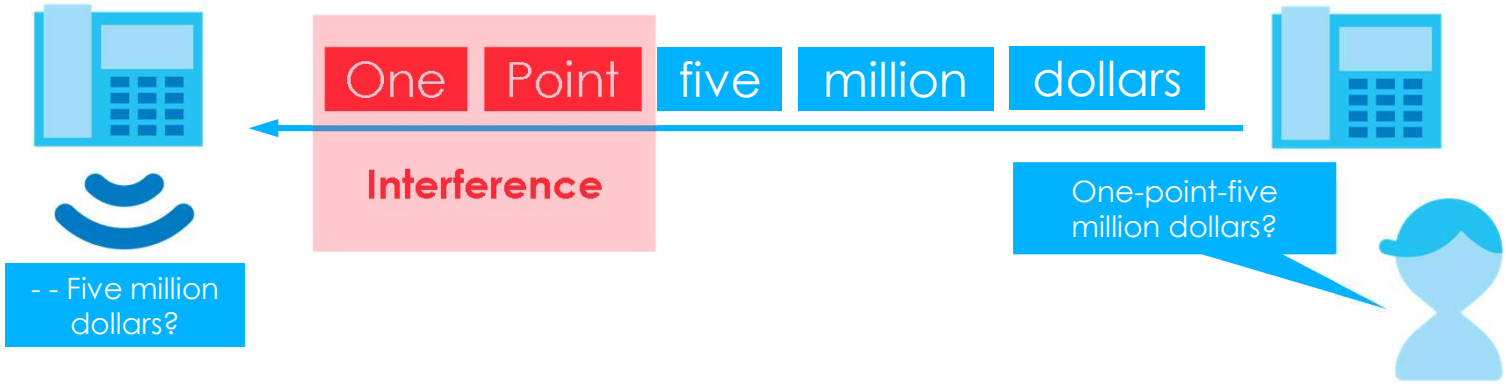
# VOIP Deployment

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

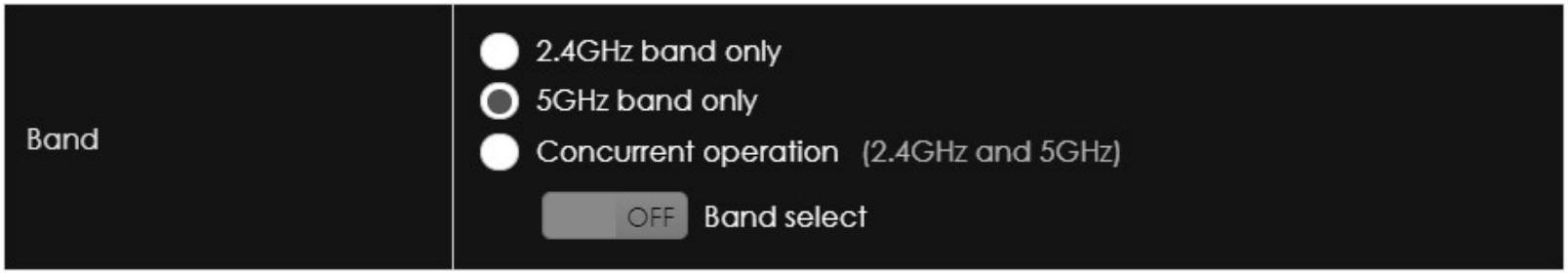
# Setup SSID

- 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% |

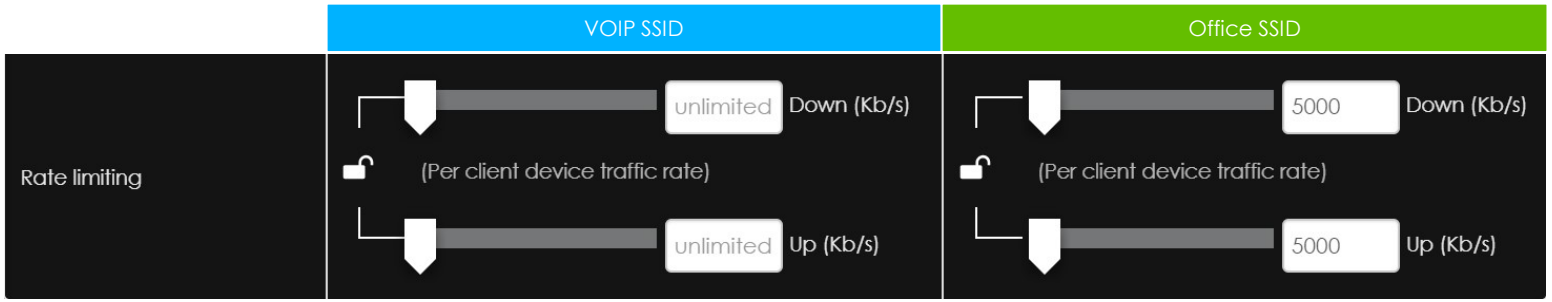
# Setup Band

- 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

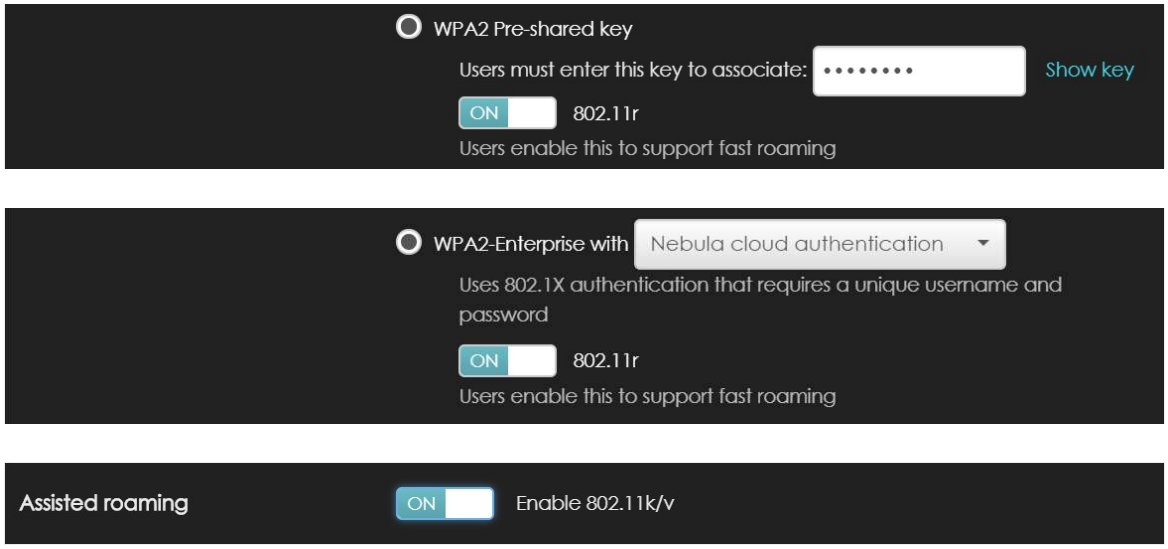


# Setup U-APSD

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

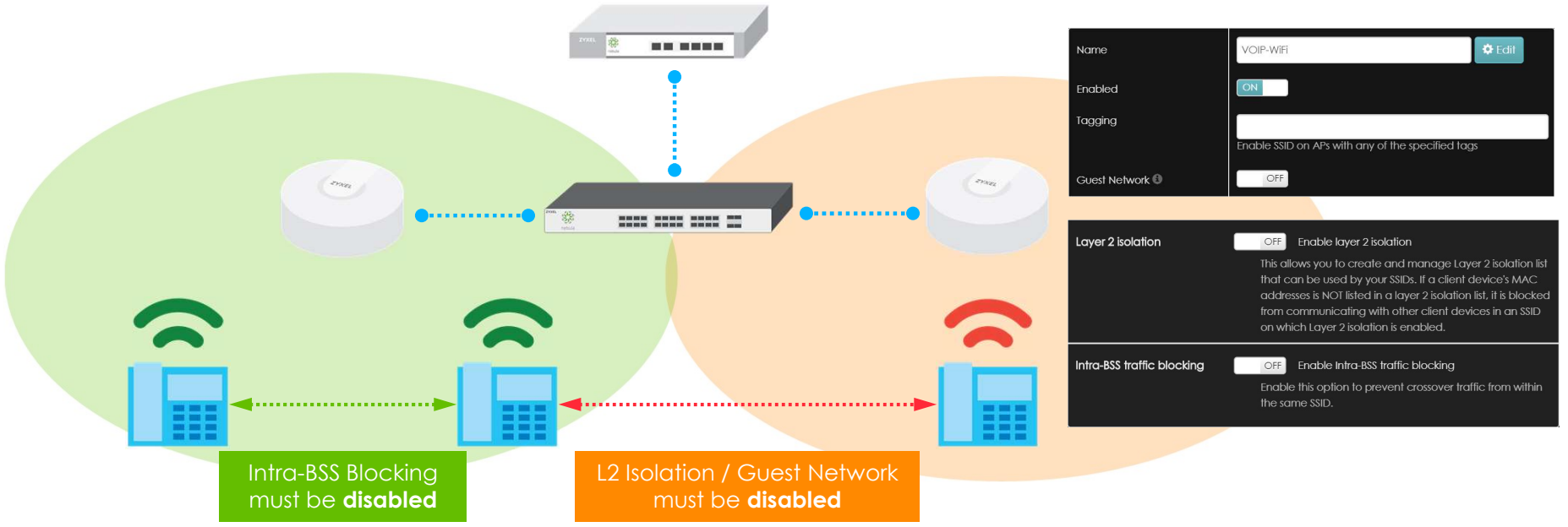
# Setup Roaming Standards

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



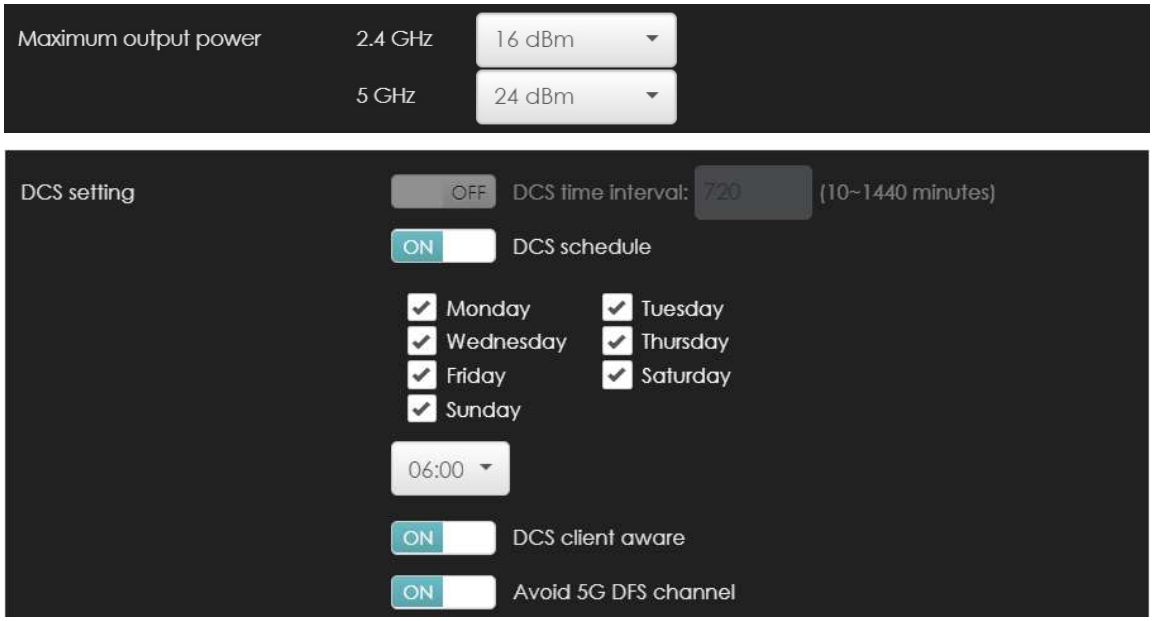
# Disable Features

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



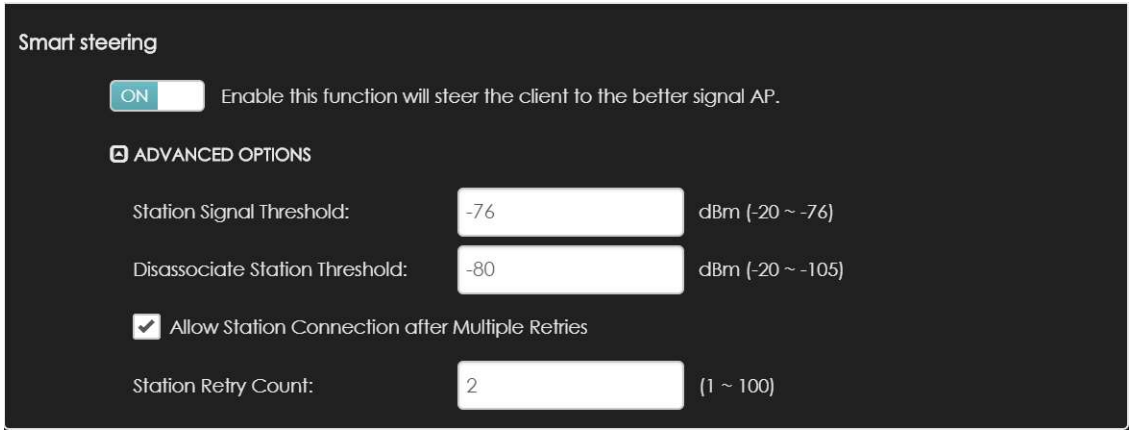
# Setup Radio

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



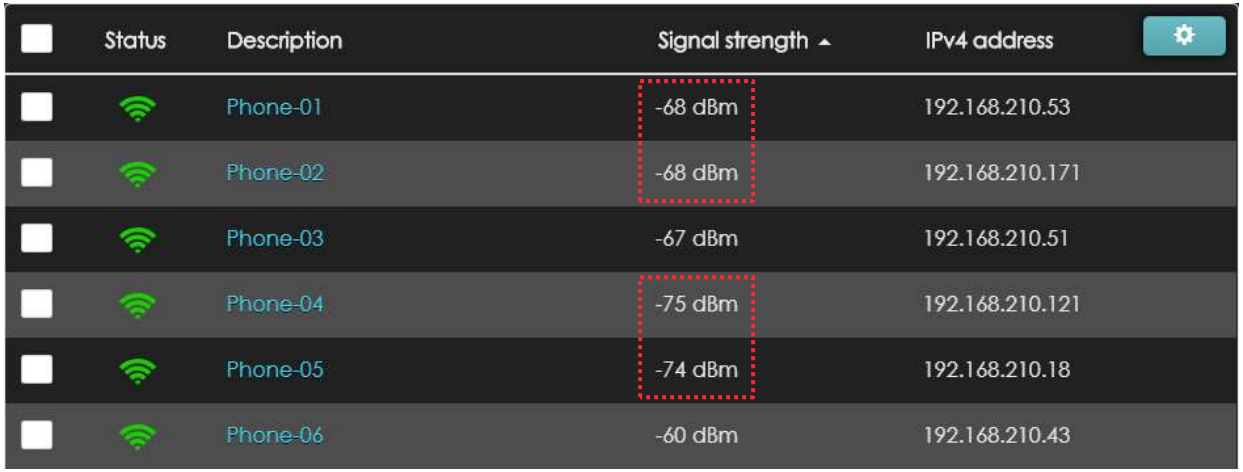
# Setup Smart Steering

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



# 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



| Status | Description | Signal strength ▲ | IPv4 address |
|---|---|---|---|
| | Phone-01 | -68 dBm | 192.168.210.53 |
| | Phone-02 | -68 dBm | 192.168.210.171 |
| | Phone-03 | -67 dBm | 192.168.210.51 |
| | Phone-04 | -75 dBm | 192.168.210.121 |
| | Phone-05 | -74 dBm | 192.168.210.18 |
| | Phone-06 | -60 dBm | 192.168.210.43 |

# Setup Switch

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

# Setup Switch

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