

How to Operate VNWA2 and VNWA3 Remotely Wired or Wireless

1. Preface:

This document describes the configuration and setup required to operate the DG8SAQ Vector Network Analyzer (VNWA2 or VNWA3) through the Silex SX-DS3000WAN USB Router as a battery-powered Standalone Unit, operated thru a Wireless or Wired Local Area Network, as an ad-hoc Wireless or a Direct Wired LAN connection.

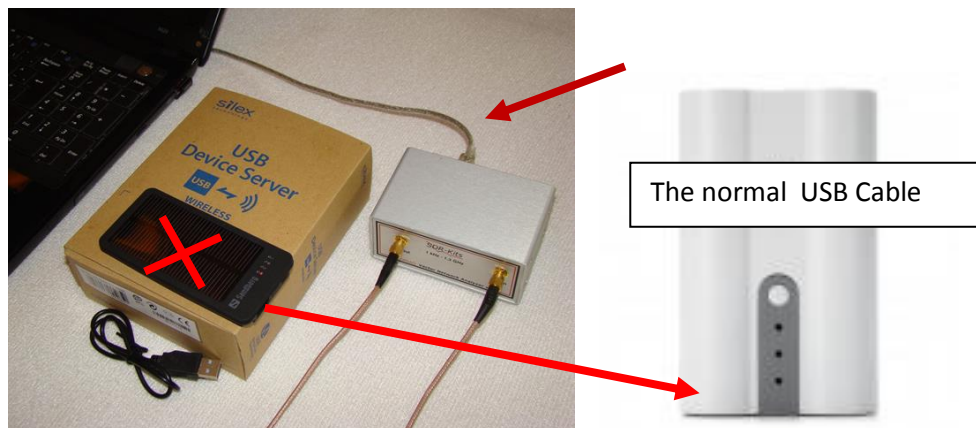
The Silex Mains AC to 5V DC 3A adaptor supplied with the USB Server can of course also supply the Silex SX-DG3000WAN USB Router as an alternative to a battery solution

A warning: The Silex SX DG3000WAN USB Router was bought from Amazon. Other Silex USB Routers of different type may be offered but can lead to disappointing results so stick to the model used. The SX DG3000WAN USB Router is also available from Conrad in Germany.

The traditional setup where the VNWA is connected to a USB port on a Laptop or Desktop computer, limits the distance between the VNWA2 or VNWA3 and the PC to about 3 meter or shorter dependent on the USB Cable used.

A solution is shown how to run the VNWA2 or VNWA3 via a Wired/Wireless USB Device Server and powered from a 5V battery pack. (the low capacity power pack shown on the left of the picture is not recommended as will be explained later ☺)

2.



The Silex USB Device Server has two USB connections, which can drive any type of USB device like the VNWA2 and VNWA3, and includes a 5V AC to DC adaptor able to deliver 3A. Thus a 5V battery power pack with a similar current capability can drive the USB Device Server. A complete battery powered system can then be made, which allow for field operation.

Field operation mode requires some special attention as the usual feature of the Internet Router providing the PC and other equipment on your Local Area Network with IP addresses is not available.

The Silex USB Device Router can be configured in an Ad Hoc mode allowing the PC wireless adaptor to connect to Silex USB Device Router. The USB Device Router and the PC Wireless adaptor however need to be programmed with fixed IP addresses for Ad Hoc mode.

If you would like to avoid this fixed IP programming of the Wireless adaptor (and in some cases of the LAN adaptor as well) on your PC, as inconvenient in daily use as a mobile PC, then an alternative solutions is shown later, how to use a small USB power driven Access Point which can provided both wireless connection to the Silex USB Device Server and provide the IP addresses for the PC from a build in DHCP server.

The USB Device Server has also a traditional LAN adaptor and the embedded WiFi can operate both on

2.4GHz and 5GHz and in Infrastructure mode and Ad Hoc mode

Several types of batteries with lower capacities than the below mentioned 6000mAh which was used with satisfactory results.

The power budget is as follows: USB Server alone (no WiFi) 0.3A, USB Server (no WiFi) and VNWA in standby (no LED lit), USB Server and VNWA running via LAN connection to the PC 0.65A and with USB Server WiFi in operation an additional 0.15A used so in total **0.8A at 5V DC**.

A higher performance battery pack was found in August 2013 on DealExtreme at <http://dealextreme.com> or <http://dx.com> for a price of US\$ 11.00. The item number SKU: 179832 and is a 6000mAh 5V Battery Charging Dock for Mobil Phone + Camera + More /White and Gray, which has two 5V USB outputs and one Charging Input for a standard 5V cellular phone/Nexus 7 tablet charger (Plug looks like a mini USB but is not such a plug) . Note though that a USB Charging cable not provided in the package. The battery pack comes without batteries which need to be ordered separately.



PUSH HERE SLIDE OPEN ☺

Two batteries are required. (although the battery pack will with only one battery fitted) of family 18530 3600mAh also found on DealExtreme. Watch out for the capacity of the various rechargeable batteries which is not all within the “family capacity” of 3600mAh.

I bought a set of two SKU: 26249 Ultrafire 18650 3.7V 3000mAh Lithium Batteries (2-pack) at US\$ 11.99 and measured the capacity as 2000mAh at first charge/discharge in my battery charge/test unit with 1A discharge rate.

A cheaper version SKU: 82785 18650 Rechargeable “3600mAh” Li-ion batteries (Pair) specified to have 1300mAh capacity, at a price of US\$ 5.60 and were measured to have a capacity of 1000mAh at first charge/discharge at 1A Rate. With slower charging higher capacity can be obtained.



Note 1: I found a suitable cable to supply the USB Server item order number: SKU214464 - Portable 5.5mm x 2.1mm to male 4.0 x 1.7mm adaptor DC adapting cable – Black.

Note 2: A custom made cable is required from standard USB-A to 4.0mmx1.7mm power plug. Such a cable was not available from DealExtreme. Either shop around or make your own!



2. CONNECTIVITY METHODS

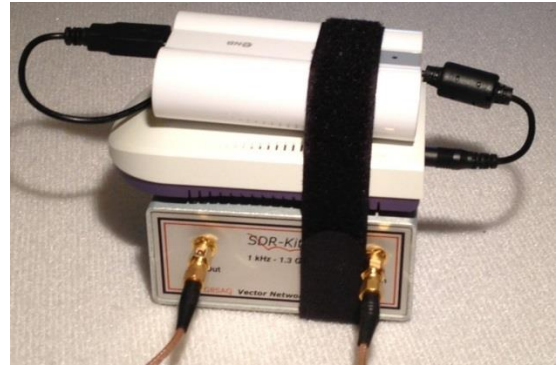
In the next section is listed the 4 ways of connection methods which could be desirable and why.

Following application can be envisaged as described below.

1. **WIRED LAN NETWORK:** If the VNWA2 or VNWA3 is used in a noisy environment or the environment has other constraints, then a tradition cable wired LAN Network connections can be used with the Silex USB Device Server. The PC can be wired to the LAN by cable or via the Local Wireless WiFi. In principle the VNWA2 or VNWA3 can be placed anywhere in the World and accessed via a fixed WAN IP address and port forwarded via your Router - A word of warning though, a VNWA may generate data at a rate of up to 450 kB/sec, which apart from potential cost - exceeds the maximum upload speed permitted by many networks!.
2. **WIFI INFRASTRUCTURE ACCESS POINT:** The VNWA2 or VNWA3 is deployed in a local environment as in point 1 but a wired LAN network does not exist, however a traditional local WiFi access point is accessible, either as a separate local WiFi Access Point or as WiFi build into the WAN Router. Thus the USB Device Server can connect to the WiFi Access Point/WiFi Router and the PC can be wired via a LAN connection or via the same or another local Wireless WiFi Access Point.
3. **WIFI AD HOC LINK:** The VNWA2 or VNWA3 being used remotely where no LAN or WiFi network exist but the connection between the PC and the USB Device Server established as a wireless ad-hoc connection directly between the PC and the USB Device Server. **Please Note, that in this instance the USB Device Server and the PC must be set to fixed IP addresses. However a mobile small USB powered Access Point with built-in DHCP can be used for the provision of IP addresses.**
4. **DIRECT WIRED LAN CABLE:** Like point 3 but when the PC does not have any WiFi circuitry and connection then made as a LAN cable connection between the PC and the USB Device Server.

3. BATTERY POWERED SOLUTION

Several connectivity methods will require the use of a battery powered solution of the VNWA and Silex USB Server system in locations where mains power is unavailable. The use of such a battery powered system is illustrated below.



Left picture shows a VNWA3, Silex USB Server and battery pack ready for field operation. A battery capacity of 2200mAh provided 1 hour and 50 minutes of continuous sweeping of the VNWA3 with this power source. As noted earlier the left shown battery pack is not recommended.

Right picture shows same setup but with a higher capacity battery pack, containing a pair of batteries with proven total capacity of 4000mAh at 2x3.7V (e.g. from Panasonic) which, during a practical test, provided 3 hours and 45 minutes of continuous VNWA operation. With smaller pauses during a typical working day, up to 5 hours service is expected with top quality batteries, before it becomes necessary to change to another set of spare batteries.

4. SILEX USB SERVER INSTALLATION – CREATION OF WIRED LAN CONNECTION

Some System considerations and important points:

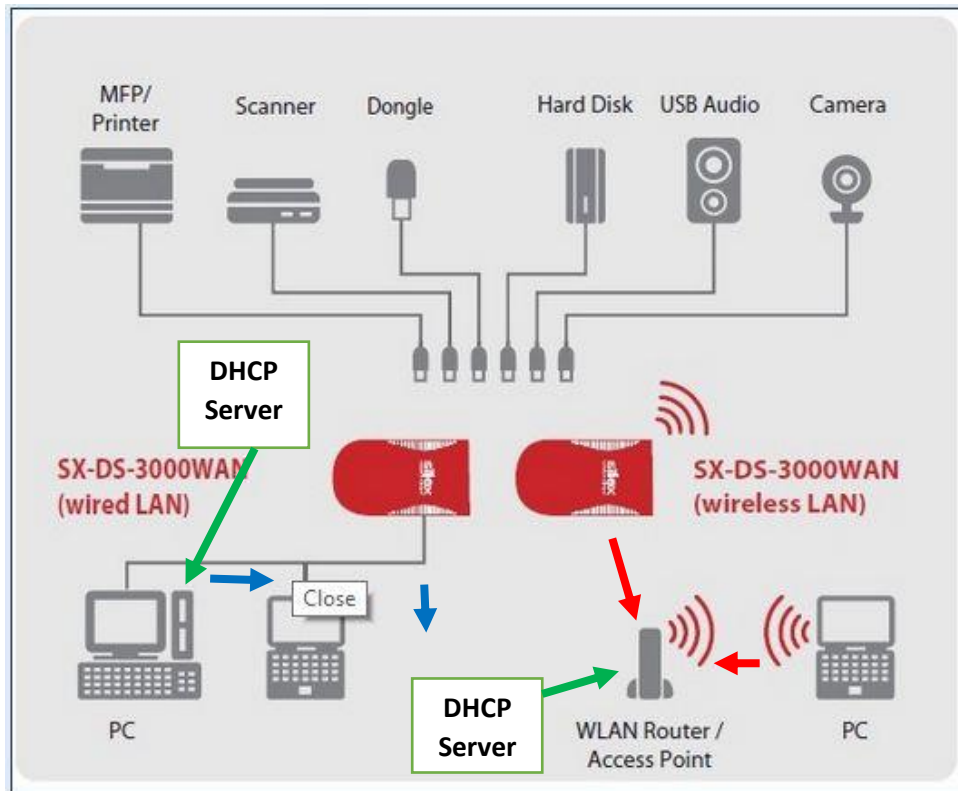
Silex SX-DS-3000WAN product information can be found in the link below.

<http://www.silexeurope.com/en/home/products/usb-device-servers/sx-ds-3000wan.html>

The block diagram shows two different basic methods to connect the USB Device Server, either as wired LAN (blue arrow) or wireless LAN (red arrow). In both cases **vital information is missing**, networks also have a **DHCP Server**, included in the WAN/LAN Router or the Wireless Router, which provides IP addresses to all devices such as PC and USB Device Servers.

Such IP addresses are needed for the devices to communicate via the TCP/IP protocol, and all devices must have IP addresses in the same segment e.g. the most common used 192.168.1.x.

In this Paper a different segment is in use: 192.68.5.x which is for my local network segment.



Of the four different Connections methods for 1. and 2. a DHCP Server exist but not for Connection Methods 3.(if the PC's operating system provides ad-hoc wireless facility) and for 4. there is no DHCP Server available and then **the PC and USB Device Server must be provided with fixed IP addresses.** ***This is a very essential point to realize else you will fight for hours unsuccessfully to get it to work.***

Note: if the Connection method 3. forces you to use a battery operated Access Point, then the provision of IP addresses via DHCP is possible and life is much easier 😊 as earlier stated.

In all cases it is advisable to set the USB Device Server to a fixed IP address, to make life easy, and so we will do in all cases to follow.

It is however important to find out what address ranges the DHCP Server provides the network with, in order avoid address conflict on the network.

If you know how to enter the Router setting you might know that already, else check what IP address the PC is granted by the DHCP Server and if that is a low number e.g. 192.168.1.3.

If that is the case the DHCP server start at 192.162.1.2 to e.g. 192.168.1.100 and - then place the Silex USB Device server with a high IP address e.g. 192.168.1.240.

If the PC is granted 192.168.1.30 then you can safely provide the USB Device Server with a low IP address e.g. 192.168.1.5. Watch out for other fixed IP addresses you have allocated to devices such as printers.

Let us get started

In the package you will find below items



- The Sillex USB Device Server,
- the 5V 3A AC Mains adaptor,
- CD Disk with the Driver Setup Software and the SX Virtual Link Software.

Please consult the Sillex Setup Guide provided with the USB Server. First the Drivers must be installed on the PC from the CD Disk, so the connection to the USB Device Server is acting just like the traditional USB cable.

Note: however for the VNWA2 and VNWA3 the Audio Codecs within the VNWA will be assigned different audio codec numbers in Windows compared to when using an USB cable, however the auto installation function guides you through the procedure, which involves setting the audio codecs to Stereo and highest bitrate (DVD quality).

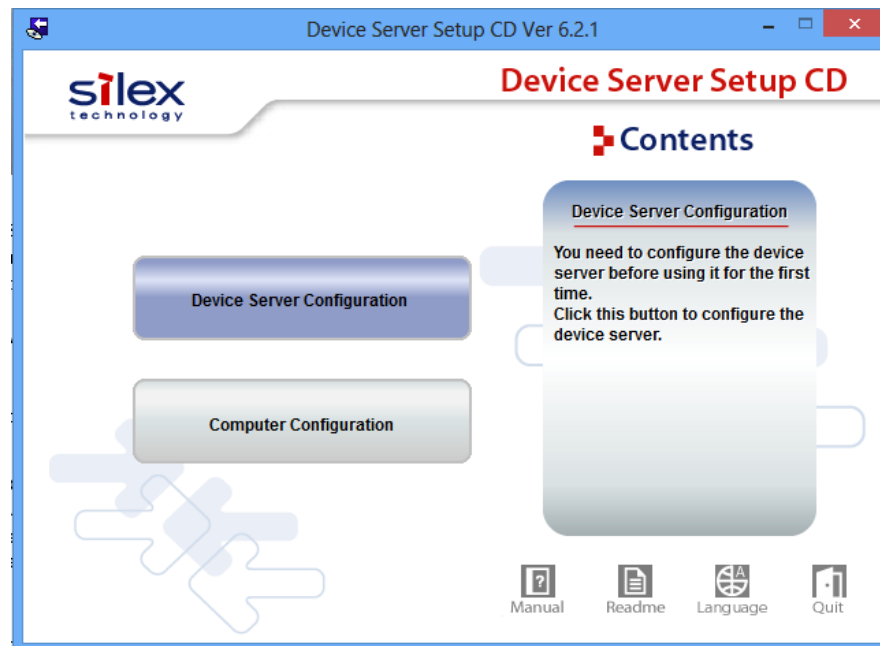
Next using Sillex Setup Guide install the SX Virtual Link Software **and in that order**

Note: It is recommended initially to connect a LAN cable to the USB Device Server (application no 1), before going into setup for the three other application simply to make sure you can setup the USB Device Server, as a firewall setting might create trouble, and not to have to many elements to control. As earlier setting the USB Device Server to a fixed IP address prevent a lot of troubleshooting later on.

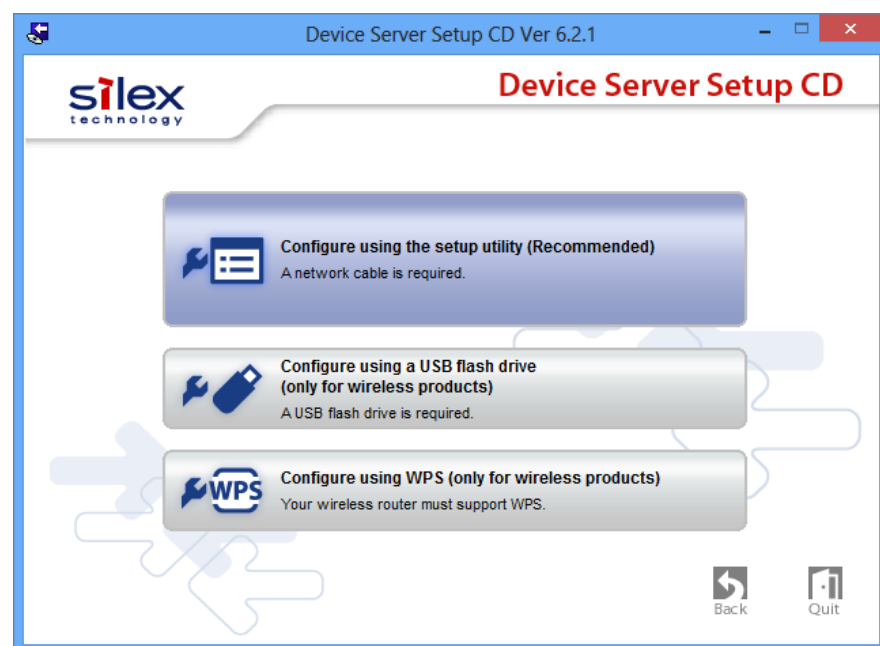
First action:

Connect a LAN cable to the USB Device Server, and apply power from the 5V DC AC adaptor. Then insert the supplied installation CD disk in the PC CD/DVD Drive and run the Autorun.exe if below windows does not appear automatic. However for a PC without CD/DVD drive just copy the content of the CD to and

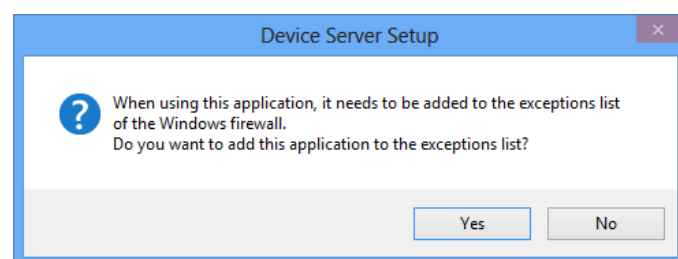
USB stick and run directly from the USB stick or Copy the content to your PC Hard drive in a folder e.g. called "Silex USB Server CD"



