DENCRYPT

Dencrypt Communication Solution

Operational User Guide

Dencrypt Connex for Android

v. 1.8

August 13, 2024
Public

Contents

Version

This guide applies for:

- Dencrypt Connex v. 1.8 for Android devices.

The version number can be verified from the Settings menu by tapping the ⋮-symbol in the top-right corner on the Contacts screen. See Figure 33.

Support

Contact your local support for assistance and in case of security incidents.

Dencrypt support	
Phone	+45 72 11 79 11
Email	support@dencrypt.dk

1 Introduction

Dencrypt Connex is an application for making encrypted voice calls, videocalls and for the exchange of encrypted instant messages from:

- Android devices

It uses the patented Dynamic Encryption technology to apply state-of-the-art, end-to-end encryption between devices.

This guide is intended for end-users of the Dencrypt Connex application and provides instructions to operate and use the application securely.

The end-users of the Dencrypt Connex application shall have familiarized themselves with this document as given in Table 1 and have received instructions from the system administrator prior to taking the product into use.

Dencrypt Connex support selected local languages. However, this guide and screenshots are shown in the English language.

Section 2	Security instructions	**Essential**
Section 3	Getting started	
Section 4	Using Dencrypt Connex	User guidance
Section 5	Making a secure call	
Section 6	Sending a secure message	
Section 7	Settings	
Appendix A	Dencrypt Communication Solution	For reference

Table 1: Reading Guide

2 Security instructions

These security instructions shall be read and understood before taking the Dencrypt Connex application into use.

2.1 General security measures

Some precautions must be observed to use the application in a secure way and to avoid disclosure of confidential information. Please observe the following before taking the application into use.

Organizational security policies Before taking Dencrypt Connex into use, the security policies and instructions for secure usage shall have been received and understood. Be aware of the classifications allowed to be exchanged using Dencrypt Connex .

Server system security The system administrator is responsible for the daily and secure operation of the Dencrypt Server System. In case of critical security incidents or unresolved vulnerabilities, the system administrator may prevent communication between specific users or may take the entire system out of operation until the issues have been resolved. In such cases, it may not be possible to establish secure communication at all or with specific users.

Secure delivery Dencrypt Connex shall only be received from Google Play or a Mobile Device Management system.

Device security The system security depends on a correct and secure operation of the device and the operating system, and there are no critical side-effects. Therefore, the Dencrypt Connex application and the operating system shall always be kept updated to the latest versions. In case of critical security incidents or unresolved vulnerabilities, the system administrator may prevent calls to a certain user or make the entire system unavailable until the issue has been resolved.

Benign applications The Dencrypt Connex application protects information during the data transmission and when stored on the device. It does not protect against malware intercepting audio, video, or text before encryption. Therefore, only benign apps shall be installed on the device. Be aware of applications, which make use of the microphone, perform screenshots, listen to the earpiece or speaker or capture keyboard strokes. Contact your system administrator for advice.

Single user device The phonebook is personal and dedicated to a specific end-user. Therefore, the device is personal and shall not be shared.

Prevent unauthorized access Protect your device against unauthorized access by always enabling a passcode or biometric login. In case of lost or stolen devices, contact your system administrator immediately.

2.2 Avoid acoustic coupling

It is not recommended to use encrypted voice or video calls in hotel rooms and like, which cannot be considered secure. Never exchange classified information through the Dencrypt Connex application when other unclassified telephones, radio transmitters, or similar are being used in immediate proximity.

Locations that are well suited to making calls may be public spaces where the caller's presence has not been pre-arranged. Using secure messaging is an alternative communication in areas where an acoustic coupling is possible.

2.3 Avoid screen exposure

Consider the surroundings when using Dencrypt Connex for secure video calls and messaging to ensure that the screen can not be observed by others. Be aware of the location of windows and cameras.

2.4 Other security recommendations

- **Avoid using wireless headsets** - The data connection from the device to the headset is not protected by Dencrypt Connex . Use wired headsets as an alternative.
- **Avoid using hands-free car systems** - The data connection from the device to the hands-free car system is not encrypted. Disable Bluetooth to avoid automatic connection and use wired headsets as an alternative.
- **Avoid using loudspeaker** - Use the Dencrypt Connex loudspeaker only with care and in locations that are protected from an acoustic coupling.
- **Don't take screenshots** – Screenshots are saved unencrypted on the devices and are not deleted when the app is closed. Screenshots may be blocked by the system administrator.
- **Don't use copy/paste** – Don't use the copy/paste functionality during messaging. Copy/paste-functionality may be blocked by the system administrator.
- **Don't use voice recordings** – Voice recordings are saved unencrypted on the devices and are not deleted when the app is closed.
- **Avoid auto-correction and predictive text features** - Avoid using keyboards that include autocorrection or predictive text features. It is recommended to disable spell-checking and predictive text from the settings menu.
- **Avoid using apps with speech recognization** - Avoid using applications, that makes use of speech recognition features, such as speech-to-text applications.

3 Getting started

A few steps are required by the end-users to get started using Dencrypt Connex .

1. Installation
2. Set permissions
3. Activation

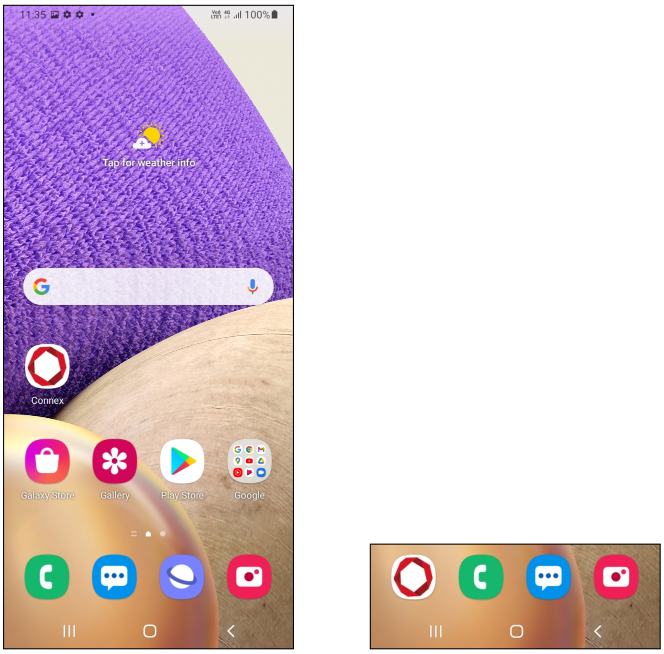
3.1 Installation

Dencrypt Connex is installed via:

- Public Google Play Store for direct installation on end-user devices.
- Google Enterprise, for installation to end-user devices via an MDM.

Links to Dencrypt Connex on the public app store are available from the Dencrypt webpage: `https://www.dencrypt.dk/downloads`

Once the app is installed, it is launched by tapping the Dencrypt Connex icon. For quick access, the icon can be dragged to the menu bar at the bottom of the screen as seen in Figure 1.



(a) Dencrypt Connex on the home screen.

(b) Dencrypt Connex icon in the menu bar.

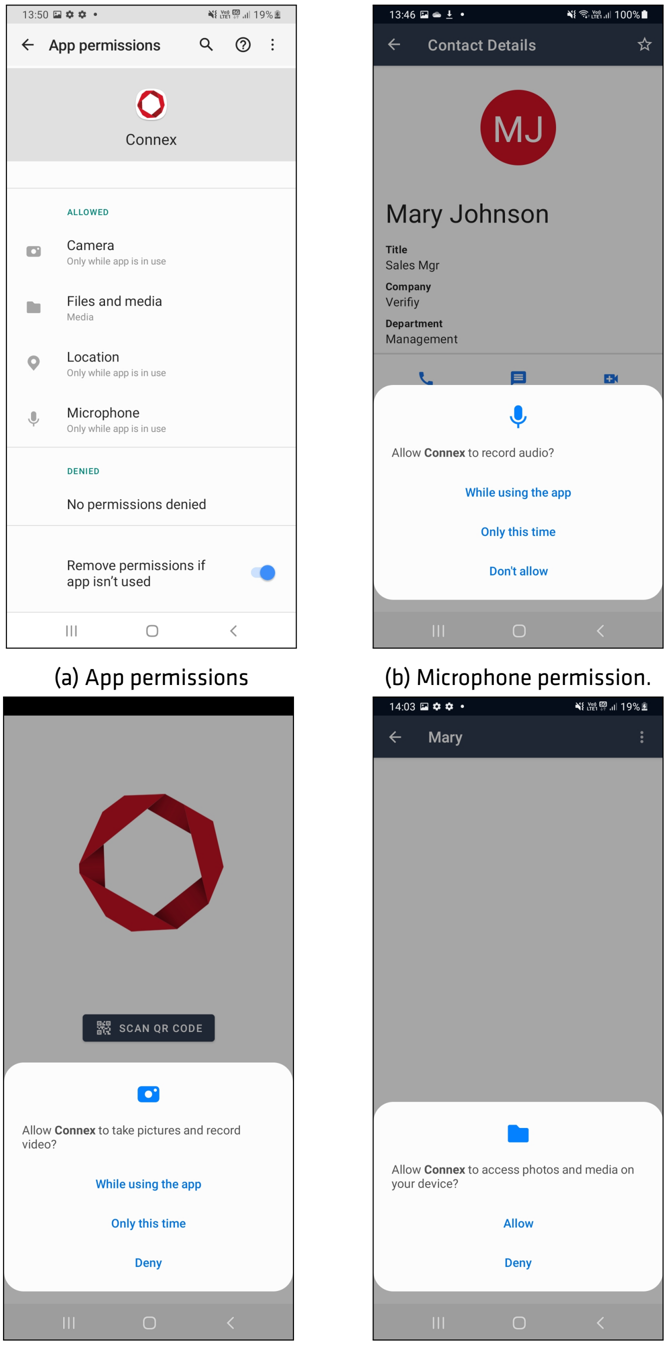
Figure 1: Home screen

3.2 Set permissions

Dencrypt Connex requests access to some of the device resources. Permission to the microphone and notifications shall be granted to perform secure voice calls. For messaging, the requested permissions are optional but will limit the functionality of the app if not granted.

When Dencrypt Connex requires access to a restricted resource or actions, the user will be requested to grant permissions. App permissions can always be managed from the systems App Info menu for Dencrypt Connex .

During the account setup, Dencrypt Connex will ask for permissions as listet in Table 2 and show in Figure 2.



13:50 · 19%

App permissions

Connex

ALLOWED

Camera
Only while app is in use

Files and media
Media

Location
Only while app is in use

Microphone
Only while app is in use

DENIED

No permissions denied

Remove permissions if app isn't used

(a) App permissions

13:46 · 100%

Contact Details

MJ

Mary Johnson

Title
Sales Mgr

Company
Verifiy

Department
Management

Allow **Connex** to record audio?

While using the app

Only this time

Don't allow

(b) Microphone permission.

SCAN QR CODE

Allow **Connex** to take pictures and record video?

While using the app

Only this time

Deny

(c) Camera permission.

14:03 · 19%

Mary

Allow **Connex** to access photos and media on your device?

Allow

Deny

(d) File access permission.

Figure 2: Permissions

Permission	Reason	
Camera	For scanning a QR-code invitation and for capturing images to attach to messages	Optional
Microphone	Required for voice calls.	Mandatory
Notifications	Required to alert for incoming calls and messages.	Mandatory
Location	Required to include GPS locations in messages.	Optional
Photo and media	Required to attach images and videos from library.	Optional

Table 2: Permission usage.

3.3 Activation

Once installed, the Dencrypt Connex is unconfigured and shall be activated before it is taken into use. The system administrator is required to create a user account on the Dencrypt Server System and provide an activation link.

The activation link is time-limited and can only be used once, and it comes in the form of a weblink (URL) or a QR code. The activation link may not be disclosed and shall be delivered in a secure way. The following options are possible:

- Email containing a weblink, send to the device.
- Email or physical letter containing a QR code to be scanned by the camera application.
- SMS containing a weblink sent to the device. [1]

Emails shall be encrypted or transmitted using encrypted connections.

Activating the link will start the provisioning process to configure the Dencrypt Connex with certificates and credentials to connect to the server system and download the phonebook. Only when the activation process has successfully completed the Dencrypt Connex is ready for use.

