

## Interoperability Report

This document captures a summary of the WLAN interoperability verification test results of Aruba's and Siemens' platform and its associated configuration guide.

Aruba	:	AOS 8.7.1.0, 7008, AP535 (Campus)
Siemens	:	SCALANCE W734-1 RJ45 (Model: MSN-W1-RJ-E2)
Validated by	:	Rajesh Sivasubramanian, Aruba Networks, Santa Clara
January 2021		

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## About Aruba

Aruba, a Hewlett Packard Enterprise company, is a leading provider of next-generation networking solutions for enterprises of all sizes worldwide. The company delivers IT solutions that empower organizations to serve the latest generation of mobile-savvy users who rely on cloud-based business apps for every aspect of their work and personal lives. To learn more, visit Aruba at <http://www.arubanetworks.com> . For real-time news updates follow Aruba on Twitter and Facebook, and for the latest technical discussions on mobility and Aruba products visit Airheads Social at <http://community.arubanetworks.com> .

## About Siemens

Siemens is a global innovator focusing on digitalization, electrification and automation for the process and manufacturing industries, and is a leader in power generation and distribution, intelligent infrastructure, and distributed energy systems. For more than 160 years, the company has developed technologies that support multiple American industries including manufacturing, energy, healthcare, and infrastructure.

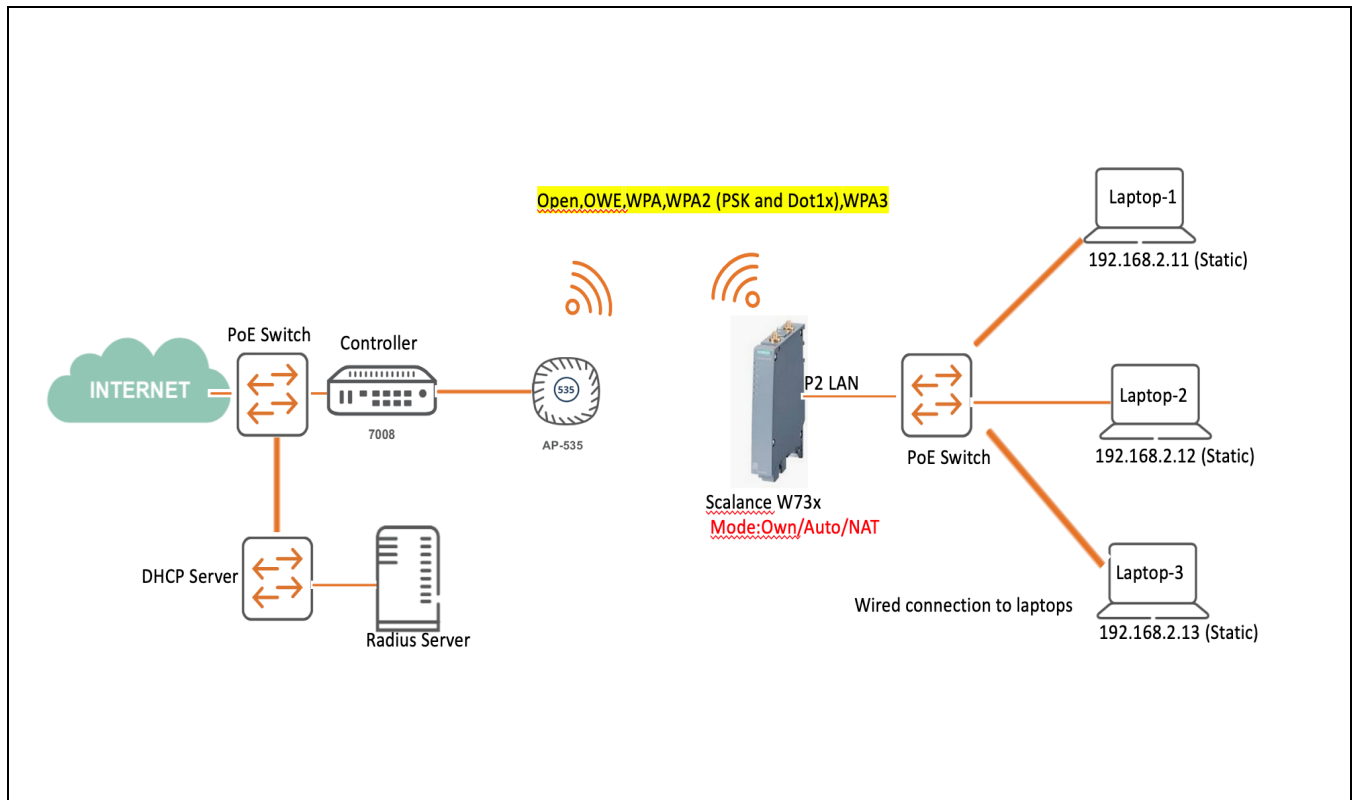
## General Conclusions

Validation of basic features including authentication, association and bi-directional traffic produced good results.

