

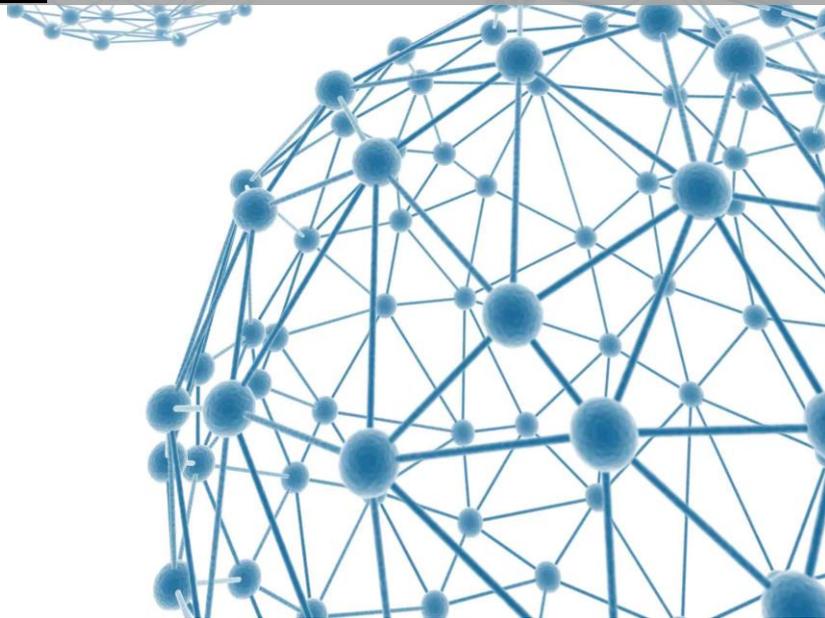


Version 1.9.1



**TECHNICAL
NOTE**

**BEANGATEWAY® MANAGEMENT ON
A LAN INFRASTRUCTURE**



DOCUMENT

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Contents

1. TECHNICAL SUPPORT	8
2. VISUAL SYMBOLS DEFINITION	9
3. ACRONYMS AND ABBREVIATIONS.....	10
4. AIM OF THIS DOCUMENT	11
5. SOME DEFINITIONS.....	12
5.1 What is a DNS?	12
5.2 What is DHCP?.....	12
5.3 Port Forwarding.....	14
6. BEANSCAPE® AND BEANGATEWAY® COMMUNICATION MECHANISMS OVERVIEW	15
6.1 Regular Communication : TCP LINK.....	15
6.1.1 LAN overview.....	15
6.1.2 Initiating connection.....	16
6.2 Communication for BeanGateway® LAN configuration : UDP Link.....	20
6.2.1 Overview.....	20
6.2.2 Communication steps.....	21
6.3 Keep Alive feature	23
7. BEANSCAPE® AND BEANGATEWAY® NETWORKS RELATED FEATURES CONFIGURATION	24
7.1 BeanGateway® LAN configuration (for advanced user only)	24
7.2 BeanScape configuration	30
7.2.1 LAN configuration (for advanced users only)	30
7.2.2 TCP Port configuration (for expert users only).....	30
7.3 KEEP ALIVE configuration	31
7.3.1 BeanGateway® side	31
7.3.2 BeanScape® side.....	33
8. MULTI-WSN CONFIGURATION.....	34
9. TYPICAL NETWORK CONFIGURATION EXAMPLES	37
9.1 Beanscape® and Beangateway® connected through direct ethernet link.....	37

9.2	Beanscape® and Beangateway® connected to a LAN network without dhcp server	40
9.3	Beanscape® and Beangateway® connected on a LAN network with dhcp server	42
9.4	BeanScape® software integration with a Windows Tablet	43
9.4.1	Using LAN cable	43
9.4.2	Using WIFI link	44
9.5	Beangateway® 2.4GHz 3G/4G/ LTE links Outdoor Version	44
10.	TROUBLESHOOTING	45
10.1	How can I Get the IP Configuration on my PC?	45
10.2	How can I modify my PC network interface configuration?	45

List of Figures

Figure 1: Network Architecture with PORT Forwarding14
Figure 2 : A multi-WSN architecture.....34

1. TECHNICAL SUPPORT

For general contact, technical support, to report documentation errors and to order manuals, contact *Beanair Technical Support Center* (BTSC) at:

tech-support@Beanair.com

For detailed information about where you can buy the Beanair equipment/software or for recommendations on accessories and components visit:

www.Beanair.com

To register for product news and announcements or for product questions contact Beanair's Technical Support Center (BTSC).

Our aim is to make this user manual as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Beanair appreciates feedback from the users of our information.

2. VISUAL SYMBOLS DEFINITION

<i>Symbols</i>	<i>Definition</i>
	<i><u>Caution or Warning</u> – Alerts the user with important information about Beanair wireless sensor networks (WSN), if this information is not followed, the equipment /software may fail or malfunction.</i>
	<i><u>Danger</u> – This information MUST be followed if not you may damage the equipment permanently or bodily injury may occur.</i>
	<i><u>Tip or Information</u> – Provides advice and suggestions that may be useful when installing Beanair Wireless Sensor Networks.</i>

3. ACRONYMS AND ABBREVIATIONS

<i>AES</i>	Advanced Encryption Standard
<i>CCA</i>	Clear Channel Assessment
<i>CSMA/CA</i>	Carrier Sense Multiple Access/Collision Avoidance
<i>GTS</i>	Guaranteed Time-Slot
<i>kSps</i>	Kilo samples per second
<i>LLC</i>	Logical Link Control
<i>LQI</i>	Link quality indicator
<i>LDCDA</i>	Low duty cycle data acquisition
<i>MAC</i>	Media Access Control
<i>PAN</i>	Personal Area Network
<i>PER</i>	Packet error rate
<i>RF</i>	Radio Frequency
<i>SD</i>	Secure Digital
<i>WSN</i>	Wireless sensor Network

4. AIM OF THIS DOCUMENT

The aim of this document is to describe closely all the parameters related to the LAN configuration of your BeanGateway®.

5. SOME DEFINITIONS

5.1 WHAT IS A DNS?

The DNS Domain Name System is a database system that translates the BeanGateway®'s fully qualified domain name into an IP address.

The BeanGateway® uses IP addresses to locate and be located in order to communicate. However, IP addresses can be difficult to remember. For example, while browsing the web it is much easier to remember domain names such `www.benair.com` rather than its associated IP address (`207.171.166.48`). The DNS allows you to manage a BeanGateway® on your Network by using its user-friendly domain name rather than its numerical IP address. Conversely, Reverse DNS (rDNS) translates an IP address into a domain name.

Each organization that maintains a computer network will have at least one server handling DNS query. The name server will hold a list of all the IP addresses within its network, plus a cache of all IP addresses for recently accessed computers outside the network. Each computer on each network needs to know the location of only one name server. When your BeanGateway® requests an IP address, one of the three following cases may happen, depending on whether or not the requested IP address is within your local network:

- If the requested IP address is registered locally (i.e., it's within your organization's network), you' will receive a response directly from one of the local name servers listed in your workstation configuration. In this case, there usually is little or no wait for a response.
- If the requested IP address is not registered locally (i.e., outside your organization's network), but someone within your organization has recently requested the same IP address, then the local name server will retrieve the IP address from its cache. Again, there should be little or no wait for a response.
- If the requested IP address is not registered locally, and you are the first person to request information about this system in a certain period of time (ranging from 12 hours to one week), then the local name server will perform a search on behalf of your workstation. This search may involve querying two or more other name servers at potentially very remote locations. These queries can take anywhere from a second or two up to a minute (depending on how well connected you are to the remote network and how many intermediate name servers must be contacted). Sometimes, due to the lightweight protocol used for DNS, you may not receive a response. In these cases, your workstation or client software may continue to repeat the query until a response is received, or you may receive an error message.

A good analogy is to think of DNS as an electronic telephone book for a BeanGateway® on your network. If you know the name of the BeanGateway® in question, the name server will look up its IP address.

5.2 WHAT IS DHCP?

Dynamic Host Configuration Protocol (DHCP) is a network protocol that enables a server to automatically assign an IP address to a computer from a defined range of numbers (i.e., a scope) configured for a given network.

DHCP assigns an IP address whenever the BeanGateway® is started, for example:

1. A user turns on the BeanGateway® with DHCP client activated.

2. The BeanGateway® sends a broadcast request (called a DISCOVER or DHCPDISCOVER), looking for a DHCP server to answer.
3. The router directs the DISCOVER packet to the correct DHCP server.
4. The server receives the DISCOVER packet. Based on availability and usage policies set on the server, the server determines an appropriate address (if any) to give to the client. The server then temporarily reserves that address for the client and sends back to the client an OFFER (or DHCPOFFER) packet, with that address information. The server also configures the client's DNS servers, NTP servers, and sometimes other services as well.
5. The client sends a REQUEST (or DHCPREQUEST) packet, letting the server know that it intends to use the address.
6. The server sends an ACK (or DHCPACK) packet, confirming that the client has been given a lease on the address for a server-specified period of time.

When a BeanGateway® uses a static IP address, it means that the BeanGateway® is manually configured to use a specific IP address. One problem with static assignment, which can result from user error or inattention to detail, occurs when two BeanGateway® are configured with the same IP address. This creates a conflict that results in loss of service. Using DHCP to dynamically assign IP addresses minimizes these conflicts.

5.3 PORT FORWARDING

Port forwarding or port mapping is a name given to the combined technique of:

1. Translating the address and/or port number of a packet to a new destination
2. Possibly accepting such packet(s) in a packet filter (firewall)
3. Forwarding the packet according to the routing table.

The destination may be a predetermined network port (assuming protocols like TCP and UDP, though the process is not limited to these) on a host within a NAT-masqueraded, typically private network, based on the port number on which it was received at the gateway from the originating host.

The technique is used to permit communications by external hosts with services provided within a private local area network.

