Manual
Workshops (Excerpt)

WLAN Workshops

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Chapter 1 WLAN - VLAN with Multi SSID WLAN

1.1 Introduction

The following chapters describe how to configure a VLAN (Virtual LAN). You connect your WLAN clients wirelessly to the corporate network via a **W2003ac**. **W2003ac** serves as the access point for the wireless networks `Management`, `Development` and `Public`. The Ethernet interface to which your hard-wired LAN is connected is operated in bridge mode and is connected over a VLAN-capable switch to the hard-wired network. The network is segmented virtually in the VLANs `Management`, `Development` and `Public`.

Configuration is performed with the **GUI** (Graphical User Interface).

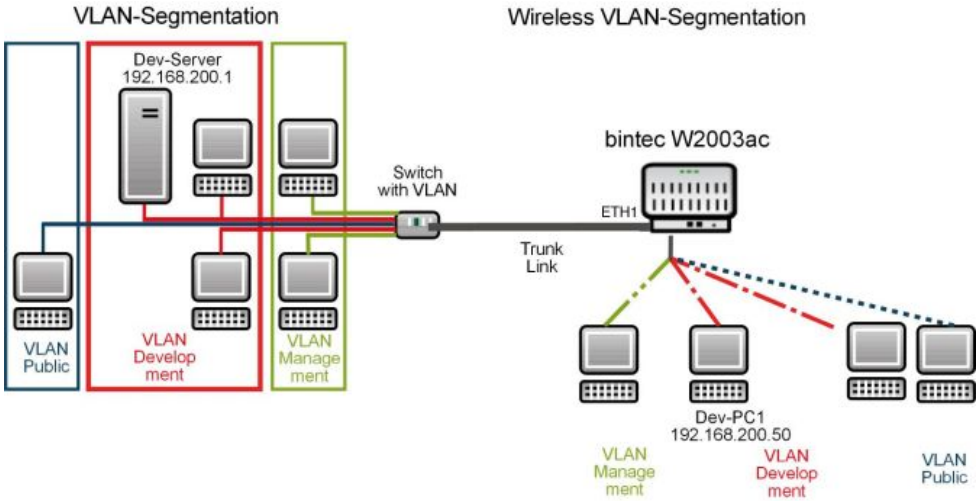


Fig. 1: VLAN segmenting

Requirements

The following are required for the configuration:

- A boot image of version 10.1.9 or later.
- A VLAN-capable switch.

1.2 Configuration

1.2.1 Configuring the wireless networks

You must set up wireless networks on the access points so that the clients can connect to the network over their access point.

Proceed as follows to create wireless networks:

(1) Go to **Wireless LAN** -> **WLAN**-> **Radio Settings**.

Configure the wireless module by editing the default entry. To do this, click the icon next to the existing entry.

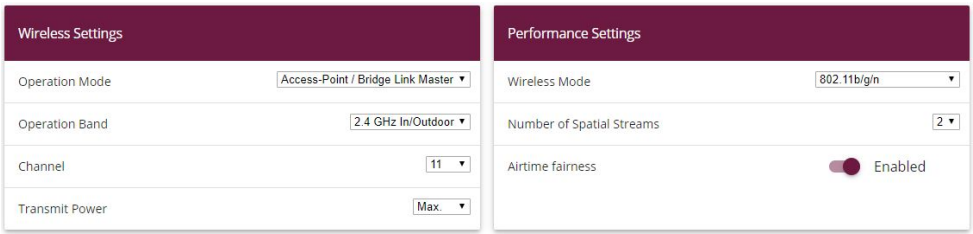


Fig. 2: **Wireless LAN** -> **WLAN**-> **Radio Settings** ->

Proceed as follows:

(1) Set **Operation Mode** to *Access-Point /Bridge Link Master*.

(2) Set the **Channel** to *11* for example.

(3) Confirm with **OK**.

Then create the wireless network entries.

(1) Go to **Wireless LAN** -> **WLAN**->**Wireless Networks (VSS)**->.

Configure the WLAN connection by editing the default entry.

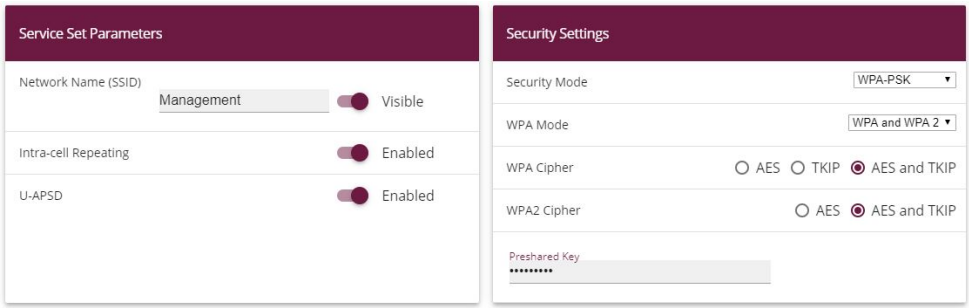


Fig. 3: **Wireless LAN** -> **WLAN1**->**Wireless Networks (VSS)**->

Proceed as follows:

(1) Under **Network Name (SSID)** enter *Management* for example.

(2) Under **Network Name (SSID)** the **Visible** option remains enabled.

(3) Set the **Security Mode** to *WPA-PSK*.

(4) Under **Preshared Key** enter *Key-Admin*, for example.

(5) Confirm with **OK**.

Note

You should use special characters, numbers and upper and lower case letters in your key to increase security.

You must then enable the wireless network you have just configured. To do this, go to the overview in the **Wireless LAN** -> **WLAN**->**Wireless Networks (VSS)**.

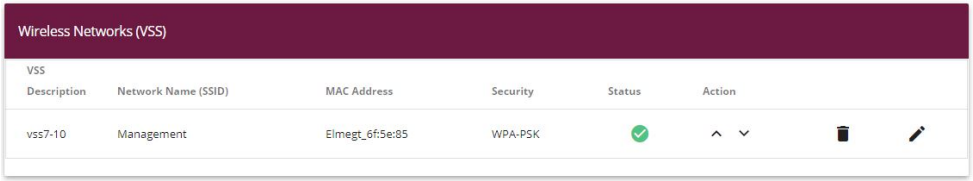


Fig. 4: **Wireless LAN** -> **WLAN**->**Wireless Networks (VSS)**

Proceed as follows:

(1) In the currently only list entry click the ^ icon in the **Action** column. Refer to the **Status** column: After a short delay, the ✓ icon will be displayed here.

Configure the corresponding new entries for the wireless networks *Development* and *Public*.

Note

Make sure that you assign different **Preshared Keys** to the various wireless networks.

Next configure the wireless adapter of the clients in your network to connect to their corresponding wireless network (VSS).

1.2.2 Configuring VLANs

VLAN *Management* is pre-configured by default on your device. Now create the VLANs *Development* and *Public*.

Go to the following menu to create a VLAN:

(1) Go to **LAN** -> **VLAN** -> **VLANs** -> **New**.

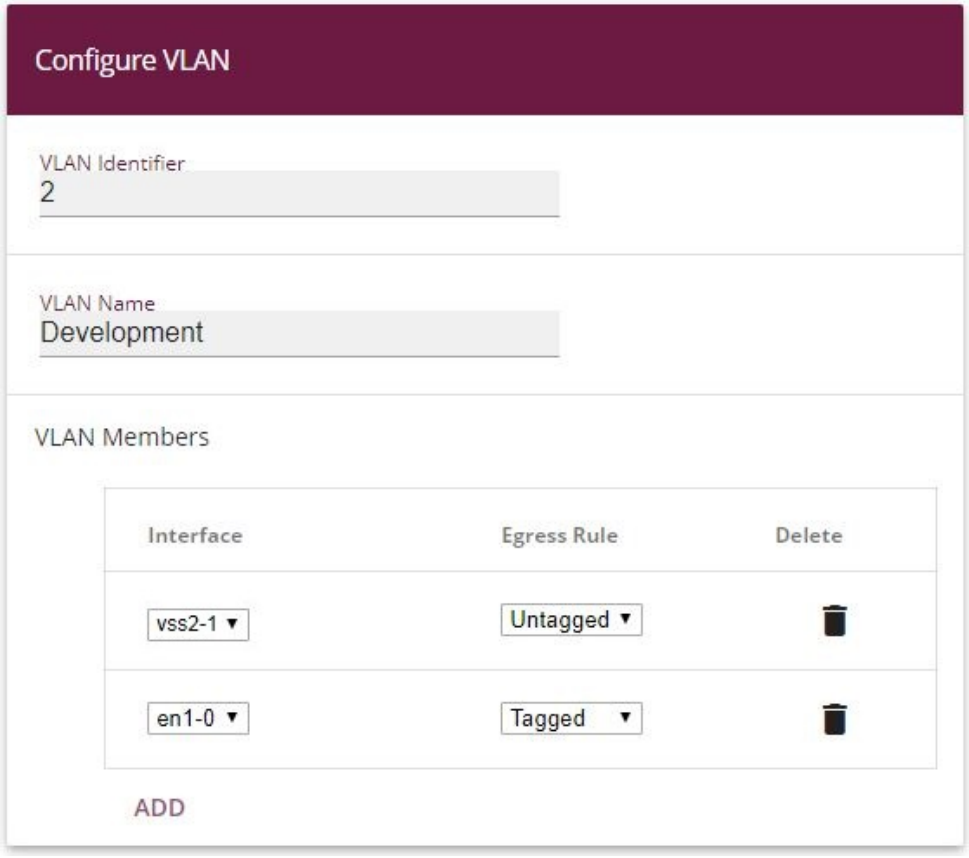


Fig. 5: **LAN** -> **VLAN** -> **VLANs** -> **New**

Proceed as follows:

(1) Under **VLAN Identifier** enter a value between 1 and 4094, in this example *2*.

(2) Under **VLAN Name** enter *Development* for example.

(3) Under **VLAN Members** click **Add** and select the corresponding WLAN interface, e.g. *vss2-1*. In addition, select the **Egress Rule** *Untagged*.

(4) Under **VLAN Members** click **Add** and select the corresponding LAN interface, e.g. `en1-0`. In addition, select the **Egress Rule** `Tagged`.

(5) Click **OK**.

Repeat these steps to create the `Public` VLAN.

(1) Under **VLAN Identifier** enter a value between 1 and 4094, in this example `3`.

(2) Under **VLAN Name** enter `Public` for example.

(3) Under **VLAN Members** click **Add** and select the corresponding WLAN interface, e.g. `vss2-2`. In addition, select the **Egress Rule** `Untagged`.

(4) Under **VLAN Members** click **Add** and select the corresponding LAN interface, e.g. `en1-0`. In addition, select the **Egress Rule** `Tagged`.

(5) Click **OK**.

1.2.3 Defining rules for receiving at the ports

In the **Port Configuration** menu, you can define the rules for receiving frames at the VLAN ports.

Proceed to the following menu to define the Port VLAN Identifier (PVID):

(1) Go to **LAN** -> **VLAN** -> **Port Configuration**.

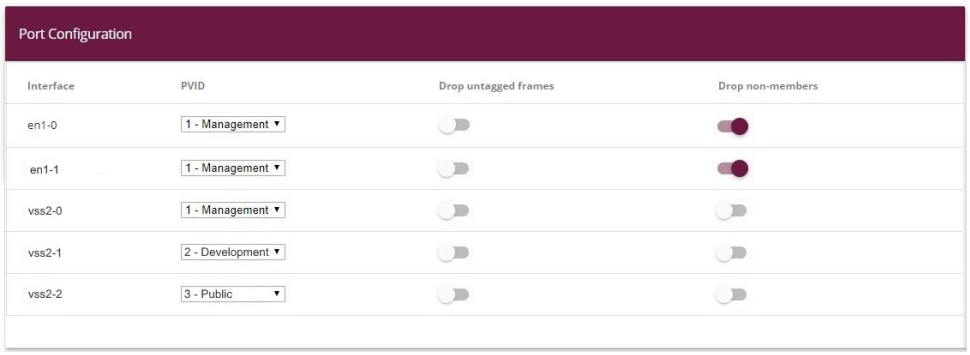


Fig. 6: **LAN** -> **VLAN** -> **Port Configuration**

Proceed as follows:

(1) In addition to the **Interface** `vss2-1`, select the **Port VLAN Identifier (PVID)**, in this example `Development`.

(2) In addition to the **Interface** `vss2-2`, select the **Port VLAN Identifier (PVID)**, in this example `Public`.

(3) Leave the option disabled for the interfaces `en1-0` and `en1-1` under **Drop untagged frames**. Enable the option for the interfaces `en1-0` and `en1-1` under **Drop non-**

members.

(4) Click **OK**.

1.2.4 Removing ports from VLAN management

The ports that you have assigned to the *Development* and *Public* VLANs will be removed from VLAN *Management*.

To do this, go to the following menu:

(1) Go to **LAN** -> **VLAN** -> **VLANs** -> **<Management>** -> .

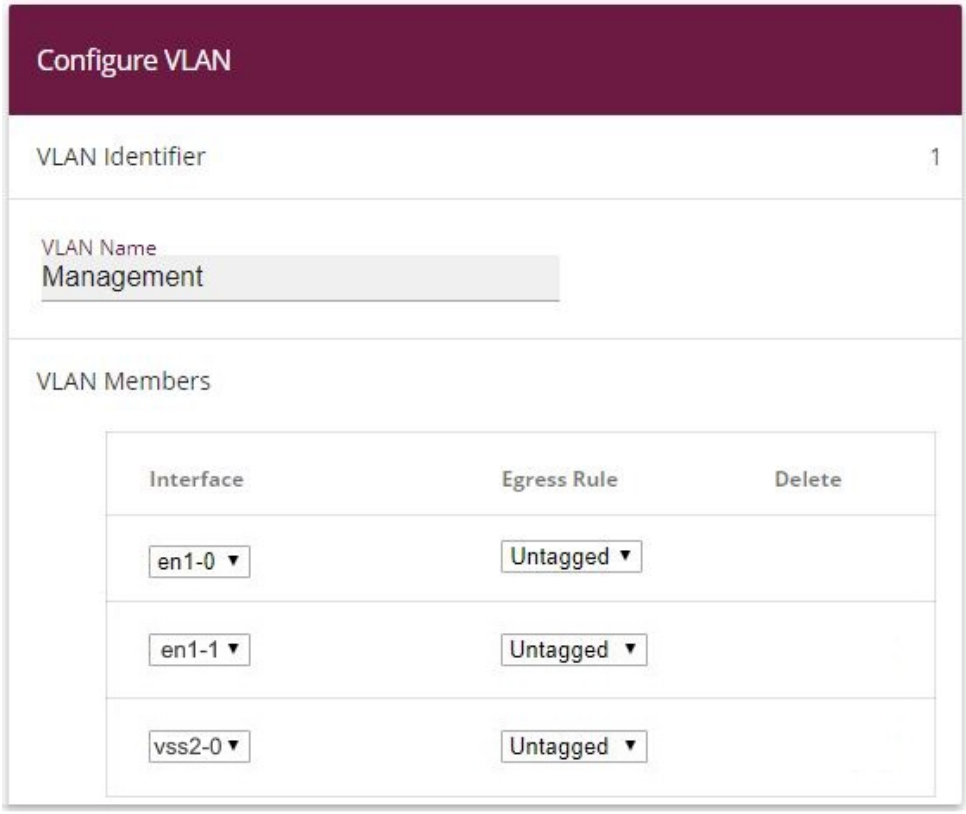


Fig. 7: **LAN** -> **VLAN** -> **VLANs** -> **<Management>** ->

Proceed as follows:

(1) Click the icon for **Interface** *vss2-1*.

(2) Click the icon for **Interface** *vss2-2*.

(3) Leave the **Interface**s `en1-0`, `en1-1` and `vss2-0` `Untagged` under **Egress Rule**.

(4) Click **OK**.

You have now set up all the necessary VLANs. You can check these in the list in the **LAN** -> **VLAN** -> **VLANs** menu.

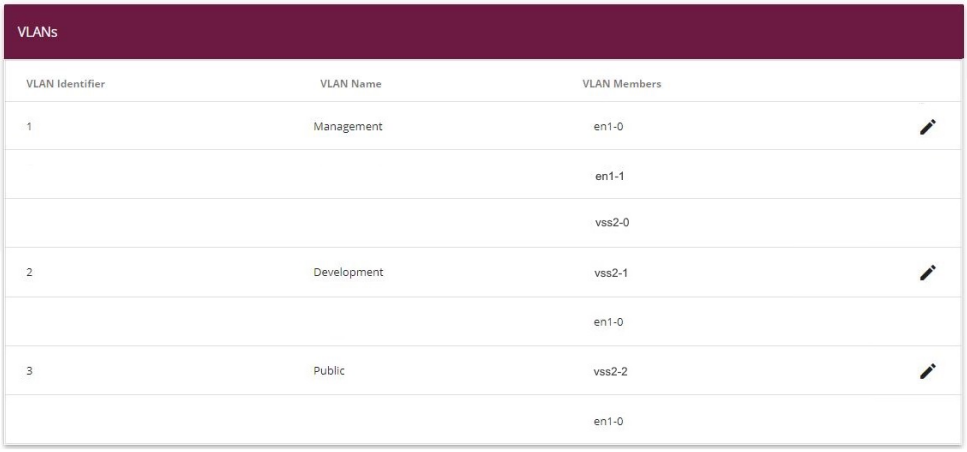


Fig. 8: VLAN overview

1.2.5 Enable VLAN

Finally, you must enable the VLAN function for the bridge group `br0`.

For this, go to the following menu:

(1) Go to **LAN** -> **VLAN** -> **Administration**.

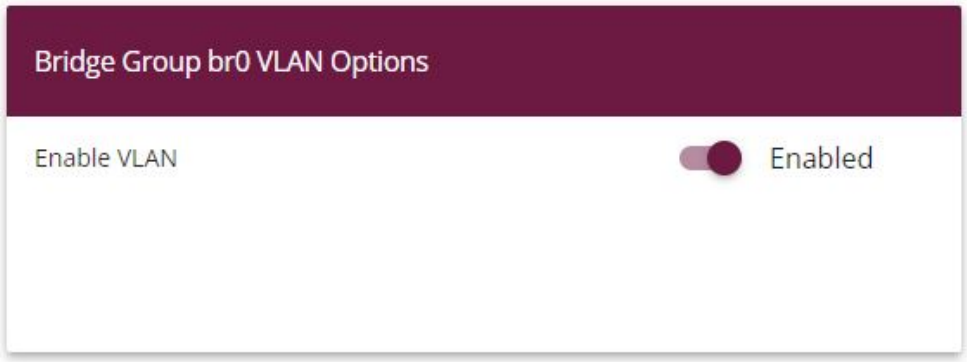


Fig. 9: **LAN** -> **VLAN** -> **Administration**

Proceed as follows:

(1) Select **Enable VLAN**.

(2) Click **OK**.

1.2.6 Configuration on bintec S128p

The switch must be configured in the same way as the access point. Only tagged (VLAN) packets must be processed in the access point direction. Tagging must be removed in the client direction, otherwise the clients cannot process the packets.

(1) Launch the browser and log in to the switch.

(2) Go to **Protocol** -> **VLAN**.

(3) Under **VLAN Operation Mode** select *802.1Q*.

(4) Click **Apply**.

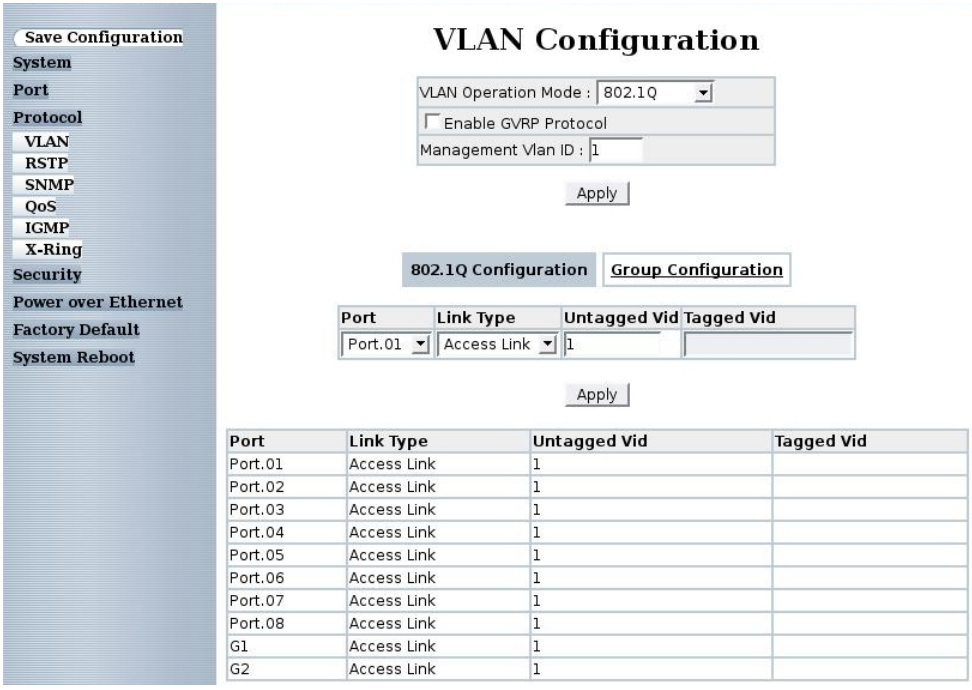


Fig. 10: **Protocol** -> **VLAN** -> **VLAN Configuration**

A total of 3 VLANs are required. In each case the **Port** (Port.01, Port.02, Port.03) and **Untagged Vid** (1, 102, 103) must be set correctly.

Proceed as follows to configure the ports:

(1) Under **Port** select *Port.01*.

(2) Set **Link Type** to *Access Link*.

(3) Under **Untagged Vid** enter `1`.

(4) Press **Apply** to confirm your entries.

(5) Proceed in the same was to configure `Port.02` (**Untagged Vid** `102`) and `Port.03` (**Untagged Vid** `103`).

(6) Press **Apply** to confirm your entries.

(7) Under **Port** select `Port.08`.

(8) Set **Link Type** to `Trunk Link`.

(9) Under **Tagged Vid** enter `1,102,103`.

(10) Press **Apply** to confirm your entries.

The complete configuration looks like this:

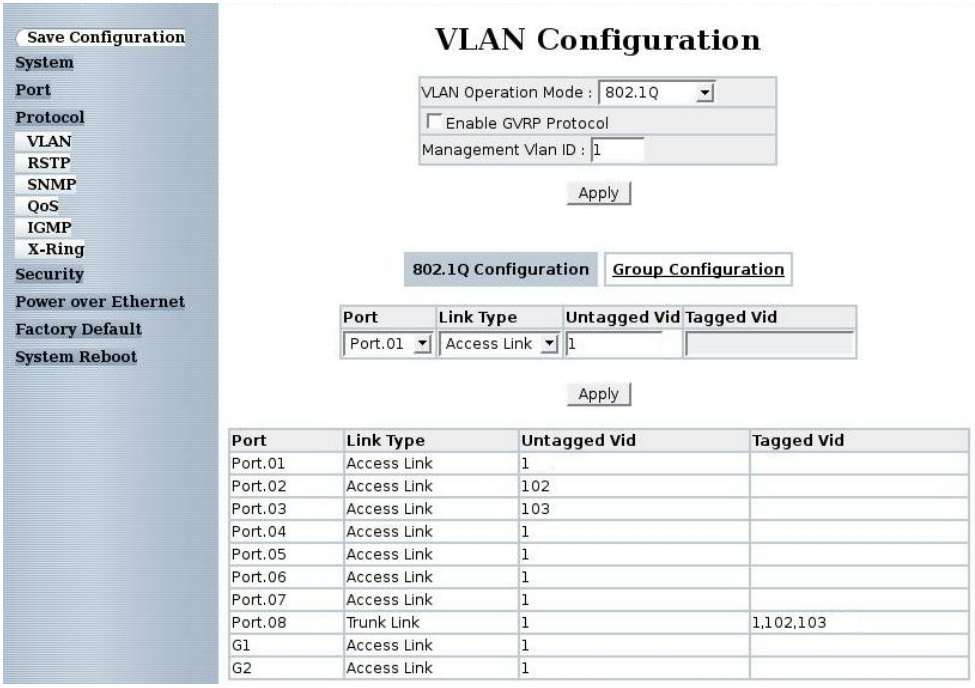


Fig. 11: **Protocol** -> **VLAN** -> **VLAN Configuration**

Checking the connection

To check the configuration, call up the command prompt on a PC and send a ping to the head office network:

e.g. `ping 192.168.100.30`

You should then receive the following message:

```
<?xml version='1.0' encoding='UTF-16'?>
C:\>ping 192.168.100.30

Ping wird ausgeführt für 192.168.100.30 mit 32 Bytes Daten:

Antwort von 192.168.100.30: Bytes=32 Zeit&lt;1ms TTL=30
Antwort von 192.168.100.30: Bytes=32 Zeit&lt;1ms TTL=30
Antwort von 192.168.100.30: Bytes=32 Zeit&lt;1ms TTL=30
Antwort von 192.168.100.30: Bytes=32 Zeit&lt;1ms TTL=30

Ping-Statistik für 192.168.100.30:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0 (0% Verlust),
C:\>
```

1.3 Result

You have set up different wireless networks for the WLAN clients in your network. The entire network has been segmented into various VLANs.

1.4 Checking the connection

To check the configuration, call up the command prompt, for example on PC Dev-PC1 (192.168.200.50), and send a ping to the Dev-Server (192.168.200.1):

e.g. `ping 192.168.200.1`

You should then receive the following messages:

```
Ping wird ausgeführt für 192.168.200.1 mit 32 Bytes Daten:

Antwort von 192.168.200.1: Bytes=32 Zeit&lt;1ms TTL=63
Antwort von 192.168.200.1: Bytes=32 Zeit&lt;1ms TTL=63
Antwort von 192.168.200.1: Bytes=32 Zeit&lt;1ms TTL=63
Antwort von 192.168.200.1: Bytes=32 Zeit&lt;1ms TTL=63

Ping-Statistik für 192.168.200.1:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0 (0% Verlust),
Ca. Zeitangaben in Millisek.:
    Minimum = 0ms, Maximum = 0ms, Mittelwert = 0ms
```

1.5 Overview of configuration steps

Enabling the access point

Field	Menu	Value
Operation Mode	**Wireless LAN** -> **WLAN** -> **Radio Settings**->	*Access-Point / Bridge Link Master*
Channel	**Wireless LAN** -> **WLAN** -> **Radio Settings**->	e.g. *11*

Setting up wireless networks

Field	Menu	Value
Network Name	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*Management* ; **Visible** remains enabled
Security Mode	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*WPA-PSK*
Preshared Key	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*Key-Admin*
Action	**Wireless LAN -> WLAN ->Wireless Networks (VSS) -><Management>**	^
Network Name	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*Development* ; **Visible** remains enabled
Security Mode	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*WPA-PSK*
Preshared Key	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*Key-Devs*
Action	**Wireless LAN -> WLAN ->Wireless Networks (VSS) -><Development>**	^
Network Name	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*Public* ; **Visible** remains enabled
Security Mode	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*WPA-PSK*
Preshared Key	**Wireless LAN -> WLAN ->Wireless Networks (VSS) ->Neu**	*Key-All*
Action	**Wireless LAN -> WLAN ->Wireless Networks (VSS) -> <Public>**	^

Configuring VLANs

Field	Menu	Value
VLAN Identifier	**LAN** -> **VLAN** -> **VLANs** -> **New**	e.g. *2*
VLAN Name	**LAN** -> **VLAN** -> **VLANs** -> **New**	e.g. *Development*
VLAN Members	**LAN** -> **VLAN** -> **VLANs** -> **New**	with **Add** e.g. *vss2-1*
Egress Rule	**LAN** -> **VLAN** -> **VLANs** -> **New**	*Untagged* for *vss2-1*
VLAN Members	**LAN** -> **VLAN** -> **VLANs** -> **New**	with **Add** e.g. *en1-0*
Egress Rule	**LAN** -> **VLAN** -> **VLANs** -> **New**	*Tagged* for *en1-0*
VLAN Identifier	**LAN** -> **VLAN** -> **VLANs** -> **New**	e.g. *3*
VLAN Name	**LAN** -> **VLAN** -> **VLANs** -> **New**	e.g. *Public*
VLAN Members	**LAN** -> **VLAN** -> **VLANs** -> **New**	with **Add** e.g. *vss2-2*
Egress Rule	**LAN** -> **VLAN** -> **VLANs** -> **New**	*Untagged* for *vss2-2*
VLAN Members	**LAN** -> **VLAN** -> **VLANs** -> **New**	with **Add** e.g. *en1-0*
Egress Rule	**LAN** -> **VLAN** -> **VLANs** -> **New**	*Tagged* for *en1-0*

Defining the Port VLAN Identifier (PVID)

Field	Menu	Value
Port VLAN Identifier (PVID)	**LAN** -> **VLAN** -> **Port Configuration**	for **Interface** *vss2-1* e.g. *Development*; for **Interface** *vss2-2* e.g. *Public*
Drop non-members	**LAN** -> **VLAN** -> **Port Configuration**	Select interfaces *en1-0* and *en1-1*

Removing ports from VLAN management

Field	Menu	Value
VLAN Members	**LAN** -> **VLAN** -> **VLANs** ->	for **Interface** *vss2-1*

Field	Menu	Value
	<Management>	and *vss2-2*

Enabling VLANs

Field	Menu	Value
Enable VLAN	**LAN -> VLAN -> Administration**	*Enabled*

Chapter 2 WLAN - bintec Hotspot Solution

2.1 Introduction

The **bintec Hotspot Solution** allows provision of public Internet accesses. The solution is adapted to setup of smaller and larger Hotspot solutions for cafes, hotels, companies, communal residences, campgrounds, etc.

The **bintec Hotspot Solution** consists of a **bintec RS353xx**, a **bintec RXL12x00** or a **be.IP** device installed onsite, which functions as a gateway, and of a Hotspot server, centrally located at a computing centre. The operator account is administered on the server via a PC with internet access (e.g., a hotel reception PC); this includes functions such as registration entry, generating tickets, statistical analysis, etc.

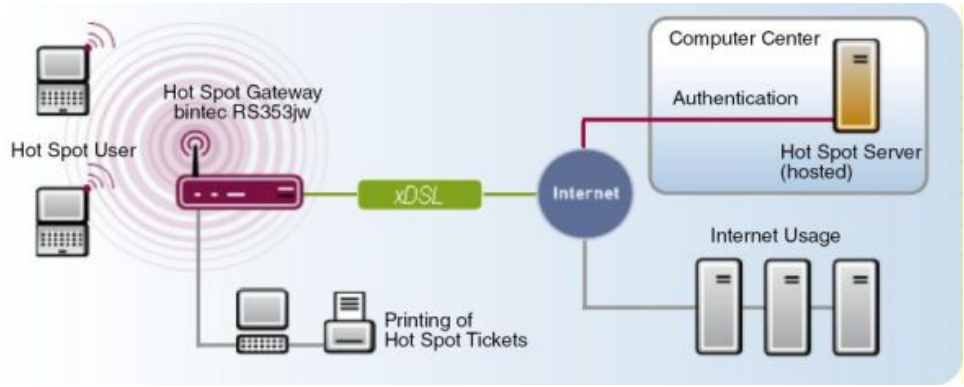


Fig. 12: Method of operation

Login sequence at the Hotspot server

- When a new user connects with the Hotspot, he/she is automatically assigned an IP address via DHCP.
- As soon as he attempts to access any Internet site with a browser, the user is redirected to the start/login page.
- After the user has entered the registration data (user/password), these are sent to the central RADIUS server (Hotspot server) as RADIUS registration.
- Following successful registration, the gateway opens Internet access.
- For each user, the gateway sends regular additional information to the RADIUS server for accounting purposes.

- When the ticket expires, the user is automatically logged off and again redirected to the start/login page.

Requirements

To operate a Hotspot, the customer requires:

- a be.IP- , RS- (e.g. **bintec RS353xx**) or RXL-series router (e.g. **bintec RXL12100**)
- **bintec Hotspot hosting** (article number 5510000198 or 5510000197)
- Access data
- Documentation
- Software licensing

  Please note that you must first activate the licence.

  - Go to *www.bintec-elmeg.com* then **Service & Support**->**Product Licencing** -> **Hot-Spot Licencing** .

  - Enter the required data (please note the relevant explanations on the license sheet), and follow the instructions of the online licensing.

  - You then receive the Hotspot server's login data.

Note

Activation may require 2 - 3 business days.

Access data for gateway configuration

RADIUS Server IP	62.245.165.180
RADIUS Server Password	funkwerk-ec
Domain	Individually set for customers by customer/dealer
Walled Network	Individually set for customers by customer/dealer
Walled Server URL	The URL set by the Hotspot-Server is to be entered here.
Terms & Conditions URL	During uploading the terms and conditions, the Hotspot server provides an URL for them. This URL is to be entered here.

Access data for configuration of the Hotspot server

Admin URL	https://hotspot.bintec-elmeg.com/
Username	Individually set by bintec elmeg
Password	Individually set by bintec elmeg

2.2 Performance features

2.2.1 Hotspot solution features

- Can be a free service, or as a time- or volume-based ticket system
- Free advertising websites accessible without registration (Walled Garden Pages)
- Applicable to WLAN as well as to wire connection LAN users
- The system is franchise-capable, i.e., a cafe- or restaurant chain can offer the system at various localities, and administer it centrally. Here, an issued ticket can be further used at other locations.

2.2.2 Gateway features

- Simple user login via Internet browser
- Redirection to a login page on initial access
- Login via RADIUS authentication
- Multiple logins for the same user are configurable
- Time credits remain if the user logs out, or the connection is interrupted
- Automatic logout of Hotspot users in case of inactivity or if users forget to log out.
- The user must actively confirm the general terms and conditions at login. You'll find model general terms & conditions in the download area at *www.bintec-elmeg.com*

2.2.3 Hotspot server features

- Several localities can be created for each customer (franchise support)
- Several rates can be created for each customer (e.g., daily ticket, hourly ticket, volume ticket)
- Every customer has a personal administrative area for ticket creation and management

2.3 Configuration

Requirements

The following are required for the configuration:

- an be.IP-, RS- (e.g. **bintec RS353xx**) or RXL-series router (e.g. **RXL12100)**
- Internet access, either via LAN, DSL or other connections
- Activated account on the central **bintec Hotspot server**

2.3.1 Configuration of the bintec Hotspot gateway

You configure your device using the **GUI** (Graphical User Interface).

Update of the gateway

Your device contains the version of the system software available at the time of production. More recent versions may have since been released. You can easily perform an update with the **GUI** using the **Software & Configuration** menu.

(1) Go to **Maintenance**-> **Software & Configuration** -> **Options**.

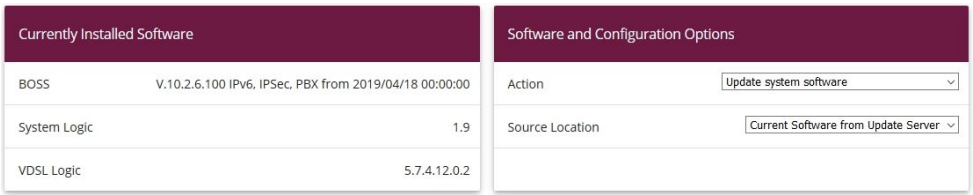


Fig. 13: **Maintenance** -> **Software & Configuration** -> **Options**

Proceed as follows:

(1) Under **Action** select `Update system software`.

(2) As **Source**, select `Current Software from Update Server`.

(3) Click **Start** to complete the update.

Configure language (reseller / partner)

You can select the language for the start/login page of a reseller / partner in the **Local Services** -> **HotSpot Gateway**-> **HotSpot Gateway**-> **New** menu.

The language can be changed on the start/login page at any time.

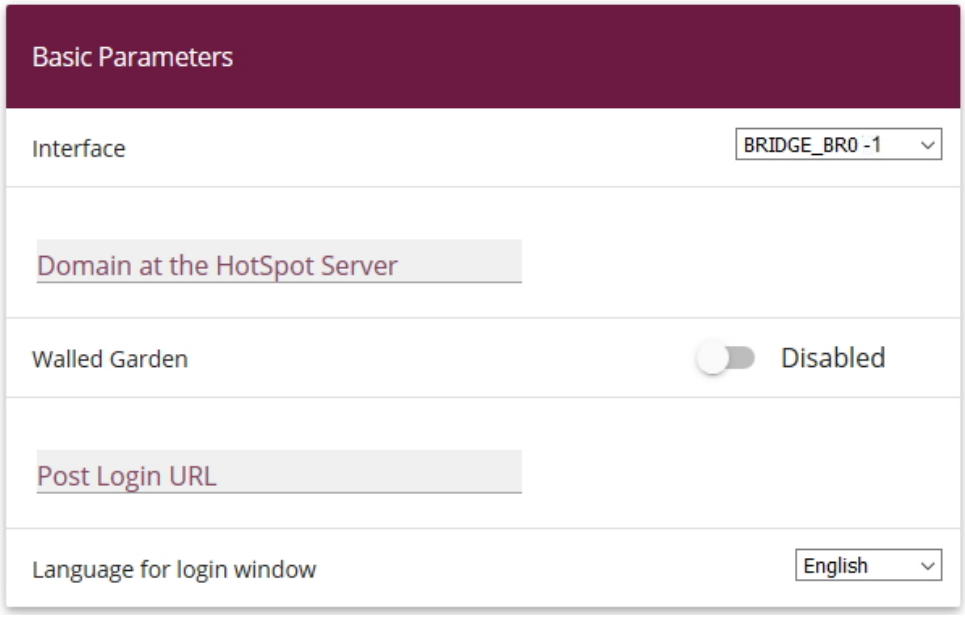


Fig. 14: **Local Services** -> **HotSpot Gateway** -> **HotSpot Gateway** -> **New**

Set time zone

You need the system time for tasks such as correct time-stamps for system messages, or accounting. For this, go to the following menu:

(1) Go to **System Management** -> **Global Settings** -> **Date and Time**.

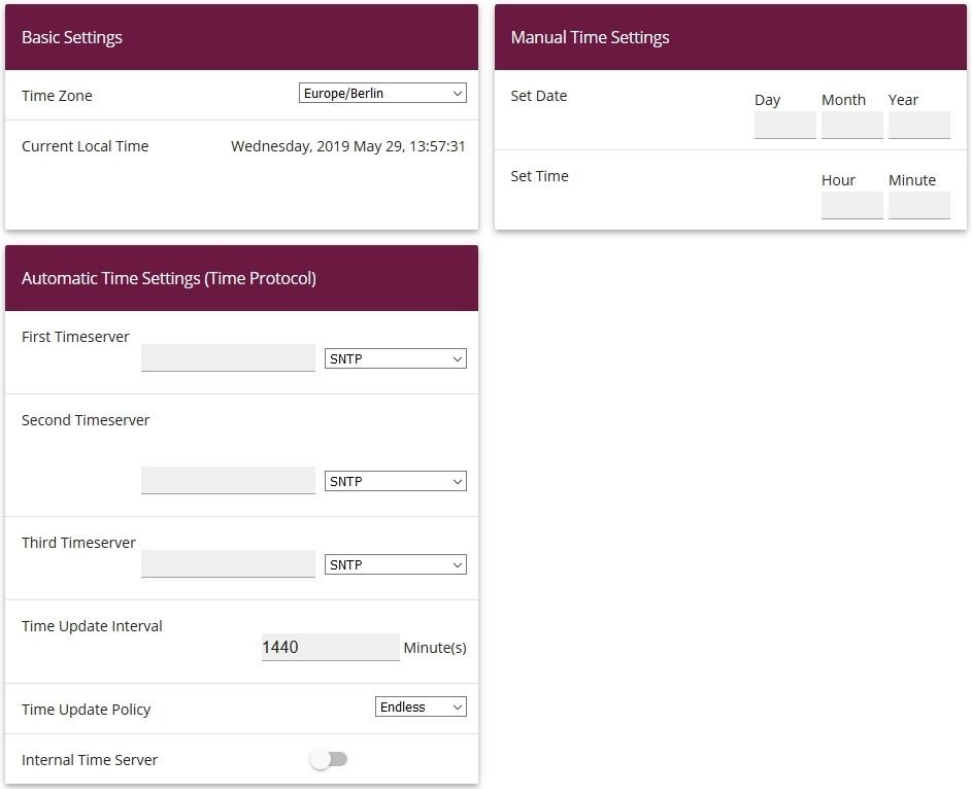


Fig. 15: **System Management** -> **Global Settings** -> **Date and Time**

Note

If a method for automatically deriving the time is defined on the device, the values obtained in this way automatically have higher priority. A manually entered system time is therefore overwritten.

Proceed as follows to configure the time zone settings:

(1) In the **Time Zone** field, select *Europe/Berlin*. To guarantee a synchronous system time, a current system time is required for operation.

(2) Disable **ISDN Timeserver**.

(3) Deactivate **Internal Time Server**. Time requests from a client are not answered.

(4) Confirm with **OK**.

Disabling of local communication

If a Wireless LAN Controller manages several access points or if you use a stand-alone access point, you can prevent communication of hotspot users registered at the same access point among each other.

If you operate a Wireless LAN Controller, proceed as follows:

(1) Go to **Wireless LAN Controller**->**Slave AP configuration**->**Wireless Networks (VSS)**-> ✎

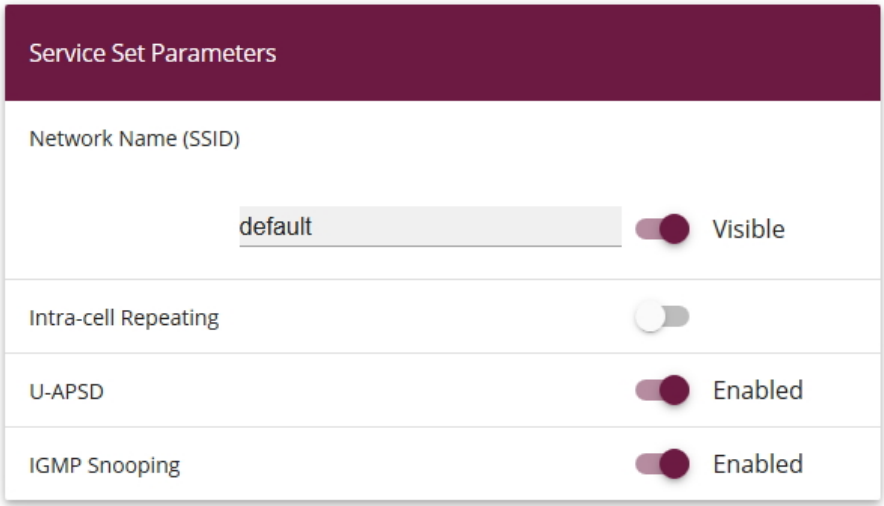


Fig. 16: **Wireless LAN Controller**->**Slave AP configuration**->**Wireless Networks (VSS)**-> ✎

(2) Disable **Intra-cell Repeating**.

(3) Confirm with **OK**.

If you operate a stand-alone-device in access point mode (**Wireless LAN** -> **WLAN** -> **Radio Settings** -> ✎ -> **Operation Mode** = `Access Point`), you can set up and edit the desired wireless networks in the **Wireless LAN** -> **WLAN** -> **Wireless Networks (VSS)** -> **New** menu.

In the following procedure, local communication between individual hotspot users registered at a stand-alone access point is prevented.

Proceed as follows:

(1) Go to **Wireless LAN** -> **WLAN** -> **Wireless Networks (VSS)** -> ✎.

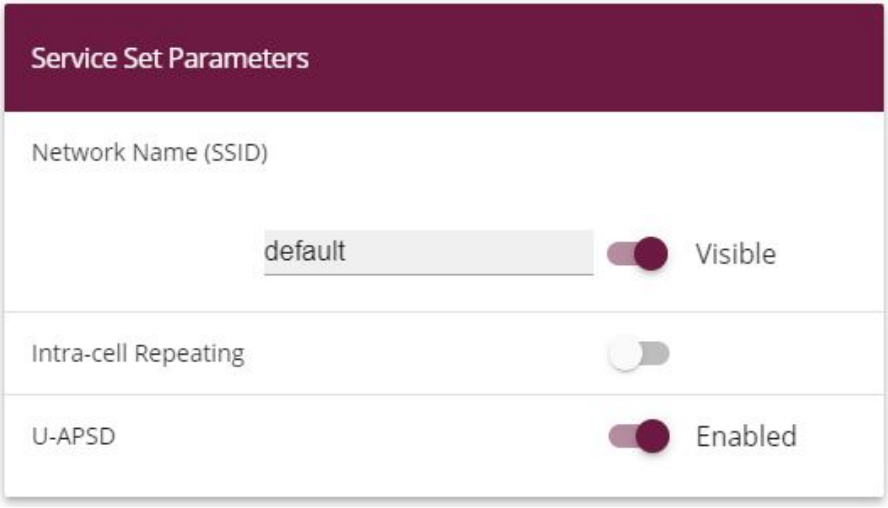


Fig. 17: **Wireless LAN** -> **WLAN** -> **Wireless Networks (VSS)** ->

(2) Disable **Intra-cell Repeating**.

(3) Confirm with **OK**.

Configure RADIUS Server access

Two entries must be created for access to the RADIUS server. The RADIUS server is a component of the central bintec Hotspot server. Use the IP address `62.245.165.180` and the password `funkwerk-ec` for RADIUS server login.

In the **System Management** -> **Remote Authentication** -> **RADIUS** menu, a list of all registered RADIUS servers is displayed.

To configure the first entry, go to the following menu:

(1) Go to **System Management** -> **Remote Authentication** -> **RADIUS** -> **New**.

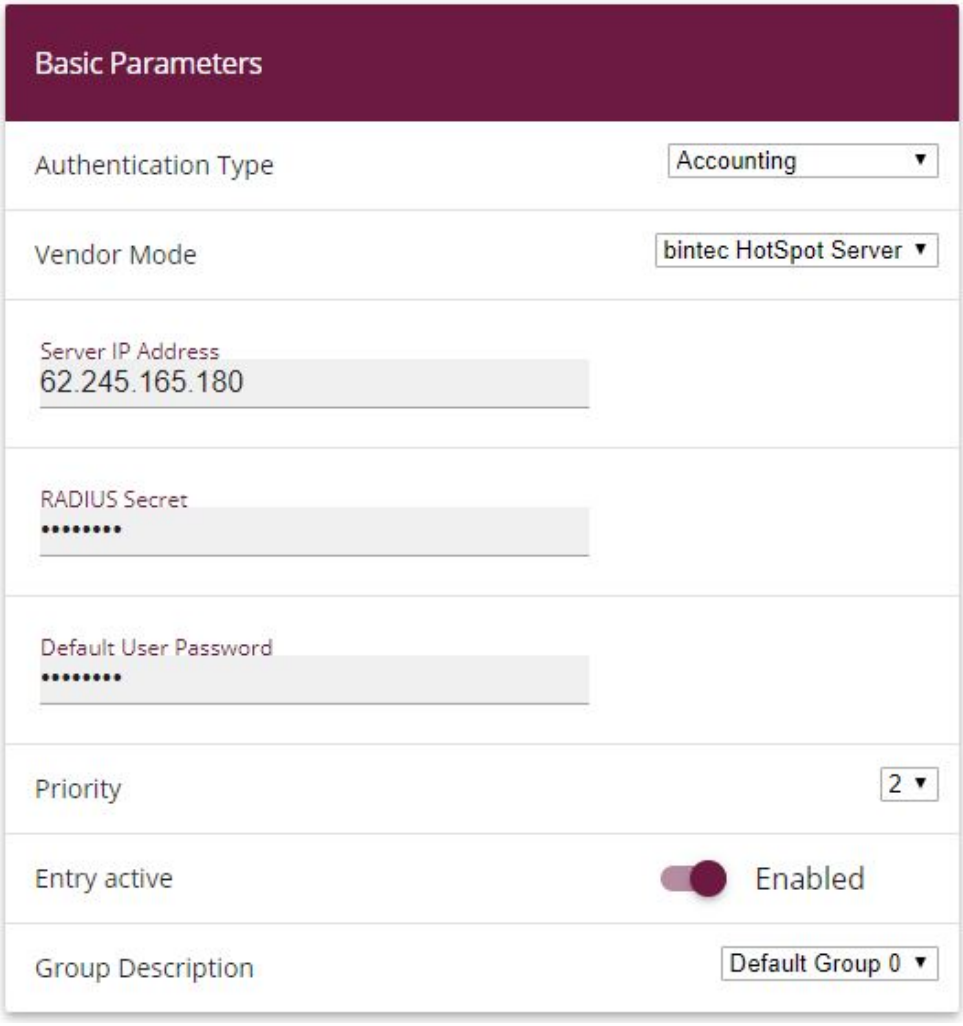


Fig. 18: **System Management** -> **Remote Authentication** -> **RADIUS** -> **New**

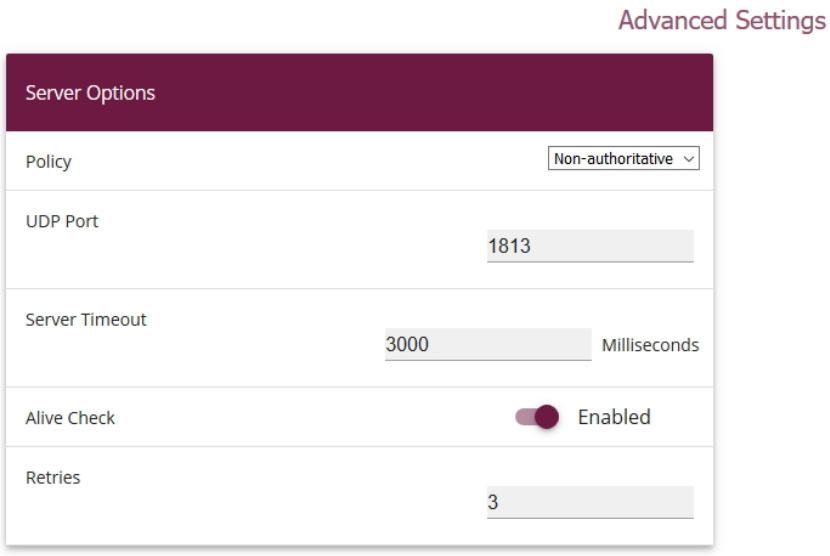


Fig. 19: **System Management** -> **Remote Authentication** -> **RADIUS** -> **New**->**Advanced Settings**

Proceed as follows:

(1) In **Authentication Type**, select *Accounting*.

(2) As the **Vendor Mode** choose *bintec HotSpot Server*.

(3) Enter the **Server IP Address** *62.245.165.180* of the RADIUS server.

(4) Enter the **RADIUS Secret** *funkwerk-ec*.

(5) Set **Priority** to *2*. The server with the highest priority will be used first.

(6) Click **Advanced Settings**.

(7) Select the **Policy** type *Non-authoritative*.

(8) Set **Server Timeout** to *3000*.

(9) Set **Retries** to *3*.

(10) Confirm with **OK**.

To configure the second entry, go again to the menu:

(1) Go to **System Management** -> **Remote Authentication** -> **RADIUS** -> **New**.

Proceed as follows:

(1) In **Authentication Type**, select *Login Authentication*.

(2) Enter the **Server IP Address** *62.245.165.180* of the RADIUS server.

(3) Enter the **RADIUS Secret** *funkwerk-ec*.

(4) Set **Priority** to *1*.

(5) Click **Advanced Settings**.

(6) Select the **Policy** type *Non-authoritative*.

(7) Confirm with **OK**.

2.3.2 Configuration of the bintec Hotspot server by the dealer

Dealers/service providers wishing to set up bintec Hotspot service receive the access data for an administrator access when ordering. This access allows the service provider to perform all relevant configurations and presets for his customers.

The dealer must determine these settings and configurations:

- Complete client profile
- Create users
- Create the desired rates
- Edit locality

Complete client profile

(1) Launch an Internet browser and open the page at *https://hotspot.bintec-elmeg.com*.

(2) Enter your user name in the **User name** field of the input window.

(3) Enter your password in the **Password** field of the input window and click on the **Login** button.

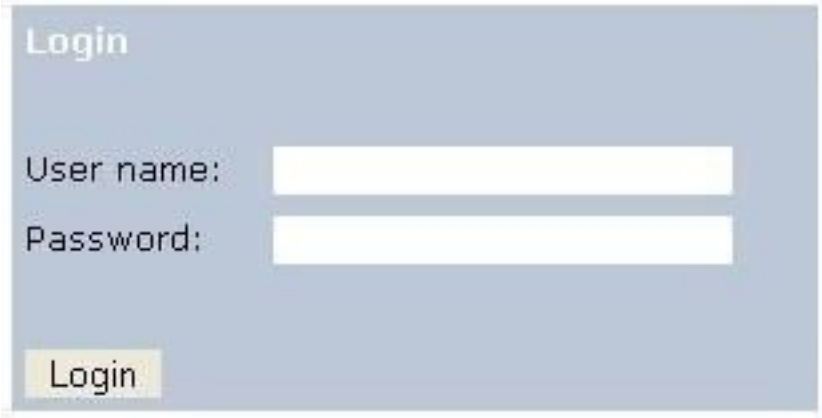


Fig. 20: Login

Proceed as follows to edit the client profile:

(1) Go to **Client** -> **Overview**.

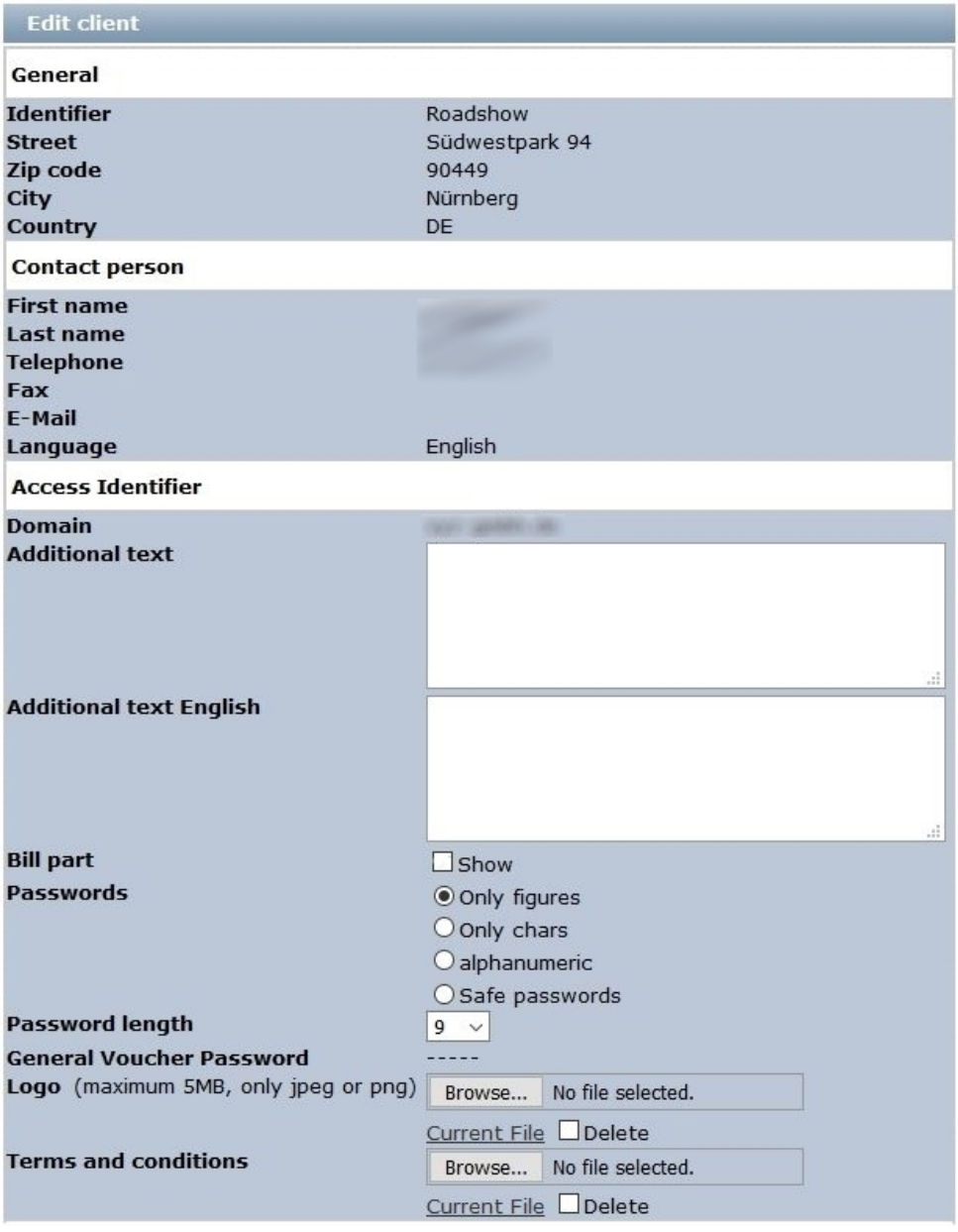


Fig. 21: **Client**-> **Edit Client**

Proceed as follows:

(1) Under **Logo** select the file with **Browse...** via the file browser. Under **Logo**, you can upload your company logo in PNG format. Your logo will appear on each printout. (The Logo of the users starting page, you can configure via edit template.)

(2) Under **Terms and conditions**, you can upload your company-specific terms and conditions for the Hotspot. However, this is only necessary if you use the Default Free Service; usually, you'll save the general terms and conditions on your own webspace (refer to **Location**->**Overview**->**Upload Manager**).

(3) Confirm your entries with **Save**.

Note

Under **Passwords** we recommend you to select the parameter *Only figures*. Thus, entering the password on Tablet PCs or with different keyboard layouts is made easier.

Create users

A list of all users is displayed in **Users** -> **Overview**. The dealer can create users. Proceed as follows:

(1) Go to **User**-> **New assistant**.

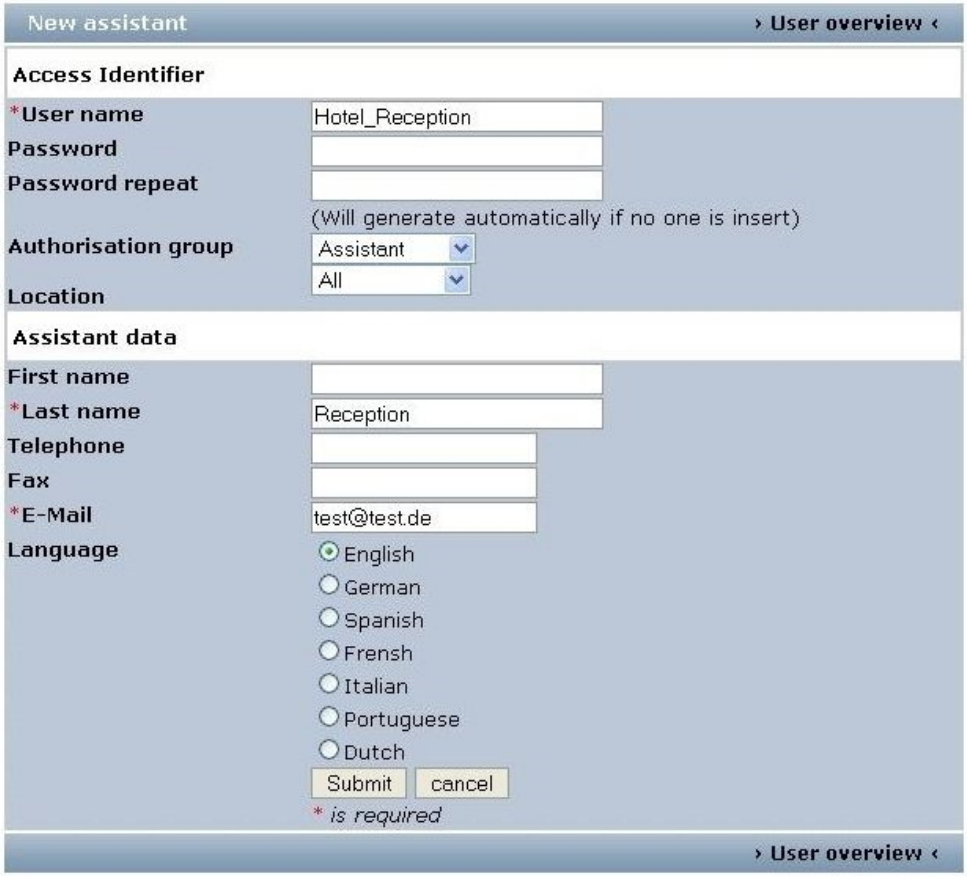


Fig. 22: **User** -> **New assistant**

Die fields **User name**, **Last name** and **E-Mail** are required fields.

Proceed as follows:

(1) Under **User name** enter *Hotel_Reception* for example.

(2) Under **Authorisation group** select *Assisant*. The assistant can only manage accounts, e.g., as needed for a hotel reception. The administrator can manage localities, users, charges and accounts, but cannot create new clients.

(3) Select a **Location**, in case several localities exist.

(4) Under **Last name** enter the surname of the user, e.g. *Reception*.

(5) Enter the **E-Mail** address of the user, e.g. *test@test.de*. The access data are automatically sent to the indicated e-mail address.

(6) Confirm your entries with **Submit**.

Create rates

A list of all created rates is displayed in **Tariff** -> **Overview**. You can edit existing rates or create new ones.

(1) Go to **Tariff** -> **New tariff** to create a new rate.

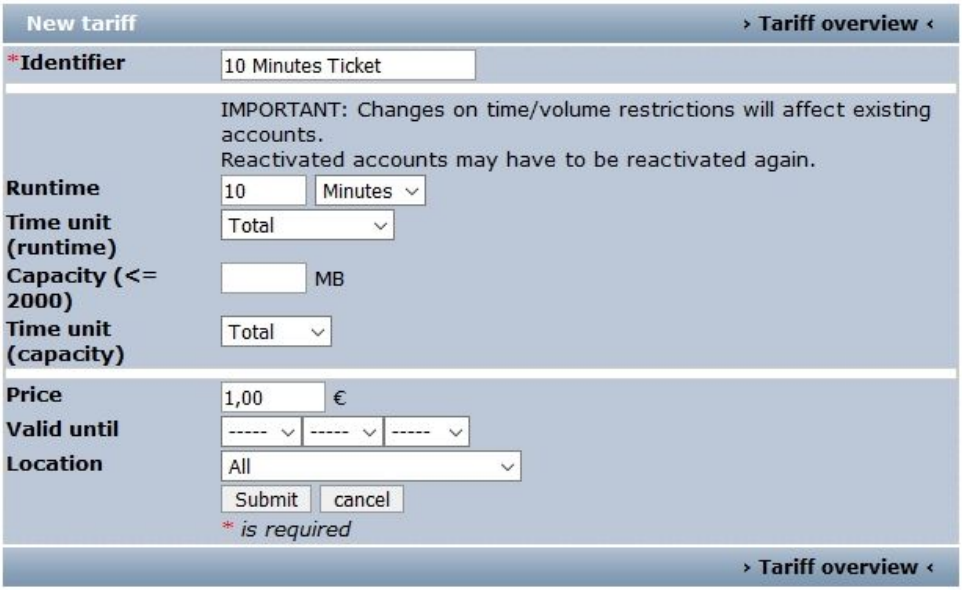


Fig. 23: **Tariff** -> **New tariff**

The **Identifier** field is a mandatory field.

Proceed as follows to create a new charge:

(1) Under **Identifier** enter a identifier for the rate, *10 Minute Ticket* for example.

(2) Enter the **Runtime**, e.g. *10* minutes.

(3) Select the **Time unit (runtime)** *Total*.

Note

Note that the available time begins to run when the user logged in for the first time. Inactivity or logging out does not stop time from decreasing. *Total* means the overall available runtime while the *daily* setting provides the available runtime every day.

The price is a symbolic parameter displayed on the pint-out.

(4) Under **Price** if applicable, enter a price in Euro, *1.00* for example.

(5) Enter an end date for the runtime of a time or volume rate.

(6) Under **Location** select `All`.

(7) Confirm your entries with **Submit**.

Tip

If you wish to enter a permanent flatrate, under **Runtime** enter `1440` minutes and under **Time unit (runtime)** select `daily`.

Edit locations

In the menus for the desired login method, you can edit a location in the **Location**-> **Overview**-> **<Edit Location>** submenu. There, the upload manager allows you to upload your terms and conditions into the provided **Home** directory.

If you intend to create additional locations, you can purchase a corresponding license, enter your data and then activate the new location at *www.bintec-elmeg.com* under **Hotspot Licensing**.

2.3.3 Administration of Hotspot accounts

You can manage Hotspot accounts on-site via the *https://hotspot.bintec-elmeg.com/* user interface. You've already received the login data per e-mail.

Creation of an account

You can generate a new ticket for a Hotspot user. Here, you can choose between simple entry and advanced entry. For simple entry, go to the following menu:

(1) Go to **Account** -> **New Account (easy)**.

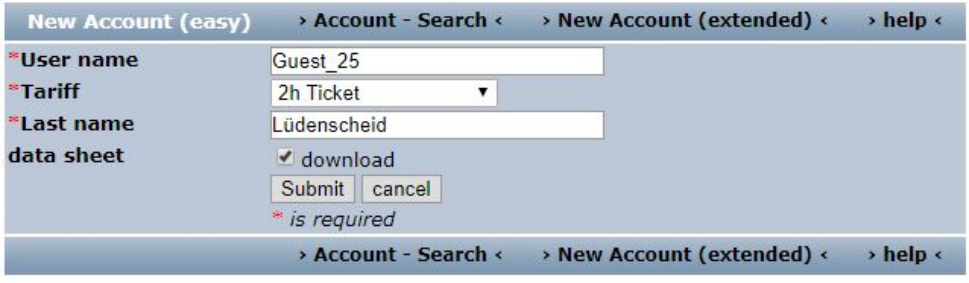


Fig. 24: **Account** -> **New Account (easy)**

The fields **User name**, **Tariff** and **Last name** are required fields.

Proceed as follows:

(1) Under **User name** enter *Guest_25* for example.

(2) Select the **Tariff** , e.g. *2h Ticket*. The rate selection can be expanded by your administrator.

(3) Under **Last name** enter *Lüdenscheid* for example.

(4) Confirm your entries with **Submit**.

Click **>Help<** for additional information.

For advanced entry, go to the following menu:

(1) Go to **Account** -> **New Account (extended)**.

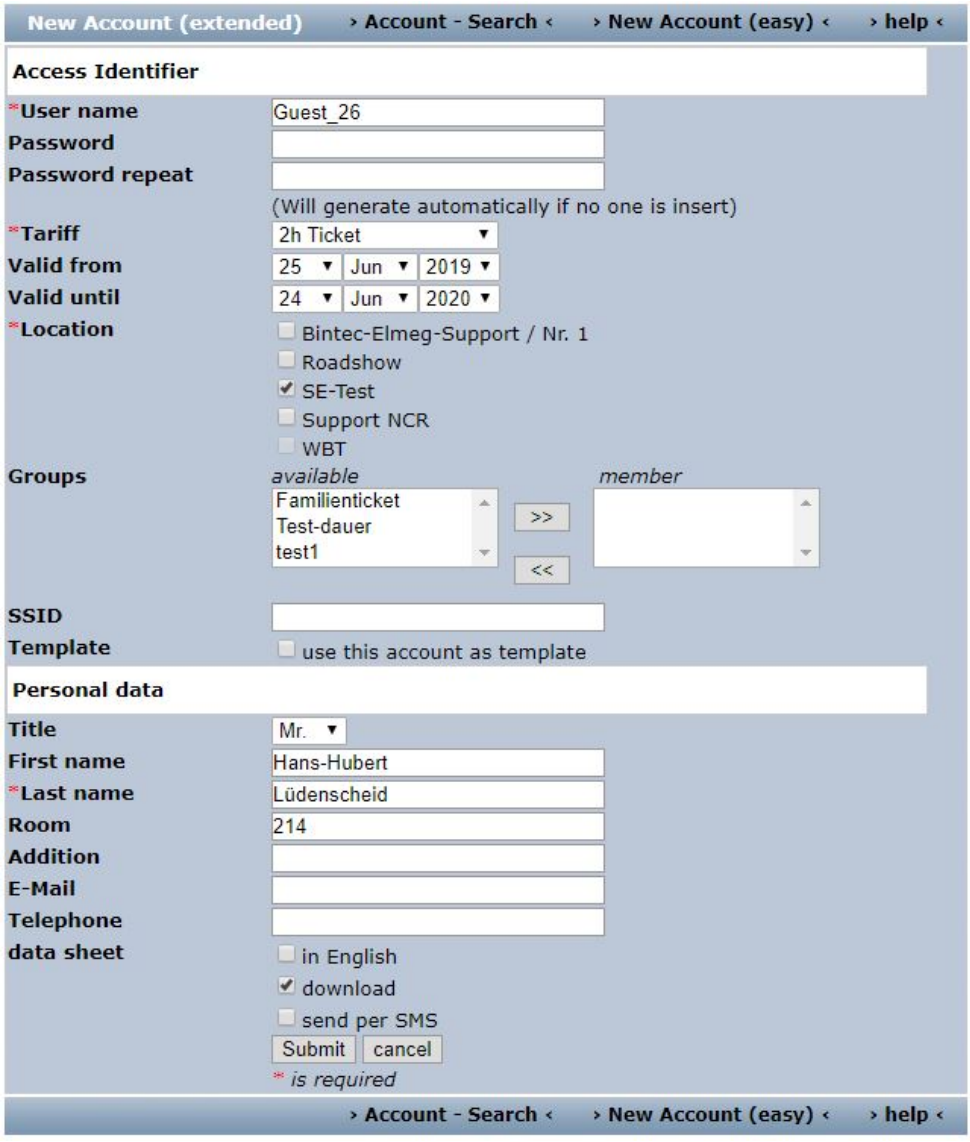


Fig. 25: **Account** -> **New Account (extended)**

Die fields **User name**, **Last name**, **Tariff** and **Location** are required fields.

Proceed as follows:

(1) Under **User name** enter *Guest_26* for example.

(2) Select the **Tariff** , e.g. *2h Ticket*. The tariff selection can be extended by your administrator.

(3) Select the **Location**, e.g. *SE-Test*.

(4) Under **Groups**, you can merge several tickets to a group and disable internet access for this group during a certain period.
Under **Account**->**Groups**, the existing groups are displayed. You can disable internet access for a group. To do so, click on the displayed number in the **actions** column of the desired group and then click on **New action**. In the **New group action** window, you can set the period for which to block internet access. This is useful, for example, to block internet access for students of a class during a test.

(5) The **SSID** field is optional, and is printed on the ticket.

(6) Under **First name** enter *Hans-Hubert* for example.

(7) Under **Last name** enter *Lüdenscheid* for example.

(8) Under **Room** enter *214* for example.

(9) Confirm your entries with **Submit**.

Click **>Help<** for additional information.

Manage account

Under **Account**, you can enable a new ticket for a Hotspot user, delete accounts and read off the remaining time. In addition, you can print the access data for your customer or generate a PDF file.

(1) Go to **Account** -> **Overview** to activate a new ticket.
To enable a newly-created user, you must first click on **Amount**. The display then switches to *Paid*.
Click **>Help<** for additional information.

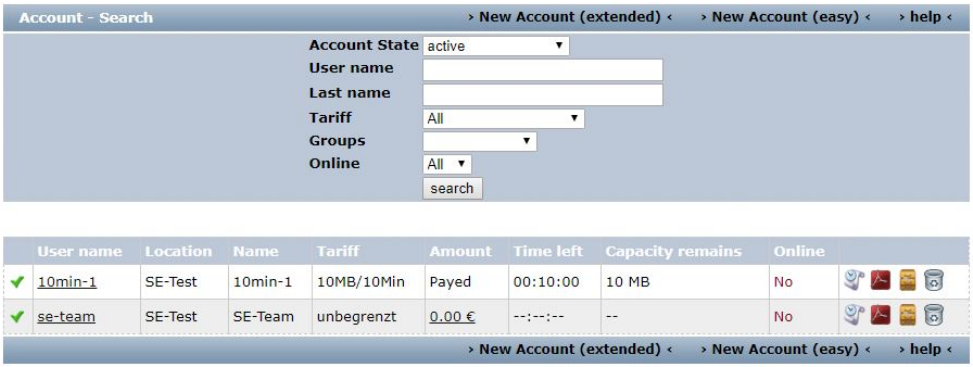


Fig. 26: **Account** -> **Overview**

2.3.4 Operation at several locations

The **bintec Hotspot Solution** allows operation of a Hotspot across locations. The Hotspot user tickets can be managed in a centralised or decentralised manner. It is possible to generate tickets which are only valid for a specific location, as it is possible to generate tickets that are valid for all locations.

As is generally known, the Hotspot server is centrally located and identical for all bintec customers (clients). Detection of which client is communicating with the Hotspot RADIUS server occurs over the so-called domain. At licence activation, this domain is issued over the licence portal (*www.bintec-elmeg.com* **Service & Support**->**Product Licencing** -> **HotSpot Licencing**) and entered at configuration of the **bintec RS353xx**. In the case of a solution with several locations, this domain is identical for all locations.

In order to nevertheless allow differentiation of locations, the `RadiusNasId` parameter is introduced.

Configuring the bintec Hotspot server

After you log in with your access data at *https://hotspot.bintec-elmeg.com*, all configured locations are displayed in the **Location** -> **Overview** menu.

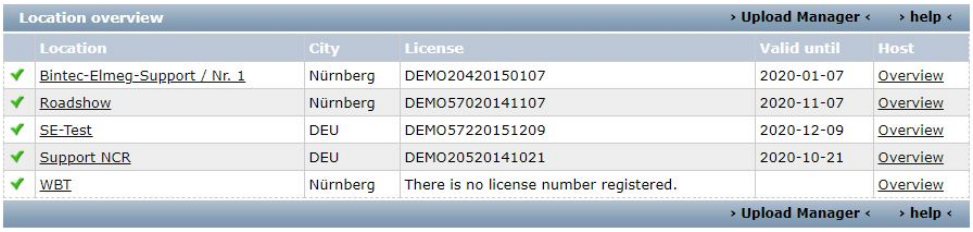


Fig. 27: **Location** -> **Overview**

Upload Manager

Click **Upload Manager** in the **Location** menu to upload your company-specific terms and conditions, for example.

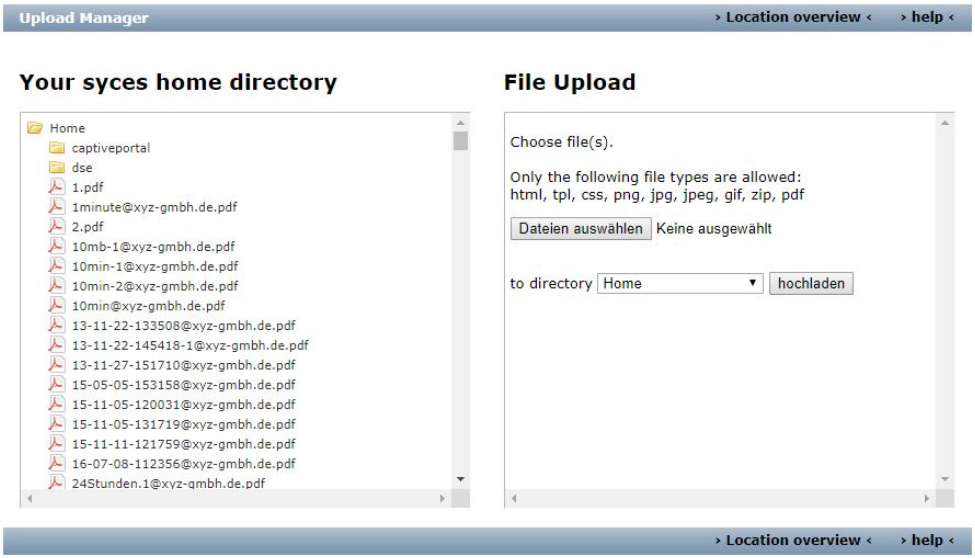


Fig. 28: **Upload Manager**

Click **>Help<** for information on how to use the upload manager.

Edit location

In **Location overview** select a *Location*. A detailed view of locations is now displayed. Here, you can edit **Location**.