Click on Device Server Configuration



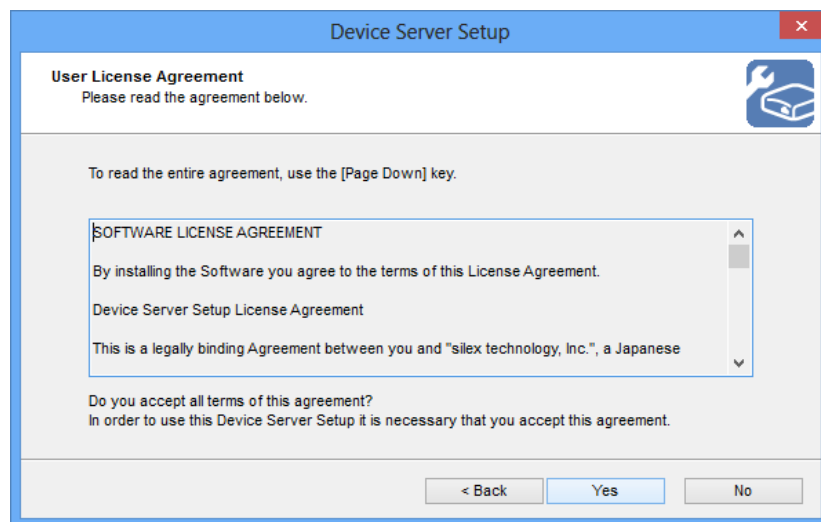
Click on Configure using the setup utility and click YES for the allowance window which follows



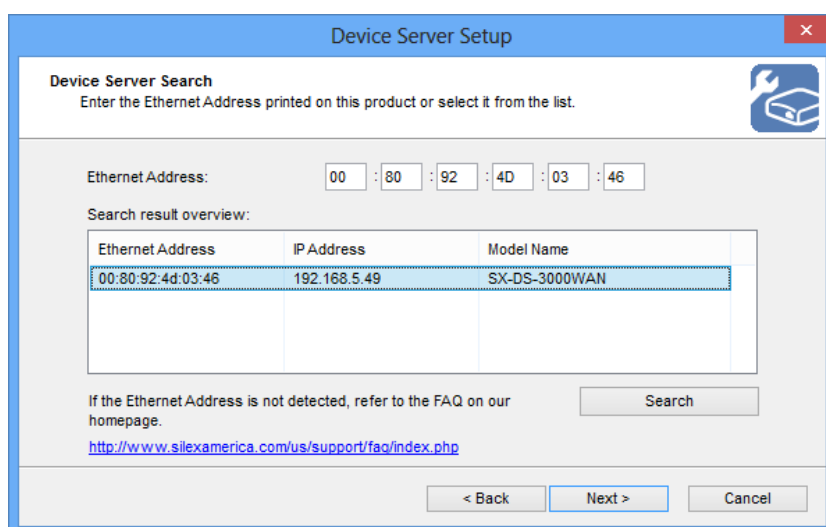
Accept also this prompt for setting up the firewall exceptions



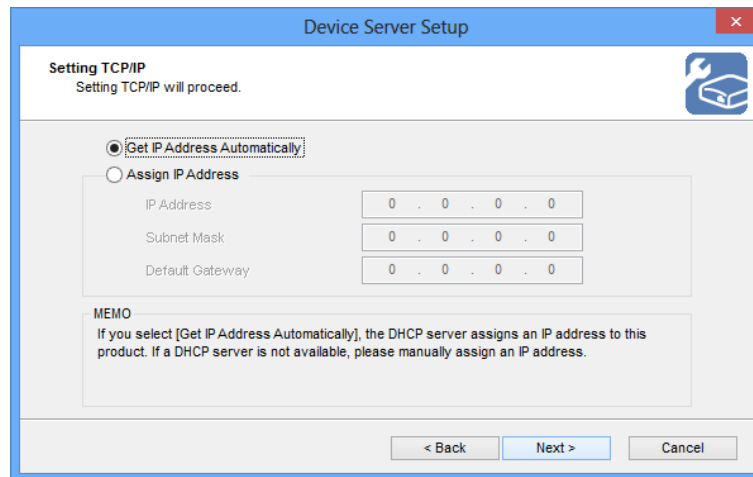
Click on Next



Agree to license agreement by clicking on Yes



Now you see the USB Device Server is found on the network.
(If not found press reset while applying power to reset to factory default and try again)
Mark it with the mouse (line turns light blue) and then click on Next



Device Server Setup

Setting TCP/IP
Setting TCP/IP will proceed.

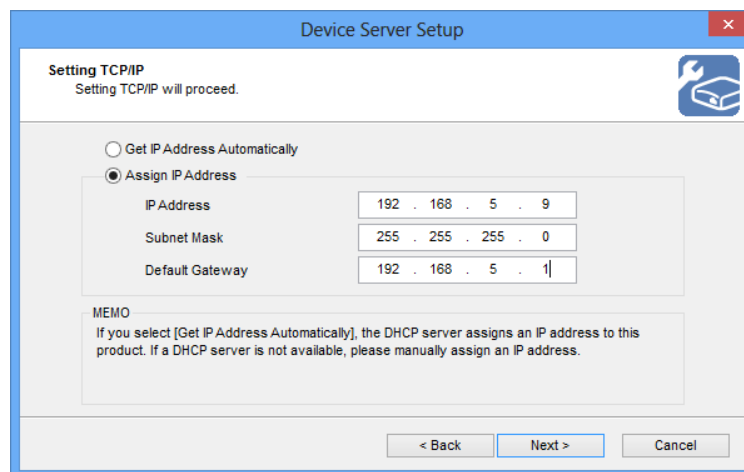
☒ **Get IP Address Automatically**
☐ **Assign IP Address**

IP Address: 0 . 0 . 0 . 0
 Subnet Mask: 0 . 0 . 0 . 0
 Default Gateway: 0 . 0 . 0 . 0

MEMO
If you select [Get IP Address Automatically], the DHCP server assigns an IP address to this product. If a DHCP server is not available, please manually assign an IP address.

< Back Next > Cancel

Now we have the option to choose whether the USB Device Server shall obtain the IP address from a DHCP server or we assign it manually. We choose the manual method as recommended before.



Device Server Setup

Setting TCP/IP
Setting TCP/IP will proceed.

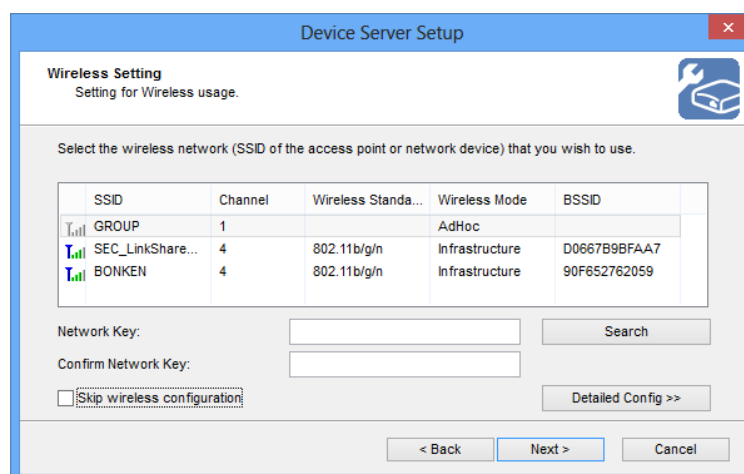
☐ Get IP Address Automatically
☒ **Assign IP Address**

IP Address: 192 . 168 . 5 . 9
 Subnet Mask: 255 . 255 . 255 . 0
 Default Gateway: 192 . 168 . 5 . 1

MEMO
If you select [Get IP Address Automatically], the DHCP server assigns an IP address to this product. If a DHCP server is not available, please manually assign an IP address.

< Back Next > Cancel

Now you have to set the IP address in accordance with your specific network. In my case the DHCP server start to assign at 192.168.5.30 so I chose a low IP address not in conflict with any other device on my network. In your case it will most likely be a different IP address segment most likely 192.168.1.x which is the most common used segment.



Device Server Setup

Wireless Setting
Setting for Wireless usage.

Select the wireless network (SSID of the access point or network device) that you wish to use.

	SSID	Channel	Wireless Standa...	Wireless Mode	BSSID
	GROUP	1		AdHoc	
	SEC_LinkShare...	4	802.11b/g/n	Infrastructure	D0667B9BFAA7
	BONKEN	4	802.11b/g/n	Infrastructure	90F652762059

Network Key: Search
 Confirm Network Key:

☐ Skip wireless configuration Detailed Config >>

< Back Next > Cancel

After a search all the wireless networks are found, but we choose for now not to connect to any.

Device Server Setup

Wireless Setting
Setting for Wireless usage.

Select the wireless network (SSID of the access point or network device) that you wish to use.

SSID	Channel	Wireless Standa...	Wireless Mode	BSSID
GROUP	1		AdHoc	
SEC_LinkShare...	4	802.11b/g/n	Infrastructure	D0667B9BFAA7
BONKEN	4	802.11b/g/n	Infrastructure	90F652762059

Network Key: Search

Confirm Network Key:

☒ Skip wireless configuration

Detailed Config >>

< Back Next > Cancel

Set a tickmark in the box marked "Skip wireless configuration" and click on Next

Device Server Setup

Confirm Configuration Parameters
The values entered are as follows:

Item	Value
[TCP/IP]	
DHCP	Disable
IP Address	192.168.5.9
Subnet Mask	255.255.255.0
Default Gateway	192.168.5.1

Click [Execute] and the Settings will be sent.

< Back Execute Cancel


Confirm by a click on Execute

Device Server Setup

Confirm Configuration Parameters
The values entered are as follows:

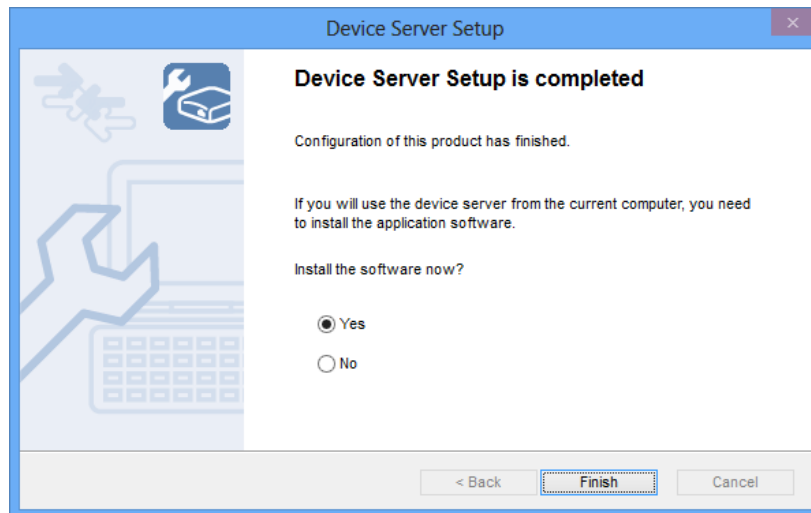
Item	Value
[TCP/IP]	
DHCP	Disable
IP Address	192.168.5.9
Subnet Mask	255.255.255.0
Default Gateway	192.168.5.1

Click [Execute] and the Settings will be sent.



< Back Execute Cancel

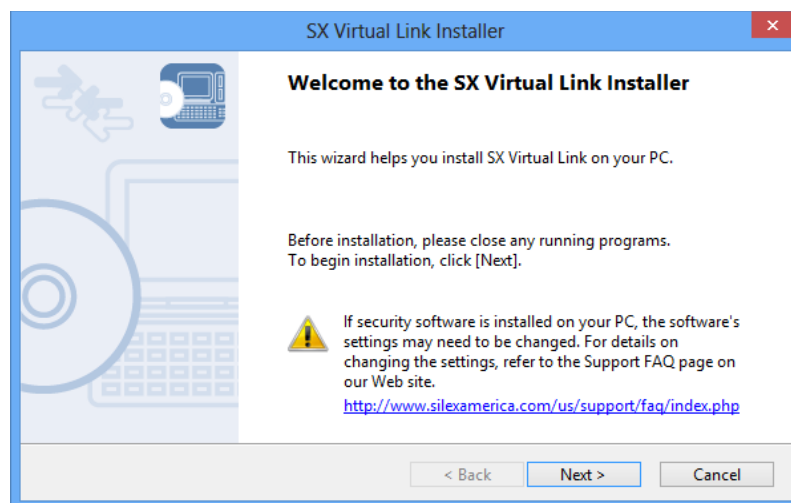
A green progress bar indicates the configuration is written to the USB Device Server and thus finalizing the configuration of the USB Device Server for LAN usage



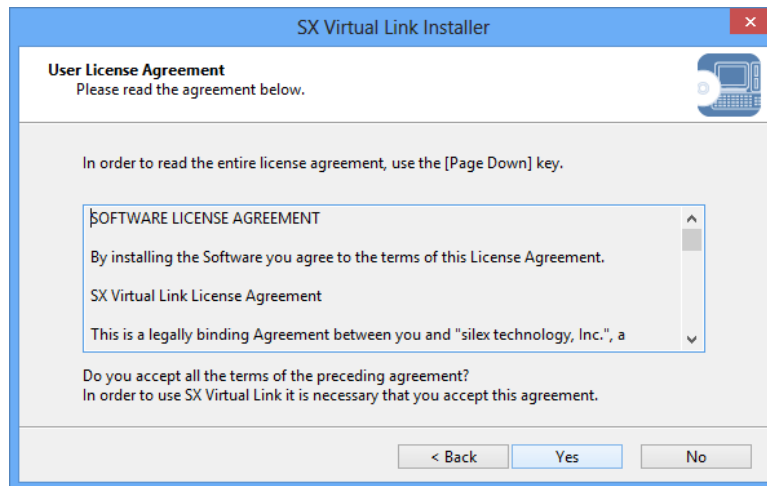
Subsequently this window shows up suggesting to install the SX Virtual Link Software which is necessary to install on the PC for the first time so just click on Finish

NOTE: THAT NEXT TIME the Configuration Utility is run select “No” – reason is because the software has already been installed!!!

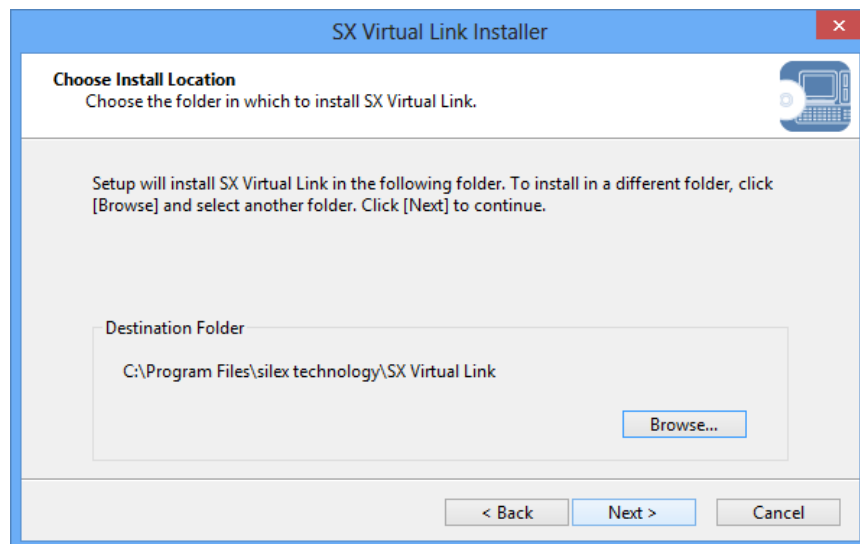
The SX Virtual Link Software is already installed when the Configuration Utility is run e.g. for setting up a wireless connection to your WiFi or an ad-hoc network, to be described later.



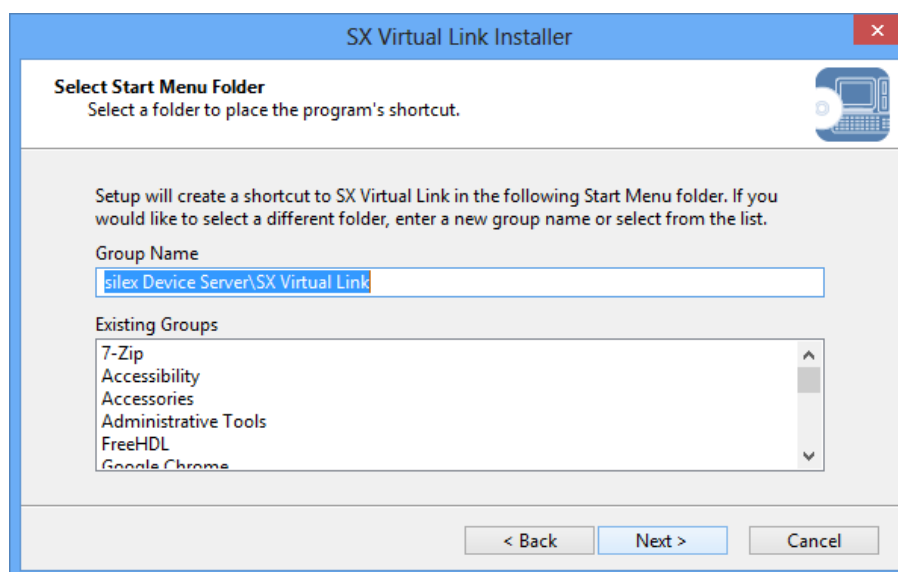
Click Next to continue the installation



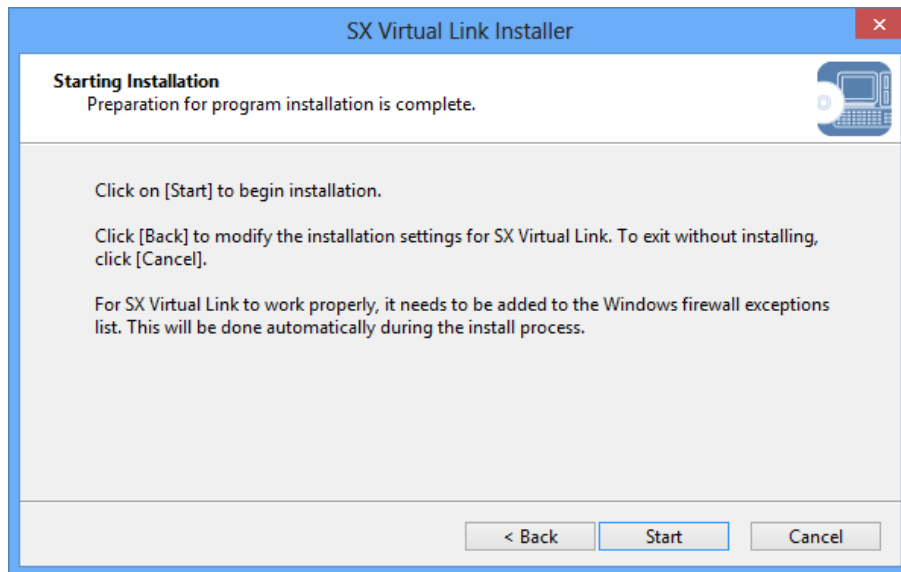
Accept the License Agreement by a click on Yes



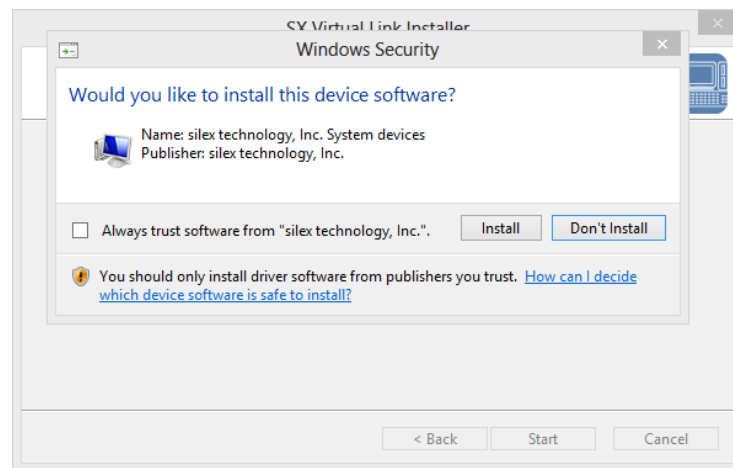
Click Next unless you want to change the installation destination on you Hard Disk



