

Resource Identifier: 100316

Revision 11.2



Communicate  
Without  
Compromise

# IP Mesh Radio Software Guide

Commercial in Confidence

A decorative graphic consisting of multiple thin, light blue wavy lines that flow from the bottom left towards the right side of the page, creating a sense of motion and depth.

## 0. Preface

### 0.1 About this Document

This document contains relevant information required control the equipment or system.

Since the available functions can be licensed and depend on the specific implementation, not all the functions and or applications contained in this document may be relevant or applicable to the system you will be working with.

The actual presentation may differ from those in this document due to hardware or software changes.

### 0.2 Notice about this Publication

While DTC makes every attempt to maintain the accuracy of the information contained in its product manuals, the information is subject to change without notice.

Performance specifications included in this manual are included for guidance. All particulars are given by DTC in good faith, actual performance may vary.

### 0.3 Copyright

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### 0.4 Document History

This is a controlled document, written and produced by the DTC Technical Publications team.

| Revision | Date       | Summary of Changes                                                                                  |
|----------|------------|-----------------------------------------------------------------------------------------------------|
| 1.0      | 03/08/2016 | Initial release.                                                                                    |
| 2.0      | 14/10/2016 | Added antenna note and Interlink 4G.                                                                |
| 3.0      | 21/02/2017 | SDR MIMO data rates.                                                                                |
| 4.0      | 07/03/2017 | Send/receive data examples.                                                                         |
| 5.0      | 20/06/2017 | Software release updates.                                                                           |
| 5.1      | 03/11/2017 | Added RF Output Port note. PA linearity explanation.                                                |
| 5.2      | 09/02/2018 | Removed RTSP record playback. Improved key fob explanation. Mic on right correction.                |
| 5.3      | 16/03/2018 | Added data multicast and manual multicast. Aux address, Wi-Fi and 4G dongle lists. Trigger example. |
| 5.4      | 20/04/2018 | SOL8SDR Interlink example.                                                                          |

| Revision | Date       | Summary of Changes                                                                                                  |
|----------|------------|---------------------------------------------------------------------------------------------------------------------|
| 5.5      | 16/08/2018 | Added 4G Interlink fall over.                                                                                       |
| 5.6      | 13/09/2018 | Added play recordings syntax.                                                                                       |
| 6.0      | 27/09/2018 | ACRX and IAS.                                                                                                       |
| 6.1      | 18/02/2019 | Audio and USB data. JSON data edit.                                                                                 |
| 7.0      | 12/08/2019 | Additional reference material. RNDIS support. Updates for release v4.4.3.                                           |
| 7.1      | 06/09/2019 | Additional IAS setup details.                                                                                       |
| 8.0      | 13/12/2019 | 64QAM FEC rate/tunnelling to Interlink. Updates for software release 5.0.0.                                         |
| 8.1      | 16/12/2019 | SDI 1 (powered) input caution.                                                                                      |
| 8.2      | 17/02/2020 | dBm to watt conversion. FIPS140-2 accreditation. Mesh 5.1.0 updates.                                                |
| 8.3      | 15/04/2020 | Added 5W variant. 5.3.0 updates.                                                                                    |
| 9.0      | 09/07/2020 | Updates for s/w v6.0.0.                                                                                             |
| 9.1      | 09/09/2020 | Improved IAS switch threshold explanation. Updates for s/w v6.1.1.                                                  |
| 9.2      | 13/04/2021 | Updated data rates. Removed split mode. Added DVDT basic setup. Operating mode capabilities table. Software v6.4.0. |
| 9.3      | 07/06/2021 | Updates for sw v7.0.4. Added PD status.                                                                             |
| 10.0     | 14/12/2021 | New web user interface. Updates for software v7.1.0.                                                                |
| 10.1     | 07/06/2022 | Updates for s/w v7.1.3 and v7.1.4.                                                                                  |
| 10.2     | 28/10/2022 | Updates for v7.2.1 including JPEG capture. ATAK integration and plugin. Serial port switching.                      |
| 10.3     | 19/01/2023 | Low bitrate efncoding. GPIO data.                                                                                   |
| 11.0     | 05/12/2023 | Updates for s/w release v8.1.0.                                                                                     |
| 11.1     | 15/03/2024 | Updates for s/w 8.2.0. Added IAS scenarios. Corrected temperature colour thresholds.                                |
| 11.2     | 03/09/2024 | Added MTU in IP settings. SD card recordings overwrite. RF gain setting. Updates for s/w 8.3.0.                     |

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# 1. IP Mesh Radio Fundamentals

## 1.1 IP Mesh Radio Capability

Data can be exchanged between nodes which can be moving in a point to point or point to multipoint network. Up to eighty IP Mesh radios can be combined to make a fluid, self-forming, self-healing wireless mesh network.

Offering non-line-of-sight coverage using COFDM, the system is fully mobile and thus supplies a network with extended range in environments usually considered too tough for other radio solutions to cope with.

IP Mesh networks constantly readjust as nodes move, working out which are in range and working out the best path to send data between them. When one node can no longer operate, the other nodes can continue to communicate with each other, directly or through one or more connected nodes.

The very flexible Mesh topology means that data can be exchanged between nodes in a point-to-point or point-to-multipoint system. Range can be extended by using nodes as repeaters. With an IP Mesh radio system many types of Mesh network can be built.

Each node behaves as a switched hub giving two physical Ethernet ports and a wireless connection to the Mesh radio link.

All nodes are connected to each other as a wireless IP network. The Mesh system arbitrates which node transmits at a given time avoiding conflict.

The nodes can seamlessly connect into the network without user intervention. The only key parameters that it is necessary to pre-load into the units are the encryption keys, frequency and Mesh ID.

Some nodes can be configured without sources and are simply used as relays to extend range. Nodes can be mounted in aircraft, ships, or ground-based vehicles.

In Mesh Ultra mode, the entire bandwidth is dedicated to the Mesh network and will not encode video. Bandwidths up to 20MHz are possible. Video encoding can be provided by attached IP cameras.

## 1.2 IP Interface

An IP Mesh radio node can be considered a multi-port switched hub with the physical Ethernet ports supporting up to 1000Base-T. IP traffic is carried over the radio link effectively acting as another Ethernet port. The IP stack is implemented using lwIP (lightweight IP).

The node implements some functions at the IP level that will enhance security of nodes deployed in the field. The implementation of VLAN is critical to sub segmenting the network and delineating the control of the radio network so that the exposed IP ports in the field do not allow an attacker to gain access to control of radio network.

## 1.3 Mesh Networking

In Mesh networking, each node may act as an independent router, regardless of whether it is connected to another network or not. It allows for continuous connections and reconfiguration around broken or blocked paths by hopping from node to node until the destination is reached. A Mesh network whose nodes are all connected to each other is referred to as a fully connected network.

Mesh networks are self-healing which means that the network can still operate when a node or connection fails. As a result, the network may typically be very reliable as there is often more than one path between a source and a destination in the network. Although mostly used in wireless scenarios, this concept is also applicable to wired networks and software interaction.

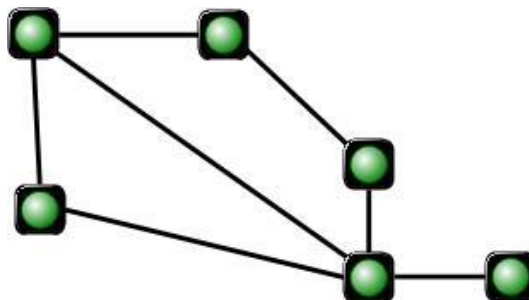
IP Mesh is a fluid, self-forming, self-healing, Mesh COFDM radio network.

The system can consist of up to eighty nodes depending on the selected mode of operation. The IP Mesh network constantly assesses which nodes are in range and the best route to send data between them.

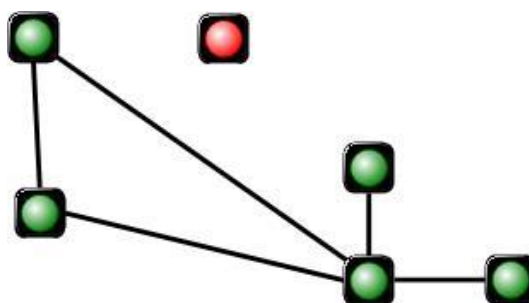
A group of nodes automatically form a network the moment you apply power. The nodes detect each other's broadcast and a network is formed. If a node fails or is out of range the network will find an alternative routing path. Connectivity is thus preserved automatically.

Only one frequency is used for the IP Mesh radio network. Each node has up to four antennas which provide receive diversity. Nodes transmit in short bursts when there is data to move, MIMO Mesh offers two transmit antennas with four-way receive diversity. Transmission is arbitrated by passing a token between nodes.

Each node can have IP devices attached to it and can also support two HD camera inputs. Some node variants have built-in GPS receivers, or you can connect a GPS receiver to the data port, which can return data used to find the unit on a map, useful for mobile nodes.



**Figure 1-1: Partially Connected Mesh Network**



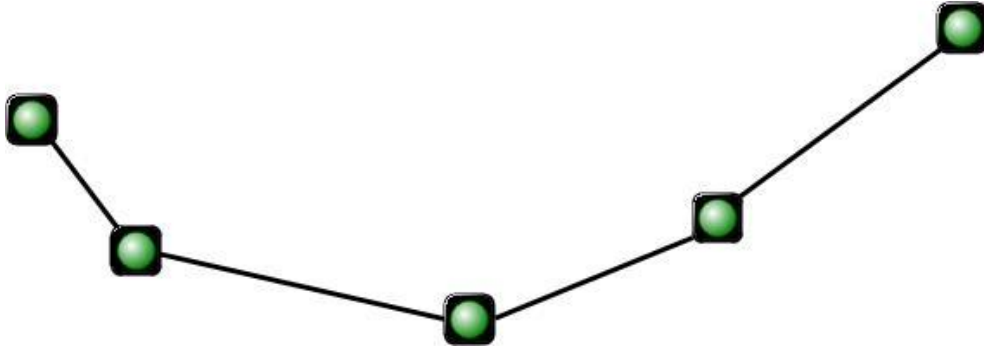
**Figure 1-2: Node moves out of range but the network stays up**

## 1.4 Mesh Topologies

### 1.4.1 Chain Network

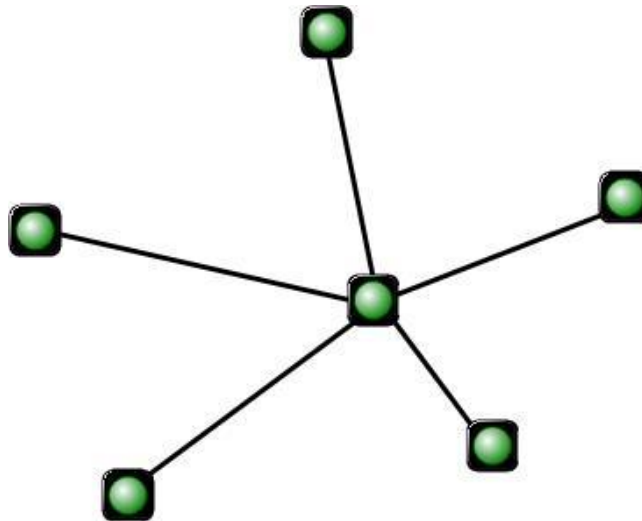
These nodes simply chain together to pass the information back to the observation point. This network can be maintained when mobile, with a linear chain of vehicles each acting as a node and the middle vehicles acting as a bidirectional relay point for example.

