Laboratory pre-configuration

Successfully pass the free certification exam at IW Academy and become an Infinet Certified Engineer.

To the certification exam

In order to setup an operational point-to-point link please follow the steps below.

Perform site survey

- Use InfiNet Wireless link planner tool **InfiPLANNER** to estimate link performance and required configuration in terms of antennas, channel width, Tx power, etc.
- Determine line of sight conditions and obstacles along the path
- Perform spectrum analysis and figure out spectrum occupation and available channels

Pre-configure units in the lab

The equipment list required for lab configuration

Component	Description
	• 2 x Outdoor Units • Supplied
	• 2 x Indoor power supply IDU-BS-G(60W) • Supplied
	• 2 x Power Cord • Supplied

Title

	• 1 x Laptop • Not Supplied
	• 4 x Ethernet patch cords • Not Supplied

Table - The equipment necessary for initial configuration

In the lab and later on site connect the devices as indicated below:

- Connect laptop to the IDU port labeled as "IN" with an Ethernet cable.
- Use another Ethernet cable to connect "GE0" port at the ODU to the IDU port labeled as "OUT".
- Use power cord to connect the IDU using AC mains.

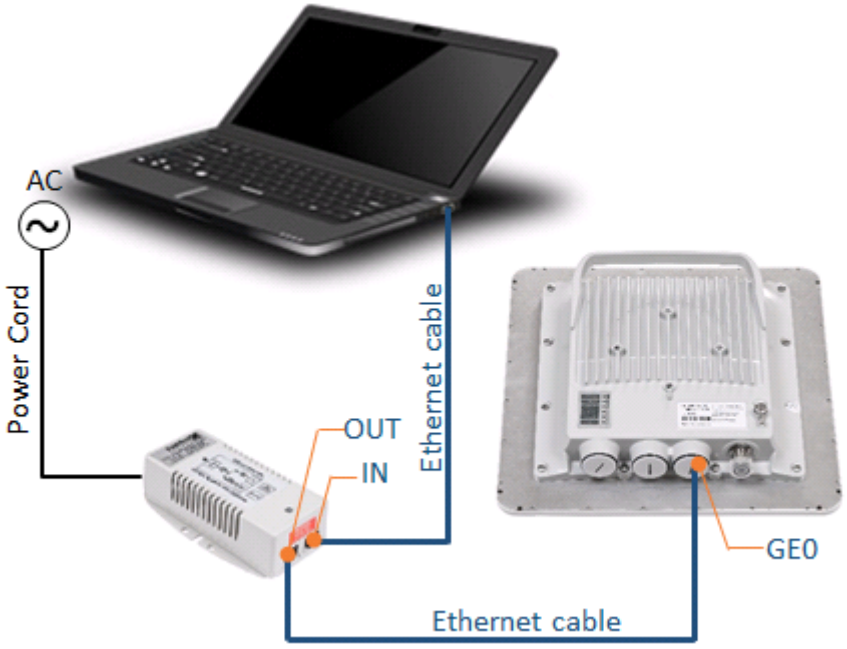


Figure- Connection Scheme

CAUTION

Before supplying power to the Um models an external antenna or RF terminators with 50 Ohms resistance must be connected to **both** N-type connectors.

During laboratory testing, it is allowed to directly connect two devices with RF cables without antennas with the **mandatory** use of attenuators with attenuation of at least 40 dB for each polarization. Switching off/on the attenuators and RF cables should only be performed when the devices are in the off state.

In case the antenna, attenuator or terminator is connected to only one N-type connector **do not switch on** the device.

PLEASE NOTE THAT VIOLATION OF THE ABOVE REQUIREMENTS VOIDS THE WARRANTY.

After the physical connections are completed, configure each unit as described below.

Units settings can be performed via:

- Web interface.
- CLI.

Settings via web interface

Step 1

Access the unit to the default IP address 10.10.10.1 with mask 255.255.255.0 via web browser.

Make sure that the Ethernet port of the Laptop has an IP address assigned from the same subnetwork as the one for the unit (for example, set 10.10.10.50 with mask 255.255.255.0).

Step 2

Use any letters or numbers for initial authentication, for example:

- User name: "login".
- Password: "password".

