Setting up a VPN connection between a mobile end device (Android), SCALANCE SC and the SINEMA Remote Connect server

SINEMA Remote Connect

https://support.industry.siemens.com/cs/ww/en/view/109479578

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1 Introduction

1.1 Overview

Industry 4.0

The Internet serves as an enormous accelerator of business processes and has revolutionized business operations around the world. The resulting change in the manufacturing industry is also referred to as Industry 4.0.

Industry 4.0 affects all aspects of the industrial value chain, with industrial communication and security being the important aspects we will consider here.

Industrial security

In the face of digitization and the increasing networking of machinery and equipment, data security must always be taken into account. The use of industrial security solutions precisely tailored to the needs of industry is therefore of fundamental importance – and should be inseparably linked with industrial communication.

This includes the following points:

- Use of robust products with security features and security services
- Use of concepts such as "Defense in Depth" and a holistic security concept

Measures

The measures for safe operation in a digital enterprise are:

- Encryption and monitoring of communication
- Access control for industrial components and networks
- Protection of transfer and saving of data
- Authentication of devices and users

The virtual private network (VPN) as a solution

To ensure secure operation in a digital enterprise, data transmission can be encrypted using a VPN to protect against data espionage and tampering. The communication partners are securely authenticated.

SINEMA Remote Connect – the management platform for remote networks – provides support in this area. SINEMA Remote Connect is a server application that allows for easy management of VPN connections between the control center, service technicians and the installed machines or plants.

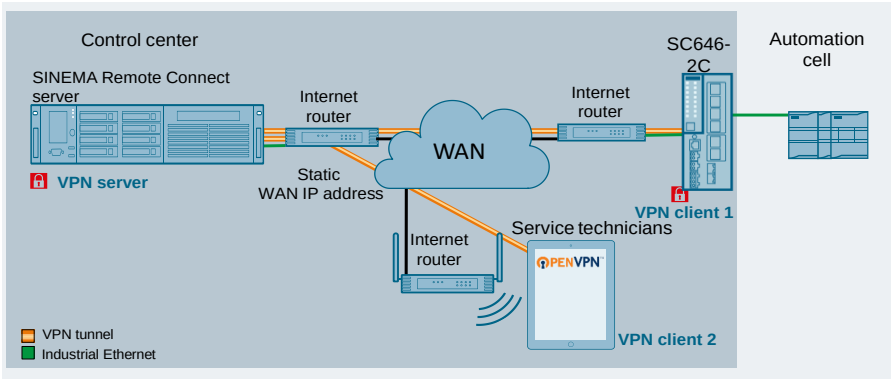
Implementation in practice

This application example will show you how to set up secure remote access to SINEMA Remote Connect Server and underlying devices for a service employee so that he or she can perform maintenance, control and diagnostics tasks.
The service employee in this example will use a mobile end device running Android.
The automation network is protected by a SCALANCE SC-600 security appliance.
SINEMA Remote Connect is used for secure and central management of the tunnel connections.

1.2 Principle of operation

Schematic representation

The Figure below shows a schematic view of the application example.



Description

The internal network of a SCALANCE SC-600 security appliance is connected with an automation cell consisting of nodes such as SIMATIC Station, a panel, drives and PCs. The service technician uses a mobile end device.

The service technician and the automation cell communicate via the SINEMA Remote Connect server located in the control center. Remote access is secured with two VPN tunnels:

- VPN tunnel 1: Client access from the mobile end device (tablet/smartphone) to the SINEMA Remote Connect server is established via the "OpenVPN Connect" app, a VPN client software application.
- VPN tunnel 2: Automation cell client access runs via the SCALANCE SC-600 security appliance.

Depending on the configured communication relationships and the security settings, the SINEMA Remote Connect server will route between the separate VPN tunnels.

Access to the SINEMA Remote Connect server (VPN server) is defined with a static WAN IP address.

Access paths on the part of the two clients are flexible; the external IP addresses of the routers are not relevant.

The role distribution when establishing the VPN tunnel is defined as follows:

Component	VPN role
Mobile end device	Initiator (VPN client 2); starts the VPN connection
SCALANCE SC	Initiator (VPN client 1); starts the VPN connection
SINEMA Remote Connect Server	Responder (VPN server); waits for the VPN connections

Note

In place of the SCALANCE SC-600 industrial security appliance, you can also use a SCALANCE S615 or a SCALANCE M industrial router.

SINEMA Remote Connect

SINEMA Remote Connect is a server application and offers integrated connection management of distributed networks via the Internet. This also includes secure remote access to subordinate

networks for maintenance, control and diagnostic purposes. SINEMA Remote Connect comprises the following components:

- SINEMA Remote Connect server
- Users (such as service employees) with the "SINEMA RC-client" software or an OpenVPN connection
- Devices that support a connection to the SINEMA Remote Connect server (e.g. SCALANCE SC-600)

The connection setup for secure remote access is very simple.
The service technician and the machine undergoing maintenance separately establish an OpenVPN connection to the SINEMA Remote Connect server. There, the identity of the participants is determined by certificate exchange. Only then is the remote access to the machine available. The administration of all licenses and the software for the connected clients is done centrally.

The connection to SINEMA Remote Connect can be established using cellular phone networks, DSL, or existing private network infrastructure.

The SINEMA Remote Connect server is configured using Web Based Management (WBM).

SCALANCE security appliance

The industrial security appliances and industrial routers support the industrial security concept of "defense in depth". They secure automation networks and seamlessly connect to the security structures of the office and IT world.

The security components protect devices and networks in discrete manufacturing and the process industry and help to set up a flexible security zone concept.

The functions they provide include the following:

- High-quality stateful inspection firewall with filtering of IP-based data traffic
- Global and dynamic firewall rules
- Management of multiple IPsec VPN connections simultaneously
- NAT/NAPT for communication with serial machines with identical IP addresses
- Secure remote access via SINEMA Remote Connect with autoconfiguration interface
- Digital input for local activation of secure remote access
- Redundant power supply
- Simple device replacement with C-PLUG removable storage device for automatic backup of configuration data

Advantages of the solution

This solution has the following advantages:

- User administration and connection management via a central server application
- Secure and easy access to facilities from anywhere in the world
- Simple configuration of the SCALANCE SC-600 security appliance thanks to an autoconfiguration interface
- Controlled and encrypted data exchange between users, far-flung facilities and machinery
- Verification of end devices using a CA certificate or fingerprint
- Low investment and operating costs for operator control and monitoring of remotely connected substations
- High security for machines and systems by implementing the cell security concept
- Easy integration into existing networks and protection of devices without their own security functions

1.3 Components used

Software packages

This solution is based on a SINEMA Remote Connect appliance. It requires SINEMA Remote Connect Server for the software.

Install this software on a PC without an operating system. Note the installation requirements. You must enter the IP address of the server during the installation. Use the IP address from Table 2-1 for this.

The tablet requires the "OpenVPN Connect" app. Download this free app from the Play Store and install it on your tablet.

CAUTION	**The SINEMA Remote Connect Server installation contains its own operating system. If you use a PC that already has an operating system installed, the hard disk will be formatted and all stored data will be lost.**

Required devices/components:

Use the following components for the setup:

Table 1-1

Hardware component	Locus of use	Note
PC with the "SINEMA Remote Connect Server" software	VPN server	SINEMA Remote Connect Server firmware ≤V3.0. In this example: Firmware V3.0
DSL access and a DSL router	VPN server	Static WAN IP address required
SCALANCE SC-600 security appliance with current firmware	VPN client 1	In this example: SCALANCE SC646-2C with firmware V2.3
DSL access and a DSL router	VPN client 1	Dynamic WAN IP address
24 V power supply with cable connector and terminal block plug	VPN client 1	For the SCALANCE SC
Tablet with the "Android" operating system and the "OpenVPN Connect" app	VPN client 2	In this example: • Android version 15.5 • "OpenVPN Connect" app version 3.2.3
DSL access and a DSL router with WLAN functionality	VPN client 2	Dynamic WAN IP address
A configuration PC with a web browser and a text editor, for example Notepad++	All	
Required network cables, TP cables (twisted pair) complying with the IE FC RJ45 standard for Industrial Ethernet	All	

Note

You can also use a different internet access method (e.g. UMTS) and, rather than a SCALANCE SC-600, a SCALANCE M-800 or a SCALANCE S615 (each including "SINEMA RC" KEY-Plug) with the latest firmware.
The configuration described below refers explicitly to the components mentioned in the section "Required devices/components".

2 Engineering

2.1 Setting up the environment

2.1.1 IP address overview

The assignment of the IP addresses is defined as follows:

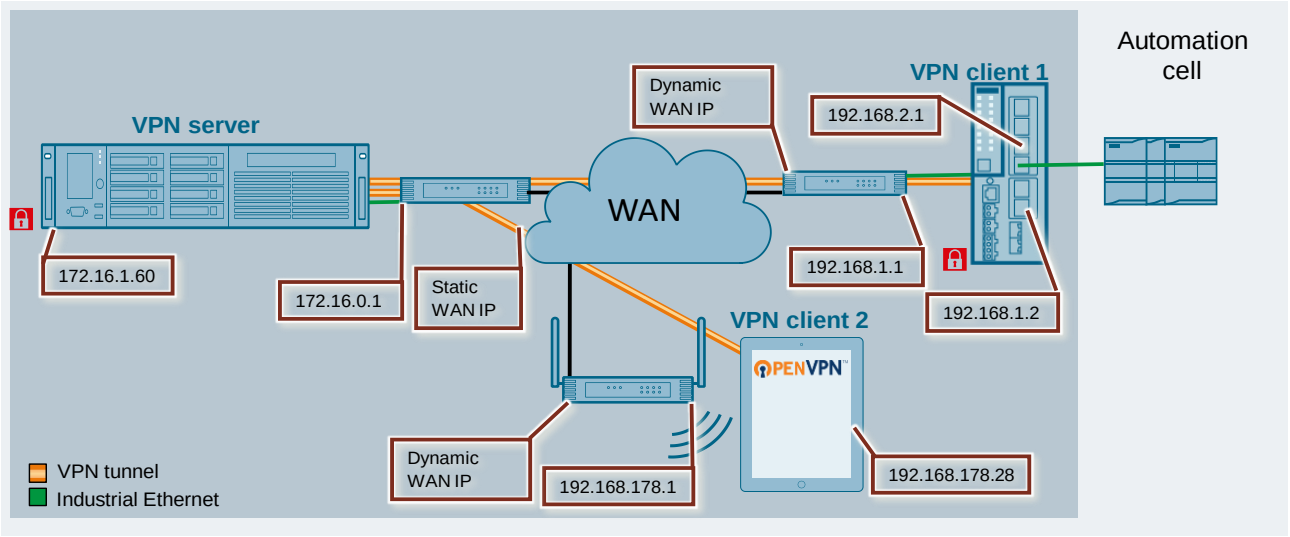


Table 2-1

Component	Port	IP address	Router	Subnet mask
SINEMA Remote Connect server (VPN server)	LAN port	172.16.1.60	172.16.0.1	255.255.0.0
Router on the SINEMA Remote Connect server	LAN port	172.16.0.1	-	255.255.0.0
	WAN port	Static IP address of the provider	-	Assigned by the provider
SCALANCE SC646-2C (VPN client 1)	Zone EXT; vlan2 LAN port: P5 or P6	192.168.1.2	192.168.1.1	255.255.255.0
	Zone INT; vlan1 LAN port: P1 to P4	192.168.2.1	-	255.255.255.0
Router on the SCALANCE SC	WAN port	Dynamic IP address of the provider	-	Assigned by the provider
	LAN port	192.168.1.1	-	255.255.255.0
Tablet (VPN client 2)	WLAN	192.168.178.26	192.168.178.1	255.255.255.0
WLAN router on the tablet	WAN port	Dynamic IP address of the provider	-	Assigned by the provider
	LAN port	192.168.178.1	-	255.255.255.0
Configuration PC (not included in the graphic)	LAN port	172.16.1.100 192.168.2.100	-	255.255.0.0 255.255.255.0

Note

In every device that is located in the internal network of the SCALANCE device, you must enter the internal IP address of the SCALANCE device (Zone INT; vlan1; LAN port: P1 to P4) as the default router.

2.1.2 Composition of the infrastructure

Connect all participating components of this solution.

Table 2-2

Component	Local port	Partners	Partner port
SINEMA Remote Connect Server	LAN port	Router on the VPN server	LAN port
Tablet	WLAN interface	Router on the tablet	WLAN interface
SCALANCE SC646-2C	Zone EXT; vlan2 LAN port: P5 or P6	Router on the SCALANCE	LAN port
	Zone INT; vlan1 LAN port: P1 to P4	Automation cell	

2.2 Preparing the devices

2.2.1 Router

VPN

If VPN connections have been configured on your router and activated, terminate them.

LAN port

On the LAN port, use a static IP address in accordance with Table 2-1.

WLAN router on the tablet

Set up the WLAN (Wi-Fi) on the WLAN router.

Static IP address on the SINEMA Remote Connect server's router

The SCALANCE device (VPN client 1) and the tablet (VPN client 2) gain WAN access to the SINEMA Remote Connect server (VPN server) via a fixed public IP address. You must apply for it with the provider and then enter it in the DSL router.

Port forwarding on the SINEMA Remote Connect server's router

In order for the tunnel packages to pass freely between the tablet, SCALANCE device and the SINEMA Remote Connect server, make sure that port forwarding for "OpenVPN" and "https" is enabled with TCP and UDP, and that the packets can be routed to the SINEMA Remote Connect server. Port forwarding pertains to the following port numbers:

Table 2-3

Protocol	Port number
TCP	443
UDP	1194
TCP	5443
TCP	6220

Note

You can modify the port numbers in SINEMA Remote Connect Server. The port numbers above are only correct if you leave the preset values.
OpenVPN uses exclusively either UDP or TCP.
UDP should be preferred (wherever possible)since it is faster and exhibits better performance.

See also the FAQ "Settings of the ports for secure VPN connections with SINEMA Remote Connect" (see \3\ in chapter 4.3).

2.2.2 SINEMA Remote Connect Server

The SINEMA Remote Connect server is configured using Web Based Management (WBM).

Preparation

The SINEMA Remote Connect server is set up via WBM on the configuration PC. To access the WBM, the following requirements must be met:

- You will need an Ethernet connection between the configuration PC and the SINEMA Remote Connect server.
- The configuration PC has an IP address in the network of the SINEMA Remote Connect server, for example 172.16.1.100/16.

Open the WBM

Proceed as follows to open the WBM:

1. Use the configuration PC to connect to the web interface of the SINEMA Remote Connect server. The IP address was set during installation.
2. Open the WBM, for example with the address "https://172.16.1.60".

Note

If you use a different port as the default HTTPS port 443, then enter the port number together with the IP address. You must enter the colon ":" separator between the IP address and the port number, for example: "https://172.16.1.60:6443".

The port for access to the web server can be set in the "System > Network > Web Server Settings" tab.

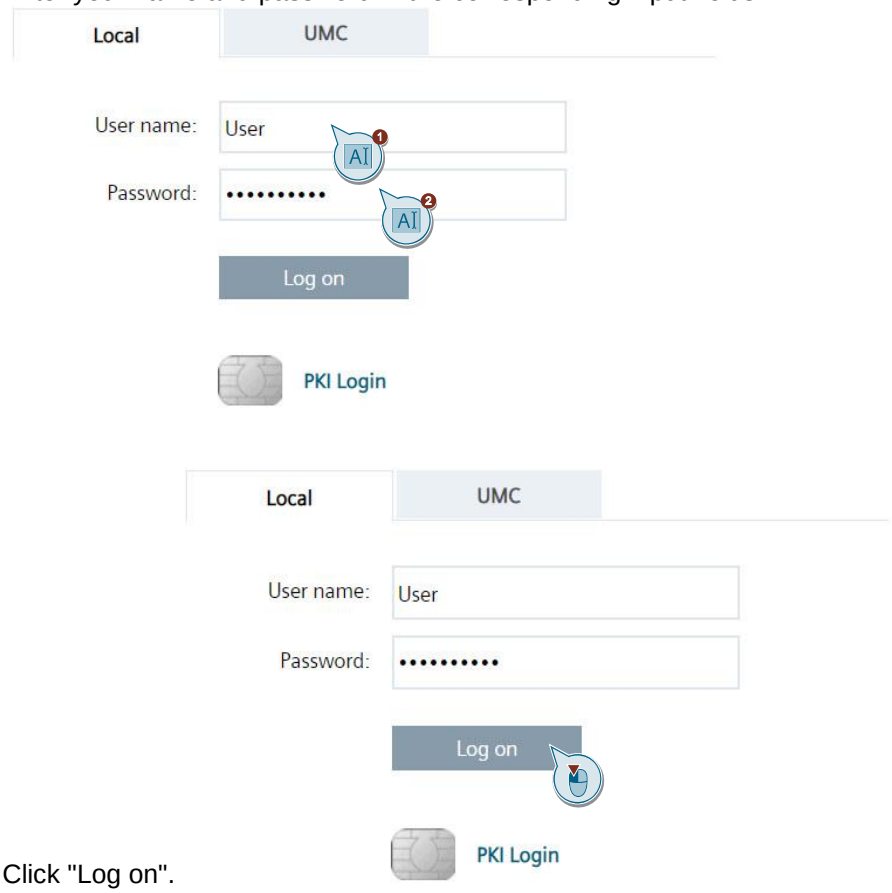
Sign in to the WBM (without a prior fresh installation)

Note

To sign in to the SINEMA Remote Connect server after a fresh install, see the section "Sign in after a fresh installation".

Proceed as follows to log in to the WBM:

1. Enter your name and password in the corresponding input fields.



2. Click "Log on".

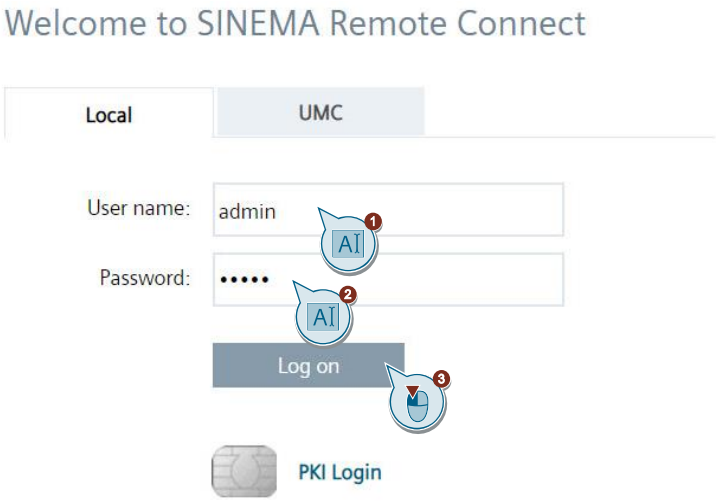
Result

The start page appears.