Activation process

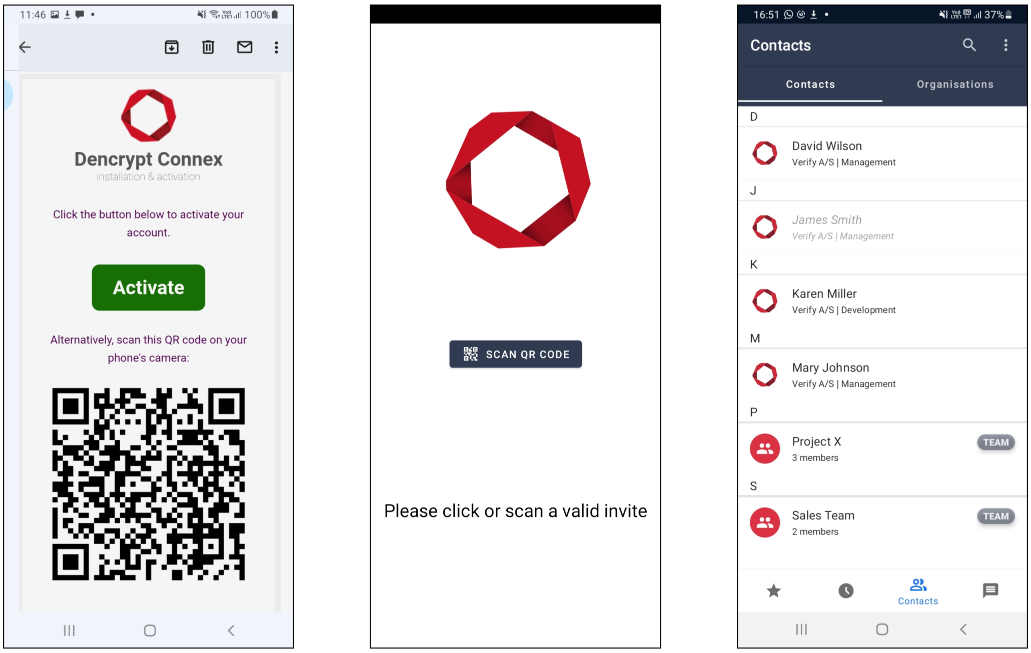
Step 1: The system administrator creates a user account on the Dencrypt Server System and provides an invitation message containing the activation link to the end user (Figure 3a).

Step 2: The user activates the link by tapping the weblink or by scanning the QR-code using Dencrypt Connex (Figure 3b) or the camera application. The user is prompted to open the link in the Dencrypt Connex .

Step 3: The Dencrypt Connex opens to configure the account and download the phonebook. This may take 1-3 minutes. **Do not close the app during the activation.**

Step 4: Once completed, the Dencrypt Connex will open and is now ready for use (Figure 3c).

[1] SMS activation is not recommended for security reasons.



11:46 100%

Dencrypt Connex

installation & activation

Click the button below to activate your account.

Alternatively, scan this QR code on your phone's camera:

Please click or scan a valid invite

16:51 37%

D

David Wilson
Verify A/S | Management

J

James Smith
Verify A/S | Management

K

Karen Miller
Verify A/S | Development

M

Mary Johnson
Verify A/S | Management

P

Project X
3 members

S

Sales Team
2 members

(a) Email invitation (b) Open app to scan QR-code. (c) Activation successful.

Figure 3: Provisioning.

3.4 Revoked application

The system administrator may revoke the Dencrypt Connex access to the server system, which will result in a Security Issue message (Figure 4a). This may happen if:

- The device has been reported lost or stolen, in which case the administrator will temporarily deactivate access.
- The account has been deleted, in which case access is permanently blocked.

In both cases, contact the system administrator to regain access to the services. The administrator may:

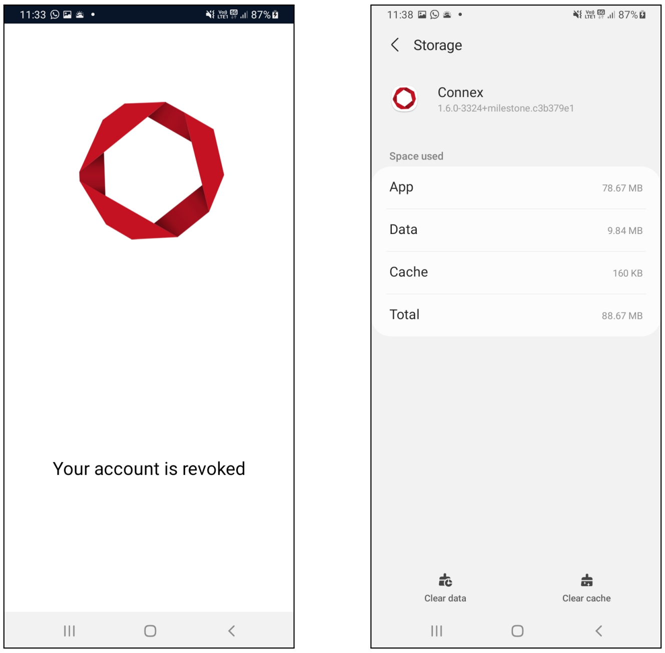
- Re-activate the device, in which messages and call history are preserved. This usually happens in case a lost phone is found again.
- Send a new invitation to provision the Dencrypt Connex app again, in which messages and call history are **NOT** preserved. Before using the new invitation, the account should be deleted:

Delete account

Step 1: On the device: Goto Settings →Apps →Dencrypt Connex →Storage (Figure 4b).

Step 2: Tap Clear Data and OK

Step 3: Provision Dencrypt Connex app again using the new invitation received.



Your account is revoked

Storage

Connex
1.6.0-3324+milestone.c3b379e1

Space used

App	78.67 MB
Data	9.84 MB
Cache	160 KB
Total	88.67 MB

(a) Revoked access to the server system.

(b) Delete account

Figure 4: Revocation.

4 Using Dencrypt Connex

Dencrypt Connex offers two main functionalities:

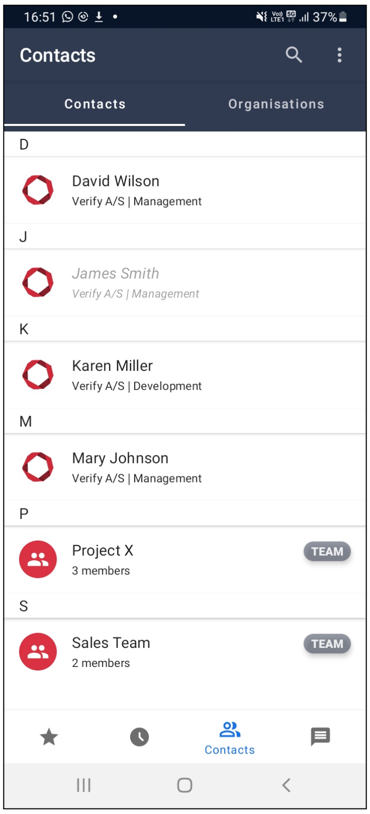
- Secure voice/video communication.
- Secure instant messaging of text and content (attachments).

The functionalities are accessible from the main screen. The icons in the menu bar at the bottom (See Figure 5) provide quick access to the following screens:

- Favourites: For quick access to selected contacts.
- Recents: For accessing the call history.
- Contacts: For accessing the entire phone book.
- Messages: For accessing the message inbox.

Settings are accessed from the ⋮ -symbol on top-right corner of the Contacts screen (See Figure 5).

Dencrypt Connex launches per default with the Contacts screen. The launch screen can be set from: Settings →App →Start view (See section 7).



D

David Wilson
Verify A/S | Management

J

James Smith
Verify A/S | Management

K

Karen Miller
Verify A/S | Development

M

Mary Johnson
Verify A/S | Management

P

Project X TEAM
3 members

S

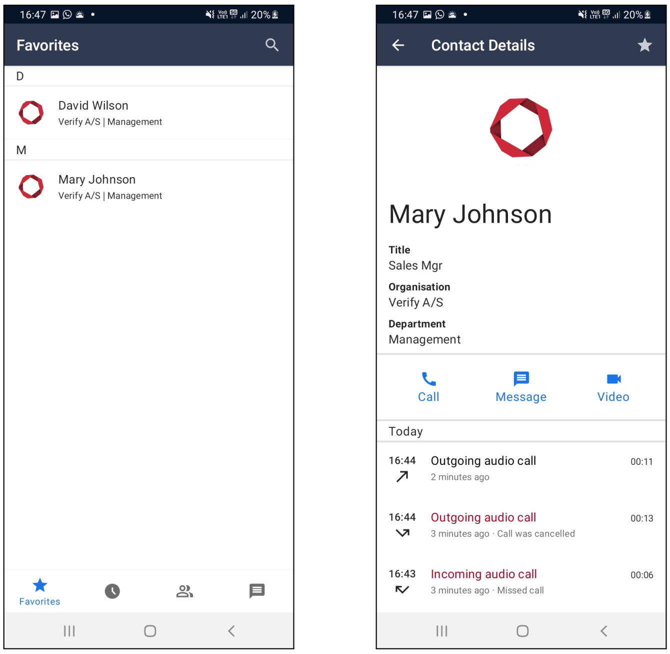
Sales Team TEAM
2 members

Figure 5: Contacts screen.

4.1 Favourites

The Favourites screen shows a contact shortlist created by the user (Figure 6a). Initially, the Favorite screen is empty. Contacts can be added to the Favourites screen by tapping the star icon found in the Contact Details (Figure 6b). The ★-icon is filled for favorite contacts.

A contact can be removed from Favorites by tapping the ★-icon again.



David Wilson
Verify A/S | Management

Mary Johnson
Verify A/S | Management

Mary Johnson

Title
Sales Mgr

Organisation
Verify A/S

Department
Management

Today

16:44	Outgoing audio call 2 minutes ago	00:11
16:44	Outgoing audio call 3 minutes ago · Call was cancelled	00:13
16:43	Incoming audio call 3 minutes ago · Missed call	00:06

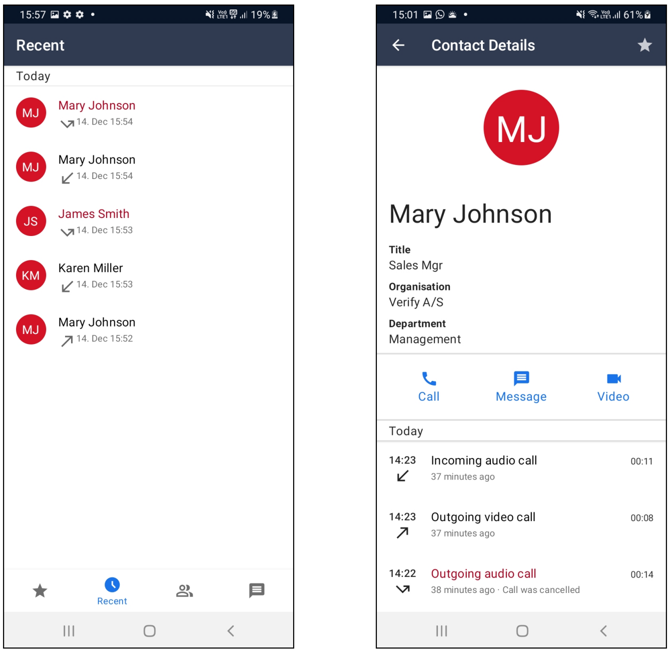
(a) Favourites screen

(b) Contact details.

Figure 6: Favourites.

4.2 Recents

The Recent screen shows the call history in chronological order (Figure 7a). Tapping an entry will open the Call Details screen, which contains the call history for that contact (Figure 7b).



15:57 19%

Recent

Today

MJ Mary Johnson 14. Dec 15:54

MJ Mary Johnson 14. Dec 15:54

JS James Smith 14. Dec 15:53

KM Karen Miller 14. Dec 15:53

MJ Mary Johnson 14. Dec 15:52

(a) Recents screen

15:01 61%

Contact Details

MJ

Mary Johnson

Title
Sales Mgr

Organisation
Verify A/S

Department
Management

Today

14:23 Incoming audio call 00:11
37 minutes ago

14:23 Outgoing video call 00:08
37 minutes ago

14:22 Outgoing audio call 00:14
38 minutes ago · Call was cancelled

(b) Recent call detail from contacts.

Figure 7: Recents.

4.3 Contacts

The Contacts screen shows the entire phone book consisting of individual contacts and team rooms (Figure 8a). The content of the phone book is centrally managed from the Dencrypt Control Center and is not editable from within the app.

Contacts are listed in alphabetic order, sorted by first name per default. Changing the sorting order can be done from the Settings menu. Locating contacts can be done in the following manners:

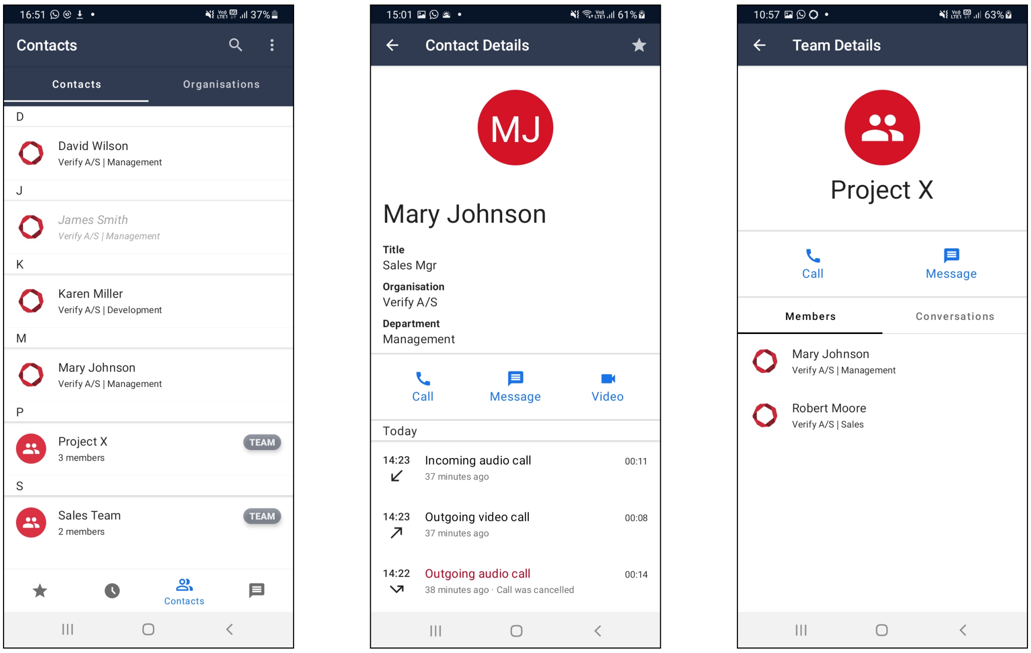
- Skip to a specific letter using the index on the right-hand side of the screen.
- Search for contacts via the search menu.
- Toggle between an All contact view or Organisation view by tapping the buttons above the list [Phonebook views 4.3.1].