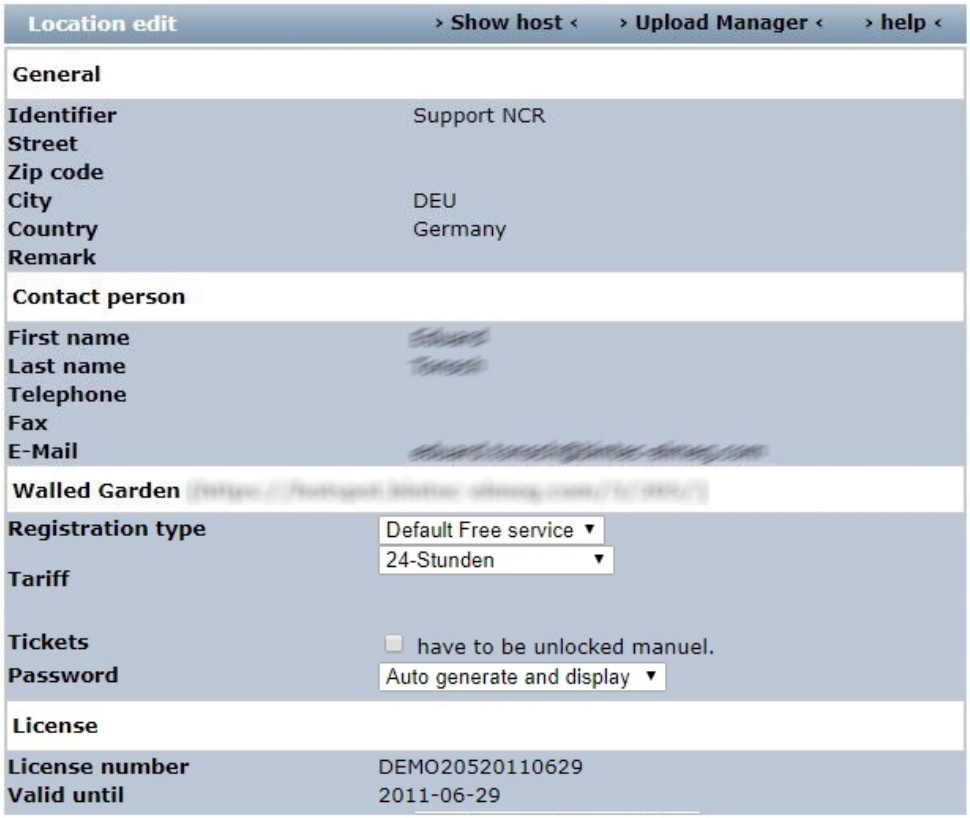


Fig. 29: **Location edit**

In the **Location edit** menu, you also have the option of switching to **Show host**.

(1) Go to **Show host**.

Fig. 30: **Show host**

Here, the **NAS Identifier** is displayed, which is required for **bintec RS353xx** configuration of the parameter **Host for multiple locations** under **Local Services**->**Hotspot Gateway**->**Options**.

Note

Note that you can only use a tariff for a special location, if a NAS identifier is set here and entered in the gateway too.

If no NAS identifier is displayed, you can set it under **New host**.

If you now create an **Account** or a **Voucher**, under **Location** you can select a location or `All`.

If you select `All` the account is valid for all locations.

(1) Go to **Voucher** -> **New voucher** to create a voucher.

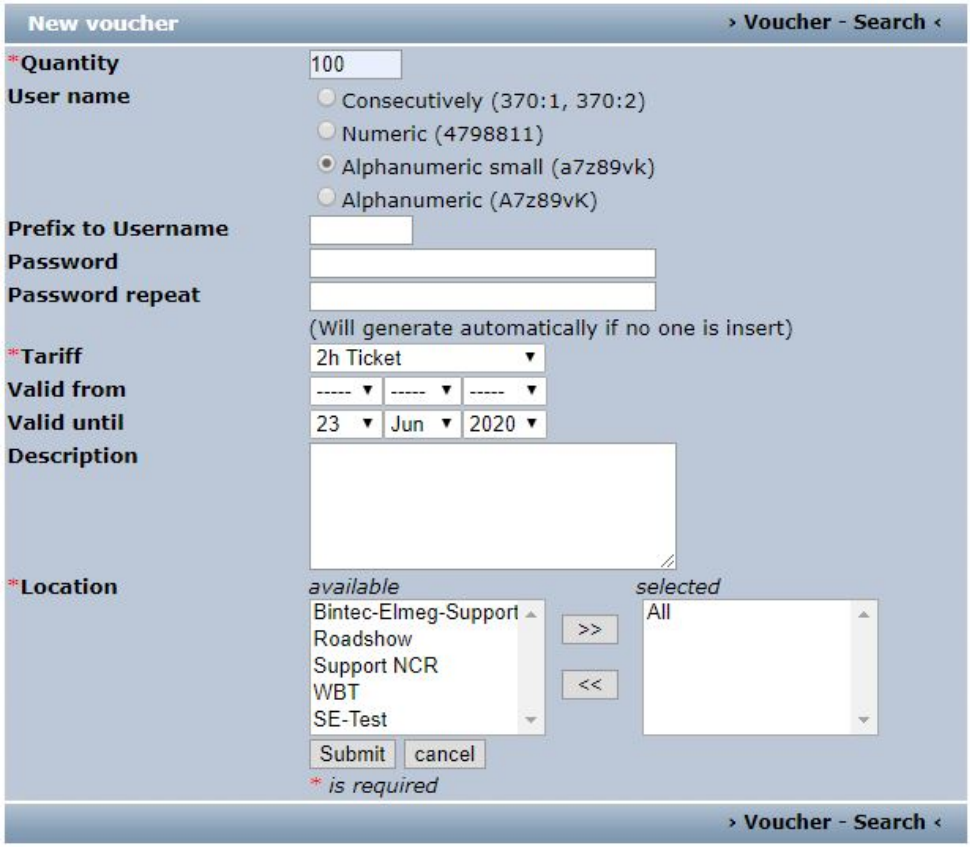


Fig. 31: New voucher

Fill in the mandatory fields **Quantity**, **Tariff** and **Location**.

Proceed as follows:

(1) Enter *100* for **Quantity**, for example.

(2) Select a **Tariff** , e. g. *2h Ticket*. The rate selection can be extended by your administrator.

(3) Under **Location** select *All*.

(4) Confirm your entries with **Submit**.

2.4 Configuring login methods

The hotspot server provides the login page for the hotspot.

Features

- There are 3 designs available (standard blue, standard grey, custom).
- The design of the login page is optimised for PC, tablet PC and smartphones. The display adjusts automatically, depending on the device.
- The language is selected automatically and is the same as the language of the browser.
- Any guest who has logged in before is automatically logged in again (Cookie-based).

Authentication processes

The following authentication methods are available for hotspot login:

- Anonymous
- 1-Click
- SMS
- PayPal

Below, you will learn how to configure a particular authentication method for hotspot login.

2.4.1 Anonymous login

With this authentication method a user can log into a hotspot free of charge simply by accepting the General Terms and Conditions.

Fig. 32: Anonymous login

Configuring the bintec hotspot server

First, configure the authentication method on the hotspot server.

(1) Start a Web browser, open the *https://hotspot.bintec-elmeg.com* page and enter your login data.

(2) Go to **Location** -> **<Edit location>**.

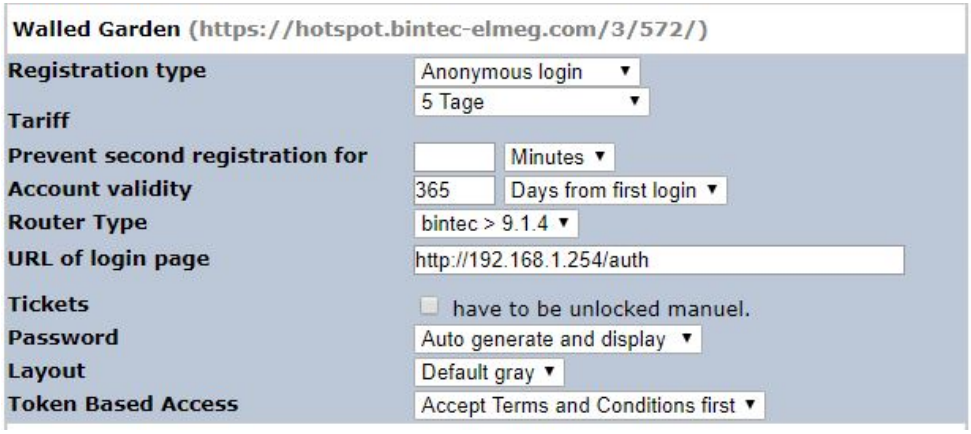


Fig. 33: **Location** -> **<Edit location>**

To create a new location, proceed as follows:

(1) For the **Registration type**, select *Anonymous login*.

(2) Select a **Tariff**, e. g. *5 Days*.

(3) The **URL of login page** is the local IP address for the hotspot gateway, here e. g. *http://192.168.1.254/auth*.

Note

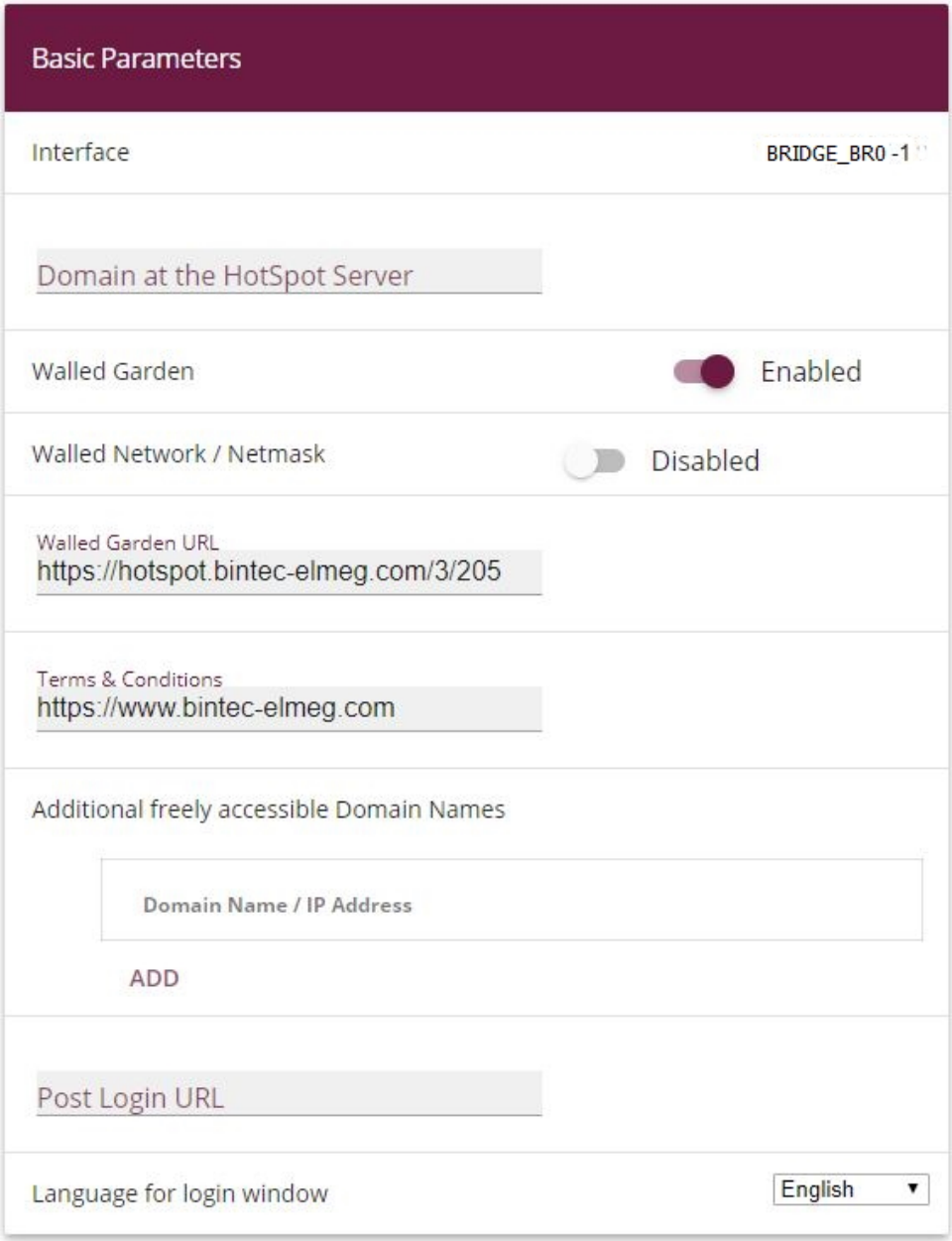
Note that the IP address appendix */auth* is essential for operation here.

(4) Press **Submit** to confirm your entries.

Configuring the bintec gateway

Establish a web connection to the bintec gateway (e. g. **bintec RS353xx**).

(1) Go to **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** .


Basic Parameters
Interface
BRIDGE_BR0 -1
Domain at the HotSpot Server
Walled Garden
Enabled
Walled Network / Netmask
Disabled
Walled Garden URL
https://hotspot.bintec-elmeg.com/3/205
Terms & Conditions
https://www.bintec-elmeg.com
Additional freely accessible Domain Names
Domain Name / IP Address
ADD
Post Login URL
Language for login window
English

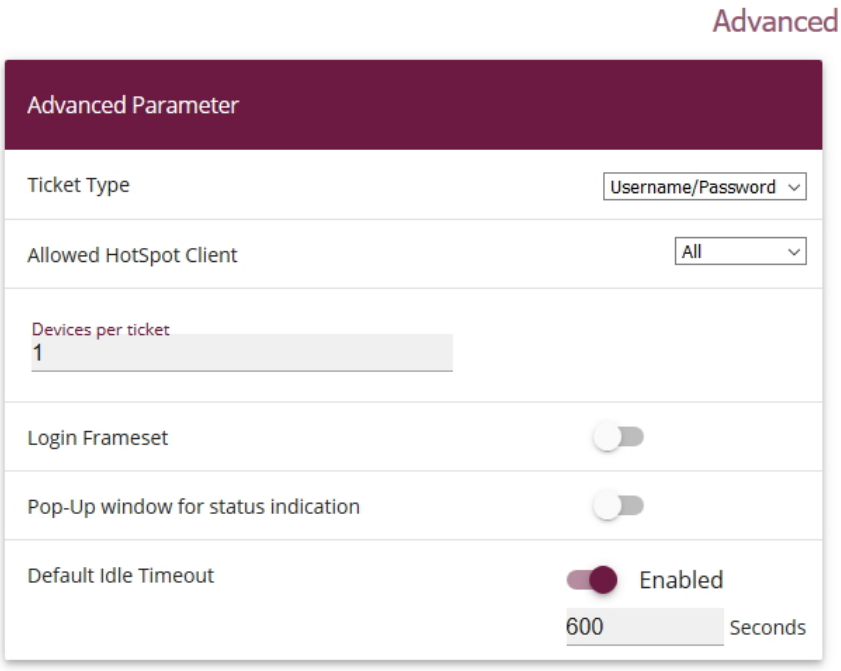


Fig. 35: **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1**

Proceed as follows in order to configure Hotspot-Gateway:

(1) Enable the **Walled Garden** function so that you can define a charge-free area on websites (intranet).

(2) Enter the login page provided by the hotspot server as the **Walled Garden URL**, here e. g. *https://hotspot.bintec-elmeg.com/3/205/*.

(3) In the **Terms & Conditions** input field enter the address of the General Terms and Conditions on the intranet server, or public server, e.g., *http://www.bintec-elmeg.com*. The page must lie within the address range of the walled garden network.

(4) Disable the **Login Frameset** function. When the function is disabled, only the website with information, adverts and/or links to freely accessible websites is displayed.

(5) Confirm with **OK**.

2.4.2 1-Click

With this authentication method a user can log into a hotspot free of charge by entering his email address.

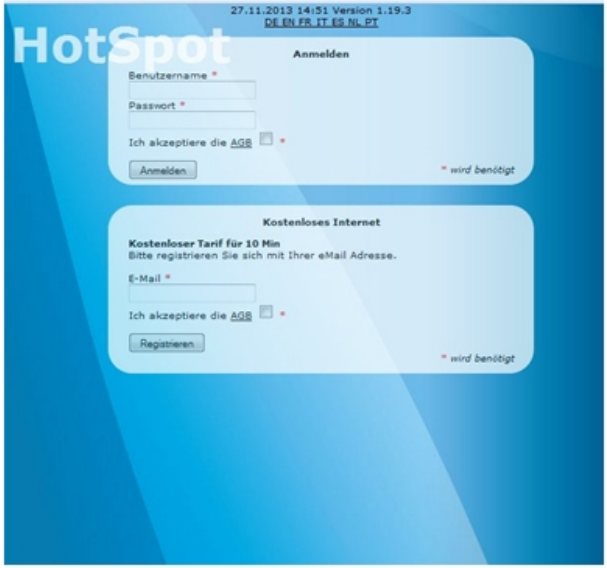


Fig. 36: 1-Click login

Users have to enter their email address and accept the General Terms and Conditions. Then, they are logged in automatically as guests. They receive an email containing credentials so that they can log in with a second device if required.

Configuring the bintec hotspot server

First, configure the authentication method at the hotspot server.

(1) Go to the **Location** ->**Overview**-> **<Edit location>** menu.

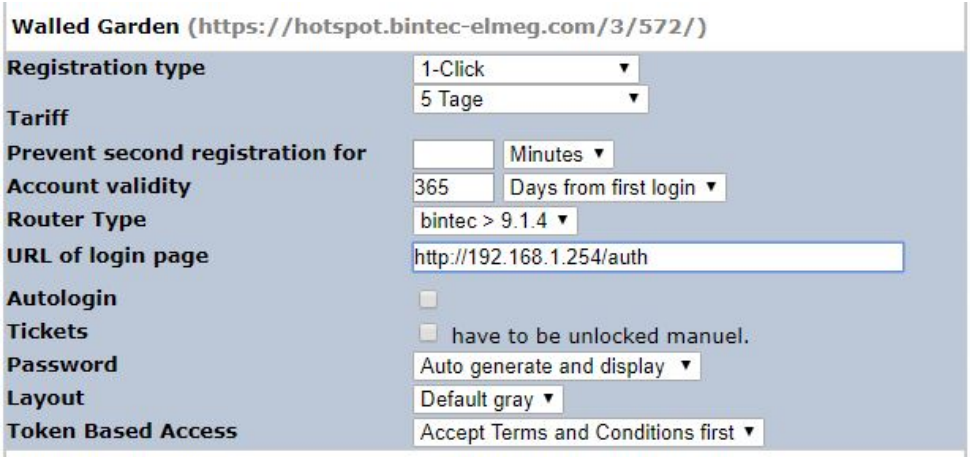


Fig. 37: **Location** ->**Overview**-> **<Edit location>**

To edit a location, proceed as follows:

(1) The page provided by the hotspot server is displayed as a **Walled Garden** URL.

(2) Here you select the *1-Click* login method under **Type**.

(3) Select a **Tariff**, e. g. *5 Days*.

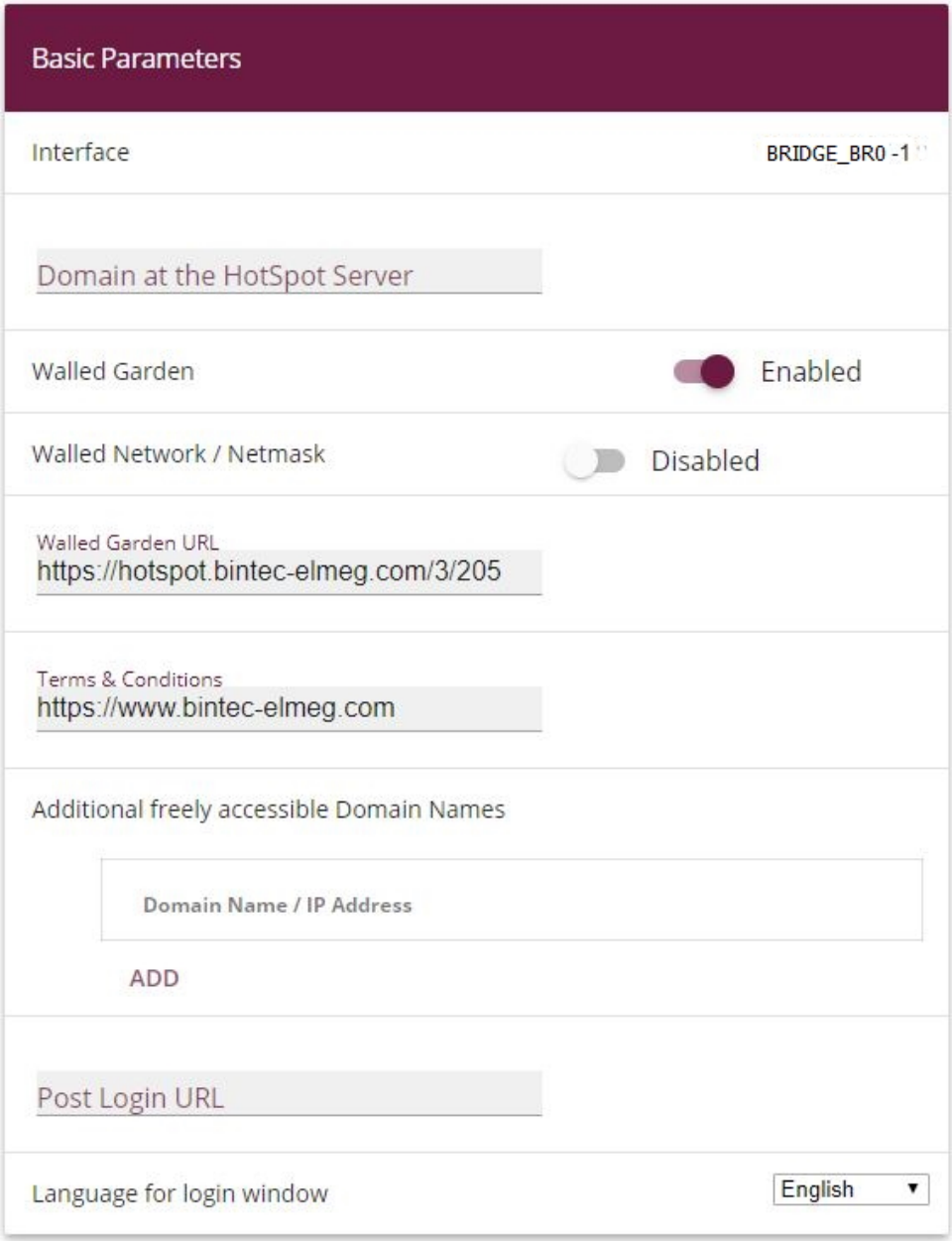
(4) The **URL of login page** is the local IP address for the hotspot gateway, here e. g. *http://192.168.1.254/auth*.

(5) Press **Submit** to confirm your entries.

Configuring the bintec hotspot gateway

Open a Web browser and establish a web connection to the bintec gateway (e. g. **bintec RS353xx**).

(1) Go to **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** .


Basic Parameters
Interface
BRIDGE_BR0 -1
Domain at the HotSpot Server
Walled Garden
Enabled
Walled Network / Netmask
Disabled
Walled Garden URL
https://hotspot.bintec-elmeg.com/3/205
Terms & Conditions
https://www.bintec-elmeg.com
Additional freely accessible Domain Names
Domain Name / IP Address
ADD
Post Login URL
Language for login window
English

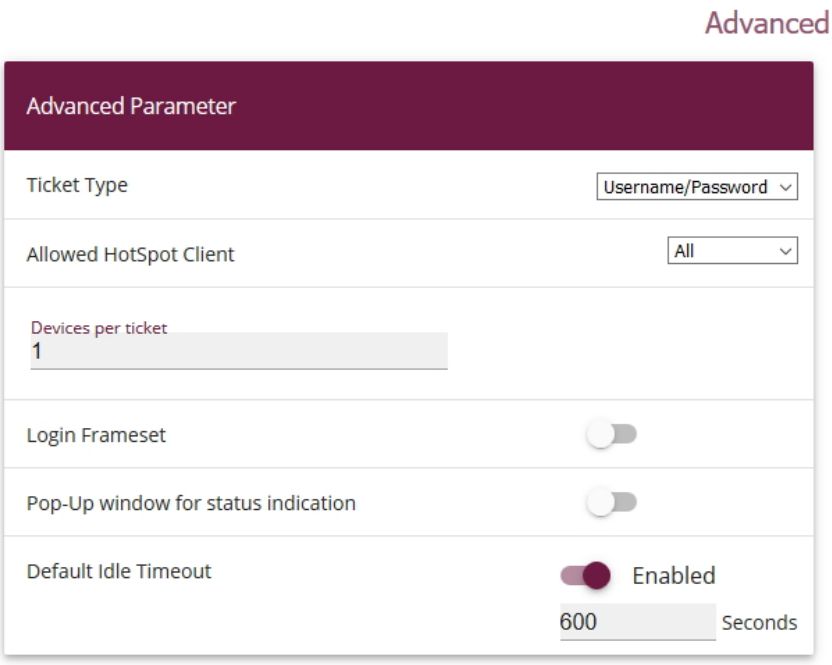


Fig. 39: **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1**

Proceed as follows in order to configure Hotspot-Gateway:

(1) Enable the **Walled Garden** function so that you can define a charge-free area on websites (intranet).

(2) Enter the login page provided by the hotspot server as the **Walled Garden URL**, here e. g. *https://hotspot.bintec-elmeg.com/3/205/*.

(3) In the **Terms & Conditions** input field enter the address of the General Terms and Conditions on the intranet server, or public server, e.g., *http://www.bintec-elmeg.com*. The page must lie within the address range of the walled garden network.

(4) Disable the **Login Frameset** function. When the function is disabled, only the website with information, adverts and/or links to freely accessible websites is displayed.

(5) Confirm with **OK**.

2.4.3 SMS

With this authentication method users can register at a hotspot free of charge by entering their mobile phone number. They will be sent an SMS containing credentials that they needs to enter on the login page. Additionally, they have to accept the terms and conditions.

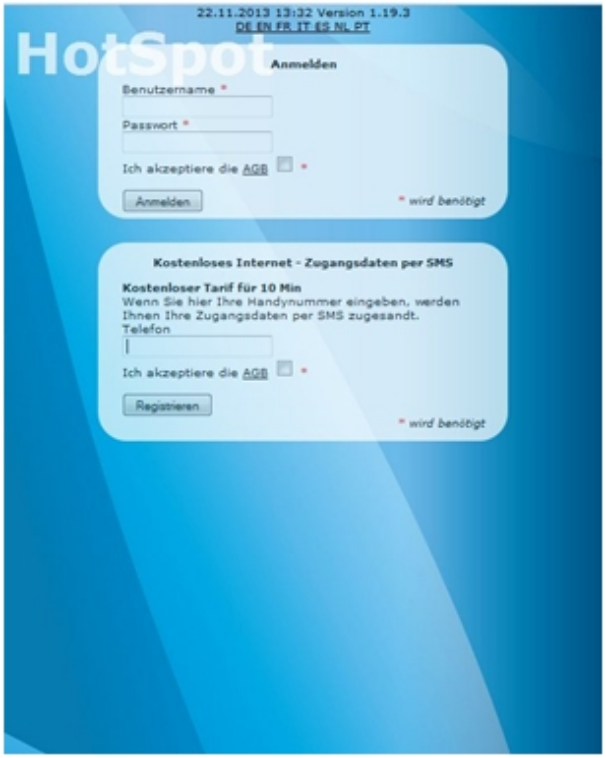


Fig. 40: SMS login

The service uses an SMS service provider to send access codes, *www.lox24.de* for example. **LOX24** requires an account to be created on *www.lox24.de* or on *www.lox24.eu*. **LOX24** offers different tariffs, **Economy** for example. For starters, a test account can be created on **LOX24**.

Configuring the bintec hotspot server

(1) Start a Web browser, open the *https://hotspot.bintec-elmeg.com* page and enter your login data.

(2) Go to the **Client** -> **<Edit Client>** menu.

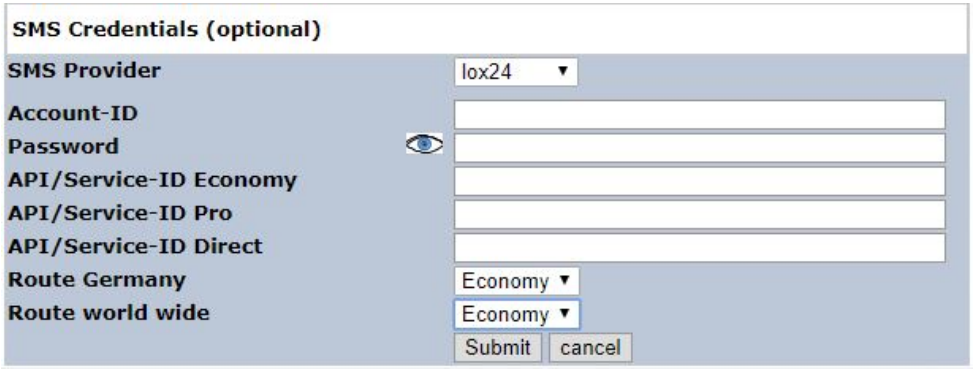


Fig. 41: **Client** -> **<Edit Client>**

Proceed as follows:

(1) Under **SMS Credentials** select **SMS Provider** *lox24*.

Note

Note that **smstrade** is also available, but it can not be used for new installations.

(2) For the **Route Germany**, select the tariff, e. g. *Economy*.

(3) Press **Submit** to confirm your entries.

Now select the **Login Method**.

(1) Go to **Location** -> **<Edit Location>**.

Fig. 42: **Location** -> **<Edit Location>**

Proceed as follows to edit the location:

(1) The page provided by the hotspot server is displayed as a **Walled Garden** URL.

(2) Here you select the *SMS* login method under **Registration type**.

(3) Select a **Tariff**, e. g. *5 Days*.

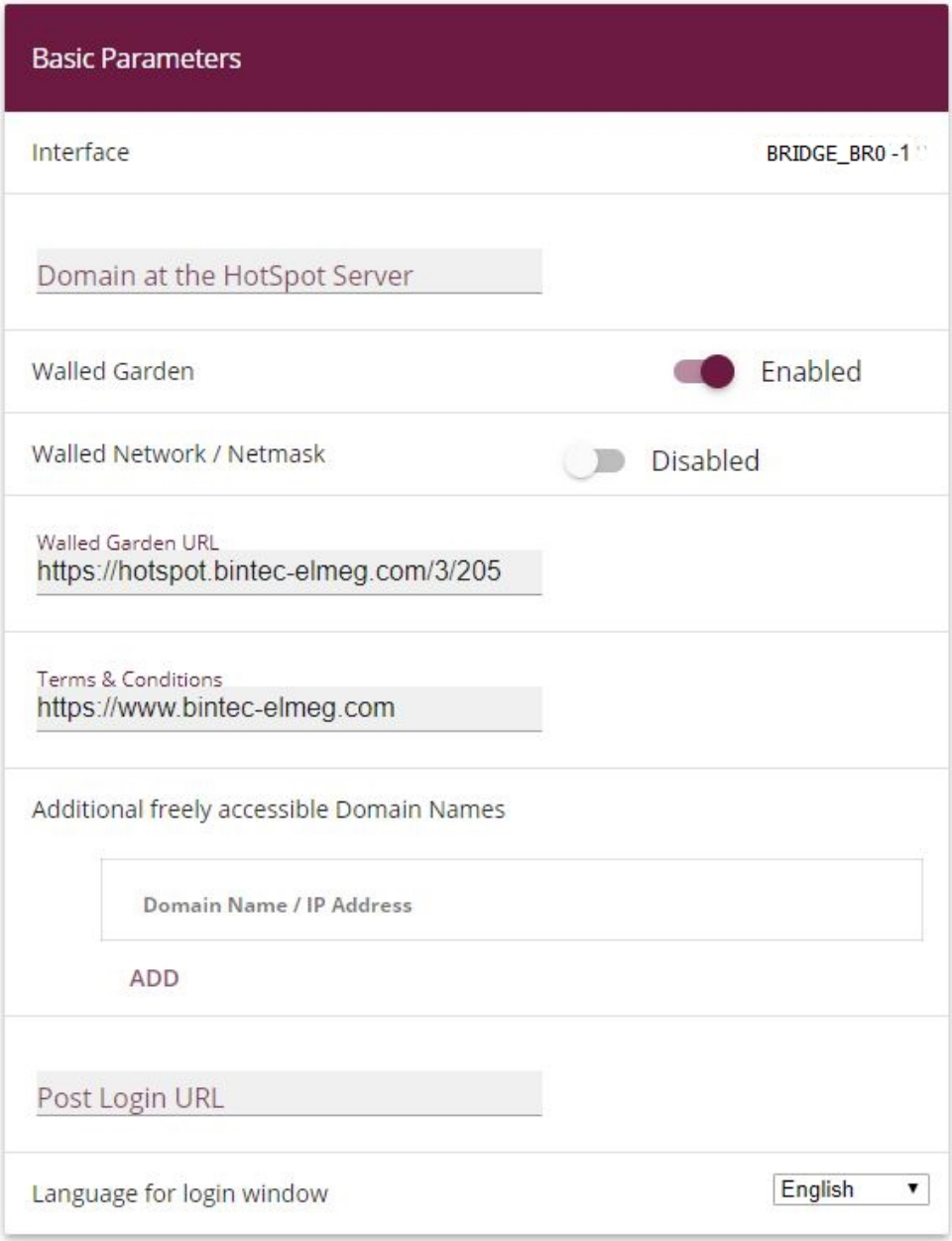
(4) The **URL of login page** is the local IP address for the hotspot gateway, here e. g. *http://192.168.1.254/auth*.

(5) Press **Submit** to confirm your entries.

Configuring the bintec hotspot gateway

Establish a web connection to the bintec gateway (e. g. **bintec RS353xx**).

(1) Go to **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** .


Basic Parameters
Interface
BRIDGE_BR0 -1
Domain at the HotSpot Server
Walled Garden
Enabled
Walled Network / Netmask
Disabled
Walled Garden URL
https://hotspot.bintec-elmeg.com/3/205
Terms & Conditions
https://www.bintec-elmeg.com
Additional freely accessible Domain Names
Domain Name / IP Address
ADD
Post Login URL
Language for login window
English

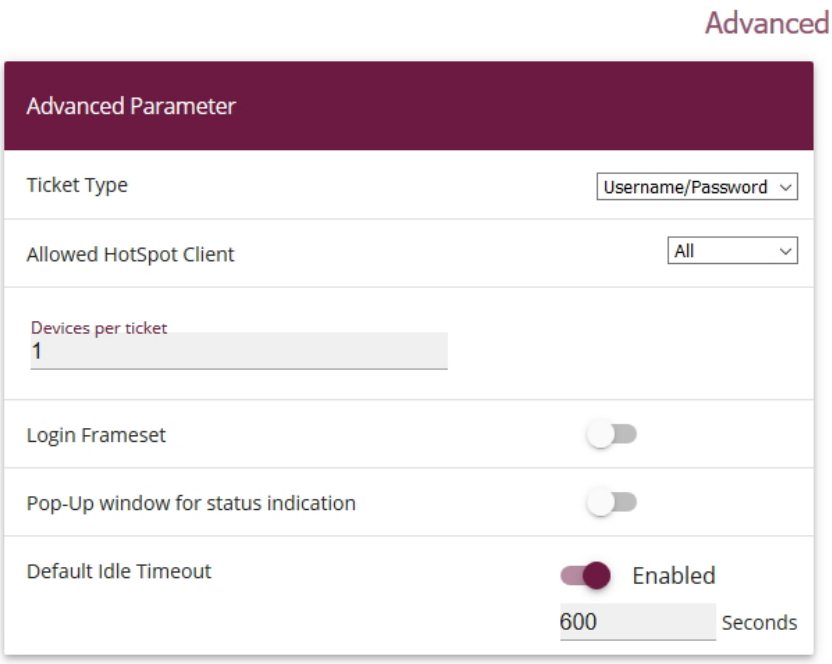


Fig. 44: **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1**

Proceed as follows in order to configure Hotspot-Gateway:

(1) Enable the **Walled Garden,** function so that you can define a charge-free area on websites (intranet).

(2) Enter the login page provided by the hotspot server as the **Walled Garden URL**, here e. g. *https://hotspot.bintec-elmeg.com/3/205/*.

(3) In the **Terms & Conditions** input field enter the address of the General Terms and Conditions on the intranet server, or public server, e.g., *http://www.bintec-elmeg.com*. The page must lie within the address range of the walled garden network.

(4) Disable the **Login Frameset** function. When the function is disabled, only the website with information, adverts and/or links to freely accessible websites is displayed.

(5) Confirm with **OK**.

2.4.4 PayPal

With the PayPal authentication method a fee-paying hotspot service is available.

Fig. 45: PayPal login

Users select a **Tariff**, e. g. `10 Minute Ticket (1.00 €)` and clicks on the **PayPal Express Buy** button. Then, the PayPal payment page is displayed. When users have made the payment they are automatically logged in. An email containing credentials is also sent to the email address registered at PayPal so that users can log in with a different device if desired.

A PayPal business account is required to use this service. It is free to register this type of account. PayPal charges a fee on the sums of money collected. Please refer to the PayPal website for details.

Configuring the bintec hotspot server

(1) Start a Web browser, open the *https://hotspot.bintec-elmeg.com* page and enter your login data.

(2) Go to **Client** -> **<Edit Client>**.

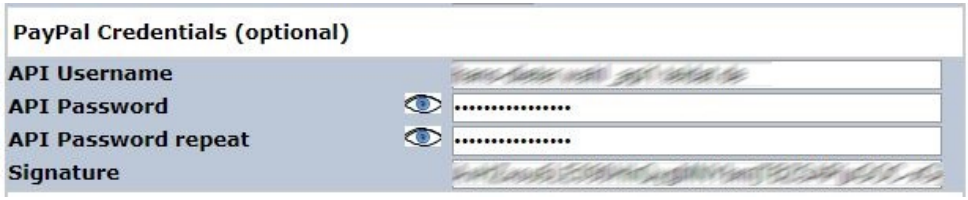


Fig. 46: **Client** -> **<Edit Client>**

Enter the API login data (**API Username**, **API Password** and the **Signature**). You can access this data via your PayPal dealer account (Mein_Profil/mehr/Verkäufer_Händler/API-Zugriff).

Now select the **Registration type**.

(1) Go to the hotspot server page at **Location** -> **<Edit Location>**.

Fig. 47: **Location** -> **<Edit Location>**

To create a new location, proceed as follows:

(1) The page provided by the hotspot server is displayed as a **Walled Garden** URL.

(2) Here you select the `Paid service` **Registration type**.

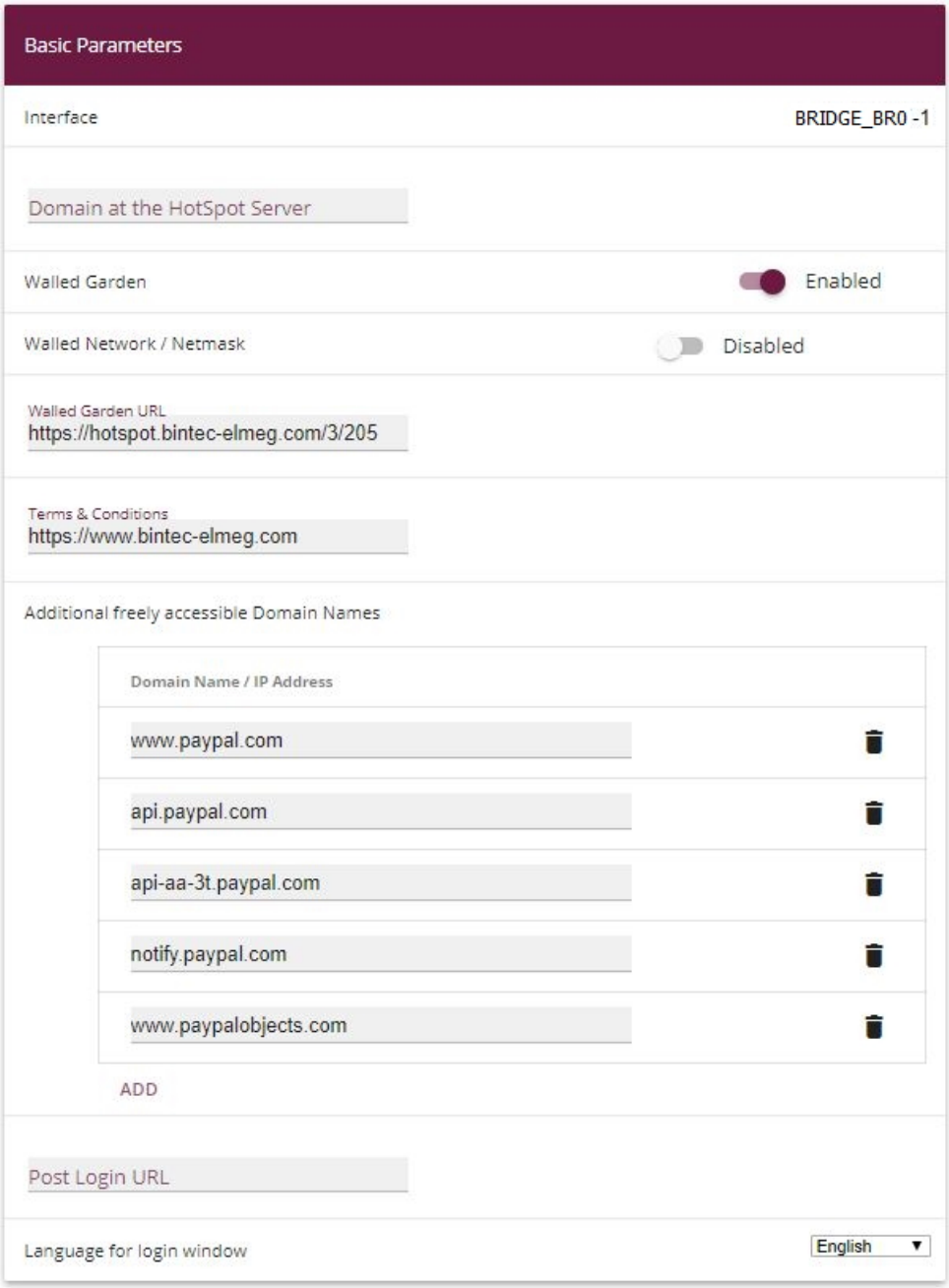
(3) The **URL of login page** is the local IP address for the hotspot gateway, here e. g. `http://192.168.1.254/auth`.

(4) Press **Submit** to confirm your entries.

Configuring the bintec hotspot gateway

To configure the hotspot gateway, establish a web connection to the bintec gateway (e. g. **bintec RS353xx**).

(1) Go to **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** ->**BRIDGE_BR0-1** .



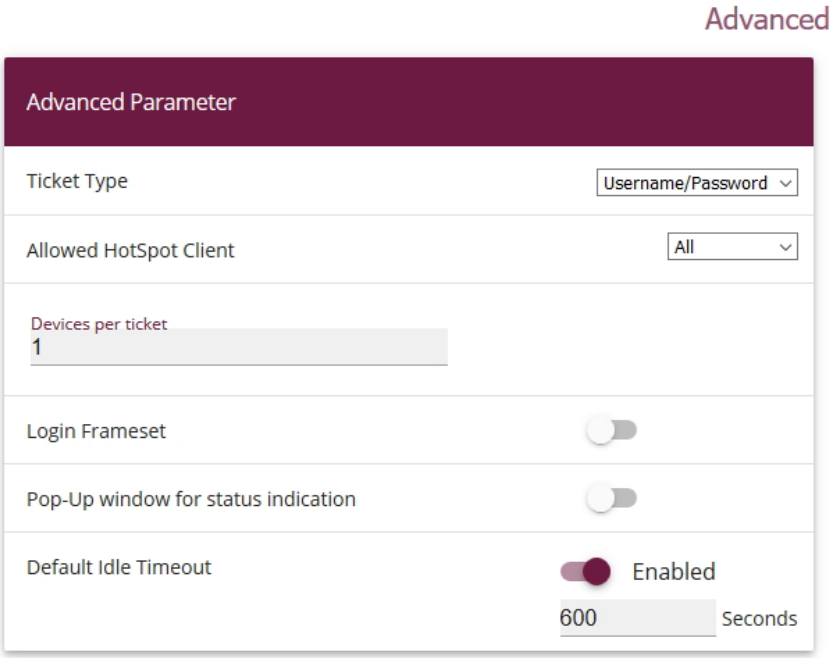


Fig. 49: **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1**

Proceed as follows in order to configure Hotspot-Gateway:

(1) Enable the **Walled Garden,** function so that you can define a charge-free area on websites (intranet).

(2) Enter the login page provided by the hotspot server as the **Walled Garden URL**, here e. g. `https://hotspot.bintec-elmeg.com/3/205/`.

(3) In the **Terms & Conditions** input field enter the address of the General Terms and Conditions on the intranet server, or public server, e.g., `http://www.bintec-elmeg.com`. The page must lie within the address range of the walled garden network.

(4) Disable the **Login Frameset** function. When the function is disabled, only the website with information, adverts and/or links to freely accessible websites is displayed.

(5) Confirm with **OK**.

Tip

Depending on the time of day it can take quite a while for the login page and the PayPal payment pages to load because of the high traffic density on the PayPal.com website. This also affects the PayPal logo on the login page because this is always loaded by PayPal.com.

With some browsers you can only avoid a security warning if you have called the **router login page** via https, for which an SSL certificate is required.

2.4.5 Default Free Service

Default Free Service is required so that previous installations will continue to work without changes. For new installations, **Default Free Service** is no longer available.

2.5 Instructions for safe operation

2.5.1 Multiple login

If configured, users can be logged in with multiple devices using a single coupon (user name, password). (Refer to **Devices per ticket** in the **Local Services**->**Hotspot Gateway**->**Hotspot Gateway**->**New**->**Advanced Settings** gateway menu.)

This is useful if they want to use a smartphone and a tablet at the same time, for example, or if there are multiple devices within a family.

2.5.2 Preventing mutual visibility of extensions

In a LAN or WLAN, all extensions at the IP level are connected to each other. This must naturally be prevented in a Hotspot system.

Hotspot with a single WLAN access point

Here, only one **bintec RS353xw** is employed as HotSpot gateway. All users are exclusively logged in over WLAN. Wired LAN is not used. Internet access is provided via a local network or ADSL.

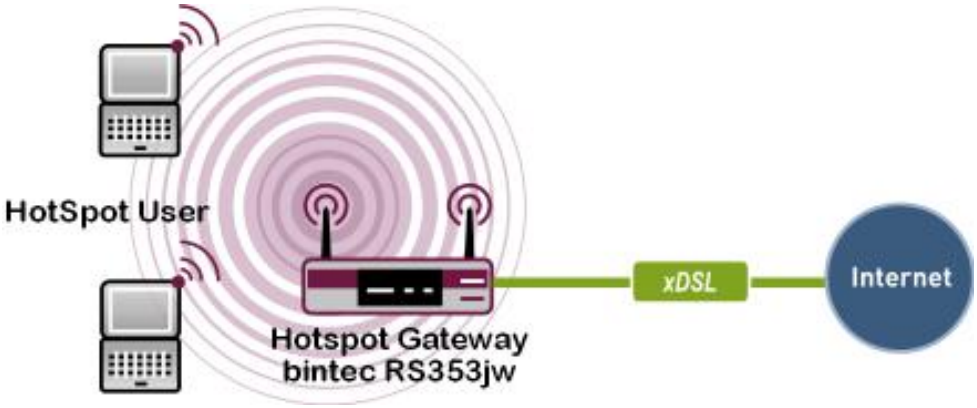


Fig. 50: Hotspot with a single WLAN access point

To prevent internal communication between Hotspot users (WLAN clients), in the menu **Wireless LAN** -> **WLAN** -> **Radio Settings** -> , the parameter **Intra-cell Repeating** must be disabled.

Hotspot with multiple WLAN access points

Here, several WLAN access points connected over LAN with the **bintec RS353xw** gateway are employed. Internet access is provided via a local network or ADSL.

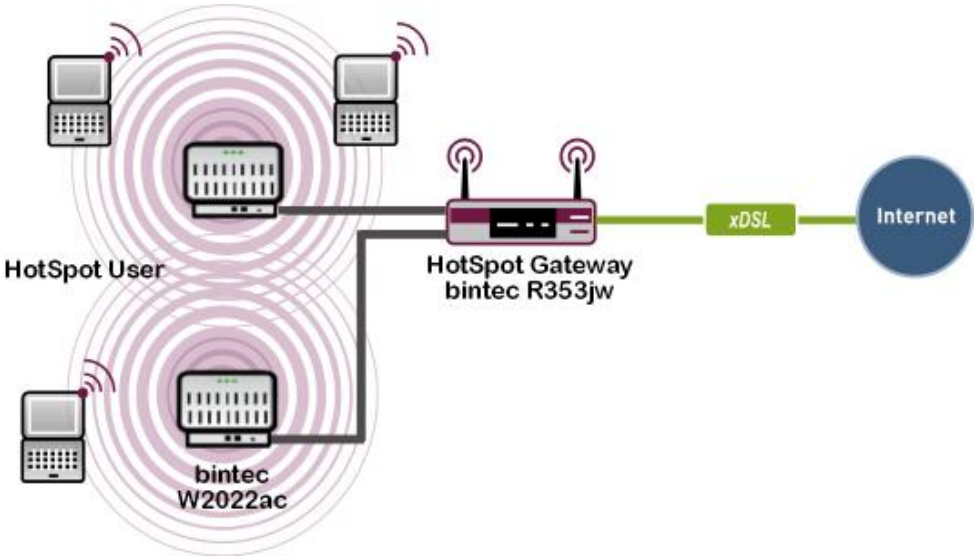


Fig. 51: Hotspot with multiple WLAN access points

To prevent visibility between Hotspot users (WLAN clients) for all WLAN workstations in the

menu **Wireless LAN** -> **WLAN** -> **Radio Settings** -> , the parameter **Intra-cell Repeating** must be disabled. Further, a specific VLAN must be created for each WLAN access point to prevent internal communication between extensions logged into the various access points.

Hot Spot with Ethernet LAN clients

Here, several Hotspot users are connected to the Hotspot gateway over a LAN. Internet access is provided via a local network or ADSL.

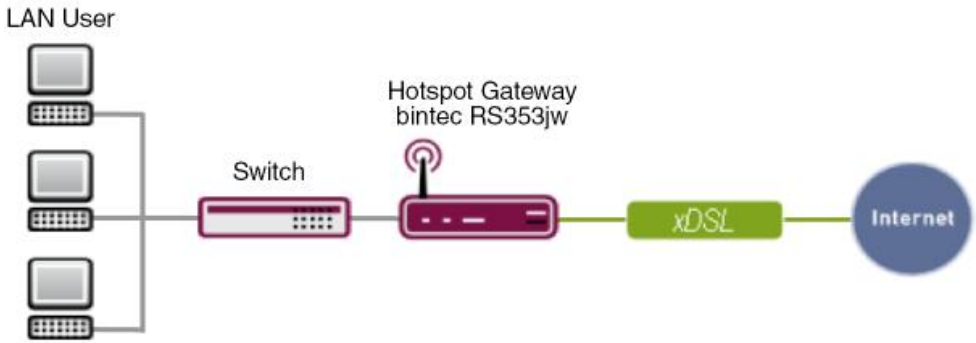


Fig. 52: Hotspot with Ethernet LAN client

A Hotspot user's PC is connected to a VLAN-capable switch. Here, each physical port of the switch has its own VLAN.

2.5.3 Encrypted/unencrypted WLAN connection

To facilitate user login to the Hotspot, most Hotspots operate without encryption.

This has the following disadvantages:

- All WLAN traffic may be intercepted by third parties with the requisite technical skill and equipment.

  - Coupon/login data for subscriber login to the Hotspot.

  - All visited websites, unless encrypted with SSL, https websites, for example. Bank websites are generally not affected, as these are SSL encrypted.

  - Non-SSL-encrypted emails.

  - Login data for non-SSL-encrypted email accounts.

Note

It is important to indicate this in the General Terms and Conditions.

2.5.4 WPA Encryption

To avoid the above disadvantages, the WLAN interface may for example be encrypted with WPA PSK. However, this does not yield much added security as this key must be known to all.

2.5.5 IP/ARP Spoofing

If the parameter **Allowed Peers** is set on *DHCP Clients* at gateway configuration, there occurs also a verification of the source *MAC+IP* for incoming packets. With IPv4A, a "spoofed" MAC+IP leads to an address conflict. This scenario is thus not intercepted.

2.6 Overview of configuration steps

Update of the gateway

Field	Menu	Value
Action	**Maintenance** -> **Software & Configuration** -> **Options**	*Update system software*
Source	**Maintenance** -> **Software & Configuration** -> **Options**	*Current Software from Update Server*

Configure language

Field	Menu	Value
Language for login window	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**	e.g. *English*

Set time zone

Field	Menu	Value
Time Zone	**System Management** -> **Global Settings** -> **Date and Time**	*Europe/Berlin*
ISDN Timeserver	**System Management** -> **Global Settings** -> **Date and Time**	Disabled
Internal Time Server	**System Management** -> **Global Settings** -> **Date and Time**	Disabled

Disabling of local communication

Field	Menu	Value
Intra-cell Repeating	**Wireless LAN Controller->Slave AP configuration -> Wireless Networks (VSS) ->**	Disabled
Intra-cell Repeating	**Wireless LAN -> WLAN -> Wireless Networks (VSS) ->**	Disabled

Configure RADIUS Server access 1

Field	Menu	Value
Authentication Type	**System Management -> Remote Authentication -> RADIUS -> New**	*Accounting*
Vendor Mode	**System Management -> Remote Authentication -> RADIUS -> New**	*bintec HotSpot Server*
Server IP Address	**System Management -> Remote Authentication -> RADIUS -> New**	e.g. *62.245.165.180*
RADIUS Secret	**System Management -> Remote Authentication -> RADIUS -> New**	*funkwerk-ec*
Priority	**System Management -> Remote Authentication -> RADIUS -> New**	*2*
Policy	**System Management -> Remote Authentication -> RADIUS -> New->Advanced Settings**	*Non-authoritative*
Server Timeout	**System Management -> Remote Authentication -> RADIUS -> New->Advanced Settings**	*3000*
Retries	**System Management -> Remote Authentication -> RADIUS -> New->Advanced Settings**	*3*

Configure RADIUS Server access 2

Field	Menu	Value
Authentication Type	**System Management -> Remote Authentication -> RADIUS -> New**	*Login Authentication*
Server IP Address	**System Management -> Remote Authentication -> RADIUS -> New**	e.g. *62.245.165.180*
RADIUS Secret	**System Management -> Remote Authentication -> RADIUS -> New**	*funkwerk-ec*

Field	Menu	Value
Priority	**System Management -> Remote Authentication -> RADIUS -> New**	*1*
Policy	**System Management -> Remote Authentication -> RADIUS -> New->Advanced Settings**	*Non-authoritative*
Server Timeout	**System Management -> Remote Authentication -> RADIUS -> New->Advanced Settings**	*3000*
Retries	**System Management -> Remote Authentication -> RADIUS -> New->Advanced Settings**	*3*

Complete client profile

Field	Menu	Value
Logo	**Client -> Edit Client**	*Browse...*
Terms and conditions	**Client -> Edit Client**	*Browse...*

Create additional users

Field	Menu	Value
User name	**User -> New assistant**	e.g. *Hotel_Reception*
Authorisation group	**User -> New assistant**	*Assistant*
Location	**User -> New assistant**	*All*
Last name	**User -> New assistant**	e.g. *Reception*
E-Mail	**User -> New assistant**	e.g. *test@test.de*

Create rates

Field	Menu	Value
Identifier	**Tariff -> New tariff**	e.g. *10 Minutes Ticket*
Runtime	**Tariff -> New tariff**	*10* Minutes
Time unit (capacity)	**Tariff -> New tariff**	*Total*
Price	**Tariff -> New tariff**	e.g. *1.00* euro
Location	**Tariff -> New tariff**	*All*

Creation of an account (easy)

Field	Menu	Value
User name	**Account -> New Account (easy)**	e.g. *Guest_25*

Field	Menu	Value
Tariff	**Account -> New Account (easy)**	e.g. *2h Ticket*
Last name	**Account -> New Account (easy)**	e.g. *Lüdenscheid*

Creating of an account (extended)

Field	Menu	Value
User name	**Account -> New Account (extended)**	e.g. *Guest_26*
Tariff	**Account -> New Account (extended)**	e.g. *2h Ticket*
Location	**Account -> New Account (extended)**	e.g. *SE-Test*
First name	**Account -> New Account (extended)**	e.g. *Hans-Hubert*
Last name	**Account -> New Account (extended)**	e.g. *Lüdenscheid*
Room	**Account -> New Account (extended)**	e.g. *214*

Manage account

Field	Menu	Value
Amount	**Account -> Overview**	Click *Amount*

Using the upload manager

Field	Menu	Value
Location	**Location -> Overview**	*Location*
Upload Manager	**LocationUpload Manager**	*File Upload/Call help*

Creating a voucher

Field	Menu	Value
Quantity	**Voucher -> New Voucher**	e.g. *100*
Tariff	**Voucher -> New Voucher**	e.g. *2h Ticket*
Location	**Voucher -> New Voucher**	*All*

Configuring login methods

Anonymous

Field	Menu	Value
Registration type	**Location -> <Edit Location>**	*Anonymuous login*
Tariff	**Location -> <Edit Location>**	e.g. *5 Days*
URL of login page	**Location -> <Edit Location>**	*http://192.168.1.254/auth*
Walled Garden	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	*Enabled*
Walled Garden URL	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	e.g. *https://www.hotspot.bintec-elmeg.com/3/205/*
Terms & Conditions	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	e.g. *http://www.hotspot.bintec-elmeg.com*
Login Frameset	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->->Advanced Settings**	*Disabled*
Pop-Up window for status indication	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->->Advanced Settings**	*Disabled*

1-Click

Field	Menu	Value
Walled Garden	**Location -> Overview-> <Edit Location>**	URL is displayed
Type	**Location -> Overview-> <Edit Location>**	*1-Click*
Tariff	**Location -> Overview-> <Edit Location>**	e.g. *5 Days*
URL of login page	**Location -> Overview-> <Edit Location>**	e.g. *http://192.168.1.254/auth*
Walled Garden	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	*Enabled*

Field	Menu	Value
Walled Garden URL	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	e.g. *https://hotspot.bintec-elmeg.com/3/205*
Terms & Conditions	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	e.g. *http://www.bintec-elmeg.com*
Login Frameset	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->->Advanced Settings**	*Disabled*
Pop-Up window for status indication	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->->Advanced Settings**	*Disabled*

SMS

Field	Menu	Value
SMS Provider	**Client -> <Edit Client>->**	lox24
Account ID	**Client -> <Edit Client>->**	xxxxxxxxxxxxxxxxx
Route Germany	**Client -> <Edit Client>->**	e.g. *Economy*
Registration type	**Location -> <Edit Location>**	*SMS*
Tariff	**Location -> <Edit Location>**	e.g. *5 Days*
URL of login page	**Location -> <Edit Location>**	e.g. *http://192.168.1.254/auth*
Walled Garden	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	*Enabled*
Walled Garden URL	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	e.g. *https://hotspot.bintec-elmeg.com/3/205*
Terms & Conditions	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->**	e.g. *http://www.bintec-elmeg.com*
Login Frameset	**Local Services -> Hotspot Gateway -> Hotspot Gateway -> BRIDGE_BR0-1 ->->Advanced**	*Disabled*

Field	Menu	Value
	Settings	
Pop-Up window for status indication	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** -> ->**Advanced Settings**	*Disabled*

PayPal

Field	Menu	Value
API Username	**Client**-> **<Edit Client>**	xxxxxxxxxxxxxxxxx
API Passwort	**Client**-> **<Edit Client>**	e.g. *supersecret*
API Passwort repeat	**Client**-> **<Edit Client>**	e.g. *supersecret*
Signature	**Client**-> **<Edit Client>**	xxxxxxxxxxxxxxxxx
Registration type	**Location** -> **<Edit Location>**	*Paid service*
Tariff	**Location** -> **<Edit Location>**	e.g. *All*
URL of login page	**Location** -> **<Edit Location>**	e.g. *http://192.168.1.254/auth*
Walled Garden	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** ->	*Enabled*
Walled Garden URL	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** ->	e.g. *https://hotspot.bintec-elmeg.com/3/205*
Terms & Conditions	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** ->	e.g. *http://www.bintec-elmeg.com*
Login Frameset	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** -> ->**Advanced Settings**	*Disabled*
Pop-Up window for status indication	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **BRIDGE_BR0-1** -> ->**Advanced Settings**	*Disabled*

Chapter 3 WLAN - 802.1x authentication using a Microsoft Server 2008

3.1 Introduction

The following describes connection of WLAN clients to a Windows Server 2008 using the 802.1x (EAP-PEAP) protocol.

WLAN authentication is performed by a RADIUS server. Here, authentication data (user name/password/certificates) are administered on the central Windows server. For this, a Windows 2008 Server is used; it features the following server roles:

- Active directory domain services (ADS)
- Active directory certificate services (CA)
- Network guidelines and access services (NPS)

The workshop demonstrates configuration of the server as certification authority (CA) and setup of the RADIUS server (Network Policy Server [NPS]). Next, configuration of an access point is described. Standard tools are used for connection of a WLAN client under Windows 7.

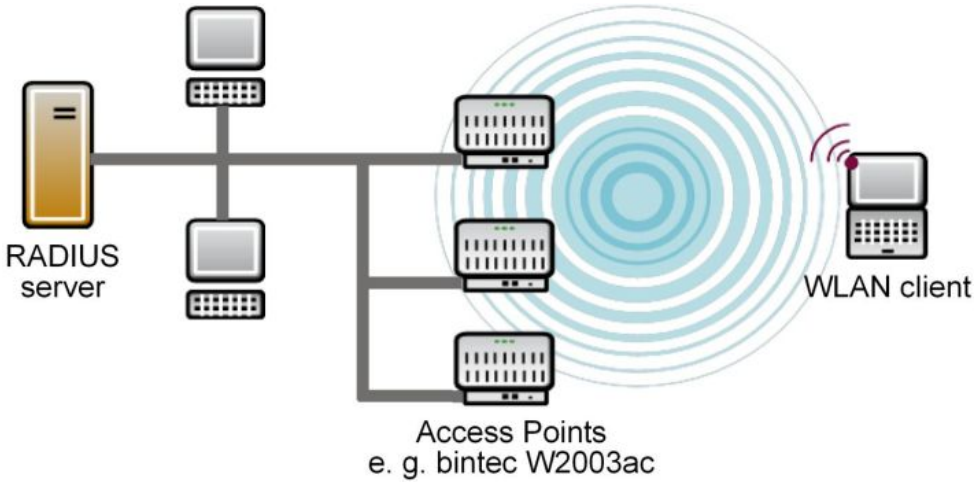


Fig. 53: Example scenario

Prerequisites

- A Microsoft Windows Server 2008 (e.g. Windows Server 2008 R2 Standard)
- Active Directory configuration is required
- A DHCP server in the network is required (e.g. Windows DHCP-Server)
- One or more **bintec** access points (e.g. **bintec W2003ac**)
- One or more WLAN clients (e.g. Windows 7 WLAN supplicant)

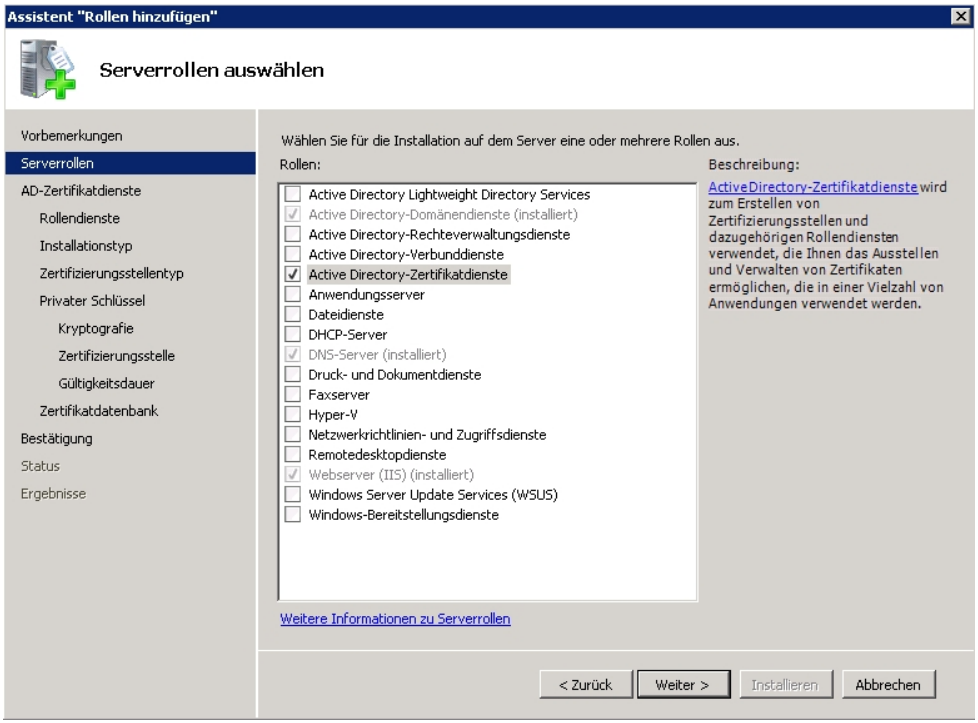
3.2 Server configuration

3.2.1 Configuration of active directory certificate services

Authentication of WLAN clients at the RADIUS server occurs via secure transport connection. For this, the certificate from a certification authority (CA certificate) is necessary. The Server Manager is used to add the **Server role**.

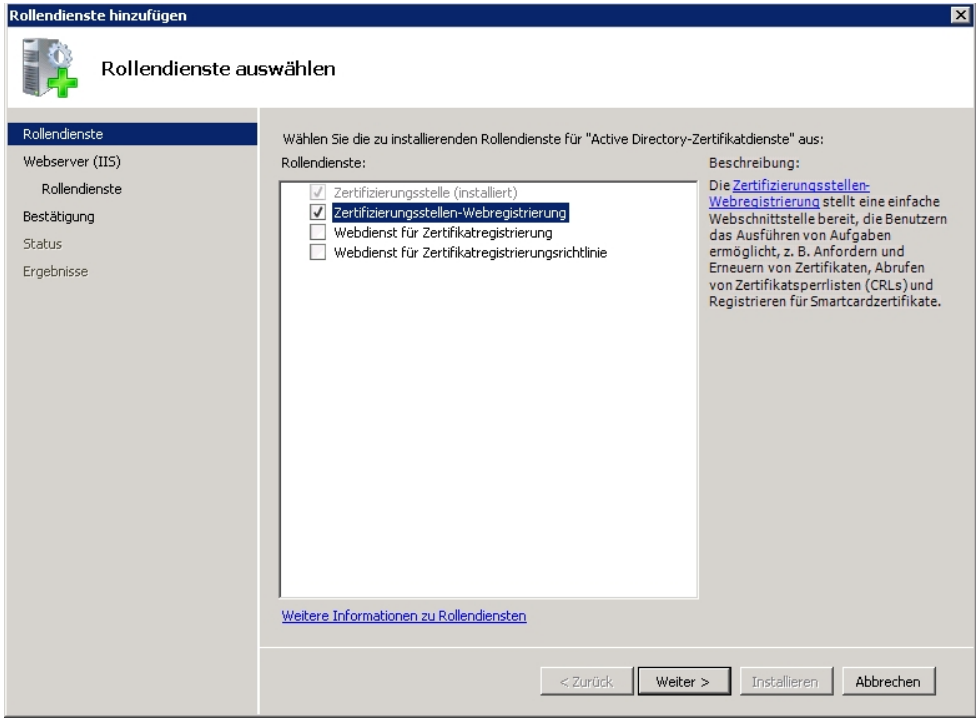
(1) Go to **"Add roles" assistant** -> **Server roles**.

The *Active Directory Certificate Services* of the Windows Server are used in this workshop.



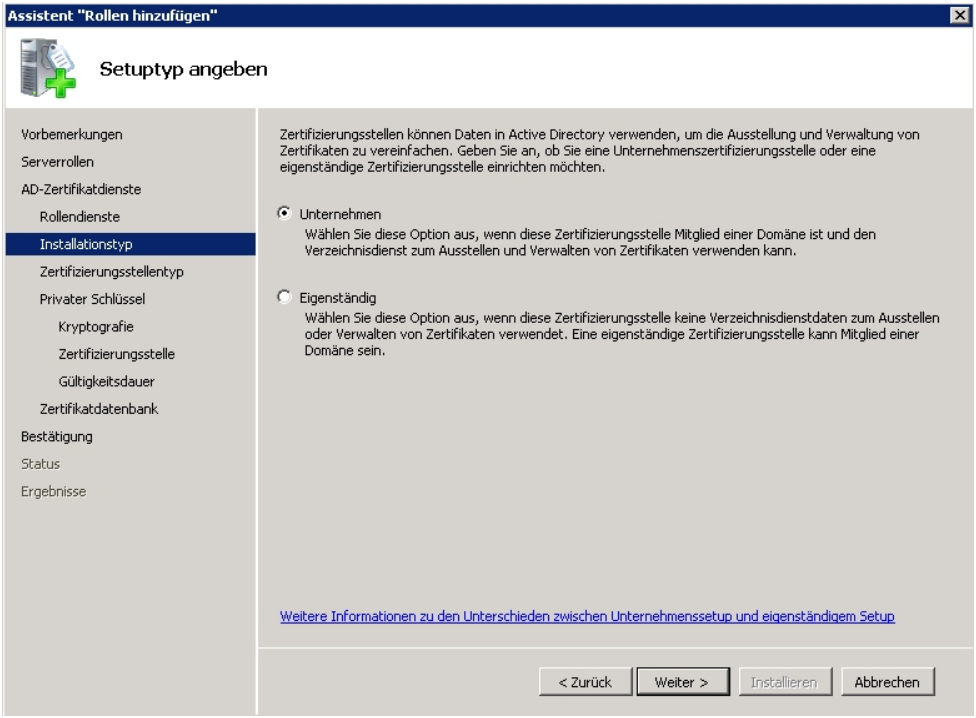
Access to the certificate occurs via a web interface.

For this, **Role service** *Certification authority web registration* is installed in addition to the certification authority itself.

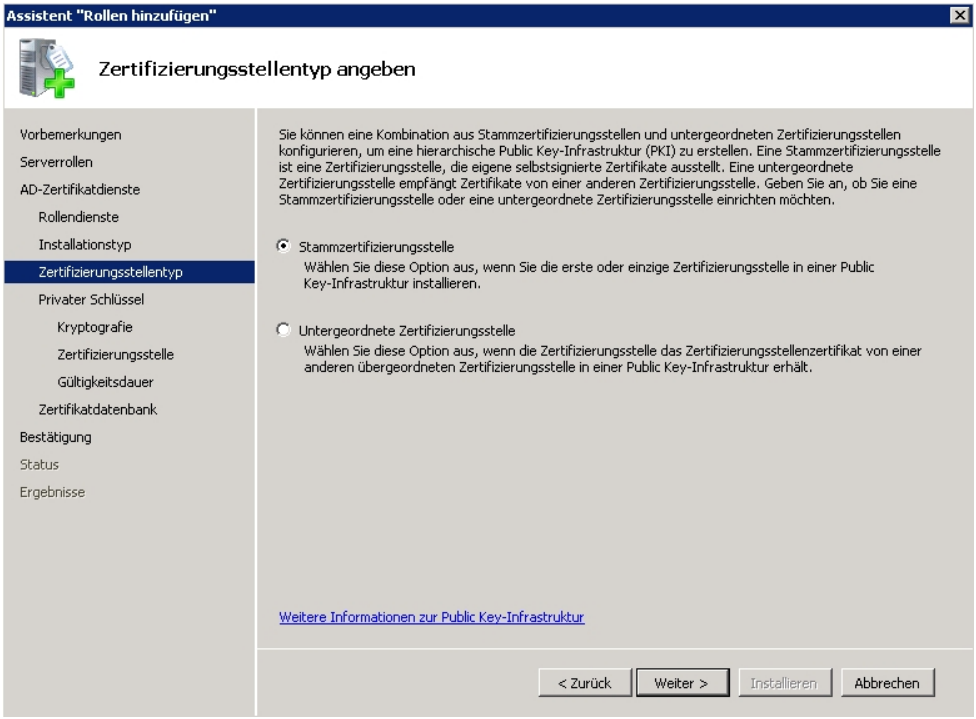


In the next steps of the assistant for creating server roles *Active Directory Certificate Services* the **Installation Type** of the certification authority is selected.

Select the *Company* option.

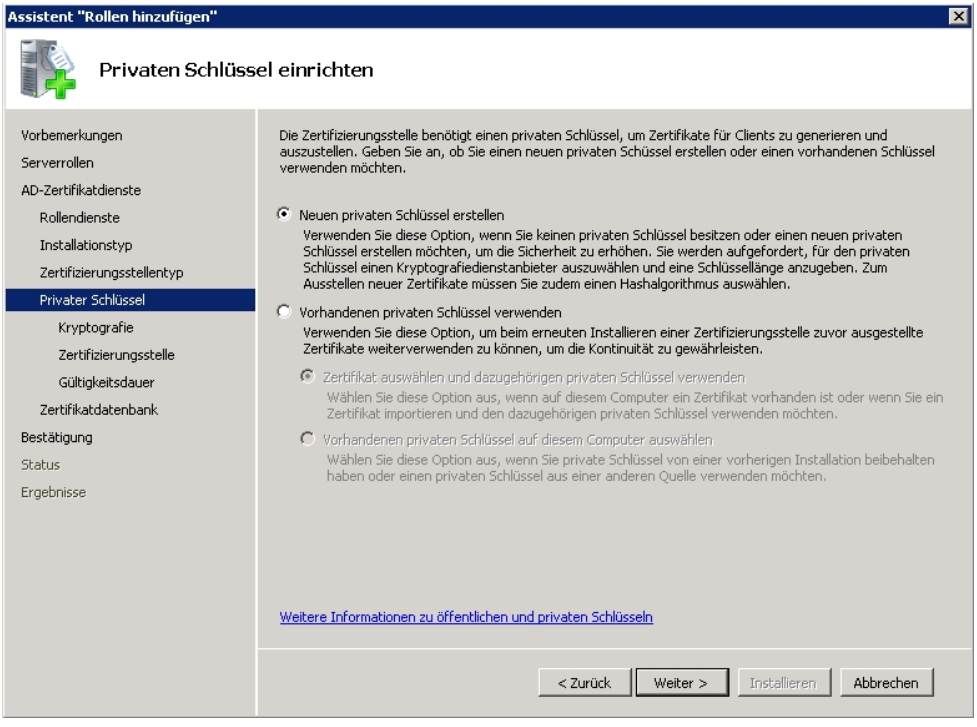


In the **Certification Authority Type** menu, select the *Root Certification Authority* option.

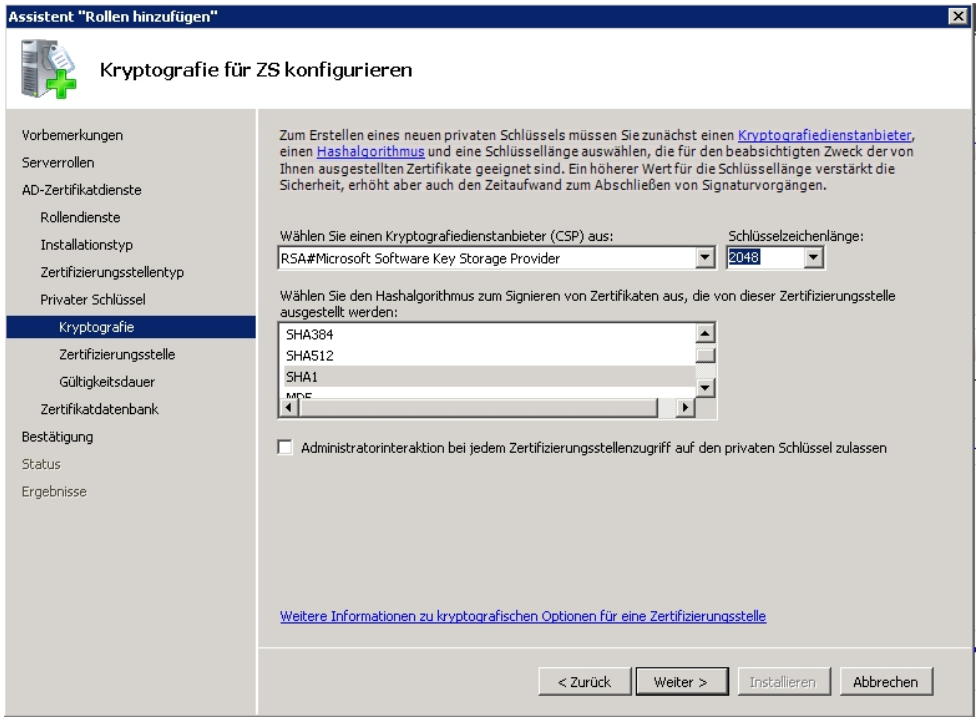


In our example, at initial installation of the certification authority, a new **Private Key** is also generated.

