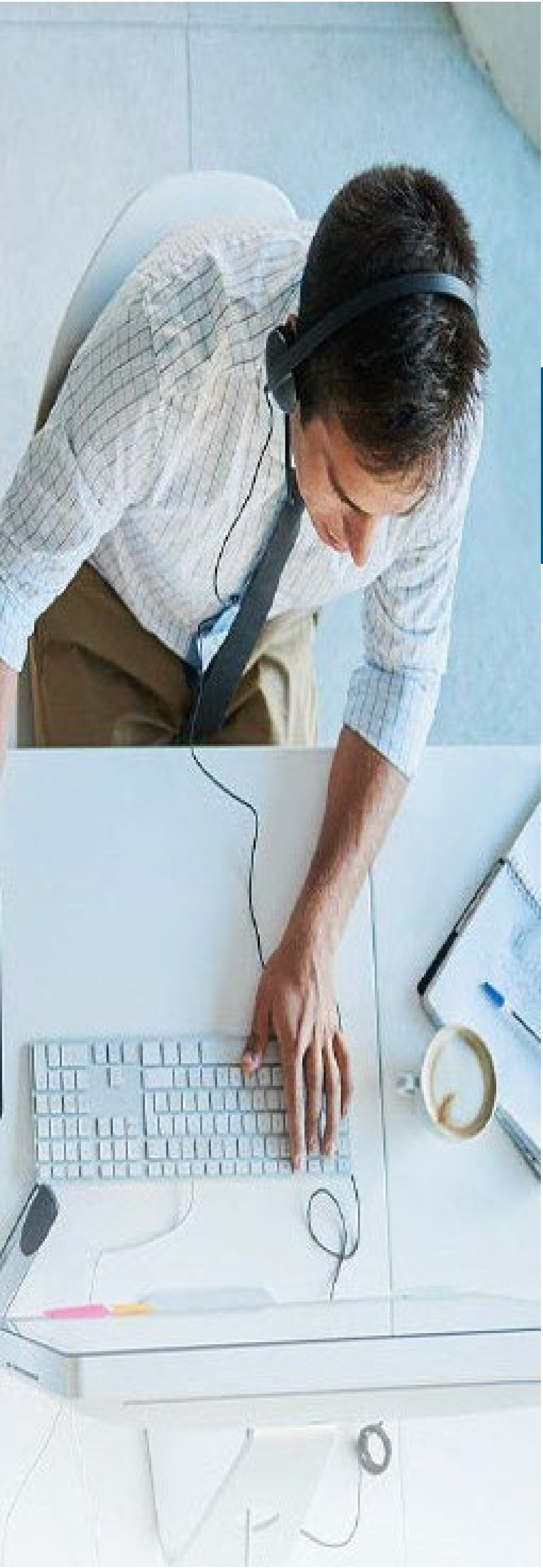


CALL RECORDING

Admin Guide

MOMENTUM

Powered By: MiaRec

UC24Q2

1. Introduction

This guide provides information of how to manage the Call Recording platform. It is targeted to administrator and engineers, who support and maintain the system.

This guide may cover optional ($) add-on features or tools that not all customers may purchase/use.

Please disregard or skip the sections related to tools that are not in use within your system.

2. Single Sign-On

2.1 About Single Sign-On

Single sign-on (SSO) is a session and user authentication service that permits a user to use one set of login credentials – for example, a name and password – to access multiple applications.
Call Recording currently supports the following Security SAML 2.0 compliant Identity Providers (IdP):

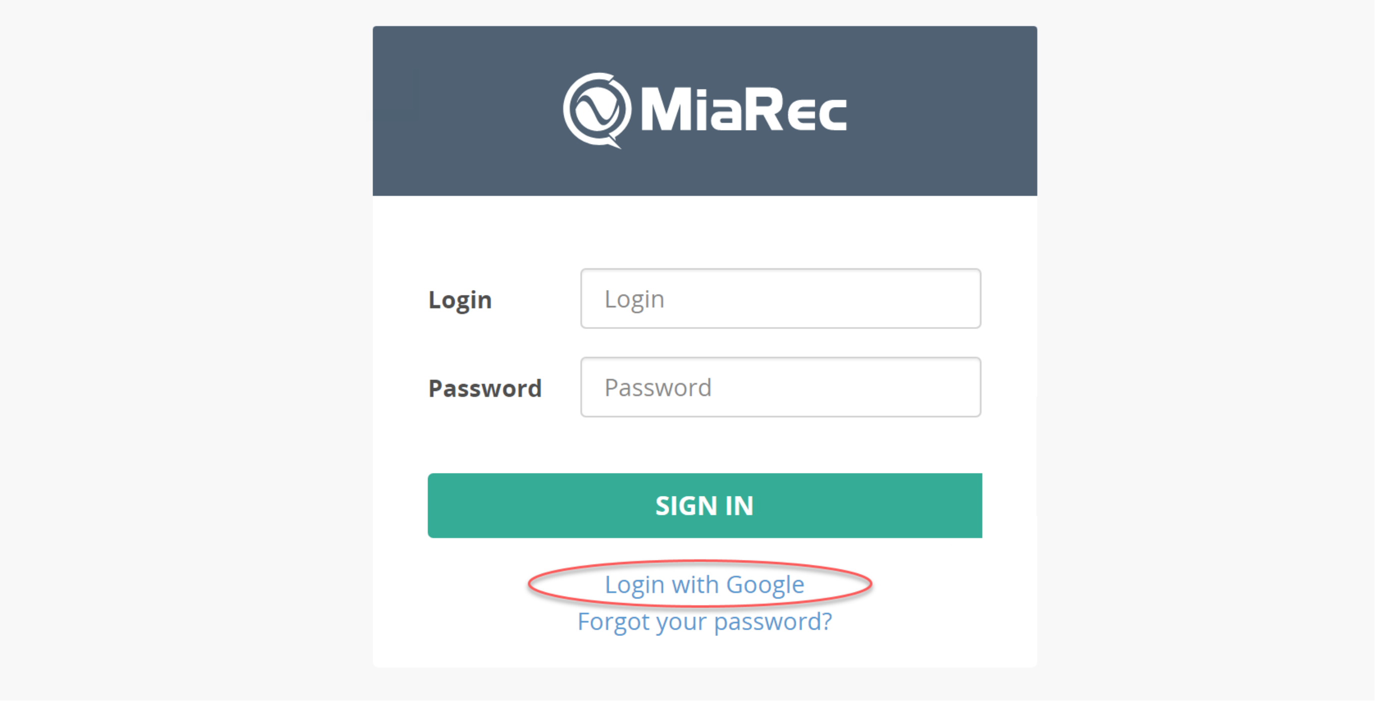
- OneLogin
- Azure AD
- Google G Suite

Other SAML 2.0 compliant Identity Providers may be supports as well, but not tested yet.

NOTE: Typical SSO access provided for Momentum customers/MSOs is via Cloud Services/DriveUC Portal.

2.2 How SAML works

Security Assertion Markup Language (SAML) is a standard protocol that gives identity providers (IdP) a secure way to let a service provider (SP) such as Call Recording know who a user is. It does this by sending Call Recording a cryptographically signed XML document confirming users' identities, along with some basic user information.



Once configured, users can authenticate with the following process:

1. The user navigates to your Call Recording account (e.g. https://recordings.example.com/).
2. Call Recording presents the user with an additional login option (Login with {name of your provider}).
3. When clicked, the user's browser will be redirected to the identity providers.
4. The identity provider authenticates the user.
5. Once authenticated, the browser is redirected to Call Recording with a SAML assertion.
6. Call Recording verifies the SAML assertion and locates the corresponding user record in internal DB.
7. The user is granted access to Call Recording.
8. The user is redirected to original link.

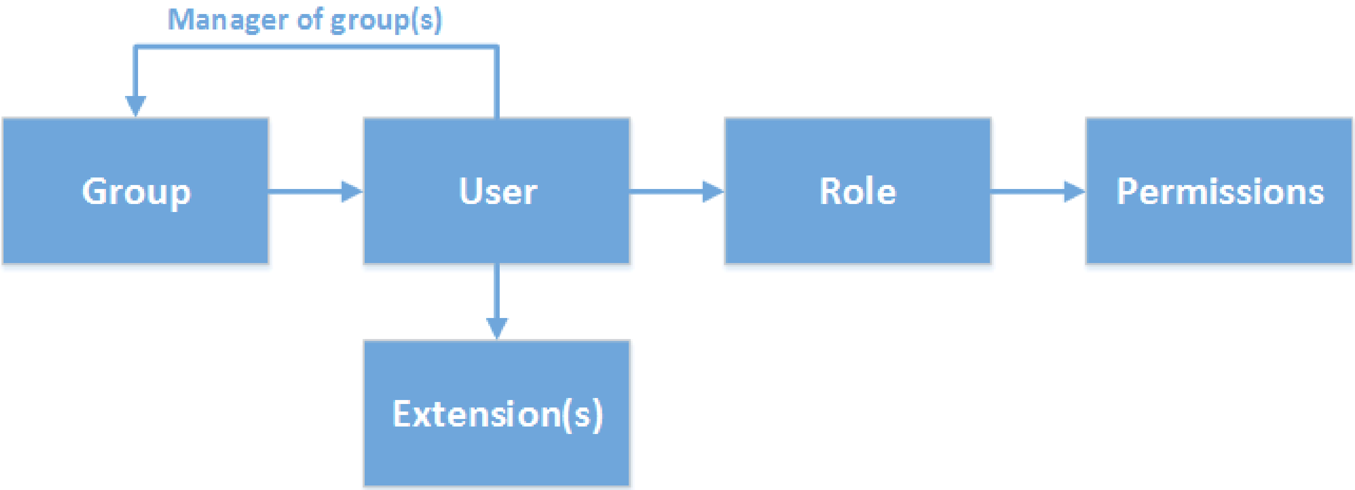
3. Two-step Verification

Two-step verification enhances security of web accounts. When activated, it requires two forms of identification to access the application: login credentials, and one-time passcode that is sent via text message (sms) to a registered phone number, email or Authy

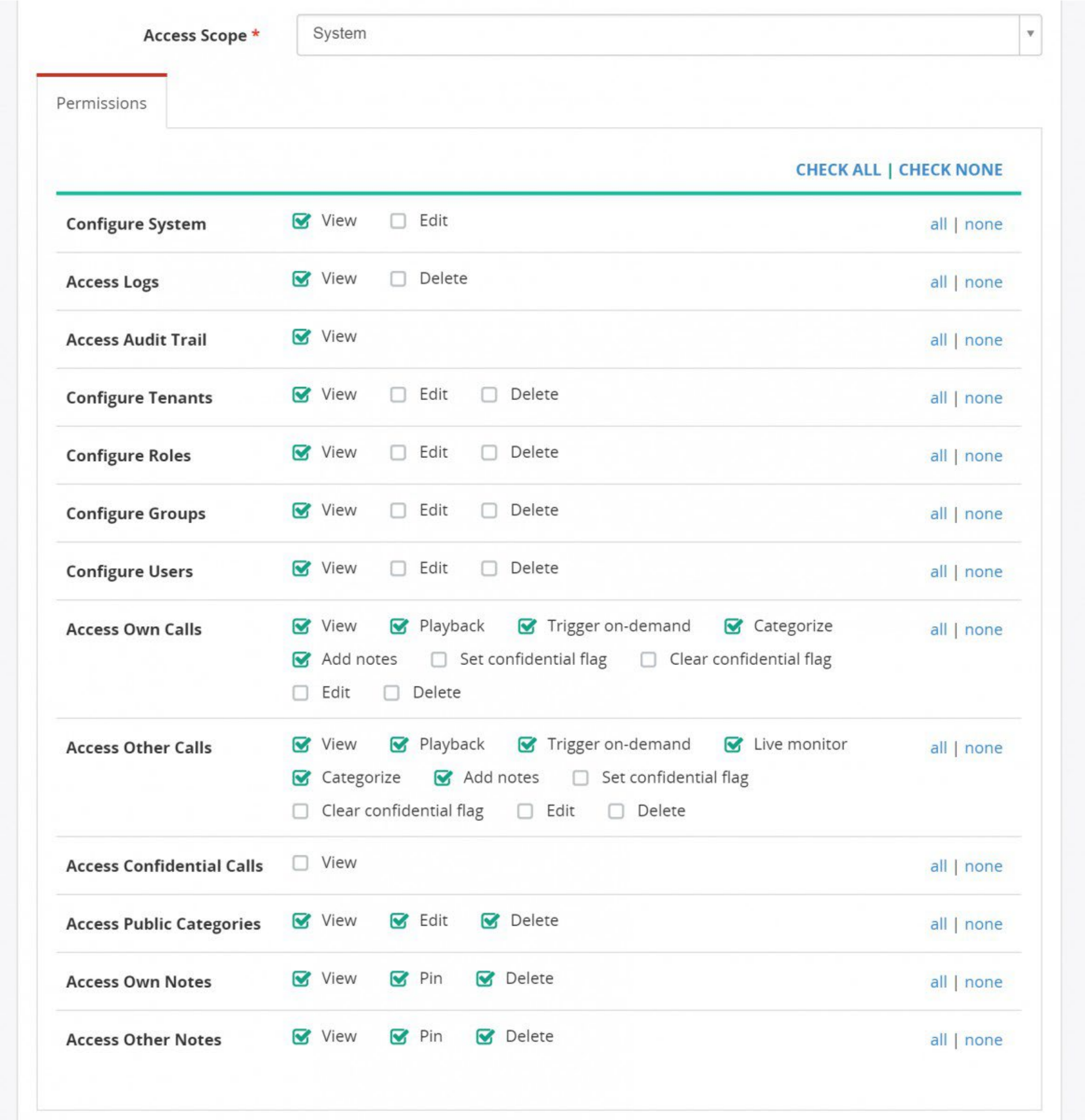
4. User Management

4.1 Understanding user roles and permissions

Call Recording software provides role-based access control feature with granular permissions. Each user account is associated with one role. And each role is configured with a set of permissions.



Each role is associated with a set of permissions, which are granted to users of this role. Permissions include such privileges like "Configure System", "Configure Users", "Playback calls", "Delete calls" etc.



Access Scope * System

Permissions

CHECK ALL | CHECK NONE

Configure System	☑ View ☐ Edit	all | none
Access Logs	☑ View ☐ Delete	all | none
Access Audit Trail	☑ View	all | none
Configure Tenants	☑ View ☐ Edit ☐ Delete	all | none
Configure Roles	☑ View ☐ Edit ☐ Delete	all | none
Configure Groups	☑ View ☐ Edit ☐ Delete	all | none
Configure Users	☑ View ☐ Edit ☐ Delete	all | none
Access Own Calls	☑ View ☑ Playback ☑ Trigger on-demand ☑ Categorize ☑ Add notes ☐ Set confidential flag ☐ Clear confidential flag ☐ Edit ☐ Delete	all | none
Access Other Calls	☑ View ☑ Playback ☑ Trigger on-demand ☑ Live monitor ☑ Categorize ☑ Add notes ☐ Set confidential flag ☐ Clear confidential flag ☐ Edit ☐ Delete	all | none
Access Confidential Calls	☐ View	all | none
Access Public Categories	☑ View ☑ Edit ☑ Delete	all | none
Access Own Notes	☑ View ☑ Pin ☑ Delete	all | none
Access Other Notes	☑ View ☑ Pin ☑ Delete	all | none

By default, the following roles are pre-created in Call Recording system, but administrator may create new roles or modify existing ones:

Root Administrator — Users of this role have unlimited access to system.

Administrator — Users of this role have a set of permissions as configured by Root Administrator. By default users of type Administrator can create/edit other user accounts.

Supervisor — This role has access to call recordings, which are associated with users in his/her managed group(s). They cannot create/edit other user accounts.

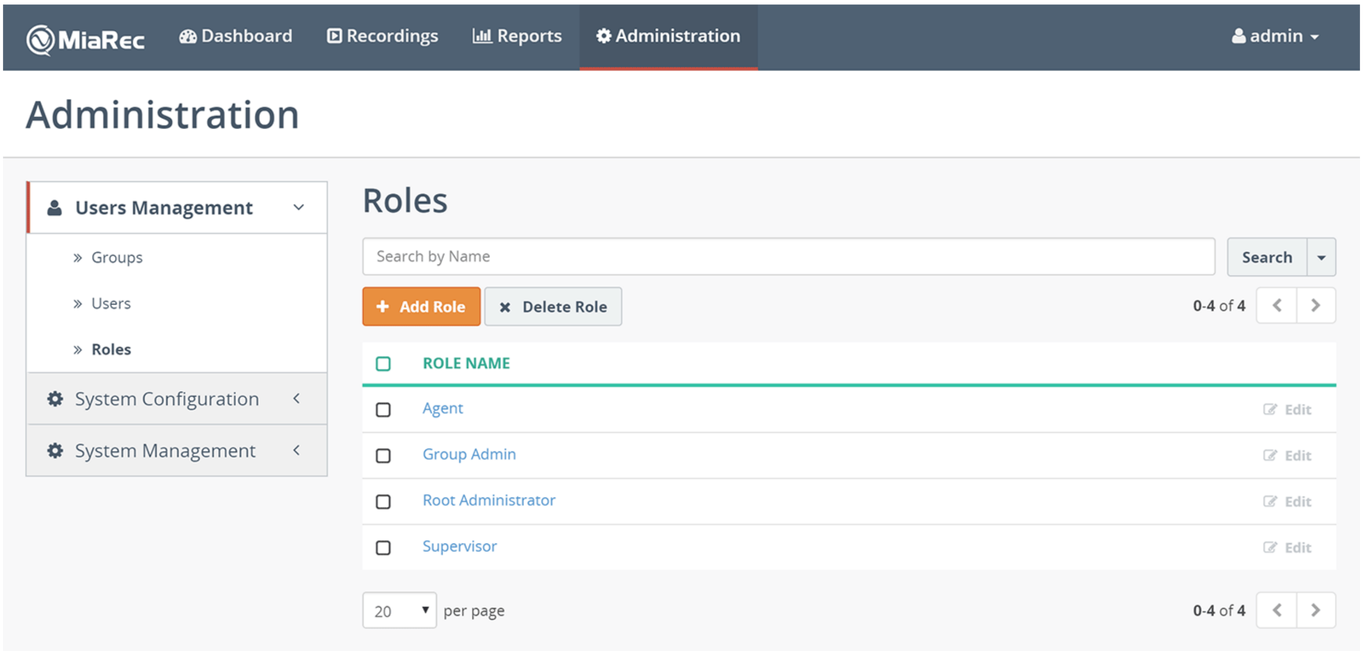
Agent — Agents have access to own call recordings only.

4.2 Roles

Each user in Call Recording system should be assigned a role. The role defines what system resources are accessible by user and what operations are permitted on these resources.

List of roles

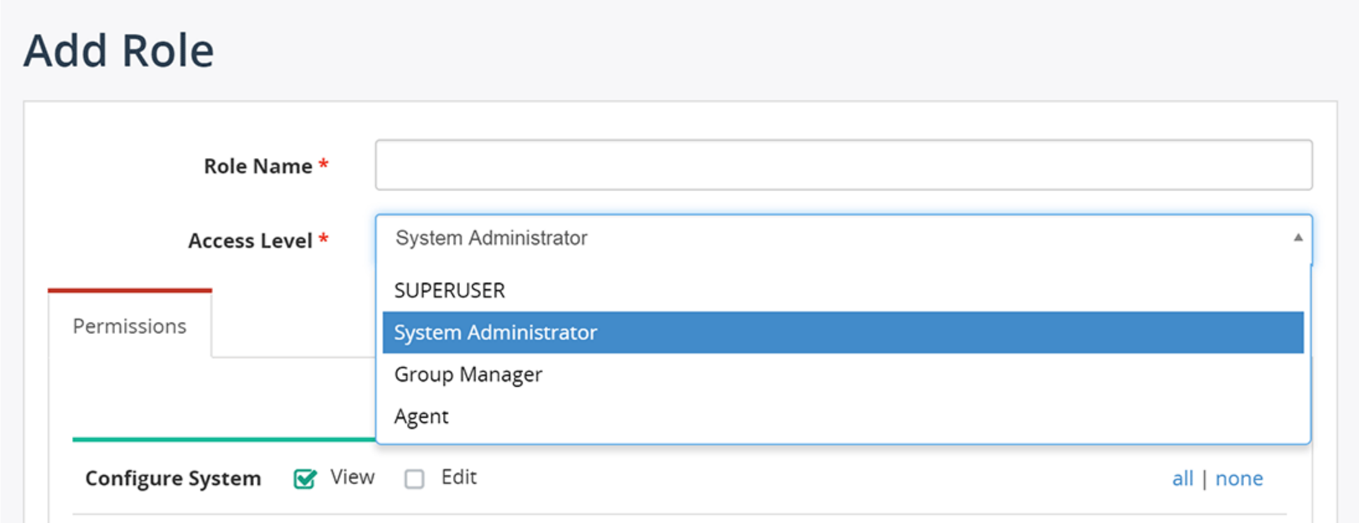
Navigate menu **Administration -> Users Management -> Roles** to see a list of available roles. During installation Call Recording automatically pre-creates a few roles. Administrator may create new roles or modify existing ones.



□	ROLE NAME	
□	Agent	Edit
□	Group Admin	Edit
□	Root Administrator	Edit
□	Supervisor	Edit

Configure access scope

Access scope setting specifies which resources are accessible by user of such role.



Role Name *

Access Level * System Administrator

- SUPERUSER
- System Administrator
- Group Manager
- Agent

Configure System ☑ View □ Edit

Access scope	Description
SUPERUSER	User with such role has unrestricted access to the system.
System	User with such role has access to all resources on the system (users, groups, calls), but the operations are restricted by permissions. One exception from this rule is when multi-tenancy is enabled and user belongs to particular tenant account. In this case access is limited to tenant resources only.
Managed Groups	User with such role has access only to resources within the managed groups. A list of managed groups is configured in user's profile. The group manager may see only users and their calls, for which he/she is a manager. Other users/calls are not visible to group manager.
User	User with such role has access only to own call recordings.

Configure permissions

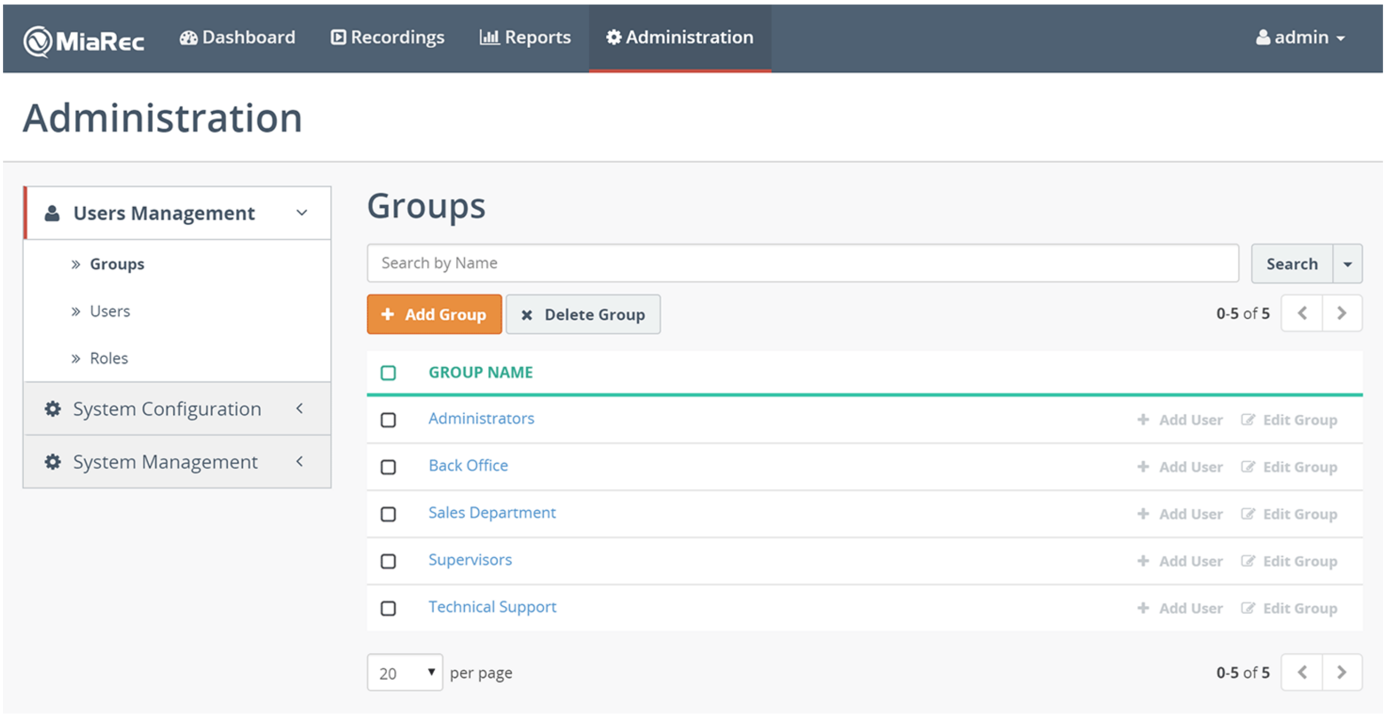
Permissions setting specifies what operations are permitted on the accessible resources. These operations include view, edit, delete, playback etc.

4.3 Groups

Each user should belong to one of groups. Most of users are just members of their group, but some of users may be managers of groups. A single user may be a manager of multiple groups at the same time.

List of groups

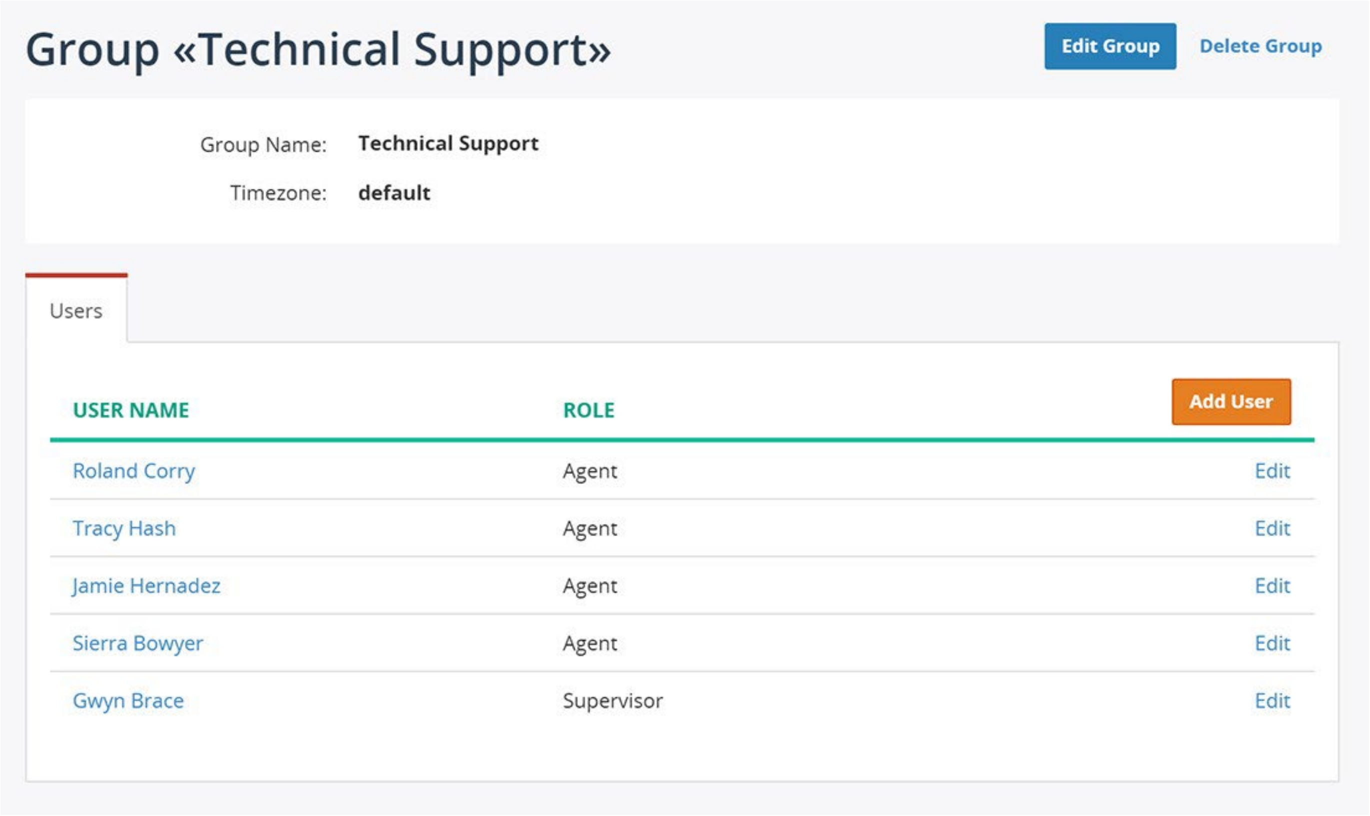
Navigate menu Administration -> Users Management -> Groups to see a list of available groups. During installation Call Recording automatically pre-creates a few sample groups. Administrator may create new groups or edit existing ones.



□	GROUP NAME		
□	Administrators	+ Add User	Edit Group
□	Back Office	+ Add User	Edit Group
□	Sales Department	+ Add User	Edit Group
□	Supervisors	+ Add User	Edit Group
□	Technical Support	+ Add User	Edit Group

View group

The group's profile page displays a list of all users, who are member of this group.



Group «Technical Support»

Group Name: **Technical Support**

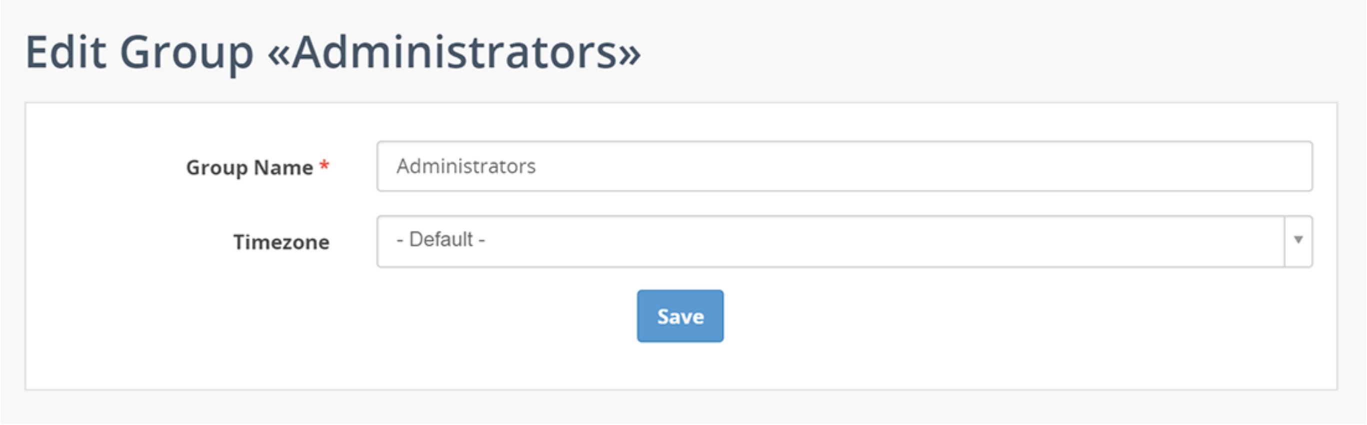
Timezone: **default**

USER NAME	ROLE	
Roland Corry	Agent	Edit
Tracy Hash	Agent	Edit
Jamie Hernadez	Agent	Edit
Sierra Bowyer	Agent	Edit
Gwyn Brace	Supervisor	Edit

Edit group settings

Configuration of group includes the following options:

- **Group name**
- **Timezone**, which will be used by default for each user in this group. The timezone setting may be overridden on user's profile page.



Edit Group «Administrators»

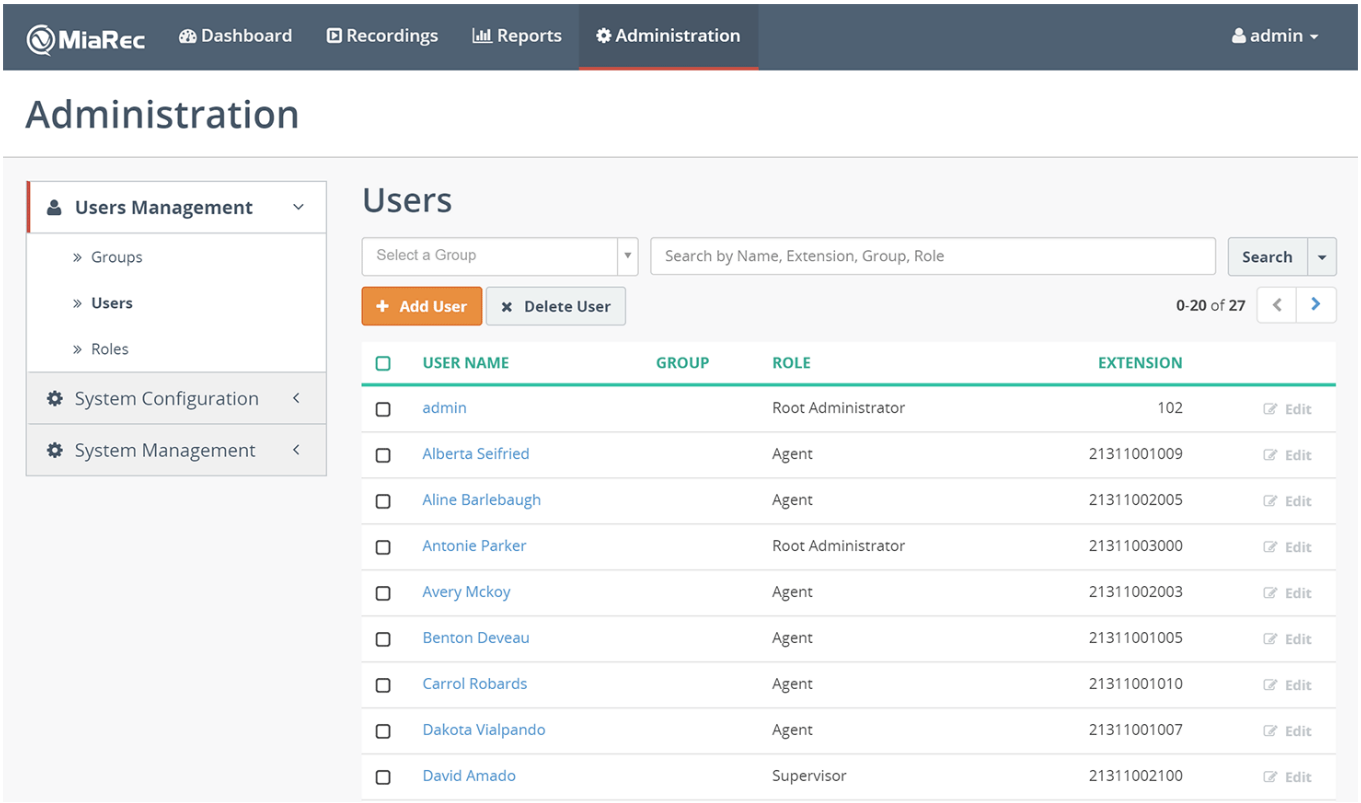
Group Name *: Administrators

Timezone: - Default -

4.4 Users

List of users

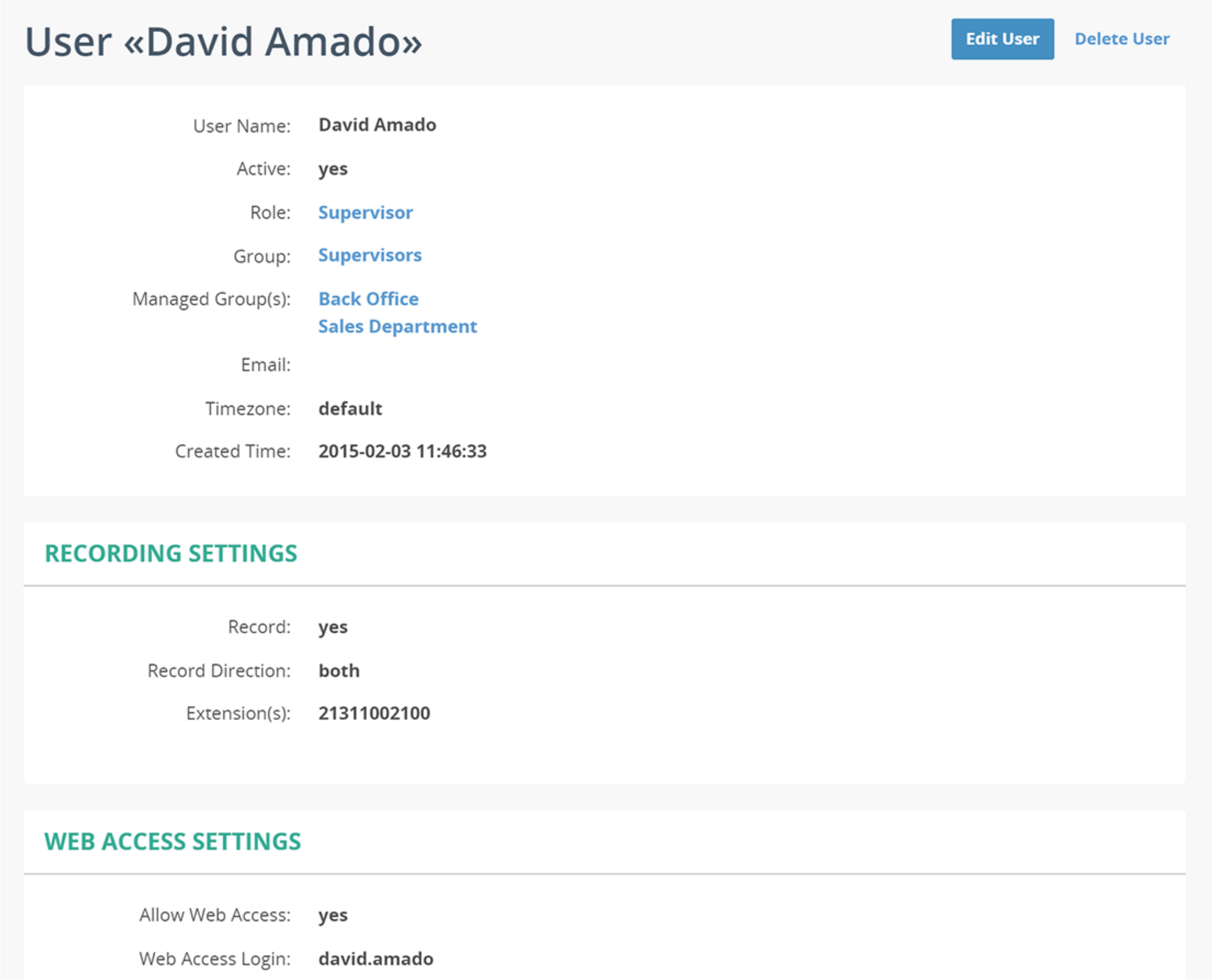
Navigate menu **Administration -> Users Management -> Users** to see a list of users. You can search users by name, group, role or extension.