Inactive contacts are indicated by grey coloring. An inactive contact is created on the system but may not have activated his/hers account yet, or has been deactivated by the system administrator. It is not possible to call or message an inactive contact. Display of inactive contacts can be enabled and disabled from the settings menu (See section 7).

Selecting a contact will open the Contact details (Figure 8b) and allow the user to start a secure call, a secure video call, or send a secure message. The Contact details screen also displays the recent call list.

Selecting a team room will open the Teamroom details (Figure 8c). This screen allows the user to list the members and/or exchange messages or start a group call with the team.

A contact can be added/removed as a Favorite by tapping the star icon.



16:51 37%

Contacts

Contacts | Organisations

D

David Wilson
Verify A/S | Management

J

James Smith
Verify A/S | Management

K

Karen Miller
Verify A/S | Development

M

Mary Johnson
Verify A/S | Management

P

Project X TEAM
3 members

S

Sales Team TEAM
2 members

Contacts

(a) Contacts screen.

15:01 61%

Contact Details

MJ

Mary Johnson

Title
Sales Mgr

Organisation
Verify A/S

Department
Management

Call | Message | Video

Today

14:23 Incoming audio call 00:11
37 minutes ago

14:23 Outgoing video call 00:08
37 minutes ago

14:22 Outgoing audio call 00:14
38 minutes ago · Call was cancelled

(b) Contact details.

10:57 63%

Team Details

Project X

Call | Message

Members | Conversations

Mary Johnson
Verify A/S | Management

Robert Moore
Verify A/S | Sales

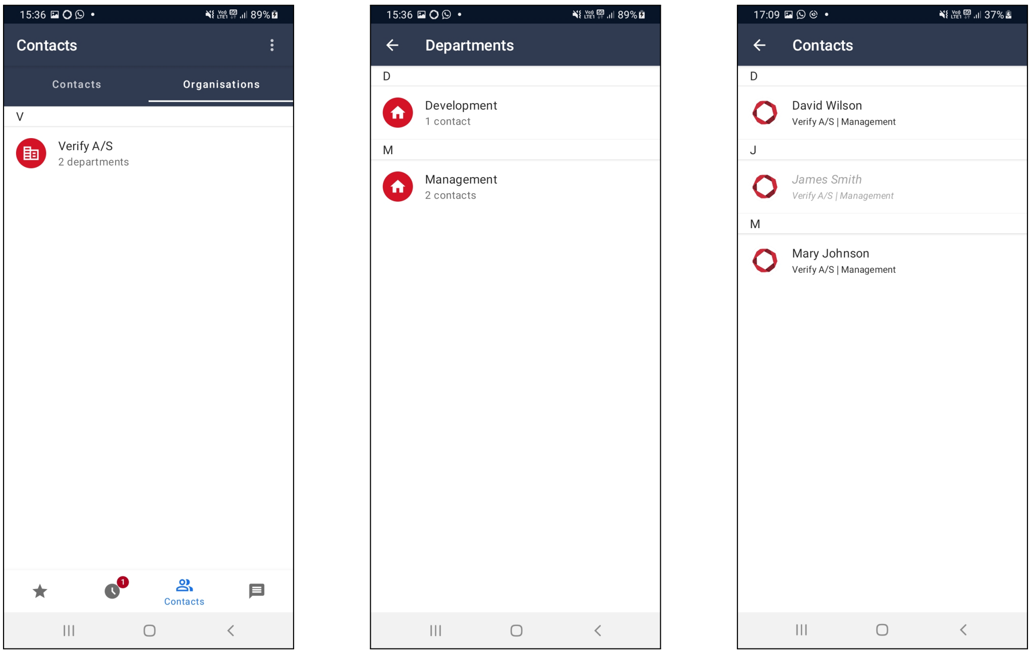
(c) Teamroom details.

Figure 8: Contacts.

4.3.1 Phonebook views

Two phonebook views are available:

- The Organsization view structures the contacts by two levels: By organization and department (Figure 9).
- The Contacts view shows all contacts in a flat alphabetically ordered list (Figure 8a).



15:36 89%

Contacts

Contacts | Organisations

V

Verify A/S
2 departments

Contacts

(a) First layer: Organization

15:36 89%

Departments

D

Development
1 contact

M

Management
2 contacts

(b) Second layer: Departments

17:09 37%

Contacts

D

David Wilson
Verify A/S | Management

J

James Smith
Verify A/S | Management

M

Mary Johnson
Verify A/S | Management

(c) Contacts in departments

Figure 9: Contacts in organization view.

4.4 Messages

The Message screen is used for sending and receiving text messages and attachments, such as photos, videos, audio clips, files, and GPS location. The system administrator may limit the available choices for security reasons.

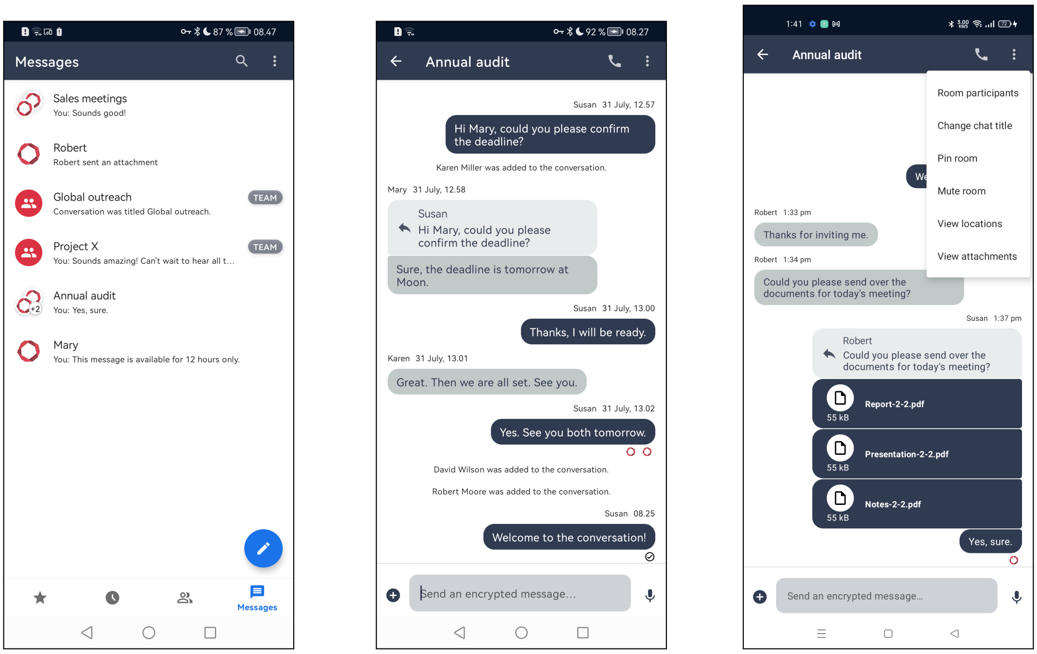
Three types of chatrooms are available:

- Direct chatrooms - for direct messaging with a single contact. The title of the message is set to the name of the contact and cannot be changed. There is only one Direct chatrooms per contact.
- Topic chatrooms - for group messaging or topic specific conversations. A title for the chatroom must be specified when creating a Topic chatrooms. It is possible to have a Direct chatroom and multiple Topic chatrooms with the same contact. Group messages are indicated by multiple avatars to the left of the room title (Figure 10a).
- Teamrooms - persistent chatrooms defined by the system administrator, who also manage the participants. Team rooms are usually created for departments, project teams, o.l. Team rooms are indicated with a TEAM label (Figure 10a).

The initial Messages screen shows a list of chatrooms containing ongoing conversations. Initially, the message inbox will be empty and shows only a placeholder text.

Tapping an entry (chatroom) will open up the messages in the conversation (Figure 13b). Tapping the ⋮-icon opens a menu for showing a list of participants, changing the chatroom title (not available for direct chatrooms), and pinning the chatroom to the top (Figure 10c).

From the chat room: Tap the ☎-icon or 📹-icon to call all chatroom participants. Video calls are only possible for chatrooms with a single contact.



Sales meetings
You: Sounds good!

Robert
Robert sent an attachment

Global outreach
Conversation was titled Global outreach.

Project X
You: Sounds amazing! Can't wait to hear all t…

Annual audit
You: Yes, sure.

Mary
You: This message is available for 12 hours only.

(a) Messages screen.

Susan 31 July, 12.57
Hi Mary, could you please confirm the deadline?

Karen Miller was added to the conversation.

Mary 31 July, 12.58
Susan
Hi Mary, could you please confirm the deadline?
Sure, the deadline is tomorrow at Moon.

Susan 31 July, 13.00
Thanks, I will be ready.

Karen 31 July, 13.01
Great. Then we are all set. See you.

Susan 31 July, 13.02
Yes. See you both tomorrow.

David Wilson was added to the conversation.

Robert Moore was added to the conversation.

Susan 08.25
Welcome to the conversation!

(b) Message conversation.

Robert 1:33 pm
Thanks for inviting me.

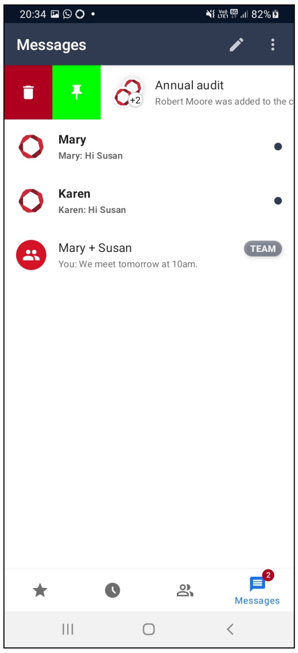
Robert 1:34 pm
Could you please send over the documents for today's meeting?

Susan 1:37 pm
Robert
Could you please send over the documents for today's meeting?
Report-2-2.pdf
Presentation-2-2.pdf
Notes-2-2.pdf
Yes, sure.

(c) chatroom options.

Figure 10: Messages

Chatrooms can be deleted or marked as favorites (pinned). In the chatroom list: Swipe right on the chatroom title to reveal a hidden menu for deleting or pinning chatrooms. Favorite chatrooms are always shown at the top of the list. Mute room will prevent notifications from being displayed for the selected duration. Muted rooms can be identified by a small icon shown in the conversation topic. Rooms can be unmuted from the options menu Figure 10c.



20:34 82%

Messages

Annual audit
Robert Moore was added to the c

Mary
Mary: Hi Susan

Karen
Karen: Hi Susan

Mary + Susan
You: We meet tomorrow at 10am.

(a) Chatroom options.

Participants can be added or removed from a topic chatroom:

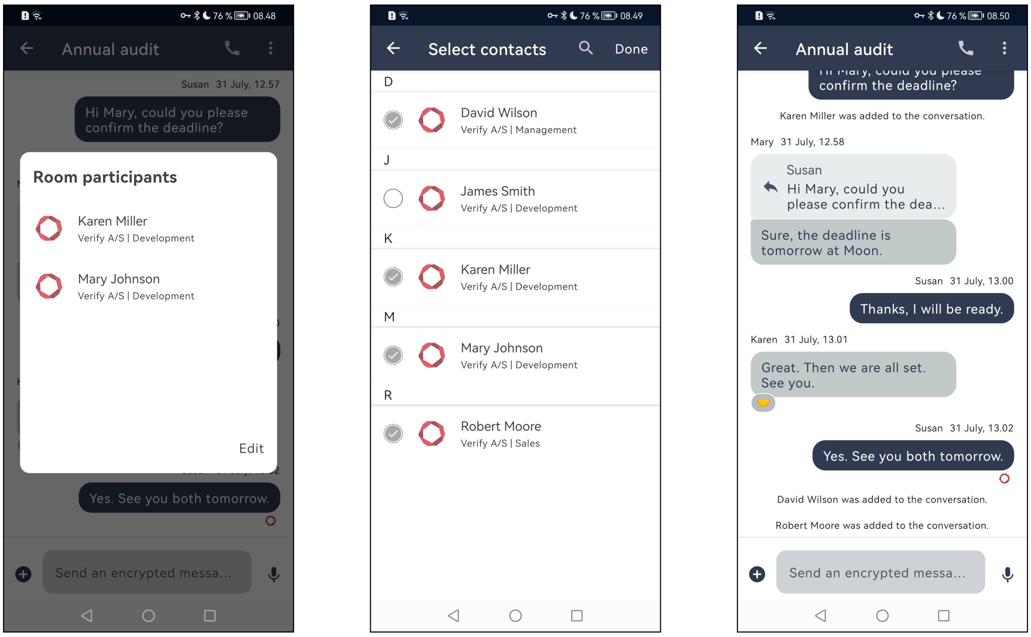
Add/remove participants

Step 1: Open the chatroom and tap ⋮.