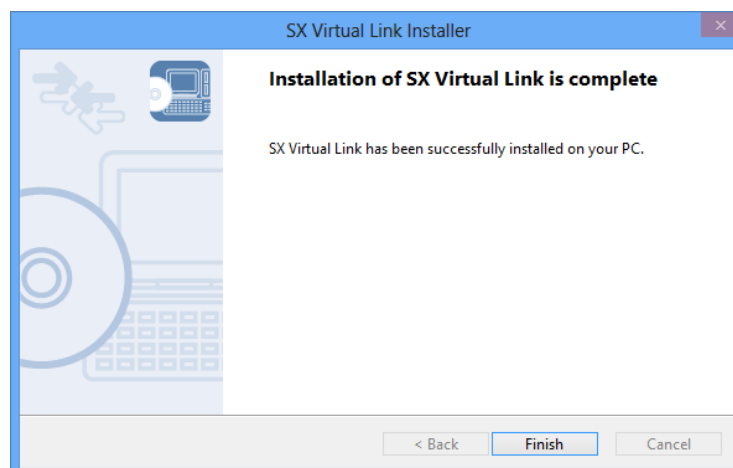
Click Next unless you have special wishes for Start Menu Folder



Click on Start



Set a tick mark in the box “Always Trust software from “Silex technology, Inc.” and click on Install

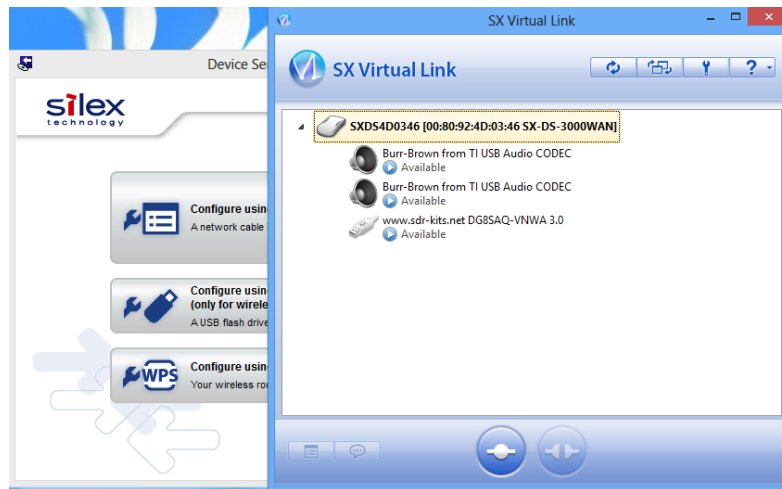


Installation of SX Virtual Link Software now complete and click on Finish

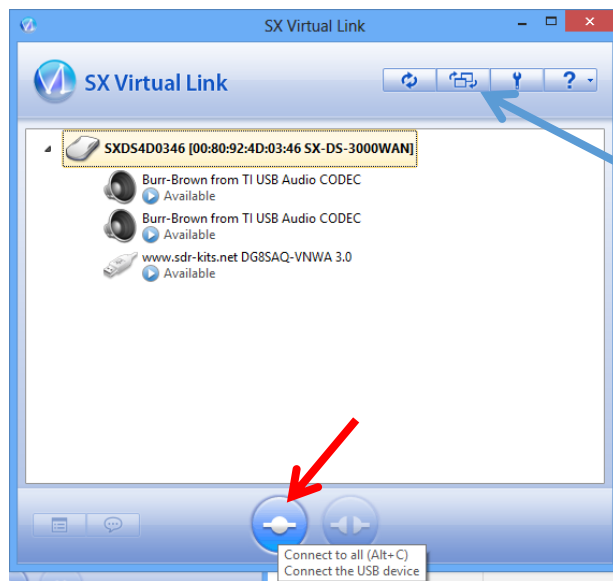
NOW we take the next step

CONNECT NOW THE VNWA USB Cable to one of the USB Ports on the USB Device Server

For a short while the PC is busy installing the VNWA drivers for The VNWA and the two Audio Codecs

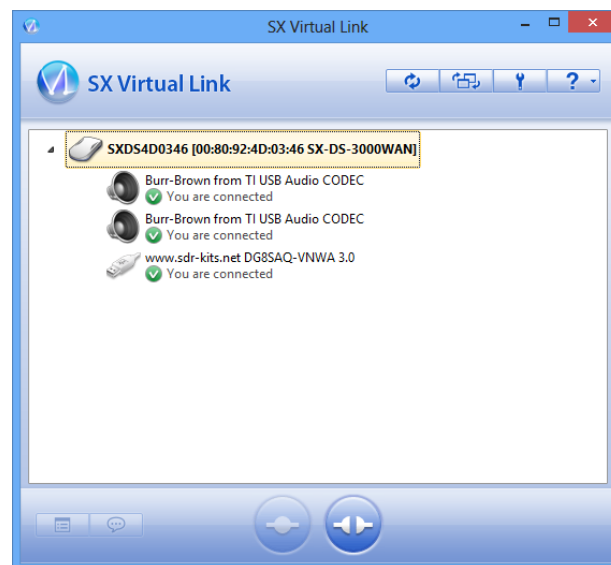


Shortly after - on top of the CD menu - you will see the SX Virtual Link window display that the VNWA USB items is “Available” and we now must create a connection.

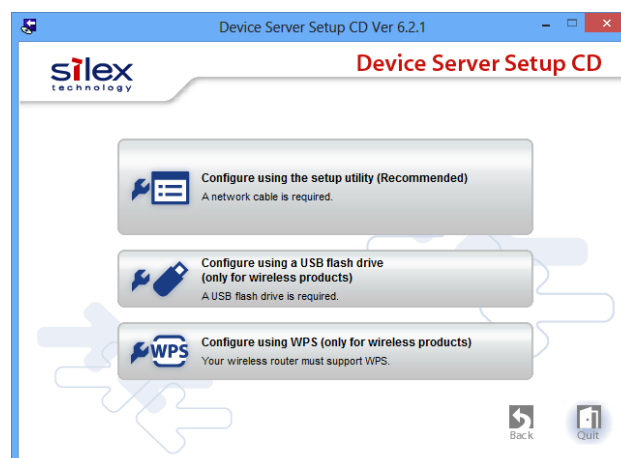


Clicking on this symbol changes the display so connection is either done to all three devices automatic or one by one by manual selection

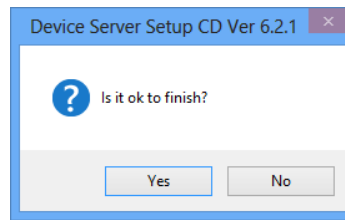
Moving the mouse over lower left symbol you create a connection to all three USB devices, one by one.



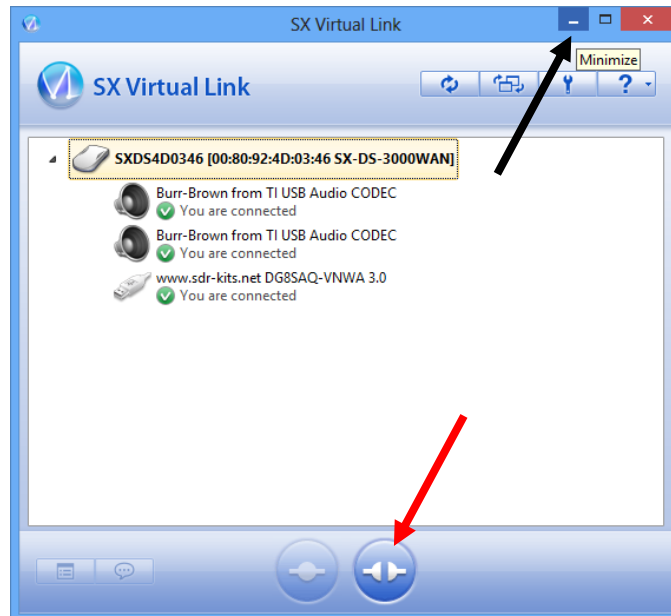
After a short while you see the indication “You are connected”



Now is the time to close the Device Server Setup Program by a click on Quit



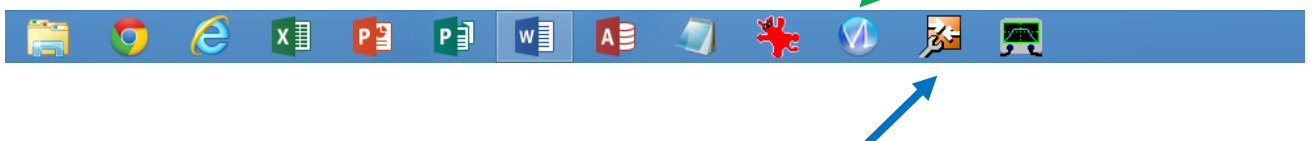
Click Yes



You may now minimize the SX Virtual Link Window. If you close the window the connection will be lost.

ALWAYS DISCONNECT PRIOR TO CLOSING THIS WINDOW BY A CLICK ON THE SYMBOL AT THE RED ARROW and confirm the closure as you are prompted three times

On your desktop or on the status line place a start icon for the **SX Virtual Link** as indicated (W8 view)

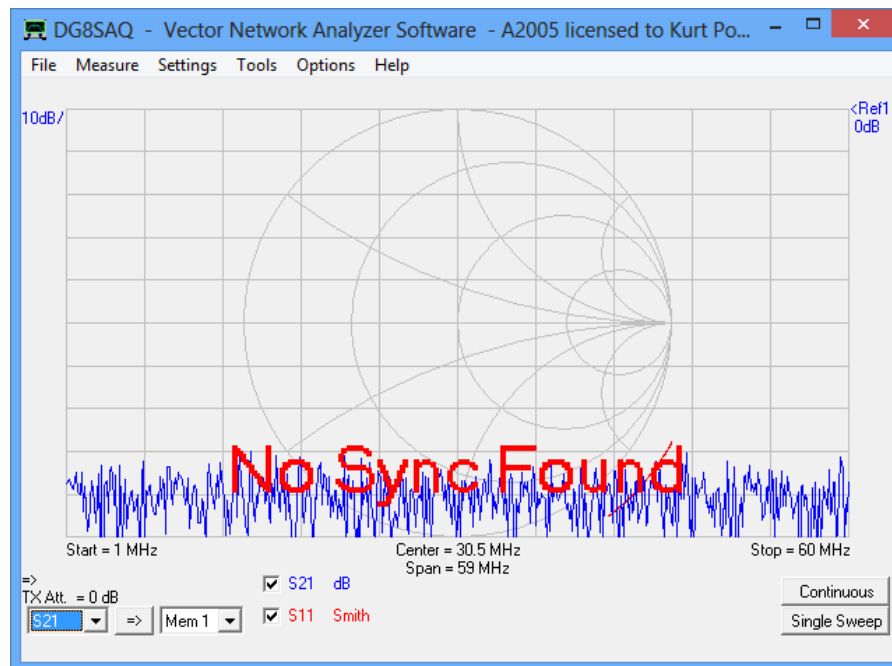


Installation of the Setup Utility on the PC Harddisk

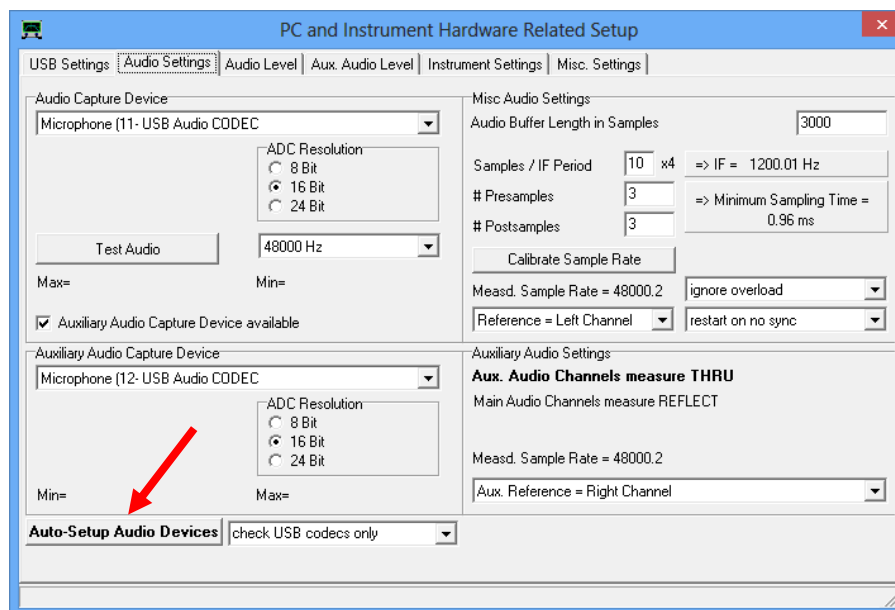
Note: The installation CD does not provide for installation of the setup Utility on the PC Harddisk which is quite inconvenient. To install the **Setup Utility on the PC** just copy and store the single folder called **Wired** as a subfolder to the folder Utility on the installation CD, to your hard disk e.g. in the root as C:/Wired. Then make a Shortcut for the **Setup.exe** in the C:/Wired folder as indicated above with the Blue arrow. The only difference from using the Installation CD is that you have to select your preferred language. As explained earlier you might already have the entire CD content on your hard drive, then just make a shortcut.

Now is the time finally to start the VNWA application.

Click on the VNWA start icon and VNWA starts as usual but if you try to run a sweep you will probably see below screen



The reason being the USB codecs has changed numbers and not set to Stereo/DVD quality, so go to Option/Setup/Audio Settings and run Auto-Setup Audio Devices

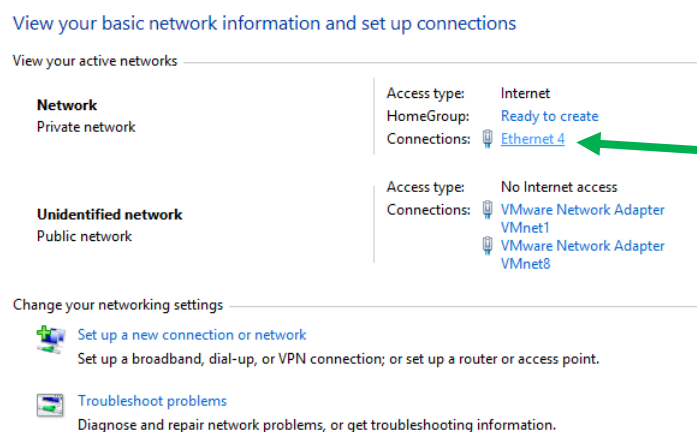
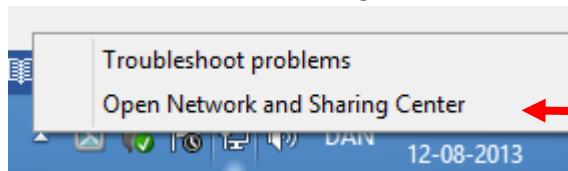


This procedure is described in the VNWA help file and will not be covered further in this document. The calibrate sample rate might fail but then just try again until it performs.

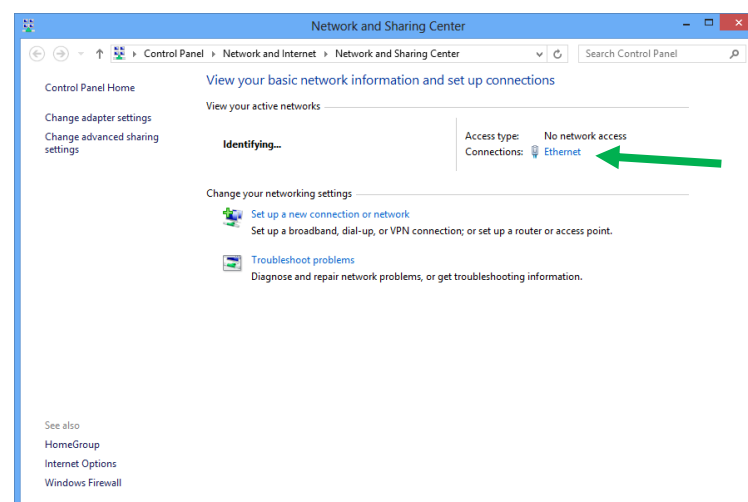
Now the VNWA is remote operated via the LAN network just as you were connected directly to an USB Port on the PC with an USB cable.

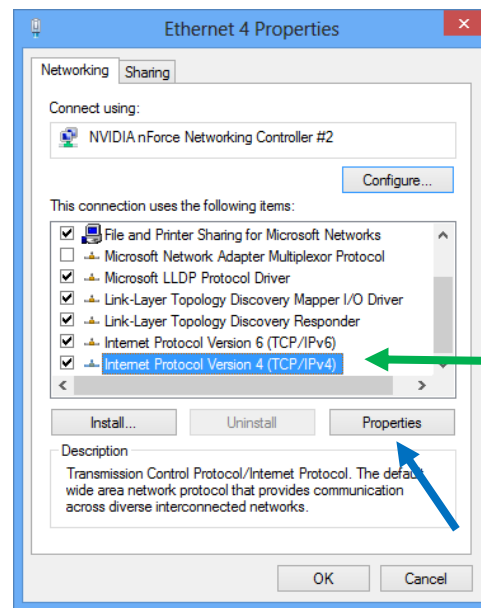
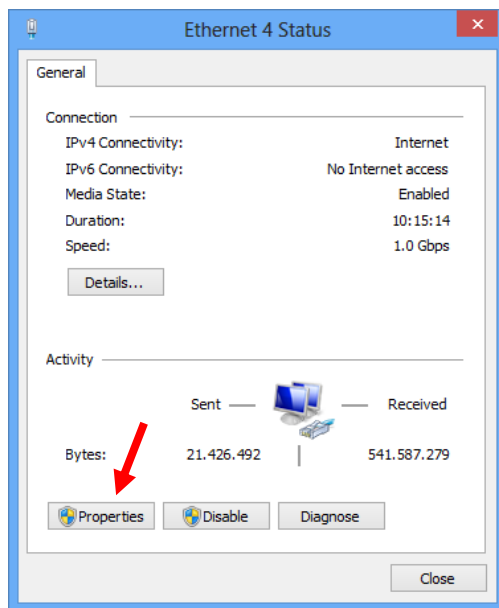
Now let us try to establish a direct connection via an Ethernet Cable between the PC and the USB Device Server without any LAN Network with a DHCP Server

While still connected to the Ethernet LAN with the DHCP Server available open the “**Network and Sharing Center**” either by right click on the LAN icon on the Status Line and select “Open Network and Sharing Center” (red arrow) or go to Control Panel and select “Network and Sharing Center” and select Connections: LAN / Ethernet (green arrow)

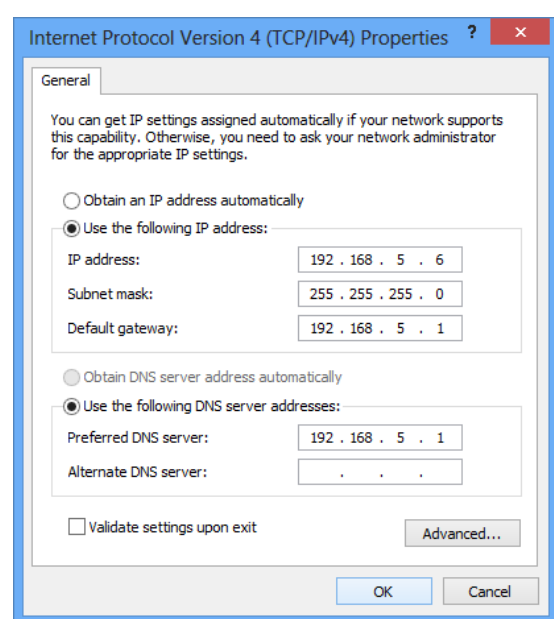
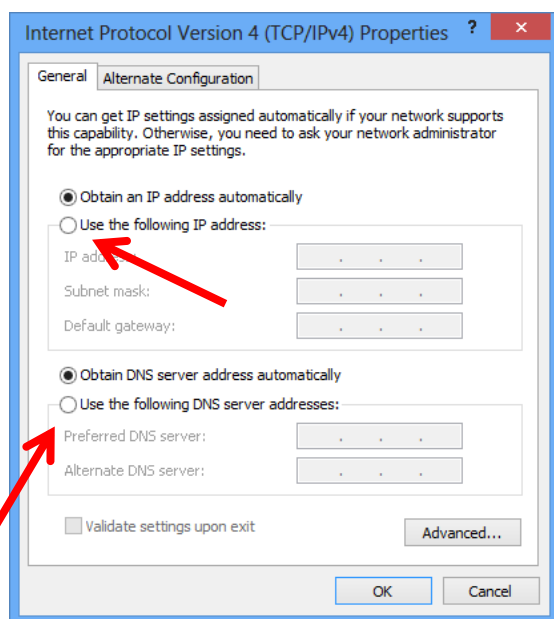