Ideal for range extension when each node is placed at the outer range limit of the node before.



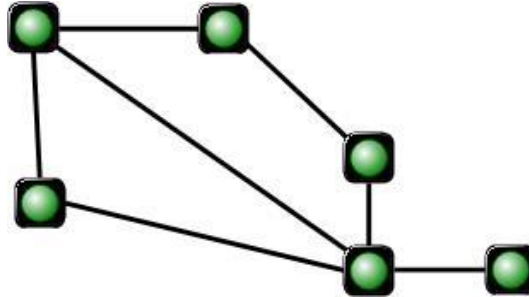
### 1.4.2 Star Network

The star network is excellent for urban coverage in P2MP (point-to-multipoint) mode. A central node is put at a high point to be a relay and all other nodes pass information back through the central unit letting you have bidirectional communications to all locations.



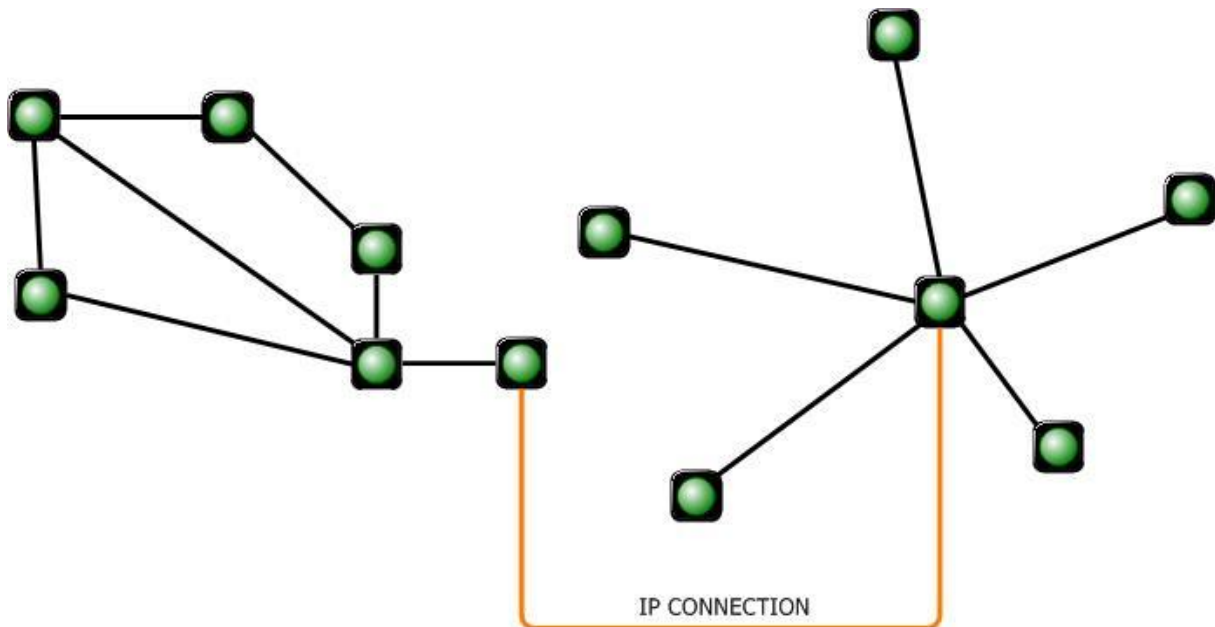
### 1.4.3 Random Network

This evolves organically to many configurations perhaps with some nodes in moving vehicles like cars or aircraft.



### 1.4.4 Combined Network (Interlink)

Many of the above topologies can be hard wire linked. If they are operating at different frequencies, they can be combined at the IP layer as long as they belong to the same Mesh ID.

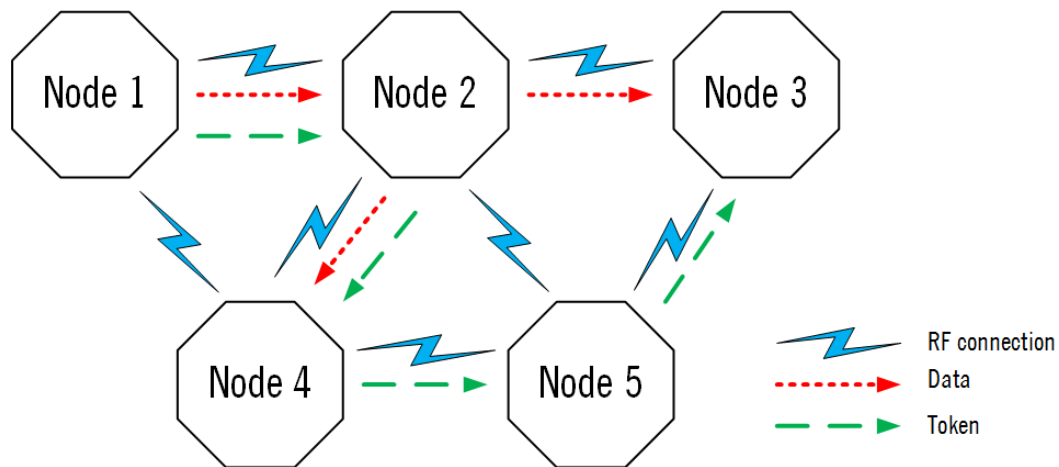


## 1.5 Token Passing and Network Management

IP Mesh radios use TCP/IP protocol to provide end-to-end data communication, specifying how data should be packetized, addressed, transmitted, routed and received.

The system operates a TDMA token passing algorithm, where the token is passing round all nodes multiple times per second (up to 300/s). Routing of data is done via a Dijkstra cost table. Colour-coded routes in the web browser status pages are denoted by the SNR of the link status not QoS.

Alongside this, a higher-level radio routing protocol determines whether information needs to be transmitted or not, depending on the routes available in the radio network. This data forwarding protocol attempts to minimise any unnecessary duplication of data transmission while ensuring data successfully makes the journey through the radio network.



**Figure 1-3: An example of data transmission including a hop**

In the example system in *Figure 1-3*, Node 1 needs to transmit data to Node 3. However, Node 1 can only make RF connections to Nodes 2 and 4. Node 3 is unreachable directly from Node 1. Node 2 can reach all Nodes in the Network.

Node 1 sends token and data to Node 2. Node 2 sends the token and data onwards to Node 4. This data can also be received by Node 3 via Node 2, even though the token is not being passed directly and so it receives the data destined for it. Node 4 then sends the token on to Node 5 but the data doesn't need to be transmitted as Node 4 can determine from network information contained within the token that Node 3 has already received the data.

## 2. Introduction

### 2.1 Product Family

The Mesh software platform can be run on the products and OEM modules in the following table.

Not all features explained in this document will apply for all products or modes. This will be noted when applicable.

| Part Number                        | Equipment Title                                                                                            |
|------------------------------------|------------------------------------------------------------------------------------------------------------|
| BluSDR-6                           | BluSDR™ Module                                                                                             |
| BluSDR-30                          | BluSDR™ 2x1W Module                                                                                        |
| BluSDR-90                          | BluSDR™ 2x5W Module                                                                                        |
| BluSDR-200                         | BluSDR™ 2x15W Module                                                                                       |
| NETNode2x2W-5PT                    | NETNode IP Mesh Radio Phase 5, Plain Tri-Band (2x2W)                                                       |
| NETNode2x2W-5RMT                   | NETNode IP Mesh Radio Phase 5, Robust Mobile Tri-Band (2x2W)                                               |
| NETNode2x2W-5RM<br>NETNode2x5W-5RM | NETNode IP Mesh Radio Phase 5, Robust Mobile (2x2W)<br>NETNode IP Mesh Radio Phase 5, Robust Mobile (2x5W) |
| NETNode2x15W-5RH                   | NETNode IP Mesh Radio Phase 5, Robust High Power (2x15W)                                                   |
| NETNode2x2W-5R                     | NETNode IP Mesh Radio Phase 5, Robust (2x2W)                                                               |
| NETNode2x2W-5P                     | NETNode IP Mesh Radio Phase 5, Plain (2x2W)                                                                |
| SOL8SDR-C                          | SOLO8 SDR, Concealment                                                                                     |
| SOL8SDR-R                          | SOLO8 SDR, Robust                                                                                          |
| SOL8SDR2X1W-P                      | SOLO8 SDR, Plain (2x1W)                                                                                    |
| SOL8SDR2X2W-P                      | SOLO8 SDR, Plain (2x2W)                                                                                    |
| SOL8SDR-H2                         | SOLO8 SDR, Handheld                                                                                        |
| SOL8SDR2x1W-UC                     | SOLO8 SDR 2x1W for UxV OEM PCB                                                                             |
| SOL8SDR-M                          | SOLO8 SDR OEM Module                                                                                       |
| D196x-OEM                          | SOLO8 SDR OEM PCB (x denotes PCB number for frequency variant)                                             |

### 2.2 Prerequisites

It is assumed that the product has been setup in accordance with the *Hardware Guide* or *OEM Integration Document* associated with it. The unit must be powered, and IP communications established via a web browser.

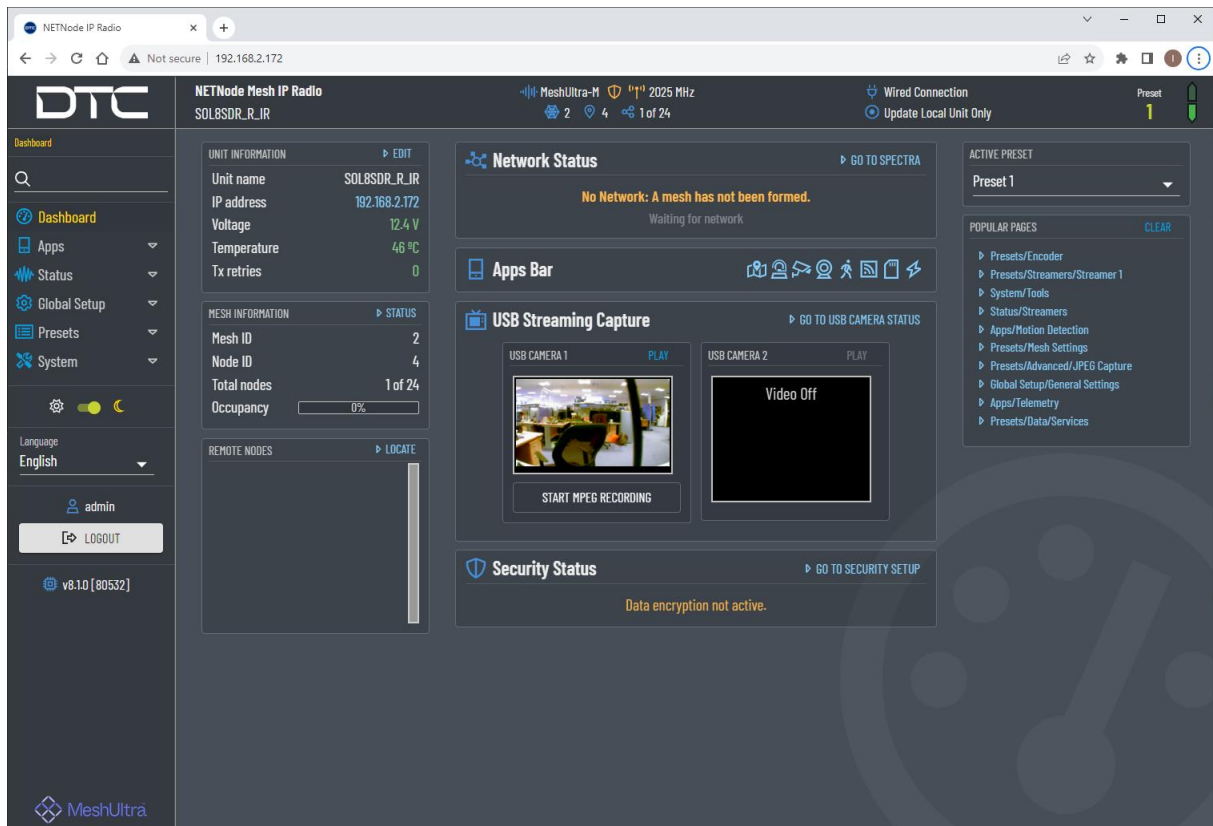
SDR products must have the **SDRAPP-MESH** license applied and the application type set to **MESH**, see *Section 9.4.2*. SDR devices that require video encoding will also need the **SDRAPP-ENC** license.