Step 2: Tap Room Participants to display a list of chatroom members (Figure 12a).

Step 3: Tap Edit to select or deselect participant (Figure 12b).

Step 4: Tap Done. The participants of the chatroom will be notified about the change (Figure 12c).



Susan 31 July, 12.57

Hi Mary, could you please confirm the deadline?

Room participants

Karen Miller
Verify A/S | Development

Mary Johnson
Verify A/S | Development

Edit

Yes. See you both tomorrow.

(a) Chatroom members.

D

○ David Wilson
Verify A/S | Management

J

○ James Smith
Verify A/S | Development

K

○ Karen Miller
Verify A/S | Development

M

○ Mary Johnson
Verify A/S | Development

R

○ Robert Moore
Verify A/S | Sales

(b) Select members.

Hi Mary, could you please confirm the deadline?

Karen Miller was added to the conversation.

Mary 31 July, 12.58

Susan
Hi Mary, could you please confirm the dea…

Sure, the deadline is tomorrow at Moon.

Susan 31 July, 13.00

Thanks, I will be ready.

Karen 31 July, 13.01

Great. Then we are all set. See you.

Susan 31 July, 13.02

Yes. See you both tomorrow.

David Wilson was added to the conversation.

Robert Moore was added to the conversation.

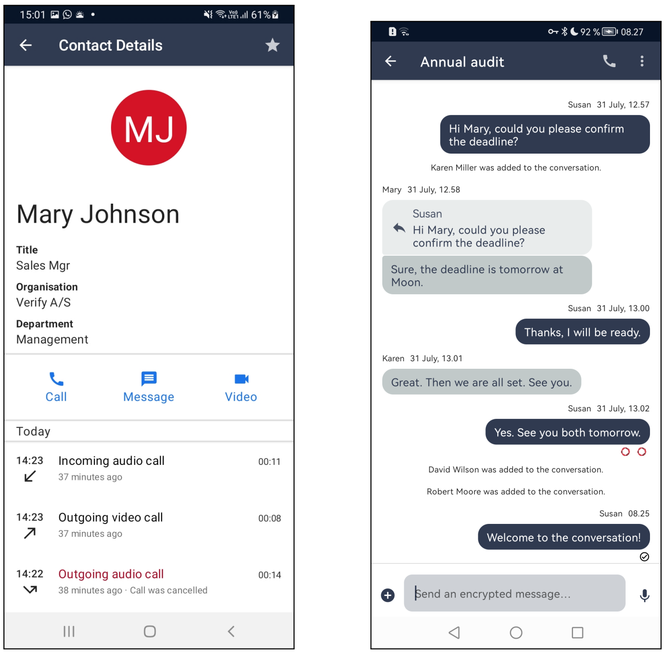
(c) Member added.

Figure 12: Add/remove participants.

5 Making a secure call

Be aware of the security instructions and the surrounding before making a secure call. Refer to [Security instructions 2].

A secure call is initiated from the Contacts screen, Favourites, the call history on the Recents screen, or from inside a message conversation (Figure 13).



15:01 61%

Contact Details

MJ

Mary Johnson

Title
Sales Mgr

Organisation
Verify A/S

Department
Management

Call Message Video

Today

14:23	Incoming audio call 37 minutes ago	00:11
14:23	Outgoing video call 37 minutes ago	00:08
14:22	Outgoing audio call 38 minutes ago · Call was cancelled	00:14

92 % 08.27

Annual audit

Susan 31 July, 12.57
Hi Mary, could you please confirm the deadline?

Karen Miller was added to the conversation.

Mary 31 July, 12.58
Susan
Hi Mary, could you please confirm the deadline?
Sure, the deadline is tomorrow at Moon.

Susan 31 July, 13.00
Thanks, I will be ready.

Karen 31 July, 13.01
Great. Then we are all set. See you.

Susan 31 July, 13.02
Yes. See you both tomorrow.

David Wilson was added to the conversation.

Robert Moore was added to the conversation.

Susan 08.25
Welcome to the conversation!

Send an encrypted message...

(a) Contact details. (b) Message conversation.

Figure 13: Making calls.

A secure call can only be made when Dencrypt Connex has a working internet connection. Secure calls are not possible during flight mode and with a poor data connection.

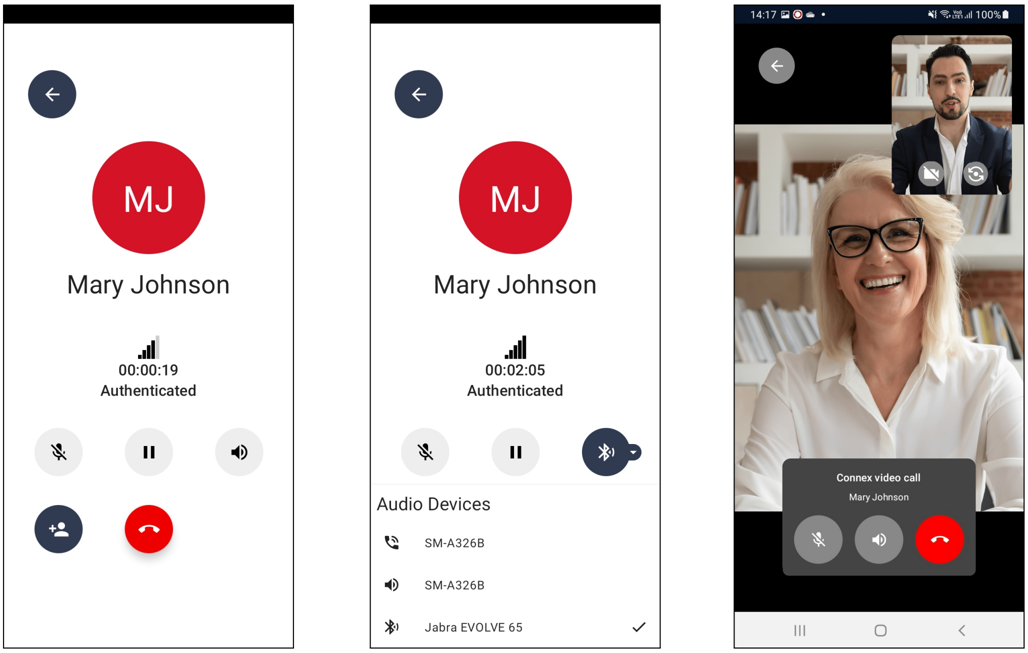
A secure audio call is initiated by tapping the Dial button, which opens the Call screen. A secure video call is started by tapping the Video button.

During the call setup, a status message will show the progress of the call setup. The call setup process is active until the call is answered, the call is timed out, or the receiving party rejects the call.

Once the call is answered, Dencrypt Connex authorizes the calling parties, exchanges encryption keys, and establishes a secure connection. When a secure connection is established, an audible notification is played, and the screen will display ”AUTHENTICATED” as shown in Figure 14. Audio is only transmitted when the connection is secured.

The usual call functionalities are available during a secure call, such as microphone muting, enabling speaker mode, and pausing the call. During a secure video call, switching between the front- and the rear camera and disabling the camera is also possible.

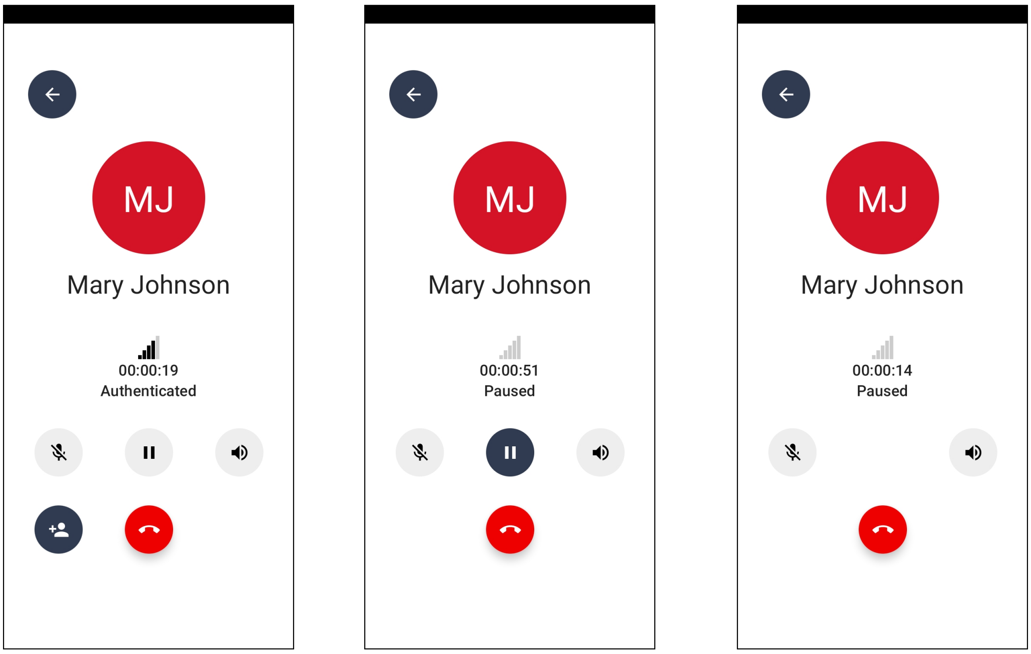
If a Bluetooth device is connected to the device, the speaker button will show a Bluetooth icon (Figure 14b). Tapping it will bring up a menu where the audio output can be selected . Be aware of the security risks by applying wireless headsets [Other security recommendations 2.4].



(a) Secured voice call. (b) Bluetooth menu (c) Secured video call.

Figure 14: In call screens.

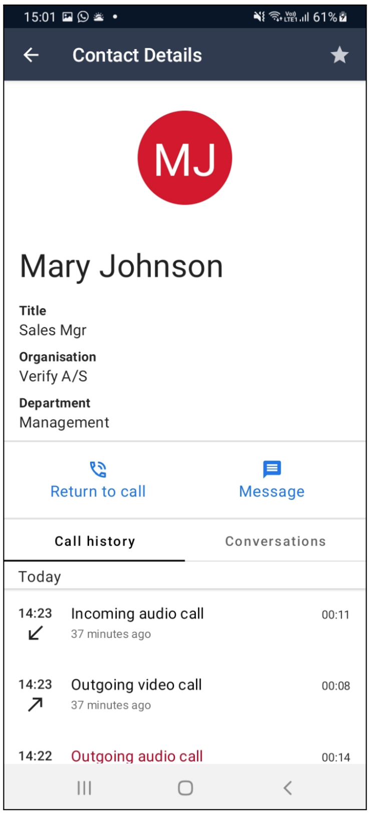
A voice call is put on hold by tapping the Pause button (Figure 15). The receiving party will hear a pause tone. Tap Pause again to resume the call.



(a) Tap Pause to put a call on hold. (b) Tap Pause again to resume call. (c) Call on hold. Receiving part.

Figure 15: Call hold

Having navigated away from the Call screen during a call, the user can return to the call from the Contact details screen, by pressing Return to call (See Figure 16).



15:01 61%

Contact Details

MJ

Mary Johnson

Title
Sales Mgr

Organisation
Verify A/S

Department
Management

Today

14:23	Incoming audio call 37 minutes ago	00:11
14:23	Outgoing video call 37 minutes ago	00:08
14:22	Outgoing audio call	00:14

Figure 16: Return to call

5.1 Voice quality

The call quality is indicated by the signal bars as seen in Table 3. The call quality depends on the network conditions, such as available bandwidth and latency. Buildings, natural obstructions, and travel speed may impact the data connection and hence the voice quality. Poor voice quality may be improved by:

Steps for improving a poor voice quality

Step 1: Switch the network from wifi to mobile internet or vice-versa. Network switching is possible without interrupting the call.

Step 2: Move to another location.

Step 3: Hang up and try calling again.

A call will automatically terminate when no audio data has been received for 30 seconds.

Quality	Reason
█████	Good network conditions → Voice quality is high.
███□□	Some audio artifacts may be heard, but the voice quality should still be understandable.
█□□□□	Severe audio artifacts and dropouts. Voice quality may be hard to understand.
□□□□□	Data connection is poor → Voice is interrupted.

Table 3: Voice quality indicators

5.2 Group calls

Group calls can be established in two ways:

1. Add additional contacts to an ongoing conversation.
2. Call all members of a chatroom.

Add participants to an ongoing secure call.

