CB-RBE2X1I PRODUCT GUIDE

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1 Abstract

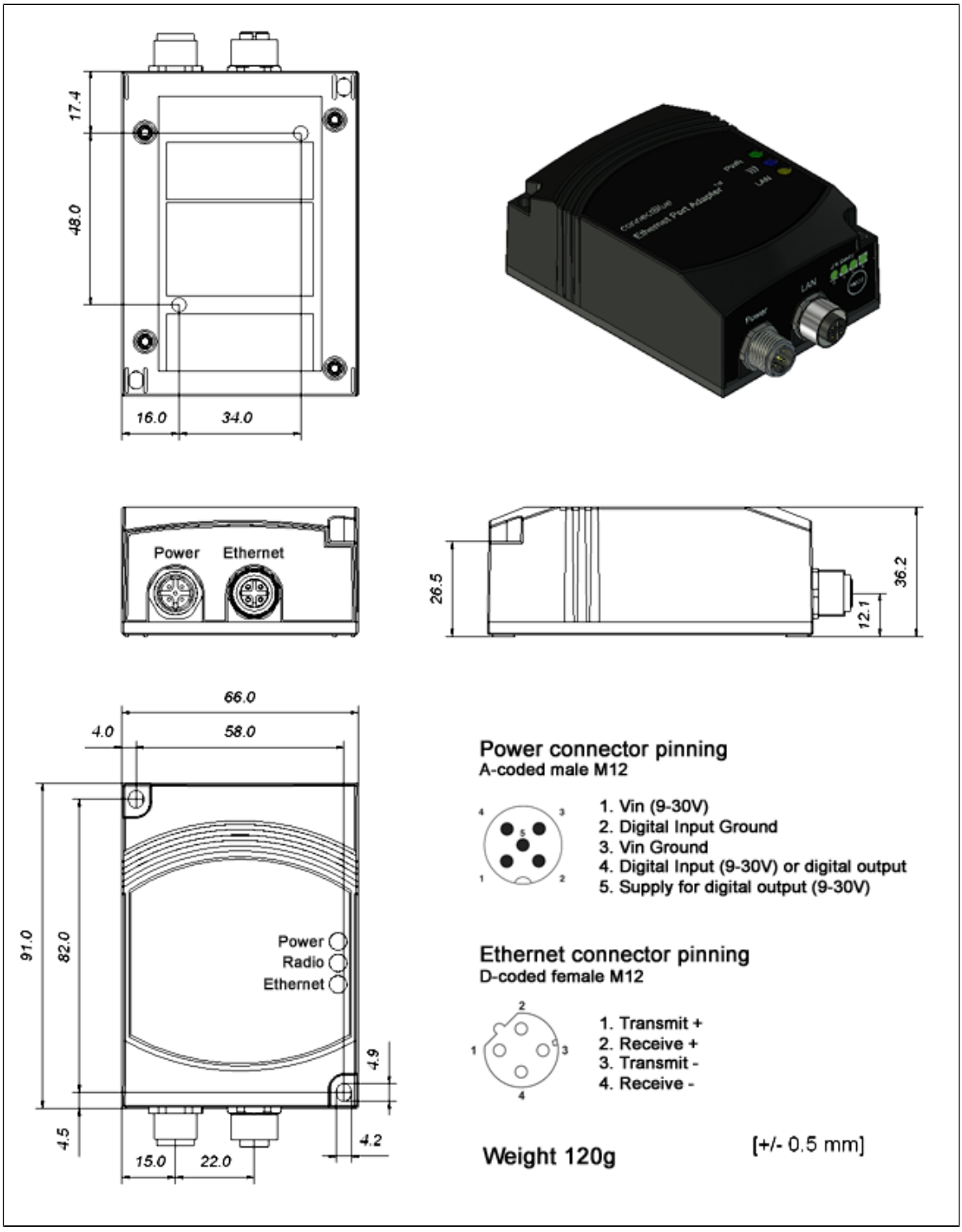
This document is a product guide defining the main use cases for the connectBlue Bluetooth Ethernet Port Adapter RBE231i/RBE221i (later called BEPA) and how to configure the specific use cases. I also contains general information about the product.

2 Table of Content

3 Related Documents

- cB-RBE2x1i Quick Setup Guide. A quick setup guide to be able to quickly setup the BEPA for the simplest use cases out-off-the-box.
- cB-RBE2x1 AT Command Specification. Detailed specification/reference for all of the supported AT commands.

4 Installation



4.1 Power

The table below shows typical current at 24 V.

Operation	Mean (mA)	Max (mA)

Startup		56.0
Idle	44.0	45.5
Idle, Ethernet	54.0	56.0
Idle + 4xMode LEDs	54.3	56.1
Connecting	60.1	60.6
Connected Data	48.3	48.4
Connected, Data, Ethernet	54.2	54.4
Connected, Data, Ethernet, 4xMode LEDs	57.8	58.9

4.2 Ethernet interface

The Ethernet interface supports 10/100 Mbps with both MDI/MDI-X auto crossover and polarity correction.