You might also do this procedure by connection a LAN Cable between the silux USB Server and the PC LAN connector and make sure you do not have a WiFi connection established to your Local Area Network and then the Network and sharing center looks like below:

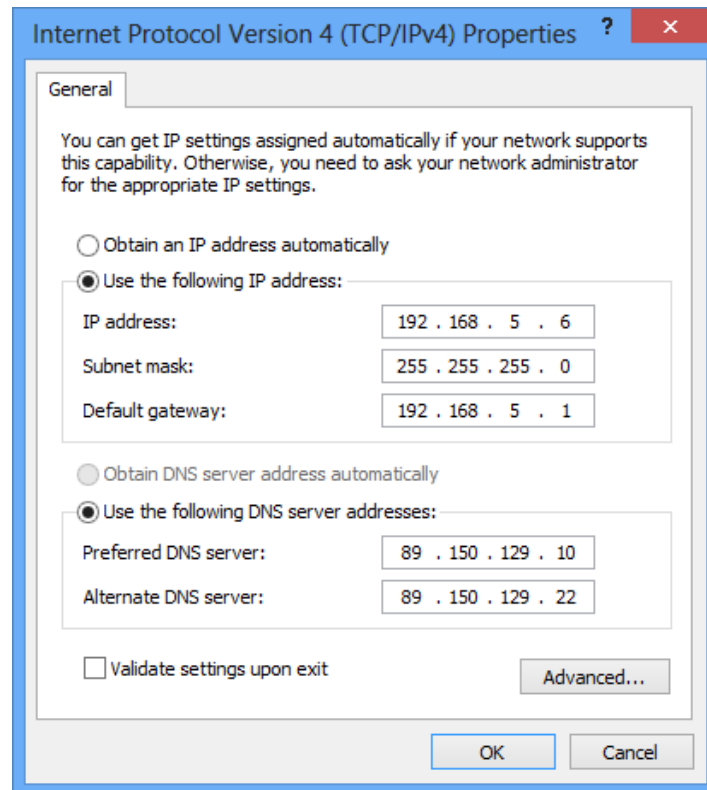




Click on Properties (red arrow) and mark Internet protocol V4 (green arrow) followed by a click on Properties (blue arrow)

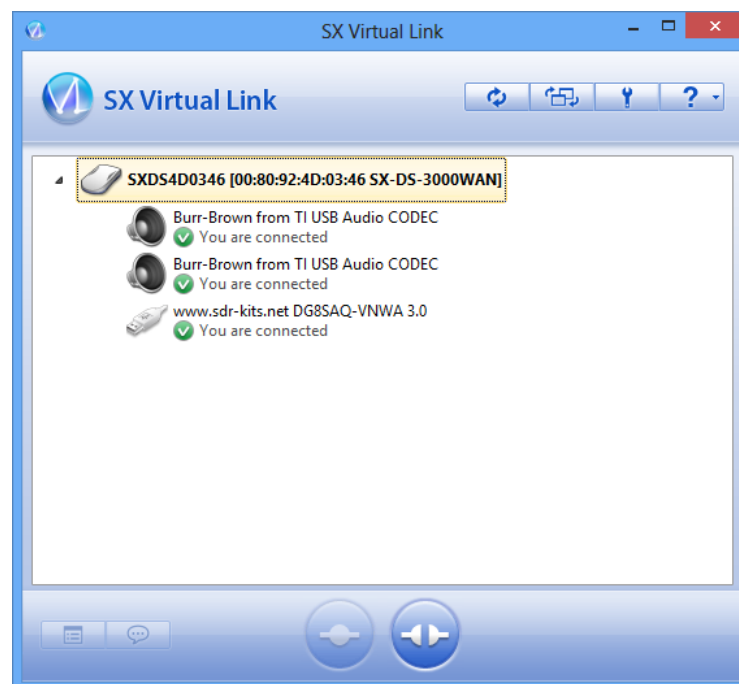


Change to **“Use the following IP Address”** (red arrow) and enter an IP address as shown following the guide lines as described earlier. If you want to maintain Internet connection at this stage, you may enter the Routers IP address as Preferred DNS, but if you then loose the Internet connection, you have to enter the DNS addresses provided by your Internet provider. You can also do this by writing the following instructions in a DOS Prompt (in the black command window – `ipconfig /all` - prior to set the IP address manually). The listing should contain you DNS addresses. If you have chosen to disconnect to the LAN network during this procedure and just have a LAN cable connection between USB Server and PC above discussion about DNS is not relevant.



My Router requires entering the full DNS settings

Now disconnect the PC from your LAN and Connect a LAN Cable between the PC LAN Connector and the USB Device Server's LAN connector (you may have chosen that already)



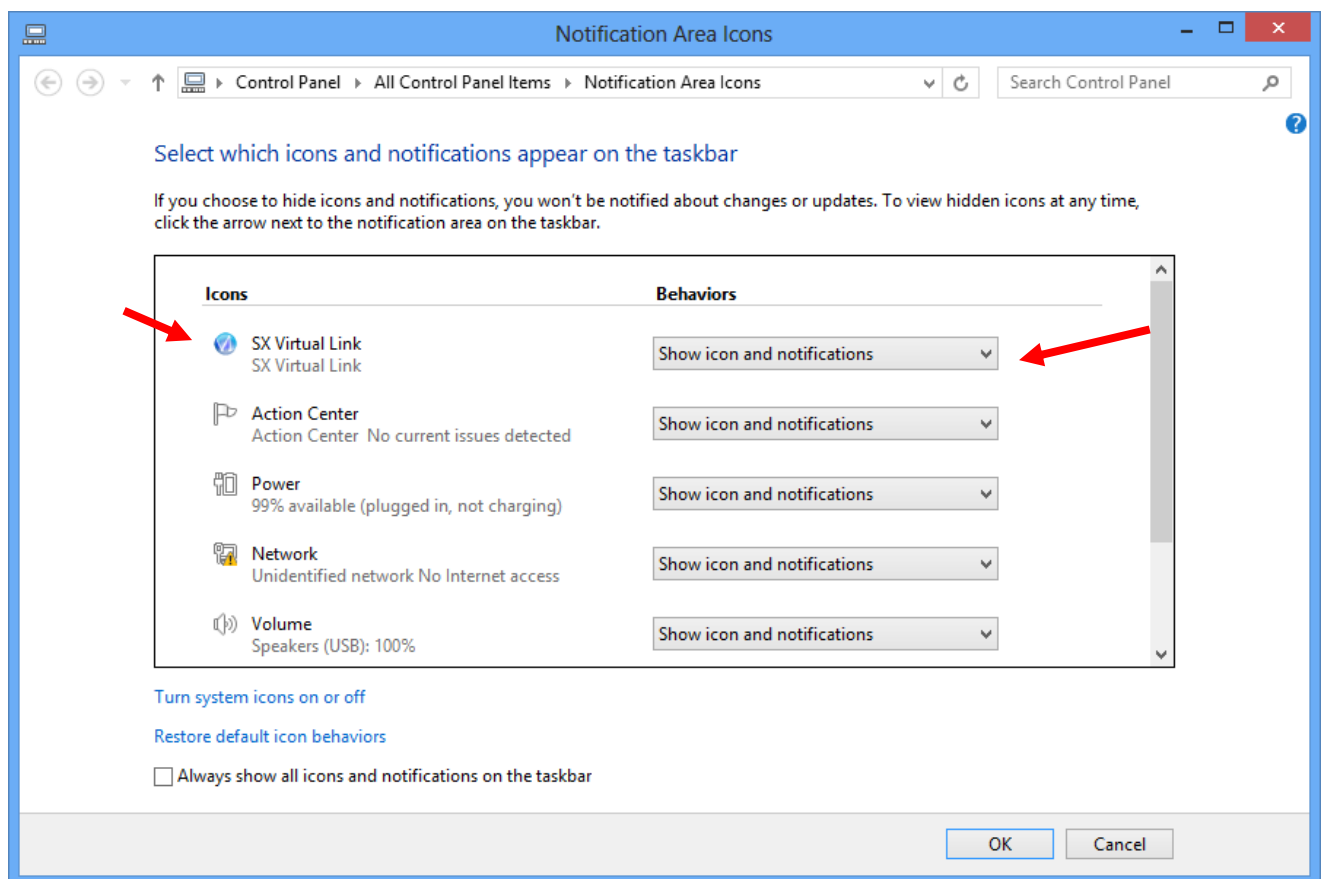
And **surprise surprise** the VNWA still connected.

Now the VNWA is remote operated solely through the LAN cable between PC and USB Device Server which might be powered by the supplied 5V DC AC adaptor or from the 5V battery pack so Connection method 4. may now be tested and should be working alright.

No change needed to the VNWA setup. The Audio codec are still working as for Connection method 1 via the local LAN.

Now we will continue with the WiFi setup....but before we do so disconnect the VNWA from the SX Virtual Link Window which you start by clicking on the icon.

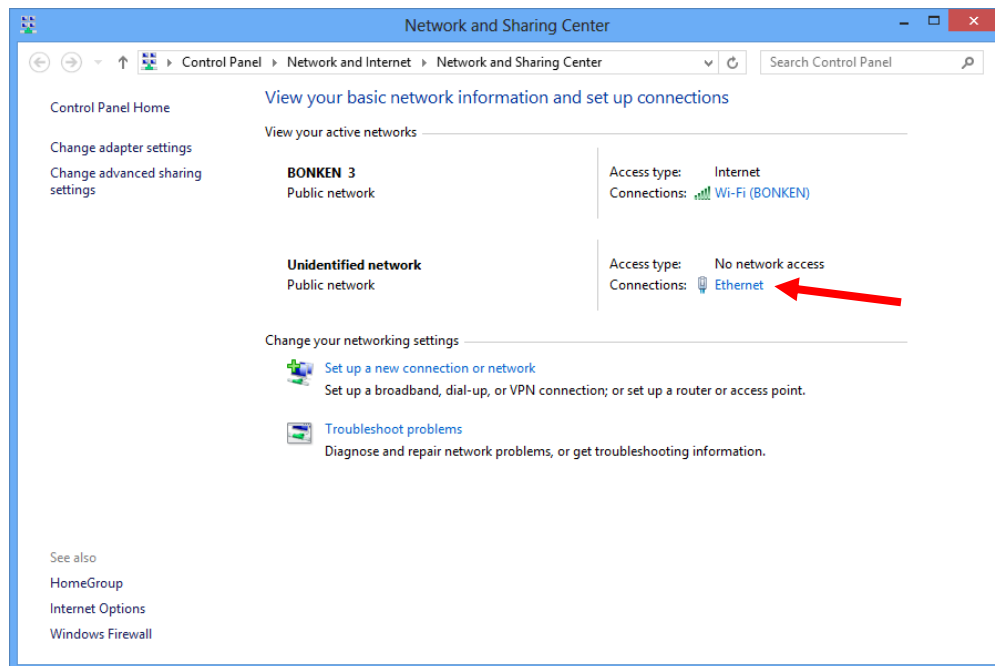
To have access to the icon you make have to set the Notification Area Icons to “Show icon and notifications” as indicated below.



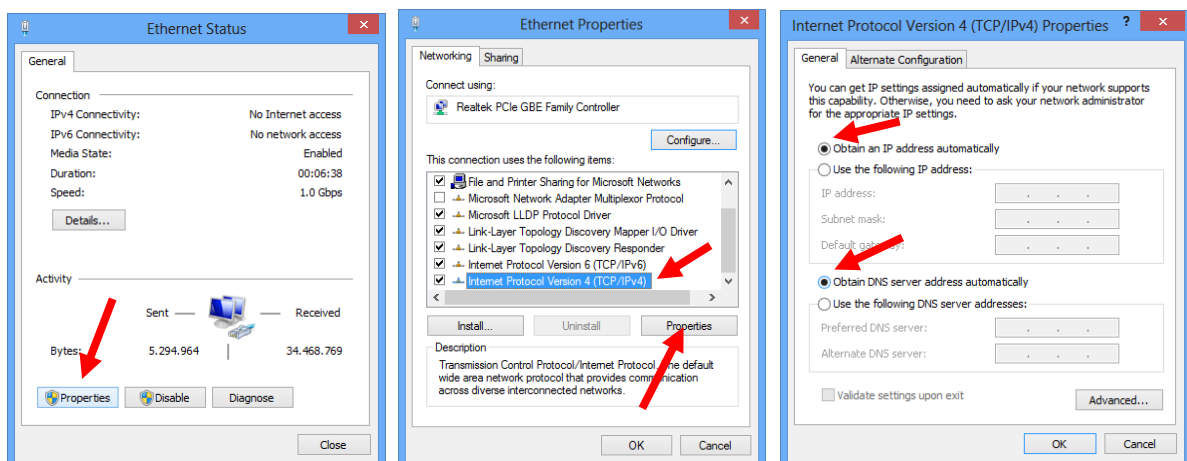
5. Setting up the USB Device Server for Wireless connection

Reconnect the PC to your Local LAN either Wired or via Wireless and likewise reconnect the USB Device Server to the Local LAN.

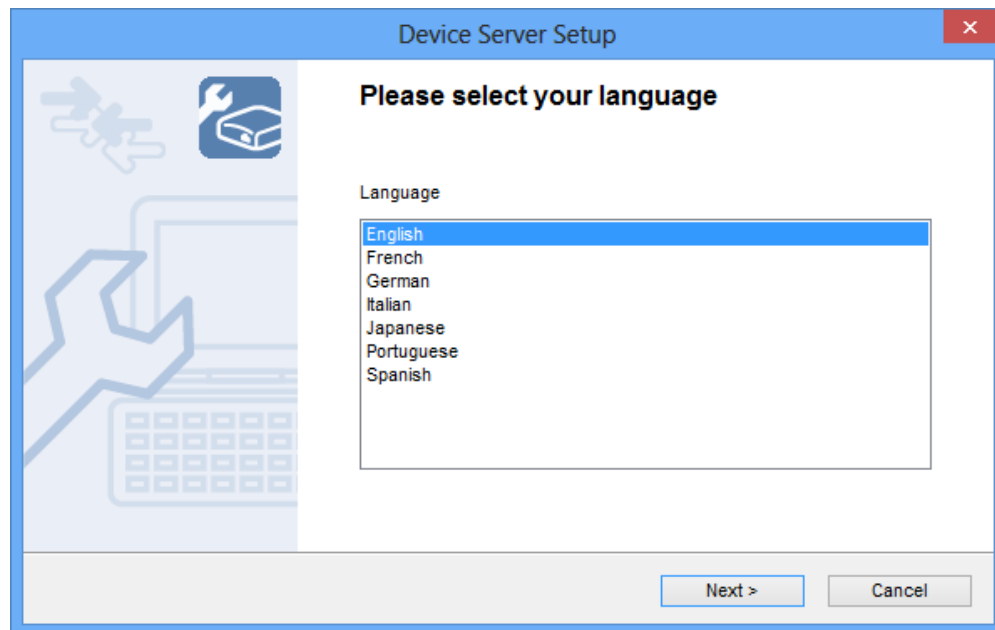
You may now carry on to use the PC programmed to a fixed IP address or revert to the situation where the DHCP Server is providing an IP address to the PC and if so open the Network and Sharing Center and do the following procedure. (If only connected to Wireless LAN then do it before the LAN cable disconnected between PC and USB Server)



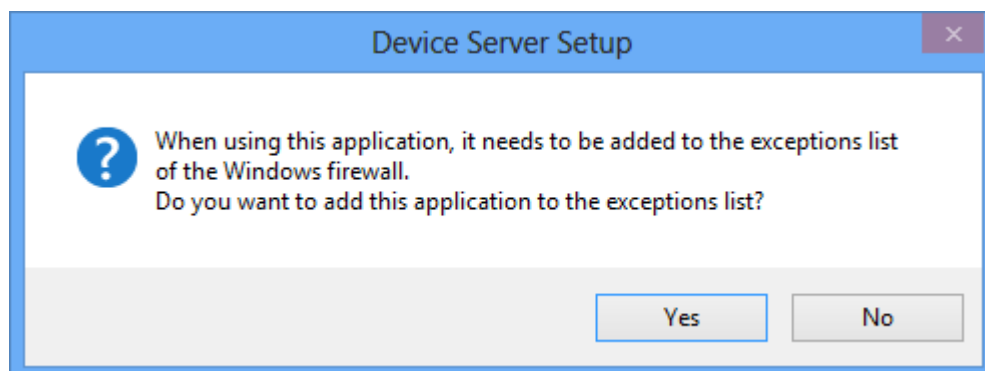
As seen below from left to right click on Properties, find the Internet Protocol Version 4 and click on Properties and select Obtain an IP and DNS server address automatically followed by a number of OK and close click's.



Now either use the Installation CD and run the Setup Utility or if you have installed it on your hard disk then click on the icon for the Setup Utility and allow the application to be run.



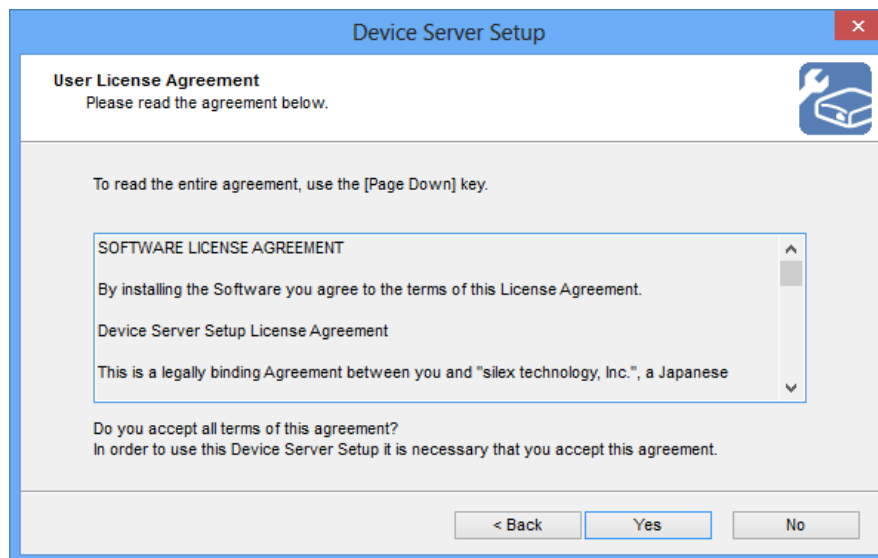
Now select you preferred Language if starting from the Hard disk followed by click on Next.