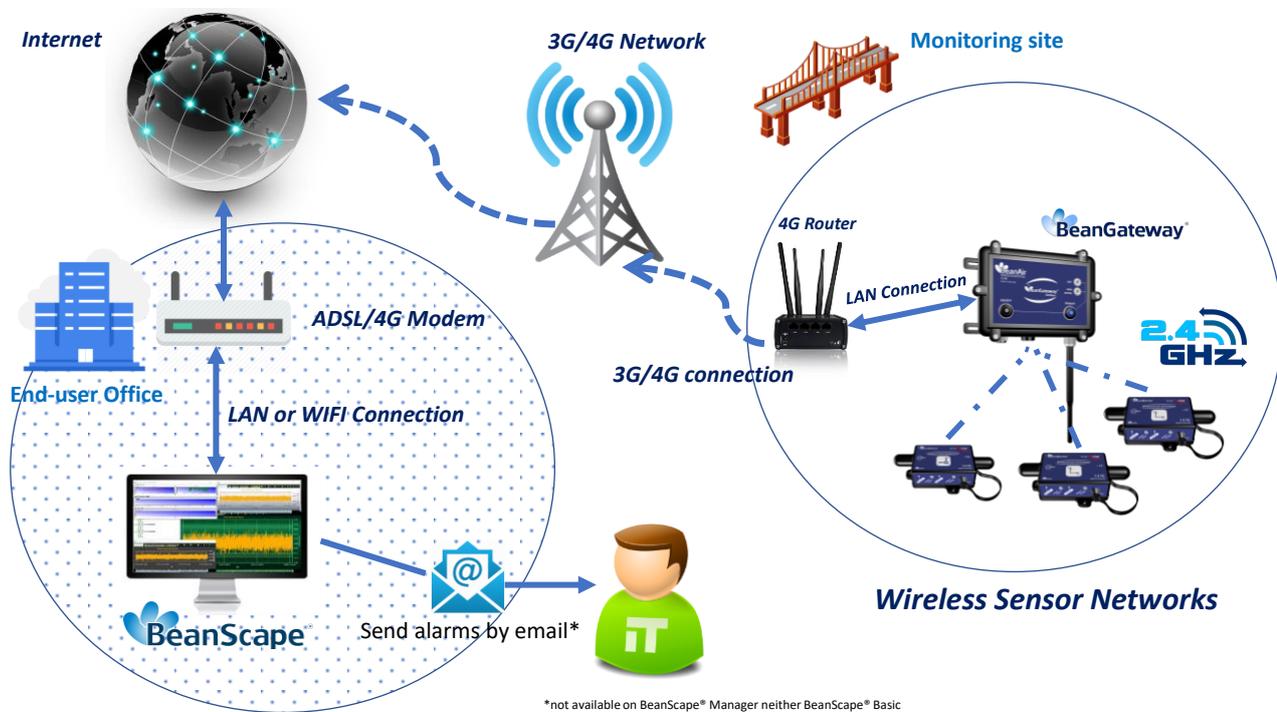
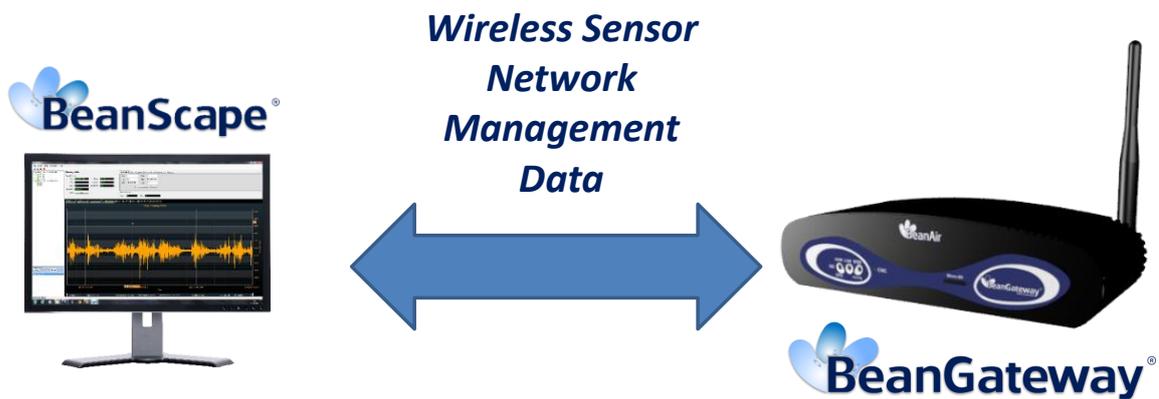


Figure 1: Network Architecture with PORT Forwarding

6. BEANSCAPE® AND BEANGATEWAY® COMMUNICATION MECHANISMS OVERVIEW

6.1 REGULAR COMMUNICATION : TCP LINK

6.1.1 LAN overview

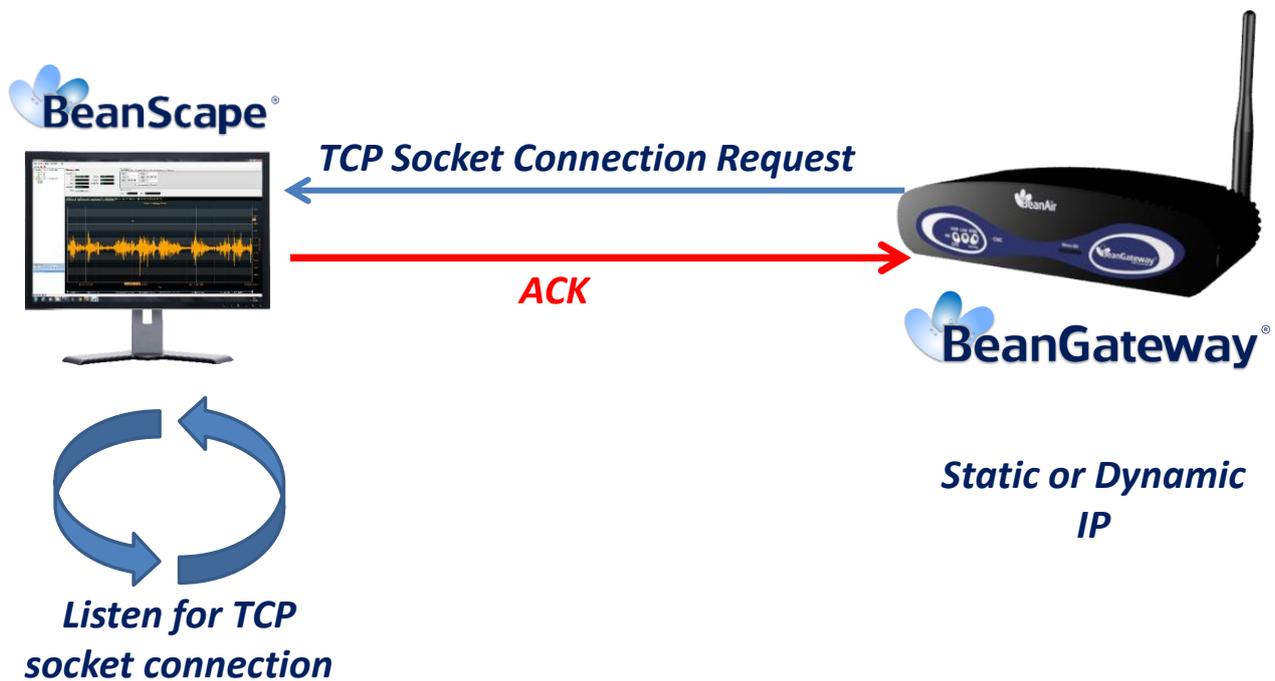


PC/BeanScape® IP Address must be known by the BeanGateway®

6.1.2 Initiating connection

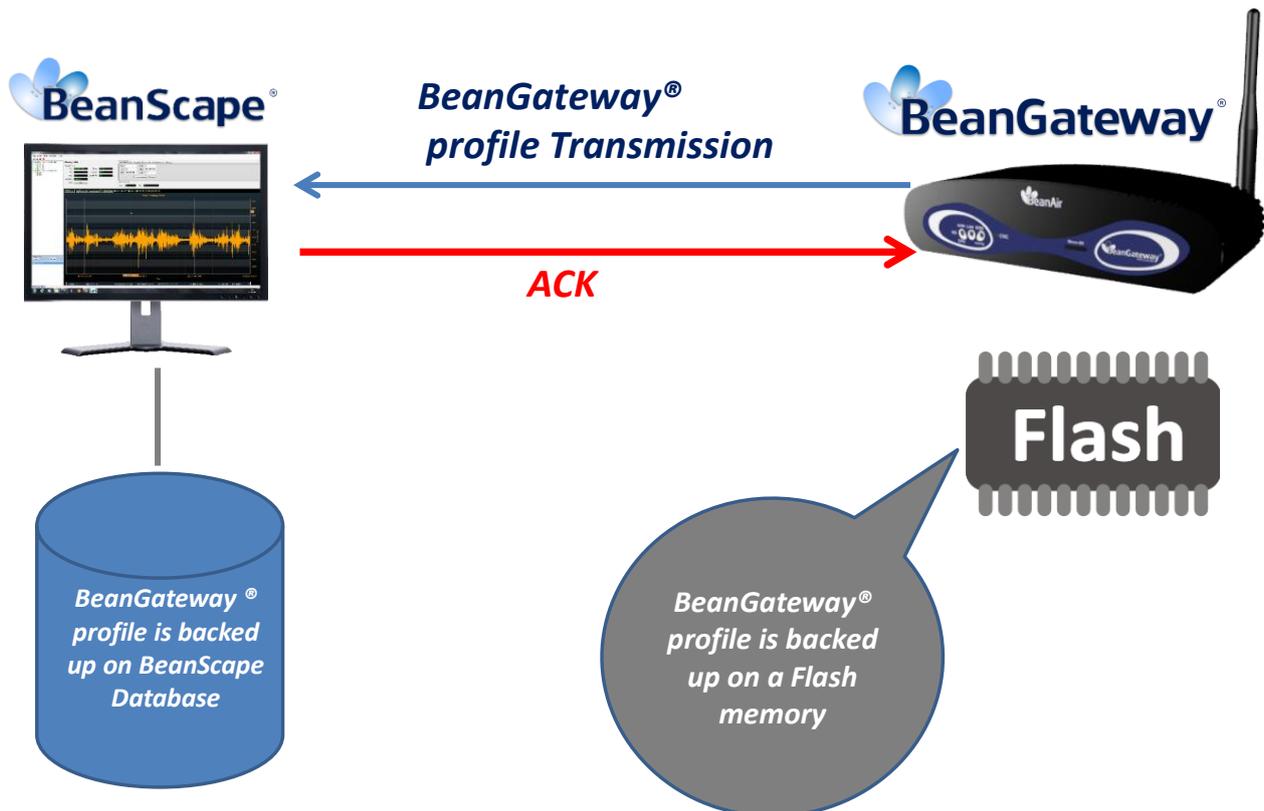
Step 1: Socket connection

- When the BeanScope® is launched , it starts listening for a TCP socket connection
- When you power up the BeanGateway®, a request for socket connection is established between the Beanscape® and the BeanGateway®
- If this request is accepted by the BeanScope®, an confirmation (or ACK) is transmitted by the BeanGateway® to the BeanScope®