Standards including 802.11r/v/k/w/OKC/WPA3/WiFi5/WiFi6 were enabled on AP. The client does not support these protocols but the client's resilience, stability and ability to associate and stay connected was tested. The client did not have any problem operating on a SSID with these protocols enabled.

Auto Mode and Own Mode on the Siemens wireless bridge were tested. NATing with three wired laptops behind the Siemens wireless bridge was validated as well.

## Test Topology



## Interoperability Test Result

Client Device Details		
Client Device Make	Siemens	
Client Device Type	Wireless Bridge	
Client Device Model	SCALANCE W734-1 RJ45	
Client Device OS type	V06.05.00	
Tested Client Device NIC capability	11N, 2x2	
Controller Details		
Aruba OS Version	8.7.1.0-77203	
Aruba Controller	7008	
Access Point	AP535 (WiFi6 , 4x4 )	
Basic Wi-Fi Interoperability Test and Capability Results		
Feature	Support	Capability Details
Association		
Supported Encryption	✓	Open,PSK(TKIP/AES), Enterprise (TKIP/AES), Mixed (PSK/AES)
Channels		
2.4 GHz Radio	✓	1,6,11
5 GHz Radio	✓	36-165
Roaming		
PMK Caching	✓	Supported. Roam Time typically 50 ms between Probe request to new bssid and the 4-way handshake completion.
Opportunistic Key Caching (OKC)	X	Not supported by client
Fast Transition (802.11r)	X	Not supported by client
Protocols		
BSS Transition (802.11v)	X	Not supported by client
WMM Client (802.11e)	✓	802.11e Capable
WMM-PS (U-APSD)	X	Not Supported by client
Radio Resource Management (802.11k)	X	Not supported by client
Management Frame Protection (802.11w)	X	Not supported by client
802.11h and 802.11d	✓	Supports DFS and TPC
WPA3 Capabilities		
OWE	X	Not Supported but the client can associate as Open client with OWE Transition mode VAP.
WPA3-SAE	X	Not Supported but the client can associate as WPA2PSK client with SAE Mixed mode VAP.
WPA3-CCM-128	X	Not supported by client
WPA3-SuiteB	X	Not supported by client
WPA3-AES-GCM-256	X	Not supported by client

802.11ax Client Capabilities		
802.11ax	X	Not supported but the client can associate successfully as 11n client to HE-SSID
Notes and Additional Comments		
<p><b>NOTE:</b> Client Device may support a superset of the above capabilities</p> <p><b>ABBREVIATIONS:</b> NR: Neighbor Report; BR: Beacon Report; LM: Link Measurement, TSM: Transmit Stream Measurement, MFP: Management Frame Protection, FT: Fast Transition, OKC: Opportunistic Key Caching, DFS: Dynamic Frequency Selection, TPC: Transmit Power Control, HE : High Efficiency,SAE : Simultaneous Authentication of Equals</p>		

## Validation: Aruba Configuration

### References

[https://support.hpe.com/hpesc/public/docDisplay?docLocale=en\\_US&docId=a00105869en\\_us](https://support.hpe.com/hpesc/public/docDisplay?docLocale=en_US&docId=a00105869en_us)

### SSID configuration:

Please refer to Chapter 24 on Page 526 on [8.7.1.0 User Guide](#)

### Configuration -> WLAN -> General

RoamDot1x	General	VLANs	Security	Access
Name (ssid):	<input type="text" value="RoamDot1x"/>			
Primary usage:	<input checked="" type="radio"/> Employee <input type="radio"/> Guest			
	Select AP Groups <input type="button" value="v"/>			
Broadcast on:	<input type="checkbox"/> default <input type="checkbox"/> AP535 <input checked="" type="checkbox"/> Roam			
Forwarding mode:	<input type="button" value="v"/> Tunnel			