Sign in after a fresh installation

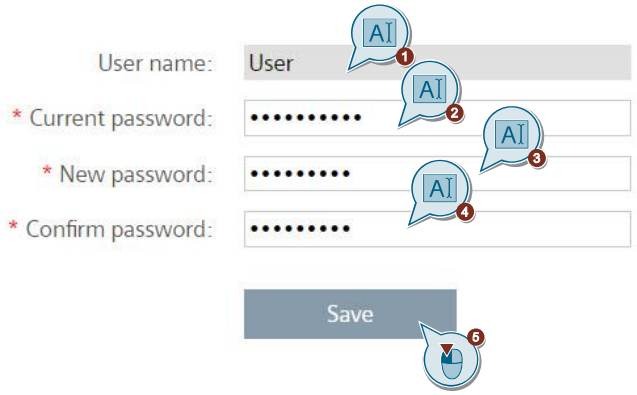
Proceed as follows to log in to the WBM after a fresh installation:

1. After the fresh installation, enter "admin" as the username and password, then click "Log on".



The WBM "Change Password" page will open.

2. Set the user name and the password for the administrator. This newly created user will automatically be assigned the role of "Administrator".
Click the "Save" button.



Result

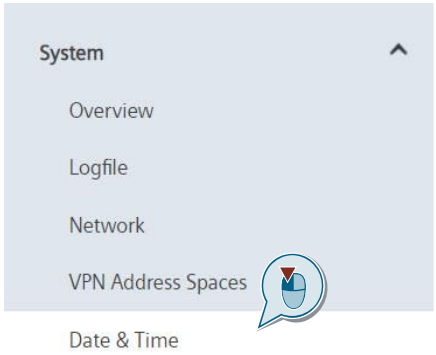
After saving, you will be automatically logged on with the newly created administrator. The "admin" user is no longer available. The start page appears. From now on, log on with the new username and password.

Set the time

To establish secure communication, it is essential that the current time and date are always set on the SINEMA Remote Connect server. Otherwise the certificates used will be interpreted as invalid and secure VPN communication is not possible.

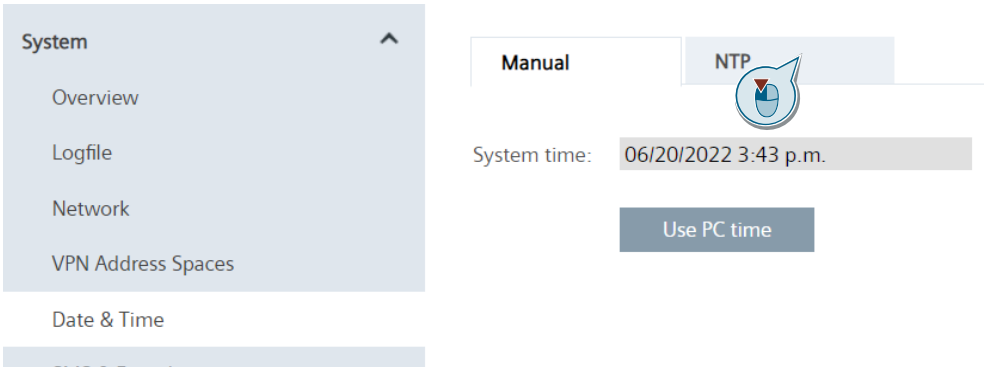
To synchronize the time automatically using the NTP protocol, proceed as follows:

1. In the navigation bar, navigate to "System > Date & Time".

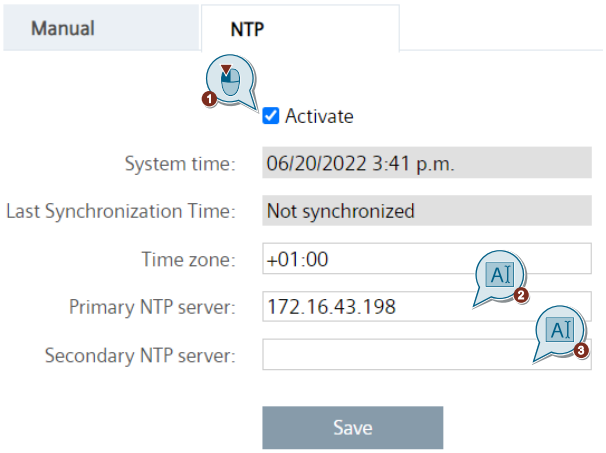


The time setting window will open and you will be in the "Manual" tab.

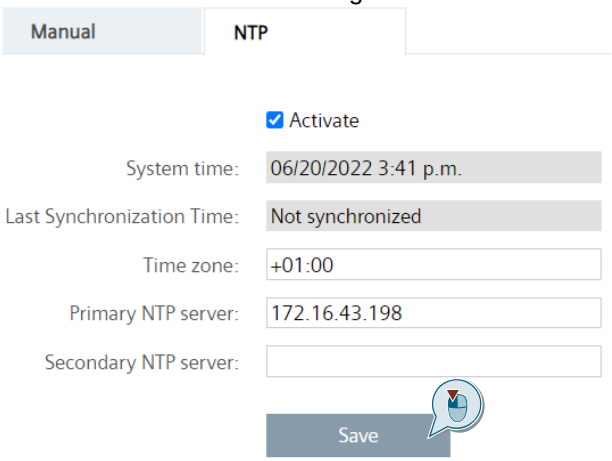
2. To automatically synchronize the system time with an NTP time server, switch to the "NTP" tab.



3. Tick the "Activate" box.
Enter the IP address or the hostname of the primary NTP server.
Optionally enter the IP address or the hostname of the secondary NTP server.



4. Click "Save" to save the settings.



Result
The time is now set. The date and time appear in the "System time" field.

Configure the WAN interface

To access the SINEMA Remote Connect server from the internet, you will need a WAN address. This could be the WAN IPv4 address of a DSL router that the SINEMA RC server uses to connect to the internet.

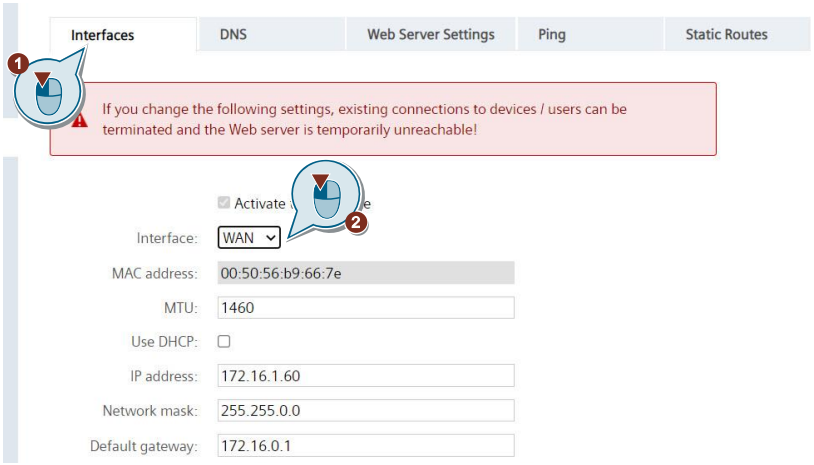
Note

If the SINEMA Remote Connect server only needs to be reachable in the local network, then you do not need to configure the WAN interface.

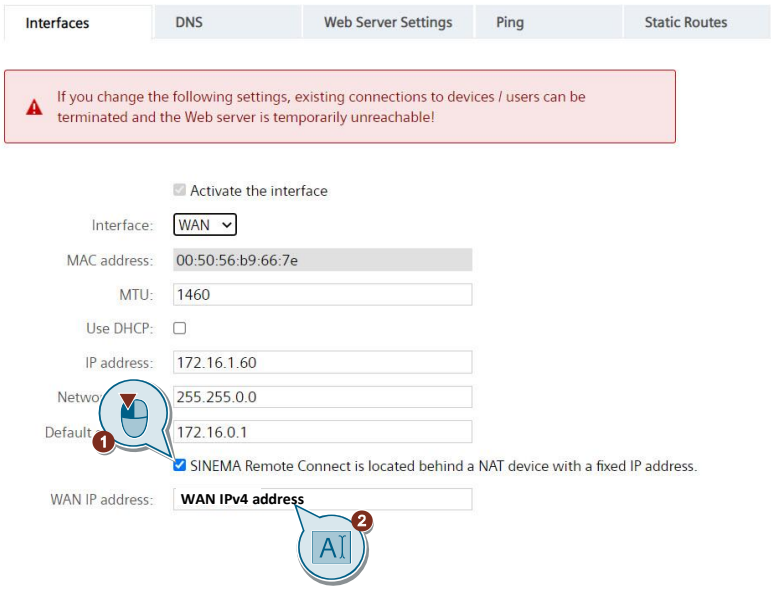
Proceed as follows to modify the WAN IPv4 address:

1. Click on "System > Network" in the navigation area.

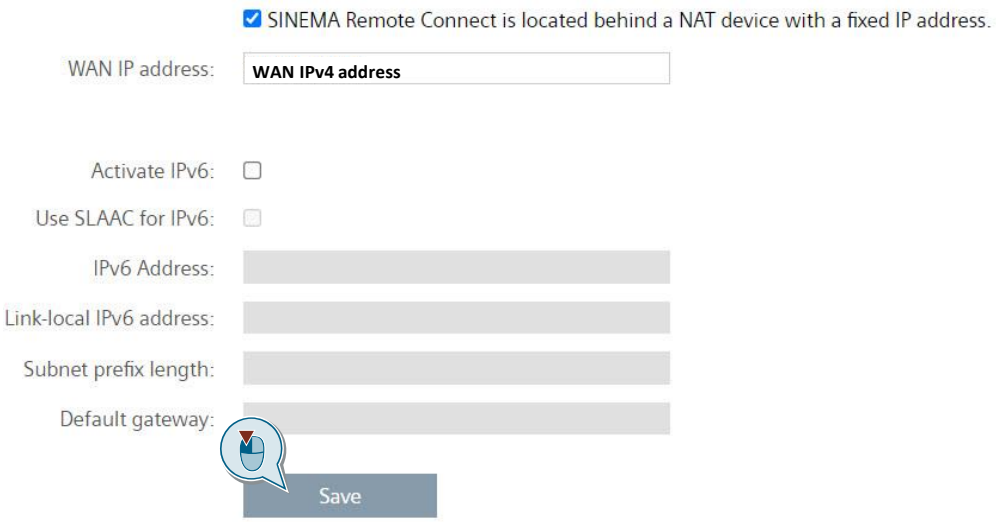
2. Open the "Interfaces" tab. In the "Interface" dropdown list, select "WAN".



3. To enter the required external WAN IPv4 address for the router, tick the checkbox for "SINEMA RC is located behind a NAT device with a fixed IP address.".
   Enter the WAN IPv4 address of the router in the "WAN IP address" field.



4. Save the settings with "Save".



Note

To access the SINEMA Remote Connect server from the internet, you also have the following options besides a WAN IPv4 address:

- IPv6 address
- Hostname

2.2.3 SCALANCE SC-600 security appliance

Factory setting

To ensure that there are no old configurations or certificates stored in the SCALANCE device, reset the appliance to its factory settings.

You will find instructions in the module manual (see chapter 4.3).

Preparation

The SCALANCE device is set up using the configuration PC and the WBM. To access the WBM, the following requirements must be met:

- You will need an Ethernet connection between the configuration PC and the SCALANCE device (Zone INT; LAN port: P1 to P4).
- The configuration PC has an IP address in the network of the SCALANCE device, for example 192.168.2.100/24.

Assign the IP address

To open the WBM or to download the configuration to the module via TIA Portal, the SCALANCE device needs an IP address. The initial assignment of an IP address for the device cannot be done with the WBM because this configuration tool itself requires an IP address. You have the following options for assigning the associated IP address to the unconfigured device (see Table 2-1):

- SINEC PNI

  To assign the device an IP address with SINEC PNI, the device must be available over Ethernet. You can download SINEC PNI for free from the Siemens Industry Online Support pages (see chapter 4.3).
- Command Line Interface (CLI)
- TIA Portal and the "Accessible Devices…" function

Assign the SCALANCE device the associated IP address for the internal network.

Open the WBM

Proceed as follows to open the WBM of the SCALANCE device:

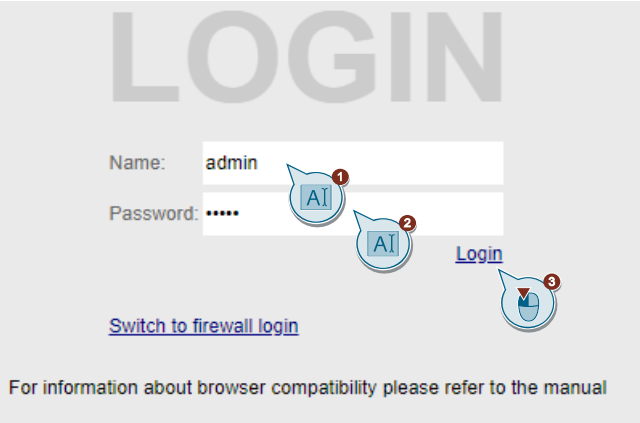
1. In the address bar of the internet browser, enter the internal IP address of the SCALANCE device (see Table 2-1) ("https://192.168.2.1").
   A message about the security certificate will appear.

2. Acknowledge this message and continue loading the page.
   The WBM login page appears.

3. If you are signing in for the first time or after a "Restore Factory Defaults and Restart", the login credentials are set as follows:
   - "Name" field: "admin"
   - "Password" field: "admin"

   Enter the name and the password in the corresponding fields.

   Click the "Login" button or confirm with the Enter key.



4. If you are signing in for the first time or after a "Restore Factory Defaults and Restart", you will be prompted to change the password.
   Enter the current password in the "Current User Password" field.
   The new password must meet the following password requirements:
   - Password length: a minimum of 8 characters, a maximum of 128 characters
   - At least 1 uppercase letter
   - At least 1 special character (special characters § and ß are not allowed)
   - At least 1 number

   Set the new password in the "New Password" field. Repeat your password to confirm. Both passwords must match.

   Click the "Set Values" button to finish the process.

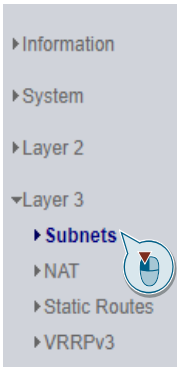
Result
The homepage of the WBM appears.

Set the IP address

At the start of the chapter, you already assigned the SCALANCE device an internal IP address (Zone: INT; vlan1).

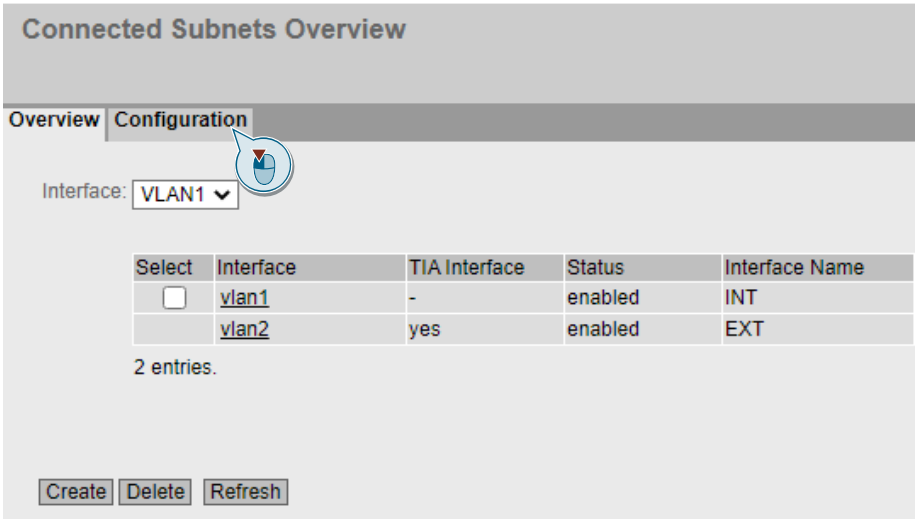
To set up the external IP address (Zone: EXT; vlan2) in the SCALANCE device, proceed as follows:

1. Open the menu "Layer 3 > Subnets".



The "Connected Subnets Overview" window will open and you will be in the "Overview" tab. This page shows you the subnets for the selected interface.

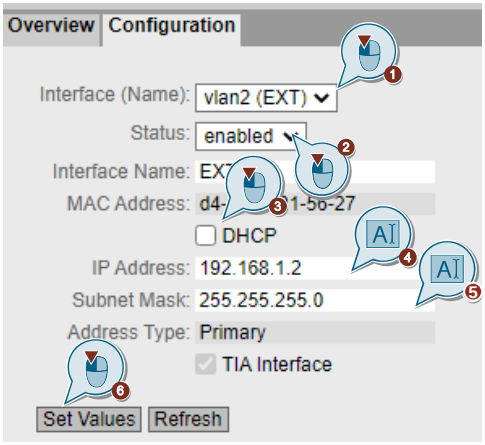
2. Switch to the "Configuration" tab.



The "Configuration" tab opens. Configure the subnet for the interface on this page.

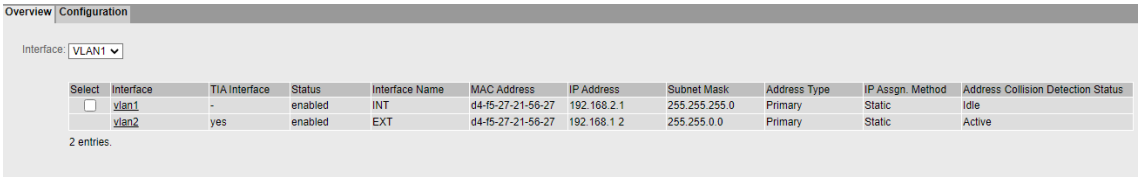
3. Make the following settings:
   - Set the interface to "vlan2 (EXT)".
   - Check whether the status is "enabled".
   - Disable DHCP.
   - For "vlan2 (EXT)", enter the IP address and subnet mask for the external network (Zone: EXT; vlan2; P5 or P6) (see Table 2-1).

   To confirm your changes, click on the "Set Values" button.



Result

The SCALANCE device has an IP address for all VLANs.
You will be automatically taken back to the "Overview" tab. Here you will see an overview of the IP addresses.