Step 1: Establish a secure call. Refer to [Making a secure call 5].

Step 2: Tap the 👤+-icon to open the phonebook (Figure 17a).

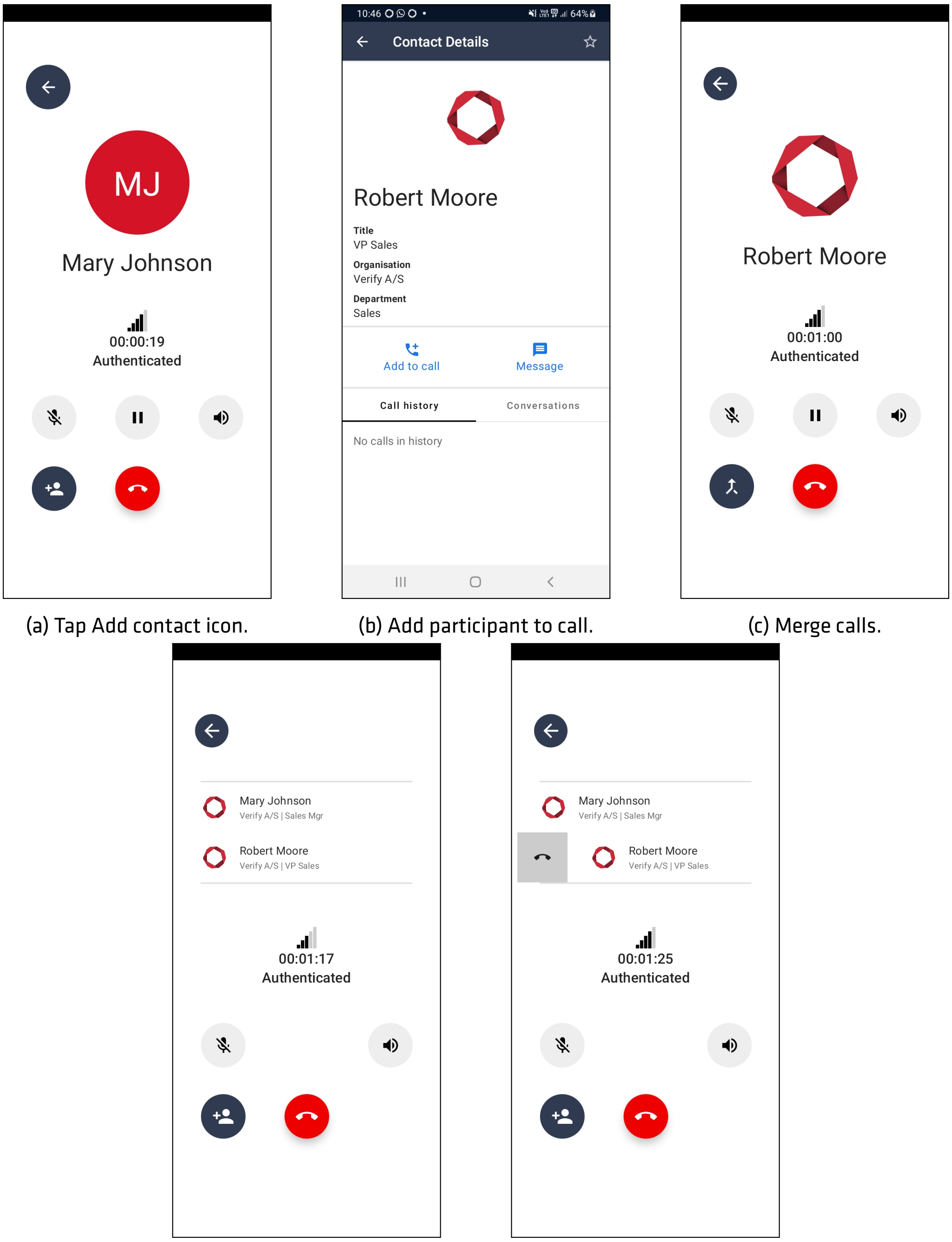
Step 3: Locate a contact in the phonebook and tap Add to call (Figure 17b). This will pause the ongoing call and establish a new secure call.

Step 4: Combine the two conversations by tapping Merge (Figure 17c). The first call is resumed and merged with the second call.

Step 5: The In-call screen displays a list of participants (Figure 17d).

Step 6: Repeat step 2 - 4 to add more participants.

Step 7: Swipe right on the participant avatar to hang up (Figure 17e).



(a) Tap Add contact icon.

(b) Add participant to call.

(c) Merge calls.

(d) Group call established.

(e) Swipe right on the avatar to hang up the participant.

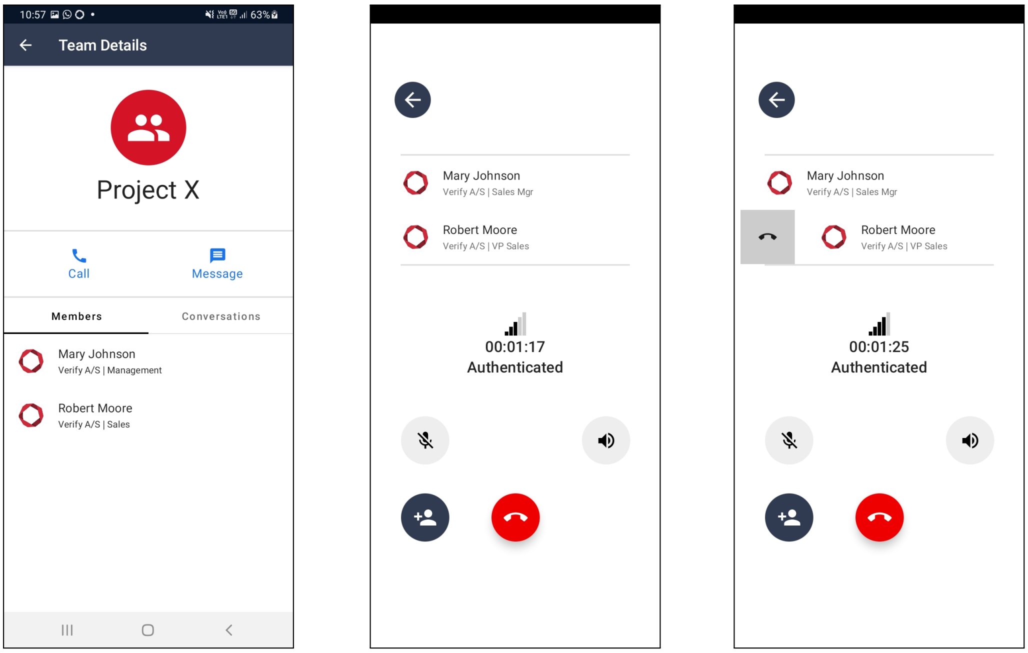
Figure 17: Group calls

Call all participants in a message room

Step 1: Go to Messages and select a chat room, or goto Contacts to select a team room.

Step 2: Tap Call to dial the participants (Figure 18a).

Step 3: Swipe right on the participant avatar to hang up (Figure 18c).



(a) Open team-/chatroom. Tap Call.

(b) Group call

(c) Swipe left to hang up participant.

Figure 18: Group calls to members of team room or message room.

The available data bandwidth limits the practical number of participants in a group call. Under normal conditions, at least 5-10 contacts should be able to participate in a group call. The user who made the first call becomes the group call host and can add additional participants.

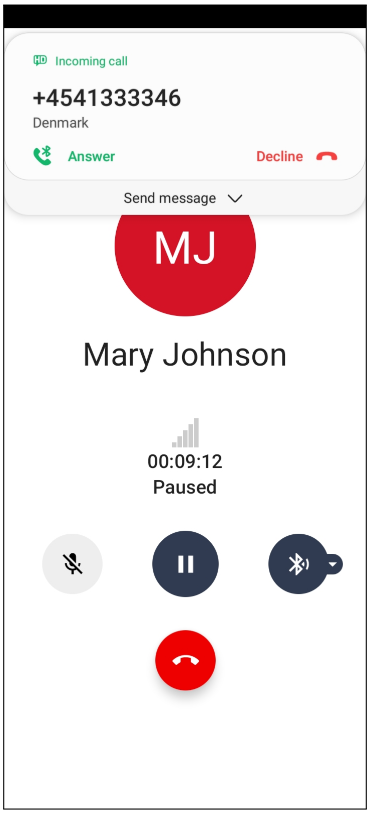
Video group calls are not supported.

5.3 Incoming calls during a secure call

Secure voice calls have the same priority as normal mobile calls. A secure call is not interrupted by an incoming normal mobile call, and the user has the usual options for handling incoming calls as seen in Figure 4 and given in the following table:

Menu	**Action**
Answer	The active secure call is paused. The secure call is resumed by tapping the Pause button. (Require Call waiting is enabled for the device.)
Decline	Reject the incoming call.

Table 4: Actions for incoming calls during a secure call.



Incoming call

+4541333346

Denmark

Mary Johnson

00:09:12

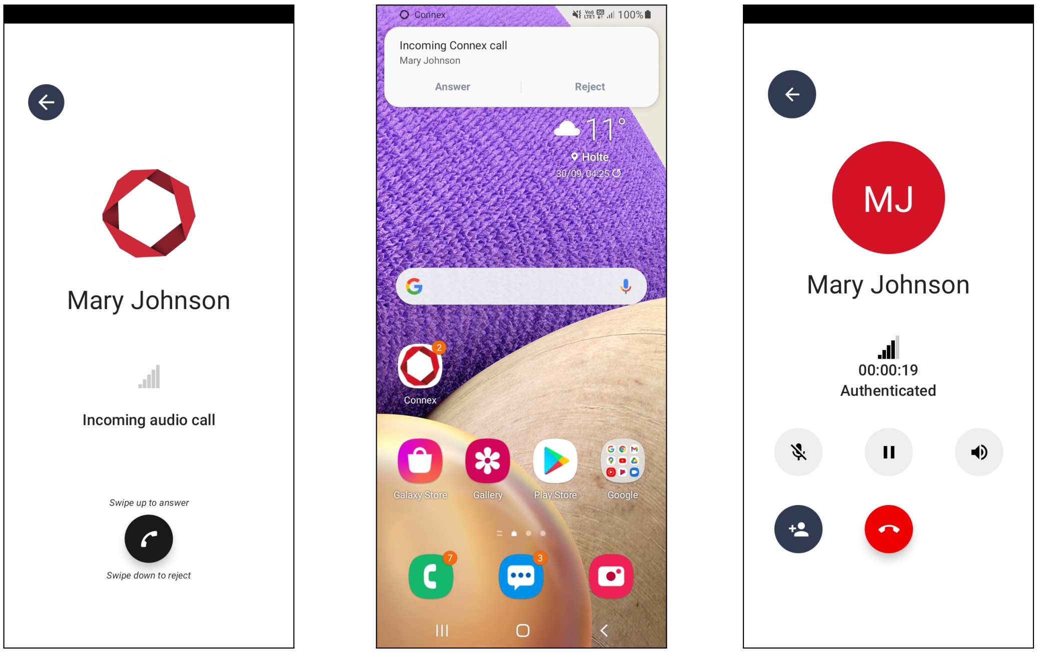
Paused

Figure 19: Incoming call during a secure call

5.4 Incoming secure calls

Incoming secure voice calls are alerted using VoIP push notifications. The incoming call screen is displayed, where the caller's name is shown, followed by incoming audio call indicating a secure voice call (Figure 20a) or by incoming video call indicating a secure video call. The call is accepted by swiping up the "phone" icon and declined by swiping down.

When the device is in use, the secure incoming call is alerted using a push notification, where the call is answered or rejected (Figure 20b). When answering the call, the Dencrypt Connex authorizes the calling parties, exchanges encryption keys, and establishes a secure connection. A waiting tone is played during the setup process, indicating that the secure channel is being established. Audio feedback is played when the channel is secured and available. Voice data is only transmitted when the secure channel is established (Figure 20c).



(a) Incoming secure call.

(b) Incoming secure call on an unlocked device.

(c) Ongoing secure call.

Figure 20: Incoming secure call.

6 Sending a secure message

The Messages screen shows all the ongoing conversations (chatrooms). Initially, the message inbox is empty and shows only a placeholder text.