□	USER NAME	GROUP	ROLE	EXTENSION	
□	admin		Root Administrator	102	Edit
□	Alberta Seifried		Agent	21311001009	Edit
□	Aline Barlebaugh		Agent	21311002005	Edit
□	Antonie Parker		Root Administrator	21311003000	Edit
□	Avery Mckoy		Agent	21311002003	Edit
□	Benton Deveau		Agent	21311001005	Edit
□	Carrol Robards		Agent	21311001010	Edit
□	Dakota Vialpando		Agent	21311001007	Edit
□	David Amado		Supervisor	21311002100	Edit

]

View user



User «David Amado»

User Name:	David Amado
Active:	yes
Role:	Supervisor
Group:	Supervisors
Managed Group(s):	Back Office Sales Department
Email:	
Timezone:	default
Created Time:	2015-02-03 11:46:33

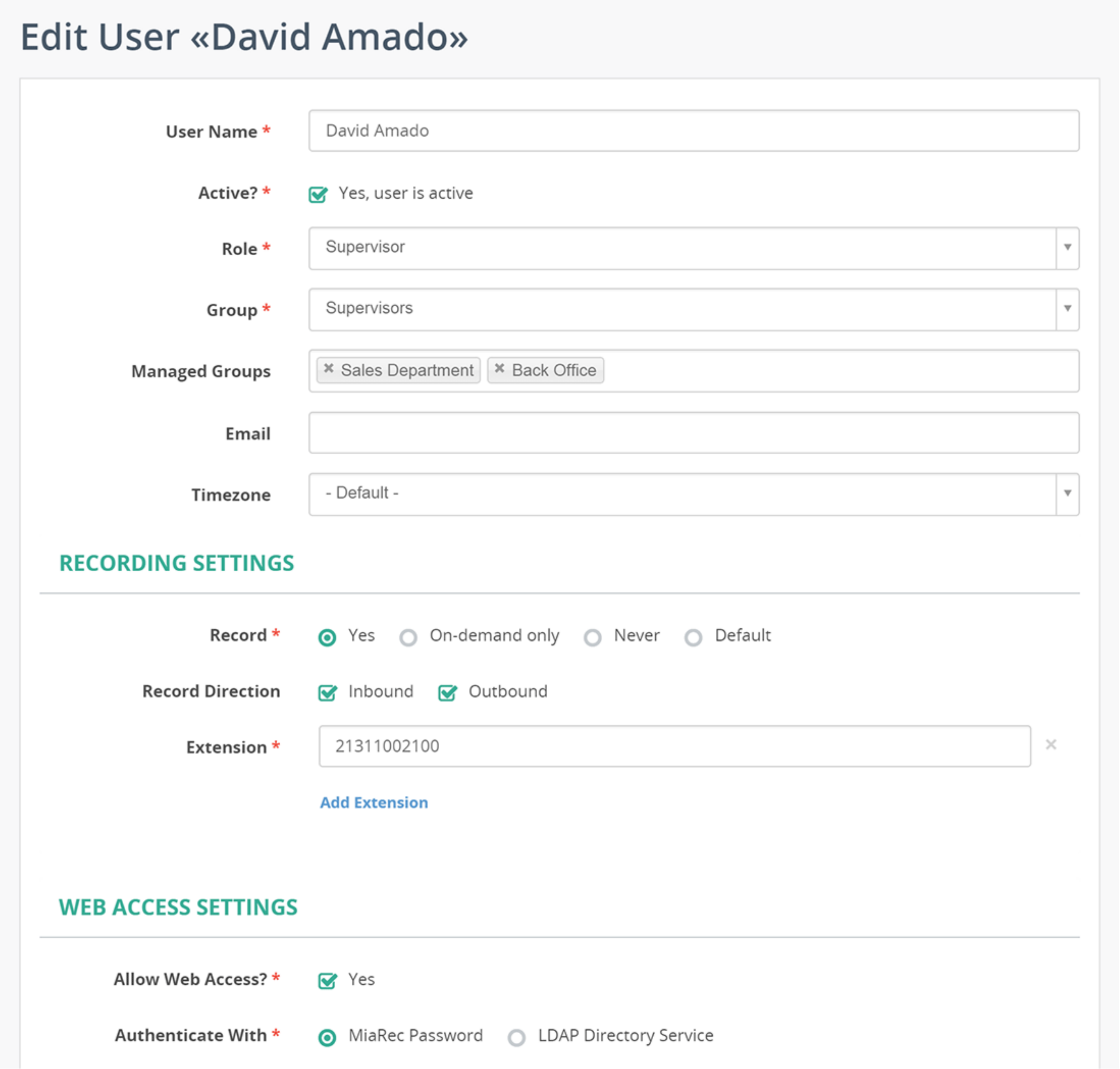
RECORDING SETTINGS

Record:	yes
Record Direction:	both
Extension(s):	21311002100

WEB ACCESS SETTINGS

Allow Web Access:	yes
Web Access Login:	david.amado

Add/edit user



Edit User «David Amado»

User Name *	David Amado
Active? *	☑ Yes, user is active
Role *	Supervisor
Group *	Supervisors
Managed Groups	× Sales Department × Back Office
Email	
Timezone	- Default -

RECORDING SETTINGS

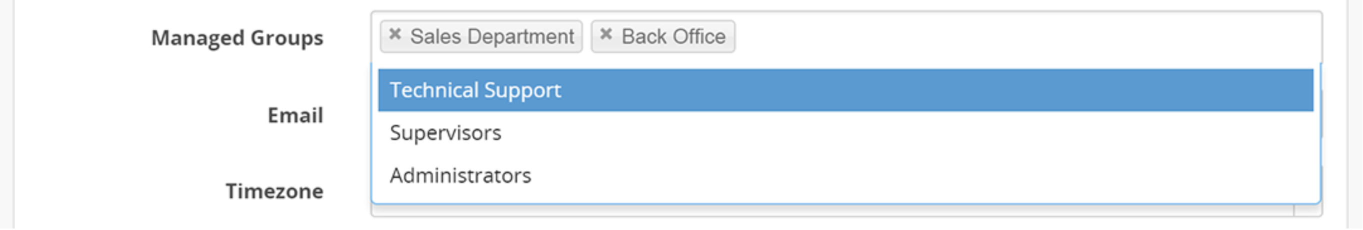
Record *	● Yes ○ On-demand only ○ Never ○ Default
Record Direction	☑ Inbound ☑ Outbound
Extension *	21311002100

WEB ACCESS SETTINGS

Allow Web Access? *	☑ Yes
Authenticate With *	● MiaRec Password ○ LDAP Directory Service

Managed groups

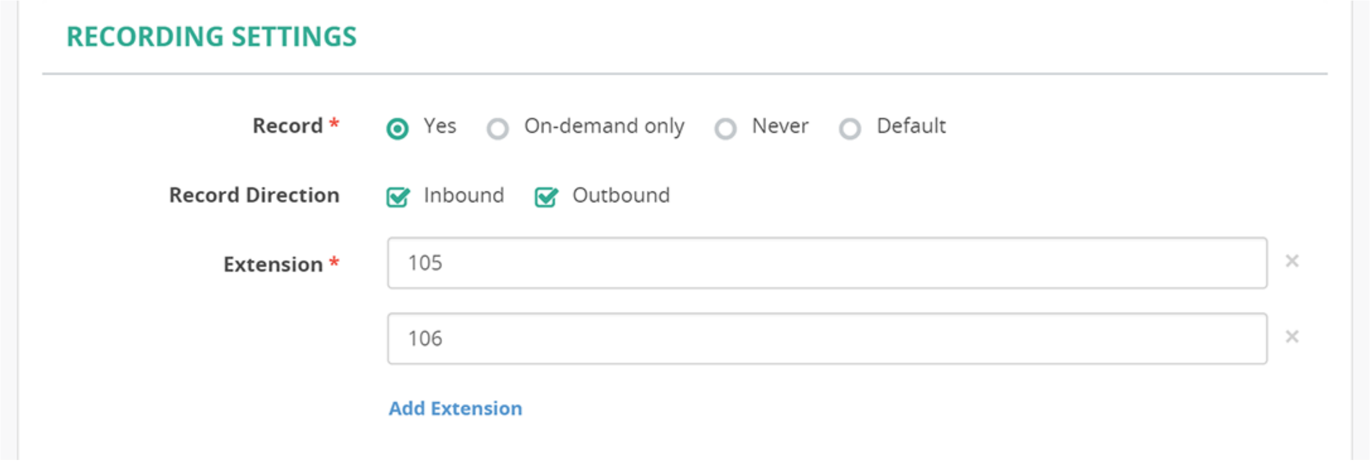
If the user's role has access level "Group Manager", then you can configure which groups are managed by this user. The group manager has access only to users and their calls recordings, which belong to his managed groups. You may select one or more managed groups from a list.



Managed Groups: × Sales Department × Back Office

Recording settings

If it is necessary to record such user, then you need to specify which extensions are assigned to this user. Call Recording uses the extensions configuration to automatically associate call recordings with users. One user may have more than one extension.

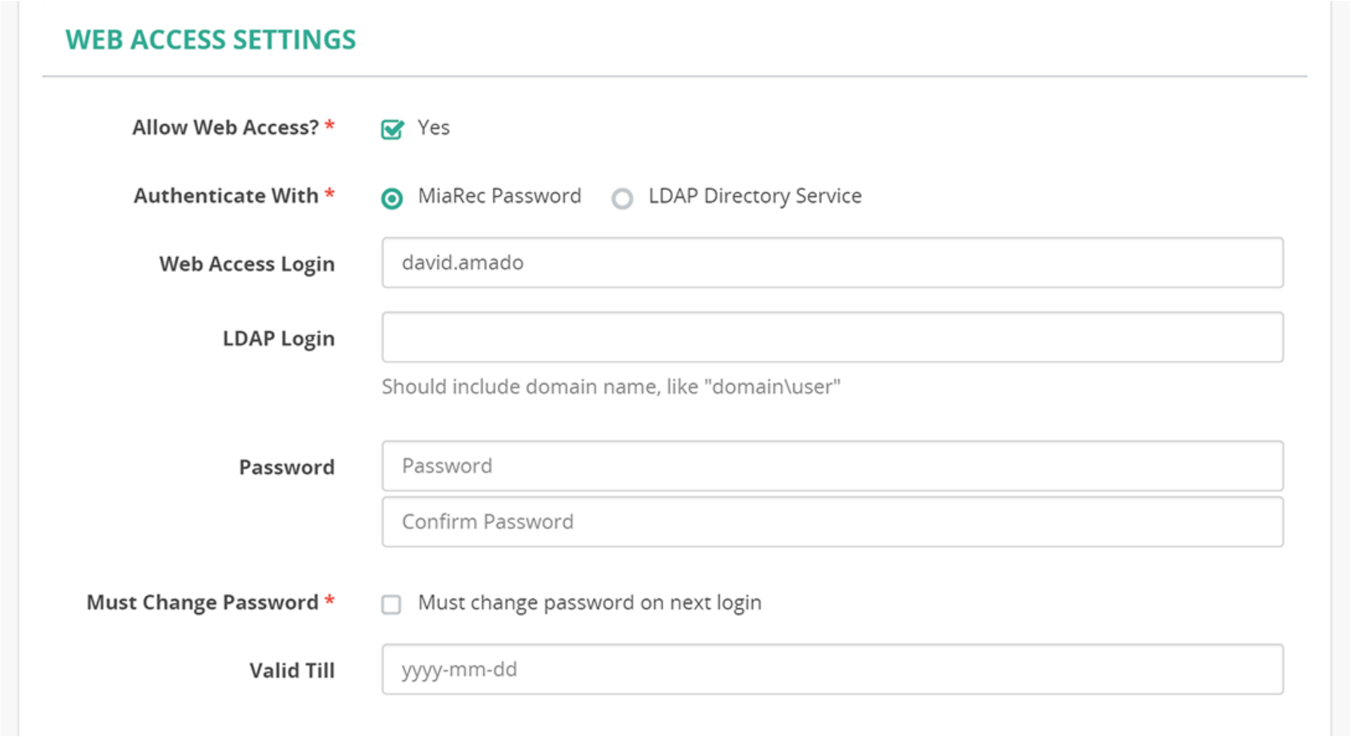


RECORDING SETTINGS

Record *	● Yes ○ On-demand only ○ Never ○ Default
Record Direction	☑ Inbound ☑ Outbound
Extension *	105 ×
	106 ×
	Add Extension

Web access settings

If the user needs access to Call Recording web portal, then administrator may create login for him/her.

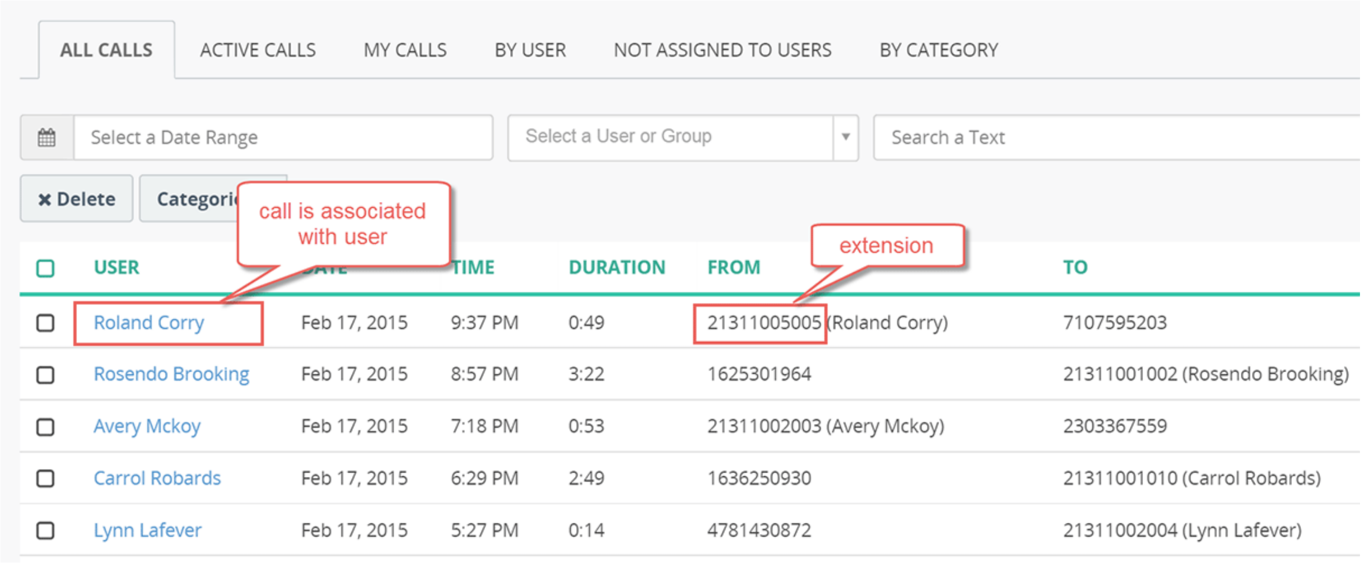


WEB ACCESS SETTINGS

Allow Web Access? *	☑ Yes
Authenticate With *	● MiaRec Password ○ LDAP Directory Service
Web Access Login	david.amado
LDAP Login	 Should include domain name, like "domain\user"
Password	Password Confirm Password
Must Change Password *	□ Must change password on next login
Valid Till	yyyy-mm-dd

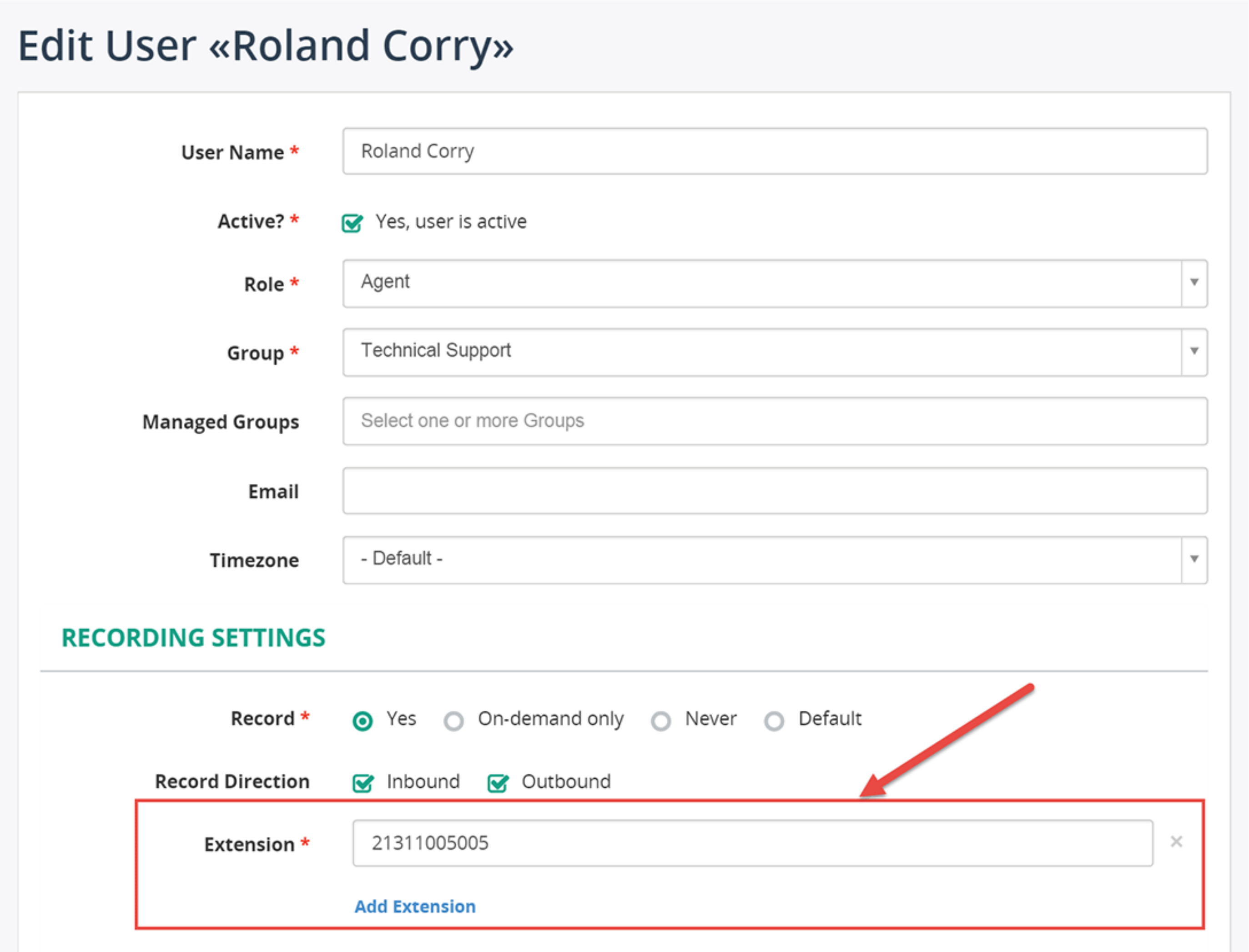
4.5 Associating calls with users

Call Recording automatically associates calls to users based on user's extension.



☐	USER	DATE	TIME	DURATION	FROM	TO
☐	Roland Corry	Feb 17, 2015	9:37 PM	0:49	21311005005 (Roland Corry)	7107595203
☐	Rosendo Brooking	Feb 17, 2015	8:57 PM	3:22	1625301964	21311001002 (Rosendo Brooking)
☐	Avery Mckoy	Feb 17, 2015	7:18 PM	0:53	21311002003 (Avery Mckoy)	2303367559
☐	Carrol Robards	Feb 17, 2015	6:29 PM	2:49	1636250930	21311001010 (Carrol Robards)
☐	Lynn Lafever	Feb 17, 2015	5:27 PM	0:14	4781430872	21311002004 (Lynn Lafever)

Administrator should configure extension on user's profile page. In below screenshot user "Roland Corry" is configured with extension "21311005005". When Call Recording recognizes a call with extension "21311005005", then such call is automatically associated with user "Roland Corry".
Such call association allows quick filtering of calls by user name. Also, this information is used when granting access to recordings. For example, supervisor will be able to view only call recordings, which are associated with users in his/her group.



Edit User «Roland Corry»

User Name * Roland Corry

Active? * ☑ Yes, user is active

Role * Agent

Group * Technical Support

Managed Groups Select one or more Groups

Email

Timezone - Default -

RECORDING SETTINGS

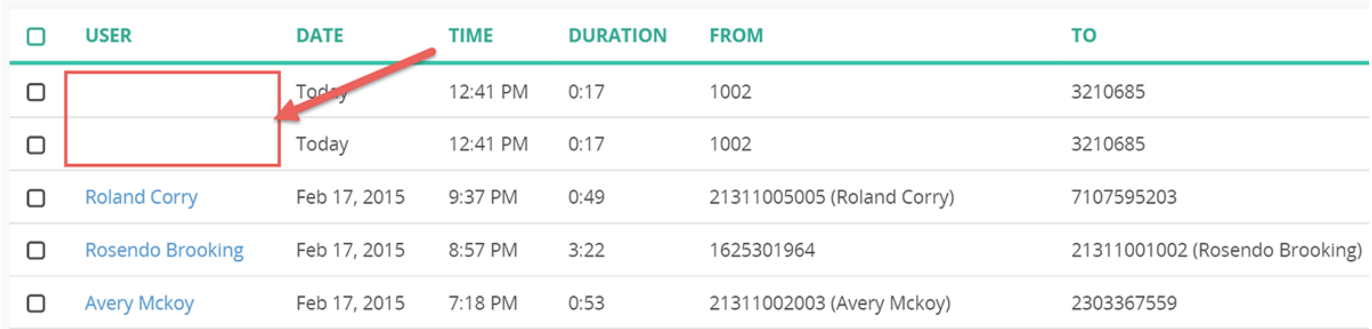
Record * ● Yes ○ On-demand only ○ Never ○ Default

Record Direction ☑ Inbound ☑ Outbound

Extension * 21311005005 ×

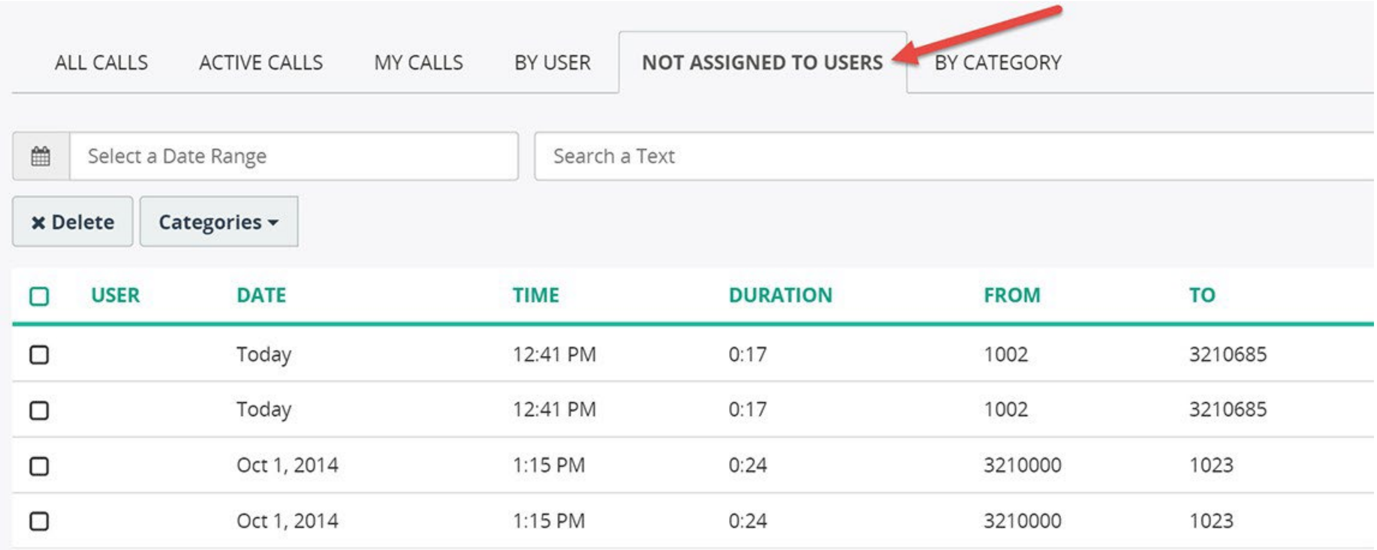
Managing unknown extensions

If Call Recording doesn't recognize extension for newly recorded call, then a default recording rule applies for the call. By default, Call Recording is configured to record such unknown calls, but this behavior may be changed by administrator (see section [Filters::OnCallStart] inside configuration file Call Recording.ini).
When call with unknown extension is recorded, then the column "User" will be empty (as shown in below screenshot).



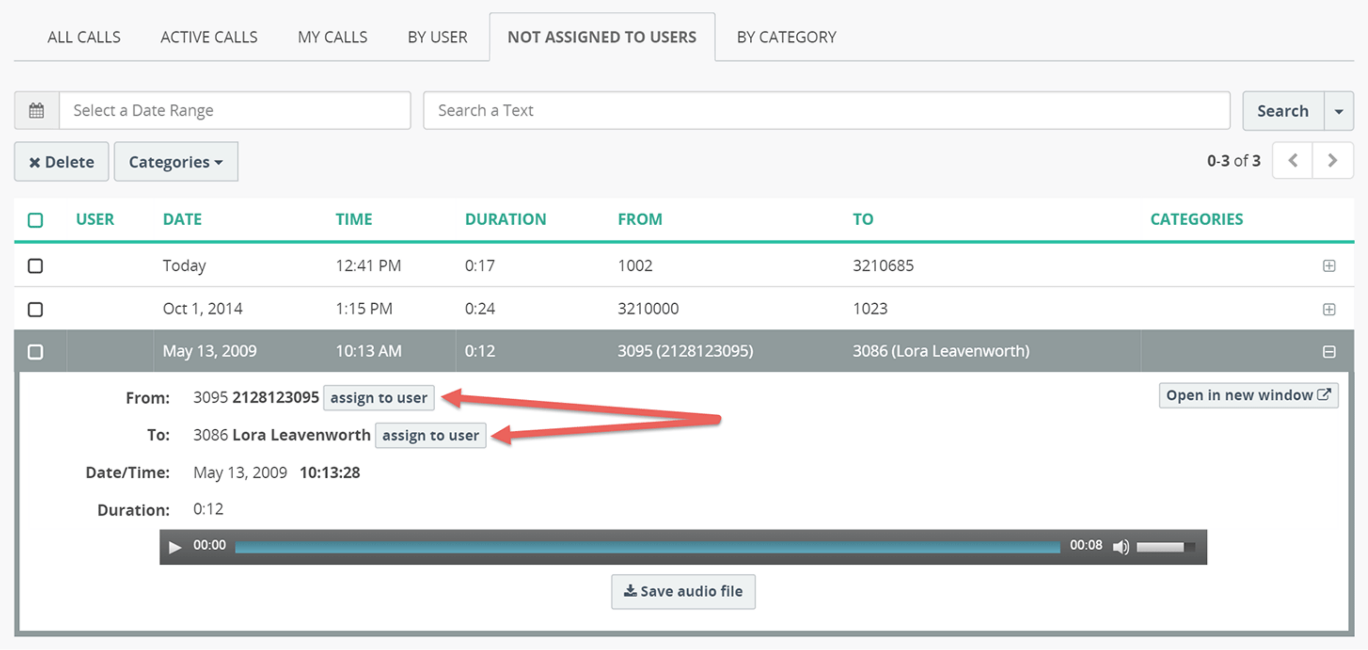
□	USER	DATE	TIME	DURATION	FROM	TO
□		Today	12:41 PM	0:17	1002	3210685
□		Today	12:41 PM	0:17	1002	3210685
□	Roland Corry	Feb 17, 2015	9:37 PM	0:49	21311005005 (Roland Corry)	7107595203
□	Rosendo Brooking	Feb 17, 2015	8:57 PM	3:22	1625301964	21311001002 (Rosendo Brooking)
□	Avery Mckoy	Feb 17, 2015	7:18 PM	0:53	21311002003 (Avery Mckoy)	2303367559

Also, these calls are shown in panel "**Not assigned to users**" (visible only to administrators).



☐	USER	DATE	TIME	DURATION	FROM	TO
☐		Today	12:41 PM	0:17	1002	3210685
☐		Today	12:41 PM	0:17	1002	3210685
☐		Oct 1, 2014	1:15 PM	0:24	3210000	1023
☐		Oct 1, 2014	1:15 PM	0:24	3210000	1023

Administrator can manually assign the call to one of existing users. First, he needs to click on a call to display call details. Then he needs to click on button "Assign to user".



☐	USER	DATE	TIME	DURATION	FROM	TO	CATEGORIES
☐		Today	12:41 PM	0:17	1002	3210685	⊞
☐		Oct 1, 2014	1:15 PM	0:24	3210000	1023	⊞
☐		May 13, 2009	10:13 AM	0:12	3095 (2128123095)	3086 (Lora Leavenworth)	⊟

From: 3095 **2128123095** assign to user

To: 3086 **Lora Leavenworth** assign to user

Date/Time: May 13, 2009 **10:13:28**

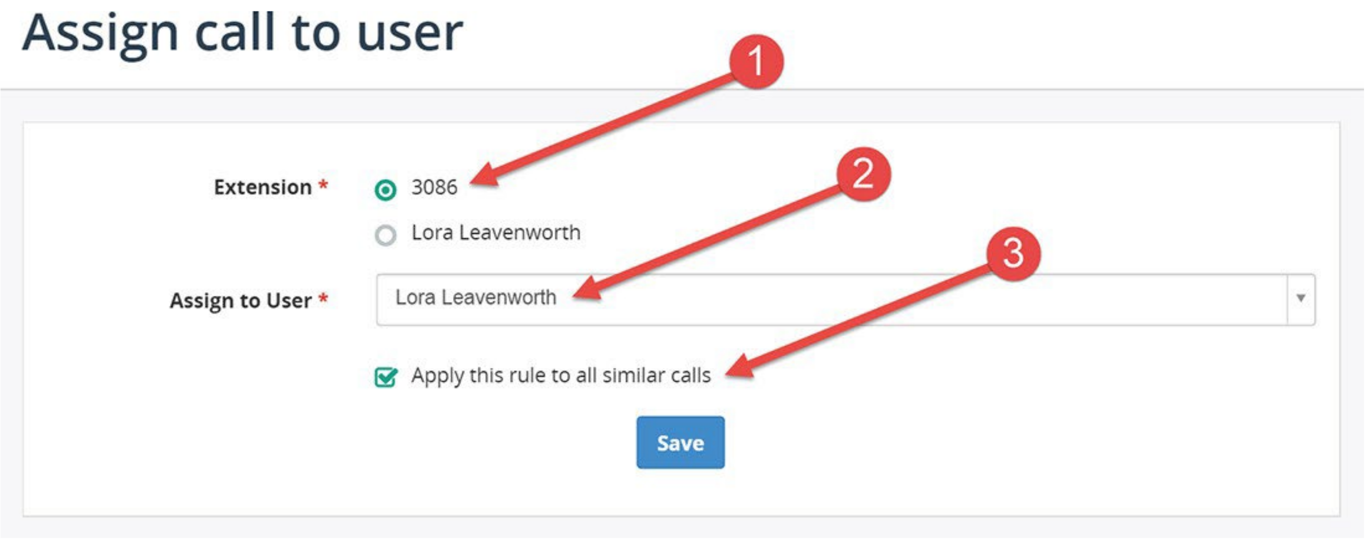
Duration: 0:12

New page will be opened with the following options:

Extension: Administrator should decide whether to use phone number or optional phone name to associate calls to users.

Assign to User: The user to associate this call with.

Apply this rule to all similar calls: When checked, then other calls with the same extension will be automatically assigned to this user. Note, Call Recording will search only calls, which are not assigned yet to any of users.



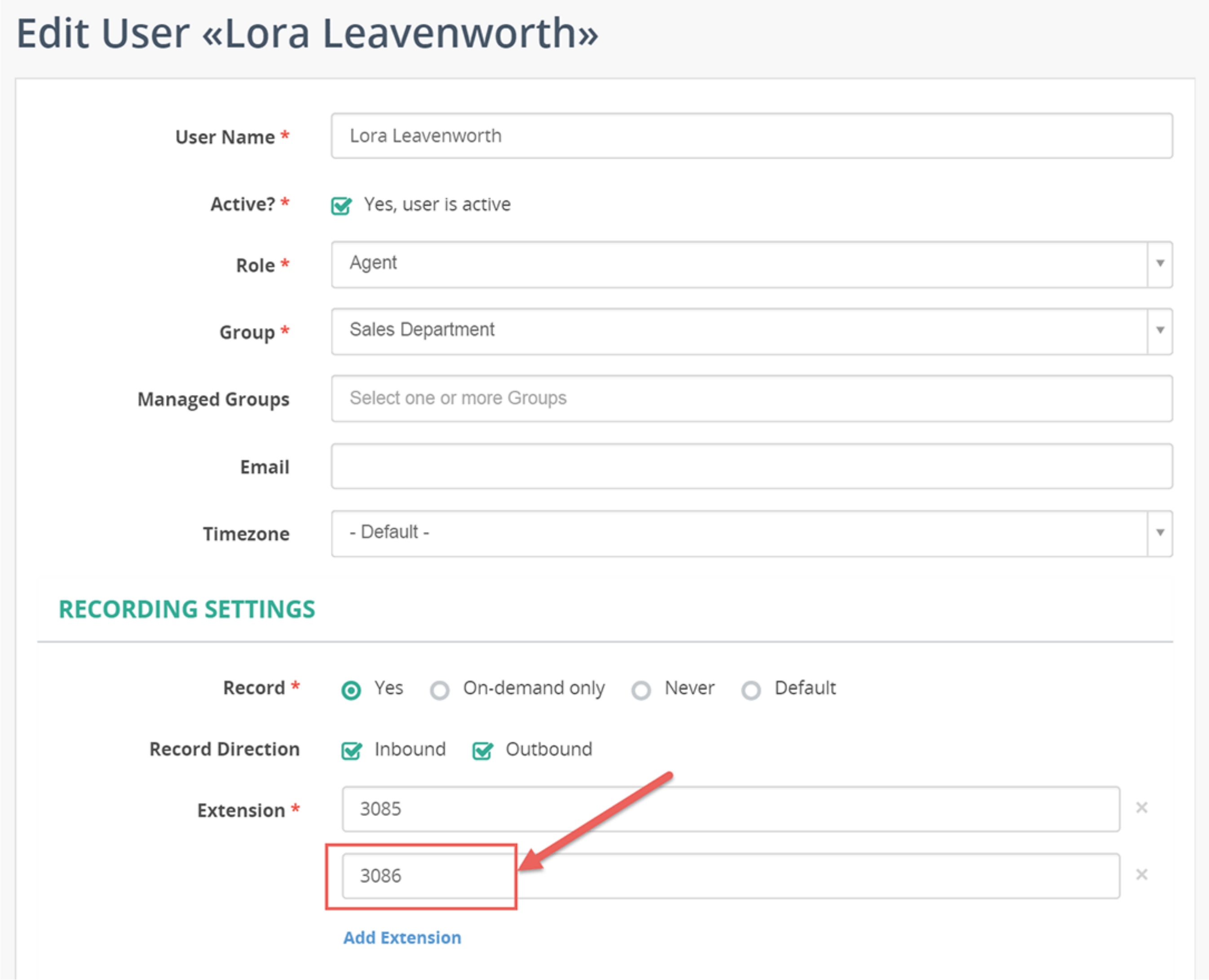
Assign call to user

Extension * ● 3086 ○ Lora Leavenworth

Assign to User * Lora Leavenworth

☑ Apply this rule to all similar calls

Upon clicking the on "Save" button the recorded calls will be searched and automatically assigned to the selected user. Additionally, the selected extension will be automatically added to user (as shown in below screenshot).