4.3 Status indicators

Description	Color	Status	Meaning
PWR	Green	On	Supply voltage is present and application is running
PWR	Green	Off	Supply voltage is not present, or no application is running
)))	Blue/Purple/Red	Blue	A Bluetooth connection has been established
)))	Blue/Purple/Red	Flashing Blue	Bluetooth data activity
)))	Blue/Purple/Red	Purple	Bluetooth activity (Inquiry, name discovery, connection attempt)
)))	Blue/Purple/Red	Red	Error
)))	Blue/Purple/Red	Off	No Bluetooth activity
LAN	Yellow	On	Ethernet link is present
LAN	Yellow	Flashing	Ethernet data activity
LAN	Yellow	Off	No Ethernet connection

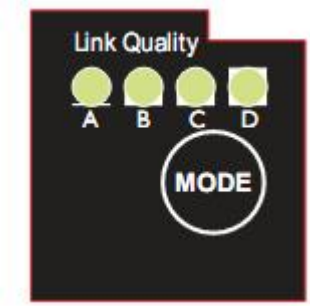
5 General Concepts

5.1 Configuration Methods

The BEPA supports four main concepts for setting and configuring the BEPA:

1. **SMART mode**. Use the buttons and LEDs on the BEPA to setup the most common use cases automatically.
2. **Web interface**. An online WEB interface with the most common manual settings for the BEPA.
3. **AT commands**. Connect to the BEPA over Ethernet using TCP or direct on Layer 2 and use a terminal like Hyperterminal to issue AT commands. This method is mainly for more advanced settings and use cases and will not be used in this document. All you can do in the Web interface and much more is supported using the AT commands.
4. **The SNMP protocol**. This will not be used and described in this document.

5.2 Using the SMART configuration mode



If the mode button is pressed within the 5 seconds from power up, the EPA will enter the SMART configuration mode. The LEDs above the button (marked A, B, C and D) will show which mode is selected. When the preferred mode is selected it must be confirmed by holding the SMART button for two seconds. This will cause the LEDs to start flashing during the operation of the selected mode.

There are currently 9 different modes:

Mode	Description	LEDs	A	B	C	D
1	Configuration mode	A				
2	Reset to factory defaults. This will reset the configuration to factory defaults	B				
3	Reset IP settings to factory defaults. This will only reset the IP settings to factory defaults	A + B				
4	Wait for Automatic configuration (LED 'C')	C				
5	Initiate Automatic configuration(LED 'A' and 'C')	A + C				
6	Initiate Automatic configuration with Profinet optimizations (LED 'B' and 'C')	B + C				

7	Initiate Automatic configuration to a connectBlue WNP (Wireless Network Platform) or AP (Access Point) (LED 'A', 'B' and 'C')	A + B + C				
8	Initiate Automatic configuration with EDR (LED 'D')	D				
9	Initiate Automatic configuration with Profinet optimizations and EDR (LED 'A' and 'D')	A+D				

The "Configuration mode" can be used to easily access the EPA if the PC is using DHCP without having to change the PC IP settings. This mode should only be used when the PC is directly connected to the EPA and not if the EPA is connected to a network where there already exists a DHCP server. Enable this mode, then connect the Ethernet cable to the computer. The EPA will then use the factory IP settings (192.168.0.99/255.255.0.0) and configuration interfaces will be enabled (if earlier disabled). The DHCP server will be enabled until a reboot of the EPA.

5.3 Restoring configuration

The device can be restored to factory default by either of the following procedures:

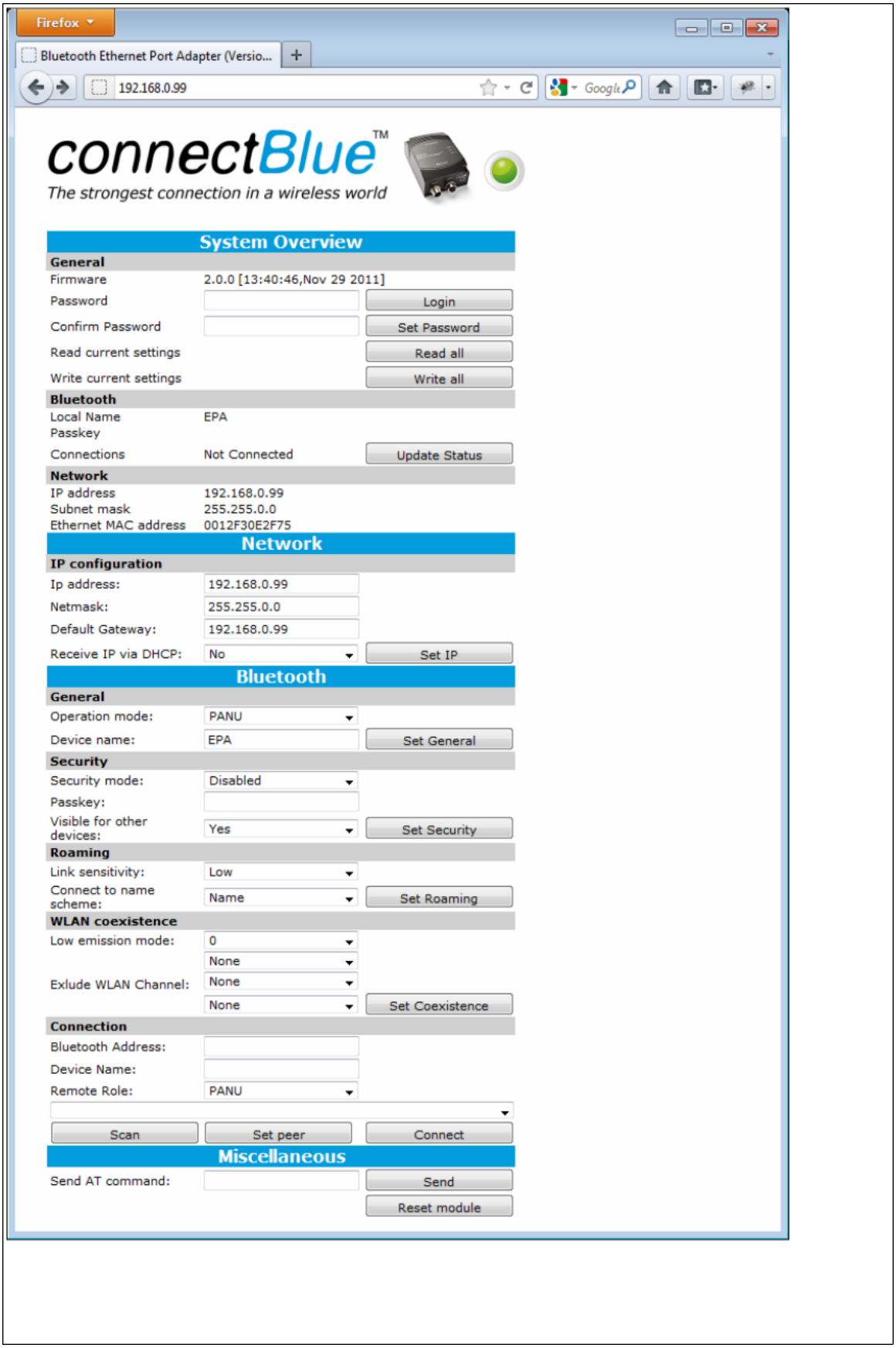
1. Issue "AT&F"
2. Execute SMART configuration mode 2
3. Holding the SMART button while powering up/restarting the device and keep it pressed until the green LED is lit.
   Note: Make sure no BOOTP/TFTP server is running while this is done!

