

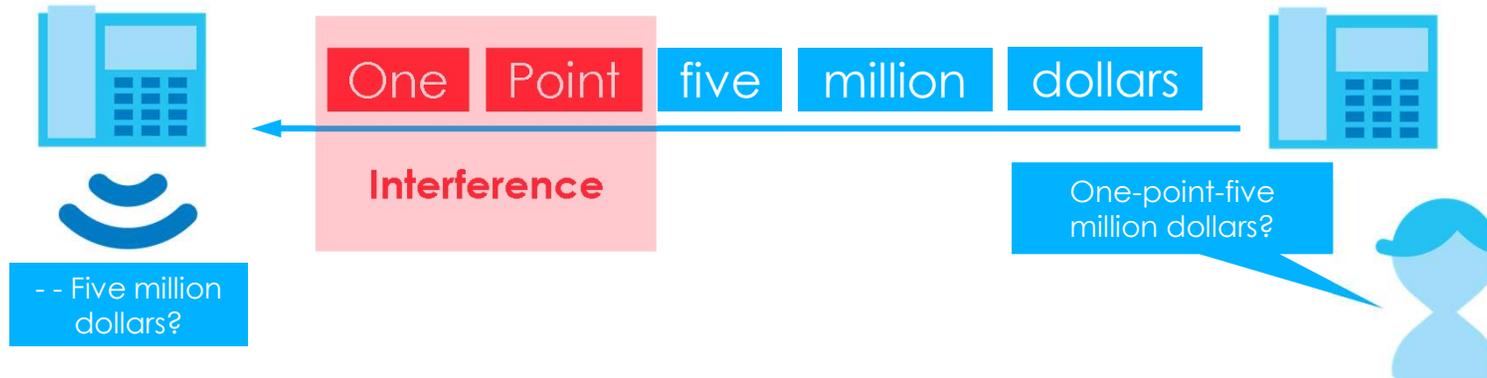
VOIP Deployment

08



Voice over IP

- Unlike data packets, voice packet comes with characteristics:
 - Requires real-time transmission/conversation
 - No integrity checks
 - Latency affects content of a conversation



Goal

- Provide guidelines that ensures the best VOIP experience for wired and wireless IP Phones
 - How to improve VOIP integrity
 - Which features compliment VOIP
 - What features to avoid
- Extend guide to Nebula Switch

Setup SSID

- Dedicate SSID and VLAN for VOIP

Name	<input type="text" value="VOIP-WIFI"/> Edit
Enabled	<input checked="" type="checkbox"/>
Tagging	<input type="text"/> <small>Enable SSID on APs with any of the specified tags</small>
Guest Network	<input type="checkbox"/> OFF
VLAN ID	<input type="text" value="100"/> (1 - 4094)

Name	<input type="text" value="Office"/> Edit
Enabled	<input checked="" type="checkbox"/>
Tagging	<input type="text"/> <small>Enable SSID on APs with any of the specified tags</small>
Guest Network	<input type="checkbox"/> OFF
VLAN ID	<input type="text" value="1"/> (1 - 4094)



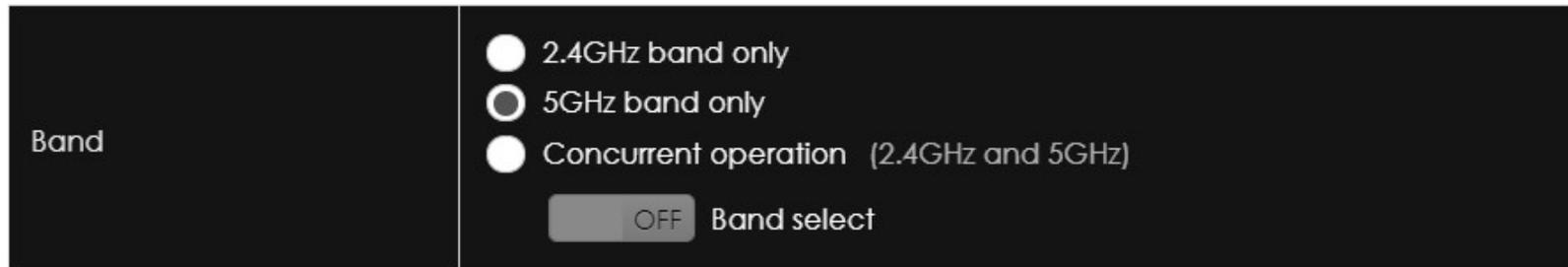
Setup SSID

- Operate with less than 3 SSID
 - Each SSID contributes wireless traffic overhead from beacon frames

Amount of Overhead:		0-10% Low	10-20% Medium	20-50% High	>50% V			
Number of APs on Channel*	Number of SSIDs							
	1	2	3	4	5	6	7	8
1	3.22%	6.45%	9.67%	12.90%	16.12%	19.35%	22.57%	25.80%
2	6.45%	12.90%	19.35%	25.80%	32.25%	38.70%	45.14%	51.59%
3	9.67%	19.35%	29.02%	38.70%	48.37%	58.04%	67.72%	77.39%
4	12.90%	25.80%	38.70%	51.59%	64.49%	77.39%	90.29%	100.00%
5	16.12%	32.25%	48.37%	64.49%	80.62%	96.74%	100.00%	100.00%
6	19.35%	38.70%	58.04%	77.39%	96.74%	100.00%	100.00%	100.00%
7	22.57%	45.14%	67.72%	90.29%	100.00%	100.00%	100.00%	100.00%
8	25.80%	51.59%	77.39%	100.00%	100.00%	100.00%	100.00%	100.00%
9	29.02%	58.04%	87.06%	100.00%	100.00%	100.00%	100.00%	100.00%
10	32.25%	64.49%	96.74%	100.00%	100.00%	100.00%	100.00%	100.00%

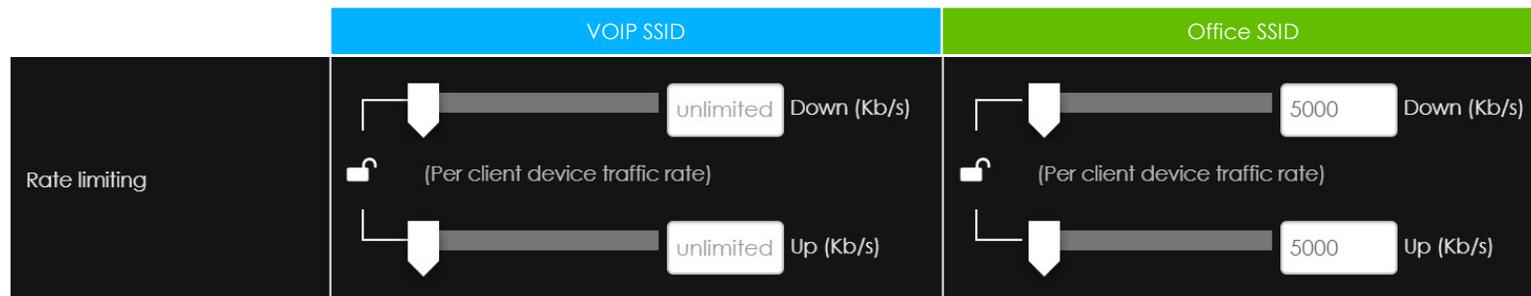
Setup Band

- Avoid 2.4GHz band
 - Congested due to limited channels
- Disable band select
 - IP Phones may not have proper support for band select causing reconnection delays or may even fall into the 2.4GHz radio



Setup Rate Limiting

- Enable rate limiting on SSID not using VOIP
- For VOIP service:
 - Unlimited upload/download
- For office service:
 - 5 Mbps upload/download
- For guest service:
 - 1 Mbps upload/download



Setup U-APSD

- Enable U-APSD only on SSID dedicated for IP phones
 - U-APSD can prevent phones from sleeping during active calls



Setup Roaming Standards

- For IP Phones frequently on the move,
 - Enable 802.11k/v
 - Enable 802.11r if phones require WPA2-PSK or WPA2-Enterprise

WPA2 Pre-shared key

Users must enter this key to associate: [Show key](#)

802.11r

Users enable this to support fast roaming

WPA2-Enterprise with

Uses 802.1X authentication that requires a unique username and password

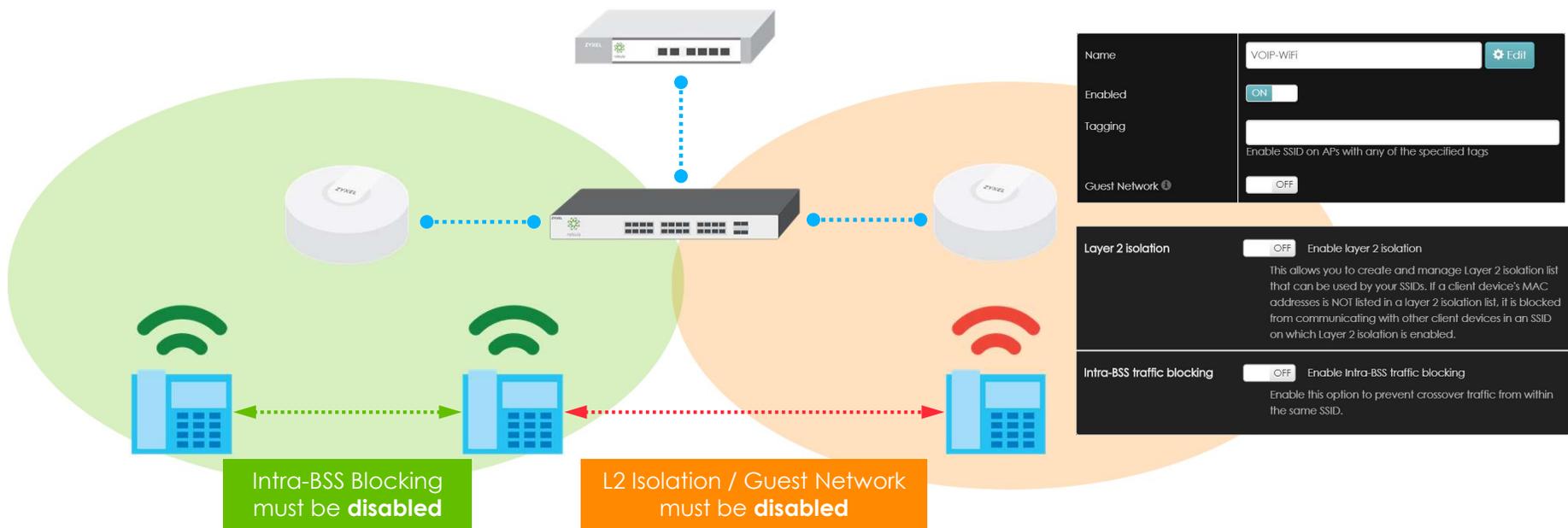
802.11r

Users enable this to support fast roaming

Assisted roaming Enable 802.11k/v

Disable Features

- Disable L2 Isolation, Guest network, or Intra BSS Blocking



Setup Radio

- Set max output power of 5GHz radio 6~8 dB higher than 2.4GHz
- Set DCS schedule outside office hours.

The screenshot displays the radio configuration interface. The 'Maximum output power' section shows 2.4 GHz set to 16 dBm and 5 GHz set to 24 dBm. The 'DCS setting' section includes a toggle for DCS (set to OFF), a DCS time interval of 720 minutes, a DCS schedule toggle (set to ON) with all days of the week checked, a start time of 06:00, and two additional toggles for 'DCS client aware' and 'Avoid 5G DFS channel', both set to ON.

Band	Maximum output power
2.4 GHz	16 dBm
5 GHz	24 dBm

DCS setting

DCS: OFF DCS time interval: 720 (10~1440 minutes)

DCS schedule: ON

Day	Checked
Monday	Yes
Tuesday	Yes
Wednesday	Yes
Thursday	Yes
Friday	Yes
Saturday	Yes
Sunday	Yes

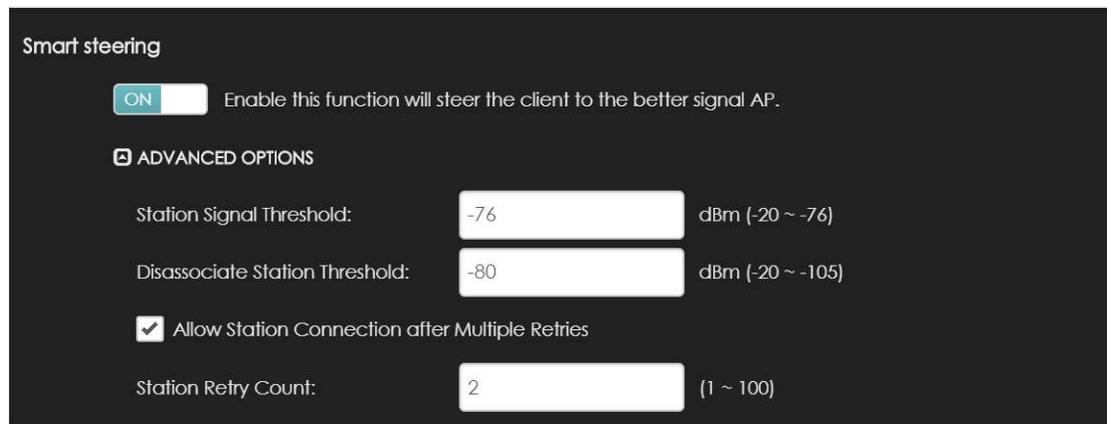
Start time: 06:00

DCS client aware: ON

Avoid 5G DFS channel: ON

Setup Smart Steering

- Enable and set Smart Steering
- Recommended thresholds:
 - Station Signal Threshold: -76
 - Disassociate Station Threshold: -80
 - Station Retry Count: 2



Smart steering

ON Enable this function will steer the client to the better signal AP.

ADVANCED OPTIONS

Station Signal Threshold: dBm (-20 ~ -76)

Disassociate Station Threshold: dBm (-20 ~ -105)

Allow Station Connection after Multiple Retries

Station Retry Count: (1 ~ 100)

Survey Client Signal

- Ideal signal strength of IP Phones: better than -67 dBm
 - Re-evaluate AP deployment if stationary IP phones shows worse than -67 dBm

<input type="checkbox"/>	Status	Description	Signal strength ▲	IPv4 address	
<input type="checkbox"/>		Phone-01	-68 dBm	192.168.210.53	
<input type="checkbox"/>		Phone-02	-68 dBm	192.168.210.171	
<input type="checkbox"/>		Phone-03	-67 dBm	192.168.210.51	
<input type="checkbox"/>		Phone-04	-75 dBm	192.168.210.121	
<input type="checkbox"/>		Phone-05	-74 dBm	192.168.210.18	
<input type="checkbox"/>		Phone-06	-60 dBm	192.168.210.43	

Setup Switch

- Set 802.1p for VOIP traffic in Nebula switch
- Location: SWITCH > Configure > Switch configuration

Quality of service

Quality of service

QoS allows network traffic prioritization based on application and service demands. IEEE802.1P defines eight priority levels to be mapped to different class of service (CoS) queue upon traffic prioritization.

VLAN	Priority	Description
100	5	VOIP

+ Add

Voice VLAN

Voice VLAN

Voice VLAN ID 100

Priority 5

OUI

OUI address	OUI mask	Description
1 60:12:AB:00:00:	FF:FF:FF:00:00:00	Zyxel-Phone

+ Add OUI on this network

Input first 6-digit MAC address of IP phones followed by 6 zeroes

Setup Switch

- Access Ports
 - Ports connected to IP phone / PC
- Trunk Ports
 - Ports connected to AP / gateway
- Location: SWITCH > Configure > Switch ports