### Configuration -> WLAN -> VLAN

RoamDot1x	General	VLANs	Security	Access
VLAN:	<input type="button" value="v"/> 192			

### Configuration -> WLAN -> Security

RoamDot1x	General	VLANs	Security	Access
More Secure				
<input checked="" type="checkbox"/> Enterprise				
<input type="checkbox"/> Personal				
<input type="checkbox"/> Open				
Less Secure				
Key management:	<input type="button" value="v"/> WPA2-Enterprise			
Auth servers:	HomeFree... <input type="button" value="+"/>			
Reauth interval:	<input type="text" value="86400"/> <input type="button" value="v"/> sec.			
Machine authentication:	<input type="button" value="v"/> Disabled			
Blacklisting:	<input type="checkbox"/>			

## Configuration -> WLAN -> Access

**RoamDot1x**    **General**    **VLANs**    **Security**    **Access**

Default role:

Server-derived roles:

Show [roles](#)

Change the 'Max IPv4 for wireless user' value under corresponding AAA profile to reflect the number devices that will be connected behind the Siemens wireless bridge.

Mobility Controller > MM-7008-6

Dashboard

Configuration

**WLANs**

- Roles & Policies
- Access Points
- AP Groups
- Authentication
- Services
- Interfaces
- System
- Tasks
- Redundancy
- IoT
- Diagnostics
- Maintenance

**RoamDot1x**    **General**    **VLANs**    **Security**    **Access**

**Profiles for WLAN RoamDot1x**

- wireless LAN
  - Virtual AP
    - RoamDot1x
      - 802.11k
      - AAA**
      - Anyspot
      - Hotspot 2.0
      - SSID
      - WMM Traffic management

**AAA Profile: RoamDot1x\_aaa\_prof**

AAA Profile:  +

Initial role:

MAC Authentication Default Role:

802.1X Authentication Default Role:

Download Role from CPPM:

Set username from dhcp option 12:

L2 Authentication Fail Through:

Multiple Server Accounting:

User idle timeout:  seconds

**Max IPv4 for wireless user:**

RADIUS Roaming Accounting:

RADIUS Interim Accounting:

RADIUS Acct-Session-Id In Access-Request:

User derivation rules:

Wired to Wireless Roaming:

Reauthenticate wired user on VLAN change:

Device Type Classification:

Enforce DHCP:



(MM-7008-6) [mynode] #show wlan ssid-profile RoamDot1x\_ssid\_prof

SSID Profile "RoamDot1x\_ssid\_prof"

```

-----
Parameter                               Value
-----
SSID enable                             Enabled
ESSID                                    RoamDot1x
WPA Passphrase                           N/A
Encryption                               wpa2-aes
Opmode transition                         Enabled
Enable Management Frame Protection (for WPA2 opmodes) Disabled
Require Management Frame Protection (for WPA2 opmodes) Disabled
DTIM Interval                            1 beacon periods
802.11a Basic Rates                       6 12 24
802.11a Transmit Rates                    6 9 12 18 24 36 48 54
802.11g Basic Rates                       1 2
802.11g Transmit Rates                    1 2 5 6 9 11 12 18 24 36 48 54
Station Ageout Time                       1000 sec
Station Refresh Direction                  bidirectional
Max Transmit Attempts                     8
RTS Threshold                             2333 bytes
Short Preamble                            Enabled
Max Associations                           64
Wireless Multimedia (WMM)                 Enabled
Wireless Multimedia U-APSD (WMM-UAPSD) Powersave Enabled
WMM TSPEC Min Inactivity Interval         0 msec
WMM DSCP Mapping Control                  Enabled
DSCP mapping for WMM voice AC (0-63)      56
DSCP mapping for WMM video AC (0-63)      40
DSCP mapping for WMM best-effort AC (0-63) 24
DSCP mapping for WMM background AC (0-63) 16
WMM Access Class of EAP traffic           default
Multiple Tx Replay Counters               Enabled
Hide SSID                                 Disabled
Deny_Broadcast Probes                    Disabled
Local Probe Request Threshold (dB)        0
Auth Request Threshold (dB)               0
Disable Probe Retry                       Enabled
Battery Boost                             Disabled
WEP Key 1                                 N/A
WEP Key 2                                 N/A
WEP Key 3                                 N/A
WEP Key 4                                 N/A
WEP Transmit Key Index                    1
WPA Hexkey                                N/A
Maximum Transmit Failures                 0
EDCA Parameters Station profile            N/A
EDCA Parameters AP profile                 N/A
BC/MC Rate Optimization                   Disabled
Rate Optimization for delivering EAPOL frames Enabled
Strict Spectralink Voice Protocol (SVP)   Disabled
High-throughput SSID Profile               default
High-efficiency SSID Profile               default
802.11g Beacon Rate                       default
802.11a Beacon Rate                       default
Video Multicast Rate Optimization         default
Advertise QBSS Load IE                     Disabled
Advertise Location Info                    Disabled
Advertise AP Name                          Disabled
Traffic steering from WLAN to cellular     Disabled
802.11r Profile                           default
Enforce user vlan for open stations        Disabled
Enable OKC                                Enabled