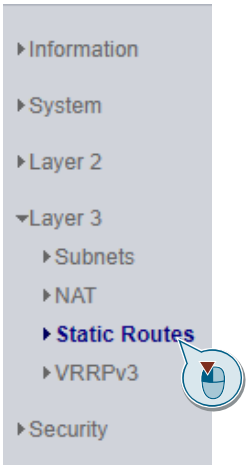


Define default router

A static route lets you specify the routes through which data can be exchanged between the various subnets.

To store a static route in the SCALANCE device, proceed as follows:

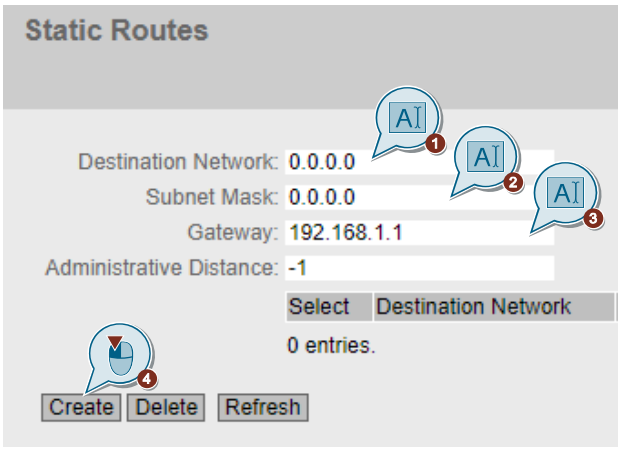
1. Open the menu "Layer 3 > Static Routes".



The "Static Routes" page opens.
Here you can specify the routes through which data can be exchanged between the various subnets.

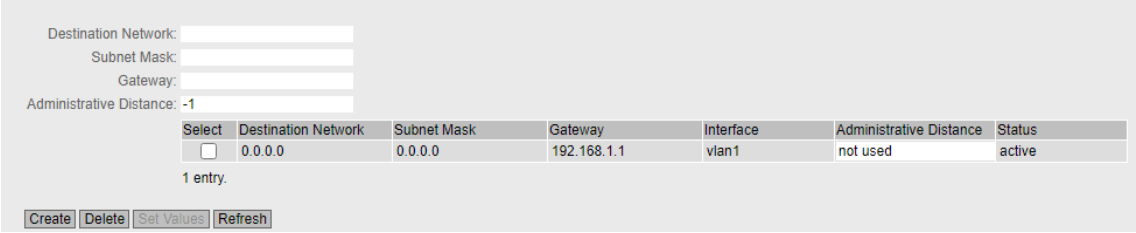
2. To reach all subnets, enter the following values:
   - In the field "Destination network" and in the field "Subnet mask", enter: the network address "0.0.0.0"
   - In the "Gateway" field, enter: the corresponding router (see Table 2-1)

   Click the "Create" button.



Result

The static route for the module has been set up. A new entry is created in the table.



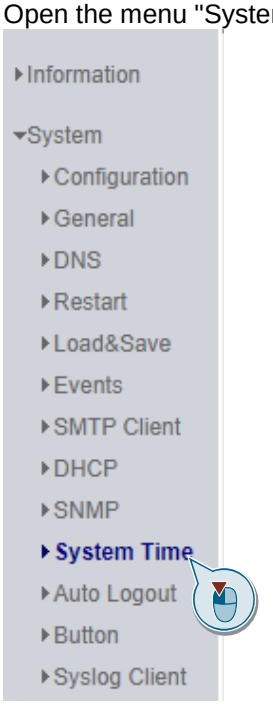
Define time synchronization

In this application example, the VPN connection is secured by the CA certificate of the SINEMA Remote Connect server. If you work with certificates, it is essential that the correct time be entered in the VPN partners. If the time in the device is incorrect, then the certificates will be considered invalid and discarded.

Use a time synchronization protocol such as NTP to set the system time of the device.

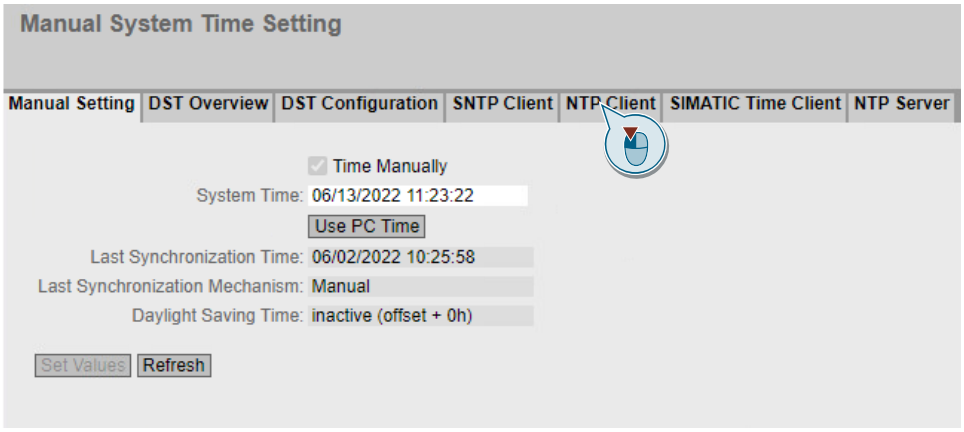
To set up time synchronization with NTP, proceed as follows:

1. Open the menu "System > System time".



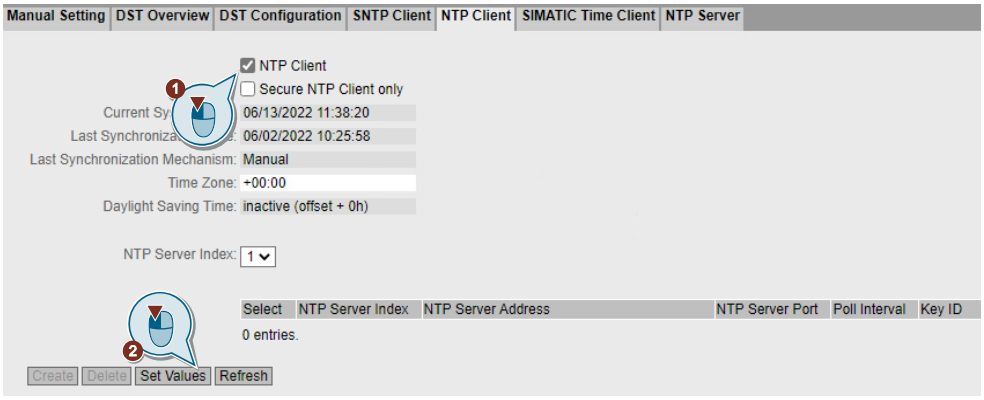
The "Manual System Time Setting" window will open and you will be in the "Manual Setting" tab.

2. Select the "NTP Client" tab.

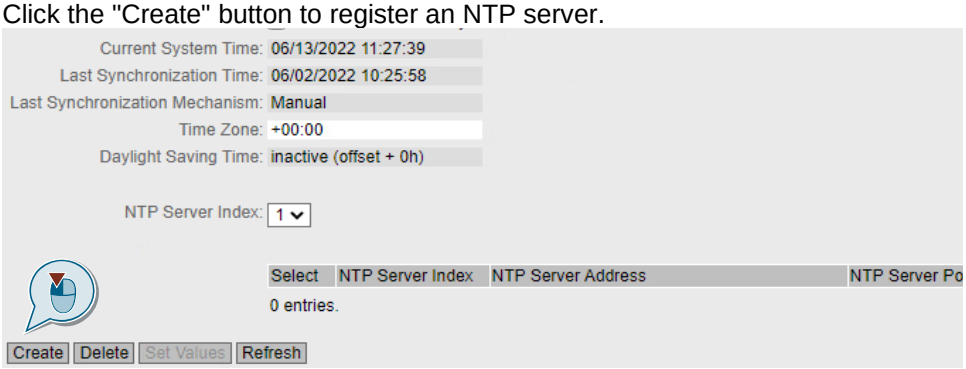


The "NTP Client" tab opens.

3. Tick the "NTP Client" box and click the "Set Values" button.



4. Click the "Create" button to register an NTP server.

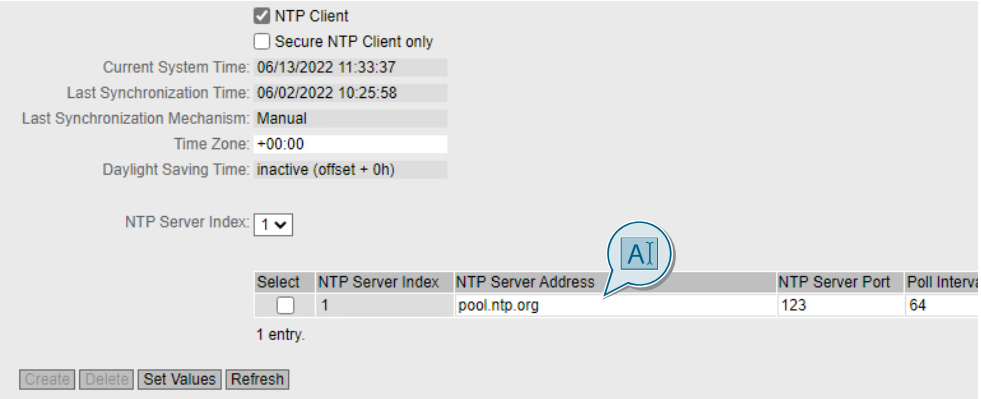


A new table row is added.

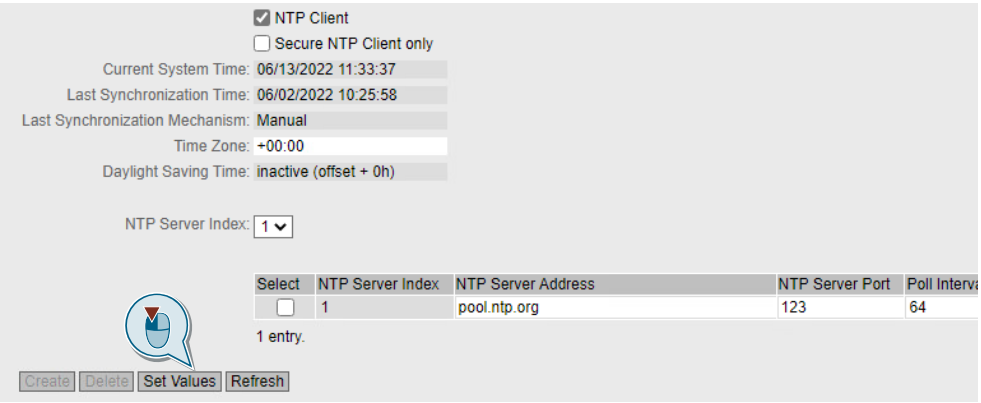
5. In the "NTP Server Address" column, enter the address of the NTP server, for example "pool.ntp.org".

Note

The "pool.ntp.org" project is a network of time servers that provide simple, reliable time synchronization over NTP.



6. To confirm your change, click on the "Set Values" button.



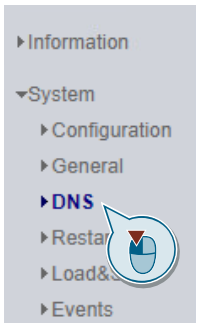
Result

The time synchronization protocol has been set up.

Enter DNS

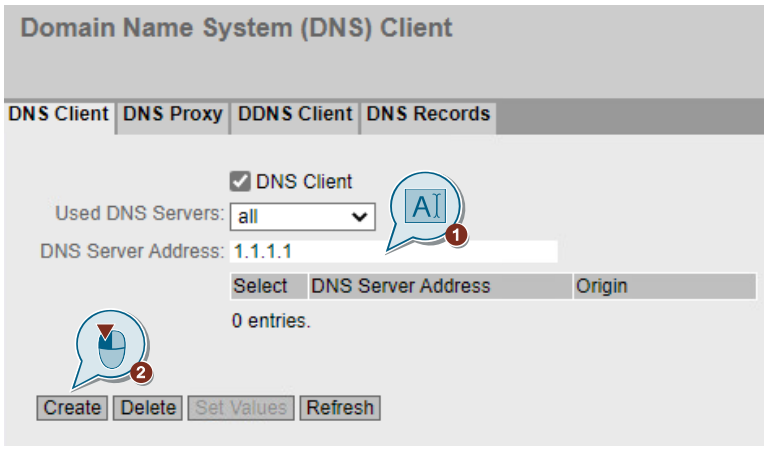
The SCALANCE device requires a DNS server address to resolve the name of the NTP server. Follow these steps:

1. Open the menu "System > DNS".

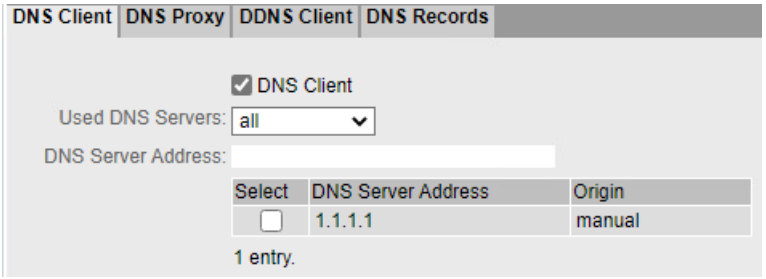


The "Domain Name System (DNS) Client" window opens and you will be in the "DNS Client" tab.

2. Enter the IP address "1.1.1.1" in the "DNS Server Address" column.
Click the "Create" button.

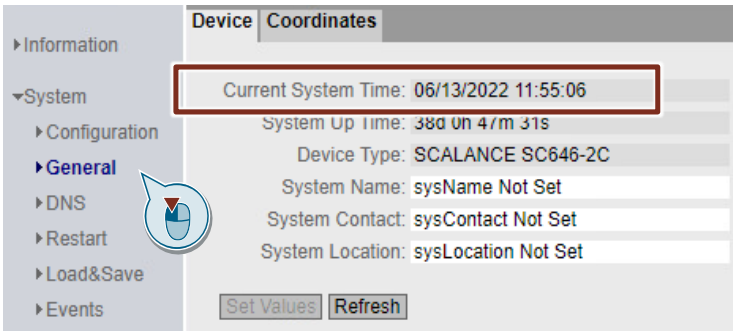


Result
The DNS server in the SCALANCE device has been set up.



Check the clock time

You can check the current system time in the SCALANCE device in the menu "System > General" in the "Device" tab.



2.2.4 Tablet

Time

To check the time validity of certificates, it is important that the tablet always has the current date and time.

Check the time on your tablet and adjust it if necessary.

VPN

If other VPN connections have been configured on your tablet and activated, terminate them.

WLAN

Set up Wi-Fi on your tablet in accordance with your router configuration. Use a static IP address in accordance with Table 2-1.

2.3 Setting up remote access on the SINEMA Remote Connect server

Overview

In order for the service employee to access the automation cell on his tablet through the SINEMA Remote Connect server, the end devices (the tablet and the SCALANCE device) must sign in to the server. The respective VPN tunnel between the end device and the SINEMA Remote Connect Server is only established after successful authentication.

Depending on the configured communication relationships and the security settings, SINEMA Remote Connect Server interconnects the individual VPN tunnels and thus enables access.

The following configuration steps are necessary for this:

- Define participant groups
- Set up remote connection for the SCALANCE device
  - Implement SCALANCE as device
  - Ascertain device ID and export CA certificate
- Set up remote connection for the service employee
  - Create user account
  - Export user configuration

Preparation

In order to access the WBM, check the following requirements:

- You will need an Ethernet connection between the configuration PC and the SINEMA Remote Connect server.
- The configuration PC has an IP address in the network of the SINEMA Remote Connect server, for example 172.16.1.100/16.

Open the WBM

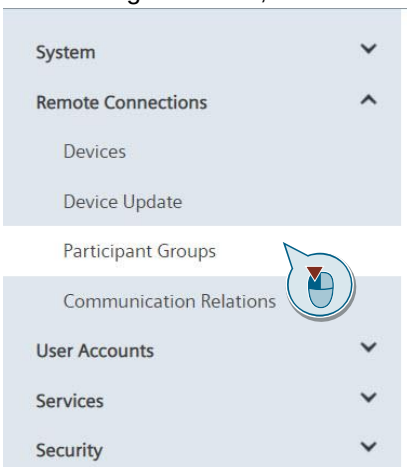
On the configuration PC, open the WBM of the SINEMA Remote Connect server ("https://172.16.1.60") and log on as an administrator.

2.3.1 Configure new group membership

Users, devices, end devices and subnets can be grouped together in participant groups. You will define whether communication between the participants in an individual group is allowed or forbidden.

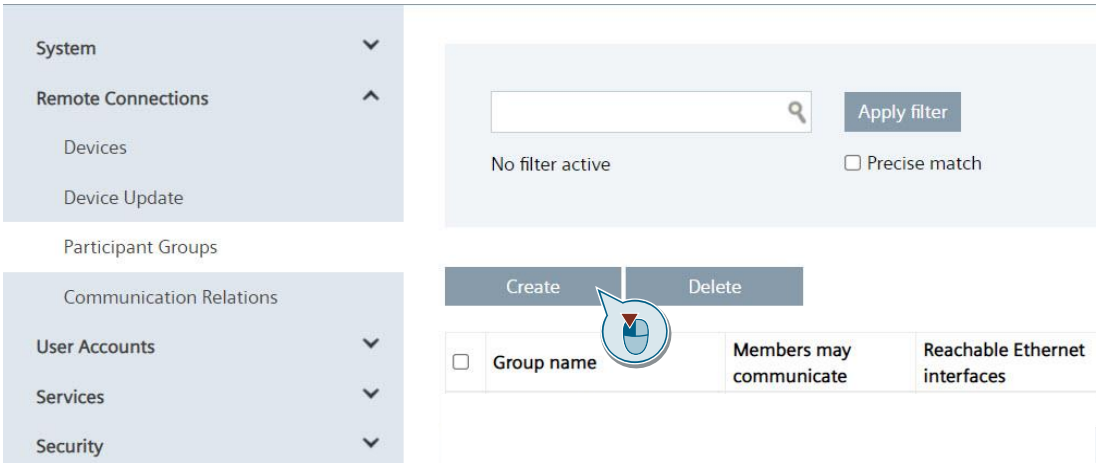
To create a new participant group, proceed as follows:

1. In the navigation area, click on "Remote Connections > Participant Groups".



A new window opens. A list of already existing participant groups will appear.