5.4 Using the WEB configuration

By default the EPA has static IP settings which are; IP address: 192.168.0.99, subnet mask: 255.255.0.0 and default gateway: 192.168.0.99. To access the EPA by the Web based configuration interface the computer must be set up in the same network, e.g. IP address: 192.168.0.1 and subnet mask: 255.255.0.0.

Open a web browser and enter http://192.168.0.99 in the address bar. Here you'll find the most common configuration parameters needed to setup a connection. If the device is in factory default, you will not need to login before configuring the unit.

Below is an example of the WEB interface shown.



5.5 Reset to factory defaults

It is possible to reset to factory settings in 3 different ways.

1. Enter and confirm SMART mode 2.

2. Issue AT&F.
3. Holding the mode button while the BEPA is starting. **Note:** Make sure that the Ethernet cable is disconnected or that any firmware update program is stopped.

6 Bluetooth Profiles

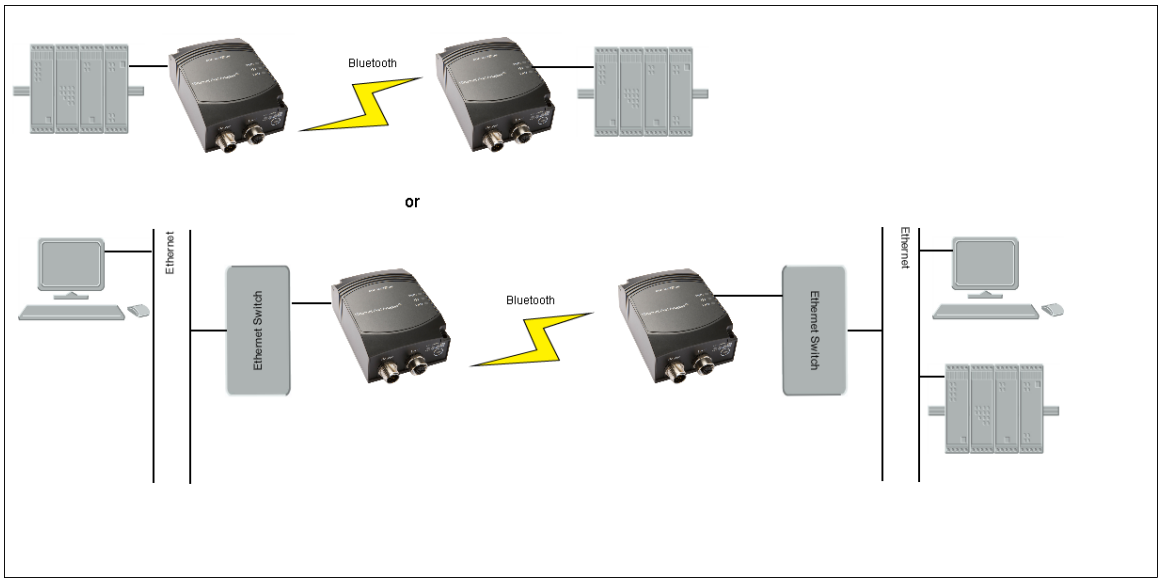
For Ethernet access over Bluetooth the Bluetooth Personal Area Network (PAN) profile is used. In this context there are two important roles:

1. **PANU**. Pan User Role. This is the normal client role when a Bluetooth device is connected to an Ethernet device. Two PANU devices may connect to each other. Several PANU devices may connect to a Bluetooth Access Point supporting the NAP role (see below). This is the default role for the BEPA.
2. **NAP**. Network Access Point Role. This is the role when a Bluetooth device is connected to network and support multiple devices to connect using the PANU role. A maximum of 7 simultaneous connections are possible (limitations of Bluetooth). **Note:** The BEPA only supports 1 connection in the NAP role.