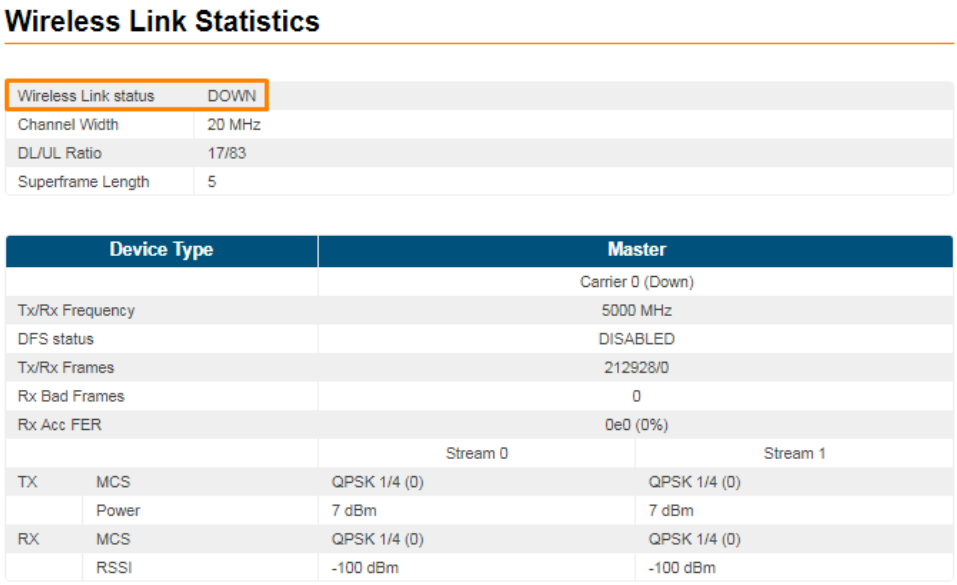
NOTE

Make sure to set strong passwords before running the units in production.

Step 3

Log in to the Web GUI.

Initially the status of the radio link is DOWN like below.



Wireless Link Statistics

Wireless Link status	DOWN
Channel Width	20 MHz
DL/UL Ratio	17/83
Superframe Length	5

Device Type		Master	
		Carrier 0 (Down)	
Tx/Rx Frequency		5000 MHz	
DFS status		DISABLED	
Tx/Rx Frames		212928/0	
Rx Bad Frames		0	
Rx Acc FER		0e0 (0%)	
		Stream 0	Stream 1
TX	MCS	QPSK 1/4 (0)	QPSK 1/4 (0)
	Power	7 dBm	7 dBm
RX	MCS	QPSK 1/4 (0)	QPSK 1/4 (0)
	RSSI	-100 dBm	-100 dBm

Figure - Initial link status

Step 4

Upgrade the units to the latest stable firmware version.

For more details go to the section "Maintenance".

Step 5

Title

Perform radio settings.

Go to the "Radio" section and set the following parameters:

- Node Type (one unit must be set to Master and the other one to Slave).
- Link ID.
- Channel Width.
- Frame period.
- Max Distance.
- Center Frequency.
- Maximal Transmit Power.

NOTE

The detailed description for each radio setting can be found in the section "Radio".

CAUTION

Please note that the following parameters must have the same values at each of the two units in the PtP link. Otherwise the wireless link won't be established:

- Center Frequency
- Channel Width
- Frame Period
- Max Distance
- Short Cyclic Prefix
- Link ID

Step 6

Save the configuration, reboot both units and check if they link is up.

The link status should be UP and the radio statistics should indicate the capabilities and quality of the link.

Wireless Link Statistics

Wireless Link status	UP
Measured Distance	168 meters
Channel Width	20 MHz
DL/UL Ratio	59/41
Superframe Length	5