```

## 802.11k configuration:

Please refer to Chapter 24 on Page 541 on [8.7.1.0 User Guide](#)

### GUI:

The following procedure describes how to configure the 802.11k profile:

1. In the **Managed Network** node hierarchy, navigate to the **Configuration > System > Profiles** tab.
2. From the **All Profiles** list, select **Wireless LAN>802.11k**.
3. To edit an existing 802.11k profile, select the 802.11k profile you want to edit. To create a new 802.11k profile, click + and enter a name for the new 802.11k profile in the **Profile name** field.
4. Configure your 802.11k radio settings. The configuration parameters are described in [Table 92](#).
5. Click **Submit**.
6. Click **Pending Changes**.
7. In the **Pending Changes** window, select the check box and click **Deploy Changes**.

### CLI:

```
(host) [node] (config) #wlan dot11k-profile <profile-name>
```

## RRM-IE configuration

### GUI:

1. Navigate to the **Configuration > System > Profiles** tab.
2. From the **All Profiles** list, select **Wireless LAN > RRM IE**.
3. To edit an existing RRM IE profile, select the RRM IE profile you want to edit. To create a new RRM IE profile, click + and enter a name for the new RRM IE profile in the **Profile name** field.
4. Configure your RRM IE settings. The configuration parameters are described in [Table 93](#).
5. Click **Submit**.
6. Click **Pending Changes**.
7. In the **Pending Changes** window, select the check box and click **Deploy Changes**.

### CLI:

```
(host) ^[mynode] (config) #wlan rrm-ie-profile <profile>
```

## 802.11r configuration:

Please refer to Chapter 24 on Page 548 on [8.7.1.0 User Guide](#)

### GUI:

1. In the **Managed Network** node hierarchy, navigate to the **Configuration > System > Profiles** tab.
2. From the **All Profiles** list, select **Wireless LAN > 802.11r**.
3. To edit an existing 802.11r profile, select the 802.11r profile you want to edit. To create a new 802.11r profile, click **+** and enter a name for the new 802.11r profile in the **Profile name** field.
4. Configure your 802.11r radio settings:
  - a. Select the **Advertise 802.11r Capability** option to allow Virtual APs using this profile to advertise 802.11r capability.
  - b. Enter the mobility domain ID value (1-65535) in the **802.11r Mobility Domain ID** field. The default value is 1.
  - c. Enter the R1 Key timeout value in seconds (60-86400) for decrypt-tunnel or bridge mode in the **802.11r R1 Key Duration** field. The default value is 3600.
5. Click **Submit**.

### CLI:

```
(host) [node] (config) #wlan dot11r-profile dot11r_profile
(host) ^[node] (802.11r Profile "dot11r_profile") #dot11r
```

Assign the 802.11r profile to an SSID profile using the following command:

```
(host) [node] (config) #wlan ssid-profile ssid_profile
(host) ^[node] (SSID Profile "ssid_profile") #dot11r-profile dot11r_profile
```

```
(MM_7008_6) [mynode] #show wlan dot11r-profile default
```

```
802.11r Profile "default"
```

```
-----
Parameter          Value
-----
```

```
Advertise 802.11r Capability Enabled
802.11r Mobility Domain ID 1
802.11r R1 Key Duration 3600
802.11r R1 Key Assignment dynamic
(Home_7008_10) [mynode] #
```

## 802.11h and 802.11d configuration:

```
(MM_7008_6) (config) # rf dot11a-radio-profile <profile name>
(MM_7008_6) (config) # csa (Default csa-count is 4)
(MM_7008_6) (config) # dot11h
(MM_7008_6) (config) # write memory
```

In WebUI:

Navigate to Configuration > AP Configuration > AP Group > Edit <AP Group> > RF Management > 802.11a radio profile.

```
(MM-7008-6) [mynode] #show rf dot11a-radio-profile default
```

```
802.11a radio profile "default"
```

```
-----
Parameter          Value
-----
Radio enable       Enabled
Mode               ap-mode
AM tx mute (radio) Disabled
```

High throughput enable (radio)	Enabled
Very high throughput enable (radio)	Enabled
High efficiency enable (radio)	Enabled
Channel	36+
Transmit EIRP	15.0 dBm
Non-Wi-Fi Interference Immunity	2
Spur Immunity	0
Enable CSA	Enabled
CSA Count	5
Spectrum Monitoring	Disabled
Smart Antenna	Disabled
Spectrum Monitoring Profile	default-a
Advertise 802.11d and 802.11h Capabilities	Enabled
Spectrum Load Balancing	Disabled
Spectrum Load Balancing Mode	channel
Spectrum Load Balancing Update Interval (sec)	30 seconds
Spectrum Load Balancing Threshold (%)	20 percent
Spectrum Load Balancing Domain	N/A
Beacon Period	100 msec
Beacon Regulate	Disabled
Advertized regulatory max EIRP	0
ARM/WIDS Override	OFF
Reduce Cell Size (Rx Sensitivity)	0 dB
Energy Detect Threshold Offset	0 dB
Management Frame Throttle interval	1 sec
Management Frame Throttle Limit	30
Maximum Distance	0 meters
RX Sensitivity Threshold	0 dB
RX Sensitivity Tuning Based Channel Reuse	disable
Set to Radar Test Mode	Disabled
Adaptive Radio Management (ARM) Profile	default-a
High-throughput Radio Profile	default-a
AM Scanning Profile	default
Enable frame transmissions	Enabled
Max Channel Bandwidth	80MHz
Min Channel Bandwidth	20MHz
Min EIRP	15 dBm
Max EIRP	21 dBm
EIRP offset	0 dB
Deploy changes daily at	N/A
Association Boost	Disabled

## Validation : Siemens Configuration

### References

[https://cache.industry.siemens.com/dl/files/805/89534805/att\\_911027/v1/BA\\_SCALANCE-W774-W734\\_76.pdf](https://cache.industry.siemens.com/dl/files/805/89534805/att_911027/v1/BA_SCALANCE-W774-W734_76.pdf)

[https://cache.industry.siemens.com/dl/files/828/108612828/att\\_825902/v1/PH\\_SCALANCE-W770-W730-WBM\\_76\\_en-US.pdf](https://cache.industry.siemens.com/dl/files/828/108612828/att_825902/v1/PH_SCALANCE-W770-W730-WBM_76_en-US.pdf)

### SCALANCE W734 Configuration Screenshots

#### WLAN configuration

**SIEMENS** 192.168.1.248/SCALANCE W734-1 RJ45

Welcome admin [Logout](#)

#### WLAN Basic Radio Settings

Basic | **Advanced** | Antennas | Allowed Channels | 802.11n | Client | Signal Recorder | Force Roaming

Country Code:

Device Mode:

Radio	Enabled	Radio Mode	Frequency Band	WLAN Mode 2.4 GHz	WLAN Mode 5 GHz	DFS (802.11h)	Outdoor Mode	max. Tx Power	max. EIRP
WLAN 1	<input checked="" type="checkbox"/>	Client	5 GHz	802.11 n	802.11 n	<input checked="" type="checkbox"/>	<input type="checkbox"/>	20 dBm	26 dBm

Tx Power Check: Following channels are not allowed in current configuration:  
WLAN 1: 36, 40, 44, 48

Warning: The device may not be permitted for use in countries denoted by a "\*" character.  
Please check the following website for more detailed information:  
<http://www.siemens.com/wireless-approvals>

**SIEMENS** 192.168.1.248/SCALANCE W734-1 RJ45

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#### WLAN Advanced Radio Settings

Basic | **Advanced** | Antennas | Allowed Channels | 802.11n | Client | Signal Recorder | Force Roaming

Radio	RTS/CTS Threshold [Bytes]	Fragmentation Length Threshold [Bytes]	HW Retries
WLAN 1	2346	2346	16

Welcome admin [Logout](#)

Antennas

Basic | **Advanced** | Antennas | Allowed Channels | 802.11n | Client | Signal Recorder | Force Roaming