## 3. Web User Interface Overview

### 3.1 Introduction

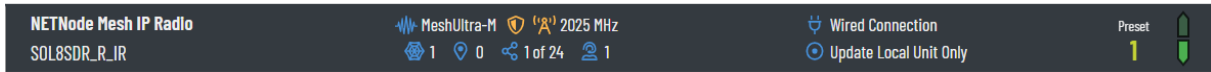
This chapter will provide a brief explanation of the structure of the web user interface (WUI) for new users.

The web user interface (WUI) is an application for effective operation and monitoring of DTC Mesh nodes and networks. The WUI can be accessed by any web browser application. Instructions for initial communications are provided in the *Hardware Guide* for your device.

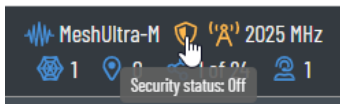


## 3.2 Information Panel

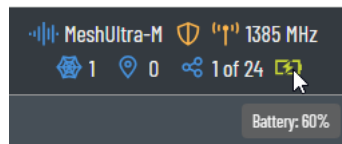
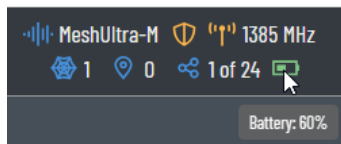
The information panel is at the top of the page and shows parameters of interest. The level of information and presentation will vary depending on the variant and the setup.



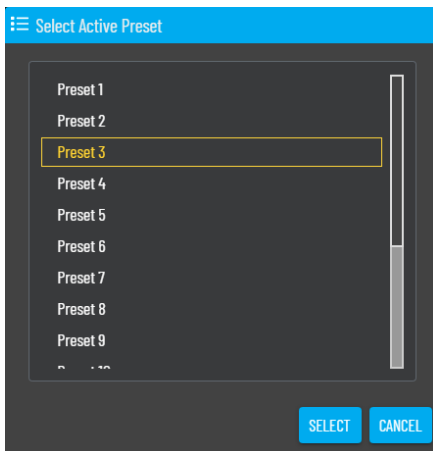
If you hover the mouse over the icons, tool tips will describe the parameter. The icons will hyperlink to the page where the parameter can be viewed and edited.



The SDR-H2 product has a battery charge level indicator which should be monitored by hovering the cursor over the icon. The icon will appear slightly different when charging.



When you click the **Preset** in the top-right corner, a dialogue box will open to allow you to change the active preset. Preset settings are detailed in *Chapter 8*.



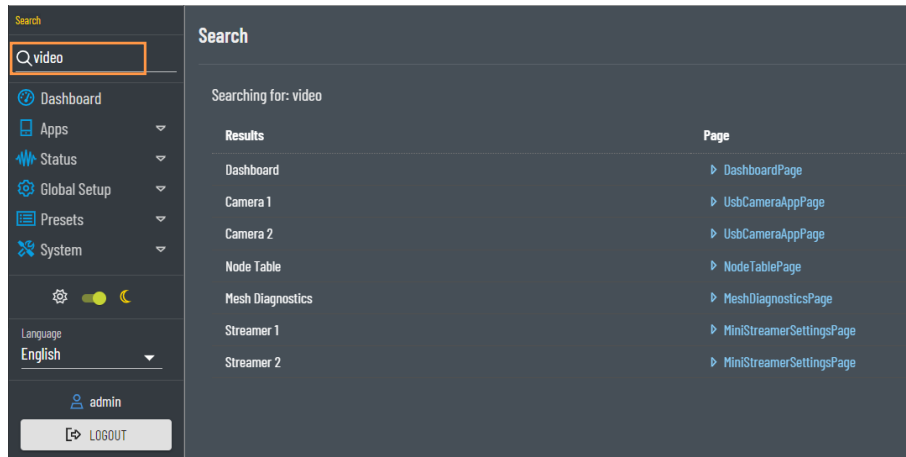
If the communication arrows at the right of the panel turn red, this means that IP communications to the device has failed.



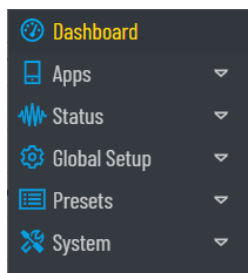
### 3.3 Interface Menu

The interface menu allows you to navigate settings and monitor the status of the network. The parameters are discussed in detail in the subsequent chapters.

The search feature requires a minimum of three characters to look through all pages for the parameter of interest.



When a page or sub-page is selected from the top-level menu, the display will change according to the selection.

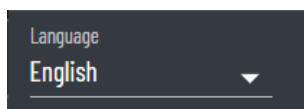


- Dashboard: *Chapter 4*
- Apps: *Chapter 5*
- Status: *Chapter 6*
- Global Setup: *Chapter 7*
- Presets: *Chapter 8*
- System: *Chapter 9*

The display appearance can be changed to suit the user's preference or need.

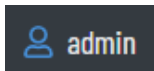


The WUI language can be selected from a drop down menu. Languages can be enabled by licensing; if you have specific language requirement, please contact DTC.



**Note:** Some languages are applied by a license and may be exclusive. If it is required to return the WUI to English, press Ctrl+[user icon]; to return to the licensed language a logout/login is required.

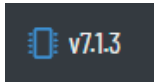
Users can have managed permissions, see *Section 9.5*. The User Name is displayed.



The logout button will end the WUI session and return to the login page.



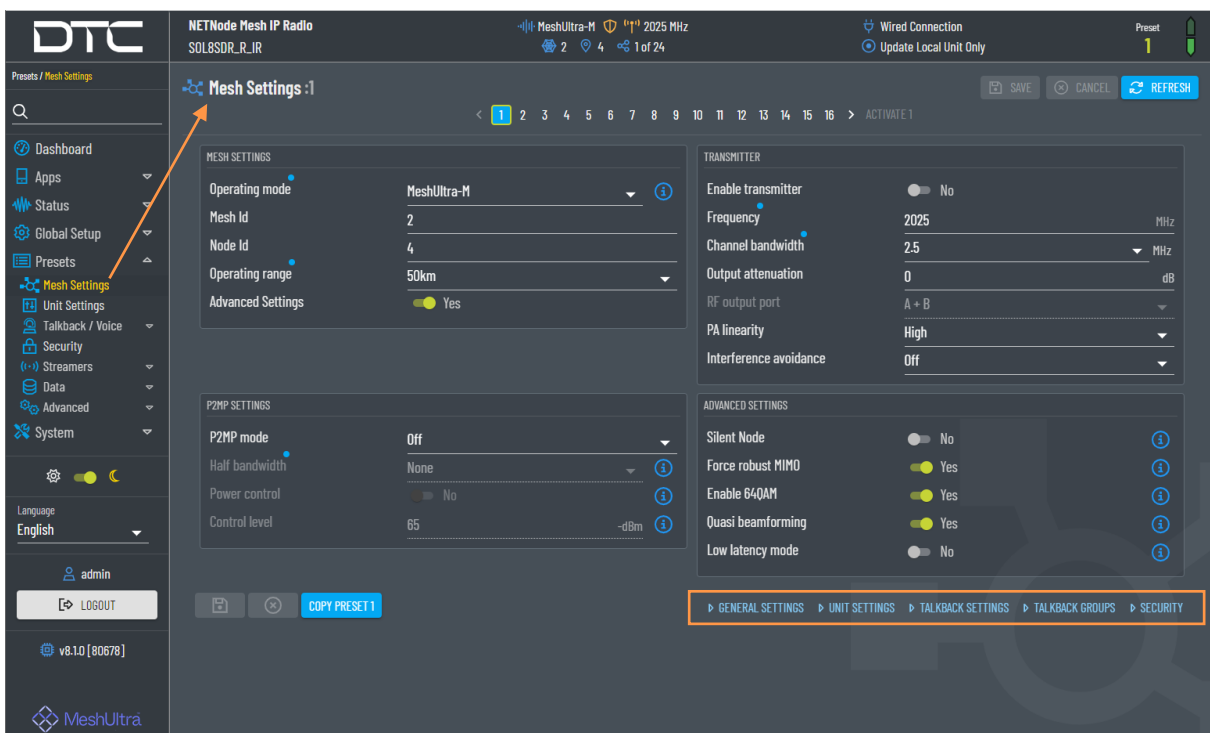
The software version is displayed with a shortcut to the Information page.



### 3.4 Display View

The display will change depending on the selection from the interface menu. The example below is of the **Presets>Mesh Settings** page.

Hyperlinks can be found on each page and are a useful way to navigate to related pages.



## 4. Dashboard Page

The Dashboard is a summary page which can be referred to during operation.

The blue text or icons are hyperlinks that will take you to the page where parameters can be viewed in closer detail or edited.

**Note:** Unit names on the Dashboard are limited to 12 characters. Therefore, if they exceed this in the **Global Setup>General Settings** page, they may be truncated.

The Dashboard contents will change depending on the waveform mode selected, the example below is for **MeshUltra-M** mode.



Colour-coded FPGA temperature measurements can be monitored. This can also be seen in the **System>Information** page, see *Section 9.1*.

**Note:** Temperature warning indicators will pop up in the information bar for orange and red temperature events, shown in table.

| Colour                                                                                        | Temperature                          | Notes                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Green                                                                                         | Less than 80°C                       | Operating temperature is satisfactory.                                                                                                                                          |
| Orange<br> | Greater than 80°C but less than 95°C | Video encoding may be disabled.<br><b>CAUTION:</b> Take immediate action to reduce the operating temperature.                                                                   |
| Red<br>    | Greater than 95°C                    | RF power may be disabled.<br><b>WARNING:</b> Damage to internal components may occur. Switch off the device, allow to cool and take action to reduce the operating temperature. |

## 5. Apps Pages

### 5.1 Introduction

Apps are features which can be viewed or edited as live applications. This means that parameters and views will change dynamically without the need to save settings.

The available Apps will change depending on the Mesh mode:

Single Mesh; MIMO Mesh; MeshUltra-M; MeshUltra-80; MeshUltra-X.