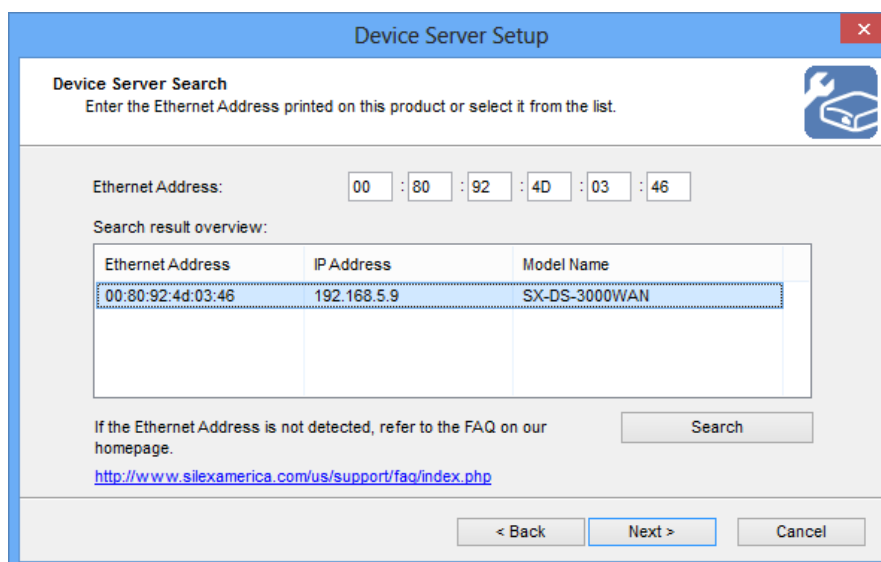
Allow to add to the firewall exception list by clicking on Yes



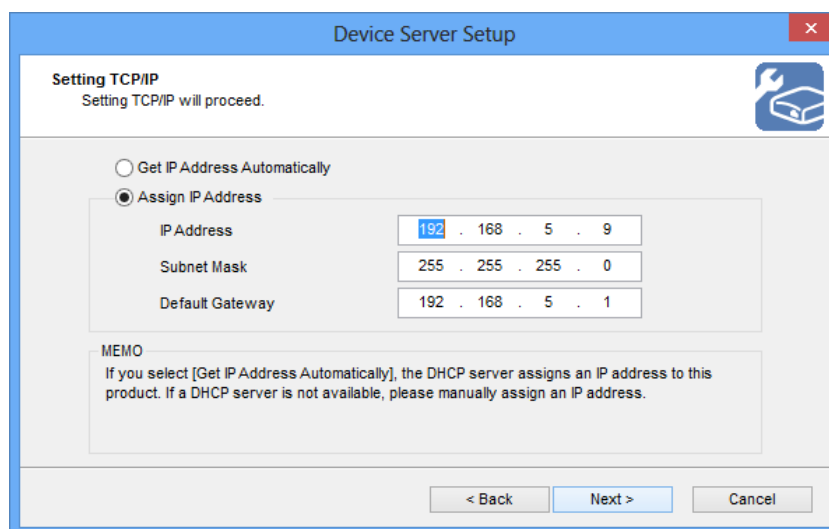
Click on Next



Accept User License Agreement by a click on Yes



The USB Device Server discovered and mark the line (turns light blue) and click on Next



We continue to use the fixed IP address as before by clicking Next

Device Server Setup

Wireless Setting
Setting for Wireless usage.

Select the wireless network (SSID of the access point or network device) that you wish to use.

	SSID	Channel	Wireless Standa...	Wireless Mode	BSSID
Y	GROUP	1		AdHoc	
Y	BONKEN	4	802.11b/g/n	Infrastructure	90F652762059
Y	SEC_LinkShare...	4	802.11b/g/n	Infrastructure	D0667B9BFAA7

Network Key:

Confirm Network Key:

☐ Skip wireless configuration

The Wireless network found and the wanted WiFi marked (Bonken) and the security password entered – substitute the xxxxxxxx with your password and click on Next

Device Server Setup

Confirm Configuration Parameters
The values entered are as follows:

Item	Value
IP Address	192.168.5.9
Subnet Mask	255.255.255.0
Default Gateway	192.168.5.1
[Wireless]	
Wireless Mode	Infrastructure
SSID	BONKEN
Network Authentication	WPA2
Encryption Mode	AES

Click [Execute] and the Settings will be sent.

Summary screen accepted by click on Execute

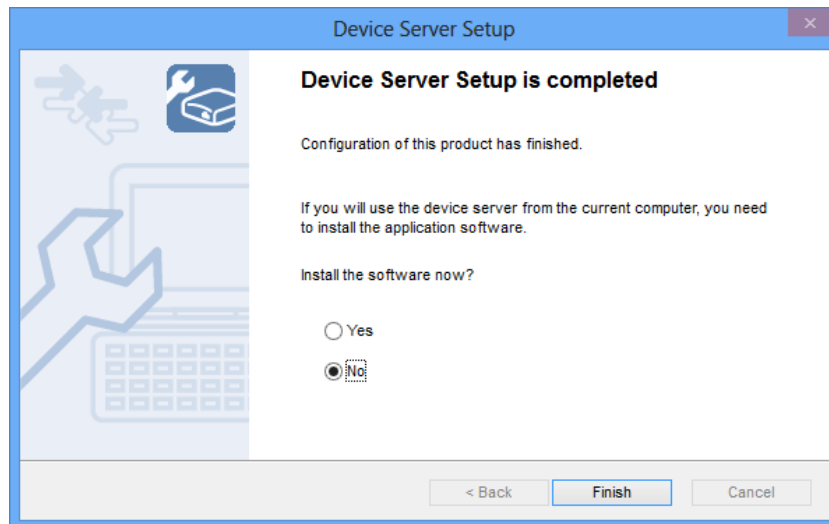
Device Server Setup

Confirm Configuration Parameters
The values entered are as follows:

Item	Value
IP Address	192.168.5.9
Subnet Mask	255.255.255.0
Default Gateway	192.168.5.1
[Wireless]	
Wireless Mode	Infrastructure
SSID	BONKEN
Network Authentication	WPA2
Encryption Mode	AES

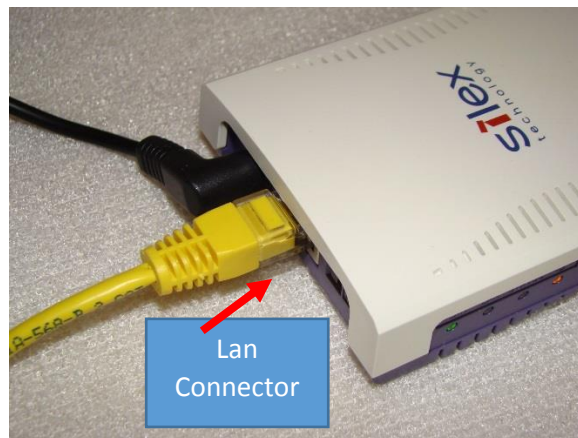
Click [Execute] and the Settings will be sent.

A green progress bar now indicates that the new setting are written to the USB Device Server

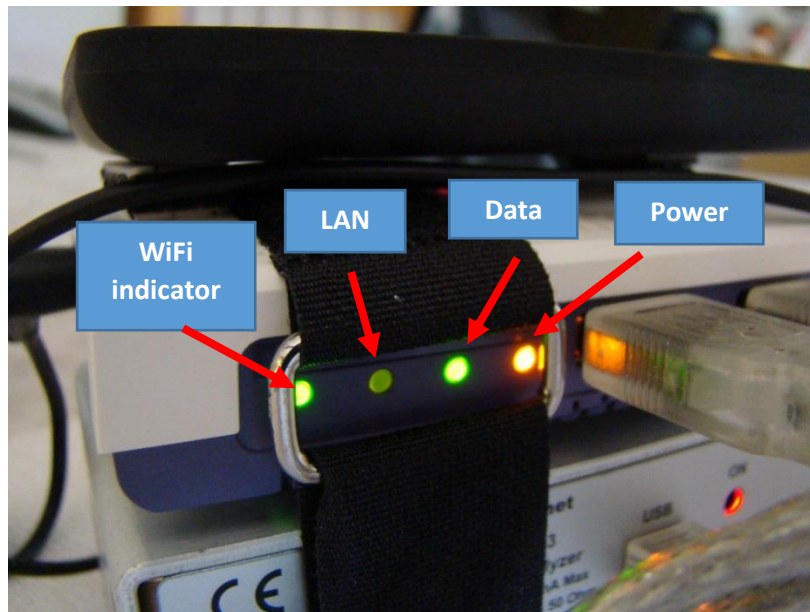


Change the dot setting to No as the SX Virtual Link Software as already installed and click on Finish

That concludes the settings and now the USB Device Server is connected via the WiFi Access Point, but remember to remove the LAN cable from the USB Device Server and Re-power it.



Observe that after a few second the WiFi indicator start flashing yellow and then turns on with Green light went connected to the WiFi Access Point.



Still no need to change anything for the VNWA application settings.

Note: Just enable the SX Virtual Link and active the connected button (3 times if you have changed the window presentation as explained before) and start the VNWA application.

Now the VNWA is remote operated through a LAN cable connected to the PC or via the Wireless LAN connection for the PC. The USB Device Server being connected to the WiFi Access Point and might be powered by the supplied 5V DC AC adaptor or from the 5V battery pack so application method 2 now tested and working OK.

Next step is to create a wireless Ad-Hoc connection between a PC (LapTop) with build in Wireless circuitry on either 2.4GHz or 5GHz and directly connected to the USB Device Server's Wireless circuitry. Then there is no connector to any Local WiFi Access Point and the VNWA can then be used in the field away from any fixed or wireless local network.

Note:

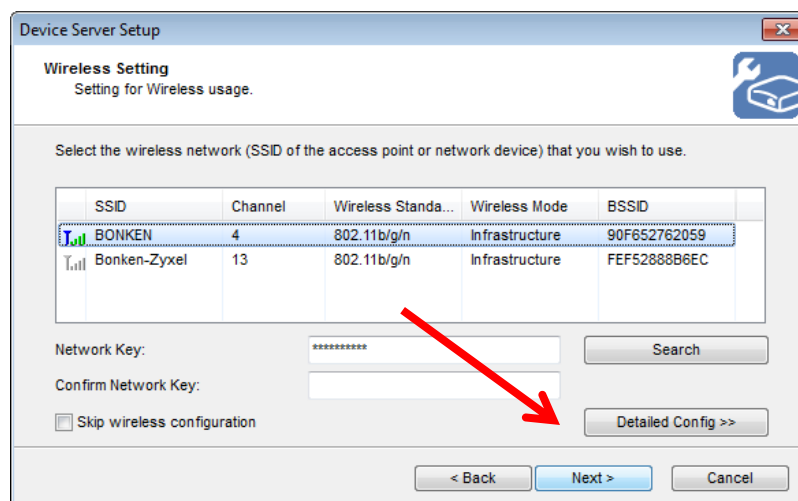
In Windows 8 and Windows XP it is not directly possible to create a Wireless ad-hoc network (a hotspot) whereas it is possible for Vista Business and Windows 7 Professional and Ultimate Versions.

However it is not needed at all as the USB Device Server can be set to a mode where it is broadcasting its APN and then it is directly connectable from any PC having a WiFi wireless function, independent of being build-in or provided by an USB WiFi device or via an external Mini Accesspoint as shall be demonstrated in details.

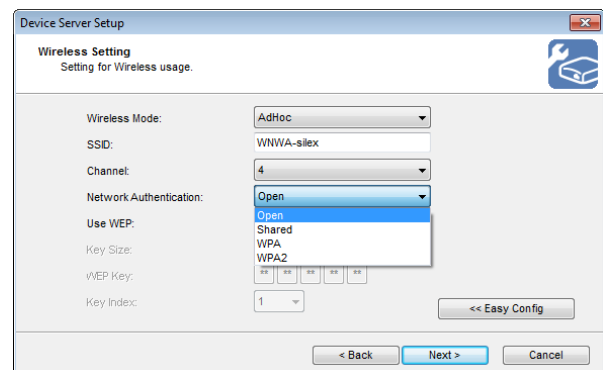
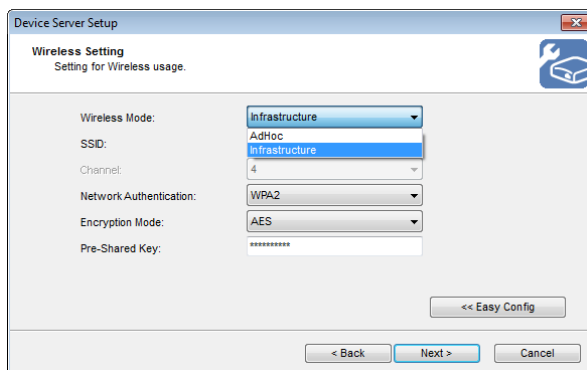
(In the addendum is explained how to set up an Ad-Hoc network (a hot spot) for those which like to experiment with that condition but as said not a needed facility)

6. Connection Method 3. - Ad-Hoc network facility in the USB Device Server

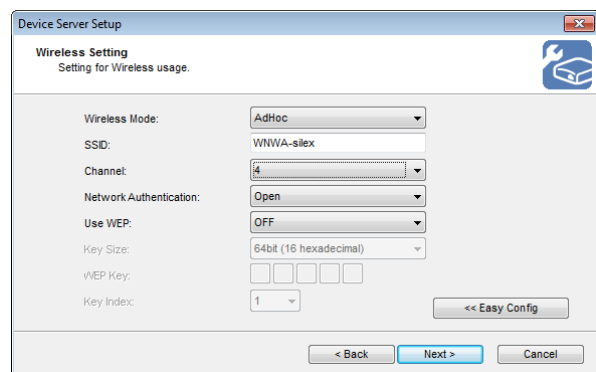
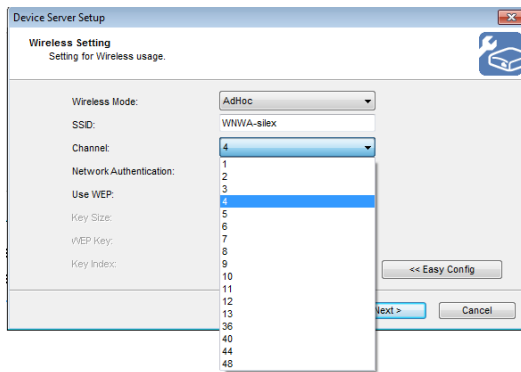
1. Establish a normal working condition for you PC connected to you LAN by cable or WiFi. If you know PC and USB Device Server is provided with fix IP addresses in the same segment just go ahead with point 2
2. Connect the USB Device Server to the LAN via Cable or if your PC is working via WiFi then to the PC LAN adaptor.
3. Repower the USB Device Server for detection of a LAN connection (having priority) and observe the WiFi LED is not on
4. Run the Setup Utility and stop at the point where Network detection takes place as shown below



Mark your wireless network, if you have one on air, so the channel can be detected by the USB Device Server and click on “Detailed Config >>”



The wireless mode gives two option and we select AdHoc and for the Network Authentication only “Open” and “Shared” is possible for AdHoc mode. We select at first “Open”. Also enter a unique SSID name for the USB Device server to broadcast here “WNWA-silex” chosen.



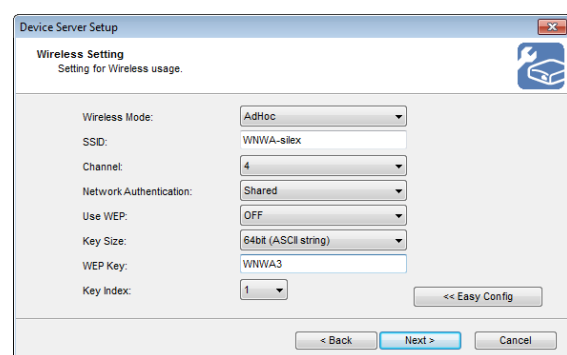
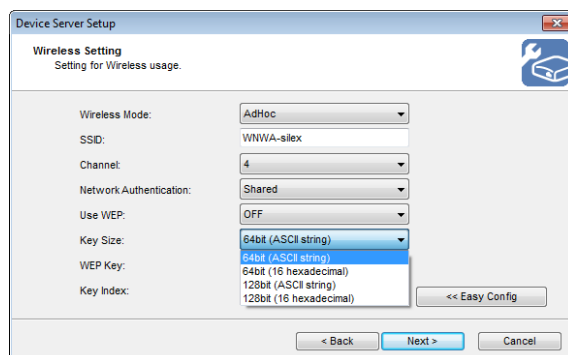
Click on Channel see the Local WiFi channel already selected as channel 4 but you may select any other Channel. Channel 1, 6 and 12 are good channels to choose as these channels has no neighbor channels occupying part of the channel frequencies thus lesser interference. We choose 4 but any other choice possible. However you might with certain PC's have difficulties to find the AdHoc network (I have such one ☺) and if so then stick to the channel preselected. The Channels from 36 to 48 is the 5GHz frequencies which will be used in the next section.

You may now click on Next and the programming of the USB Device Device Server will be performed but let us first look at the option when choosing Network Authentication "Shared".

Note:

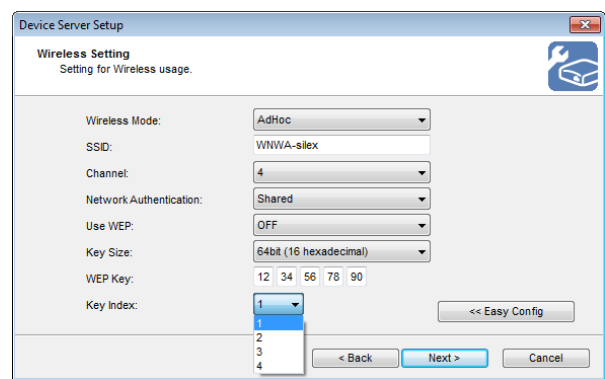
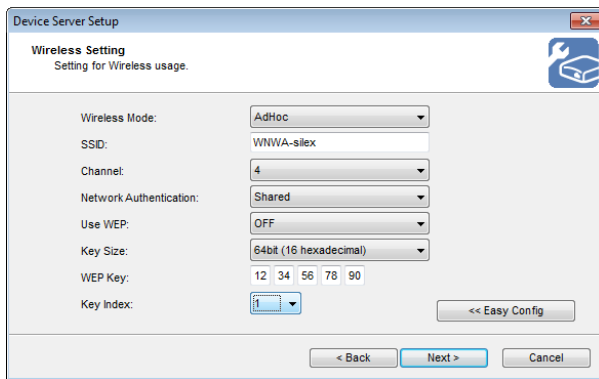
A superb Android AP is called "WiFi Analyzer" which graphically shows channels in use. For iPhone "WiPry" does a similar job. While at it for both platforms the AP "Fing" analyzes your network for unit's IP addresses.

For Network Authentication there is no protection of your AdHoc Network provided by the USB Device Server if "Open" selected but when "Shared" Selected some more options is selectable.

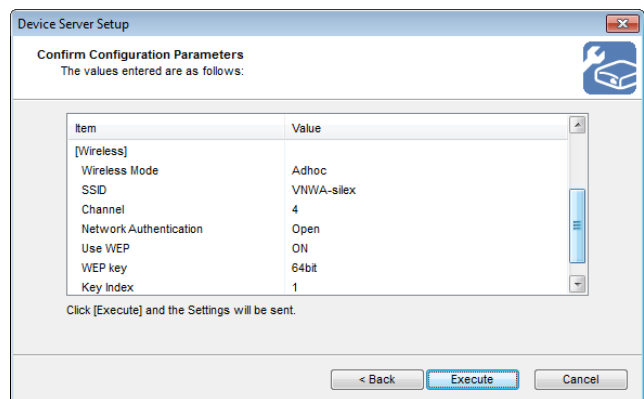
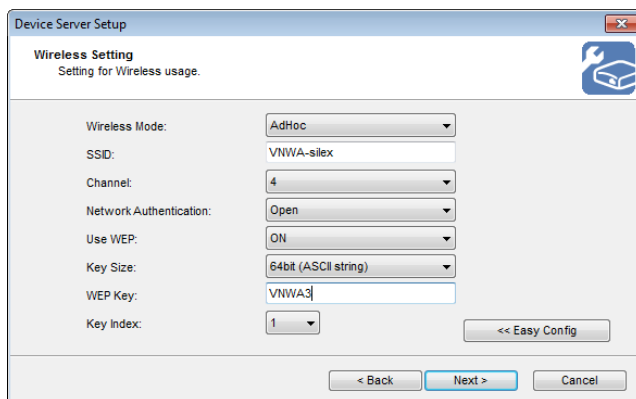


If Shared chosen and WEP set to OFF you have to enter a "Key" either as 5 character ASCII (text) or in 16 bit hexadecimal format and with either 64 or 128 bit length. Left is an example for ASCII being WNWA3 A Key index has also be chosen as shown below where also an 5 block long hexadecimal key is entered .