2. Click the "Create" button.

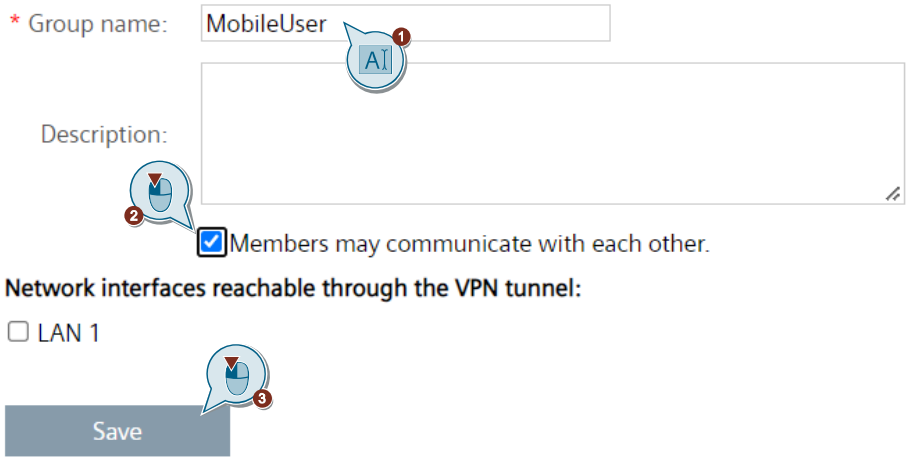


The dialog for creating a new participant group appears.

3. Create a new participant group.
   - Enter a group name and an optional description.
   - Tick the "Members may communicate with each others" checkbox to allow the group members to communicate with each other.
   - Click the "Save" button.

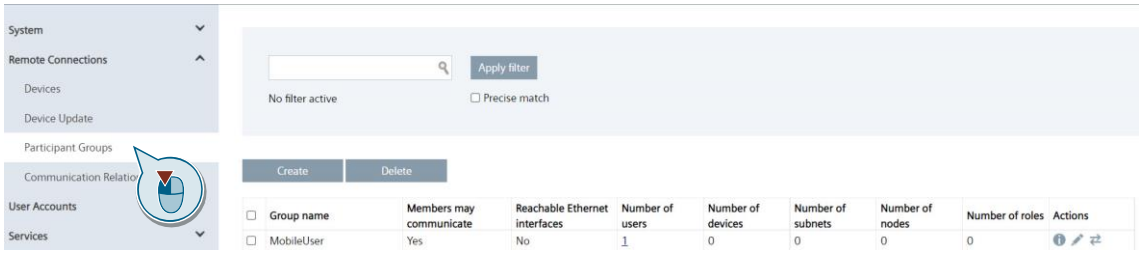
Note

The "Members may communicate with each others" setting not only allows all devices, but also all users to communicate with each other. If you do not want this, you must create multiple participant groups and define the communication relationships.



Result

The participant group has been created. You will be automatically taken back to the overview page. The participant group appears as a new entry in the list.



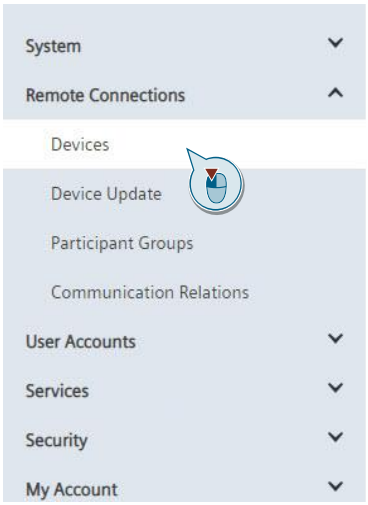
2.3.2 Create a remote connection for the SCALANCE SC-600 security appliance

Create a device

In order for the SCALANCE device to initiate a VPN connection to the SINEMA Remote Connect server, it is declared as a device to the SINEMA Remote Connect server.

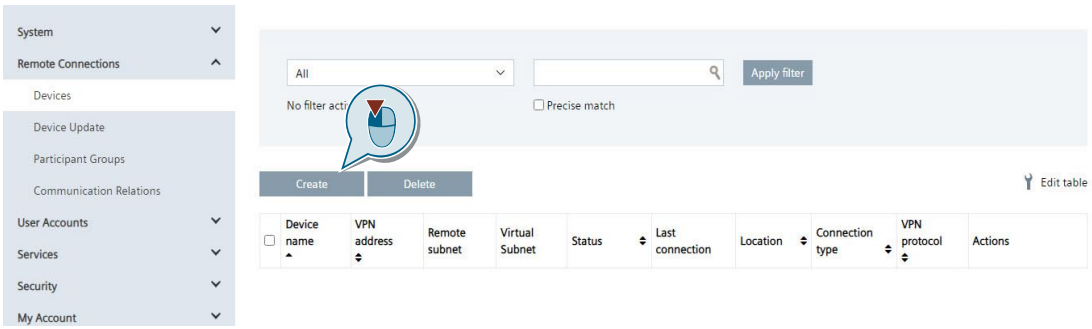
Proceed as follows to manage the devices:

1. Click on "Remote Connections > Devices" in the navigation area.



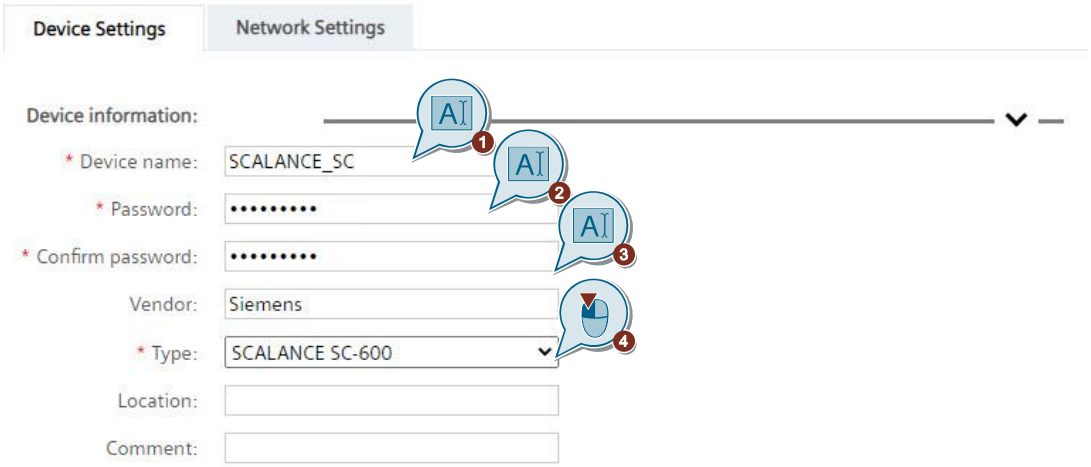
The device overview opens. This page shows a table listing the existing device records. The most important information for each device appears in various columns.

2. Click the "Create" button to create a new device.



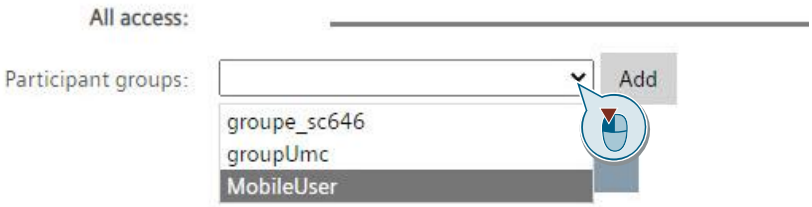
A new window will open and you will be in the "Device Settings" tab. The device settings comprise three sections.

3. In the first section, "Device information", configure the general device information:
   - Give the device a name.
   - Assign a password and confirm it.
   - Select the end device type from the list (here: "SCALANCE SC-600")



4. Leave the settings in the second section, "VPN settings", at the default values.

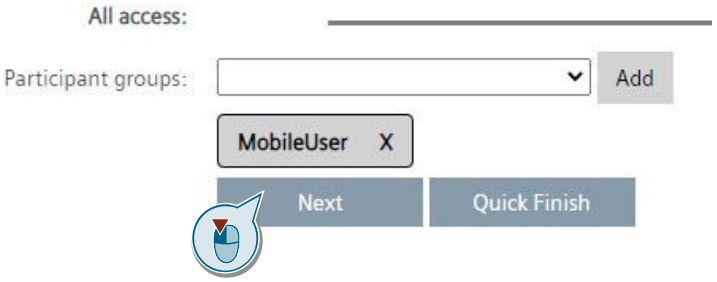
5. In the third section, "All access", configure the participant group. Select the participant group "MobileUser" (created in chapter 2.3.1). The subnets and end devices reachable via this device automatically become members in this participant group.



6. Click the "Add" button.

The participant group will be added.
This completes the device settings.

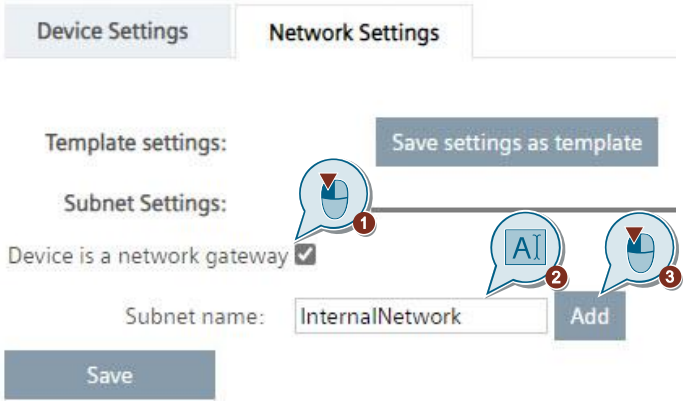
7. Click on "Next".



The "Network Settings" tab opens.

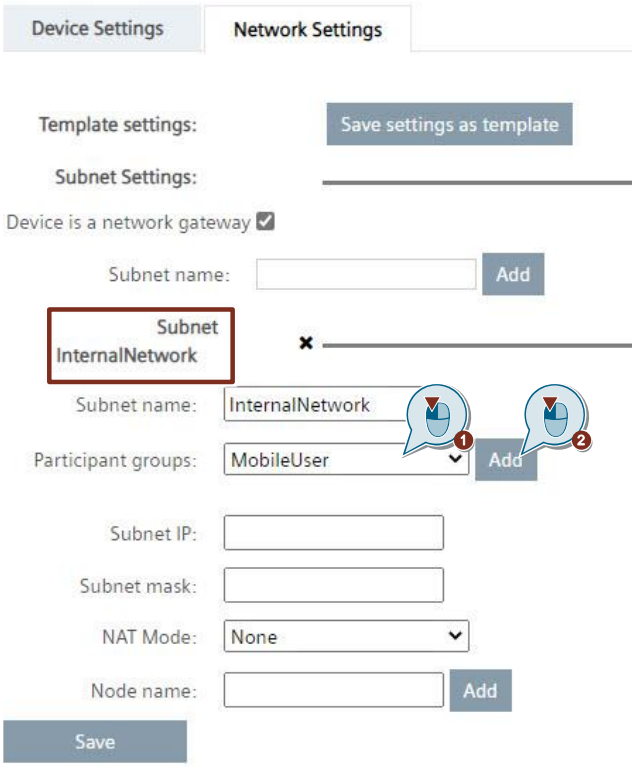
8. Since the SCALANCE device is a gateway, tick the checkbox for "Device is a network gateway".

   In the "Subnet name" field, enter a unique name for the subnet behind the SCALANCE device, then click "Add".



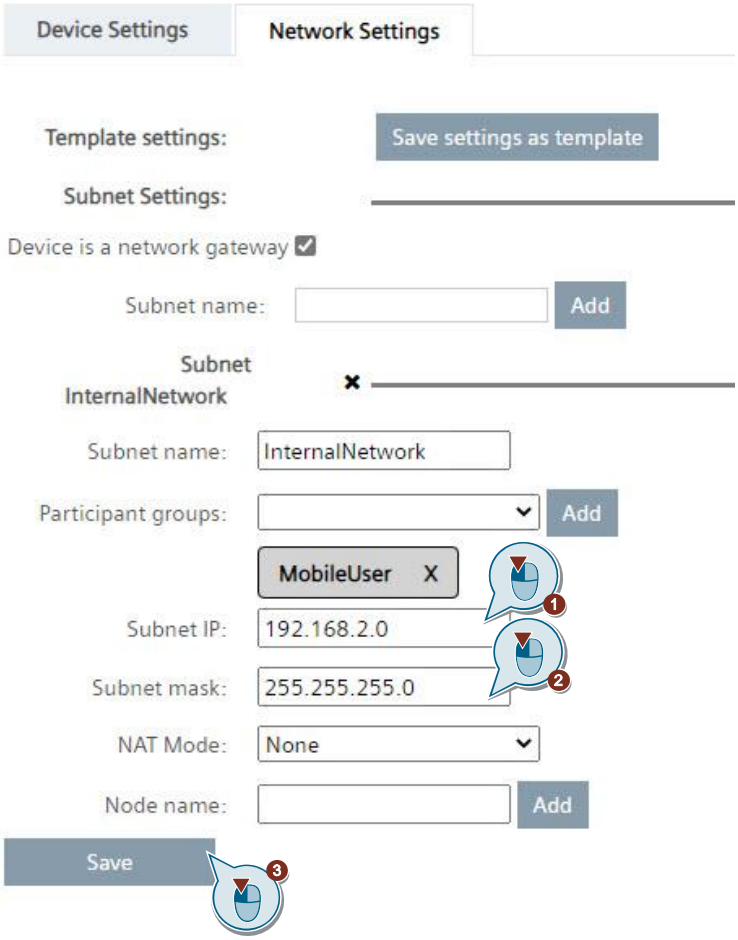
The area "Subnetname <InternalNetwork>" will be created.

9. You will configure the subnet in the steps below.
   Select the participant group you created in chapter 2.3.1. This participant group is allowed to access the subnet. Click the "Add" button.



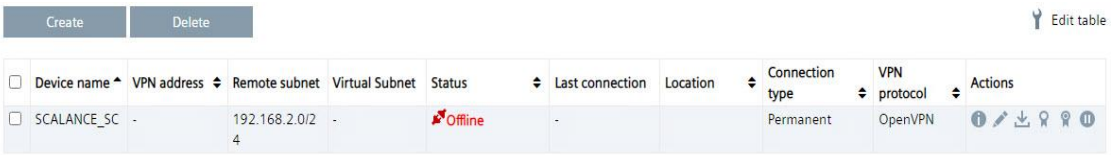
The participant group will be added.

10. Specify the IPv4 address of the internal subnet and the associated subnet mask reachable via the device (see Table 2-1).
    Save the settings with "Save".



Result

The device configuration is complete and the window will close. You will be taken back to the "Devices" tab in the "Remote Connections > Devices" menu.
The "SCALANCE_SC" device is created and appears as a new device in the list.



Ascertain device ID and load CA certificate

For each device in the device overview, the SINEMA Remote Connect server generates a unique device ID and a unique fingerprint. The device ID and the fingerprint can be found in the device information for the device.

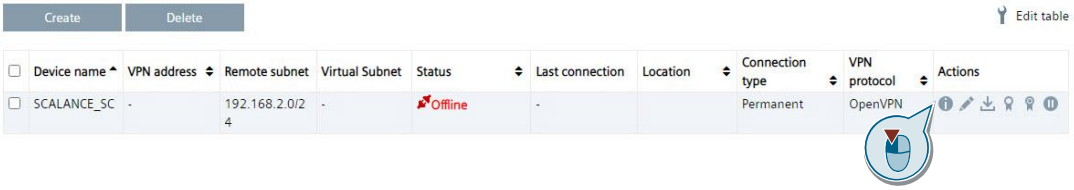
The device ID and fingerprint or CA certificate are information that the SCALANCE device uses to authenticate itself when connecting to the SINEMA Remote Connect Server. You will enter this information in the SCALANCE device when configuring the VPN connection.

Note

In place of the fingerprint, the device can also authenticate itself with the CA certificate of the SINEMA Remote Connect server. This is the method that this example uses.

Proceed as follows to open the device information:

1. Click the "i" icon in the "Actions" column.

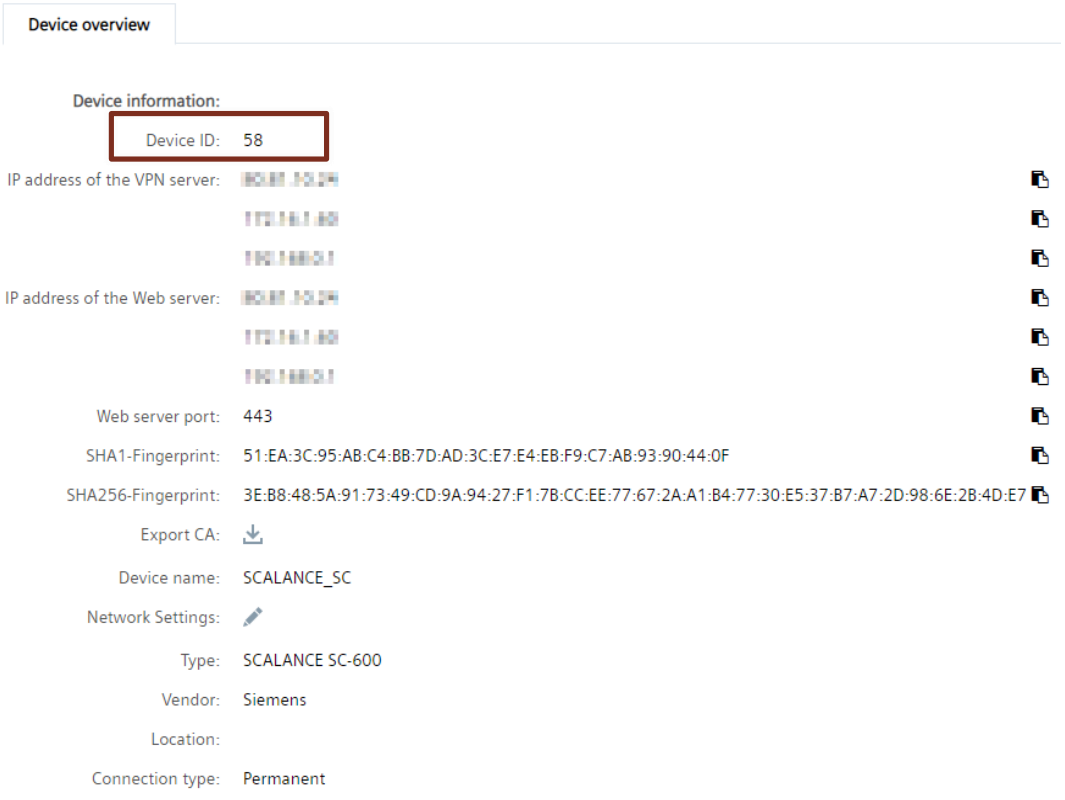


The "Device information" is displayed.