7 Supported Use Cases

7.1 Two BEPAs connected as an Ethernet Bridge

7.1.1 Overview



This use case is using two BEPAs connected as bridge between two Ethernet segments. This use case supports several Ethernet devices on each side of the BEPA.

7.1.2 How to setup this use case?

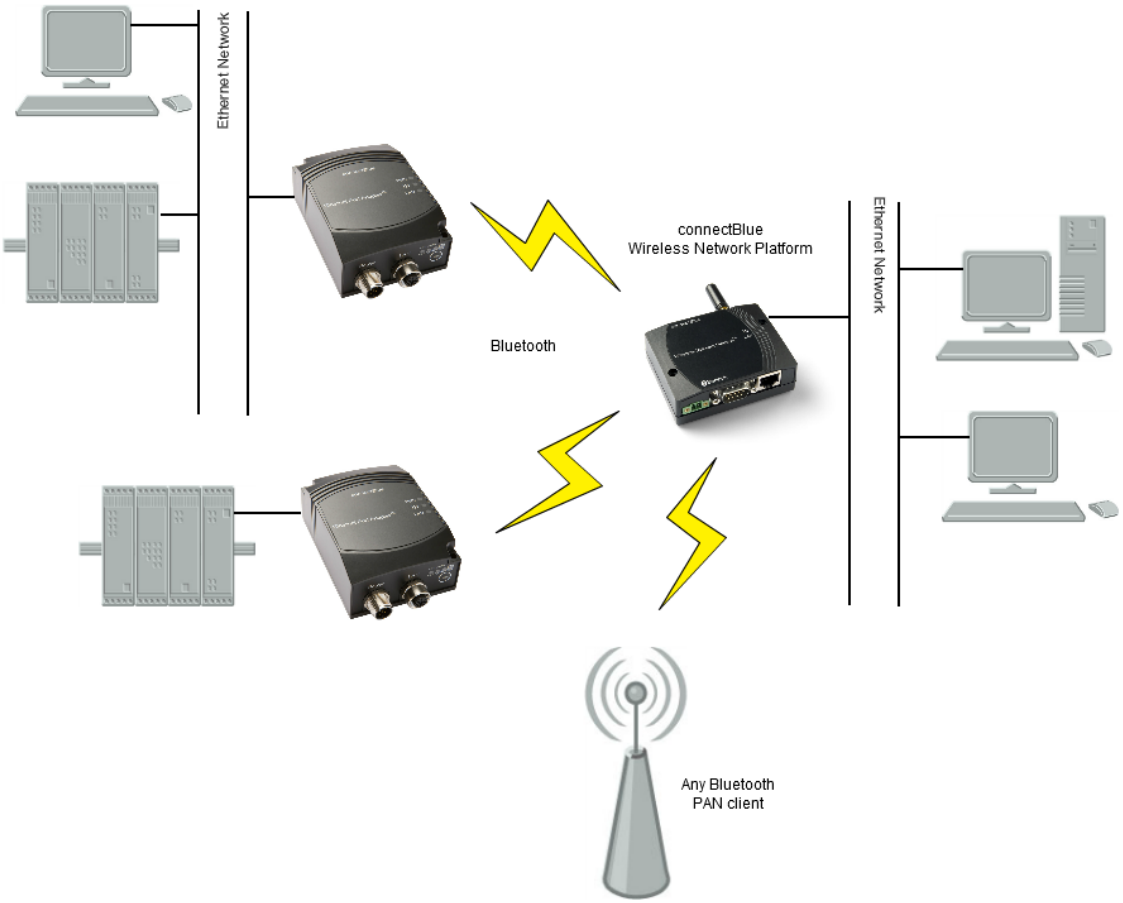
This use case can be set up by using the SMART button:

This is used to transfer data between two Ethernet segments.

1. Power on the first device and enter SMART configuration mode 4
2. Power on the second device and enter SMART configuration mode 5
3. Wait for the devices to connect and restart.
4. Now, the first device will have IP address 192.168.0.99 and the second 192.168.0.100.

7.2 One or more BEPAs connected to a WNP (Wireless Network Platform)

7.2.1 Overview



Up to 7 BEPAs (or other Bluetooth PANU devices) can be connected to one WNP. All devices connected to BEPA and WNP respectively are seen as transparently connected to the same Ethernet network.