### 5.2 Tactical Display

#### 5.2.1 Overview



The Tactical Display application shows current positional and IP data for a selected node.

**Note:** The unit names are limited to a character length of 12. Therefore, if the **Unit name** in the **Global Setup>General Settings** page exceeds this, they may be truncated.

### 5.2.2 Node Icon Status

Nodes in the map will appear with a yellow background glow when **selected**, and the node's status will be displayed in the Node View to the right of the Map Display, see *Section 5.2.4*.



**Unselected** nodes may appear with a green or clear background depending on whether the map Move selection is set to Nodes or Map.

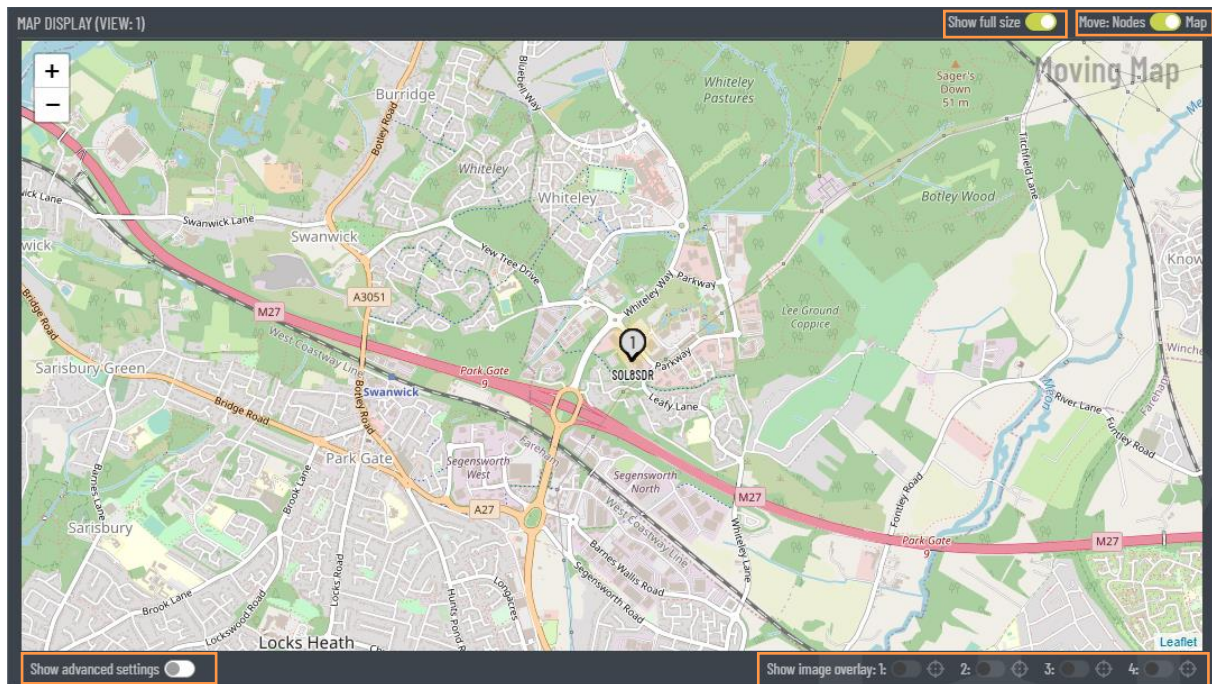
The node icon will go into an alarm status when **Tx errors** are exceeded. Yellow is severe and Orange critical.



Nodes with a **GPS** module will be shown with a dot over the icon in the map display, see *Section 5.2.4* for GPS settings.

| GPS Node Icon                                                                       | Description                                                                          |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|    | Grey dot: GPS is fitted but <b>Use GPS</b> is set to <b>No</b> .                     |
|  | Orange dot: GPS is fitted, <b>Use GPS</b> is set to <b>Yes</b> and GPS is not fixed. |
|  | Green dot: GPS is fitted, <b>Use GPS</b> is set to <b>Yes</b> and GPS is fixed.      |

### 5.2.3 Map Display



| Item                   | Description                                                                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show full size         | When the switch is green, the display will resize and the information section to the right will be removed.                                                                                                                                                                                                                                |
| Move: Nodes/Map        | <p>When the switch is green, the map view can be manoeuvred but the nodes will be fixed in position. Zoom in or out of the map view by clicking the <b>+/-</b> icons in the top-left corner of the screen, or use the mouse wheel, if possible.</p> <p>When the switch is grey, the nodes can be moved but the map view will be fixed.</p> |
| Show advanced settings | <p>When the switch is green, the <b>Map Settings</b>, <b>View Settings</b> and <b>Image Overlay</b> parameters will open.</p> <p>See <a href="#">Section 5.2.6</a>, <a href="#">Section 5.2.7</a> and <a href="#">Section 5.2.8</a>.</p>                                                                                                   |
| Show image overlay     | <p>Show image overlay will allow up to four uploaded maps or images to be used in the map display, see <a href="#">Section 5.2.8</a>.</p> <p>The locator icon  will centre the map on the display.</p>                                                  |

### 5.2.4 Node View: GPS Info/TX Info

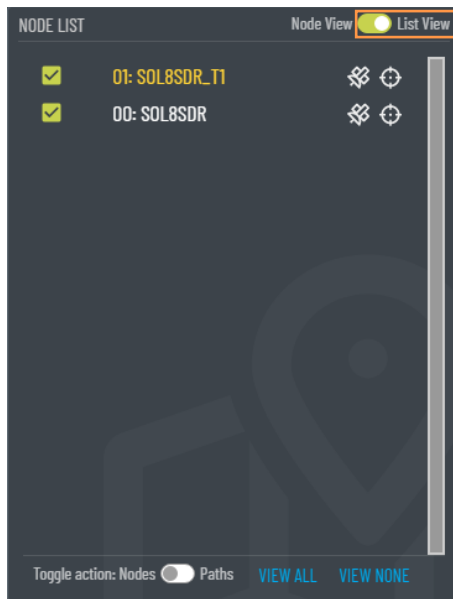


When **Node View** is selected, the switch is grey and node information is displayed.

When **TX Info** is selected, the switch is green and IP traffic data is displayed.

When **GPS Info** is selected, the switch is grey and geolocation data is displayed if a GPS fix has been achieved. **Use GPS** will locate the node position on the map, if fixed. **Update All Nodes** will transfer the **Use GPS** setting to all nodes in the network. See Section 5.2.2 to see how the node icon status changes.

### 5.2.5 List View



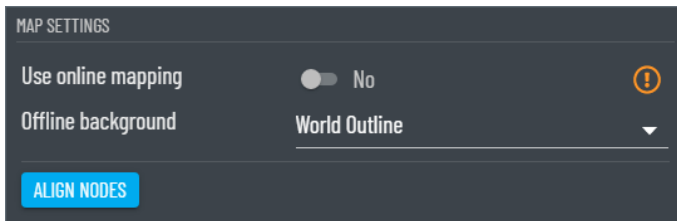
When the **List View** is selected, the switch is green and a list of all nodes in the Mesh network is displayed.

The map display can be simplified by selecting specific nodes in the list using the checkbox adjacent to the node identifier.

| Item                                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GPS disabled  | Click the GPS icon to use GPS geolocation without needing to switch to the node view.                                                                                                                                                                                                                                                                                                              |
| GPS enabled   |                                                                                                                                                                                                                                                                                                                                                                                                    |
|               | Click the locator icon to centre the map view on the selected node.                                                                                                                                                                                                                                                                                                                                |
| Toggle action:<br>Nodes/Paths                                                                    | When <b>Nodes</b> is selected the switch is grey. The paths will be removed from the map display.<br><br>When the <b>Paths</b> is selected, the switch is green. This will show the RF paths between the nodes in the map display. The links will change status as the RF environment changes or nodes move about. The colour codes illustrated in <i>Section 6.3</i> also apply for this display. |
| View All<br>View None                                                                            | The <b>View All</b> or <b>View None</b> options will quickly select or deselect all nodes in the list.                                                                                                                                                                                                                                                                                             |

### 5.2.6 Map Settings

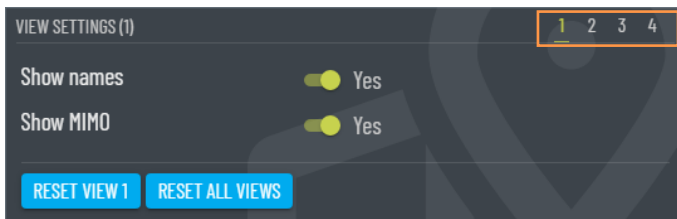
Map Settings can be changed when **Show advanced settings** is selected.



| Item               | Description                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use online mapping | Set <b>Use online mapping</b> to <b>Yes</b> , to use online mapping data when an internet connection is available.<br><br><b>CAUTION:</b> Mapping data is supplied by the <a href="https://www.openstreetmap.org/">https://www.openstreetmap.org/</a> server and by using it will reveal your connection data such as IP address. |
| Offline background | When there is no internet connection or online mapping is set to No, the background can be changed to a low-resolution <b>World Outline</b> or <b>Grid</b> .                                                                                                                                                                      |
| Align Nodes        | Align Nodes will move the nodes to the current map display.                                                                                                                                                                                                                                                                       |

### 5.2.7 View Settings

Map View Settings can be changed when **Show advanced settings** is selected.



Up to four map views can be selected.

| Item                          | Description                                                                                                                                                                                      |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show names                    | When set to <b>Yes</b> , the unit names for the nodes are shown on the map display.                                                                                                              |
| Show MIMO                     | When set to <b>Yes</b> , the colours from the full MIMO signal quality table (Section 6.3) are added to the node paths.                                                                          |
| Reset View<br>Reset All Views | Reset view places every node in the current view to the default 0:0 latitude and longitude. If more than one node is reset, they will be overlayed.<br><br>Reset the selected view or all views. |

## 5.2.8 Image Overlay

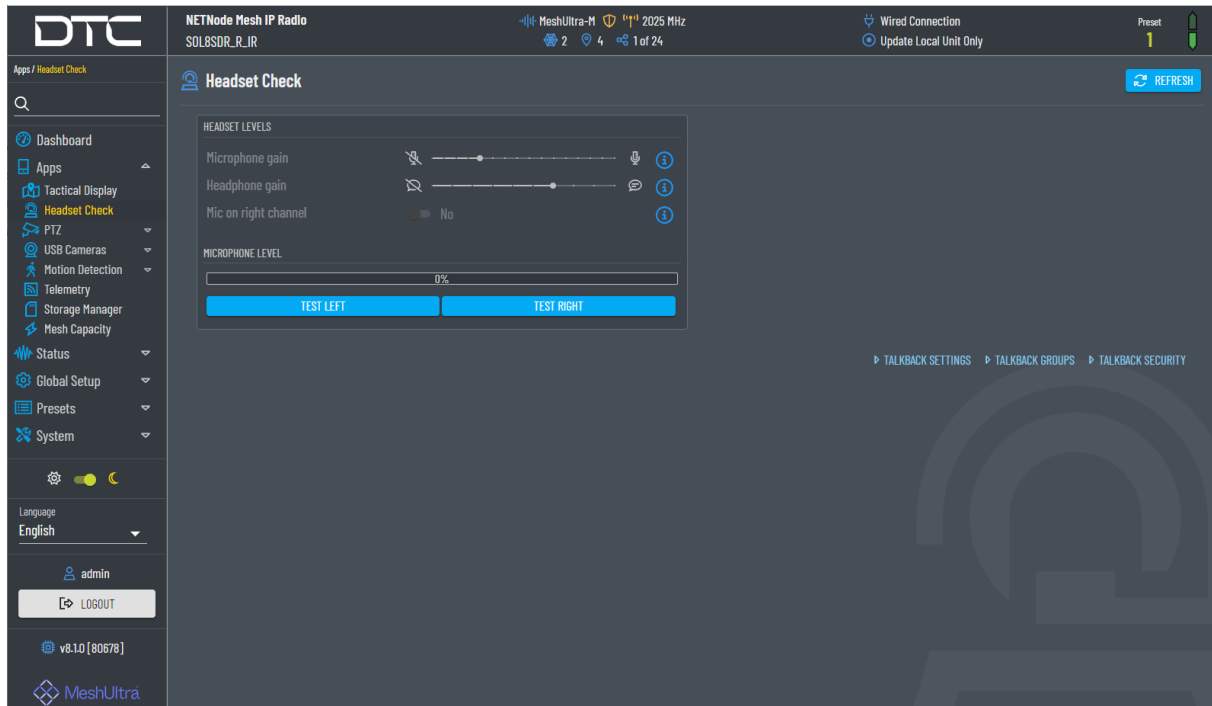
Image Overlay settings can be changed when **Show advanced settings** is selected.