Select the *Create New Private key* option.



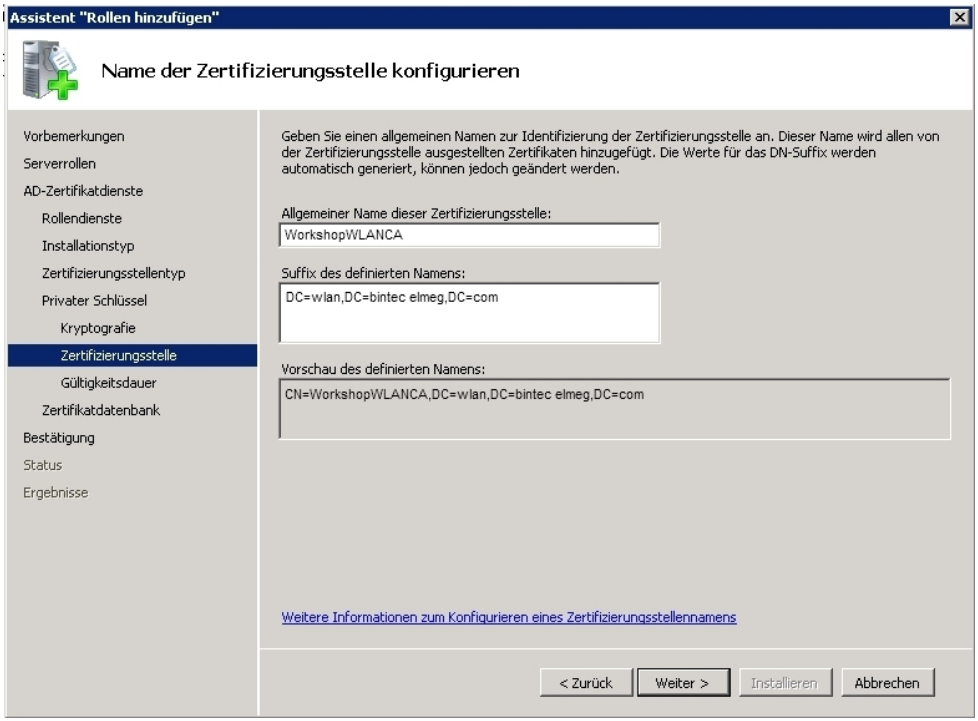
In the **Encryption** menu, select hash algorithm *SHA1* and a **Key Character Length** of *2048* bits.



In the next step, the designation of the certification authority certificate is specified in the **Certification Authority** menu, along with the distinguished name (DN).

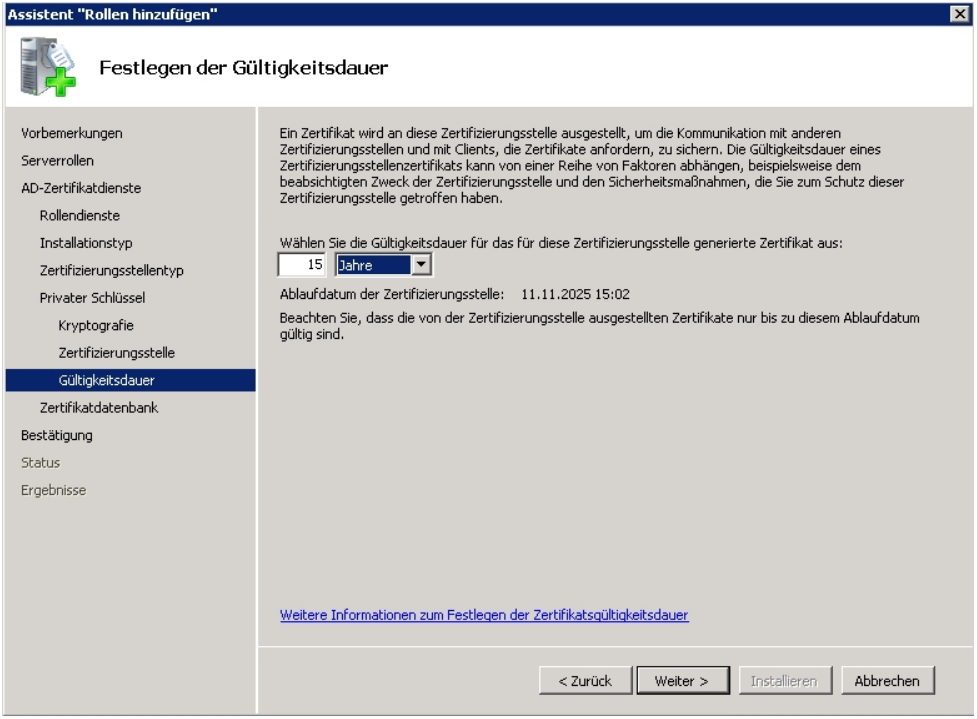
Under **Common Name of this Certification Authority** enter *WorkshopWLANCA*, for example.

As **Suffix of the defined name** enter *DC=wlan,DC=funkwerk-ec,DC=com*, for example.

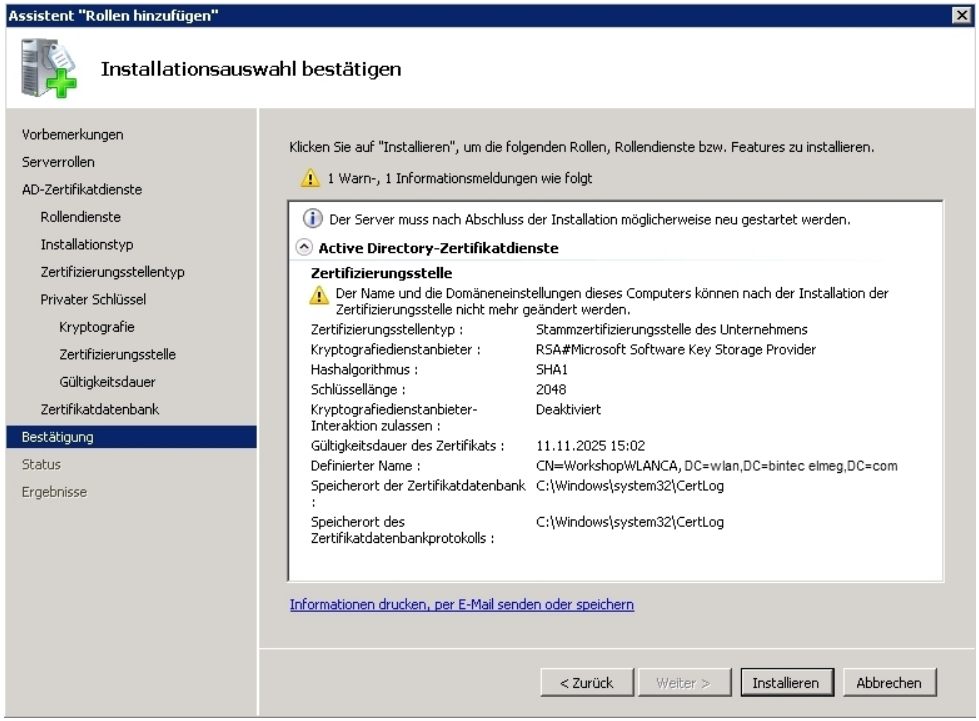


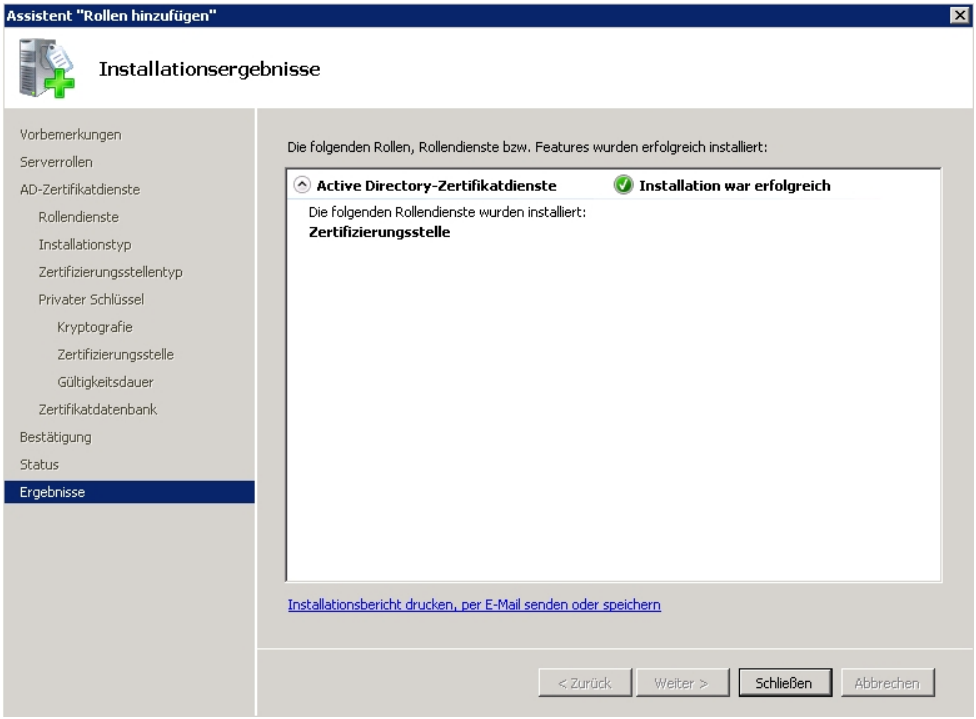
Also select the **Period of Validity** for the certification authority certificate.

In our example, the period of validity is set to `15 years`.



At conclusion of the installation of the server role **Active Directory Certificate Services** a summary is displayed, along with the result of the installation.


Assistent "Rollen hinzufügen"
Installationsauswahl bestätigen
Vorbemerkungen
Serverrollen
AD-Zertifikatdienste
Rollendienste
Installationstyp
Zertifizierungsstellentyp
Privater Schlüssel
Kryptografie
Zertifizierungsstelle
Gültigkeitsdauer
Zertifikatdatenbank
Bestätigung
Status
Ergebnisse
Klicken Sie auf "Installieren", um die folgenden Rollen, Rollendienste bzw. Features zu installieren.
1 Warn-, 1 Informationsmeldungen wie folgt
Der Server muss nach Abschluss der Installation möglicherweise neu gestartet werden.
Active Directory-Zertifikatdienste
Zertifizierungsstelle
Der Name und die Domäneneinstellungen dieses Computers können nach der Installation der Zertifizierungsstelle nicht mehr geändert werden.
Zertifizierungsstellentyp : Stammzertifizierungsstelle des Unternehmens
Kryptografiedienstanbieter : RSA#Microsoft Software Key Storage Provider
Hashalgorithmus : SHA1
Schlüssellänge : 2048
Kryptografiedienstanbieter-Interaktion zulassen : Deaktiviert
Gültigkeitsdauer des Zertifikats : 11.11.2025 15:02
Definierter Name : CN=WorkshopWLANCA, DC=wlan,DC=bintec elmeg,DC=com
Speicherort der Zertifikatdatenbank : C:\Windows\system32\CertLog
Speicherort des Zertifikatdatenbankprotokolls : C:\Windows\system32\CertLog
Informationen drucken, per E-Mail senden oder speichern
< Zurück
Weiter >
Installieren
Abbrechen

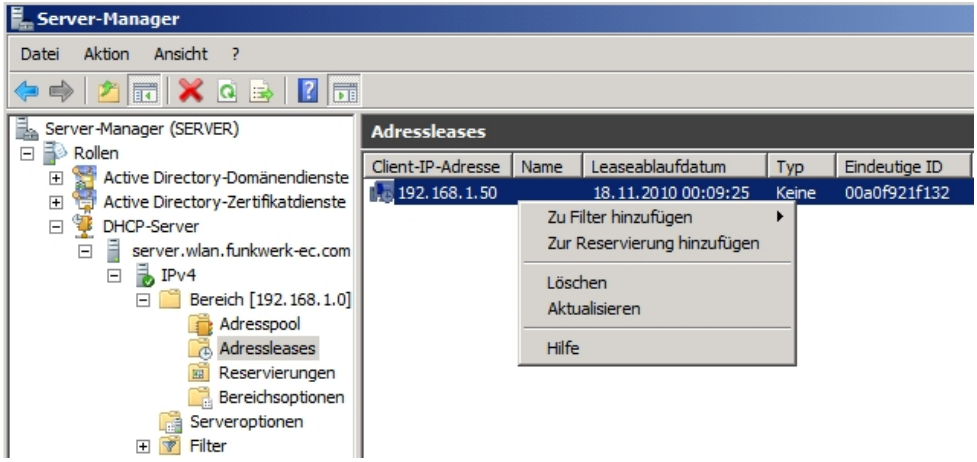


3.2.2 Reservation of access point IP addresses at DHCP server (Windows Server 2008)

The **bintec** access points employed (e.g. **bintec W1002n**) are integrated into the network with the DHCP client mechanism. In this workshop, the Windows Server operates as a DHCP server, notably administering IP addresses of access points. To insure that the access points always remain accessible at the same IP address and always use the same IP address for RADIUS authentication, their IP addresses are reserved at the DHCP server.

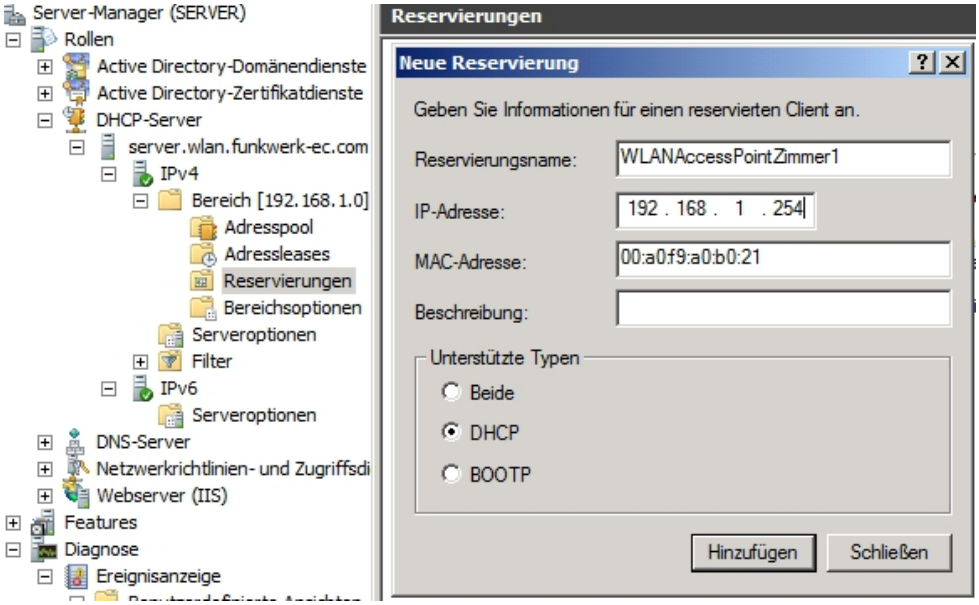
Previously allocated IP addresses are listed in the **Address Leases** menu of the Windows 2008 Server manager. Using the context menu, the addresses of access points can be added as **Reservations**.

(1) Go to **Server Manager** -> **DHCP Server** -> **Address leases**.



WLAN access points without active **Address Leases** (no IP address assigned) can be created via the **New Reservation** context menu. For this, the Ethernet MAC address of the respective access point must be saved.

(1) Go to **Server Manager** -> **DHCP Server** -> **Reservations**.



To specify the information for a reserved client, proceed as follows;

(1) Under **Reservation number** enter *WLANAccessPointRoom1*, for example.

(2) Enter the **IP Address**, e.g. *192.168.1.254*.

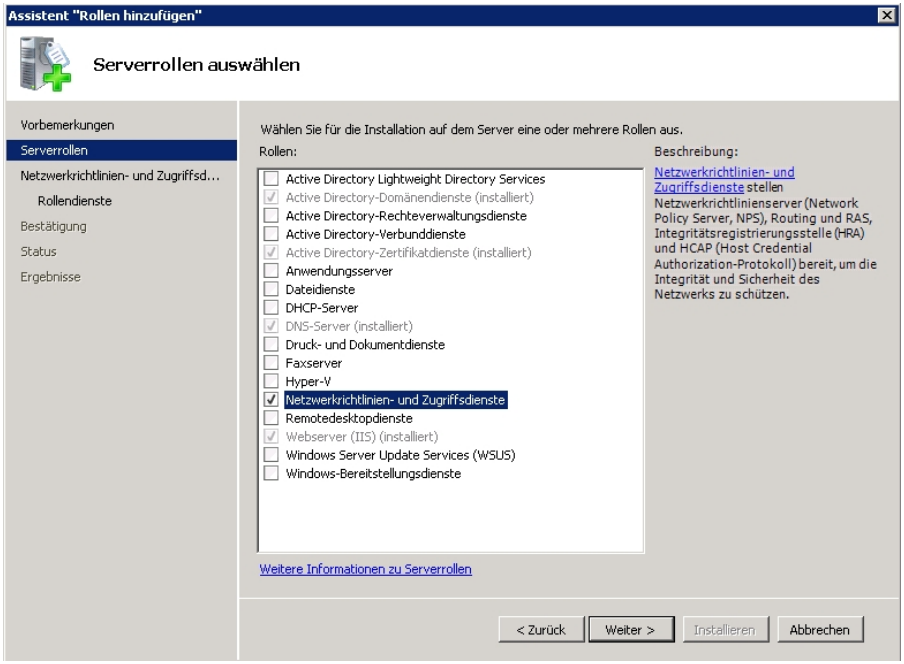
(3) As **MAC Address**, enter e.g. *00:a0:f9:a0:b0:21*

3.2.3 Installation of network policy and access services (NPS/RADIUS server)

With installation of the *Network Policy and access services (NPS)* the RADIUS server of Windows 2008 Server is installed. For this, use the **Add Roles** function of the server manager. Proceed as follows:

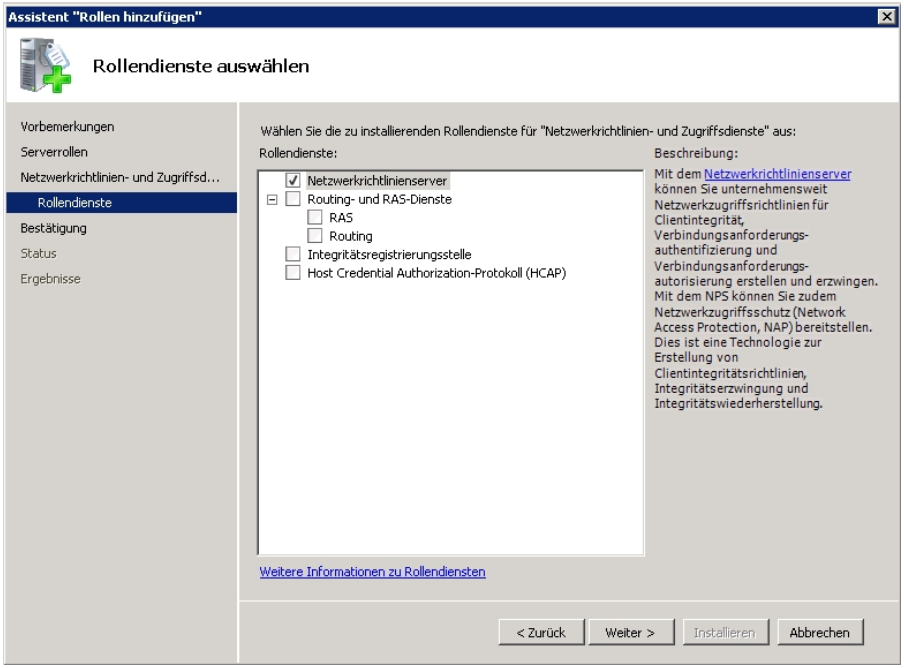
(1) Go to **"Add Roles" assistant** ->**Server Roles**.

(2) Select the option *Network policy and access services*.

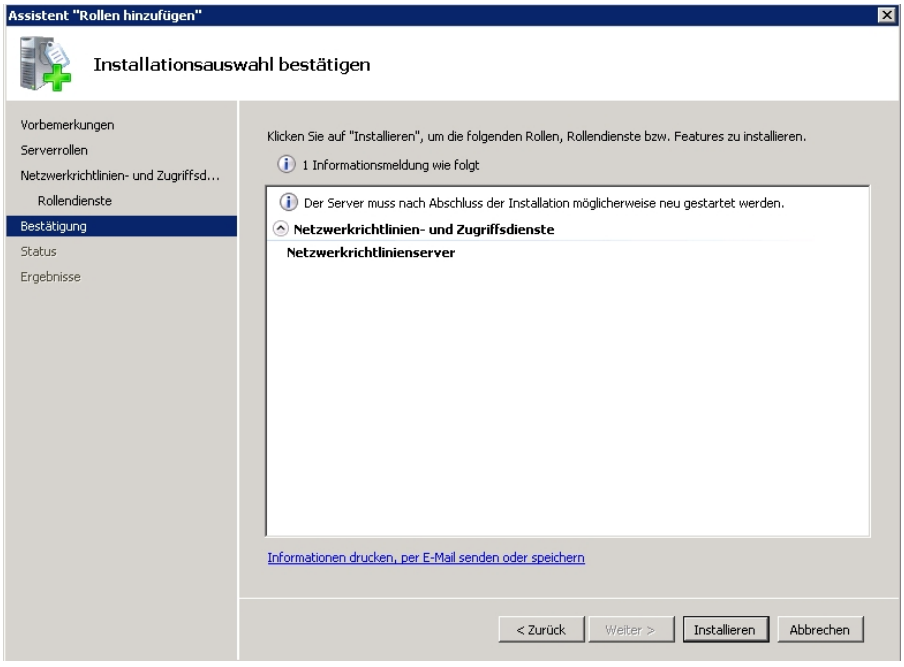


(3) Go to **Role Services**.

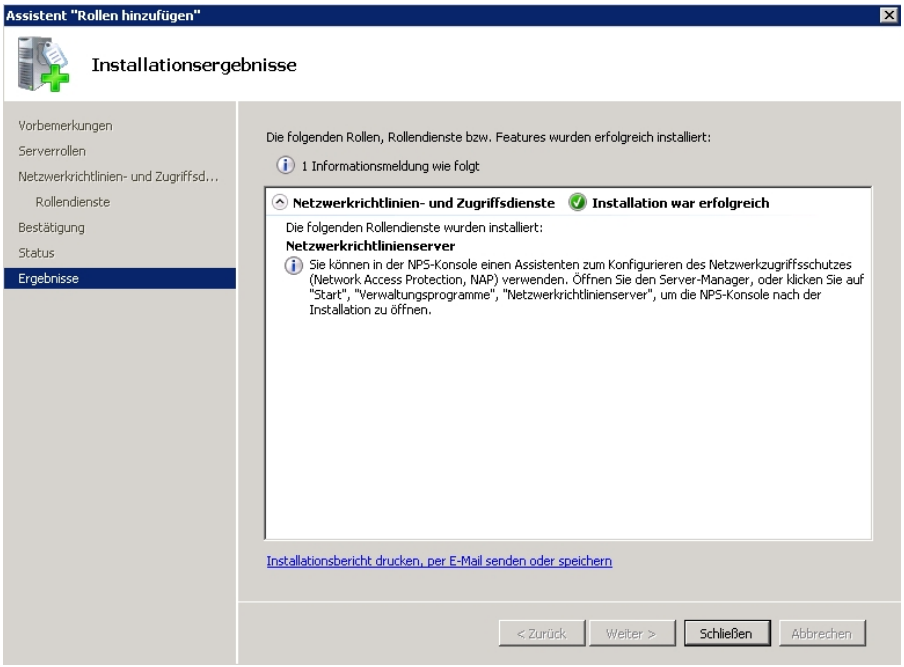
Enable the option *Network Policy Server*.



(4) Click **Install**. The roles are installed.



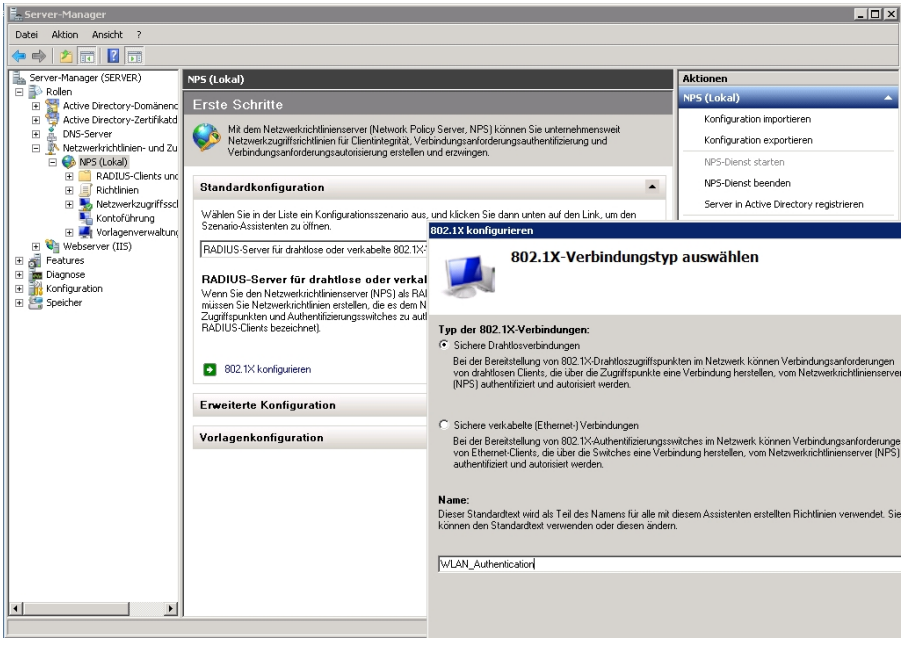
(5) Under **Results** you can check whether the roles are successfully installed.



3.2.4 Configuration of network policy and access services (NPS/RADIUS server)

The RADIUS server for the 802.1x WLAN authentication is configured in the **Network Policy Servers (NPS)** menu.

(1) Go to **Server Manager** -> **Network Policies and Access Services (NPS)** -> **NPS (local)**.

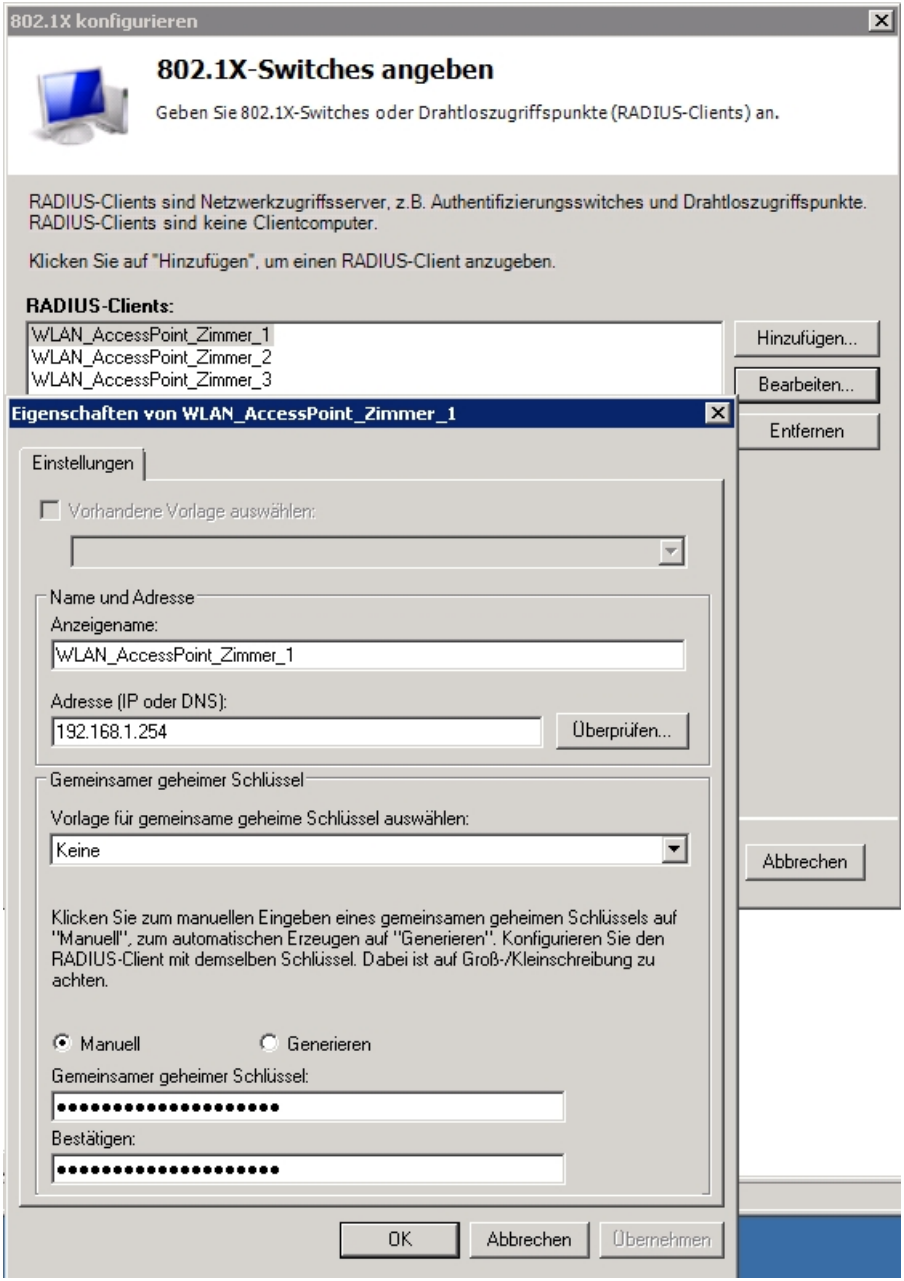


(2) Select a configuration scenario.

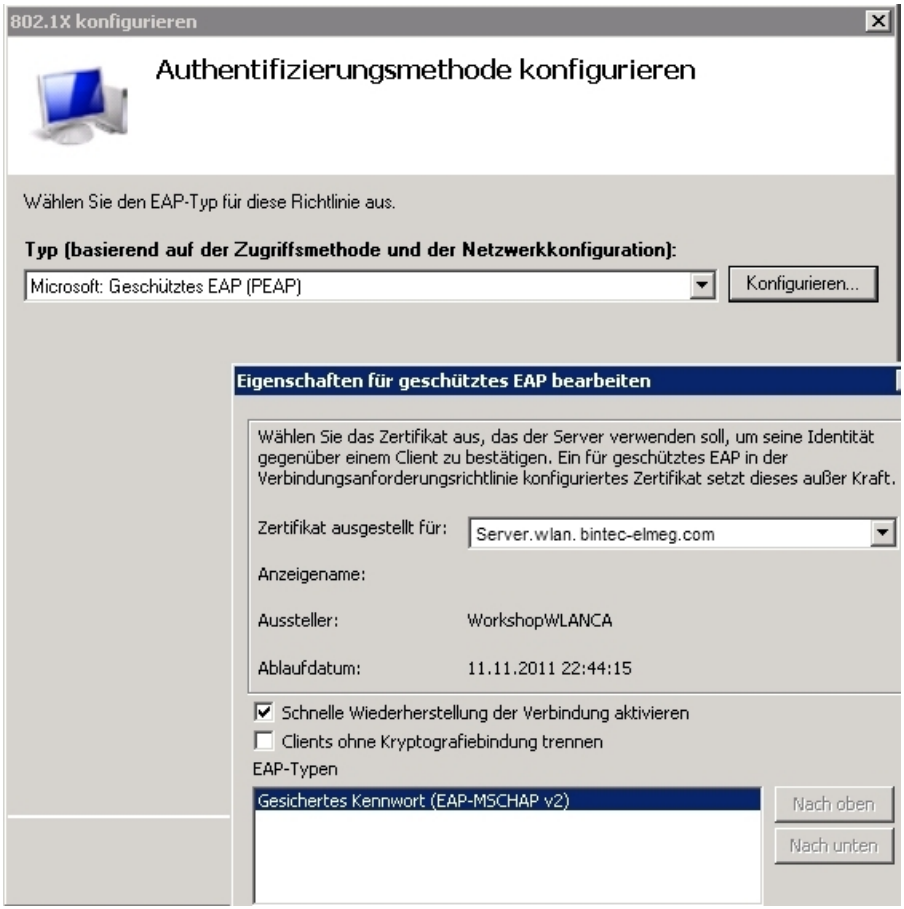
(3) Click on the **Configure 802.1X** link to open the scenario assistant.

(4) In the first step, select **Type of 802.1x Connections** *Secure Wireless Connections* and assign a **Name** e. g. *WLAN_Authentication*.

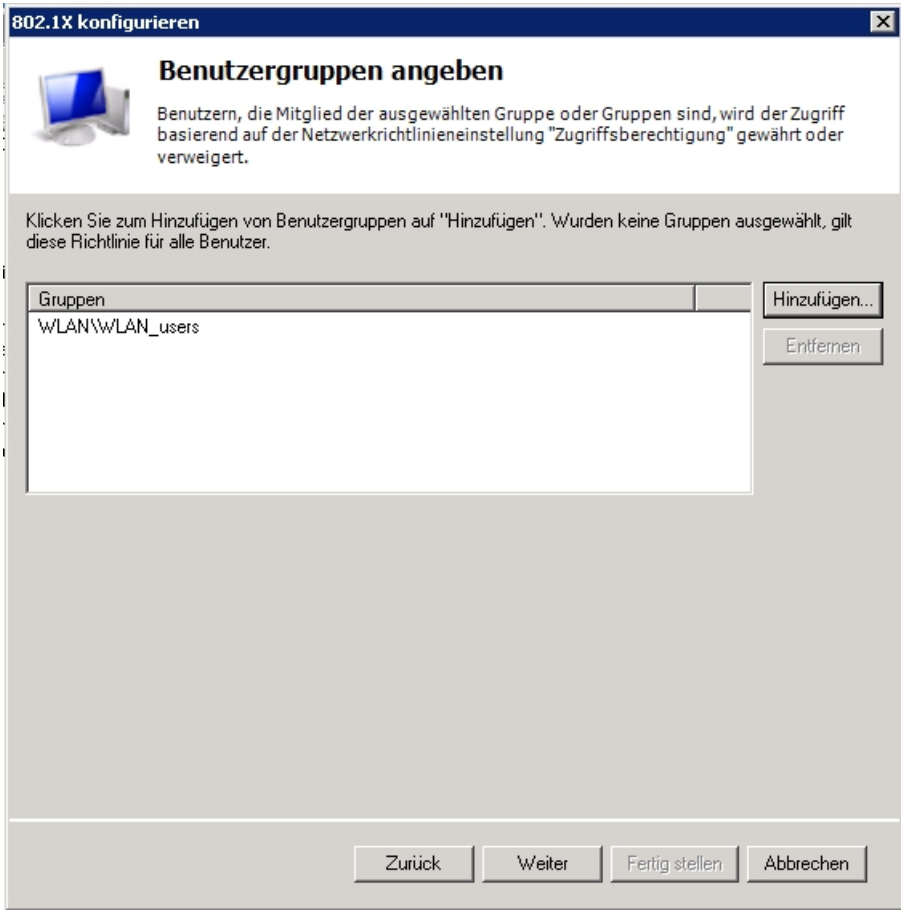
(5) In the second step of the assistant, all access points are configured as RADIUS client. At login of a WLAN client, the access points send authentication requests to the RADIUS server (network policies and access services, NPS). When creating the RADIUS clients (access points), their IP address and a password are assigned to protect the RADIUS authentication.



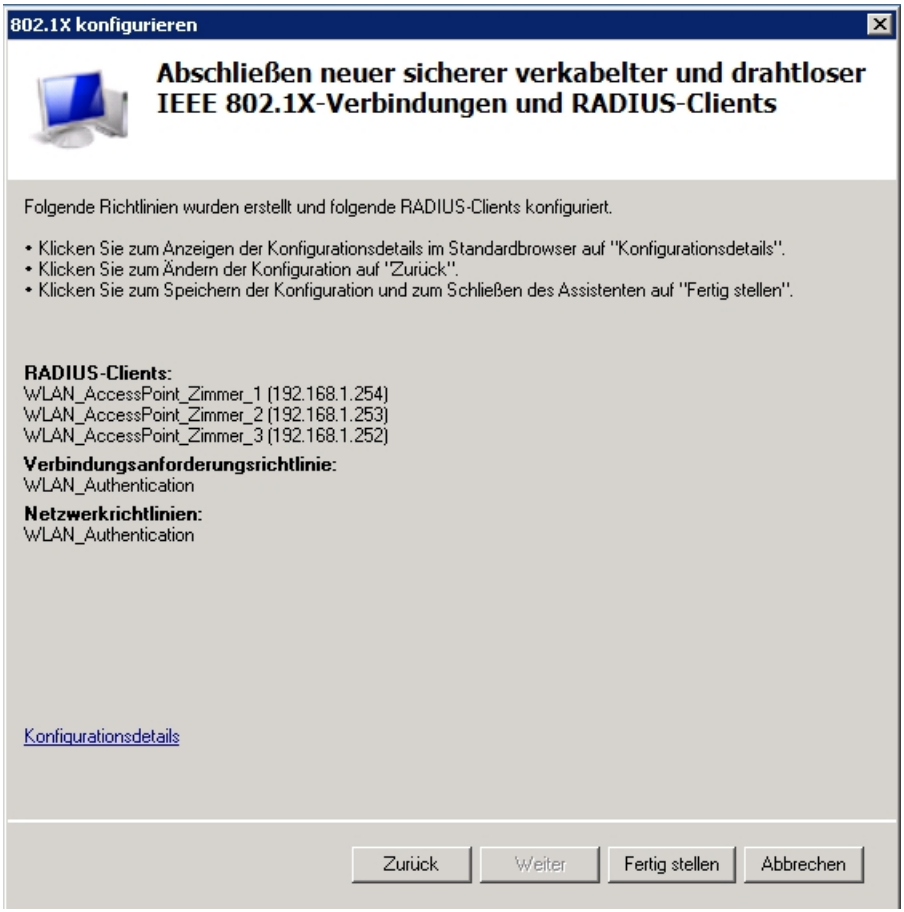
(6) Next, the **EAP type** (Extensible Authentication Protocol) is selected for authentication of the WLAN client. In this workshop *EAP-PEAP* is used. In the EAP-PEAP option configuration dialog box, the server certificate for identification to the WLAN client must be selected.



(7) In the next step, WLAN access can be restricted to individual user groups. In this workshop, we're allowing access to members of the **WLAN**user group.



(8) Before closing, the assistant displays a summary and the configuration of the Network Policy Server (NPS) is created.



3.3 RADIUS configuration of the access point

When a WLAN client logs in, the access point routes the authentication request to the RADIUS server (Windows 2008 NPS) as a RADIUS request. The RADIUS server is configured at the **bintec** access point using the GUIGUIGUI.

(1) Go to **System Management** -> **Remote Authentication** -> **RADIUS** -> **New.**

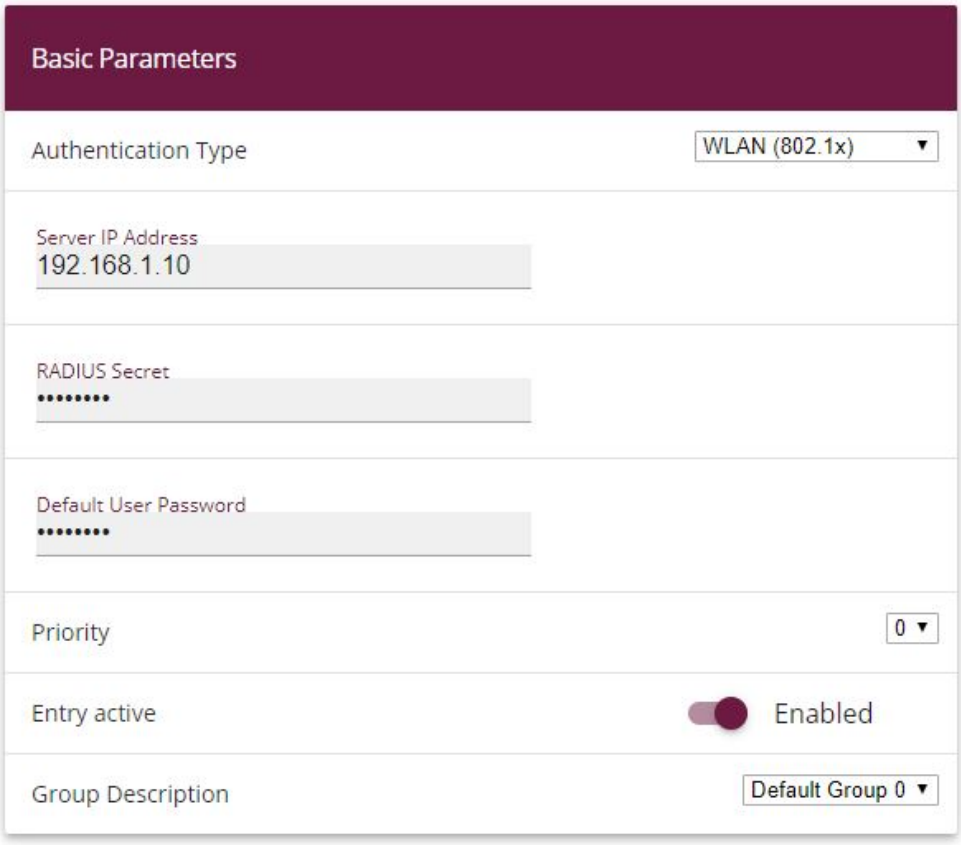


Fig. 54: **System Management** -> **Remote Authentication** -> **RADIUS** -> **New**

To configure the RADIUS server, proceed as follows:

(1) To control access to WLAN network, you must set **Authentication Type** to the value *WLAN (802.1x)*.

(2) Enter the **IP Address** of the Windows 2008 server, e.g. *192.168.1.10*.

(3) Communication with the RADIUS server is protected by a **RADIUS password**. Here, please use the password saved in the RADIUS server.

(4) Press **OK** to confirm your entries.

3.4 WLAN configuration of the access point

You can adapt settings of the WLAN wireless module to requirements. In our example, we're using the 2.4 GHz band with automatic channel selection.

(1) Go to **Wireless LAN** -> **WLAN** -> **Wireless Module Settings** -> .

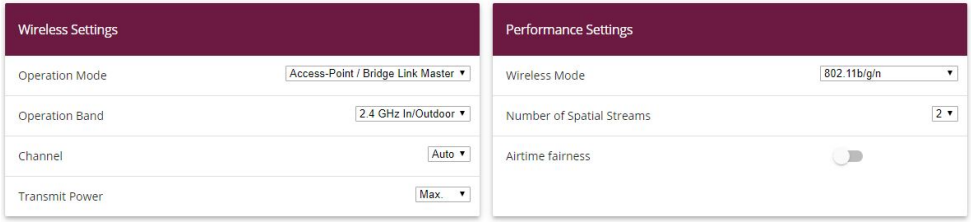


Fig. 55: **Wireless LAN** -> **WLAN** -> **Radio Settings**->

To configure the access point, proceed as follows:

(1) For **Operating Mode**, select *Access-Point / Bridge Link Master*.

(2) For **Frequency Band** select *2.4 GHz In/Outdoor*.

(3) Set **Channel** to *Auto*.

(4) Leave the remaining settings unchanged and confirm with **OK**.

With configuration of a wireless network (VSS), authentication requests of a WLAN client are routed to the configured RADIUS server.

(1) Go to **Wireless LAN** -> **WLAN** -> **Wireless Networks (VSS)** -> **New**.

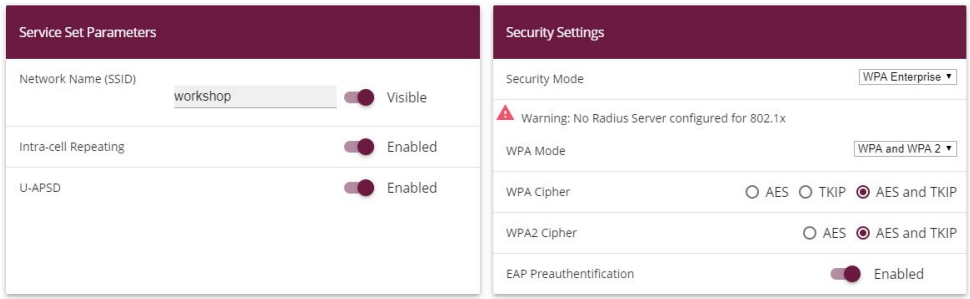


Fig. 56: **Wireless LAN** -> **WLAN** -> **Wireless networks (VSS)** ->**New**

To configure wireless networks, proceed as follows:

(1) In **Network name (SSID)** enter *workshop*, for example.

(2) For **Safety Mode**, the *WPA Enterprise* safety mode must be selected.

(3) For **WPA Mode** select *WPA and WPA 2*.

(4) For **WPA Cipher** select *AES and TKIP* encryption.

(5) For **WPA2 Cipher** select *AES and TKIP* encryption.

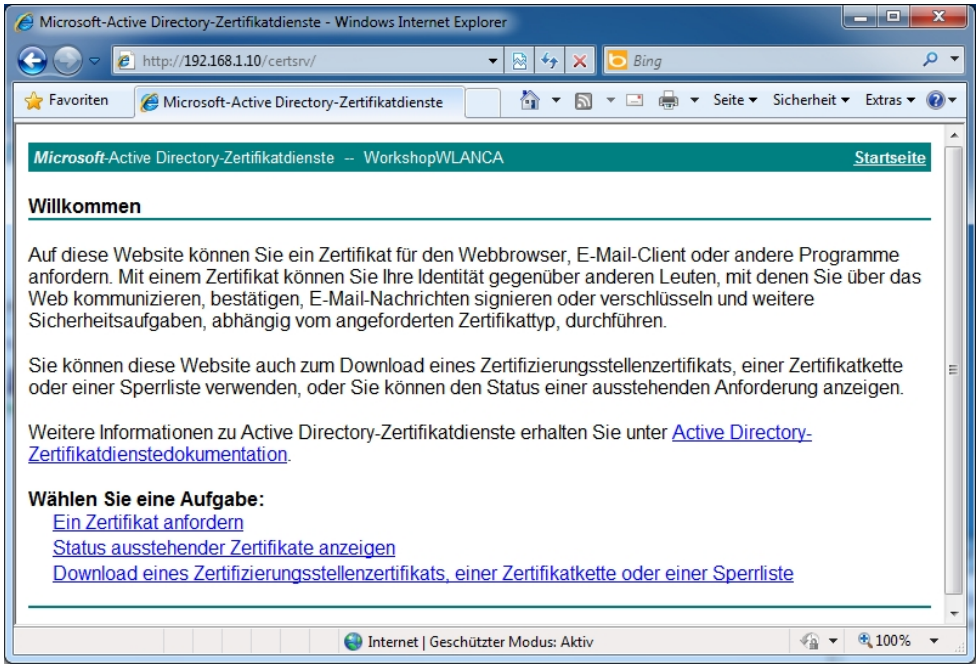
(6) Leave the remaining settings unchanged and confirm with **OK**.

3.5 Connection of a Windows 7 WLAN client

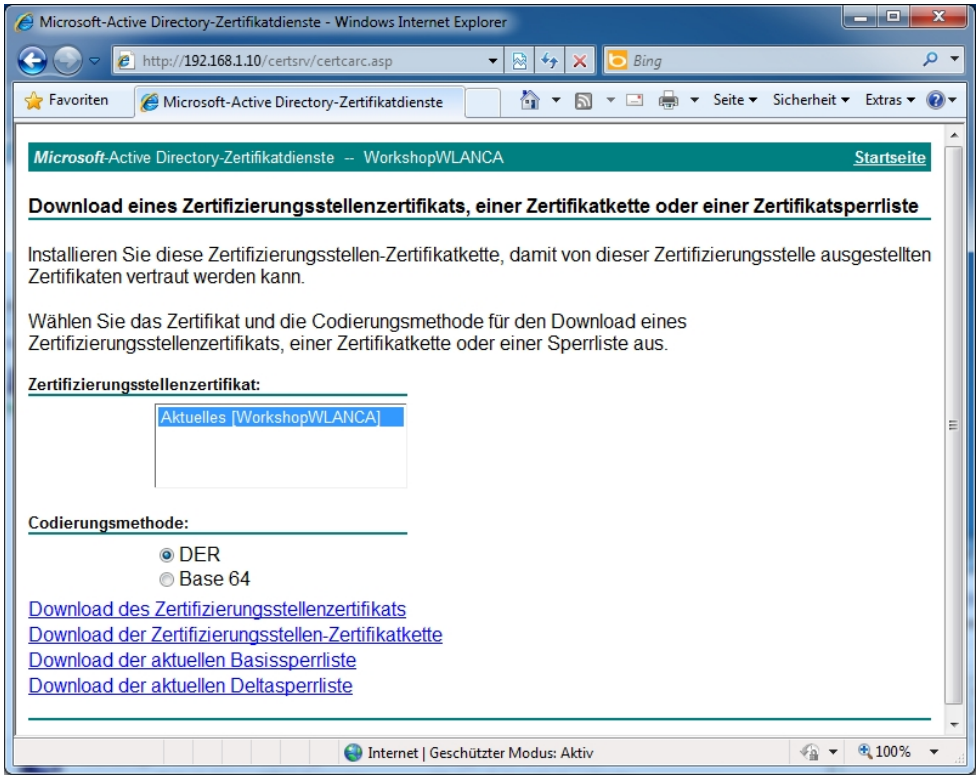
3.5.1 Importing the certification from the certification authority (CA certificate)

With the selected authentication method *802.1x / EAP-PEAP* a secure transport connection for transmission of login information is established. To insure that this tunnel is set up to the right remote terminal, the WLAN client identifies the server using the issued certificate. Hence, the certificate from the certification authority must be installed on every WLAN client.

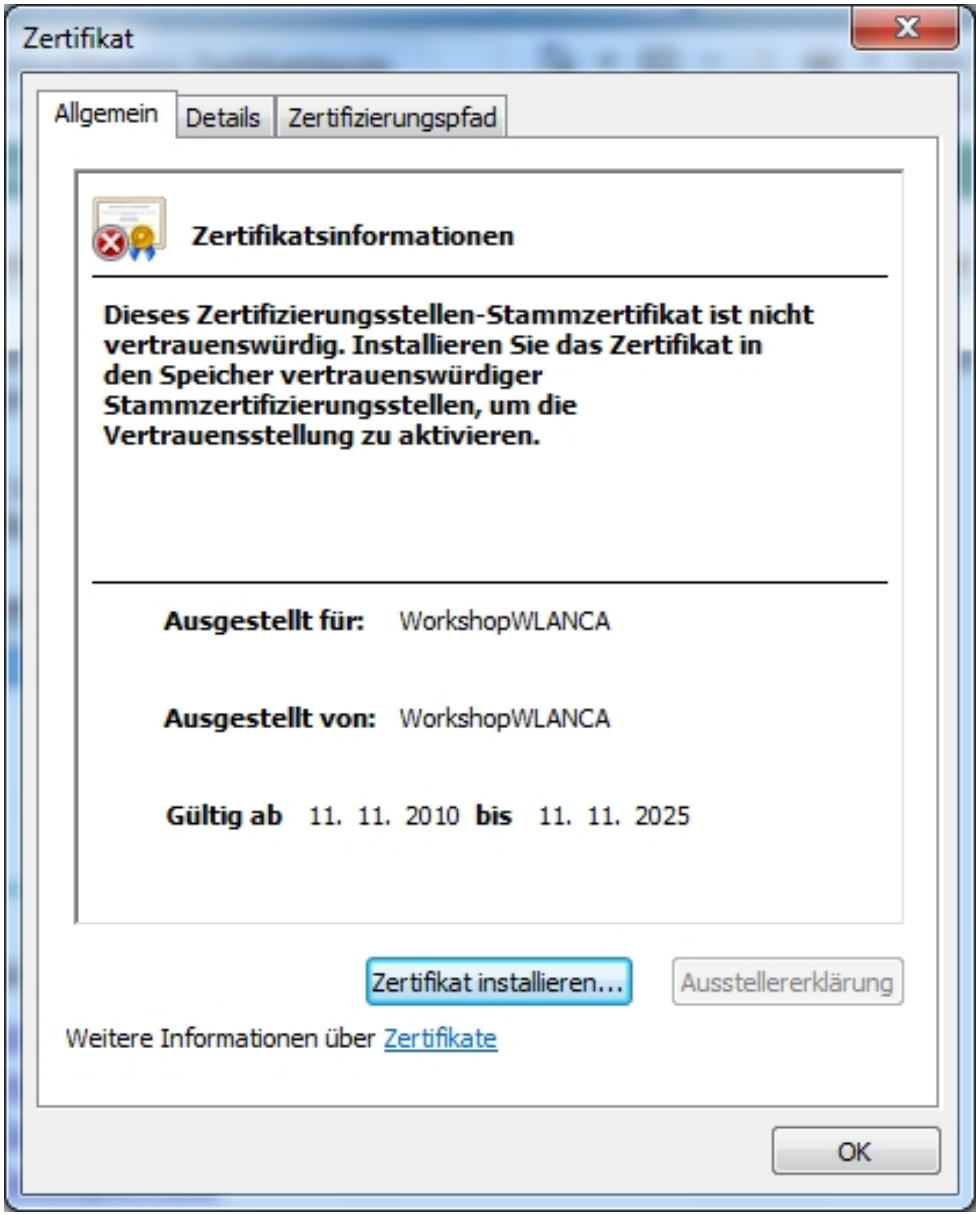
In this workshop the web interface of the certificate server is used for installation of the certification authority certificate (CA certificate). For this, the notebook to be connected is first linked per Ethernet with the Window Server network. The web interface of the certificate server is accessible over the following URL: "http://SERVER_IP_Adresse/certsrv/" (e.g. http://192.168.1.10/certsrv/).



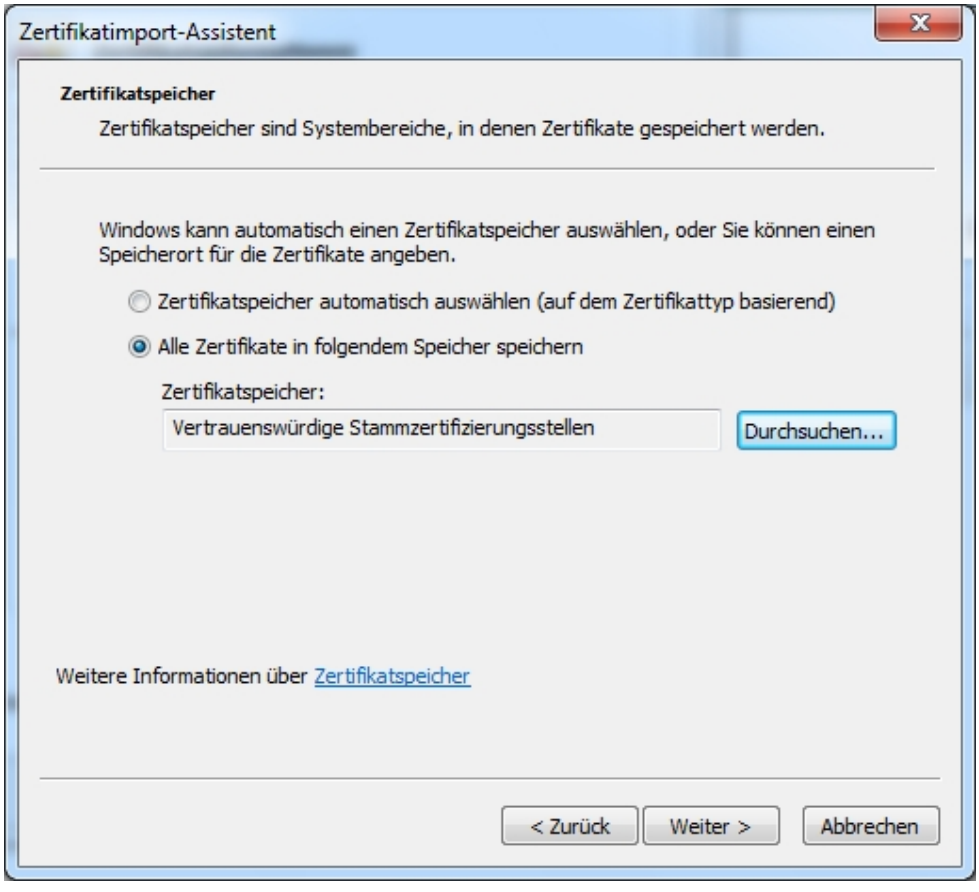
With the **Download a certification authority certificate** option, the root certificate can be transferred onto the notebook (WLAN client).



The certificate is then installed.

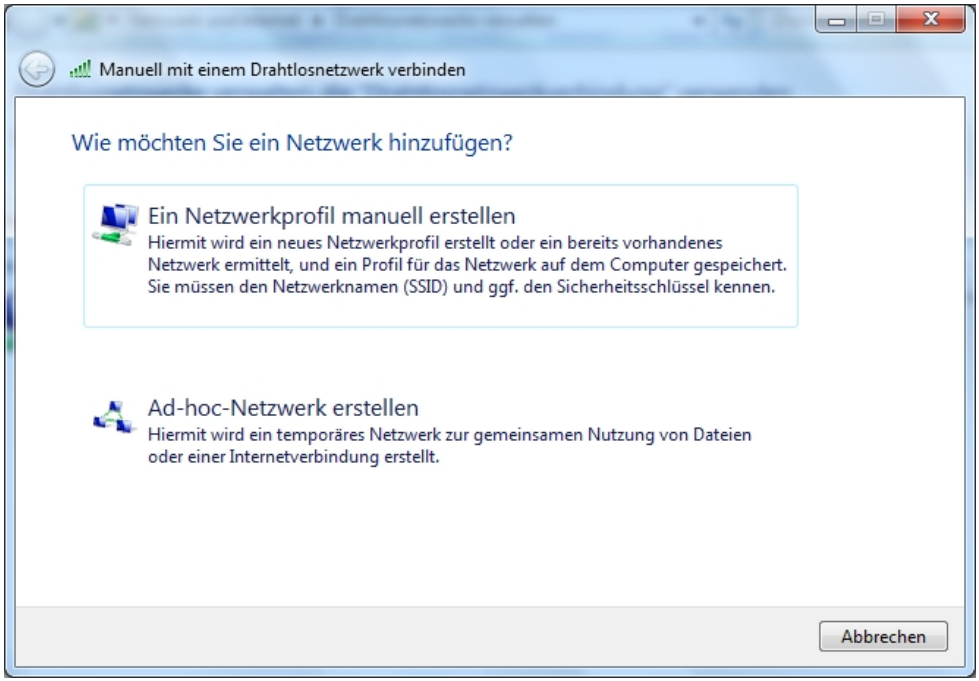


Manually select the location where you wish to save the certificate.

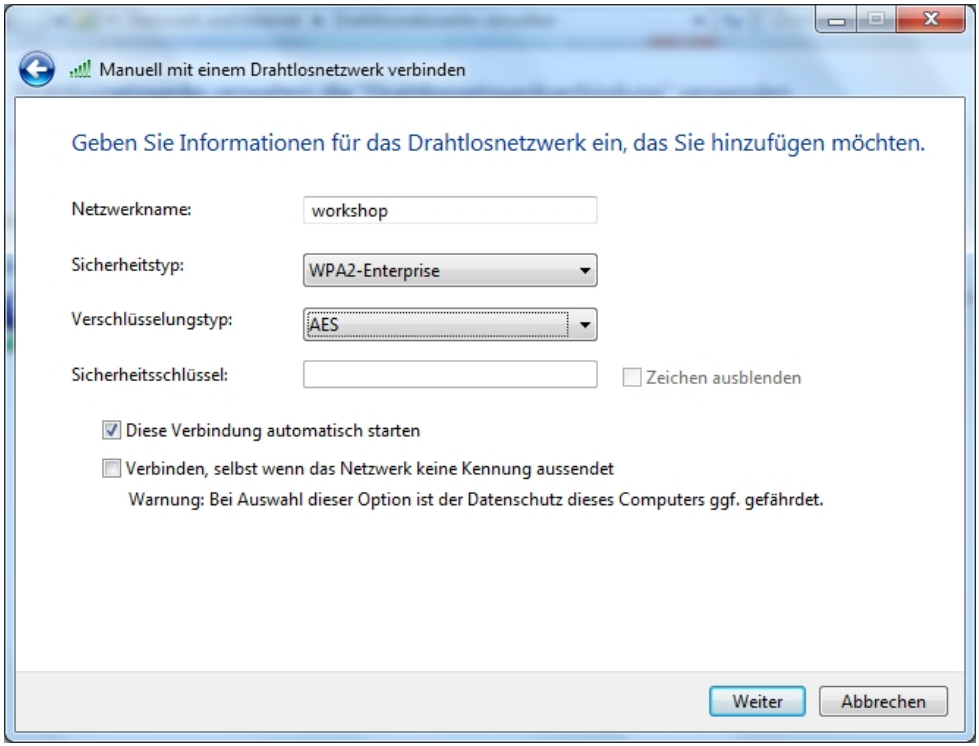


3.5.2 Configuration of the Windows 7 WLAN client

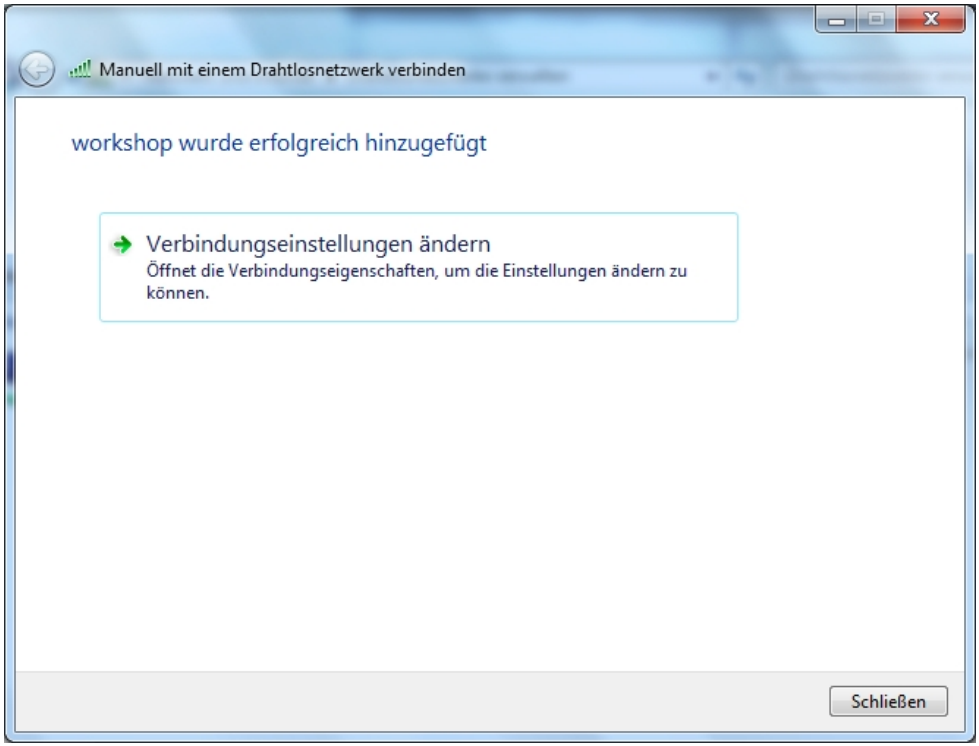
WLAN configuration is illustrated with the example of a Windows 7 client. Here, a new wireless connection is added using the **Manage wireless networks** dialog box.



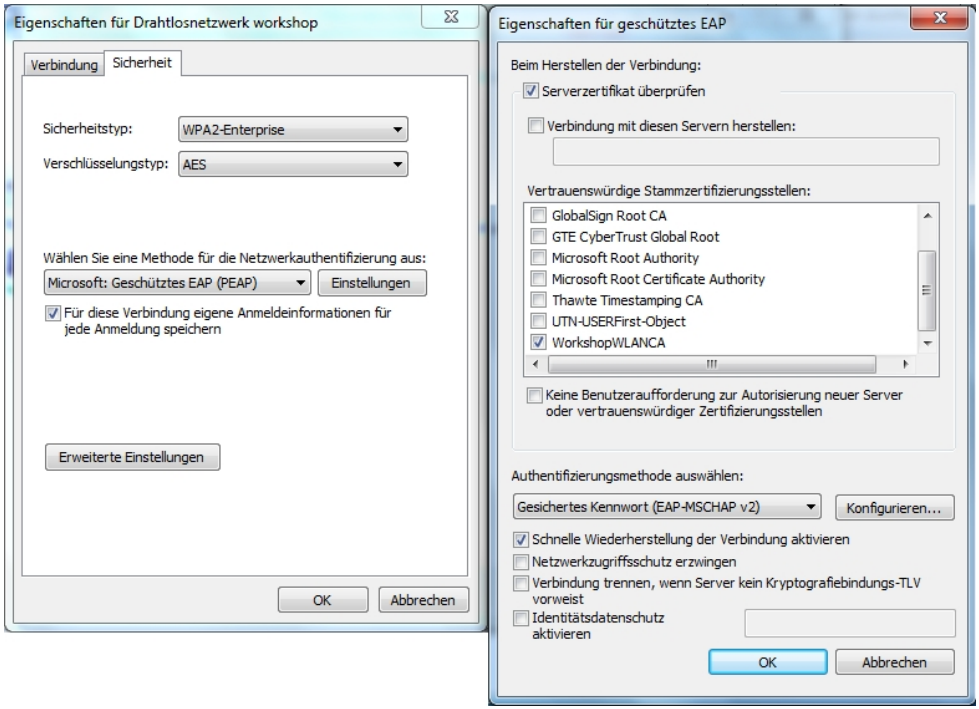
The **Network Name**, along with **Safety Type** and **Encryption Type** are manually saved in the assistant.



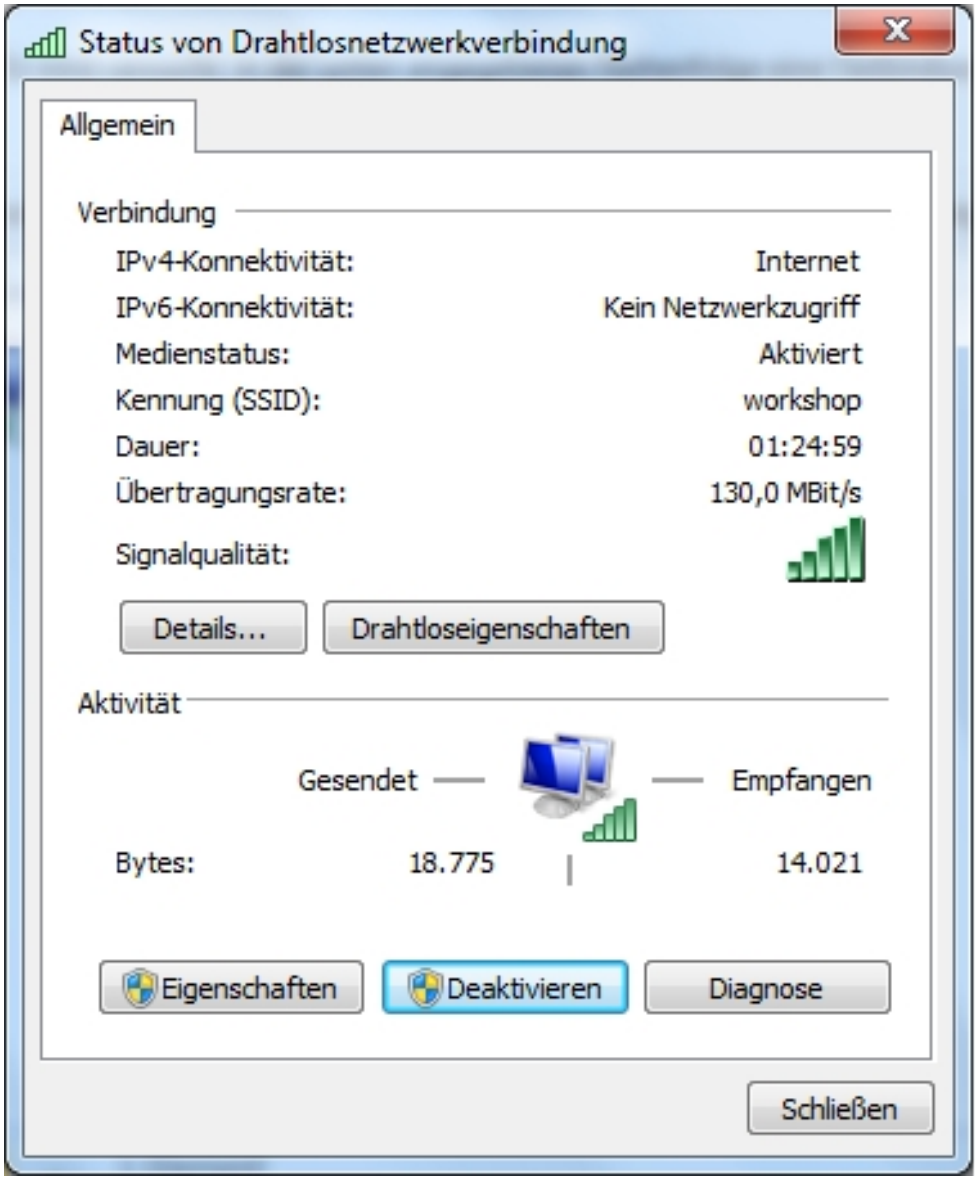
After the new connection has been added using the assistant, the connection settings must be further adjusted.



In the process, the previously-installed certificate from the certification authority is selected as a trustworthy certificate in the safety method settings `Protected EAP (PEAP)`. This configuration step defines the Windows 2008 RADIUS server as a trustworthy remote terminal.



Using the generated certificate, a secure connection is established between the WLAN client and the Windows 2008 server when setting up the WLAN connection. This connection serves for transmission of the Windows login data (user- or computer authentication) to the Microsoft Network Policy Server (RADIUS server).


Status von Drahtlosnetzwerkverbindung
Allgemein
Verbindung
IPv4-Konnektivität:
Internet
IPv6-Konnektivität:
Kein Netzwerkzugriff
Medienstatus:
Aktiviert
Kennung (SSID):
workshop
Dauer:
01:24:59
Übertragungsrate:
130,0 MBit/s
Signalqualität:
Details...
Drahtloseigenschaften
Aktivität
Gesendet
Empfangen
Bytes:
18.775
14.021
Eigenschaften
Deaktivieren
Diagnose
Schließen

3.6 Overview of Configuration Steps

Configuration of active directory certificate services

Field	Menu	Value
Active directory certificate services	**"Add Roles" assistant** -> **Server Roles**.	Enable
Certification authority web registration	**"Add Roles" assistant** -> **Role Services**.	Enable
Company	**"Add roles" assistant** -> **Installation type**.	Enable
Root certification authority	**"Add Roles" assistant** -> **Certification Authority Type**.	Enable
Generate new private key	**"Add Roles" assistant** -> **Private Key**.	Enable
Key character length	**"Add Roles" assistant** -> **Encryption**.	*2048*
Hash algorithm	**"Add Roles" assistant** -> **Encryption**.	*SHA1*
Common name of certification authority	**"Add Roles" assistant** -> **Certification Authority**.	e.g. *WorkshopWLANCA*.
Suffix of the defined name	**"Add Roles" assistant** -> **Certification Authority**.	e.g. *DC=wlan,DC=funkwerk,DC=com*
Validity period	**"Add Roles" assistant** -> **Validity Period**.	*15 years*

Reservation of access point IP addresses at DHCP server

Field	Menu	Value
Address leases	**Server Manager** -> **DHCP Server** -> **Address Leases**.	*Add to reservation*
Reservation name	**Server Manager** -> **DHCP Server** -> **Address Leases**.	E.g. *WLANAccess-PointRoom1*
IP address	**Server Manager** -> **DHCP Server** -> **Address Leases**.	e.g. *192.168.1.254*
MAC address	**Server Manager** -> **DHCP Server** -> **Address Leases**.	E.g. *00:a0:f9:a0:b2:21*

Installation of network policies and access services

Field	Menu	Value
Network policies and access services	**"Add Roles" assistant** -> **Server Roles**.	Enable
Network policy server	**"Add Roles" assistant** -> **Role Services**.	Enable

Configuration of network policies and access services

Field	Menu	Value
Configure 802.1X	**Server Manager** -> **Network policies and access services (NPS)** -> **NPS (local)**.	Starting
Secure wireless connections	**Server Manager** -> **Network policies and access services (NPS)** -> **NPS (local)**.	Enable
Name	**Server Manager** -> **Network policies and access services (NPS)** -> **NPS (local)**.	E. g. *WLAN_Authentication*
Display name	**configure 802.1X** -> **specify 802.1X Switches**	E.g. *WLAN_AccessPoint_Room_1*
Address (IP or DNS)	**configure 802.1X** -> **specify 802.1X Switches**	e.g. *192.168.1.254*
Common secret key	**configure 802.1X** -> **specify 802.1X Switches**	e.g. *supersecret*
Type	**configure 802.1X** -> **Configure authentication method**	*Microsoft: protected EAP (PEAP)*
Certificate issued for:	**configure 802.1X** -> **Configure authentication method**	*Server.wlan.bintec-elmeg.com*
WLAN\WLAN_users	**configure 802.1X** -> **Specify user groups**	Add

Radius configuration of access point

Field	Menu	Value
Authentication Type	**System Management**->**Remote Authentication**->**RADIUS**-> **New**	WLAN (802.1x)
Server IP Address	**System Management**->**Remote Authentication**->**RADIUS**-> **New**	e.g. *192.168.1.10*

Field	Menu	Value
RADIUS Password	**System Management->Remote Authentication->RADIUS-> New**	e.g. *supersecret*

WLAN configuration of the access point

Field	Menu	Value
Operation Mode	**Wireless LAN -> WLAN -> Radio Settings->**	*Access-Point / Bridge Link Master*
Operation Band	**Wireless LAN -> WLAN -> Radio Settings->**	*2.4GHz In/Outdoor*
Channel	**Wireless LAN -> WLAN -> Radio Settings->**	*Auto*
Network Name (SSID)	**Wireless LAN -> WLAN -> Wireless networks (VSS) ->New**	e.g. *workshop*
Security mode	**Wireless LAN -> WLAN -> Wireless networks (VSS) ->New**	*WPA Enterprise*
WPA Mode	**Wireless LAN -> WLAN -> Wireless networks (VSS) ->New**	*WPA and WPA 2*
WPA Cipher	**Wireless LAN -> WLAN -> Wireless networks (VSS) ->New**	*AES and TKIP*
WPA2 Cipher	**Wireless LAN -> WLAN -> Wireless networks (VSS) ->New**	*AES and TKIP*

Connection of a Windows 7 WLAN client

Field	Menu	Value
Certification authority certificate download	**Explorer 192.168.1.10**	Enable
Certification authority certificate	**Explorer 192.168.1.10**	*Current (WorkshopWLANCA)*
Certificate	**Explorer 192.168.1.10**	Install certificate
Certificate memory	**Explorer 192.168.1.10**	Save all certificates in the following memory

Configuration of the Windows 7 WLAN client

Field	Menu	Value
Wireless connection	**Manage wireless network connection**	Add
Network Name	**Manage wireless network connec-**	e.g. *workshop*

Field	Menu	Value
	tion	
Safety type	**Manage wireless network connection**	*WPA2 Enterprise*
Encryption type	**Manage wireless network connection**	*AES*
Modify connection settings	**Manage wireless network connection**	Enable
Select authentication method	**Manage wireless network connection**	Secure password (EAP-MSCHAP v2)

Chapter 4 WLAN - Bintec WLAN Controller Introduction

4.1 Functional overview

The **bintec WLAN Controller** offers the following advantages for an easier management of your WLAN infrastructure:

- Wizard-guided quick installation in five steps
- Automatic recognition and installation of new devices
- VLAN and Multi SSID support
- Integrated 802.11abgn support
- Optimised roaming characteristics for VoWLAN
- Centralised management of all Access Points:
  - Easy modification of settings for all APs
  - Any modification, e.g. of the SSIDs, immediately applies to all APs
- Access Points installed at public locations no longer are a security risk:
  - Network keys and passwords are not saved on the AP and hence cannot fall into unauthorised hands through AP theft
  - Any direct AP (configuration) access is blocked by the WLAN controller
- Automated frequency management:
  - Integrated channel plan, for non-overlapping frequency assignment
  - Interference reduction through intelligent frequency assignment
  - Consideration of foreign access points (neighbor APs)
- Monitoring:
  - Access point operation
  - Client activity
  - Recognition and display of undesired access points (neighbor access points)
- E-mail Alert in case of failure of a managed access points
- Scheduler based actions (e.g. overnight shutdown of the WLAN)
- Configuration Management: The configuration is centrally saved and automatically reassigned to APs, e.g. after loss of power.
- Centralised firmware updates

4.2 Project planning

4.2.1 Determining customer requirements

It all starts with the customers - and determining what their needs really are. In most cases customers want a WLAN network in the 2.4 GHz frequency range, allowing employees and visitors wireless connection to the company network and the Internet throughout offices and meeting rooms. Next the question arises of whether a radio frequency site survey by a specialist needs to be performed. Because of the considerable expense involved, the radio frequency site survey is frequently skipped; instead the APs are positioned at customer discretion and in consideration of the facility's spatial arrangement.