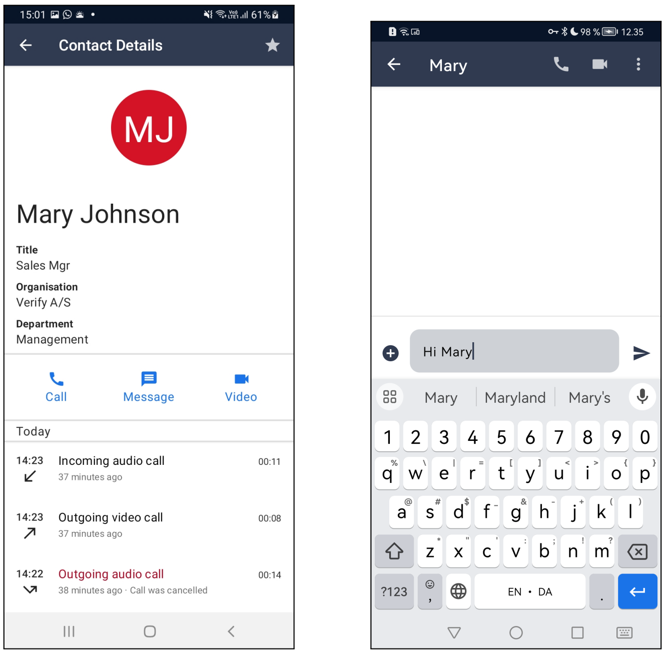
6.1 Create a *direct chat room*

A direct chatroom is the default chatroom for conversations with a single contact. Only one direct chatroom per contact exists, and the title is fixed to the contact name.

Create a *direct message* conversation

Step 1: Select contact details and tap the Message icon (Figure 21a).

Step 2: If an existing conversation exists, the chatroom opens to continue the conversation. If not, a new chatroom is created (Figure 21b).



Mary Johnson

Title
Sales Mgr

Organisation
Verify A/S

Department
Management

Today

14:23 Incoming audio call 37 minutes ago 00:11

14:23 Outgoing video call 37 minutes ago 00:08

14:22 Outgoing audio call 38 minutes ago · Call was cancelled 00:14

Hi Mary

(a) Select Message.

(b) Start typing the first message.

Figure 21: Create a Direct chatroom.

6.2 Create a *topic chatroom*

A topic chatroom is used for group messaging and for conversations with a single contact on a specific topic.

Creating a conversation

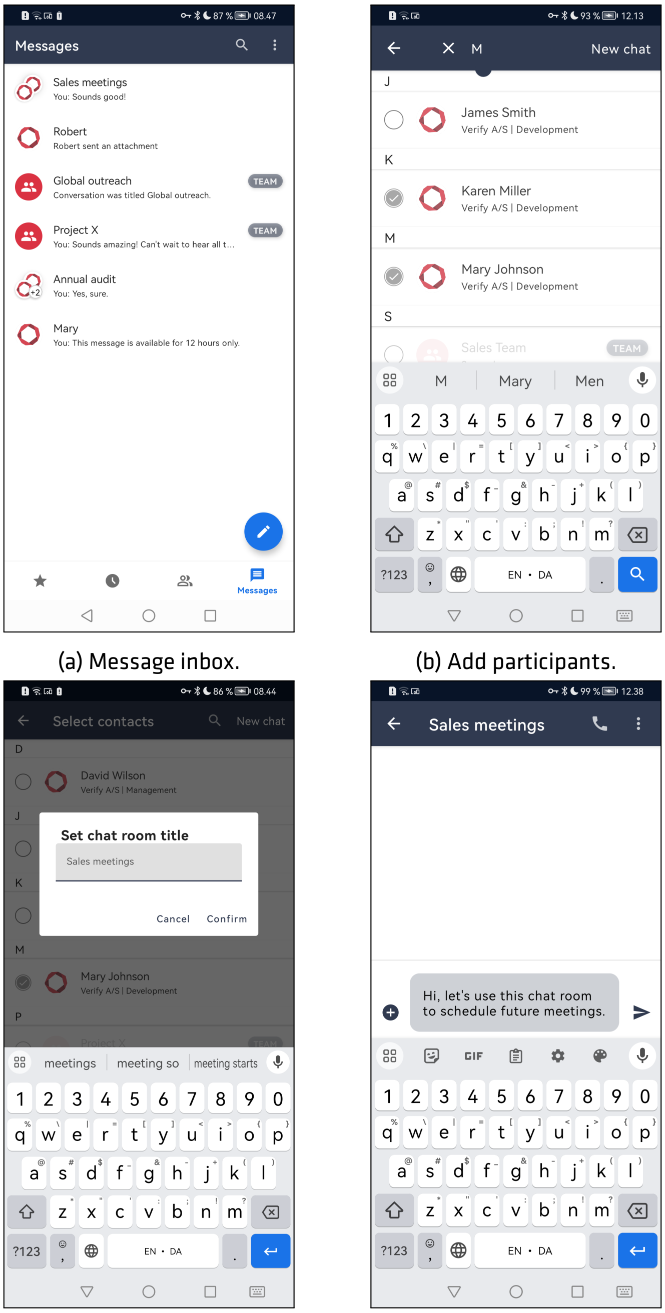
Step 1: Goto the the Messages tap.

Step 2: Tap the ✎-icon in the top-right corner.

Step 3: Search and select one or more recipients to add them to a conversation (Figure 22b). Tap New Chat.

Step 4: Set a title for the chat room and tap Confirm (Figure 22c).

Step 5: Start writing the first message (Figure 22d).



Messages

Sales meetings
You: Sounds good!

Robert
Robert sent an attachment

Global outreach TEAM
Conversation was titled Global outreach.

Project X TEAM
You: Sounds amazing! Can't wait to hear all t...

Annual audit
You: Yes, sure.

Mary
You: This message is available for 12 hours only.

(a) Message inbox.

M New chat

J
○ James Smith
Verify A/S | Development

K
● Karen Miller
Verify A/S | Development

M
● Mary Johnson
Verify A/S | Development

S
○ Sales Team TEAM

(b) Add participants.

Select contacts New chat

D
○ David Wilson
Verify A/S | Management

Set chat room title
Sales meetings
Cancel Confirm

M
● Mary Johnson
Verify A/S | Development

(c) Set title.

Sales meetings

Hi, let's use this chat room to schedule future meetings.

(d) Write the first message.

Figure 22: Create a topic room.

6.3 Sending a secure message

Sending a secure message

Step 1: Select an existing Chatrom from the Message tap.

Step 2: Enter text and tap Send.

The message is encrypted and transmitted immediately when an active data connection exists. A successful transmission is indicated by a ✓ -icon.

A message pending transmission is indicated by a ”spinner” icon next to it. The message is stored encrypted, and automatic retransmission will be attempted while the app is open. A notification is received if the app is closed while having pending transmission. Once opened again, the app will attempt to resend the message.

Encrypting and sending large-size attachments may take longer.

6.4 Message context menu

Long pressing on any message will bring up a context menu (Figure 23) presenting the following options:

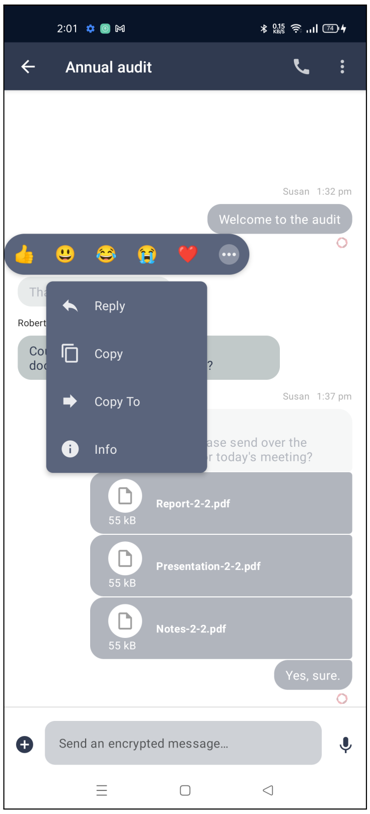
Delivery status Message delivery status. Refer to [Message delivery status 6.4.1].

Reply Reply to message. Refer to [Reply to message 6.4.2].

Copy Copy messages and/or attachments from one conversation to another [Copy messages 6.4.3].

Show Show message.

Emoji reaction React to message. Refer to [Emoji reaction 6.4.4]



Susan 1:32 pm

Welcome to the audit

Th

Robert

Co
do
?

Susan 1:37 pm

ase send over the
r today's meeting?

Report-2-2.pdf
55 kB

Presentation-2-2.pdf
55 kB

Notes-2-2.pdf
55 kB

Yes, sure.

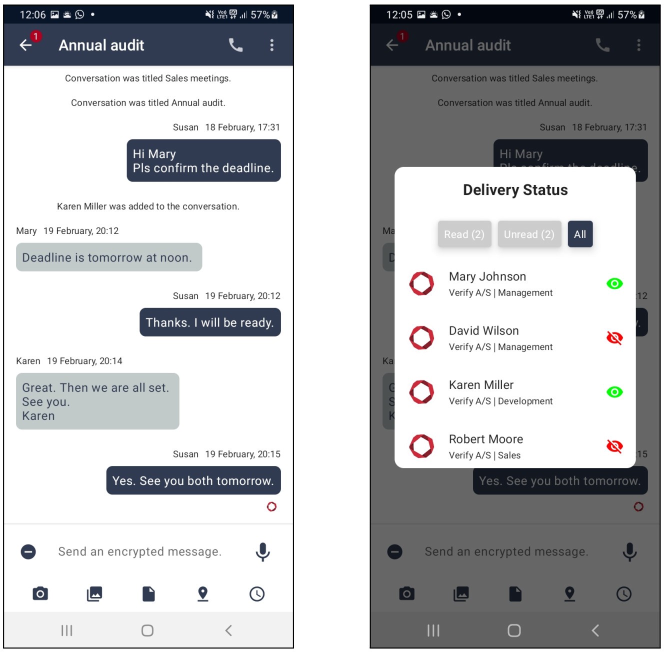
Figure 23: Long pressing on a message

6.4.1 Message delivery status

A delivery status for sent messages is displayed under each message in the conversation screen:

- The ✓-icon indicates that the message has been delivered. Tapping the icon will open the Delivery Status screen.
- An avatar indicates who has read the messages. Tapping the avatar will open the Delivery Status screen.

Figure 24 gives a conversation example with all color codes. Detailed delivery status is available when long pressing on a message.



12:06 57%

Annual audit

Conversation was titled Sales meetings.

Conversation was titled Annual audit.

Susan 18 February, 17:31

Hi Mary
Pls confirm the deadline.

Karen Miller was added to the conversation.

Mary 19 February, 20:12

Deadline is tomorrow at noon.

Susan 19 February, 20:12

Thanks. I will be ready.

Karen 19 February, 20:14

Great. Then we are all set.
See you.
Karen

Susan 19 February, 20:15

Yes. See you both tomorrow.

Send an encrypted message.

12:05 57%

Annual audit

Delivery Status

Read (2) Unread (2) All

Mary Johnson Verify A/S | Management	✓
David Wilson Verify A/S | Management	✗
Karen Miller Verify A/S | Development	✓
Robert Moore Verify A/S | Sales	✗

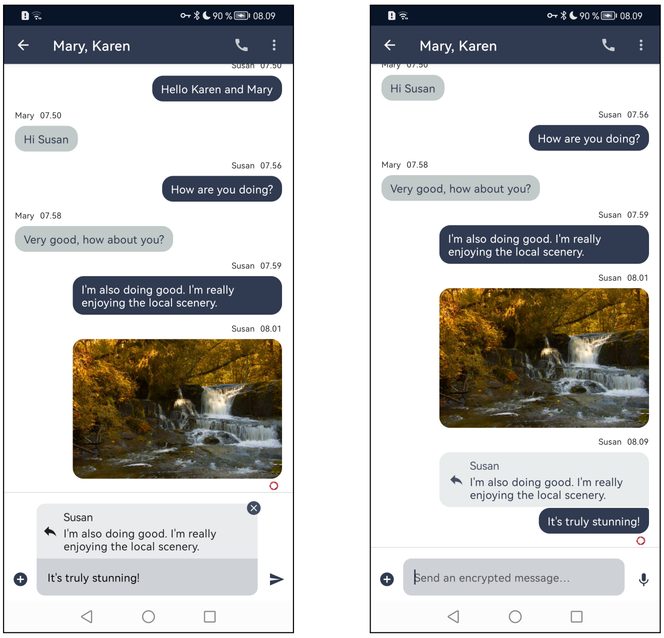
(a) Conversation screen.

(b) Delivery status details.

Figure 24: Message delivery status

6.4.2 Reply to message

A user can reply to a specific message by long pressing on a given message and selecting Reply. This will show the original message and allow the user to send a response to it. Tapping the ⊗-button will cancel the reply feature, tapping Send will send the reply (Figure 25). Both the senders and receivers conversation screen will show both the original message and the reply message. Tapping the original message will scroll the conversation so the original message is shown.



90 % 08.09

Mary, Karen

Hello Karen and Mary

Mary 07.50

Hi Susan

Susan 07.56

How are you doing?

Mary 07.58

Very good, how about you?

Susan 07.59

I'm also doing good. I'm really enjoying the local scenery.

Susan 08.01

Susan
I'm also doing good. I'm really enjoying the local scenery.

It's truly stunning!

90 % 08.09

Mary, Karen

Hi Susan

Susan 07.56

How are you doing?

Mary 07.58

Very good, how about you?

Susan 07.59

I'm also doing good. I'm really enjoying the local scenery.

Susan 08.01

Susan 08.09

Susan
I'm also doing good. I'm really enjoying the local scenery.

It's truly stunning!

Send an encrypted message...

(a) Writing a reply.

