User Manual

For the model for WMPI-01

Prepared By: Joel Giles Cheang

Dated:

Approved By:

_____

Pankaj Sharma

CTO

Whizpace Pte. Ltd.

Singapore

Date:

COPYRIGHT NOTICE

Role	Name	Designation	Signature
Owner			
Reviewer			
Approver			
Version			

WARNING

Check document control system for the latest version before using or copying.

REVISION HISTORY

Version	Date	Authors	Comments	Reasons for Change
0.1				

CONTRIBUTORS

- Benjamin Lim Zheng Jie

- Boonyang Tan

- Chiu Ying Lay

- Hong Feng

- Joel Giles Cheang

- Oh Ser Wah

- Pankaj Sharma

- Alger Goh

- Swe Zin

DEFINITIONS, ACRONYMS & ABBREVIATIONS

AC	Alternating Current
BPSK	Binary Phase-Shift Keying
CPU	Central Processing Unit
dB	Decibel
F/B Ratio	Front-to-Back Ratio
FCC	Federal Communications Commission
GUI	Graphics User Interface
IMDA	Info-Communications Media Development Authority
IP Address	Internet Protocol Address
KM	Kilometre (Unit of Measurement)
Mbps	Megabits per second
MHz	Megahertz
No.	Number
OFDM	Orthogonal Frequency-Division Multiplexing
PoE	Power over Ethernet
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase-Shift Keying
RF	Radio Frequency
RX Rate	Receiving Rate
SDRAM	Synchronous Dynamic Random Access Memory
SMA Antenna	SubMiniature A Antenna
SSID	Service Set Identification
TCP	Transmission Control Protocol
TVWS	Television White Spaces
TX Rate	Transmitting Rate
UDP	User Datagram Protocol
WEP	Wired Equivalent Privacy
WPA	Wi-Fi Protected Access
WPA2	Wi-Fi Protected Access 2

Strictly Confidential

FCC Regulatory Information

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Part 15 TV Band Device Notice

This equipment has been tested and found to comply with the rules for TV bands devices, pursuant to part 15 of the FCC rules. These rules are designed to provide reasonable protection against harmful interference. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

(1) Reorient or relocate the receiving antenna.
(2) Increase the separation between the equipment and receiver.
(3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
(4) Consult the manufacturer, dealer or an experienced radio/TV technician for help.

Caution: Exposure to Radio Frequency Radiation.

To comply with FCC RF exposure compliance requirements, for fixed configurations, a separation distance of at least 40 cm must be maintained between the antenna of this device and all persons.

This device must not be co-located or operating in conjunction with any other antenna or transmitter.

HQ Contact:
Whizpace Pte. Ltd.
77 Ayer Rajah Crescent,
#02-30,
Singapore-139954
US Contact:
Virtual Gateway Labs.
1732 North First Street, Suite 220,
San Jose, California 95112
USA
Phone: +1 408 453 4557
Fax: +1 408 453 4046
Website: http://www.vg-labs.com/

Table of Contents

1. Introduction

1.1. Purpose

The purpose of the manual is to provide a quick guide with appropriate information and procedures on how to setup and operate the WhizMesh radio to establish a TV White Space (TVWS) radio link.

1.2. Product Overview

WhizMesh is a wireless communication solution based on dynamic sharing technology that make use of the underutilized TV Band, also known as TVWS. WhizMesh are designed to provide long range and good penetration characteristic which can lower down the cost of network and increase the speed of deployment. It supports mesh topology on top of the traditional point-to-point and point-to-multi-point (star) topologies.

Figure 1: Whizmesh

2. System Block Diagram

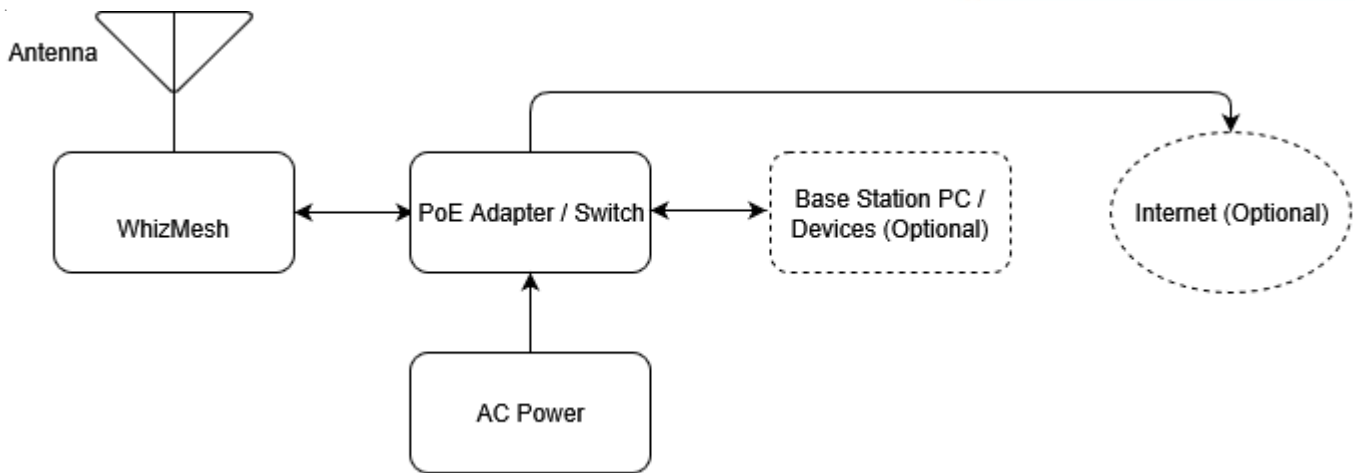This part will show the basic block diagram of WhizMesh installation for different applications.

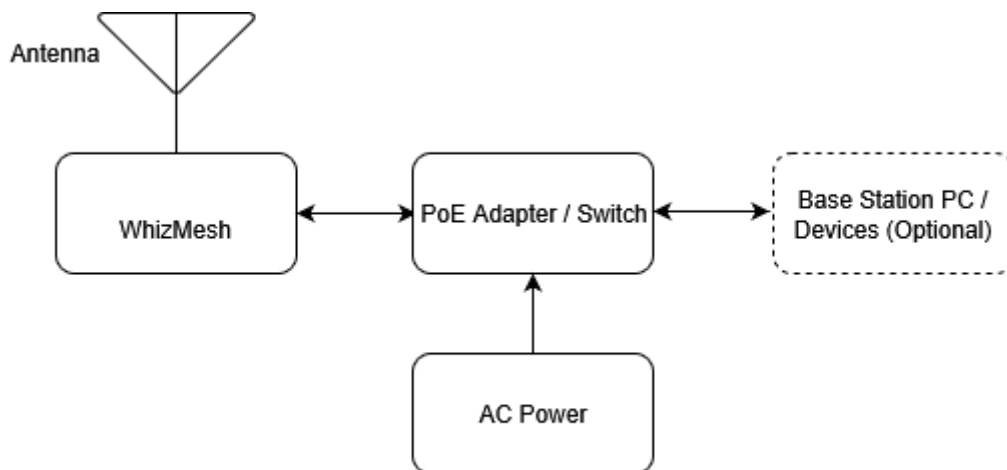Figure 2: Base station installation diagram.

Figure 3: Client station installation diagram.

The TVWS radio link is established between both the base station and client station for different applications

3. Hardware setup and configuration

3.1. Setup (TP-Link PoE)

1. Connect AC power cord to PoE Adapter
2. PoE Ethernet OUT to WhizMesh
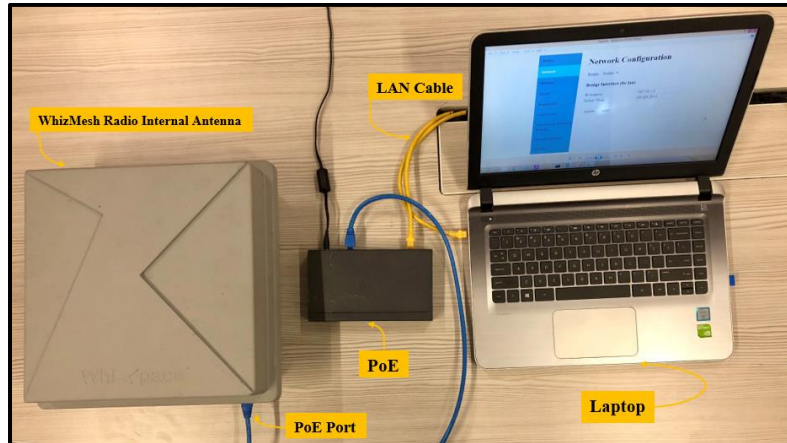3. PoE Ethernet IN to Base Station PC

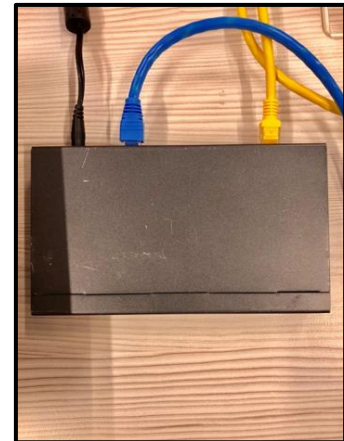Figure 4: Connection between Whizpace device with laptop

Figure 5: Connection of POE

3.2. Setup (TP-Link Switch)

1. Connect AC power cord to TP-Link Switch
2. TP-Link Ethernet ports 1 - 4 to WhizMesh
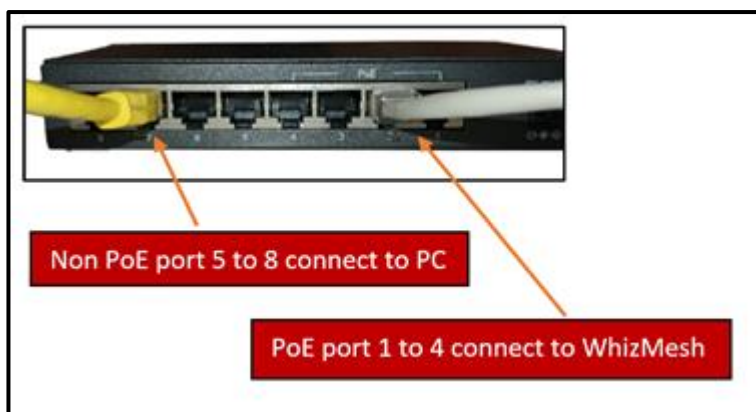3. TP-Link Ethernet port 5 – 8 to Base Station PC

Figure 6: Connection between Whizpace products and laptop using TP-Link Switch
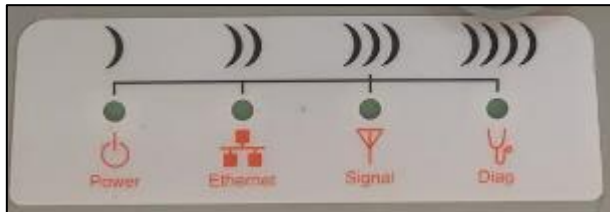
3.3. LED Indicators on WhizMesh

Figure 7: LED Indicators on Whizpace Products

4. POWER – Display the ON/OFF Status of WhizMesh
5. ETHERNET – Display if the Ethernet Port is active and functioning
6. SINGNAL – Not applicable
7. DIAG. – Not applicable

4. GUI control interface

General Status

br-lan

IP Address   : 192.168.1.12
Subnet Mask : 255.255.255.0

eth0

IP Address   :
Subnet Mask :

eth1

IP Address   :
Subnet Mask :

wlan0

IP Address   :
Subnet Mask :

ESSID   :
Mode   : Client
Channel   : Scanning...
Tx Power   : 29
Link Quality : 0/70
Signal Level : 0
Noise Level   : -65 dBm

Access Point :

Sidebar: Status, Network, Wireless, Route, Diagnostics, Commands, System, Change Password, Log Out

Figure 8: General Status of the products

All General Status of the WhizMesh is displayed on the first page of the GUI

Eth0:

ESSID: Network Name

Mode: Base Station/Client Station

Channel: Current Network Channel

TX Power: Transmission Power in dBm

Link Quality: Quality of the connection between the two devices

Signal Level: Strength of connection in dBm

Noise Level: Channel Noise Level in dBm

*For simple link setup, users could use the default values and skip the other pages of the GUI

Enabling the bridge let users wirelessly connect two interfaces together.

Figure 9: Enabling Bridge Interfaces in Network Configuration

Strictly Confidential

Figure 10: Disabling the Bridge Interfaces in Network Configuration

Wireless Configuration

- Enable ○ Disable
Mode : Master ▼
Channel Switch : ○ On ● Off
ESSID : unknown
● FCC ○ IMDA
FCC Channel : Select: ▼
IMDA Channel : Select: ▼
Count : 3 ▼
Distance :
Tx Power : 7 ▼
Encryption : None ▼
Key :

[Update] [Cancel]

Figure 11: Enable Wireless Configuration

- Select your suitable ESSID, Operating Channel, Mode and TX power

Routing

Kernel IP routing table

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface	
192.168.1.0	*	255.255.255.0	U	0	0	0	br-lan	DELETE

☐ **Add Route**
Router Address : [   ]
Gateway : [   ]
Subnet Mask : [   ]

☐ **Edit Default Gateway**
Default Gateway : [   ]

Submit

Figure 12: Routing

- Select your routing.
- (Optional) Use options Add Route & Edit Default Gateway if you require customized routing.

Diagnostic Testing

Status

Network

Wireless

Route

Diagnostics

Commands

System

Change Password

Log Out

Ping an IP Address

IP Address : 192.168.2.2

Ping Count : 4 (1-50)

Ping Packet Size : 48 (4-1472 Bytes)

Ping Timeout : 10 (10-120 Seconds)

Ping   Reset

Display the Routing Table

Display

Reboot the Router

Reboot

Throughput Tester

Server

Client

Figure 13: Diagnostic Testing of the products

- Run tests to find out your ping and bandwidth details

- Display the routing table

- Reboot the device

Router Information

You can run command lines via the web interface.
Fill the text area with your command and click *Submit*.

* Continuous output will not be displayed

Command

[Submit] [Clear]

Status

Network

Wireless

Route

Diagnostics

Commands

System

Change Password

Log Out

Figure 14: Running command lines through the web interface

• Run command Lines on the GUI
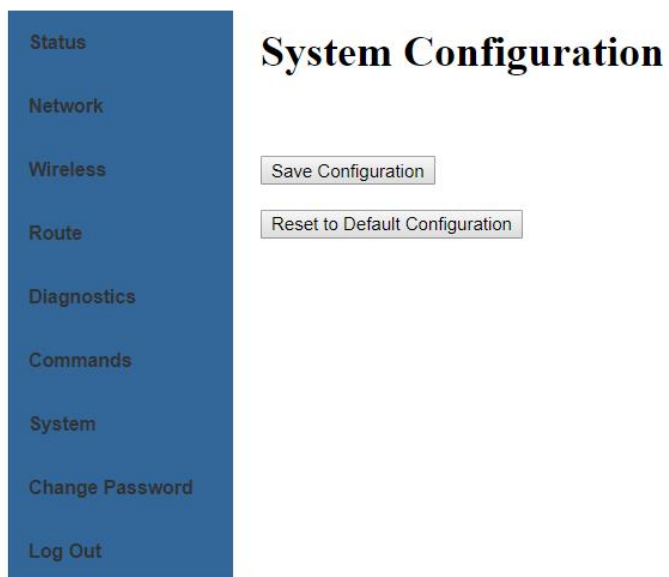
Check with Whizpace for supported command lines

Figure 15: System Configuration

- Save the current configuration

- Reset the WhizMesh device

Status	Old Password : [ ]
Network	New Password : [ ]
Wireless	Confirm New Password : [ ]
Route	Change Password
Diagnostics	
Commands	
System	
Change Password	
Log Out	

Figure 16: Changing password for the GUI

5. Specifications

5.1. WhizMesh Key Features

- No need line-of-sight communication

- Long range communication up to 10 km (line-of-sight)

- Data rates from 1.5 to 16.25Mbps

- Supports point-to-point, point-to-multipoint and mesh topologies

- Supports up to 2,000 connection associations

- Supports various networking protocols such as TCP/IP & UDP

- Supports traffic prioritization queues for video, voice and data applications

- Secured communication with WEP, WPA or WPA2 security

- Built-in antenna

- Supports 24V/48V Power-over-Ethernet for ease of deployment

- Operation in license-exempt TV White Space bands

- P65 ratings for outdoor deployment

5.2. WhizMesh Hardware Specifications

System Specifications	
Product	WMP-ID6-01
Mesh Topology	
Occupied Channel Bandwidth	5MHz
Channel Spacing	6/8MHz (configurable to 5,6 or 7 MHz)
Data Rates (For a Single Channel)	16.25, 13.5, 12, 9, 6, 5.5, 4.5, 3, 2.5, 2.25, 1.5, 1.25, 0.25 Mbps
Step size	1MHz
Modulation	OFDM, QAM, QPSK, BPSK
Range	Up to 5 km
Number of Nodes	Up to 2,000 associations
Transmit Power	Up to +17dBm (Operational) exclude Antenna
Receiver Sensitivity	-96dBm @ 1.5Mbps (Typical)
Maximum System Gain	113dB (Without Antenna)
Back End Interface	IP
Processor	Atheros CPU 533MHz
Flash	8MB Strata Flash
SDRAM	32MB SDRAM
RF Port	N/A
Antenna	Internal 6 dBi 78º Beamwidth
Mechanical Specifications	
Dimension	25x25x18 cm
Weight	
Enclosure	Plastic Casing IP65
Mounting	Pole Mount
Environment Specifications	
Operating Temperature	-30 to +70ºC
Operating Humidity	Up to 95% non-condensing

5.3. Internal Antenna Specifications

Antenna Specifications	
Frequency Range	450 – 750 MHz
Gain	5.0 dBi
F/B Ratio	>=15dB
3-dB Beamwidth	~78° (xz-plane)/~66° (yz-plane)
VSWR	<=1.4
Polarization	Vertical
Maximum Power	10W

Strictly Confidential

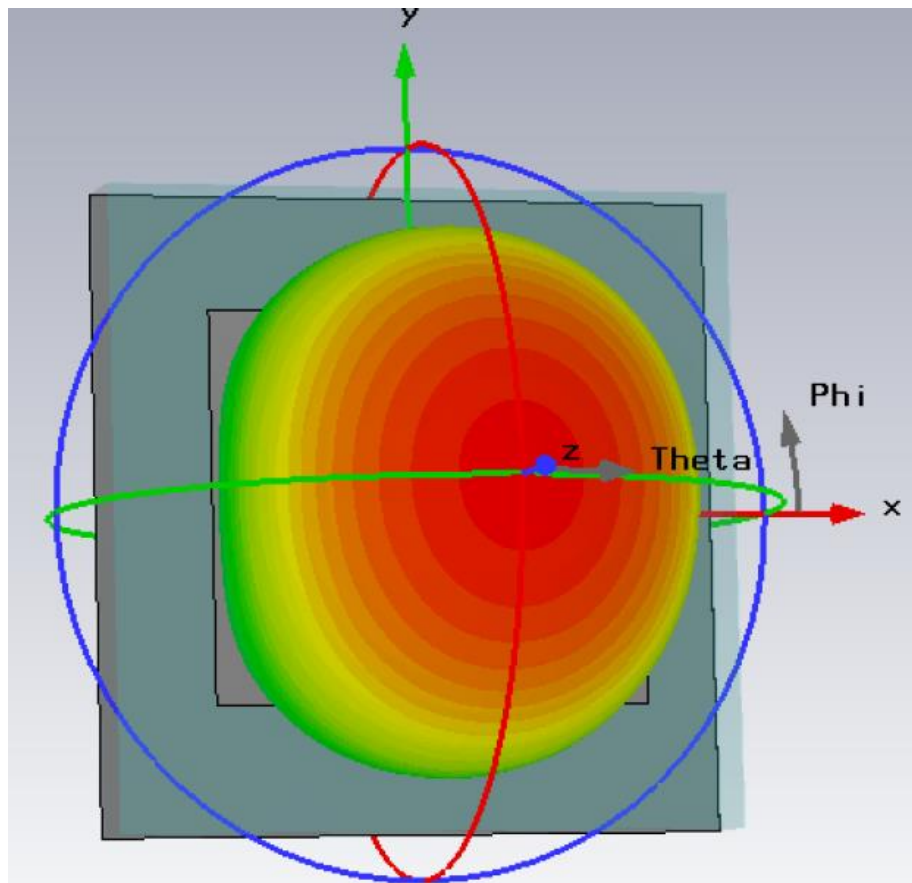| Impedance	50Ω
Connector	MMCX (male)
Mechanical Specifications	
Weight	250 gm
Dimensions	23cm x 15cm x 7cm
Antenna Color	White

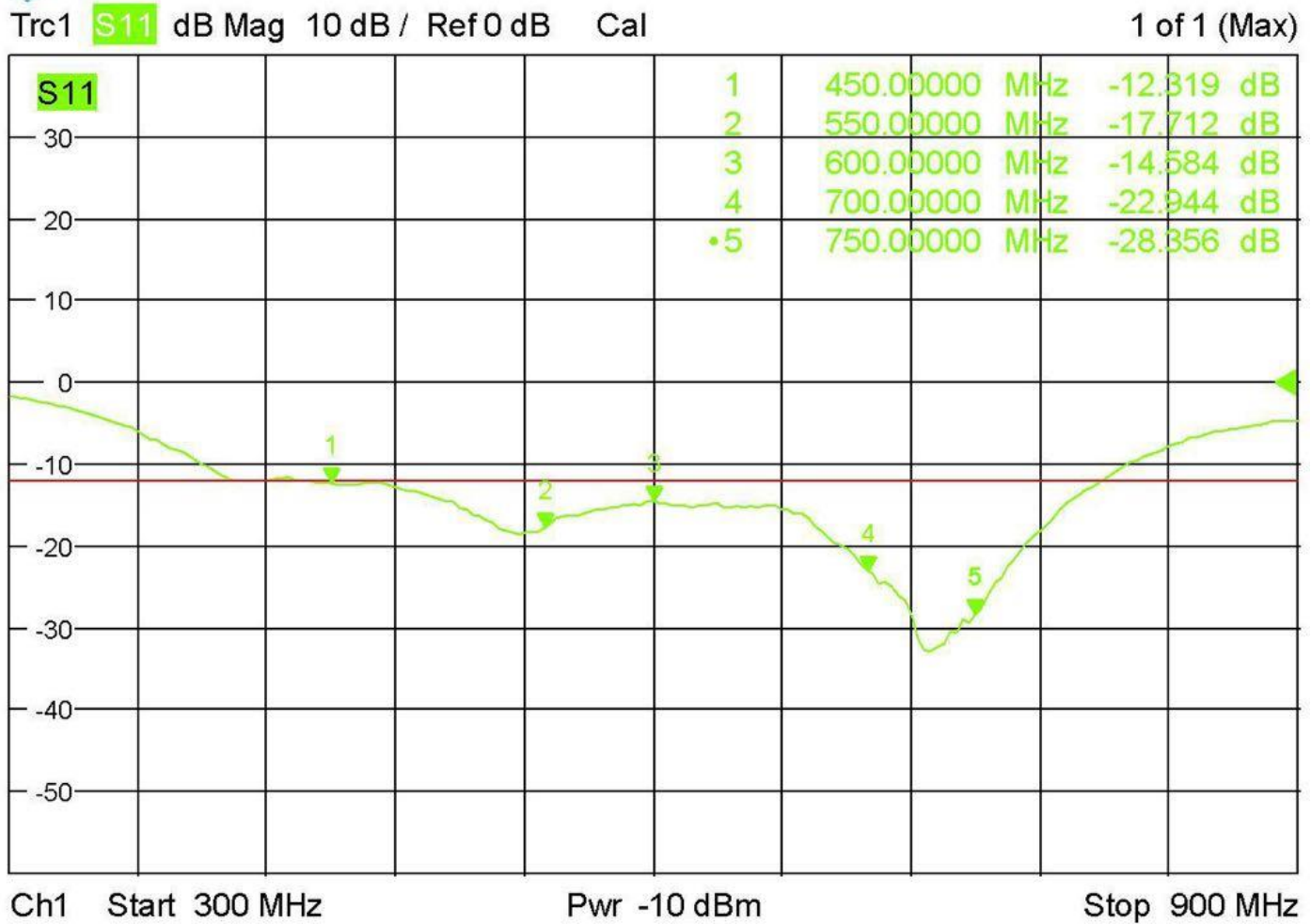

Figure 20: 3-D Simulated radiation patterns
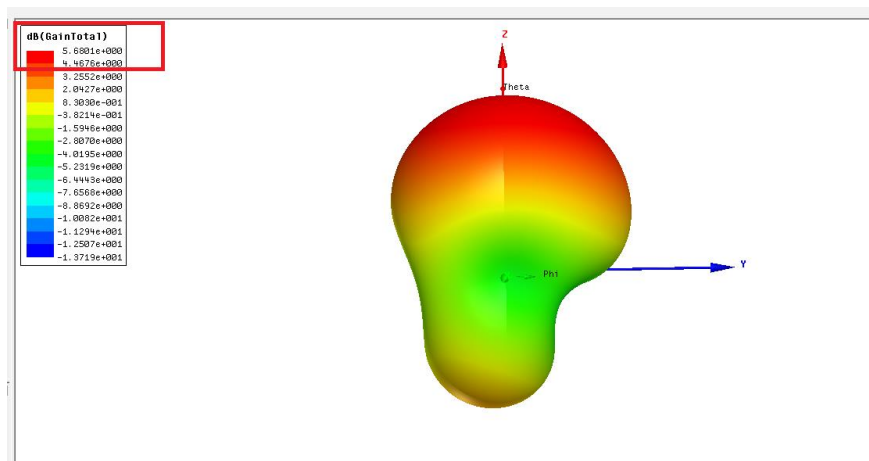
Figure 21: Return Loss with Frequency

Figure 22: 3D Gain with Plot

SI N0.	FREQUENCY (MHz)	GAIN (dBi)
1	400	6.4
2	450	5.4
3	500	4.0
4	550	7.5
5	650	8.2
6	750	6.1

Figure 23: Gain Measurement with frequency

Figure 24: Radiation pattern Horizontal BW

Figure 25: Radiation pattern Vertical BW
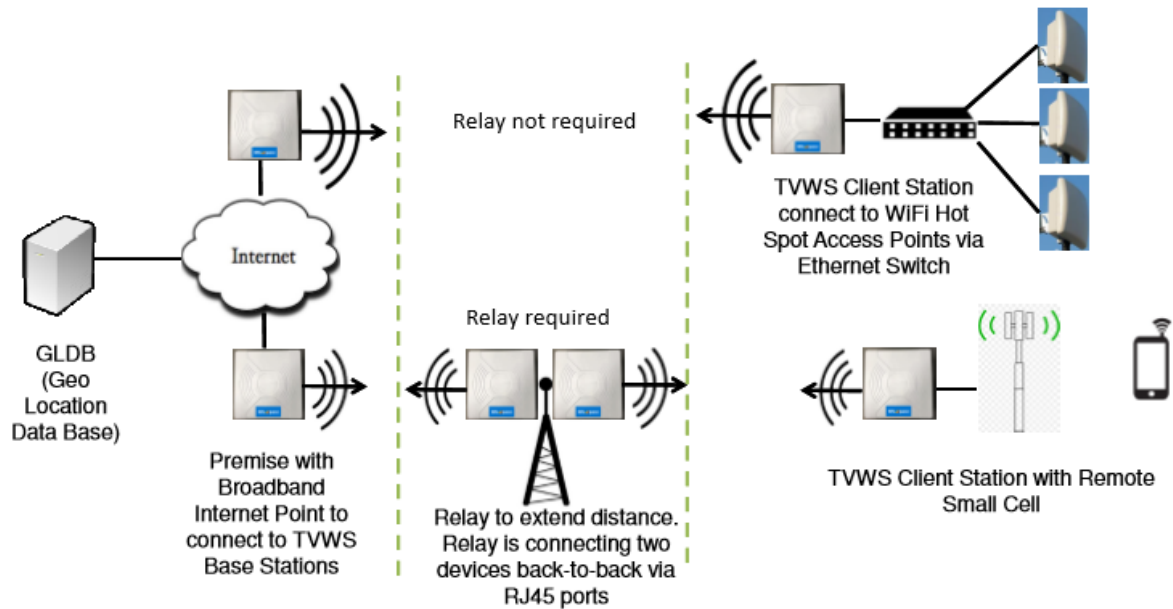
6. Modes of Operation

6.1. Point to point operation

Figure 26: Point-to-point operation
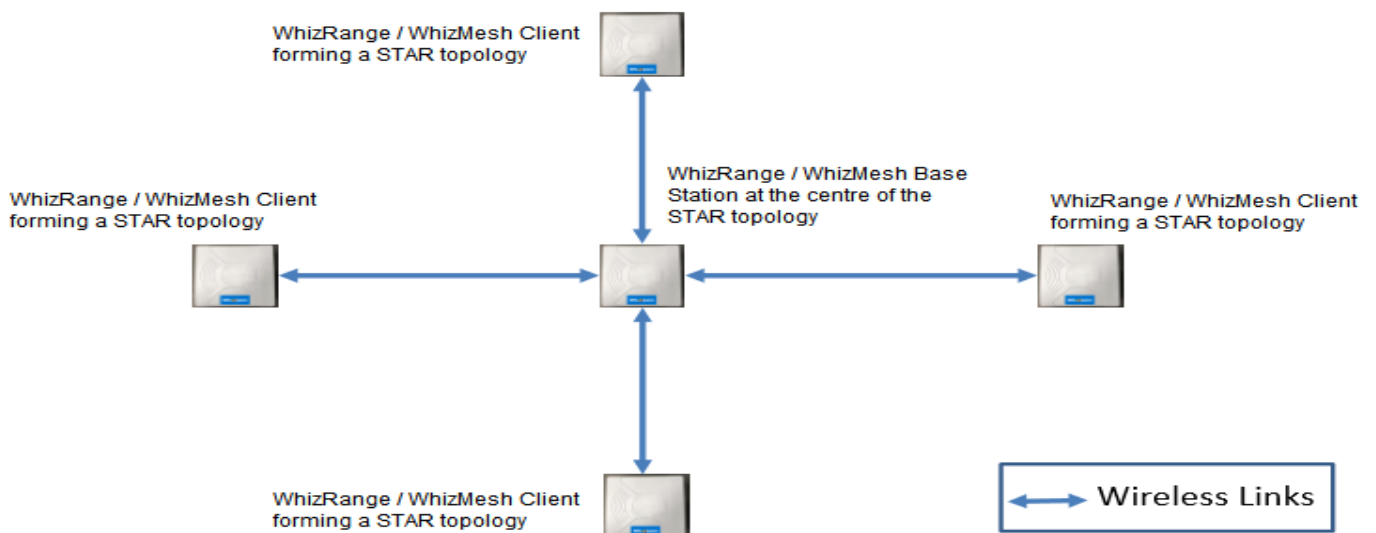
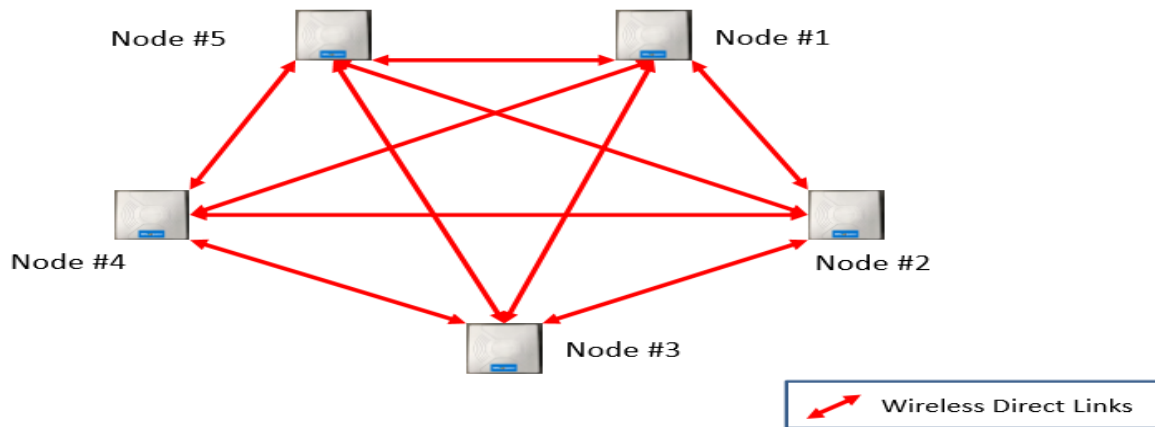## 6.2. Operation in Star Topology

Figure 27: Whizpace product operation in Star Topology

6.3. WhizMesh Nodes forming a MESH topology

WhizMesh Nodes forming a MESH topology.

Figure 28: Whizpace product operation in MESH Topology