Edit User «Lora Leavenworth»

User Name * Lora Leavenworth

Active? * ☑ Yes, user is active

Role * Agent

Group * Sales Department

Managed Groups Select one or more Groups

Email

Timezone - Default -

RECORDING SETTINGS

Record * ● Yes ○ On-demand only ○ Never ○ Default

Record Direction ☑ Inbound ☑ Outbound

Extension * 3085

3086

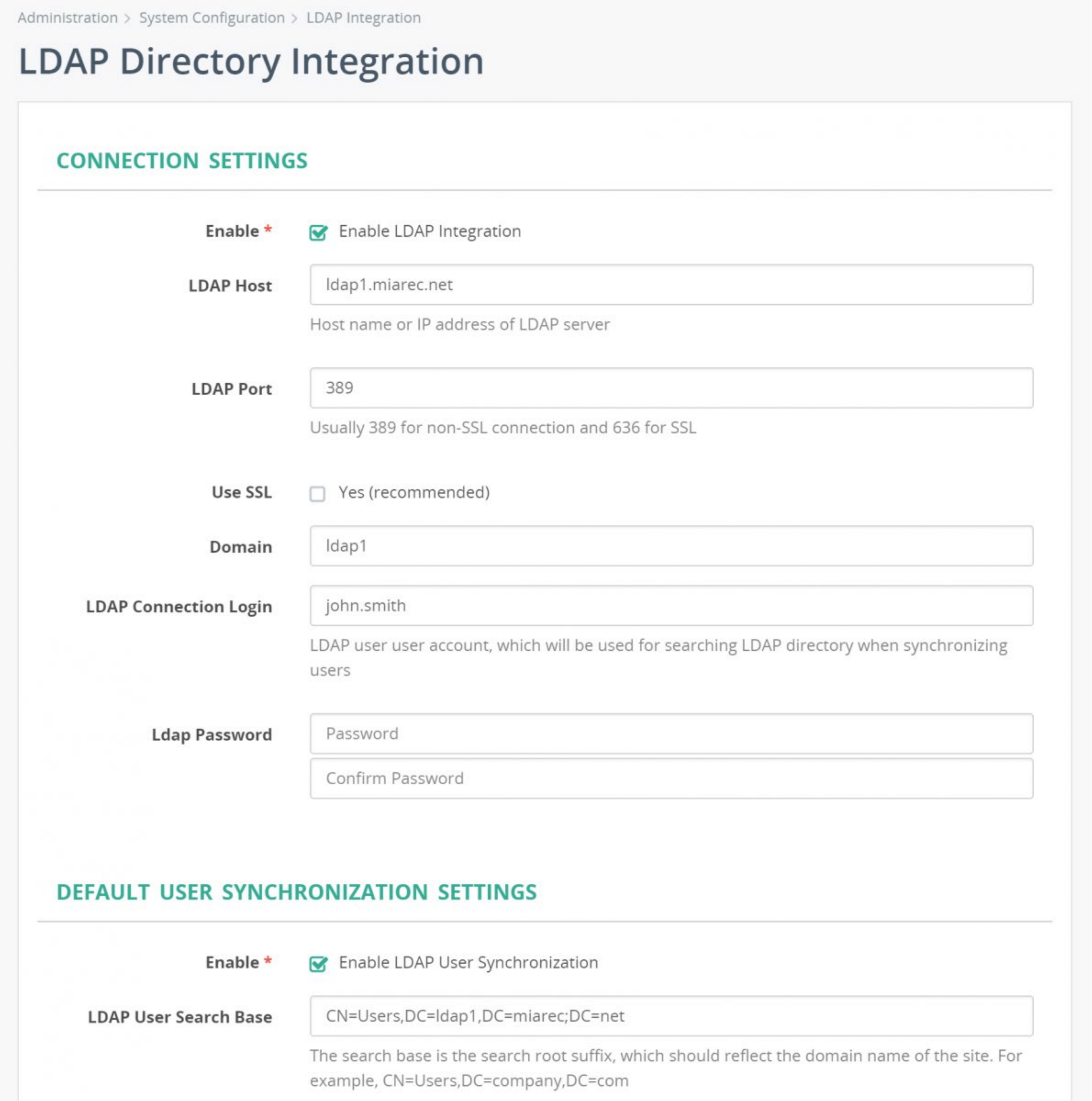
4.6 Configuring LDAP integration

Call Recording supports LDAP (Active Directory) integration to accomplish two tasks:

- LDAP authentication
- LDAP user synchronization

LDAP authentication

Navigate to Administration -> System Configuration -> LDAP Integration to configure LDAP autentication.



Administration > System Configuration > LDAP Integration

LDAP Directory Integration

CONNECTION SETTINGS

Enable * ☑ Enable LDAP Integration

LDAP Host: ldap1.miarec.net

Host name or IP address of LDAP server

LDAP Port: 389

Usually 389 for non-SSL connection and 636 for SSL

Use SSL ☐ Yes (recommended)

Domain: ldap1

LDAP Connection Login: john.smith

LDAP user user account, which will be used for searching LDAP directory when synchronizing users

Ldap Password: Password

Confirm Password

DEFAULT USER SYNCHRONIZATION SETTINGS

Enable * ☑ Enable LDAP User Synchronization

LDAP User Search Base: CN=Users,DC=ldap1,DC=miarec;DC=net

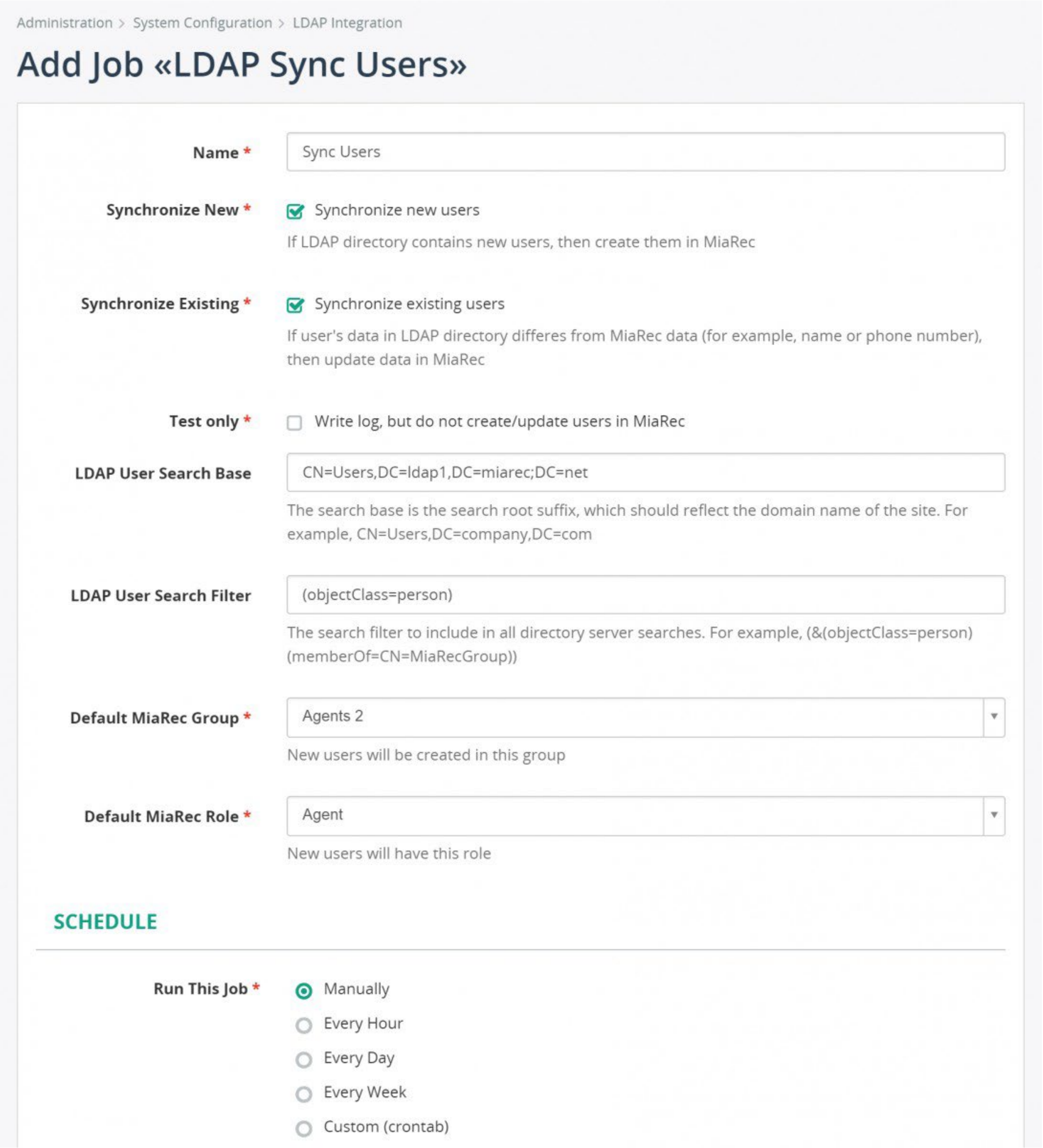
The search base is the search root suffix, which should reflect the domain name of the site. For example, CN=Users,DC=company,DC=com

How it works

When user tries to login to Call Recording web portal, his/her login and password is verified on LDAP server. If login and password are accepted by LDAP server, then user is allowed to login to Call Recording web portal.
Such feature allows to manage users' passwords in one location only (on your LDAP server). Call Recording doesn't store user's passwords in own database in this scenario. If user's password is changed in LDAP server, then Call Recording will automatically accept such new password during login phase. Also, when user account is removed/deactivated in LDAP server, then such user will not be able to login to Call Recording web-portal too.
Please, note, Call Recording doesn't automatically accept login from any LDAP user in your system. It is required that user account has been previously created in Call Recording and appropriate access permissions have been granted to user. On user's profile page administrator may specify whether user's password should be stored locally (in encrypted one-way hash form) or LDAP authentication is enabled for such user.

LDAP user synchronization

When LDAP user synchronization is enabled, then Call Recording will automatically scan LDAP directory for new user accounts and create Call Recording users.



Administration > System Configuration > LDAP Integration

Add Job «LDAP Sync Users»

Name *	Sync Users
Synchronize New *	☑ Synchronize new users If LDAP directory contains new users, then create them in MiaRec
Synchronize Existing *	☑ Synchronize existing users If user's data in LDAP directory differes from MiaRec data (for example, name or phone number), then update data in MiaRec
Test only *	□ Write log, but do not create/update users in MiaRec
LDAP User Search Base	CN=Users,DC=ldap1,DC=miarec;DC=net The search base is the search root suffix, which should reflect the domain name of the site. For example, CN=Users,DC=company,DC=com
LDAP User Search Filter	(objectClass=person) The search filter to include in all directory server searches. For example, (&(objectClass=person)(memberOf=CN=MiaRecGroup))
Default MiaRec Group *	Agents 2 New users will be created in this group
Default MiaRec Role *	Agent New users will have this role

SCHEDULE

Run This Job *	● Manually ○ Every Hour ○ Every Day ○ Every Week ○ Custom (crontab)

How it works

First you need to create LDAP user synchronization job. This job may be started manually or by schedule (for example, every night). If Call Recording detects new user account in LDAP server, then during synchronization the same account will be created in Call Recording. This newly created user will be added into pre-configured default user group and a default role will be assigned to user. If LDAP database contains phone number for users, then such phone number will be automatically added as an extension to user.

When phone number is updated in LDAP server, then during synchronization such change will be applied to Call Recording user record also. For, example, when phone number in LDAP server is moved from one user to another, then Call Recording will move corresponding extension to new user too.

When phone number is removed from LDAP user account, but the same phone number is not assigned to any other users, then Call Recording will do nothing during synchronization. The extension will not be removed from user account. This is by design. It allows you to add extensions to Call Recording users manually on his/her profile page, and such manually created extensions will not be removed during synchronization if your LDAP server is missing phone number info.

4.7 Multi-tenancy

Understanding multi-tenancy

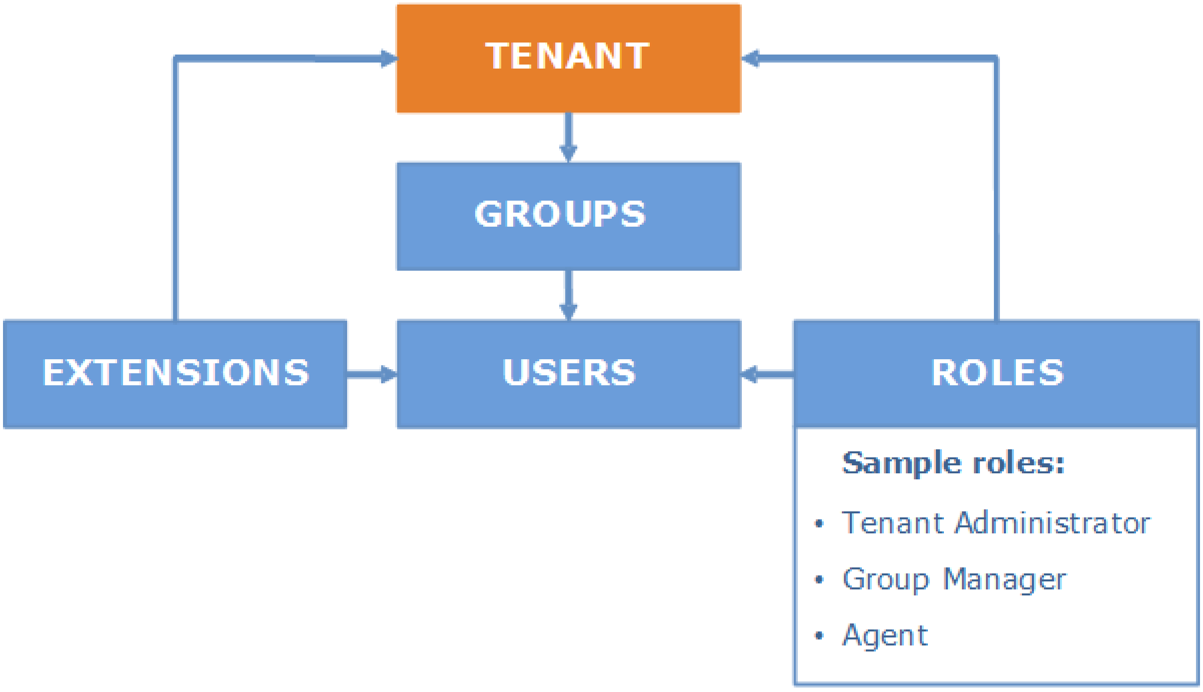
Call Recording supports a multi-tenant configuration. Multi-tenancy involve an architecture where a single package application can serve multiple customers. Each and every client or company that is created under such multi tenant architecture is referred to as a tenant. A multi-tenant software enables users to setup separate tenant partitions where one tenant cannot have access to the configurations or data of other tenants.

Who should use a multi-tenant configuration?

Multi-tenancy is the best suited for service provides and/or BPO contact centers, who record calls on behalf of other business organizations.

How it works

Each and every tenant has own set of users, groups, roles, and extensions. Tenant users have access to data only within boundaries of own tenant account. Tenant's data is isolated from each other.
Call Recording provides self-service capability to tenants. For example, tenant administrator may reset own users' passwords, modify role permissions, move existing user into another group, etc.



Frequently asked questions

1. How call recordings are associated with tenant?
Each tenant has a pre-configured set of extensions. Call Recording uses this data to automatically associate calls to users. 2. **Can tenant administrator change own extensions?**
No. The extensions are configured by system administrator. The tenant administrator may only re-allocate available extension from one user to another. 3. **Is it required to give tenants an access to admin interface?**
No, it is not required. It's possible to create tenant users with read-only access to Call Recording web-portal and skip creation of tenant administrator role.

Enable multi-tenancy in Call Recording

In Call Recording web portal navigate to Administration -> System Configuration -> Advanced Settings. Click on Edit settings and change Multitenancy settings from **disabled** to **enabled**.

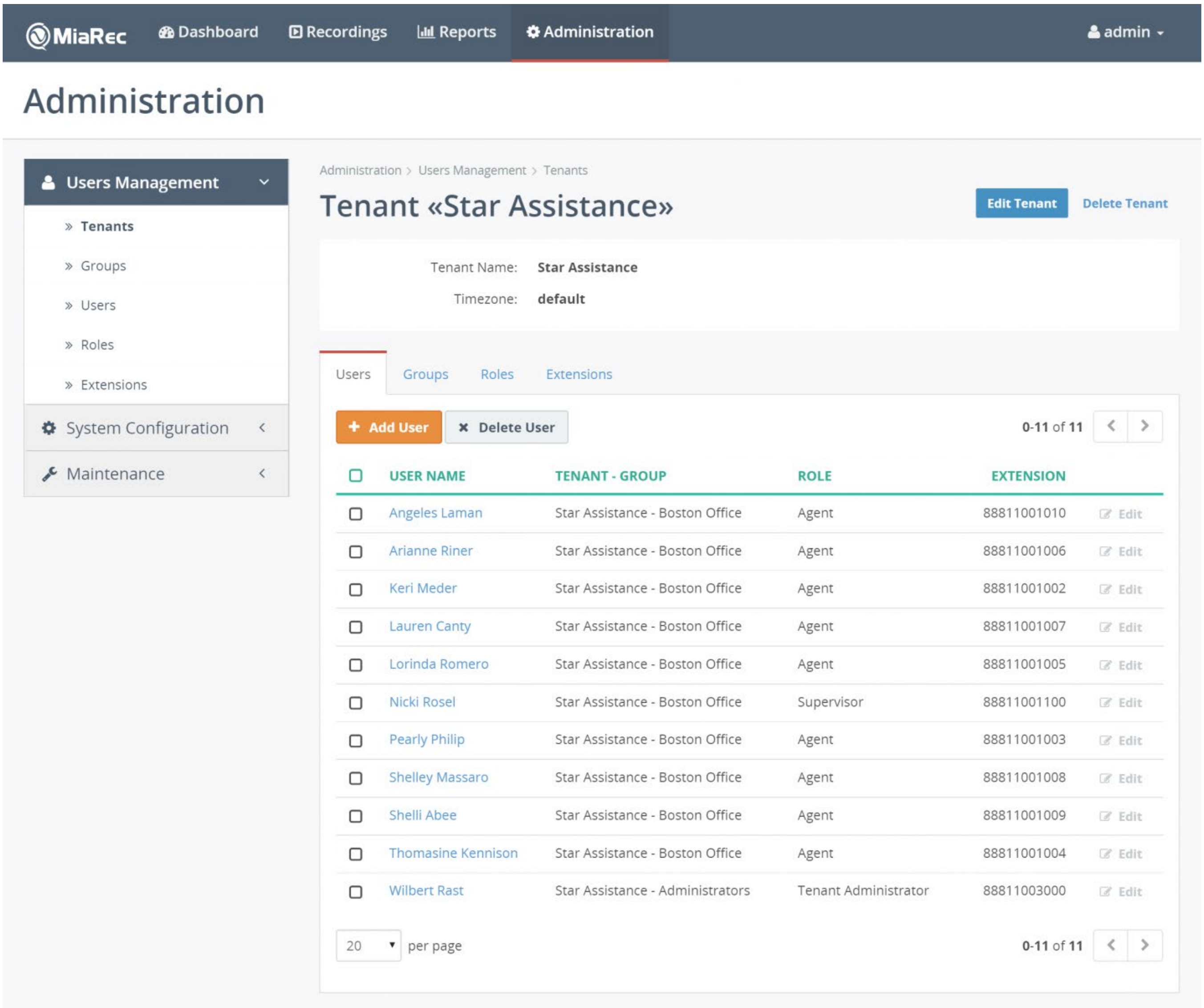
Now you should be able to see **Tenants** configuration inside administration interface.

Add tenant

To create a new tenant account navigate to **Administration -> Users Management -> Tenants** and complete the following steps:

1. Create new tenant account
2. Create at least one group. For example, "Users".
3. Create at least one role with appropriate permissions. For example, "Agent role". Optionally, you may create tenant admin account who will be able to manage own tenant users (reset users passwords, edit role permissions, create new groups, etc).
4. Create users and assign extensions to them.

Extension in Call Recording is a "phone number", "phone name" and/or "broadworks user ID". If you are using Broadworks platform, then it is recommended to enter your users' broadworks ID's as extensions. For other platforms it is recommended to use users phone number as an extension. Using of phone name is recommended in cases when multiple users share the same extension and only the phone name part is unique.



Administration

Administration > Users Management > Tenants

Tenant «Star Assistance»

Tenant Name: **Star Assistance**

Timezone: **default**

0-11 of 11

□	USER NAME	TENANT - GROUP	ROLE	EXTENSION	
□	Angeles Laman	Star Assistance - Boston Office	Agent	88811001010	Edit
□	Arianne Riner	Star Assistance - Boston Office	Agent	88811001006	Edit
□	Keri Meder	Star Assistance - Boston Office	Agent	88811001002	Edit
□	Lauren Canty	Star Assistance - Boston Office	Agent	88811001007	Edit
□	Lorinda Romero	Star Assistance - Boston Office	Agent	88811001005	Edit
□	Nicki Rosel	Star Assistance - Boston Office	Supervisor	88811001100	Edit
□	Pearly Philip	Star Assistance - Boston Office	Agent	88811001003	Edit
□	Shelley Massaro	Star Assistance - Boston Office	Agent	88811001008	Edit
□	Shelli Abee	Star Assistance - Boston Office	Agent	88811001009	Edit
□	Thomasine Kennison	Star Assistance - Boston Office	Agent	88811001004	Edit
□	Wilbert Rast	Star Assistance - Administrators	Tenant Administrator	88811003000	Edit

20 per page

0-11 of 11

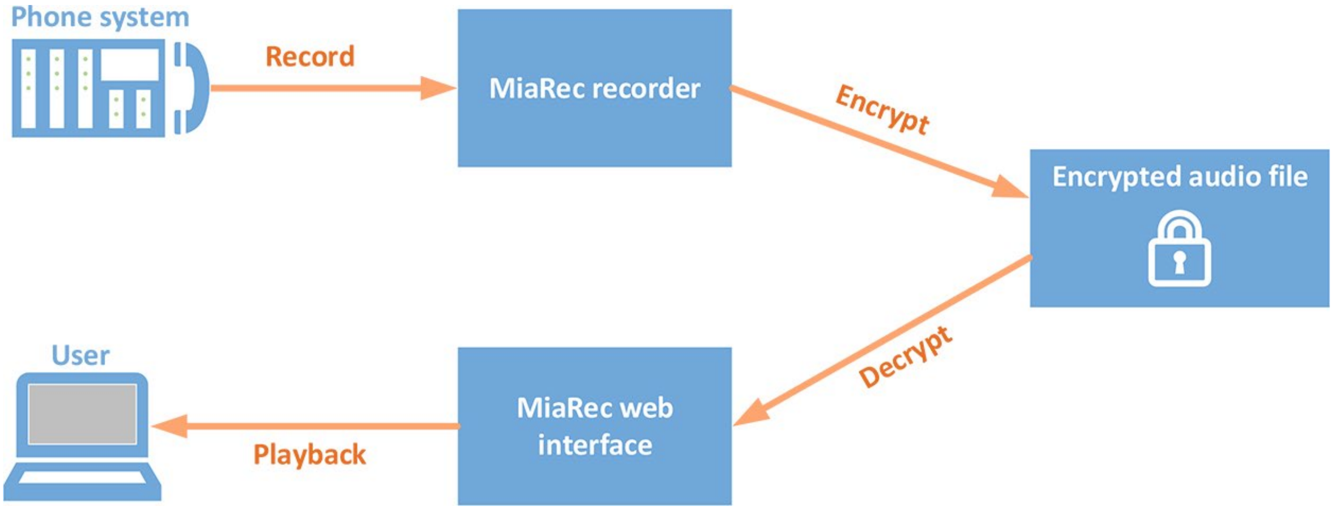
5. Storage Management

5.1 Audio file encryption

File encryption overview

Call Recording provides rock-solid audio encryption functionality, ensuring all call recordings are securely stored. Call Recording encryption
functionality helps companies confidently adhere to the highest corporate security standards and comply with legal regulations such as PCI-DSS, HIPAA, Dodd-Frank, and Sarbanes-Oxley.
Some key features of Call Recording audio file encryption:

- Asymmetric encryption, where a public key is used for encrypting and a private key is used for decrypting
- Administrator has control over who can play back (decrypt) the recordings
- In a multi-tenant mode, each tenant has it's own unique encryption key
- Encryption is applied to backup data, as well



Audio file encryption vs role-based access control

Call Recording role-based access control system provides protection of data from unauthorized access to the Call Recording web-portal. Everyone accessing the system must be an authenticated user with associated set of permissions.
Audio file encryption provides an additional layer of security over the role-based access control system in Call Recording. If encryption is enabled, then audio files are stored on a hard disk in encrypted format. This insures that even if unauthorized user gains physical access to the storage system, he/she has no ability to play back recordings because he/she doesn't have the private encryption key.

Download of encrypted recordings

When a user downloads individual call recordings through Call Recording web-portal, the file is decrypted in flight. The file is saved on the user's computer in unencrypted form.
However, when a user uses the bulk download feature and downloads multiple call recordings in ZIP archive, then the downloaded files are retrieved in encrypted form. The user cannot play back such call recordings unless he/she imports them into the Call Recording system together with private encryption key.

Encryption for backups

Use of file encryption is beneficial for backup data, as well. All recordings in backup archive can be encrypted.

Encryption in multi-tenant environment

In multi-tenant mode, each tenant has it's own encryption key. Even if an audio file from one tenant becomes available to another tenant, the latter could not play back, because the file is encrypted with a different key.
Additionally, in a multi-tenant hosted environment, Call Recording supports the following usage scenario: Tenant may provide the service provider with the public encryption key only. The tenant doesn't is not required to disclose their own private key to the service provider. This means that nobody on the service provider side - even system administrators - would be able to play back tenants' call recordings. To play back such call recordings, they should be uploaded to tenant's private network and imported into a local instance of Call Recording software.

Encryption algorithms

Call Recording encrypts every call recording with asymmetric encryption. For every recording, Call Recording generates a random AES encryption key. This symmetric encryption key is then encrypted using asymmetric encryption (one key for encryption - often referred to as the "public" key - and a different key for decryption - often referred to as the "private" key).
Call Recording uses Advanced Encryption Standard (AES) for symmetric encryption (256-bit key) and the Rivest-Shamir-Adleman (RSA) public key algorithm for asymmetric encryption (2,048-bit keys).
The details and theory behind the asymmetric encryption method is beyond the scope of this article. However, a good primer is available at https://en.wikipedia.org/wiki/Public-key_cryptography. In short, a public key is used for encrypting data and private key is used for decrypting it. The public key doesn't need to be stored securely. Anyone can access the public key, but no one can use the public key to decrypt the data that the public key encrypted. The only way users can decrypt data is with the private key.

User access to encryption keys

Administrators need to grant particular users access to encryption key(s) before they can play back (decrypt) audio files. Note, the administrator may grant access only to those encryption keys which are granted to him/her. If administrator (even if he/she has role "Root administrator") has no access to the encryption key, then he/she cannot grant access to other users for the same key.
Call Recording software never stores encryption keys in the database in plain text for security reasons. Even if an unauthorized party gains access to database files, he/she could not retrieve the private keys because they are stored in encrypted format. There is no way to gain user's private key without knowing the user's password.

Configuration check-list

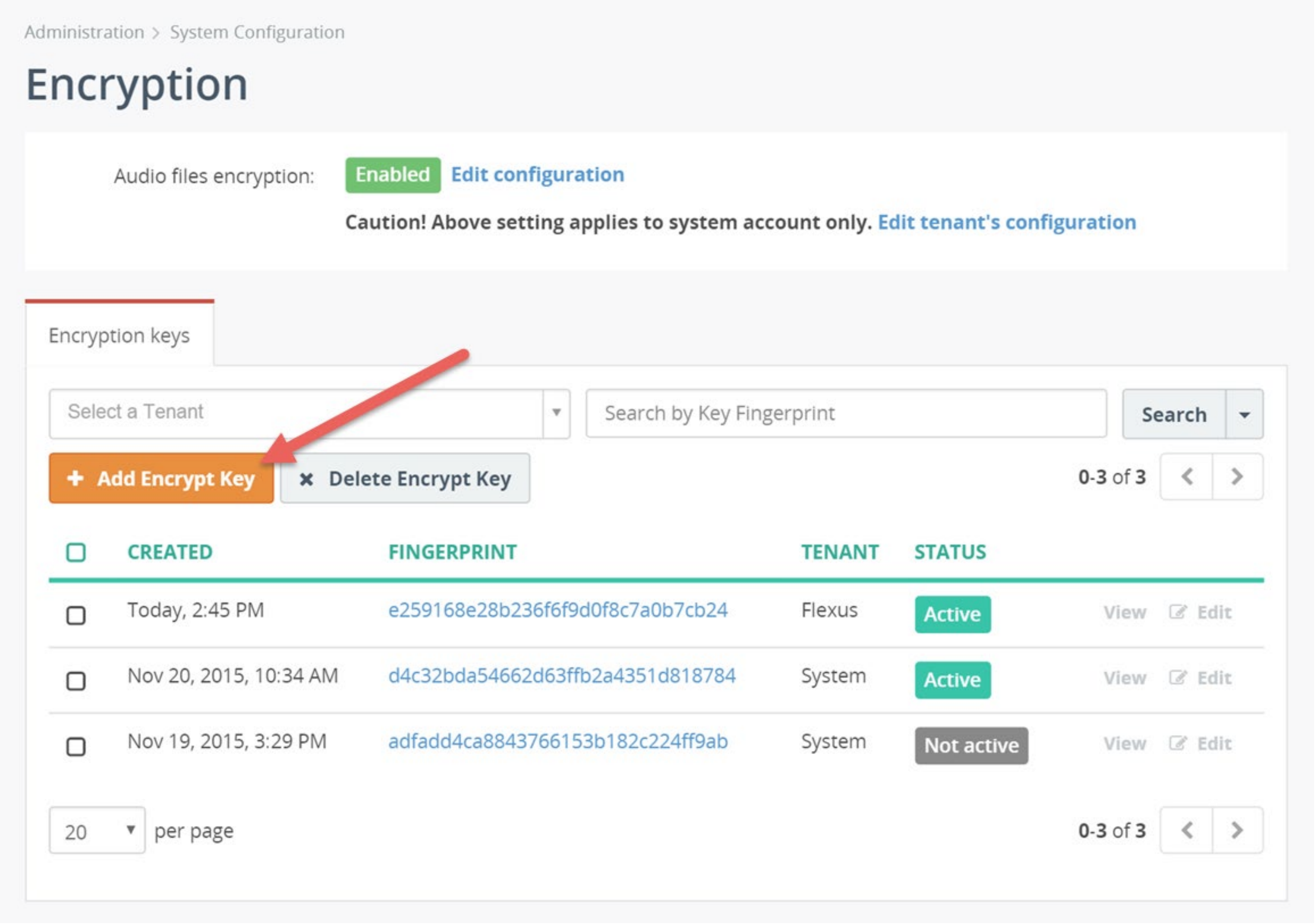
Configure Call Recording audio file encryption as follows:

1. Create new encryption key or use existing one for System or Tenant (in multi-tenant mode)
2. Export/backup new encryption key and save it in secure place for recovery purposes
3. Grant access to encryption key to authorized users
4. Enable audio file encryption on System or Tenant profile.

Create new encryption key

Navigate to Administration -> Storage -> File Encryption to create new encryption key.

Service Provider Note, in multi-tenant version, you need to create key for "System" account first. Then you can create tenant encryption key. On System account, you do not need to enable "Audio file encryption" unless you record calls into System tenant (which is not recommended).



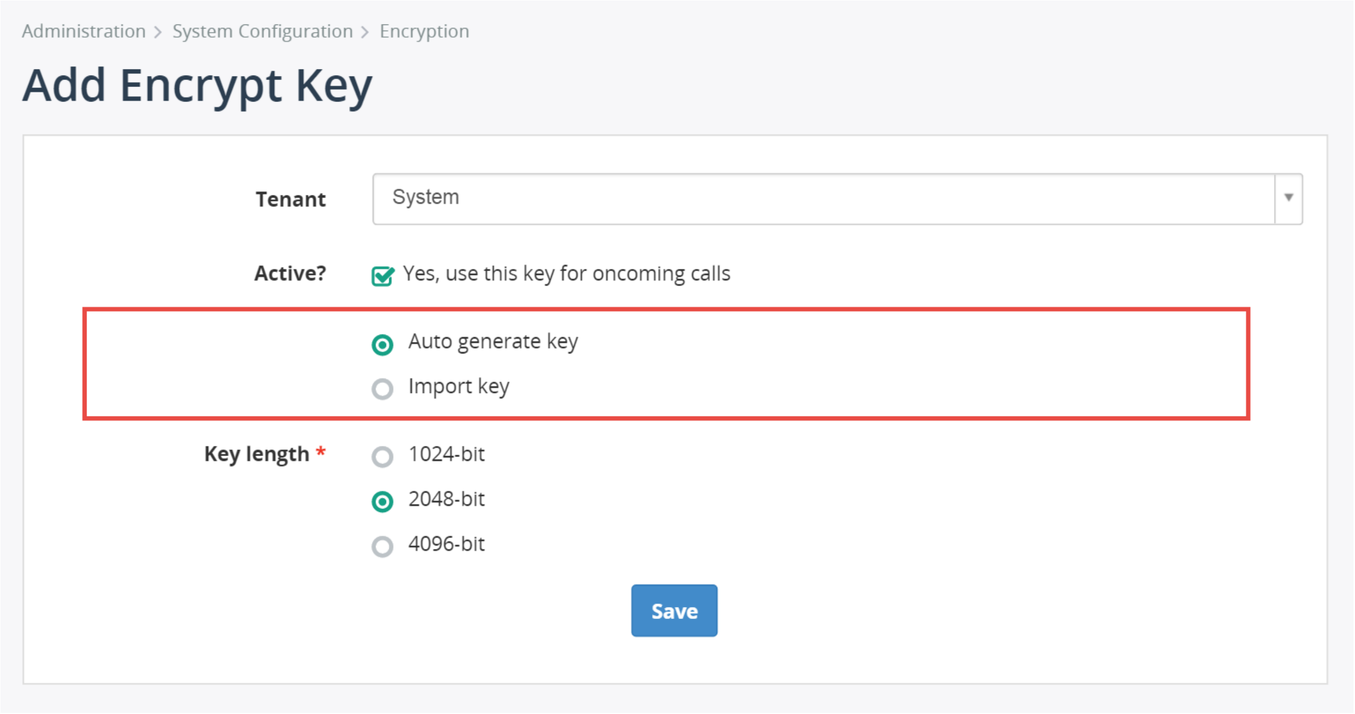
Administration > System Configuration

Encryption

Audio files encryption: Enabled Edit configuration

Caution! Above setting applies to system account only. Edit tenant's configuration

□	CREATED	FINGERPRINT	TENANT	STATUS		
□	Today, 2:45 PM	e259168e28b236f6f9d0f8c7a0b7cb24	Flexus	Active	View	Edit
□	Nov 20, 2015, 10:34 AM	d4c32bda54662d63ffb2a4351d818784	System	Active	View	Edit
□	Nov 19, 2015, 3:29 PM	adfadd4ca8843766153b182c224ff9ab	System	Not active	View	Edit



Administration > System Configuration > Encryption

Add Encrypt Key

Tenant: System

Active? ☑ Yes, use this key for oncoming calls

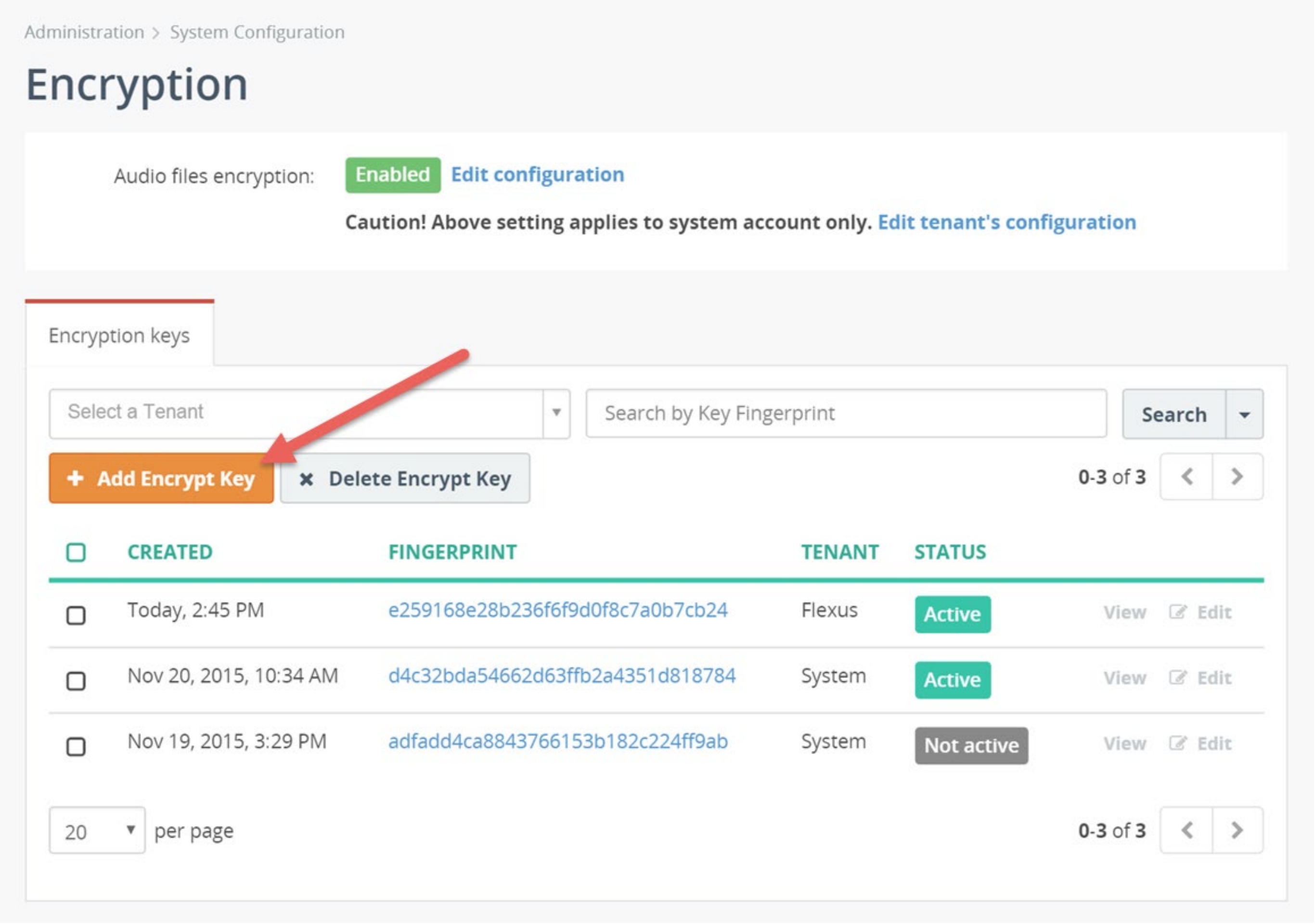
● Auto generate key
○ Import key

Key length *
○ 1024-bit
● 2048-bit
○ 4096-bit

Import encryption key

Encryption key can be imported from the existing key rather than generated from scratch.

Navigate to **Administration -> Storage -> File Encryption** to import the existing encryption key.