Up to four map images and geo location files can be loaded into the node to allow mapping when not connected to a network.

| Item                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show image           | When set to <b>Yes</b> , the loaded image will be added to the map display.                                                                                                                                                                                                                                                                                                                                                          |
| Show geo-referencing | When set to <b>Yes</b> , the map coordinates will open and can be entered manually, if required.                                                                                                                                                                                                                                                                                                                                     |
| Load Image           | <p><b>Load Image</b> enables the upload of map images to the node. Up to four images can be loaded by first selecting one of the map overlays.</p> <p>Images must be in one of the following file types:</p> <ul style="list-style-type: none"> <li>• .jpg</li> <li>• .png</li> <li>• .gif</li> <li>• .bmp</li> </ul> <p>JPEGs are good quality but small files. Bitmaps on the other hand are excellent quality but very large.</p> |
| Load Geo Data        | <p>Enables the upload of geolocation information relative to the map coordinates.</p> <p>The data must be loaded as an INI file with coordinates in the format:</p> <pre>[Coordinates] TopLeft=50.887074000,-1.262457500 TopRight=50.886664400,-1.236370000 BottomLeft=50.875292300,-1.261705000</pre>                                                                                                                               |
| Locate Image         | Centres the image on the selected map display.                                                                                                                                                                                                                                                                                                                                                                                       |
| Align Image          | Rescales and moves the image to the selected map display.                                                                                                                                                                                                                                                                                                                                                                            |
|                      | <b>Note:</b> This will overwrite the current geo-referencing                                                                                                                                                                                                                                                                                                                                                                         |

## 5.3 Headset Check

The headset check page can be used to verify the function of the headset microphone and headphone audio.



When the microphone receives an audio input, a horizontal bar will indicate the microphone level. Microphone gain can be adjusted actively using the slide tool.

Use the **Test Left** and **Test Right** buttons to transmit an audio tone to the headphones. Headphone gain can be adjusted actively using the slide tool.

**Note:** It may be necessary to refresh the browser to see an indication of microphone level.

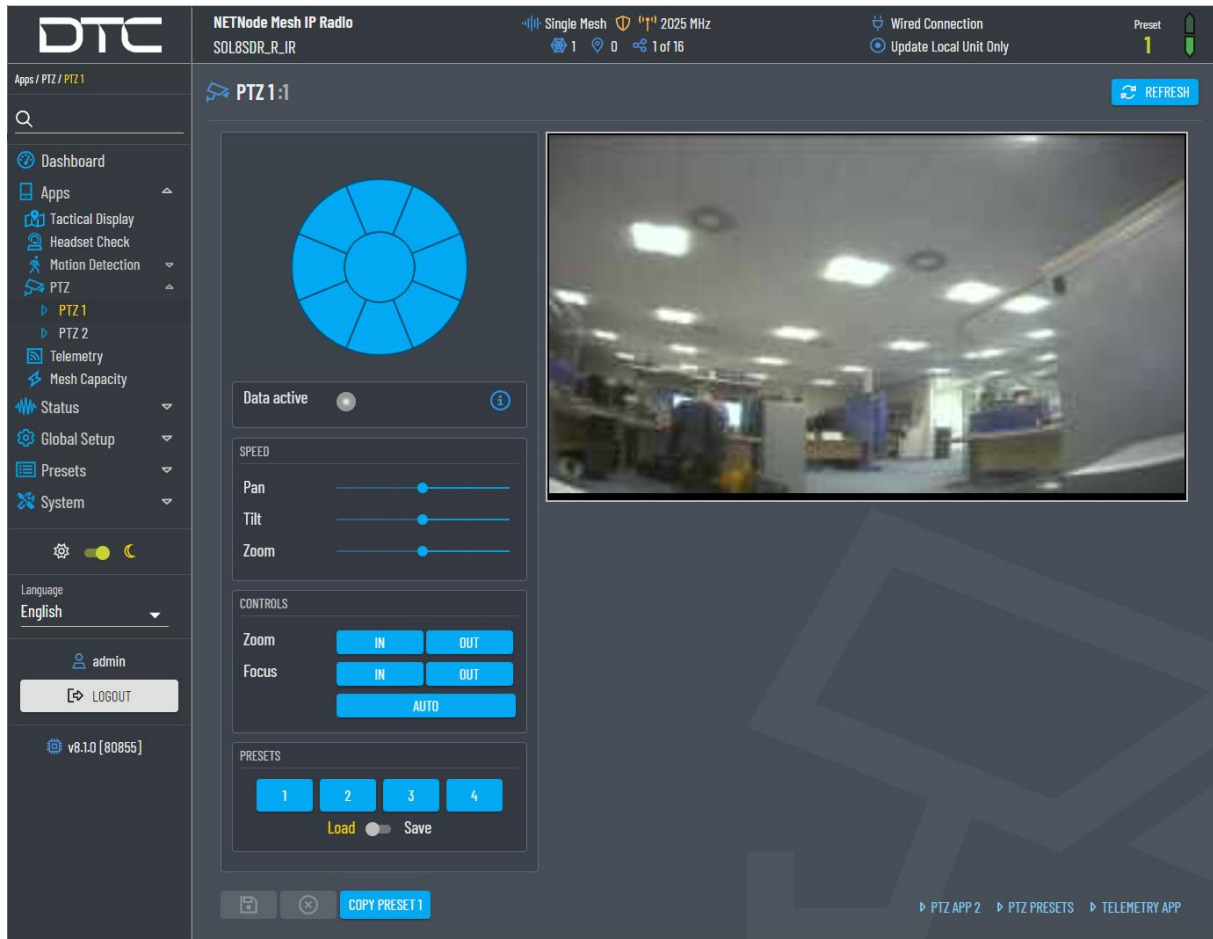
## 5.4 PTZ

### 5.4.1 Introduction

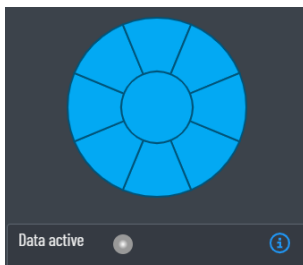
The PTZ page, allows you to control the pan-tilt-zoom and focus functions of an attached camera. An MJPEG video display is provided for feedback.

**Note:** Not all cameras will support all PTZ functions.

PTZ data settings will need to be configured, see *Section 8.15*.



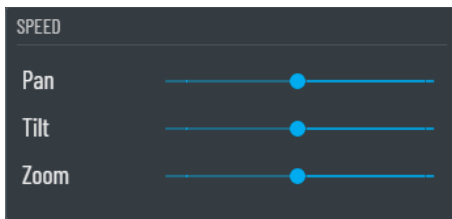
### 5.4.2 Pan/Tilt



Click to move the PTZ camera in the direction of the sector. The middle circle will stop the movement for cameras with continuous movement.

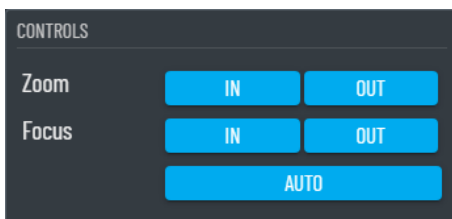
Colour-coded data activity will be displayed; click the info button for details.

### 5.4.3 Speed



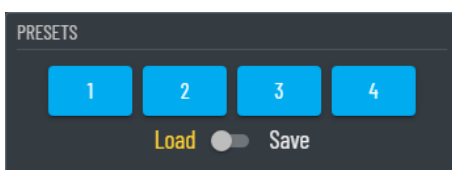
| Property | Description                                                       |
|----------|-------------------------------------------------------------------|
| Pan      | Drag and drop the slider to set the rate of left/right movement.  |
| Tilt     | Drag and drop the slider to set the rate of up/down movement.     |
| Zoom     | Drag and drop the slider to set the rate of zoom in/out movement. |

### 5.4.4 Controls



| Property | Description                                     |
|----------|-------------------------------------------------|
| Zoom     | Click the IN/OUT buttons to adjust zoom.        |
| Focus    | Click the IN/OUT buttons to adjust focus.       |
| Auto     | Click the Auto button to allow automatic focus. |

### 5.4.5 Presets



Up to four PTZ configurations can be saved as presets.

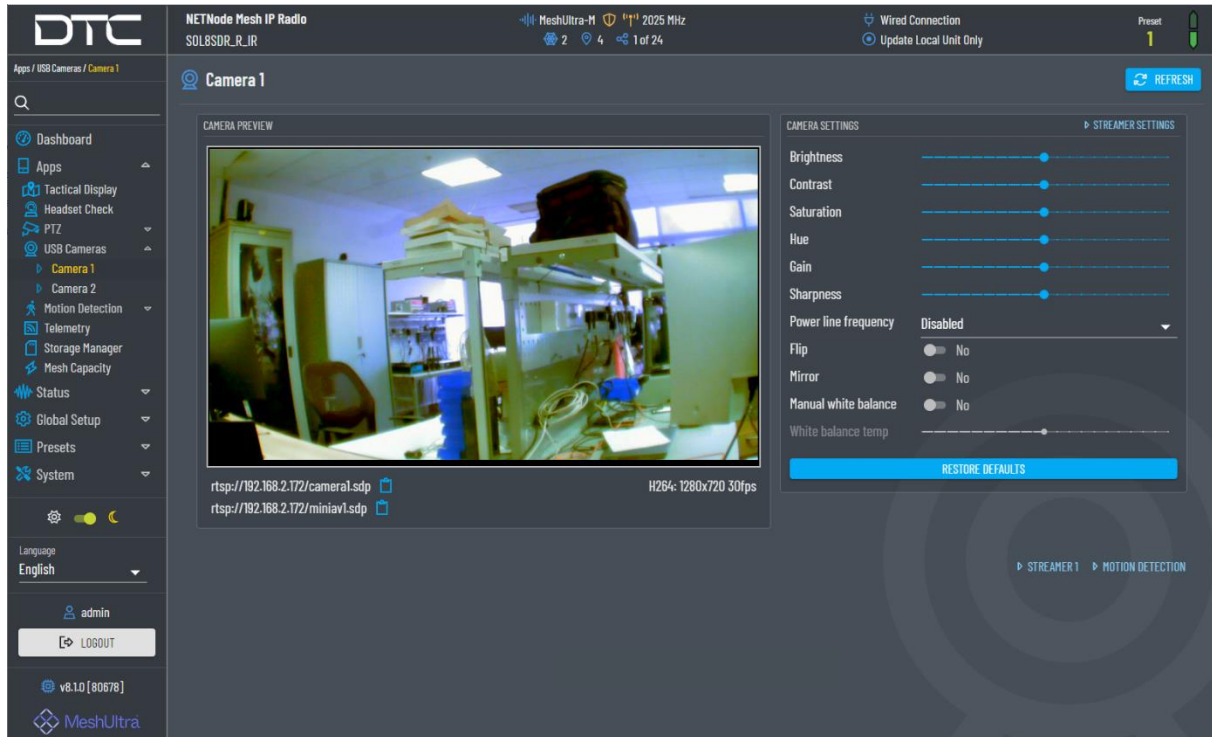
Set the **Save** selection, then select the **Preset** to save the configuration.