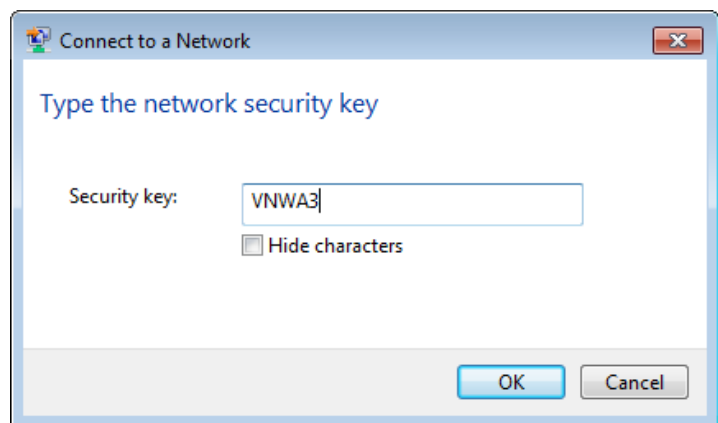
These values must be remembered (write them down).



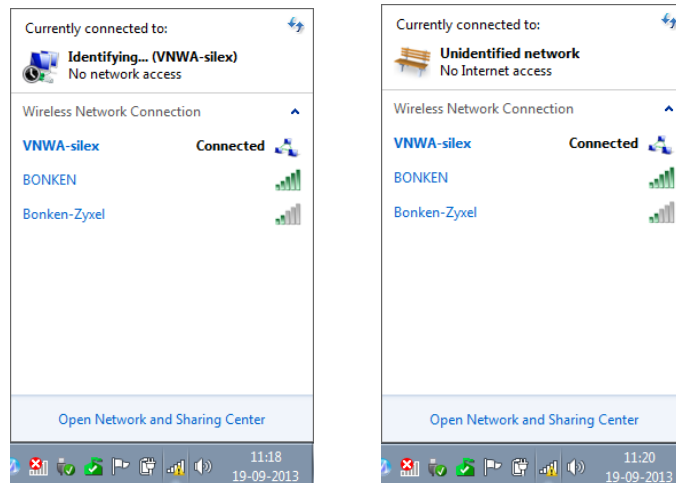
When wanted settings are performed click on next to see the summary screen and click on “Execute” for programming the USB Device Server and you are done.



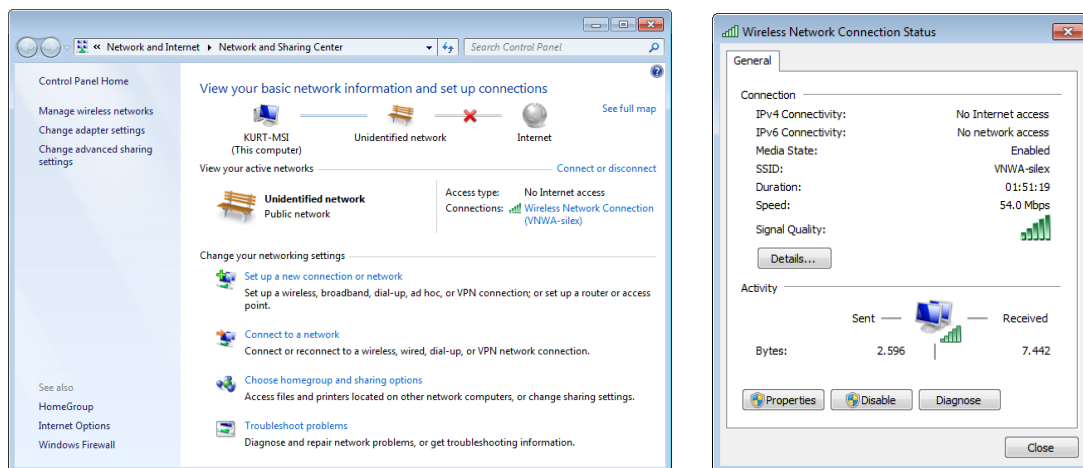
Next STEP is to remove the LAN cable from the USB Device Server and PC and Repower the USB Device Server after which the Green LED “WiFi Indicator” is lit.



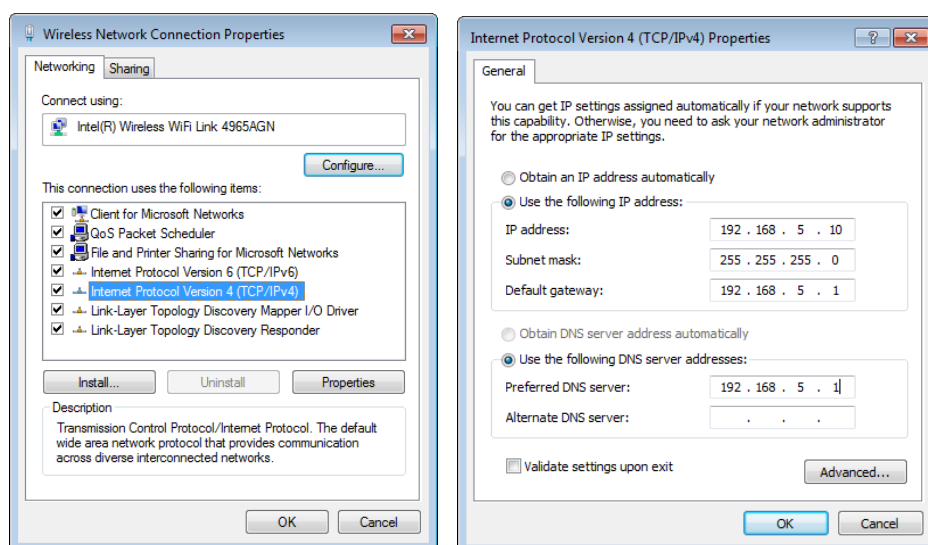
Going to monitoring the WiFi Connection status we see the Local WiFi Access Point still connected and the AdHoc VNWA-silex is visible. By disconnection “Bonken” and by connecting to VNWA-silex” a prompt for Security key appears and we enter our choice VNWA3 and by clicking on OK the connection will be established. At first the network identification progresses resulting in an unidentified network which is OK



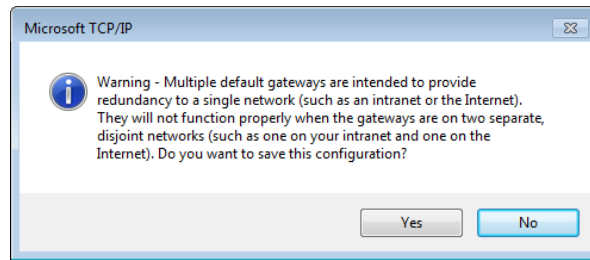
Remaining concert is to set the PC connection to a fixed IP by going into Network and Sharing Center and click on the Wireless Network Connection (VNWA-silex) selecting Properties and set the IP address to a non conflicting IP address.



The Gateway maybe you LAN network Gateway or the USB Device Server IP address. It is unimportant as we have no connection or LAN or Internet just the connection between PC and USB Device Server is in force.



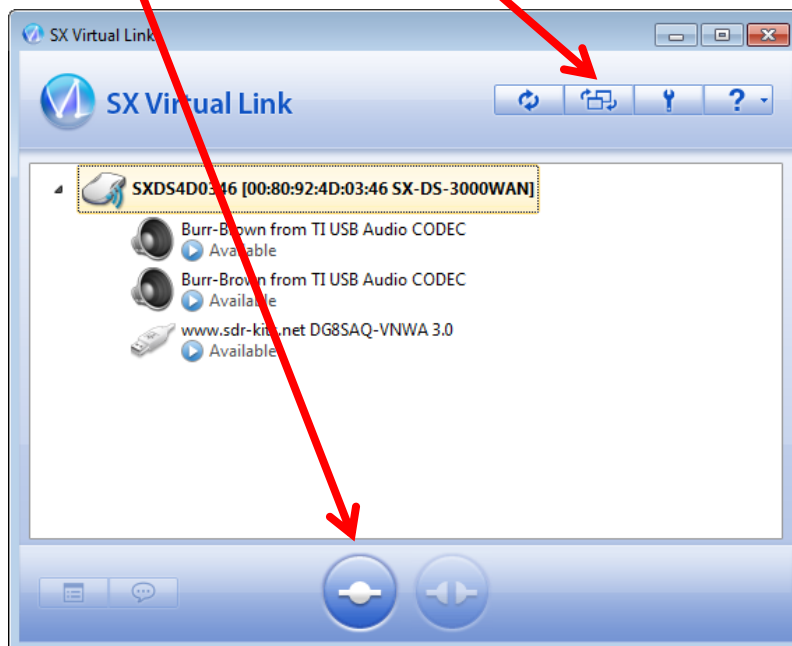
If this warning is coming up when closing the windows then just accept with a YES



We are now completely finished to start using the system.

By activating the SX Virtual Link we most likely see the three VNWA USB devices waiting for being connected by the usual Click on the Connect Button.

If not done for all three at once then click on the Switch View button



Start the VNWA application and run the Auto Setup Audio Devices and you are ready for Field Operation far away from your local network.

**NOW TO THE RESQUE FOR THOSE NOT HAVING A PC WITH BUILT IN WIFI FACILITIES
and
THOSE NOT INTERESTED TO DEAL WITH FIXED IP ADDRESSES**

There are some situations where the proposed methods so far are not ideal and an alternative required due to facts and conditions as follows:

1. **The Wireless Ad-Hoc Network running on the USB Device Server is not providing IP addresses to the PC/LapTop, so those not interested in setting the LAN/Wireless adaptor to a fixed IP address.**
2. **Those having a PC/LapTop not fitted with no WiFi facilities**
3. **Those using a battery pack where the total power budget of 0.8A causes trouble with the silex USB Device Server's WiFi circuitry drawing a high current spike when starting and thus force the silex to reboot endlessly.**

For those conditions usage of a small battery operated Router/Accesspoint/Client/Bridge, TP-LINK model no. TL-WR702N, as seen on the picture below, removes many troublesome operation as the unit is able to provide IP addresses by a build in DHCP Server. This facility combined with setting the unit as an Access Point makes like much easier for a small sum of money. Besides the unit being very universal is a great tool for other purposes when not used by the VNWA.



On above picture is seen it has an LAN port and when configuring it as an Access Point, then the connection is both via WiFi and via the LAN port and in both cases IP addresses is provided by the build in DHCP Server, just like on your home network. That allows us to connect a short LAN from the LAN port on the USB Device Server to the LAN port on the Access Point LAN. It is a convenient and reliable Wireless Access point to connect to from the PC/Laptop without any modifications, regarding IP addresses. It is just another Wireless network to connect to. Only recommended requirement is to once and for all to set the USB Device Server to a fixed IP address, within the Access Points IP address segment and outside the range for DHCP Servers allocation range, **despite it is not required as such but convenient.**

The Total Power budget is not changed as the TP –Link draws 0.17A in action and that correspond the reduced power consumption in the USB Device Server when it's WiFi circuitry is switched off.

Note:

If configured as Router then the LAN port is the WAN port and can only be used for configuring the device and the connection between PC and USB Server can only be via two wireless connections so

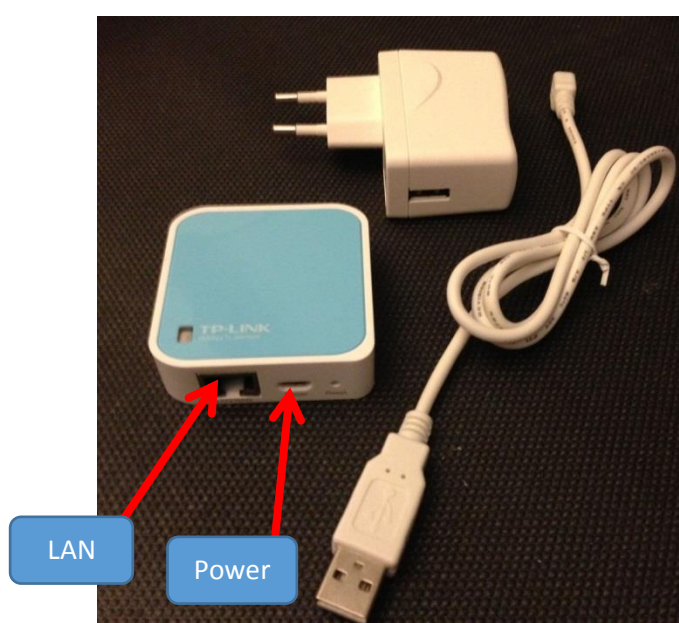
best configuration is as Access Point.

In special cases it can be desirable to extend the range between PC and USB Server and let the Access Point be supplied by own battery. As Access Point it is still feasible with independent placement e.g. in between PC and USB Server.

For those not having a PC/LapTop without Wireless Network facilities just connect the TL-WR702N to the LAN port on the PC/LapTop and then configure the USB device Server for Wireless connection to the TL-WR702N. This is also an alternative to the proposal above if you have a Battery Power Pack capable of driving the USB Device Server without any problem.

As said above it is still best to let the USB Server be configured with a fixed IP Address as then best possible stability obtained.

The TP Link TL-WR702N Universal Router/Access Point/Client/Repeater/Bridge is just ideal for the task and configured very simply by connection the LAN adaptor of the PC to the LAN port of the TL-WR702N as from factory configured as Access Point and just enter 192.168.0.254 in your browser. The default username and password is printed on the box and likewise the default Wireless SSID and password.



As supplied from TP-LINK in the box where the USB/Powercable is used for 5V supply either from the Battery power pack for the USB Device Server or from a USB port on the PC/LapTop.



Complete package ready for the field operation with or without the inclusion of the TL-WR702N

Some few screen shoots of how the TL-WR702N must be configured.
Chose a LAN IP address matching the IP address of the USB Server (192.168.5.9 in my case).

The screenshot shows the TP-LINK web interface. On the left is a navigation menu with options: Status, Basic Settings, Quick Setup, Working Mode, Network, Wireless, Advanced Settings, DHCP, Maintenance, and System Tools. The main content area is titled 'Status' and displays the following information:

- Firmware Version:** 4.18.107 Build 121123 Rel.31456n
- Hardware Version:** WR702N 1.0 00000000
- LAN**
 - MAC Address:** A0-F3-C1-FB-B9-A4
 - IP Address:** 192.168.5.254
 - Subnet Mask:** 255.255.255.0
- Wireless**
 - Wireless Mode:** AP Mode
 - Wireless Radio:** Enable
 - Name (SSID):** VNWA
 - Channel:** Auto(Current Channel 1)
 - Mode:** 11bgn mixed
 - Channel Width:** Auto
 - MAC Address:** A0-F3-C1-FB-B9-A4
 - WDS Status:** Disable

At the bottom, it shows 'System Up Time: 0 day(s) 00:29:52' and a 'Refresh' button.

At first the LAN IP is changed from 192.68.0.254 to 192.168.5.254 and when DHCP Server enabled automatic changed to provide IP addresses from 192.168.5.100, not in conflict with the fixed IP of the USB Server

This block contains two screenshots from the TP-LINK interface. The left screenshot is the 'LAN' settings page, showing the 'IP Address' field set to '192.168.5.254'. A red arrow points from the text above to this field. The right screenshot is the 'DHCP Settings' page, showing the 'DHCP Server' set to 'Enable' and the 'Start IP Address' set to '192.168.5.100'. A red arrow points from the text above to this field.

Wireless SSID chosen to be VNWA and security code VNWA4ever with WPA-PSK/WPA2-PSK security mode

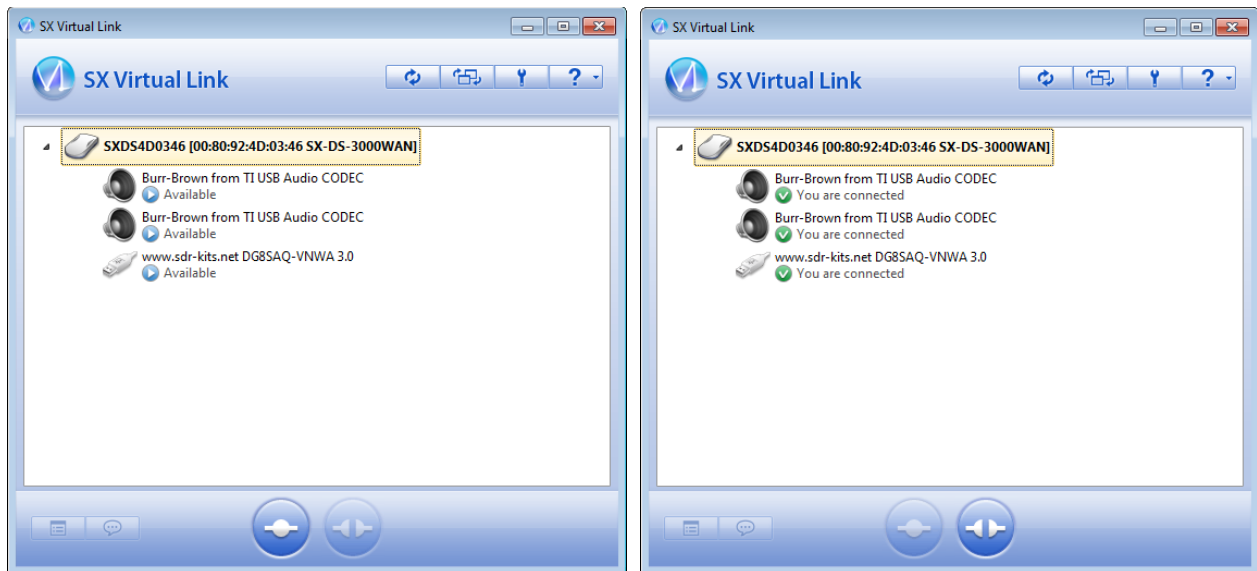
This block contains three screenshots from the TP-LINK interface. The top-left screenshot is the 'Wireless Settings - AP' page, showing the 'SSID' field set to 'VNWA'. A red arrow points from the text above to this field. The top-right screenshot is the 'Wireless Working Mode Settings' page, showing the 'AP' mode selected. A red arrow points from the text above to this section. The bottom screenshot is the 'WPA-PSK/WPA2-PSK' security settings page, showing the 'PSK Password' field set to 'VNWA4ever'. A red arrow points from the text above to this field.

Case 1: The TL-WR702N connected to the USB Device Server's LAN Port

Now connect the USB Server LAN connector to the TP Link LAN connector and **repower the USB Server** and observe the LAN led only is illuminated. Watch out for any green light in the Wireless led on the USB Server. It must not be connecting to any previous connection made.

On the PC create a wireless connection to the VNWA network providing the security code VNWA4ever once and for all, and that is all needed.

Activate the SX Virtual Link and establish connection.



Start the VNWA and perform an Auto setup Audio devices and it works instantly.

One very good indicator whether the Wireless connection is OK is by looking at “calibrate sampling rate” test data for the primary and aux codecs. If the Aux data differs from the Primary, then you will see instability in the traces. Mine was 48011.1 exactly both of them (with direct USB cable closer to 48000).