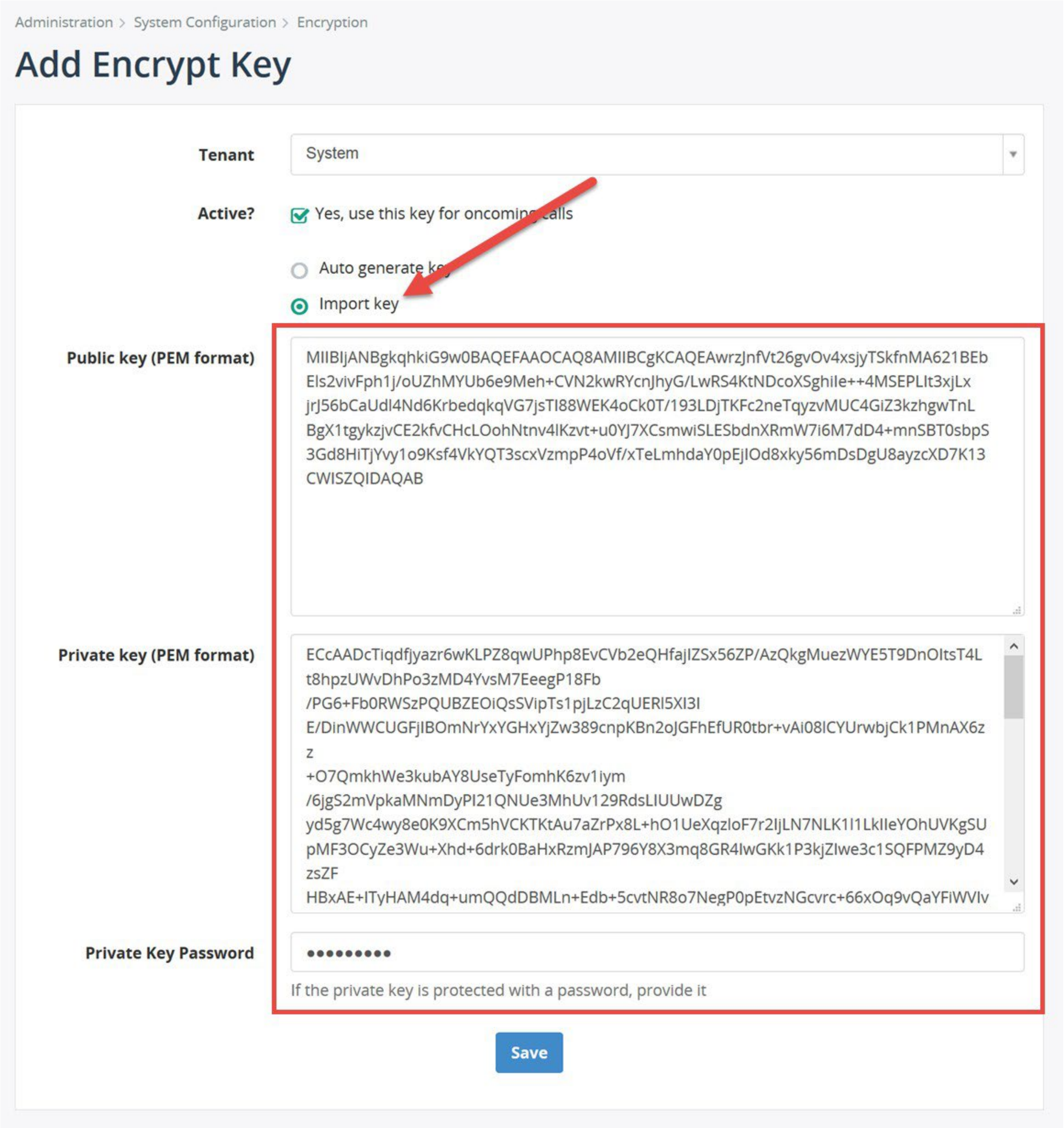
Administration > System Configuration

Encryption

Audio files encryption: Enabled Edit configuration

Caution! Above setting applies to system account only. Edit tenant's configuration

□	CREATED	FINGERPRINT	TENANT	STATUS	
□	Today, 2:45 PM	e259168e28b236f6f9d0f8c7a0b7cb24	Flexus	Active	View Edit
□	Nov 20, 2015, 10:34 AM	d4c32bda54662d63ffb2a4351d818784	System	Active	View Edit
□	Nov 19, 2015, 3:29 PM	adfadd4ca8843766153b182c224ff9ab	System	Not active	View Edit



Administration > System Configuration > Encryption

Add Encrypt Key

Tenant System

Active? ☑ Yes, use this key for oncoming calls

○ Auto generate key

● Import key

Public key (PEM format)

```
MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAwrzJnfVt26gvOv4xsjyTSkfnMA621BEb
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CWISZQIDAQAB
```

Private key (PEM format)

```
ECcAADcTiqdfjyazr6wKLPZ8qwUPhp8EvCVb2eQHfajIZSx56ZP/AzQkgMuezWYE5T9DnOltsT4L
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zsZF
HBxAE+ITyHAM4dq+umQQdDBMLn+Edb+5cvtNR8o7NegP0pEtvzNGcvrc+66xOq9vQaYFiWVlv
```

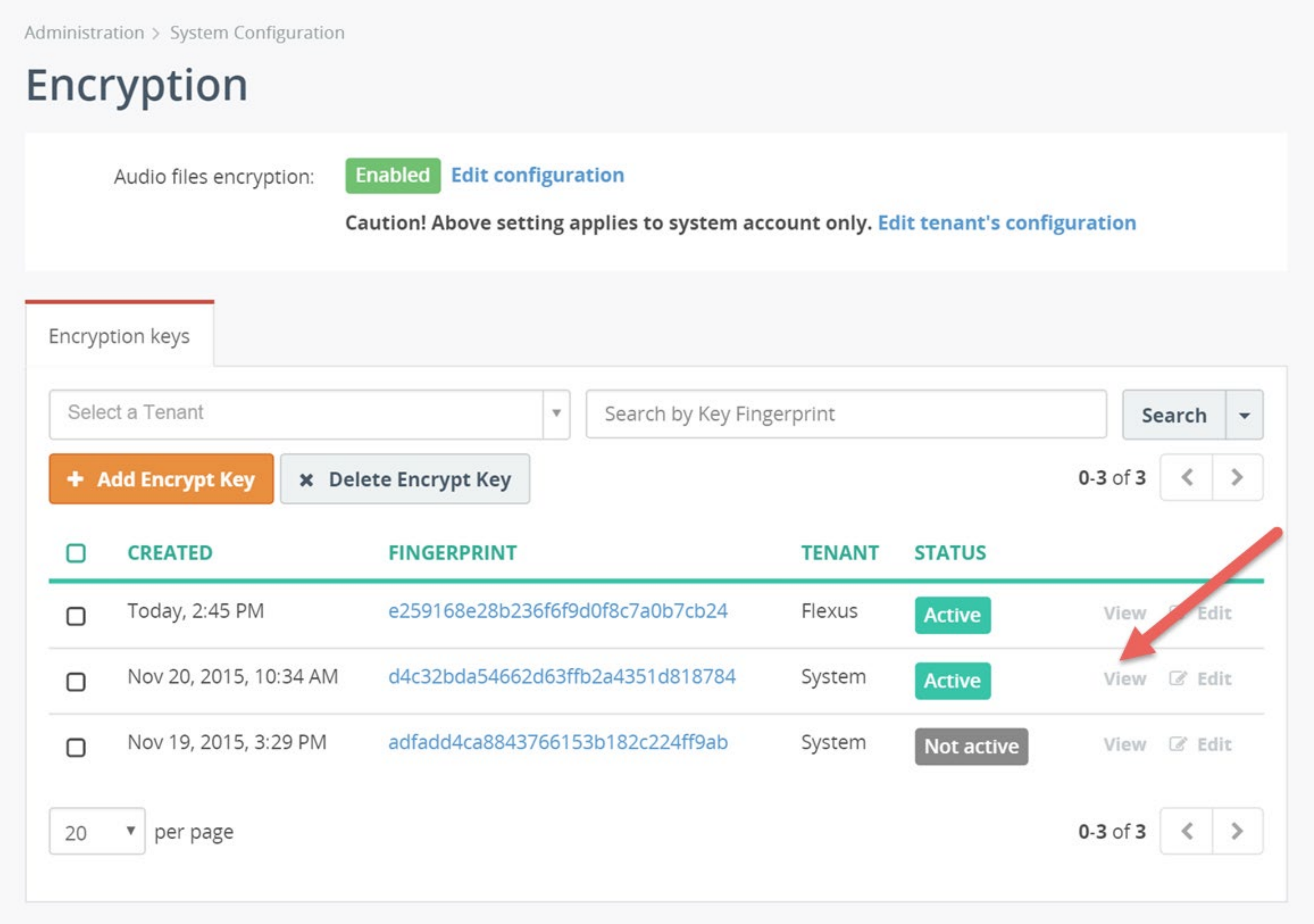
Private Key Password •••••••••

If the private key is protected with a password, provide it

Export encryption key

Navigate to **Administration -> Storage -> File Encryption** to export the existing encryption key.

It is highly recommended to export all existing keys and store them in secure place for backup purposes. You may need such backup copies when all authorized people forgot their passwords or database is destroyed and you need to recover the audio files from archive.



Administration > System Configuration

Encryption

Audio files encryption: Enabled Edit configuration

Caution! Above setting applies to system account only. Edit tenant's configuration

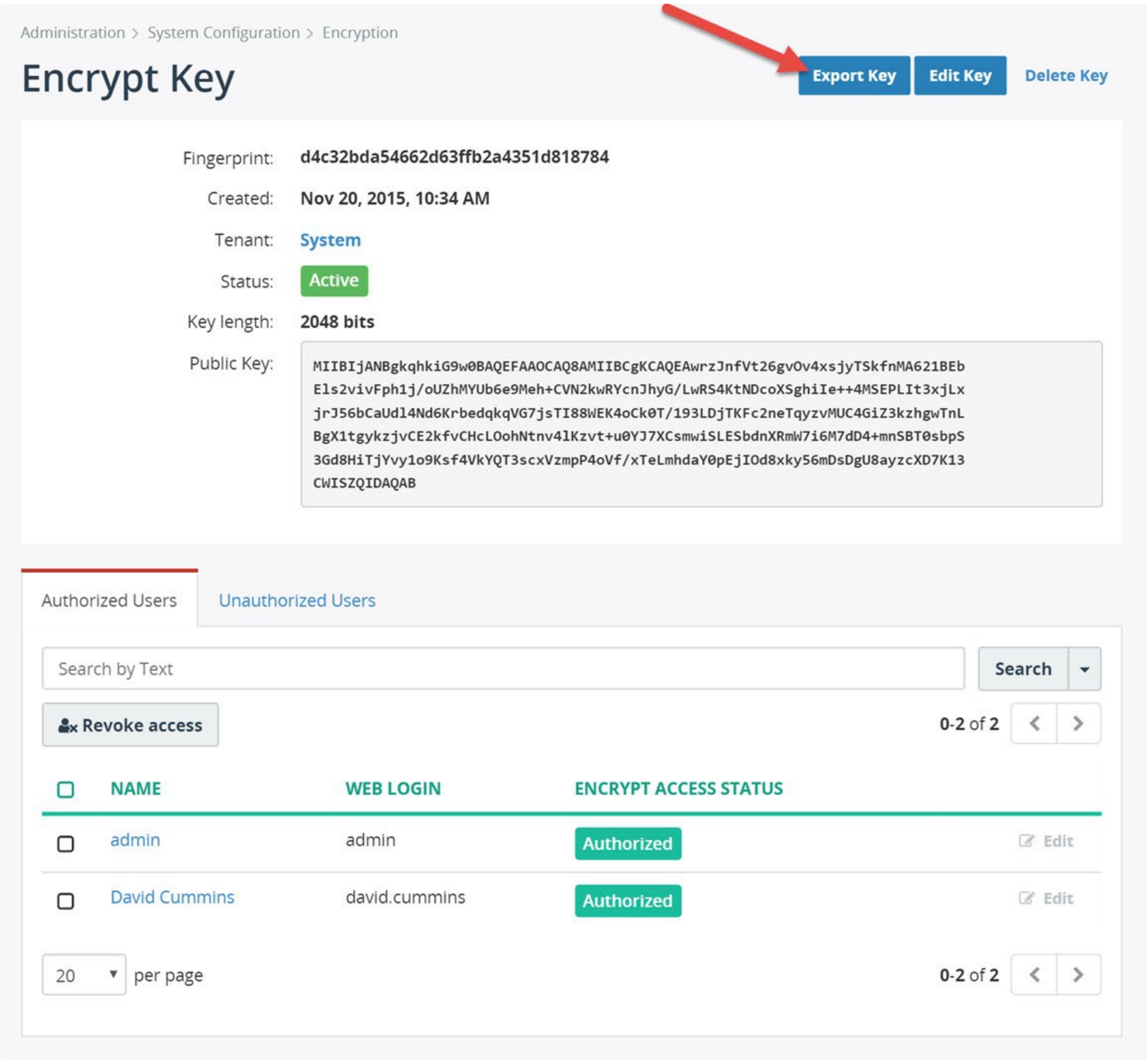
Encryption keys

Select a Tenant | Search by Key Fingerprint | Search

+ Add Encrypt Key | ✖ Delete Encrypt Key | 0-3 of 3

□	CREATED	FINGERPRINT	TENANT	STATUS		
□	Today, 2:45 PM	e259168e28b236f6f9d0f8c7a0b7cb24	Flexus	Active	View	Edit
□	Nov 20, 2015, 10:34 AM	d4c32bda54662d63ffb2a4351d818784	System	Active	View	Edit
□	Nov 19, 2015, 3:29 PM	adfadd4ca8843766153b182c224ff9ab	System	Not active	View	Edit

20 per page | 0-3 of 3



Administration > System Configuration > Encryption

Encrypt Key

Fingerprint:	d4c32bda54662d63ffb2a4351d818784
Created:	Nov 20, 2015, 10:34 AM
Tenant:	System
Status:	Active
Key length:	2048 bits

Public Key:

```
MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAwrzJnfVt26gvOv4xsjyTSkfnMA621BEb
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3Gd8HiTjYvy1o9Ksf4VkYQT3scxVzmpP4oVf/xTeLmhdaY0pEjIOd8xky56mDsDgU8ayzcXD7K13
CWISZQIDAQAB
```
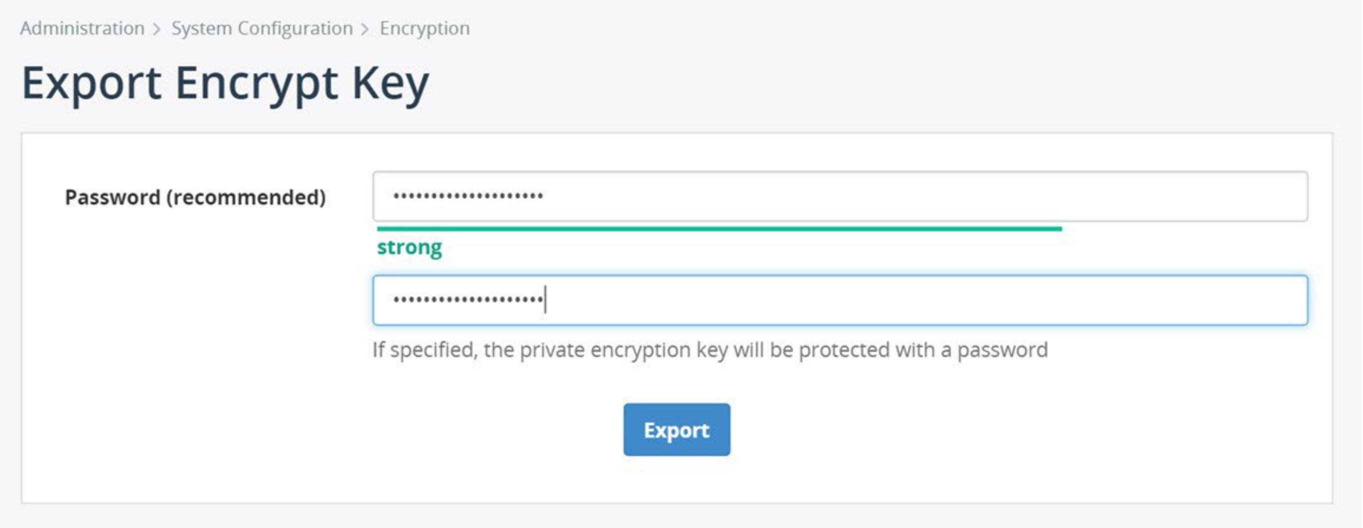

□	NAME	WEB LOGIN	ENCRYPT ACCESS STATUS	
□	admin	admin	Authorized	Edit
□	David Cummins	david.cummins	Authorized	Edit



Administration > System Configuration > Encryption

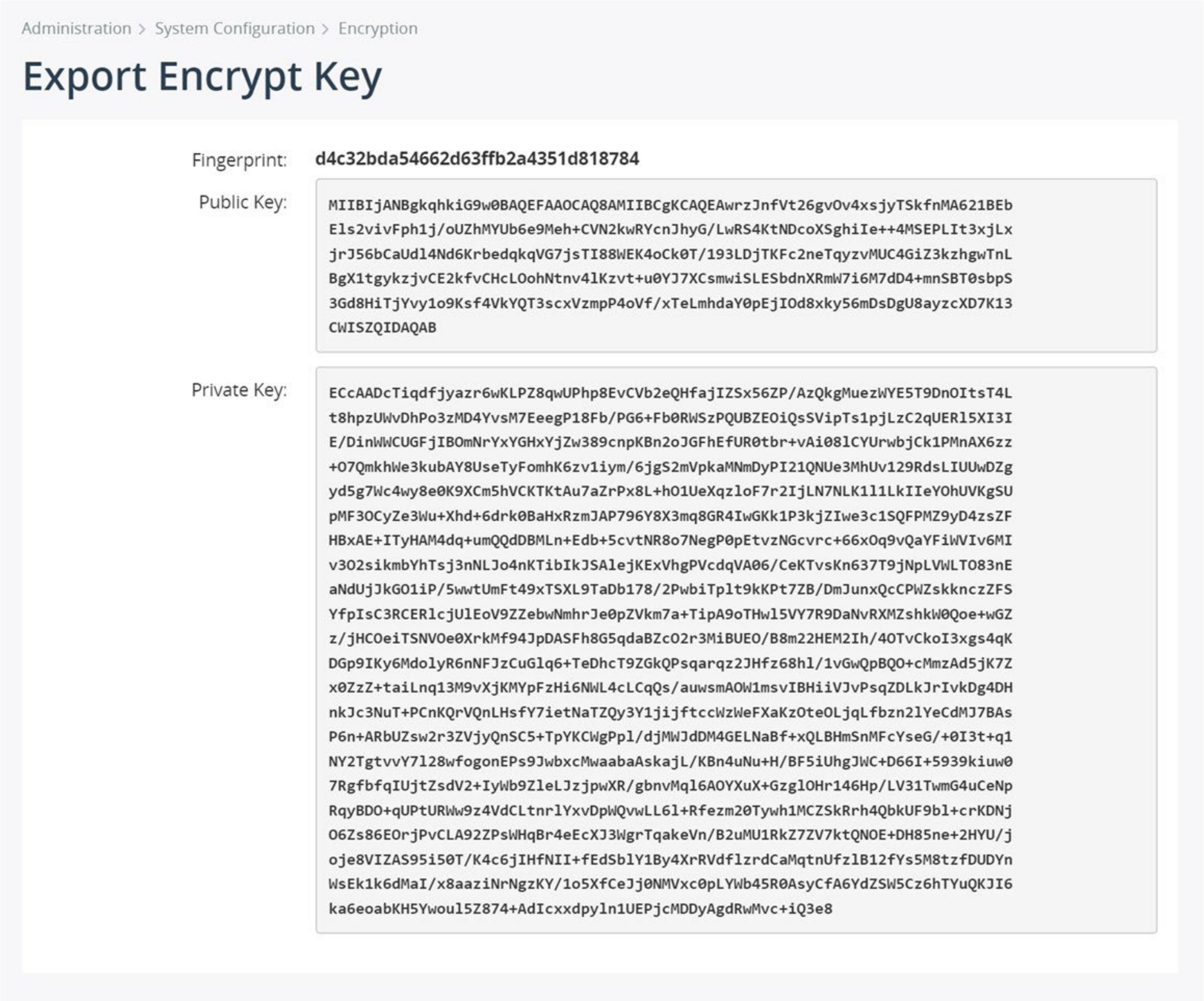
Export Encrypt Key

Password (recommended) ••••••••••••••••••••

strong

••••••••••••••••••••

If specified, the private encryption key will be protected with a password



Administration > System Configuration > Encryption

Export Encrypt Key

Fingerprint: **d4c32bda54662d63ffb2a4351d818784**

Public Key:

```
MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAwrzJnfVt26gvOv4xsjyTSkfnMA621BEb
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CWISZQIDAQAB
```

Private Key:

```
ECcAADcTiqdfjyazr6wKLPZ8qwUPhp8EvCVb2eQHfajIZSx56ZP/AzQkgMuezWYE5T9DnOItsT4L
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```
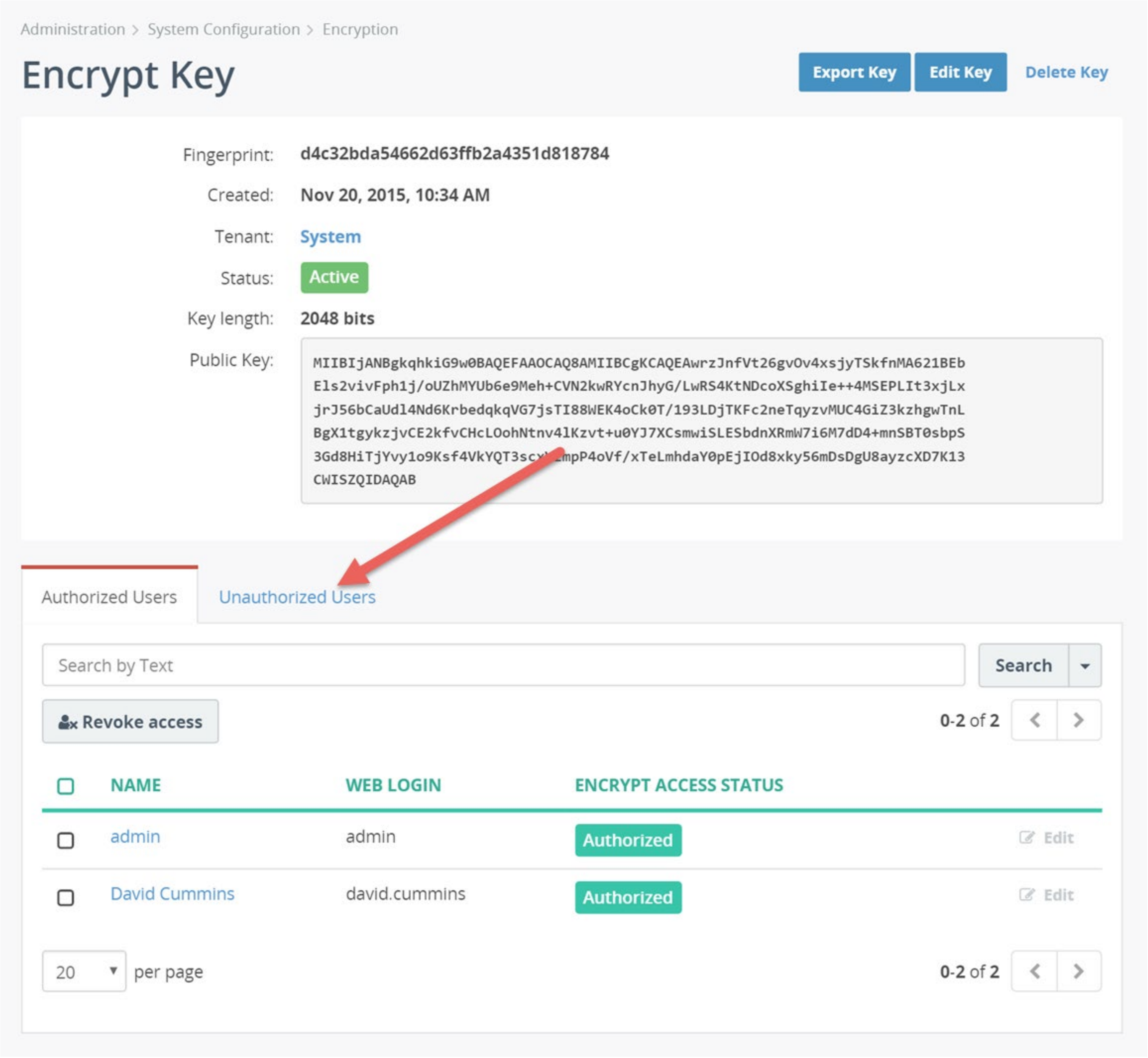

Grant access to encryption key

Navigate to **Administration -> Storage -> File Encryption**, select the appropriate key and authorize users to access the data encrypted with the same key.

Administrators need to grant particular users access to encryption key(s) before they can play back (decrypt) audio files. Note, the administrator may grant access only to those encryption keys which are granted to him/her. If administrator (even if he/she has role "Root administrator") has no access to the encryption key, then he/she cannot grant access to other users for the same key.

Call Recording software never stores encryption keys in the database in plain text for security reasons. Even if an unauthorized party gains access to database files, he/she could not retrieve the private keys because they are stored in encrypted format. There is no way to gain user's private key without knowing the user's password.



Administration > System Configuration > Encryption

Encrypt Key

Export Key | Edit Key | Delete Key

Fingerprint: d4c32bda54662d63ffb2a4351d818784

Created: Nov 20, 2015, 10:34 AM

Tenant: System

Status: Active

Key length: 2048 bits

Public Key:

```
MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAwrzJnfVt26gvOv4xsjyTSkfnMA621BEb
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jrJ56bCaUdl4Nd6KrbedqkqVG7jsTI88WEK4oCk0T/193LDjTKFc2neTqyzvMUC4GiZ3kzhgwTnL
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3Gd8HiTjYvy1o9Ksf4VkYQT3scx[illegible]mpP4oVf/xTeLmhdaY0pEjIOd8xky56mDsDgU8ayzcXD7K13
CWISZQIDAQAB
```

Authorized Users | Unauthorized Users

Search by Text | Search

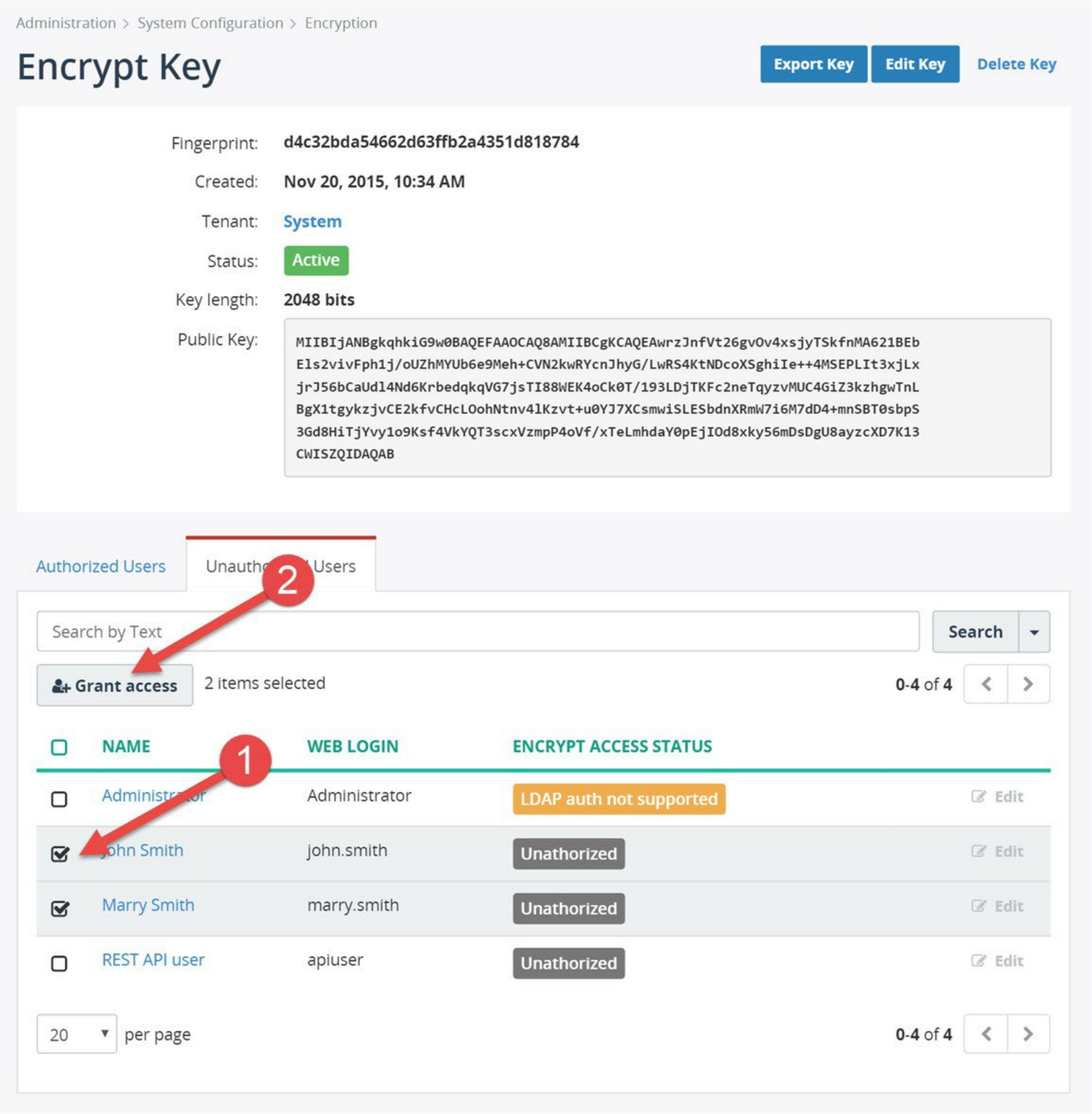
Revoke access

0-2 of 2

☐	NAME	WEB LOGIN	ENCRYPT ACCESS STATUS	
☐	admin	admin	Authorized	Edit
☐	David Cummins	david.cummins	Authorized	Edit

20 per page

0-2 of 2



Encrypt Key

Fingerprint: d4c32bda54662d63ffb2a4351d818784

Created: Nov 20, 2015, 10:34 AM

Tenant: System

Status: Active

Key length: 2048 bits

Public Key:

```
MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAwrzJnfVt26gvOv4xsjyTSkfnMA621BEb
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CWISZQIDAQAB
```

2 items selected

0-4 of 4

☐	NAME	WEB LOGIN	ENCRYPT ACCESS STATUS	
☐	Administrator	Administrator	LDAP auth not supported	Edit
☑	John Smith	john.smith	Unathorized	Edit
☑	Marry Smith	marry.smith	Unathorized	Edit
☐	REST API user	apiuser	Unathorized	Edit

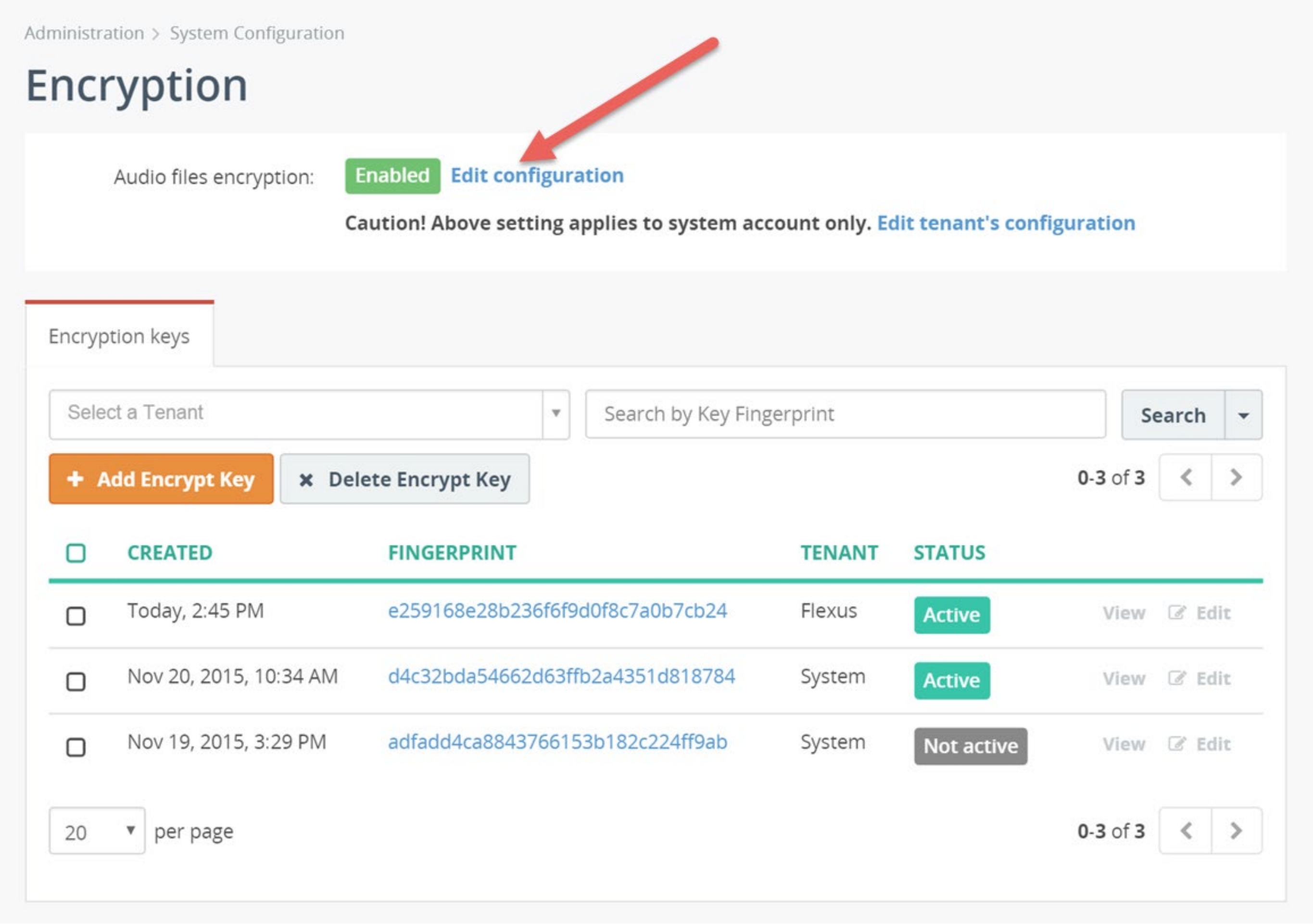
20 per page

0-4 of 4

Enable file encryption

Non-multi-tenant configuration

In a non-multi-tenant configuration, navigate to Administration -> Storage -> File encryption and click Edit configuration to enable encryption for all data.



Administration > System Configuration

Encryption

Audio files encryption: Enabled Edit configuration

Caution! Above setting applies to system account only. Edit tenant's configuration

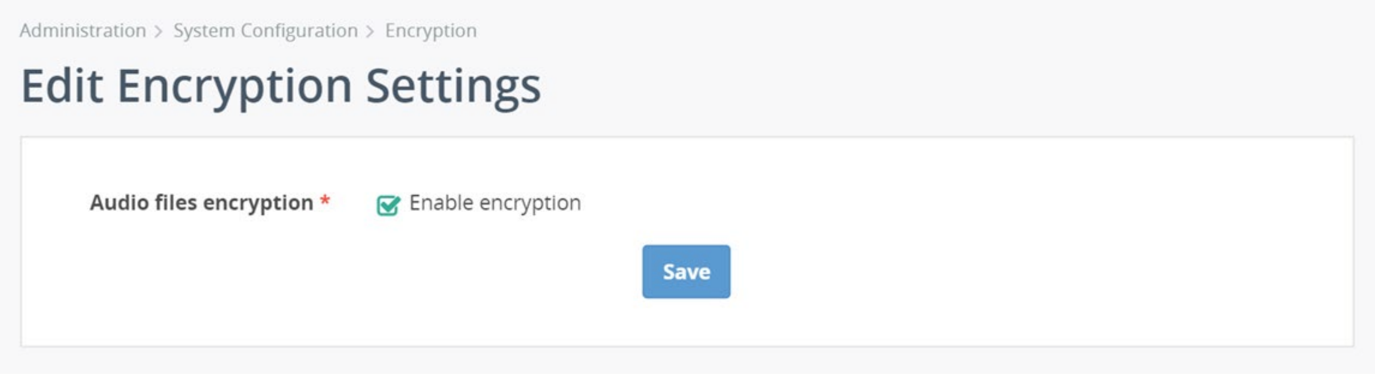
Encryption keys

Select a Tenant | Search by Key Fingerprint | Search

+ Add Encrypt Key | ✖ Delete Encrypt Key | 0-3 of 3

☐	CREATED	FINGERPRINT	TENANT	STATUS	
☐	Today, 2:45 PM	e259168e28b236f6f9d0f8c7a0b7cb24	Flexus	Active	View Edit
☐	Nov 20, 2015, 10:34 AM	d4c32bda54662d63ffb2a4351d818784	System	Active	View Edit
☐	Nov 19, 2015, 3:29 PM	adfadd4ca8843766153b182c224ff9ab	System	Not active	View Edit

20 per page 0-3 of 3



Administration > System Configuration > Encryption

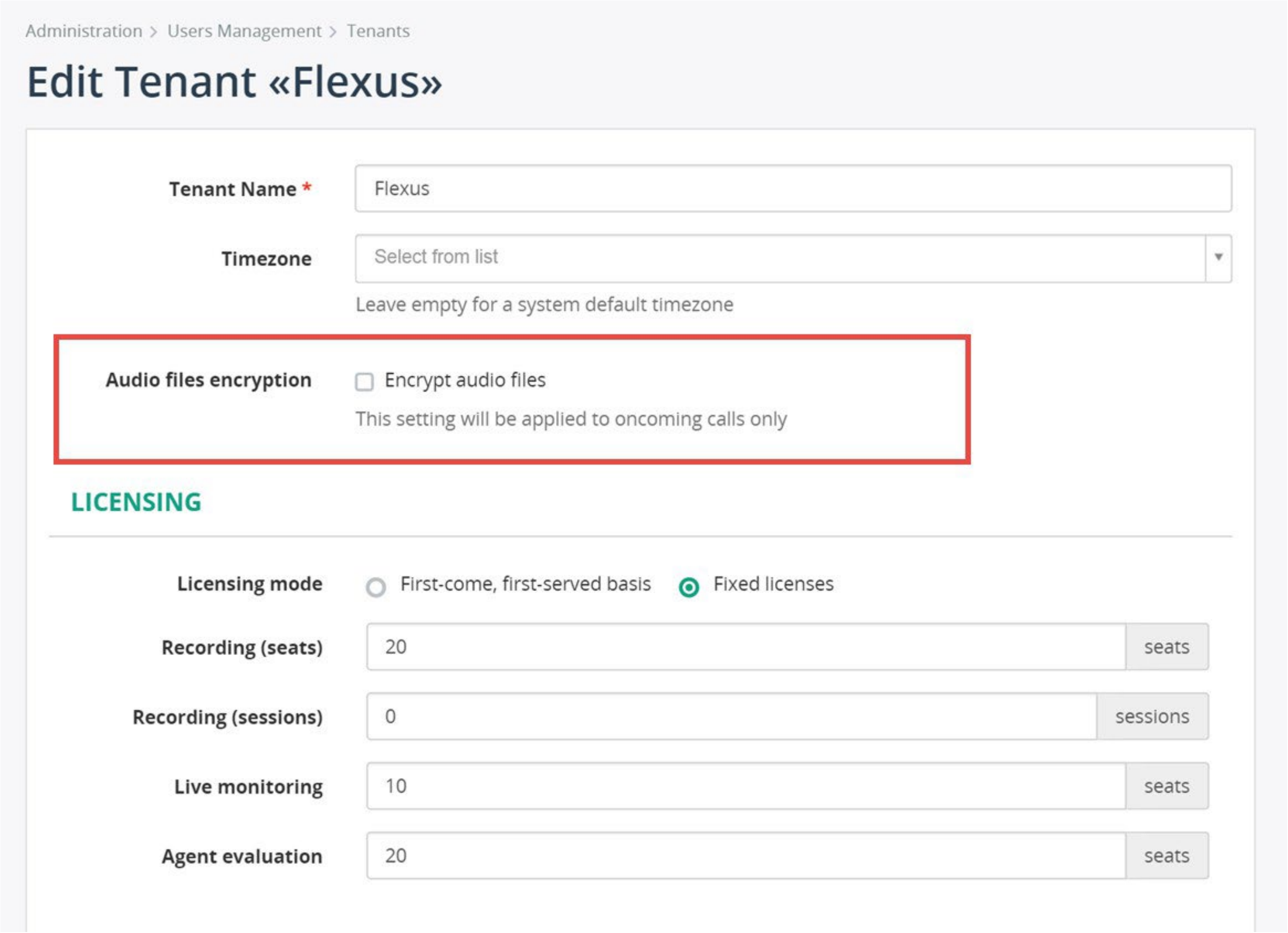
Edit Encryption Settings

Audio files encryption * ☑ Enable encryption

Save

Multi-tenant configuration

In a multi-tenant configuration, navigate to **Administration -> Storage -> File encryption**, select the appropriate tenant profile, then click **Edit configuration** to enable encryption for this particular tenant.
Alternatively, you can enable encryption on tenant profile under **Administration -> User Management -> Tenants**.



Administration > Users Management > Tenants

Edit Tenant «Flexus»

Tenant Name *	Flexus
Timezone	Select from list Leave empty for a system default timezone
Audio files encryption	□ Encrypt audio files This setting will be applied to oncoming calls only

LICENSING

Licensing mode	○ First-come, first-served basis ● Fixed licenses
Recording (seats)	20 seats
Recording (sessions)	0 sessions
Live monitoring	10 seats
Agent evaluation	20 seats

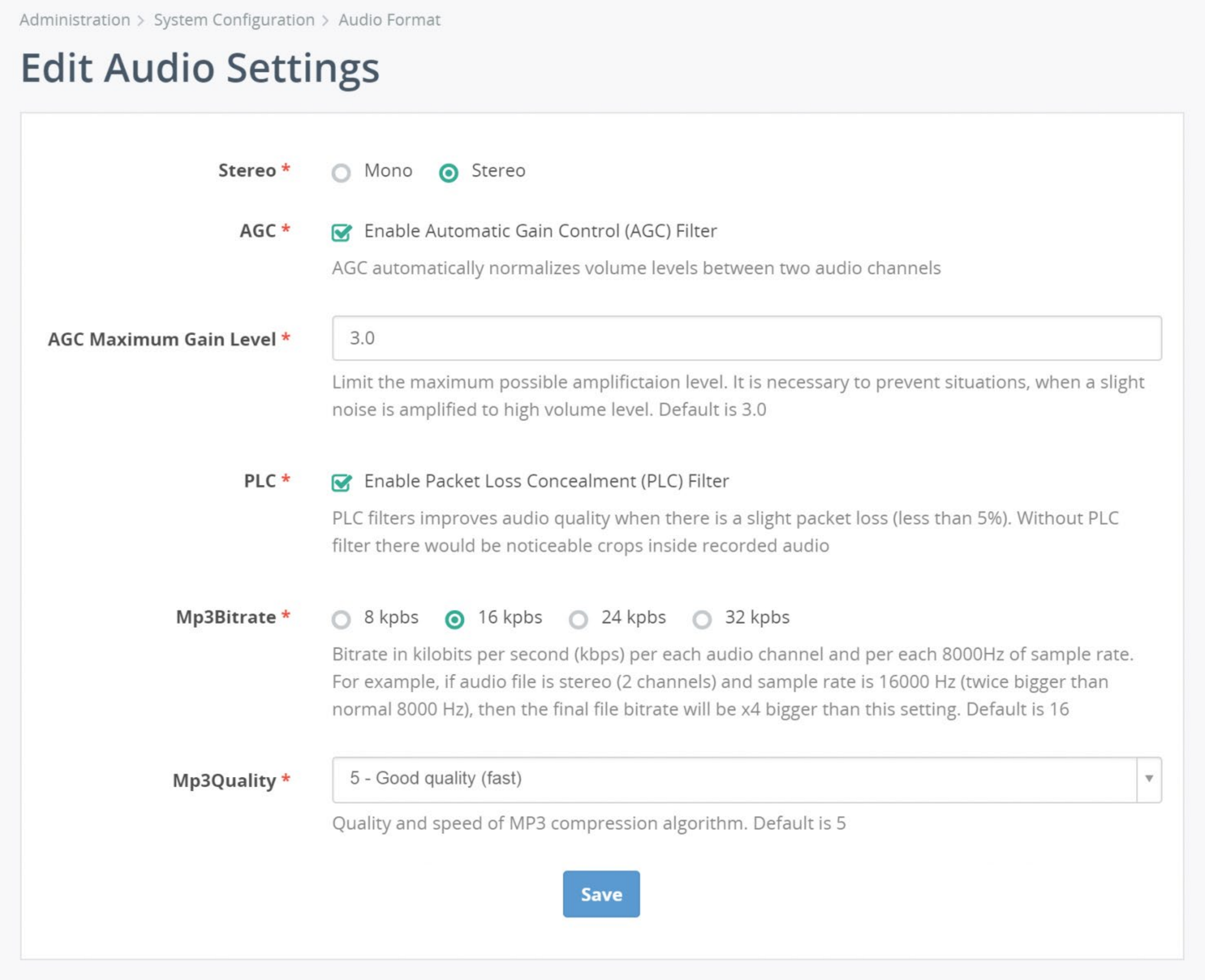
Export of the encrypted files

An important aspect of any file encryption facility's design is that file data is never available in unencrypted form except to users that access the file via the encryption facility. This restriction particularly affects backup process, when data is exported to external storage.

Call Recording addresses this problem by keeping files in encrypted form during backup process. The backup utility don't have to be able to decrypt file data before backup.
It is safe to export encrypted files to backup archive. The backup archive may be imported back to the same system or to new system during recovery process. When importing data to new system, it is necessary to import old encryption key as well.

5.2 Audio settings

Navigate to **Administration -> System Configuration -> Audio Settings** to change audio format (stereo/mono), MP3 bitrate and other settings.



Administration > System Configuration > Audio Format

Edit Audio Settings

Stereo * ○ Mono ● Stereo

AGC * ☑ Enable Automatic Gain Control (AGC) Filter

AGC automatically normalizes volume levels between two audio channels

AGC Maximum Gain Level * 3.0

Limit the maximum possible amplifictaion level. It is necessary to prevent situations, when a slight noise is amplified to high volume level. Default is 3.0

PLC * ☑ Enable Packet Loss Concealment (PLC) Filter

PLC filters improves audio quality when there is a slight packet loss (less than 5%). Without PLC filter there would be noticeable crops inside recorded audio

Mp3Bitrate * ○ 8 kpbs ● 16 kpbs ○ 24 kpbs ○ 32 kpbs

Bitrate in kilobits per second (kbps) per each audio channel and per each 8000Hz of sample rate. For example, if audio file is stereo (2 channels) and sample rate is 16000 Hz (twice bigger than normal 8000 Hz), then the final file bitrate will be x4 bigger than this setting. Default is 16

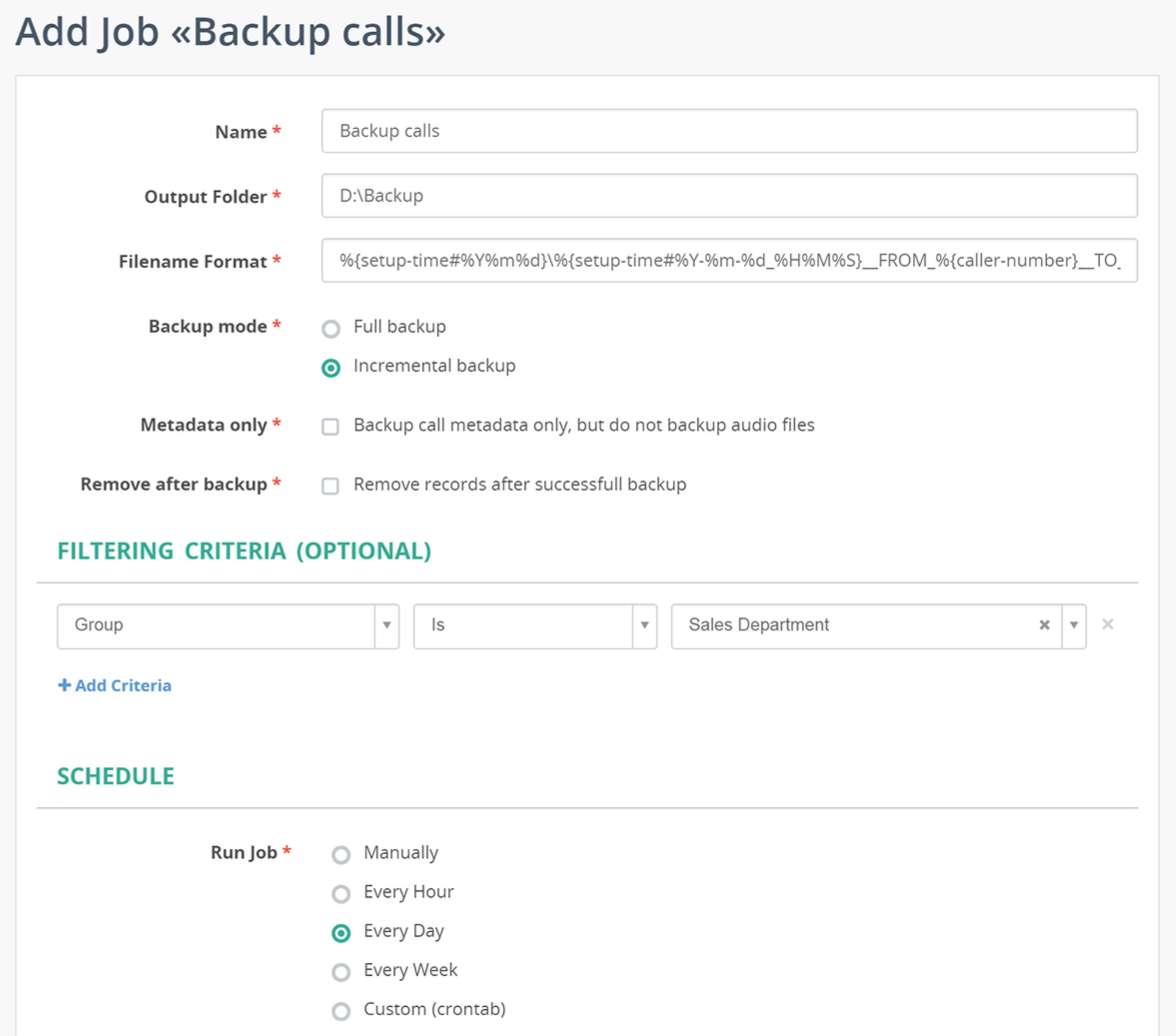
Mp3Quality * 5 - Good quality (fast)

Quality and speed of MP3 compression algorithm. Default is 5

5.3 Backup and restore

Backup call recordings

Navigate to Administration -> Storage -> Export Recordings to create backup job. In version before March 2016, navigate to menu Administration -> Maintenance -> Backup Calls.
Backup job may be started manually or by schedule (for example, every night/week etc).



Add Job «Backup calls»

Name *	Backup calls
Output Folder *	D:\Backup
Filename Format *	%{setup-time#%Y%m%d}\%{setup-time#%Y-%m-%d_%H%M%S}__FROM_%{caller-number}__TO_
Backup mode *	○ Full backup ● Incremental backup
Metadata only *	□ Backup call metadata only, but do not backup audio files
Remove after backup *	□ Remove records after successfull backup

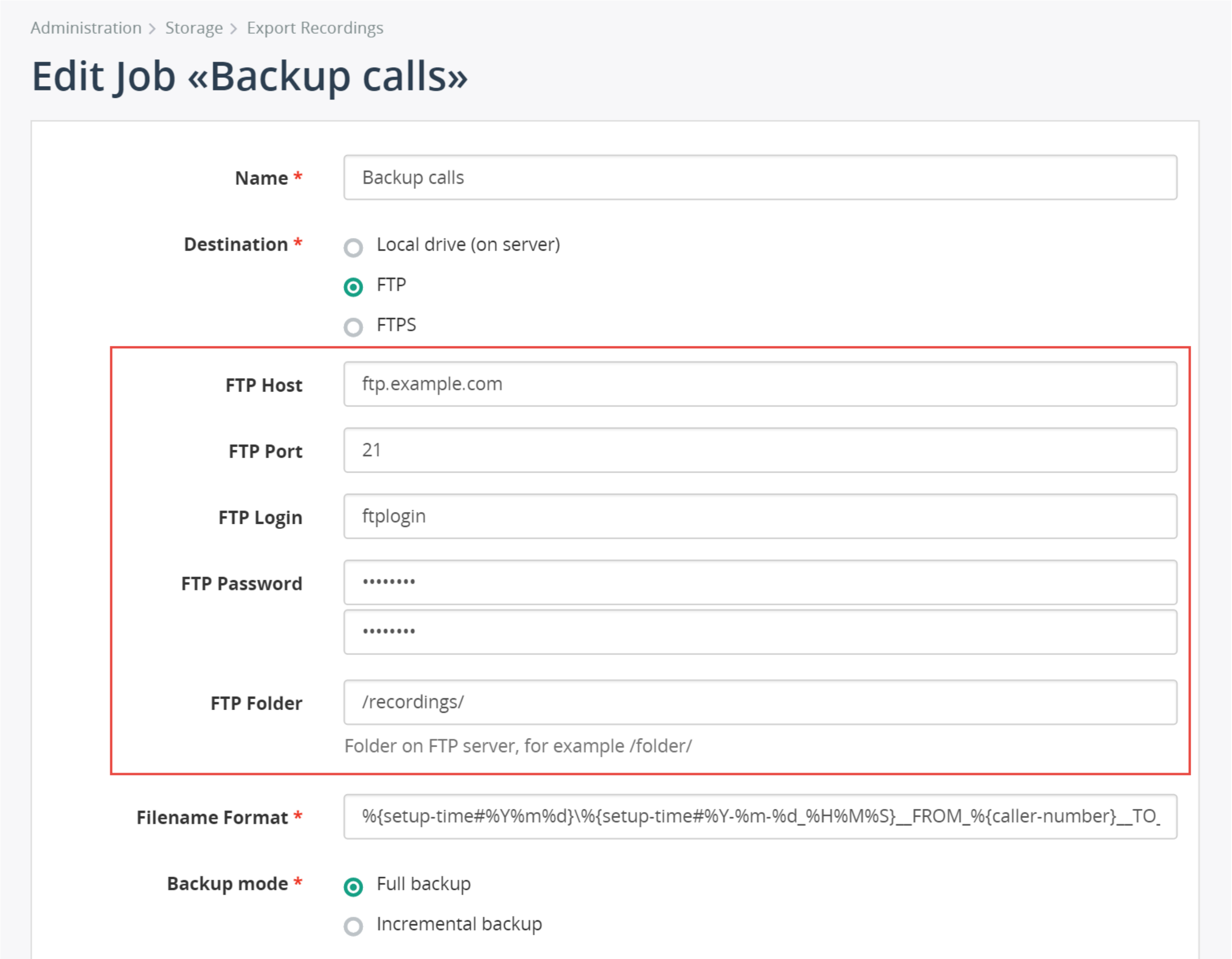
FILTERING CRITERIA (OPTIONAL)

Group | Is | Sales Department

SCHEDULE

Run Job *
○ Manually
○ Every Hour
● Every Day
○ Every Week
○ Custom (crontab)

Export to FTP server:



Administration > Storage > Export Recordings

Edit Job «Backup calls»

Name * Backup calls

Destination *
○ Local drive (on server)
● FTP
○ FTPS

FTP Host ftp.example.com

FTP Port 21

FTP Login ftplogin

FTP Password ••••••••
••••••••

FTP Folder /recordings/

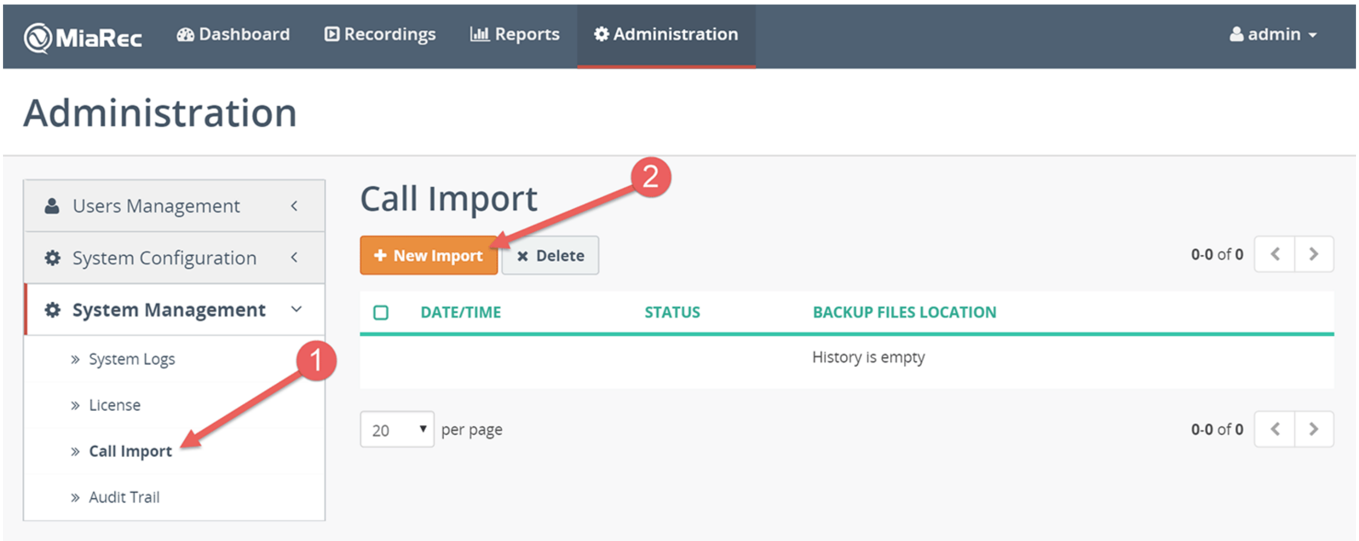
Folder on FTP server, for example /folder/

Filename Format * %{setup-time#%Y%m%d}\%{setup-time#%Y-%m-%d_%H%M%S}__FROM_%{caller-number}__TO_

Backup mode *
● Full backup
○ Incremental backup

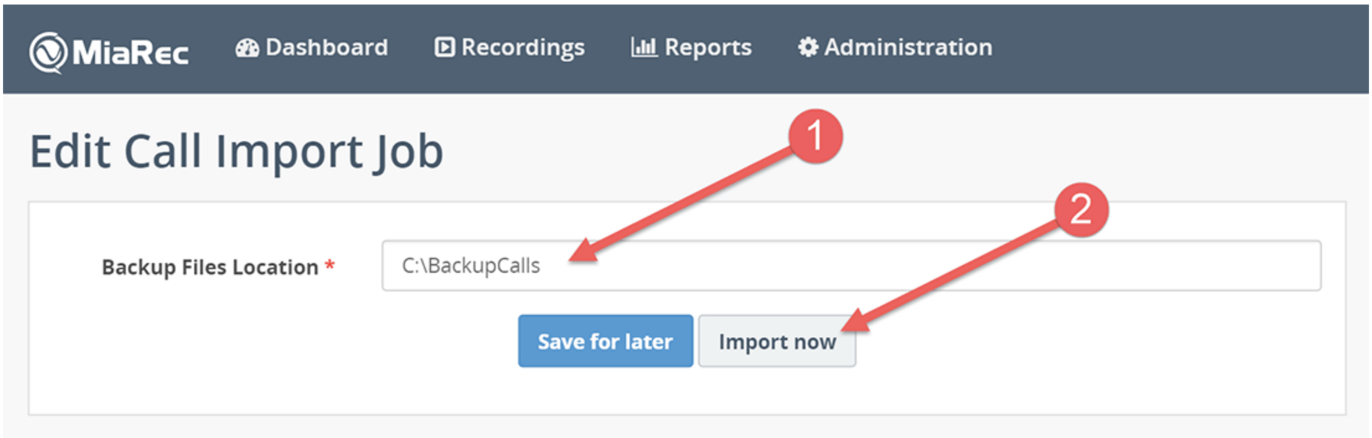
Restore call recordings

Navigate to **Administration -> Storage -> Import Recordings** to create job. In version before March 2016, navigate to menu Administration -> Maintenance -> Restore Calls



History is empty

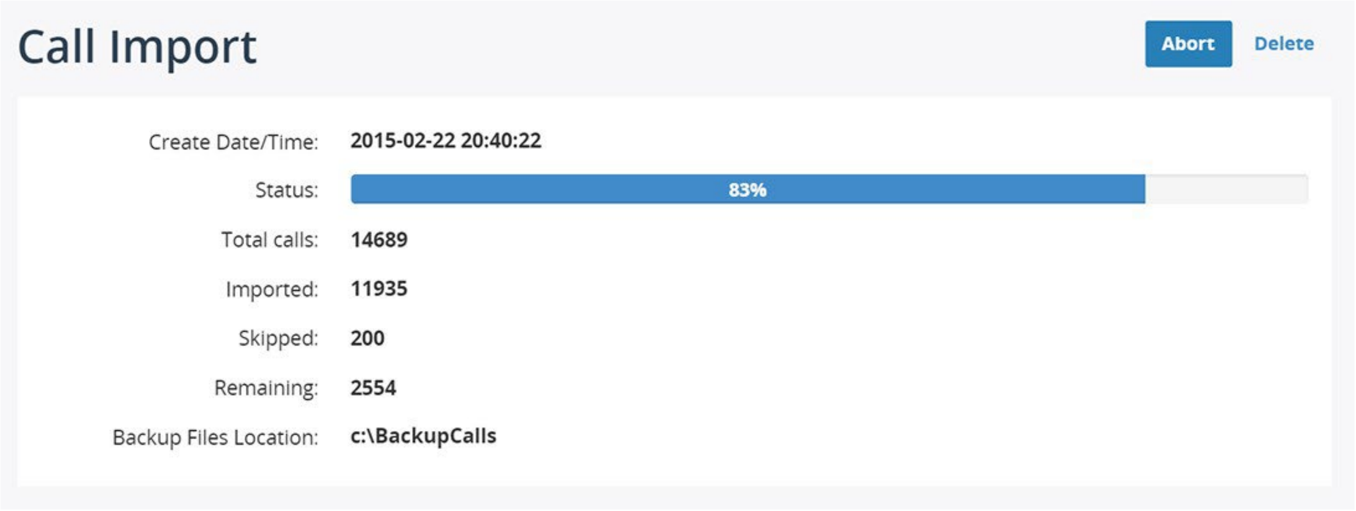
In "Edit Call Import Job" form specify the location of backup files and click on **Import now** button.



Backup Files Location *: C:\BackupCalls

Additional steps in case the backup files are located on network share

It is important to note, that backup files will be accessed by a program application running on Call Recording server rather than from the computer on which you open Call Recording web portal. This means that even if you can access backup files from your own computer, the same files may be inaccessible from Call Recording server.
If backup files are stored on a network share, then on Windows servers you should use correct UNC path like \server\dir, on Linux servers you should mount the network share to a local file system, for example, /mount/backup.
When using UNC path on Windows, take into account that such path will accessed by a process running as a Windows service application. By default service applications are running under credentials of LOCAL_SYSTEM user account. This is internal user account, which has no access to network. To solve this issue, you would need to change parameters of "Call Recording Celery" service and run it under credentials of some user account, which can access the backup network share. The process of call importing will be started and the progress will be displayed on web-page.



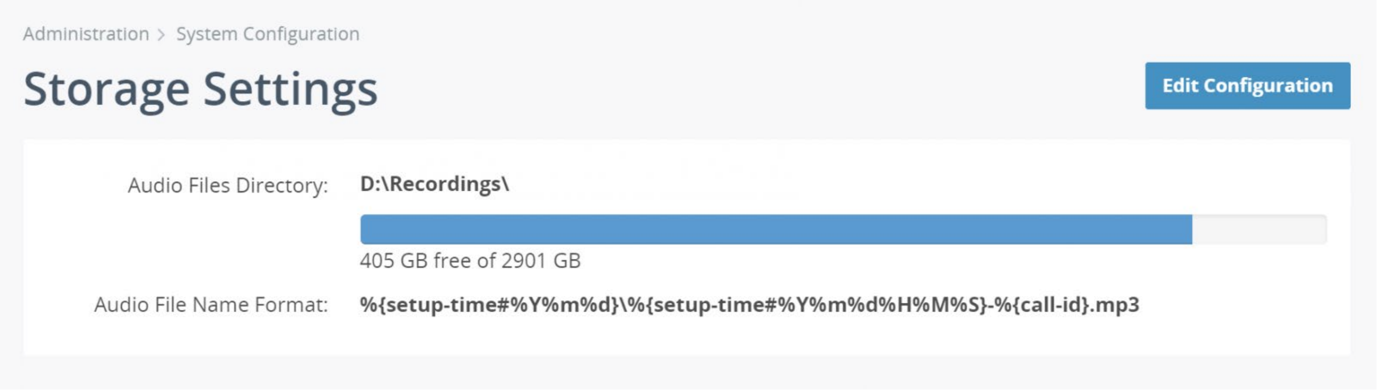
Call Import

Create Date/Time:	2015-02-22 20:40:22
Status:	83%
Total calls:	14689
Imported:	11935
Skipped:	200
Remaining:	2554
Backup Files Location:	c:\BackupCalls

5.4 Location for audio files

Location for audio files

Navigate to **Administration -> System Configuration -> Storage** to view/edit location of audio files and filename format.



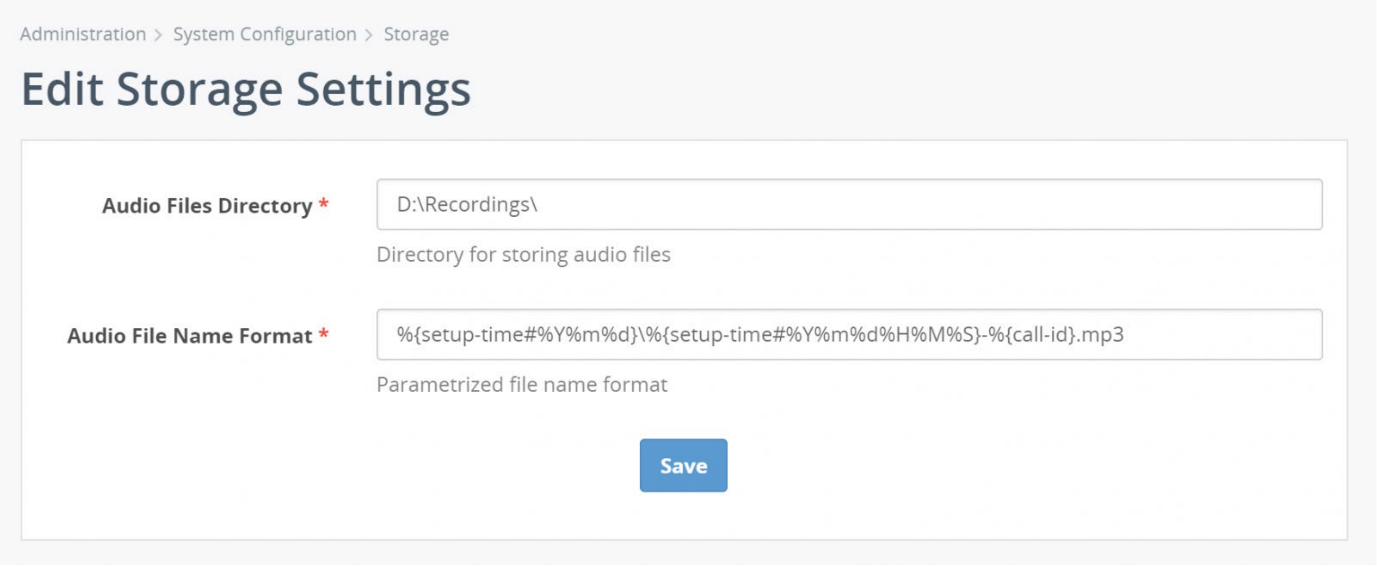
Storage Settings

Audio Files Directory: **D:\Recordings\**

405 GB free of 2901 GB

Audio File Name Format: **%{setup-time#%Y%m%d}\%{setup-time#%Y%m%d%H%M%S}-%{call-id}.mp3**

Click on **Edit Configuration** to modify settings.



Edit Storage Settings

Audio Files Directory *: D:\Recordings\

Directory for storing audio files

Audio File Name Format *: %{setup-time#%Y%m%d}\%{setup-time#%Y%m%d%H%M%S}-%{call-id}.mp3

Parametrized file name format

Audio File Name Format is a parametrized format of audio file name. This is very powerful way of configuring audio files location. Parameters are described in details in article File name format.
See also:

- File name format
- Time formatting inside file name

File name format

Call Recording supports flexible naming of audio files. It is possible to include date/time, ip-address, phone number and other call parameters into file name.
Example:

```
C:\Recordings\%{setup-time#%Y%m%d}\%{setup-time#%Y-%m-%d-%H%M%S}.mp3
```

In above example audio files are stored inside directory C:\Recordings\.

For each day a new sub-directory is created (for example, C:\Recordings\20110203\ for 3rd of February 2011). This is done with the help of parametrized string **%{setup-time#%Y%m%d}**, which is converted to date (read details about parametrized strings below). The file name consists of a date and time of when a call is started, for example, 20110203104522.mp3.

If two or more calls are started at the same time, then Call Recording appends a unique number at the end of file name, for example, 20110203104522_2.mp3, 20110203104522_3.mp3 etc.
Parameters have the following format:

```
%{parameter-name} or
%{parameter-name#format-string}
```

where:

- **parameter-name** is a name of call parameter (see Table 1)
- **#format-string** is an optional format of call parameter (see Time formatting).

Examples:

- %{caller-number}
- %{setup-time#%Y%m%d}

Table 1. Supported parameters inside file path

Parameter	Description
%{call-id}	Unique id of a call, which is assigned to each recorded call by Call Recording
%{parent-call-id}	Id of a call, which is a parent to the current call. The meaning of this parameter depends on particular voip protocol. For example, for Avaya H.323 protocol, when call is put on hold and then retrieved from hold, the new audio file will be created. In this case %{parent-call-id} points to the very first call part.
%{protocol-call-id}	Id of a call, which is assigned by IP PBX. This value is valid only for supported voip protocol (SIP, Skinny, H.323 and MGCP). For example, for SIP protocol this value is retrieved from header "Call-ID" inside SIP INVITE message.
%{protocol-tracking-id}	Id of a call interaction assigned by IP PBX. Usually IP PBX assigned the same tracking id to related calls, like transferred from one agent to another. For Avaya Aura Communication Manager, it is UCID. For Broadworks, it is extTrackingID. Available since August 2018
%{call-state}	Phase (state) of the call. It is a numeric value, one of: • **0 - Idle** • **1 - Initiated**. The first phase of a call: the caller sent invitation to the callee • **2 - Accepted**. The callee received invitation and confirmed this • **3 - Alerting**. The callee started ringing • **4 - Connected**. The call was answered • **5 - Disconnecting**. The call was initiated for disconnecting by one of parties • **6 - Disconnected**. The call was completed (disconnected) • **7 - Hold**. The call was put on Hold • **8 - Transferred**. The call was transferred to the third party • **9 - Deleted**. The call was deleted from the disk.
%{record-state}	State of the audio recording. It is a numeric value, one of: • **10 - Active**. Call is active at the moment and recording is in progress • **20 - Partial recording**. Recording of call was stopped because of not enough licenses • **30 - Finished**. Call is finished. Audio was recorded in full • **40 - Ignored**. Call is ignored by recording filters.
%{voip-protocol}	

Parameter	Description
	Voip protocol of the call. It is a numeric value, one of: • **0 – Unknown** (not recognized protocol). Call is recorded from RTP packets • **1 - SIP** • **2 - H.323** • **4 - SCCP (Cisco Skinny)** • **5 - MGCP** • **6 - Avaya** (H.323 protocol with proprietary extensions) • **7 - Nortel UNISTIM** • **8 - TAPI** • **9 - MGCP PRI Backhaul** (it is used between Cisco CCM and Voice Gateway) • **10 - Alcatel** (proprietary protocol used by Alcatel OmniPCX) • **11 - Avaya RTP** (passive recording w/o signaling) • **12 - Avaya TSAPI** (TSAPI + port mirroring recording) • **13 - SIPREC** • **14 - Cisco Built-in-Bridge** • **15 - NEC SIP** (SIP protocol with NEC proprietary extensions) • **16 - ED137** • **17 - Cisco Built-in-Bridge passive** • **18 - SIPREC passive** • **19 - Avaya DMCC**
%{protocol-call-direction}	Call direction reported by IP PBX, available for active recording interfaces only. It is a numeric value, one of: • **0 - Unknown** • **1 - Outbound** • **2 - Inbound** Available since August 2018
%{setup-time}	Time when call was established (when a called party received incoming call message). See Time formatting
%{alerting-time}	Time when phone started ringing on called party side. See Time formatting
%{connect-time}	Time when call was answered. See Time formatting
%{disconnect-time}	Time when call was disconnected. See Time formatting
%{duration}	Duration of voice part of a call in seconds. This is a difference beween %{connect-time} and %{disconnect-time}
%{total-duration}	Total duration of a call in seconds. This is a difference beween %{setup-time} and %{disconnect-time}
%{filename}	Name of audio file without full path (for example, 20110410104600.mp3) Caution! This value is available only to a recording engine when file is initially created. It is not available to post-processing jobs, like export, relocate, etc.
%{filename-full}	Full path to the file, including directory (for example, C:\Recordings\20110410104600.mp3) Caution! This value is available only to a recording engine when file is initially created. It is not available to post-processing jobs, like export, relocate, etc.
%{filename-dir}	Directory path to the file, excluding drive letter (for example, \Recordings)

Parameter	Description
	Caution! This value is available only to a recording engine when file is initially created. It is not available to post-processing jobs, like export, relocate, etc.
%{caller-number} or %{callee-number}	Phone number of caller/callee
%{caller-name} or %{callee-name}	Name of caller/callee. This parameter is protocol-dependent. For example, for SIP protocol name is extracted from "From" and "To" sip headers
%{caller-id} or %{callee-id}	Id of a caller/callee. This paramter is protocol-dependent. For example, for SIP protocol it is SIP URI
%{caller-ip} or %{callee-ip}	Ip-address of caller/callee
%{caller-port} or %{callee-port}	Port of caller/callee
%{caller-mac} or %{callee-mac}	Mac-address of caller/callee

%{transfer-from-number}
%{transfer-from-name}
%{transfer-from-id}
	Name, number and id of party, from which the call was transferred. This parameter is available only for Skinny protocol.

%{transfer-to-number}
%{transfer-to-name}
%{transfer-to-id}
	Name, number and id of party, to which the call was transferred. This parameter is available only for Skinny protocol.

%{sip-header-invite}	Value of specific SIP header inside INVITE message. The name of header is specified after hash (#) symbol. Examples: • %{sip-header-invite#**User-Agent**} • %{sip-header-invite#**X-My-header**}

	Caution! This value is available only to a recording engine when file is initially created. It is not available to post-processing jobs, like export, relocate, etc.
%{BroadWorks-userID}	Broadworks User ID
%{BroadWorks-groupID}	Broadwors Group ID
%{BroadWorks-serviceProviderID}	Broadworks Service Provider ID
%{MetaSwitch-recorderParty}	Metaswitch CFS User Extension
%{MetaSwitch-userName}	Metaswitch CFS User Name

Parameter	Description
%{MetaSwitch-businessGroup}	Metaswitch CFS Business Group Name
%{MetaSwitch-systemName}	Metaswitch CFS System Name
%{agent-id}	Avaya Agent ID
%{agent-name}	Avaya Agent Name
%{orig-caller-number}	Originally Caller Number (if different from caller-number)
%{orig-caller-name}	Originally Caller Name (if different from caller-name)
%{orig-callee-number}	Originally Dialed Number (if different from callee-number)
%{orig-callee-name}	Originally Dialed Name (if different from callee-name)

%{user-id}
%{user-name}
	ID, name of user, the call recording is assigned to. If the call is an internal (i.e. assigned to multiple users), then this value points to the first user only.
	Note: this value is available in post-processing jobs only (Export/Replication/File relocation). It is not available for the initial filename creation by the recorder process (configured at menu Administration -> Storage -> File Location)
	Available since May 2018.

%{group-id}
%{group-name}
	ID, name of group, the call recording is assigned to. If the call is an internal (i.e. assigned to multiple users) or user belongs to multiple groups, then this value points to the first group only.
	Note: this value is available in post-processing jobs only (Export/Replication/File relocation). It is not available for the initial filename creation by the recorder process (configured at menu Administration -> Storage -> File Location)
	Available since May 2018.

%{tenant-id}
%{tenant-name}
	ID, name of tenant, the call recording is assigned to.
	Note: this value is available in post-processing jobs only (Export/Replication/File relocation). It is not available for the initial filename creation by the recorder process (configured at menu Administration -> Storage -> File Location)
	Available since May 2018.

%{acd-number}
%{acd-name}
%{acd-id}
	Number/name/id of ACD.
	Broadworks and Avaya envorinments only.
	Available since July 2018.

Example 1