## 5.5 USB Cameras



USB Cameras is applicable for MeshUltra modes, and for products that do not have on-board video encoding.

The camera page allows you to view and adjust the attached USB video stream output.



### 5.5.1 Camera Settings

| Item                 | Description                                                                                                  |
|----------------------|--------------------------------------------------------------------------------------------------------------|
| Brightness           | Brightness is how dark or light a picture appears.                                                           |
| Contrast             | Contrast is the scale of difference between black and white.                                                 |
| Saturation           | Saturation refers to the intensity of colour.                                                                |
| Hue                  | Hue refers to pure colour.                                                                                   |
| Gain                 | Gain adjusts sensitivity to light.                                                                           |
| Sharpness            | Sharpness refers to the clarity of an image.                                                                 |
| Power line frequency | If applicable for the attached USB camera, the power line frequency sends a command to cancel video flicker. |
| Flip                 | If set to <b>Yes</b> , this will reverse the image.                                                          |
| Mirror               | If set to <b>Yes</b> , this will mirror the image.                                                           |
| Manual white balance | If set to <b>Yes</b> , use the slider tool below to adjust white balance                                     |
| White balance temp   | White balance adjusts the colour casts of an image so that they appear accurate.                             |

## 5.6 Motion Detection

### 5.6.1 Introduction



Motion detection allows you to set up an event to cause an action in the Mesh node.

See [Section 8.17](#) if the JPEG capture (SNAPSHOTS) license has been enabled.

The Motion Events parameters will differ slightly for SDI cameras with H.264 encoding and USB cameras in MeshUltra modes.

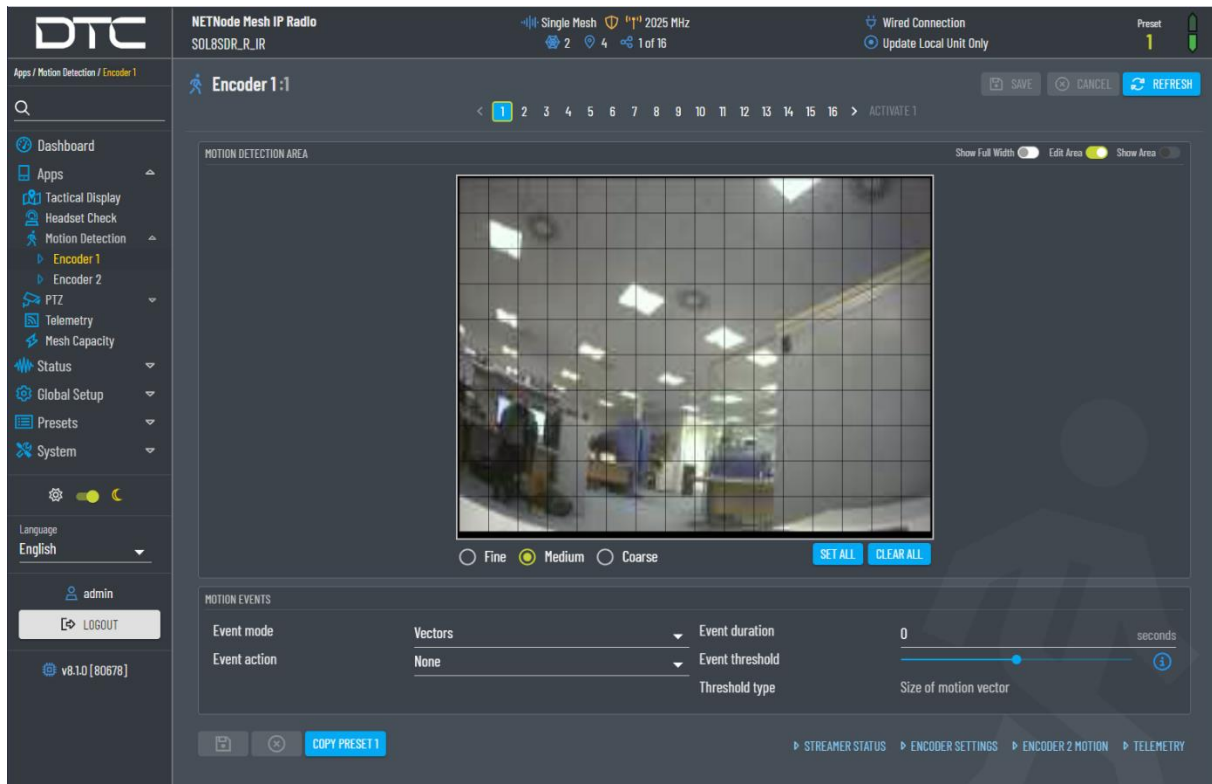


Figure 5-1: Motion Detection H.264 Encoding (Single/MIMO Mesh)

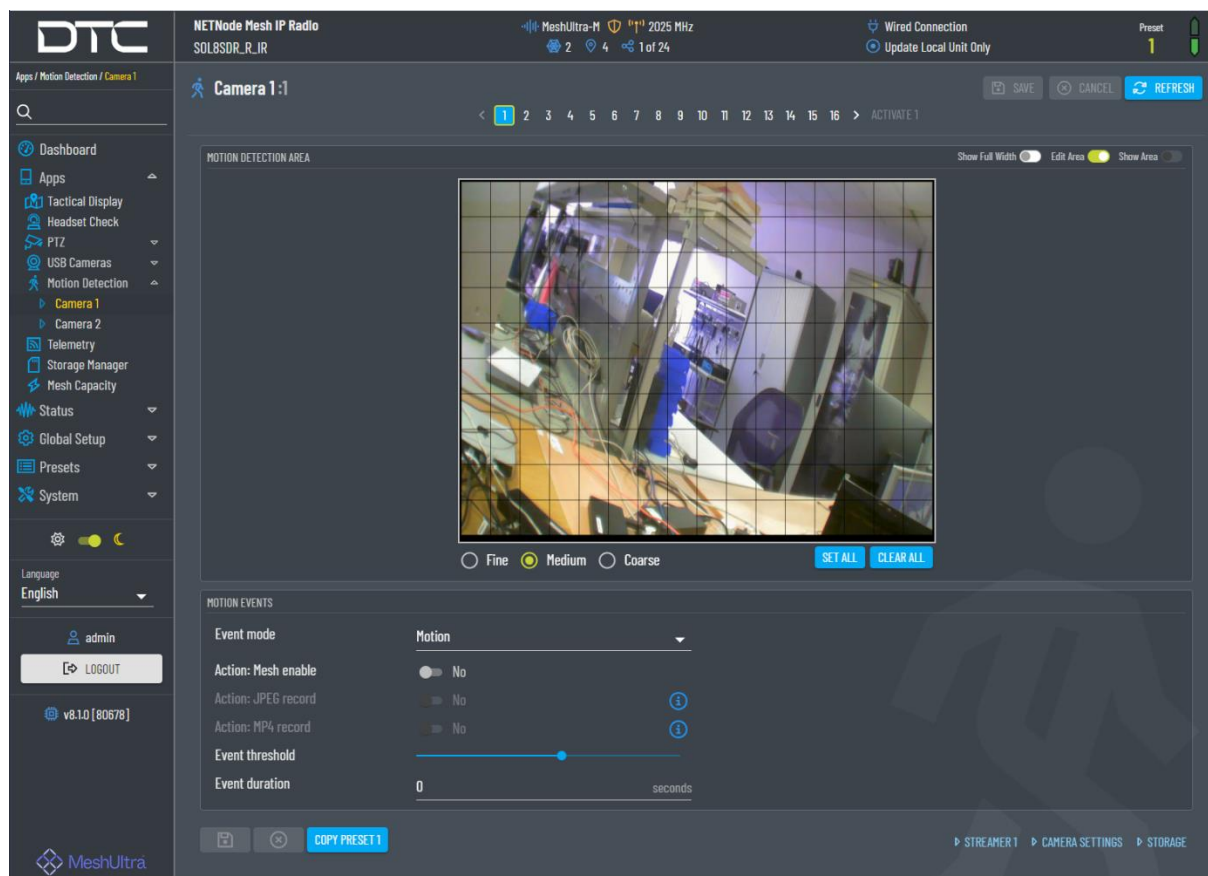
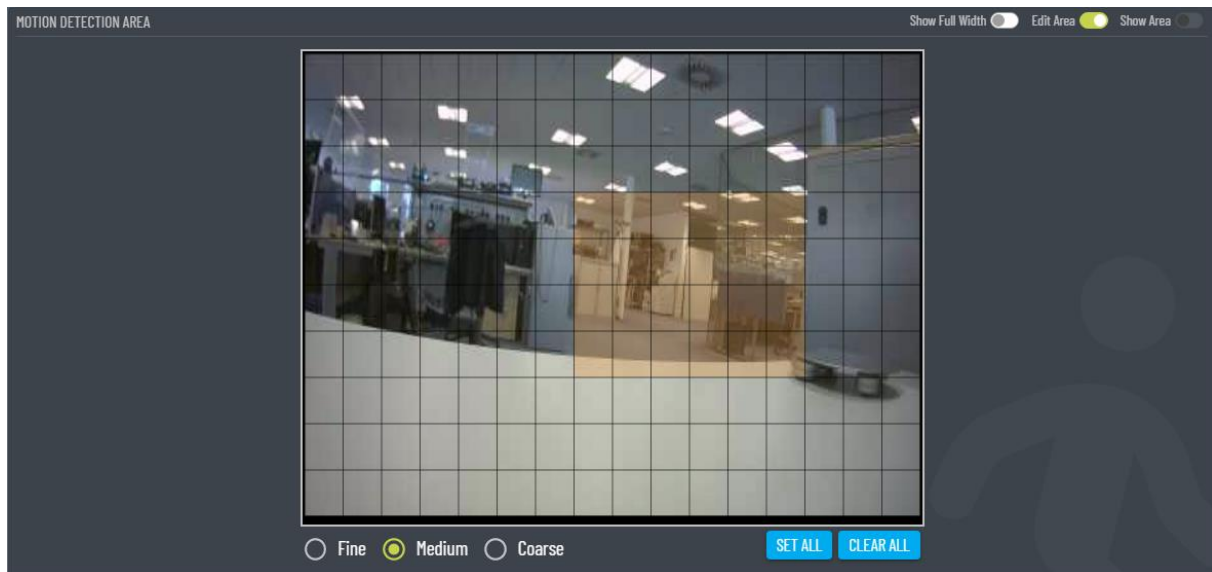


Figure 5-2: Motion Detection USB Cameras (MeshUltra)

## 5.6.2 Motion Detection Area



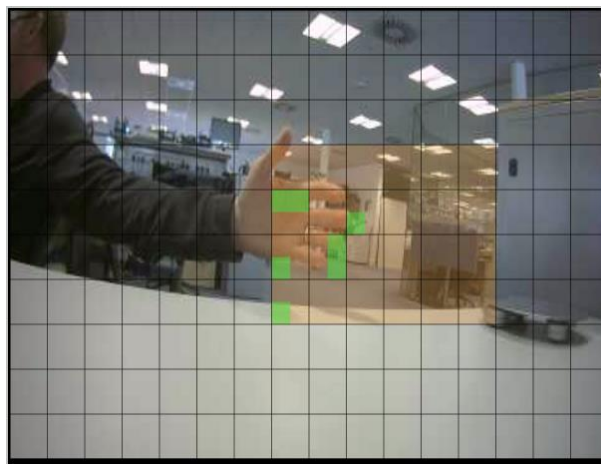
When an Event mode has been selected (see [Section 5.6.3](#)), the **Motion Detection Area** will become active, and the video input will be displayed as MJPEG video.