However in case of complex buildings or if the customer requires a high-performance network with continuous coverage and VoWLAN-readiness, a radio frequency site survey is indispensable.

4.2.2 Recommended hardware installation on site

Next an electrician comes into play to install the access points in corridors and offices. If doing without a radio frequency site survey, APs should be mounted at a distance of 15-20 meters to each other: this rule usually results in a functional setup.

All APs should be connected to a PoE-capable switch over an Ethernet cable. Power supply via the Ethernet cable (PoE) avoids installation of a 230 V socket and considerably simplifies setup.

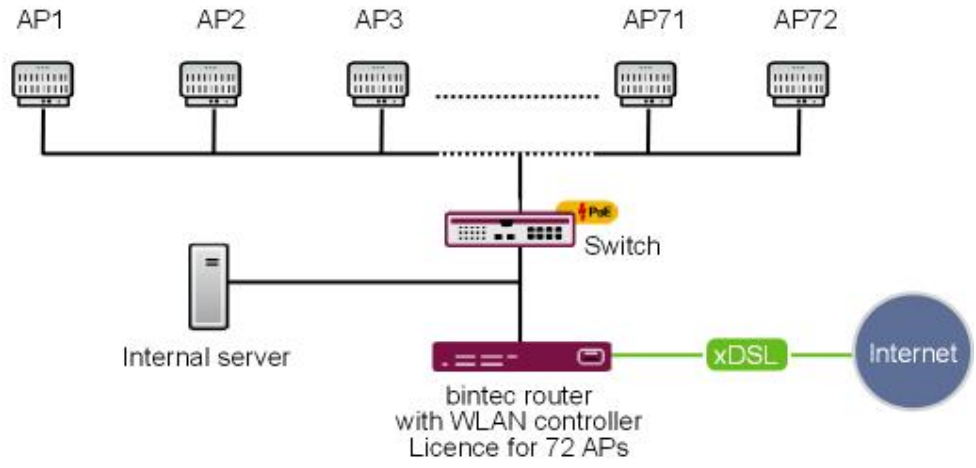


Fig. 57: WLAN infrastruktur

The electrician should document the locations and MAC addresses of the devices so that names or locations can later be assigned to the devices during configuration.

4.3 System requirements

4.3.1 WLAN Controller hardware

The following devices with firmware versions 10.1.21 or higher can be used as WLAN controllers (supported devices with firmware versions lower than 10.1.21 need to be updated before installation):

- **bintec Access Points (W1001n, W1003n, W2003ac/ext, W2022 ac/ext., WI1003n, WO1003ac, WO2003ac)**
- **bintec Medium Router (RS123 series, RS353 series)**
- **bintec be.IP , be.IP plus**
- **bintec RXL12100**: central router, high-performance multiplex VPN gateway
- **bintec RXL12500**: central router, high-performance central site VPN gateway

For small installations up to 6 access points no dedicated WLAN controller hardware is needed and one of the access points (running as master access point) can take on the function of the WLAN controller. If a WLAN network with more than 6 access points is desired, at mimimum a R1202 is necessary as WLAN controller hardware.

4.3.2 Access Point hardware

The WLAN controller can manage the Access Points with software version 10.1.21.

4.3.3 WLAN Controller software licences

For testing purposes, the WLAN controller is already activated in the firmware of every supported device; however, only a single access point can be managed. For business operation a WLAN controller licence must be installed on the controller.

The WLAN controller licenses can be found on our homepage at *https://www.bintec-elmeg.com/service-support/produkt-lizenzierung/*

4.4 Network configuration

4.4.1 WLAN Controller device network settings

Before connecting the WLAN controller device to the network of the (still unconfigured) access points it needs to have its IP address and network settings (different from factory defaults) configured according to the setup of your local network. Otherwise the next steps will fail.

4.4.2 DHCP server

4.4.2.1 Internal DHCP server

If there is no active DHCP server in your network, and if the WLAN controller device will also act as DHCP server (internal DHCP server) you can directly proceed with *WLAN rollout with the WLAN controller wizard* on page 105 and start the WLAN rollout. The WLAN controller wizard includes the setup of all necessary DHCP server settings.

4.4.2.2 External DHCP server

For the access points to be manageable by the WLAN controller they must know the IP address of the WLAN controller. So in addition to the required basic network settings such as device IP address, default gateway and nameserver, the DHCP server needs to provide the access point with the IP address of the WLAN controller. This is done via option 138 of the DHCP protocol. This option (also named CAPWAP Access Controller) must, therefore, be enabled on the DHCP server, and the IP address of the WLAN controller (which you configured in chapter 4.1) must be specified. In case:

- Another Bintec router is operating as DHCP server:

  The required configuration steps are described in the appendix.
- A Microsoft Server 2003 or Server 2008 is operating as DHCP server:

  The required configuration steps are described in the appendix.
- A Linux server is operating as DHCP server:

  The required configuration steps are described in the appendix.
- The router of a third-party provider is operating as DHCP server:

  Please perform the configuration of DHCP option 138 according to the respective documentation.

4.4.2.3 No DHCP server - APs with static IP address settings

Occasionally, it may be necessary to operate a WLAN-controller-managed network with static IP address and network settings. Thus each access point requires the manual configuration of IP and network settings. The necessary configuration steps for all access points is described in *Appendix* on page 110.

4.5 WLAN rollout with the WLAN controller wizard

The WLAN controller wizard guides you through configuration and rollout of your WLAN network in five steps.

4.5.1 Wizard Step 1

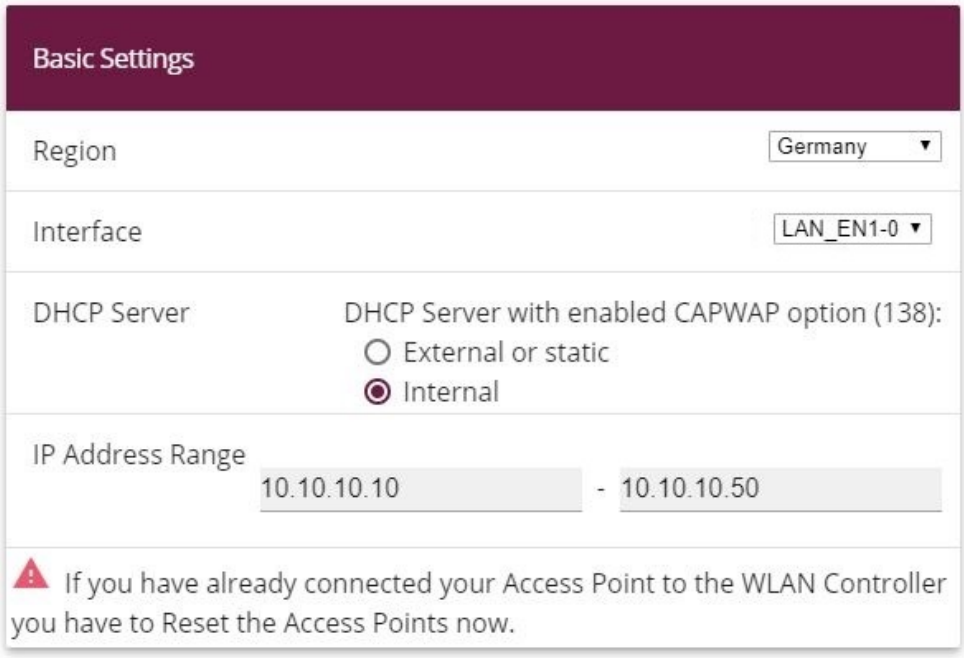


Fig. 58: **Wireless LAN Controller->Wizard->Wireless LAN Controller Wizard**

Here you define certain basic characteristics of the WLAN controller:

(1) **Region**: The region where your WLAN network is located. This setting adapts your WLAN network to the WLAN regulations of your region (e.g. permitted frequencies).

(2) **Interface**: Defines over which interface the controller communicates with the APs (the

IP of this interface is the WLAN Controller IP address configured in option 138 of the DHCP server).

(3) **DHCP Server**: Defines whether the `Internal` or an `External` DHCP server is used for the access points. When using the internal DHCP server, all DHCP server settings including option 138 are made automatically. You'll find information on configuring an external DHCP server in *Appendix* on page 110.

(4) **IP Address Range**: Defines the IP address range available to the internal DHCP server.

(5) Click on **Next**.

Note

Before proceeding, please make sure that any existing external DHCP server is operative and that DHCP option 138 is enabled. If an external or internal DHCP server was already enabled at the time of AP installation, but DHCP option 138 was only subsequently enabled, the WLAN controller may fail to display the APs within your network. This can happen because the APs have already been assigned an IP address, but have not yet received the WLAN controller IP address. This can be remedied by waiting for the expiration of the DHCP lease time or by resetting the APs.

4.5.2 Wizard Step 2

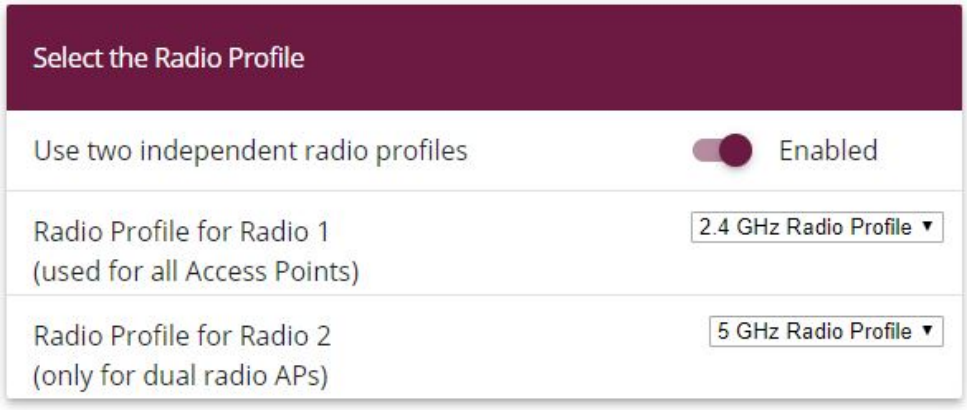


Fig. 59: **Wireless LAN Controller->Wizard->Wireless LAN Controller Wizard**

Here, you define the radio profile with which the WLAN network will operate. A 2.4 GHz and a 5 GHz radio profile are available by default. Additional radio profiles can be created outside of the wizard via the **Wireless LAN Controller->Slave AP configuration->Radio Profile** menu.

Click on **Next**.

4.5.3 Wizard Step 3

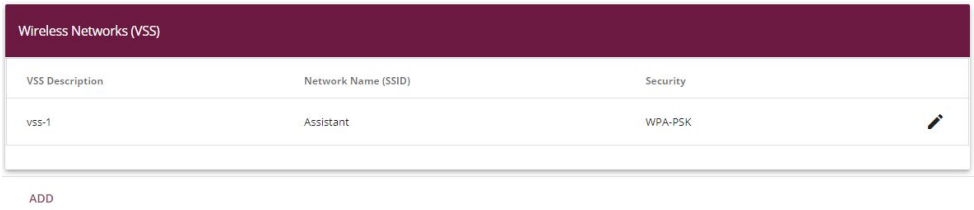


Fig. 60: **Wireless LAN Controller->Wizard->Wireless LAN Controller Wizard**

Here, you define which SSID/VSS shall be present in the network. One VSS is already available per default; this can be customised via the icon. With **Add** you can can create up to seven additional VSS.

In this example, we create an additional VSS for visitor access:

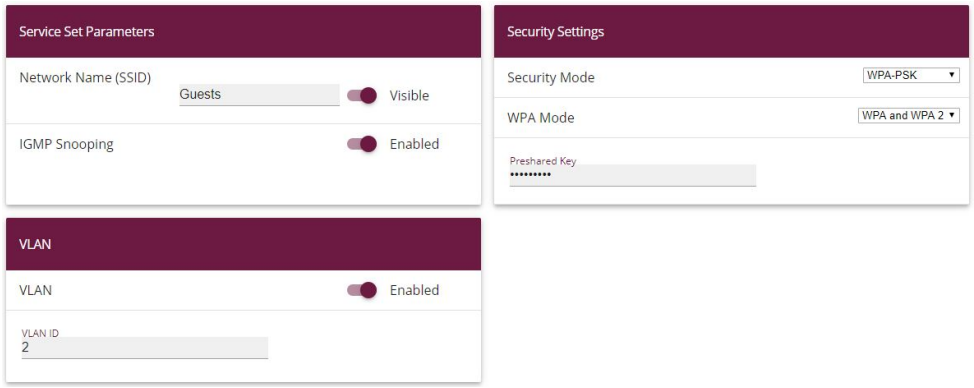


Fig. 61: **Wireless LAN Controller->Wizard->Wireless LAN Controller Wizard**

(1) A **Network Name (SSID)** is assigned for the new VSS.

(2) Select the **Security Mode** *WPA-PSK*.

(3) As we do not want access to the company intranet from the guest network, a VLAN is defined for this VSS (in this example **VLAN ID** *2*): All data from the "Guest" network will be tagged with that VLAN ID on the Ethernet (LAN).

(4) Click on **OK**.

Note

VLAN ID 0 and 1 are reserved (for management VLAN) and cannot be used for any VSS.

VLAN tagging gives you the possibility to separate guest data from other data, and you can setup your network switches and/or Internet access routers in a way ´so that, e.g., all data from VLAN ID 2 and thus all guests are allowed to access the Internet but not the company intranet (please see the manual of your switch and/or router for how to configure VLAN separation there).

We now leave the VSS configuration with **OK** and return back to the VSS overview page. Before proceeding to wizard step 4 make sure that all access points that are supposed to be managed are connected to your LAN and are powered on.

4.5.4 Wizard Step 4

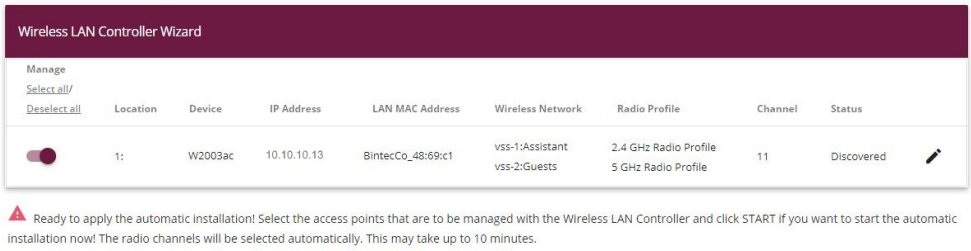


Fig. 62: **Wireless LAN Controller->Wizard->Wireless LAN Controller Wizard**

Now all discovered access points are displayed. By default, all defined wireless network profiles (VSS) and the previously selected radio profile are assigned to all access points. With the symbol you can customise these standard settings and provide each device with an individual location description.

Note

In some cases, not all expected APs are displayed. The reason in that case is that not all APs were discovered by the WLAN controller. In this case **Back** can be used to update the display.

4.5.5 Start WLAN rollout to access points

After selecting the check box in the "Manage" field of all access points you want to use, you can launch the WLAN controller rollout and automatic frequency management with **Start**. The display now switches to a status screen indicating the WLAN controller's current activities:

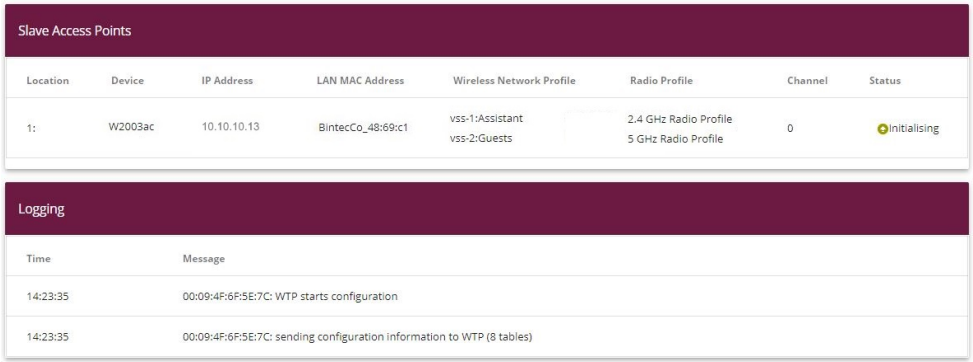


Fig. 63: **Wireless LAN Controller->Wizard->Wireless LAN Controller Wizard**

The configuration now is transfered sequentially to all access points. The configuration of an access point is finished and indicated with status `managed` after the best radio channel was found for it. When assigning radio channels, the WLAN controller ensures that only non-overlapping channels (e.g. 1, 6, 11) are assigned and that interference between the individual access points is kept to a minimum.

Managed access points are locked by the WLAN controller and all direct access to them is prohibited. An access point can only be locally configured after the WLAN controller released the access point.

After all access points are managed, the display changes once again and shows the final result:

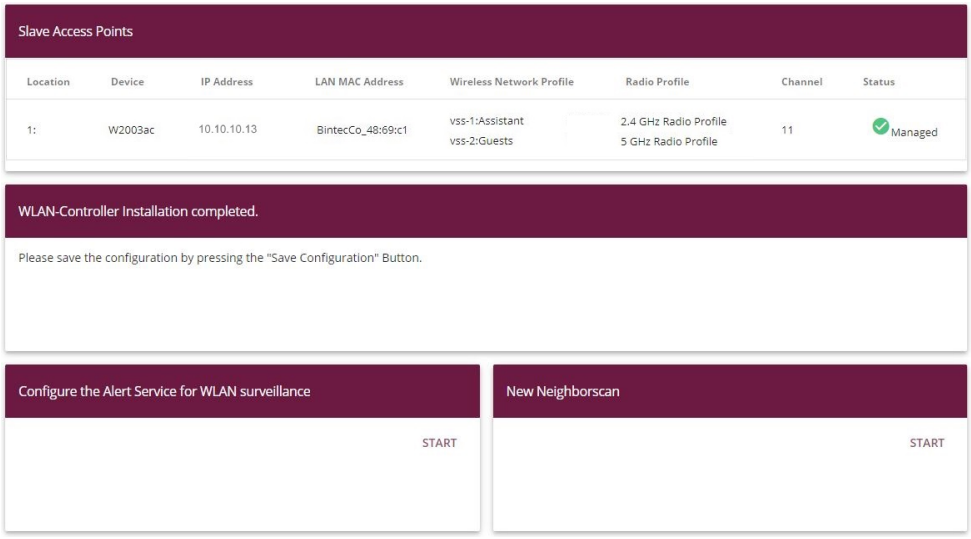


Fig. 64: **Wireless LAN Controller->Wizard->Wireless LAN Controller Wizard**

The configuration now needs to be saved on the WLAN controller device via the **Save configuration** button in the upper left. The access points themselves keep their current configuration in their volatile memory only and do not save it to their persistent memory. In the event of power failure, the configuration within the access points is lost and automatically re-loaded into the access point by the WLAN controller after power is restored. Keeping the configuration only in the volatile memory of the APs has the additional advantage that no sensitive access data (such as WLAN keys) can be compromised through theft of an access point installed at a public location.

After a power failure, all access points are re-initalised by the WLAN controller at once and radio management is not re-started, but the previously used channel is used instead. Thus recovery of WLAN infrastructure after power failure is much faster than the initial rollout.

Under **Configure the Alert Service for WLAN surveillance**, click **Start** to monitor your managed APs. You are taken to the **External Reporting**-> **Alert Service** -> **Alert Recipient** menu with the default setting **Event** = `Managed AP offline`. You can specify that you wish to be notified by e-mail if the `Managed AP offline` event occurs

4.6 Appendix

4.6.1 E-mail alert in case of access point failure

You can have an E-mail send from the WLAN Controller in case one of the managed access points is no longer reachable. This is especially helpful in larger and complex WLAN infrastructures where this kind of failure does not become immediately apparent. (The **notification settings** are not described here).

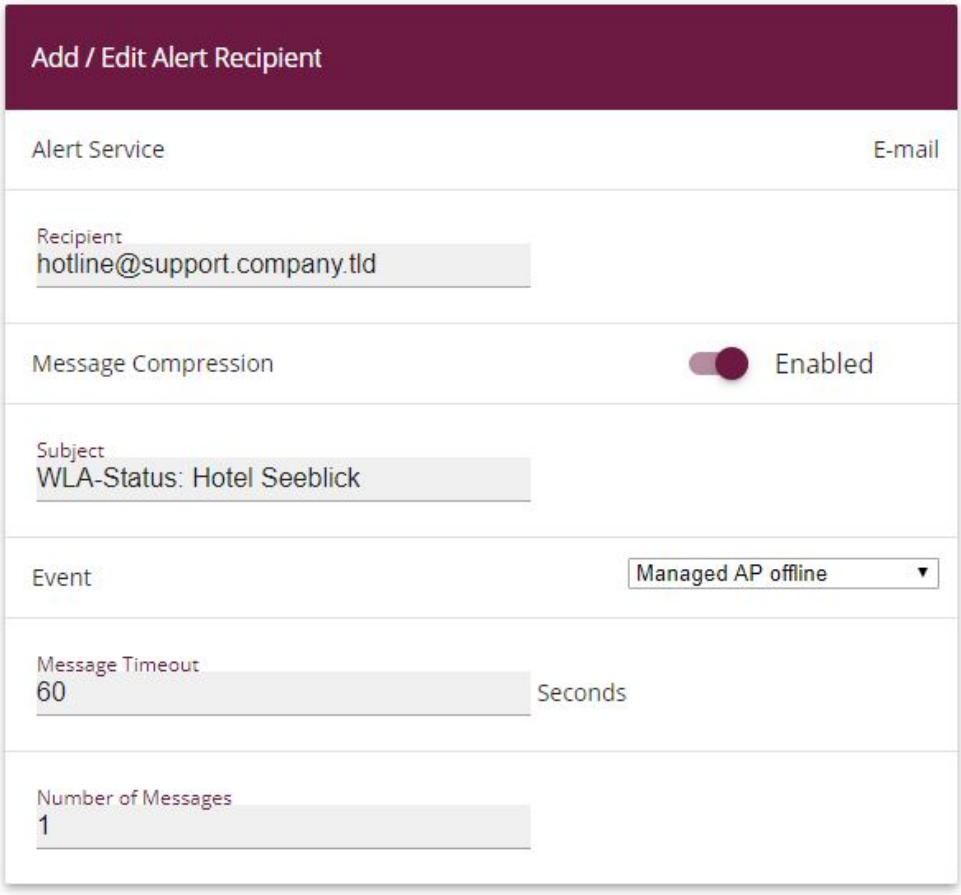


Fig. 65: **External Reporting**-> **Alert Service** -> **Alert Recipient**

4.6.2 Configuration of a DHCP server on another Bintec router

The requirement is a Bintec router with software release 10.1.21 or higher.

First, you must define an IP address pool on the **Local Services**->**DHCP Server**-> **IP Pool Configuration** -> **New** menu.

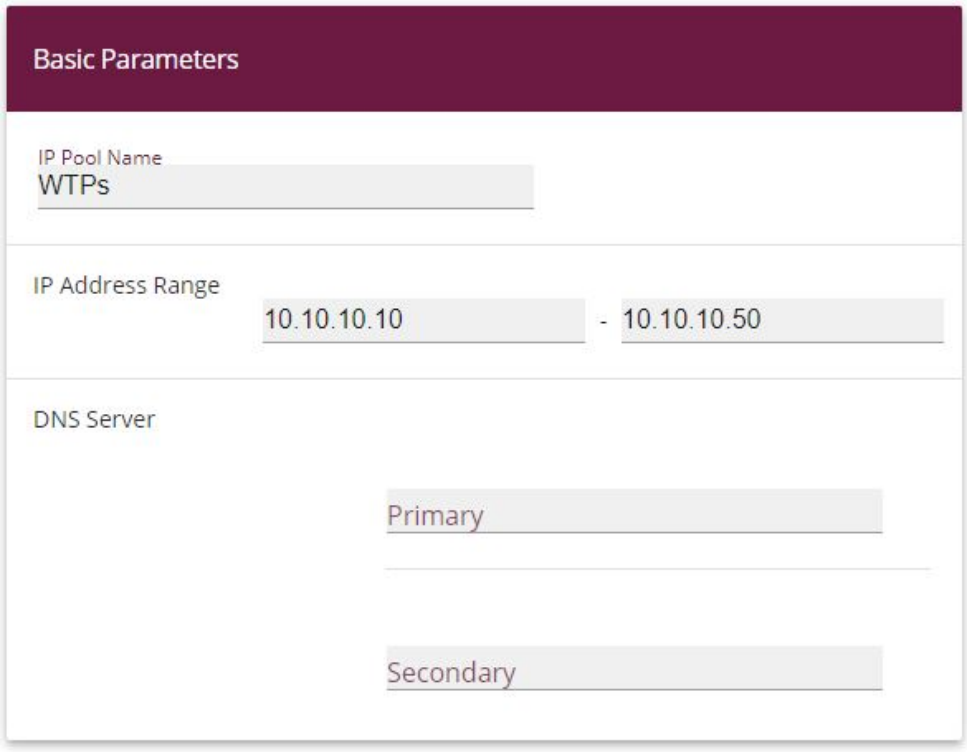


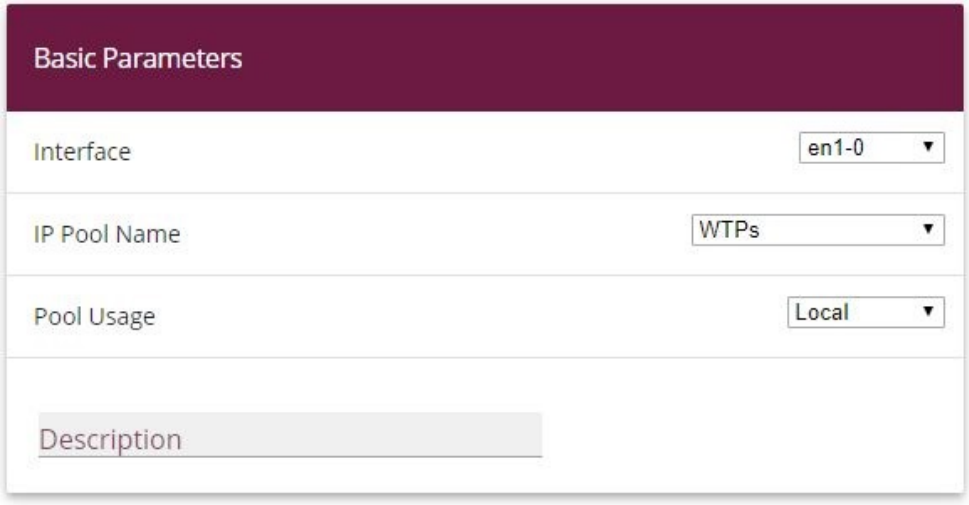
Fig. 66: **Local Services**->**DHCP Server**-> **IP Pool Configuration** -> **New**

(1) Enter any description at **IP Pool Name**, e. g. *WTPs* .

(2) For **IP Address Range**, enter the first and the last IP address in the IP address pool, e. g. *10.10.10.10* - *10.10.10.50*.

(3) Confirm with **OK**.

In the **Local Services**->**DHCP Server**-> **DHCP Configuration** -> **New** menu, you can perform additional configuration.



Advanced Settings:

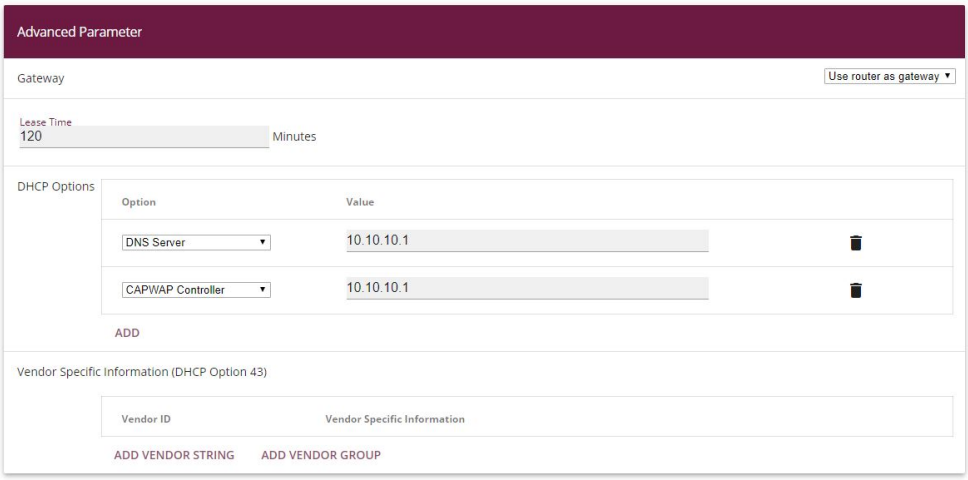


Fig. 68: **Local Services->DHCP Server-> DHCP Configuration -> New**

(1) Select the interface over which the addresses defined in **IP Address Range** are to be assigned to DHCP clients.

(2) Under **IP Pool Name** select a configured **IP-Pool**.

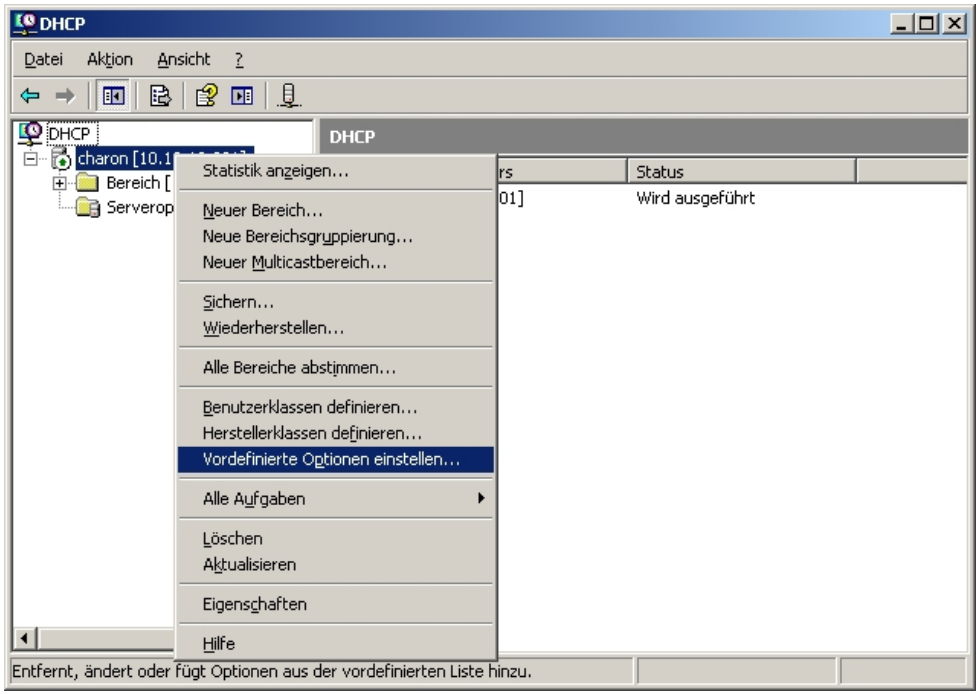
(3) Under **Advanced Settings** on the **DHCP Options** menu add with the **Add** button the option `CAPWAP controller` and under **Value** enter the IP address of the WLAN Controller.

(4) Confirm with **OK**.

4.6.3 Configuration of a DHCP server on Windows Server 2003/2008

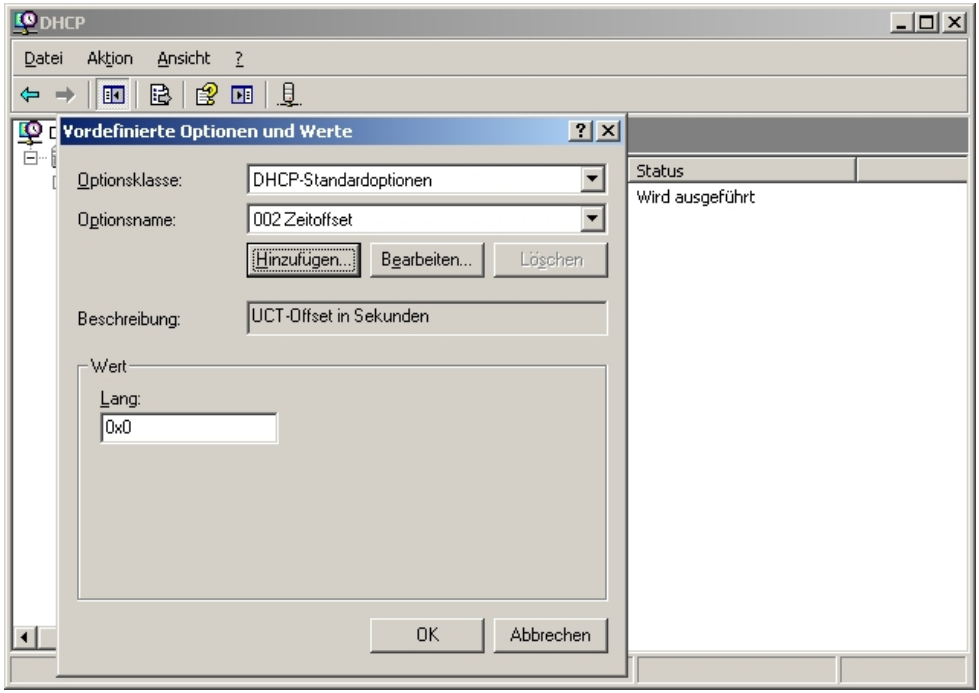
First, your Windows DHCP server service must receive a basic set up, i.e. the DHCP IP address range needs to be defined,and standard options such as DNS server and standard gateway/router need to be configured according to your network infrastructure.

4.6.3.1 Step 1



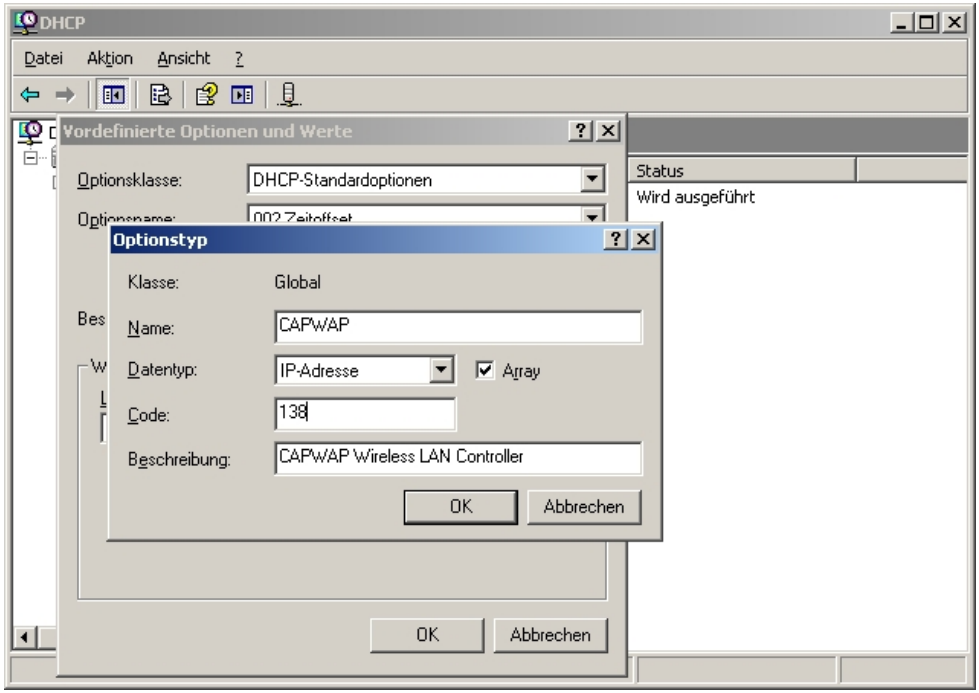
In the DHCP service window (accessible via **Control Panel**, there under **Administration**), right-click on the existing DHCP service instance (you can identify it through the computer name and the IP address the DHCP service is linked to), then click on **Set Predefined Options** in the expanded context menu.

4.6.3.2 Step 2



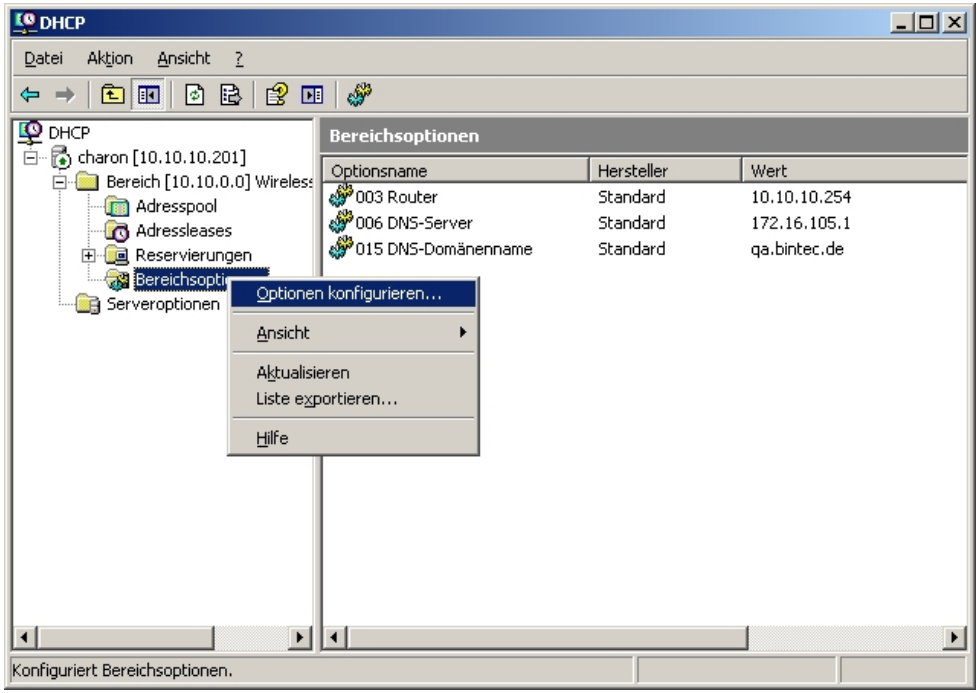
In the window now opening, click **Add** to add the CAPWAP option.

4.6.3.3 Step 3



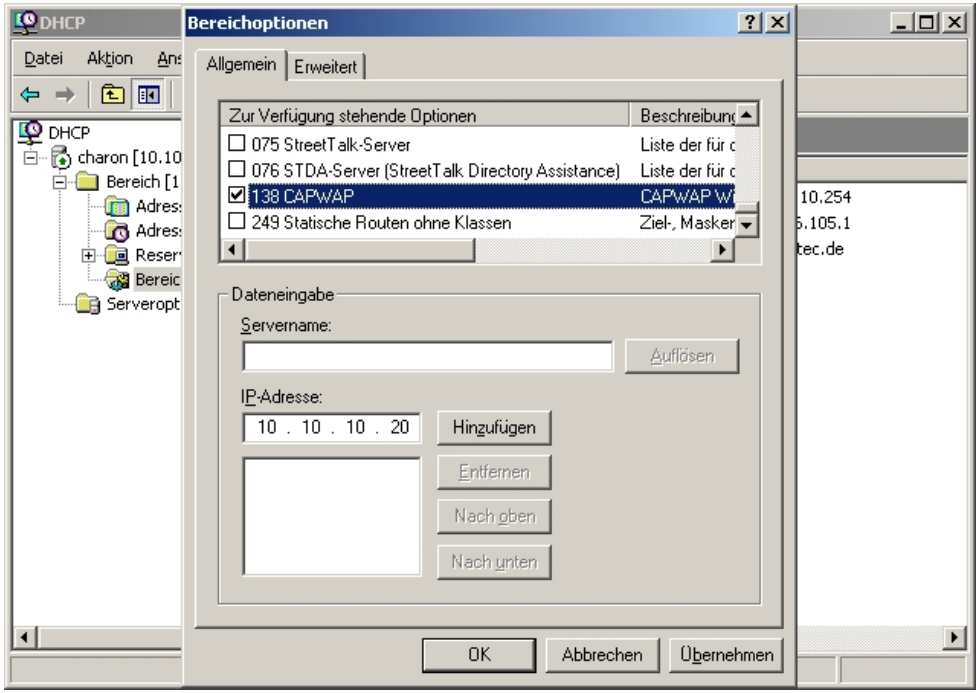
In the **Option Type** dialogue window, the CAPWAP option is now defined (but not yet activated). **Name** and **Description** can be freely selected, but should be plausible. Data type must be set to *IP Address*, and **Array** checked. In addition, **Code** must be set to *138*. If the code is already in use for another, self-defined DHCP option not matching the CAPWAP DHCP option, the pre-existing one must first be deleted. Close the dialogue and the previous window by clicking **OK**.

4.6.3.4 Step 4



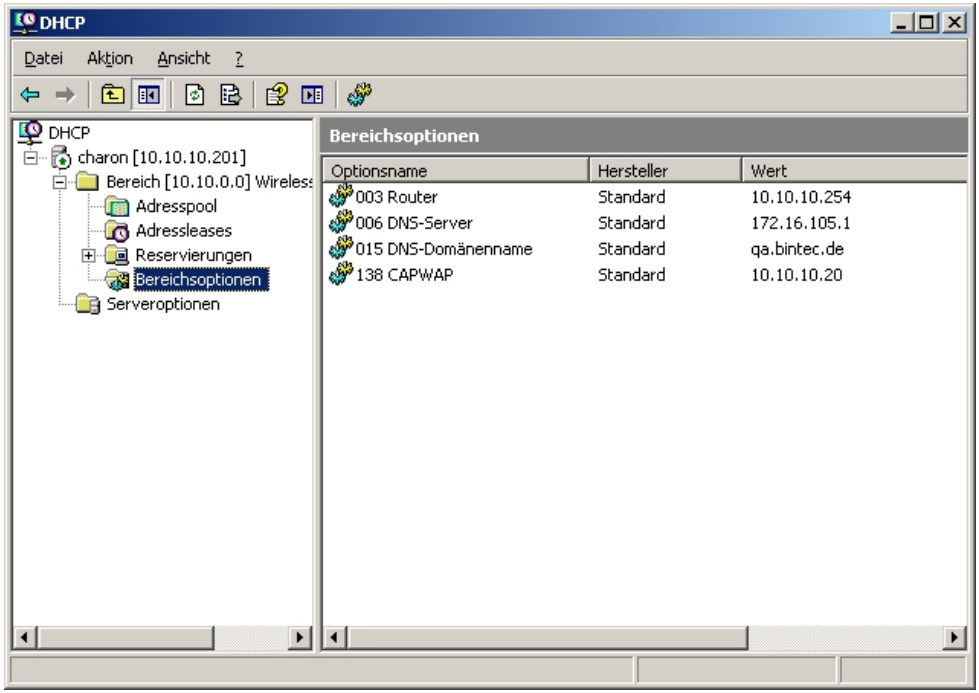
Now, in the IP address range of the DHCP service already configured for future slave access points, right-click **Range options** and select **Configure Options** in the context menu.

4.6.3.5 Step 5



In the expanding dialogue window, select option **138** in the list of **Available Options**. In the **IP Address** entry field, enter the IP address of the WLAN controller; then, on the right, click **Add**. Theoretically, it is possible to enter several WLAN controller IP addresses here. At present, however, only the first IP address is taken into account by the Funkwerk access points. Now, also close this dialogue box by clicking **OK**.

4.6.3.6 Step 6



The DHCP service overview window should now also list the CAPWAP option. At this stage, the access points and the WLAN controller in the network for which the DHCP service ihas been configured, can go into operation.

4.6.4 Configuration of a DHCP server under Linux

In the configuration file /etc/dhcp/dhcpd.conf, add the following:

```
# Format definition of DHCP CAPWAP option for Wireless LAN Controller
option wifi-controller code 138 = array of ip-address;
# IP address range for Slave APs/WTPs<
subnet 10.10.0.0 netmask 255.255.255.0 {
range 10.10.10.10 10.10.10.100;
option domain-name-servers mydnsserver.mydomain.tld;
option routers 10.10.10.1;
option broadcast-address 10.10.10.255;
default-lease-time 600;
max-lease-time 7200;
# IP address of Wireless LAN Controller
option wifi-controller 10.10.10.5;
}
```

The lines beginning with **option wifi-controller** are the most crucial ones. The first line defines the data format of option 138, as it is not contained in the standard format definitions of the dhcpd. The second line specifies the IP address of the WLAN controller to which the individual slave AP's log in after they have received all data (own IP address, WLAN controller IP, etc.) from the DHCP server.

Any other information is standard for the definition of a DHCP pool: **subnet**, **range**, **domain-name-servers**, **routers** etc. need to be configured according to the customer's own requirements.

Once the configuration file is saved, restart the DHCP server with the command `/etc/init.d/dhcp-server restart`.

4.6.5 Operation of APs with static IP address settings

As described in *DHCP server* on page 104 the DHCP server not only assigns IP addresses but also provides the access points to be managed with the IP address of the WLAN Controller. In case of static IP address settings for access points it is necessary not only to specify an IP address and a netmask at each access point that is to be managed, but also to manually specify the IP address of the WLAN controller. You can find the necessary configuration parameter in the menu **System Management**->**Global Settings**->**System** page:

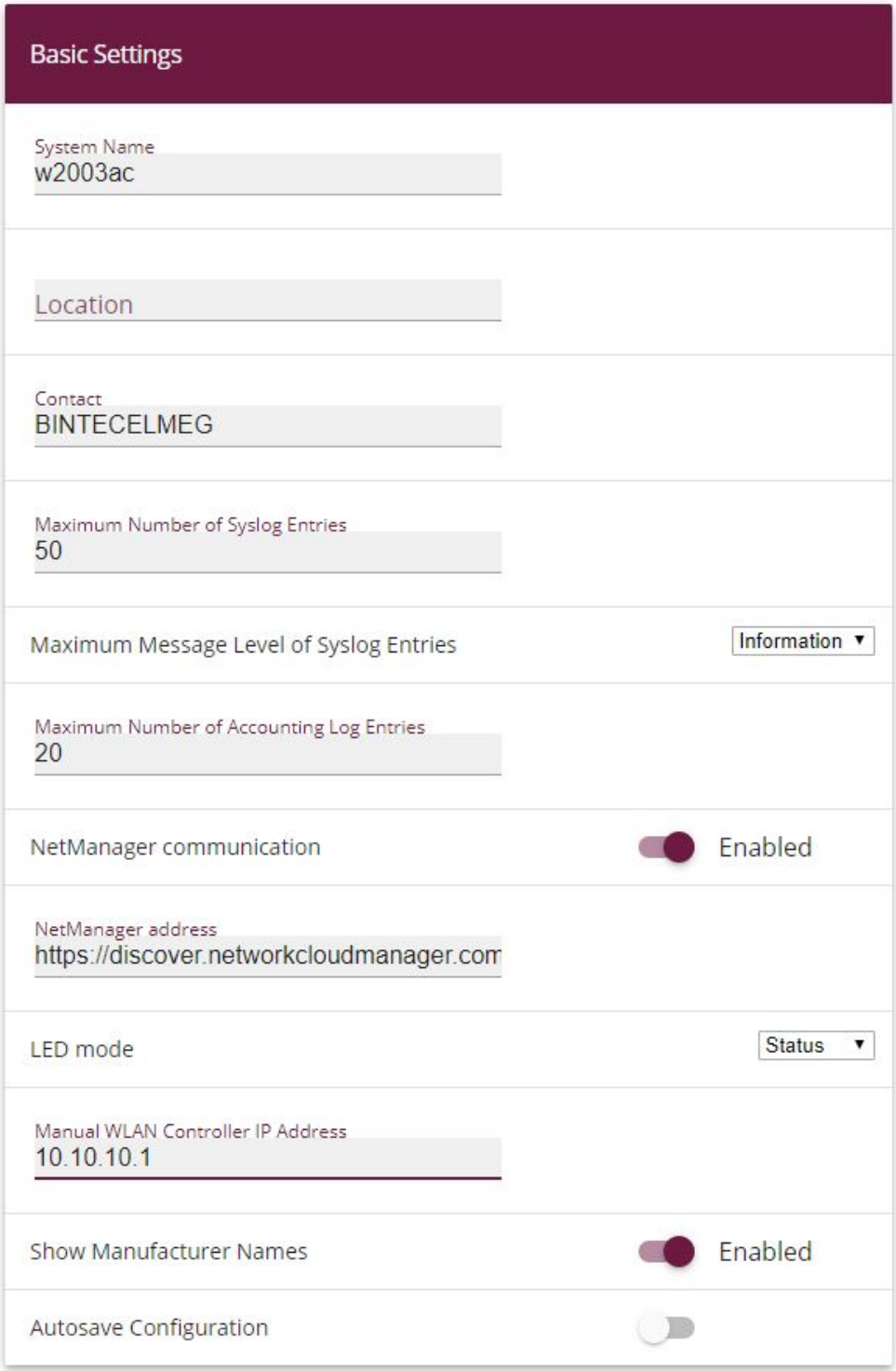

Basic Settings
System Name
w2003ac
Location
Contact
BINTECELMEG
Maximum Number of Syslog Entries
50
Maximum Message Level of Syslog Entries
Information
Maximum Number of Accounting Log Entries
20
NetManager communication
Enabled
NetManager address
https://discover.networkcloudmanager.com
LED mode
Status
Manual WLAN Controller IP Address
10.10.10.1
Show Manufacturer Names
Enabled
Autosave Configuration

Fig. 69: **System Management->Global Settings->System**

When starting the WLAN controller wizard, it is essential to choose **Extern** for DHCP Server in WLAN controller wizard step 1.

4.7 Overview of configuration steps

Wireless network installation: Step 1

Feld	Menü	Wert
Region	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 1**	e.g. *Germany*
Interface	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 1**	e.g. . *LAN_EN1-0*
DHCP Server	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 1**	e.g. *Internal*
IP Address Range	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 1**	e.g. *10.10.10.10 - 10.10.10.50*

Wireless network installation: Step 2

Feld	Menü	Wert
Radio Profile for Radio 1	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 2**	e.g. *2,4 GHz Radio Profile*
Radio Profile for Radio 2	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 2**	e.g. *5 GHz Radio Profile*

Wireless network installation: Step 3

Feld	Menü	Wert
Network Name (SSID)	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 3**	e.g. *Assistent*
Network Name (SSID)	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 3 ->Hinzufügen**	e.g. *Guests*
Security Mode	**Wireless LAN Controller -> Wizard**	*WPA-PSK*

Feld	Menü	Wert
	-> **Wireless LAN Controller Wizard ->Step 3 ->Hinzufügen**	
Preshared Key	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 3 ->Hinzufügen**	e.g. *supersecret*
VLAN	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 3 ->Hinzufügen**	*Enabled*
VLAN ID	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 3 ->Hinzufügen**	e.g. *2*

Wireless network installation: Step 4

Feld	Menü	Wert
Select device	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 4**	*Enabled*
Configure the Alert Service for WLAN surveillance	**Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard ->Step 4**	*START*

E-mail alert

Feld	Menü	Wert
Recipient	**External Reporting-> Alert Service -> Alert Recipient**	e.g. *hotline@support.company.ltd*
Subject	**External Reporting-> Alert Service -> Alert Recipient**	e.g. *WLAN-Status: Hotel Seebliick*
Event	**External Reporting-> Alert Service -> Alert Recipient**	*Managed AP offline*

Configuration of a DHCP server on another router

Feld	Menü	Wert
IP-Pool Name	**Local Services->DHCP Server-> IP Pool Configuration -> New**	e.g. . *WTPs*
IP Address Range	**Local Services->DHCP Server-> IP Pool Configuration -> New**	e.g. *10.10.10.10 - 10.10.10.50*
Interface	**Local Services->DHCP Server-> DHCP Configuration -> New**	e.g. *en1-0*

Feld	Menü	Wert
IP Pool Name	**Local Services->DHCP Server-> DHCP Configuration -> New**	e.g. *WTPs*
Pool Usage	**Local Services->DHCP Server-> DHCP Configuration -> New**	*Local*
DHCP Options	**Local Services->DHCP Server-> DHCP Configuration -> New ->Advanced Settings**	**Option***CAPWAP Controller*, **Value** e.g. *10.10.10.1*

Operation with static IP address

Feld	Menü	Wert
Manual WLAN Controller IP Address	**System Management->Global Settings->System**	e.g. *10.10.10.1*

Chapter 5 WLAN - VoWLAN Basics and Configuration

5.1 General

When using a cordless phone, the user expects the best possible voice quality and excellent reliability.

The DECT (Digital Enhanced Cordless Telecommunications) standard has a high level of acceptance and fulfils those requirements. In contrast to WLAN, DECT uses its own reserved frequency range. Because DECT works in the 1.9 GHz range, the high frequency propagation characteristic is better than with WLAN, and this results in a greater coverage. So, with VoWLAN, more access points are also required than with DECT. WLAN was originally developed for data transmission by terminals whose location does not change. With VoWLAN, however, the wifi telephone's location is constantly changing. So VoWLAN must be capable of handing the connection over from one access point to the next access point (handover/roaming). This must be possible with no noticeable interruption to the connection (seamless handover). This feature is particularly important for installations in large enterprises in which multiple access points are being used.

The chapters that follow will show how this type of VoWLAN network has to be configured and set up so that the main quality features demanded of cordless telephony can be provided. We shall use the **bintec be.IP** oder **be.IP plus**, **bintec W2003ac-ext** WLAN access point, a **bintec RS123w** as WLAN controller, and the bintec-certified **Ascom i62**.

5.2 WLAN infrastructure

5.2.1 WLAN radio illumination

When faced with a WLAN infrastructure for data transmission, the design of the WLAN network for VoWLAN must be more closely meshed. In doing the planning, the WLAN supply to nearby areas also needs to be considered so that, for example, phone calls can be made in the coffee area. For the roaming to function perfectly and to achieve good voice quality, a supply with at least -70 dBm within a cell must be assured. The radio cells should also overlap by 6-10 dBm. The VoWLAN telephones and the access points should be set to maximum transmit power (20 dBm/100 mW).

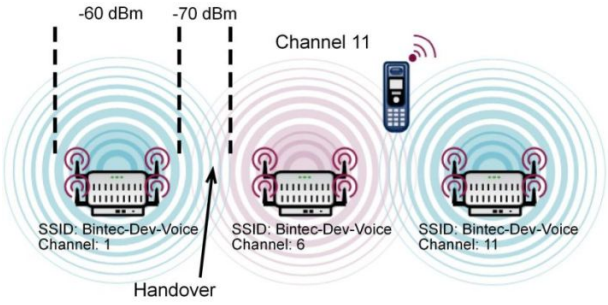


Fig. 70: List of minimum requirements for the WLAN radio frequency site survey for VoWLAN

With larger buildings, the three available non-overlapping radio channels, (e. g. 1, 6, 11) will need to be assigned more than once. For there to be no restrictions on performance it should be ensured that, within a radio cell on the same channel, there are no access points working that deliver a signal that is stronger than -80 dBm.

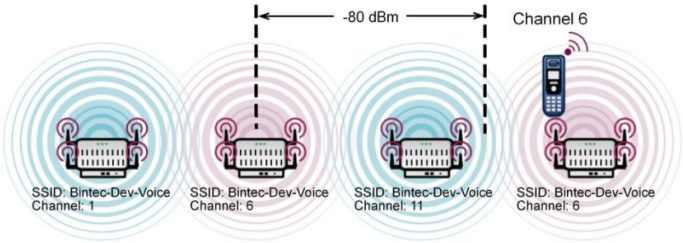


Fig. 71: Minimum space between two WLAN access points on the same transmit channel

When installing a VoWLAN it is essential to do an **Ekahau site survey** (www.ekahau.de) to plan the building's illumination and to identify the locations for the access points. A **site survey** uses PC-based planning software to inspect the building and calculate comprehensive illumination. It also identifies the best locations for the WLAN access points.

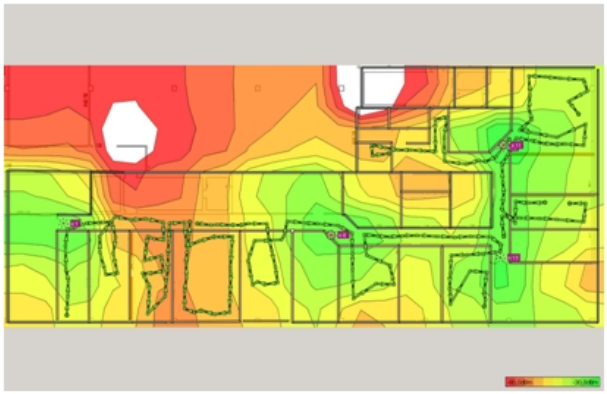


Fig. 72: Typical result of a site survey

5.2.2 Handover between the access points

For the handover between the access points to function correctly, all the access points need to use the same SSID. It is preferable that a separate SSID is used for the voice communication.

In the case of networks with 802.11g and 802.11n (20 MHz), the radio channels must have a channel spacing of 5 channels. So, e. g., only channels 1, 6 and 11 can be assigned without an overlap.

With some VoWLAN telephones (e. g. Ascom), a channel plan (e. g. channel 1, 6, 11) can be entered to optimise the handover between the access points. This means that, when the WLAN signal is weak, the telephone only searches for a new access point on the channels in the channel plan. This method enables a rather quicker handover. It is just important that, when doing the configuration, the telephone's channel plan is the same as the channels used in the WLAN network.

5.2.3 Bandwidth requirement

The maximum achievable gross data rate of a WLAN connection initially depends on the 802.11 operating mode used. But it should be noted that, when the distance between the access point and the terminal is on the large side, this gross rate can easily drop to the minimum gross rate. However, the actual net rate is only around 40-50 % of the gross rate.

802.11 operating mode	Maximum gross rate	Minimum gross rate
802.11b	11 Mbit/s	1 Mbit/s
802.11bg	54 Mbit/s	6 Mbit/s
802.11n (1stream/20 MHz)	72.2 Mbit/s	7.2 Mbit/s

A voice channel requires around 100 kbit/s, but when doing the capacity planning it should be assumed that there are sufficient reserves in the basic channel to also be able to transmit each RTP packet immediately.

802.11g and 802.11n are mutually 100 % compatible, so a WLAN network can run in mixed mode with no problems. With 802.11b (11 Mbit/s), however, there is the peculiarity that a device with 802.11b (11 Mbit/s) pulls an entire network onto this low bit rate. 802.11b devices are still uncommon, so we strongly recommend that an operating mode that does not permit 802.11b is used. Therefore we recommend that "802.11g/n" is set up as the 802.11 operating mode in order to not permit 802.11b devices.

5.2.4 The safety standard and the handover

WLAN was originally developed for data transmission by terminals whose location does not change. With VoWLAN, however, the WLAN telephone's location is constantly changing. So a VoWLAN installation must be capable of handing the connection over from one access point to the next access point without any noticeable interruption to the connection (seamless handover). This feature is particularly important for installations in large enterprises in which multiple access points are being used. In particular, simple, cheap access points from the consumer sector, and older terminals too, often have problems here.

The WLAN security method selected also has a crucial impact on handover performance. When handing over from one access point to another access point with a better WLAN signal, once the connection has been established the WLAN security must be restored before the next voice data packet can be transmitted. We recommend WPA2-PSK, as this achieves a high level of security with, at the same time, excellent handover times (<40 ms).

We advise against using 802.1x or WPA2-Enterprise in wireless VoWLAN networks, because the restoring of security after a handover to a new access point takes far longer than with WPA2-PSK. This may then result in audible interruptions and interfering sounds.

5.2.5 QoS, WMM and U-APSD

For the terminals to achieve a long talk time and high standby times with one battery charge, both the terminals and the access points need to support relevant power saving mechanisms. U-APSD (Unscheduled Automatic Power Save Delivery) ensures that the terminal only transmits when necessary. During the terminal's sleep phase, the access point ensures that data packets which are to be sent to the telephone are temporarily stored and that the telephone is also woken up on time. Whether U-APSD functions correctly depends on the QoS class that is signalled, because U-APSD always has a reference to the QoS class. When doing the configuration, therefore, the manufacturer's recommendations should be complied with.

The voice data is transmitted as RTP (real-time transport protocol) data. To achieve the

transmitting of the RTP voice data packets between the IP PABX and the VoWLAN telephone with low latency times, the voice data needs to be given priority over the normal data.

This chapter describes how the prioritising of the voice data works in the LAN and the WLAN, and what relationship there is with the U-APSD power saving mechanism.

5.2.5.1 WMM priority classes and COS (Layer 2) mapping

The 802.11e standard defines four WMM access categories (AC's) for handling the data traffic in compliance with the QoS requirements.

- AC_BK (background)
- AC_BE (best effort)
- AC_VI (video)
- AC_VO (voice)

802.11e also specifies a mapping between the LAN's Layer 2 (802.1d) Class of Service and the WLAN's WMM access categories.

Mapping table based on 802.11e

Priority	Layer 2 COS	WMM Access Category
Lowest	1	AC_BK (background)
	2	AC_BK (background)
	0	AC_BE (best effort)
	3	AC_BE (best effort)
	4	AC_VI (video)
	5	AC_VI (video)
	6	AC_VO (voice)
Highest	7	AC_VO (voice)

The access points (**bintec W2003ac-ext**, **bintec WI1003n**) have implemented the mapping in compliance with the 802.11e standard. The access points' WLAN driver does the mapping between the LAN's Layer 2 priority and the WLAN's WMM class, in both directions.

In the many IP networks (no VLAN or VLAN without Layer 2 priority), the QoS requirements for the data transmission are signalled using Layer 3 priority (TOS/DSCP). Therefore the WLAN access points need to support Layer 3 <- -> Layer 2 mapping.

Layer 3 / Layer 2 / WMM Mapping

DSCP Field Hex/Bin/Dec	Layer 2 Prio	Traffic Type	Acronym	WMM Access Category
0x38 / 111000 / 56	7	Network Control	NC	AC_VO
0x30 / 110000 / 48	6	Voice	VO	AC_VO
0x28 / 101000 / 40	5	Video	VI	AC_VI
0x20 / 100000 / 32	4	Controlled Load	CL	AC_VI
0x18 / 011000 / 24	3	Excellent Effort	EE	AC_BE
0x10 / 010000 / 16	2	Spare	--	AC_BK
0x08 / 001000 / 8	1	Background	BK	AC_BK
0x00 / 000000 / 0	0	Best Effort	BE	AC_BE

The mapping above only includes the top three bits in the TOS/DSCP field, so it is relatively fuzzy and leads to problems with VoWLAN devices.

But most VoWLAN devices use as Class of Service Expedited Forwarding (EF) with DSCP value (0x2E / 101110 / 46) in compliance with RFC 4594. The mapping table above would map this class in the WMM Class 'AC_VI'. But this is incorrect, because the VoWLAN telephone uses "WMM AC 'AC_VO" for the opposite direction.

To avoid this problem, bintec access points map data tagged with "EF" in the following way:

DSCP Field Hex/Bin/Dec	Layer 2 Prio	Traffic Type	Acronym	WMM Access Category
0x2E / 101110 / 46	6	Voice	VO	AC_VO

Note: When doing the installation, the user only needs to be aware that the VoWLAN telephone and the IP PABX use as Class of Service Expedited Forwarding (EF) with DSCP value (0x2E / 101110 / 46). In the case of the **bintec be.IP plus** this value is preset.

5.2.5.2 U-APSD (Unscheduled Automatic Power Save Delivery)

U-APSD is a part of 802.11e and helps considerably in increasing the battery life of VoWLAN terminals. U-APSD must be supported both by the VoWLAN terminal and by the WLAN access point. U-APSD always only works for the WMM access category concerned, so it is important that the requirements listed in the chapter above are met.

The basic procedure works as follows:

- The VoWLAN terminal logs in with Class of Service Expedited Forwarding (EF) and U-APSD at the WLAN access point.
- The VoWLAN terminal then switches to power-save mode.
- If the WLAN access point is sent data packets for the VoWLAN terminal concerned with the Class of Service Expedited Forwarding (EF), the access point temporarily stores this data for a short time and waits until the VoWLAN terminal is woken up again. Only then is the data sent.
- The procedure works so rapidly that, even in the call status, the terminal still has enough time for the power-save mode.

Apart from the longer battery life, U-APSD has another positive effect. With longer phone calls, VoWLAN terminals with functioning U-APSD are far cooler than devices that do not support U-APSD.

U-APSD is supported by the access points (**bintec W2003ac-ext**, **bintec WI1003n**) upwards of relay 10.1.609.

5.2.6 WLAN controllers – A must in a VoWLAN network?

To optimise the handover, some manufacturers' solutions manage the WLAN data centrally in the WLAN controller. These solutions then use so-called thin APs, i. e. access points with no intelligence of their own. The disadvantage of these solutions is that all the data traffic is centrally decoupled so that a load is put on the networks. Since the introduction of 802.11n technology, the data volume has risen substantially, so solutions using thin APs have become even less significant in comparison with intelligent, fat APs. Since the introduction of the WPA2-PSK security standard and fast roaming in compliance with 802.11r, the handover problem in the case of WLAN solutions with fat APs has been resolved, too.

The **bintec WLAN Controller** solution works with mit intelligent access points (fat APs) that manage the basic data locally. This scenario has considerable performance benefits in comparison with thin client solutions. The **bintec WLAN Controller** is not obligatory for a VoWLAN installation, but it makes installation far easier and it simplifies system monitoring.

5.2.7 Potential sources of interference

The 2.4 GHz band is used by all sorts of wireless services as well as WLAN. Most of these services are limited to small transmission power and only have limited coverage. For instance, most Bluetooth devices that we often find in office environments only have a transmission power of 1 mW, so they are not really a problem for VoWLAN. For VoWLAN operations to be free of interference it is also important, of course, that there are as few third-party access points (neighbours) in the vicinity as possible. While these third-party access points do not actually interfere, they reduce the net bandwidth. This can be improved by, e. g., changing the channel plan so that your tranmission bypasses the neighbouring access point. Particularly if a VoWLAN network is planned for a large number of subscribers, it may also be useful to install a second WLAN network with 5 GHz in order to bring the data applications to the free 5 GHz network.

In our experience, it is unusual for there to be unidentified sources of interference in VoWLAN applications if the basic rules described here are adhered to when doing the installation. Any broadband sources of interference or neighbouring access points that might lead to problems at a later stage are also identified by a site survey of the building, and counter measures can be taken in advance.

5.3 Example configuration

5.3.1 Network plan

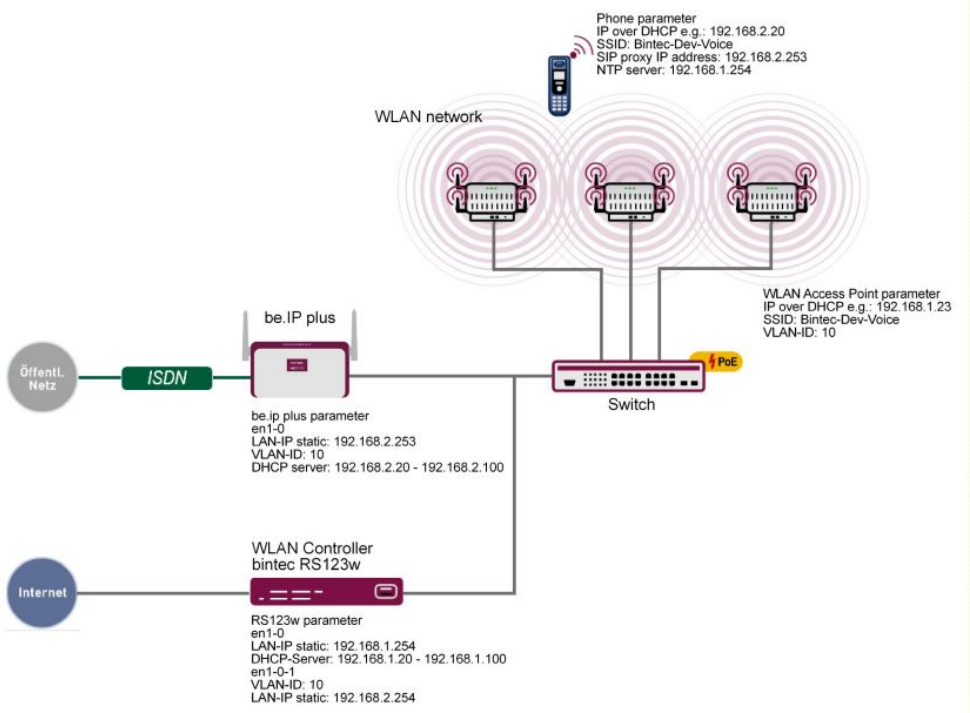


Fig. 73: Example scenario

The example configuration above shows a small application scenario, comprising an **bintec be.IP plus**, a **bintec RS123w** as the WLAN controller, three **bintec W2003ac-ext** access points and an **Ascom i62** VoWLAN telephone.

The LAN consists of two networks. Firstly the 192.168.1.0/24 network - this network is used for communications between the WLAN controller (**bintec RS123w**) and the access points.

The second network, 192.168.2.0/24, is tagged here with the **VLAN ID** *10* and is used to transport the voice data. The **SSID** *Bintec-Dev-Voice* is assigned to the **VLAN-ID** *10*, which means that only the voice data is sent between the VoWLAN telephone and the hybrid via the WLAN route.

bintec RS123w works as the WLAN controller and also provides the NTP time server (192.168.1.254) for the VoWLAN telephones.

5.3.2 WLAN configuration with or without WLAN controller

A VoWLAN network can be configured and operated via a WLAN controller or manually. As the handling work involved in a larger installation is far less when a WLAN controller is used, and is also more convenient in terms of monitoring, we recommend that a WLAN controller is deployed in installations with more than three access points.

The GUIGUIGUI (Graphical Unit Interface) is used to do the configuration.

To access the configuration interface enter the IP address **bintec RS123w** in your Web browser.

Go to **Wireless LAN Controller** -> **Slave AP Configuration** -> **Radio Profiles** -> **New**.

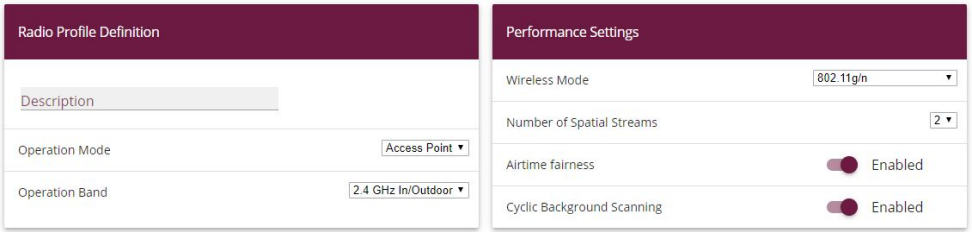


Fig. 74: **Wireless LAN Controller** -> **Slave AP Configuration** -> **Radio Profiles** -> **New**

Proceed as follows:

(1) For **Operation Mode**, specify the mode in which the wireless module profile is to be run, here `Access Point`.

(2) Select the **Operation Band** of the wireless module profile `2.4 GHz In/Outdoor`.

(3) For **Number of Spatial Streams**, select how many traffic flows are to be used in parallel, e. g. `2` (default value): Two traffic flows will be used.

(4) For **Wireless Mode**, select the wireless technology that the access point is to use, here `802.11 g/n`.

(5) Click **Advanced Settings**.

(6) Select the **Max. Transmission Rate**. With `Auto` (default value), the transmission speed is determined automatically.

(7) Confirm with **OK**.

Then create the wireless network entries.

Go to **Wireless LAN Controller** -> **Slave AP Configuration** -> **Wireless Networks (VSS)**-> **New**.

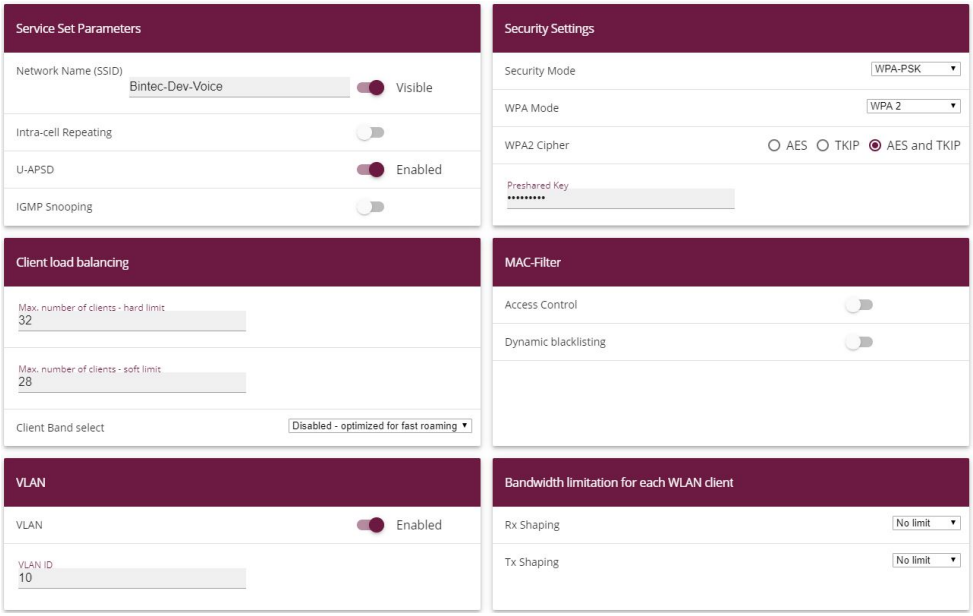


Fig. 75: **Wireless LAN Controller** -> **Slave AP Configuration** -> **Wireless Networks (VSS)** -> **New**

Proceed as follows:

(1) Enter the **Network Name (SSID)** for the wireless network, e. g. *Bintec-Dev-Voice*.

(2) Disable **Intra-cell Repeating**. Communication between the WLAN clients within a radio cell is permitted.

(3) Under **Security Mode**, select *WPA-PSK*.

(4) For **WPA Mode**, select the encryption that is to be applied, here *WPA2*.

(5) For **WPA2 Cipher**, select the encryption with which you wish to apply WPA, here *TKPI* and *AES*.

(6) For **Preshared Key** enter the WPA password, e. g., *supersecret*. If the key has not been changed, your device will not be protected against unauthorised access!

(7) Disable **ACL Mode**. All clients are permitted for this wireless network.

(8) For **VLAN ID**, select the numerical value that identifies the VLAN, here *10*.

(9) Confirm with **OK**.

5.4 Ascom i62 Talker configuration

5.4.1 Requirements

The following devices and software are required to configure the **Ascom i62**:

- **Ascom i62** Talker (EH1-AAAA/1A)
- Ascom Desktop Programmer (DP1-AAAA)
- Ascom WinPDM Version 3.8.1 or later
- Software version 2.1.20 or later
- Parameter version 13.3 or later

5.4.2 Configuration

5.4.2.1 Create a new telephone

(1) Open the Ascom WinPDM program.

(2) To create a new subscriber, go to **Numbers** -> **New**.

(3) In the **Call number** field, enter the SIP number, e. g. *2011*.