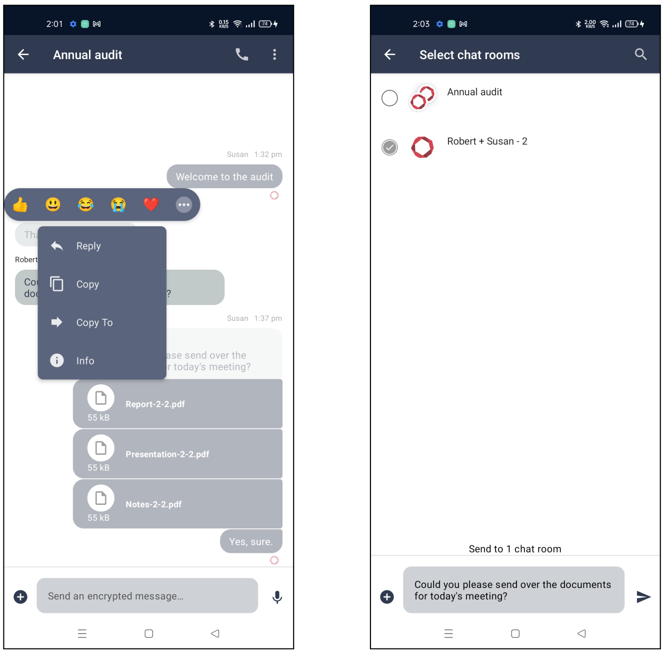
(b) Reply sent.

Figure 25: Message with a reply.

6.4.3 Copy messages

Messages can be copied from one conversation and inserted into another.

Long pressing a message and selecting Copy To from the context menu will allow the user to select the rooms to which the text message should be sent.



Susan 1:32 pm
Welcome to the audit

Robert

Susan 1:37 pm

ase send over the
r today's meeting?

Report-2-2.pdf 55 kB

Presentation-2-2.pdf 55 kB

Notes-2-2.pdf 55 kB

Yes, sure.

Send an encrypted message...

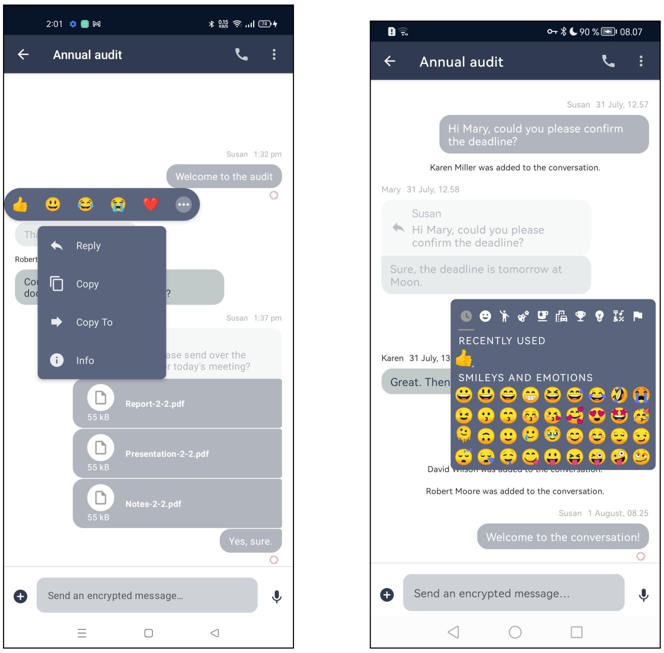
Could you please send over the documents for today's meeting?

(a) Selecting messages for copying.

(b) Selecting copy destination.

6.4.4 Emoji reaction

Emojis can assigned to messages from the context menu [Message context menu 6.4]. The most recently used emojis are available directly in the context menu. Pressing ••• will present a wider selection of emojis (Figure 27).



Susan 1:32 pm

Welcome to the audit

Susan 1:37 pm

Report-2-2.pdf 55 kB

Presentation-2-2.pdf 55 kB

Notes-2-2.pdf 55 kB

Yes, sure.

(a) Recent emojis

Susan 31 July, 12.57

Hi Mary, could you please confirm the deadline?

Karen Miller was added to the conversation.

Mary 31 July, 12.58

Susan
Hi Mary, could you please confirm the deadline?

Sure, the deadline is tomorrow at Moon.

Karen 31 July, 13

Great. Then

Robert Moore was added to the conversation.

Susan 1 August, 08.25

Welcome to the conversation!

(b) More emojis

Figure 27: Emojis

6.5 Sending attachments

Sending attachments

Step 1: Expand the Attachment menu by tapping the ⊕-icon the lower-left corner (Figure 28a).

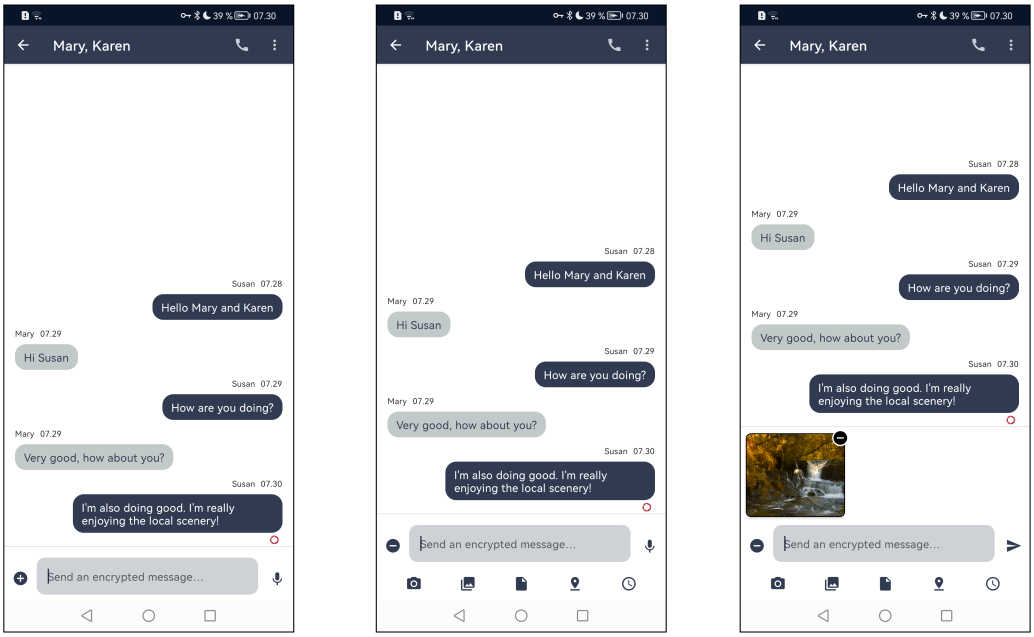
Step 2: Select the source for attachments.

Options as seen in Figure 28b are:

- 📷 Open the camera for in-app capturing of images and video.
- 🖼 Open the gallery for attaching images and videos.
- 📄 Open the file manager for attaching files.
- 📍 Open Google Maps to select and share a location.
- 🕓 Set time constraints on a message availability.

The system administrator may disable some options to comply with local policies.

Attachments will be added above the compose text field. Attachments can be removed from the message by tapping the ⊖-icon on the top-right corner of each attachment (Figure 28c). Photos, videos, audio clips, and shared locations generated from within Dencrypt Connex will permanently disappear and cannot be recovered once removed.



Mary, Karen

Susan 07.28
Hello Mary and Karen

Mary 07.29
Hi Susan

Susan 07.29
How are you doing?

Mary 07.29
Very good, how about you?

Susan 07.30
I'm also doing good. I'm really enjoying the local scenery!

(a) Open attachment menu (⊕).

(b) Select attachment type.

(c) Attachment selected.

Figure 28: Sending attachments.

6.6 Push-to-Talk

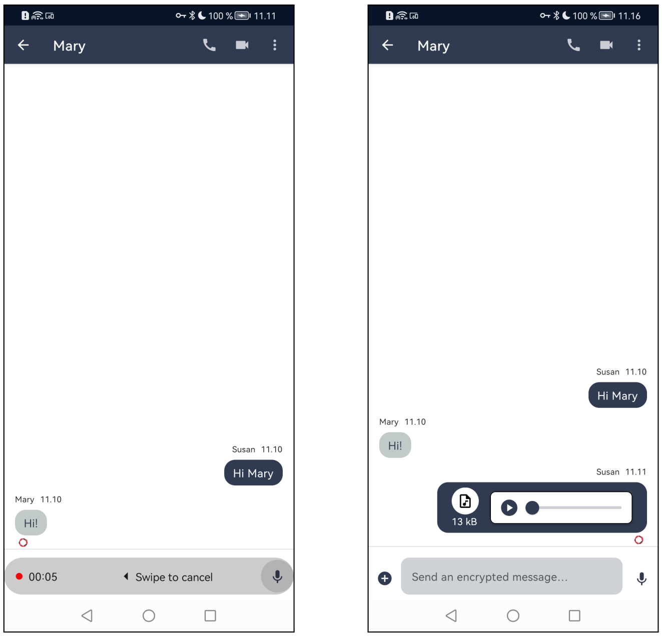
Push-to-Talk functionality is available through the 🎙-icon in the compose field (Figure 29).

Send an instant audio message

Step 1: Tap and hold the 🎙-icon in the compose field.

Step 2: Record audio message.

Step 3: Release the 🎙-icon to send the audio message.



Susan 11.10
Hi Mary

Mary 11.10
Hi!

Susan 11.11

(a) Record audio message.

(b) Send audio clip.

Figure 29: Push-to-Talk messaging

6.7 Location sharing

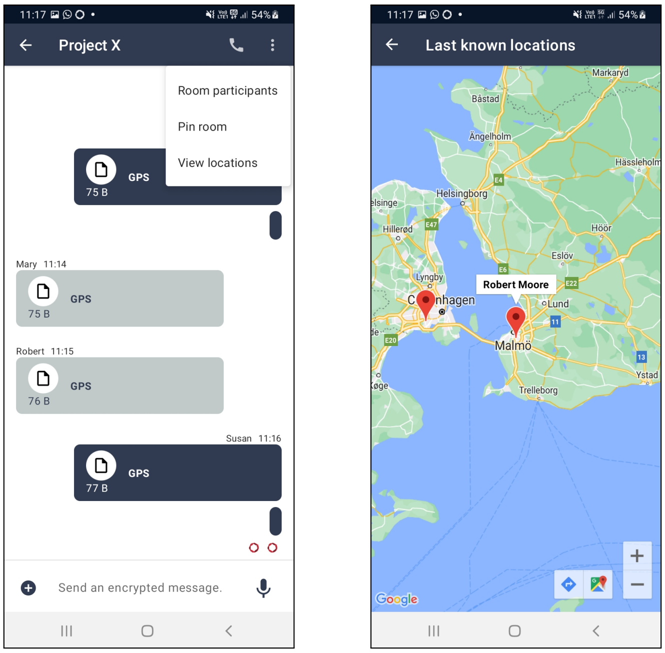
Participants in a chat room can share their location as an attachment. The last known location of the participants, who have shared a location, is displayed on a single map (Figure 30).

View last known locations

Step 1: Open the chatroom. Tap any of the shared GPS-messages to see the location of a single participant.

Step 2: Tap ⋮→View locations to open a map with all shared locations.

Step 3: Tap a pin to see the name of the contact.



(a) Shared locations.

(b) Map view.

Figure 30: Location sharing

6.8 Message expiry

Message expiry is used to set time constraints on a message making it available for the receiver in defined periods only. Expired messages will still be available to the sender. The time constraints can be set in the attachment menu [Sending attachments 6.5] as seen in Figure 32.

Set time constraints on messages

Step 1: Tap 🕒 to open the configuration screen to set time limits.

Step 2: Tap Valid from or Valid until to set start and end date and time.

Step 3: Tap Max reveal duration to set a duration.

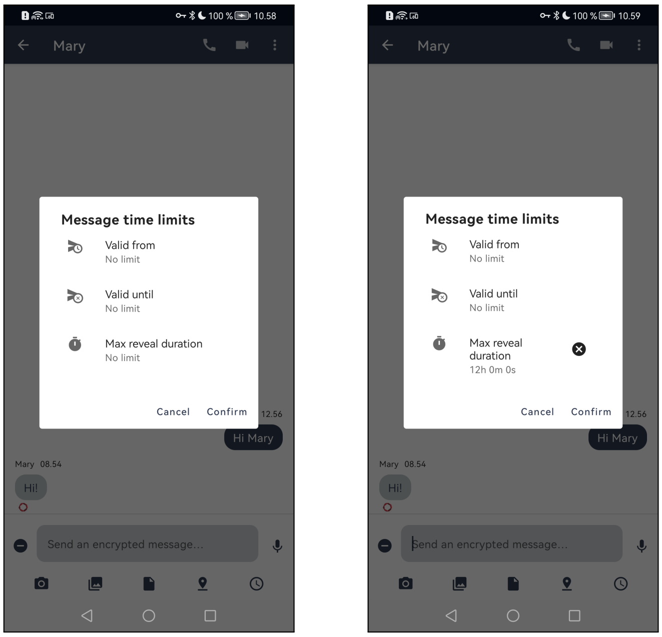
Step 4: Tap Confirm

Step 5: Type and send message

Valid from The message will not be available for the recipients before this date. The receiver will get a notification when the message becomes available.