Orange blocks make that part of the video active to a trigger event. You can set or clear blocks using the mouse pointer and dragging or use the **Set All** or **Clear All** buttons. Select from **Fine**, **Medium** or **Coarse** to increase or decrease the block size. When the cells have been selected, click **Save**.

**Note:** If an OSD has been enabled, it will be masked automatically from trigger events. See [Section 8.8.1](#) for OSD settings.

Screen display preferences are provided in the top-right corner.

The detection area will display a momentary green overlay on the screen when triggered.



### 5.6.3 Motion Events

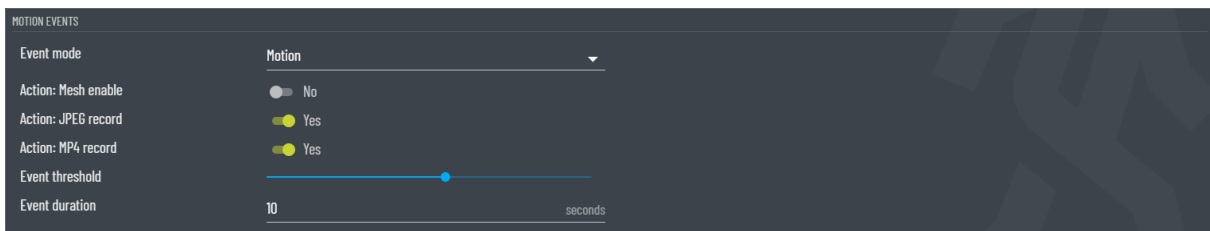
#### H.264 Encoding

**MOTION EVENTS**

|              |         |                 |                       |         |
|--------------|---------|-----------------|-----------------------|---------|
| Event mode   | Vectors | Event duration  | 0                     | seconds |
| Event action | None    | Event threshold |                       |         |
|              |         | Threshold type  | Size of motion vector |         |

| Property        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Event mode      | <p>This sets the mode which will cause the trigger event. When you select an event mode, the motion detection area will become active.</p> <ul style="list-style-type: none"> <li>• <b>Brightness</b> is sensitive to changes in light</li> <li>• <b>Vectors</b> is sensitive to movement</li> <li>• <b>Vectors-Median</b> has improved noise filtering, i.e., less sensitive to gentle movement</li> <li>• <b>Hybrid</b> is a combination of vectors and brightness</li> </ul>                                                                                                                                                                                                                                    |
| Event action    | <p>This will set the action to be taken when the event occurs.</p> <p>When <b>Enable Mesh</b> is selected, the transmitter must be disabled for this to be an active.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Event duration  | <p>The length in seconds that the event action will occur.</p> <p>Recordings are made in 30 second chunks. Therefore, a minimum 30s is required.</p> <p><b>Domo Video Download Tool</b> can be used for merging of recorded files, see <i>Section 12.1</i> for basic setup.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Event threshold | <p>This will control the detection threshold for a trigger event.</p> <p>Moving the slider to the <b>left</b> lowers the threshold which makes triggering <b>more sensitive</b>.</p> <p>Moving the slider to the <b>right</b> increases the threshold which makes triggering <b>less sensitive</b>.</p> <p>Click the info button  for a brief description of operation.</p> <div style="border: 1px solid #00a0e3; padding: 5px;"> <p><b>Note:</b> When an HD source is used, the event threshold may need to be lowered (slider left) from the setting used for a comparable SD source to achieve the same results.</p> </div> |
| Threshold type  | <p>A brief description of what the event threshold is changing. This will match the event mode selection.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## MeshUltra



| Property                                                         | Description                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Event mode                                                       | <p>This sets the mode which will cause the trigger event. When you select an event mode, the motion detection area will become active.</p> <ul style="list-style-type: none"> <li>• <b>Motion</b> is sensitive to movement</li> </ul>                                                                                                                      |
| Action: Mesh enable<br>Action: JPEG record<br>Action: MP4 record | <p>When the event occurs, the Mesh device will transmit. The transmitter must be disabled for this to be an active.</p> <p>When the event occurs, JPEG recording will begin.</p> <p>When the event occurs, MPEG recording will begin.</p> <p><b>Note:</b> Ensure recording is enabled in the <b>Presets&gt;Streamer</b> page, see <i>Section 8.12</i>.</p> |
| Event threshold                                                  | <p>This will control the detection threshold for a trigger event.</p> <p>Moving the slider to the left lowers the threshold which makes triggering more sensitive.</p> <p>Moving the slider to the right increases the threshold which makes triggering less sensitive.</p>                                                                                |
| Event duration                                                   | <p>The length in seconds that the event action will occur.</p> <p>Recordings are made in 1 minute chunks.</p> <p>Domo Video Download Tool can be used for merging of recorded files, see <i>Section 12.1</i> for basic setup.</p>                                                                                                                          |

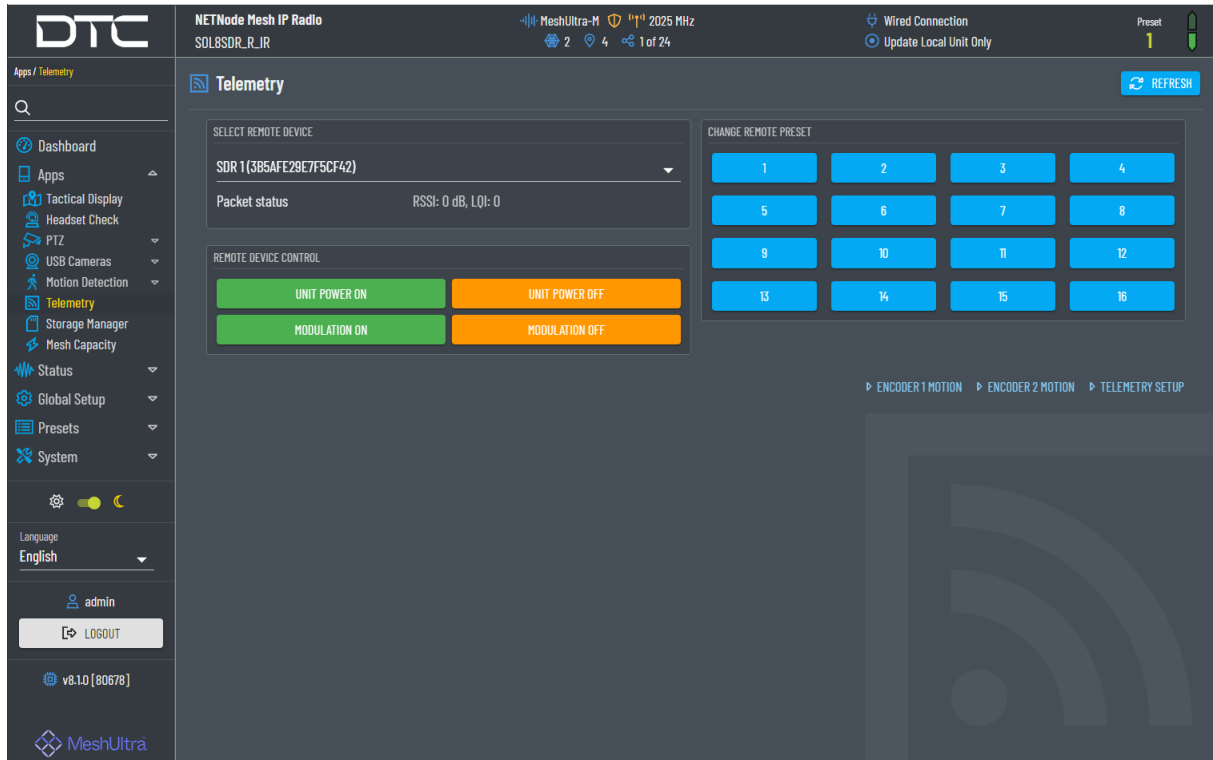
## 5.7 Telemetry



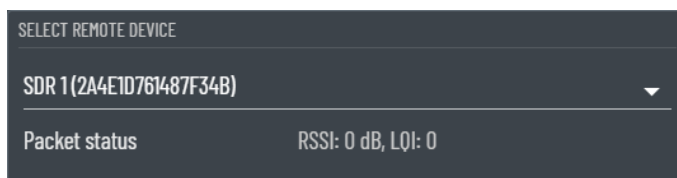
Telemetry is applicable for products with built-in telemetry modules.

A node can be configured with other devices to remotely control power and RF modulation.

**Note:** DTC's SOL8TELTRX product can also be used for modulation and power control.



### 5.7.1 Select Remote Device



Select a telemetry device from the drop-down list. If no devices are present, go to **Setup>Telemetry** or click the **Telemetry Setup** hyperlink to add telemetry devices and configure the telemetry module, see [Section 7.5](#).

The Received Signal Strength Indication (RSSI) and Link Quality Indicator (LQI) of the telemetry signal will be displayed.

**Note:** Initially, the values will be 0 but will display RSSI and LQI figures when data is passed.

5.7.2 Remote Device Control



| Property       | Description                                              |
|----------------|----------------------------------------------------------|
| Unit Power On  | This button will wake the remote device from sleep mode. |
| Unit Power Off | This button will put the remote device into sleep mode.  |
| Modulation On  | This button will turn the remote device RF power on.     |
| Modulation Off | This button will turn the remote device RF power off.    |

5.7.3 Change Remote Preset



Change Remote Preset allows you to change the preset configuration of the selected remote device.

## 5.8 Storage Manager



Storage Manager is applicable in MeshUltra modes, and for products that do not have on-board encoding. The storage manager page provides an easy method to view and download recordings from the SD card.

**Note:** Recordings are signed for validity and can be controlled from the **Preset>Streamer** page.

Click on the links to save the recordings directly to your computer's **Downloads** folder.

The recorded **MPEG** files are saved as *mp4* files of up to 1 min. length, **Domo Video Download Tool** can be used to merge the recordings into a single file, see [Section 12.1](#).