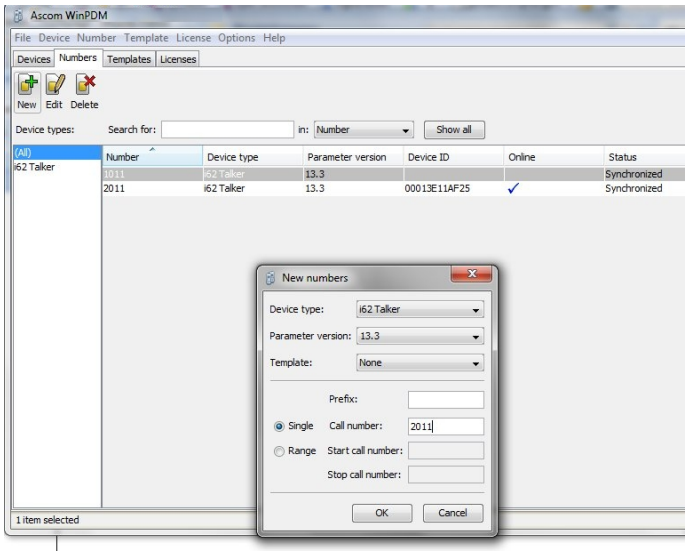


Fig. 76: **Numbers** -> **New**

Define a network

With the **Ascom i62**, four WLAN networks (networks A to D) can be defined.

Go to **Network** -> **Network B**.

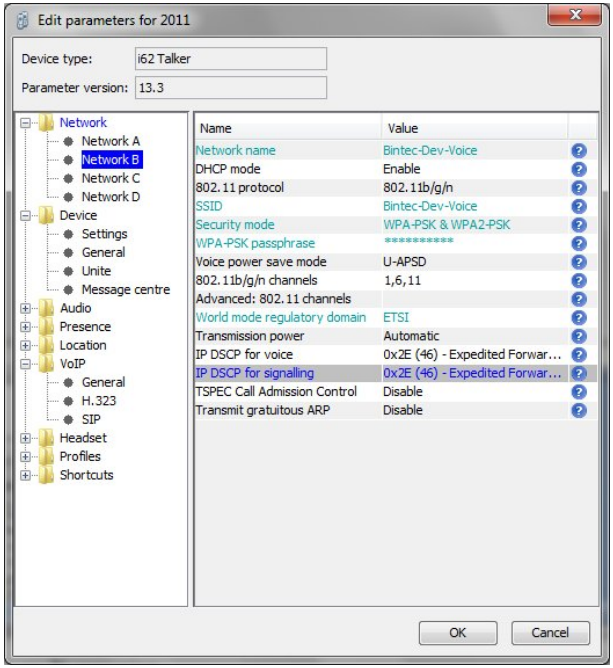


Fig. 77: **Network** -> **Network B**

For it to operate, the following entries are required:

Name	Value
DHCP mode	Enable
SSID	Bintec-Dev_Voice
Security mode	WPA-PSK & WPA2-PSK
WPA-PSK passphrase	e. g. supersecret
Voice power save mode	U-APSD
802.11b/g/n channels	1, 6, 11
IP DSCP for voice	0x2E (46)
IP DSCP for signalling	0x2E (46)

Device settings

Go to **Device** -> **Settings**.

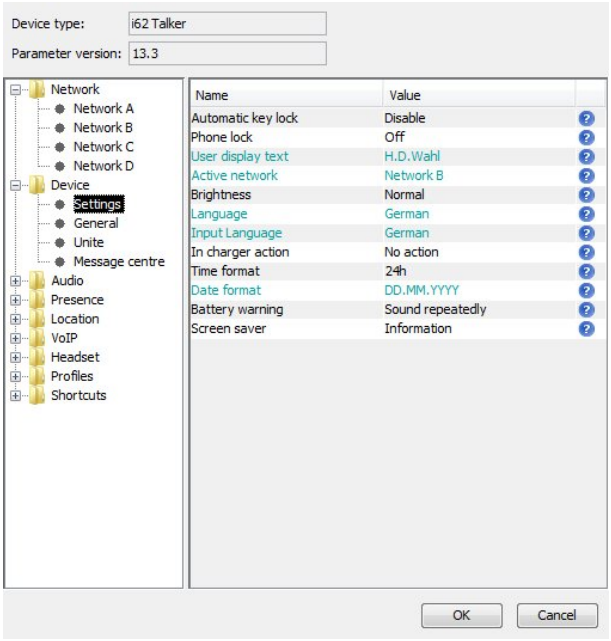


Fig. 78: **Device** -> **Settings**

For it to operate, the following entries are required:

Name	Value
User display text	e. g. bintec elmeg
Active Network	Network B

General device settings

Go to **Device** -> **General**.

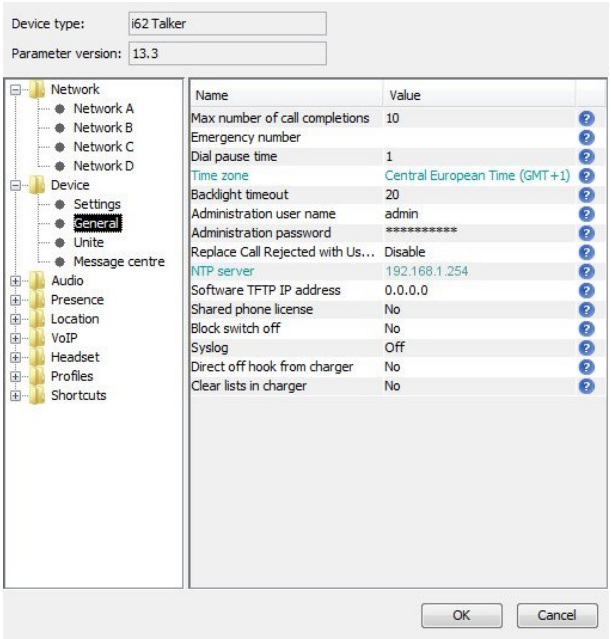


Fig. 79: **Device** -> **General**

For it to operate, the following entries are required:

Name	Value
Time zone	Central European Time (GMT+1)
NTP server	192.168.1.254

General VoIP settings

Go to **VoIP** -> **General**.

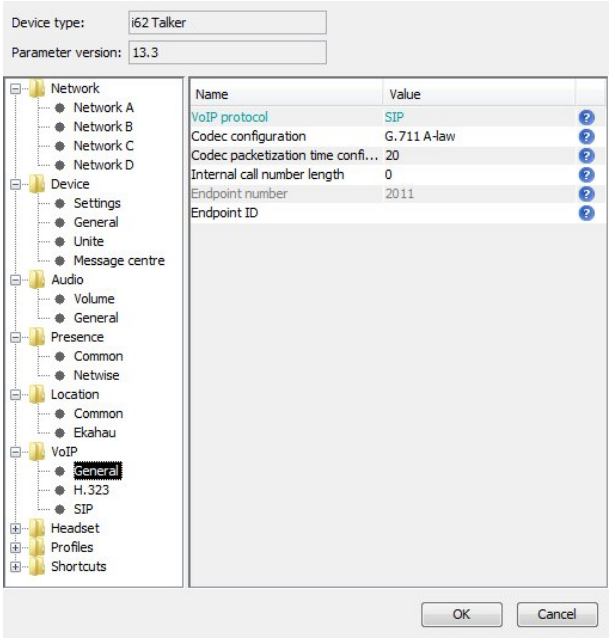


Fig. 80: **VoIP** -> **General**

For it to operate, the following entries are required:

Name	Value
VoIP protocol	SIP
Endpoint number	Displays the number of the device and cannot be modified here. The number is specified when the device's parameter set is generated.

SIP configuration

Go to **VoIP** -> **SIP**.

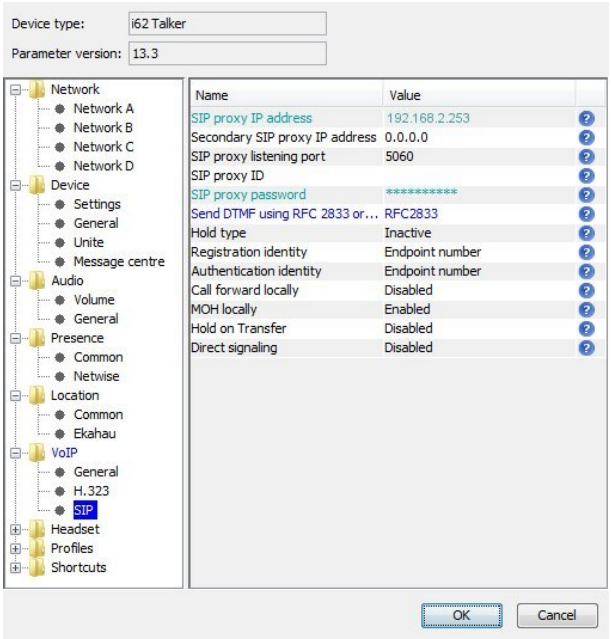


Fig. 81: **VoIP** -> **SIP**

For it to operate, the following entries are required:

Name	Value
SIP proxy IP address	192.168.2.253
SIP proxy password	e. g. supersecret
Authentication identity	Endpoint number (the number is used as the SIP username)

5.4.3 Test commands on the Ascom i62

The **Ascom i62** has certain test commands which are useful when installing it and troubleshooting:

*#76# Switches the RSSID display on/off

*#77# Switches the site survey tools on

5.5 Configuring the elmeg hybird 300

5.5.1 Configuration

A SIP subscriber must be set up for the VoWLAN telephone. The DSCP value being set to 0x2E / 101110 / 46, which is vital, is taken into account as the default setting, so that no further change is required here.

In our example, the network interface of the **elmeg hybird 300** must be tagged with **VLAN ID** *10*.

To access the configuration interface enter the IP address of the **elmeg hybird 300** in your Web browser.

Go to **LAN** -> **IP Configuration** -> **Interfaces** -> **New**.

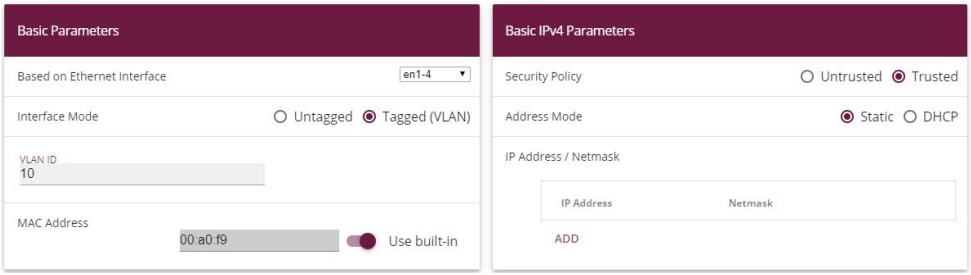


Fig. 82: **LAN** -> **IP Configuration** ->**Interfaces** -> **New**

Proceed as follows:

(1) For **Based on Ethernet Interface**, select the virtual interface, e. g. *en1-4*.

(2) For **Interface Mode**, select *Tagged (VLAN)*.

(3) For **VLAN ID**, enter *10*.

(4) Confirm with **OK**.

5.5.2 Operational scenario: WLAN telephone cannot be accessed

A call to the WLAN telephone may fail if, for example, the subscriber is situated outside the range of an access point, the telephone is switched off, or if the battery is dead. To ensure calls are not lost, it is a good idea to set up **call forwarding** *on busy / on no reply* in the **elmeg hybird 300** for the extensions concerned.

Go to **Call Routing** -> **Outgoing Services** -> **Call Forwarding** -> **New**.

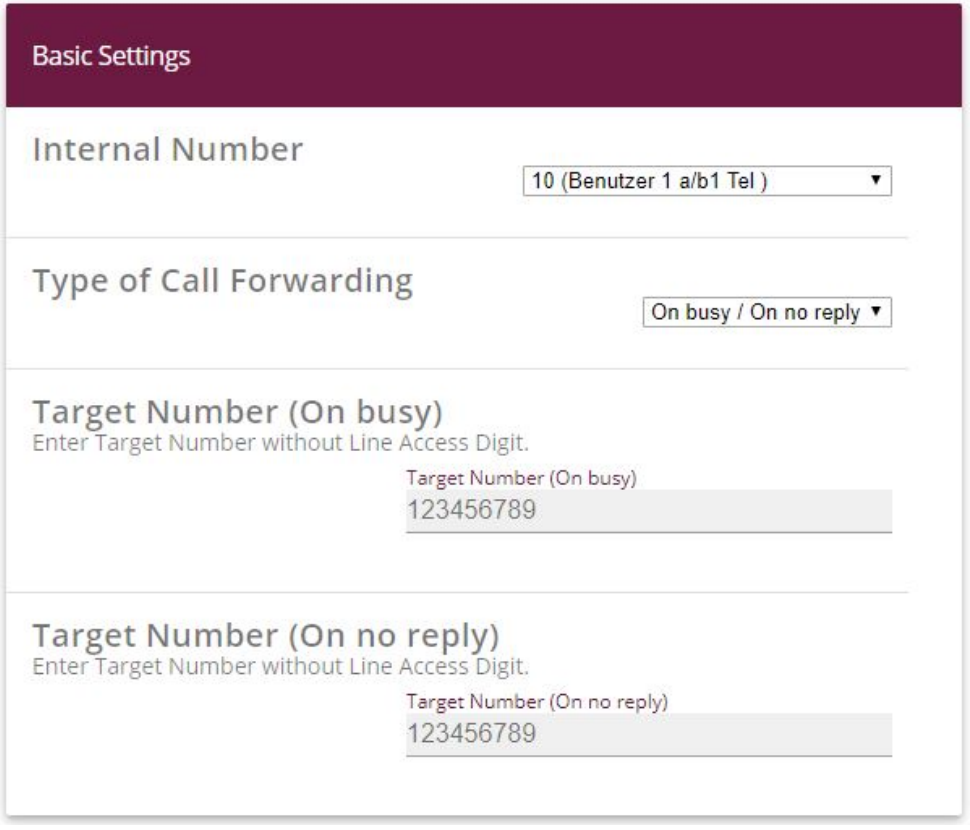


Fig. 83: **Call routing** -> **Outgoing Services** -> **Call Forwarding** -> **New**

Proceed as follows:

(1) Select an **Internal Number** for which incoming calls are to be forwarded.

(2) For **Type of Call Forwarding**, select `On busy / On no reply`.

(3) Enter a **Target Number** to which incoming calls should be forwarded on busy or on no replay.

(4) Confirm with **OK**.

5.6 Use other WLAN telephones

Other devices from other suppliers can, of course, be used apart from the **Ascom i62** VoWLAN terminals which we certify and recommend. Smartphones such as an **Apple iPhone** can also be used. Unfortunately, with these there are small differences in the performance, for example certain devices do not have U-APSD implemented or the roaming performance leaves something to be desired.

We have achieved good results with the devices listed here:

- **Apple iPhone 4** with bintec SIP APP (no U-APSD)
- **Nokia 6710**

5.7 Overview of Configuration Steps

Configure radio profiles

Action	Menu	Value
Operation Mode	**Wireless LAN Controller -> Slave AP Configuration -> Radio Profiles -> New**	*Access Point*
Operation Band	**Wireless LAN Controller -> Slave AP Configuration -> Radio Profiles -> New**	*2.4 GHz In/Outdoor*
Number of Spatial Streams	**Wireless LAN Controller -> Slave AP Configuration -> Radio Profiles -> New**	*2*
Wireless Mode	**Wireless LAN Controller -> Slave AP Configuration -> Radio Profiles -> New**	*802.11 g/n*
Max. Transmission Rate	**Wireless LAN Controller -> Slave AP Configuration -> Radio Profiles -> New**	*Auto*

Configure radio profiles

Action	Menu	Value
Network Name (SSID)	**Wireless LAN Controller -> Slave AP Configuration -> Wireless Networks (VSS) -> New**	e. g. *Bintec-Dev-Voice*
Intra-cell Repeating	**Wireless LAN Controller -> Slave AP Configuration -> Wireless Networks (VSS) -> New**	*Disabled*
Security mode	**Wireless LAN Controller -> Slave AP Configuration -> Wireless Networks (VSS) -> New**	*WPA-PSK*
WPA Mode	**Wireless LAN Controller -> Slave AP Configuration -> Wireless Networks (VSS) -> New**	*WPA2*

Action	Menu	Value
WPA2 Cipher	**Wireless LAN Controller -> Slave AP Configuration -> Wireless Networks (VSS) -> New**	*AES and TKIP* enabled
Preshared key	**Wireless LAN Controller -> Slave AP Configuration -> Wireless Networks (VSS) -> New**	e. g. *supersecret*
ACL Mode	**Wireless LAN Controller -> Slave AP Configuration -> Wireless Networks (VSS) -> New**	*Disabled*
VLAN ID	**Wireless LAN Controller -> Slave AP Configuration -> Wireless Networks (VSS) -> New**	*10*

Configure Ascom i62

Field	Menu	Value
Call number	**Numbers -> New**	e. g. *2011*
DHCP mode	**Network -> Network B**	*Enable*
SSID	**Network -> Network B**	e. g. *Bintec-Dev-Voice*
Security mode	**Network -> Network B**	*WPA-PSK & WPA2-PSK*
WPA-PSK passphase	**Network -> Network B**	e. g. *supersecret*
Voice power save mode	**Network -> Network B**	*U-APSD*
802.11b/g/n channels	**Network -> Network B**	*1,6,11*
IP DSCP for voice = 0x2E (46)	**Network -> Network B**	*0x2E (46)*
IP DSCP for signaling = 0x2E (46)	**Network -> Network B**	*0x2E (46)*
User display text	**Device -> Settings**	e. g. *bintec elmeg*
Active network	**Device -> Settings**	*Network B*
Time zone	**Device -> General**	*Central European Time (GMT+1)*
NTP server	**Device -> General**	e. g. *192.168.1.254*
VoIP protocol	**VoIP -> General**	SIP
SIP proxy IP address	**VoIP -> SIP**	e. g. *192.168.2.253*
SIP proxy password	**VoIP -> SIP**	e. g. *supersecret*

Field	Menu	Value
Authentication identity	**VoIP -> SIP**	*Endpoint number*

Configure interface

Field	Menu	Value
Based on Ethernet Interface	**LAN -> IP Configuration ->Interfaces -> New**	e.g. *en1-4*
Interface Mode	**LAN -> IP Configuration ->Interfaces -> New**	*Tagged (VLAN)*
VLAN ID	**LAN -> IP Configuration ->Interfaces -> New**	*10*

Configure call forwarding

Field	Menu	Value
Internal Number	**Call routing -> Outgoing Services -> Call Forwarding -> New**	Internal number
Type of call forwarding	**Call routing -> Outgoing Services -> Call Forwarding -> New**	*On busy/On no reply*
Target Number (On Busy)	**Call routing -> Outgoing Services -> Call Forwarding -> New**	Target number
Target Number (On no reply)	**Call routing -> Outgoing Services -> Call Forwarding -> New**	Target number

Chapter 6 WLAN Management for Multiple Locations: WLAN controller via VPN

6.1 Introduction

We shall now describe how to configure a bintec router from the **RS** series as the central WLAN controller for a WLAN infrastructure spread over more than one location (**bintec W2003ac** access points). A bintec router from the **RS** series is used, here, at the location concerned as a gateway for the Internet access.

The **GUI** (Graphical User Interface) is used for configuring.

Workshop task profile:

- A company has multiple locations that are to have WLAN installed. The plan is that all the employees will then be able to access the WLAN, and that it will be possible to manage it centrally.
- The employee's devices are to be automatically integrated into the company network by DHCP.
- The employees are to be able to use the WLAN to access both the Internet and the company's intranet. Access to the company intranet at head office and the field offices will be via the Internet using a VPN secured by IPSec.

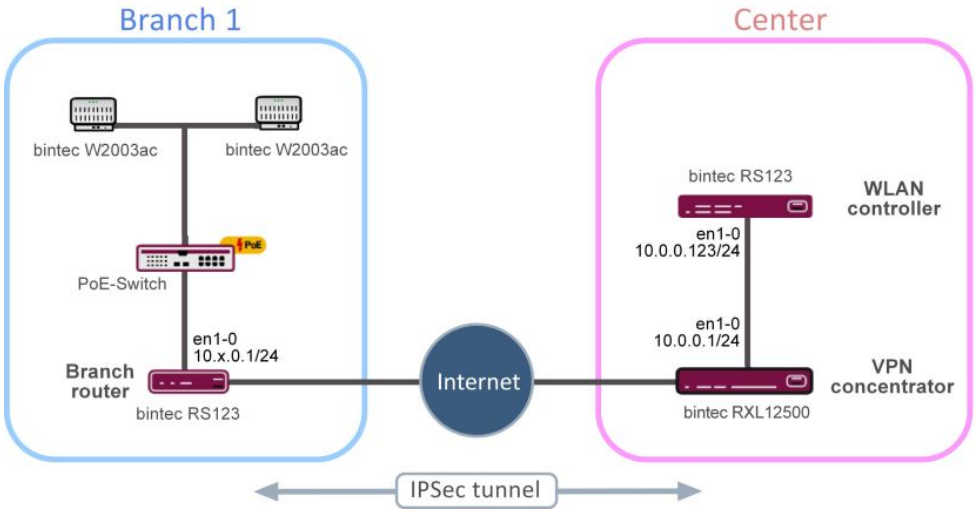


Fig. 84: Example scenario

6.1.1 Requirements

At company head office:

- Two bintec routers from the **RS** or **RXL** series, bintec be.IP or be.IP plus whose firmware version is at least **10.1.9** .

  As examples, the workshop will use a **bintec RS123** as the WLAN controller and a **bintec RXL12500** as a VPN concentrator.

At the branch office:

- A bintec router with firmware which is at least version **10.1.9** . Routers from the **RS**, **TR** or the various **R** series (old **R2xx** series, old **Rxx00** series and new **RS** series) are used for Internet access in the branch office.

  A **bintec RS123** is used as a branch router in the example.
- One or more bintec access points from the **bintec W2003ac** or **bintec WI1003n** with at least firmware version **10.1.9** . The minimum number of access points required depends on the size and building structure of the company location and can be accurately determined by a prior WLAN radio frequency site survey.

  In this workshop, four **bintec W2003ac** access points are used in the example branch office.
- Internet access
- A PoE switch for the access points (optional).

6.1.2 About the test setup

Here you will find an overview of the interface assignment in the individual routers.

Router	Interface	Description	IP address / address range
Routers in the xth branch office	en1-0	LAN connection in the branch office	10.x.0.1/24
	en1-0	DHCP server for access points and WLAN devices in the branch office	10.x.0.10 to 10.x.0.254
VPN concentrator at head office	en1-0	LAN connection at head office	10.0.0.1/24
WLAN controller at	en1-0	IP address of the	10.0.0.123/24

Router	Interface	Description	IP address / address range
head office		WLAN controller which must be accessible in the entire VPN	
	en1-0	Default route on the VPN concentrator	10.0.0.1
	en1-0	WLAN controller for all access points in all the branch offices	

6.2 Configuration

6.2.1 Presettings

A functioning VPN needs to be set up in advance between the VPN concentrator at head office (in the workshop **bintec RXL12500**) and one or more branch routers (in the workshop **bintec RS123**). To install a VPN, please refer to the IP workshop »RIPv2 Routing Protocol over IPSec Connection«. In the settings for this workshop you need to replace the IP address ranges in the LAN segments concerned with the values from the table above. Please leave the other settings unchanged.

Using RIPv2 offers these benefits:

- All the routers listed above for use in the branch office can be used.
- The devices used are relative simple to set up.
- The configuration can easily be extended to other locations while live.

6.2.2 Configure the router in the field office

6.2.2.1 IP configuration

As a supplement to the IP workshop »RIPv2 Routing Protocol over IPSec Connection«, the first branch office router's IP interface is configured as follows.

(1) Go the menu **LAN** -> **IP Configuration** ->**Interfaces** -> **<en1-0>** .

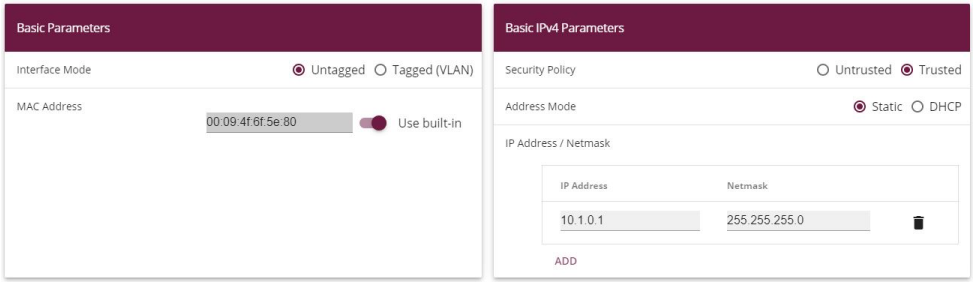


Fig. 85: **LAN** -> **IP Configuration**-> **Interfaces** -> **<en1-0>**

Proceed as follows:

(1) In **Address Mode**, select `Static`.

(2) In this field, enter the **IP Address / Netmask** e. g. `10.1.0.1` of the first branch office router. The IP addresses for the second, third, etc. branches are, as a result, `10.2.0.1`, `10.3.0.1`, etc. As the **Netmask** you select `255.255.255.0` in this case.

(3) Leave the **Interface Mode** set to `Untagged`.

(4) For **MAC Address**, leave `Use built-in` selected.

(5) Confirm with **OK**.

6.2.2.2 Configure DHCP pool

You then need to create a DHCP pool on the interface concerned for all the devices in the LAN, such as the slave access points and the employee devices that will later be connected via the WLAN.

(1) To do this, go to the menu **Local Services** -> **DHCP Server** ->**IP Pool Configuration** -> **New**.

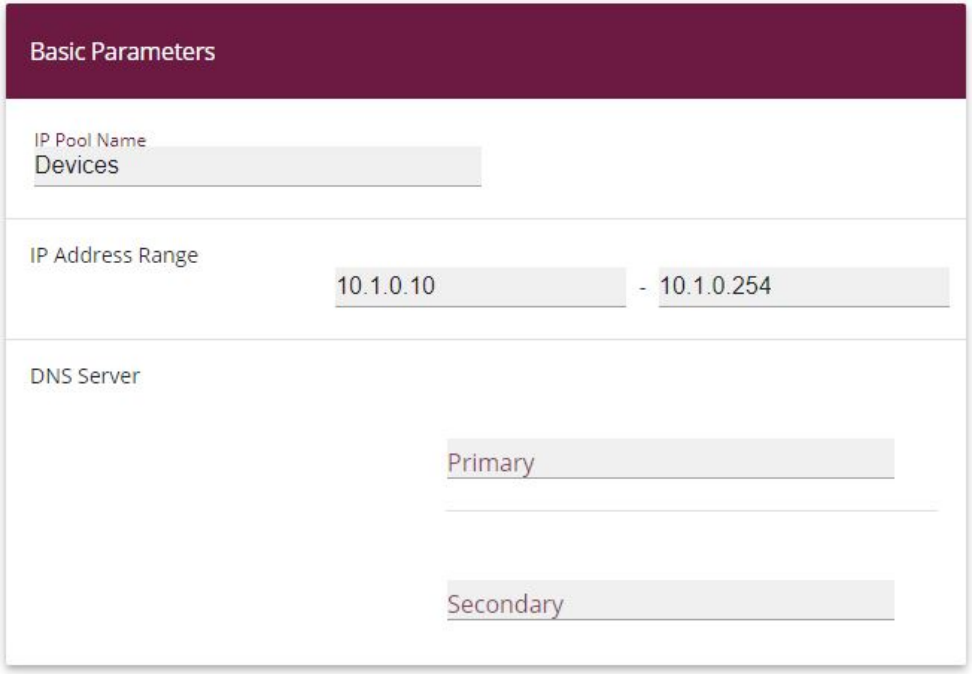


Fig. 86: **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**

Proceed as follows:

(1) For the **IP Pool Name**, you can use `Devices`, for example.

(2) For the **IP Address Range** for the first branch router, use e. g. `10.1.0.10` to `10.1.0.254`. This means that, in this case, another eight addresses are free below 10.1.0.10 for other statically configured devices.

(3) Press **OK** to confirm your entries.

In the **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New** menu, you can perform additional configuration.

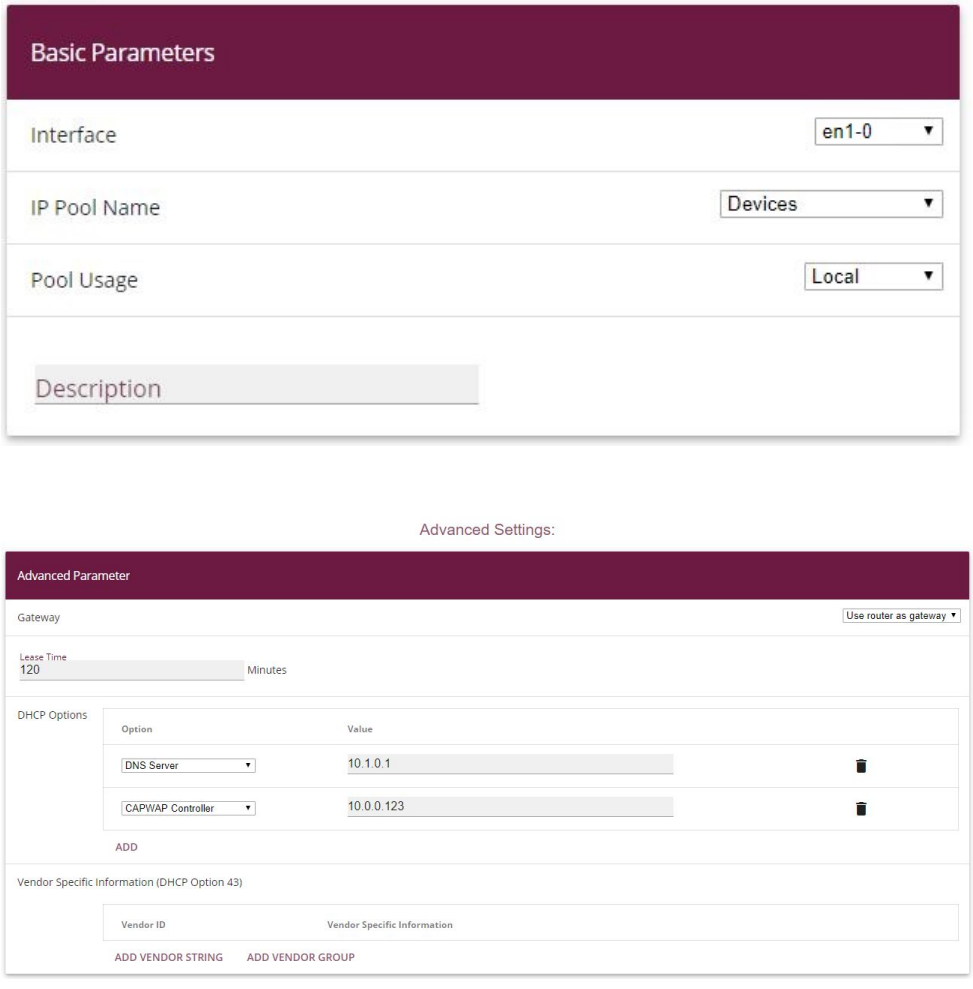


Fig. 88: **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**

Proceed as follows:

(1) Select the **Interface** *en1-0* .

(2) Select a valid **IP Pool Name**, here e. g. *Devices*.

(3) The **Pool Usage** is set to *Local*.

(4) Click **Advanced Settings**.

(5) The setting *User Router as Gateway* is retained under **Gateway**. This means that all the DHCP-capable devices in the network can access the default gateway under the current IP address of interface en1-0.

(6) The **Lease Time** is set to *120* minutes.

(7) For **DHCP Options**, click **Add**.

(8) First specify the DNS server's IP address. To do this, under **Option** select *DNS Server* and, under **Value**, enter the IP address of interface *en1-0* e. g. *10.1.0.1* .

(9) Click **Add**.

(10) Under **Option**, select *CAPWAP Controller* and, under **Value**, enter the IP address of the WLAN controller at head office, thus, in our case *10.0.0.123*.

(11) Press **OK** to confirm your entries.

Note

It is not essential that you set up any other DHCP options for the slave access points and WLAN devices. However, configuring the *DNS domain name*, *time server*, etc. can be useful and depends on the infrastructure present.

Note

We do not recommend that you set up, on the branch router instead of the local DHCP server, a so-called **DHCP relay** to a DHCP server located at head office. Because that would mean that, at head office, you could no longer easily see from the slave access points' IP address range and from the employees' devices which branch the device concerned was located in. Moreover, if you were using **DHCP relay** and the Internet access or the VPN failed, the employees' devices might no longer be able to log into the relevant location's local network because they would no longer be getting an IP address via DHCP.

This completes the configuration of the branch router. Save the configuration with **Save configuration** and confirm the selection with **OK**.

6.2.3 Configure the VPN concentrator at head office

As a supplement to the IP workshop »RIPv2 Routing Protocol over IPSec Connection«, the IP interface of the VPN concentrator at head office is set up as follows.

(1) Go to menu **LAN** -> **IP Configuration** ->**Interfaces** -> **<en1-0>** .

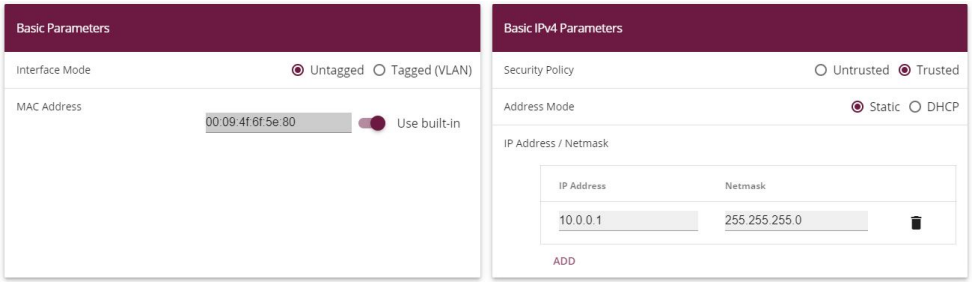


Fig. 89: **LAN** -> **IP Configuration**-> **Interfaces** -> **<en1-0>**

Proceed as follows:

(1) For the **Address Mode**, select `Static`.

(2) In this field, enter the **IP Address** e. g. `10.0.0.1` and the **Netmask** `255.255.255.0`.

(3) Leave the **Interface Mode** set to `Untagged`.

(4) Confirm with **OK**.

6.2.4 Configure the WLAN controller at head office

6.2.4.1 IP configuration

First of all you set the WLAN controller's IP parameters.

(1) Go to **LAN** -> **IP Configuration** ->**Interfaces** -> **<en1-0>** .

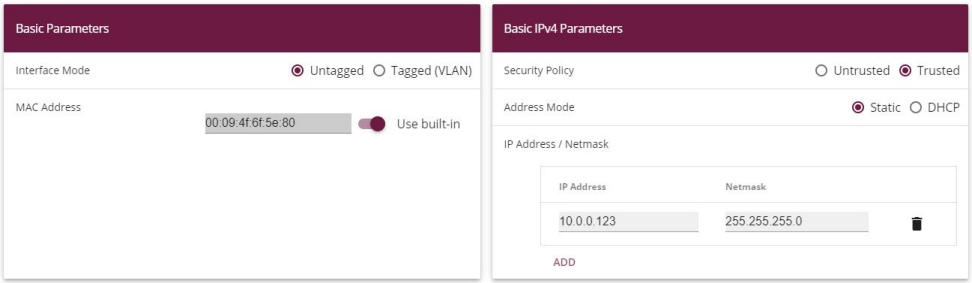


Fig. 90: **LAN** -> **IP Configuration**-> **Interfaces** -> **<en1-0>**

Proceed as follows:

(1) For the **Address Mode**, select `Static`.

(2) In this field, enter the **IP Address** e. g. `10.0.0.123` and the **Netmask** `255.255.255.0`.

(3) Leave the **Interface Mode** set to *Untagged*.

(4) Confirm with **OK**.

6.2.4.2 Set up the default route

The default route via interface *en1-0* to the VPN concentrator's IP address is then set up on the WLAN controller.

(1) Go to **Network** -> **Routes** -> **IPv4 Route Configuration** -> **New**.

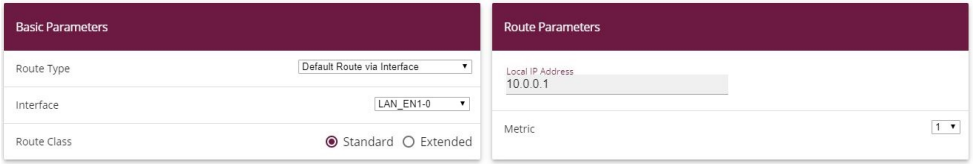


Fig. 91: **Network** -> **Routes** -> **IPv4 Route Configuration** -> **New**

Proceed as follows:

(1) Set the **Route Type** to *Default Route via Interface*.

(2) As the **Interface**, select *LAN_EN1-0*.

(3) Under **Local IP Address**, select the IP address of the host to which your device will pass the IP packets, in this case the VPN concentrator's LAN ID address *10.0.0.1* .

(4) Set the **Metric** of the route to e. g. *1* to select the route's priority. The lower the value, the higher the priority of the route.

(5) Select **OK** to confirm your entries.

The IP routes overview then looks like this:

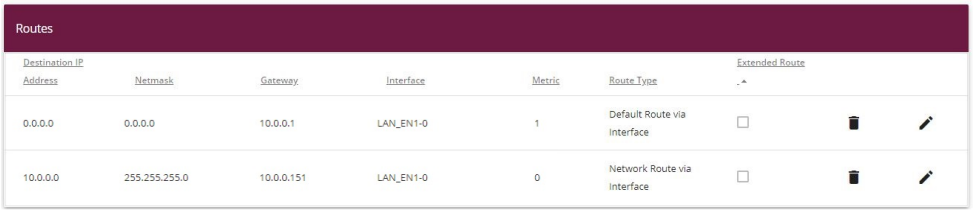


Fig. 92: **Network** -> **Routes** -> **IPv4 Route Configuration**

This completes the configuration of the VPN concentrator. Save the configuration with **Save configuration** and confirm the selection with **OK**.

6.2.4.3 Configure WLAN controller

The WLAN controller itself can be activated now.

(1) Go to **Wireless LAN Controller** -> **Controller Configuration** -> **General**.

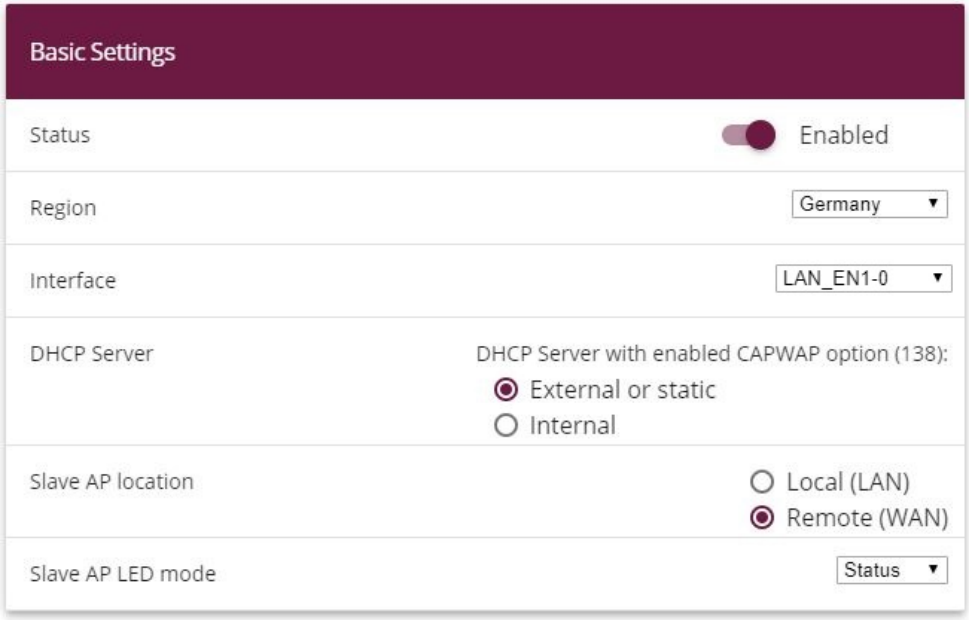


Fig. 93: **Wireless LAN Controller** -> **Controller- Configuration** -> **General**

Proceed as follows:

(1) The **Region** must be set up to match the location of the access points, e. g. *Germany*. The result of this setting is that the access points' WLAN wireless module will only run inside the legally permitted framework of the country concerned.

(2) As the WLAN controller's **Interface**, select *LAN_EN1-0*.

(3) The **DHCP Server** setting must be left at *External or static* because the DHCP server has already been set up on the branch office routers.

(4) The **Slave AP location** must be changed to *Remote (WAN)* . The result of this is that managed slave access points continue to run autonomously if the network falls over (so that, at least, the local WLAN at the location affected goes on working) and are only reinitialized after reconnecting to the WLAN controller. Likewise, this switch is also used to adapt slave access points' and WLAN controllers' mutual waiting times to typical WAN characteristics (e. g. short network interruptions due to forced DSL separation).

(5) Confirm with **OK**.

The settings are now enabled and the WLAN controller is started.

6.2.4.4 Configure wireless network profile

Next, the default existing profile for a wireless network is modified as follows.

(1) Go to **Wireless LAN Controller** -> **Slave AP Configuration**->**Wireless Networks (VSS)**.

To do this, for the existing entry **<vss-1>** click the ✎ symbol.

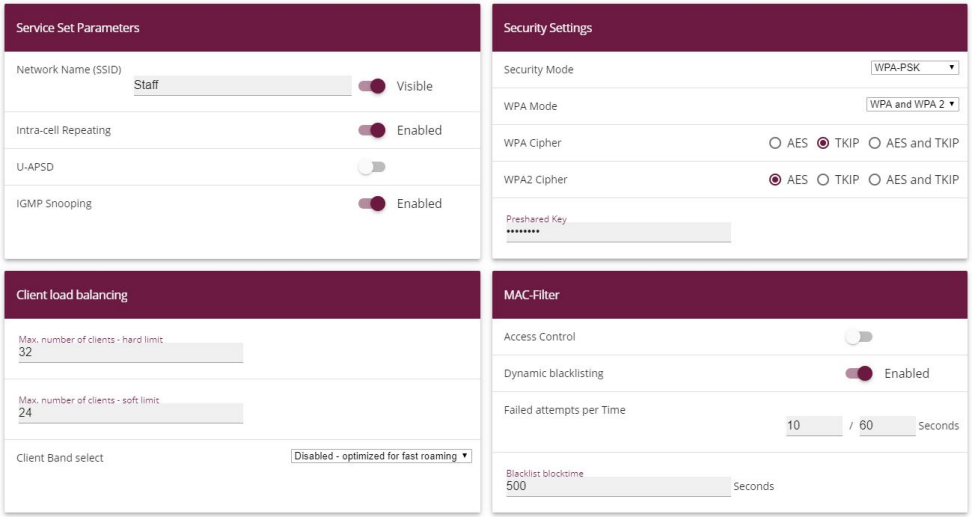


Fig. 94: **Wireless LAN Controller** -> **Slave AP Configuration**->**Wireless Networks (VSS)**-> **<vss-1>** ✎

Proceed as follows:

(1) The **Network Name (SSID)** is change to e. g. *Staff*.

(2) The default settings are left for **Intra-cell Repeating** and **Max. Clients**.

(3) As the **Security Mode**, select *WPA-PSK*.

(4) You can then leave the **WPA Mode** set to *WPA and WPA 2* .

(5) For **WPA Cipher**, *TKIP* is enabled and, for **WPA2 Cipher**, *AES* is enabled.

(6) The **Preshared Key** is the WLAN access password for all the employees. Enter an ASCII string with 8 - 63 characters.

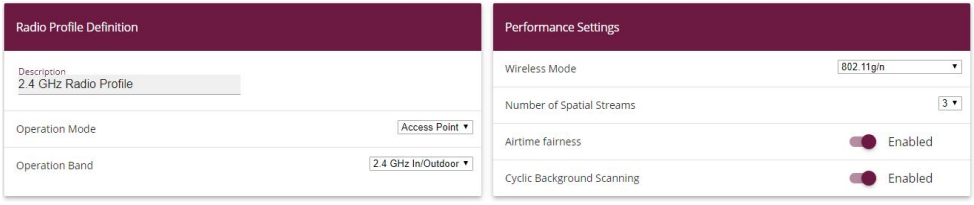
(7) Confirm with **OK**.

6.2.4.5 Configure Radio Profiles

In the next step, the **Radio Profiles** are edited. You configure the **Radio Profiles** by editing the default entry.

(1) Go to **Wireless LAN Controller** -> **Slave AP configuration** -> **Radio Profiles**.

(2) Where you have the existing entry **<2.4 GHz Radio Profile>** , click the symbol.



Advanced Settings

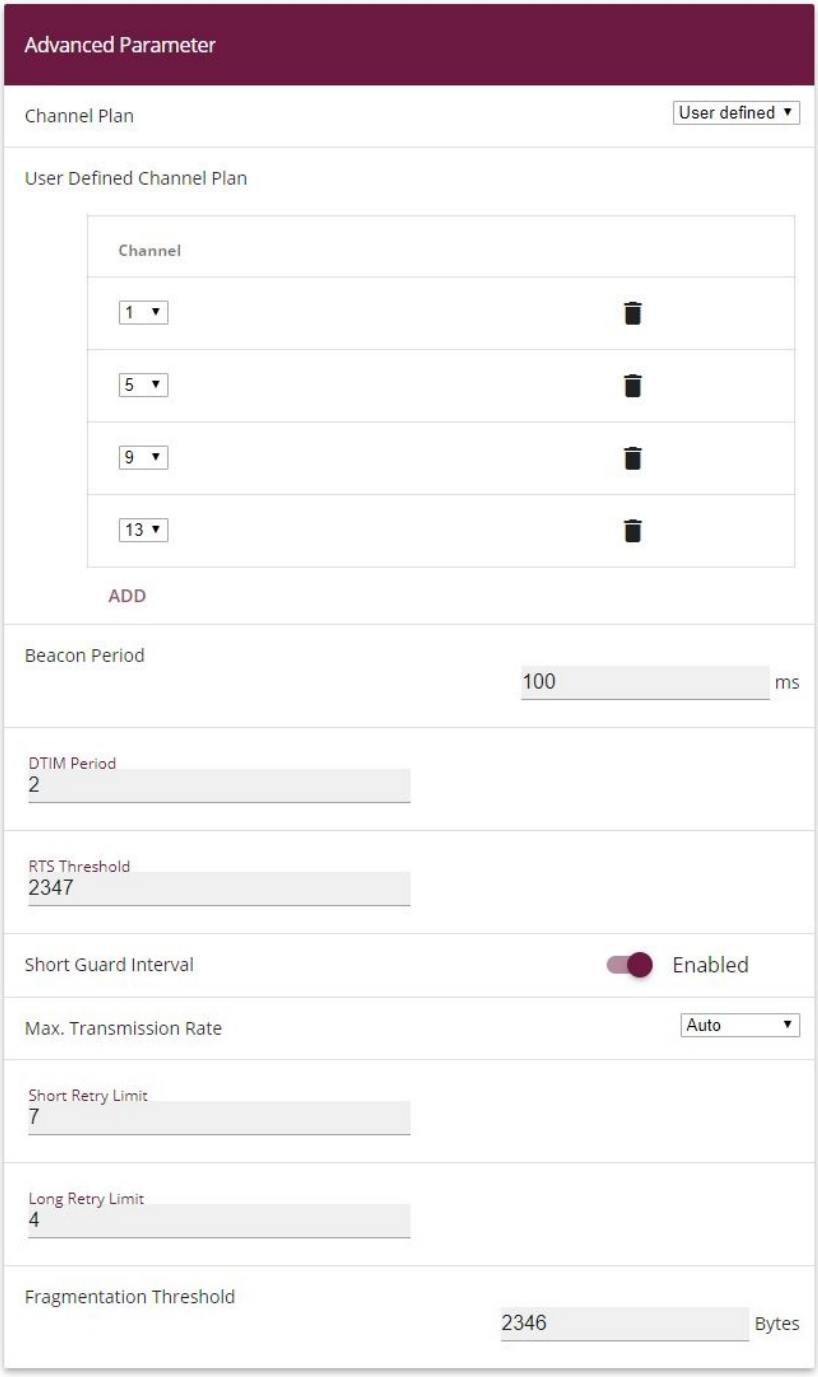


Fig. 96: **Wireless LAN Controller** -> **Slave AP configuration**-> **Radio Profiles**-> **<2.4 GHz Radio Profile>**

Proceed as follows:

(1) The wireless module profile's **frequency range** is left at *2.4 GHz In/Outdoor*.

(2) Change the **Wireless Mode** to *802.11g/n*.

Note

The result of changing the wireless mode is that older WLAN devices which are only based on the 802.11b transmission standard will no longer be able to use the WLAN. The main advantage of doing this, however, is to prevent any automatic reduction in bandwidth once a 802.11b is connected.

(3) Enable the option **Burst Mode** to increase the transmission speed.

(4) Click **Advanced Settings**.

(5) Select the **Channel Plan** you require. *User-defined* enables you to select the channels you require yourself.

(6) Under **User-defined**, select as the permitted channels *1*, *5*, *9* and *13* . This channel plan is the recommended ideal channel plan for every country where channels 1 to 13 are allowed and it does not have any (significant) frequency overlaps with 802.11g/n. This means that the access points have more choices for using a channel with minimal interference, which improves the performance and reliability of the entire WLAN.

(7) Enable the **Short Guard Interval** function in order to reduce the guard interval (= time between transmitting two data symbols) from 800 ns to 400 ns.

(8) The other settings remain unchanged and you save and leave the configuration menu with **OK**.

All the necessary profiles have now been set up in the WLAN controller.

6.2.4.6 Configure access points

Now the access points are enabled and set up.

(1) Go to **Wireless LAN Controller** -> **Slave AP configuration**-> **Slave Access Points**.

In this overview, all the existing access points should be marked as *Found*. If this is not the case, we recommend that you take another look at the DHCP server settings on the branch office router. You should check, particularly, whether the CAPWAP option has been set up correctly. The VPN network connection from head office to the branch office may also be the cause of the fault. If these can be ruled out as the cause of the fault, an accidentally activated DHCP server on a device in the branch office may be causing the problem. This server must be deactivated and all the access points in the branch office disconnected from

the mains in order to get a fresh network configuration from the DHCP server. Another alternative is to wait for the so-called DHCP Lease Time to expire.

Now the wireless and VSS profiles that were set up previously can be set up on the access points that have been found. We shall now describe how to modify an access point for the location »Nbg - Shop«.

(1) Go to **Wireless LAN Controller** -> **Slave AP Configuration**-> **Slave Access Points** .

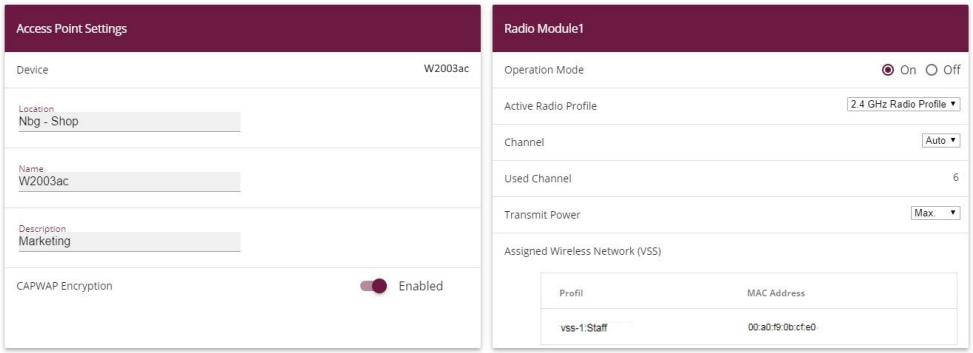


Fig. 97: **Wireless LAN Controller** -> **Slave-AP Configuration** -> **Slave Access Points**

Proceed as follows:

(1) A name that is as unambiguous as possible should be given as the **Location**, e. g. *Nbg - Shop*.

(2) It is essential that the wireless module's **Operation Mode** is left as *On*. This means that the wireless module profile being used determines the operating mode.

(3) Next the *2.4 GHz Radio Profile* that was configured previously is selected to be the **Active Radio Profile**.

(4) The **Channel** is left as *Auto* so that it is determined dynamically using the wireless profile's channel plan and the WLAN environment.

(5) Lastly, under **Assigned Wireless Networks (VSS)** and using the **Add** button, the wireless network *Staff* that has been configured is assigned to the wireless module.

(6) The other settings are applied as they are. Confirm with **OK**.

Note

If an access point has two wireless modules, two configuration masks appear for **Wireless Module 1** and **Wireless Module 2**. They are set in the same way as in the previous example.

The other access points in the overview list are configured in exactly the same way as the first one was. Just one unique location name must be given to each access point, otherwise there is no longer any way to distinguish between the access points, e. g. when doing the WLAN network monitoring (in the menu **Wireless LAN Controller** ->**Monitoring**).

Once the access points have all been set up, they are given the status `Managed` in the overview under **Wireless LAN Controller** ->**Slave AP configuration**-> **Slave Access Points**, so they are now live. The WLAN controller is also blocking them against any sort of external configuration access.

Choose whether the selected Access Pont is to be managed by the WLAN Controller by clicking the ^ button or the v button in the **Action** column.

You can disconnect the Access Point from the WLAN Controller and therefore remove it from your WLAN infrastructure by click on the v button. The Access Point then receives the `Discovered` status, but is no longer `Managed`.

However, the WLAN channels shown in the menu (**Wireless LAN Controller** ->**Slave AP configuration** -> **Slave Access Points**) may not be ideal, e. g. in terms of one channel being assigned more than once. While being taken up and running, the access points were only able to tune into the general WLAN environment, not to each other. There are two ways of correcting this retrospectively: Either by using the **START** button to triggeri the **New channel setting** action for all the managed access points at every location, or by triggering the channel search specifically for one affected access point by clicking the Refresh symbol in the **Channel search** column.

When the channel setting is complete, adjacent access points at any location ought to transmit on different channels.

The list of configured access points now looks like this:

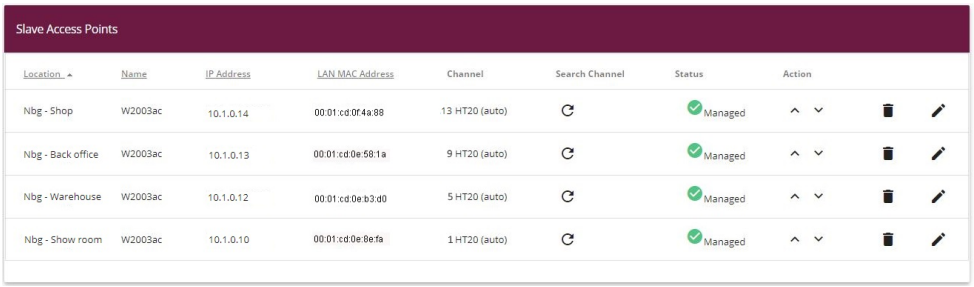


Fig. 98: **Wireless LAN Controller** -> **Slave-AP configuration** -> **Slave Access Points**

6.2.4.7 Set up an email alarm

An email alarm is then set up for the slave access points. This is to immediately and automatically notify the system administrators responsible about (WLAN) network problems at individual locations, including (indirect) faults due to Internet access and VPNs going down. When there are network problems, the access points become invisible to the WLAN controller and they are declared *offline* after a particular period of time, even if they are continuing to perform their service locally.

To be able to use the email alarm, you need to first set up an email server, and then a recipient for the alarm message.

(1) Go to **External Reporting** -> **Alert Service** -> **Alert Settings**.

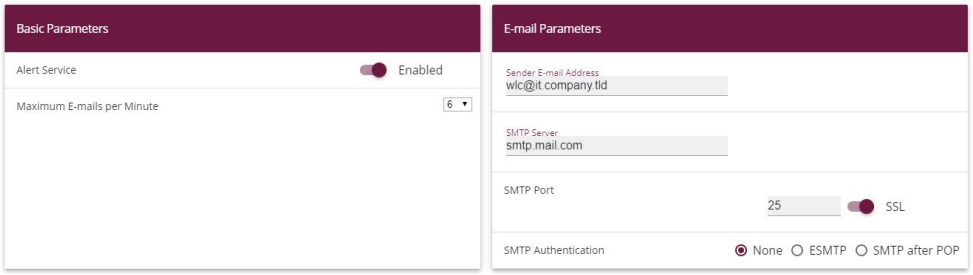


Fig. 99: **External Reporting** -> **Alert Service** -> **Alert Settings**

Proceed as follows:

(1) The **Alert Service** must be enabled.

(2) Enter an address that will be put in the email's sender field, e. g. *wlc@it.company.tld*.

(3) You can use the value for **Maximum E-mails per Minute** to delimit the number of outgoing mails per minute, e. g. *6*.

(4) Enter the IP address of the **SMTP Server** that is to be used to send the mails, e. g. *smtp.mail.com*.

(5) You may wish to select an authentication method for the SMTP server.

(6) Confirm with **OK**.

Finally, an email alarm is set up for the slave access points.

(1) Go to **External Reporting** -> **Alert Service** -> **Alert Recipient** -> **New**.

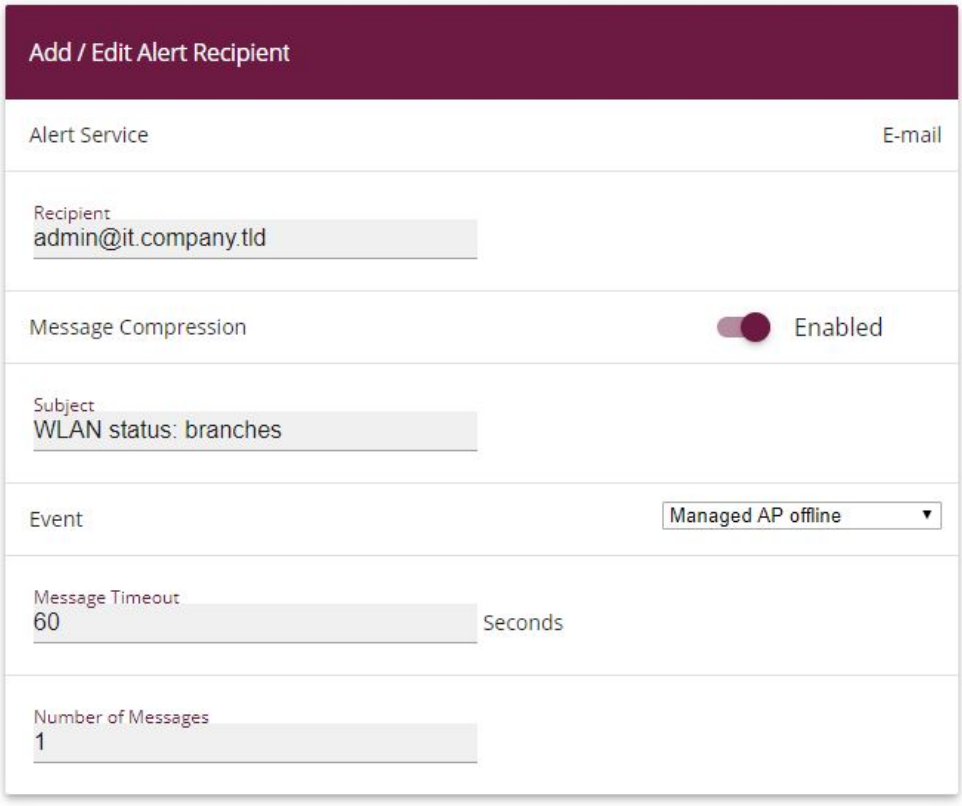


Fig. 100: **External Reporting** -> **Alert Service** -> **Alert Recipient** -> **New**

Proceed as follows:

(1) The email contact address of the system administrators responsible for this WLAN is entered as the **Recipient**, e. g. `admin@it.company.tld`.

(2) Some information which should be kept as short as possible should be entered as the **E-Mail Subject**, e. g. `WLAN status: branches`.

Note

The content of an alarm email includes other information such as the reason for the alarm, the time of the event, and the device affected.

(3) `Managed AP offline` must be entered as the **Event**.

(4) Leave the remaining settings unchanged and confirm them with **OK**.

This completes the configuration of the WLAN controller-. Save the configuration with **Save configuration** and confirm the selection with **OK**.

6.3 Overview of Configuration Steps

Configure the router in the field office - IP configuration

Field	Menu	Value
Address mode	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Static*
IP Address / Netmask	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	IP address: e. g. *10.0.0.123* Net mask: e. g. *255.255.255.0*
Interface Mode	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Untagged:*
MAC Address	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Use Built-In*

Configure the router in the field office - DHCP pool

Field	Menu	Value
IP pool name	**Local Services -> DHCP Server -> IP Pool Configuration -> New**	e. g. *Devices*
IP Address Range	**Local Services -> DHCP Server -> IP Pool Configuration -> New**	e. g. *10.1.0.10 - 10.1.0.254*
Interface	**Local Services -> DHCP Server -> DHCP Configuration -> New**	*en1-0*
IP pool name	**Local Services -> DHCP Server -> DHCP Configuration -> New**	e. g. *Devices*
Pool Usage	**Local Services -> DHCP Server -> DHCP Configuration -> New**	*Local*
Gateway	**Local Services -> DHCP Server -> DHCP Configuration -> New**	*Use Router as Gateway*
Lease Time	**Local Services -> DHCP Server -> DHCP Configuration -> New**	e. g. *120*
DHCP Options	**Local Services -> DHCP Server -> DHCP Configuration -> New-> Add**	*DNS Server*: e. g. *10.1.0.1* *CAPWAP Controller*: e. g. *10.0.0.123*

Configure the VPN concentrator at head office

Field	Menu	Value
Address mode	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Static*
IP Address / Netmask	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*IP Address*: e. g. *10.0.0.1* *Netmask*: e. g. *255.255.255.0*
Interface Mode	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Untagged:*
MAC address	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Use Built-In*

Configure the WLAN controller at head office - IP configuration

Field	Menu	Value
Address mode	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Static*
IP Address / Netmask	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*IP Address*: e. g. *10.0.0.123* *Netmask*: e. g. *255.255.255.0*
Interface Mode	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Untagged:*
MAC address	**LAN -> IP Configuration-> Interfaces -> <en1-0>**	*Use Built-In*

Configure the WLAN controller at head office - default route

Field	Menu	Value
Route Type	**Network -> Routes-> IPv4 Route Configuration -> New**	*Default Route via Interface*
Interface	**Network -> Routes-> IPv4 Route Configuration -> New**	*LAN_EN1-0*
Gateway	**Network -> Routes-> IPv4 Route Configuration -> New**	e. g. *10.0.0.1*
Metric	**Network -> Routes-> IPv4 Route**	e. g. *1*

Field	Menu	Value
	Configuration -> **New**	

Configure the WLAN controller at head office - WLAN controller

Field	Menu	Value
Region	**Wireless LAN Controller** -> **Controller Configuration** -> **General**	e. g. *Germany*
Interface	**Wireless LAN Controller** -> **Controller Configuration**-> **General**	*LAN_EN1-0*
DHCP Server	**Wireless LAN Controller** -> **Controller Configuration**-> **General**	*External or static*
Slave AP location	**Wireless LAN Controller** -> **Controller Configuration**-> **General**	*Remote (WAN)*

Configure the WLAN controller at head office - wireless network profile

Field	Menu	Value
Network Name (SSID)	**Wireless LAN Controller** ->**Slave AP Configuration** ->**Wireless Networks (VSS)**	e. g. *Staff* (visible)
Intra-cell Repeating	**Wireless LAN Controller** ->**Slave AP Configuration** ->**Wireless Networks (VSS)**	*Enabled*
ARP Processing	**Wireless LAN Controller** ->**Slave AP Configuration** ->**Wireless Networks (VSS)**	*Disabled*
WMM	**Wireless LAN Controller** ->**Slave AP Configuration** ->**Wireless Networks (VSS)**	*Enabled*
Max. Clients	**Wireless LAN Controller** ->**Slave AP Configuration** ->**Wireless Networks (VSS)**	e. g. *32*
Security mode	**Wireless LAN Controller** ->**Slave AP Configuration** ->**Wireless Networks (VSS)**	*WPA-PSK*
WPA Mode	**Wireless LAN Controller** ->**Slave AP Configuration** ->**Wireless Networks (VSS)**	*WPA and WPA 2*
WPA Cipher	**Wireless LAN Controller** ->**Slave AP Configuration** ->**Wireless Networks (VSS)**	*TKIP*

Field	Menu	Value
WPA2 Cipher	**Wireless LAN Controller ->Slave AP Configuration ->Wireless Networks (VSS)**	*AES*
Preshared key	**Wireless LAN Controller ->Slave AP Configuration ->Wireless Networks (VSS)**	String with 8 - 63 characters
ACL Mode	**Wireless LAN Controller ->Slave AP Configuration ->Wireless Networks (VSS)**	*Disabled*
Allowed Addresses	**Wireless LAN Controller ->Slave AP Configuration ->Wireless Networks (VSS)**	*None*
VLAN	**Wireless LAN Controller ->Slave AP Configuration ->Wireless Networks (VSS)**	*Disabled*

Configure the WLAN controller at head office - Radio Profiles

Field	Menu	Value
Description	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	e. g. *2.4 GHz Radio Profile*
Operation Mode	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*Access Point*
Operation Band	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*2.4 GFz In / Outdoor*
Number of Spatial Streams	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*2*
Wireless Mode	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*802.11 g/n*
Max. Transmission Rate	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*Auto*
Burst Mode	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-**	*Enabled*

Field	Menu	Value
	> 2.4 GHz Radio Profile>	
Channel plan	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*User-defined*
User-defined Channel Plan	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*1*, *5*, *9*, *13*
Beacon Period	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*100* ms
DTIM Period	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> 2.4 GHz Radio Profile>**	*2*
RTS Threshold	**Wireless LAN Controller ->Slave AP Configuration -> Radio Profiles-> 2.4 GHz Radio Profiles**	*2347*
Short Guard Interval	**Wireless LAN Controller ->Slave AP Configuration -> Radio Profiles-> 2.4 GHz Radio Profiles**	*Enabled*
Short Retry Limit	**Wireless LAN Controller ->Slave AP Configuration -> Radio Profiles-> 2.4 GHz Radio Profiles**	*7*
Long Retry Limit	**Wireless LAN Controller ->Slave AP Configuration -> Radio Profiles-> 2.4 GHz Radio Profiles**	*4*
Fragmentation Threshold	**Wireless LAN Controller ->Slave AP Configuration -> Radio Profiles-> 2.4 GHz Radio Profiles**	*2346* bytes

Configure the WLAN controller at head office - access points

Field	Menu	Value
Location	**Wireless LAN Controller -> Slave AP Configuration-> Slave Access Points**	e. g. *Nbg - Shop*
CAPWAP Encryption	**Wireless LAN Controller -> Slave AP Configuration-> Slave Access Points**	*Enabled*

Field	Menu	Value
Operation Mode	**Wireless LAN Controller -> Slave AP Configuration-> Slave Access Points**	*On*
Active Radio Profile	**Wireless LAN Controller -> Slave AP Configuration-> Slave Access Points**	e. g. *2.4 GHz Radio Profile*
Channel	**Wireless LAN Controller -> Slave AP Configuration-> Slave Access Points**	*Auto*
Used Channel	**Wireless LAN Controller -> Slave AP Configuration-> Slave Access Points**	e. g. *13*
Transmit Power	**Wireless LAN Controller -> Slave AP Configuration-> Slave Access Points**	*Max.*
Assigned wireless networks (VSS)	**Wireless LAN Controller -> Slave AP Configuration-> Slave Access Points**	e. g. *Staff*

Set up an email alarm - server

Field	Menu	Value
Alert Service	**External Reporting -> Alert Service -> Alert Settings**	*Enable*
Maximum E-mails per Minute	**External Reporting -> Alert Service -> Alert Settings**	e. g. *6*
Sender E-Mail Address	**External Reporting -> Alert Service -> Alert Settings**	e. g. *wlc@itcompany.tld*
SMTP Server	**External Reporting -> Alert Service -> Alert Settings**	e. g. *smtp.mail.com*
SMTP Authentication	**External Reporting -> Alert Service -> Alert Settings**	e. g. *None*

Set up an email alarm - email recipient

Field	Menu	Value
Recipient	**External Reporting -> Alert Service -> Alert Recipient -> New**	e. g. *admin@itcompany.tld*
Message Compression	**External Reporting -> Alert Service -> Alert Recipient -> New**	*Enabled*

Field	Menu	Value
Subject	**External Reporting** -> **Alert Service** -> **Alert Recipient** -> **New**	e. g. *WLAN status: branches*
Event	**External Reporting** -> **Alert Service** -> **Alert Recipient** -> **New**	*Managed AP offline*
Message Timeout	**External Reporting** -> **Alert Service** -> **Alert Recipient** -> **New**	e. g. *60*
Number of Messages	**External Reporting** -> **Alert Service** -> **Alert Recipient** -> **New**	e. g. *1*

Chapter 7 WLAN - Wireless LAN Controller as Network Access Gateway

7.1 Introduction

We shall now describe how to configure a bintec router in the Rxx02 series as a WLAN controller for the local WLAN infrastructure (**bintec W2003ac** access points) and as the central access gateway in the WAN (Internet) with automatic network setup and firewall for devices in the WLAN and Ethernet LAN.

The **GUI** (Graphical User Interface) is used for configuring.

A company location should be equipped with Ethernet LAN and WLAN used separate by employees and guests:

- The computers and other devices of the two user groups should be automatically integrated into the network by DHCP and be able to access the Internet.
- Guests should not be able to access the employee intranet.
- However, employees ought to be able to access the guests' intranet, for example to be able to securely and quickly share selected documents with an external project partner on the premises within the company.
- Access to the network infrastructure should also be limited to system administrators.

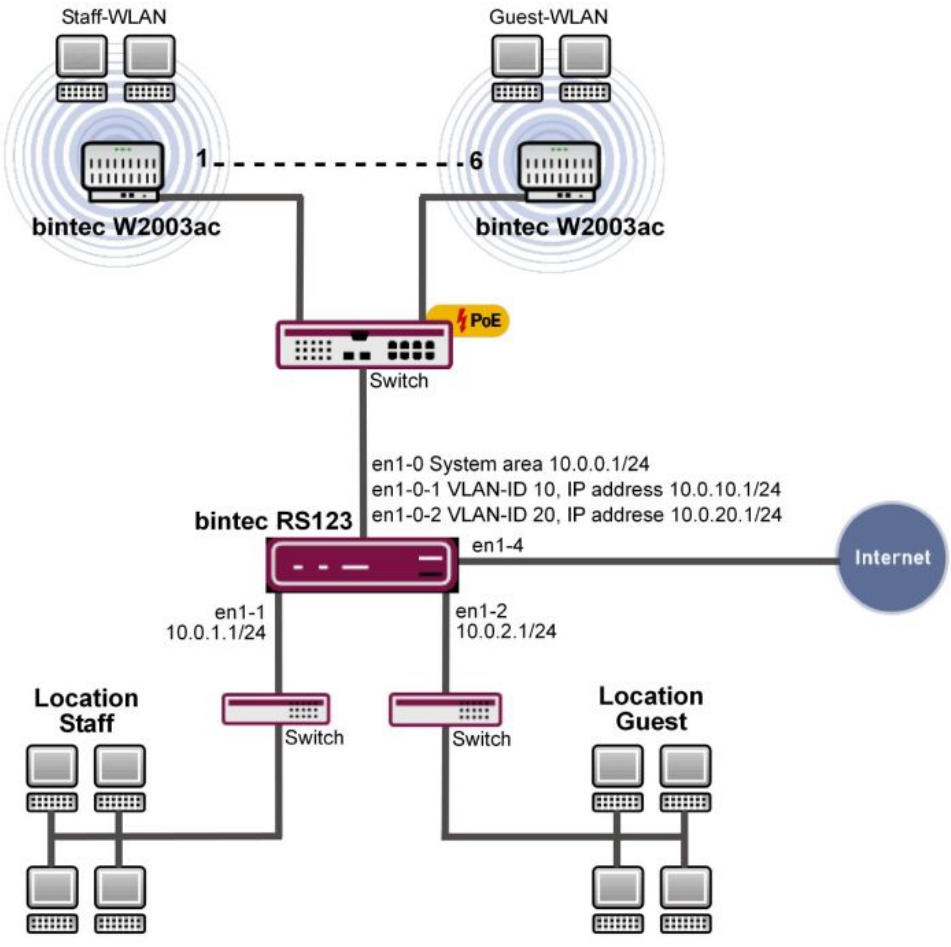


Fig. 101: Example scenario

Requirements

The following are required for the configuration:

- A Bintec router from the RS series, the RXL series, the **be.IP** or **be.IP plus**.
- Access points from the **bintec W2003ac** series or bintec WIx0xxn series (e. g. **bintec WI1003n**). The minimum number of necessary access points depends on the size and building structure of the company location and can be accurately determined by a prior WLAN radio frequency site survey (see the WLAN Controller introduction for more on this). In our example, we use 5 **bintec W2003ac**'s and one **bintec WI1003n**.
- A boot image with at least version 10.1.9 for the Bintec router

- A boot image with at least version 10.1.9 for the access points
- Internet access at the company location.
- At least one PoE switch for the access points and other switches for the LAN.

About the test setup

Overview of interface configuration on the Bintect router:

en1-0	System area	IP address 10.0.0.1/24: DHCP server for access points and the WLAN controller interface
en1-0-1	Staff WLAN	Virtual interface via en1-0 with VLAN ID 10, IP address 10.0.10.1/24: DHCP server and gateway for the employee WLAN
en1-0-2	Guest WLAN	Virtual interface via en1-0 with VLAN ID 20, IP address 10.0.20.1/24: DHCP server and gateway for the employee WLAN
en1-1	Staff Ethernet LAN	IP address 10.0.1.1/24: DHCP server and gateway for the employee Ethernet WLAN
en1-2	Guest Ethernet LAN	IP address 10.0.2.1/24: DHCP server and gateway for the guest Ethernet WLAN
en1-4	WAN	Uplink to the Internet

7.2 Configuration

Port Configuration

Note

The computer from which the router is being configured should be connected to Ethernet port 1 throughout the configuration process. Otherwise, one will be repeatedly locked out of the router during the configuration process.

First of all, the Ethernet ports are configured as separate interfaces, and a separate interface is assigned to each port, in ascending order, beginning with en1-0.

(1) Go to **Physical Interfaces** -> **Ethernet Ports** -> **Port Configuration**.

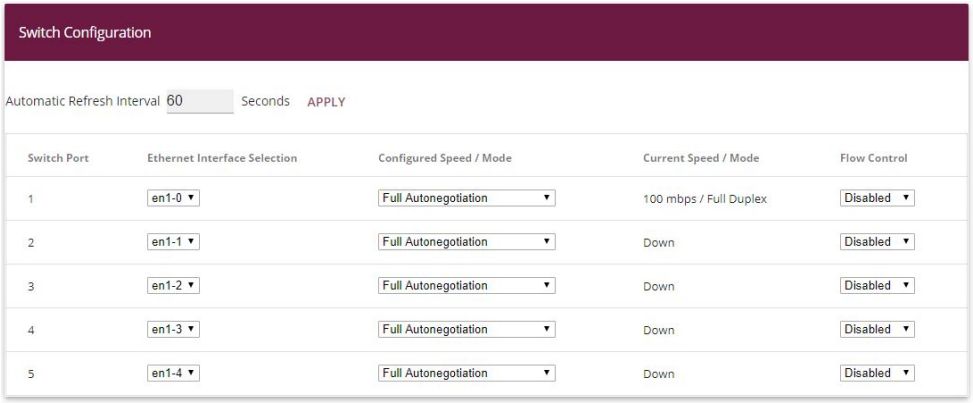


Fig. 102: **Physical Interfaces** -> **Ethernet Ports** -> **Port Configuration**

Proceed as follows to assign the ports to the interfaces:

(1) Under **Ethernet Interface Selection** select *en1-0* to *en1-4* for the **Switch Ports 1** and **5** from the dropdown menu.

(2) Confirm with **OK**.

The WAN and Internet access is then set up. The **GUI** has a **wizard** to configure the Internet access. To do this, go to the following menu:

(1) Go to **Assistants** -> **Internet Access**-> **Internet Connections** -> **New**.

(2) For **Connection Type**, select the appropriate connection type for your Internet access, in our example *External gateway/cable modem*.

(3) Click on **Next** to configure a new Internet connection.