Valid until The message will not be available for the recipients after this date.

Max reveal duration The message will only be available for the receivers for a limited time period. A timer will start a countdown once the message is opened and the message becomes unavailable at timeout.



Message time limits

Valid from
No limit

Valid until
No limit

Max reveal duration
No limit

12.56
Hi Mary

Mary 08.54
Hi!

Message time limits

Valid from
No limit

Valid until
No limit

Max reveal duration
12h 0m 0s

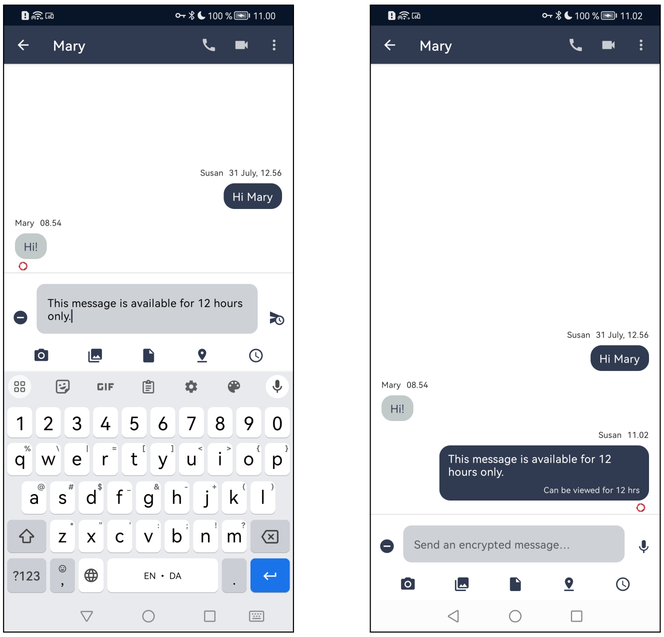
12.56
Hi Mary

Mary 08.54
Hi!

(a) Message expiry options.

(b) Message with time constraints.

Figure 31: Set message expiry.



Susan 31 July, 12.56
Hi Mary

Mary 08.54
Hi!

This message is available for 12 hours only.

Susan 31 July, 12.56
Hi Mary

Mary 08.54
Hi!

Susan 11.02
This message is available for 12 hours only.
Can be viewed for 12 hrs

(a) Typing message.

(b) Time limited message.

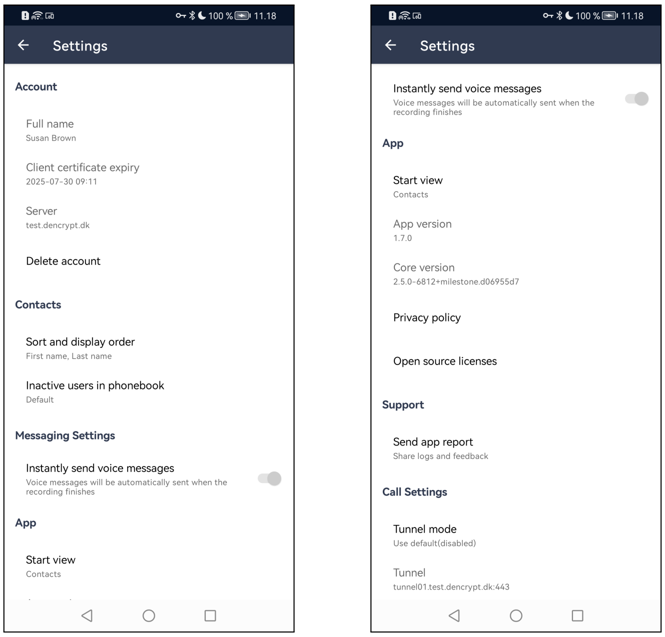
Figure 32: Message expiry

7 Settings

Most of the configuration of Dencrypt Connex is performed centrally by the system administrator.

Dencrypt Connex settings are opened by tapping the ⋮-symbol in the top right corner of the Contacts screeniOS-Devicescreen. The Settings menu gives access to the following options and information:

- **Account**
  - Fullname - The display name of the end-user
  - SIP ID - Unique user identifier.
  - Client certificate expiry - Timestamp for certificate expiry.
  - Server name
  - Delete account. Warning: This will permanently delete all messages and data.
- **Contacts**
  - Sort and display order [Firstname Lastname/Lastname, Firstname].
  - Show inactive users [Default/Show/Hide].
- **Messaging Settings**
  - Instantly send voice messages [On / Off].
- **App**
  - Start view [Last used/Favorites/Recent/Contacts/Messages].
  - App version - The version number of the app.
  - Core version - The version number of the core SDK.
  - Privacy policy - Links to the privacy policy.
  - Open source licenses: Displays a list of used open source licenses. Tap a library name to display the licensing terms.
- **Support**
  - Send a support email: The end-user can share logs with Dencrypt Developers.
- **Server policy**
  - Biometric Authentication.
  - Video calls.
  - Instant messaging.
- **Call Settings**
  - Enable Opus [Enabled, prefer Speex / Enabled, prefer Opus / Disabled, use Speex].
  - Tunnel mode: - Toggle Tunnel mode. Used in VoIP blocking regions (Default: Off) [Default/Auto/Enabled/Disabled].
  - SIP mode [Default / Enable / Disable].
  - Tunnel: - Address for tunnel server.



100 % 11.18

Settings

Account

Full name
Susan Brown

Client certificate expiry
2025-07-30 09:11

Server
test.dencrypt.dk

Delete account

Contacts

Sort and display order
First name, Last name

Inactive users in phonebook
Default

Messaging Settings

Instantly send voice messages
Voice messages will be automatically sent when the recording finishes

App

Start view
Contacts

(a) Settings menu - Part 1.

100 % 11.18

Settings

Instantly send voice messages
Voice messages will be automatically sent when the recording finishes

App

Start view
Contacts

App version
1.7.0

Core version
2.5.0-6812+milestone.d06955d7

Privacy policy

Open source licenses

Support

Send app report
Share logs and feedback

Call Settings

Tunnel mode
Use default(disabled)

Tunnel
tunnel01.test.dencrypt.dk:443

(b) Settings menu - Part 2.

Figure 33: Settings

Appendices

A Dencrypt Communication Solution

The Dencrypt Communication Solution is an encrypted Voice-over-IP-based communication system that offers encrypted mobile voice/video communication and instant messaging within closed user groups. Once Dencrypt Connex is installed and provisioned, it allows for two or more persons to talk securely or exchange instant messages securely.

The solution consists of Dencrypt Connex , a smartphone application (app) installed on the end-users smartphone, and a Dencrypt Server System as illustrated in Figure 34. The Dencrypt Server System is responsible for setting up the encrypted calls, routing messages, and distributing an individual phonebook to each device, defining to whom calls and messaging can be performed. The server system is also responsible for initiating the provisioning process for the first-time activation.

The server system only facilitates call setup and message routing. It is not capable of decrypting voice calls or messages as these are end-to-end encrypted between devices.

The Dencrypt Connex application is installed from Google Play or pushed by a Mobile-Device-Management (MDM) system. The Dencrypt Server System is managed by a system administrator.

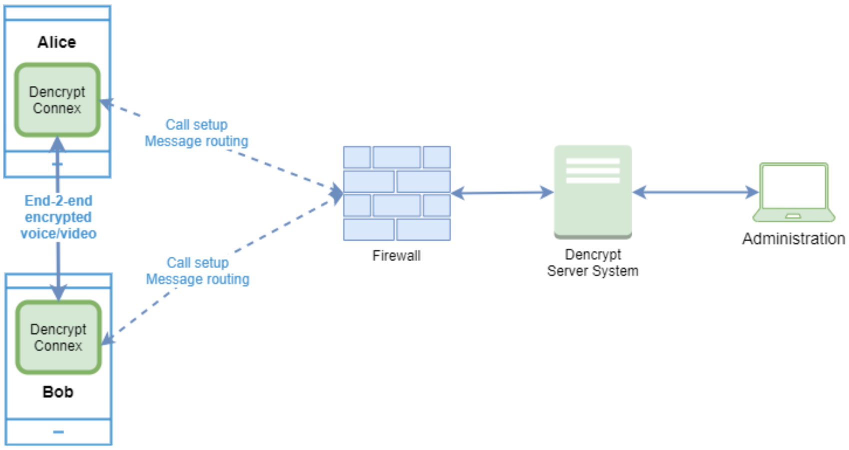


Figure 34: Dencrypt Communication Solution.

A.1 End-2-end encrypted VoIP calls

For secure voice and video calls, an end-to-end encrypted connection between the devices is established using the mobile internet or wifi-networks. Only the data transmission between the devices is protected. The audio/video connection between the user and the device through the microphone, speaker, headset, or screen is not protected as illustrated in Figure 35

Once a connection is established, the exchange of encryption keys happens automatically and directly between the two devices. The key exchange is initiated when a call is answered and a data connection is established. At call termination, encryption keys are permanently removed from the device and cannot be recovered.

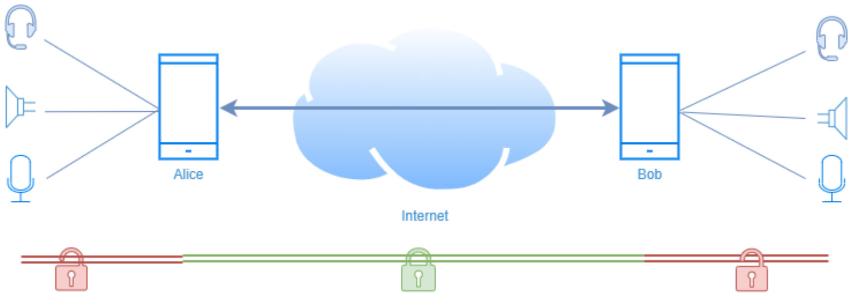


Figure 35: Area of protection for voice/video calls.

A.2 End-2-end encrypted instant messaging

Also, instant messaging is encrypted end-2-end between devices and transmitted, via the Dencrypt Server System, over the mobile internet or wifi-networks. Both the message exchange and the storage on the device (chat history) are protected, whereas the connections to external keyboards or screens are not protected, as shown in Figure 36.

The key exchange happens directly between the communicating devices but is facilitated by the Dencrypt Server System, which also queues the encrypted messages for delivery.

The message history is stored encrypted on the device and requires two keys for decryption: 1) A local key protected by the trusted platform module on the device and 2) a remote key stored on the server system. Hence, the chat history is only accessible when a data connection to the server has been established. The remote key is destroyed when the app is closed.

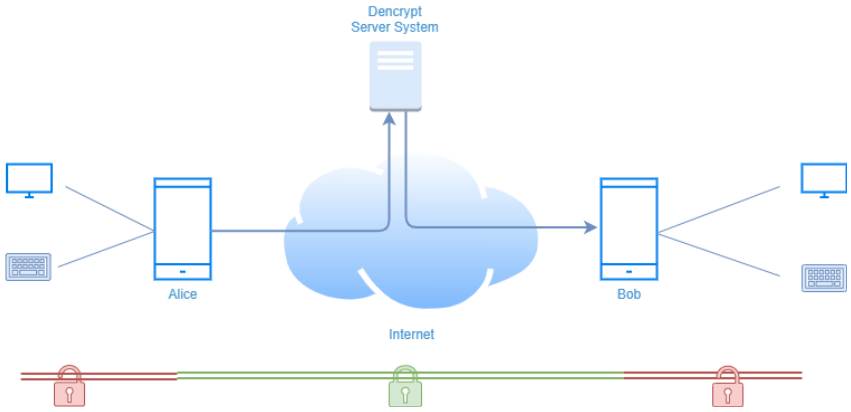


Figure 36: Area of protection for instant messaging

A.3 Authenticated connections

All communication between the Dencrypt Connex and the Dencrypt Server System takes place over mutually authenticated connections. Hence, the server system will only accept connections from authenticated users, and the app will only connect to authorized server systems. The authentication is automatic and does not require user actions besides the initial provisioning.

A.4 Encryption keys

All encryption keys for voice/video calls and for instant messaging are generated automatically when a new conversation is initiated and does not require user actions. Encryption keys are overwritten in memory when a call is terminated or when the app is closed or put in the background.

A.5 Secure phonebook

To ensure that only authorized persons can communicate, the Dencrypt Communication Solution applies a centrally managed and individual phonebook. The phonebook defines with whom a user can communicate. The phonebooks are generated by the system administrator, and updates are pushed to the apps when they connect to the server system. Hence, the phonebook is always up-to-date without any user actions required. The phonebook is stored encrypted on the device using the same key management as for the chat history [End-2-end encrypted instant messaging A.2].

The phonebook concept supports two-way and one-way conversations. Hence, it is possible to receive calls from persons not listed in the phonebook and without being able to call back. Messages received from not listed contacts can be answered.

A.6 Push notifications

Push notification services from Google are used for alerting on incoming secure calls and messages. The push messages are sent either with empty content or with encrypted content.