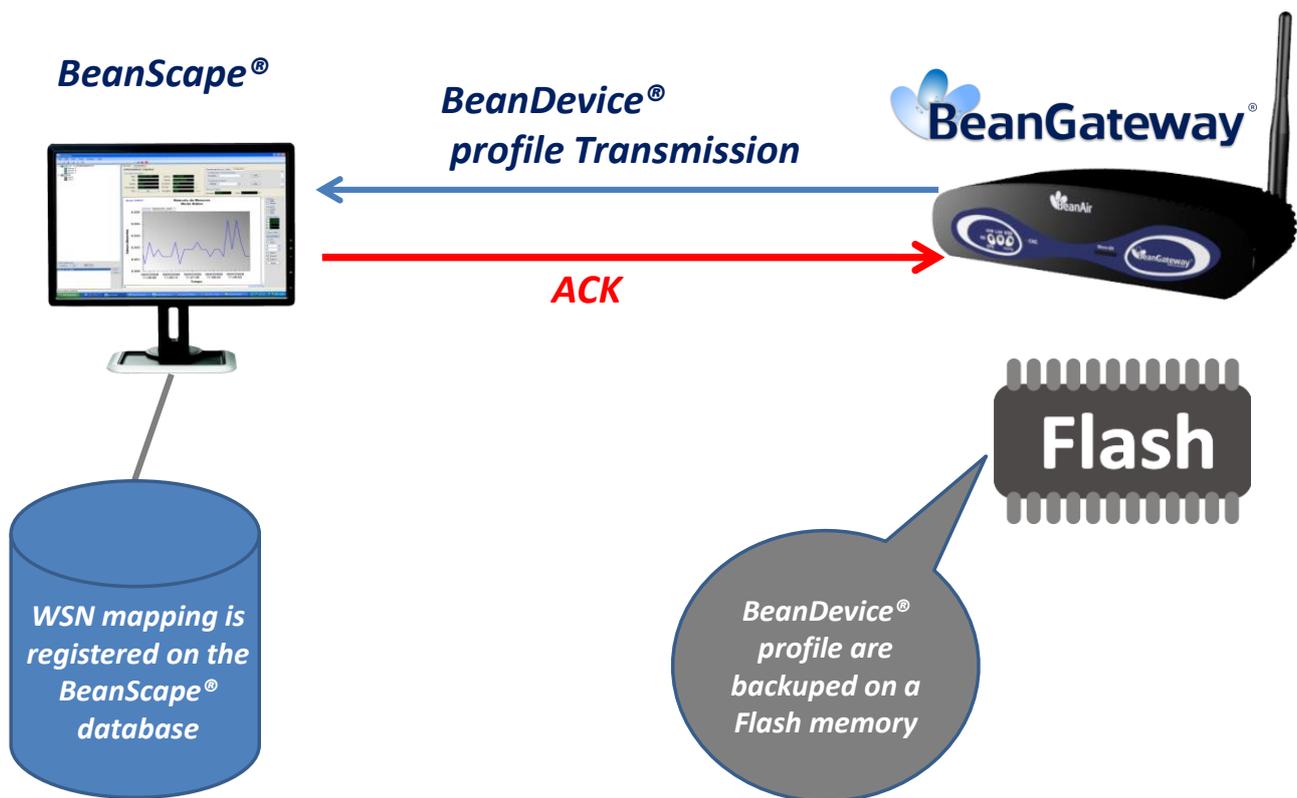
Step 2: BeanGateway® Profile Transmission

- The BeanGateway® profile is recorded on its flash memory. This profile contains informations regarding the BeanGateway® address (NWK Add, PAN ID, MAC ID, IP...) , versions ID (Hardware, embedded software, stack...), Radio Management parameters (Radio channel, TX Power,);
- The BeanGateway® profile is transmitted to the BeanScape®



Step 3: WSN Mapping transmission

- The WSN mapping concerns all Beandevicé® profiles. The WSN mapping is backed up on the BeanGateway® flash memory. When a new BeanDevicé® joins a WSN, its profile is transmitted to the BeanGateway® and the BeanScape®.
- The BeanScape® displays the WSN Mapping within the BeanDevicé® profile;
- WSN Mapping is also backed up on the BeanScape® Database.



Step 4: Time & Date update

- The Date is transmitted to the BeanGateway by NTP (Net-Time Protocole)
- Time & Date are updated on the BeanGateway instantly
- The BeanGateway integrates a Real-Time-Clock directly powered by th internal battery which allows to maintain the Date when the BeanGateway® is powered down
- The Date is updated instantly on the BeanGateway®

BeanScape®



*Time transmission through
NTP (Net Time protocol)*



ACK

BeanGateway®



***BeanGateway® Time and
Date is synchronized
with your PC***



The WSN Time & Date is synchronized with your PC. The User must make sure that the Date on his computer is not wrong.

6.2 COMMUNICATION FOR BEANGATEWAY® LAN CONFIGURATION : UDP LINK

The BeanScape® provides a LAN configuration tool allowing the user to accelerate the integration of the BeanGateway® on a LAN infrastructure.

6.2.1 Overview

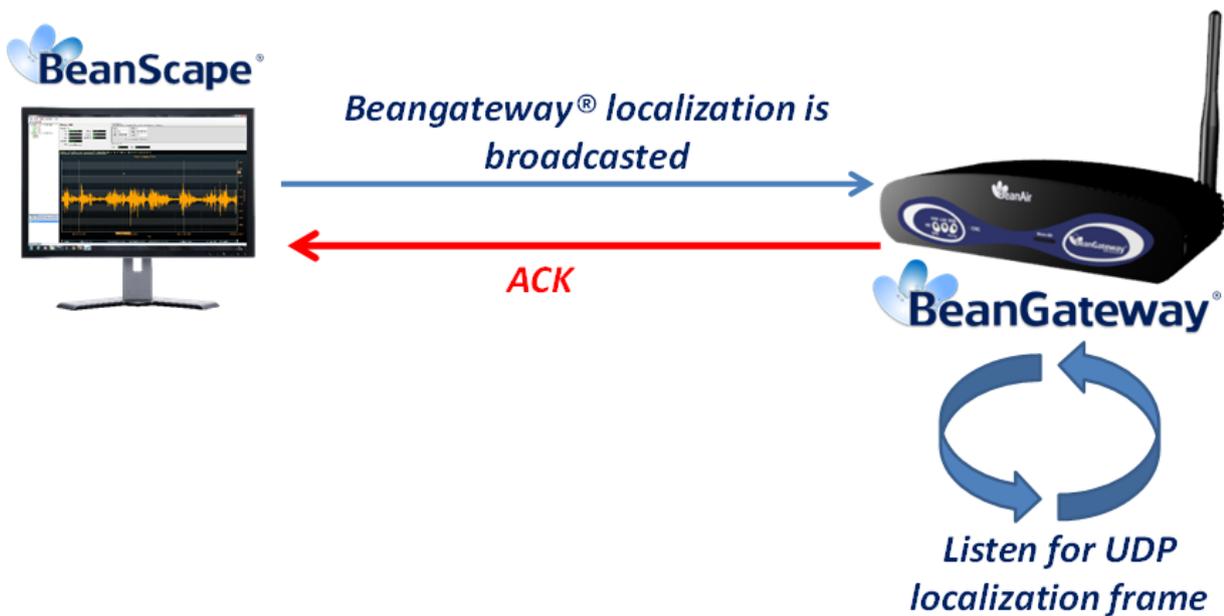


The BeanGateway® UDP Port must be known by the BeanScape®.

6.2.2 Communication steps

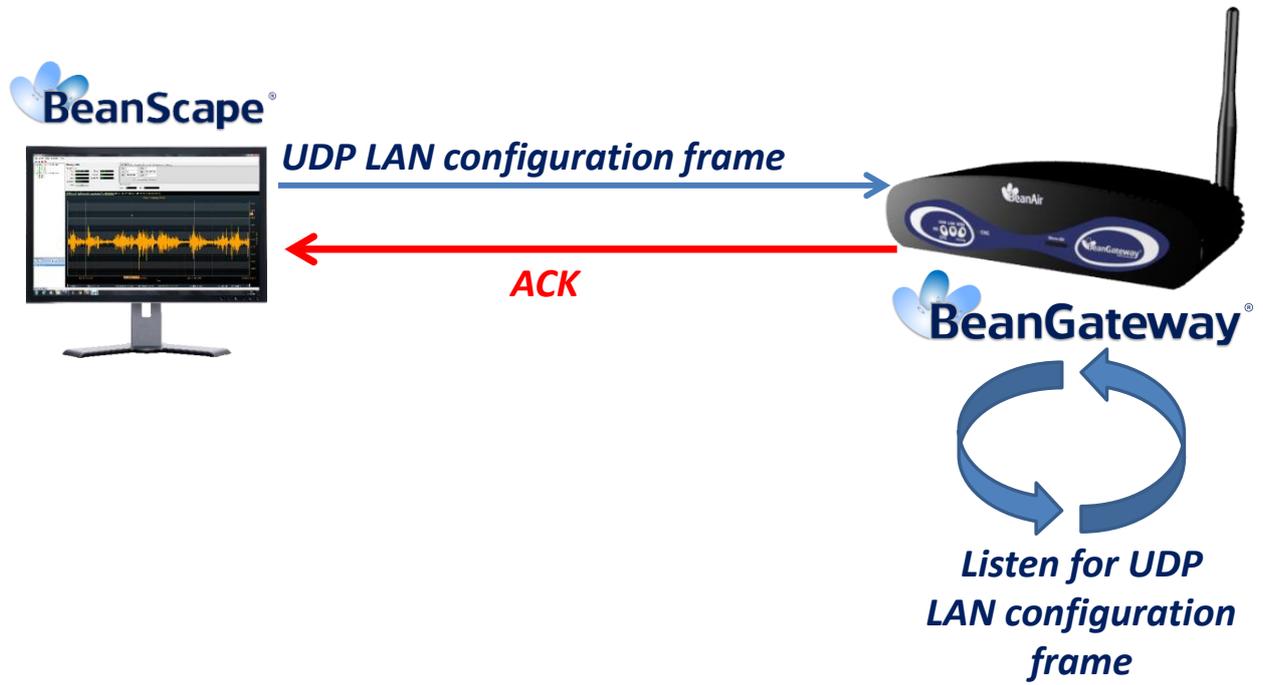
Step 1: Localization

- The BeanScape® broadcasts an UDP frame for locating the BeanGateway®.
- All the BeanGateways® present on the Ethernet network replies with an ACK.
- All the discovered BeanGateway® are listed by the "BeanGateway® LAN configuration Tool".