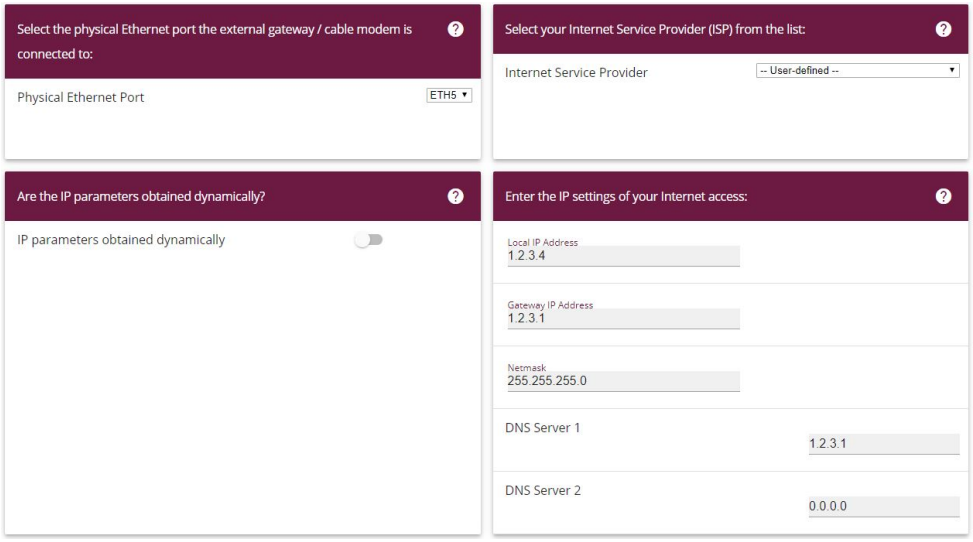


Fig. 103: **Assistants** -> **Internet Access** -> **Internet Connections** -> **New** -> **Next**

We shall now describe the setup for an external gateway:

(1) Under **Physical Ethernet Port** select the physical Ethernet port to which the xDSL modem or the Internet uplink is connected, in this case *ETH5*.

(2) For **Internet Service Provider**, select *--User-defined---*.

(3) Deselect the **IP parameters obtained dynamically** option.

(4) Under **Local IP Address**, enter your Internet access data, e. g. *1.2.3.4*.

(5) For **Gateway IP Address** enter the gateway's IP address, e. g. *1.2.3.1*.

(6) Enter the relevant **Netmask**, e. g. *255.255.255.0*.

(7) For **DNS Server 1** enter the name server's IP address, e. g. *1.2.3.1*.

(8) Press **OK** to confirm your entries.

Variant:

(1) If the uplink is a provider's xDSL access, you can, instead, select *Internal modem* as the **Connection Type** in the first step of the Internet access wizard.

(2) In this case, the internal **Network Interface**, instead of being called *en1-4* , is usually called *WAN_Providername* and, when the configuration has been completed in the menu **Network** -> **Routes** -> **IP Routes**, appears as the interface for the default gateway (in the simplest case, this is the only entry with the target IP address and netmask the same *0.0.0.0*).

(3) The **interface** name is relevant for subsequent configuration steps when setting up the firewall.

Note

This interface is not to be confused with the (underlying) *ethoa* interface which is also present.

The LAN interfaces are then configured.

You configure the Ethernet interface by editing the default entry. To do this, click the icon next to the existing **<en1-0>** entry.

(1) Go to **LAN** -> **IP Configuration** -> **Interfaces** -> .

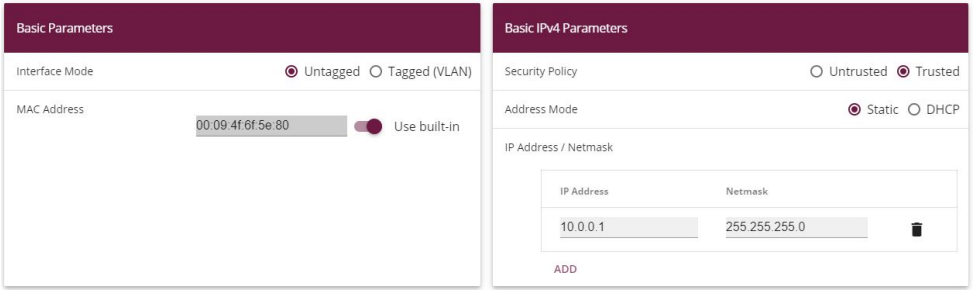


Fig. 104: **LAN** -> **IP Configuration** -> **Interfaces** ->

Proceed as follows to configure the Ethernet interface:

(1) Enter the static **IP Address** *10.0.0.1* and the **Netmask** *255.255.255.0*.

(2) Confirm with **OK**.

Note

After you have confirmed the configuration with **OK**, you have locked yourself (just the once) out of the router. Log back onto the newly set up **IP Address** *10.0.0.1* for *en1-0* (your own computer's network configuration may have to be changed before doing this).

(1) The static **IP Address** *10.0.1.1* with **Netmask** *255.255.255.0* is then set up on the Ethernet interface *en1-1*.

(2) Confirm with **OK**.

(3) Finally, the Ethernet interface *en1-2* is set up with the static **IP Address** *10.0.2.1* and with the **Netmask** *255.255.255.0* . The Ethernet interface *en1-3* remains unused.

(4) Confirm with **OK**.

In the next step, two virtual interfaces based on `en1-0` are added.

(1) Go to **LAN** -> **IP Configuration** -> **Interfaces** -> **New**.

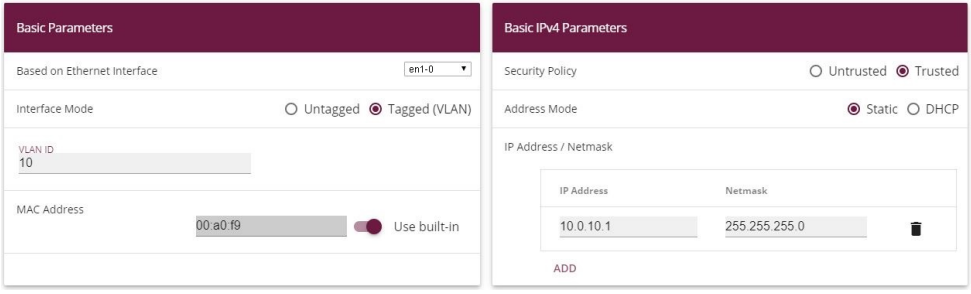


Fig. 105: **LAN** -> **IP Configuration** ->**Interfaces** -> **New**

Proceed as follows to configure the first virtual interface:

(1) For **Based on Ethernet Interface**, select the interface `en1-0`.

(2) Assign **VLAN ID** `10` to the interface.

(3) For **IP Address / Netmask**, click **Add**.

(4) The first virtual interface is given the static **IP Address** `10.0.10.1` and the **Netmask** `255.255.255.0`.

(5) Confirm with **OK**.

You configure the second virtual interface as follows:

(1) For **Based on Ethernet Interface**, select the interface `en1-0`.

(2) Assign **VLAN ID** `20` to the interface.

(3) For **IP Address / Netmask**, click **Add**.

(4) The second virtual interface is given the static **IP Address** `10.0.20.1` and the **Netmask** `255.255.255.0`.

(5) Confirm with **OK**.

Results:

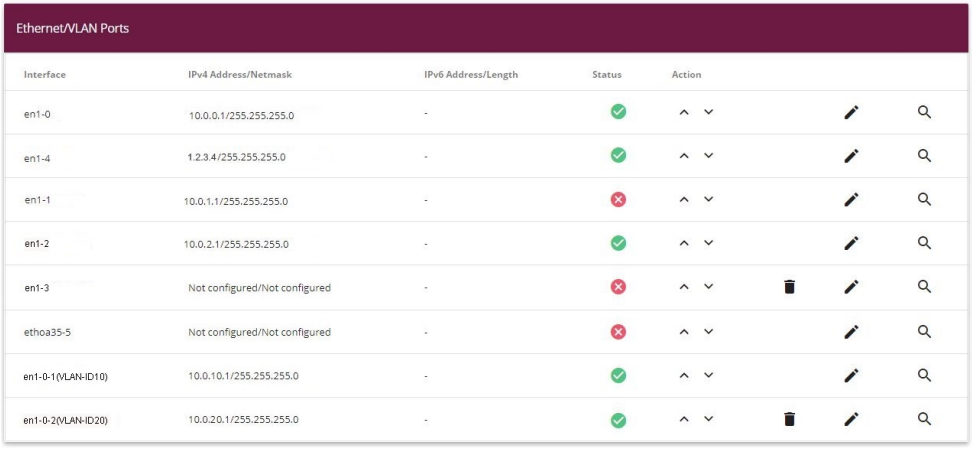


Fig. 106: **LAN** -> **IP Configuration** -> **Interfaces**

System access and firewall setup

Administrative access to the device is configured in the **Access** menu. Firstly, all of the router's configuration services are restricted to the administrative Ethernet interface *en1-0*.

(1) Go to **System Management** -> **Administrative Access** -> **Access** .

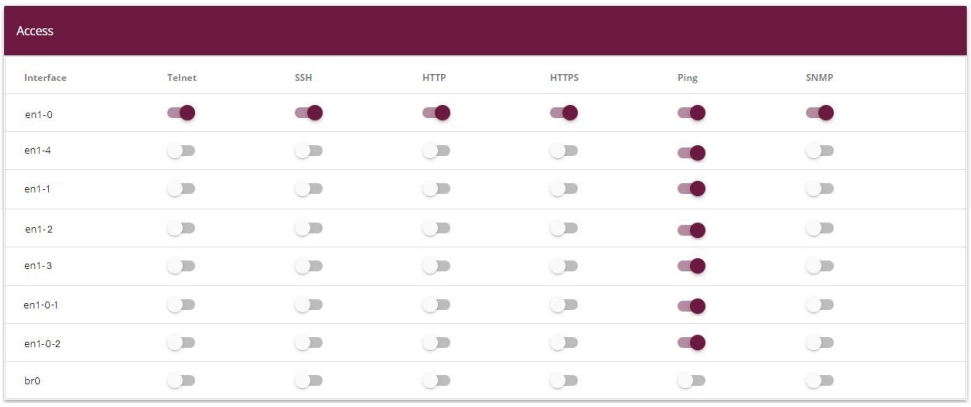


Fig. 107: **System Management** -> **Administrative Access** -> **Access**

Proceed as follows:

(1) For the **Interface** *en1-0*, select the router's configuration services *Telnet*, *SSH*, *HTTP*, *HTTPS*, *Ping* and *SNMP*.

(2) On all the other interfaces, only *Ping* should be allowed. We do not recommend that you also block Ping, because this makes it unnecessarily difficult to search for errors

in the LAN (with no additional security).

(3) Click **OK**.

Setting the **Passwords** is another basic system setting. Make sure you change the passwords to prevent unauthorised access to the device

(1) Go to **System Administration** -> **Global Settings** -> **Passwords**.

(2) Enter the password for the user name *admin*.

(3) Confirm the password by entering it again.

(4) Click **OK**.

The **Firewall** for the LAN is then set up. Define a group that contains all the services that the router itself is to offer in the LAN.

(1) Go to **Firewall** -> **Services** -> **Groups** -> **New**.

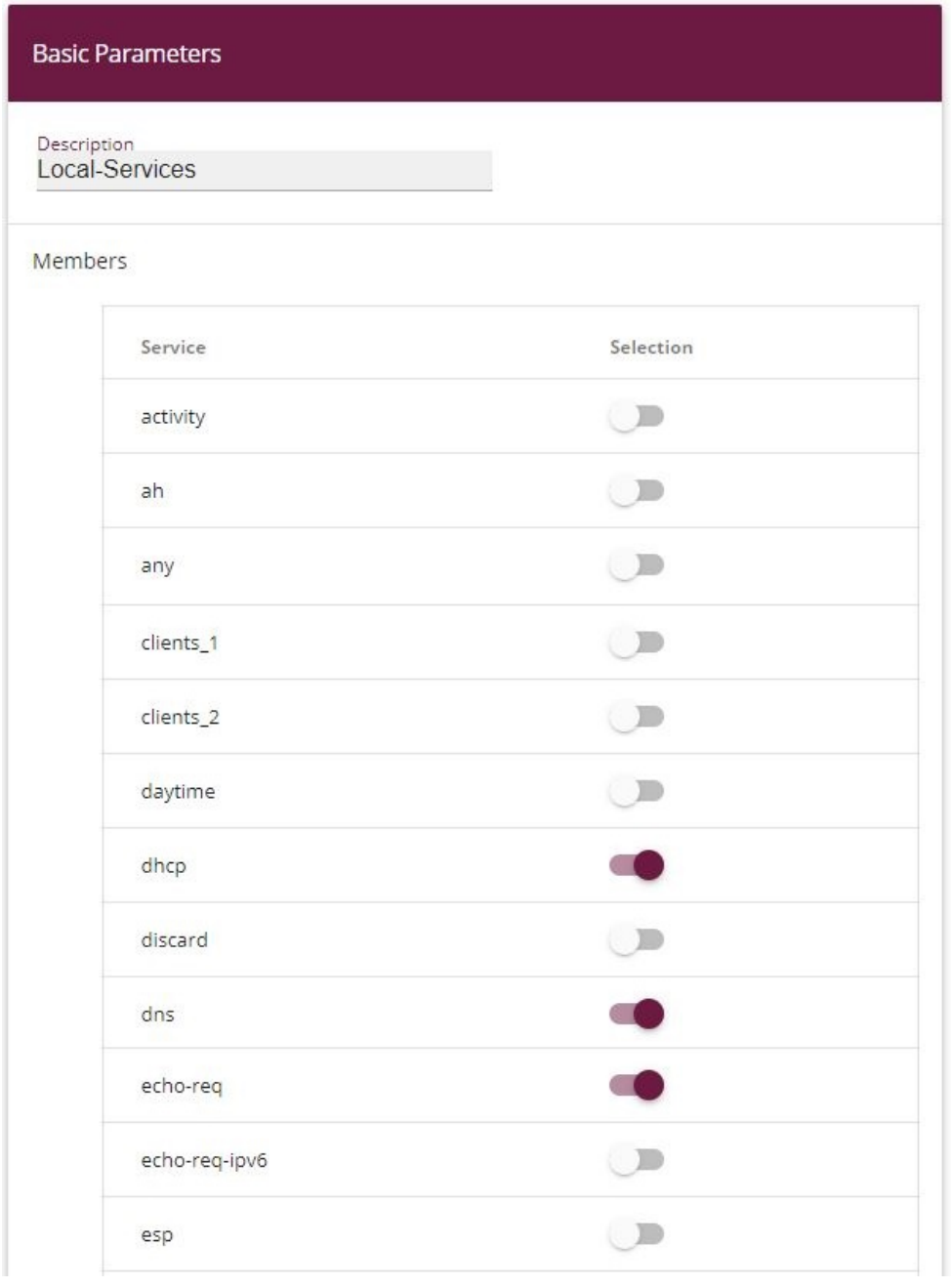


Fig. 108: **Firewall** -> **Services** -> **Groups** -> **New**

Proceed as follows:

(1) For **Description**, enter `Local-Services` for the group.

(2) Select the **Members** of the group, e. g. *echo*, *dns*, *dhcp*, *ntp*. To do this, activate the field in the **Members** column.

(3) Confirm with **OK**.

In the next step, you define the firewall's address lists. By default, *ANY* is the only entry.

(1) Go to **Firewall** -> **Addresses** -> **Address List** -> **New**.

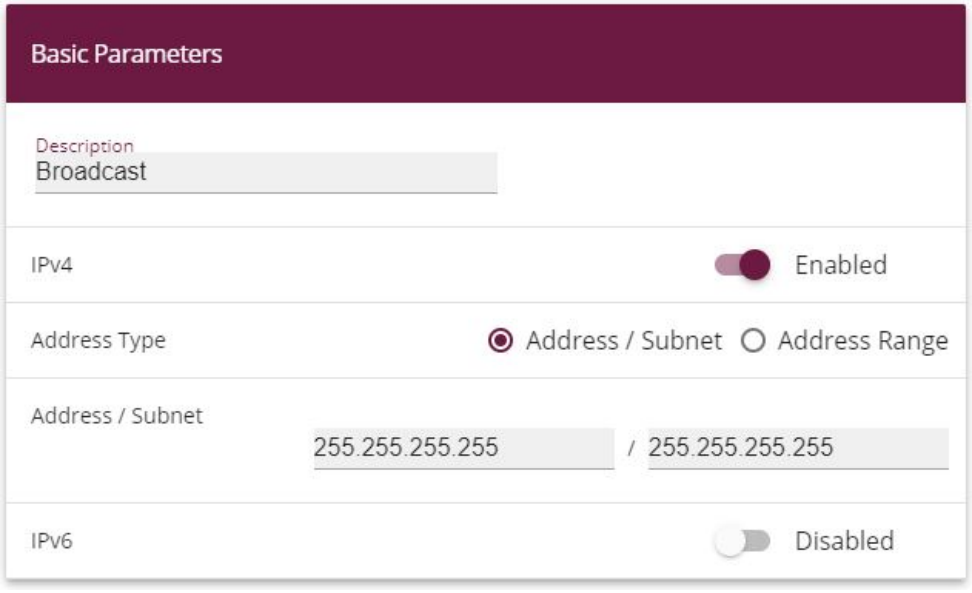


Fig. 109: **Firewall** -> **Addresses** -> **Address List** -> **New**

Proceed as follows:

(1) Under **Description**, enter *Broadcast*.

(2) For the **Address / Subnet**, enter *255.255.255.255* and *255.255.255.255* .

(3) Confirm with **OK**.

Define other LAN IP address lists.

(1) For *Employee LAN GW* (en1-1) the **IP Address** *10.0.1.1* with the **Netmask** *255.255.255.255*.

(2) Confirm with **OK**.

(3) For *Guest LAN GW* (en1-2) the **IP Address** *10.0.2.1* with the **Netmask** *255.255.255.255*.

(4) Confirm with **OK**.

(5) For *Employee WLAN GW* (en1-0-1) the **IP Address** *10.0.10.1* with the **Netmask** *255.255.255.255*.

(6) Confirm with **OK**.

(7) For *Guest WLAN GW* (en1-0-2) the **IP Address** *10.0.20.1* with the **Netmask** *255.255.255.255*.

(8) Confirm with **OK**.

Note

The IP addresses in the firewall need to match the interfaces concerned for IP configuration (and be modified if the configuration is changed). The mask must always be 255.255.255.255 and has nothing to do with the netmask of the networks concerned. The mask restricts the range of the relevant address list to precisely the one IP address that was entered.

The list of configured addresses now looks like this:

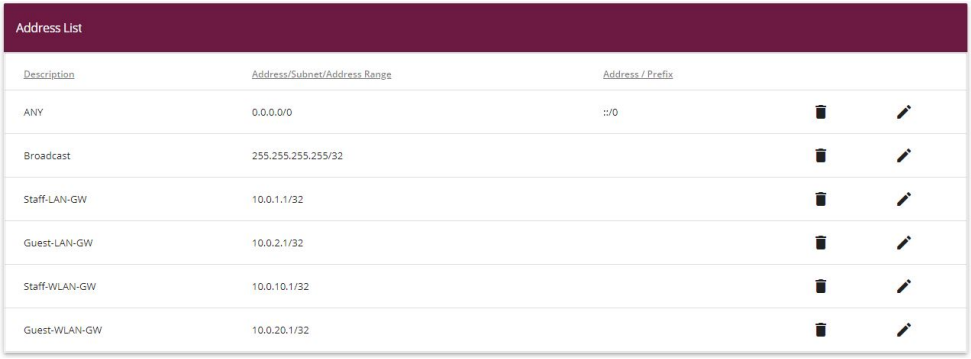


Fig. 110: **Firewall** -> **Addresses** -> **Address List**

Now you still need to define the interfaces for the individual user groups.

(1) Go to **Firewall** -> **Interfaces**-> **IPv4 Groups** -> **New**.

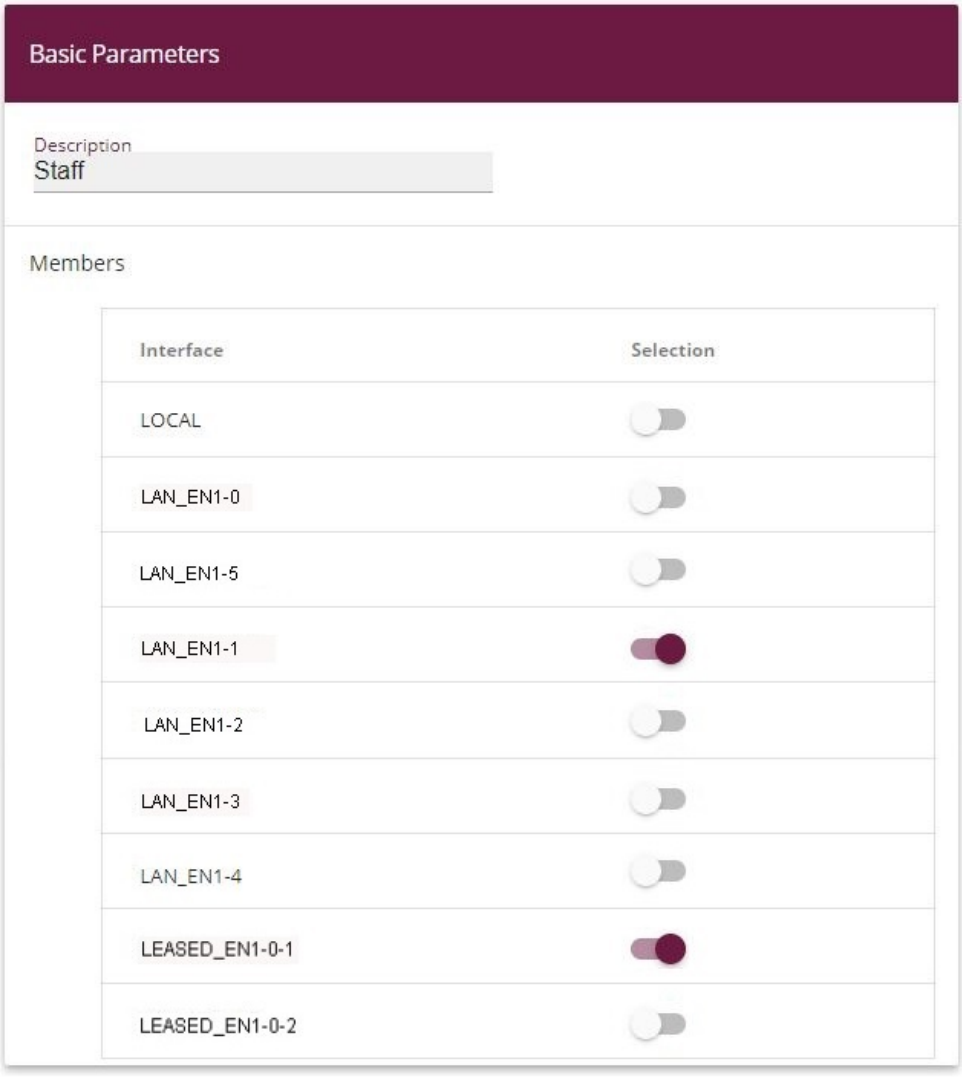


Fig. 111: **Firewall** -> **Interfaces** -> **IPv4 Groups** -> **New**

Proceed as follows to set up the *Employees* group:

(1) Enter *Staff* as the **Description** for the group.

(2) From the interfaces that have been configured, select *LAN_EN1-1* and *LEASED_EN1-0-1* as **Members** of the group.

(3) Confirm with **OK**.

Define another group *Guest* as follows:

(1) Enter *Guest* as the **Description** for the group.

(2) Select *LAN_EN1-2* and *LEASED_EN1-0-2* as **Members** of the group.

(3) Confirm with **OK**.

Set up the interfaces group *Users* (staff and guests).

(1) Enter *User* as the **Description** for the group.

(2) As **Members** of the group, select *LAN_EN1-1*, *LAN_EN1-2*, *LEASED_EN1-0-1* and *LEASED_EN1-0-2* .

(3) Confirm with **OK**.

The list of configured groups now looks like this:

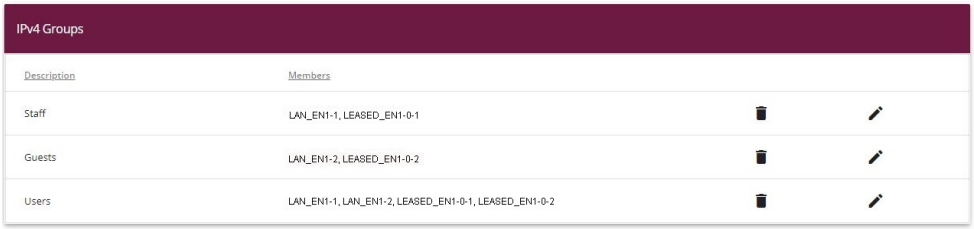


Fig. 112: **Firewall** -> **Interfaces** -> **IPv4 Groups**

Now the actual firewall rules can be created based on these definitions. Firstly, the rule for the administrators area in *en1-0* must be defined (otherwise one will be locked out totally and immediately).

(1) Go to **Firewall** -> **Policies** -> **IPv4 Filter Rules** ->**New**.

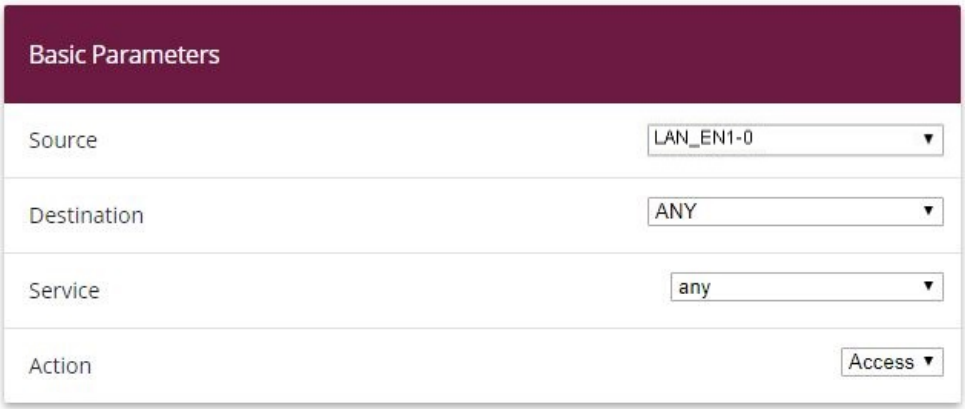


Fig. 113: **Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**

Proceed as follows:

(1) Select the packet's **Source**, in this case *LAN_EN1-0*.

(2) Set the **Destination** to *ANY*. Neither the destination interface or the destination address will be checked.

(3) For **Services**, select *any* (all the services).

(4) Select the **Action** that is to be applied, in this case *Access*. The packets are forwarded on the basis of the entries.

(5) Confirm with **OK**.

(6) As the next rule, the **Source group** *Staff* is to be granted access to the **Destination group** *Users* via **Services** *any* .

(7) Confirm with **OK**.

(8) After that, a rule is created which is used to permit access from the **Source group** *Guest* to the **Destination group** *Guest* via **Services** *any*.

(9) Confirm with **OK**.

(10) Another rule should give all the *Users* access to the Internet: As the **Source**, select *Users*, as the **Destination**, select *LAN_EN1-4* , and as the **Service**, select *any*.

(11) Confirm with **OK**.

Note

If an Internet access via an internal xDSL modem has been set up, instead of *LAN_EN1-4*, you need to select the relevant WAN interface (*WAN_Providername*) as the **Destination**.

Up to this point, the only access rules to have been defined are those for network areas connected via the router, and nobody outside the system area at the interface *en1-0* is permitted to access IP addresses defined locally in the router.

To be able to use the basic services such as *dns*, *dhcp* etc., you need to explicitly allow **access** to the IP address of the interface concerned which is linked to the router.

(1) Go to **Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**.

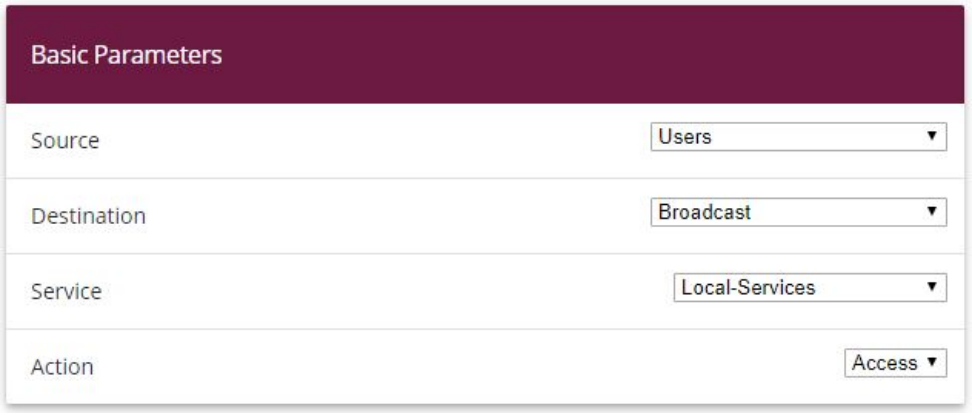


Fig. 114: **Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**

Proceed as follows:

(1) As the **Source** of the packet, select the *Users* group.

(2) As the **Destination**, select the *Broadcast* address that was defined previously.

(3) For **Service**, select the service group that the users are to be permitted to access, in this case *Local-Services*.

(4) Select the **Action** that is to be applied, in this case *Access*. The packets are forwarded on the basis of the entries.

(5) Confirm with **OK**.

(6) In the next rule you select the **Source** *LAN_EN1-1*. As the **Destination**, select the *Staff LAN GW* that was defined previously, as the **Service** select *Local Services* and, for the **Action**, select *Access*.

(7) Confirm with **OK**.

(8) In the next rule you select the **Source** *LAN_EN1-2*. As the **Destination**, select the *Guests LAN GW* address that was defined previously, as the **Service** select *Local-Services* and, for the **Action**, select *Access*.

(9) Confirm with **OK**.

(10) In the next rule, as the **Source** you select *LEASED_EN1-0-1*, as the **Destination** you select the *Staff WLAN GW* address which was defined previously, as the **Service** you select *Local services* and as the **Action** you select *Access*.

(11) Confirm with **OK**.

(12) In the final rule, as the **Source** you select *LEASED_EN1-0-2*. As the **Destination**, select the *Guests WLAN GW* address that was defined previously, as the **Service** select *Local Services* and, for the **Action**, select *Access*.

(13) Confirm with **OK**.

The list of configured filter rules now looks like this:

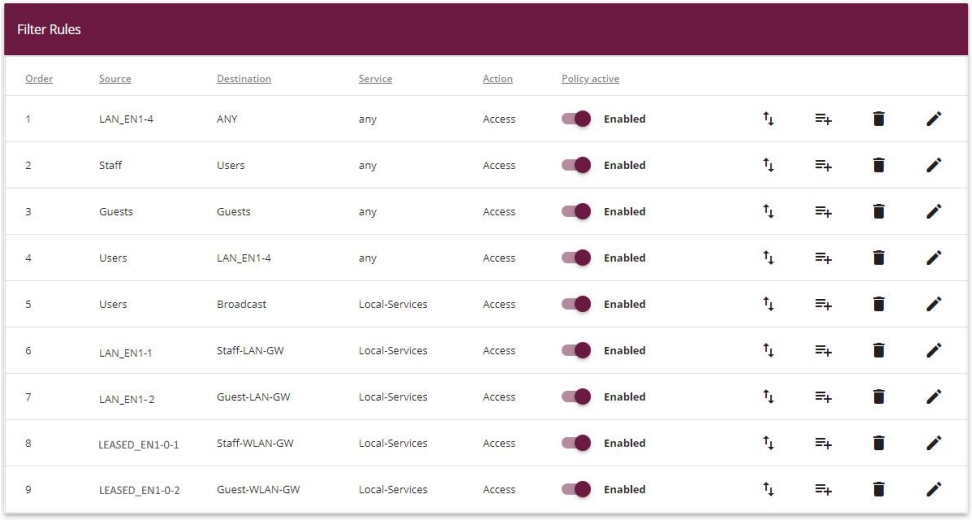


Fig. 115: **Firewall** -> **Policies** ->**IPv4 Filter Rules**

The firewall automatically rejects any other data which does not fit with the above rules. So there is no need to create any explicit exclusion rules to reject the other data traffic. This also means that, with the current firewall configuration, any IP data traffic on the router and to the LAN that is initiated by the WAN/Internet (`en1-4` in our example) is suppressed. If access from outside is required, separate firewall rules need to be defined for this purpose with the WAN interface (in this case `LAN_EN1-4`) as the source.

To finish, check whether the firewall is enabled. To do this, go to the following menu:

(1) Go to **Firewall** -> **Policies** -> **Options** .

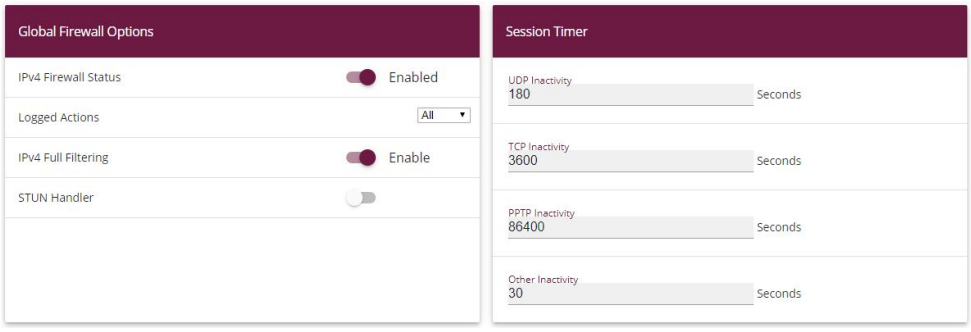


Fig. 116: **Firewall** ->**Policies**->**Options**

The **IPv4 Firewall Status** option must be set to `Activated`.

DHCP server configuration

After that, 5 DHCP servers, in all, now need to be configured to match the relevant interface's network.

(1) Go to **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**.

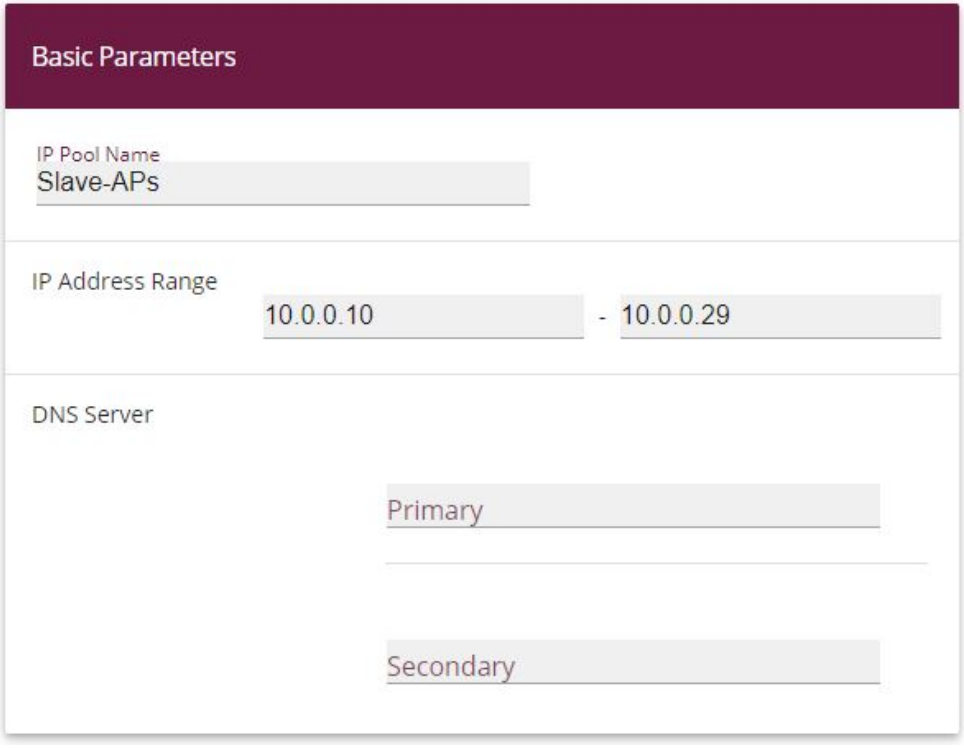


Fig. 117: **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**

Proceed as follows to set up the IP address pool for the slave APs:

(1) Enter a unique **IP Pool Name**, e. g. `Slave APs`.

(2) Enter an **IP Address Range**. In our example, we shall take the IP address range from `10.0.0.10` to `10.0.0.29`. The size of the IP address range depends on the maximum number of access points required (6 plus reserve in our example). So the remaining addresses can be used for other infrastructure in the same network.

(3) Press **OK** to confirm your entries

In the **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New** menu, you can perform additional configuration.

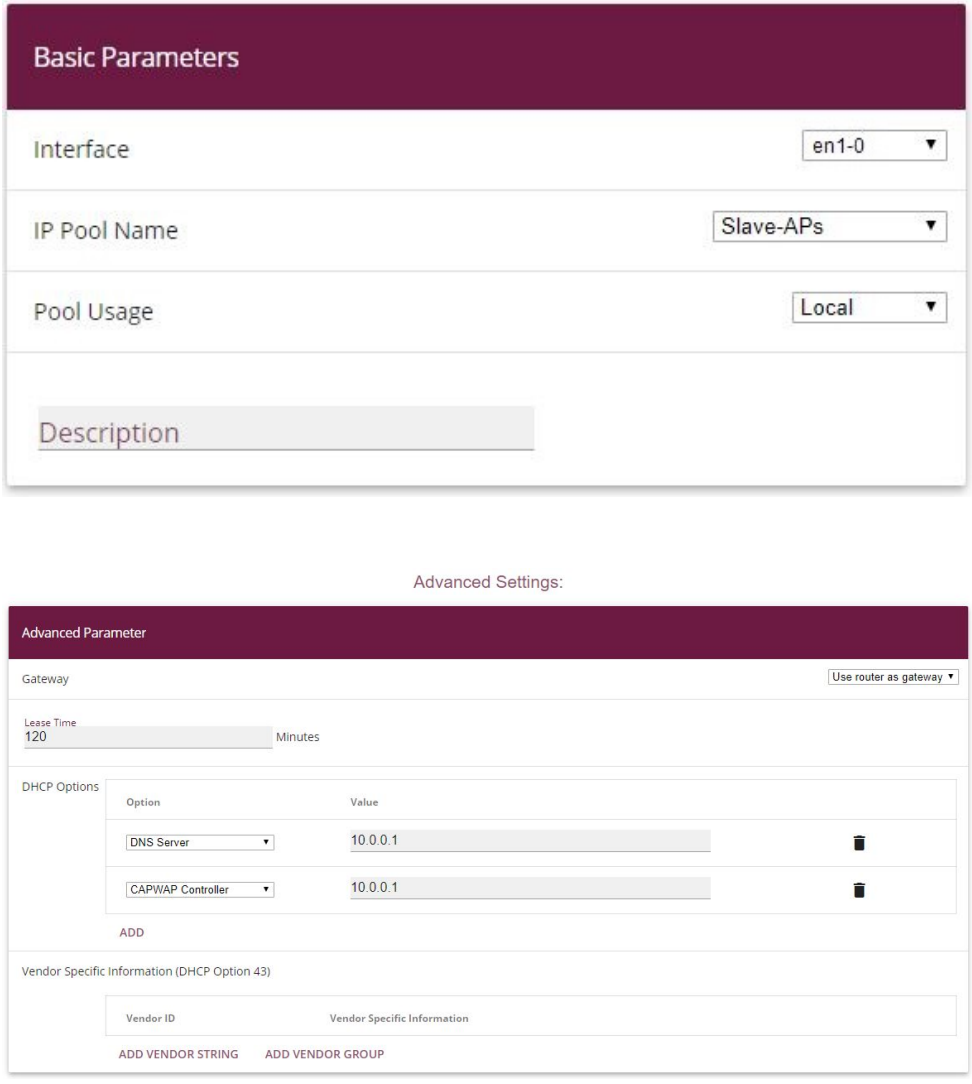


Fig. 119: **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**

Proceed as follows:

(1) Under **Interface**, select the logical interface `en1-0`.

(2) Select a valid **IP-Pool**, here e. g. `Slave-APs` .

(3) Click **Advanced Settings**.

(4) Under **Gateway** leave the setting `Use Router as Gateway`. The current IP address of the interface `en1-0` is propagated as the default gateway to the DHCP devices.

(5) For **DHCP Options**, click **Add**.

(6) Select the option *DNS Server* and enter the IP address of the interface *en1-0*, in this case *10.0.0.1*.

(7) Click **Add** again.

(8) Select the option *CAPWAP Controller* and enter the IP address of the interface *en1-0*, in this case *10.0.0.1*.

(9) Press **OK** to confirm your entries.

No other DHCP options are required for the slave access points to operate correctly.

In the next step, you define the **DHCP Pool** *Staff WLAN* .

Go to **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**.

(1) For **IP Pool Name**, enter e. g. *Staff-WLAN*.

(2) Enter an **IP Address Range**. In our example, the IP address range from *10.0.20.10* to *10.0.20.254*.

(3) Press **OK** to confirm your entries.

(4) Go to **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**.

(5) Under **Interface**, select the interface *en1-0-1*.

(6) For **IP Pool Name**, enter e. g. *Staff-WLAN*.

(7) Click **Advanced Settings**.

(8) Under **Gateway** leave the setting *Use Router as Gateway*.

(9) For **DHCP Options**, click **Add**.

(10) Select the option *DNS Server* and enter the IP address of the interface *en1-0*, in this case *10.0.10.1*.

(1) Press **OK** to confirm your entries.

Proceed as follows to set up another IP address pool for the *Guest WLAN*:

Go to **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**.

(1) For **IP Pool Name**, enter e. g. *Guest-WLAN*.

(2) Enter an **IP address range**. In our example, the IP address range from *10.0.20.10* to *10.0.20.254*.

(3) Press **OK** to confirm your entries.

(4) Go to **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**.

(5) Under **Interface**, select the interface *en1-0-2*.

(6) Select a valid **IP-Pool**, here e. g. *Guest-WLAN*.

(7) Click **Advanced Settings**.

(8) Under **Gateway** leave the setting *Use Router as Gateway*.

(9) For **DHCP Options**, click **Add**.

(10) Select the option *DNS Server* and enter the IP address of the interface, in this case *10.0.20.1*.

(11) Press **OK** to confirm your entries.

Do the same thing to configure the **DHCP Pool** for *Staff Ethernet*.

Go to **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**.

(1) For **IP Pool Name**, enter e. g. *Staff-Ethernet*.

(2) Enter an **IP Address Range**. In our example, the IP address range from *10.0.1.10* to *10.0.1.254*.

(3) Press **OK** to confirm your entries.

(4) Go to **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**.

(5) Under **Interface**, select the interface *en1-1*.

(6) Select a valid **IP-Pool**, here e. g. *Staff-Ethernet* .

(7) Click **Advanced Settings**.

(8) Under **Gateway** leave the setting *Use Router as Gateway*.

(9) For **DHCP Options**, click **Add**.

(10) Select the option *DNS Server* and enter the IP address of the interface, in this case *10.0.1.1*.

(11) Press **OK** to confirm your entries.

Then configure the **DHCP Pool** for *Guest Ethernet*.

Go to **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**.

(1) For **IP Pool Name**, enter e. g. *Guest-Ethernet*.

(2) Enter an **IP address range**. In our example, the IP address range from *10.0.2.10* to *10.0.2.254*.

(3) Press **OK** to confirm your entries.

(4) Goto **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**.

(5) Under **Interface**, select the interface *en1-2*.

(6) Select a valid **IP-Pool**, here e. g. *Guest-Ethernet* .

(7) Click **Advanced Settings**.

(8) Under **Gateway** leave the setting *Use Router as Gateway*.

(9) For **DHCP Options**, click **Add**.

(10) Select the option *DNS Server* and enter the IP address of the interface, in this case

10.0.2.1.

(11) Press **OK** to confirm your entries.

The list of configured DHCP pools now looks like this:

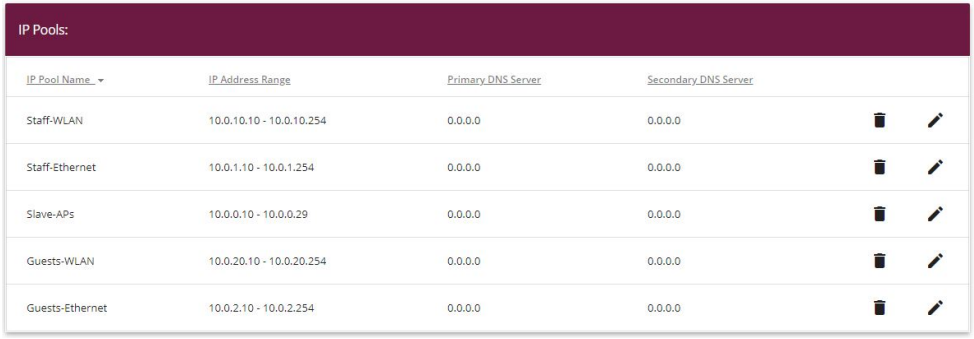


Fig. 120: **Local Services** -> **DHCP Server** -> **IP Pool Configuration**

WLAN Controller setup

Now the **Wireless LAN Controller** on interface *en1-0* can be enabled.

(1) Go to **Wireless LAN Controller** -> **Controller Configuration** -> **General**.

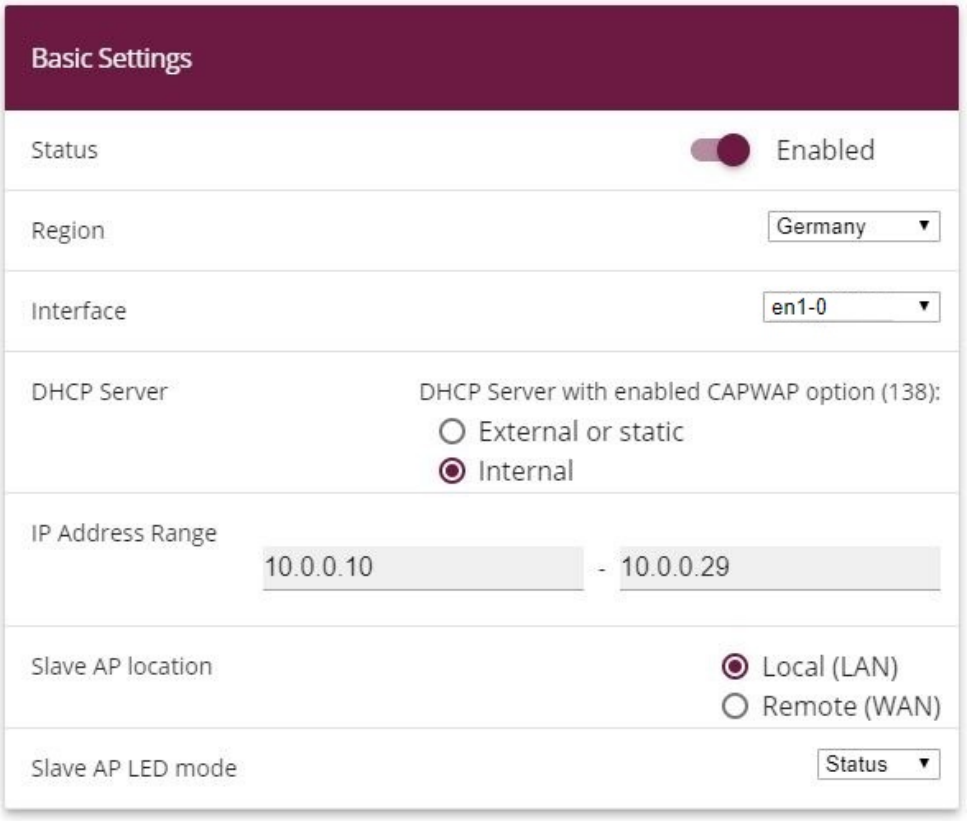


Fig. 121: **Wireless LAN Controller** -> **Controller Configuration** -> **General**

Proceed as follows:

(1) The **Region** must be set up to match the location of the access points, *Germany* in our example. This means that the access points' WLAN wireless modules will only run inside the legally permitted framework of the country concerned.

(2) As the WLAN controller's **Interface**, select *en1-0*.

(3) When the interface has been selected, the **DHCP Server** settings automatically change to *Internal* .

(4) **IP Address Range** displays the address range that was configured in the DHCP Pools menu on interface *en1-0* , in this case *10.0.0.10* - *10.0.0.29*.

(5) Leave the **Slave AP location** set to *Local (LAN)*.

(6) Confirm with **OK**.

The settings are now enabled and the WLAN controller is started.

The **Wireless Networks (VSS)** are now edited.

Go to the following menu to set up your WLAN network:

(1) Go to **Wireless LAN Controller** -> **Slave AP Configuration**->**Wireless Networks (VSS)**.

Configure the WLAN connection by editing the default entry. To do this, for the existing entry **<vss-1>** click the ✎ symbol.

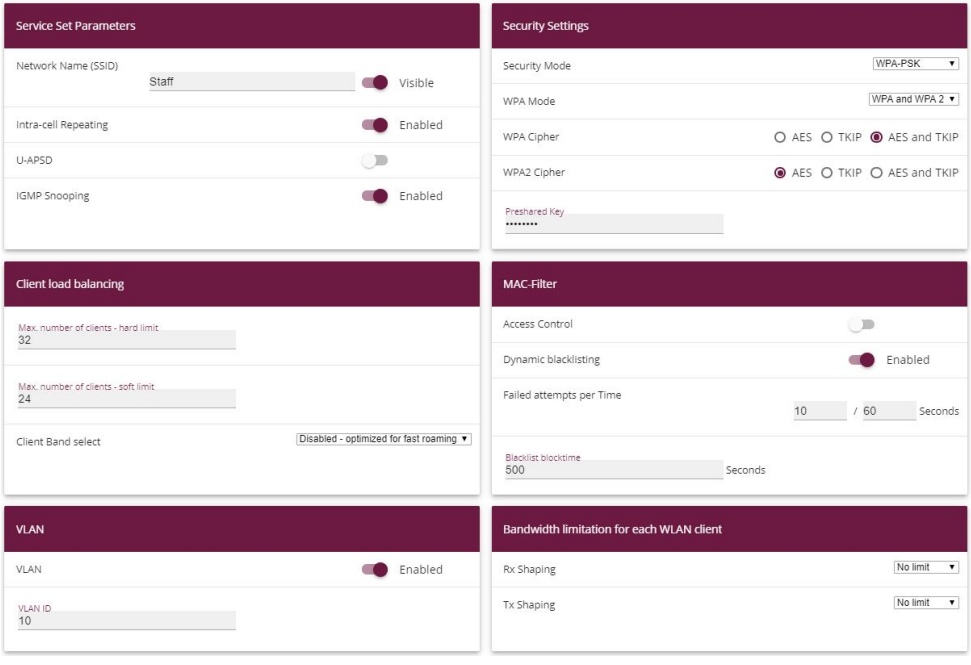


Fig. 122: **Wireless LAN Controller** -> **Slave AP Configuration**->**Wireless Networks (VSS)**-> **<vss-1>** ✎

Proceed as follows:

(1) Under **Network Name (SSID)** enter e. g. `Staff`. The **Visible** option remains enabled.

(2) Set the **Security Mode** to `WPA-PSK`.

(3) Leave the **WPA Mode** set to `WPA and WPA 2`.

(4) The **WPA Cipher** is set to `TKIP`.

(5) Set the **WPA2 Cipher** to `AES`.

(6) The **Preshared Key** is the WLAN access password for all the employees. Enter an ASCII string with 8 - 63 characters.

(7) Enable the **VLAN** option.

(8) Enter the **VLAN-ID** `10`.

The result of this is that all the data that from the WLAN devices connected later to the SSID *Employees* is marked by the slave access points in the Ethernet with the **VLAN-ID** *10*. This means that the employee data traffic between router and access points is a standalone network area at the Ethernet level (layer 2), too.

(9) Confirm with **OK**.

Select the **New** button to configure a wireless network for the guest access.

(1) Go to **Wireless LAN Controller** -> **Slave AP Configuration**->**Wireless Networks (VSS)**-> **New**.

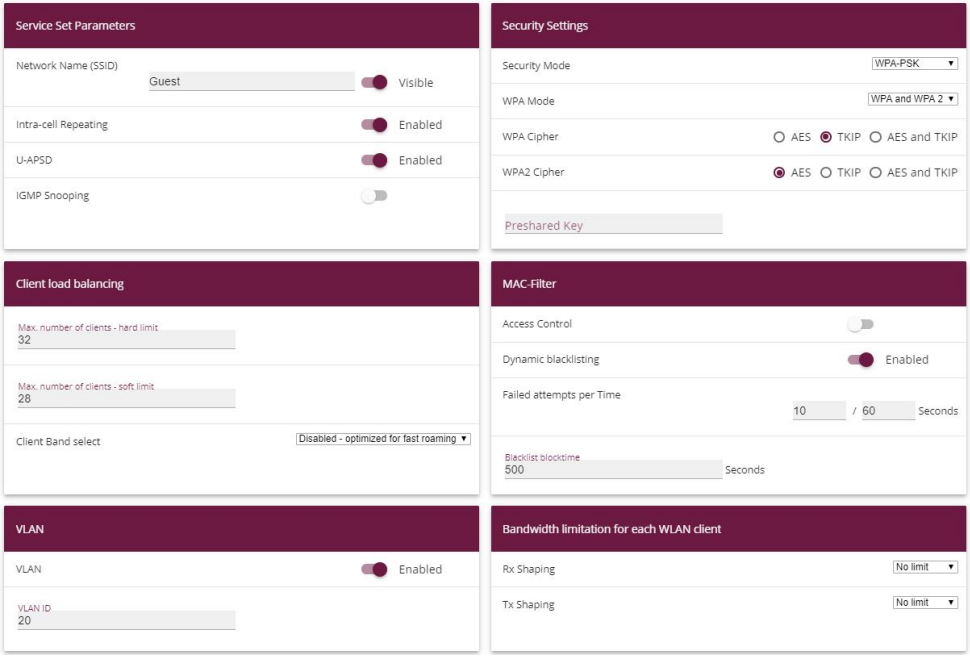


Fig. 123: **Wireless LAN Controller** -> **Slave AP Configuration**->**Wireless Networks (VSS)**-> **New**

Proceed as follows:

(1) Under **Network Name (SSID)** enter *Guest* for example. The **Visible** option remains enabled.

(2) Set the **Security Mode** to *WPA-PSK*.

(3) Leave the **WPA Mode** set to *WPA and WPA 2*.

(4) The **WPA Cipher** is set to *TKIP*.

(5) Set the **WPA2 Cipher** to *AES*.

(6) The **Preshared Key** is the WLAN access password for all the guests. Enter an ASCII string with 8 - 63 characters.

(7) Enable the **VLAN** option.

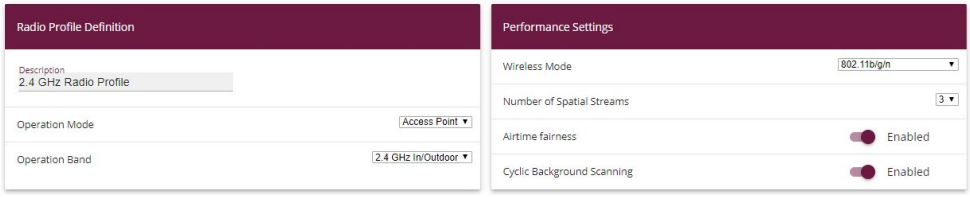
(8) Enter the **VLAN-ID** *20*.

(9) Confirm with **OK**.

In the next step, the **Radio Profiles** are edited. You configure the **Radio Profiles** by editing the default entry.

(1) Go to **Wireless LAN Controller** -> **Slave AP Configuration**-> **Radio Profiles** .

(2) Where you have the existing entry **<2.4 GHz Radio Profile>** , click the symbol.



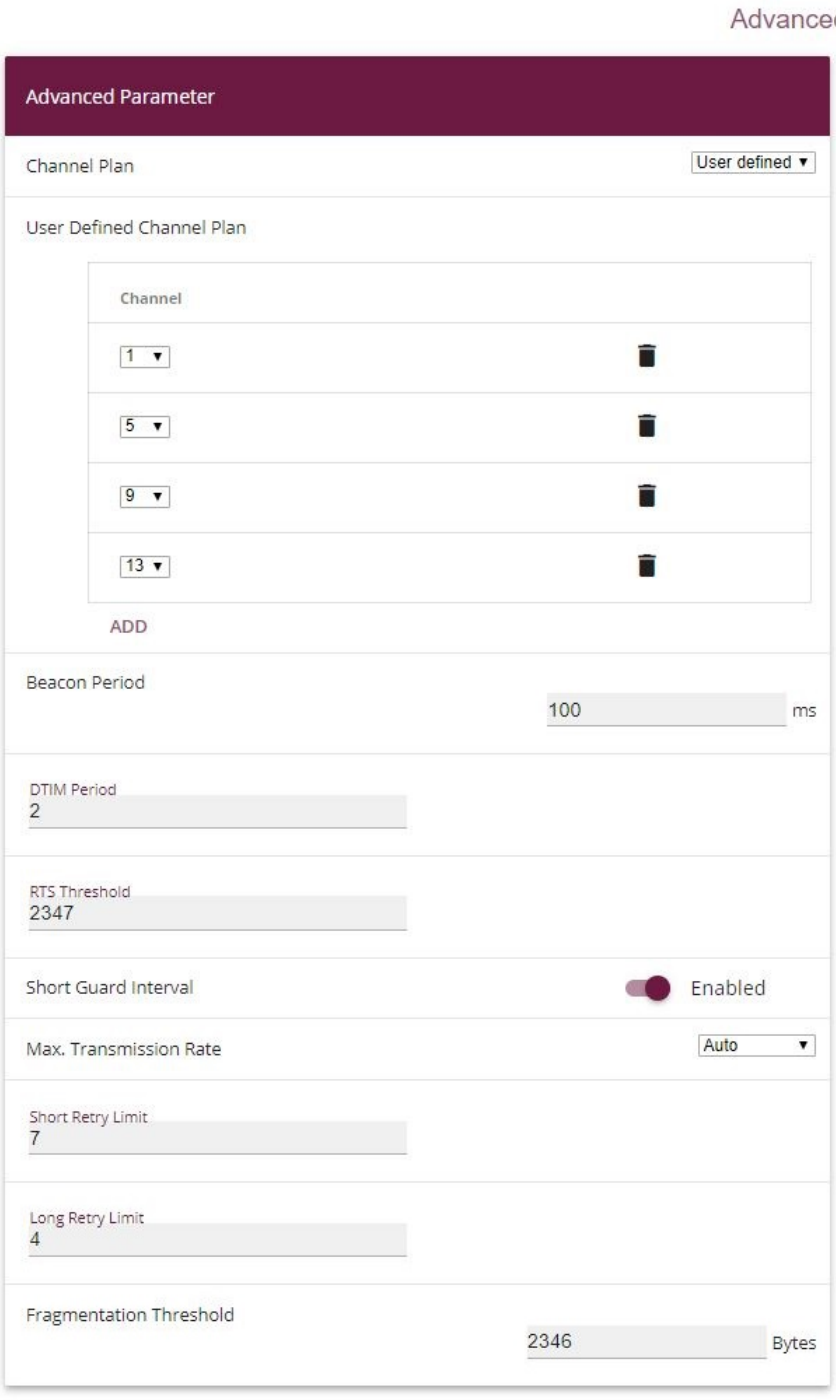


Fig. 125: **Wireless LAN Controller** -> **Slave AP Configuration**-> **Radio Profiles**-> **<2.4**

GHz Radio Profile> 

Proceed as follows:

(1) The wireless module profile's **frequency range** is left at *2.4 GHz In/Outdoor*.

(2) For **Wireless Mode**, select *802.11 g/n*. The result of changing the **Wireless Mode** is that old WLAN devices which have become relatively rare and which only talk 802.11b will no longer be able to use the WLAN. The great advantage of only allowing 802.11g/n is that the data throughput for all the connected WLAN devices is no longer automatically and drastically reduced as soon as a WLAN device attempts to get into the WLAN network in 802.11b mode.

(3) Enable the option **Burst Mode** to increase the transmission speed.

(4) Click **Advanced Settings**.

(5) Select the **Channel Plan** you require. *User-defined* enables you to select the channels you require yourself.

(6) Under **User Defined Channel Plan**, select the permitted channels, *1*, *5*, *9* and *13* . This channel plan is the recommended ideal channel plan for every country where channels 1 to 13 are allowed and it does not have any (significant) frequency overlaps with 802.11g/n. This means that the access points have more choices for using a channel with minimal interference, which improves the performance and reliability of the entire WLAN.

(7) Enable the **Short Guard Interval** function in order to reduce the guard interval (= time between transmitting two data symbols) from 800 ns to 400 ns.

(8) Leave the remaining settings unchanged and confirm them with **OK**.

All the necessary profiles have now been set up in the WLAN controller.

Now the access points are enabled and set up. The **Slave Access Points** menu displays a list of all the APs found using the **Wizard** (here e.g. a **bintec W2003ac**).

(1) Go to **Wireless LAN Controller** -> **Slave AP Configuration**-> **Slave Access Points**.

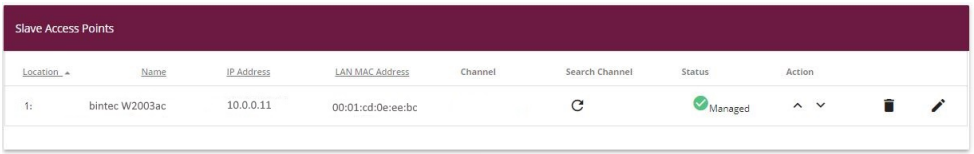


Fig. 126: **Wireless LAN Controller** -> **Slave-AP Configuration**-> **Slave Access Points**

Note

If no access points are displayed, we recommend that you re-check the DHCP server settings for the **DHCP pool** *slave APs*, whether it is connected to the correct interface (*en1-0* in this case) and whether the CAPWAP option has been set correctly (*10.0.0.1* in this case). Also check whether another DHCP server is enabled on a different device in the system area. Switch all the access points off and back on so that they get the network configuration settings from the DHCP server again.

Finally, the **Radio Profiles** that were configured previously and the **wireless networks** are set up for each access point.

(1) Go to **Wireless LAN Controller** -> **Slave AP Configuration**-> **Slave Access Points** .

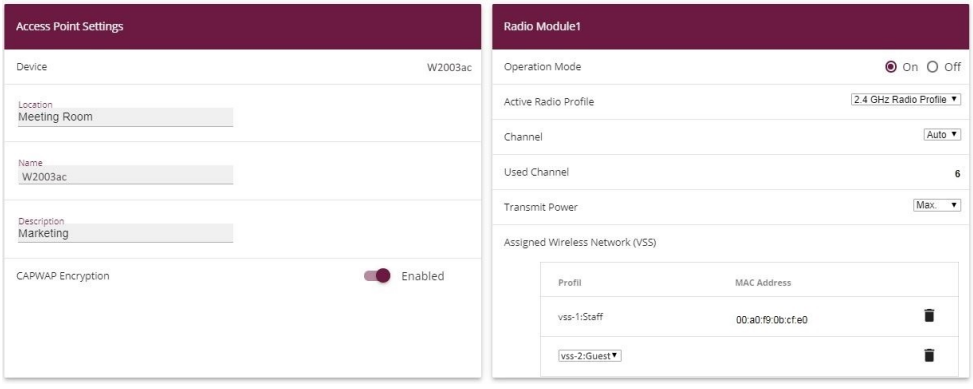


Fig. 127: **Wireless LAN Controller** -> **Slave-AP Configuration**-> **Slave Access Points**

Proceed as follows:

(1) For **Location** enter e. g. *Meeting Room*.

(2) For **Description** enter e. g. *Marketing*.

(3) Leave the **CAPWAP Encryption** set to *Enabled*.

(4) Leave the **Operation Mode** set to *On*. This results in all the settings being used in the selected radio profiles.

(5) As the **Active Radio Profile**, select the wireless module profile that was configured previously, in this case *2.4 GHz Radio Profile*.

(6) Leave the **Channel** set to *Auto* (this means it is determined dynamically using the wireless profile's channel plan and the WLAN environment).

(7) For **Assigned Wireless Networks (VSS)**, the two configured wireless networks *Staff* and *Guest* are assigned to the wireless module.

(8) Confirm with **OK**.

Configure all the access points that have been found in the same way.

Note

Every access point must be given a unique location name. Otherwise there will be no way of distinguishing between the access points once they are running.

The list of configured access points (here e. g. a **bintec W2003ac**) now looks like this:

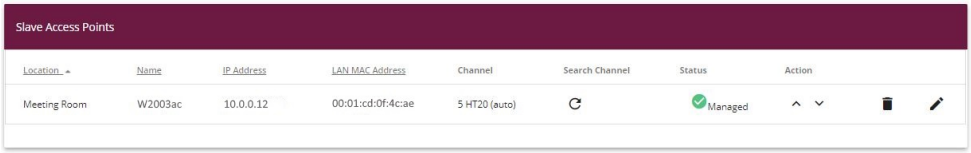


Fig. 128: **Wireless LAN Controller** -> **Slave-AP Configuration**-> **Slave Access Points**

Once all the access points have been set up, there is a short initialization phase and they are given the status `Managed` , so they are now up and running. The WLAN controller is also blocking them against any sort of external configuration access.

Choose whether the selected Access Pont is to be managed by the WLAN Controller by clicking the ^ button or the v button in the **Action** column.

You can disconnect the Access Point from the WLAN Controller and therefore remove it from your WLAN infrastructure by click on the v button. The Access Point then receives the `Discovered` status, but is no longer `Managed`.

The WLAN channels currently being used which are displayed on the overview page are not yet optimal because during the initial startup, the access points were only able to tune in to the general WLAN environment.

Under **New Channel Setting**, click the **START** button to be able to optimally tune the assigned channels to one another.

When the channel setting is complete, adjacent access points ought to have different channels.

This concludes the configuring of the WLAN controller and of the router as an access gateway. Save the configuration with **Save configuration** and confirm the selection with **OK**.

Note

In some cases it may occur that individual adjacent access points still have the same channel even after the channels have been newly set. This always occurs if adjacent access points cannot identify one another sufficiently, or at all, with the WLAN. If the access points are correctly spaced out, one frequent reason for this is strong local interference from third party access points, or a difficult building structure such as fire doors made of steel (usually closed) between two adjacent building areas. In such cases we recommend that, for each access point in the pairs affected, you manually set a fixed channel (which fits with the channel plan) for the wireless modules and you re-run the search for new channels. The result of this is that the other access points which were configured using the automatic channel selection are assigned channels which suit the environment of the access points that have been fixed manually.

7.3 Overview of Configuration Steps

Assign interfaces

Field	Menu	Value
Switch port 1 to 5	**Physical Interfaces** -> **Ethernet Ports** -> **Port Configuration**	*en1-0* to *en1-4*

Set up Internet access

Field	Menu	Value
Connector Type	**Assistants** -> **Internet Access** -> **Internet Connections** -> **New**	*External gateway/ cable modem*
Physical Ethernet Port	**Assistants** -> **Internet Access** -> **Internet Connections** -> **Next**	*ETH5*
Internet Service Provider	**Assistants** -> **Internet Access** -> **Internet Connections** -> **Next**	*- User-Specified -*
IP parameters obtained dynamically	**Assistants** -> **Internet Access** -> **Internet Connections** -> **Next**	Disabled
Local IP Address	**Assistants** -> **Internet Access** -> **Internet Connections** -> **Next**	e. g. *1.2.3.4*
Gateway IP address	**Assistants** -> **Internet Access** -> **Internet Connections** -> **Next**	e. g. *1.2.3.1*
Netmask	**Assistants** -> **Internet Access** -> **Internet Connections** -> **Next**	*255.255.255.0*
DNS Server 1	**Assistants** -> **Internet Access** -> **In-**	e. g. *1.2.3.1*

Field	Menu	Value
	ternet Connections -> **Next**	

Configure interfaces

Field	Menu	Value
IP Address / Netmask	**LAN** -> **IP Configuration**-> **Interfaces** -> **<en1-0>**	*10.0.0.1* and *255.255.255.0*
IP Address / Netmask	**LAN** -> **IP Configuration**-> **Interfaces** -> **<en1-1>**	*10.0.1.1* and *255.255.255.0*
IP Address / Netmask	**LAN** -> **IP Configuration**-> **Interfaces** -><**en1-2**>	*10.0.2.1* and *255.255.255.0*
Based on Ethernet Interface	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*en1-0*
Address mode	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*Static*
IP Address / Netmask	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*10.0.10.1* and *255.255.255.0*
Interface Mode	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*Tagged (VLAN)*
VLAN ID	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*10*
Based on Ethernet Interface	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*en1-0*
Address mode	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*Static*
IP Address / Netmask	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*10.0.20.1* and *255.255.255.0*
Interface Mode	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*Tagged (VLAN)*
VLAN ID	**LAN** -> **IP Configuration**-> **Interfaces** -> **New**	*20*

Set up access

Field	Menu	Value
en1-0	**System Management** -> **Administrative Access** -> **Access**	*Telnet*, *SSH*, *HTTP*, *HTTPS*, *Ping*, *SNMP*
en1-1 to en1-4	**System Management** -> **Administrative Access** -> **Access**	*Ping*

Change password

Field	Menu	Value
System Admin Password	**System Management** -> **Global Settings** -> **Passwords**	e. g. *test12345*
Confirm Admin Password	**System Management** -> **Global Settings** -> **Passwords**	e. g. *test12345*

Set up firewall

Field	Menu	Value
Description	**Firewall** -> **Services** -> **Groups** -> **New**	*Local services*
Members	**Firewall** -> **Services** -> **Groups** -> **New**	e. g. *echo*, *dns*, *dhcp*, *ntp*

Define addresses

Field	Menu	Value
Description	**Firewall** -> **Addresses** -> **Address List** -> **New**	*Broadcast*
Address / Subnet	**Firewall** -> **Addresses** -> **Address List** -> **New**	*255.255.255.255* / *255.255.255.255*
Description	**Firewall** -> **Addresses** -> **Address List** -> **New**	e. g. *Employee LAN GW*
Address / Subnet	**Firewall** -> **Addresses** -> **Address List** -> **New**	*10.0.1.1* / *255.255.255.255*
Description	**Firewall** -> **Addresses** -> **Address List** -> **New**	*Guest LAN GW*
Address / Subnet	**Firewall** -> **Addresses** -> **Address List** -> **New**	*10.0.2.1* / *255.255.255.255*
Description	**Firewall** -> **Addresses** -> **Address List** -> **New**	*Employee WLAN GW*
Address / Subnet	**Firewall** -> **Addresses** -> **Address List** -> **New**	*10.0.10.1* / *255.255.255.255*
Description	**Firewall** -> **Addresses** -> **Address List** -> **New**	*Guest WLAN GW*
Address / Subnet	**Firewall** -> **Addresses** -> **Address List** -> **New**	*10.0.20.1* / *255.255.255.255*

Define groups

Field	Menu	Value
Description	**Firewall** -> **Interfaces** -> **IPv4 Groups** -> **New**	*Employees*
Members	**Firewall** -> **Interfaces** -> **IPv4 Groups** -> **New**	*LAN_EN1-1*, *LEASED_EN1-0-1*
Description	**Firewall** -> **Interfaces** -> **IPv4 Groups** -> **New**	*Guest*
Members	**Firewall** -> **Interfaces** -> **IPv4 Groups** -> **New**	*LAN_EN1-2*, *LEASED_EN1-0-2*
Description	**Firewall** -> **Interfaces** -> **IPv4 Groups** -> **New**	*Users*
Members	**Firewall** -> **Interfaces** -> **IPv4 Groups** -> **New**	*LAN_EN1-1*, *LAN_EN1-2*, *LEASED_EN1-0-1*, *LEASED_EN1-0-2*

Create policies (network areas connected by the router)

Field	Menu	Value
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*LAN_EN1-0*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*ANY*
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*any*
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Employees*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Users*
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*any*
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Guest*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Guest*

Field	Menu	Value
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*any*
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Users*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*LAN_EN1-4*
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*any*
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*

Create policies (IP addresses connected on the router)

Field	Menu	Value
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Users*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Broadcast*
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Local services*
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*LAN_EN1-1*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Employee LAN GW*
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Local services*
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*LAN_EN1-2*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Guest LAN GW*
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Local services*

Field	Menu	Value
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*LEASED_EN1-0-1*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Employee WLAN GW*
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Local services*
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*LEASED_EN1-0-2*
Destination	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Guest WLAN GW*
Service	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Local services*
Action	**Firewall** -> **Policies** -> **IPv4 Filter Rules** -> **New**	*Access*

DHCP configuration

Field	Menu	Value
IP Pool Name	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *Slave APs*
IP Address Range	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	*10.0.0.10* - *10.0.0.29*
Interface	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*en1-0*
IP Pool Name	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	e. g. *Slave APs*
Pool Usage	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Local*
Gateway	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Use Router as Gateway*
DHCP Options	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*DNS Server* / *10.0.0.1* and *CAPWAP Controller* / *10.0.0.1*

Field	Menu	Value
IP Pool Name	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *Staff-WLAN*
IP Address Range	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	*10.0.10.10* - *10.0.10.254*
Interface	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*en1-0-1*
IP Pool Name	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	e. g. *Staff-WLAN*
Pool Usage	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Local*
Gateway	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Use Router as Gateway*
DHCP Options	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*DNS Server* / *10.0.10.1*
IP Pool Name	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *Guest-WLAN*
IP Address Range	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	*10.0.20.10* - *10.0.20.254*
Interface	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*en1-0-2*
IP Pool Name	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	e. g. *Guest-WLAN*
Pool Usage	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Local*
Gateway	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Use Router as Gateway*
DHCP Options	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*DNS Server* / *10.0.20.1*
IP Pool Name	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *Staff-Ethernet*
IP Address Range	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	*10.0.1.10* - *10.0.1.254*
Interface	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*en1-1*
IP Pool Name	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	e. g. *Staff-Ethernet*
Pool Usage	**Local Services** -> **DHCP Server** ->	*Local*

Field	Menu	Value
	DHCP Configuration -> **New**	
Gateway	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Use Router as Gateway*
DHCP Options	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*DNS Server*/ *10.0.1.1*
IP Pool Name	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *Guest-Ethernet*
IP Address Range	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	*10.0.2.10* - *10.0.2.254*
Interface	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*en1-2*
IP Pool Name	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	e. g. *Guest-Ethernet*
Pool Usage	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Local*
Gateway	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Use Router as Gateway*
DHCP Options	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*DNS Server*/ *10.0.2.1*

Configure WLAN controller

Field	Menu	Value
Region	**Wireless LAN Controller** -> **Controller Configuration** -> **General**	*Germany*
Interface	**Wireless LAN Controller** -> **Controller Configuration** -> **General**	*LAN_EN1-0*
DHCP Server	**Wireless LAN Controller** -> **Controller Configuration** -> **General**	*Internal*
IP Address Range	**Wireless LAN Controller** -> **Controller Configuration** -> **General**	*10.0.0.10* - *10.0.0.29*
Slave AP location	**Wireless LAN Controller** -> **Controller Configuration** -> **General**	*Local (LAN)*

Edit wireless networks

Field	Menu	Value
Network Name (SSID)	**Wireless LAN Controller** -> **Slave AP Configuration**->**Wireless Networks (VSS)**-> **<vss-1>**	e. g. *Employees*

Field	Menu	Value
Security mode	**Wireless LAN Controller -> Slave AP Configuration->Wireless Networks (VSS)-> <vss-1>**	*WPA-PSK*
WPA Mode	**Wireless LAN Controller -> Slave AP Configuration->Wireless Networks (VSS)-> <vss-1>**	*WPA and WPA 2*
WPA Cipher	**Wireless LAN Controller -> Slave AP Configuration->Wireless Networks (VSS)-> <vss-1>**	*TKIP*
WPA2 Cipher	**Wireless LAN Controller -> Slave AP Configuration->Wireless Networks (VSS)-> <vss-1>**	*AES*
Preshared key	**Wireless LAN Controller -> Slave AP Configuration->Wireless Networks (VSS)-> <vss-1>**	Enter password
VLAN	**Wireless LAN Controller -> Slave AP Configuration->Wireless Networks (VSS)-> <vss-1>**	*Enabled*
VLAN ID	**Wireless LAN Controller -> Slave AP Configuration->Wireless Networks (VSS)-> <vss-1>**	*10*
Network Name (SSID)	**Wireless LAN -> WLAN1 ->Wireless Networks (VSS)-> New**	e. g. *Guest*
Security mode	**Wireless LAN -> WLAN1 ->Wireless Networks (VSS)-> New**	*WPA-PSK*
WPA Mode	**Wireless LAN -> WLAN1 ->Wireless Networks (VSS)-> New**	*WPA and WPA 2*
WPA Cipher	**Wireless LAN -> WLAN1 ->Wireless Networks (VSS)-> New**	*TKIP*
WPA2 Cipher	**Wireless LAN -> WLAN1 ->Wireless Networks (VSS)-> New**	*AES*
Preshared key	**Wireless LAN -> WLAN1 ->Wireless Networks (VSS)-> New**	Enter password
VLAN	**Wireless LAN -> WLAN1 ->Wireless Networks (VSS)-> New**	*Enabled*
VLAN ID	**Wireless LAN -> WLAN1 ->Wireless Networks (VSS)-> New**	*20*

Edit radio profiles

Field	Menu	Value
Operation Band	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> <2.4 GHz Radio Profile>**	*2.4 GHz In/Outdoor*
Wireless Mode	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> <2.4 GHz Radio Profile>**	*802.11g/n*
Burst Mode	**Wireless LAN Controller -> Slave AP Configuration-> Radio Profiles-> <2.4 GHz Radio Profile>**	*Enabled*
Channel plan	**Wireless LAN Controller ->Slave AP Configuration -> Radio Profiles-> <2.4 GHz Radio Profile> -> Advanced Settings**	User-defined
User-defined Channel Plan	**Wireless LAN Controller ->Slave AP Configuration -> Radio Profiles-> <2.4 GHz Radio Profile> -> Advanced Settings**	*1*, *5*, *9*, *13*
Short Guard Interval	**Wireless LAN Controller ->Slave AP Configuration -> Radio Profiles-> <2.4 GHz Radio Profile> -> Advanced Settings**	*Enabled*

Set up slave access points

Field	Menu	Value
Location	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	e. g. *Meeting Room*
Description	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	e. g. *Marketing*
CAPWAP Encryption	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	*Enabled*
Operation Mode	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	*On*
Active wireless module	**Wireless LAN Controller -> Slave-**	*2.4 GHz Radio Pro-*

Field	Menu	Value
profile	**AP Configuration-> Slave Access Points**	*file*
Channel	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	*Auto*
Assigned wireless networks (VSS)	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	*vss-1: Employee* / *vss-2: Guest*
Location	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	e. g. *Kitchen*
Location	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	e. g. *Terrace*
Location	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	e. g. *Bottom of stairs*
Location	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	e. g. *Bend in stairs*
Location	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	e. g. *End of hall*

New channel setting

Field	Menu	Value
New channel setting	**Wireless LAN Controller -> Slave-AP Configuration-> Slave Access Points**	**START**

Chapter 8 WLAN network with guest WLAN

8.1 Introduction

The following section describes how to configure a WLAN access to the local network and a guest WLAN. To integrate additional Access Points, use the Wireless LAN Controller. For the separation of both networks on Layer 2 level, a VLAN is configured for the guest network. The users of the guest WLAN have unrestricted access to the internet, but no access to the local network.

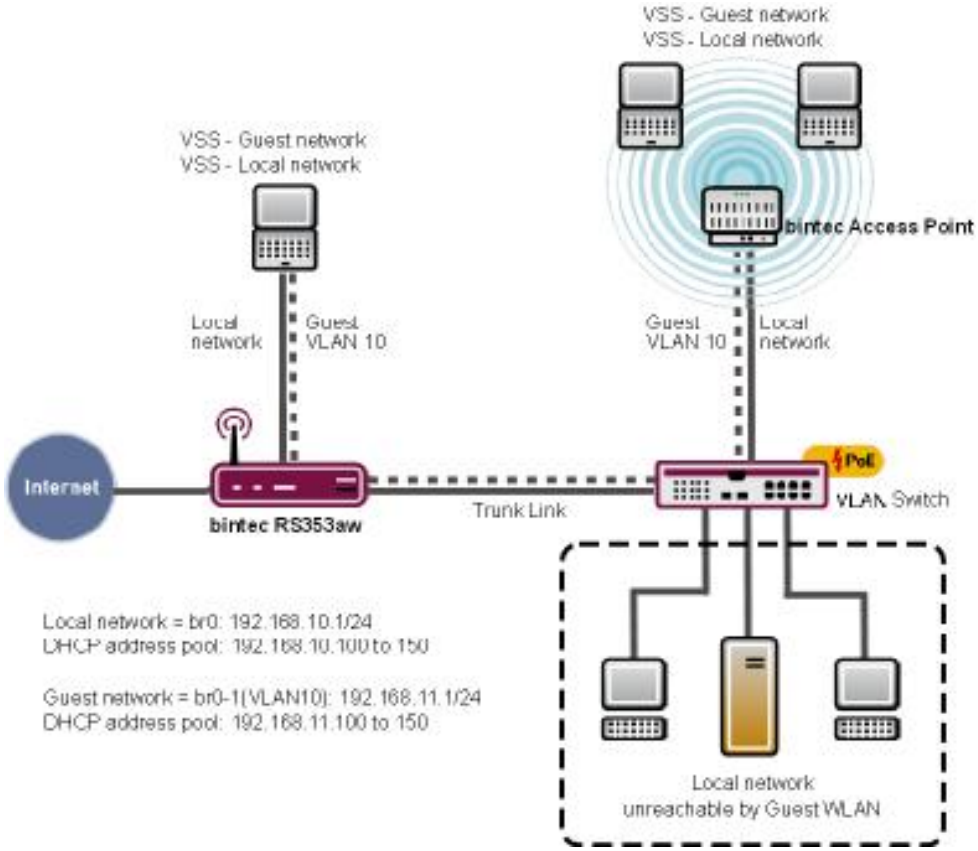


Fig. 129: Example WLAN scenario with guest WLAN

Note

The Trunk Link (see illustration) leads to **RS353aw** with one of the four ETH Ports (ETH1 to ETH4), which are assigned 1-0 by default.

Requirements

The following prerequisites for configuration must be met:

- An RS-series device, a be.IP or be.IP plus
- A boot image of version 10.1.9 patch 3 or above
- Switches, which support 802.1q VLAN

The **GUI** (Graphical User Interface) is used for configuring.

8.2 Configuration

8.2.1 Configuring the IP address

Configure an IP address from the LAN interface.

(1) Go to **LAN**->**IP Configuration**->**Interfaces**->**<en1-0>**->

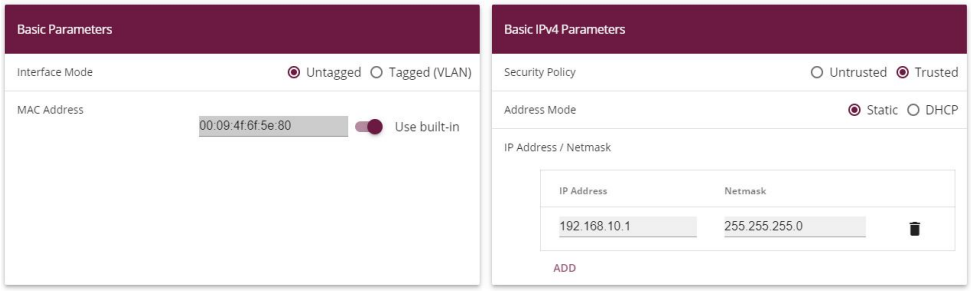


Fig. 130: **LAN**->**IP Configuration**->**Interfaces**->**<en1-0>**->

Proceed as follows to configure the IP address:

(1) Set the **Security Policy** to `Trusted`.

(2) Leave the **Address Mode** on `Static`.

(3) Click **Add**. Enter the IP address, e.g. `192.168.10.1`. Leave **Netmask** `255.255.255.0`.

(4) Press **OK** to confirm your entries.

8.2.2 Create bridge groups and assign LAN interface

Create a new bridge group and assign the LAN interface to these.

Go to **System Management**->**Interface Mode / Bridge Groups**->**Interfaces**.

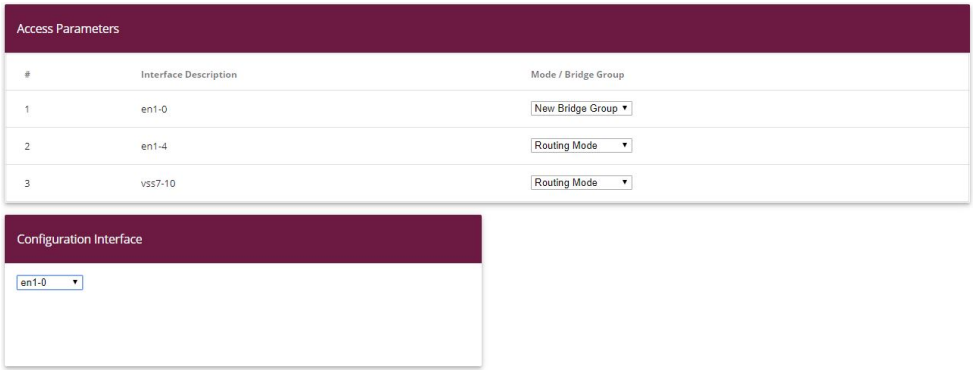


Fig. 131: **System Management**->**Interface Mode / Bridge Groups**->**Interfaces**

Proceed as follows to assign the LAN interface to a new bridge group and to transer the IP address of the LAN interface to the bridge group.

(1) Choose the line *en1-0* under **Mode / Bridge Group** *New Bridge Group*.

(2) Set to **Configuration Interface** *en1-0*.

As soon as you have pressed **OK**, the bridge group *br0* is created automatically and the interface *en1-0* is added to this bridge group. The bridge group *br0* automatically receives the IP configuration for the *en1-0* interface. You can check the IP configuration of the bridge group *br0* in the **LAN** -> **IP Configuration** -> **<br0>** -> menu.

8.2.3 Put Wireless LAN Controller into operation

The IP Address Range, which you will configure below, must match the IP address of the LAN facility.

Note

If, in the menu **Local Services**->**DHCP Server**->**DHCP Configuration** of the interface *en1-0*, there was already an IP pool assigned, then this entry must be deleted.

Go to the following menu to configure an IP Address Range:

Go to **Wireless LAN Controller**->**Wizard**->**Step 1**.

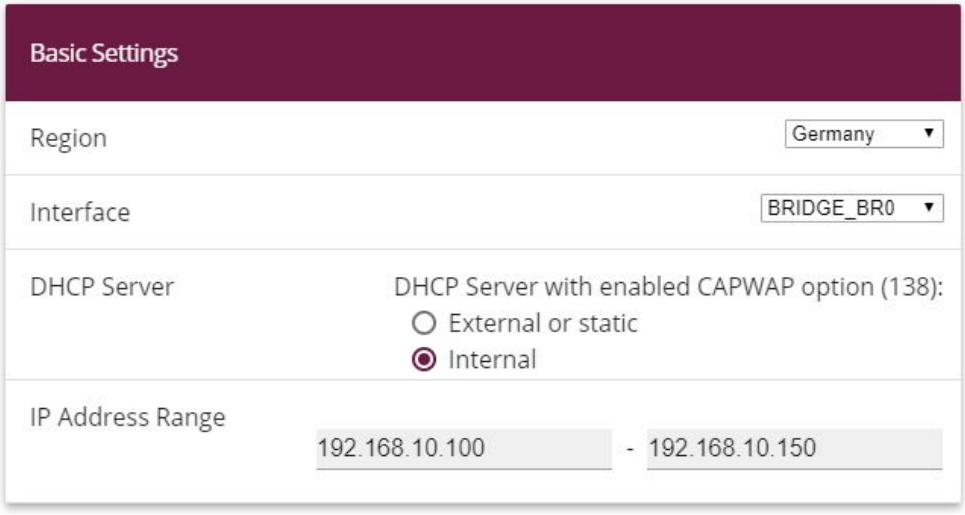


Fig. 132: **Wireless LAN Controller**->**Wizard**

Proceed as follows:

(1) Select the country in which the wireless LAN controller is to be operated. Leave, under **Region**, the entry *Germany*.

(2) Select the **Interface** to be used for the wireless controller, here *BRIDGE_BR0*.

(3) Select **DHCP Server** *Internal*.

(4) Enter the first and last value of the IP Address Range, e.g. *192.168.10.100* - *192.168.10.150*.

(5) Click on **Next**.

8.2.4 Choose radio profile and configure WLAN access to the local network.

Determine which radio profile is to be used. **Use two independent radio profiles** should be activated, when access point with two 2.4/5 Ghz-capable radio profiles are installed.

Step 2

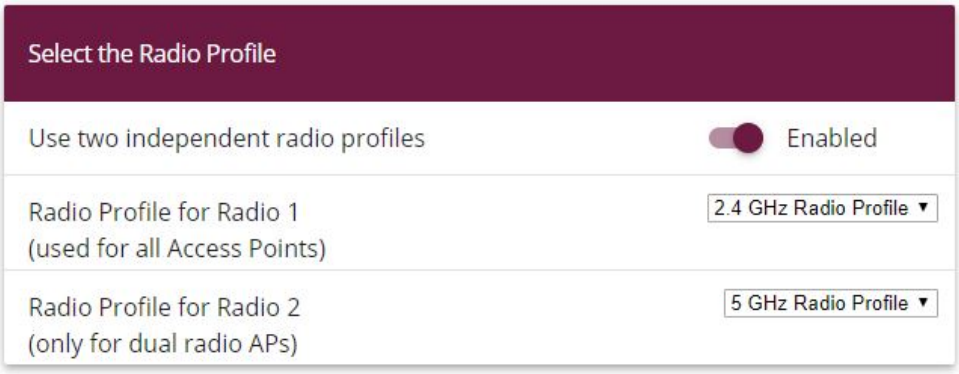


Fig. 133: **Wireless LAN Controller->Wizard**

Proceed as follows:

(1) Activate this option **Use two independent radio profiles** when APs with two radio profiles are used in your network.
Radio profile for module 1 (for all Access Points) = `2.4 GHz Radio Profile` and **Radio profile for module 2 (only for APs with 2 radio modules)** = `5 GHz Radio Profile` is automatically chosen and shown.

(2) Click **Next**.
Step 3

Fig. 134: **Wireless LAN Controller->Wizard**
Configure the WLAN access to your local network. At vss-1, click the icon .
Step 3

Fig. 135: **Wireless LAN Controller->Wizard-><vss-1>**

(3) Enter a **Network Name (SSID)** for the profile, e.g. `Local-Network`.

(4) Enter, under **Preshared Key**, a password, e.g. `supersecret`, leave the presetting of the remaining parameters and click on **OK**.
You see the local network which you have configured.

8.2.5 Configure guest WLAN

You have configured a WLAN access to your local network and are now configuring a guest network. For the separation of both networks on Layer 2 level, configure a VLAN for the guest network, in the following example with VLAN ID 10. All data packets in the guest WLAN are VLAN 10 tagged, data packets in the local WLAN are untagged.

Note

Please note that the switches in your 802.1q VLAN network must be supporting, so that the Layer 2 separation of both network works.

The Wireless LAN Controller configures your bintec-elmeg Access Points, you must configures your switches according yourself.

Click, in **Wireless LAN Controller**->**Wizard Add**.

Step 3

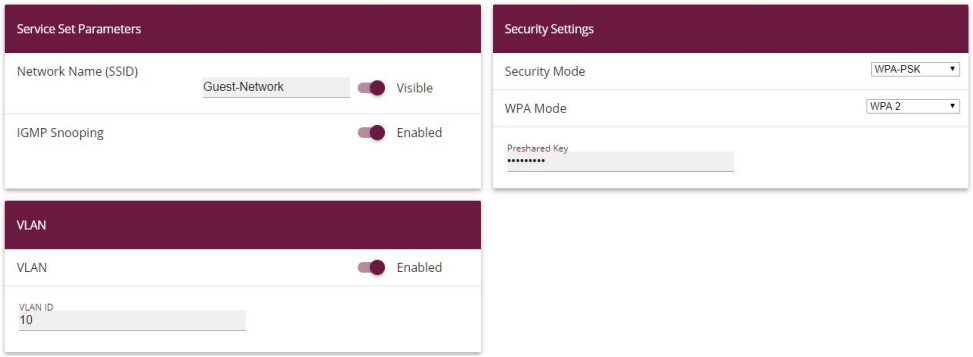


Fig. 136: **Wireless LAN Controller->Wizard->Add**

Proceed as follows:

(1) Enter a **Network Name (SSID)** for the guest network, e.g. *Guest-Network*.

(2) Set **Security Mode** *WPA PSK*.

(3) Set **WPA Mode** *WPA 2*.

(4) Enter a **Preshared Key**, e.g. *supersecret*.

(5) Click **VLAN** on *Enabled*.

(6) Enter a **VLAN ID**, e.g. *10*.

(7) Confirm with **OK**.

You see the local network together with the guest network which you have just configured.

Fig. 137: **Wireless LAN Controller->Wizard** *with configured guest network*

Click **Next**.

All found Access Points are shown.

Set **Manage** in the column of those Access Points which you wish to have automatically configured and managed by the Wireless LAN Controller.

Step 4

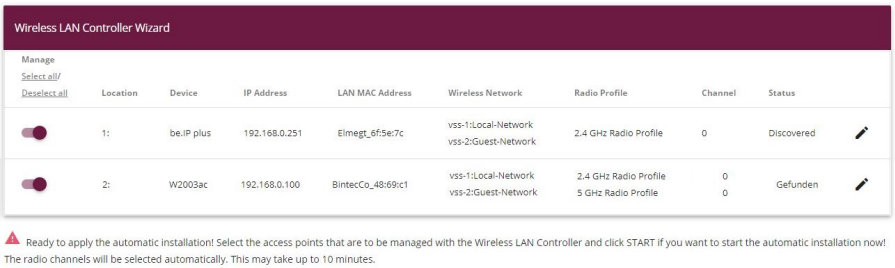


Fig. 138: **Wireless LAN Controller->Wizard**

8.2.6 Configure Access Points with the Wireless LAN Controller

Let the chosen Access Points from the Wireless LAN Controller be automatically configured.

(1) Click **Start**.
The configuration process is carried out step by step and can, according to the number of the installed points, take a while.

(2) After the configuration is finished, check if all of the chosen access points are in **Status** `Managed`. All `Managed` Access Points have received a configuration from the WLAN controller and are managed by these.

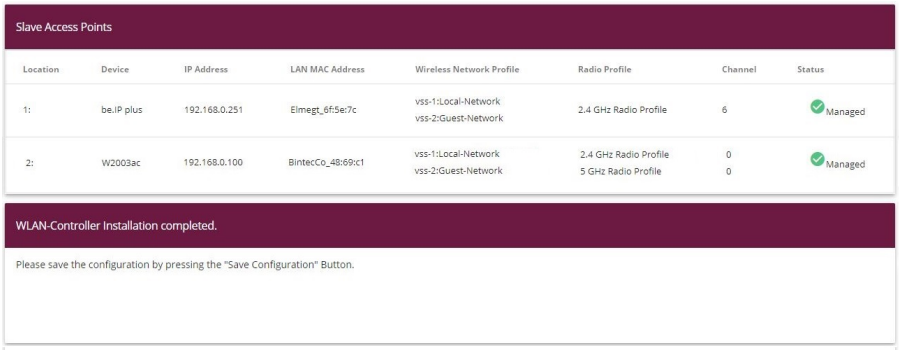


Fig. 139: **Wireless LAN Controller->Wizard**

8.2.7 Configure the IP address for the virtual Bridge Interface

Configure a virtual bridge interface with VLAN ID 10, so that the WLAN clients can access the local service, e.g. DHCHP, DNS and Echo. Configure an IP address for this interface.

Go to the following menu:

Go to **LAN->IP Configuration->Interfaces->News**.

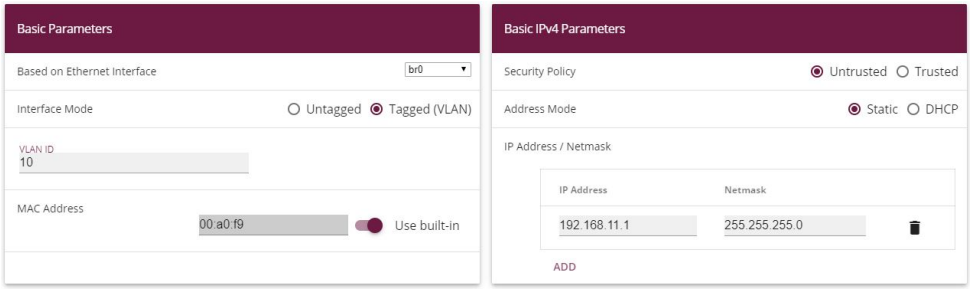


Fig. 140: **LAN->IP Configuration->Interfaces->New**

Proceed as follows:

(1) Set `br0` under **Based on Ethernet Interface**.

(2) Leave, under **Interface Mode**, the `Tagged (VLAN)` entry.

(3) Enter the **VLAN ID** value `10`.

(4) Under **Security Policy** select `Untrusted`.

(5) Leave the **Address Mode** `Static`.

(6) Click **Add**. Enter the IP address, e.g. `192.168.11.1`. Leave the **Netmask** `255.255.255.0`.

(7) Press **OK** to confirm your entries.

The result of your configuration is shown in the list in the last line.

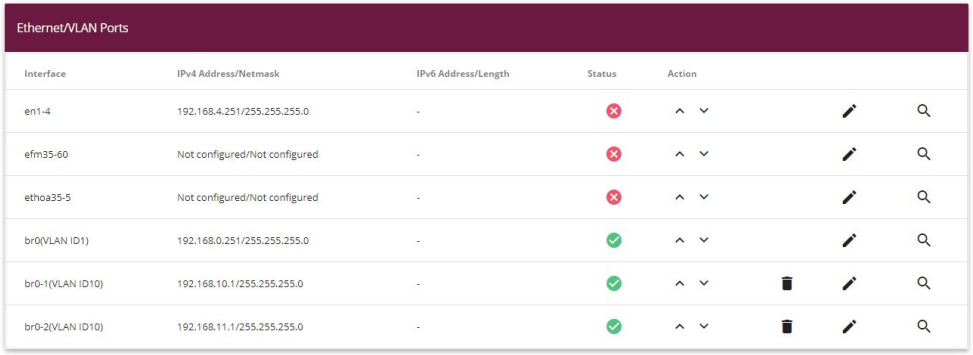


Fig. 141: **LAN->IP Configuration->Interfaces->New**

8.2.8 Configure the IP Address Range for the guest network

Configure an IP Address Range for the IP Address Assignment to WLAN Clients in the guest network. This IP Address Range must match the just-configured IP address of the virtual Bridge Interface.

Go to the following menu to configure an IP Address Range:

Go to **Local Services->DHCP Server->IP Pool Configuration->New**.

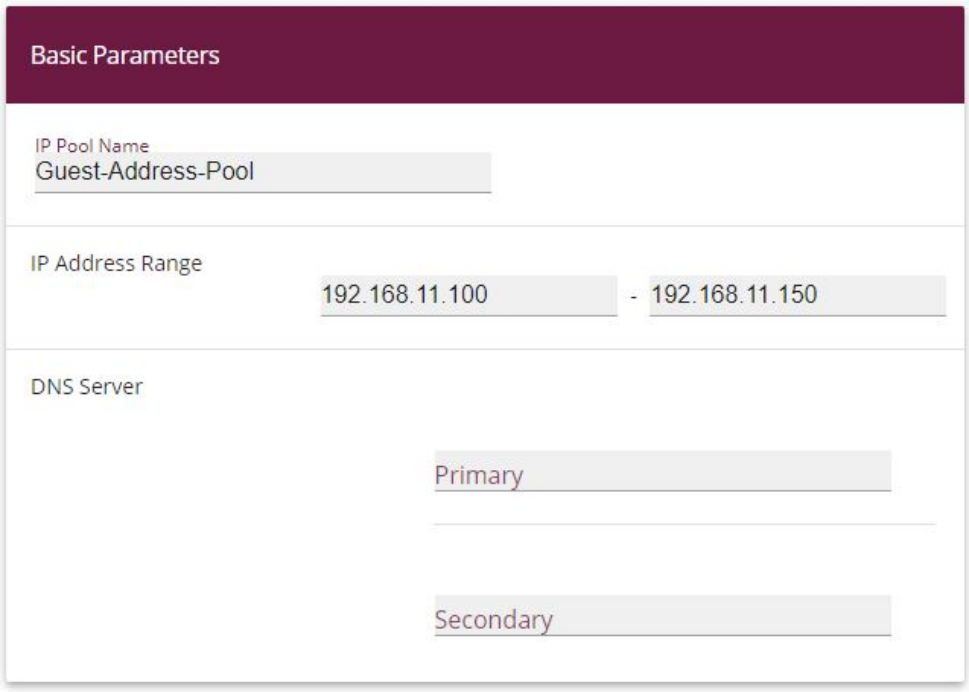


Fig. 142: **Local Services->DHCP Server->IP Pool Configuration->New**

Proceed as follows:

(1) Enter, under **IP Pool Name**, a description, e.g. *Guest-Address-Pool*.

(2) Enter, under **IP Address Range**, the first and last value of the IP Address Range, e.g. *192.168.11.100* - *192.168.11.150*.

(3) Press **OK** to confirm your entries.

You see the new IP Address Range in the list.

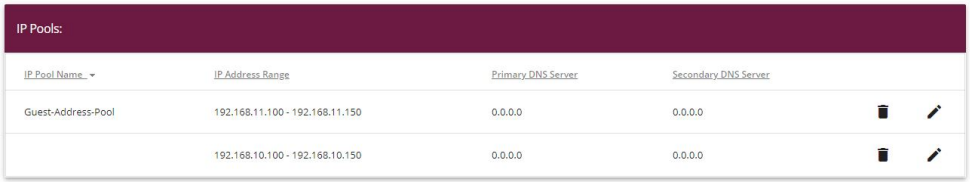


Fig. 143: **Local Services->DHCP Server->IP Pool Configuration**

8.2.9 Configure DHCP use

Configure the use of DHCP for WLAN Clients in guest networks.

Go to the following menu:

Go to **Local Services**->**DHCP Server**->**DHCP Configuration**->**New**.

Fig. 144: **Local Services**->**DHCP Server**->**DHCP Configuration**->**New**

Proceed as follows:

(1) Select a **Interface** e.g. `br0-1`.

(2) Choose, under **IP Pool Name**, an IP address pool, e.g. `Guest-Address-Pool`.

(3) Choose, under **Pool Usage**, for which the DNCP requests of the DHCP pool should be used, e.g. `Local`.

(4) Press **OK** to confirm your entries.

You see the new DHCP configuration in the list.

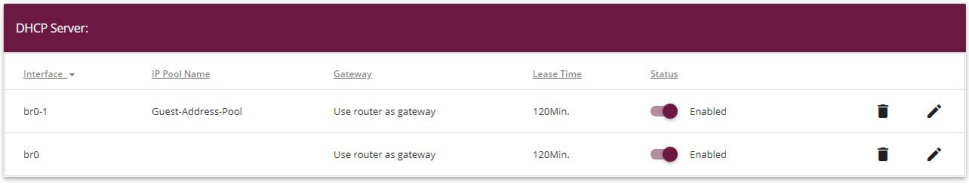


Fig. 145: **Local Services**->**DHCP Server**->**DHCP Configuration**

8.2.10 Set up firewall

The following firewall configuration is a simple example, to guarantee the basic function of the firewall. If you require further safety adjustments, then adapt this example to your requirements.

Define bridge interface as trustworthy

Define the interface *br0* (the interface for your local network) as a trustworthy interface.

Go to **Firewall**->**Policies**->**IPv4 Filter Rules**. In the **Default Filter Rules** in the Trusted Interfaces area, click the icon.

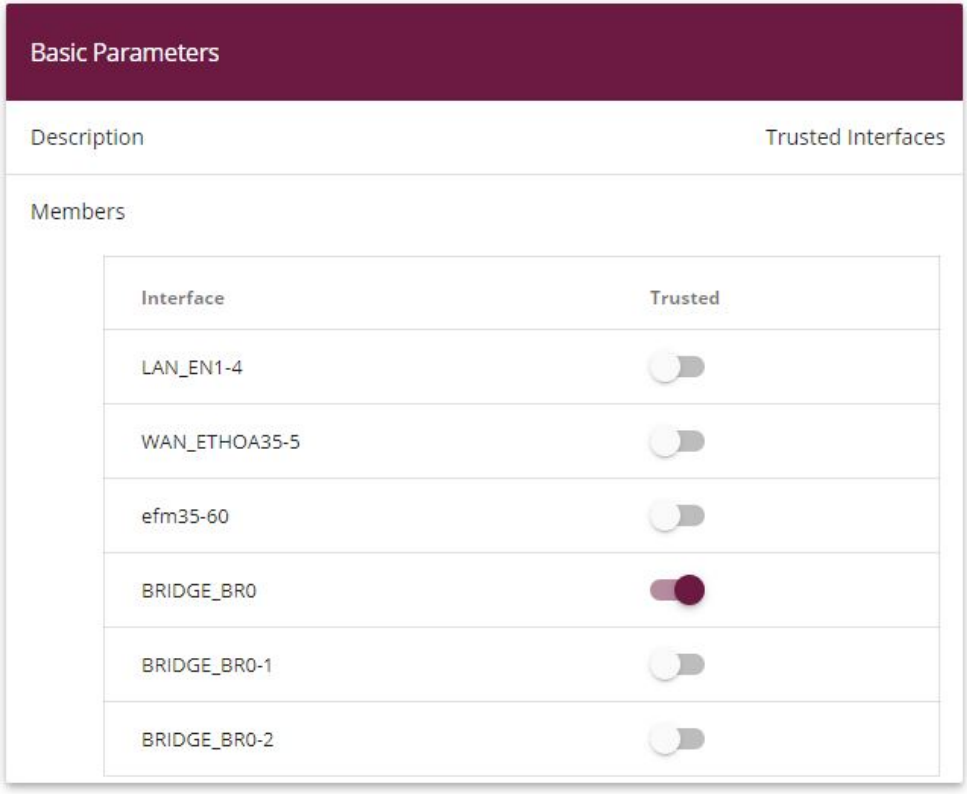


Fig. 146: **Firewall**->**Policies**->**IPv4 Filter Rules**->**Default Filter Rules**

Proceed as follows:

(1) Highlight the interface *BRIDGE_BR0* as a trustworthy interface.

(2) Make sure that no further interface is highlighted.

(3) Press **OK** to confirm your entries.

Create service group

Create a service group with the services which the clients in the guest WLAN wish to use.

Go to **Firewall**->**Services**->**Groups**->**New**.

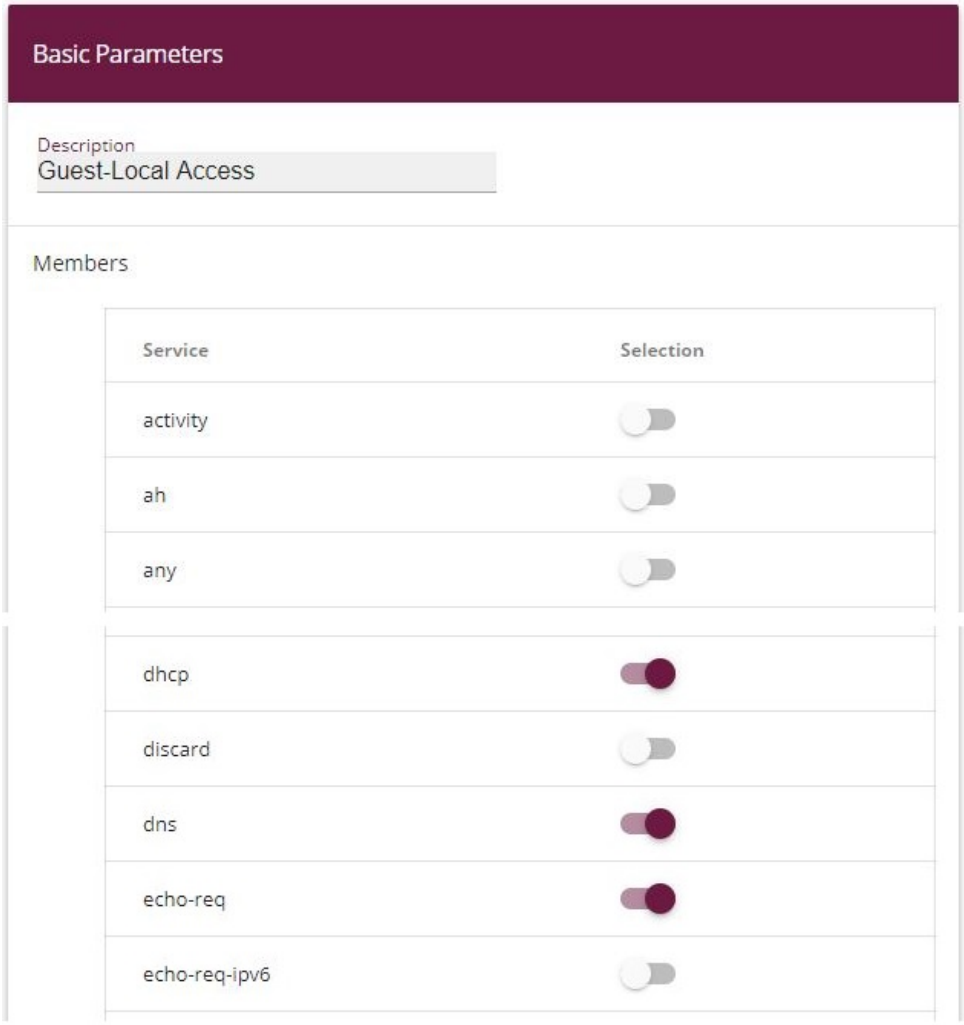


Fig. 147: **Firewall**->**Services**->**Groups**->**New**

Proceed as follows:

(1) Enter a **Description**, e.g. `Guest-Local-Access`.

(2) Choose the desired **Members**, e.g. `dhcp`, `dns` and `echo`.

(3) Press **OK** to confirm your entries.

The configured service group is displayed.

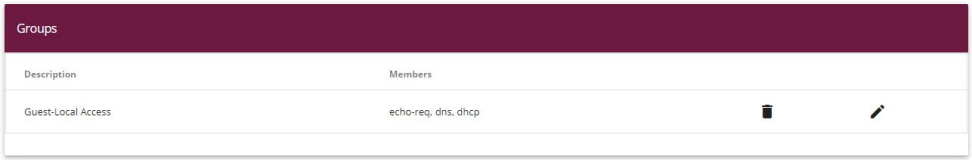


Fig. 148: **Firewall**->**Services**->**Groups**

Creating Ipv4 filter rules

Create a rule, so that your guests can use the services of the DHCP, DNS and Echo, that you have combined in a Service Group.

Go to **Firewall**->**Policies**->**IPv4 Filter Rules**->**New**.

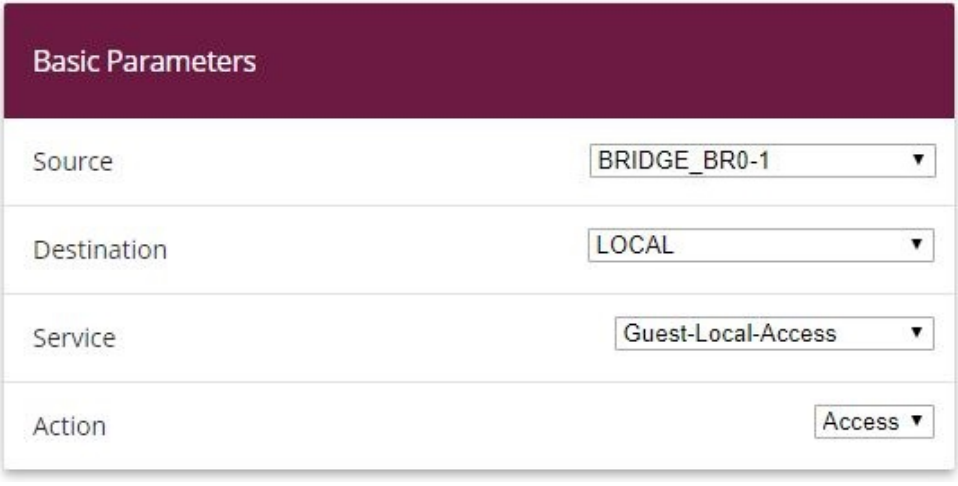


Fig. 149: **Firewall**->**Policies**->**IPv4 Filter Rules**->**New**

Proceed as follows:

(1) Set **Source** *BRIDGE_BR0-1*.

(2) Set **Destination** *LOCAL*.

(3) Set *Guest-Local-Access* as a **Service** or service group.

(4) Set **Action** *Access*.

(5) Press **OK** to confirm your entries.

Create a filter rule for the access of your guests to the internet.

Go to **Firewall**->**Policies**->**IPv4 Filter Rules**->**New**.

Proceed as follows:

(1) Set **Source** *BRIDGE_BR0-1*.

(2) Set **Destination** *WAN_INTERNET*.

(3) Select a **Service**, e.g. *any*.

(4) Set **Action** *Access*.

(5) Press **OK** to confirm your entries.

Both filter rules are shown.

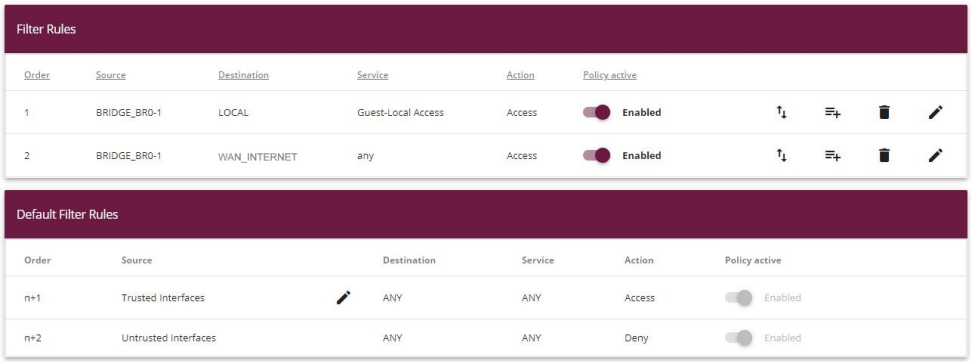


Fig. 150: **Firewall->Policies->IPv4 Filter Rules**

Add further rules to this if needed.

Switch on firewall

When you have finished the firewall configuration, you must switch on the firewall.

Go to **Firewall->Policies->options**.

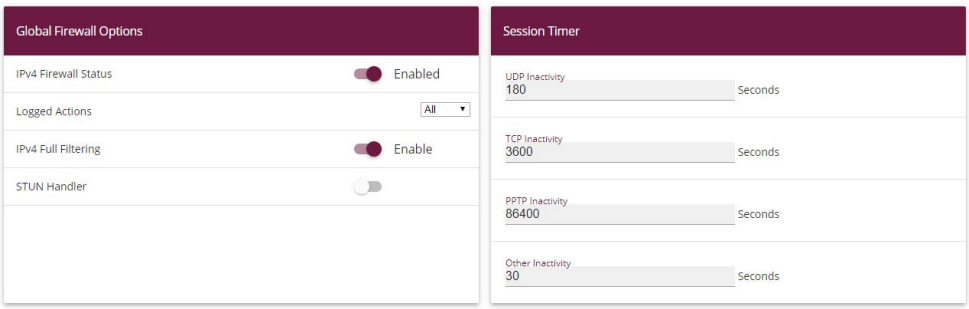


Fig. 151: **Firewall->Policies->Options**

Proceed as follows:

(1) Activate the **IPv4 Firewall Status**.

(2) Press **OK** to confirm your entries.

8.3 Result

You have configured a WLAN access to the local network and a guest WLAN. Your guests can access the internet, but not the local network.

8.4 Overview of Configuration Steps

Configuring the IP address

Field	Menu	Value
Security Policy	**LAN-> IP Configuration-> Interfaces -><en1-0->**	*Trusted*
Address Mode	**LAN ->IP Configuration-> Interfaces-><en1-0->**	*Static*
IP Address / Netmask	**LAN ->IP Configuration ->Interfaces -><en1-0->**	*192.168.10.1 / 255.255.255.0*

Create bridge groups and assign LAN interface

Field	Menu	Value
Interface Description	**System Management ->Interface Mode / Bridge Groups ->Interfaces**	*en1-0*
Mode / Bridge Group	**System Management ->Interface Mode / Bridge Groups ->Interfaces**	*New Bridge Group*
Configuration Interface	**System Management ->Interface Mode / Bridge Groups ->Interfaces**	*en1-0*

Put Wireless LAN Controller into operation

Field	Menu	Value
Region	**Wireless LAN Controller-> Wizard**	*Germany*
Interface	**Wireless LAN Controller ->Wizard**	*BRIDGE_BR0*
DHCP Server	**Wireless LAN Controller ->Wizard**	*Internal*
IP Address Range	**Wireless LAN Controller ->Wizard**	e. g. *192.168.10.100* / *192.168.10.150*

Choose radio profile and configure WLAN access to the local network.

Field	Menu	Value
Use two independent radio profiles	**Wireless LAN Controller-> Wizard ->Next**	*Enabled*
Radio profile for module 1 (for all Access Points)	**Wireless LAN Controller-> Wizard ->Next**	*2.4 GHz Radio Profile*
Radio profile for module 2 (only for APs with two radio modules)	**Wireless LAN Controller-> Wizard ->Next**	*5 GHz Radio Profile*
Network Name (SSID)	**Wireless LAN Controller-> Wizard ->Next -><vss-1>->**	*Local Network*
Preshared Key	**Wireless LAN Controller ->Wizard ->Next -><vss-1>->**	e. g. *supersecret*

Configure guest WLAN

Field	Menu	Value
Network Name (SSID)	**Wireless LAN Controller ->Wizard ->Next ->Add**	e.g. *Guest-Network*
Security Mode	**Wireless LAN Controller-> Wizard ->Next-> Add**	*WPA PSK*
WPA Mode	**Wireless LAN Controller-> Wizard ->Next ->Add**	*WPA2*
Preshared Key	**Wireless LAN Controller-> Wizard ->Next-> Add**	e.g. *Super-Secret-1*
VLAN	**Wireless LAN Controller-> Wizard ->Next-> Add**	*Enabled*
VLAN ID	**Wireless LAN Controller ->Wizard ->Next-> Add**	e. g. *10*
Manage	**Wireless LAN Controller ->Wizard ->Next**	*Enabled*

Configure Access Points with the Wireless LAN Controller

Field	Menu	Value
Wireless LAN Controller Wizard	**Wireless LAN Controller-> Wizard ->Next-> Next ->Next**	**START**

Configure the IP address for the virtual Bridge Interface

Field	Menu	Value
Based on Ethernet In-	**LAN ->IP Configuration ->Inter-**	*br0*

Field	Menu	Value
terface	**faces-> New**	
Interface Mode	**LAN-> IP Configuration-> Interfaces-> New**	*Tagged (VLAN)*
VLAN ID	**LAN ->IP Configuration ->Interfaces-> New**	*10*
Security Policy	**LAN-> IP Configuration ->Interfaces ->New**	*Untrusted*
Address Mode	**LAN-> IP Configuration ->Interfaces-> New**	*Static*
IP Address / Netmask	**LAN ->IP Configuration ->Interfaces-> New**	*192.168.11.1 / 255.255.255.0*

Configure the IP Address Range for the guest network

Field	Menu	Value
IP Pool Name	**Local Services ->DHCP Server-> IP Pool Configuration-> New**	*Guest-Address-Pool*
IP Address Range	**Local Services ->DHCP Server ->IP Pool Configuration ->New**	e. g. *192.168.11.100* / *192.168.11.150*

Configure DHCP use

Field	Menu	Value
Interface	**Local Services-> DHCP Server-> DHCP Configuration ->New**	*br0-1*
IP Pool Name	**Local Services-> DHCP Server-> DHCP Configuration-> New**	*Guest-Address-Pool*
Pool Usage	**Local Services ->DHCP Server-> DHCP Configuration ->New**	*Local*

Set up firewall

Field	Menu	Value
BRIDGE_BR0	**Firewall-> Policies ->IPv4 Filter Rules ->Default Filter Rules**	**Trusted** *Enabled*
Description	**Firewall-> Services-> Groups-> New**	e.g. *Guest-Local-Access*
Members	**Firewall-> Services-> Groups-> New**	e.g. *dhcp*, *dns* and *echo*
Source	**Firewall ->Policies-> IPv4 Filter Rules-> New**	*BRIDGE_BR0-1*

Field	Menu	Value
Destination	**Firewall-> Policies ->IPv4 Filter Rules ->New**	*LOCAL*
Service	**Firewall-> Policies ->IPv4 Filter Rules ->New**	*Guest-Local-Access*
Action	**Firewall-> Policies ->IPv4 Filter Rules ->New**	*Access*
Source	**Firewall ->Policies-> IPv4 Filter Rules-> New**	*BRIDGE_BR0-1*
Destination	**Firewall-> Policies ->IPv4 Filter Rules ->New**	*WAN_INTERNET*
Service	**Firewall-> Policies ->IPv4 Filter Rules ->New**	e.g. *any*
Action	**Firewall-> Policies ->IPv4 Filter Rules ->New**	*Access*
Status of the IPv4 Firewall	**Firewall-> Policies-> Options**	*Enabled*

Chapter 9 WLAN - WLAN controller installation with integrated HotSpot functionality

9.1 Introduction

A WLAN network is to be created with a wireless LAN controller and the **bintec HotSpot Solution**. The WLAN network is to provide two SSIDs. One SSID for employees, who are to be given full access to the internal network and the Internet. The second SSID is for guests who are only to have Internet access after logging in via the bintec HotSpot solution.

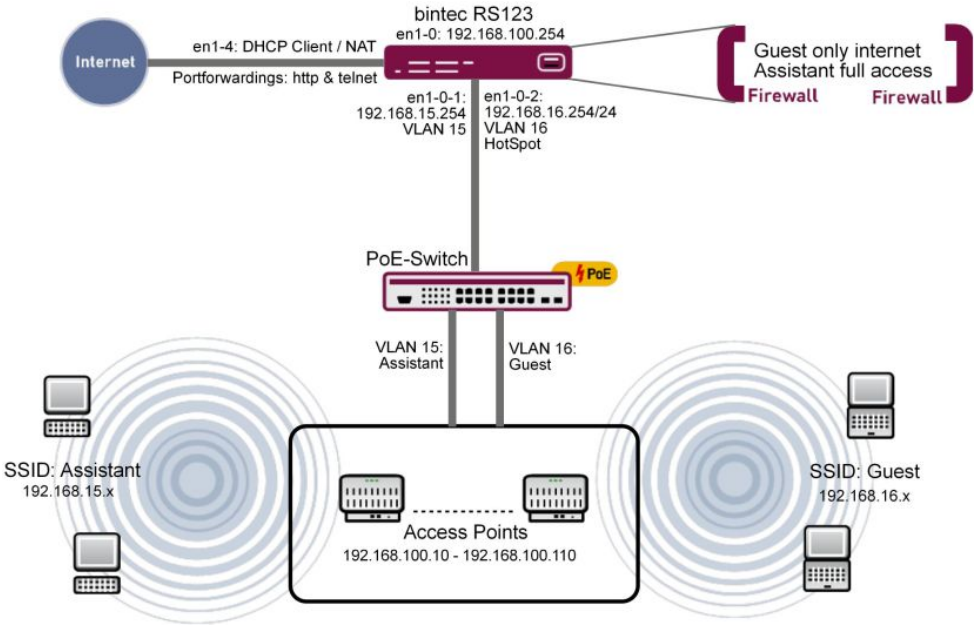


Fig. 152: Example scenario

Requirements

- An RS series router (e. g. **bintec RS123**) or an RXL series device (e. g. **bintec RXL12500**)
- A **bintec W2003ac**
- Software licenses for the bintec router
- WLAN controller licence

- 6 access points
- bintec Hotspot hosting 2yrs 1 location

9.2 Function

The bintec router (e. g. **bintec RS123**) serves, at the same time, as a gateway, firewall, WLAN controller and HotSpot gateway. The access points provide SSIDs which are each tagged with a separate VLAN. The router uses the tagging to separate the two traffic flows and provides them internally to two virtual ports.

The router provides three DHCP pools. One for the access points (192.168.100.10 to 192.168.100.110), this is automatically created by the wireless LAN controller wizard. When doing so, the wireless LAN controller wizard automatically includes the configuring of the DHCP option 138. That is the WLAN controller address which the access points require to communicate with the WLAN controller. The other two DHCP pools are created manually and are used, respectively, for the SSIDs *employees* and SSIDs *guests*.

Note

In small WLAN installations of up to 6 access points, a **bintec W2003ac** can also be used as a WLAN controller. This cannot be done here because the device also has to take on the HotSpot gateway functionality at the same time. However, to do this, router functions are required which are deactivated in the **bintec W2003ac** if it is working as a WLAN controller.

9.3 Configuration

9.3.1 Basic configuration

Before you start configuring based on the description below, you need to set up an Internet access using the assistants. If you have acquired a WLAN controller license, you need to enter it in the menu **System Management** -> **Global Settings** -> **System Licenses**. You also need to specify an NTP time server and set up the time zone. This is vital if the Hot-Spot is to work reliably. Do not, initially, set up a DHCP pool for the router, since the DHCP pool for the WLAN access points is set up automatically when setting up the WLAN controller.

9.3.2 LAN configuration

First of all, change the IP address in the **IP Configuration** menu.

(1) Go to **LAN** -> **IP Configuration** -> **Interfaces** -> **<en1-0>** .

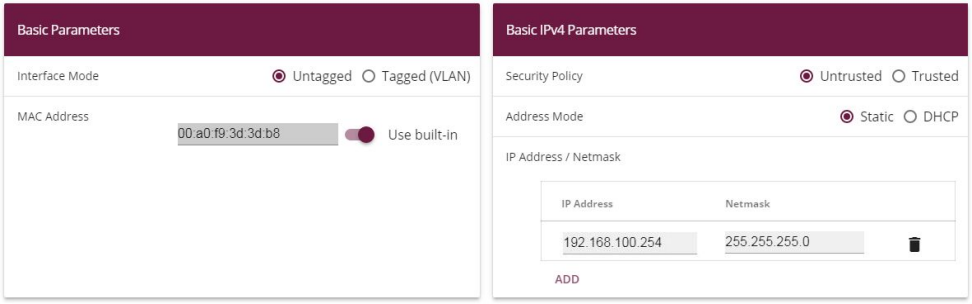


Fig. 153: **LAN** -> **IP Configuration** -> **Interfaces** -> **<en1-0>** .

Proceed as follows:

(1) Set the **Interface Mode** to *Untagged*.

(2) Enter the **IP Address / Netmask** *192.168.100.254*.

(3) Confirm with **OK**.

Now add the virtual interface.

(1) Go to **LAN** -> **IP Configuration** -> **Interfaces** -> **New**.

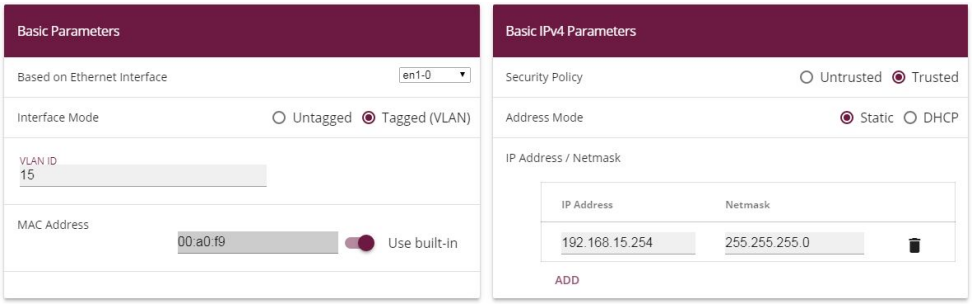


Fig. 154: **LAN** -> **IP Configuration** ->**Interfaces** -> **New**

Proceed as follows:

(1) For **Based on Ethernet Interface**, select *en1-0*.

(2) For **Interface Mode**, select *Tagged (VLAN)*.

(3) Assign a **VLAN ID** to the interface, e. g. *15*.

(4) Use **Add** to enter the **IP Address / Netmask** *192.168.15.254*.

(5) Confirm with **OK**.

You have added a virtual interface *en1-0-1* with the **VLAN ID** *15*.

(1) Go to **LAN** -> **IP Configuration** -> **Interfaces** -> **New** to create another interface.

(2) For **Based on Ethernet Interface**, select `en1-0`.

(3) For **Interface Mode**, select `Tagged (VLAN)`.

(4) Assign a **VLAN ID** to the interface, e. g. `16`.

(5) Use **Add** to enter the **IP Address / Netmask** `192.168.16.254`.

(6) Confirm with **OK**.
You have added a virtual interface `en1-0-2` with the **VLAN ID** `16`.

After this configuration, the **Interfaces** menu looks like this.

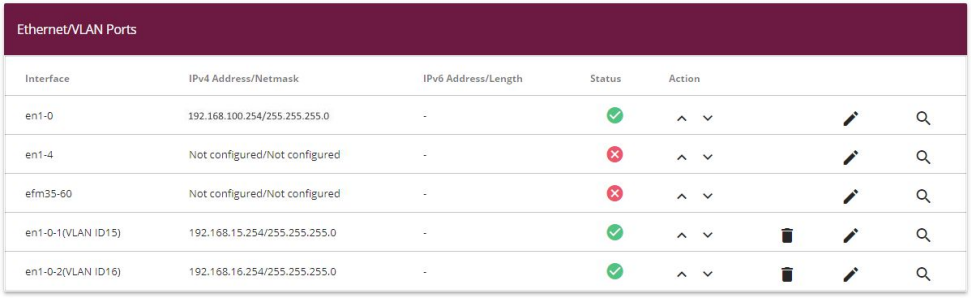


Fig. 155: **LAN** -> **IP Configuration** -> **Interfaces**

9.3.3 HotSpot configuration

To prepare for the configuration, you need to get your license authorised via the licensing portal on the bintec elmeg website *http://www.bintec-elmeg.com* . You will then quickly be sent your personal access data.

First you need to enter a RADIUS server.

RADIUS (Remote Authentication Dial In User Service) is a service that enables authentication and configuration information to be exchanged between your device and a RADIUS server.

(1) Go to **System Management** -> **Remote Authentication** -> **RADIUS** ->**New.**

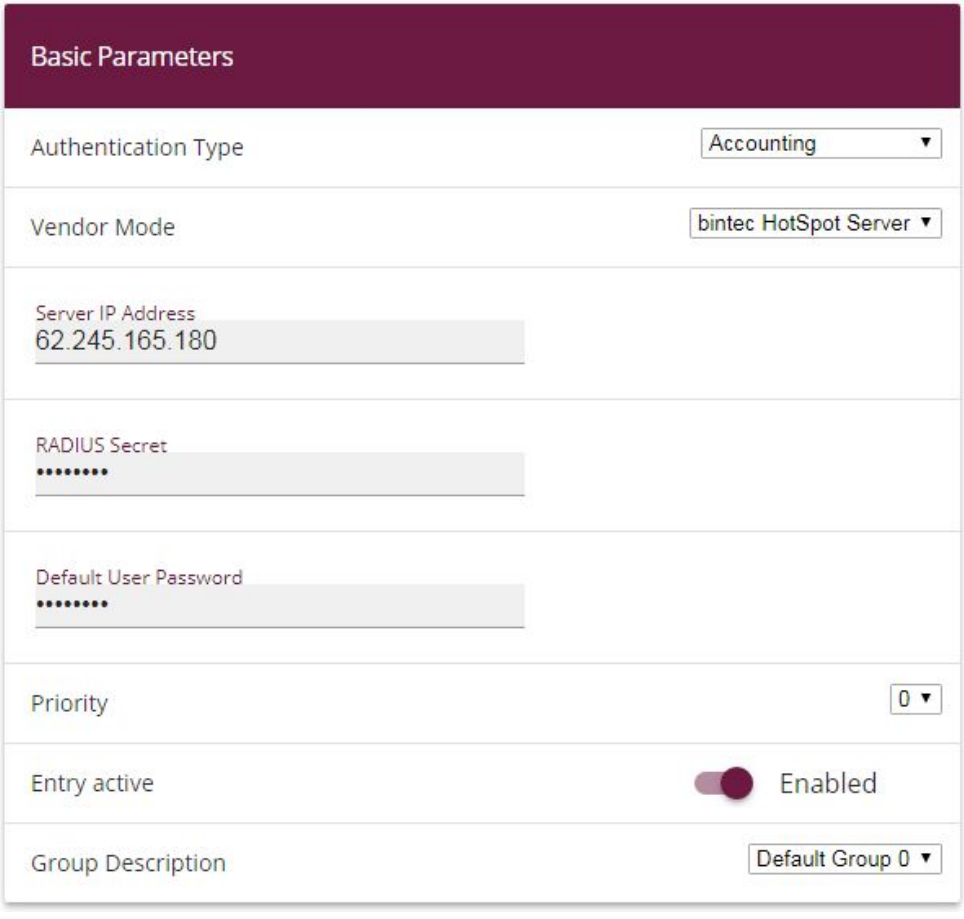


Fig. 156: **System Management** -> **Remote Authentication** -> **RADIUS** -> **New**

Proceed as follows to set up a RADIUS server:

(1) Select the **Authentication Type** *Accounting*. The RADIUS server is used for recording statistical call data.

(2) As **Vendor Mode**, select *bintec HotSpot Server*.

(3) For **Server IP Address**, enter the address of the central bintec HotSpot server, here e. g. *62.245.165.180*.

(4) You will find the **RADIUS Secret** in your access data.

(5) The **Default User Password** is the same as the **RADIUS Secret**.

(6) Set the **Priority** to *0* (top priority).

(7) Confirm with **OK**.

(1) Go to **System Management** -> **Remote Authentication** -> **RADIUS** ->**New** to set up the second RADIUS server.

(2) Select the **Authentication Type** *Login Authentication*.

(3) For **Server IP Address**, enter the address of the central bintec HotSpot server, here e. g. *62.245.165.180*.

(4) You will find the **RADIUS Secret** in your access data.

(5) The **Default User Password** is the same as the **RADIUS Secret**.

(6) Set the **Priority** to *0* (top priority).

(7) In the **Advanced Settings** menu, choose *Non-authoritative* for **Policy**.

(8) Confirm with **OK**.

The complete configuration looks like this:

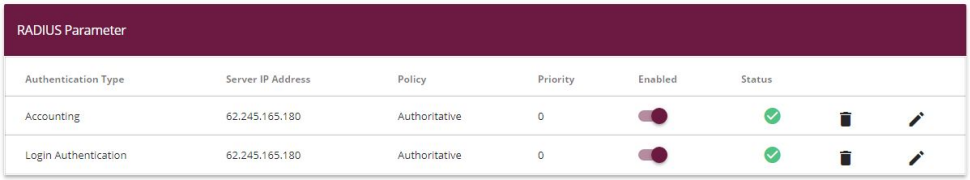


Fig. 157: **System Management** -> **Remote Authentication** -> **RADIUS**

In the next step, a HotSpot network will be set up.

(1) Go to **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**.

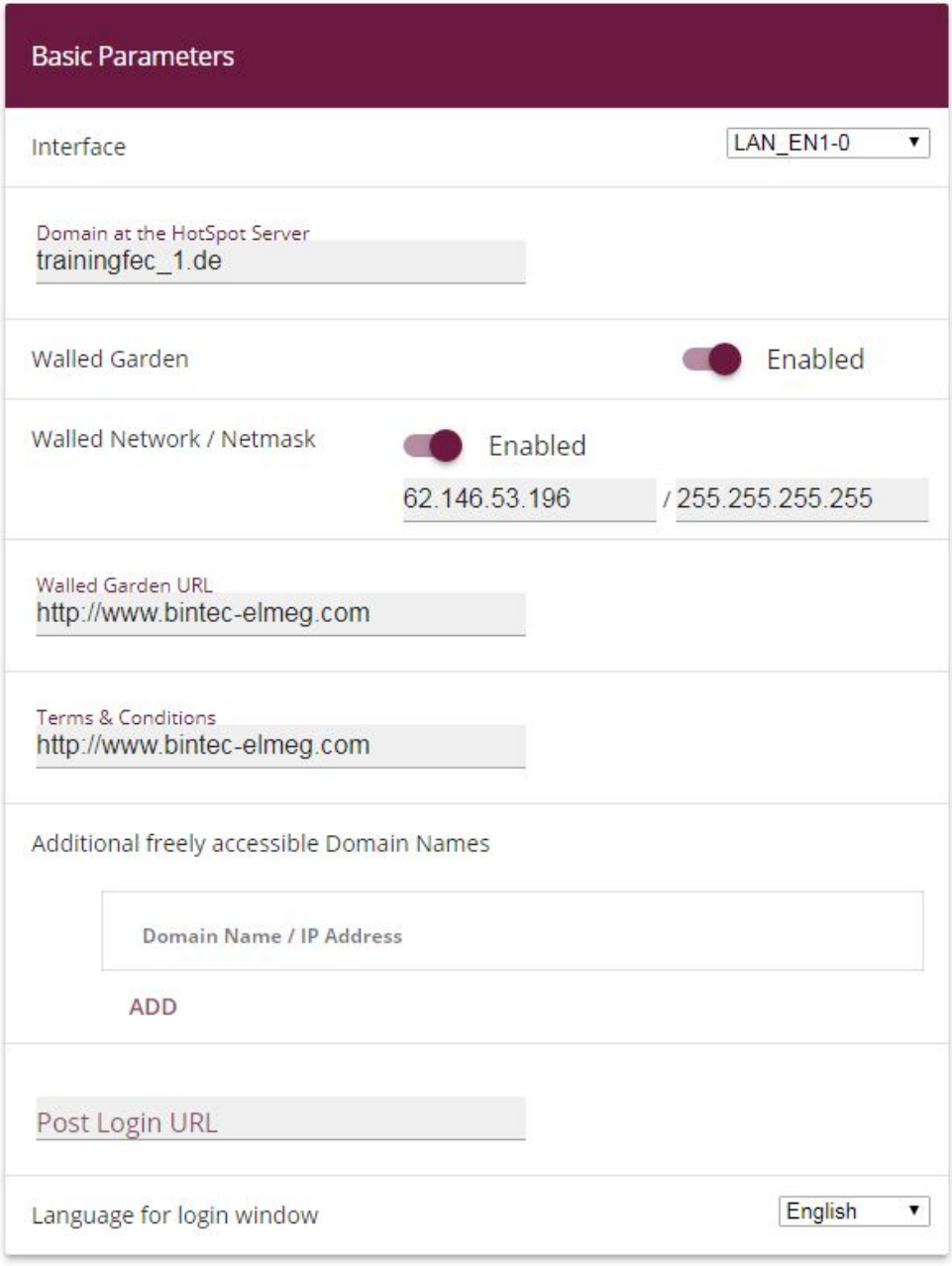


Fig. 158: **Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**

Proceed as follows:

(1) Select the **Interface** *LAN_EN1-0*. This will later correspond with the **SSID** *Guests*.

(2) Under **Domain at the HotSpot Server**, specify the domain that you were sent with

the access data, e. g. *trainingfec_1.de*.

(3) Enable the **Walled Garden** option.

(4) For **Walled Network / Netmask**, specify the IP address which your HotSpot guests are permitted to reach without loggin in, e. g. *62.146.53.196* and *255.255.255.255*.

(5) Under **Walled Garden URL** specify the URL that your HotSpot guests are to be able to see without logging in, e. g. *http://www.bintec-elmeg.com*. The Walled Garden URL must be accessible under the Walled Network address.

(6) Under **Terms & Conditions**, enter the URL at which you created your General Terms and Conditions website, e. g. *http://www.bintec-elmeg.com*. The URL must be accessible under the Walled Network address.

(7) Confirm with **OK**.

9.3.4 DHCP configuration

Now the two DHCP pools are created for the virtual interfaces en1-0-1 (VLAN ID 15) and en1-0-2 (VLAN ID 16).

(1) Go to **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New** to configure the IP pool.

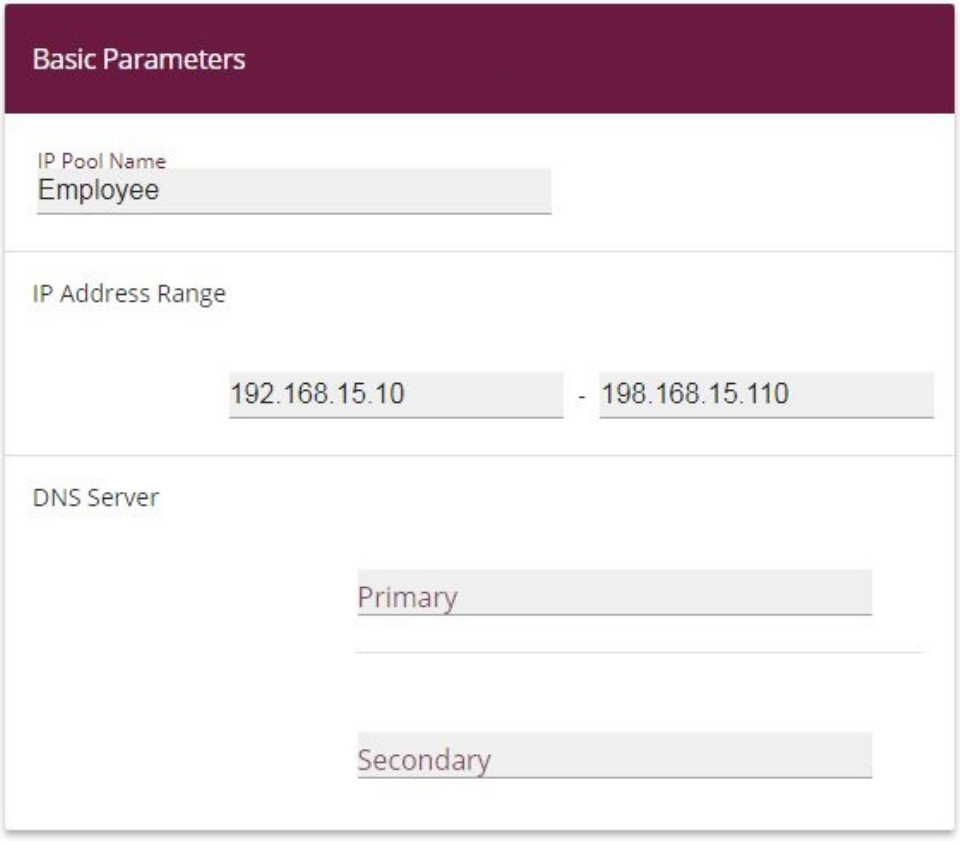


Fig. 159: **Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**

Proceed as follows:

(1) For **IP Pool Name**, enter any description to name the IP pool in a unique way, e. g. *Employee*.

(2) For **IP Address Range**, enter the first (first field) and the last (second field) IP address in the IP address pool, e. g. *192.168.15.10* - *192.168.15.110*.

(3) Confirm with **OK**.

In the **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New** menu, you can perform additional configuration.

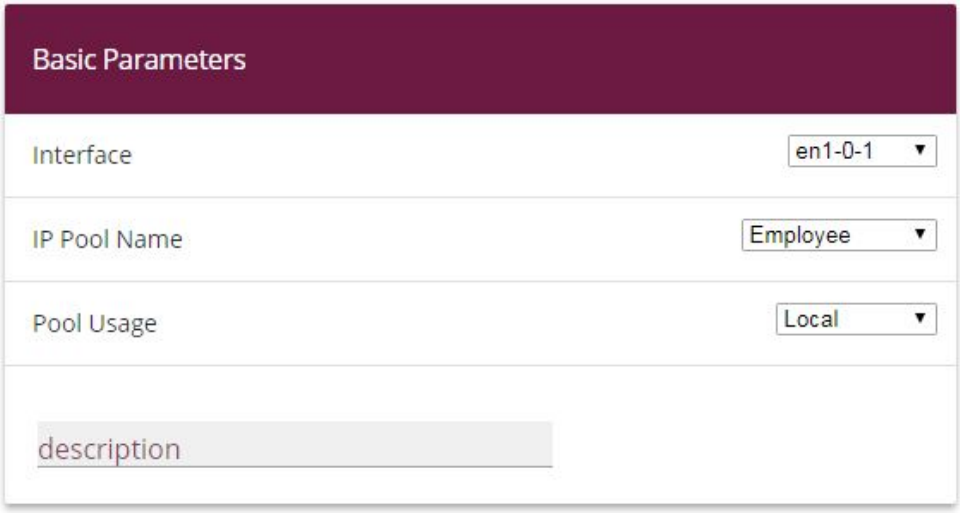


Fig. 160: **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**

Proceed as follows:

(1) Select the **Interface** *en1-0-1*.

(2) Select a valid **IP-Pool Name**, here e. g. *Employee*.

(3) For **Pool Usage**, select *Local*. The DHCP pool is only used for DHCP requests in the same subnet.

(4) Confirm with **OK**.

Now create another DHCP pool for the second virtual interface en1-0-2 (VLAN ID 16).

(1) Go to **Local Services** -> **DHCP Server** -> **IP Pool Configurationl** -> **New**.

(2) For **IP Pool Name**, enter e. g. *Guest*.

(3) For **IP Address Range**, enter the IP address of the IP address pool, e. g. *192.168.16.10* - *192.168.16.110*.

(4) Confirm with **OK**.

(5) Go to **Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**.

(6) Select the **Interface** *en1-0-2*.

(7) Select a validn **IP Pool Name**, here e. g. *Guest*.

(8) For **Pool Usage**, select *Local*.

(9) Confirm with **OK**.

The complete configuration looks like this:

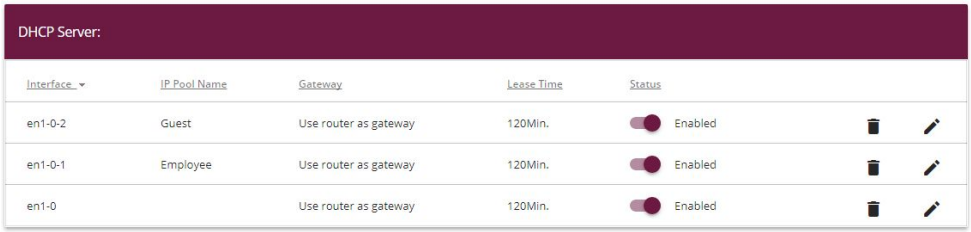


Fig. 161: **Local Services** -> **DHCP Server** -> **DHCP Configuration**

9.3.5 Wireless LAN controller wizard

By using the **wireless LAN controller**, you can set up and manage a WLAN infrastructure with multiple access points (APs). The WLAN controller has a Wizard which assists you in the configuration of your access points.

(1) Go to **Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**.

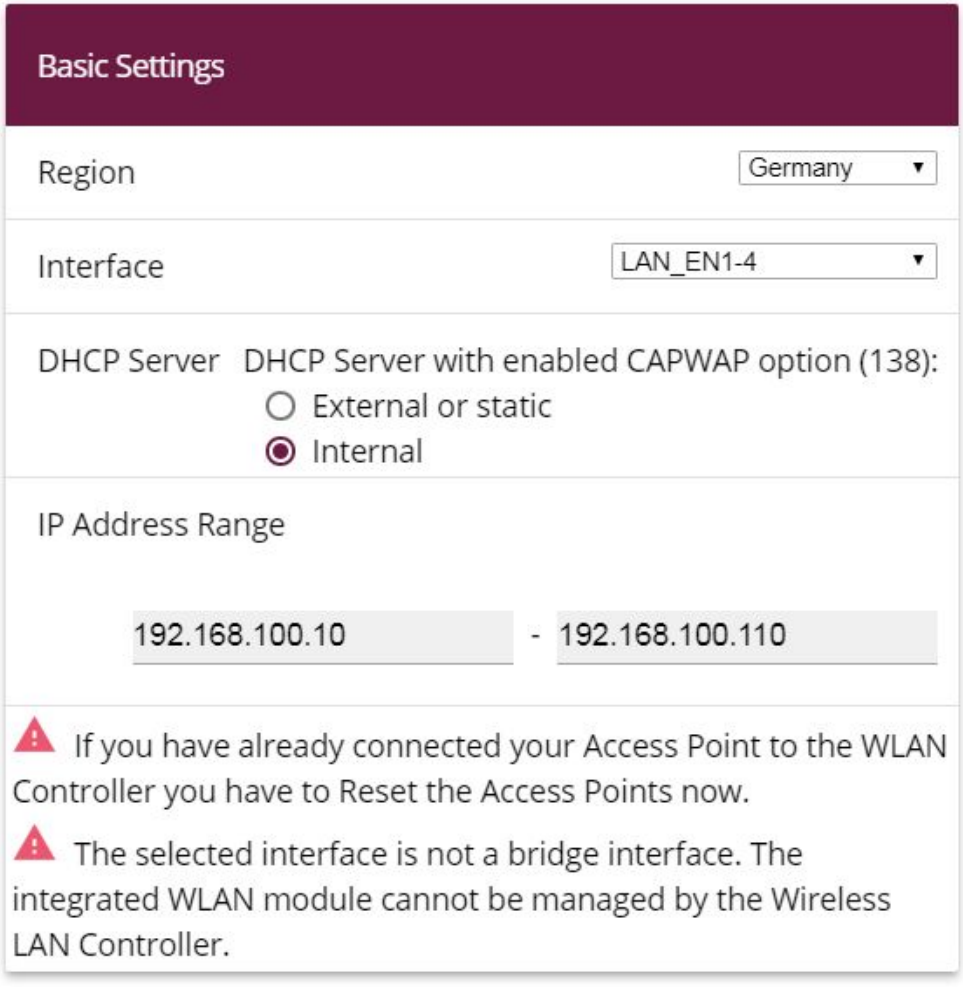


Fig. 162: **Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**

Proceed as follows:

(1) For **Region**, select *Germany*.

(2) Select the **Interface** *LAN_EN1-0*.

(3) For **DHCP Server**, select *Internal*.

(4) Enter the **IP Address Range**, here *192.168.100.10* - *192.168.100.110*.
Now another DHCP pool is automatically created for the interface EN1-0. In doing this, it is taken into account that the IP address of the WLAN controller is sent as CAPWAP Option 138 for each DHCP request. The access points are told the address of the WLAN controller in this way.

(5) Select **Next**.

In the second step, the wizard queries whether the WLAN network is to be run in the 2.4 or 5 GHz frequency range. If you WLAN network is to work in the 2.4 and the 5 GHz frequency range, select 2.4 GHz initially. Later on you can change the configuration of individual radio modules to 5 GHz.

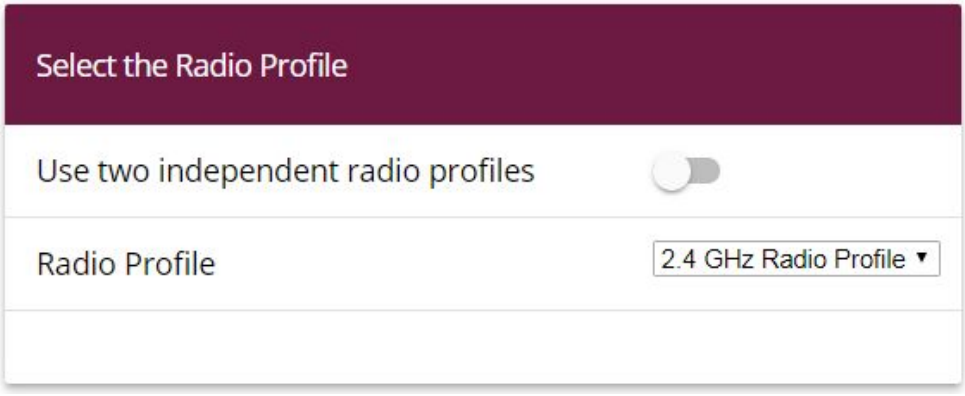


Fig. 163: **Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**

Click **Next**.

In the next step you define the SSID which is to be supplied later.

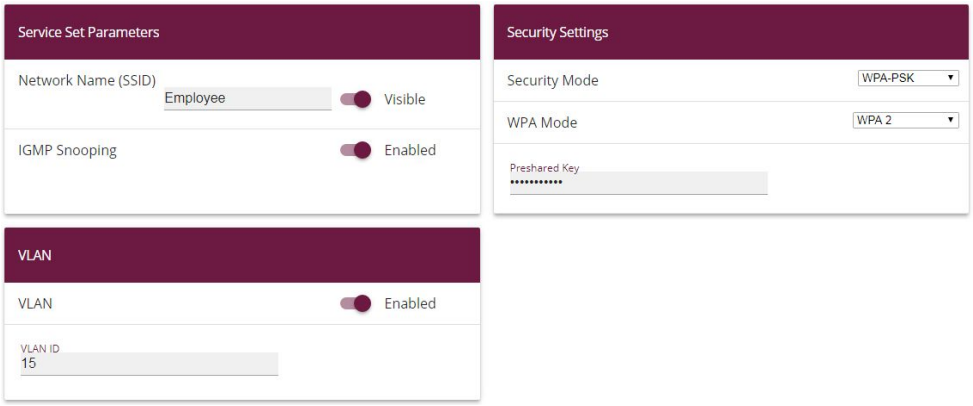


Fig. 164: **Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**

Proceed as follows:

(1) Click **Add**.

(2) For **Network Name (SSID)**, enter `Employee`.

(3) Set the **Security Mode** to `WPA-PSK`.

(4) Set the **WPA Mode** set to `WPA 2`.

(5) For Preshared Key, enter your defined password.

(6) For **VLAN ID**, enter `15`.

(7) Confirm with **OK**.

With these settings, all the traffic from WLAN clients which are connected via this SSID are routed to virtual interface en1-0-1.

Now define the second SSIDs which are to be supplied later.

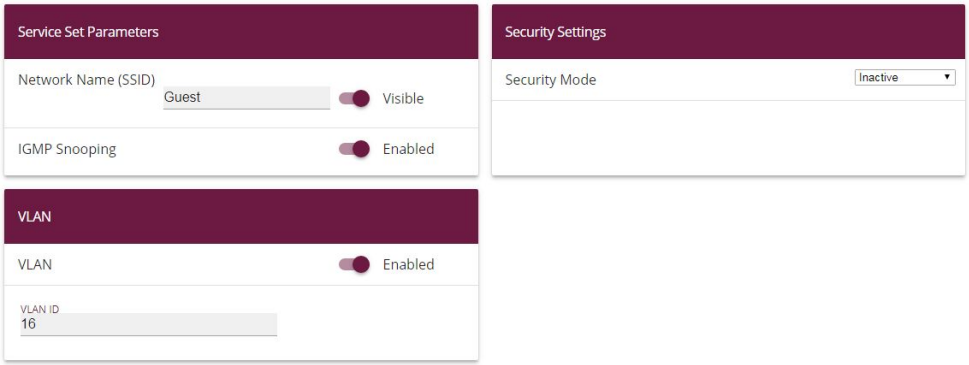


Fig. 165: **Wireless LAN Controller -> Wizard -> Wireless LAN Controller Wizard**

Proceed as follows:

(1) Click **Add**.

(2) For **Network Name (SSID)**, enter `Guest`.

(3) Set **Security Mode** to `Inactive`.

(4) For **VLAN ID**, enter `16`.

(5) Confirm with **OK**.

With these settings, all the traffic from WLAN clients which are connected via this SSID are routed to virtual interface en1-0-2.

Note: Before you continue, ensure that all the access points that the WLAN controller is going to manage are switched on and connected via a switch to the router's en1-0 interface.

Click **Next**.

You now see a list of all the access points detected.

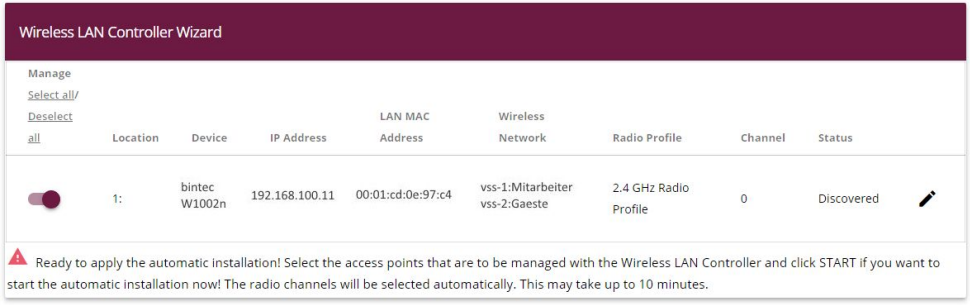


Fig. 166: **Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**

If you wish to change the settings of a detected AP, click on ✎ in the corresponding entry.

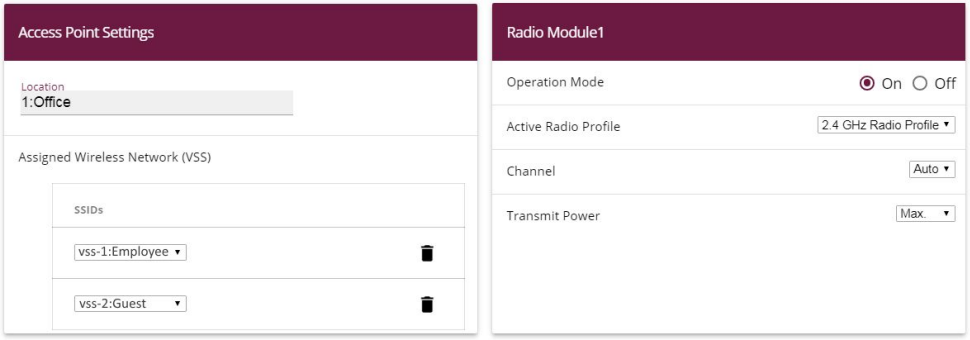


Fig. 167: **Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**

Proceed as follows:

(1) For **Location**, enter the installation location for the device, e. g. `1:Office`. This will make it easier for you to monitor the devices later on.

(2) For **Assigned Wireless Network (VSS)** you are shown the wireless networks that are currently assigned, here e. g. `vss-1:Employee` and `vss-2:Guest`.

(3) **Active Radio Profile** displays the wireless module profile that is currently selected, here `2.4 GHz Radio Profile`. You can select another wireless module profile from the list if more than one wireless module profile are being set up.

(4) Confirm with **OK**.

Now select the access points that your WLAN controller is to manage. To do this, click the entries you want in the **Manage** column.

Click **Start** to begin configuring the access points. When the installation is complete, you will see a list of the **Managed** access points.

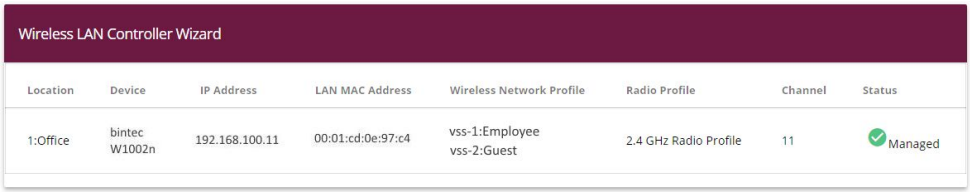


Fig. 168: **Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**

To ensure your `Guests` can use the Internet but are not given access to your other network components, firewall rules need to be added. Here is an example of a simple firewall rule intended to prevent the `Guests` from accessing the internal network.

First of all, two new groups are created to ensure that defining the filter rules is easier to understand.

Proceed as follows:

(1) Go to **Firewall** -> **Services** -> **Groups** -> **New**.

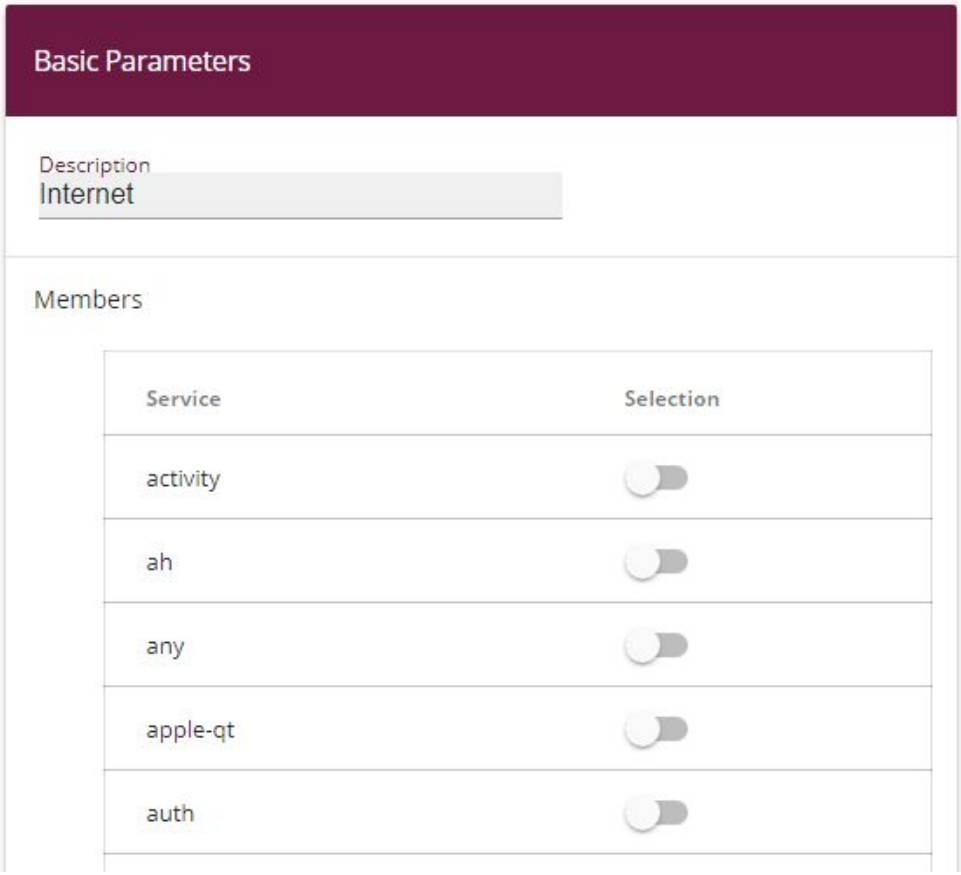


Fig. 169: **Firewall** -> **Services** -> **Groups** -> **New**

Proceed as follows:

(1) Enter a **Description** of the service group, e. g. `Internet`.

(2) Select the members of the group from the available service aliases. To do this, activate the field in the **Members** column.

(3) Confirm with **OK**.

Proceed in the same way for the settings for the second group, e. g. `local services`.

The complete configuration now looks like this:

Fig. 170: **Firewall** -> **Services** -> **Groups**

In the last step, the local services are further restricted. Access to the `http` and `http(SSL)` services must be permitted so that the router can show the login page to the Hot-Spot guests.

(1) Go to **Firewall** -> **Policies** -> **Filter Rules** ->**New**.

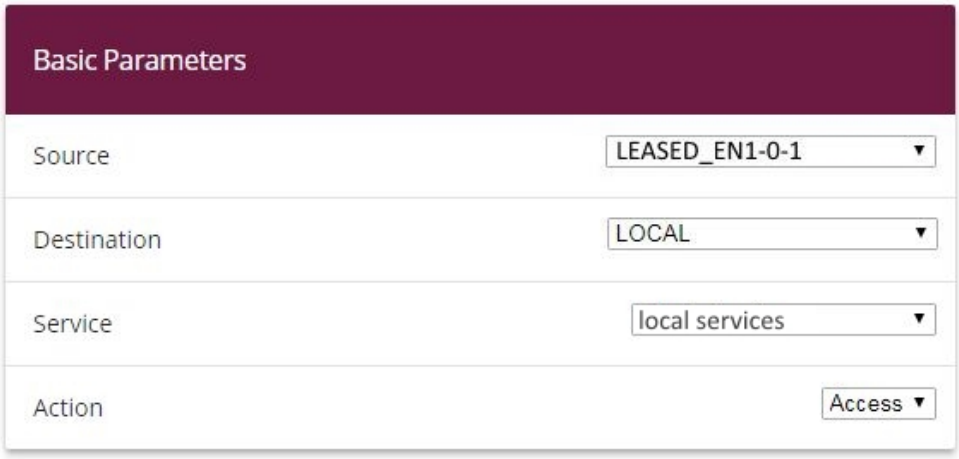


Fig. 171: **Firewall** -> **Policies** -> **Filter Rules** -> **New**

Proceed as follows to restrict the local services.

(1) For **Source**, select e. g. `LEASED_EN1-0-1`.

(2) For **Destination** select e. g. `LOCAL`.

(3) Select the **Service**, e. g. `local services`.

(4) For **Action**, select `Access`.

(5) Confirm your entries with **OK**.

Proceed in the same way in making the settings for other services.

The complete configuration then looks like this, e. g.:

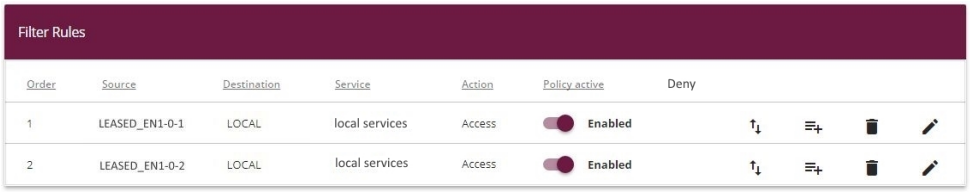


Fig. 172: **Firewall** -> **Policies** -> **Filter Rules**

This concludes the configuration. Save the configuration with **Save configuration** and confirm the selection with **OK**.

You can now test the configuration. To do this, log in with the SSID of the `employees`, or with the SSID of the `guests`.

Note

For **WTP failure**, we recommend that you configure an email notification to monitor the system.

9.4 Overview of configuration steps

LAN configuration

Field	Menu	Value
IP Address / Netmask	**LAN -> IP Configuration -> Interfaces -> <en1-0>** .	e. g. *192.168.100.254*
Interface Mode	**LAN -> IP Configuration -> Interfaces -> <en1-0>** .	*Untagged:*
Based on Ethernet Interface	**LAN -> IP Configuration ->Interfaces -> New**	en1-0
IP Address / Netmask	**LAN -> IP Configuration ->Interfaces -> New**	e. g. *192.168.15.254*
Interface Mode	**LAN -> IP Configuration ->Interfaces -> New**	*Tagged (VLAN)*
VLAN ID	**LAN -> IP Configuration ->Interfaces -> New**	*15*
Based on Ethernet Interface	**LAN -> IP Configuration ->Interfaces -> New**	en1-0
IP Address / Netmask	**LAN -> IP Configuration ->Interfaces -> New**	e. g. *192.168.16.254*
Interface Mode	**LAN -> IP Configuration ->Interfaces -> New**	*Tagged (VLAN)*
VLAN ID	**LAN -> IP Configuration ->Interfaces -> New**	*16*

Hotspot configuration

Field	Menu	Value
Authentication Type	**System Management -> Remote Authentication -> RADIUS -> New**	*Accounting*
Vendor Mode	**System Management -> Remote Authentication -> RADIUS -> New**	*bintec HotSpot Server*
Server IP Address	**System Management -> Remote Authentication -> RADIUS -> New**	e. g. *62.245.165.180*
RADIUS Secret	**System Management -> Remote Authentication -> RADIUS -> New**	e. g. *supersecret*
Default User Password	**System Management -> Remote Authentication -> RADIUS -> New**	e. g. *supersecret*

Field	Menu	Value
Priority	**System Management** -> **Remote Authentication** -> **RADIUS** -> **New**	*0*
Authentication Type	**System Management** -> **Remote Authentication** -> **RADIUS** -> **New**	*Login Authentication*
Server IP Address	**System Management** -> **Remote Authentication** -> **RADIUS** -> **New**	e. g. *62.245.165.180*
RADIUS Secret	**System Management** -> **Remote Authentication** -> **RADIUS** -> **New**	e. g. *supersecret*
Default User Password	**System Management** -> **Remote Authentication** -> **RADIUS** -> **New**	e. g. *supersecret*
Priority	**System Management** -> **Remote Authentication** -> **RADIUS** -> **New**	*0*

Set up Hotspot network

Field	Menu	Value
Interface	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**	e. g. *LAN_EN1-0*
Domain at the HotSpot Server	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**	e. g. *training-fec_1.de*
Walled Garden	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**	*Enabled*
Walled Network / Netmask	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**	e. g. *62.146.53.196* and *255.255.255.255*
Walled Garden URL	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**	*http://www.bintec-elmeg.com*
Terms & Conditions	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**	*http://www.bintec-elmeg.com*
Language for login window	**Local Services** -> **Hotspot Gateway** -> **Hotspot Gateway** -> **New**	e. g. *German*

DHCP configuration

Field	Menu	Value
IP Pool Name	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *Assistant*
IP Address Range	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *192.168.15.10* - *192.168.15.110*

Field	Menu	Value
Interface	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*en1-0-1*
IP Pool Name	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	e. g. *Assistant*
Pool Usage	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Local*
IP Pool Name	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *Guests*
IP Address Range	**Local Services** -> **DHCP Server** -> **IP Pool Configuration** -> **New**	e. g. *192.168.16.10* - *192.168.16.110*
Interface	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*en1-0-2*
IP Pool Name	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	e. g. *Guests*
Pool Usage	**Local Services** -> **DHCP Server** -> **DHCP Configuration** -> **New**	*Local*

WLAN Controller Wizard

Field	Menu	Value
Region	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**.	*Germany*
Interface	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**.	*LAN_EN1-0*
DHCP Server	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**.	*Internal*
IP Address Range	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**.	e. g. *192.168.100.10* - *192.168.100.110*
Radio profile	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** ->**Next**	*2.4 GHz Radio Profile*
Network Name (SSID)	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** ->**Next**	e. g. *Employees*
Security Mode	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** ->**Next**	*WPA-PSK*
WPA Mode	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard**	*WPA2*

Field	Menu	Value
	->**Next**	
Preshared key	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** ->**Next**	e. g. *supersecret*
VLAN	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** ->**Next**	*Enabled*
VLAN ID	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** ->**Next**	*15*
Network Name (SSID)	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** -> **Next**-> **Add**	e. g. *Guests*
Security Mode	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** -> **Next**-> **Add**	Inactive
VLAN	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** -> **Next**-> **Add**	*Enabled*
VLAN ID	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** -> **Next**-> **Add**	*16*
Location	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** ->**Next**	e. g. *1:Office*
Active Radio Profile	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** ->**Next**	*2.4 GHz Radio Profile*
Assigned Wireless Networks (VSS)	**Wireless LAN Controller** -> **Wizard** -> **Wireless LAN Controller Wizard** -> **Next**	e. g. *vss-1:Employees* and *vss-2:Guests*

Add firewall rules

Field	Menu	Value
Description	**Firewall** -> **Services** -> **Groups** -> **New**	e. g. *Internet*
Members	**Firewall** -> **Services** -> **Groups** -> **New**	e. g. *http*, *http (SSL)*

Field	Menu	Value
Description	**Firewall** -> **Services** -> **Groups** -> **New**	e. g. *Local Services*
Members	**Firewall** -> **Services** -> **Groups** -> **New**	e. g. *http*, *http (SSL)*

Restrict local services

Field	Menu	Value
Source	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*LEASED_EN1-0-1*
Destination	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*LOCAL*
Service	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*local services*
Action	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*LEASED_EN1-0-2*
Destination	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*LOCAL*
Service	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*local services*
Action	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*Access*
Source	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*LAN_EN1-0-1*
Destination	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*LAN_EN1-0-1*
Service	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*any*
Action	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*Deny*
Source	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*LAN_EN1-0-2*
Destination	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*LAN_EN1-0-2*
Service	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*any*

Field	Menu	Value
Action	**Firewall** -> **Policies** -> **Filter Rules** -> **New**	*Deny*

Chapter 10 WLAN - Cloud NetManager

10.1 Introduction

The Cloud NetManager is a system that is able to administer both small as well as very large networks that are distributed over many locations.

Requirements

The following prerequisites for configuration must be met:

- registers users on the Cloud NetManager portal
- one or several bintec WLAN Access Points e.g., **W1001n**, **W1003n**, **W2003n**, … with SW Rel. 10.1.8.Patch 2 or higher
- DVC (Device Verification Code) of the access points to be administered or a DHCP server that supports option 43
- a valid Cloud NetManager licence for each access point
- Internet access

10.2 First steps in the portal

10.2.1 Creating a user

Open a browser and enter the URL into the address line: *https://bintec.networkcloudmanager.com* .

First, you must register. To do so, on the registration page click on **Register** on the top right.

Enter the required data for the registration.

The **Partner number** and **Login** fields are optional.

If you have more than one user account for your company, please observe the following:

- Only one user can be created per company name. Therefore, the form of the company must vary (e.g., Company_1; Company_2; ...).
- If another user is to administer the same WLAN network, do not create any other users.

You can set up other users for your account after the login with both full as well as restricted user rights.

- If you would like to set up an additional user who is not to see the settings of the first user already set up, you can do so at this point.

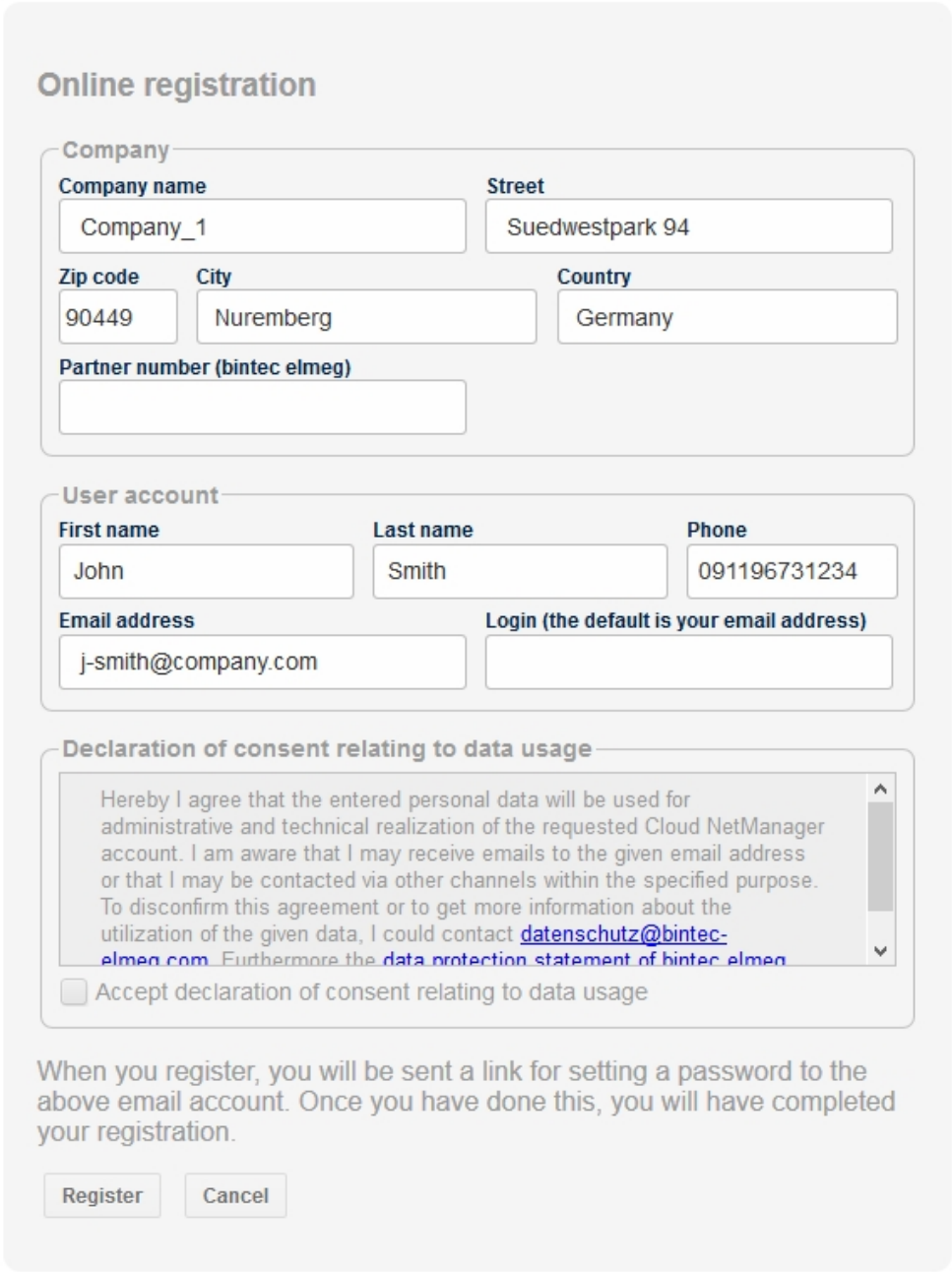


Fig. 173: Online registration

Once the registration form has been submitted, you will receive an email after a few minutes.

Follow the instructions and create a **Password** for your user.

10.2.2 Changing the time zone

The time zone when logging in for the first time is set to **UTC**. Please change this to **Europe/Berlin**.

Furthermore, you have the option of selecting a language.

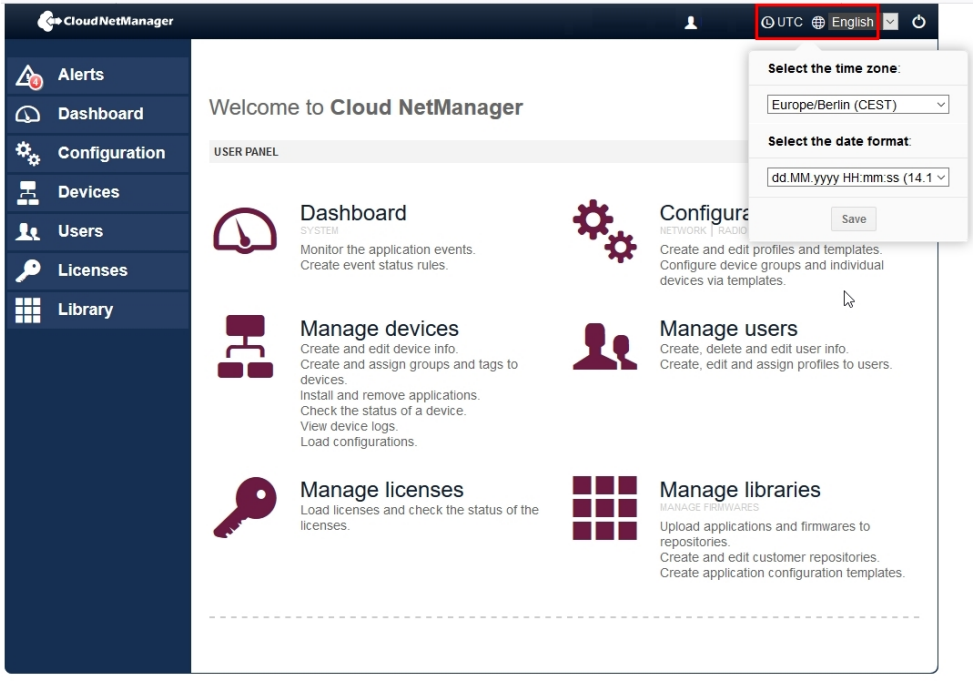


Fig. 174: Changing the time zone

10.2.3 Importing the licences

On the status page go to the **Licences**->**Licences for this cloud server**->**New Licence** menu.

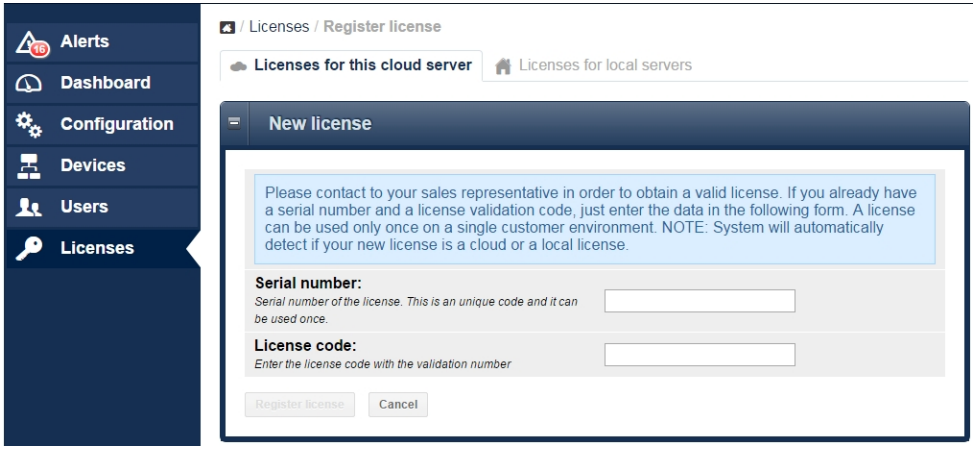


Fig. 175: New licence

- Enter the **Serial number** and the **Licence code** (PIN).
- Press **Register Licence**.

The **Manage Licences** overview shows which licences are still available in your account.

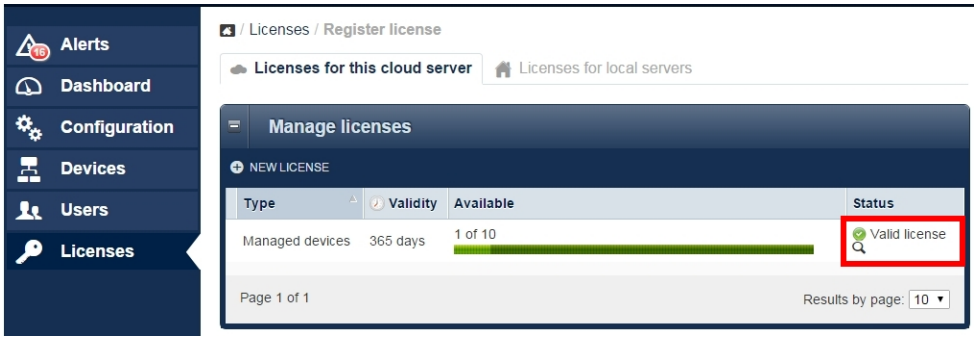


Fig. 176: Overview

Please note that only the installed licences will be displayed. The availability does not indicate the remaining time but the runtime of the purchased licence or licences packet.

- A licence which was registered on a user account cannot be subsequently transmitted to another user.
- The licence runtime is only counted down here if the licence for the management of a device was used. If the used device is removed, the licence will be available for other devices. The runtime is not counted down if the licence is not being used.
- If the licence for an administered device expires, the system will obtain another licence from the pool of registered licences. If no free licences are available, the device in ques-

tion will no be longer be managed. The configuration cannot be changed and monitoring is no longer possible. The device itself will continue to work even in the event of a power failure.

You can display the licences which are to be used by an administered device. To do so, under **Status** click on **Valid Licence**.

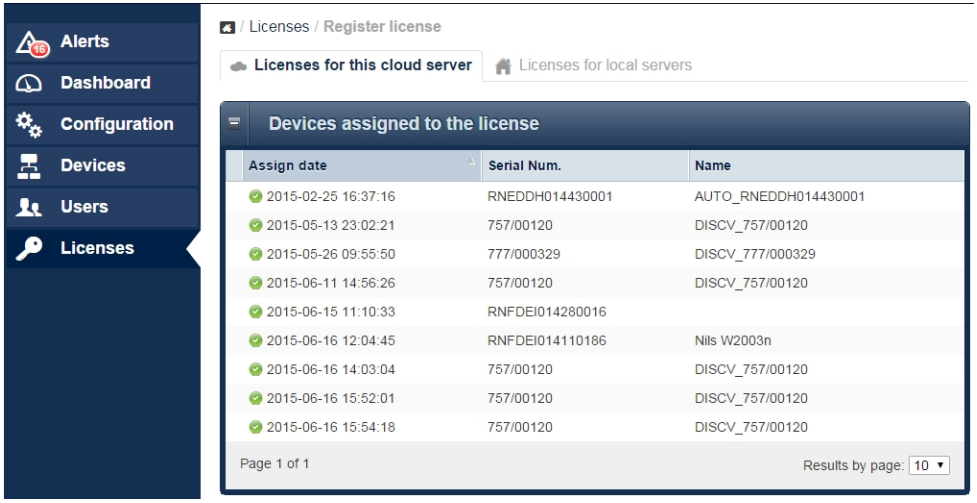


Fig. 177: Devices that are associated with the licence

10.3 Creation of profiles

10.3.1 Creation of network profiles (SSID)

At least one network profile (SSID) must be created.

To do so, go to the **Configuration**->**Network** menu.

Click on **New Network Profile**.

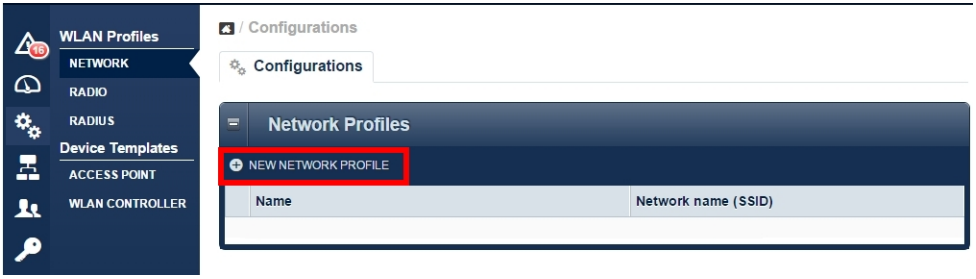


Fig. 178: Network profiles

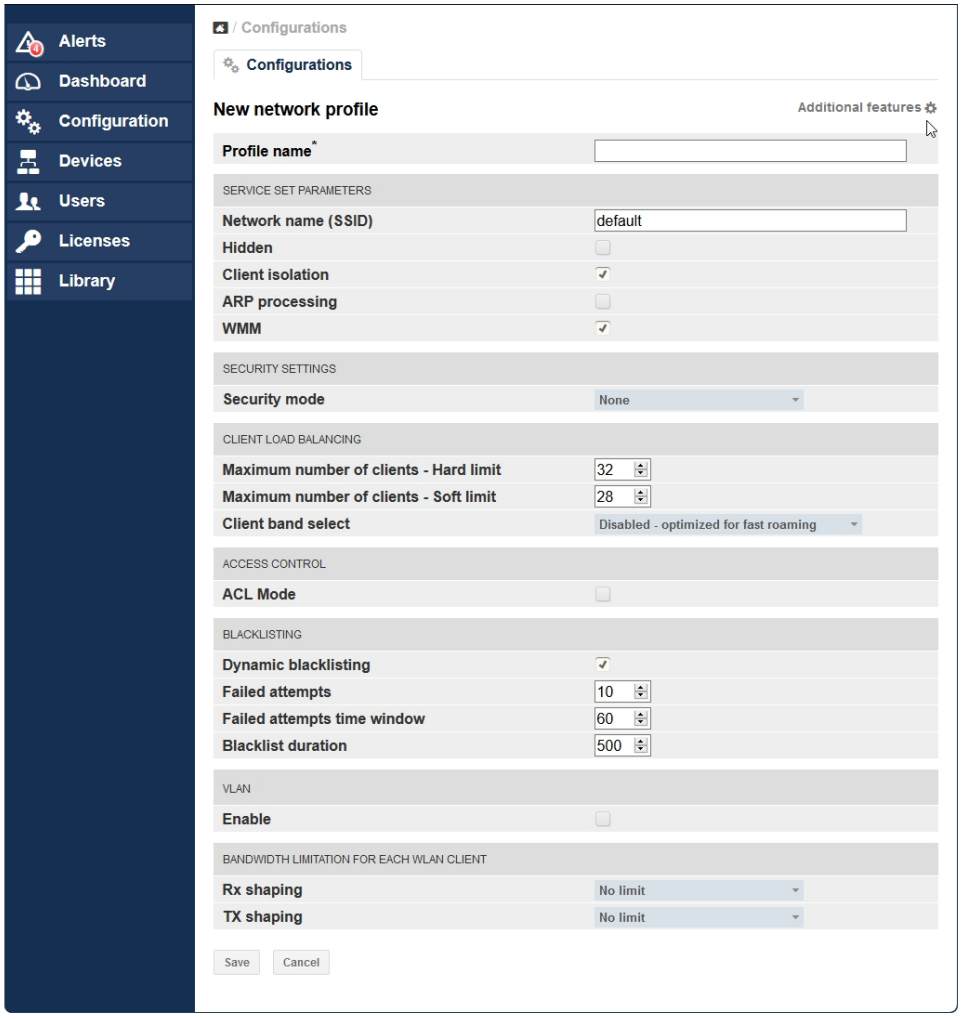


Fig. 179: Configuring network profiles

The important parameters for the respective SSID are predefined. The parameters are identical to the default configuration of the bintec access points or the WLAN Controllers.

- In **Profile name** enter the name of the WLAN network profile..
- The **Network Name (SSID)** is the name of the WLAN network that is viewed by the users of the access points.
- Click on **Save** to confirm your details.

10.3.2 Creation of radio profiles

At least one radio profile must be created.

If access points with two radio modules are to be administered, a radio profile must be created for 2.4 GHz and 5 GHz. The parameters are identical to the default configuration of the bintec access points or the WLAN Controllers.

Go to the **Configuration**->**Radio** ->**New radio profile** menu.

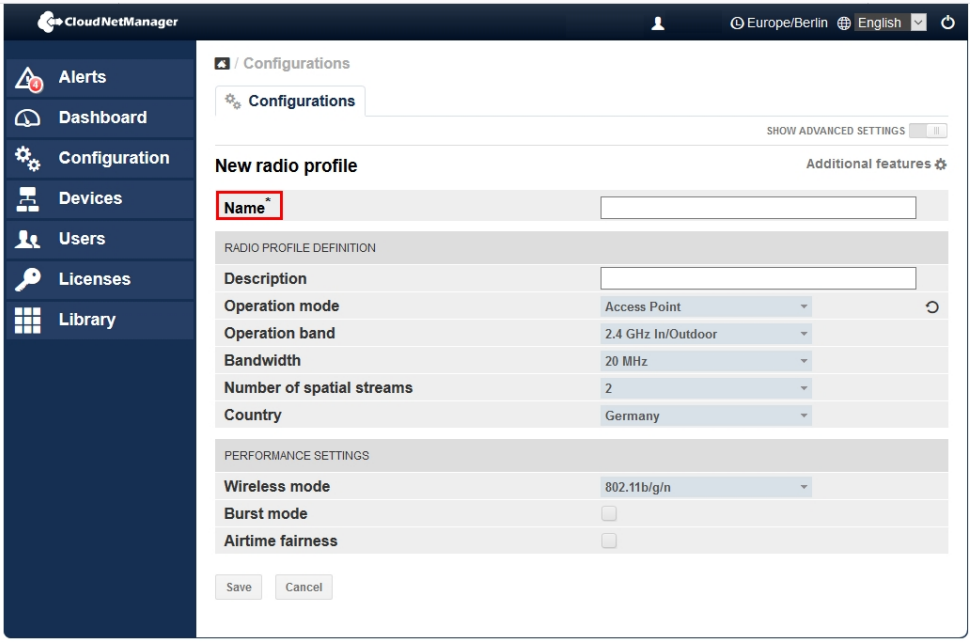


Fig. 180: New radio profile

Proceed as follows:

- Enter a **Name** for the radio profile.
- Set **Operation mode** to `Access Point`.

- Select the *20 MHz* **Bandwidth** for **Operation band** = *2.4 GHz*.
- Select the *20 MHz* or *40 MHz* **Bandwidth** for **Operation band** = *5 GHz*.
- Set the **Wireless mode** for 2.4 GHz profile to *802.11b/g/n*.
- Set the **Wireless mode** for 5 GHz profile to *802.11ac/a/n*.
- Confirm your details by clicking on **Save**.

10.3.3 Creation of device templates / access point template

At least one device template must be defined.

Go to the **Configuration**->**Access Point**->**New Access point template** menu.

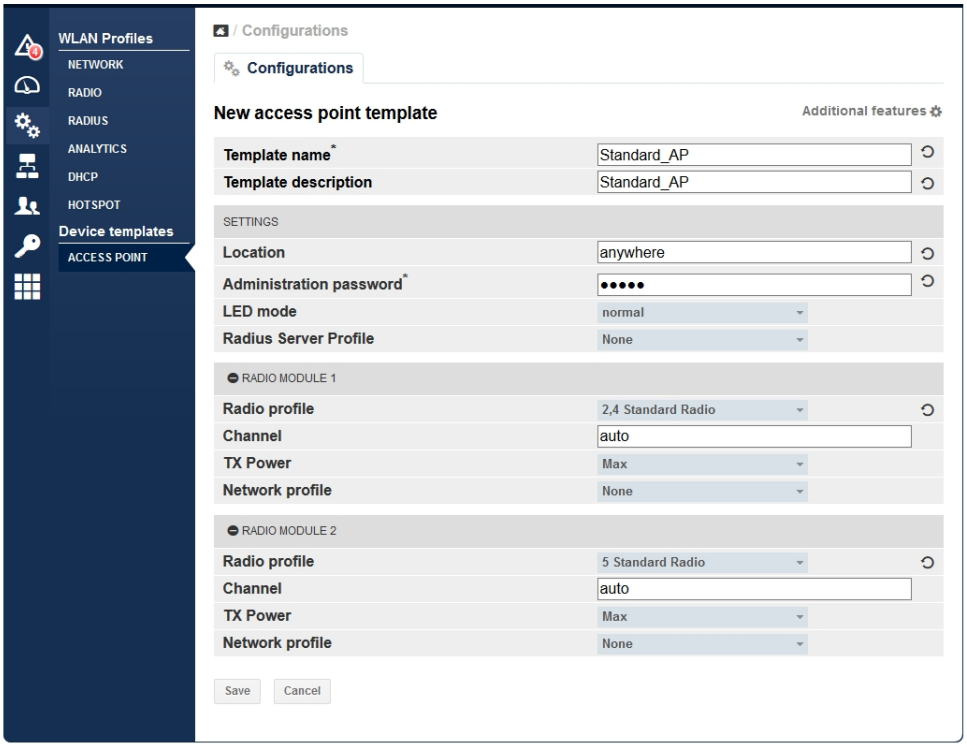


Fig. 181: Device template

Proceed as follows:

- For **Template name** please enter a template name.
- Enter the **Administration password**.
- The **Administration password** is the password to locally login to an access point. In

comparison to bintec WLAN Controller, here it is possible to log into one access point locally. However, all WLAN parts relevant for configuration cannot not be locally configured.

- If, in the case of SSID configuration, you select the security mode `WPA Enterprise`, you must define a **Radius Server Profile**.
- It is important for a 2.4 GHz to be associated with radio module 1 and a 5 GHz radio profile to be associated with radio module 2.
- Confirm your details by clicking on **Save**.

10.3.4 Administer devices

In the **Devices** menu, a list of all registered device is displayed. First, you must create a **Group**.

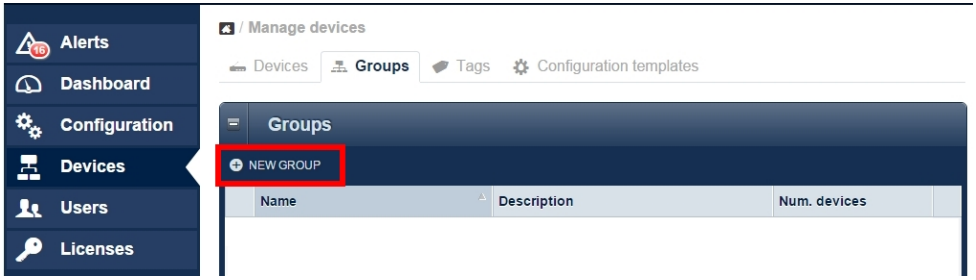


Fig. 182: Administer devices

Go to the **Devices**->**Groups**->**New Group** menu.

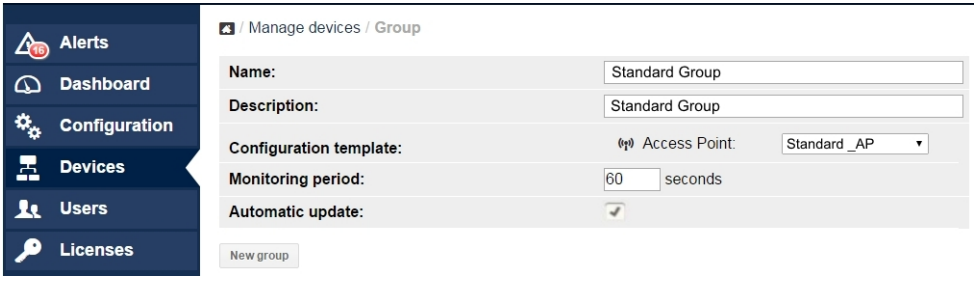


Fig. 183: Administer devices/group

- Select the previously defined **Configuration template**.
- Activate the **Automatic update**. In doing so, the configuration change becomes effective immediately. Furthermore, newly registered access points are automatically put into operation with this default group immediately.

- Confirm your details by clicking on **New group**.

10.4 Register and administer access points

To add a new device, go to the **Devices->Managed Devices->Add Devices** menu.

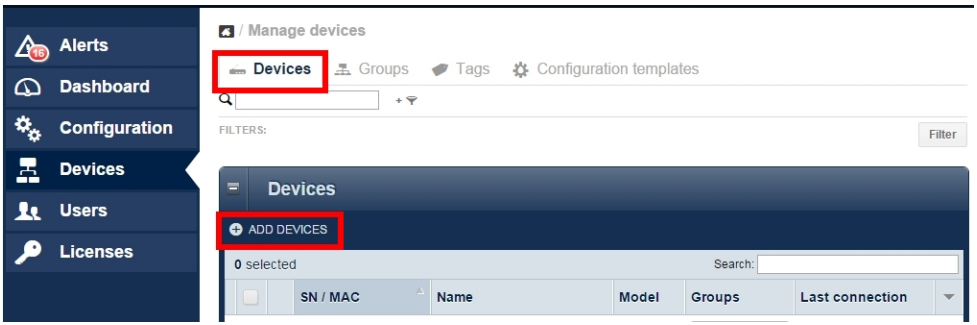


Fig. 184: Register and administer access points

10.4.1 Manually register devices

For manual registration, go to the **Devices->Add Devices->Manual registration** menu.

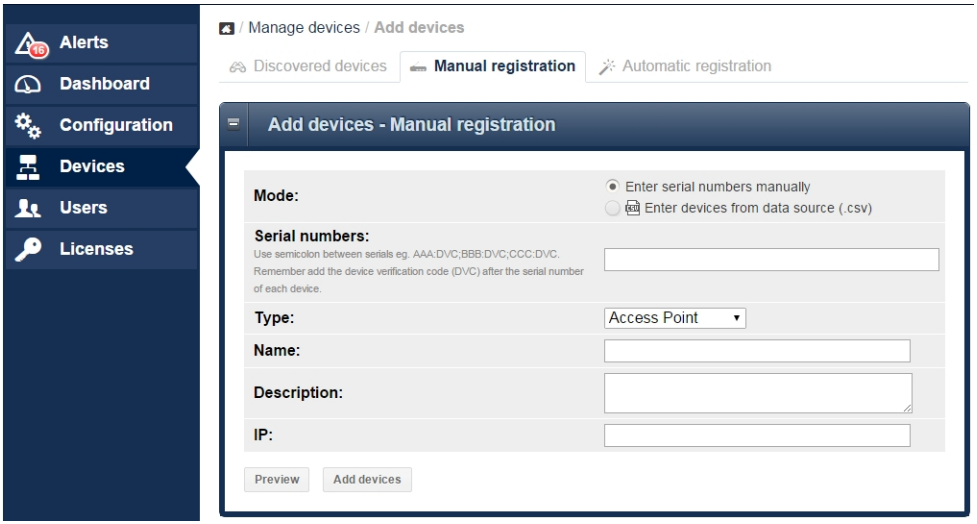


Fig. 185: Manual registration

Proceed as follows:

- If the **Mode Enter serial numbers manually** option is activated, you will need the **Serial number,** which is located on the device's name plate.
- If the **Mode Enter devices from data source** option is activated, you will need the **Device Verification Code (DVC),** which is located on the device's name plate. If the DVC is not on the device's name plate, please contact our support.
- If you would like to register more than one device at a time, you can create and scan a **CSV File**.
- Click on **Add devices** to confirm your details.

10.4.2 Automatically register device

For automatic registration, go to the **Devices**->**Add Devices**->**Automatic registration** menu.

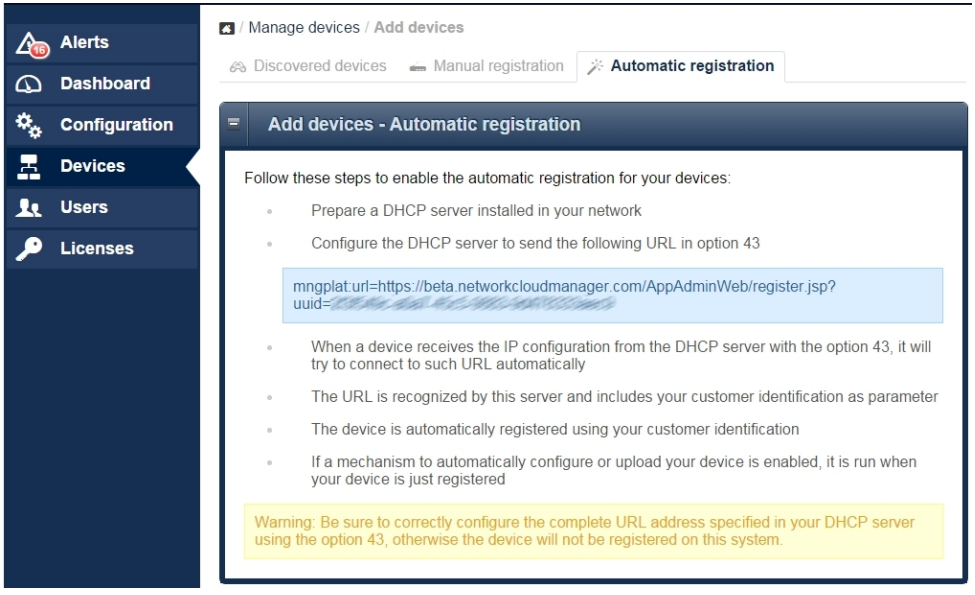


Fig. 186: Automatic registration

With the **DHCP option** *43*, the local DHCP server of the network in which the access point is located, can inform the access point, which user ID the access point is to use to login to Cloud NetManager. In doing so, an automatic registration and automatic commissioning without entering the serial number and DVC (see *Administer devices* on page 266) is enabled.

10.5 Device administration

In the **Devices** menu, registered devices are displayed.

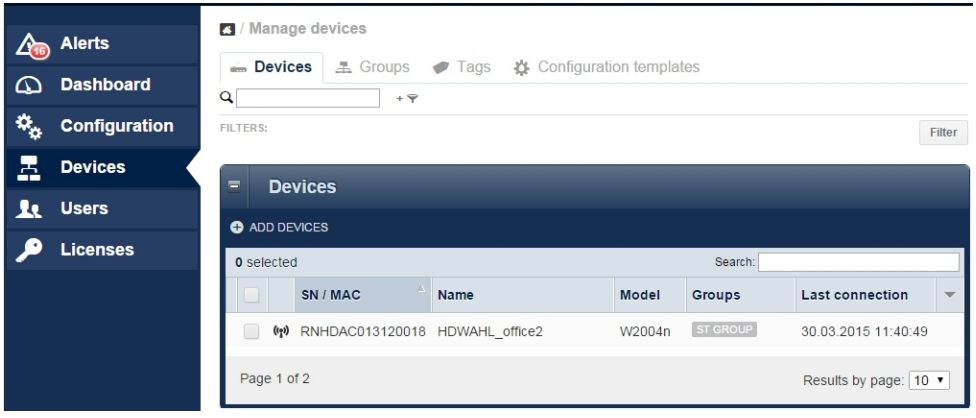


Fig. 187: Display devices

By clicking on the line of the device in the overview, a detailed view is displayed.

Using **Edit** you can edit the **Details**. Click on **Health** or **Advanced** to display these options.

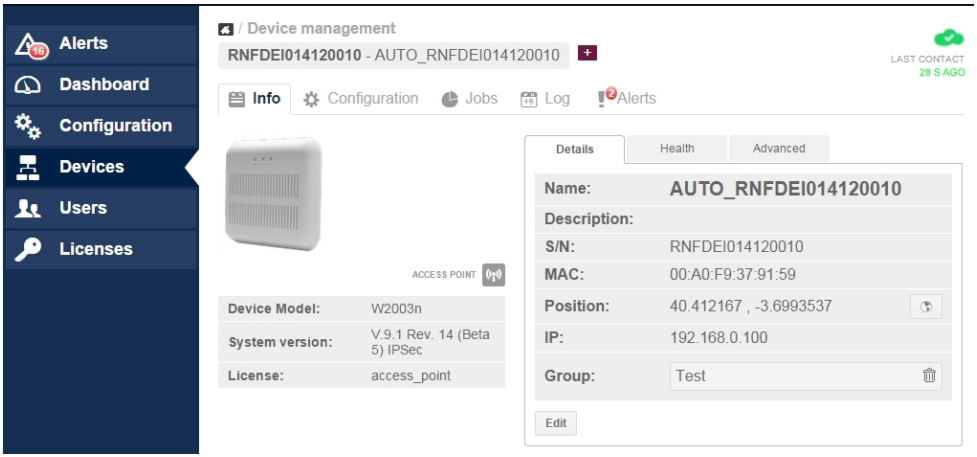


Fig. 188: Detailed view

10.5.1 Batch operations and software update

Further device administration options are available in the device view. If you mark several devices in the device view, there is, for example, the option of starting **Batch Operations** to update the **Firmware** of the marked devices.

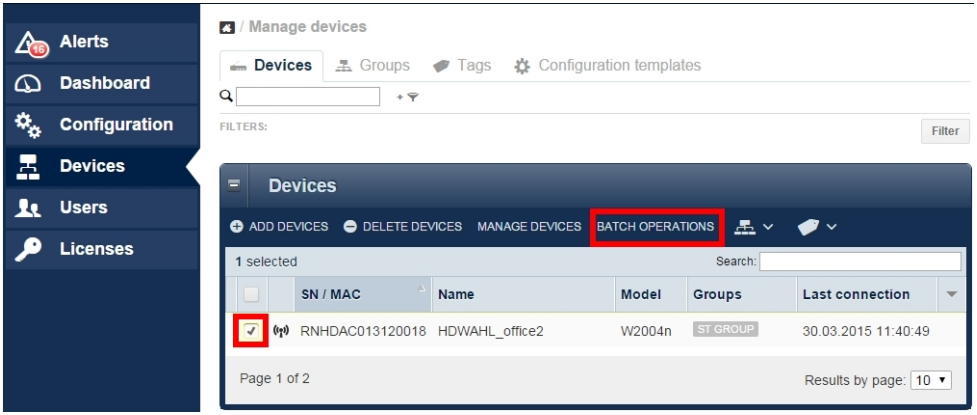


Fig. 189: Batch operations

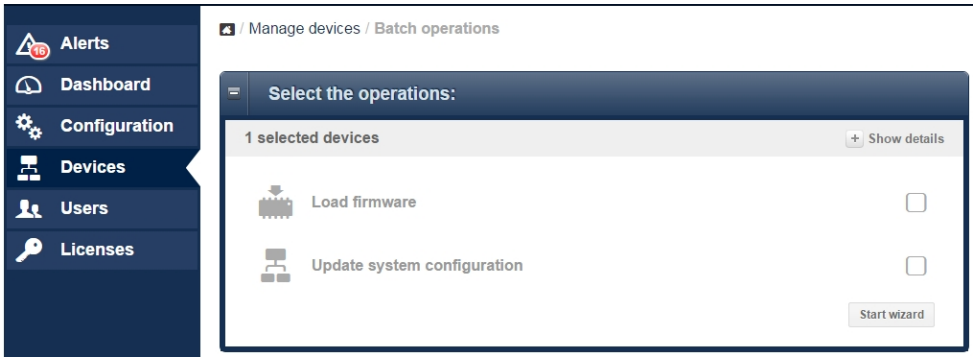


Fig. 190: Select operations

10.6 Appendix

10.6.1 Establishing another data centre

If you do not want to use our Cloud NetManager as an SAAS (Software as a Service), but want to host the virtual Cloud NetManager in your own data centre, you must assign the access points to another Cloud NetManager URL. You have two options.

10.6.1.1 URL allocation via DHCP Option 43

You can assign the access points to another Cloud NetManager URL. You must configure **Option 43** (vendor specific option) on the local DCHP server.

If you are using the DCHP server of a **bintec** router, proceed as follows:

Enter **GUI** (Graphical User Interface) in the **Local Services**->**DHCP Server**->**DHCP Configuration** menu.

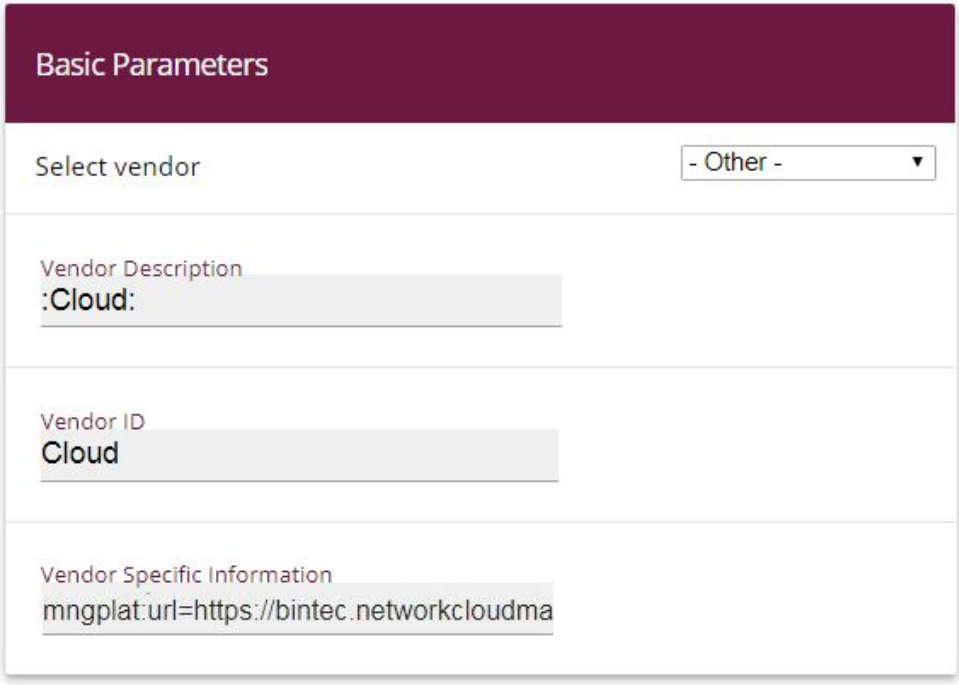


Fig. 191: **Local Services** -> **DHCP Server** -> **DHCP Configuration**

- Choose the icon to edit an existing entry.
- Go to **Advanced Settings**.
- In the **Vendor Specific Information (DHCP Option 43)** field, click on the **Add Vendor**

String button.

- Under **Select vendor**, choose `-Other-`.
- Under **Vendor Description**, enter the name of the manufacturer, e.g. `:Cloud:`.
- To identify the device, enter the **Vendor ID**, e.g. `Cloud`.
- Under **Vendor Specific Information**, enter the new Cloud NetManager URL. If you want to submit a user ID, please read the string from the Cloud NetManager (see *Automatically register device* on page 268).
- Click **Apply**.

10.6.1.2 Direct URL change in the GUI

Using the **GUI** of the Access Point, you can enter other Cloud NetManager addresses.

Optionally, the user ID of the account in question can be transferred. In this case, the device is automatically registered and configured with the default configurations.

In the **System Management** menu, go to **Global Settings** -> **System**.

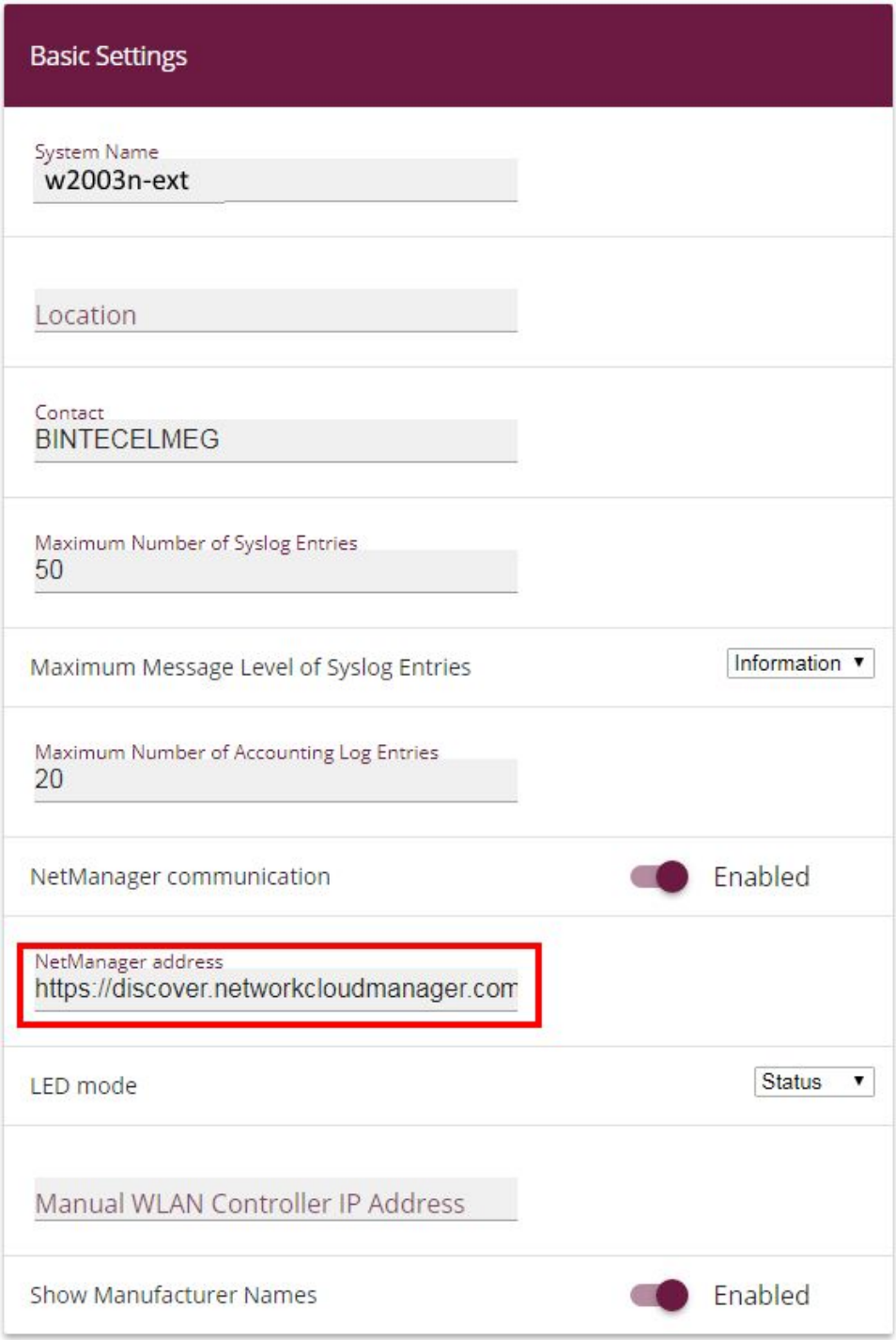

Basic Settings
System Name
w2003n-ext
Location
Contact
BINTECELMEG
Maximum Number of Syslog Entries
50
Maximum Message Level of Syslog Entries
Information
Maximum Number of Accounting Log Entries
20
NetManager communication
Enabled
NetManager address
https://discover.networkcloudmanager.com
LED mode
Status
Manual WLAN Controller IP Address
Show Manufacturer Names
Enabled

Fig. 192: **System Management->Global Settings ->System**

- Enable the **NetManager communication** option.
- Enter the Address of the Cloud NetManager server in the **NetManager address** field.
- Press **OK** to confirm your entries.

10.6.2 Automatic configuration

With the Cloud NetManager, you have the option of automatically transferring a previously-determined configuration to every new Access Point which is connected to the local LAN. This method is suitable, for example, for small businesses which do not have their own in-house IT staff, but which need to quickly and easily put new access points into operation.

In order to use this automatic configuration, three requirements must be met:

(a) The access point must be able to automatically log into the Cloud NetManager. To this end, the DCHP Option 43 must be set up with the User ID string, or the Cloud NetManager URL must be adjusted in the GUI of the Access Point. You can view the client-specific URL and User ID under **Devices->Add Device->Automatic Login** in the Cloud NetManager.

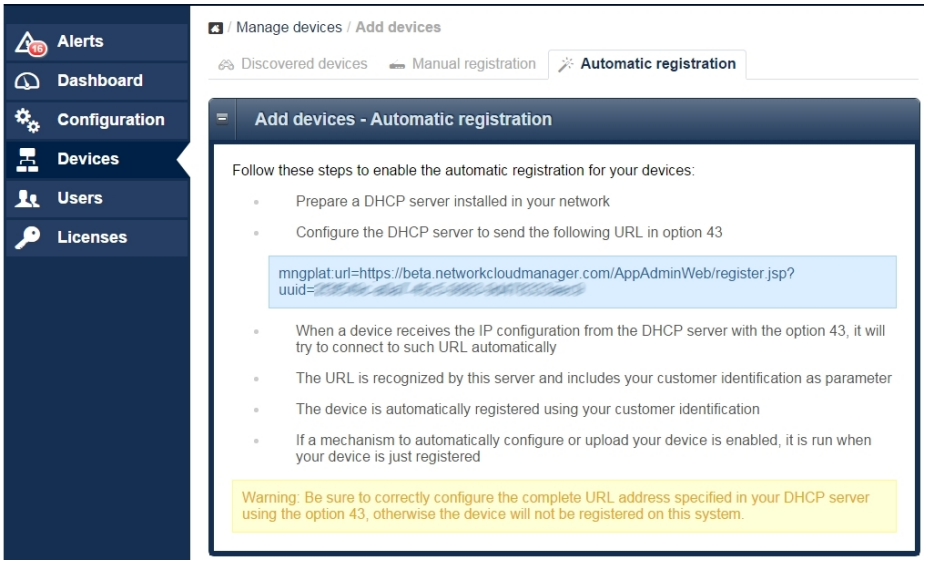


Fig. 193: **Devices->Add Device->Automatic Login**

(b) In the Cloud NetManager, under **Devices->Groups**, a standard group must be defined.

(c) In the Cloud NetManager, under **Devices->Groups**, under the Standard group the **Automatic Update** option must be activated.

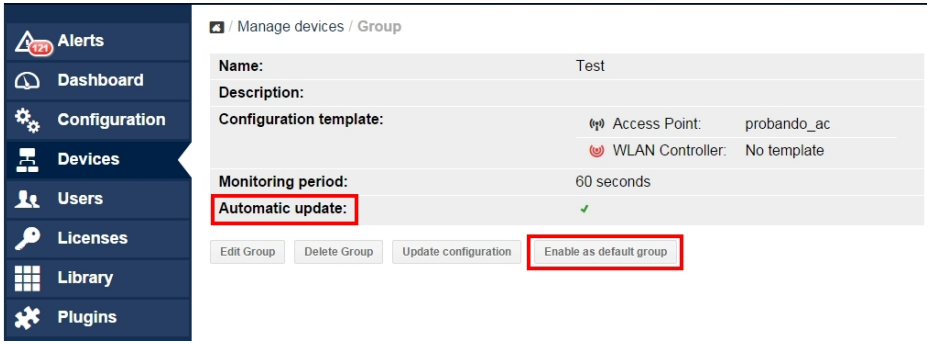


Fig. 194: **Devices->Groups**

10.7 Error search

10.7.1 A new device is not visible

There are a number of reasons why a device is not displayed in the device overview although the correct DVC was entered.

- The device is locally administered by a WLAN Controller. Please reset the device to the ex works state and delete the **WLAN Controller** DHCP option in the local DHCP server.
- The local firewall blocked port 443 for outgoing connections.

10.7.2 No more communication with an administered device

The logo that displays the communication state is no longer green but red.

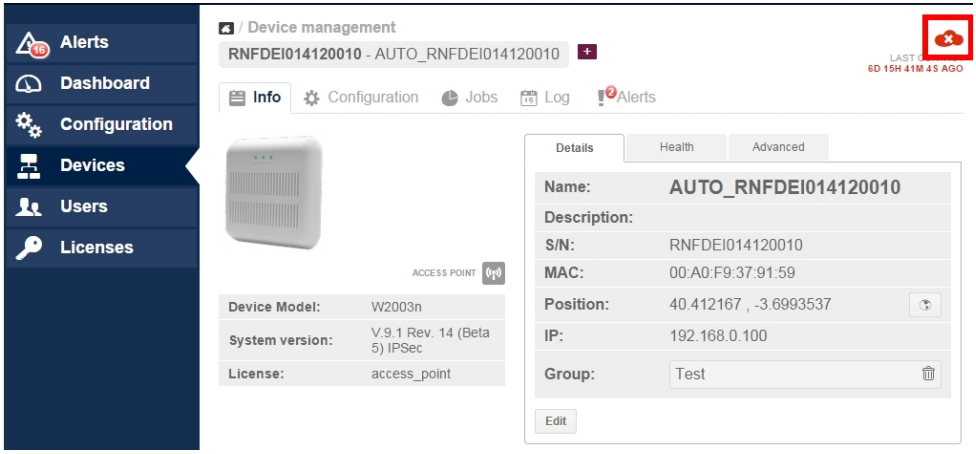


Fig. 195: Communication error

First, it must be ensured that the access point has an Internet connection. If the problem persists, the cause may be an incorrect SSL certificate. This can have different causes, e.g., it may have been deleted on the access point or the device may have been register to another account.

In this case, the device configuration must be reset to the ex works state and the security certificate on the server must be deleted from the access point in question.

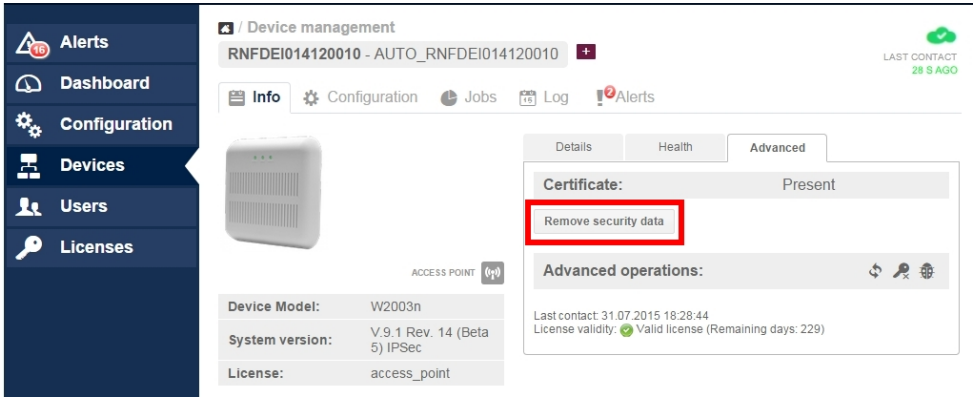


Fig. 196: Communication error

10.7.3 Further debug options

In the **Devices**->**Manage devices** menu, select a device. Go to **Manage devices**->**Configuration**.

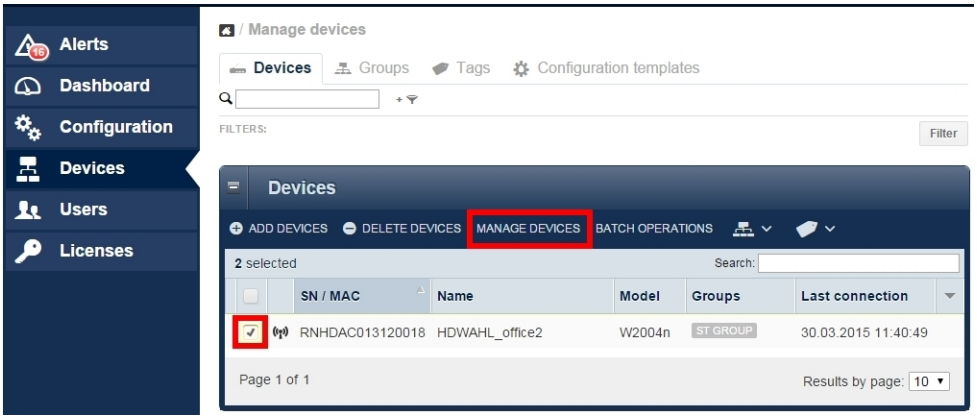


Fig. 197: Communication error

Click on the small logo to display the configuration file.

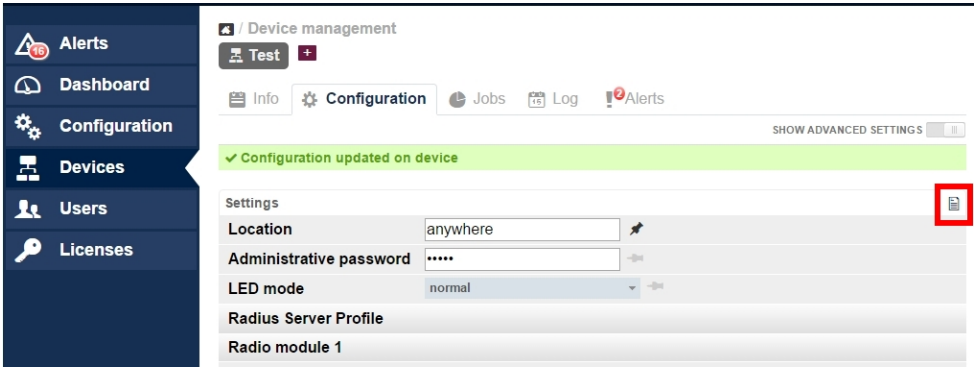


Fig. 198: Debug options

Make sure that all passwords in this file are encrypted.

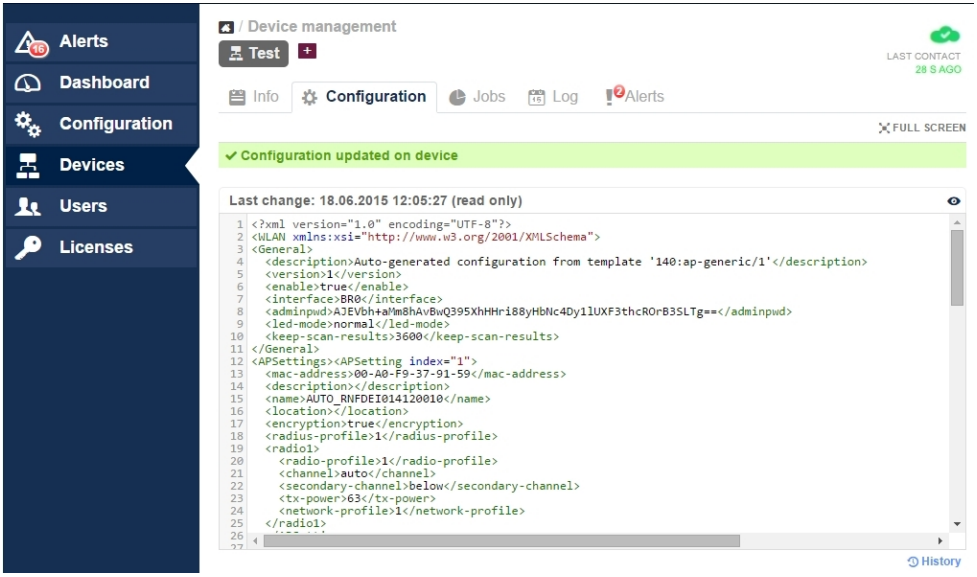


Fig. 199: Debug message

10.7.4 Debugging at device level

Correct timestamps

Access points need a correct time setting in order to transmit and allocate performance values. Therefore, check the time setting before starting error diagnostics.

A DHCP server can be used as time server too. If you use a **bintec** device for this, go to the **System Management**->**Global Settings**->**Time and Date** menu and activate the **Internal Time Server** item.

Using static IP addresses you can enter manually up to three time servers in the same menu.

Debugging

If there is no communication between the access point and Cloud NetManager, you can track communications using Telnet or the SSH terminal. You must log into the access point and enter the command “debug tremp”. No communication between the access point and Cloud NetManager is displayed.

```
Welcome to W2004n version V.9.1 Rev. 14 (Beta 4) IPSec from 2015/05/27 00:00:00
systemname is w2004n, location


Login: admin
Password:

Password not changed. Call "setup" for quick configuration.

w2004n:> debug tremp
08:48:56 INFO/TREMP: -> https://discover.networkcloudmanager.com/api/task/all
08:49:01 INFO/TREMP: <- HTTP/1.1 200 OK
08:49:06 INFO/TREMP: ->
https://discover.networkcloudmanager.com/api/monitor/system/events
08:49:06 INFO/TREMP: The message has been compressed about 36%
08:49:09 INFO/TREMP: <- HTTP/1.1 200 OK
08:49:26 INFO/TREMP: -> https://discover.networkcloudmanager.com/api/task/all
08:49:29 INFO/TREMP: <- HTTP/1.1 200 OK
08:49:36 INFO/TREMP: ->
https://discover.networkcloudmanager.com/api/monitor/system/events
08:49:36 INFO/TREMP: The message has been compressed about 23%
```

In this way, communication problems and certification problems can be analysed quickly.