An improvement might be able by increasing buffer size but not seen necessary yet.

Case2: The TL-WR702N connected to PC/LapTop's LAN Port

The quick way is to reset the TL-WR702N completely (or if just unboxed use it as is) by holding the Reset button for a few seconds when applying power.

1. Configure the TL-WR702N as explained above and then connect the USB Device Server to the PC/LapTop LAN Port and configure the LAN adaptor to a fixed IP address outside the TL-WR702N DHCP range.
2. Run the USB Server configuration Utility and program it for Wireless Connection to the TL-WR702N according to the programming of TL-WR702N.
3. Disconnect the LAN port of the USB Device Server and repower it.
4. Now connect the TL-WR702N to the PC/LapTop and Activate the SX Virtual Link and establish connection to the 3 VNWA USB devices. (You may also connect via the build in Wireless adaptor to the TL-WR702N but beware now two wireless “jumps” is in action and might give problem with adequate dataflow).
5. Start the VNWA and perform an Auto setup Audio devices and it works instantly.

Summary so far:

Now we have for the situation where the USB Device Server is used for direct Wireless connection and for case1 and case 2 where the TL-WR702N is used for the wireless connection, the VNWA is remote operated through a Wireless Network operated from the VNWA application on the PC/LapTop.

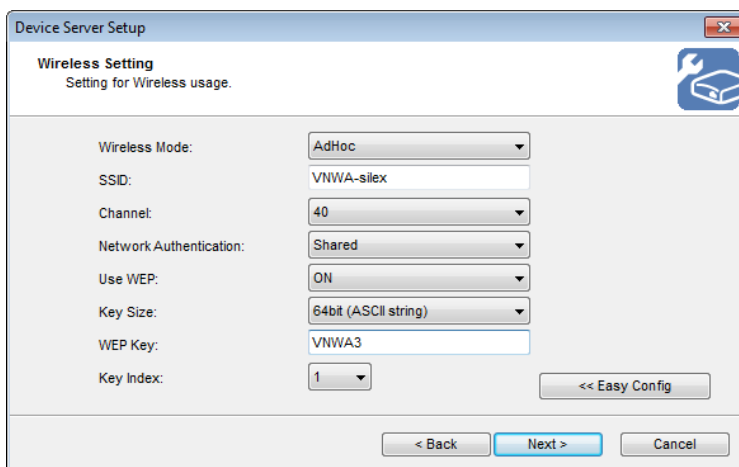
Everything powered from a dual 5V battery pack so application method 3 now tested and working alright.

A final demonstration follows where the Wireless Connection performed with a TP-LINK Dual Band USB adaptor N600, running on either 2.4 or 5GHz with the USB Device Server acting as an AdHoc Point.

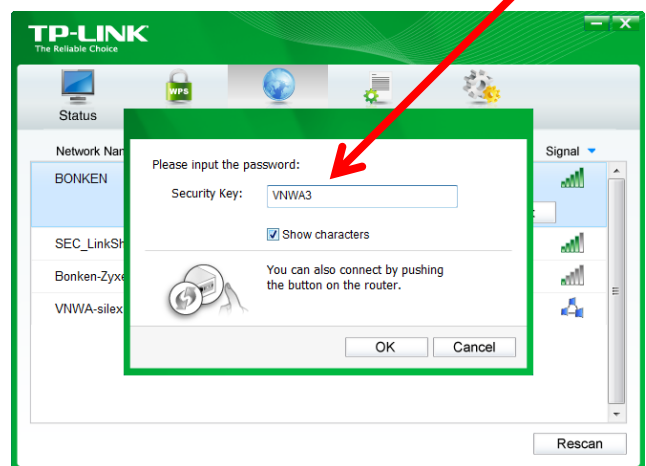
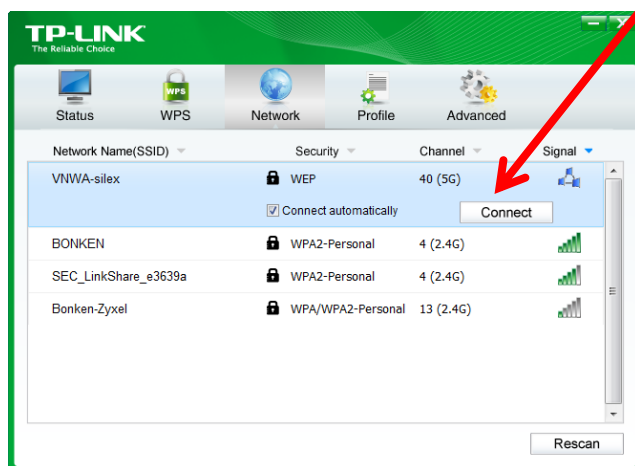
If this product used on a PC with build in Wireless adaptor be aware that additional software is installed and you are prompted to insert the USB Adaptor every time the PC/Laptop is started. In addition you will have indication of two networks in action so if not specifically acquired for using the 5GHz band my favorite is the TL-WR702N also under the assumption" there more software in action the more goes wrong frequently".

The installation of the Drivers is not described just follow the manual.

Then program the USB Device Server as an AdHoc point as before but this time we choose Channel 40 in the 5GHz band as seen below. Else same settings as before according to your choices. Remember to repower the USB Device server and remote the LAN cable.



When starting the TP-LINK Wireless Configuration Utility for the N600 USB Stick below screen is seen where we just mark the line "VNWA-silex and click on the "Connect" and receives a prompt for the key "VNWA3".



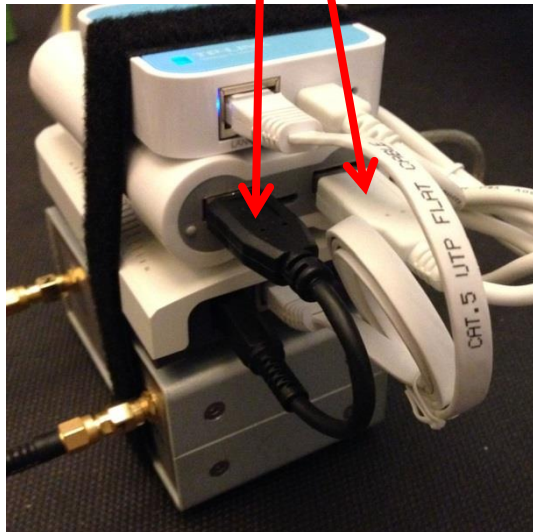
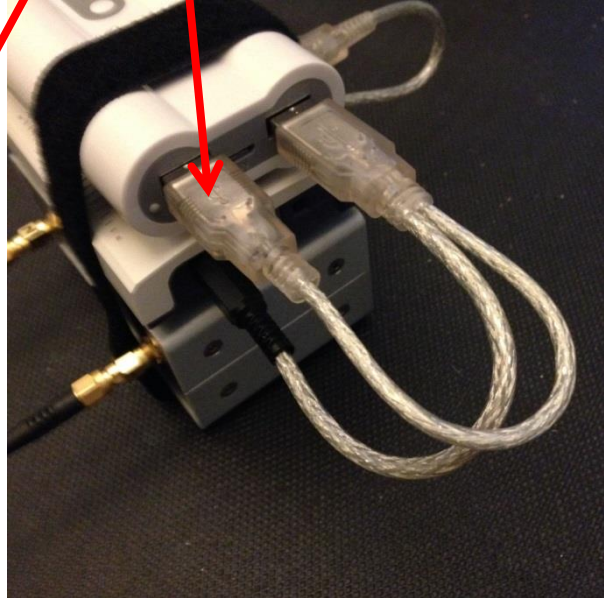
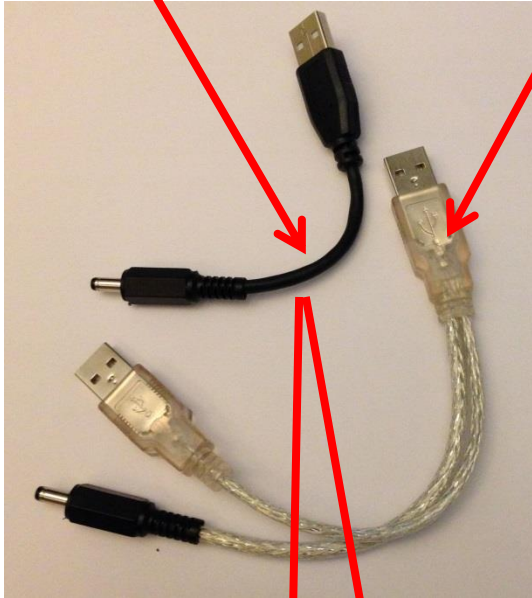
Then follows the traditional procedure:

1. Activate the SX Virtual Link and establish connection
2. Start the VNWA and perform an Auto setup Audio devices and it works instantly.

SOME ADDITIONAL IMAGES

Regarding the Dual 5V USB Output battery power pack a picture taken of two additional homemade supply cables seen below for supply of the USB Device Server. The dual USB cable will double the current capability from the powerpack to ensure high transient current from the USB Device Server is not causing problems.

The Second very short is to use when additional equipment it is to be provided with power such as the TP-LINK TL-WR702N



September 20 2013

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Addendum:

A Windows 7 (and Vista) ad-hoc network creation

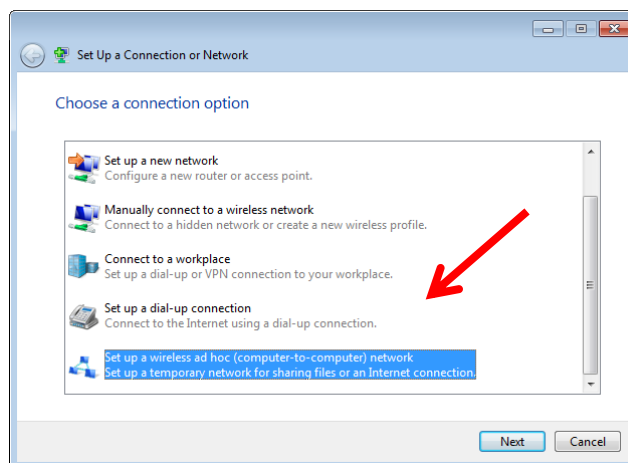
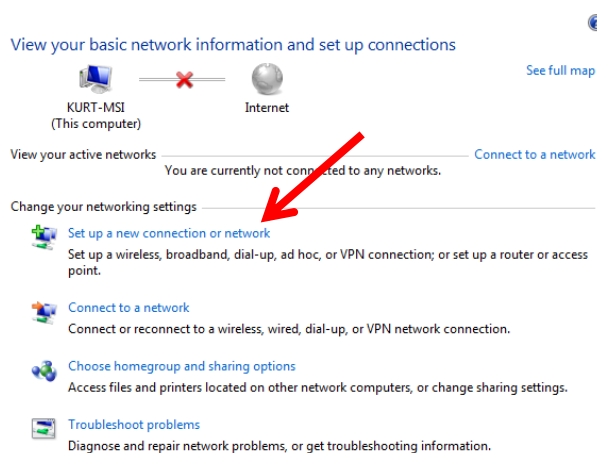
First action is to disconnect the USB Device Server from the SX Virtual Link window. (You may right click on the three USB devices and select Disconnect)

Then the LAN cable must again be connected to the USB Device Server and it must be repowered.

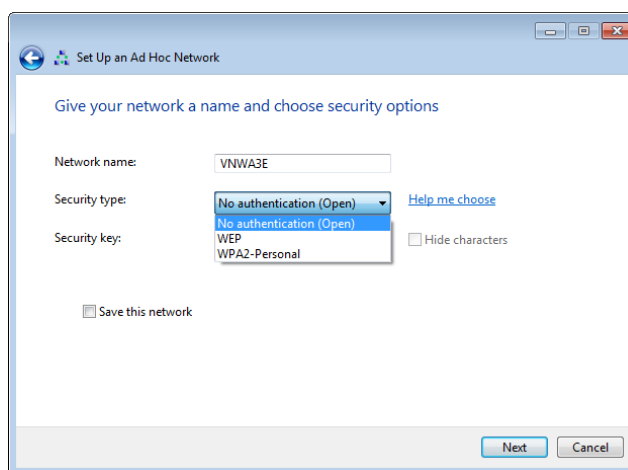
Then disconnect the Wireless network on the PC if enabled and connect a LAN cable to the PC

When repowered the USB Device Server LAN connection has priority over the Wireless connection and the Green LAN Led is active on the USB Device Server.

Next action is to create an ad-hoc network on the LapTop by going to the Network and Sharing Center as described earlier. Then chose to configure an ad-hoc wireless network (computer to computer) as seen below

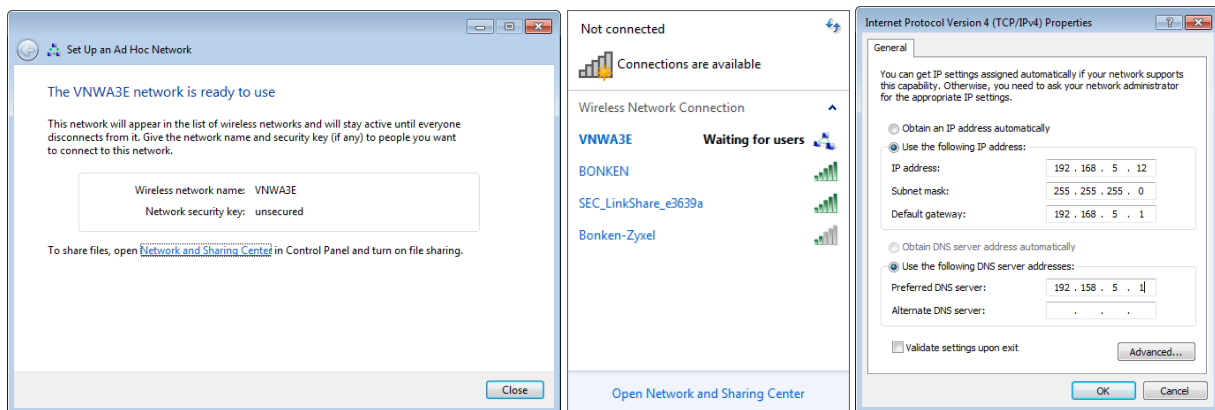


Select "Set up a new connection or network" and on next page mark "Set up a wireless ad hoc (computer - to - computer) network" followed by a click on Next



Read the explanations and decide what the Network Name you would like to apply (here VNWA3E) and decide whether to use any security and what type, here No authentication (Open) selected (or if you like to have security select WEP), for the specific reason that the USB Server does not support WPA2-Personal in Ad Hoc mode as we shall see later.

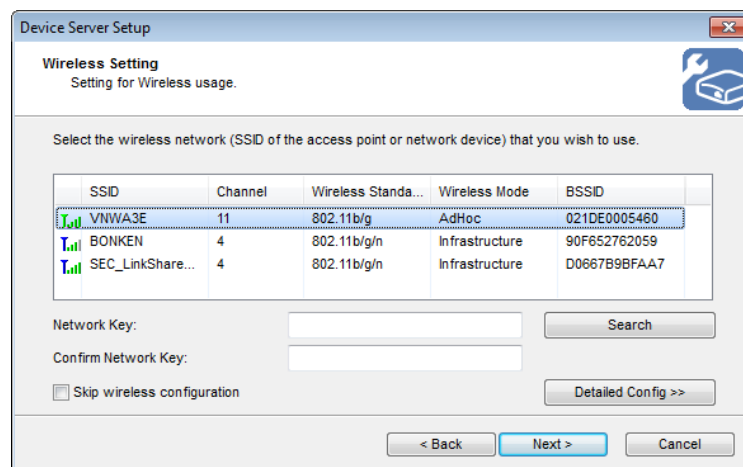
There will not be required to enter a Security code so the next page gives a summary and then click on “Close”



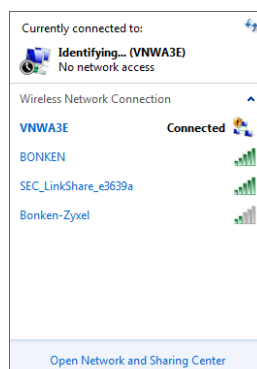
By clicking on the wireless icon on the status bar we now see the VNWA network is active and is awaiting users to connect.

REMEMBER REMEMBER the PC has no connection to a DHCP Server so it must be set to a fixed IP of your choice within the address segment chosen

Third action is to run the Setup Utility once again to Program the USB Device Server for Wireless connection to the VNWA3E Network. The steps are identical to the previous programming for Wireless Connection to the Local Access Point and need not to be repeated here, apart from when we reach to the point for choosing the Wireless Network a shown below.



We just mark the SSID VNWA3E and click on next to see the Summary Screen and select “No” for the prompt about installation. Now remove the LAN cable to the USB Server, followed by a repowering, and shortly after the Wireless LED is lit on the USB Server and on the PC we see VNWA3E connected.



We are now ready to use the link. But before we do so we will see the option in the Detailed Config >> as an educational element, why WPA and WPA2 does not work in an AdHoc network.

If the Wireless mode selected to AdHoc then Network Authentication can be Open or Shared (WEP)

Device Server Setup

Wireless Setting
Setting for Wireless usage.

Wireless Mode: AdHoc

SSID: AdHoc

Channel: 11

Network Authentication: Open

Use WEP: OFF

Key Size: 64bit (16 hexadecimal)

WEP Key: [][][][][]

Key Index: 1

<< Easy Config

< Back Next > Cancel

If Shared selected then a WEP key must be entered, according to the drop down menu, but if WPA or WPA2 is selected then the Wireless mode is changed to infrastructure, which is incompatible with Ad-Hoc mode on the PC, which only support Open or Shared (WEP)

Device Server Setup

Wireless Setting
Setting for Wireless usage.

Wireless Mode: AdHoc

SSID: VNWA3E

Channel: 11

Network Authentication: Shared

Use WEP: OFF

Key Size: 64bit (16 hexadecimal)

WEP Key: 64bit (ASCII string)
64bit (16 hexadecimal)
128bit (ASCII string)
128bit (16 hexadecimal)

Key Index: 1

<< Easy Config

< Back Next > Cancel

So below is seen the summary screen for the setup of the USB Server

Device Server Setup

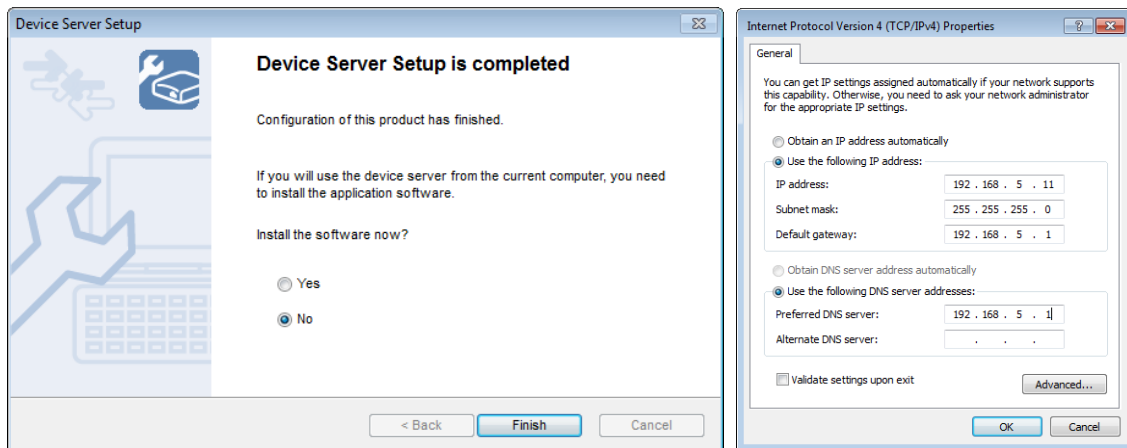
Confirm Configuration Parameters

The values entered are as follows:

Item	Value
[TCP/IP]	
DHCP	Disable
IP Address	192.168.5.9
Subnet Mask	255.255.255.0
Default Gateway	192.168.5.1
[Wireless]	
Wireless Mode	AdHoc
SSID	VNWA3E

Click [Execute] and the Settings will be sent.