Step 2: Configuration

- The user validates a configuration for a BeanGateway®. This configuration will be sent by the BeanScape® to the targetted BeanGateway®
- Once the configuration is received and validated by the BeanGateway®, it will reply by an ACK to the BeanScape®.



6.3 KEEP ALIVE FEATURE



On both side BeanScape® and BeanGateway®, a “keepalive” signal is often sent at predefined intervals. If an emitted signal is left without any response signal, then the link will be assumed as “Dead”. A “keepalive” signal can also be used to indicate to the Network Infrastructure that the connection should be preserved. Without the “keepalive” signal intermediate routers can drop the connection after the timeout occurs.

Since the main purpose of the “keepalive” functionality is either to find links that do not work or to indicate links that should be preserved, “keepalive” messages tend to be short and not take much bandwidth. However, their precise format and usage terms depend on the communication protocol.

- The “keepalive” time is the duration between two “keepalive” transmissions in idle condition. TCP “keepalive” time period is required to be configurable and by default is set to no less than 2 hours.
- The “keepalive” interval is the time duration between two successive “keepalive” retransmissions, (In case if no response to the first “Keepalive” has been issued from the target).
- The “Keepalive retry” is the number of retransmissions to be carried out before declaring that remote end is either not reachable or out of service.

7. BEANSCAPE® AND BEANGATEWAY® NETWORKS RELATED FEATURES CONFIGURATION

7.1 BEANGATEWAY® LAN CONFIGURATION (FOR ADVANCED USER ONLY)

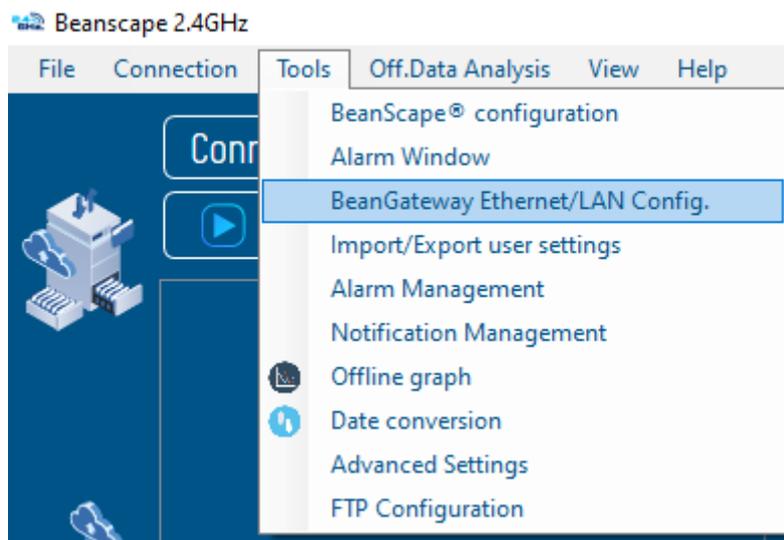


Please check your Network settings before you make any changes.

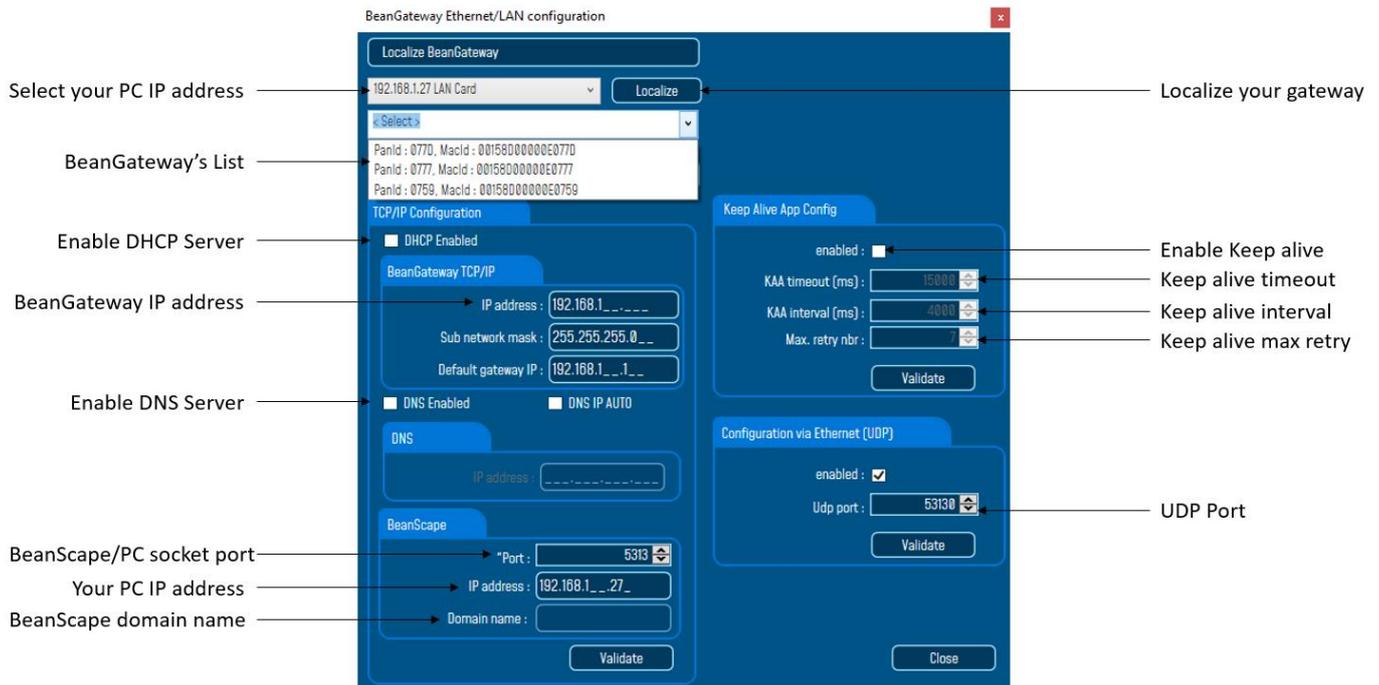
By default, the BeanGateway® is configured with a static IP address: **192.168.4.123**. This allows the user to quickly connect the BeanGateway® to a PC.

If the user wants to set the BeanGateway® IP on the business network and get a dynamic IP address (via DHCP), you can configure the BeanGateway® from a serial port or from the Ethernet.

Go on your BeanGateway® profile and click on Tools, then click on **BeanGateway® Ethernet/LAN Config.**(BeanScape® version superior to 1.24.1296.8).

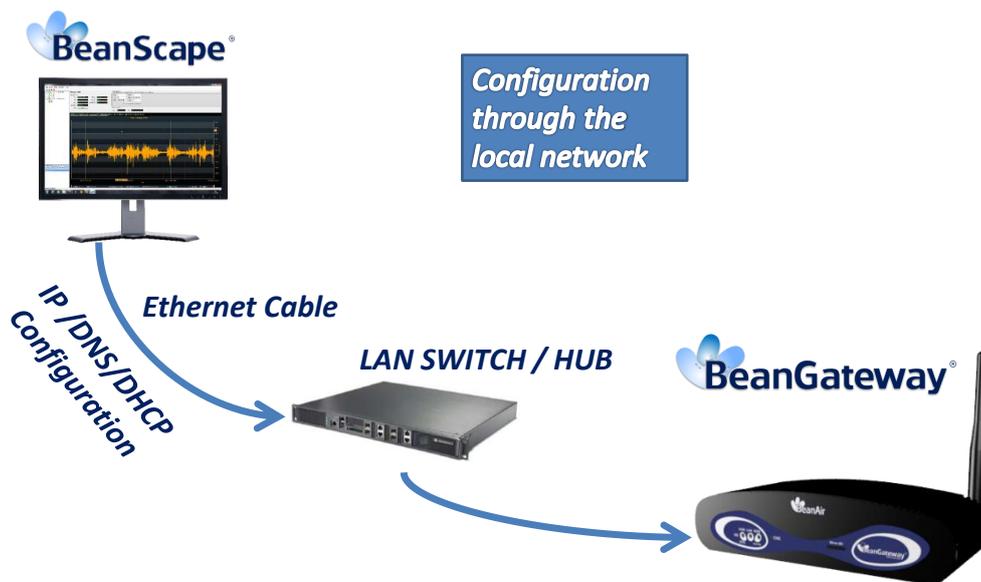
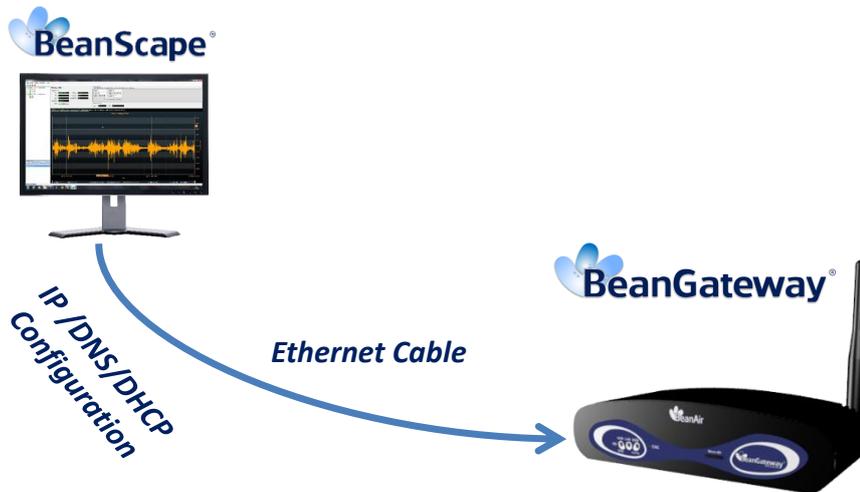


A new window will open called **BeanGateway® configuration / BeanGateway Ethernet/LAN Config** depending on the BeanScope version you use.