Connector	Antenna Type	Antenna Gain 2.4 GHz [dBi]	Antenna Gain 5 GHz [dBi]	Cable Length [m]	Additional Attenuation [dB]	Antenna Mode
R1 A1	Omni-Direct-Mount: ANT795-4MB	2	3	0	0	RX/TX
R1 A2	Omni-Direct-Mount: ANT795-4MB	2	3	0	0	RX/TX

Dynamic Transmit Antenna Selection (DTAS)

[Set Values](#) [Refresh](#)

Welcome admin [Logout](#)

Allowed Channels Settings

Basic | **Advanced** | Antennas | Allowed Channels | 802.11n | Client | Signal Recorder | Force Roaming

Radio  Use Allowed Channels only

WLAN 1

Frequency Band: 2.4 GHz

Select / Deselect all

Radio	Radio Mode	1	2	3	4	5	6	7	8	9	10	11
WLAN 1	Client	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Frequency Band: 5 GHz

Select / Deselect all

Radio	Radio Mode	36	40	44	48	52	56	60	64	100	104	108	112	116	132	136	140	149	153	157	161	165	
WLAN 1	Client	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

[Set Values](#) [Refresh](#)

Welcome admin [Logout](#)

802.11n Advanced Radio Settings

Basic | **Advanced** | Antennas | Allowed Channels | 802.11n | Client | Signal Recorder | Force Roaming

Radio	A-MPDU	A-MPDU Limit [Frames]	A-MPDU Limit [Bytes]	A-MSDU	A-MSDU Packet Size [Bytes]
WLAN 1	<input checked="" type="checkbox"/>	32	50000	<input checked="" type="checkbox"/>	100

[Set Values](#) [Refresh](#)

Welcome admin | Client Settings

Logout

Basic | Advanced | Antennas | Allowed Channels | 802.11n | Client | Signal Recorder | Force Roaming

WLAN Settings:

Radio	MAC Mode	MAC Address	Any SSID	DHCP Renew After Roaming	min. AP Signal Strength [dBm]
WLAN 1	Automatic	00-00-00-00-00-00	<input type="checkbox"/>	<input type="checkbox"/>	0

Radio	Roaming Threshold	Background Scan Mode	Background Scan Interval [ms]	Background Scan Threshold [dBm]
WLAN 1	medium	idle	5000	0

Scan Channels: WLAN 1 36,40,44,48,52,56,60,64,100,104,108,112,116,132,136,140,149,153,157,161,165

Radio	Enabled	SSID	Security
WLAN 1	<input checked="" type="checkbox"/>	RoamDot1x	Context 1
WLAN 1	<input type="checkbox"/>		Context 1
WLAN 1	<input type="checkbox"/>		Context 1
WLAN 1	<input type="checkbox"/>		Context 1
WLAN 1	<input type="checkbox"/>		Context 1
WLAN 1	<input type="checkbox"/>		Context 1
WLAN 1	<input type="checkbox"/>		Context 1
WLAN 1	<input type="checkbox"/>		Context 1

Warning: The approval process may not be finished in current country for channels denoted by a "\*" character.  
Please check the following website for more detailed information:  
<http://www.siemens.com/wireless-approvals>

- **'Own' MAC mode** : Client uses the MAC address of the Ethernet interface for the WLAN interface.
- **'Automatic' MAC mode** : Client automatically adopt the source MAC address of the first frame that it receives over the Ethernet interface.

NAT configuration

Welcome admin | IP Network Address Translation (NAT) Settings

Logout

Basic | NAT

Interface: P1

Enable NAT

TCP Idle Timeout [s]: 86400

UDP Idle Timeout [s]: 300

Local Interface IP address: 192.168.2.1

Local Interface Subnet Mask: 255.255.255.0

IPv6 Transparent Mode

IPv4 Multicast Forwarding

From Global to Local Interface

From Local to Global Interface

PROFINET Transparent Mode

PROFINET Station Name: \*

Welcome admin | IP Network Address Port Translation (NAPT)

Logout

Basic | NAPT

Interface: P1

Traffic Type: TCP

Global Port: 100

Local IP Address:

Local Port: 100

Select	Enable	Interface	Traffic Type	Global Port	Local IP Address	Local Port
<input type="checkbox"/>	<input checked="" type="checkbox"/>	P1	TCP	100	192.168.2.11	100
<input type="checkbox"/>	<input checked="" type="checkbox"/>	P1	TCP	101	192.168.2.12	101

2 entries.

Create Delete Set Values Refresh