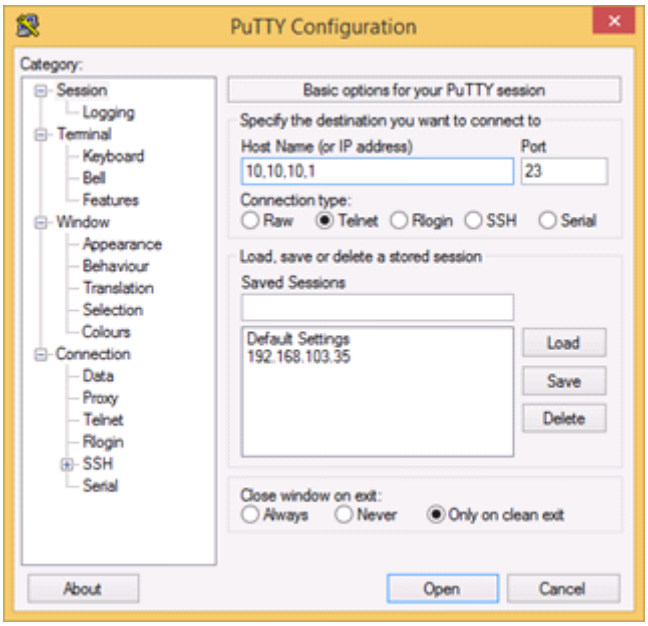
Device Type		Master (local)		Slave (remote)	
Tx Capacity		75200 kbps		97075 kbps	
		Carrier 0 (Up)			
Tx/Rx Frequency		5000 MHz		5000 MHz	
DFS status		DISABLED		DISABLED	
Tx/Rx Frames		72926/26864		131998/37741	
Rx Bad Frames		4		737	
Rx Acc FER		1.49e-4 (0.01%)		1.92e-2 (1.92%)	
		Stream 0	Stream 1	Stream 0	Stream 1
TX	MCS	QAM64 4/6 (5)	QAM64 4/6 (5)	QAM256 30/32 (9)	QAM256 30/32 (9)
	Power	7 dBm	7 dBm	7 dBm	7 dBm
RX	MCS	QAM256 30/32 (9)	QAM256 30/32 (9)	QAM256 6/8 (7)	QAM64 4/6 (5)
	CINR	31 dB	31 dB	31 dB	31 dB
	RSSI	-56 dBm	-56 dBm	-57 dBm	-57 dBm
	Errors	176	168	12136	12167
	Acc TBER	4.09e-4 (0.04%)	3.9e-4 (0.04%)	2.02e-2 (2.02%)	2.03e-2 (2.03%)

Figure - Link UP status

Settings via CLI

Step 1

CLI is available via telnet: "cmd> telnet 10.10.10.1" or use any suitable telnet client such as Putty.



Step 2

Use any letters or numbers for initial authentication, for example:

- User name: "login".
- Password: "password".

NOTE

Make sure to set strong passwords before running the units in production.

Step 3

Check the firmware version and upgrade the units to the latest stable firmware version.

You can check firmware version via command:

```
xginfo version
```

Compare current version of the unit with version on official Infinet ftp server: https://ftp.infinet.ru/pub/Firmware/XG/. In case a newer version is available we recommend upgrading.

For more details go to the section "Maintenance".

Step 4

Title

Configure radio parameters.

Parameter	Command	Value (example)
Node Type	xg -type	master (slave)
Link ID	xg -cell-id	1
Channel Width	xg -channel-width	40
Frame period	xg -sframelen	5
Max Distance	xg -max-distance	1
Downlink Center Frequency	xg -freq-dl	4960
Uplink Center Frequency	xg -freq-ul	5010
Maximal Transmit Power	xg -txpwr	10

NOTE

Commands description is given in the section "Commands for modem configuration".

CAUTION

Please note that the following parameters must match at both units. Otherwise the wireless link won't be established:

- Center Frequency
- Channel Width
- Frame Period
- Max Distance
- Short Cyclic Prefix
- Link ID

NOTE

In order to apply the same settings to the another unit you should use the following command output "*xg config -peer-exported*". Execute these commands in CLI of the another unit.

```
#Peer exported config:
xg -v3-start
xg -v3 a01b833402f59907abdcb812d5de20fd.Ko7ClHTRVps/8oyNjnucBcSqUlcCJbOae9Kf4OZ
xg -v3 zRU7tYm1REMTUyHWYTaGGuuooDp2DWkcxyFGLmEb5yx45wFImL5Nx72XK6bnl9AzRdZjWVSN
xg -v3 xCrliSUfn7JZazn1yTEKE90fKLIK/HKNJXYN7vg4lEocgBWguYdFc/u8fEwENtJYBSKNGbu3
xg -v3 HQ0HvIdTqAwOz5vXM89CkhL5ZZmDuYN3FFSo6wV+h//zBuSfuJ5QVb6fv2Do6tPIE4kuZSsB
xg -v3 UXLavUriPtSlRxzIYUO7+9XSMggomrf7NZtM37PxQkUYIZ116K3++w5HPVXXq8Po7xVmotnq
xg -v3 px1uDbYtSjs2O9yx6h6Z0HGp8GLAEY7Ka5ZRoyAvyfA73pobYrEhzZ+hdwWnDDJYM3DmAhuW
xg -v3 yAUgtVHJ4hC9u6BP5IAlQXsm5QSbuRwihWdmrwiThwSGmXiZWCXOmxzg1IA==
xg -v3-end
```

