value in Listing 4.3 after the table.	Installation and app configuration

Listing 4.3: Default value for `keycloak/login/messages/en/accessDeniedMsg` (page 18)

```
'Access forbidden.<br>You do not have the needed privileges to access this
→application. Please contact the administrator that you do not have access to
→the service {0} if you find this to be incorrect.'
```

keycloak/login/messages/de/accessDeniedMsg

This setting sets the access denied message during login in German. This setting only has effect, if you have configured Keycloak for application specific access restriction as described in *Restrict access to applications* (page 22).

Required	Default value	Set
No	See default value in Listing 4.4 after the table.	Installation and app configuration

Listing 4.4: Default value for `keycloak/login/messages/de/accessDeniedMsg` (page 18)

```
'Zugriff verboten.<br>Bitte wenden Sie sich an den Administrator, dass Sie
→keinen Zugriff auf den Service {0} haben, wenn Sie feststellen, dass dies
→nicht korrekt ist.'
```

4.9 Customize the appearance

The **Keycloak** app uses the same web theme as UCS, so that the UCR variable `ucs/web/theme`¹² applies to Keycloak, as well. To adjust the web theme, follow the steps outlined in *Creating a custom theme/Adjusting the design of UCS web interfaces*¹³ in the *UCS 5.0 Manual* [2].

Administrators can change the values of the following CSS variables to customize the appearance of the web theme for the sign-in form provided by Keycloak. These CSS variables are specifically relevant to Keycloak. They take their default values from UMC and expect CSS background values.

- `--login-background`

¹² <https://docs.software-univention.de/manual/5.0/en/appendix/variables.html#envvar-ucs-web-theme>

¹³ <https://docs.software-univention.de/manual/5.0/en/central-management-umc/introduction.html#central-theming-custom>

- `--login-box-background`
- `--login-logo`

Keycloak also uses `/usr/share/univention-management-console-login/css/custom.css` and loads from the URL `/univention/login/css/custom.css`. The CSS file gives more control than just the theme.

Caution: You may need to adjust your customizations in the CSS file `custom.css` after updates for UCS or the Keycloak app, because CSS selectors may change on updates.

See also:

background - CSS: Cascading Style Sheets | MDN¹⁴

for more information about the syntax for background values.

4.9.1 Adjusting texts on the Keycloak login page

The **Keycloak** app lets Administrators overwrite any messages on the **Keycloak** login page. Each text variable value in this login template can be overwritten by using a UCR variable of the form

```
keycloak/login/messages/[de/en]/key=value
```

This make use of the **Keycloak** message bundles that are documented here: https://www.keycloak.org/docs/latest/server_development/#messages

For example, the login title in the **Keycloak** login dialogue can be adjusted like this:

```
$ ucr set \
keycloak/login/messages/en/loginTitleHtml=\
'Login at Domainname'
```

After setting one of these variables, this command has to be run to make the change visible in **Keycloak** login page:

```
$ univention-app configure keycloak
```

Warning: These settings are local settings. The UCR variables have to be set on each host running **Keycloak**.

4.9.2 Additional links on the login page

New in version 22.0.1-ucs2: Additional links below login dialog

Administrators can add links below the login dialog, for example to the user self service for a forgotten password or legal information such as a privacy statement.

To manage up to 12 links, use the command line tool **univention-keycloak**. To add links to the login page for both English and German run the following commands:

Listing 4.5: Add links below login dialog with **univention-key-cloak**

```
$ univention-keycloak login-links set en 1 "Link 1" "Link 1 description"
$ univention-keycloak login-links set en 2 "Link 2" "Link 2 description"
$ univention-keycloak login-links set de 1 "Link 1" "Beschreibung von 1"
$ univention-keycloak login-links set de 2 "Link 2" "Beschreibung von 2"
```

¹⁴ <https://developer.mozilla.org/en-US/docs/Web/CSS/background>

The login page then shows the links below the login dialog as in Fig. 4.1.

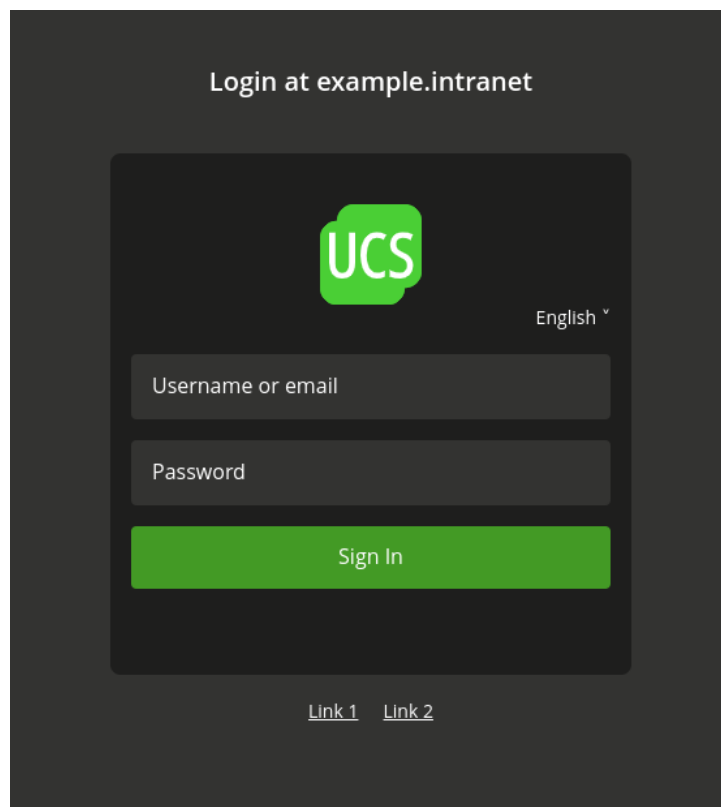


Fig. 4.1: Custom links below the login dialog

Use **univention-keycloak** to modify and remove login links.

Listing 4.6: Modify or delete links below login dialog with **univention-keycloak**

```
$ univention-keycloak login-links set en 1 "Link 1 new" "Link 1 new description"
$ univention-keycloak login-links delete en 2
```

To show the links that the login page has configured for a given language, use **univention-keycloak** like in the following example:

Listing 4.7: Show configured links below the login dialog with **univention-keycloak**

```
$ univention-keycloak login-links get en
```

4.9.3 Cookie consent banner dialog

The **Keycloak** app allows the configuration of a cookie consent banner dialog on the login page. The UCS portal, the UMC and the login page provided by the **Keycloak** app share the same configuration for the cookie banner.

For more information about how to configure the cookie consent banner, see [Consent for using Cookies](#)¹⁵.

¹⁵ <https://docs.software-univention.de/manual/5.0/en/central-management-umc/cookie-banner.html#banner>

4.10 Customize web server configuration for Keycloak

The **Keycloak** app ships a configuration for the Apache HTTP web server in `/etc/apache2/sites-available/univention-keycloak.conf`. The Keycloak app creates the file and overwrites any changes during app updates. Therefore, administrators shouldn't edit this file.

You as administrator can customize the web server configuration for Keycloak by creating the file `/var/lib/univention-appcenter/apps/keycloak/data/local-univention-keycloak.conf`.

For example, an administrator may want to restrict the access to the *Keycloak Admin Console* to a specific IP subnet and writes the appropriate configuration into `local-univention-keycloak.conf`.

```
<LocationMatch "^(/admin/|/realms/master/)">
    deny from all
    allow from 10.207.0.0/16
</LocationMatch>
```

To activate the configuration, you need to validate the configuration and then tell the web server to reload it. Use the following commands on the command line as super user.

1. The validation of the configuration is necessary, because the Apache HTTP web server terminates upon errors without error message. The Apache HTTP web server offers a dedicated command to validate the configuration.

```
$ apachectl configtest
Syntax OK
```

2. After the validation didn't show any errors, you can restart the Apache HTTP web server to activate your custom changes.

```
$ service apache2 restart
```

4.11 Activating Kerberos authentication

In the default configuration, the **Keycloak** app evaluates **Kerberos** tickets during the authentication process. If you have a UCS domain with client workstations that obtain **Kerberos** tickets during the user login process, users can configure their web browsers to send this ticket to **Keycloak** for authentication to enable a passwordless login, for example in the UCS portal.

To enable the web browser to send the **Kerberos** tickets, you must change the following settings:

Open a tab and enter `about:config` in the address bar to open the Firefox configuration. Search for `network.negotiate-auth.trusted-uris` and add the FQDN (fully qualified domain name) of your **Keycloak** server, which is `ucs-sso-ng. [Domain name]` by default.

For Microsoft Edge on Windows, you need to configure Kerberos authentication in the general settings of the operating system. Open the *Control Panel* and move to *Security* ▶ *Local Intranet* ▶ *Sites* ▶ *Advanced*. Add the FQDN of your **Keycloak** server, `ucs-sso-ng. [Domain name]` by default, to the list of *Websites*.

If you install the **Active Directory-compatible Domain Controller** app *after* installing **Keycloak**, you need to run the following command on the Primary Directory Node. It ensures that the Kerberos authentication also works with the **Active Directory-compatible Domain Controller**:

```
$ eval "$(ucr shell keycloak/server/sso/fqdn)"
$ samba-tool spn add "HTTP/$keycloak_server_sso_fqdn" "krbkeycloak"
```

Per default, **Keycloak** tries to use **Kerberos**. If no **Kerberos** ticket is available, *Keycloak* falls back to user-name and password authentication. You can deactivate this behavior in the *Keycloak Admin Console* (page 4) with the following steps:

- Select the realm UCS.

- On the sidebar, click *User federation* and choose `ldap-provider`.
- Go to the section *Kerberos integration* and deactivate *Allow Kerberos authentication*.

4.12 Restrict access to applications

New in version 21.1.2-ucs2.

With the UCS **simpleSAMLphp** integration, you can restrict access of groups and users to specific *SAML service providers* through the UDM (Univention Directory Manager) SAML settings.

The configuration steps in the following sections restrict access to certain *SAML service providers* and *OIDC Relying parties* through group membership in a similar way with **Keycloak**.

Attention: Application access restriction isn't yet integrated into the UDM UMC module yet.

If you already need the application access restriction for groups at this time, read on and follow the steps outlined below. Note that you may need to perform manual migration steps after the integration is complete.

If you don't have an immediate need, it's recommended that you wait until the integration is complete in a future version of the **Keycloak** app.

This configuration differs from the one provided by **simpleSAMLphp** in the following ways:

- Only the group membership restricts the access to applications. It isn't possible to restrict the access for an individual user directly.
- You must configure group access restrictions for *SAML SP* and *OIDC RP* directly in the *Keycloak Admin Console* (page 4), although you manage users and their group memberships in UDM.
- By default, **Keycloak** allows access to all users. Only when you specifically configure the *SAML SP* or *OIDC RP* to use app authorization will **Keycloak** evaluate the access restriction to applications.

Important: Univention doesn't support nested groups in the group mapper between UCS and **Keycloak**. The reason is that **Keycloak** doesn't support groups as members of groups.

4.12.1 Create authentication flow

Keycloak version 21.1.2-ucs2 provides an authenticator extension called *Univention App authenticator*, which performs the authorization validation on the user during the sign-in.

To use this authenticator, you need to create a *Keycloak authentication flow* that includes this authenticator. Use the command **univention-keycloak** as follows. The command doesn't give any output:

Listing 4.8: Create a Keycloak *authentication flow*

```
$ univention-keycloak legacy-authentication-flow create
```

See also:

For more information on authentication flows, see *Keycloak Server Administration Guide: Authentication flows* [9].

4.12.2 Assign authentication flow

Keycloak calls the *SAML SP* and the *OIDC RP Client*. By default, neither *SAML SP* nor *OIDC RP* use the created authentication flow.

To restrict application access, you must assign the *created authentication flow* (page 22) to each *Keycloak Client*. Otherwise, the *Keycloak Client* still allows access to all users. To assign a specific flow to an existing *Keycloak Client*, use the following command in Listing 4.9.

Listing 4.9: Assign authentication flow to a *Keycloak Client*

```
$ univention-keycloak client-auth-flow \
  --clientid "REPLACE_WITH_YOUR_CLIENT_ID" \
  --auth-flow "browser flow with legacy app authorization"
```

Note: You can also pass the option `--auth-browser-flow` when you create a *SAML SP* or *OIDC RP* as a *Keycloak Client*. See section *Keycloak as SAML Identity Provider* (page 11) on how to create a *Keycloak Client*.

4.12.3 Map UDM groups to Keycloak

To restrict access to certain *Keycloak Clients* by group membership, you must map the necessary groups to **Keycloak**. Use the *Keycloak Admin Console* (page 4) to create an appropriate *LDAP mapper*.

1. In *Keycloak Admin Console* (page 4) go to *UCS realm* ▶ *User Federation* ▶ *ldap-provider* ▶ *Mappers* ▶ *Add mapper*.
2. Choose the *Name* of the mapper freely.
3. Select the *Mapper type* `group-ldap-mapper` to extend the form. Fill in the fields as following:

LDAP Groups DN

Set to the value of the base LDAP DN of your domain, for example `dc=example, dc=local`.

Group Object Classes

`univentionGroup`

Ignore Missing Groups

On

Membership LDAP Attribute

`memberUid`

Membership Attribute Type

UID

Drop non-existing groups during sync

On

Important: It's strongly recommended to set an *LDAP Filter* in the group mapper so that **Keycloak** only maps strictly necessary groups. If you don't specify an *LDAP filter*, **Keycloak** synchronizes **all groups**

from the LDAP directory service. Depending on the size of the groups, it may impact the performance of **Keycloak**.

Example

To filter groups by their name and only allow **Keycloak** to synchronize the mentioned groups, use `(|(cn=umcAccess)(cn=nextcloudAccess))`

4. Scroll down and click *Save*.

To trigger the synchronization of the groups immediately, click the name of the mapper you just created to open it and select *Sync LDAP groups to Keycloak* from the *Action* drop-down.

4.12.4 Create Keycloak client roles

The authenticator extension *Univention App authenticator* restricts access by evaluating the roles of a user in **Keycloak**. It specifically checks for a client specific role named `univentionClientAccess`. If this client specific role exists, the authenticator extension restricts access of all users that don't have this role.

For each *Keycloak Client* that you want to check access restrictions, you need to create the role `univentionClientAccess`. In *Keycloak Admin Console* (page 4) go to *UCS realm* ▶ *Clients*. For each client of interest, run the following steps:

1. Select *YOUR_CLIENT* ▶ *Roles* ▶ *Create role*.
2. Enter name for the role `univentionClientAccess`.
3. Click *Save*.

Important: Follow the next section *Attach the client specific role to groups* (page 24) immediately, because saving the client role enforces the sign-in restriction for the *Keycloak Client*.

See also:

For more information on roles in Keycloak, see *Keycloak Server Administration Guide: Assigning permissions using roles and groups* [10].

4.12.5 Attach the client specific role to groups

To grant access permission to group members of a group so that they can sign in to an app, you need to attach the *Keycloak Client* role to the groups. All group members then inherit the client role.

In *Keycloak Admin Console* (page 4) go to *UCS realm* ▶ *Groups*. For each group of interest, run the following steps:

1. Select *YOUR_GROUP* ▶ *Role mapping* ▶ *Assign role* ▶ *Filter by clients*.
2. Find and select the app you intend to control with `univentionClientAccess`.

Warning: **Keycloak** doesn't evaluate nested group memberships. Only direct group membership of a user give the user the necessary client role.

3. Click *Assign*.

From now on, only the users that inherited the *Keycloak Client* specific role `univentionClientAccess` have access to the respective applications.

4.12.6 Customize the authorization error page

Keycloak shows an error page, if a user doesn't have access to an application because the access restriction applies to them.

You can configure the error page through the following App settings:

German

`keycloak/login/messages/de/accessDeniedMsg` (page 18)

English

`keycloak/login/messages/en/accessDeniedMsg` (page 18)

You can include HTML format with links in this setting to customize the error page.

The default message shows the `client ID` of the *Keycloak Client* that forbids access to the user. If you need a human readable name, you can set the attribute *Name* of the *Keycloak Client* in the *Keycloak Admin Console* (page 4). With the attribute set, Keycloak shows the *Name* instead of the `client ID`.

Important: The app setting only applies to the local Keycloak instance. You can use different values on the different Keycloak installations, for example, to show a link to the local portal.

For more information, refer to *Adjusting texts on the Keycloak login page* (page 19).

DATABASE CONFIGURATION

Keycloak uses an external database to store configurations and settings. By default, the **Keycloak** app installs and configures a **PostgreSQL** database.

In case you want to use your own database backend, you can change the database settings for **Keycloak** prior or after the app installation.

5.1 Default database

The **Keycloak** app installation procedure automatically installs and configures the **PostgreSQL** database during the initial installation of the app in the UCS domain. **Keycloak** uses this database for all additional installations of the app in the UCS domain. The default database doesn't provide replication or any kind of failover.

However, it's not mandatory to use the default **PostgreSQL** database instance. Administrators may decide to use another one, for example, if there is a need to use an already existing or clustered database.

5.2 Custom database

Keycloak supports a wide range of different databases as backend. For detailed information, consult the **Keycloak** manual *Configuring the database* [7].

Note: On the contrary to the official **Keycloak** container image, the custom image that the **Keycloak** App provides, does not contain the drivers that support an Oracle Database. Using an Oracle Database as a backend for **Keycloak** is currently not supported.

The **Keycloak** app provides app settings for the configuration of the database backend. For the available settings, see the *Settings* (page 13) section.

Important: Changing these settings doesn't affect the database itself, no matter if you use the command line tools or the *App Center*. The database settings only tell **Keycloak** where and how to connect to the database. Ensure that you first perform the needed changes on the database itself.

5.3 Changing the database configuration

The following sections explain how to change the database settings. The example uses the **MariaDB** database and the following assumptions:

- The database for Keycloak exists.
- The **Keycloak** server can connect to the database.
- A user account with the appropriate permissions for the database exists.

Note: The database user needs the following minimum privileges to work in a single machine setup. Use the **GRANT** command¹⁶:

```
GRANT SELECT, INSERT, UPDATE, DELETE, CREATE, ALTER, REFERENCES, INDEX, DROP
ON `<database>`.* TO `<user>`@`<host>`;
```

5.3.1 Initial installation

This section explains how to setup the **Keycloak** app to use a different database, such as **MariaDB** in this example, during the initial and first installation of the **Keycloak** app in the UCS domain.

To specify an existing MariaDB database during the initial installation, you can either run the following installation command from the command line:

Listing 5.1: Install Keycloak with alternative database settings

```
$ univention-app install keycloak --set \
  kc/db/url="jdbc:mariadb://database-server:3306/database-name" \
  kc/db/password="database-password" \
  kc/db/username="database-username"
```

Or alternatively, you can set the corresponding app settings *kc/db/url* (page 15), *kc/db/password* (page 15) and *kc/db/username* (page 15) during the installation in the *Univention App Center*.

Additional installations of the **Keycloak** app automatically use these database settings without any further database configuration.

5.3.2 After initial installation

After you completed the app installation in the UCS domain, **Keycloak** stores the database settings in a domain wide settings object. Subsequent installations of the **Keycloak** app use these settings, regardless of the database settings during the installation.

Warning: Changing the database settings after the installations means losing every existing configuration settings and session.

You have to manually backup **Keycloak** before and restore the settings after changing the database backend. For more information, see *Backup and restore* (page 12).

To change the database settings for existing **Keycloak** instances you have to use the following steps:

1. Change the domain wide database settings with the following command on one of the UCS systems that has **Keycloak** installed:

¹⁶ <https://mariadb.com/kb/en/grant/>


```
$ univention-keycloak domain-config \  
--set username="database-username" \  
--set uri="jdbc:mariadb://database-server:3306/database-name" \  
--set password="database-password" \  
--set driver="org.mariadb.jdbc.Driver" \  
--set ping_datatype="VARBINARY(255)"
```

2. Re-configure one of the **Keycloak** instances and verify that it works:

```
$ univention-app configure keycloak
```

3. Re-configure the rest of the **Keycloak** instances.

ARCHITECTURE

The **Keycloak** app architecture consists of the following elements:

- The operating environment UCS with the App Center and the Docker engine running Keycloak.
- The Keycloak software.
- The OpenLDAP LDAP directory in UCS as identity store for Keycloak
- A SQL database as data persistence layer with read-write access for Keycloak.

This architecture view doesn't go into detail of the Keycloak software itself, because it's beyond the scope of this documentation.

6.1 Overview

Fig. 6.1 shows the architecture with the most important elements.

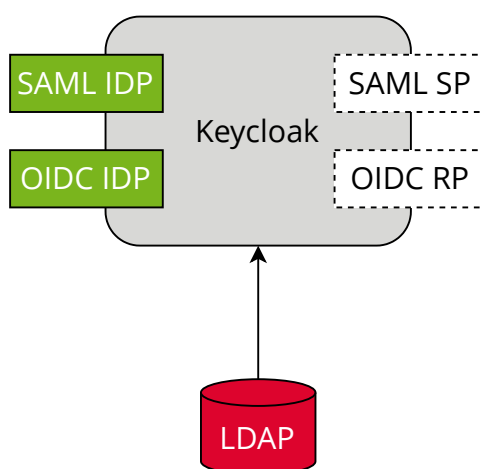


Fig. 6.1: Keycloak app architecture

View focuses on the elements Keycloak, SAML and OIDC as its most important interfaces for single sign-on, and the LDAP directory.

The following list describes the elements in more detail.

Keycloak

Keycloak is the Keycloak software as distributed by the Keycloak project as container image for Docker. The **Keycloak** app uses the unmodified Keycloak binary image and additionally includes files to for example support synchronization of data between instances deployed on the same domain.

LDAP

LDAP is the LDAP directory provided by UCS with the OpenLDAP software. In UCS it is the storage for all

identity and infrastructure data of the UCS domain. For more information, see [LDAP directory](#)¹⁷ in *UCS 5.0 Manual* [2].

SAML IDP

SAML IDP stands for *SAML Identity Provider* and is the SAML interface in Keycloak that offers user authentication as a service through SAML.

SAML SP

SAML SP stands for *SAML Service Provider* and is the SAML interface in Keycloak that outsources its user authentication function to an *IDP*.

OIDC Provider

OP is short for *OpenID Connect Provider*. In Keycloak this OIDC interface offers user authentication as a service.

OIDC RP

OIDC RP is short for *OpenID Connect Relying Party*. In Keycloak this OIDC interface outsources its user authentication function to an *OP*.

Keycloak Client

A *Keycloak Client* is any entity that can request Keycloak to authenticate a user. This includes all *OIDC Relying Parties* and *SAML Service Providers*.

6.2 Design decisions

One goal of the **Keycloak** app is to provide a ready to run Keycloak setup for UCS. To reach that goal, the Univention team made the following decisions.

The **Keycloak** app configures a so-called *user federation* in the realm *UCS* in Keycloak. In general, a user federation synchronizes users from LDAP and Active Directory servers to Keycloak. In the Keycloak app, the user federation **doesn't** synchronize user accounts from LDAP to Keycloak, but delegates authentication decisions to LDAP. A realm manages a set of users, credentials, roles, and groups in Keycloak.

The user federation in the realm *UCS* uses the LDAP DN (Distinguished Name) `uid=sys-idp-user, cn=users, $ldap_base` to bind to the LDAP directory in UCS.

The app registers `ucs-ss0-ng.$domainname` to the DNS that serves as host for API entry points of Keycloak and administrative web interface.

¹⁷ <https://docs.software-univention.de/manual/5.0/en/domain-ldap/ldap-directory.html#domain-ldap>

REQUIREMENTS AND LIMITATIONS

To ensure a smooth operation of the **Keycloak** app on UCS, administrators need to know the following requirements and limitations:

7.1 User federation and synchronization

The app configures a user federation in the realm *UCS*. **Don't** remove the user federation or Keycloak won't be able to resolve users anymore.

The configured user federation in the realm *UCS* doesn't synchronize the user accounts from the UCS LDAP to Keycloak. For more information, see *Design decisions* (page 32).

7.2 Installation on UCS

The App Center installs the app **Keycloak** on a UCS 5.0-x Primary Directory Node or Backup Directory Node in your UCS environment, see *Installation* (page 3). The app is suitable for production use in UCS domains. Administrators need to keep in mind, other apps may be unable to authenticate users through SAML without manual reconfiguration.

Administrators need to take care with experiments that involve the reconfiguration, for example, of UMC, and other services to use Keycloak. The experiments may have undesired results. In particular, when you change the UCR variable `umc/saml/idp-server` to point to your Keycloak installation and restart the LDAP server, the LDAP server doesn't accept SAML tickets any longer that the *simpleSAMLphp* based identity provider issued. So users find their existing sessions invalidated.

7.3 No user activation for SAML

In the *Users* UMC module, the user account's *SAML settings* at *Account* ▶ *SAML settings* don't require anymore that administrators activate identity providers for user accounts. Therefore, any user account can use SAML for single sign-on. The behavior is the same as for the OIDC capability before through the **OpenID Connect Provider** app.

7.4 Password restriction

Keycloak offers a password policies feature, see *Keycloak Server Administration Guide: Password policies* [11]. Because of the user federation with UCS, see *Design decisions* (page 32), Keycloak **doesn't** manage the users credentials.

UCS takes care of password policy definition and enforcement. For more information, see *LDAP directory*¹⁸ in *UCS 5.0 Manual* [2].

7.5 Application clients

Keycloak offers the possibility to create SAML or OIDC clients using the command line tool **univention-keycloak**. Administrators can adjust the generic client configuration, if they need a specific configuration. In this case you can use the *Keycloak Admin Console* (page 4).

¹⁸ <https://docs.software-univention.de/manual/5.0/en/domain-ldap/ldap-directory.html#domain-ldap>

USE CASES

This section describes some uses cases for the app **Keycloak** to give a deeper insight of the app's capability.

8.1 Expired password and change password on next sign-in

In some situations, administrators create a user account with a temporary password that requires the account owner to change their password during their first sign-in. The procedure can be company policy or just considered a good practice. Also, if for any other reason like a lost or compromised user password, the account owner can contact the administrator and request a password change.

See also:

User management module - Account tab^{Page 35, 19}

For user account expire and set password upon first login, refer to *UCS 5.0 Manual* [2].

To enable these capabilities with **Keycloak**, the app offers the following extensions. The extensions *only* provide the capabilities in the *UCS* realm with the **Keycloak** app installed.

Univention LDAP mapper

In *Keycloak Admin Console* (page 4) follow *UCS realm* ▶ *User Federation* ▶ *ldap-provider* ▶ *Mappers*

The LDAP mapper reads necessary attributes from the LDAP directory and triggers a password update when needed.

Univention update password

In *Keycloak Admin Console* (page 4) follow *UCS realm* ▶ *Authentication* ▶ *Required Actions*

Univention update password provides dialogs and forms in the Keycloak login flow.

8.2 Single sign-on through external public domain name

The typical single sign-on configuration in UCS uses a shared DNS record to provide a failover for the sign-in. The *SAML IDP* is available at `ucs-sso-ng.$domainname`. The administrator chose the environment's *\$domain-name* during UCS installation.

See also:

Domain settings²⁰ during UCS installation

for information about domain modes, settings and naming conventions in the *UCS 5.0 Manual* [2].

Administrators often choose the UCS domain name for an intranet scenario and adapt the service configuration to match the target domain and hostnames. The term FQDN identifies the combination of hostname and domain used to uniquely identify a service. For more information, see Wikipedia contributors [12].

The use case *single sign-on through external, public domain name* addresses administrators who want single sign-on availability from the internet. Administrators find the steps to reconfigure the FQDN for the single sign-on and the

¹⁹ <https://docs.software-univention.de/manual/5.0/en/user-management/umc.html#users-management-table-account>

²⁰ <https://docs.software-univention.de/manual/5.0/en/installation.html#installation-domain-settings>

UCS portal in this section. The configuration for this scenario recommends two UCS servers or more for serving the different FQDNs. If you encounter problems during the steps below, see *Configuration of single sign-on through external public domain* (page 42).

Validate configuration success

Administrators can validate the success of their configuration with the following steps:

1. Use your preferred web browser and open the UCS portal under the just configured FQDN.
2. Sign in as user through single sign-on.
3. After sign-in through single-sign on, the browser redirects you as user back to the UMC portal.
4. If you encounter problems during the validation, see *Configuration of single sign-on through external public domain* (page 42).

Note: The following aspects faced by administrators encounter in this use case are beyond the scope of this document:

- Configuration of an external DNS to point to the UCS system.
 - Configuration of network components to route the connection from the internet to the UCS system.
 - Obtaining a valid certificate from a CA.
-

Warning: The **Keycloak** admin interface as well as the **Keycloak** REST API are also publicly available if the **Keycloak** app was configured to be available externally. For security reasons, this should be restricted. Please see *Customize web server configuration for Keycloak* (page 21) for an exemplary configuration.

8.2.1 External FQDN different from internal UCS name

New in version 21.0.1-ucs2.

A common scenario is to have the UCS portal available at one FQDN, such as `portal.internet.domain`, and single sign-on available at another different FQDN, such as `sso.internet.domain`.

Before starting with the configuration of this use case, consider the following aspects:

Pre-conditions:

For the scenario described below, it's important to have the following setup in place, before you proceed:

1. You configured the external DNS entry for Keycloak, for example `sso.internet.domain`.
2. You configured the external DNS entry for the UCS portal, for example `portal.internet.domain`.
3. You have obtained proper SSL certificates for Keycloak and the UCS portal new FQDN.

The following steps require a working network access from the UCS system to the external identity provider FQDN.

Configuration of the identity provider

To configure single sign-on on each Keycloak instance in your UCS domain, follow the steps below:

1. Configure the single sign-on FQDN to a custom value. Set the following UCR variables:

```
$ SSO_FQDN=sso.internet.domain
$ ucr set keycloak/server/sso/fqdn="${SSO_FQDN}"
$ ucr set keycloak/server/sso/autoregistration=false
$ ucr set keycloak/apache2/ssl/certificate="/path/to/${SSO_FQDN}/cert.pem"
$ ucr set keycloak/apache2/ssl/key="/path/certificate/${SSO_FQDN}/private.key"
# Add the new public domain of the portal to the frame-ancestor to the CSP
$ ucr set keycloak/csp/frame-ancestors='https://*.internet.domain'

$ univention-app configure keycloak
```

2. Adjust the standard Keycloak portal entry in the UCS domain after changing the single sign-on FQDN:

```
$ udm portals/entry modify \
--dn "cn=keycloak,cn=entry,cn=portals,cn=univention,${ucr get ldap/base}" \
--set link="en_US" "https://sso.internet.domain/admin/"
```

Warning: After changing the configuration of the identity provider with the previous steps, all services can't use that identity provider until proper configuration.

Configuration of UMC as service provider

To re-configure single sign-on for UMC on all UCS systems in the domain, run the following commands:

```
$ ucr set umc/saml/idp-server="https://${SSO_FQDN}/realms/ucs/protocol/saml/
→descriptor"
$ service slapd restart
```

For UCS systems joining the domain, configure a UCR policy and assign it the UCS systems before you install them. The UCR policy must set `umc/saml/idp-server` to your custom FQDN.

Configuration of UCS Portal to use external fully qualified domain name

As an example use case to expose the UCS portal to the internet, follow the steps below. Apply the steps on all UCS systems that expose the UCS portal to the internet and also on the UCS Primary Node.

1. Store the certificate files for the UCS portal in the following locations on your UCS system:
 - Certificate: `/etc/univention/ssl/${PORTAL_FQDN}/cert.pem`
 - Private key for the certificate: `/etc/univention/ssl/${PORTAL_FQDN}/private.key`
2. Configure the UCR variables to use the custom FQDN and the certificates:

```
$ SSO_FQDN=sso.internet.domain
$ PORTAL_FQDN=portal.internet.domain
$ ucr set umc/saml/sp-server="${PORTAL_FQDN}"
$ ucr set umc/saml/idp-server="https://${SSO_FQDN}/realms/ucs/protocol/saml/
→descriptor"
```

3. Run the join script to update the web server configuration:

```
$ univention-run-join-scripts \
--force \
--run-scripts 92univention-management-console-web-server.inst
```

8.2.2 External FQDN identical to internal UCS name

New in version 21.1.0-ucs1.

In this scenario the FQDN of the UCS system and the external name for accessing the UCS Portal are identical. Furthermore, the name for the single sign-on endpoint uses the same FQDN. To achieve this use a different URL path for the single sign-on endpoint, for example:

Internal name

portal.example.test

External name

portal.example.test

Single sign-on URL

portal.example.test/auth

Pre-conditions:

For this scenario, it's important to have the following setup in place, before you proceed:

1. You configured the external DNS entry for Keycloak, for example `portal.example.test`.
2. You have obtained proper SSL certificates for this name, for example with the **Let 's Encrypt** app from the App Center.

Warning: In this scenario the new **Keycloak** URL path must not be `/` to not override the global configuration of the web server.

Configuration of the identity provider

To configure this scenario run the following steps on each **Keycloak** instance in your UCS domain.

```
$ FQDN="portal.example.test"
$ SSO_PATH="/auth"
$ ucr set keycloak/server/sso/fqdn="$FQDN"
$ ucr set keycloak/server/sso/path="$SSO_PATH"
$ ucr set keycloak/server/sso/virtualhost=false
$ ucr set keycloak/server/sso/autoregistration=false

$ univention-app configure keycloak
```

Warning: After changing the configuration of the identity provider with the previous steps, all services can't use that identity provider until proper configuration.

Configuration of UMC as service provider

To re-configure single sign-on for UMC on all UCS systems in the domain, run the following commands:

```
$ FQDN="portal.example.test"
$ SSO_PATH="/auth"
$ ucr set \
  umc/saml/idp-server="https://${FQDN}${SSO_PATH}/realms/ucs/protocol/saml/
  ↪descriptor"
$ service slapd restart
```

For UCS systems joining the domain, configure a UCR policy and assign it the UCS systems before you install them. The UCR policy must set `umc/saml/idp-server` to your custom *SAML IDP* URL.

8.2.3 Official (Let ' s Encrypt) certificates for single sign-on

If the single sign-on endpoint is exposed to the internet, usually an official certificate for the server is required. This can be achieved with the **Let ' s Encrypt** app (but it is not required to use this app to create the official certificate).

Note: The examples below assume the **Let ' s Encrypt** was used to create the certificate. The actual filenames of the certificate and key can differ depending on which mechanism was used to create the certificate.

Dedicated FQDN for single sign-on endpoint

In case you use the **Let ' s Encrypt** app, you have to configure **Let ' s Encrypt** to acquire a certificate for both names, the UCS portal and **Keycloak**. Apply the following app settings for the **Let ' s Encrypt** app:

App setting	Value
Domain(s) to obtain a certificate for, separated by space	portal.extern.com auth. extern.com
Use certificate in Apache	yes

In this scenario the single sign-on endpoint has its own web server configuration, as web server virtual host. To configure the certificate files for **Keycloak**, set the following UCR variables:

Listing 8.1: Set UCR variables to use the Let's Encrypt certificate

```
$ cert_file="/etc/univention/letsencrypt/signed_chain.crt"
$ key_file="/etc/univention/letsencrypt/domain.key"
$ ucr set keycloak/apache2/ssl/certificate="$cert_file"
$ ucr set keycloak/apache2/ssl/key="$key_file"
$ systemctl reload apache2.service
```

Single sign-on FQDN identical to UCS Portal FQDN (or internal name)

If you use the **Let ' s Encrypt** app to generate the certificates, you need the following app settings for **Let ' s Encrypt**:

App Setting	Value
Domain(s) to obtain a certificate for, separated by space	portal.extern.com
Use certificate in Apache	yes

In this use case, the **Keycloak** app uses the global web server configuration. You can therefore use the standard UCR variables for the **Apache** certificate files as outlined in [Listing 8.2](#).

Listing 8.2: Assign certificates to web server configuration

```
$ cert_file="/etc/univention/letsencrypt/signed_chain.crt"
$ key_file="/etc/univention/letsencrypt/domain.key"
$ ucr set apache2/ssl/certificate="$cert_file"
$ ucr set apache2/ssl/key="$key_file"
$ systemctl reload apache2.service
```


TROUBLESHOOTING

When you encounter problems with the operation of the **Keycloak** app, this chapter provides information where you can look closer into and to get an impression about what is going wrong.

9.1 SAML assertion lifetime

By default, SAML assertions are valid for 300 seconds. Clients must renew them no later than that to continue using them. In scenarios where renewing SAML assertions at such short intervals is too expensive for clients or servers you have to increase the lifetime of SAML assertions.

To change SAML assertion lifespan of a client, you need to:

1. Open *Keycloak Admin Console* (page 4).
2. Navigate to *UCS realm* ▶ *Clients*.
3. Select the specific SAML `client-id` and go to *Advanced* ▶ *Advanced Settings*.
4. Set the appropriate value, for example 1 hour, in the section *Assertion Lifespan*.
5. Save your change by clicking on the *Save* button.

9.2 Log files

The **Keycloak** app produces different logging information in different places.

`/var/log/univention/appcenter.log`

Contains log information around activities in the App Center.

The App Center writes Keycloak relevant information to this file, when you run app lifecycle tasks like install, update and uninstall or when you change the app settings.

`/var/log/univention/join.log`

Contains log information from join processes. When the App Center installs Keycloak, the app also joins the domain.

Keycloak Docker container

The app uses the vanilla [Keycloak Docker image](https://quay.io/repository/keycloak/keycloak)²¹. The App Center runs the container. You can view log information from the Keycloak Docker container with the following command:

```
$ univention-app logs keycloak
```

Keycloak Admin Console

Offers to view event logs in *Events* in the *Manage* section. Administrators can see *Login Events* and *Admin Events*. For more information, see *Keycloak Server Administration Guide: Configuring auditing to track events* [13].

²¹ <https://quay.io/repository/keycloak/keycloak>

9.3 Debugging

To increase the log level for more log information for the **Keycloak** app, see *keycloak/log/level* (page 13).

This log level only affects the log information that Keycloak itself generates and writes to the Docker logs. The App Center sets the Docker container's `KEYCLOAK_LOGLEVEL` environment variable to the value of *keycloak/log/level* (page 13).

9.4 Configuration of single sign-on through external public domain

Administrators may encounter some problems when reconfiguring of the Univention Management Console and Keycloak for a custom FQDN. This section describes the most common problems that may occur.

9.4.1 Univention Management Console join script failure

During the run of the UMC (Univention Management Console) join script as described in *Configuration of UMC as service provider* (page 37), the join script may fail with the error code 3.

During the script run, the join script downloads the SAML metadata from the *SAML IDP* specified in `umc/saml/idp-server`. The download was unsuccessful. Check manually, for example with your web browser, if you can reach the metadata at `https://$SSO_FQDN/realms/ucs/protocol/saml/descriptor`. After you can load the metadata manually, run the following commands:

```
# Set the SAML metadata url
$ ucr set umc/saml/idp-server="https://${SSO_FQDN}/realms/ucs/protocol/saml/
↳descriptor"

# Execute the join script again
$ univention-run-join-scripts --force --run-scripts 92univention-management-
↳console-web-server.inst
```

9.4.2 Single sign-on session not refreshed

After a sign-in to the UCS portal through single sign-on, the portal passively refreshes the user session every five minutes. If the configuration of the Keycloak virtual host in the Apache web server is incorrect, the passive refresh doesn't work for the UCS portal or other services.

To allow external connections to Keycloak, you need to add the sources as space separated list to the UCR variable *keycloak/csp/frame-ancestors* (page 16).

Tip:

Recommendation

To test this behavior, use a private or incognito session in your web browser.

CHANGELOG

This changelog documents all notable changes to the **Keycloak** app. [Keep a Changelog](#)²² is the format and this project adheres to [Semantic Versioning](#)²³.

Please also consider the [upstream release notes](#)²⁴.

10.1 24.0.5-ucs1

Released: 14. June 2024

- The app updates to **Keycloak** version 24.0.5 (https://www.keycloak.org/docs/24.0.5/release_notes/).
- The Content Security Policy of Keycloak is expanded to allow <https://login.microsoftonline.com> as a frame ancestor. This is needed for proper Single Logout from Microsoft 365.
- The FQDN configured for Keycloak is now suggested as and passed to the container as lower case. This should fix some problems with mixed case domains caused by Keycloak checking its FQDN with case sensitivity.

10.2 24.0.3-ucs1

Released: 6. May 2024

- The app updates to **Keycloak** version 24.0.3 (https://www.keycloak.org/docs/24.0.0/release_notes/).
- From this version on **Keycloak** automatically redirects from the welcome page to the login page of the *Keycloak Admin Console*. The internal docker health check script has been changed to no longer expect the welcome page, but instead ask the **Keycloak** health endpoints (enabled by the option `--health-enabled=true`) for the status.

10.3 23.0.7-ucs1

Released: 6. April 2024

- The app updates to **Keycloak** version 23.0.7 of the upstream Docker image from <https://quay.io/repository/keycloak/keycloak>.
- The ad hoc federation feature has been removed from the App due to incompatibility with the new **Keycloak** version. If you used this feature in production, do not upgrade and contact the support of Univention.

²² <https://keepachangelog.com/en/1.0.0/>

²³ <https://semver.org/spec/v2.0.0.html>

²⁴ https://www.keycloak.org/docs/latest/release_notes/index.html

10.4 22.0.3-ucs2

Released: 20. December 2023

- Using an Oracle DB backend for **Keycloak** is no longer possible. The Oracle DB drivers that were provided by **Keycloak** have been removed. If you are currently using an Oracle DB as a backend for **Keycloak**, a migration according to ref:*app-database-custom* is necessary to continue using this app.
- The container of the **Keycloak** app has been changed from the upstream *Redhat ubi-micro-build* to the *ucs-base-image*, which is based on Debian.
- The **Keycloak** app added support for PostgreSQL 15 databases.
- The error messages shown during login using **Keycloak** have been adapted to show more detailed information in case an account is locked, expired or disabled.