< Back Execute Cancel



The final step is to choose No as the SX Virtual Link Software is already installed followed by a click on Finish

REMEMBER REMEMBER The Wireless AdHoc network must also be set to a fixed IP Address as seen above right. Always ensure that LAN adaptor and Wireless adaptors must have different IP addresses.

A Windows 8 ad-hoc network creation

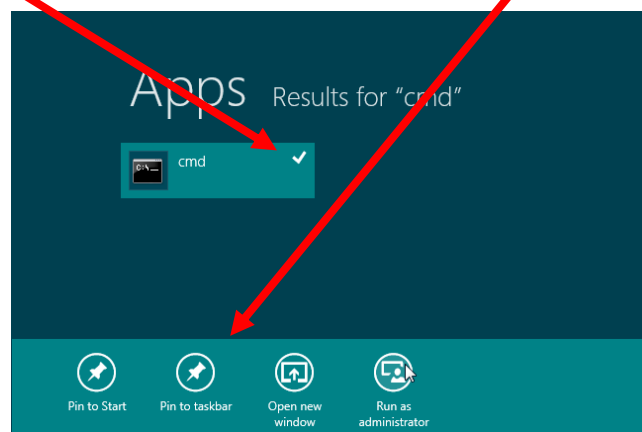
For windows 8 there is third party program for providing such a hot spot as indicated in below referenced article by watch out they will most likely install other -unwanted applications which you will hate so follow below described procedure. *However it is a very tricky solution so I recommend to focus on the Battery operated access point solutions.*

The W8 trick description is to find in the addendum of this report for those which would like to try it out.

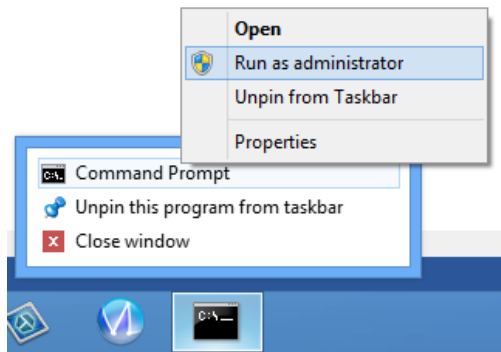
Below two links leads to very good articles how to “tweek” W8, using the netsh command and found at the following links.

<http://www.redmondpie.com/how-to-set-up-wireless-ad-hoc-internet-connection-in-windows-8/> and <http://www.addictivetips.com/windows-tips/how-to-create-wireless-ad-hoc-internet-connection-in-windows-8/>

A little preparation required at first by Pinning the Command Prompt to the taskbar. Right click on the cmd icon so the white tick mark appears and the click on “Pin to taskbar” (Done in the tiles menu)



For all the following commands then Command Prompt has to be run as “administrator” and that is done by right click on the cmd icon on the taskbar and right click again on command prompt and select run as administrator



Now, first you need to check whether your network interface supports virtualization or not. Simply, run the following command to view *Hosted network supported* status

netsh wlan show drivers

```

Administrator: Command Prompt
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.
C:\Windows\system32>netsh wlan show drivers
  
```

The result was successful as “Hosted network supported” by a YES so we may carry on

```

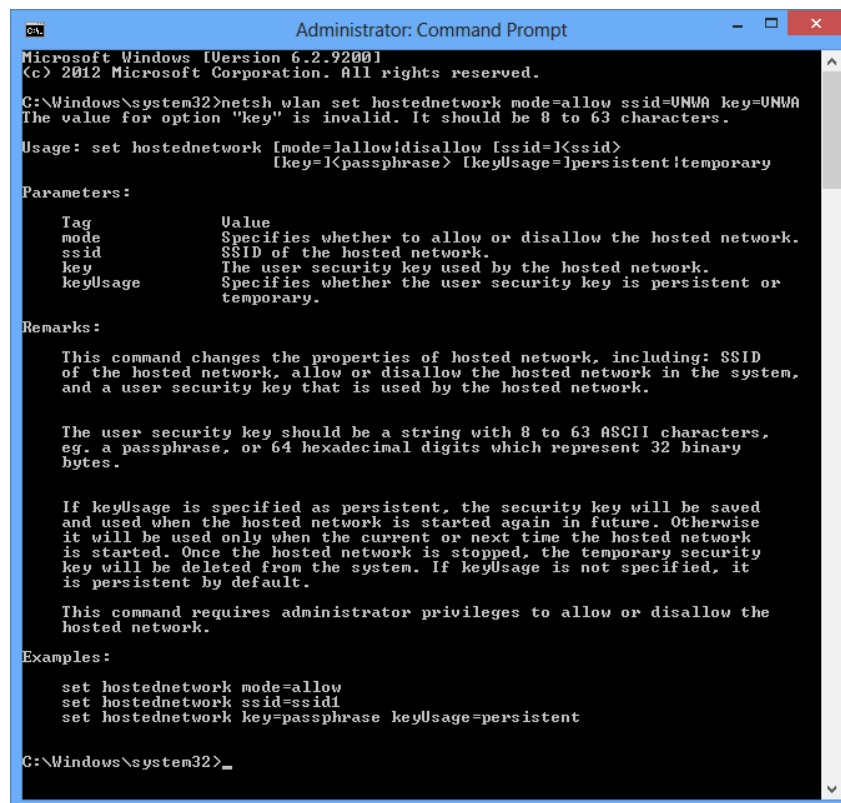
Administrator: Command Prompt
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.
C:\Windows\system32>netsh wlan show drivers
Interface name: Wi-Fi

Driver               : Qualcomm Atheros AR928X Wireless Network Adapter
Vendor               : Qualcomm Atheros Communications Inc.
Provider             : Microsoft
Date                 : 03-07-2012
Version              : 3.0.0.130
INF file             : C:\Windows\INF\netathrx.inf
Files                : 2 total
                     : C:\Windows\system32\DRIVERS\athrx.sys
                     : C:\Windows\system32\drivers\vwifibus.sys
Type                 : Native Wi-Fi Driver
Radio types supported : 802.11b 802.11g 802.11n
FIPS 140-2 mode supported : Yes
802.11w Management Frame Protection supported : Yes
Hosted network supported : Yes
Authentication and cipher supported in infrastructure mode:
Open                 None
Open                 WEP-40bit
  
```

In case, it says *No*, you will need to update your network adapter's driver. If your NIC supports virtualization, you're good to go. Now, enter the following commands to configure an ad hoc wireless connection

```
netsh wlan set hostednetwork mode=allow ssid=<network name> key=<passkey>
```

We will name the ad-hoc network VNWA and the password VNWA4ever as it needs to be more than 8 and less than 63 characters. Below response appears if password below 8 characters



```
Administrator: Command Prompt
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.

C:\Windows\system32>netsh wlan set hostednetwork mode=allow ssid=VNWA key=VNWA
The value for option "key" is invalid. It should be 8 to 63 characters.

Usage: set hostednetwork [mode=allow|disallow [ssid=<ssid>
                        [key=<passphrase> [keyUsage=<persistent|temporary>

Parameters:
    Tag      Value
    mode     Specifies whether to allow or disallow the hosted network.
    ssid     SSID of the hosted network.
    key       The user security key used by the hosted network.
    keyUsage  Specifies whether the user security key is persistent or
              temporary.

Remarks:
    This command changes the properties of hosted network, including: SSID
    of the hosted network, allow or disallow the hosted network in the system,
    and a user security key that is used by the hosted network.

    The user security key should be a string with 8 to 63 ASCII characters,
    eg. a passphrase, or 64 hexadecimal digits which represent 32 binary
    bytes.

    If keyUsage is specified as persistent, the security key will be saved
    and used when the hosted network is started again in future. Otherwise
    it will be used only when the current or next time the hosted network
    is started. Once the hosted network is stopped, the temporary security
    key will be deleted from the system. If keyUsage is not specified, it
    is persistent by default.

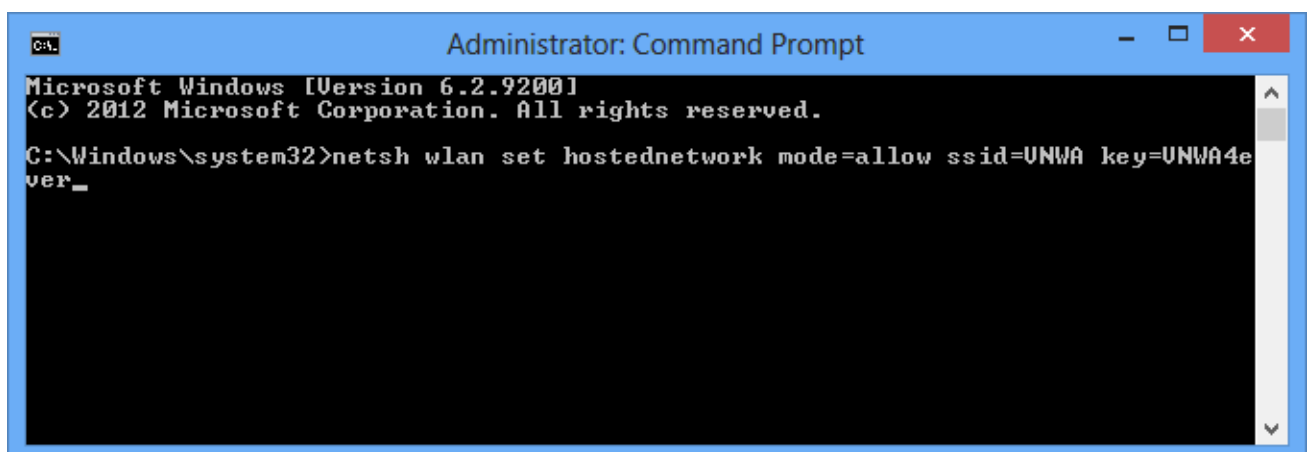
    This command requires administrator privileges to allow or disallow the
    hosted network.

Examples:
    set hostednetwork mode=allow
    set hostednetwork ssid=ssid1
    set hostednetwork key=passphrase keyUsage=persistent

C:\Windows\system32>_
```

Then the correct entry is as below

```
netsh wlan set hostednetwork mode=allow ssid=VNWA key=VNWA4ever
```



```
Administrator: Command Prompt
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.

C:\Windows\system32>netsh wlan set hostednetwork mode=allow ssid=VNWA key=VNWA4e
ver_
```

And the positive response accordingly

```
Administrator: Command Prompt
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.

C:\Windows\system32>netsh wlan set hostednetwork mode=allow ssid=VNWA key=VNWA4ever
The hosted network mode has been set to allow.
The SSID of the hosted network has been successfully changed.
The user key passphrase of the hosted network has been successfully changed.

C:\Windows\system32>
```

Once the hosted network has been set to allow, you need to start the mode to create an ad hoc connection. Just enter the command below.

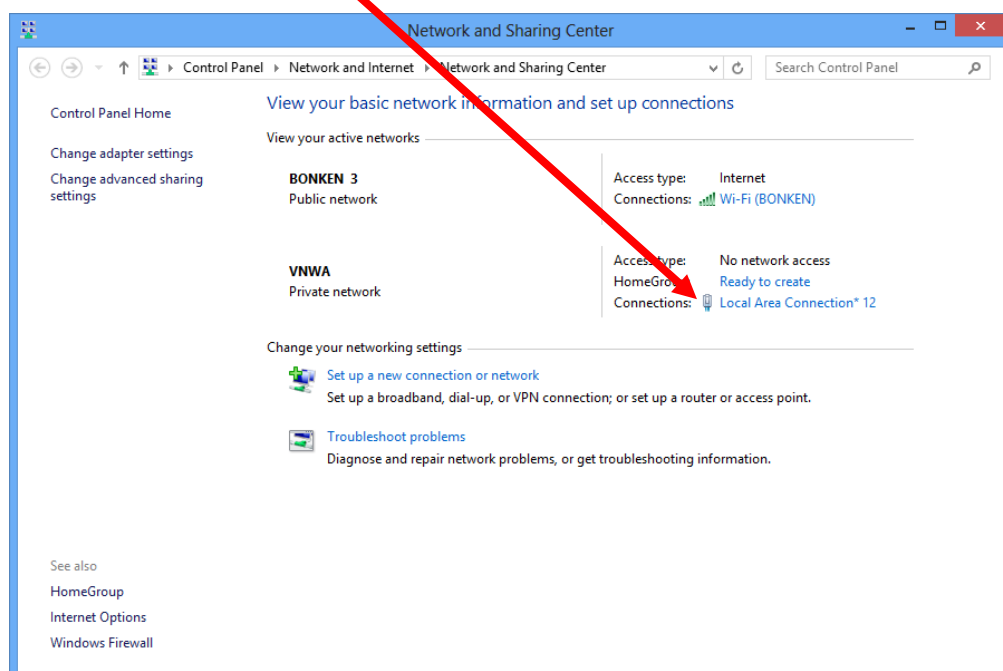
netsh wlan start hostednetwork

```
Administrator: Command Prompt
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.

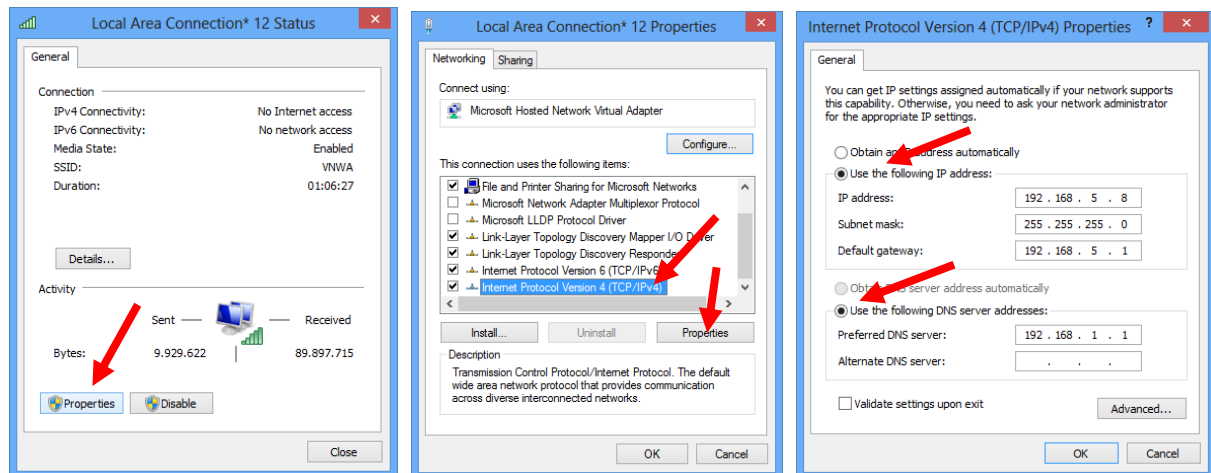
C:\Windows\system32>netsh wlan set hostednetwork mode=allow ssid=VNWA key=VNWA4ever
The hosted network mode has been set to allow.
The SSID of the hosted network has been successfully changed.
The user key passphrase of the hosted network has been successfully changed.

C:\Windows\system32>netsh wlan start hostednetwork
```

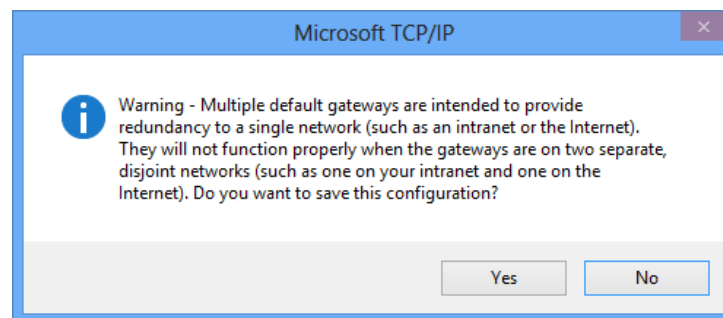
Next step is to set the IP address for the new ad-hoc network by going into Network and Sharing Center and click on the VNWA Local Area Connection



As seen below from left to right click on Properties, find the Internet Protocol Version 4 and click on Properties and select Obtain an IP and DNS server address automatically followed by a number of OK and close click's.



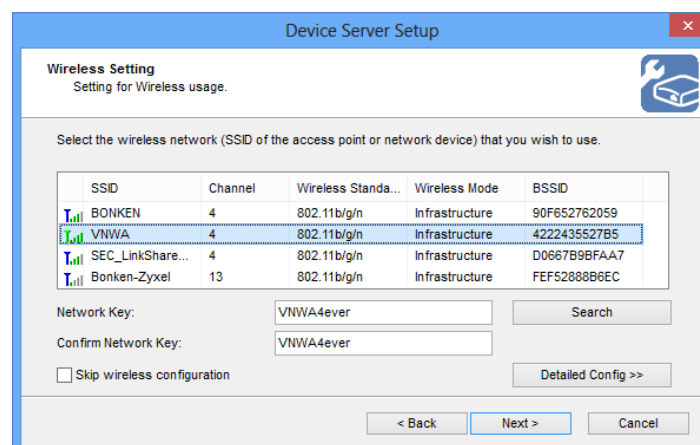
Accept with Yes below warning if shown.



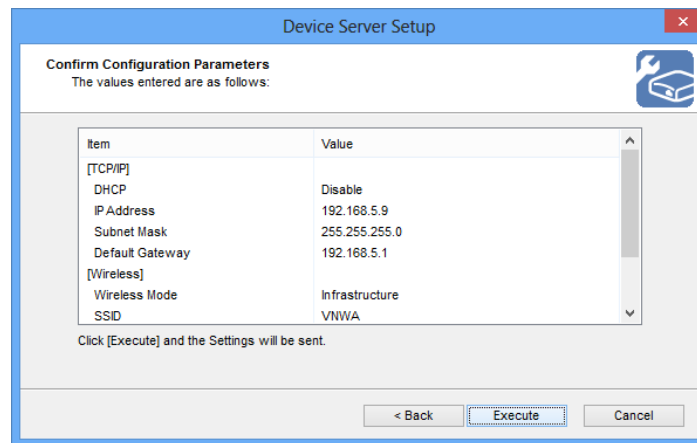
The next step is for the USB Server to connect to the new ad-hoc Wireless Network (hot spot) and an existing wireless connection must be disconnected and both the PC and USB Server must be connected to the LAN network (so the PC can obtain an IP address from the DHCP server or the PC and USB Server is connected with a LAN Cable and the PC configured with a fixed IP address in the segment 192.168.5.xx

Now either use the Installation CD and run the Setup Utility or if you have installed it on your hard disk then click on the icon for the Setup Utility and allow the application to be run as before until the USB Server found and selected followed by searching wireless network as seen below.

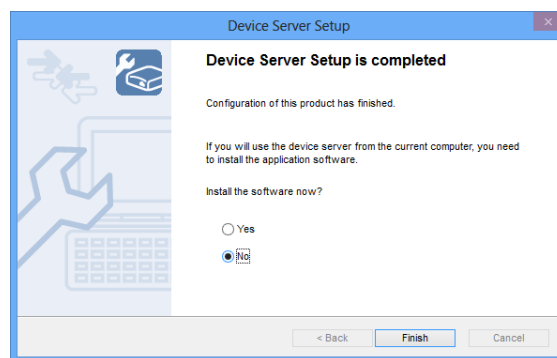
We select the VNWA ad-hoc Network and enter the password chosen and click on Next



All relevant information displayed and by click on Execute the USB Server is being configured



Select No and Finish. Remove the LAN cable(s) and re-power the USB Server and we are done.



Start the VNWA application and you will be able to run a sweep instantly as the VNWA USB devices still connected unless you have terminated the connections.

End of appendix: