

Setting up a Linksys SPA941 VOIP telephone for use as a Mesh VOIP Phone

My special thanks to Tracy Lenocker, WA6ERA, for sharing with me how to use the SPA941 VOIP phone in a Broadband Mesh Network

Phones set up using this procedure are intended to be used with a Static IP address and always put into service with the same mesh router. I store each phone and its associated router together and they always are put into service together.

1. If you are using a used phone do a factory reset.
 - a. Apply power to the phone and connect it to a router so that it will initialize to the startup screen on the display.
 - b. Press the Setup button to access the phone's options directory.



Setup button

- c. Scroll through the menu until you are at the factory reset option.
 - d. Select the factory reset option.
2. With the phone connected to its associated mesh router login to the phone using the IP address assigned to the phone by the router.
 - a. To determine the IP address of the phone look at the mesh status and look in the Port Forwarding, DHCP, and Services page under the Setup tab look for the IP address assigned to the phone.
 - b. Open an internet browser and type the IP address into the location bar.
 - i. The phone's Info Screen should be displayed.
 - ii. Login as Admin

3. At the User Basic Info Tab review the settings but make no change.

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Linksys Telephone Configuration

Info System User Admin Login basic advanced Personal Directory Call History

System Information

DHCP:	Enabled	Current IP:	10.204.106.59
Host Name:	NB70-VOIP-2	Domain:	
Current Netmask:	255.255.255.248	Current Gateway:	10.204.106.57
Primary DNS:	10.204.106.57		
Secondary DNS:			

Product Information

Product Name:	SPA-941	Serial Number:	88014FA11138
Software Version:	S.1.8	Hardware Version:	1.0.0(3399)
MAC Address:	00E08DA0B16	Client Certificate:	Installed
Licenses:	None		

Phone Status

Current Time:	1/1/2003 12:14:02	Elapsed Time:	00:14:02
Broadcast Pkts Sent:	10	Broadcast Bytes Sent:	3420
Broadcast Pkts Recv:	7	Broadcast Bytes Recv:	1099
Broadcast Pkts Dropped:	0	Broadcast Bytes Dropped:	0
RTP Packets Sent:	0	RTP Bytes Sent:	0
RTP Packets Recv:	0	RTP Bytes Recv:	0
SIP Messages Sent:	0	SIP Bytes Sent:	0
SIP Messages Recv:	0	SIP Bytes Recv:	0
External IP:			

Ext 1 Status

Registration State:	Not Registered	Last Registration At:	
Next Registration In:		Message Waiting:	No
Mapped SIP Port:			

Ext 2 Status

Registration State:	Not Registered	Last Registration At:	
Next Registration In:		Message Waiting:	No
Mapped SIP Port:			

Ext 3 Status

Registration State:	Not Registered	Last Registration At:	
Next Registration In:		Message Waiting:	No
Mapped SIP Port:			

Ext 4 Status

Registration State:	Not Registered	Last Registration At:	
Next Registration In:		Message Waiting:	No
Mapped SIP Port:			

a.

4. Click on the User System Tab

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Linksys Telephone Configuration

Info System User Admin Login basic advanced Personal Directory Call History

System Configuration

User Password:

Internet Connection Type

DHCP: ☒ yes

Static IP: NetMask:

Gateway:

Optional Network Configuration

HostName: NB70-VOIP-2 Domain:

Primary DNS: Secondary DNS:

- a.
- b. Make certain that DHCP is set to yes.
- c. All other items should be left blank but will be filled in automatically later.

5. Click on the User Basic User tab

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Info System **User** Admin Login basic | advanced
Personal Directory Call History

Call Forward

Cfwd All Dest:		Cfwd Busy Dest:	
Cfwd No Ans Dest:		Cfwd No Ans Delay:	20
Speed Dial 2:	10.178.188.37	Speed Dial 3:	10.28.22.108
Speed Dial 4:	10.2.96.244	Speed Dial 5:	
Speed Dial 6:		Speed Dial 7:	
Speed Dial 8:		Speed Dial 9:	

Supplementary Services

CW Setting:	yes ▾	Block CID Setting:	no ▾
Block ANC Setting:	no ▾	DND Setting:	no ▾

Audio Volume

Ringer Volume:	10	Speaker Volume:	13
Handset Volume:	10	Headset Volume:	10
Lcd Contrast:	8		

- a.
 - b. The speed dial entries will be filled out later when you know the IP addresses of the other phones that will be in the mesh.
6. Login as a Admin by clicking on Admin Login in the upper right corner of the setup screen.
 7. Click on the Admin Info Tab

LINKSYS®
A Division of Cisco Systems, Inc. Linksys Telephone Configuration

Info System SIP Regional Phone Ext 1 Ext 2 Ext 3 Ext 4 **User** User Login basic | advanced
Personal Directory Call History

System Information

DHCP:	Enabled	Current IP:	10.204.106.59
Host Name:	NBFO-VOIP-2	Domain:	
Current Netmask:	255.255.255.248	Current Gateway:	10.204.106.57
Primary DNS:	10.204.106.57		
Secondary DNS:			

Product Information

Product Name:	SPA-941	Serial Number:	88014FA11138
Software Version:	5.1.8	Hardware Version:	1.0.0(3359)
MAC Address:	000E08DA0B16	Client Certificate:	Installed
Licenses:	None		

Phone Status

Current Time:	1/1/2003 12:20:02	Elapsed Time:	00:20:02
Broadcast Pkts Sent:	10	Broadcast Bytes Sent:	3420
Broadcast Pkts Recv:	8	Broadcast Bytes Recv:	1159
Broadcast Pkts Dropped:	0	Broadcast Bytes Dropped:	0
RTP Packets Sent:	0	RTP Bytes Sent:	0
RTP Packets Recv:	0	RTP Bytes Recv:	0
SIP Messages Sent:	0	SIP Bytes Sent:	0
SIP Messages Recv:	0	SIP Bytes Recv:	0
External IP:			

Ext 1 Status

Registration State:	Not Registered	Last Registration At:	
Next Registration In:		Message Waiting:	No
Mapped SIP Port:			

Ext 2 Status

Registration State:	Not Registered	Last Registration At:	
Next Registration In:		Message Waiting:	No
Mapped SIP Port:			

Ext 3 Status

Registration State:	Not Registered	Last Registration At:	
Next Registration In:		Message Waiting:	No
Mapped SIP Port:			

Ext 4 Status

Registration State:	Not Registered	Last Registration At:	
Next Registration In:		Message Waiting:	No
Mapped SIP Port:			

- a.
- b. As in the User Info Tab no changes are made here.

8. Click on the Admin System Tab

The screenshot shows the Linksys Telephone Configuration web interface. The top header includes the Linksys logo and the text "A Division of Cisco Systems, Inc." and "Linksys Telephone Configuration". Below the header is a navigation bar with tabs: Info, System (selected), SIP, Regional, Phone, Ext 1, Ext 2, Ext 3, Ext 4, and User. To the right of the tabs are links for User Login, basic, advanced, Personal Directory, and Call History. The main content area is titled "System Configuration" and contains several sections: "Enable Web Server" with a dropdown set to "yes" and a "User Password" field; "Internet Connection Type" with a "DHCP" dropdown set to "yes", "Static IP" and "NetMask" fields, and a "Gateway" field; "Optional Network Configuration" with "HostName" (set to "NB7O-VOIP-2"), "Domain", "Primary DNS", "Secondary DNS", "DNS Query Mode" (set to "Parallel"), "Syslog Server", "Debug Server", and "Debug Level" (set to "0").

- a.
- b. Set Enable Web Server to Yes
- c. Set DHCP to Yes
- d. Set Hostname to your call sign and the sequential number of the phone or some other meaningful name

9. Do not make any changes in the Admin SIP tab

The screenshot shows the Linksys Telephone Configuration web interface with the SIP tab selected. The navigation bar shows Info, System, SIP (selected), Regional, Phone, Ext 1, Ext 2, Ext 3, Ext 4, and User. The main content area is titled "SIP" and contains several sections: "Response Status Code Handling" with "SIT1 RSC", "SIT2 RSC", "SIT3 RSC", and "SIT4 RSC" fields; "RTP Parameters" with "RTP Port Min" (set to "16384") and "RTP Port Max" (set to "16482") fields; "SDP Payload Types" with "AVT Dynamic Payload" (set to "101"), "G726r16 Dynamic Payload" (set to "98"), "G726r24 Dynamic Payload" (set to "97"), "G726r40 Dynamic Payload" (set to "96"), and "G729b Dynamic Payload" (set to "99") fields; and "Linksys Key System Parameters" with a "Force LAN Codec" dropdown set to "none".

- a.

10. Click on the Admin Regional Tab

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Linksys Telephone Configuration

Info System SIP **Regional** Phone Ext 1 Ext 2 Ext 3 Ext 4 User User Login basic advanced Personal Directory Call History

Control Timer Values (sec)
 Call Back Expires: 1800 Call Back Retry Intvl: 30

Vertical Service Activation Codes

Call Return Code:	*69	Blind Transfer Code:	*98
Call Back Act Code:	*66	Call Back Deact Code:	*86
Cfwd All Act Code:	*72	Cfwd All Deact Code:	*73
Cfwd Busy Act Code:	*90	Cfwd Busy Deact Code:	*91
Cfwd No Ans Act Code:	*92	Cfwd No Ans Deact Code:	*93
CW Act Code:	*56	CW Deact Code:	*57
CW Per Call Act Code:	*71	CW Per Call Deact Code:	*70
Block CID Act Code:	*67	Block CID Deact Code:	*68
Block CID Per Call Act Code:	*81	Block CID Per Call Deact Code:	*82
Block ANC Act Code:	*77	Block ANC Deact Code:	*87
DND Act Code:	*78	DND Deact Code:	*79

Vertical Service Announcement Codes

Miscellaneous

Set Local Date (mm/dd): Set Local Time (HH/mm):
 Time Zone: GMT-08:00 Time Offset (HH/mm):

-
- Set the local Date (mm/yy) something similar to 01/16
- Set the local Time (HH/mm) something similar to 09/45
- You may set Time Zone and Local Offset but these really do not matter for Mesh Network VOIP work.

11. Click on the Admin Phone Tab

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Linksys Telephone Configuration

Info System SIP Regional **Phone** Ext 1 Ext 2 Ext 3 Ext 4 User [User Login](#) [basic](#) [advanced](#) [Personal Directory](#) [Call History](#)

General

Station Name: NB7O AP9 Voice Mail Number:

Text Logo: phone 2

Line Key 1

Extension: 1 Short Name: NB7O-VOIP 2

Line Key 2

Extension: 1 Short Name: \$USER

Line Key 3

Extension: 1 Short Name: \$USER

Line Key 4

Extension: 1 Short Name: \$USER

SCA Line ID Mapping: Vertical First ACD Ext: 1

Ring Tone

Ring1: n=Classic-1;w=3;c=1

Ring2: n=Classic-2;w=3;c=2

Ring3: n=Classic-3;w=3;c=3

Ring4: n=Classic-4;w=3;c=4

Ring5: n=Simple-1;w=2;c=1

Ring6: n=Simple-2;w=2;c=2

Ring7: n=Simple-3;w=2;c=3

Ring8: n=Simple-4;w=2;c=4

Ring9: n=Simple-5;w=2;c=5

Ring10: n=Office;w=4;c=1

Audio Input Gain (dB)

Handset Input Gain: 0 Headset Input Gain: 0

Speakerphone Input Gain: 0

-
- Set Station Name to whatever you want. I prefer to type the name of the Mesh Node name that will be associated with this phone. In this example this VOIP phone will always be paired with NB7O AP9. I enter this here so that if phones and routers get mixed up I can pair them back here.
- Set Text Logo to whatever you want. I enter the sequential phone number in the order of their inclusion in my inventory.
- Set Key Line 1 Short Name to whatever you want. I use the naming convention of my call sign with VOIP and the sequential number of the phone. E.G. for the phone in the example above NB7O-VOIP 2. The phone is labeled with this name and can easily be matched to its router which is labeled as in the Station Name.

12. Click on the Admin Ext 1 Tab

The screenshot shows the Linksys Telephone Configuration web interface. At the top, the Linksys logo and "A Division of Cisco Systems, Inc." are on the left, and "Linksys Telephone Configuration" is on the right. Below this is a navigation bar with tabs: Info, System, SIP, Regional, Phone, Ext 1 (selected), Ext 2, Ext 3, Ext 4, and User. To the right of the tabs are links for User Login, basic, advanced, Personal Directory, and Call History. The main content area is divided into several sections with red headers: General, NAT Settings, SIP Settings, Call Feature Settings, Proxy and Registration, Subscriber Information, and Audio Configuration. Each section contains various configuration options with dropdown menus and text input fields.

Linksys Telephone Configuration			
Info System SIP Regional Phone Ext 1 Ext 2 Ext 3 Ext 4 User			
User Login basic advanced Personal Directory Call History			
General			
Line Enable:	yes		
NAT Settings			
NAT Mapping Enable:	no	NAT Keep Alive Enable:	no
SIP Settings			
SIP Port:	5060	SIP Debug Option:	none
Call Feature Settings			
Message Waiting:	no	Default Ring:	1
Mailbox ID:			
Proxy and Registration			
Proxy:		Register:	yes
Make Call Without Reg:	yes	Register Expires:	3600
Ans Call Without Reg:	yes		
Subscriber Information			
Display Name:		User ID:	
Password:		Use Auth ID:	no
Auth ID:			
Audio Configuration			
Preferred Codec:	G711u	Use Pref Codec Only:	no
Silence Supp Enable:	no	DTMF Tx Method:	Auto

-
- Set the General Line Enable to Yes
- Set the Proxy and Registrations Make Call Without Reg to Yes
- Set the Proxy and Registration Ans Call Without Reg to Yes

13. Do not make any changes on Admin Ext 2-4 Tabs

14. Click on the Admin User Tab

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Linksys Telephone Configuration

Info System SIP Regional Phone Ext 1 Ext 2 Ext 3 Ext 4 **User** User Login basic advanced Personal Directory Call History

Call Forward

Cfwd All Dest:		Cfwd Busy Dest:	
Cfwd No Ans Dest:		Cfwd No Ans Delay:	20
Speed Dial 2:	10.178.188.37	Speed Dial 3:	10.28.22.108
Speed Dial 4:	10.2.96.244	Speed Dial 5:	
Speed Dial 6:		Speed Dial 7:	
Speed Dial 8:		Speed Dial 9:	

Supplementary Services

CW Setting:	yes	Block CID Setting:	no
Block ANC Setting:	no	DND Setting:	no
Secure Call Setting:	no	Dial Assistance:	no
Auto Answer Page:	yes	Preferred Audio Device:	Speaker
Time Format:	24hr	Date Format:	month/day

Audio Volume

Ringer Volume:	10	Speaker Volume:	13
Handset Volume:	10	Headset Volume:	10
Lcd Contrast:	8		

-
- In Call Forward Speed Dial 2 through 9 enter the IP addresses of any other phones you have in your inventory.

15. Click on the Submit All Changes Button at the bottom of the setup screen.



-
- This will cause all of the changes you have made to be stored in the phone.

16. Log into the Mesh Node Router that is associated with this VOIP phone

17. Click on the Setup Button in the Mesh Screen

NB7O-AP9 

[Help](#) Refresh Mesh Status OLSR Status WiFi Scan Setup ☐ Night Mode

WiFi address	10.121.141.71 / 8 fe80::213:10ff:fe79:8d47 Link	Signal/Noise/Ratio	-26 / -82 / 56 dB	Auto
LAN address	10.204.106.57 / 29 fe80::213:10ff:fe79:8d45 Link	firmware version	3.1.0	
default gateway	10.12.236.27 NB7O-AP13	configuration	mesh	
your address	10.187.83.187 MSI	system time	Tue Jan 19 2016 04:24:58 UTC	
		uptime	1:23	
		load average	0.15, 0.04, 0.00	
		flash	= 496 KB	
		free space	/tmp = 7060 KB	
		memory	= 2680 KB	

-

18. Enter the Username and Password for the router that you have previously established

19. Click on the Port Forwarding, DHCP, and Services option at the top of the setup screen

Node Status **Basic Setup** Port Forwarding, DHCP, and Services Administration

Help Save Changes Reset Values Default Values Reboot

Node Name NB70-AP9 Password

Node Type Mesh Node Verify Password

a.

b.

20. Reserve the IP address for the VOIP so that it always is given the same IP address by the router when it is attached to the router and initialized.

Node Status Basic Setup **Port Forwarding, DHCP, and Services** Administration

Help Save Changes Reset Values Refresh

DHCP Address Reservations

Hostname	IP Address	MAC Address	
NB70-VOIP-2	10.204.106.59	00:0e:08:da:0b:16	Del

- IP Address - Add

Advertised Services

Name	Link	URL	
NB70-AP9	://NB70-AP9		Add

Current DHCP Leases

Hostname	IP Address	MAC Address	
NB70-VOIP-2	10.204.106.59	00:0e:08:da:0b:16	Add

Port Forwarding

Interface	Type	Outside Port	LAN IP	LAN Port	
WAN	TCP	10.204.106.59	- IP Address -		Add

a.

b. This step makes certain that the phones always receive the same IP addresses so that dialing can be accomplished.

c. Locate the current IP address assigned to the VOIP (step 1 above)

d. Click the Add button associated with the IP address assigned to the VOIP (step 1 above)

e. Compare the name and address in step 2 above with the information in step 1 above. Make certain the information carried over correctly.

f. Click the Save Changes button in Step 3 above to save the IP reservation for the VOIP

g. Reboot the router after the save changes step completes.

h. Repeat steps 16 to 20 to confirm that the IP reservation was saved.

21. You are done setting up the VOIP and its associated Router

22. To make a call you simply need to enter the speed dial number of the phone you desire to call and then press the soft button under the word Dial in the display; E.G. 2 <Dial>