7.2.2 How to setup this use case?

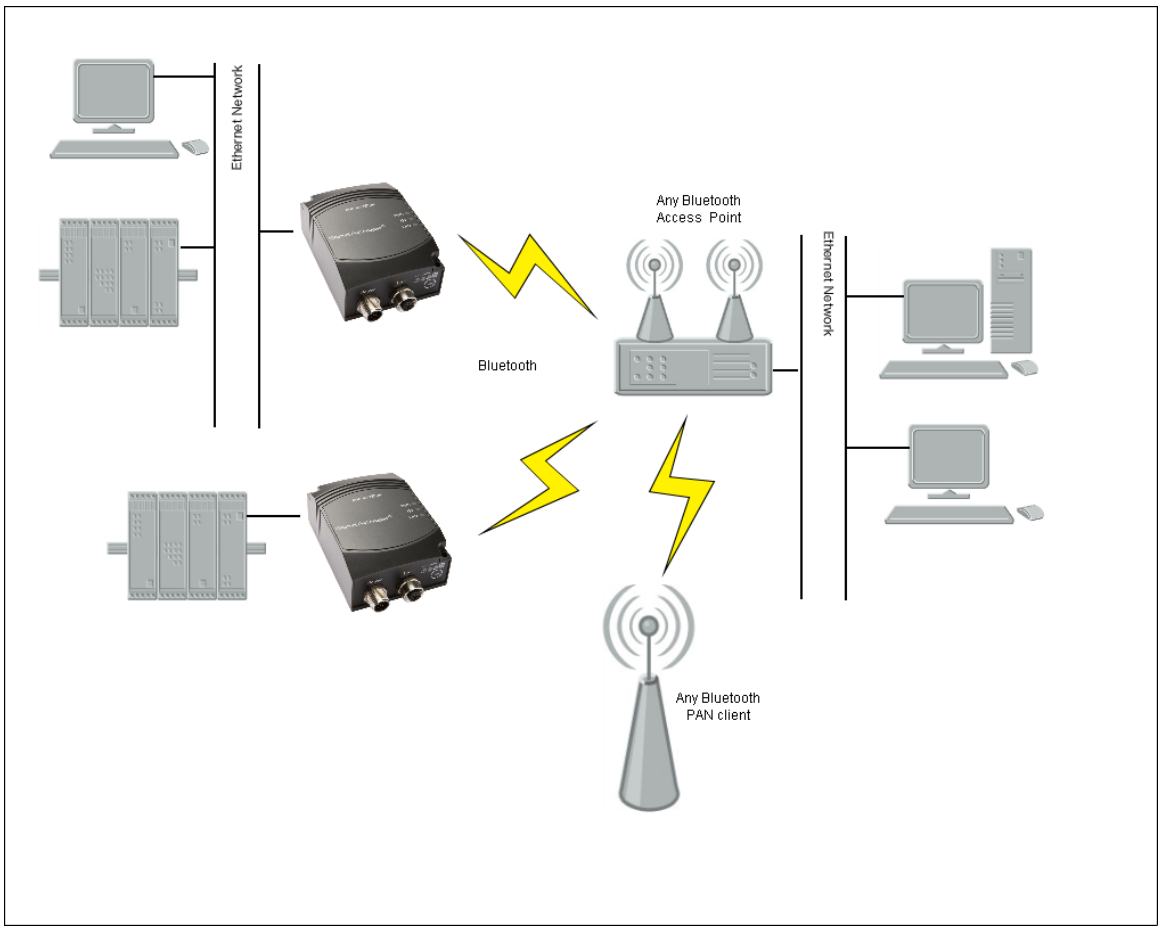
This use case can be set up by using the SMART button:

1. Power on the WNP. The WNP must be configured as Bluetooth Access Point (Bluetooth PAN profile, the NAP role). How to configure the WNP is not covered in this document.
2. Power on the BEPA device and enter SMART configuration mode 7.
3. Wait for the devices to connect and restart.

If other settings than the default settings is required the built-in WEB interface must be used. See section "Using the WEB configuration" for more information on how to use the WEB interface.

7.3 One or more BEPAs connected to one generic Bluetooth Access Point

7.3.1 Overview



Up to 7 BEPAs or other Bluetooth PAN devices can be connected to one Bluetooth Access Point (there might be a limitation in the chosen access point). This use case assumes a static network with no roaming.

7.3.2 How to setup this use case?

1. Connect a PC to the BEPA:s. See section "Using the WEB configuration" for more information on how to connect to the BEPA.
2. Define the Bluetooth connection parameters. The following parameters are required:

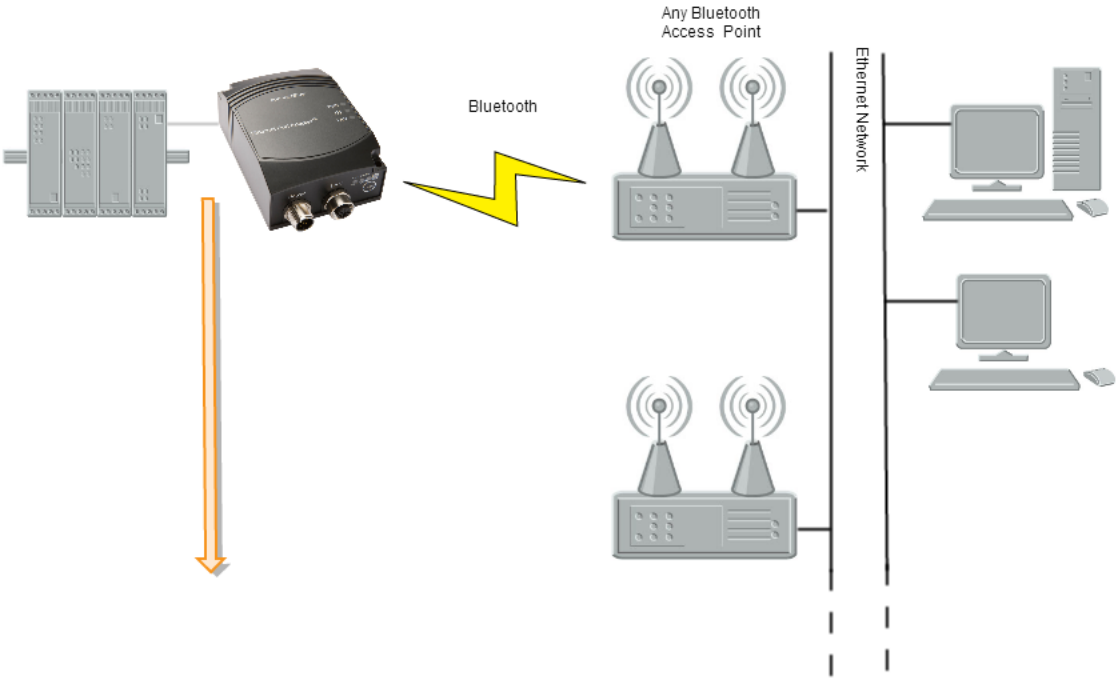
Parameter	Required Value	Comment
Device Name		Name of the device. Normally not used in this use case.
Security Mode		Depending on the setup of the access point to connect to.
Passkey		Same passkey as the access point, if required.

Visible for other devices	No (Yes)	Not required as we assume the BEPA intitiates the connection.
Link Sensitivity		This function defines the sensitivity for roaming. A high value will disconnect the link quicker if the unit moves out of range. If no roaming is required a low value can be chosen.
Connect to name scheme		Not valid in this use case as we assume a fixed connection using the BDADDR of the access point.
Low Emission Mode	Off	Not valid in this use case.
Exclude WLAN Channel		Not valid in this use case.
Bluetooth Address		Use the Scan function to search for the access point.
Device Name		
Remote Role	NAP	

How to setup the WNP is out of scope for this document.

7.4 A BEPA roaming between two or more Bluetooth Access Points

7.4.1 Overview



In this use case in the BEPA roaming between several Bluetooth Access Points e.g. connectBlue WNPs.

7.4.2 How to setup this use case?

1. Connect a PC to the BEPA. See section "Using the WEB configuration" for more information on how to connect to the BEPA.
2. Define the Bluetooth connection parameters. The following parameters are required:

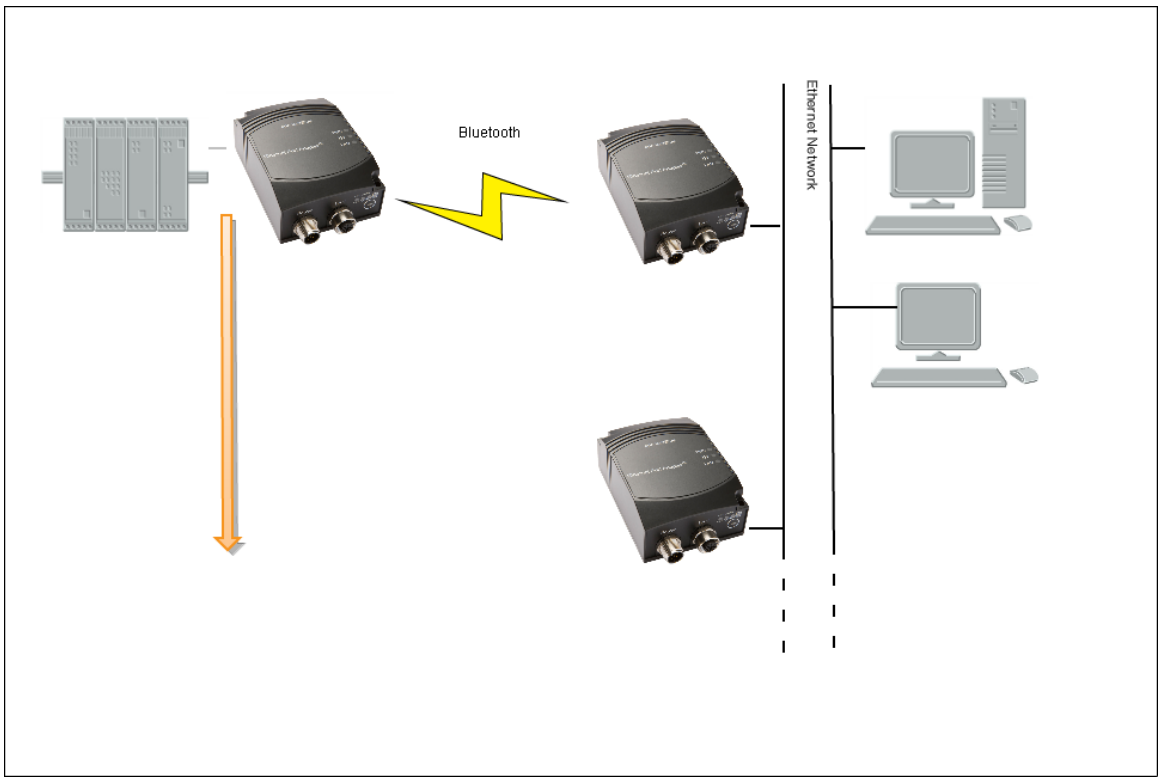
Parameter	Required Value	Comment
Device Name		Name of the device. Normally not used in this use case.
Security Mode		Depending on the setup of the access point to connect to.
Passkey		Same passkey as the access point, if required.
Visible for other devices	No (Yes)	Not required as we assume the BEPA initiates the connection.
Link Sensitivity		This function defines the sensitivity for roaming. A high value will disconnect the link quicker if the unit moves out of range..