10.5 22.0.3-ucs1

Released: 27. September 2023

- The app setting `keycloak/theme` has been removed. The UCS theme, controlled by the UCR variable `ucs/web/theme`²⁵ is now used.
- The **Keycloak** app supports configurable links below the login dialog on the login page.
- When opening the login page provided by **Keycloak** for the first time, the page shows a cookie banner, if the administrator has configured it. Users must accept the cookie banner, otherwise they can't continue to use **Keycloak**.
- The app updates to *Keycloak* version 22.0.3 of the upstream Docker image from <https://quay.io/repository/keycloak/keycloak>.

10.6 22.0.1-ucs1

Released: 30. August 2023

- The app updates to *Keycloak* version 22.0.1 of the upstream Docker image from <https://quay.io/repository/keycloak/keycloak>.

10.7 21.1.2-ucs2

Released: 18. August 2023

- The app can now be configured to restrict access to certain apps using group memberships. For more information about the configuration of this feature, see *Restrict access to applications* (page 22).
- If the *Keycloak* hostname is accessed using http, you are now directly redirected to https
- Due to longer replication times during password updates, it could happen that after a successful password update during the *Keycloak* login an error was shown. This has been fixed.

²⁵ <https://docs.software-univention.de/manual/5.0/en/appendix/variables.html#envvar-ucs-web-theme>

10.8 21.1.2-ucs1

Released: 19. July 2023

- The app updates to *Keycloak* version 21.1.2 of the upstream Docker image from <https://quay.io/repository/keycloak/keycloak>.

10.9 21.1.1-ucs1

Released: 5. July 2023

- The app updates to *Keycloak* version 21.1.1 of the upstream Docker image from <https://quay.io/repository/keycloak/keycloak>. See [release notes for Keycloak 21.1.0²⁶](#) for more details.
- The app now configures **Kerberos** ticket authentication through the web browser. For more information, see [Activating Kerberos authentication](#) (page 21).

10.10 21.0.1-ucs4

Released: 28. June 2023

- A Base64 *NameID* mapper has been added, to make the migration of the Microsoft365 connector to **Keycloak** possible.

10.11 21.0.1-ucs3

Released: 31. May 2023

- The UCR variable *keycloak/apache/config* (page 14) replaces the variable *ucs/server/sso/virtualhost*. In case you set *ucs/server/sso/virtualhost* to *false* to turn off the UCS web server configuration for **Keycloak**, set *keycloak/apache/config* (page 14) to *true* before the update.
- The app can use a different URL path for the single sign-on endpoint. For more information about the configuration, see [Single sign-on through external public domain name](#) (page 35).

10.12 21.0.1-ucs2

Released: 28. April 2023

- The **Keycloak** app can use an external fully qualified domain name. For more information about the configuration, see [Single sign-on through external public domain name](#) (page 35).

²⁶ https://www.keycloak.org/docs/latest/release_notes/index.html#keycloak-21-1-0

10.13 21.0.1-ucs1

Released: 19. April 2023

- From this version on the **Keycloak** app requires a CPU that supports the micro architecture level `x86-64-v2`. For more information, see [Univention Help 21420](#)²⁷.
- The app updates *Keycloak* to version 21.0.1 of the upstream Docker image from `keycloak / keycloak - Quay`²⁸. See [release notes for Keycloak 21.0.0](#)²⁹ for more details.
- Accessing the `userinfo` endpoint now requires inclusion of `openid` in the list of requested scopes. For background information, see [this upstream issue](#)³⁰.

10.14 19.0.2-ucs2

Released: 23. March 2023

- This release of the **Keycloak** app includes extensions for
 1. Univention LDAP mapper
 2. Univention Password reset
 3. Univention Self service
- **Keycloak** now checks the password expiry during the sign-in and presents a password change dialog if the password has expired.
- The app now offers a setting to deny the sign-in for unverified, self registered user accounts. For more information, see [use cases](#) (page 35).

10.15 19.0.1-ucs3

Released: 14. October 2022

- This release of the **Keycloak** app includes an extended version of the command line program **univention-keycloak**. Use it to directly create Keycloak *Client* configurations for *SAML Service Providers* and *OpenID Connect Relying Parties*.

10.16 19.0.1-ucs2

Released: 9. September 2022

- This release of the **Keycloak** app includes an SPI (Service Provider Interfaces) extension for so called ad-hoc federation. See the documentation for details.
- Administrators can install the app **Keycloak** on UCS 5.0-x UCS Primary Directory Nodes. For more information, see [Installation on UCS](#) (page 33).

²⁷ <https://help.univention.com/t/21420>

²⁸ <https://quay.io/repository/keycloak/keycloak>

²⁹ https://www.keycloak.org/docs/latest/release_notes/index.html#keycloak-21-0-0

³⁰ <https://github.com/keycloak/keycloak/issues/14184>

10.17 19.0.1-ucs1

Released: 7. September 2022

- The app now offers **univention-keycloak**, a command line program to configure *SAML SP* and *OIDC Provider* clients in *Keycloak* directly.
univention-keycloak simplifies the integration of client apps with *Keycloak* and the downloads of signing certificates for example as PEM file (see option groups `saml/idp/cert` or `oidc/op/cert`).
- **univention-keycloak** supports the setup of a 2FA authentication flow for the members of a specific LDAP group. The second factor is a time-based one-time password (TOTP) in this case.
- The app updates to *Keycloak* version 19.0.1 of the upstream Docker image from <https://quay.io/repository/keycloak/keycloak>.
- Administrators can install the app **Keycloak** on UCS 5.0-x UCS Primary Directory Nodes. For more information, see *Installation on UCS* (page 33).

10.18 18.0.0-ucs1

Released: 28. June 2022

- Initial release of the app.
- Administrators can install the **Keycloak** app on UCS 5.0-x Primary Directory Nodes.
- The app uses the upstream Docker image from <https://quay.io/repository/keycloak/keycloak>.

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