2. Make a note of the entry for "Device ID" or copy the entry and save the value in a text file in your local directory.

Note

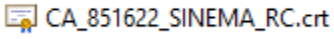
Your device ID can have a different value than the one shown here.



3. Click on the download icon in the "Export CA" row and place the CA certificate of the SINEMA Remote Connect server in a local directory of the configuration PC.

Result

You have found the device ID of the SCALANCE device and loaded the CA certificate. You will need the device ID and the CA certificate when configuring the VPN connection in the SCALANCE device (see chapter 2.4).



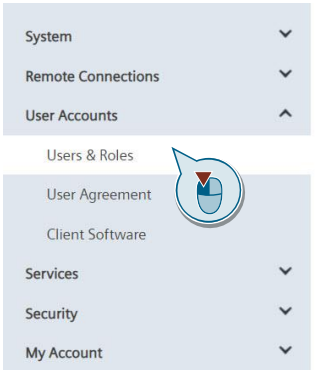
2.3.3 Create user account for the tablet

Define new user

In order to grant the service employee access to the SINEMA Remote Connect server with a tablet, set up a user account with a username and password.

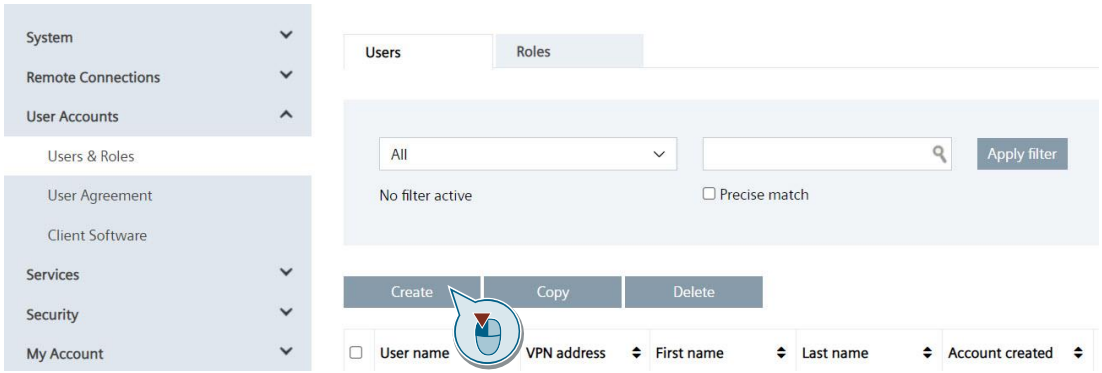
Follow these steps:

1. In the navigation area, click on "User Accounts > Users & Roles".



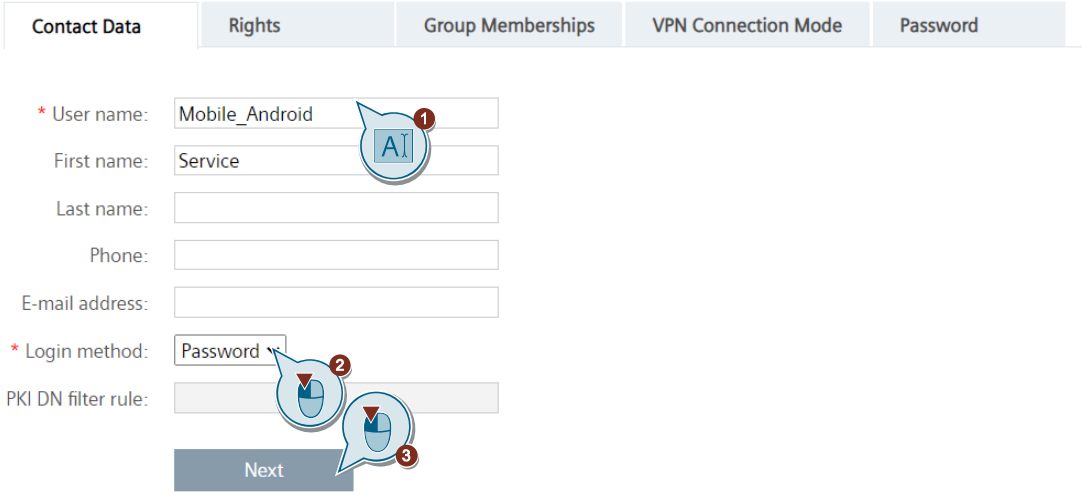
A new window opens and you will be in the "Users" tab. You will see a list of existing users and their status.

2. Click "Create".



A new window opens and you will be in the "Contact Data" tab.

3. Edit the contact data:
   - Enter the necessary information. The "User name" field is required. The other contact information is optional and can be entered or modified by the user himself.
   - For "Login method", select "Password".
   - Click on "Next".

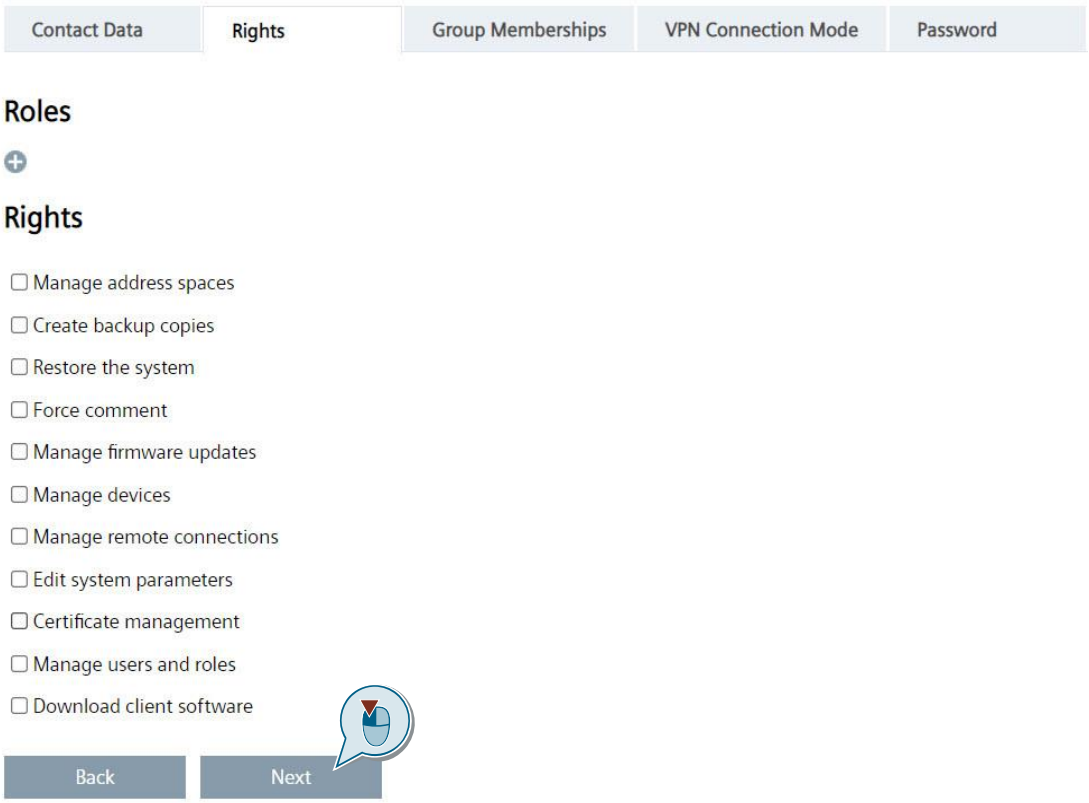


You are in the "Rights" tab.

4. You are able to give the user rights:
   - Assign rights by assigning a role:
     Click "+" and select the desired role from the dropdown menu. The user receives the rights that are assigned to the role. Tick the boxes to assign additional rights.
   - Assign rights without assigning a role:
     If you have not selected a role, activate the pertinent role by clicking on the checkbox.

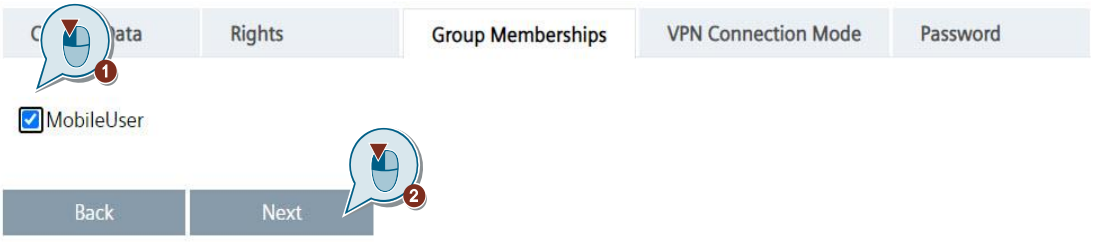
   The user is not assigned any additional rights in this example.

   Click on "Next".



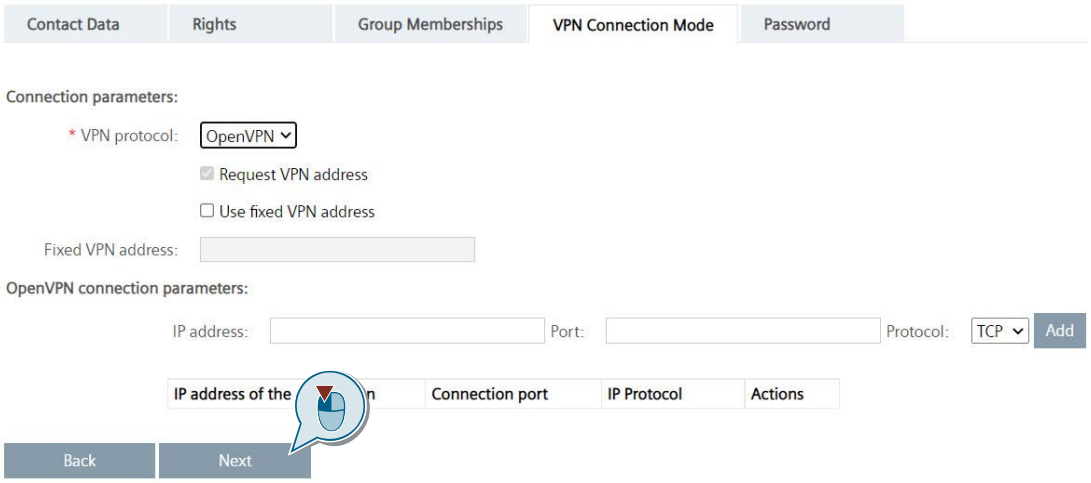
   The "Group Memberships" tab appears.

5. If you already created participant groups, you can assign the new user to one of them.
   Select the participant group "MobileUser" (see chapter 2.3.1).
   Click on "Next".



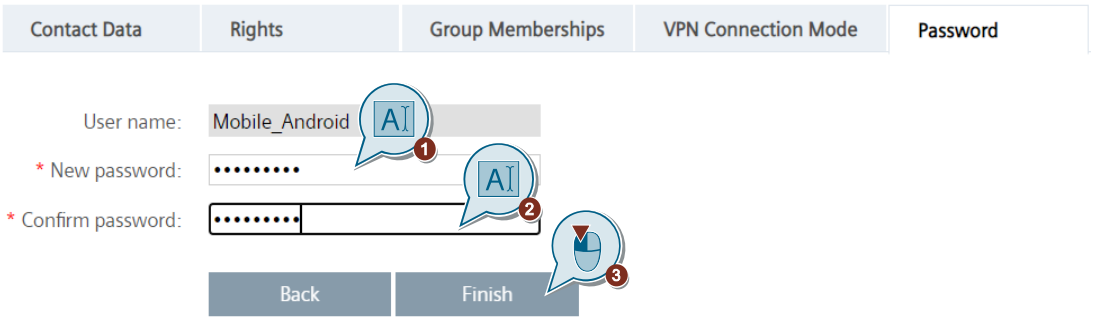
   The "VPN Connection Mode" tab appears.

6. Do not make any changes in this tab.
   Click on "Next".

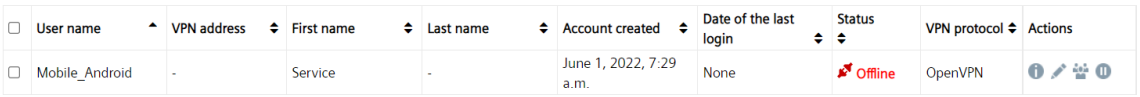


   The "Password" tab appears.

7. Enter a password and confirm it. The assigned password can be changed later by the respective user himself.
   Click "Finish".



Result
The window closes and you will be back in the "Users" tab in the menu "User Accounts > Users & Roles".
The user "Mobile_Android" has been created and appears in the list as a new user.



Load user configuration

The following data are automatically generated when the user is created:

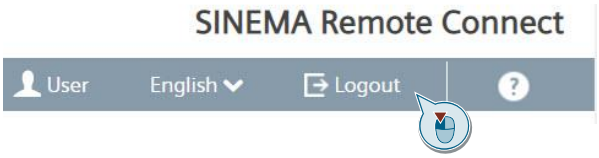
- The configuration file "<Username>.ovpn" containing various parameters necessary for a connection with the server
- A file "<Username>.pem" with the certificate and the key as ASCII code
- A certificate container "<Username>.pkcs12" in PFX format

These files are downloaded to the participant in the remote network who establishes a VPN connection to the SINEMA Remote Connect server.

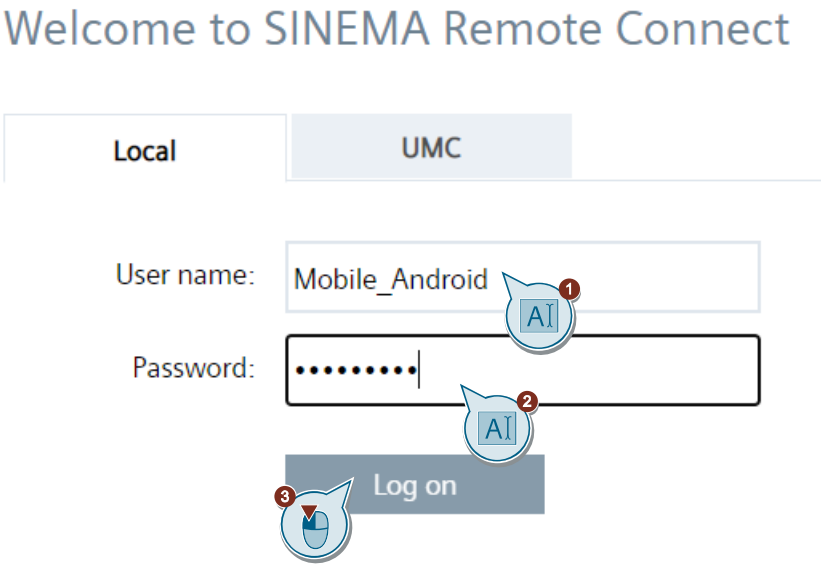
To download the files to the service worker's tablet, first export the files from the SINEMA Remote Connect server.

Proceed as follows to export the files:

1. Log off as an administrator from the WBM. The "Logout" button is located in the display area of the window.

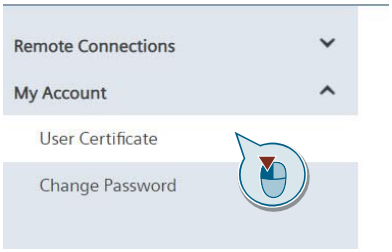


2. Log back in with the new user you just created.

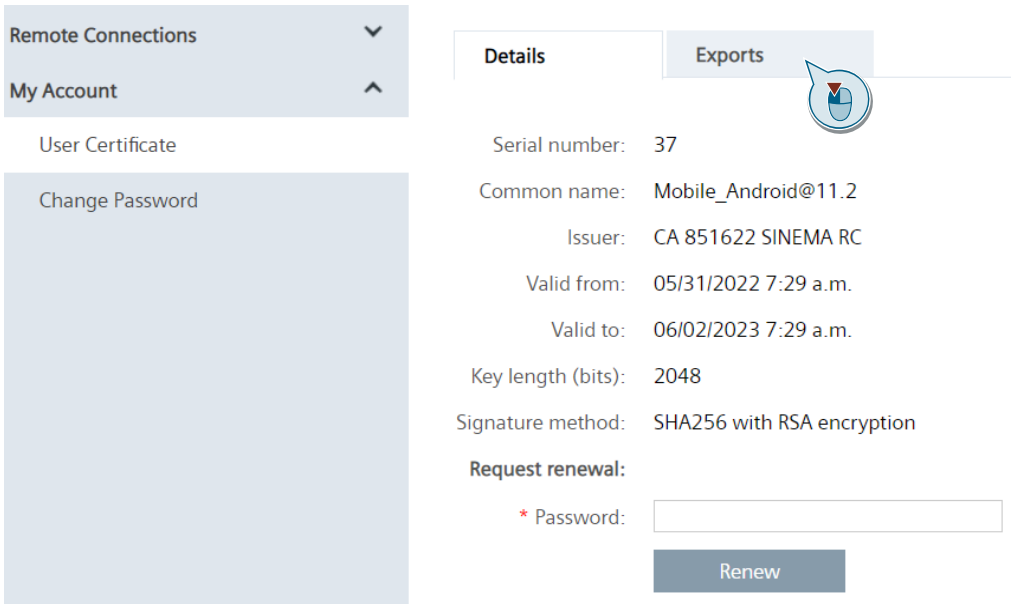


The user's homepage will open.

3. In the navigation area, click on "My Account > User Certificate".

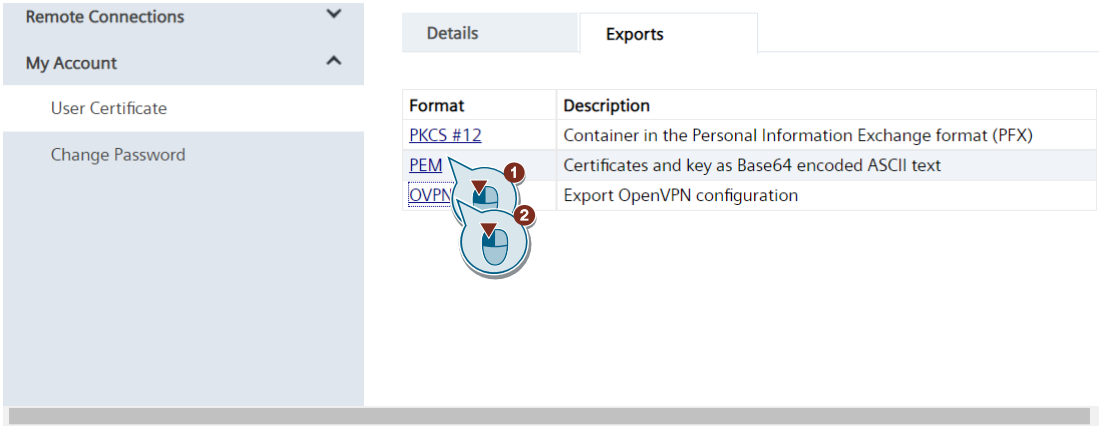


4. You will be in the "Details" tab. Here you will see an overview of the user certificate, which is derived from the CA certificate.
   Change to the "Exports" tab.

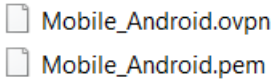


   The "Exports" tab opens.

5. All exportable files will appear here.
   Click on each of the format descriptions to download the following files to a local directory on your configuration PC:
   - PEM: Certificate and key as a Base64-encoded ASCII text
   - OVPN: OpenVPN configuration for user



Result
All necessary certificates have saved in the local directory.



2.4 Setting up remote access on the SCALANCE device

Overview

The following configuration steps are required in order to successfully establish a VPN tunnel between the SCALANCE device and the SINEMA Remote Connect server:

- Download certificate to device
- Configure VPN connection

Preparation

To access the WBM, the following requirements must be met:

- You will need an Ethernet connection between the configuration PC and the SCALANCE device (Zone INT; LAN port: P1 to P4).
- The configuration PC has an IP address in the network of the SCALANCE device, for example 192.168.2.100/24.

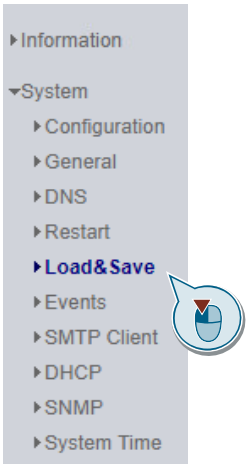
Open the WBM

Open the WBM of the SCALANCE device with the address "https://192.168.2.1". Log on as an administrator.

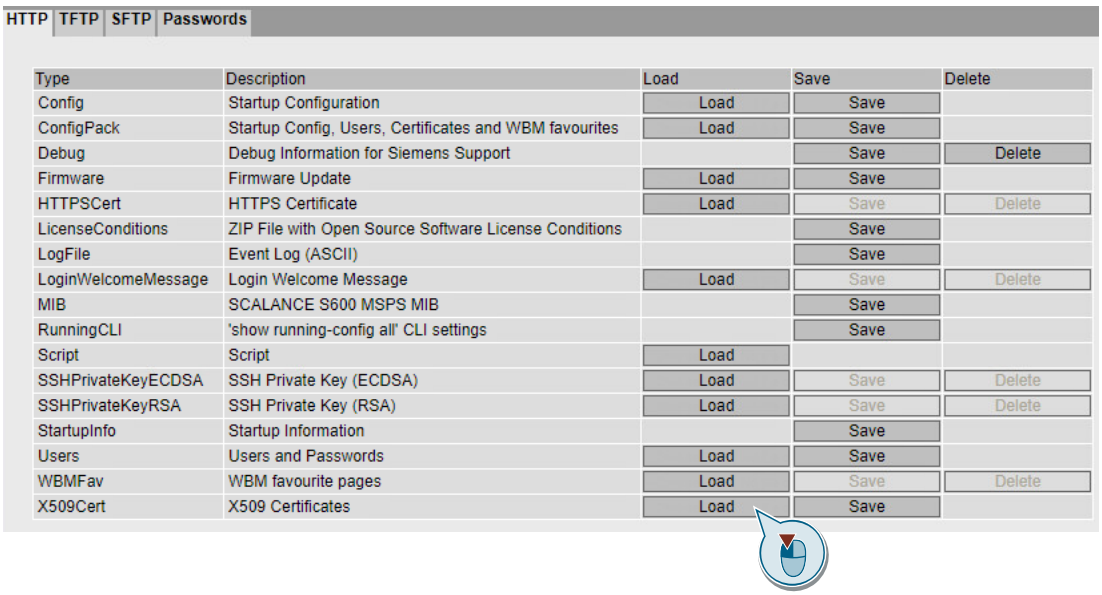
2.4.1 Load CA certificate

When the OpenVPN connection is established, the SCALANCE device authenticates itself with the SINEMA Remote Connect server using its CA certificate. This certificate is now exported from the SINEMA Remote Connect server (see chapter 2.3.2) and downloaded to the SCALANCE device.

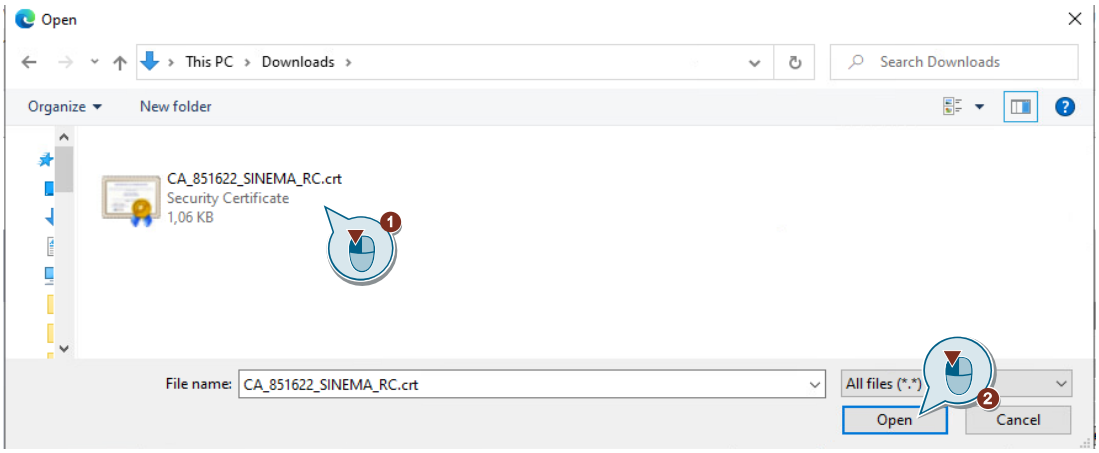
1. In the navigation pane, click "System > Load & Save".



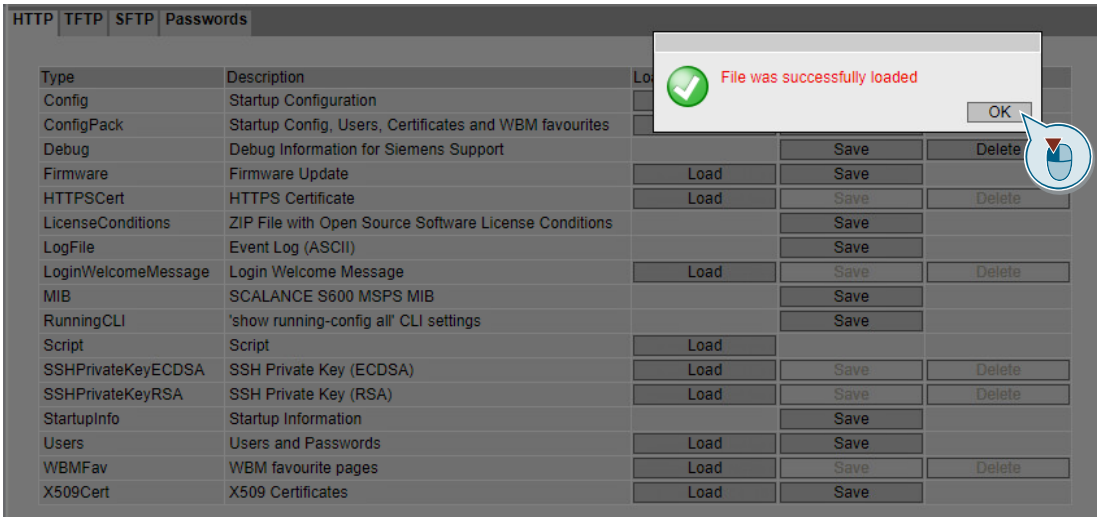
2. A new window opens and you will be in the "HTTP" tab. Here you can load the certificates required in order to establish a secure VPN connection.
By the type "X509Cert", click the "Load" button.



3. The file upload dialog will open. Navigate to the CA certificate exported from the SINEMA Remote Connect server.
   Click on the "Open" button in the dialog.

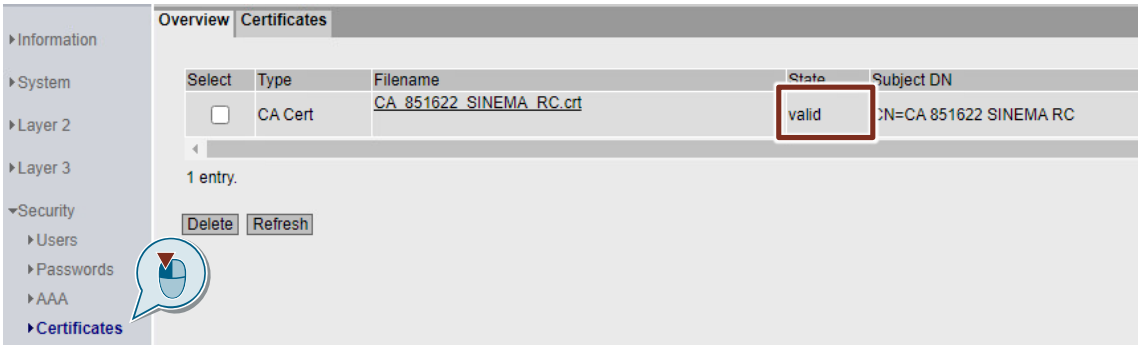


4. The file will now be loaded to the device. When the file is loaded, confirm the next dialog with "OK".



Result

The certificate has been loaded. You can view the certificate under "Security > Certificates". Check whether the certificate has the status "valid".



Note

If the certificate appears with the status "expired", then check whether the time on the SCALANCE device is correct.

2.4.2 Configure VPN connection

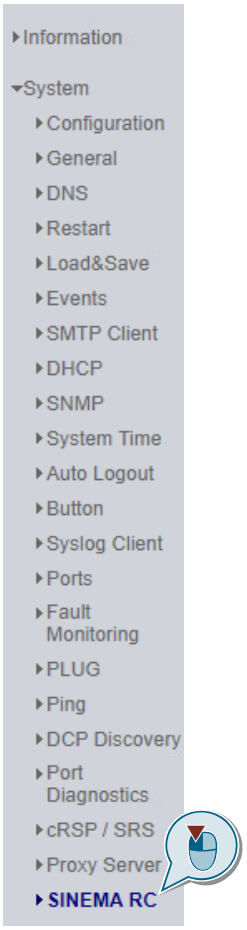
The connection to the SINEMA Remote Connect server has already been allowed in the SCALANCE SC-600. Thanks to the autoconfiguration interface, the connection to the SINEMA Remote Connect server is simple to configure.

Note

To allow the connection to the SINEMA Remote Connect server with a SCALANCE S615 or SCALANCE M-800 industrial router, you will need the "SINEMA RC" KEY-Plug.

Proceed as follows to set up the VPN connection:

1. Click "System > SINEMA RC" in the navigation area.



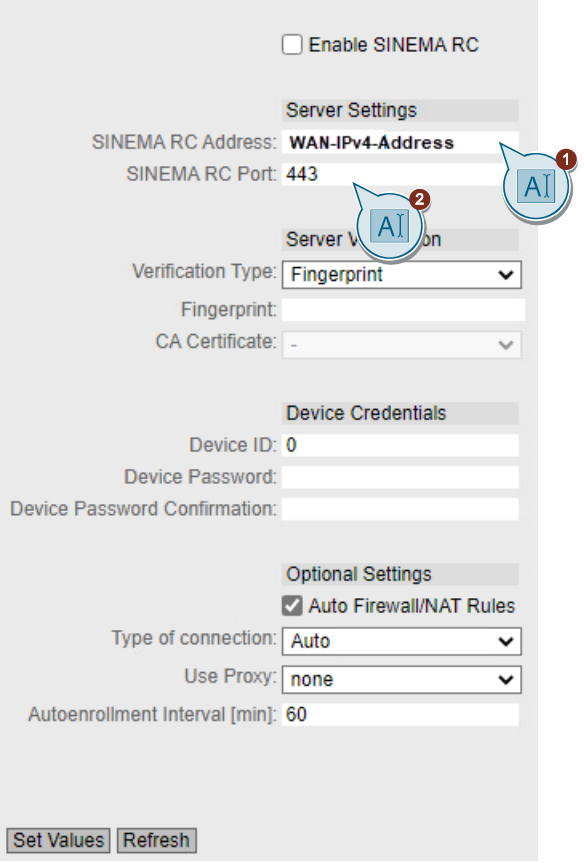
2. The "SINEMA Remote Connect (SINEMA RC)" window opens. Here you will configure access to the SINEMA Remote Connect server in multiple sections.

   Configure the "Server settings" section.
   In the "SINEMA RC Address" field, enter the WAN IPv4 address. In the "SINEMA RC Port" field, enter the HTTPS port of the SINEMA Remote Connect server.

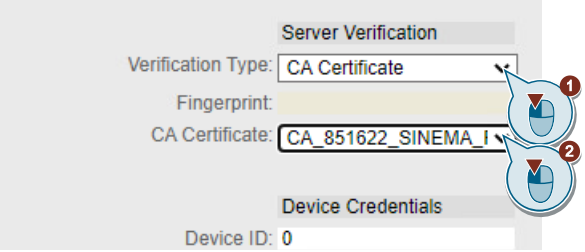
Note

If you entered a hostname in the SINEMA Remote Connect server, then enter the FQDN (fully qualified domain name) here.

If you use a different port than the default HTTPS port 443, then enter your modified port number.

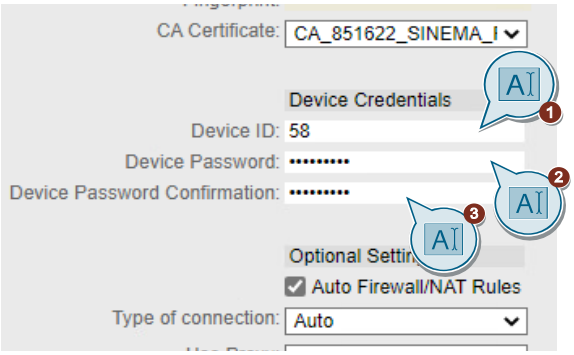


3. Change to the "Server Verification" section.
   In the "Verification Type" dropdown list, select "CA Certificate". In the "CA Certificate" dropdown list, select the server certificate that you loaded previously (see chapter 2.4.1).

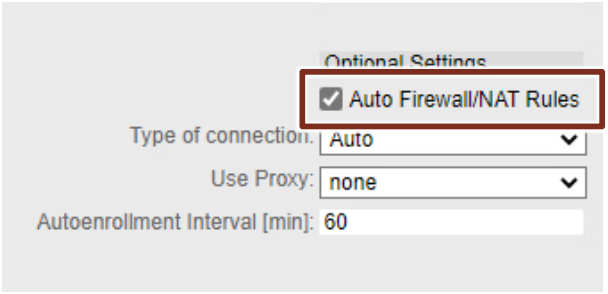


4. Change to the "Device Credentials" section.
   In the "Device ID" field, you will enter the value for the "device ID" that the SCALANCE device received from the SINEMA Remote Connect server (see chapter 2.3.2).

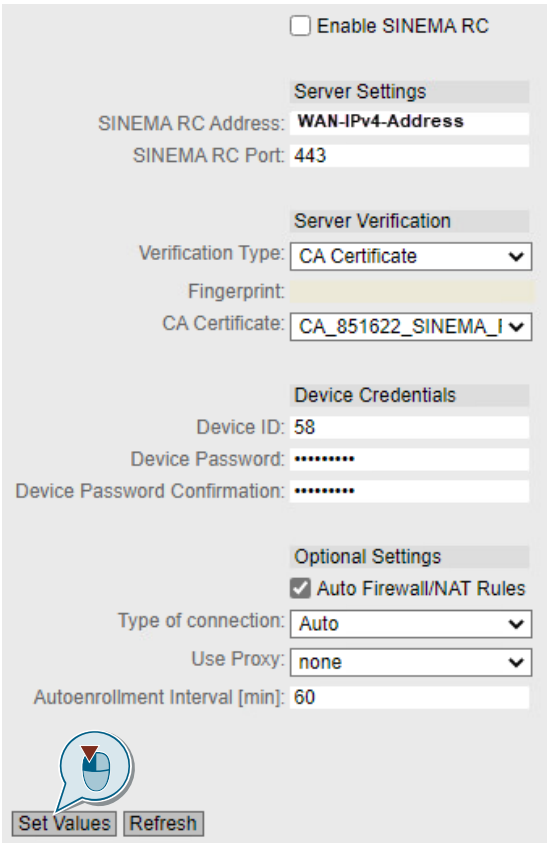
   In the "Device Password" field, enter the access password that you configured earlier (see chapter 2.3.2).



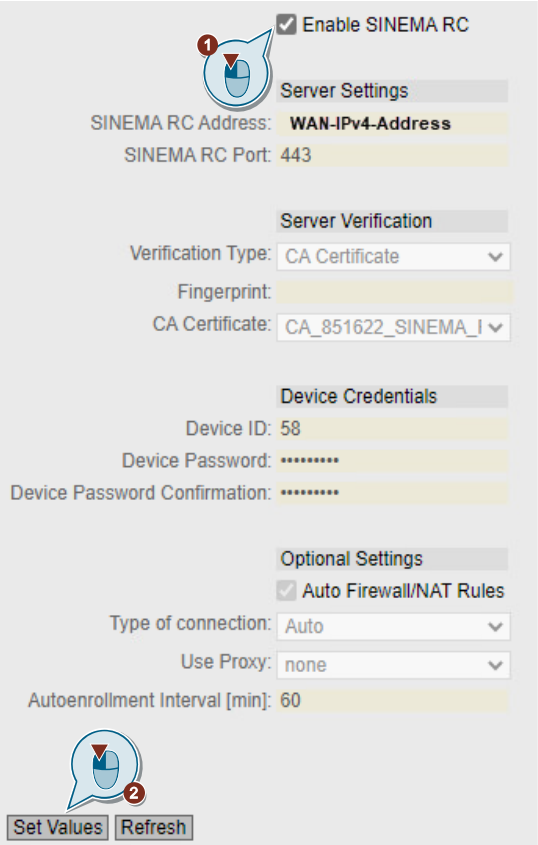
5. By default, the "Auto Firewall/NAT Rules" checkbox in the "Optional Settings" section is ticked so that the appropriate NAT and firewall rules will be created automatically. Leave the default setting or tick the box if it is not ticked.



6. Click the "Set Values" button.



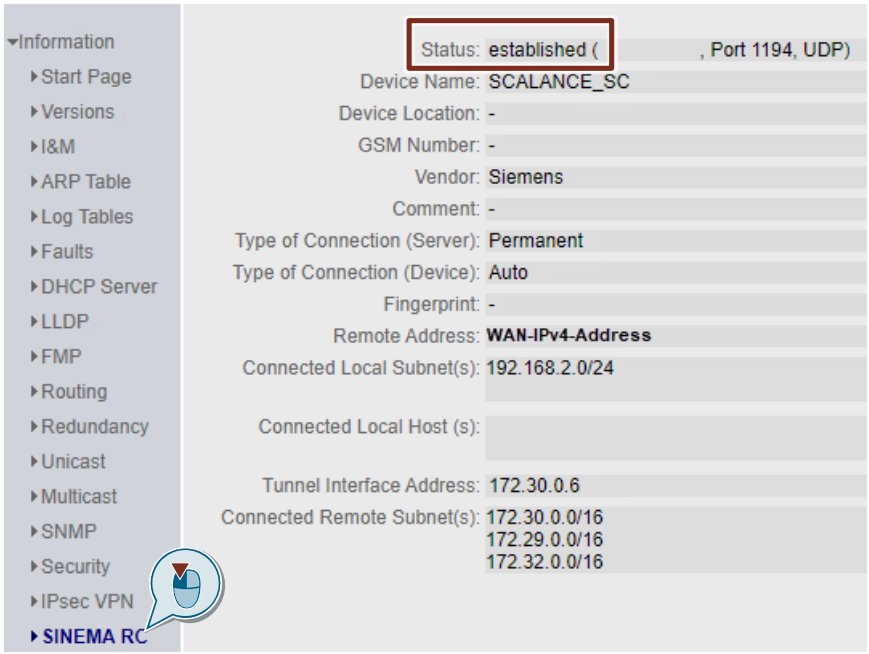
7. To activate the SINEMA Remote Connect server, tick the "Activate SINEMA RC" checkbox. Click the "Set Values" button.



Result

The SCALANCE device establishes an OpenVPN tunnel to the SINEMA Remote Connect server.

You can check whether the connection is successful in the WBM under "Information > SINEMA RC".



2.5 Setting up remote access on the tablet

Remote access between the tablet and the SINEMA Remote Connect server is secured with an OpenVPN connection.

The party that initiates the connection is the "OpenVPN Connect" app installed on the tablet.

2.5.1 Prepare configuration file

In chapter 2.3.2 you exported the following files from the user account of the SINEMA Remote Connect server:

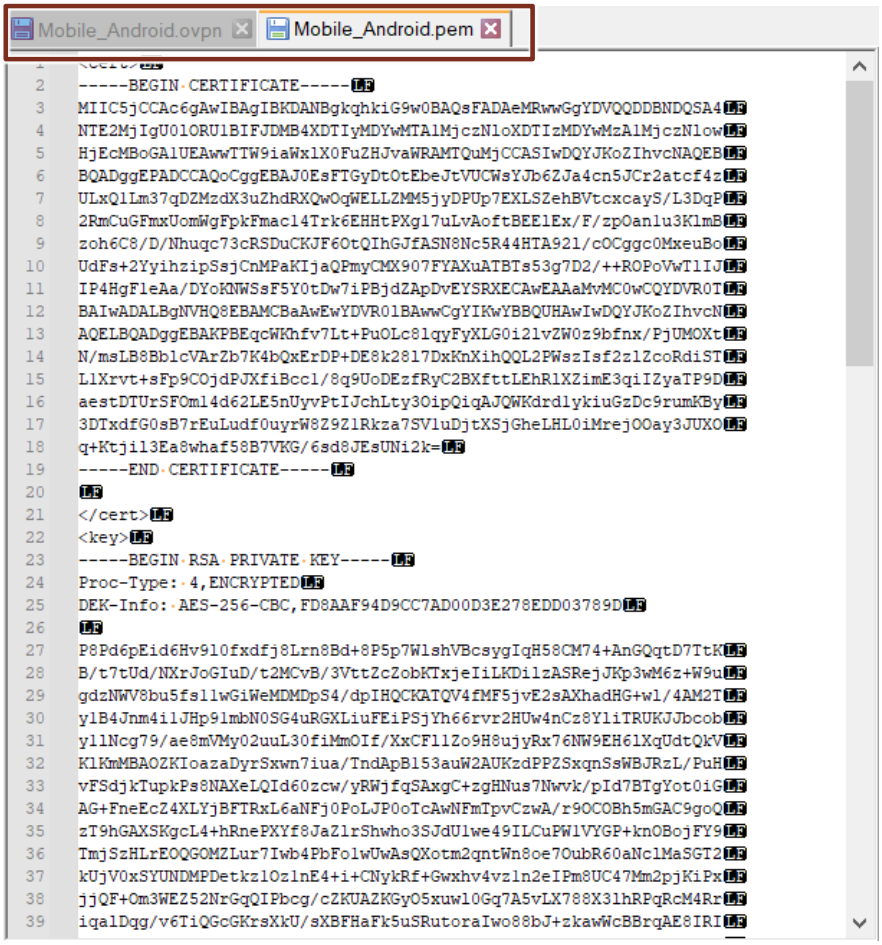
- Certificate and key as a Base64-encoded ASCII text
- OpenVPN configuration for the user

In this chapter, you will combine the certificate, key and configuration file into one single file.

The easiest way to combine the certificate, key and configuration file is to use a text editor.

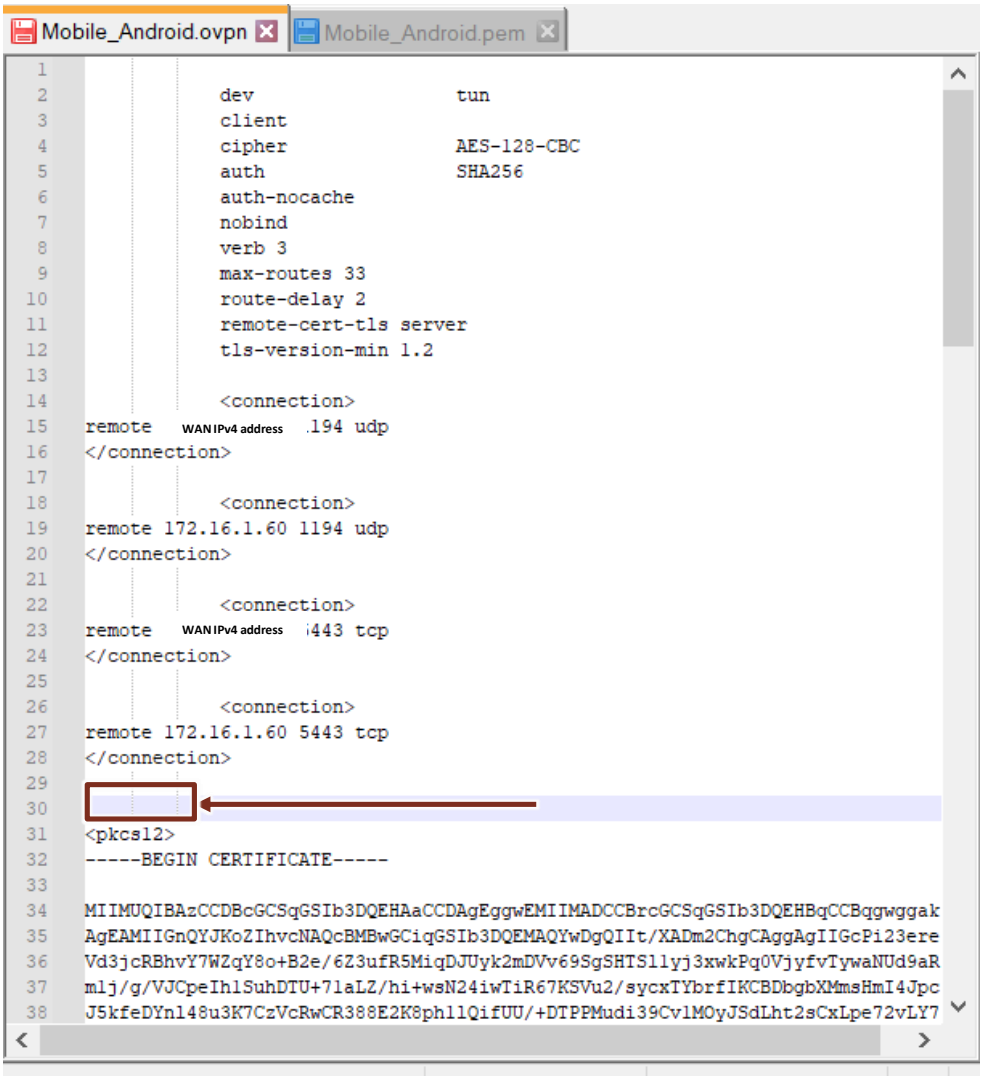
Follow these steps:

1. Open the files "Mobile_Android.ovpn" and "Mobile_Android.pem" with an editor (such as Notepad++).

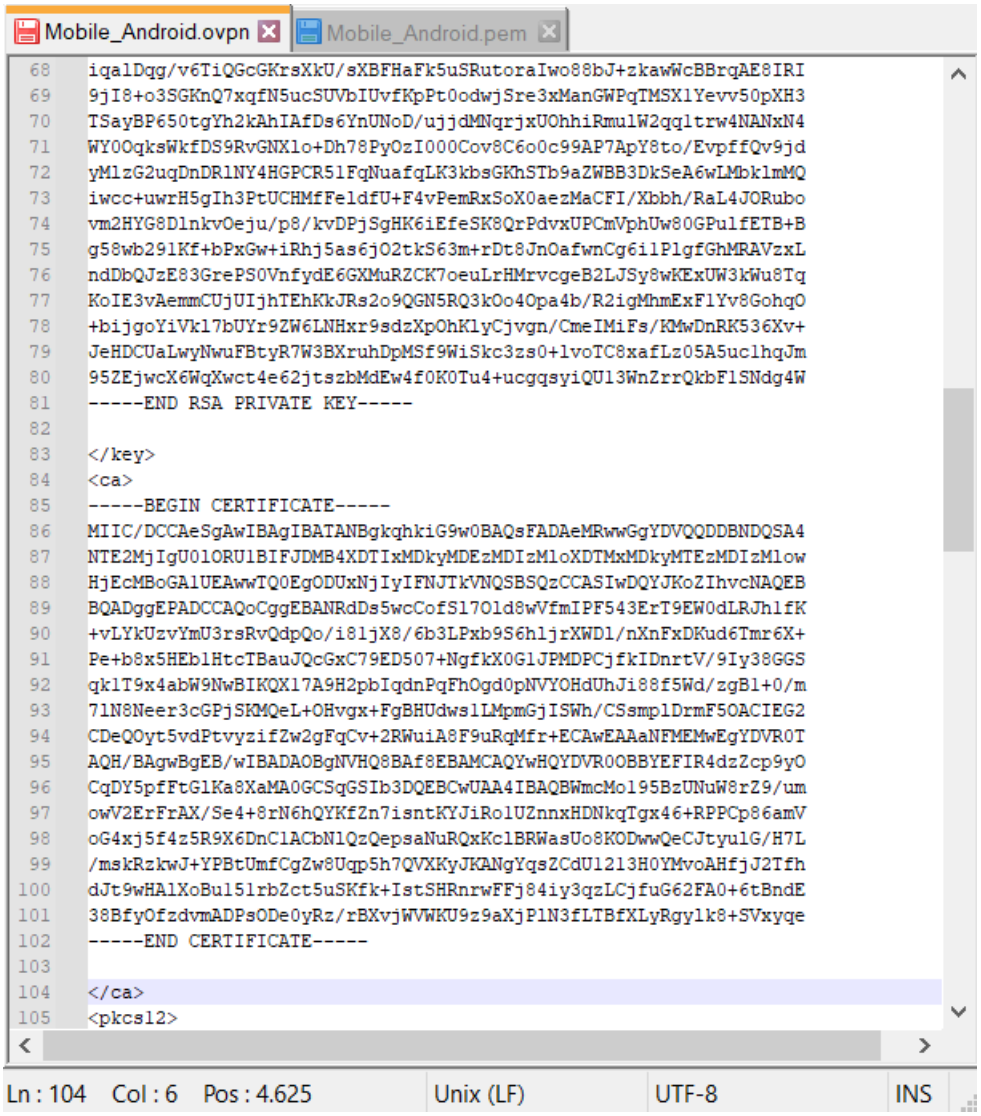


2. Click anywhere in the "Mobile_Android.pem" file and use the keyboard combination <CTRL + A> to select all.
Copy the selected text to the clipboard with the <CTRL + C> keyboard combination.

3. In the file "Mobile_Android.ovpn", click on the empty line before the tag <pkcs12>.

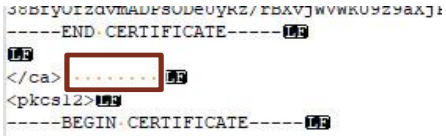


4. Now press <CTRL + V> to paste the contents of the clipboard at this location.



5. Instruct your text editor to display non-printing characters. In Notepad++, click the "Show All Characters" button.

6. Remove the extra spaces and returns after the "</ca>" tag.



7. Select the paragraph from "<pkcs12>" to "</pkcs12> and delete it.

8. Save the changes in the file "Mobile_Android.ovpn".

Result

You have added the contents of the file "Mobile_Android.pem" to the configuration file "Mobile_Android.ovpn". You removed the extra spaces and the "<pkcs12>" paragraph.

2.5.2 Transfer configuration files

Transfer the modified configuration file to the tablet. In this example, the file is loaded to the tablet with a USB connection.

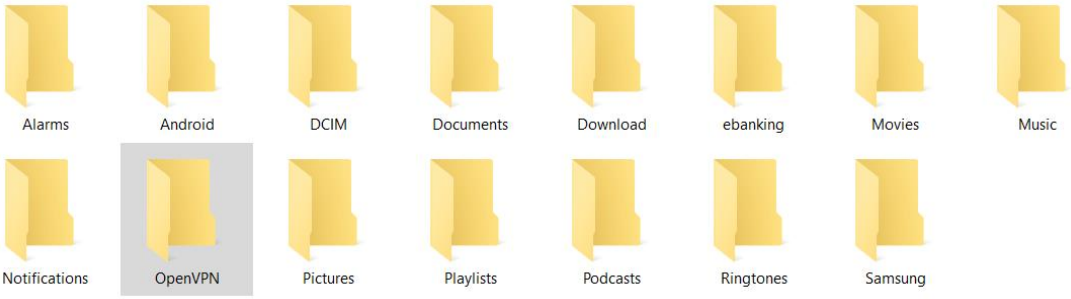
Follow these steps:

1. Connect the tablet to the configuration PC, for example over USB. The smartphone is detected as a storage device and appears in the file system.

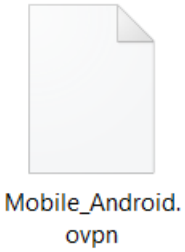
Note

If the file system does not appear correctly, open the tablet. A message will appear. Select the reason for the USB connection and allow it.

2. Create a new folder for the OpenVPN files, for example "OpenVPN".



3. Copy the required "MobileAndroid.ovpn" file from the local directory on your configuration PC into the newly created folder.



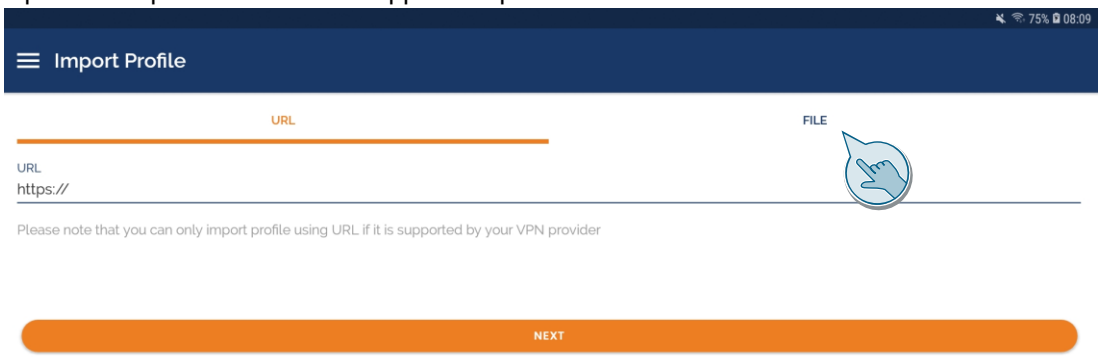
Result

The modified configuration file is now located on the tablet.

Import the configuration file

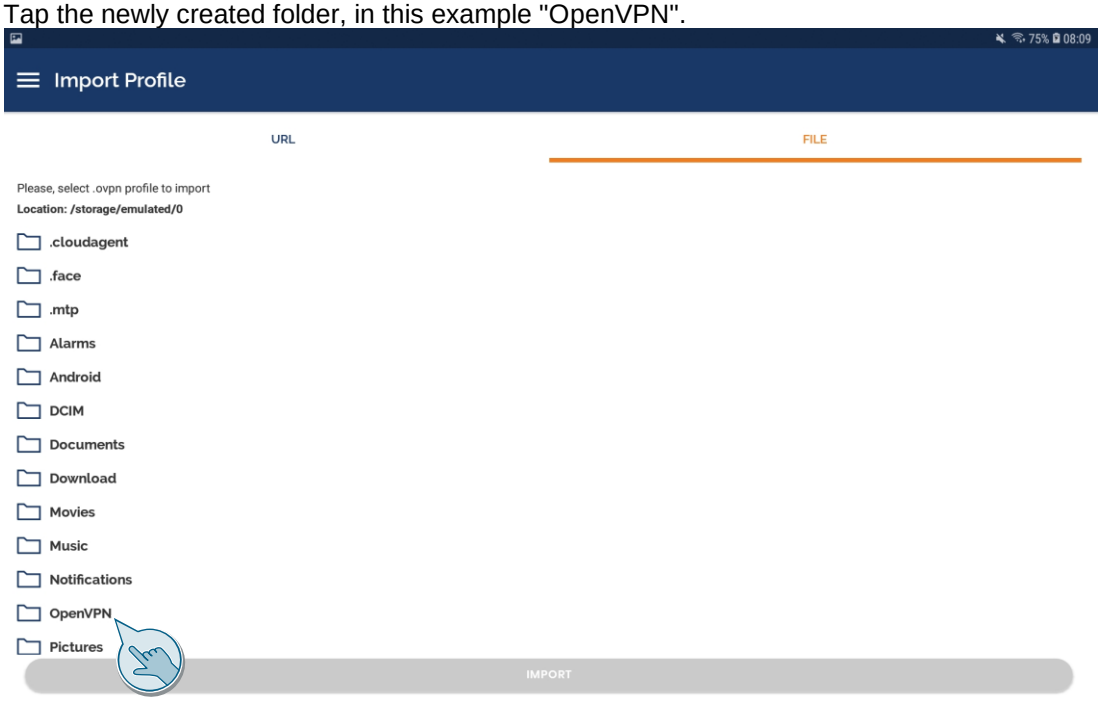
Proceed as follows to import the configuration file into the "OpenVPN Connect" app:

1. Open the "OpenVPN Connect" app and tap on "File" in the menu.



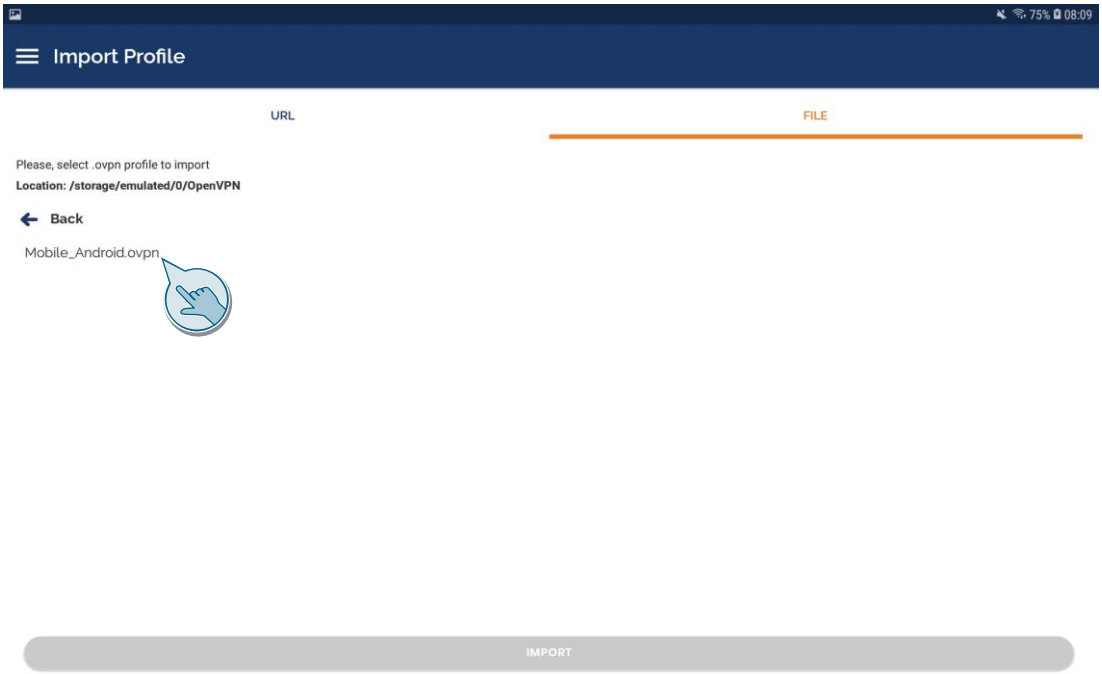
The file system of your tablet will be displayed.

2. Tap the newly created folder, in this example "OpenVPN".



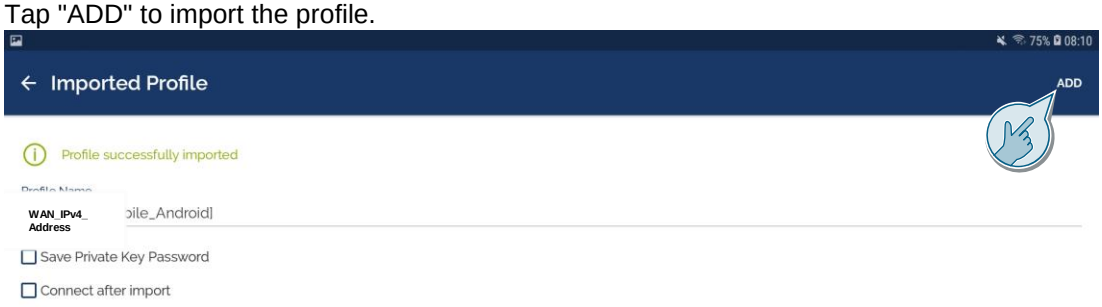
The contents of the folder appear and you should see the configuration file "MobileAndroid.ovpn".

3. Tap the file.



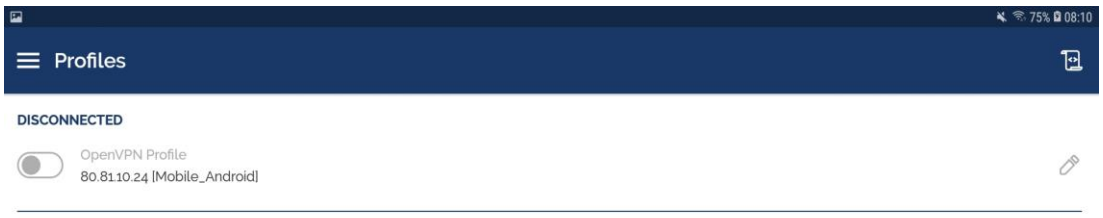
The profile appears.

4. Tap "ADD" to import the profile.



Result

The profile has been imported. The VPN connection is inactive and appears as "DISCONNECTED".

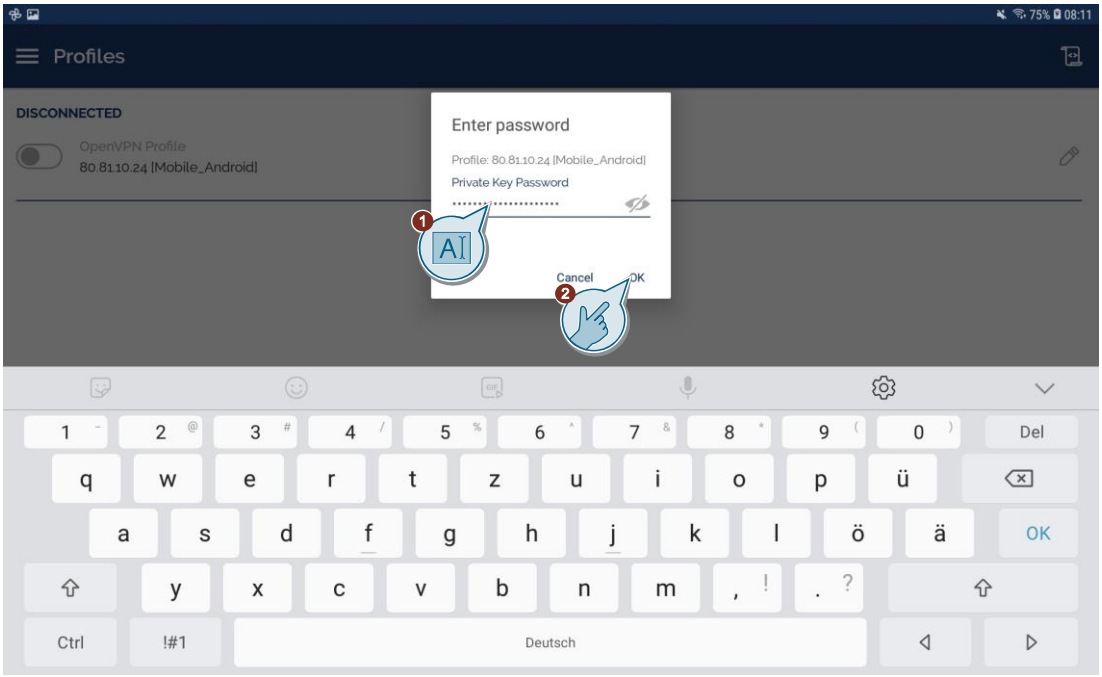


Initialize VPN

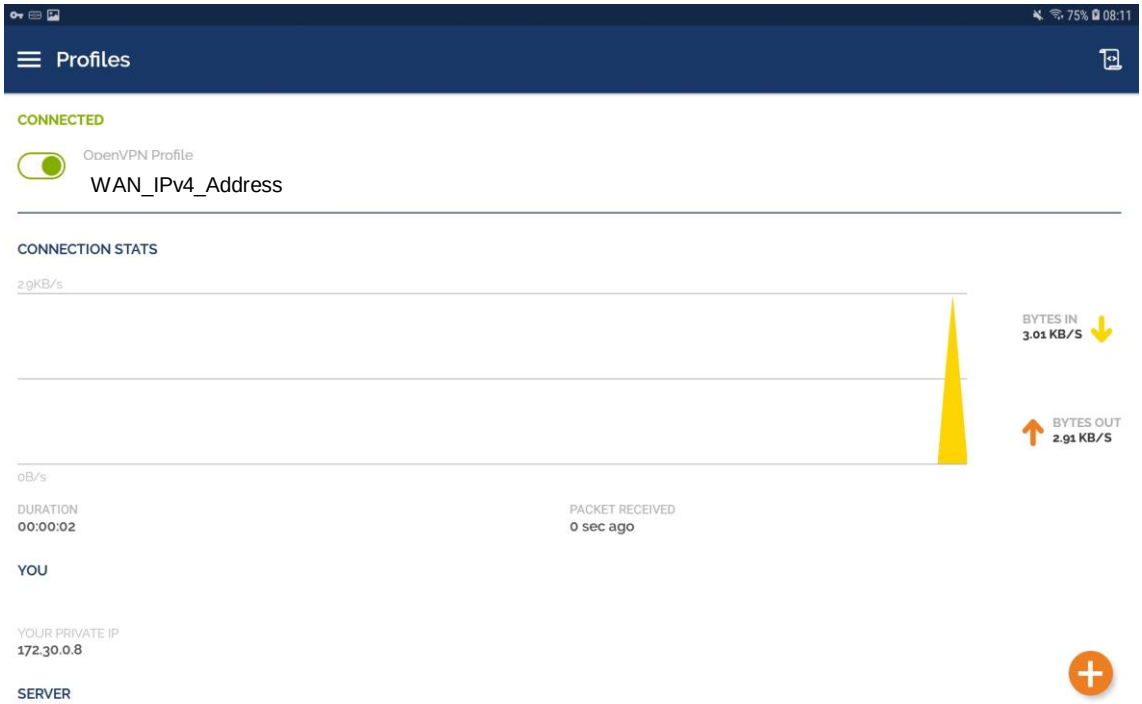
Proceed as follows to initialize the OpenVPN tunnel between the "OpenVPN Connect" app on the tablet and the SINEMA Remote Connect server:

1. Slide the switch to the right.

2. You will be prompted to enter the password. In the "Private Key Password" field, enter the password that you defined in SINEMA Remote Connect Server for the new user (see chapter 2.3.2), then tap "OK".



Result
Once the connection has been established, the status in the "OpenVPN Connect" app will appear as "CONNECTED".



3 Operation

3.1 Check VPN connection

After chapter 2, the configurations on the SCALANCE device and the tablet are complete. The partners establish a VPN tunnel to the SINEMA Remote Connect server.

You can check the status in the devices themselves or centrally in the SINEMA Remote Connect server.

Preparation

To access the WBM of the SINEMA Remote Connect server, check the following points:

- You will need an Ethernet connection between the configuration PC and the SINEMA Remote Connect server.
- The configuration PC has an IP address in the network of the SINEMA Remote Connect server, for example 172.16.1.100/16.

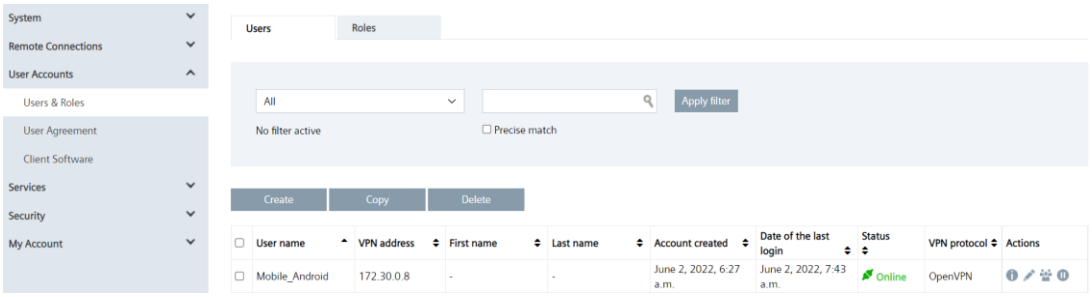
Open the WBM

On the configuration PC, open the WBM of the SINEMA Remote Connect server ("https://172.16.1.60") and log on as an administrator.

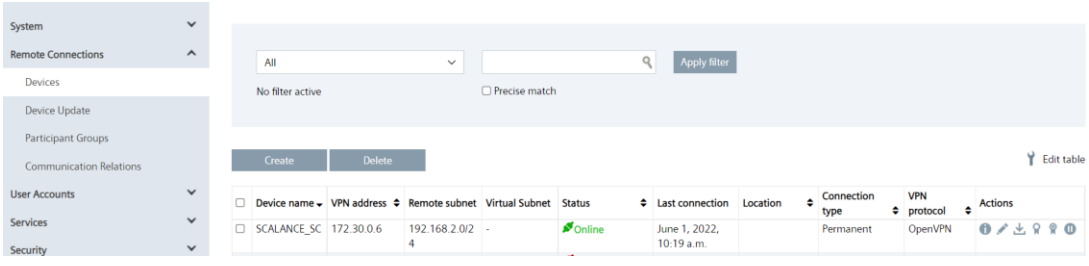
Check the connection

Proceed as follows to check the status in the SINEMA Remote Connect server:

1. In the navigation area, click on "User Accounts > Users & Roles". You can see the user "Mobile_Android" online.



2. Click on "Remote Connections > Devices" in the navigation area. You can see the SCALANCE device online.



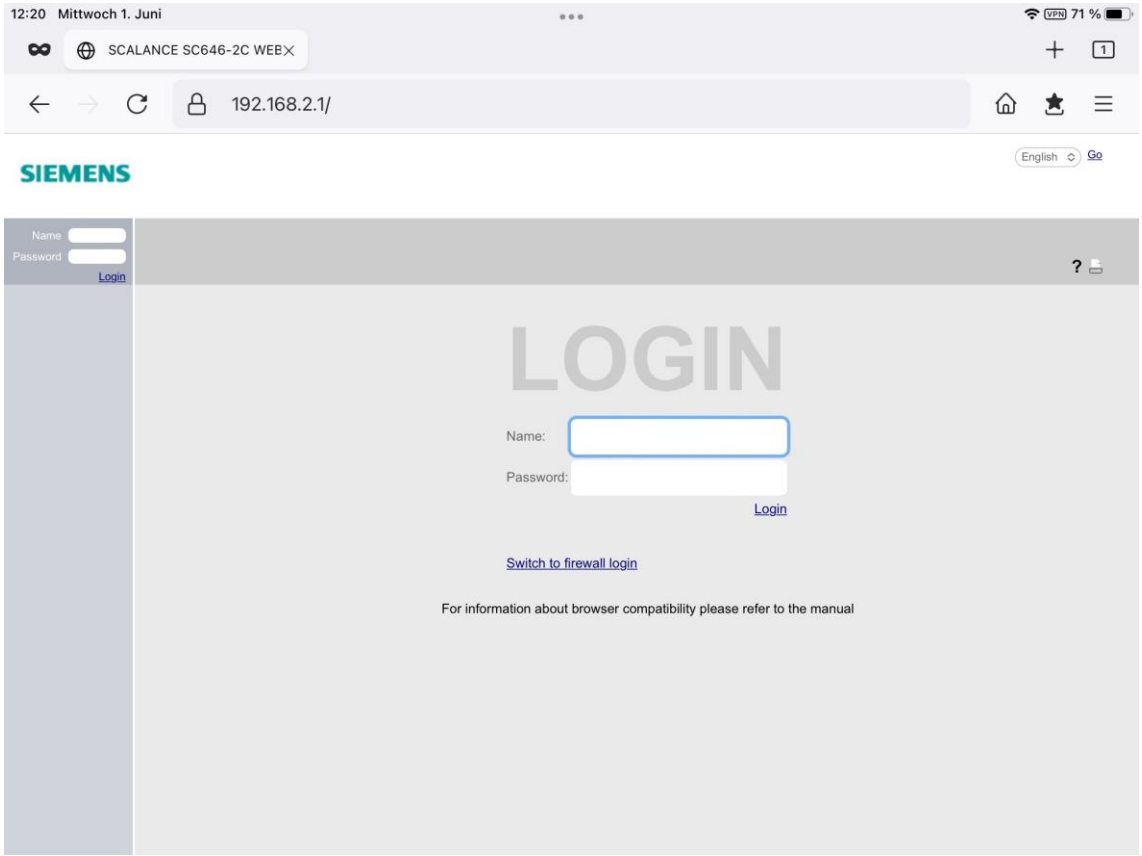
3.2 Test VPN connection

If the tablet and the SCALANCE device have initiated their OpenVPN tunnel to the SINEMA Remote Connect server, then the tablet can access the internal network of the SCALANCE device (subnet 192.168.2.0).

Note

In every device that is located in the internal network of the SCALANCE device, the internal IP address of the SCALANCE device (Zone INT; LAN port: P1 to P4) must be entered as the default router.

You can test this by opening the WBM of the SCALANCE device via its internal IP address ("https://192.168.2.1"). The start page appears.



4 Appendix

4.1 Service and support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:

support.industry.siemens.com

Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers
– ranging from basic support to individual support contracts.

Please send queries to Technical Support via Web form:

support.industry.siemens.com/cs/my/src

SITRAIN – Digital Industry Academy

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that’s tailored to the customer’s specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:

siemens.com/sitrain

Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:

support.industry.siemens.com/cs/sc

Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for iOS and Android:

support.industry.siemens.com/cs/ww/en/sc/2067

4.2 Industry Mall

The Siemens Industry Mall is the platform on which the entire siemens Industry product portfolio is accessible. From the selection of products to the order and the delivery tracking, the Industry Mall enables the complete purchasing processing – directly and independently of time and location:
mall.industry.siemens.com

4.3 Links and literature

Table 4-1

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to the article page of the application example https://support.industry.siemens.com/cs/ww/en/view/109479578
\3\	FAQ: Settings of the ports for secure VPN connections with SINEMA Remote Connect https://support.industry.siemens.com/cs/de/en/view/109745584
\4\	Overview document: Secure remote access with VPN https://support.industry.siemens.com/cs/de/en/view/26662448

4.4 Change documentation

Table 4-2

Version	Date	Change
V1.0	09/2015	First version
V2.0	06/2022	Complete revision