Connect to name scheme		1. Connect To First Name. The BEPA search for **one** Access Point. When it finds one, it checks if its name contains the string entered in "Connection: Device Name" and connects to it. If the name not is correct it will retry the procedure. 2. Connect To Name. The BEPA is searching for a list of access points in its neighborhood. It connects to the first which name contains the string entered in "Connection: Device Name". 3. Connect To Best Name. The BEPA is searching for a list of access points in its neighborhood . It connects to the access point which name contains the string entered in "Connection: Device Name" and that has the best RSSI (Received Signal Strength) value.
Low Emission Mode		Select "On" or "Off". By setting it to "On", other wireless devices in the neighborhood will be less disturbed during the device discovery and connection phase but on the other hand the risk for missing a connection attempt becomes higher.
Exclude WLAN Channel		Used for coexistence. Exclude WLAN-channels not to use. Exclude the same channels in the Access Point.
Bluetooth Address		Needs to be left empty.
Connection: Device Name		String used to filter out which Access Point to connect to. See "Connect to name scheme".
Remote Role	NAP	

See the access point documentation for how to set it up.

7.5 A BEPA roaming between two or more BEPAs

7.5.1 Overview



In this use case in the BEPA roaming between several other BEPAs.

7.5.2 How to setup this use case?

7.5.2.1 The Network BEPAs

1. Connect a PC to the BEPAs. See section "Using the WEB configuration" for more information on how to connect to the BEPA.
2. Define the Bluetooth connection parameters. The following parameters are required:

Parameter	Required Value	Comment
Device Name		Name of the device. Use a naming scheme as one of the "Connect to name" schemes are used.
Security Mode		Depending on the application requirements.
Passkey		Depending on the Security Mode used.
Visible for other devices	Yes	Required for this use case as "Connect to name" is used.

Link Sensitivity		This function defines the sensitivity for roaming. A high value will disconnect the link quicker if the unit moves out of range. It is recommended to use the same value as the Roaming EPA.
Connect to name scheme		Not valid as these units are the receivers of the connection attempts.
Low Emission Mode		Not valid as these units are the receivers of the connection attempts.
Exclude WLAN Channel		Used for coexistence. Exclude WLAN-channels not to use. Exclude the same channels as defined for the Roaming BEPA.
Bluetooth Address		Needs to be left empty.
Connection: Device Name		Needs to be left empty.
Remote Role		Not valid as these units are the receivers of the connection attempts.

7.5.2.2 The Roaming BEPA

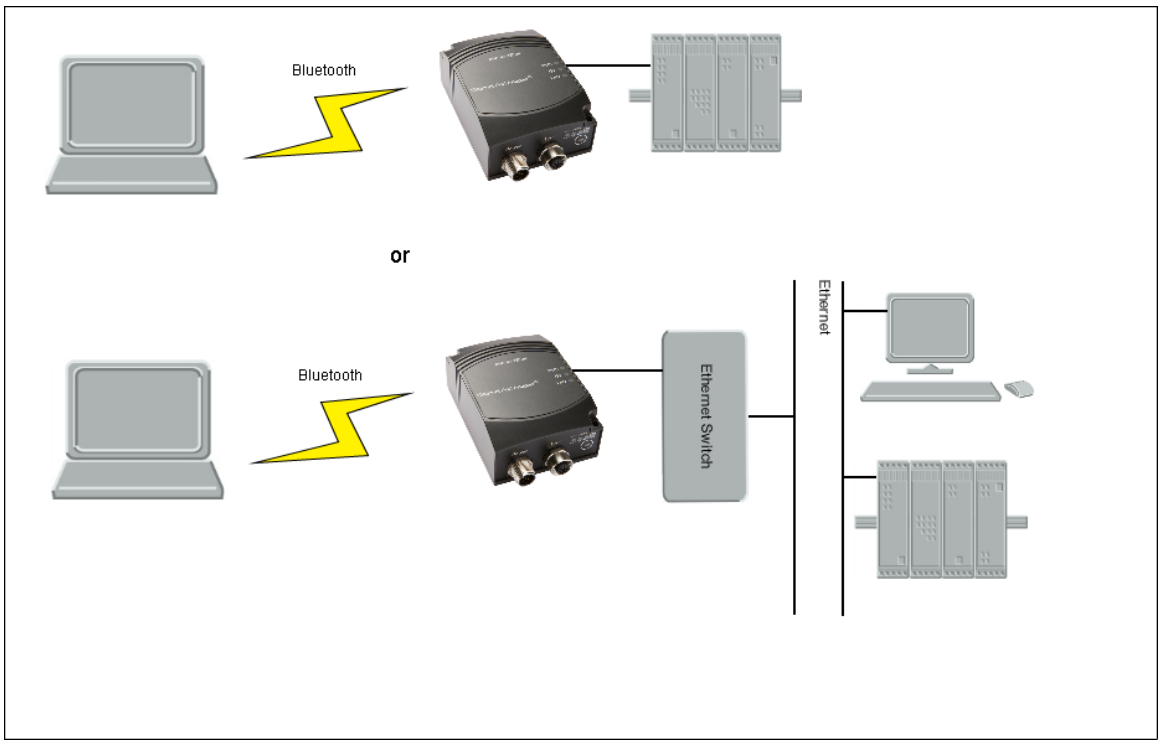
1. Connect a PC to the BEPA. See section "Using the WEB configuration" for more information on how to connect to the BEPA.
2. Define the Bluetooth connection parameters. The following parameters are required:

Parameter	Required Value	Comment
Device Name		Name of the device. Normally not used in this use case.
Security Mode		Depending on the application requirements.
Passkey		Depending on the Security Mode used.
Visible for other devices	No (Yes)	Not required as we assume the BEPA initiates the connection.
Link Sensitivity		This function defines the sensitivity for roaming. A high value will disconnect the link quicker if the unit moves out of range. it is recommended to use the same value as the Roaming EPA.

Connect to name scheme		1. Connect To First Name. The BEPA search for **one** BEPA. When it finds one, it checks if its name contains the string entered in "Connection: Device Name" and connects to it. If the name not is correct it will retry the procedure. 2. Connect To Name. The BEPA is searching for a list of BEPAs in its neighborhood. It connects to the first which name contains the string entered in "Connection: Device Name". 3. Connect To Best Name. The BEPA is searching for a list of BEPAs in its neighborhood . It connects to the access point which name contains the string entered in "Connection: Device Name" and that has the best RSSI (Received Signal Strength) value.
Low Emission Mode		Select "On" or "Off". By setting it to "On" other wireless devices in the neighborhood will be less disturbed during the device discovery and connection phase but on the other hand the risk for missing a connection attempt becomes higher.
Exclude WLAN Channel		Used for coexistence. Exclude WLAN-channels not to use. Exclude the same channels in the Network BEPA.
Bluetooth Address		Needs to be left empty.
Connection: Device Name		String used to filter out which Network BEPA to connect to. See "Connect to name scheme".
Remote Role	PANU or PAN	

7.6 A PC wireless connected to a BEPA

7.6.1 Overview



A PC supporting the Bluetooth profile (PANU role) is connected to a BEPA. This might be either a BEPA connected to single device or a BEPA connected to a Ethernet network with several devices.

7.6.2 How to setup this use case?

1. Connect a PC to the BEPA. See section "Using the WEB configuration" for more information on how to connect to the BEPA.
2. Define the Bluetooth connection parameters. The following parameters are required:

Parameter	Required Value	Comment
Device Name		This is the name that will be shown when searching for the device from the PC.
Security Mode		Depending on the application requirements.
Passkey		Depending on the Security Mode used.
Visible for other devices	Yes	Required if you want to search for the device from the PC.
Link Sensitivity		This function defines the sensitivity for roaming. A high value will disconnect the link quicker if the unit moves out of range. If no roaming is required a low value can be chosen.

Connect to name scheme		Not valid in this use case.
Low Emission Mode		Not valid in this use case.
Exclude WLAN Channel		Not valid in this use case.
Bluetooth Address		Needs to be left empty.
Connection: Device Name		Not valid as the PC is the initiator of the connection in this use case.
Remote Role		Not valid as the PC is the initiator of the connection in this use case.

How to setup the PC is dependent on the Bluetooth solution supported for the PC. Use the Bluetooth GUI to search for a PAN device with the same name as the BEPA. Use the same security settings as setup for the BEPA.

8 Legal and Regulatory

8.1 Declaration of Conformity

We, **connectBlue AB**, of **Norra Vallgatan 64 3V, SE-211 22 Malmö, Sweden**

declare under our sole responsibility that our products:

cB-RBE231i-02, cB-RBE221i-02 and cB-RBE221s-02

meets the essential requirements according to article of the following EC-Directive(s):

R&TTE Directive 1999/5/EC

Effective use of frequency spectrum:
EN 300 328 V1.7.1 (2006-10)

EMC:
EN 301 489-1 V1.9.2 (2011-09)
EN 301 489-17 V2.1.1 (2009-05)
EN 61000-6-2:2005
EN 61000-6-3:2007 + A1:2011

Safety:
EN 50371:2002
EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011
IEC 60950-1:2005 + A1:2009

2013-03-21 Malmö, Sweden

CTO of connectBlue AB

8.2 Licenses

This product contains software under the following licenses:

```
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 * OF SUCH DAMAGE.
 *
 * This file is part of the lwIP TCP/IP stack.
 *
 * Author: Adam Dunkels <adam@sics.se>
 *
 */
```

9 Safety and Warning Instructions

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D OR non-hazardous locations only. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.

WARNING - EXPLOSION HAZARD

Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

WARNING - EXPLOSION HAZARD

Substitution of any components may impair the suitability for Class I, Division 2.

Wiring Terminals marked to indicate proper connections for the input power, output power, and control circuits.

Field Wiring terminals to use Copper Conductors only, wire size AWG 14, minimum temperature rating 60ºC.

Equipment suitable for an ambient temperature of max 65ºC.