- **DHCP Enabled:** Check this box if you want to enable the DHCP. For further information about DHCP read section: [“What is DHCP?”](#).
- If DHCP is not enabled, the user must configure the BeanGateway® IP parameters:
 - ✓ **IP Address:** BeanGateway® IP Address. The BeanGateway® IP address should have the following format: “X.Y.Z.B”. With A, B, X, Y and Z numbers between 0 and 255
 - ✓ **Subnet mask:** mask of the network.
 - ✓ **Gateway IP Address:** The network router IP address. It should have the following format “X.Y.Z.1”. If the BeanGateway® and the BeanScope® are on the same sub network, this value has no effect;
- **DNS Enabled:** Check this box if you want to enable the DNS. For further information about DNS read the read section 2.1 of this document: [“What is DNS ?”](#).
 - ✓ If DNS Server IP is given by the DHCP server, check DNS IP Auto, else DNS Sever IP must be fulfilled.
- **BeanScope® configuration:**
 - ✓ **Port:** By default the communication port used is «5313”. This port is generally free, if not choose another Socket Port. The socket port must be the same for the BeanScope® and BeanGateway®. (see Section [TCP Port configuration \(for experts user only\)](#)).
 - ✓ BeanScope® Domain Name must be fulfilled if DNS is enabled.

The configuration can be done either directly or through the local network, as shown in the diagrams below.



Step 1

- Connect the BeanGateway® to your PC or to a LAN Switch
- Open the "BeanGateway® configuration" window

Step 2

- Select your PC IP Address
- Click on Localize

The screenshot shows the 'Localize BeanGateway' configuration window. It features a dropdown menu for selecting the PC IP address, currently set to '192.168.1.27 LAN Card'. A 'Localize' button is visible next to the dropdown. Below the dropdown is a list of localized BeanGateways, each with its PanId and MacId. Callouts point to the IP address dropdown, the 'Localize' button, and the list of localized devices.

Select your PC IP address

Click on Localize in order to scan all the BeanGateway® present on your network

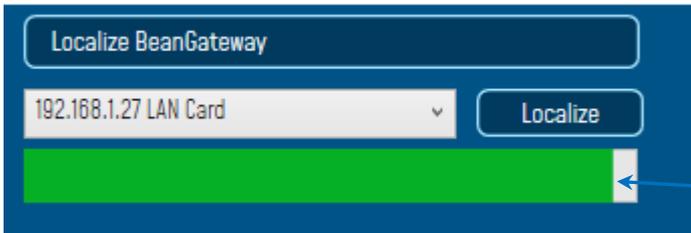
List of BeanGateway localized on your LAN Network

PanId	MacId
077D	00158D00000E077D
0777	00158D00000E0777
0759	00158D00000E0759

Step 3

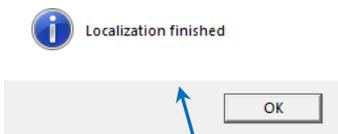
- Click on "localize" in order to scan all the BeanGateway® present on your network. BeanGateway® localization starts. When this process is done, a new window occurs"localization finished"
- A list of BeanGateway® present on the LAN Network is updated

BeanGateway Ethernet/LAN configuration

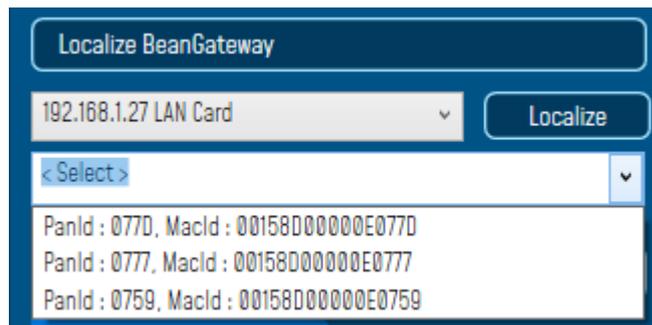


BeanGateway®
Location starts

BeanGateway Configuration via Ethernet



A new window occurs, the
scan is finished



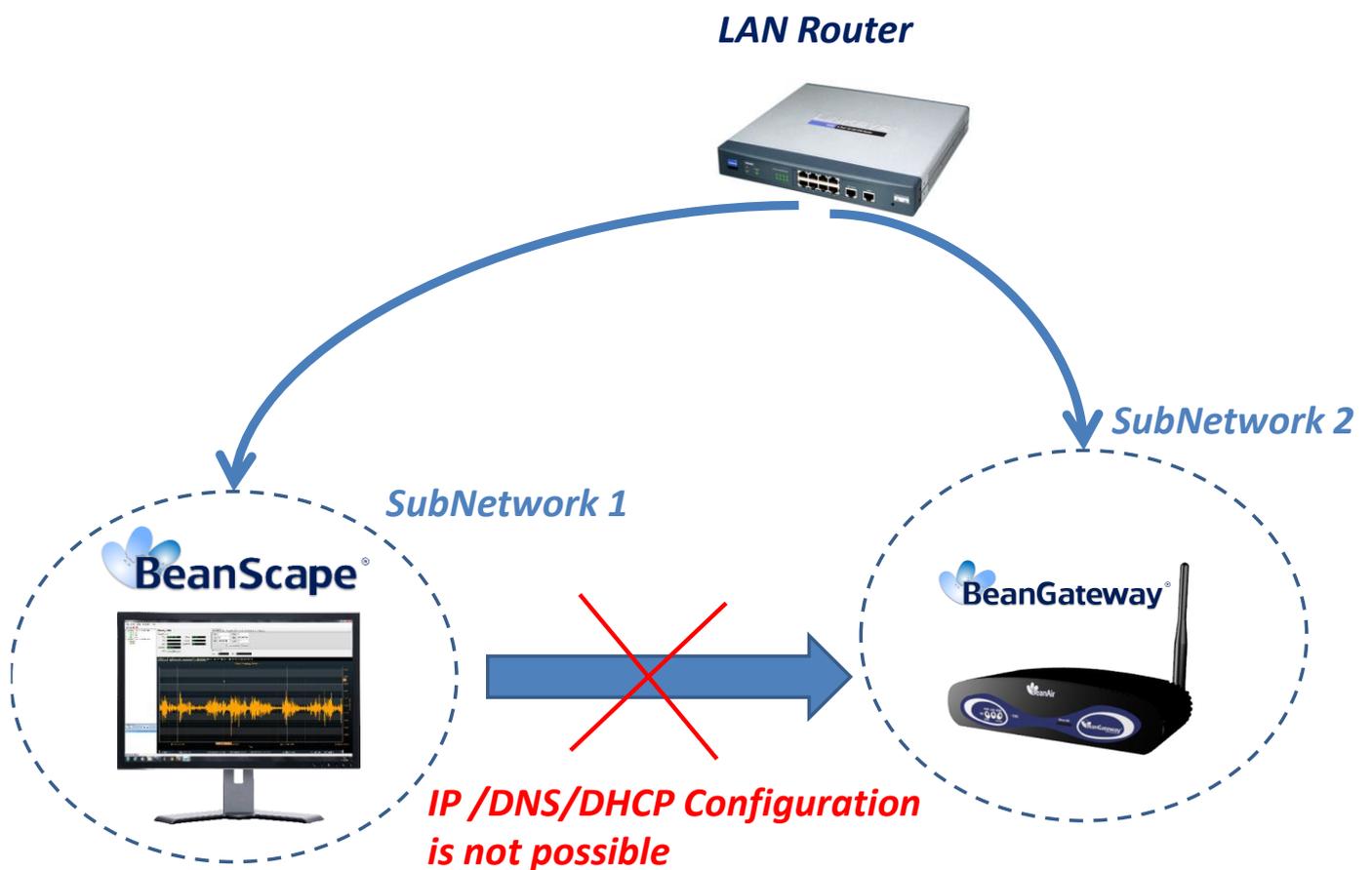
List of
BeanGateway®
present on the
LAN Network

Step 4

- Select the BeanGateway® which must be configured
- Start configuring the BeanGateway® LAN features ("TCP/IP Configuration" frame)
- Click on "validate" button (TCP/IP Configuration frame) in order to validate your configuration



You will not succeed in localizing your BeanGateway® if it is on another subnetwork than your BeanScape®, i.e if there is a LAN Router between them.



7.2 BEANSCAPE CONFIGURATION

7.2.1 LAN configuration (for advanced users only)

The BeanScape LAN configuration is given by the PC LAN default configuration. To change the LAN configuration, you should change you LAN parameters on Windows.

To do this, please have a look in the troubleshooting section: [Troubleshooting](#)

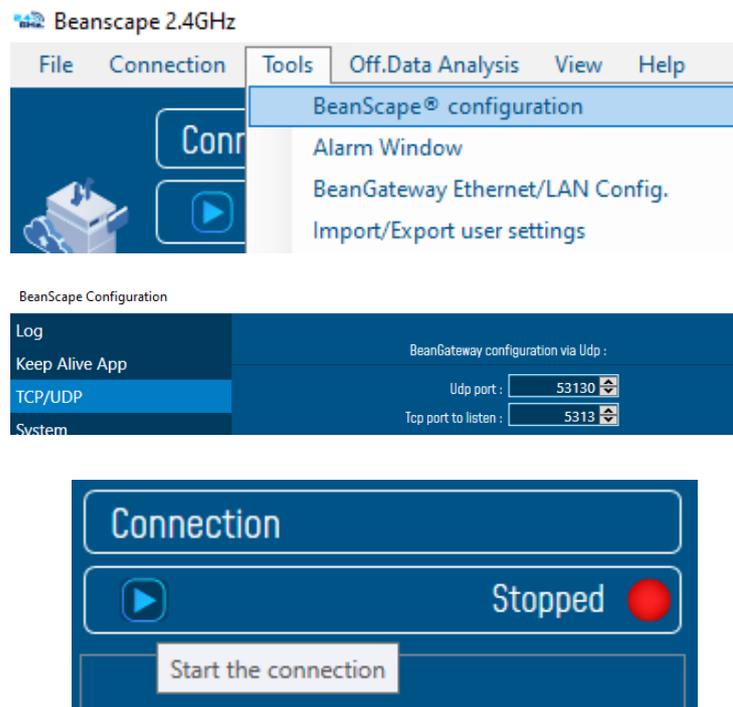


If your computer has two or more networks interfaces, you can equally connect BeanGateway® to each interface, but you must ensure that BeanGateway® is well configured, i.e. that it is configured with the interface IP address that it is connected to (directly or indirectly).

7.2.2 TCP Port configuration (for expert users only)

The default port used for communication between BeanScape and BeanGateway is the 5313 port. This port is generally free, but if not, you can choose another Port.

To change this configuration:



Step 1

- Go to your Beangateway® profile and click on Tools, then click on **BeanScope configuration**

Step 2

- In the TCP/IP section, you can change the “Tcp port to listen”
- Apply the changes and save

Step 3

- If the server was previously started, stop it and start again, if else then just start the server.



Changing this parameter involves changing the BeanGateway configuration. Please refer to this [section](#).

7.3 KEEP ALIVE CONFIGURATION

7.3.1 BeanGateway® side

BeanGateway® Keep Alive configuration can be performed in the same window. You can enable or disable this feature by checking/unchecking the check box.

Keep Alive App Config

enabled :

KAA timeout [ms] : 15000

KAA interval [ms] : 4000

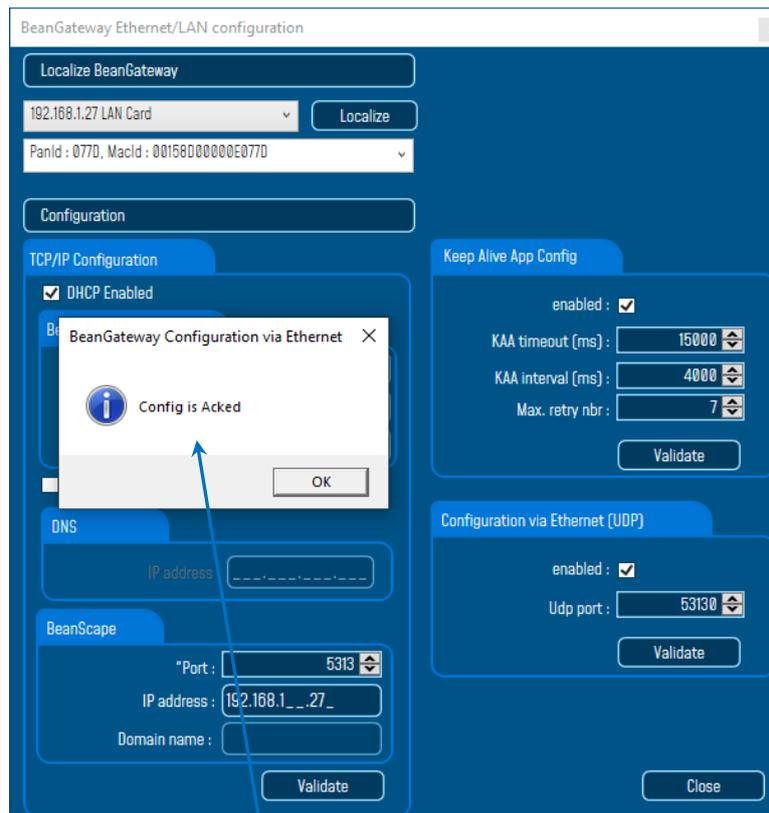
Max. retry nbr : 7

Validate

If the “KeepAlive” feature is enabled, Keep Alive Timeout / Interval and retry number can be configured:

- **Timeout** is the time the BeanGateway® may wait before it sends a KeepAlive frame.
- **Interval** is the time duration between two successive “keepalive” retransmissions, (In case if no response to the first “Keepalive” has been issued from the target).
- **Max retry nbr** is the number of KeepAlive frame transmissions retrieval to be carried out before closing the Ethernet socket (= the internet link is broken between the BeanGateway® and the BeanScope®).

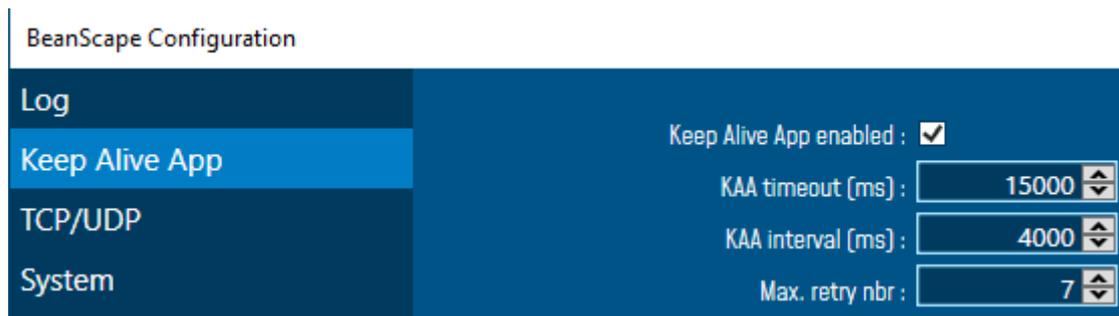
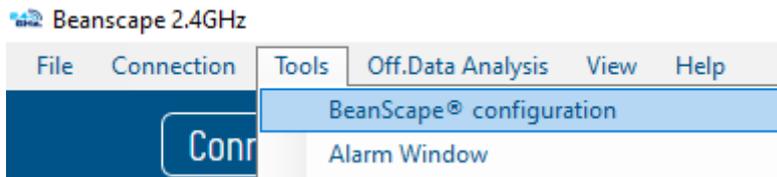
Click on Validate in order to validate your configuration, a window will appear “Config is Acked”



A new window appears,
your new configuration is
ACKED

7.3.2 BeanScape® side

Click on the tab “**Tools**” then “**Options**”



If the “KeepAlive” feature is enabled, Keep Alive Timeout / Interval and retry number can be configured:

- **Timeout** is the time the BeanScape® may wait before it sends a KeepAlive frame.
- **Interval** is the time duration between two successive “keepalive” retransmissions, (In case if no response to the first “Keepalive” has been issued from the target).
- **Max retry nbr** is the number of KeepAlive frame transmissions retrieval to be carried out before closing the Ethernet socket (= the internet link is broken between the BeanGateway® and the BeanScape®).

Click on **Apply** then **Save** in order to validate your configuration.



Keep Alive should not be used during a 3G/4G connection, BeanGateway®

8. MULTI-WSN CONFIGURATION

With the Multi-WSN Configuration user has the ability to connect several BeanGateway on the same LAN and managed by the same BeanScape software.

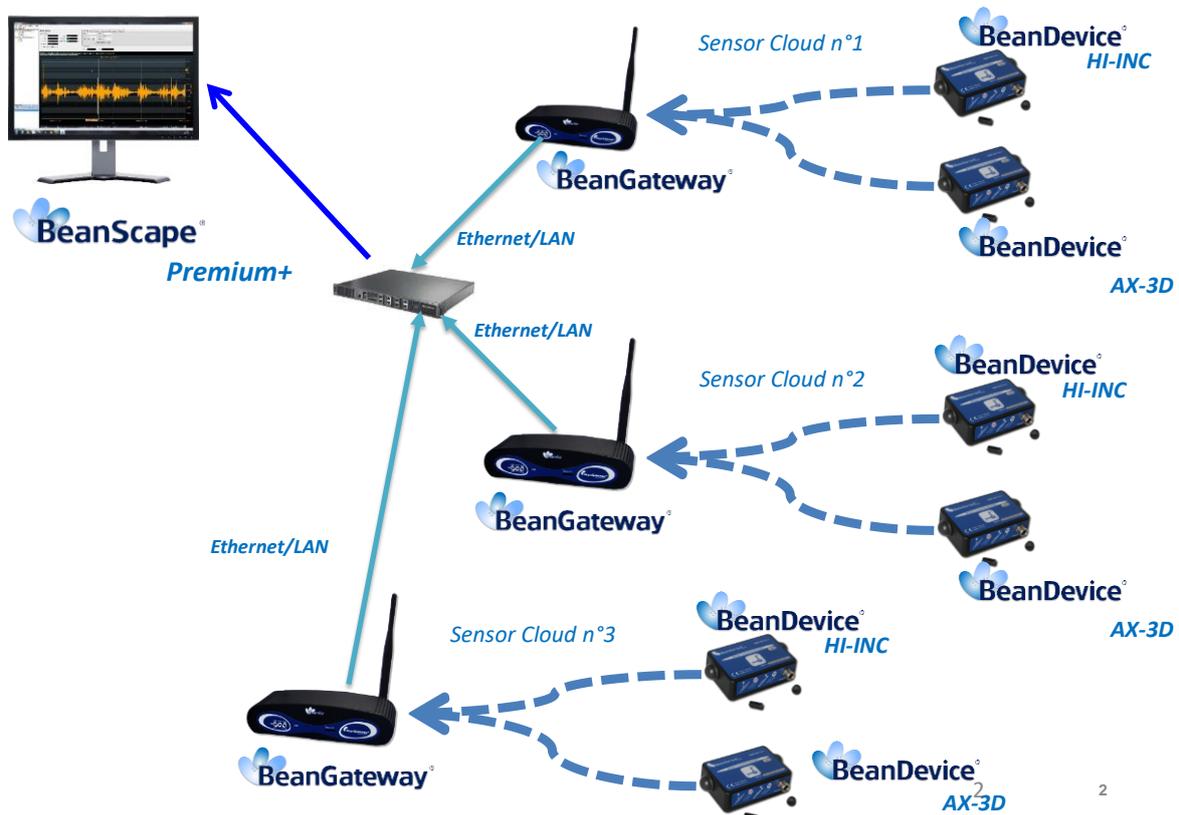


Figure 2 : A multi-WSN architecture

Before to start deploying your wireless sensors with the multi-WSN architecture some settings are mandatory

- PAN ID should be different between each BeanGateway®
- The distance between each BeanGateway® should be at least 5 meters;
- Each BeanGateway® should use different Radio channel;

How to change PAN ID on the BeanGateway

From the BeanScape software click on the BeanGateway profile then click on **radio Config**. Tab
On PanID Configuration enter a new PANID (3901 for example) then click on validate.

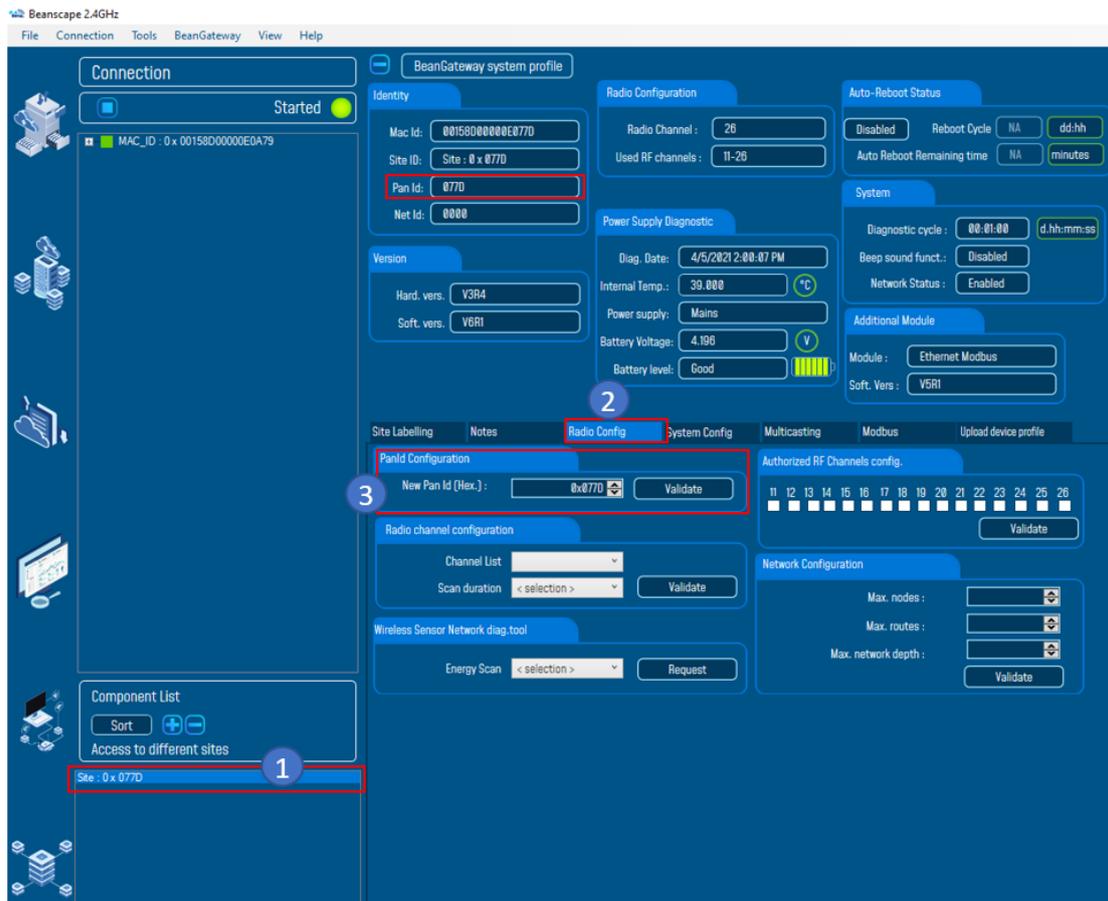


Figure 3 : PAN ID Configuration

To change RF channel just scroll down the channel list and select a channel from the available list then validate.

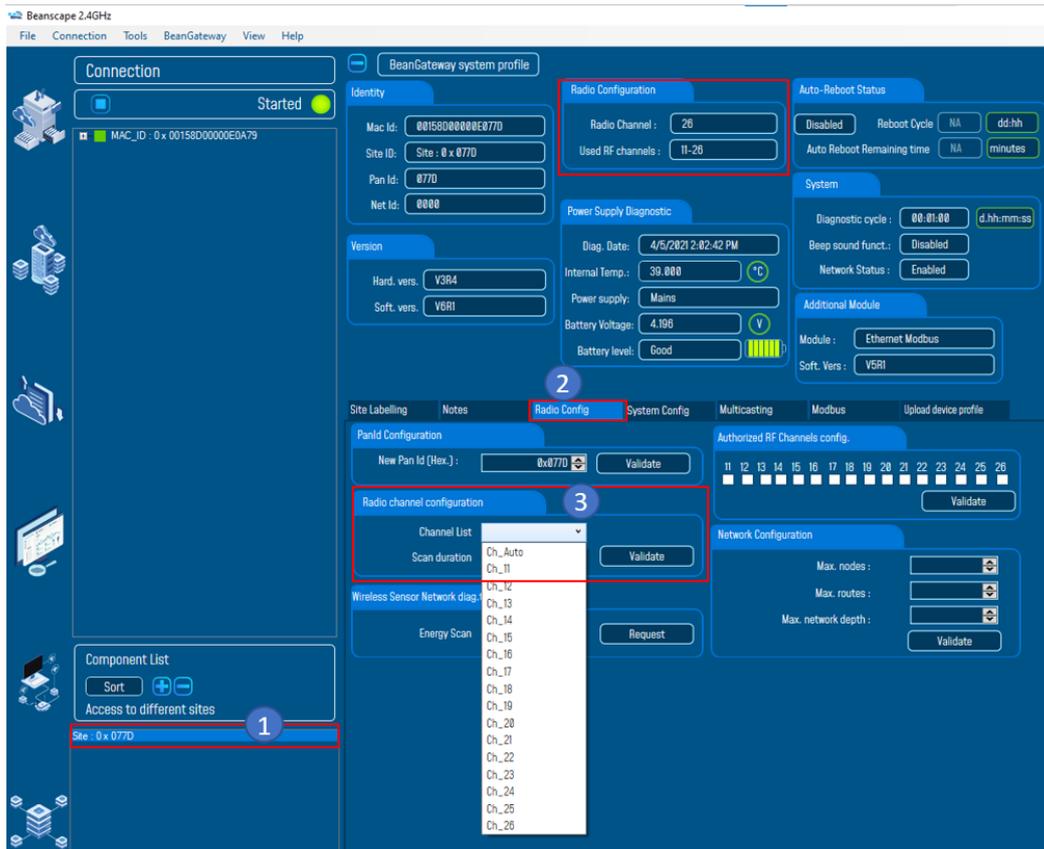


Figure 4 : Manual Radio Channel selection

9. TYPICAL NETWORK CONFIGURATION EXAMPLES

In this section you can find some examples of network configurations that you can set up. The IP address and Subnet mask given in those examples can be changed to fit your own architecture. **If static IP configuration is used, be sure to set the right subnet mask regarding your network IP address system.**

9.1 BEANSCAPE® AND BEANGATEWAY® CONNECTED THROUGH DIRECT ETHERNET LINK



[Watch the video](#)

Static IP
X.Y.Z.A

 **BeanScape®**



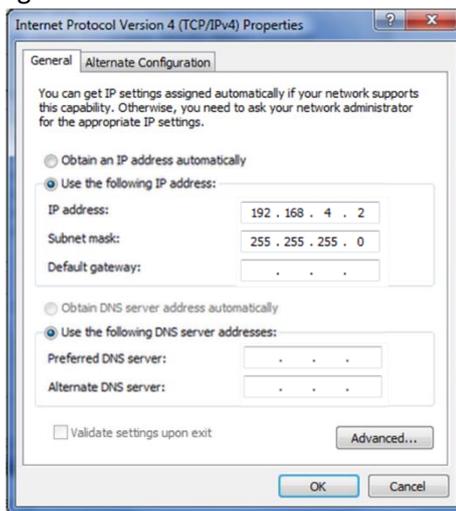
Static IP
X.Y.Z.B



 **BeanGateway®**

- The PC running the BeanScape® must have a static IP configured on its Network interface:

- ✓ **IP address:** 192.168.4.2
- ✓ **Subnet mask:** 255.255.255.0
- ✓ Default Gateway not necessary
- ✓ DNS Server addresses not necessary



- The BeanGateway® will be configured with a static IP address
 - ✓ **IP address:** 192.168.4.123
 - ✓ **Subnet mask:** 255.255.255.0
 - ✓ Default Gateway will not be used but can be filled
 - ✓ BeanScape IP address must be the same as the one defined above
 - ✓ BeanScape Port must be the same than the one defined in your BeanScape options

Configuration

TCP/IP Configuration

DHCP Enabled

BeanGateway TCP/IP

IP address : 192.168.4.123

Sub network mask : 255.255.255.0

Default gateway IP : 192.168.4.1

DNS Enabled DNS IP AUTO

DNS

IP address : _____

BeanScape

*Port : 5313

IP address : 192.168.4.2

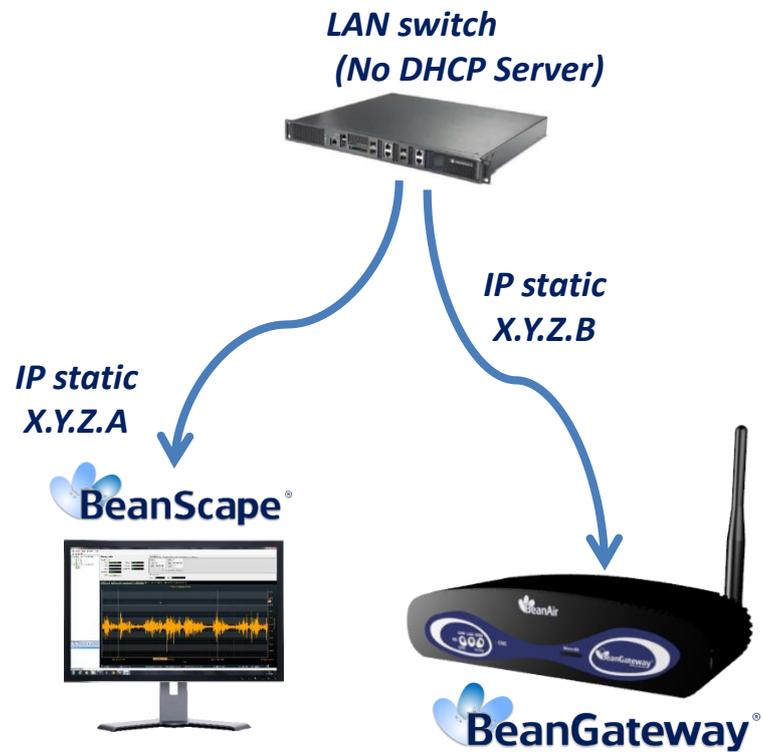
Domain name : _____

Validate



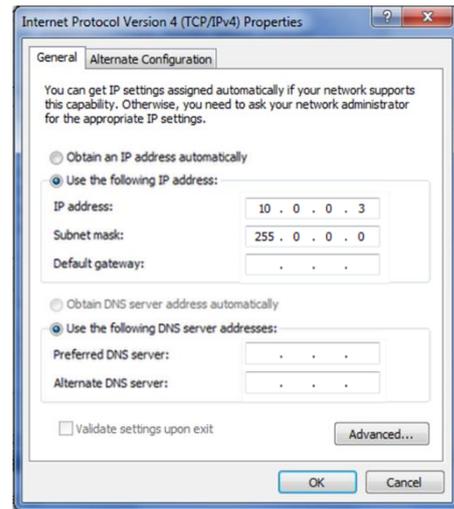
Keep Alive should not be used during a 3G/4G connection, because latency time is not guaranteed to 4G network.

9.2 BEANSCAPE® AND BEANGATEWAY® CONNECTED TO A LAN NETWORK WITHOUT DHCP SERVER



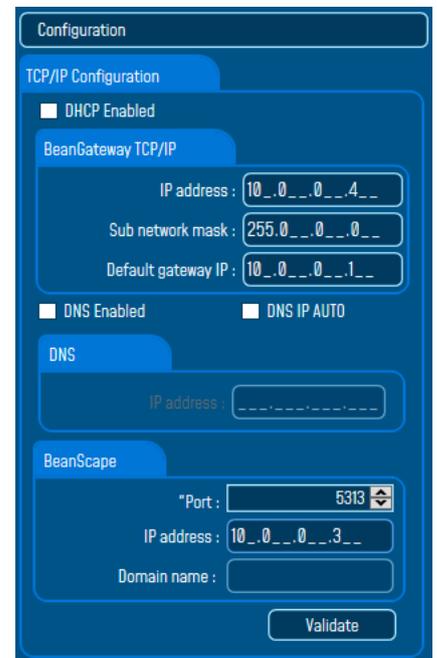
■ **Assign a static IP address on the PC running the BeanScape®:**

- ✓ IP address: 10.0.0.3
- ✓ Subnet mask: 255.0.0.0
- ✓ Default Gateway not necessary
- ✓ DNS Server addresses not necessary



■ **Assign a static IP Address on your BeanGateway®:**

- ✓ Enter your IP address (example: 10.0.0.4)
- ✓ Enter the subnet mask: 255.0.0.0
- ✓ Default Gateway will not be used but can be filled
- ✓ Your PC IP Running the BeanScape® must be the same than the one defined above
- ✓ BeanScape® Port must be the same than the one defined in your BeanScape options



9.3 BEANSCAPE® AND BEANGATEWAY® CONNECTED ON A LAN NETWORK WITH DHCP SERVER

LAN Router with DHCP Server



LAN switch



IP allocated by
DHCP Server
X.Y.Z.A

 **BeanScape®**

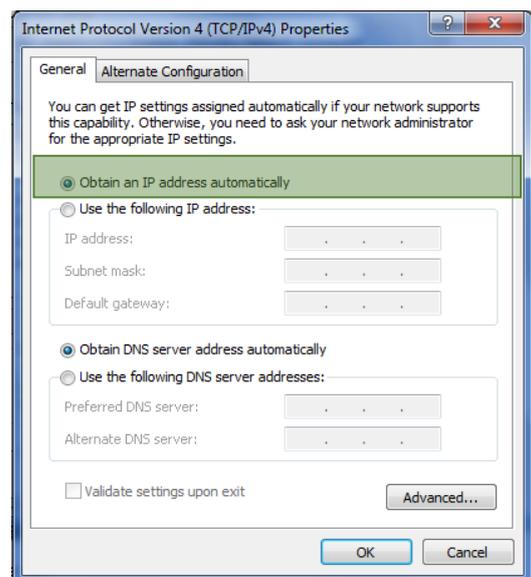


IP allocated by
DHCP Server
X.Y.Z.B



 **BeanGateway®**

- Choose the “option obtain an IP address automatically” on your PC



- Configure the BeanGateway® with a dynamic IP address
 - ✓ DHCP enabled
 - ✓ Enter the IP address of your PC running the BeanScope®

9.4 BEANSCAPE® SOFTWARE INTEGRATION WITH A WINDOWS TABLET

9.4.1 Using LAN cable

You can connect your BeanGateway Directly to your Tablet or Your WIFI/LAN router using an Ethernet cable.



If you connect your BeanGateway® to your WIFI/LAN router, you can easily go for Dynamic IP address.

If your BeanGateway® is directly linked to your Tablet, static IP should be selected as there is no DHCP server hosted on your Tablet.

9.4.2 Using WIFI link

You can connect your Tablet to your WIFI/LAN Router via WIFI, in this case you can select the dynamic IP option.



9.5 BEANGATEWAY® 2.4GHZ 3G/4G/ LTE LINKS OUTDOOR VERSION

The BeanGateway 2.4GHz 4G integrates both 2.4GHz and 3G/4G/LTE wireless protocols which can be an alternative of connecting the BeanGateway to a 3G/4G Router what gives you the ability to go for a remote access based on VPN over DDNS or based on IP forwarding.

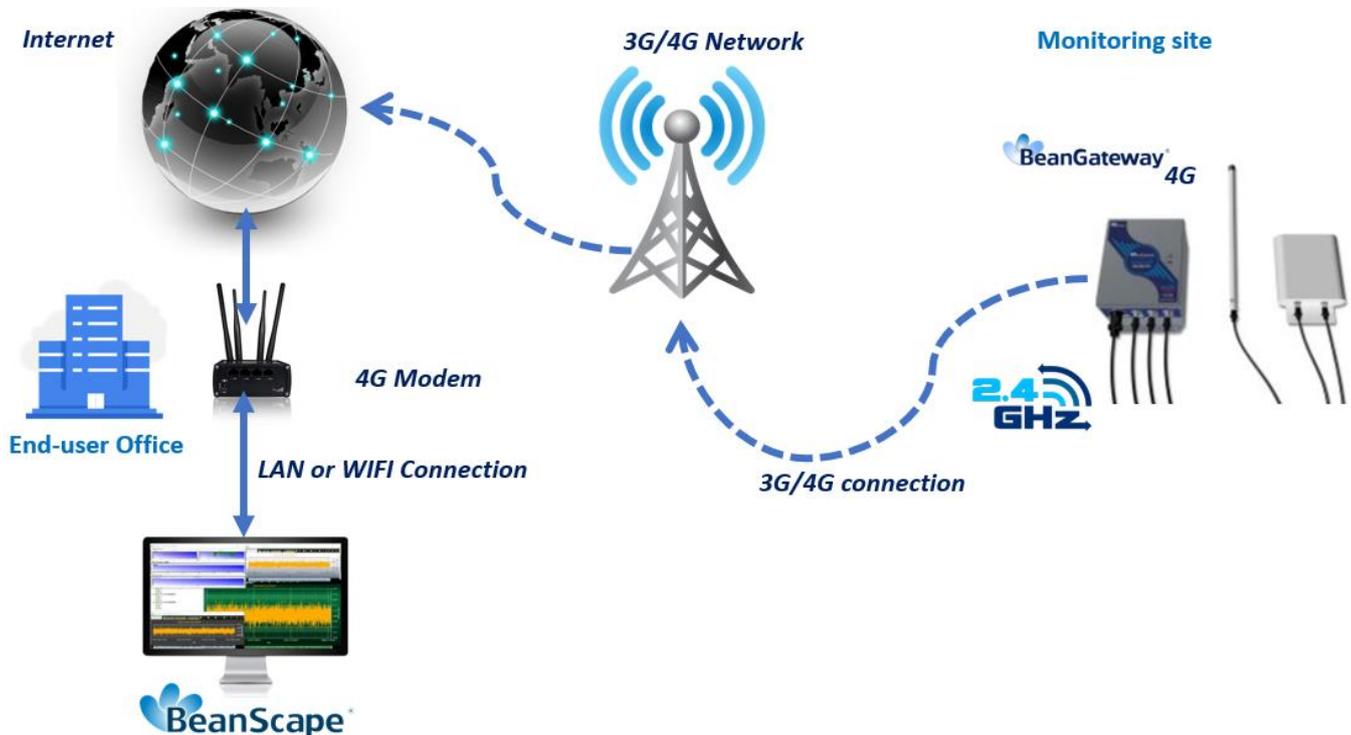


Figure 5 : Network architecture using BeanGateway 4G

10. TROUBLESHOOTING

10.1 HOW CAN I GET THE IP CONFIGURATION ON MY PC?

Open up your windows start menu and Type **cmd** in the *programs and files box* and press **Enter** on your keyboard. call the Windows command prompt window.



“Search
This will

The IP Address can be found by launching DOS command Window and entering the console application IPconfig. This application displays all current TCP/IP network configuration values and can modify Dynamic Host Configuration Protocol DHCP and Domain Name System DNS settings.

```

C:\Windows\system32\cmd.exe
Microsoft Windows [version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. Tous droits réservés.
C:\Users\BeanaïrDamon>ipconfig
Configuration IP de Windows

Carte Ethernet Connexion au réseau local :
    Statut du média. . . . . : Média déconnecté
    Suffixe DNS propre à la connexion. . . :

Carte réseau sans fil Connexion réseau sans fil :
    Suffixe DNS propre à la connexion. . . :
    Adresse IPv6 de liaison locale . . . : fe80::10fd-51e8-7c3c-6403%11
    Adresse IPv4. . . . . : 192.168.1.22
    Masque de sous-réseau. . . . . : 255.255.255.0
    Passerelle par défaut. . . . . : 192.168.1.1

Carte Tunnel isatap.{F8DCBBD9-AAB4-485D-8F43-469125E1D43F} :
    Statut du média. . . . . : Média déconnecté
    Suffixe DNS propre à la connexion. . . :

Carte Tunnel isatap.{C6A390C2-D720-45CB-B612-F7A53D4F0777} :
    Statut du média. . . . . : Média déconnecté
    Suffixe DNS propre à la connexion. . . :

Carte Tunnel Ieredo Tunneling Pseudo-Interface :
    Suffixe DNS propre à la connexion. . . :
    Adresse IPv6. . . . . : 2001:0:5ef5:79fb:2cef:234a:b18e:4b
    Adresse IPv6 de liaison locale. . . . : fe80::2cef:234a:b18e:4b30%15
    Passerelle par défaut. . . . . :

C:\Users\BeanaïrDamon>
  
```

IP config command

IP Address of your PC

10.2 HOW CAN I MODIFY MY PC NETWORK INTERFACE CONFIGURATION?

Please visit Microsoft support pages that will show how you can access and modify your PC interface configuration.

https://support.microsoft.com/en-us/windows/change-tcp-ip-settings-bd0a07af-15f5-cd6a-363f-ca2b6f391ace#WindowsVersion=Windows_10