```
C:\Recordings\%{setup-time#%Y%m%d%H%M%S}.mp3
```

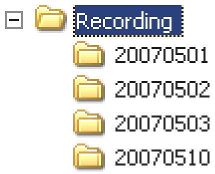
%{setup-time#%Y%m%d%H%M%S} will be replaced with a date and time of when a call was started. For example, if a call was started on 1st of May 2007 at 10:56:34, it will be stored into directory ‘C:\Recordings’ with the filename ‘20070501105634.mp3’.

Note: If two or more calls were started at the same time, a unique decimal suffix will be added to every file name (expect the first one), like: ‘20070501105634_2.mp3’, ‘20070501105634_3.mp3’ etc.

Example 2

```
C:\Recordings\%{setup-time#%Y%m%d}\File.mp3
```

This example contains a parameterized string inside a directory path. This means that files will be stored into sub-directories with name %{setup-time#%Y%m%d} (which will be replaced by a date of a call, for example, ‘20070501’). If such directory doesn’t exist, it will be created automatically.
In this example calls will be grouped into directories by date, like:



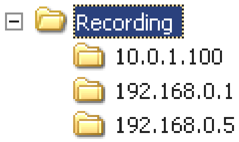
Recording
20070501
20070502
20070503
20070510

For every new day a separate directory will be created (a directory is not created if no calls were recorded at that day). Audio file names in this example will be File.mp3, File_2.mp3, File_3.mp3 and so on.

Example 3

```
C:\Recordings\%{caller-ip}\File.mp3
```

\ %{caller-ip} will be replaced with ip-address of a caller, for example 192.168.0.1. Calls will be grouped into directories by caller ip-address, like:



Recording
10.0.1.100
192.168.0.1
192.168.0.5

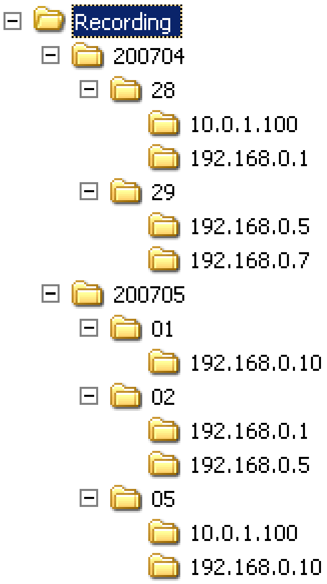
Example 4

```
C:\Recordings\%{setup-time#%Y%m}\%{setup-time#%d}\%{caller-ip}\File.mp3
```

In this example multiple parameter replacements occur:

- **%{setup-time#%Y%m}** will be replaced with a year and month of a call (YYYYMM). For 1st of May 2007 it will be 200705.
- **%{setup-time#%d}** will be replaced with a day of a call (DD). For 1st of May 2007 it will be 01.
- **%{caller-ip}** will be replaced with an ip-address of a caller, for example 192.168.0.1.

Calls will be grouped into directories by months, then by days and then by callers' ip-addresses, like:



```
Recording
    200704
        28
            10.0.1.100
            192.168.0.1
        29
            192.168.0.5
            192.168.0.7
    200705
        01
            192.168.0.10
        02
            192.168.0.1
            192.168.0.5
        05
            10.0.1.100
            192.168.0.10
```

Time formatting inside file name

All date/time parameters support a formatting attribute. Formatting attribute is specified after hash (#) symbol. For example:

- %{setup-time#%Y} will return year, like: 2011
- %{setup-time#%m} will return month, like: 02
- %{setup-time#%Y-%m} will return both year and month, like: 2011-02

Table 1. Formatting codes

Code	Description
%a	Abbreviated weekday name
%A	Full weekday name
%b	Abbreviated month name
%B	Full month name
%d	Day of month as decimal number (01 – 31)
%H	Hour in 24-hour format (00 – 23)
%I	Hour in 12-hour format (01 – 12)
%j	Day of year as decimal number (001 – 366)
%m	Month as decimal number (01 – 12)
%M	Minute as decimal number (00 – 59)
%p	A.M./P.M. indicator for 12-hour clock
%S	Second as decimal number (00 – 59)
%U	Week of year as decimal number, with Sunday as first day of week (00 – 53)
%w	Weekday as decimal number (0 – 6; Sunday is 0)
%W	Week of year as decimal number, with Monday as first day of week (00 – 53)
%y	Year without century, as decimal number (00 – 99)
%Y	Year with century, as decimal number
%%	Percent sign
%u	Microseconds as decimal number

Table 2. Examples of time formatting

Format string	Result
%Y-%m-%d	2004-11-10
%H%M%S	160201
%I%M%S	040201
%d %b %Y, %A	10 Nov 2004, Wednesday

Note, for all examples, we used the same date/time, which is “10th of November 2004 16:02:01”. This day is a Wednesday.

5.5 Replication

5.5.1 Multi-master asynchronous replication

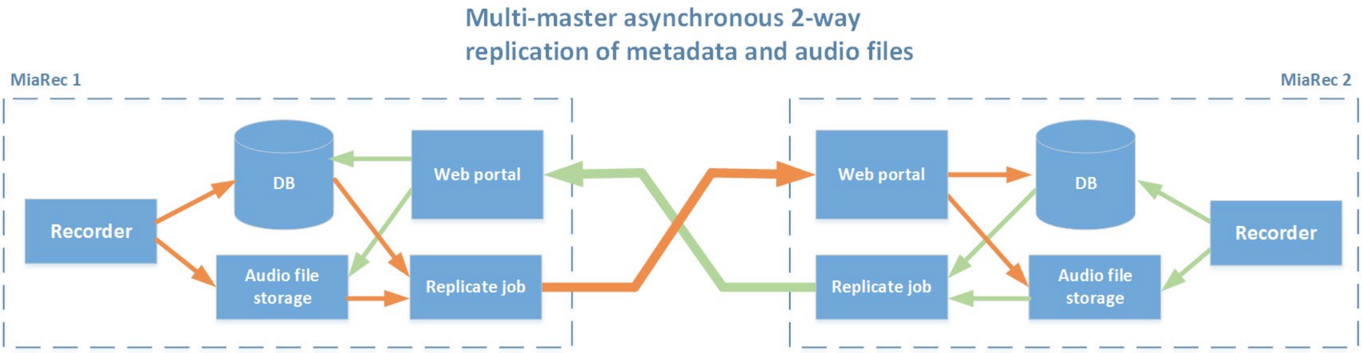
The solution implements data replication with the following characteristics:

- Multi-master
- One-way, two-way or N-way
- Asynchronous
- Application-level
- GEO distributed
- Continuous, manual or scheduled
- Auto resume after network breakdown

This articles describes in details each of these characteristics and compares Call Recording solution with alternatives. The competitive solutions are built usually on file-storage based replication and have a number of weaknesses discussed below.

How it works

When recording of each individual call is completed, Call Recording pushes it into queue for automatic replication to other server(s) in a cluster. Such data replication may be started immediately upon call completion or scheduled to specific time of day (for example, at night).
Besides replication of call recordings, Call Recording replicates also user data in one-way or two-way directions. The updates to user data is automatically uploaded to other servers in a cluster.



Replication architecture of Call Recording has the following characteristics:

- **Multi-master.** Any of servers in a cluster can be used for recording tasks at any time. It is possible to use multiple recorders simultaneously for load balancing purposes.
- **Asynchronous replication.** Data is replicated asynchronously. Data synchronization can be triggered by schedule (once per hour/day/week) or continuously upon each individual call completion. It works seamlessly in GEO-redundant architecture when datacenters are located too far from each other. In a contrast, other solution may use synchronous replication, which require low latency (less than 5ms) connection between datacenters, this is equal to maximum 100km distance between servers. With a synchronous replication, if a link between datacenters is down even for 1 second, the redundant server is removed from a cluster and manual re-synchronization is required between servers. Automatic restore of cluster is not possible by design with synchronous replication.
- **Application-level replication.** Call Recording implements replication internally on application level. It has a few advantages: cost, easy management and selective replication. In a contrast, other solutions may use replication on database level or disk level (SAN). SAN replication is supported only in highly expensive enterprise SAN disk arrays. In both of these competitive solusions (database replication and SAN replication) the selective replication is not supported.

Multi-master vs master-slave replication

Multi-master replication (Call Recording)

All servers run as master servers, thus you can record calls on any of servers at any time or even simultaneously to multiple servers.

This makes system highly flexible in a way that any operation can be processed in any server which enables better load balancing.

However, such flexibility brings the challenge of keeping servers consistent. A conflict occurs if more than one server tries to update the same object. In Call Recording we solved this issue with the following mechanisms:

1. Careful design of database structure from scratch to address unique redundancy requirements. We do not use integer auto-incremental fields for IDs. Instead we use UUID all over the database to guarantee uniqueness through multiple servers.
2. Replication is implemented on application level instead of database engine or disk-level. More about this later.

Master-slave replication (other vendors)

In master-slave replication, there is only one server in the system which is capable of recording data. All other replicating servers are called slaves and can only accept read-only requests.

In master-slave replication, the master server becomes overwhelmed and system suffers from scalability due to using a single server for write operations (call recording).

Setup of automatic fail-over mechanism can be tricky. When master server becomes unavailable, one of the slaves can be promoted as a master. When the master server is back, it usually stays in off-line mode and requires manual re-synchronization of servers to assure data consistency. Such synchronization process is quote time consuming and it is recommended to have at least 3 servers in a cluster (1 master and 2 slaves) in order to avoid single point of failure situations while master server is in off-line mode.

If such configuration is used in GEO-redundant setup, it may create too much burden to administration staff in case of frequent issues with connection between datacenters.

Asynchronous vs synchronous replication

Asynchronous replication (Call Recording)

In asynchronous replication, an incoming request is processed and get committed on the receiving server without propagating it to other replicating servers simultaneously. Instead, committed request are deferred and sent to all other replicating servers asynchronously. Once replicating servers receive these deferred request, they process them and make themselves synchronized.

Asynchronous replication utilizes network resources intelligently, creates less traffic, and provides higher performance. Deferring multiple request and propagating them all as a big chunk of requests is much more efficient rather than to propagate each of them separately. Operation latency is reduced as opposed to synchronous replication because a server can go ahead and process a request without need to talk with other servers to commit it. It also provides better scalability since response time of a server is independent from the number of replicating servers, and generated network traffic is proportional to the number of replicating servers. Moveover, network latency introduced due to the geographical distance between replicating servers can be tolerated and hidden since requests are deferred and propagated asynchronously.

Additionally, asynchronous replication can be scheduled to execute during less busy hours, like at night or weekends.

Synchronous replication (other vendors)

In synchronous replication, incoming requests are propagated to and processed by all replicating servers immediately. The benefits of synchronous replication is to guarantee that data is consistent at all servers at any time.

While propagating requests and synchronizing servers, two-phase commit protocol is used. When a request comes in a sever, the same request is also forwarded immediately to all replicating servers. All servers have to process incoming request to see if it is OK to be committed, and have to inform the propagating server in this regard. If and only if all replicating servers inform that request can be committed, then second message is propagated to commit the request in all replicating servers. If any replicating server complains about the request, than abort message is propagated and all servers have to disregard the request.

Although it ensures that replicating servers are synchronized immediately when a request is committed and prevent consistencies may occur otherwise, it generates huge network traffic due to high number of sends and receives to decide to commit or abort. It increases processing latency which degrades operation performance since operation has to wait until all replicating servers have been synchronized. Scalability also suffers from increasing number of replicating metadata servers that tend to create exponentially growing network traffic and processing latency that ends up with longer response time.

Synchronous replication is not suitable for GEO-redundancy when distance between datacenters is more than 100km.

Application-level vs Storage array-based replication

Application-level replication (Call Recording)

The replication mechanism is based on knowledge of data. This allows it to selectively replicate only the necessary data. For example, administrator may enable continuous (as soon as possible) replication for call recording data and for the rest of data (like logs) schedule replication during off-hours (at night, for example).

Additionally, it is possible to set filtering criteria for replication. For example, replicate only call recordings of particular tenant(s) or group(s).

Having knowledge of data allows the application to resolve conflicts intelligently. For example, if the same user record is updated from multiple servers simultaneously, then administrator may decide to resolve conflicts automatically based on priorities or manually.

In a contrast to storage array-based replication (SAN), Call Recording replication mechanism supports any storage, like NAS, local, virtual environment. It doesn't depend on hardware. It is possible to mix different storage types in the same cluster, for example, replicate from local or NAS storage to SAN.

Aplication-level replication supports multi-master architecture, which is not possible with a storage array-based replication. As a result, utilization of hardware is much better due to using second storage in load balancing configuration. Call Recording supports also replication to
multiple servers simultaneously.

Application-level replication is tolerant to temporary problems with a link between replicating servers. In case of problems with a link between datacenters, Replication process is postponed and automatically resumed when link is restored. No data loss occurs due to in this case.

Storage array-based replication (other vendors)

Storage array-based replication is expensive. Usually it is available only in enterprise SAN disk arrays.

It doesn't have knowledge of data that is stored on disk. As a result, it is not possible to configure selective replication. You need to replicate an entire SAN or nothing.

Storage array-based replication works only for a pair of SAN arrays of exactly the same vendor/ model and size. It is not possible to mix SANs from different vendors or even different models of the same vendor.

SAN replication usually supports both asynchronous and synchronous replication, but the latter is not suitable in GEO-redundant environment because it works only for a distance up to 100km between datacenters.

When using SAN replication in asynchronous mode, it suffers from ineffectiveness of investments. One of SAN-arrays in a pair is used in passive mode most of the time until disaster occurs.

In case of DR, a switch from primary SAN to the secondary usually occurs automatically, but a reverse operation requires the manual intervention of human.

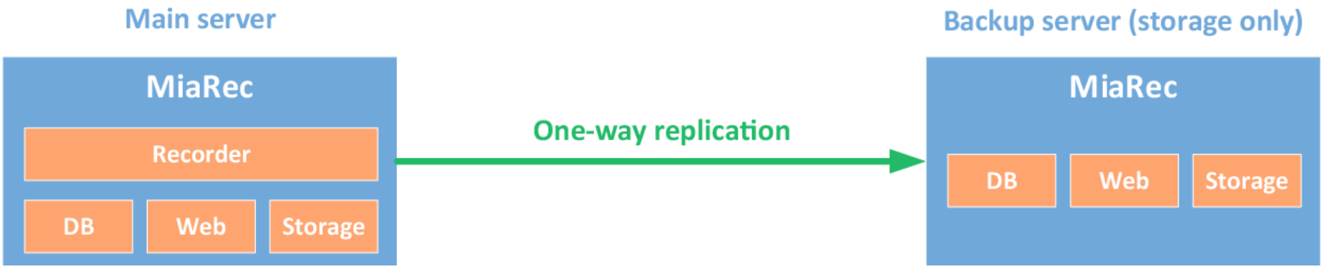
In case of problems with a link between datacenters, data on primary and secondary SAN arrays becomes inconsistent and requires manual re-synchronization, which is very time consuming.

Use cases for replication

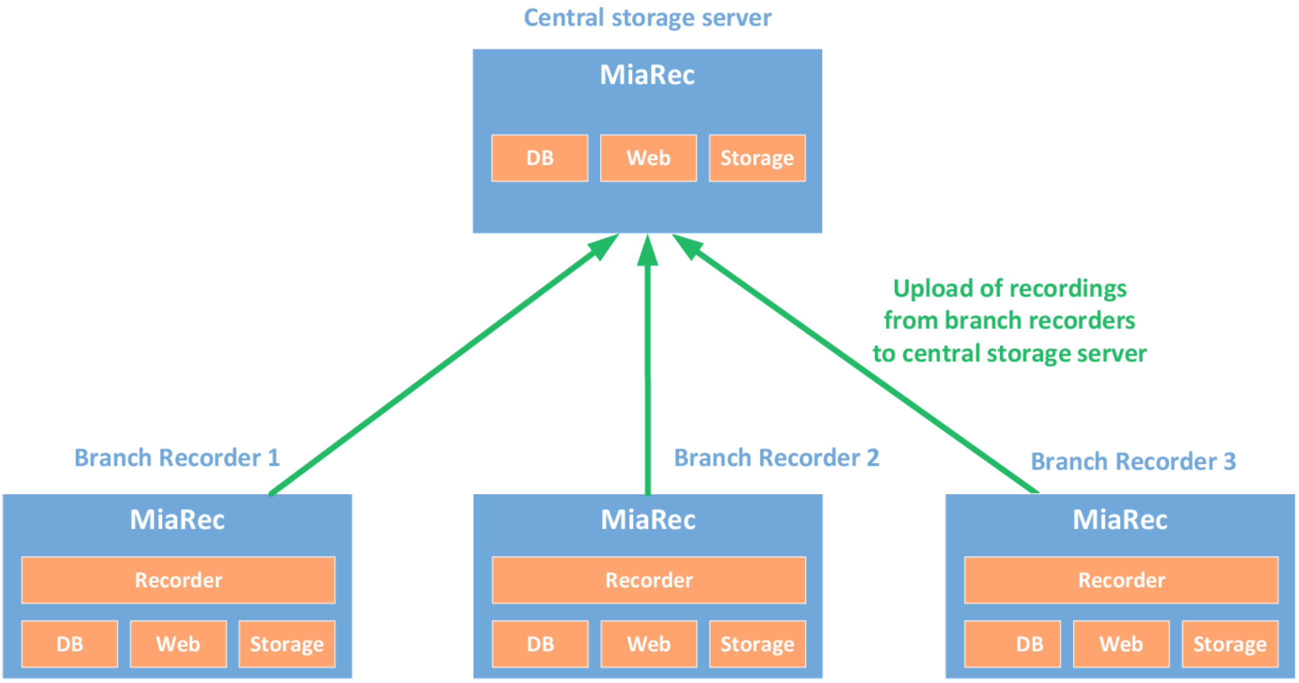
Call Recording supports advanced replication mechanism between two or more Call Recording servers.

Such replication may be configured one-way or two-way. Call Recording server may play role of **target** (recipient) or **source** (sender) or both roles at the same time.
The following scenarios are supported:

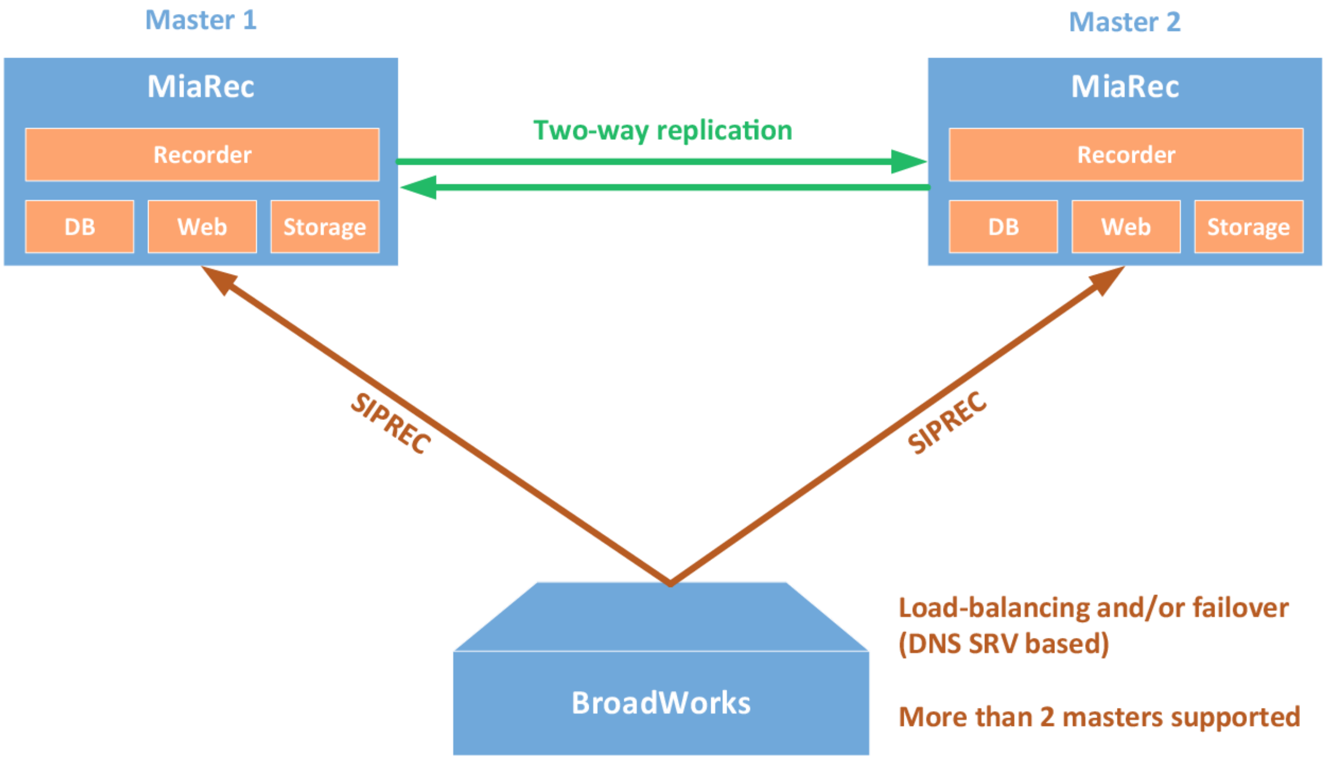
Replication to backup storage



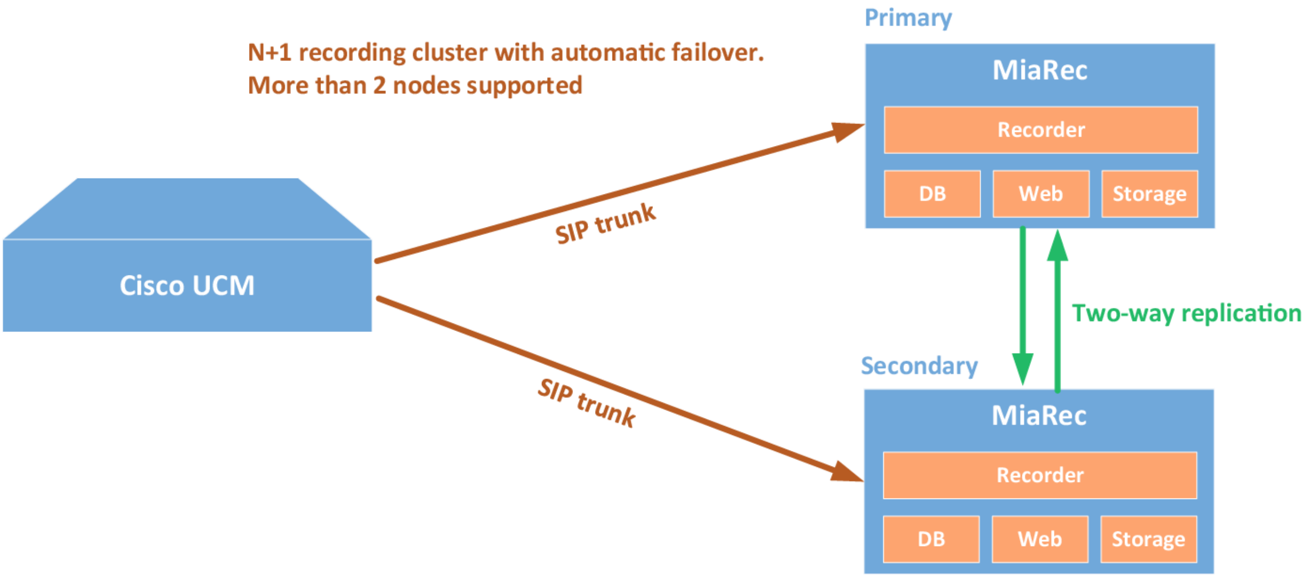
Replication to centralized storage



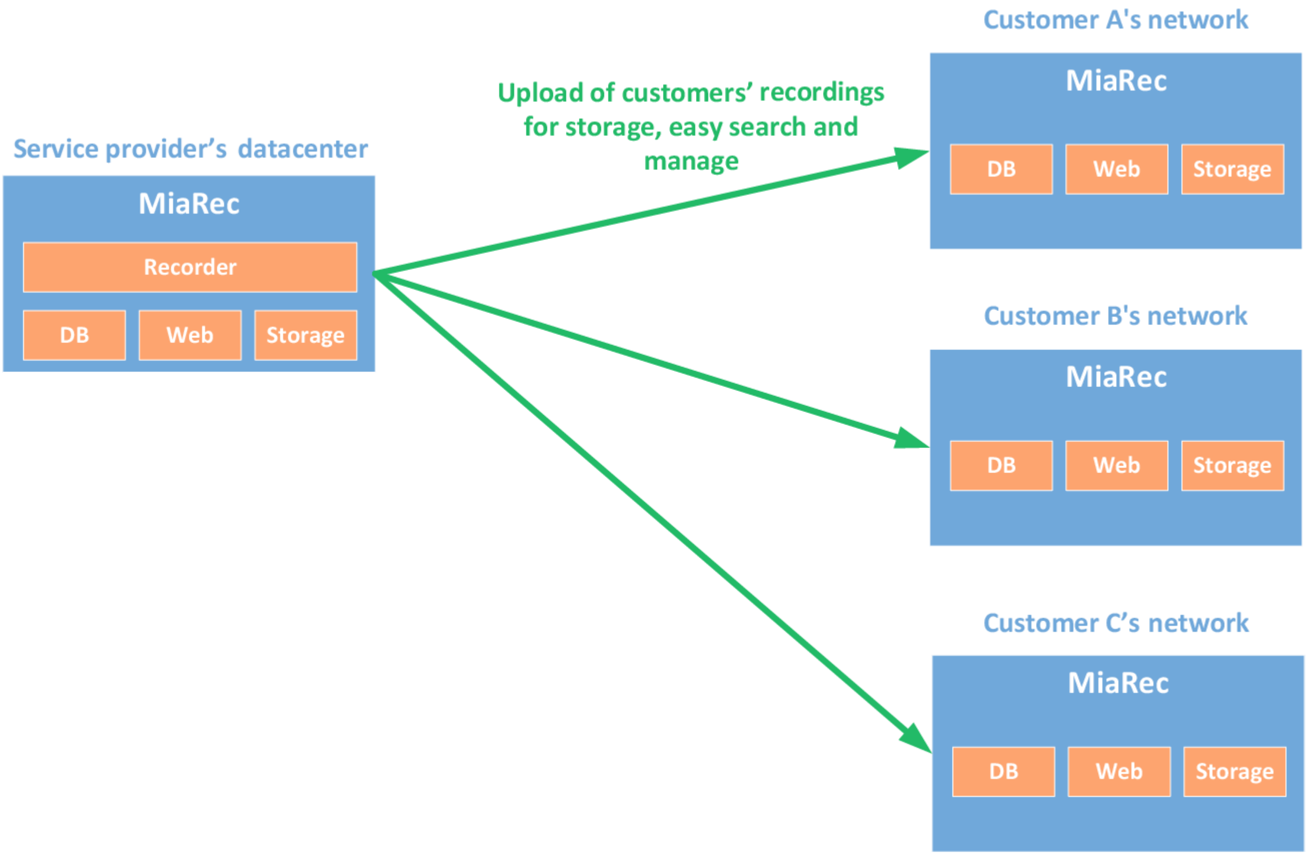
Redundant recorder with BroadWorks SIPREC



Redundant recorder with Cisco Built-in-Bridge



Upload call recordings from service provider to customer network



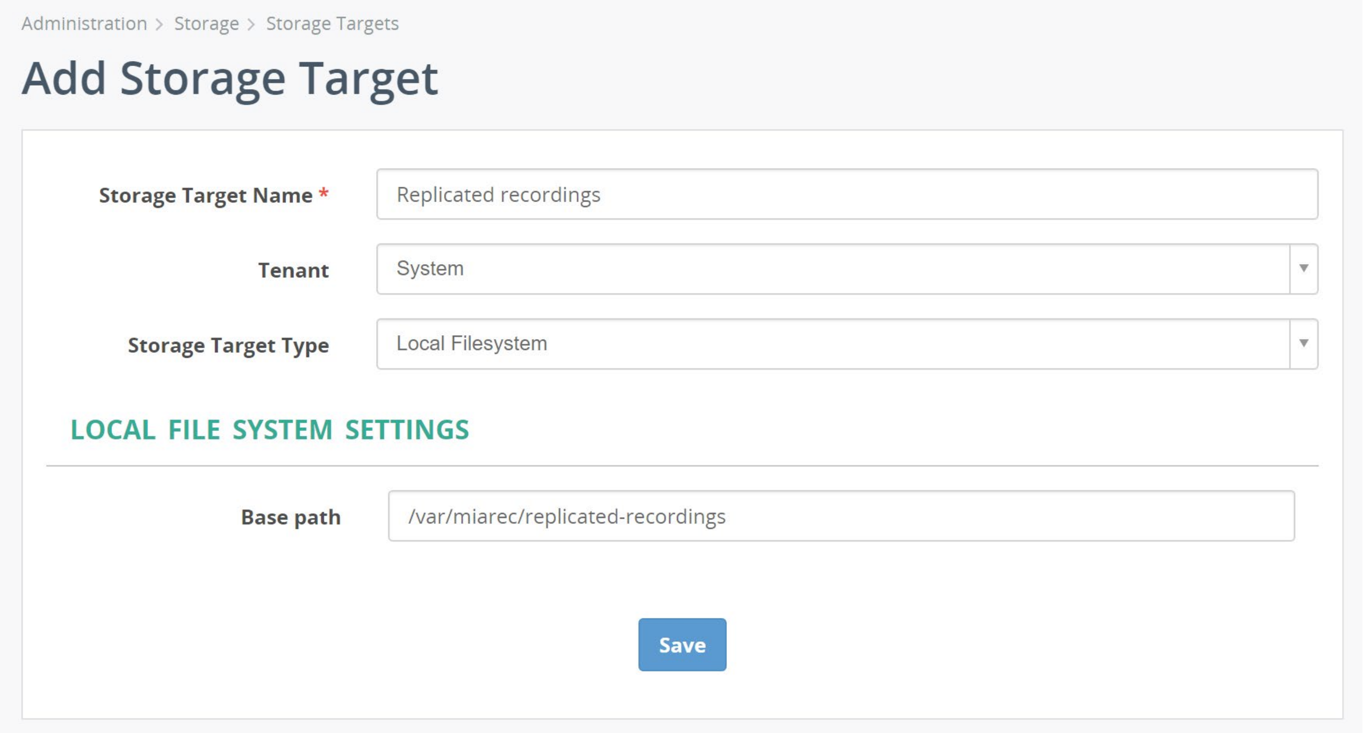
Configuring target server (recipient)

Step 1. Create Storage Target for the received recordings

Navigate to **Administration -> Storage -> Storage Targets**, click **Add** button to create new storage target for the received files from a remote server.
Supported storage target types:

- Local File System (the same server, where the web portal component is running on)
- Network Share (SMB)
- FTP/FTPS Server
- SFTP Server
- Amazon S3 bucket

In this example, we create a Local File System storage target, i.e. the received files will be stored on the local server, where the Call Recording web portal is running on.



Administration > Storage > Storage Targets

Add Storage Target

Storage Target Name *: Replicated recordings

Tenant: System

Storage Target Type: Local Filesystem

LOCAL FILE SYSTEM SETTINGS

Base path: /var/miarec/replicated-recordings

When Local File System storage is used and the web portal is running on Linux, then you need to change ownership to the folder on disk. Execute the following command (change the file path as necessary):
On Centos:

```
chown -R apache:apache /var/miarec/replicated-recordings
```

On Ubuntu:

```
chown -R www-data:www-data /var/miarec/replicated-recordings
```

Caution! Do not use the same folder for storing the locally recorded files as well as replicated files as it will cause permission issues. The locally recorded files are stored by default at `/var/Call Recording/recordings` .

Step 2. Create the incoming replication token.

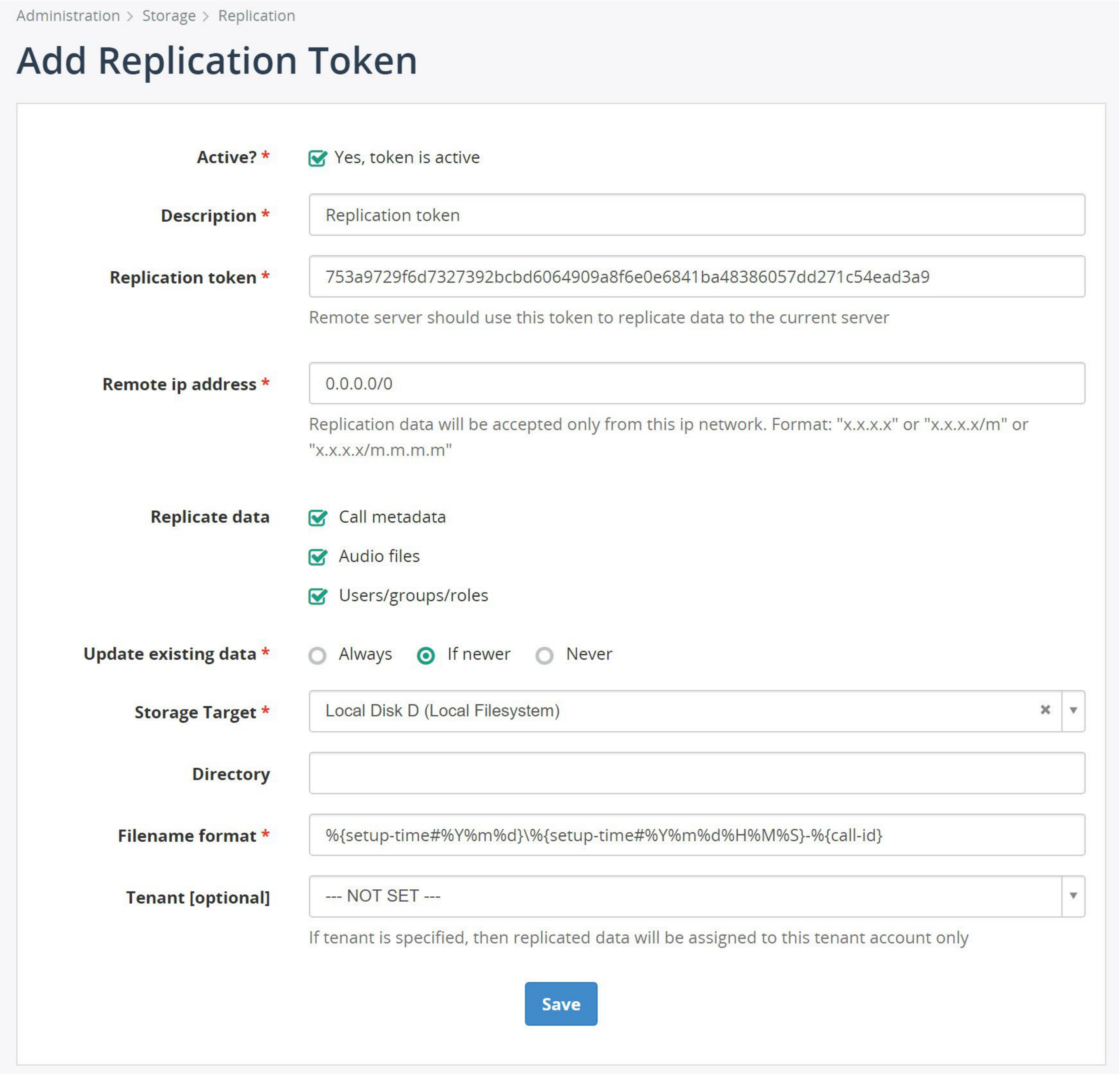
Navigate to **Administration -> Storage -> Replication** to configure incoming replication token

Click on **Add token** button to create a secure token for incoming replication. This secure token will be used by the sender server to upload data to the target server.
Fill out the following parameters:

- **Replication token**. A replication token, auto-generated. Optionally, it can be modified.
- **Remote ip address** (recommended). The IP-address or IP network mask of the sender server. This parameter can be set to "0.0.0.0/0" to accept replication data from any IP-address.
- **Replicate data**. Data that is replicated
- **Update existing data**. A conflict resolution strategy when the same record is updated on both servers.
- **Storage target**. A location of the received data (audio files)
- **Directory** (optional). A sub-directory within the Storage Target path
- **Filename format**. A format for filenames and, optionally, directories. The replication process can inject various call metadata attributes into file/directory names. For example, it can create directory for each day in format `YYYYMMDD` and then include `caller-number` and `called-number` into file name. More details about file name format **Tenant** (optional). When

specified, the replicated data will be imported into the specified tenant account.

The same target server may receive data from multiple source servers. You will need to create a token for each source server.



Administration > Storage > Replication

Add Replication Token

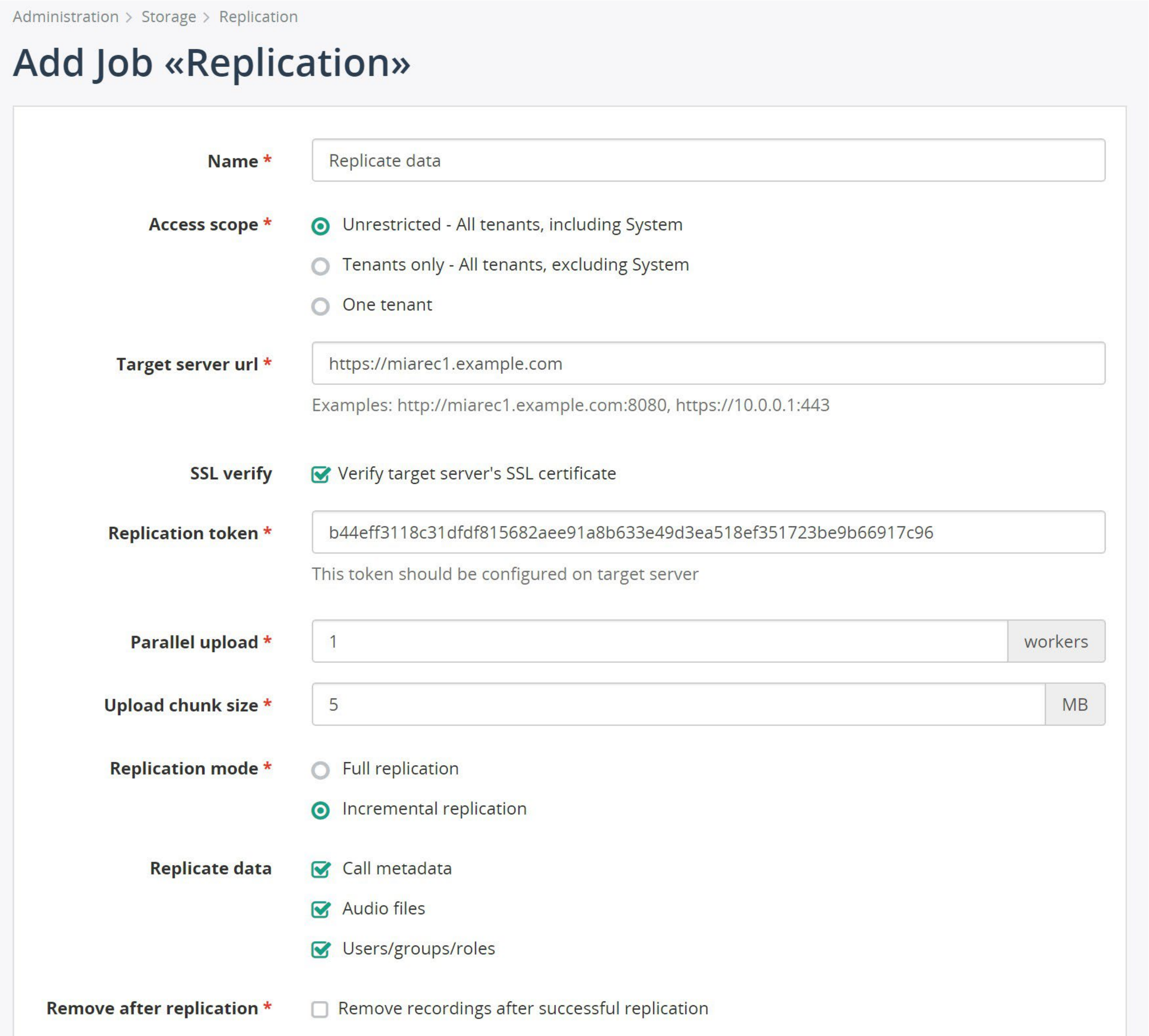
Active? *	☑ Yes, token is active
Description *	Replication token
Replication token *	753a9729f6d7327392bcbd6064909a8f6e0e6841ba48386057dd271c54ead3a9 Remote server should use this token to replicate data to the current server
Remote ip address *	0.0.0.0/0 Replication data will be accepted only from this ip network. Format: "x.x.x.x" or "x.x.x.x/m" or "x.x.x.x/m.m.m.m"
Replicate data	☑ Call metadata ☑ Audio files ☑ Users/groups/roles
Update existing data *	○ Always ● If newer ○ Never
Storage Target *	Local Disk D (Local Filesystem)
Directory	
Filename format *	%{setup-time#%Y%m%d}\%{setup-time#%Y%m%d%H%M%S}-%{call-id}
Tenant [optional]	--- NOT SET --- If tenant is specified, then replicated data will be assigned to this tenant account only

Hit **Save** button.

Configuring replication server (sender)

Navigate to **Administration -> Storage -> Replication -> Outgoing Replication** on the source (sender) replication server to create an outgoing replication job.
Click **New Job** button to create the replication job. If necessary, you may create multiple replication jobs to upload the same recordings to multiple target servers simultaneously.
Fill out the required configuration parameters:

- **Access scope** (visible in multi-tenant version only). Specifies what tenants are replicated to the target server.
- **Target server url**. The URL (domain or IP-address) or the target server web portal.
- **SSL verify**. If enabled and a domain name is used for the **Target server url**, then the sender automatically verifies the target server's SSL certificate (recommended).
- **Replication token**. A secure replication token created on the target server. See the previous step
- **Parallel upload**. A number of parallel upload workers sending data simultaneously. Depending on network latency, an increase of the parallel workers may improve a replication speed due to better bandwidth utilization.
- **Upload chunk size**. A maximum file chunk per one upload request. Depending on network bandwidth/latency, an increase of this attribute may improve a replication speed.
- **Replication mode**. Full or incremental replication mode.
- **Full replication mode** will upload all call recordings to target server everytime the job is started. It will gracefully skip upload process if the target server contains such recordings already.
- **Incremental replication mode** remembers which records have been uploaded already to the target server and do not process them on next start. Such mode is useful when job is scheduled for periodic replication (every hour/day etc). It will work a lot faster than the full replication mode because it will skip automatically the previously uploaded recordings.
- **Replicate data**. Type of data to be replicated (audio files, call metadata, users configuration).
- **Remove after replication**. The recordings can be deleted automatically after successful replication.

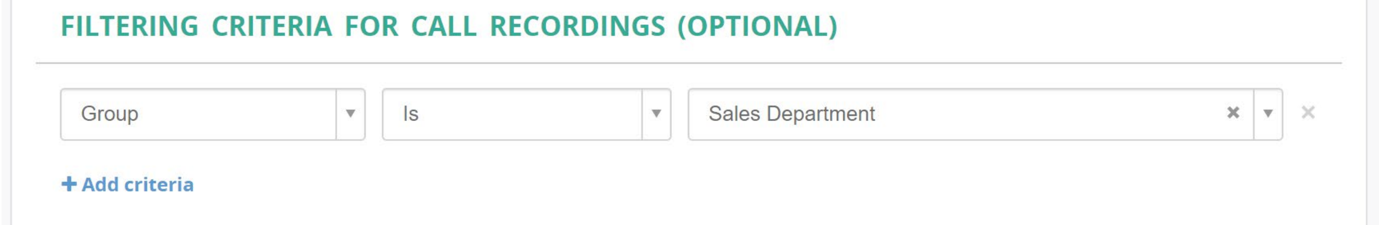


Administration > Storage > Replication

Add Job «Replication»

Name *	Replicate data
Access scope *	● Unrestricted - All tenants, including System ○ Tenants only - All tenants, excluding System ○ One tenant
Target server url *	https://miarec1.example.com Examples: http://miarec1.example.com:8080, https://10.0.0.1:443
SSL verify	☑ Verify target server's SSL certificate
Replication token *	b44eff3118c31dfdf815682aee91a8b633e49d3ea518ef351723be9b66917c96 This token should be configured on target server
Parallel upload *	1 workers
Upload chunk size *	5 MB
Replication mode *	○ Full replication ● Incremental replication
Replicate data	☑ Call metadata ☑ Audio files ☑ Users/groups/roles
Remove after replication *	□ Remove recordings after successful replication

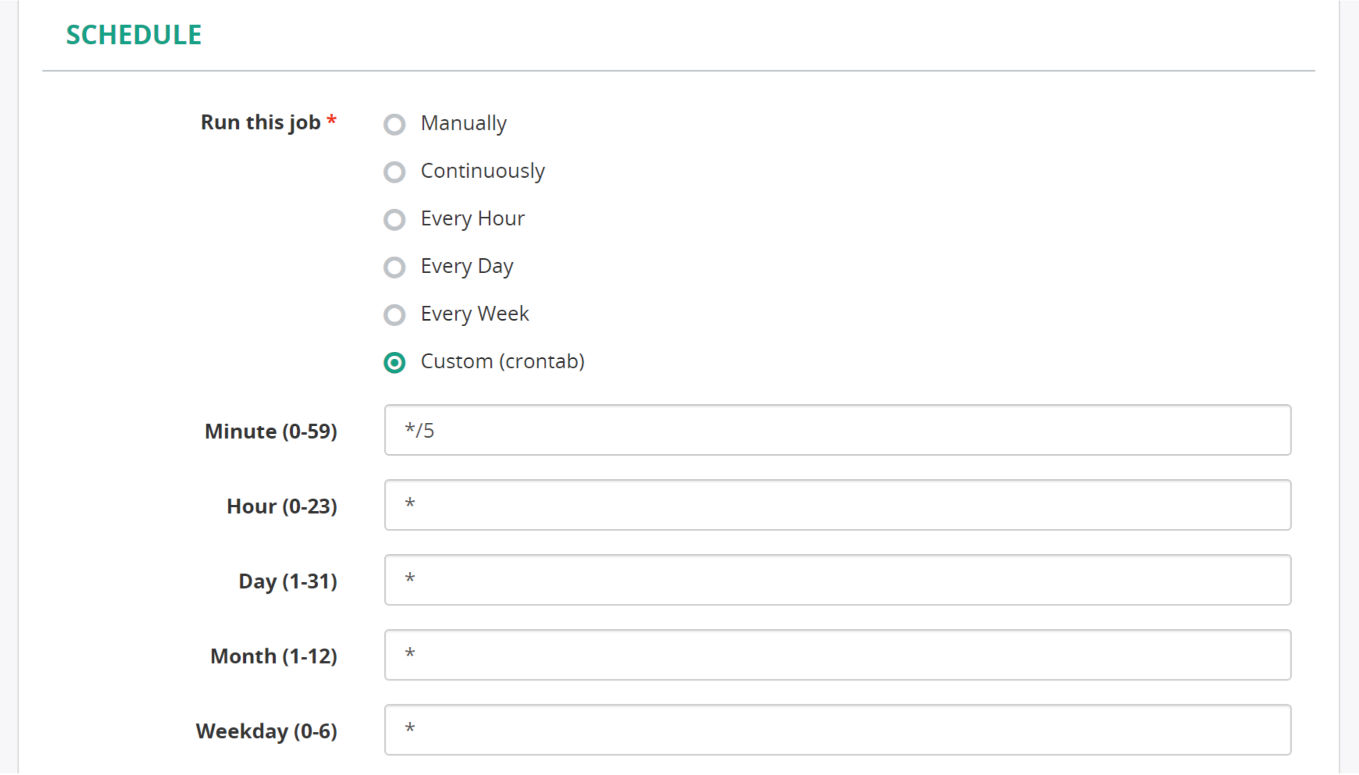
Each replication job supports filtering criteria to limit what call recordings are uploaded to the target server. For example, you may configure replication for specific group of users only.



FILTERING CRITERIA FOR CALL RECORDINGS (OPTIONAL)

Group	Is	Sales Department

Replication job may be started manually or automatically by schedule. Schedule may be configured by time (for example every hour/day/week) or automatic continuous replication. With continuous replication call recordings are uploaded to the target server immediately upon call completion.



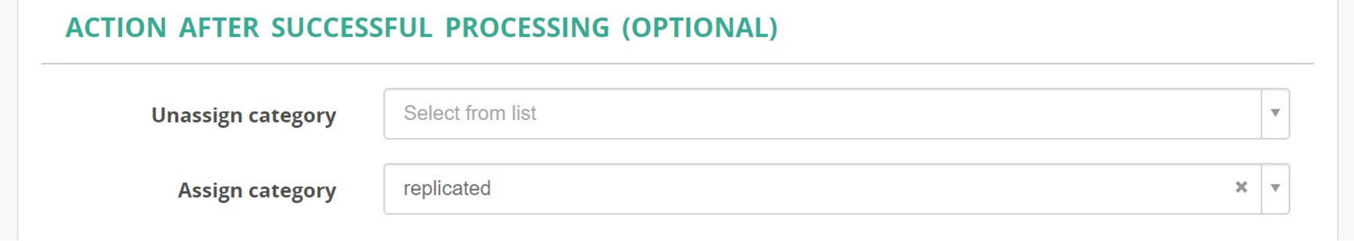
SCHEDULE

Run this job *

○ Manually
○ Continuously
○ Every Hour
○ Every Day
○ Every Week
● Custom (crontab)

Minute (0-59)	*/5
Hour (0-23)	*
Day (1-31)	*
Month (1-12)	*
Weekday (0-6)	*

Optionally, the replication process may assign/unassign a category once the recording is replicated. This capability can be used to create a chain of post-processing, like relocate files first, then replicate, then transcribe, etc.



ACTION AFTER SUCCESSFUL PROCESSING (OPTIONAL)

Unassign category	Select from list
Assign category	replicated

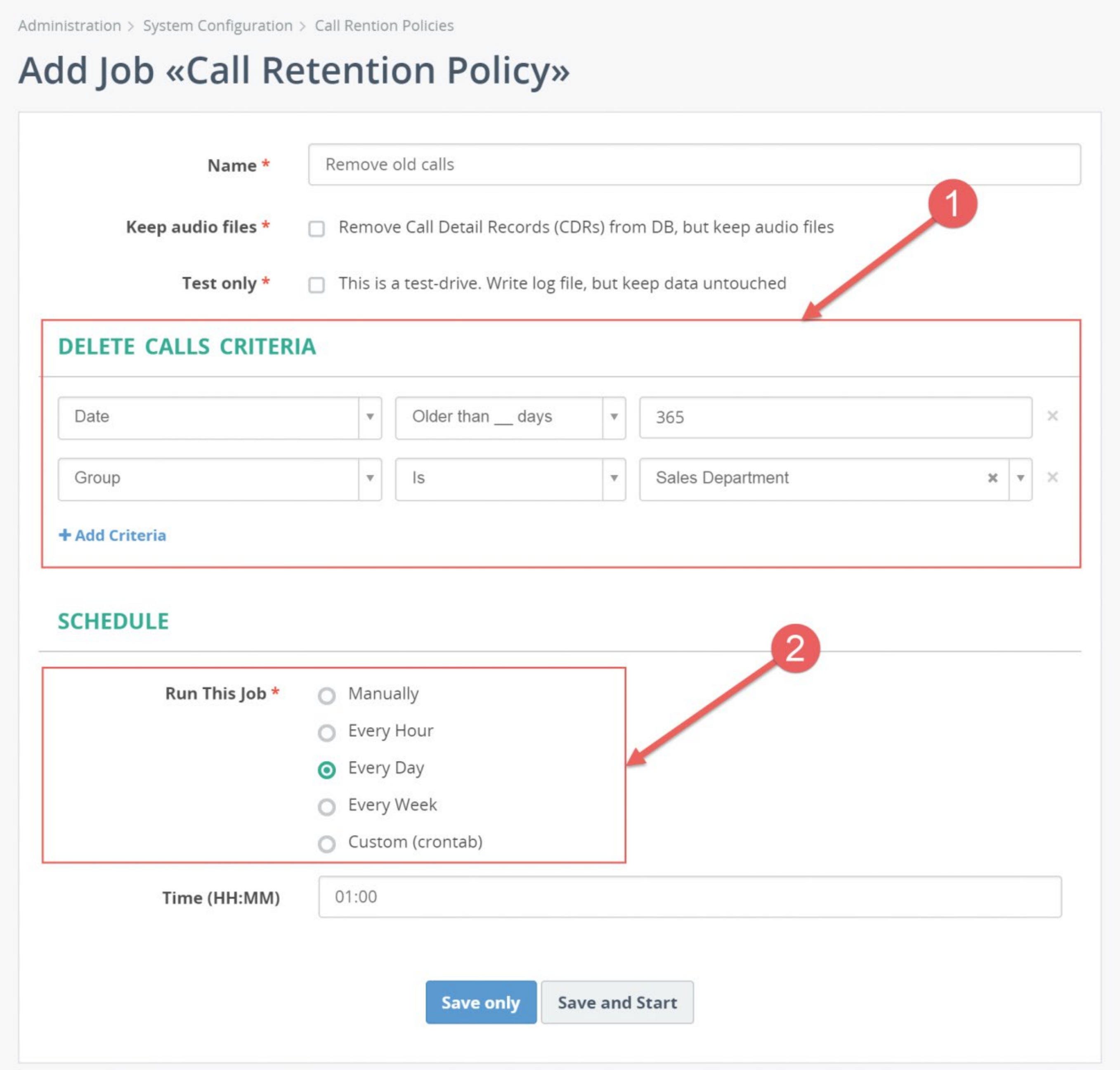
Status of replication job is available on job page. For incremental replication mode Call Recording stores statistics of replicated calls per day.

5.6 Retention policy

Navigate to **Administration -> Storage -> Retention Policies** to add one or more retention policies.

You can create more than one retention policies. For example, one group of users will have retention period 3 years, while other groups will have retention period 7 years.
Click on "New Job" to create a retention policy job.

Inside the job settings you can specify the filtering criteria, for example, delete recording that are older than 180 days, limit to a particular group of users, etc.
Retention job may be started manually or automatically by schedule.



Administration > System Configuration > Call Rention Policies

Add Job «Call Retention Policy»

Name * Remove old calls

Keep audio files * □ Remove Call Detail Records (CDRs) from DB, but keep audio files

Test only * □ This is a test-drive. Write log file, but keep data untouched

DELETE CALLS CRITERIA

Date	Older than __ days	365
Group	Is	Sales Department

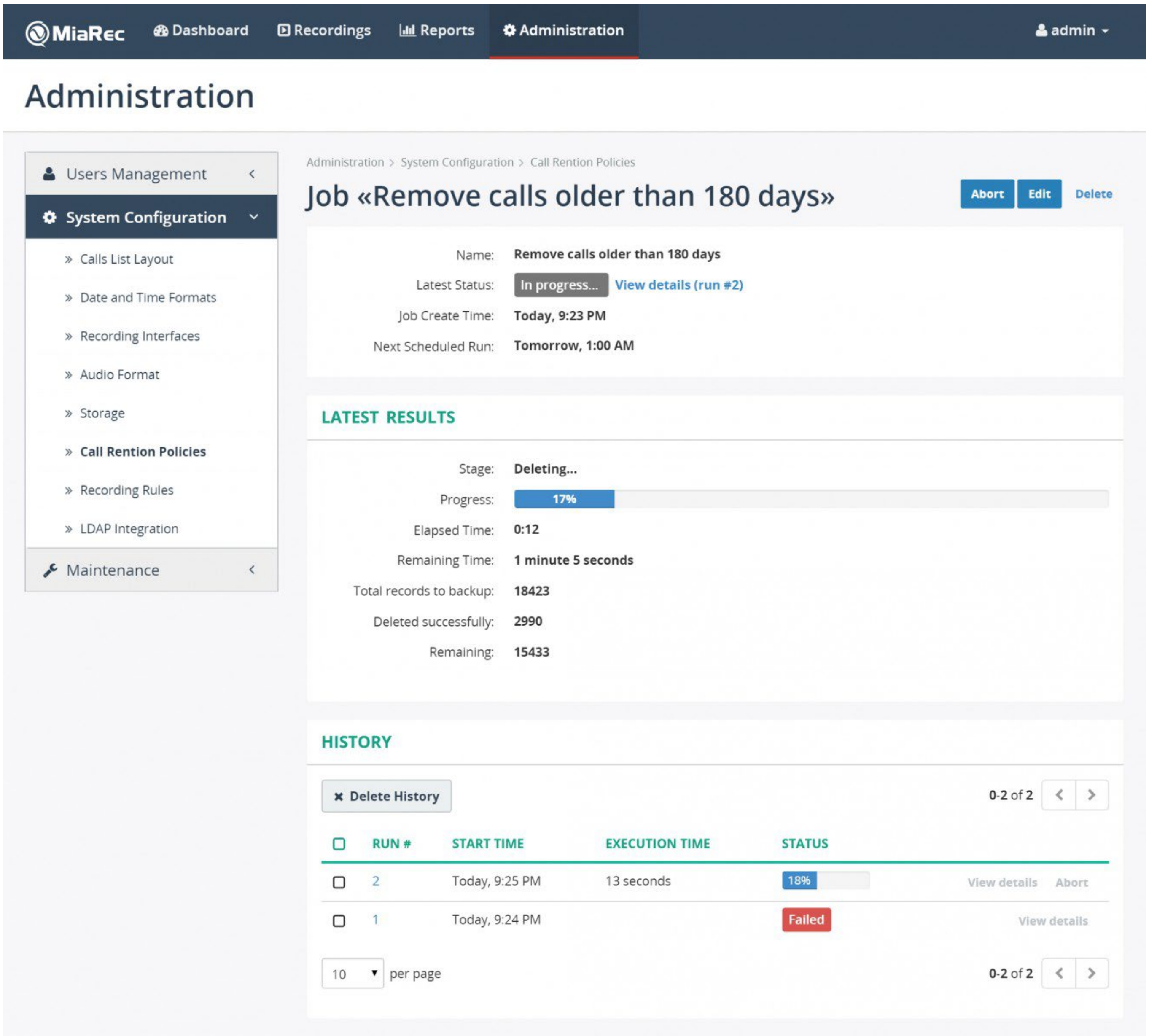
+ Add Criteria

SCHEDULE

Run This Job *
○ Manually
○ Every Hour
● Every Day
○ Every Week
○ Custom (crontab)

Time (HH:MM) 01:00

Results of a retention job execution are displayed on the job page.



Administration

Administration > System Configuration > Call Rention Policies

Job «Remove calls older than 180 days»

Name: Remove calls older than 180 days

Latest Status: In progress... View details (run #2)

Job Create Time: Today, 9:23 PM

Next Scheduled Run: Tomorrow, 1:00 AM

LATEST RESULTS

Stage: Deleting...

Progress: 17%

Elapsed Time: 0:12

Remaining Time: 1 minute 5 seconds

Total records to backup: 18423

Deleted successfully: 2990

Remaining: 15433

HISTORY

0-2 of 2

□	RUN #	START TIME	EXECUTION TIME	STATUS	
□	2	Today, 9:25 PM	13 seconds	18%	View details Abort
□	1	Today, 9:24 PM		Failed	View details

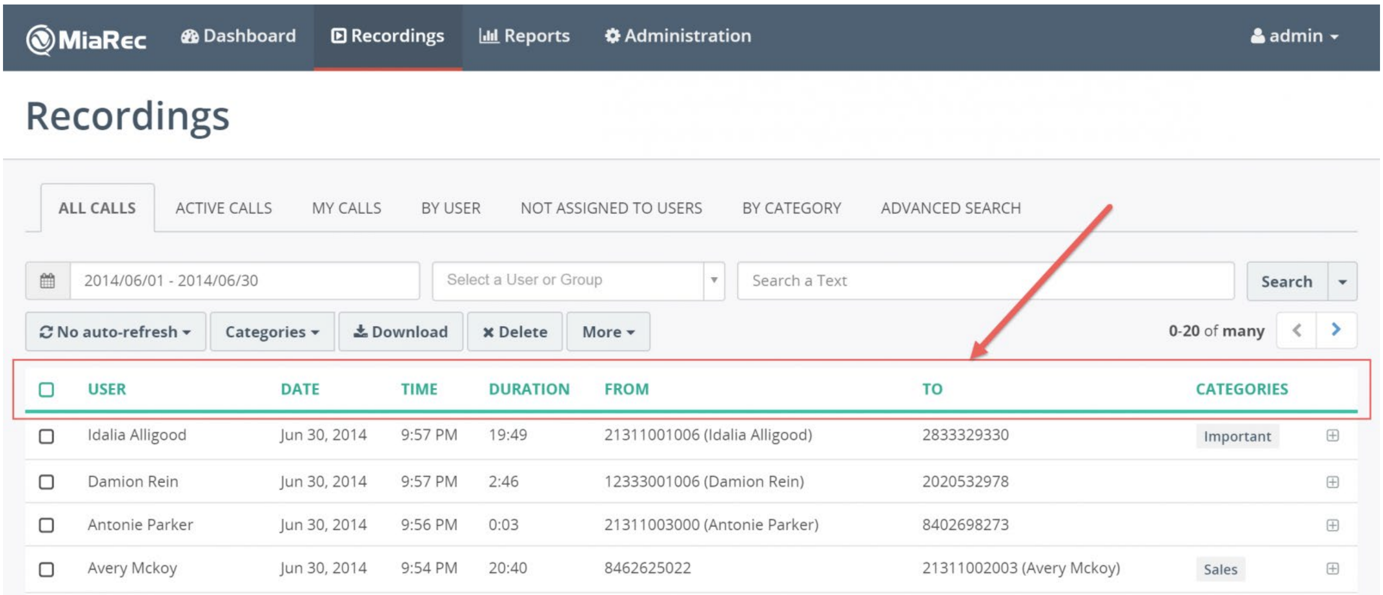
10 per page

0-2 of 2

6. Customization

6.1 Calls list layout

A list of visible columns is configurable.

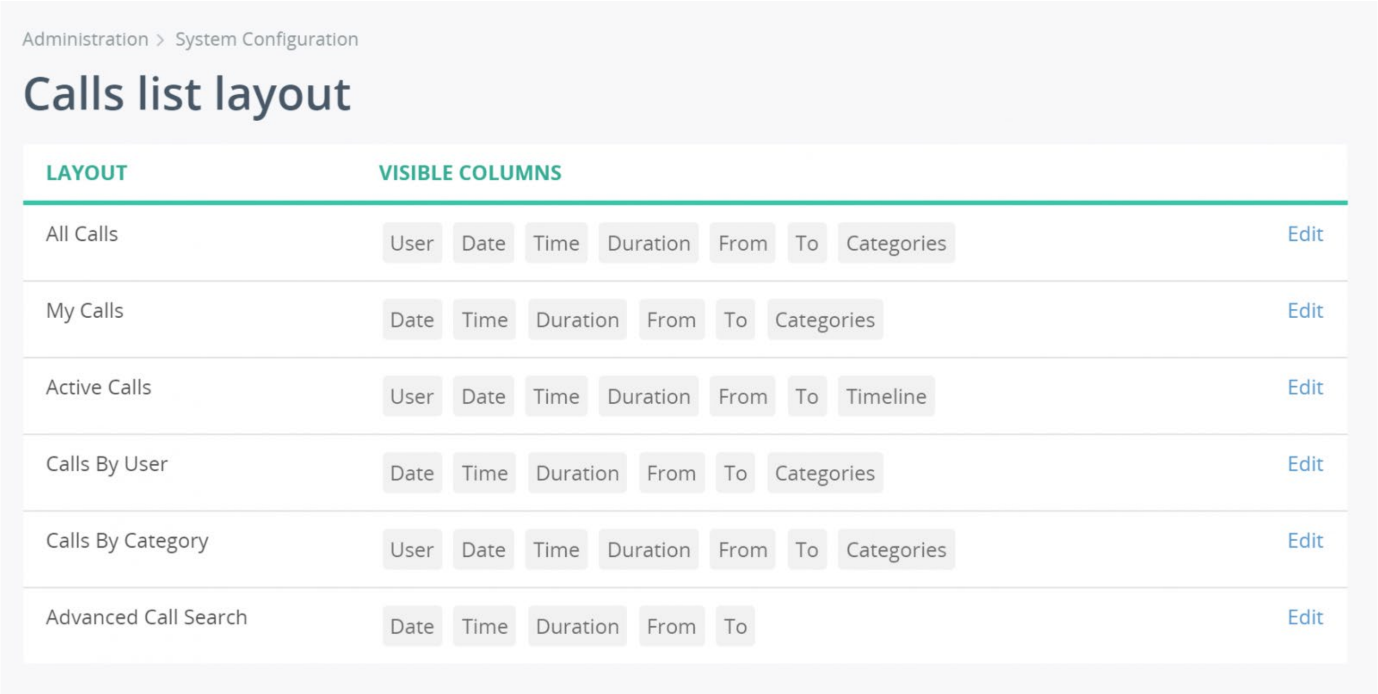


Recordings

2014/06/01 - 2014/06/30

□	USER	DATE	TIME	DURATION	FROM	TO	CATEGORIES	
□	Idalia Alligood	Jun 30, 2014	9:57 PM	19:49	21311001006 (Idalia Alligood)	2833329330	Important	⊞
□	Damion Rein	Jun 30, 2014	9:57 PM	2:46	12333001006 (Damion Rein)	2020532978		⊞
□	Antonie Parker	Jun 30, 2014	9:56 PM	0:03	21311003000 (Antonie Parker)	8402698273		⊞
□	Avery Mckoy	Jun 30, 2014	9:54 PM	20:40	8462625022	21311002003 (Avery Mckoy)	Sales	⊞

Navigate to Administration -> System Configuration -> Calls List Layout to specify which columns are visible.

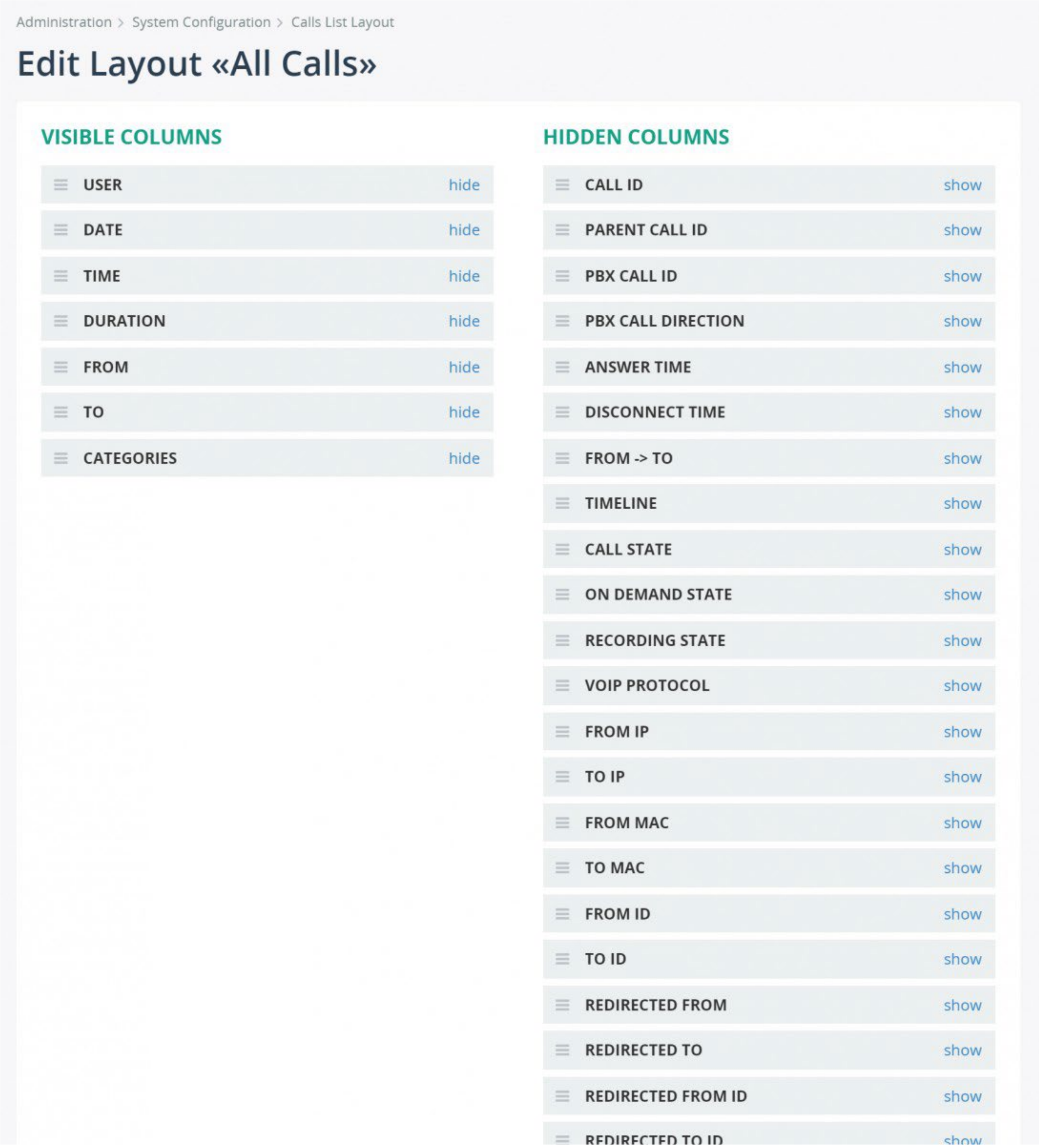


Administration > System Configuration

Calls list layout

LAYOUT	VISIBLE COLUMNS	
All Calls	User Date Time Duration From To Categories	Edit
My Calls	Date Time Duration From To Categories	Edit
Active Calls	User Date Time Duration From To Timeline	Edit
Calls By User	Date Time Duration From To Categories	Edit
Calls By Category	User Date Time Duration From To Categories	Edit
Advanced Call Search	Date Time Duration From To	Edit

Click on **Edit** button for appropriate list to change visible columns and their orders. You can drag-and-drop columns to change their order.



Administration > System Configuration > Calls List Layout

Edit Layout «All Calls»

VISIBLE COLUMNS

USER	hide
DATE	hide
TIME	hide
DURATION	hide
FROM	hide
TO	hide
CATEGORIES	hide

HIDDEN COLUMNS

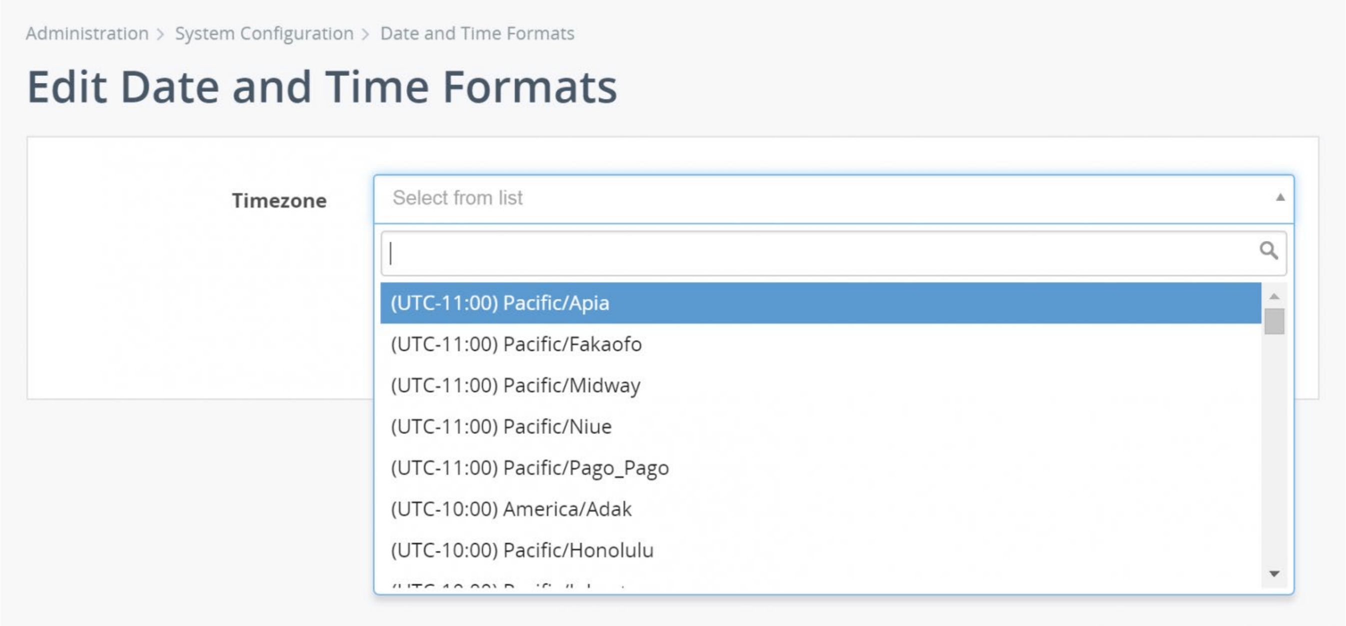
CALL ID	show
PARENT CALL ID	show
PBX CALL ID	show
PBX CALL DIRECTION	show
ANSWER TIME	show
DISCONNECT TIME	show
FROM -> TO	show
TIMELINE	show
CALL STATE	show
ON DEMAND STATE	show
RECORDING STATE	show
VOIP PROTOCOL	show
FROM IP	show
TO IP	show
FROM MAC	show
TO MAC	show
FROM ID	show
TO ID	show
REDIRECTED FROM	show
REDIRECTED TO	show
REDIRECTED FROM ID	show
REDIRECTED TO ID	show

6.2 Timezone settings

By default, Call Recording uses timezone settings of the server on which is running.

Navigate to Administration -> System Configuration -> Date and Time Formats to change a default timezone value.

This timezone value will be used for all users as a default value. Additionally it is possible to specify unique timezone value for tenant, group or individual user. Navigate to tenant/group/user profile web-page to edit timezone value.



Administration > System Configuration > Date and Time Formats

Edit Date and Time Formats

Timezone: Select from list

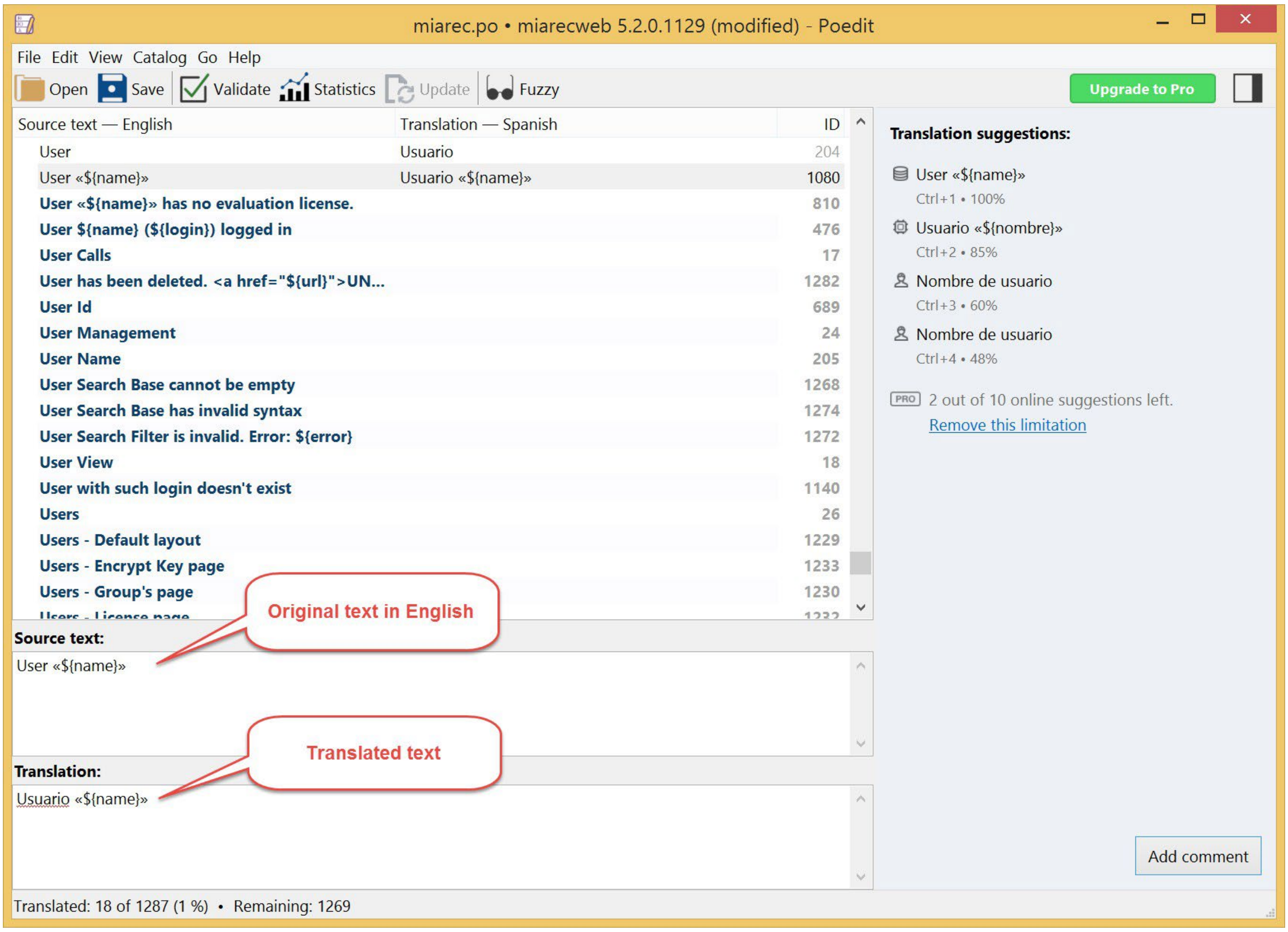
(UTC-11:00) Pacific/Apia
(UTC-11:00) Pacific/Fakaofo
(UTC-11:00) Pacific/Midway
(UTC-11:00) Pacific/Niue
(UTC-11:00) Pacific/Pago_Pago
(UTC-10:00) America/Adak
(UTC-10:00) Pacific/Honolulu

6.3 Translate Call Recording to other language

Call Recording offers internationalization and localization of user interface. If you would like to edit existing translation or create translation for new language, you can use POEdit application or any other application supporting **gettext** *.po file format. First, you need to contact the Service Provider or Vendor’s team and ask for *.po file for your language.

Once you have PO file, open it in POEdit application and translate english phrases to your language. When finished, send the PO file back to the Service Provider or Vendor’s team for inclusion into distributive.
You need to know a few formats, which are used in Call Recording to represent text:

1. Text within `${ }` brackets should be kept AS IS (not translated). These are placeholders, which will be replaced with appropriate values when displaying in UI. For example, text `User ${name}` may be displayed in UI as `User David`



Source text — English	Translation — Spanish	ID
User	Usuario	204
User «${name}»	Usuario «${name}»	1080
User «${name}» has no evaluation license.		810
User ${name} (${login}) logged in		476
User Calls		17
User has been deleted. <a href="${url}">UN...		1282
User Id		689
User Management		24
User Name		205
User Search Base cannot be empty		1268
User Search Base has invalid syntax		1274
User Search Filter is invalid. Error: ${error}		1272
User View		18
User with such login doesn't exist		1140
Users		26
Users - Default layout		1229
Users - Encrypt Key page		1233
Users - Group's page		1230
Users - License page		1232

Source text:
User «${name}»

Translation:
Usuario «${name}»

Translated: 18 of 1287 (1 %) • Remaining: 1269

Translation suggestions:

User «${name}»
Ctrl+1 • 100%

Usuario «${nombre}»
Ctrl+2 • 85%

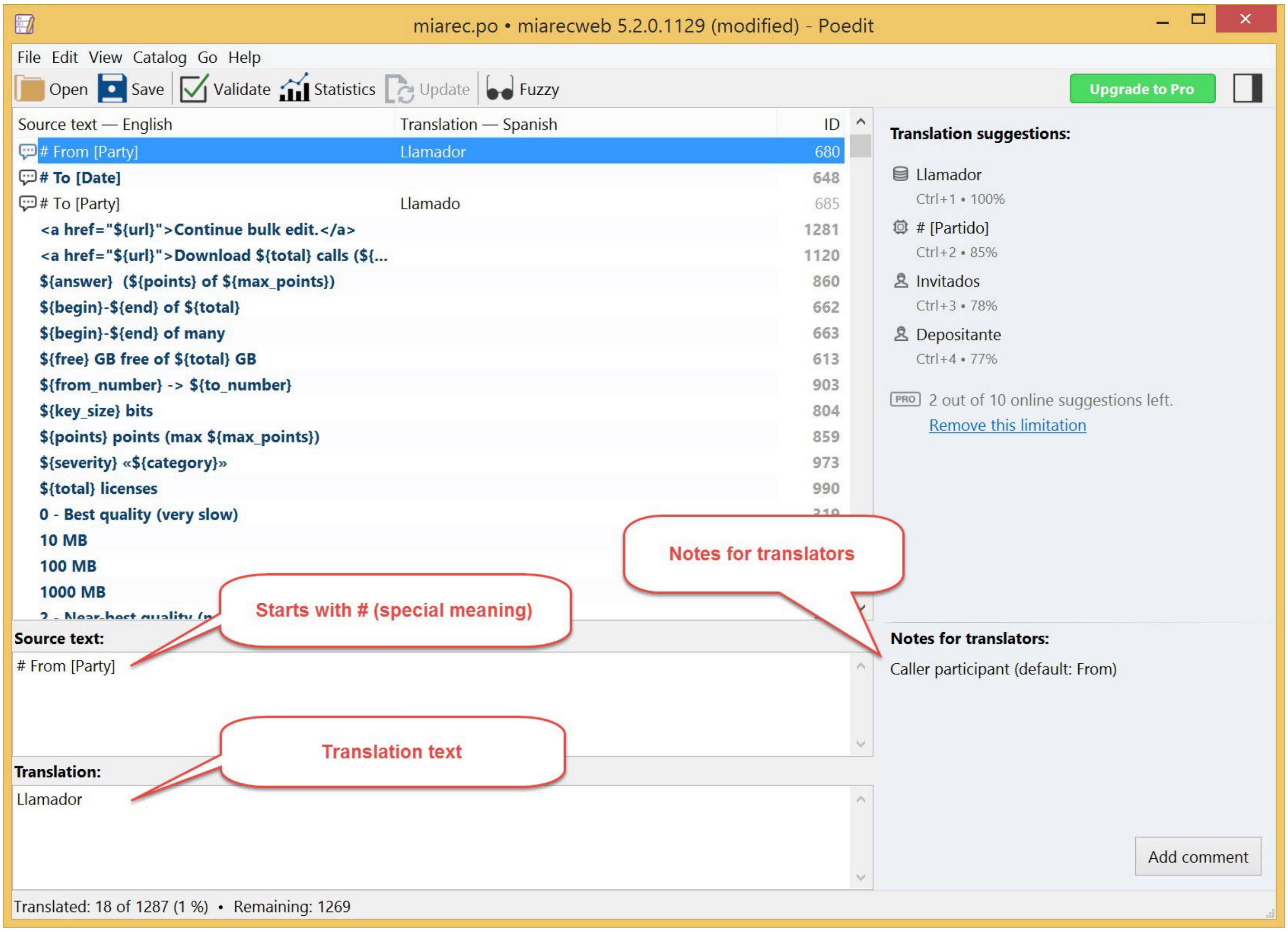
Nombre de usuario
Ctrl+3 • 60%

Nombre de usuario
Ctrl+4 • 48%

PRO 2 out of 10 online suggestions left.
Remove this limitation

2. Text starring with `#` (hash) symbol has special meaning. It doesn't not need to be translated word-by-word. It is used to distinguish words, which have the same writing, but different meaning. For example, word "from" may be used together with date value or as label for "caller party". In PO file you will find "# From [date]" and "# From [party]", which are both displayed

in English as "From", but in other languages it may require different translations, for example, in Spanish they are translated to "desde" and "Llamador" correspondingly. Pay attention to notes in the right bottom corner of POEdit application.


miarec.po • miarecweb 5.2.0.1129 (modified) - Poedit
File Edit View Catalog Go Help
Open
Save
Validate
Statistics
Update
Fuzzy
Upgrade to Pro

Source text — English	Translation — Spanish	ID
# From [Party]	Llamador	680
# To [Date]		648
# To [Party]	Llamado	685
<a href="${url}">Continue bulk edit.</a>		1281
<a href="${url}">Download ${total} calls (${...		1120
${answer} (${points} of ${max_points})		860
${begin}-${end} of ${total}		662
${begin}-${end} of many		663
${free} GB free of ${total} GB		613
${from_number} -> ${to_number}		903
${key_size} bits		804
${points} points (max ${max_points})		859
${severity} «${category}»		973
${total} licenses		990
0 - Best quality (very slow)		319
10 MB		
100 MB		
1000 MB		
2 - Near-best quality (n		

Source text:

From [Party]

Translation:

Llamador

Translation suggestions:

Llamador
Ctrl+1 • 100%

[Partido]
Ctrl+2 • 85%

Invitados
Ctrl+3 • 78%

Depositante
Ctrl+4 • 77%

PRO 2 out of 10 online suggestions left.
Remove this limitation

Notes for translators:

Caller participant (default: From)

Add comment

Translated: 18 of 1287 (1 %) • Remaining: 1269

Notes for translators

Starts with # (special meaning)

Translation text

7. Security

7.1 Call Recording and Apache Log4j vulnerability CVE-2021-44228 statement

Various information security news outlets reported on the discovery of critical vulnerability CVE-2021-44228 in the Apache Log4j library (CVSS severity level 10 out of 10).
This articles explains how this vulnerability affects the Call Recording application.

In short:

The Call Recording application is not affected by CVE-2021-44228.

Longer explanation:

Call Recording application is not written in Java. It doesn't use Log4j library, so it is not affected by CVE-2021-44228.

Call Recording uses Apache httpd web server as one of its components. This product is not written in Java either, i.e. it is not affected by CVE-2021-44228.

7.2 PCI scanners and false positives

This article describes how to deal with some vulnerabilities reports generated by automated scanner tools.

Who is this article for?

This article is for Call Recording customers who use automated scanners to test Call Recording server(s) against know security vulnerabilities. The scanners may report false positive vulnerabilities.
What is a false positive?

Some security scanning and auditing tools make decisions about vulnerabilities based solely on the version number of components they find. This results in false positives as the tools do not take into account backported security fixes. Old version may not have the reported vulnerability if the fix is already applied to it.
What is a Security Backporting?

Note, this article applies to Call Recording installations on Linux OS only. On Windows version, we use a different approach to deal with security vulnerabilities reports.
The term "backporting" describes the action of taking a fix of a security flow out of the most recent version of an upstream package and applying that fix to an older version of the package.
Call Recording software is deployed on Centos or RedHat operating system (FYI, Centos is based on RedHat Enterprise Linux distributive). RedHat (a company) uses Security Backporting Practice to apply the most recent fixes to older versions of the software packages.
To keep the server secure and patched, it is enough to run the command:

```
yum update
```

To see a list of all patches/fixes applied to the system, install `yum-changelog` package with:

```
sudo yum install yum-changelog
```

For example, to check all the backported patches to "httpd" (Apache) package, run:

```
yum changelog all httpd
```

This command will show all currently installed patches as well as all available patches, that may be installed with `yum update <package>` command.

Example of output:

```
==================== Installed Packages ====================
httpd-2.4.6-80.el7.centos.1.x86_64         installed
* Tue Sep 19 05:00:00 2017 Lubo? Uhliarik <luhliari@redhat.com> - 2.4.6-69
- Resolves: #1493065 - CVE-2017-9798 httpd: Use-after-free by limiting
  unregistered HTTP method

* Tue Jul 25 05:00:00 2017 Lubo? Uhliarik <luhliari@redhat.com> - 2.4.6-68
- Resolves: #1463194 - CVE-2017-3167 httpd: ap_get_basic_auth_pw()
  authentication bypass

...

==================== Available Packages ====================
httpd-2.4.6-93.el7.centos.x86_64           base
* Tue Oct  8 05:00:00 2019 Lubos Uhliarik <luhliari@redhat.com> - 2.4.6-93
- Resolves: #1677496 - CVE-2018-17199 httpd: mod_session_cookie does not respect
  expiry time

* Thu Aug 22 05:00:00 2019 Joe Orton <jorton@redhat.com> - 2.4.6-92
- htpasswd: add SHA-2 crypt() support (#1486889)

...
```

As you can see, the `yum changelog` output includes information about what `CVE-` vulnerabilities have been fixed with each update. You can save this output into a file for later review, or use `grep` command to check if a certain vulnerability is already fixed:

```
yum changelog all httpd > httpd_patches.txt

yum changelog all httpd | grep "CVE-2019-0220"
```

Why not simply upgrade the vulnerable software to the most recent version?

None of software exists in isolation. Any individual software component usually needs to integrate with other software components. All these components work together as a tightly integrated, complex solution.
An update of a single component to the latest version may cause compatibility issues to other components. To keep a software solution reliable and stable, we recommend to use security backporting rather than version upgrades as a solution to security issues.
We still use version upgrades for Call Recording solution from time to time, when it makes sense. Anyway, we perform a thorough testing of the new package version(s) to guarantee compatibility and stability of a whole solution.
How to treat reports from PCI scanner vulnerabilities?

Any report should be reviewed by the qualified personnel to determine if it contains false positives.

Vulnarebilties are usually named with "CVE-" prefix. If a report complaints that version of a system package is old, execute `yum changelog <package>` command and search for the corresponding CVE issue number. There are high chances that this issue has been already fixed/backported.
To keep system secure and updated, run periodically the system update command:

```
yum update
```

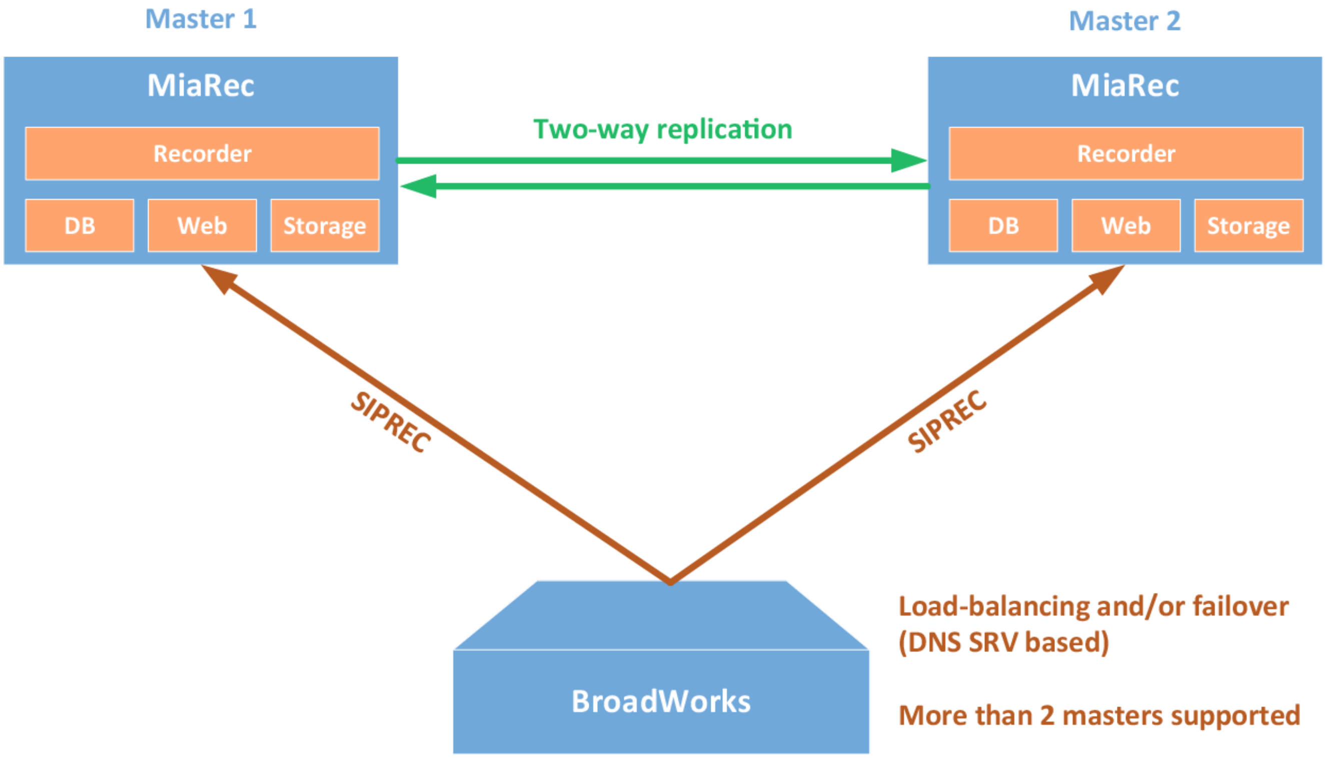
Note, the `yum update` command my require a server reboot. It is highly recommended to do it during maintenance window and begin with a secondary Call Recording server first. When a stability of the secondary server is confirmed, continue to the primary Call Recording server (in a few days).
Submit to PCI scanner vendor the print of `yum changelog` command. They can review it and mark your server as non-vulnerable to that particular issue.
Contact Call Recording team if you have any questions.

8. High availability

8.1 Overview

Call Recording implements a redundant, high availability architecture.

Below diagram show a network design of redundant recording in BroadWorks environment. Similar design applies to Cisco Built- in-Bridge recording interface, SIPREC recording interface for Metaswitch CFS, Metaswitch Perimeta SBC, Avaya SBC, Oracle/ AcmePacket SBC.



Supported features

- Automatic fail over to the next available server in a cluster
- Load balancing of recording traffic between multiple servers
- More than 2 master servers in a cluster
- Geographical redundancy
- Replication of data may be continuous (immediately upon call completion) or by schedule (at night during low load hours).

How it works

A Call Recording cluster supports 2 and more servers. Any server in a cluster may receive recordings at any time.
Upon call completion, audio files and call metadata is automatically uploaded/synchronized to other servers in a cluster.
This document describes implementation of redundancy for BroadWorks SIPREC and Cisco SIP Trunk built-in-bridge recording methods. Implementation of recording interface for these two platforms is based on similar principles with some variations.

Redundancy - new recordings

At the beginning of call recording, the phone system (Broadworks / Cisco UCM) sends SIP INVITE to the first available server in a cluster. If the primary server is down or its network is disconnected, it cannot respond to the SIP invitation. The usual SIP processing in this case is to deliver the invitation to the next recording server in the preference list.

Redundancy - in-progress recordings

If a recording server fails, all active recordings will be interrupted. If failure was caused by issues with network, then call recordings will be completed automatically by timeout (configurable). If failure was caused by hardware/software issue with recording process, then such recordings will remain in ACTIVE state till administrator manually mark them as completed. In both cases, the recording data will contain media from the beginning of call till the failure moment (unless there is issue with disk system).

Call Recording supports advanced architecture in order to achieve fault-tolerant architecture for in-progress calls. This architecture involves a dedicated recording server, which is configured in passive recording mode. Currently it is tested only for Cisco BiB protocol, but may work for SIPREC protocol with other phone platforms as well. The Cisco BiB network traffic, which is sent to the primary recording server, should be mirrored to a redundant server, which works in passive recording mode. This server records a copy of each call that is captured by the primary server. In case of the primary server failure in a middle of call, the redundant server has ability to continue recording of such call till the call disconnect. Such mechanism is based on architecture of Cisco Built-in-Bridge mechanism. Once media forking is activated, Cisco IP phone continues to send RTP packets to the primary recorder even if the latter is not reachable anymore. The phone doesn’t stop sending of RTP packets even if it receives “port is unreachable” ICMP error message. The redundant server continues to capture such RTP packets till call completes. This allows to achieve 100% redundancy for call recording.

Redundancy - completed recordings

After a recording is complete, Call Recording adds the call recording into queue for automatic replication to other server(s) in a cluster. Such data replication may be started immediately upon call completion or scheduled to specific time of day (for example, at night).

Geographical redundancy

Call Recording servers in a cluster may reside in different datacenter for geographical redundancy. There is no requirement for minimum latency between servers. It is only required that bandwidth between datacenters is enough to process data replication.
Data replication may configured as continuous (immediately upon call completion) or by schedule at specific time (for example, at night during low load hours).
Although there is no requirement to the 100% of availability of network link between datacenters. In case of unavailability of the target replication server, the replication process will be retried when network connection is restored.
The source replication server uses queue for data replication. The call recording is removed from queue only after successful replication. Overhead on queue is insignificant (it uses only a hundred of bytes per call recording in replication queue).

8.2 High availability for BroadWorks SIPREC recording

High availability and automatic failover for SIPREC interface is based on two technologies:

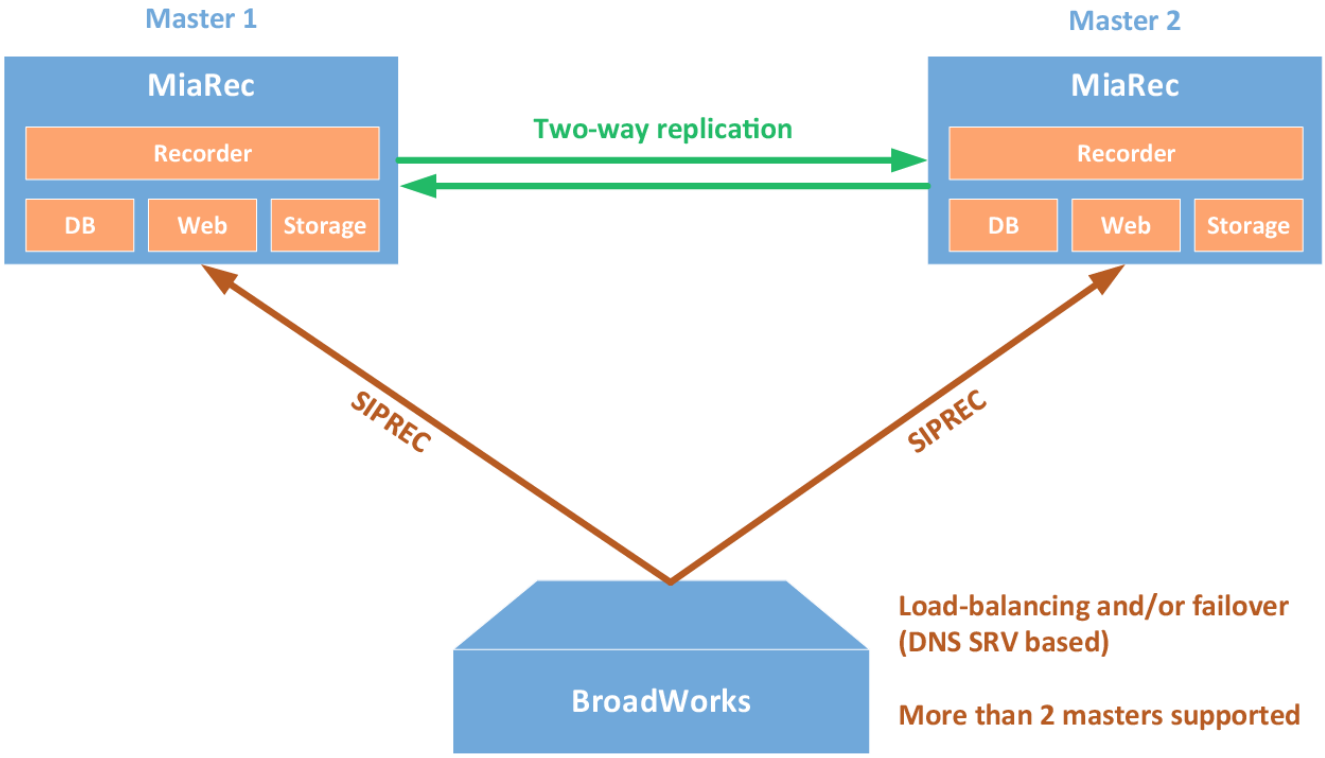
- DNS SRV for automatic failover (requires Broadworks R22+)
- Call Recording call replication

How it works

BroadWorks platform supports DNS SRV records for SIPREC interface. This allows building of the following configurations:

- Multiple recording servers and split SIPREC traffic between them (load balancing)
- Multiple recording servers with automatic failover from a primary server to a secondary one.
- A combination of above two variants.

Call Recording supports automatic call replication between two or more recording servers. Audio file and call metadata is automatically uploaded to replication target server(s) upon call completion or by schedule (for example, at night).



Example of DNS SVR records

```
# _service._proto.name.   TTL    class   SRV   priority  weight    port   target.
_sip._tcp.example.com.    86400  IN      SRV   10        40        5060   miarec1.example.com.
_sip._tcp.example.com.    86400  IN      SRV   10        30        5060   miarec2.example.com.
_sip._tcp.example.com.    86400  IN      SRV   10        30        5060   miarec3.example.com.
_sip._tcp.example.com.    86400  IN      SRV   20        0         5060   miarec4.example.com.
```

The first three records share a priority of 10, so the weight field's value will be used by BroadWorks to determine which recording server to contact. The sum of all three values is 100, so "miarec1" will be used 40% of the time. The remaining two hosts "miarec2" and "miarec3" will be used for 30% of requests each. If "miarec1" is unavailable, these two remaining servers will share the load equally, since they will each be selected 50% of the time.

If all three servers with a priority of 10 are unavailable, the records with the next lowest priority value will be chosen, which is “miarec4”. This might be a machine in another physical location, presumably not vulnerable to anything that would cause the first three servers to become unavailable.

Limitations:

- The load balancing provided by SRV records is inherently limited, since the information is essentially static. Current load of servers is not taken into account.
- In case of failover from one server to another, the currently active recordings on the failed server are interrupted. A new recording server will handle only new SIPREC requests.

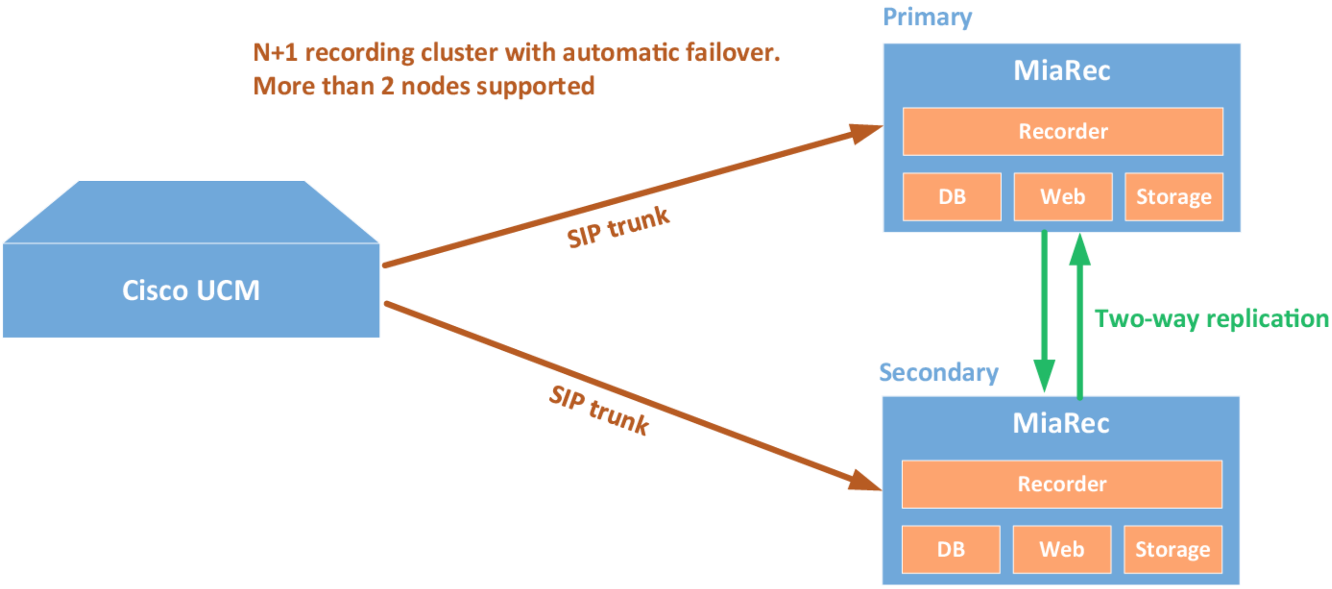
Check also: Call Recording automatic replication

8.3 High availability for Cisco Built-in-bridge recording

High availability and automatic failover for Cisco active recording interface is based on the following technologies:

- Call Recording automatic replication between multiple servers in a cluster
- Multiple SIP Trunks or DNS SRV for automatic failover and/or load balancing
- SIP OPTIONS Ping feature in Cisco UCM for fast detection of server unavailability

How it works



The recording server in Cisco UCM is configured as a SIP Trunk. Cisco UCM supports configuration of multiple SIP Trunks with automatic failover between them.
Additionally, Cisco UCM starting from v.8.5(1) supports SIP OPTIONS Ping feature. Cisco UCM periodically sends a SIP OPTIONS (ping) message to each recording server to detect its availability. If the recording server is unavailable – indicated by either no response, response of “408 Request Timeout” response of “503 Service Unavailable”, Cisco UCM marks this recording server as unavailable. If the recording server is available – indicated by any other responses other than “503” or “408”, Cisco UCM marks this recording server as available. Cisco UCM will send new INVITE only to “available” recording servers.

Call Recording supports automatic call replication between two or more recording servers. Audio file and call metadata is automatically uploaded to replication target server(s) upon call completion or by schedule (for example, at night).
Alternatively, instead of configuring multiple SIP Trunks in Cisco UCM it is possible to configure a single SIP Trunk pointing to DNS SRV records. The multiple recording servers are configured as SRV records. Such configuration allows to build automatic failover and load balancing configurations with multiple recording servers.

Example of DNS SRV records:

```
# _service._proto.name. TTL class SRV priority weight port target.
_sip._tcp.example.com. 86400 IN SRV 10 40 5060 miarec1.example.com.
_sip._tcp.example.com. 86400 IN SRV 10 30 5060 miarec2.example.com.
_sip._tcp.example.com. 86400 IN SRV 10 30 5060 miarec3.example.com.
_sip._tcp.example.com. 86400 IN SRV 20 0  5060 miarec4.example.com.
```

The first three records share a priority of 10, so the weight field’s value will be used by Cisco UCM to determine which recording server to contact. The sum of all three values is 100, so “miarec1” will be used 40% of the time. The remaining two hosts

“miarec2” and “miarec3” will be used for 30% of requests each. If “miarec1” is unavailable, these two remaining servers will share the load equally, since they will each be selected 50% of the time.
If all three servers with priority 10 are unavailable, the records with the next lowest priority value will be chosen, which is “miarec4”. This might me a machine in another physical location, presumably not vulnerable to anything that would cause the first three servers to become unavailable.

Limitations:

- Load balancing provided by SRV records is inherently limited, since the information is essentially static. Current load of servers is not taken into account.
- In case of failover from one server to another, the currently active recordings on a failed server are interrupted. The new recording server will handle only new SIP requests.

Check also: Call Recording automatic replication

9. Maintenance

9.1 Troubleshooting

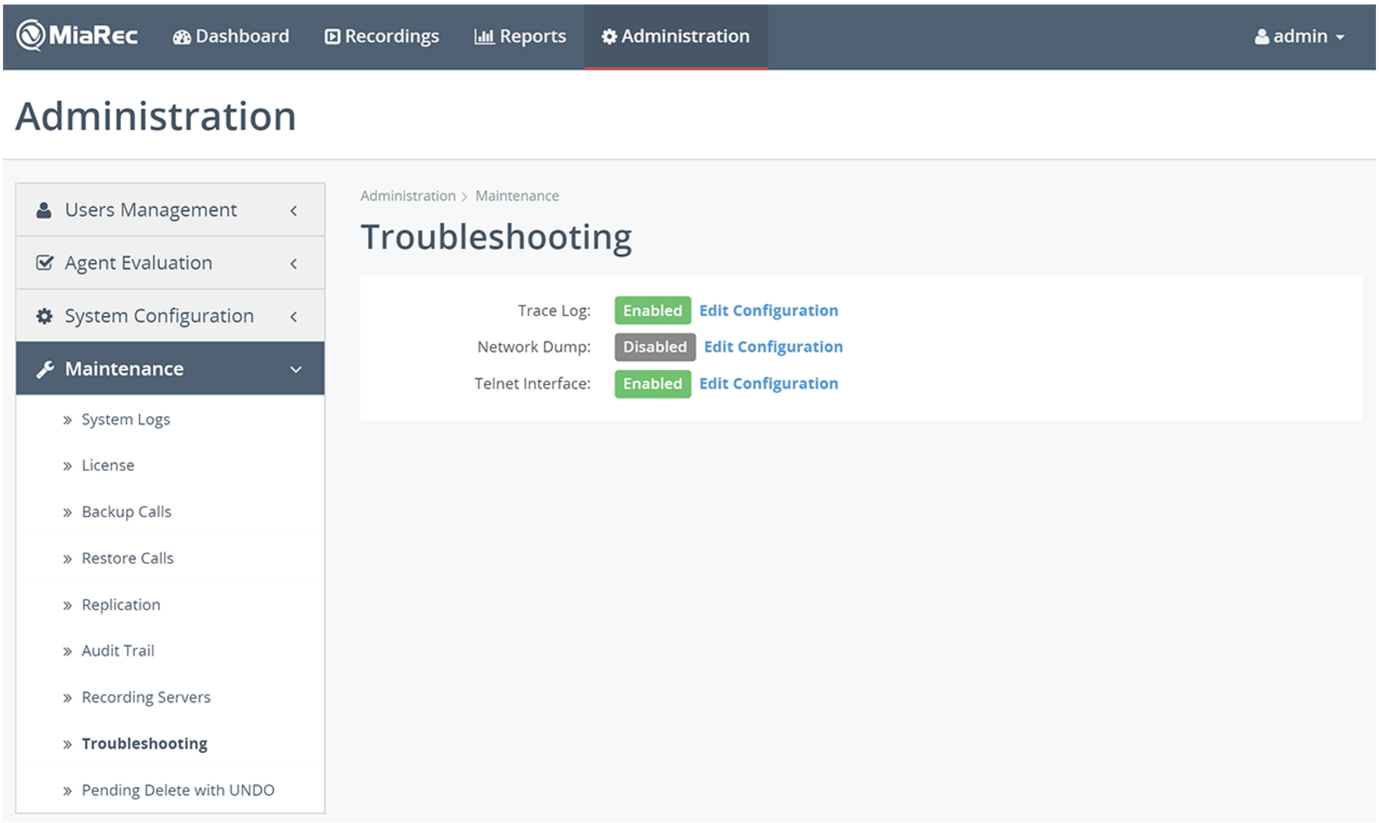
Log files

Call Recording solution consists of multiple components. Most of these components have own log file location.

Call Recording component	Location
Call recording service (MiaRec)	• Log messages inside DB (accessible via web UI menu Administration -> System Management -> System Log) • If trace is enabled, the trace files are located in Data\log\trace (on Windows) or /var/log/ miarec/trace (on Linux)
Web portal	• Log messages inside DB (accessible via web UI menu Administration -> System Management -> System Log) • Apache service logs own messages into directory Data\log\apache (on Windows) or /var/log/ httpd/ (on Linux)
Celery scheduler	Log files are located in directory Data\log\celery (on Windows) or /var/log/miarecweb/celery/ or /var/log/celery/ (on Linux)
Redis (cache system)	Log files are located in directory Data\log\redis (on Windows) or /var/log/redis_*/
(on Linux) System Logs	Event Viewer Logs (on Windows) or /var/log/messages (on Linux)

Call Recording recorder trace

MiaRec supports writing detailed trace information into text file. Such trace information may be useful during problem investigation. Navigate to menu Administration -> Maintenance -> Troubleshooting and click Configure button at the Trace option.



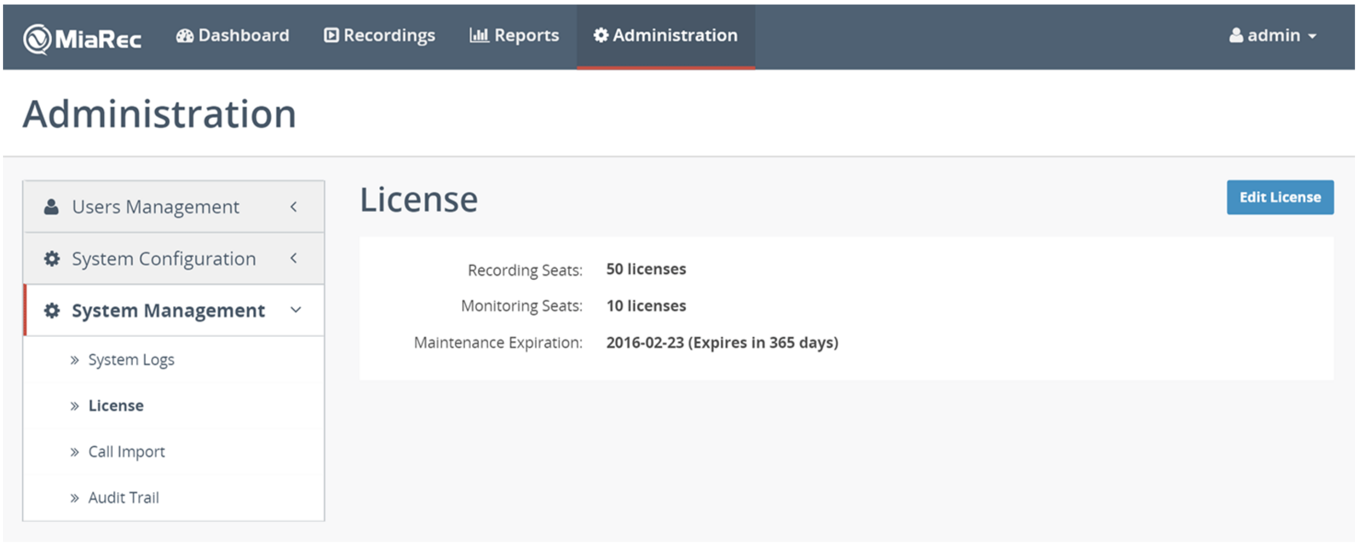
Trace Log: Enabled Edit Configuration
Network Dump: Disabled Edit Configuration
Telnet Interface: Enabled Edit Configuration

In the next configuration page you can specify:

- Full path to the trace log file
- Trace level depth (recommended log level for troubleshooting is 5)
- Log rotation settings

9.2 License

Navigate to menu Administration -> System Management -> License.
Customer Administrators cannot edit licenses.



Recording Seats: 50 licenses
Monitoring Seats: 10 licenses
Maintenance Expiration: 2016-02-23 (Expires in 365 days)