Step 5

Save configuration.

```
config save
```

Step 6

Restart the unit.

```
restart yes
```

Step 7

Check the link status.

```
Sys log show | grep UP
```

In case of success configuration:

```
[XG]: changed state UP->DOWN
```

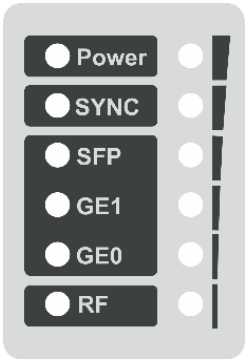
Perform Initial Antenna Alignment

Step 1

Install both units on the pole and direct them at each other (more detailed information about units installation and antenna alignment is described in the section "Units Installing").

Step 2

Turn them on and make sure that the units subsystems are working properly. This can be done by LED indication.



LED	Normal state	Function
Power	On	On - power is applied to the device Off - no power is applied or improper power source
SYNC	On	TDD-synchronization
SFP	On	Ethernet link
GE1	On	Ethernet link
GE0	On	Ethernet link
RF	On	RF link. Blinking while establishing RF link

Table - Indicator Panel Description

Step 3

Perform coarse alignment using built-in signal strength indicators.

> **NOTE**
>
> The more indicators are on, the better wireless connection is established. The blinking indicator means an intermediate state. The more often the indicator blinks the higher level connection is established.

Step 4

Perform fine alignment using the "Alignment tool" available in the Web interface or "xginfo stat" output in the CLI. Try to maximize CINR and RSSI readings. Please follow the detailed indications from section Antenna alignment for a proper antenna alignment.

Optimize the Link Performance

Method 1

Depending on the values for CINR, RSSI change the following parameters:

- Decrease/increase the Tx power level in order to have the CINR above 28 dB and the RSSI between -40...-60 dBm.
- Enable ATPC mode with setting "Target RSSI" value. The RSSI value of the master tries to engage the target range, the center value of which is the "Target RSSI".

Method 2

Use the Spectrum Analyzer tool built-in the Web GUI in order to determine the best frequency and to check the radiation levels in the installation area. Frequency should be left to "auto" in case of Instant DFS units (for unlicensed bands), or it should be set to a specific value (in countries where DFS is not mandatory) on the master unit after performing the Spectrum Analyzing test on both units.

Method 3

Select the most appropriate air frame period:

- A shorter frame period gives lower latency, but also has higher overheads.
- Using longer frame periods cuts down overheads, but increases the latency.

Method 4

Enable "Short Cyclic Prefix" mode in order to mitigate inter-symbol interference due to multipath propagation environment.

Method 5

Enable "Control Block Boost" mode that improves link availability in the most difficult propagation and interference conditions due to the radio frame with control information transfer at duplicate transmit power.

Method 6

Enable "Instant DFS" that gives availability to change frequency without link interruption.

Method 7

Title

Monitor air block error rate by checking the "Acc TBER" parameter in the "Status" page or in "xginfo stat" output and adjust the AMC strategy if necessary.

> **NOTE**
>
> Acceptable error rate depends on the application. See some examples in the table below.

Application	Acceptable error rate
TCP-based applications (web, FTP, etc.)	10^{-4}
Voice-over-IP	10^{-5}
UDP video (CCTV, IPTV, etc)	10^{-6}
TDM-over-IP	$10^{-7}...10^{-9}$

Table - Acceptable error rates for different applications

The "AMC Stratefy" may be changed depending on customer erquirements:

- "*conservative*" assumes using higher CINR thresholds in order to minimize the error rate.
- "*aggressive*" lowers the thresholds in order to use higher modulation levels and thus increase the throughput.
- "*normal*" represents a balance between the error rate and throughput values.

It is recommended to use "normal" strategy initially and adjust it based on target and actual TBER values.