The **JPEG** recordings are saved as *tar* files which can be opened with an unzip file application.

The stored files can be deleted using the **Erase SD Card Recordings** button in the **System>Tools** page, see [Section 9.4.1](#).

## 6. Status Pages

### 6.1 Introduction

The Status pages will allow you to monitor current RF and IP data for the entire Mesh network and for individual nodes.

The available Status pages will change depending on the Mesh mode:

Single Mesh; MIMO Mesh; MeshUltra-M; MeshUltra-80; MeshUltra-X.

### 6.2 Node Table

The **Node Table** page provides statistical data for nodes in the Mesh network. The type of data viewed can be selected.

#### 6.2.1 Summary

The **Summary View** provides an overview of the network. **Occupancy** is an indication of the volume of data generated by the node (blue) and the volume of data being forwarded to the node (orange).

**Note:** Unit names in the node table are limited to a character length of 12. Therefore, if the **Unit name** in the **Global Setup>General Settings** page exceeds this, they may be truncated.

NETNode Mesh IP Radio  
DVT\_MASTER

MeshUltra-M 2165 MHz  
22 10 4 of 24

Wired Connection  
Update All Active

Preset 1

Node Table

Summary Detailed Video Interlink

SUMMARY VIEW

| ID | Unit Name   | IP Address    | Battery | Temp  | Software version | Occupancy | Tx Retries |
|----|-------------|---------------|---------|-------|------------------|-----------|------------|
| 10 | DVT_MASTER  | 192.168.2.185 | 13.1 V  | 34 °C | 8.1.0 [80532]    | 0%        | 0          |
| 1  | DVT_01987_2 | 192.168.2.182 | 12.4 V  | 51 °C | 8.1.0 [80532]    | 0%        | 0          |
| 2  | DVT_01987_1 | 192.168.2.186 | 12.4 V  | 47 °C | 8.1.0 [80532]    | 0%        | 0          |
| 4  | DVT_1866    | 192.168.2.186 | 11.9 V  | 48 °C | 8.1.0 [80532]    | 0%        | 0          |

QUALITY MATRIX LEVELS SPECTRA

Language  
English

admin  
LOGOUT

v8.1.0 [80532]  
MeshUltra

### 6.2.2 Detailed

The **Detailed View** provides IP traffic data.

**Node Table** Summary **Detailed** Video Interlink

DETAILED VIEW

| ID | Unit Name | Tx Retries | Token Rx Fails | No. of Tokens | Tx IP Packets | Rx IP Packets | Rx IP Errors | Tx IP Errors | Tx IP Bytes | Tx O/P Atten | Forward Bytes | Forward Packets |
|----|-----------|------------|----------------|---------------|---------------|---------------|--------------|--------------|-------------|--------------|---------------|-----------------|
| 1  | BD_1800_1 | 0          | 0              | 208           | 7             | 94            | 0            | 0            | 5.06 kB     | 25           | 0             | 0               |
| 2  | BD_1800_2 | 0          | 0              | 202           | 89            | 9             | 0            | 0            | 18.38 kB    | 25           | 0             | 0               |
| 4  | BD_1966   | 0          | 0              | 200           | 1             | 87            | 0            | 0            | 240 B       | 25           | 4.31 kB       | 3               |

[QUALITY MATRIX](#) [LEVELS](#) [SPECTRA](#)

| Property        | Description                                                                                                                                                                                                                              |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tx Retries      | The number of Tx retry attempts made per 2s.                                                                                                                                                                                             |
| Token Rx Fails  | The number of failed Token decodes.<br>In systems with three or more nodes, it is normal for Token Rx fails to occur, especially when the network is fragmented. <b>Token Rx failures are not an indication of degraded performance.</b> |
| No. of Tokens   | The number of tokens that have passed through the node per 2s.                                                                                                                                                                           |
| Tx IP Packets   | The number of IP packets sent from the node per 2s.                                                                                                                                                                                      |
| Rx IP Packets   | The number of IP packets received by the node per 2s.                                                                                                                                                                                    |
| Rx IP Errors    | The number of received IP errors from all nodes.                                                                                                                                                                                         |
| Tx IP Errors    | Number of rejected transmitted IP packets due to overflow.                                                                                                                                                                               |
| Tx IP Bytes     | The number of bytes sent.                                                                                                                                                                                                                |
| Tx O/P Atten    | The transmitter output power attenuation applied to the node.                                                                                                                                                                            |
| Forward Bytes   | The number of bytes node forward from other nodes.                                                                                                                                                                                       |
| Forward Packets | The number of IP packets forwarded by the node per 2s.                                                                                                                                                                                   |

**Table 6-1: IP Traffic Definitions**

### 6.2.3 Ultra-X

The **Ultra-X View** is applicable for devices in MeshUltra-X mode. It displays the SNRs and signal levels for the received signals.

**Node Table** Summary Detailed **Ultra-X** Video Interlink

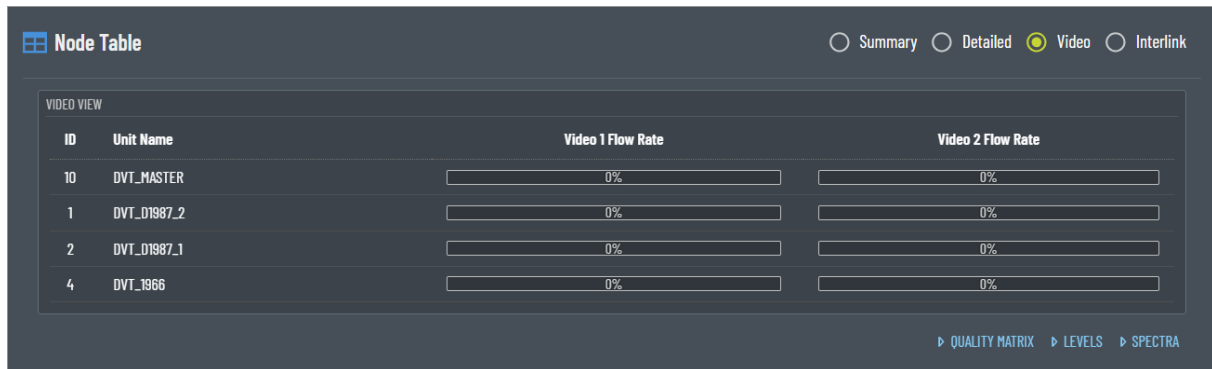
ULTRA-X VIEW

| ID | Unit Name    | Rx Robust SNR | Rx MIMO SNR | Rx SigLev A | Rx SigLev B | Rx SigLev C | Rx SigLev D |
|----|--------------|---------------|-------------|-------------|-------------|-------------|-------------|
| 6  | PHASE5       | -             | -           | -104dBm     | -104dBm     | -103dBm     | -104dBm     |
| 5  | D1987ForChar | 30.7dB        | 27.3dB      | -33dBm      | -32dBm      | -31dBm      | -33dBm      |

[QUALITY MATRIX](#) [LEVELS](#) [SPECTRA](#)

## 6.2.4 Video

The **Video** view displays the flow rate for each video stream.



## 6.2.5 Interlink

The **Interlink** view provides Interlink status and IP traffic data.

The screenshot shows the 'Node Table' interface with the 'Interlink' view selected. The table displays the following data:

| ID | Unit Name   | Interlink Status | Tx Packets | Rx Packets | Tx Bytes |
|----|-------------|------------------|------------|------------|----------|
| 10 | DVT_MASTER  | -                | 0          | 0          | 0        |
| 1  | DVT_D1987_2 | -                | 0          | 0          | 0        |
| 2  | DVT_D1987_1 | -                | 0          | 0          | 0        |
| 4  | DVT_1966    | -                | 0          | 0          | 0        |

Navigation links at the bottom: [QUALITY MATRIX](#), [LEVELS](#), [SPECTRA](#).

## 6.2.6 NTP

The **NTP** view provides time server status.

The screenshot shows the 'Node Table' interface with the 'NTP' view selected. The table displays the following data:

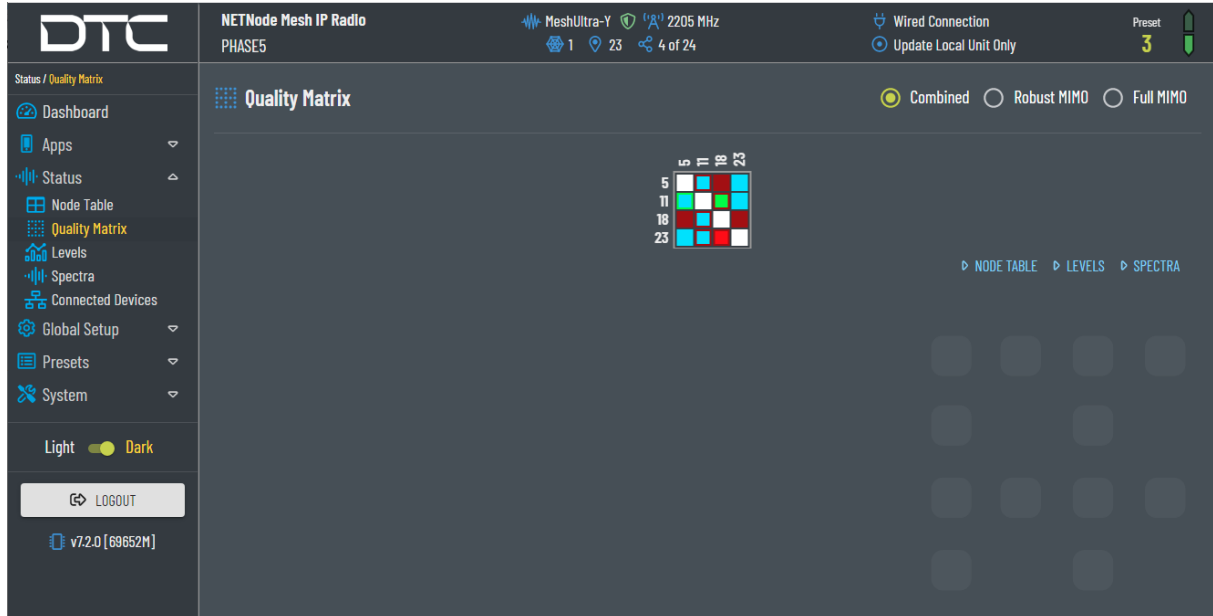
| ID | Unit Name    | IP Address    | Is Server | P2P | Reference   | Sync OK | Stratum | System Offset | RMS Offset | System Time         |
|----|--------------|---------------|-----------|-----|-------------|---------|---------|---------------|------------|---------------------|
| 0  | SOL8SDR-R_IR | 192.168.2.178 | No        | No  | 192.168.2.6 | Yes     | 4       | 0.000002      | 0.000006   | 2024-08-22T16:31:13 |

Navigation links at the bottom: [QUALITY MATRIX](#), [LEVELS](#), [SPECTRA](#).

## 6.3 Quality Matrix

The **Quality Matrix** page displays a simple picture of the signal quality around the Mesh system. The transmit node is indicated on the top row and the receive node at the side column.

**Note:** Full MIMO displays the signal quality for nodes which are in full MIMO mode only, i.e. MIMO antennas are deployed.



### 6.3.1 MeshUltra-M

The SNR of the signal is converted to a signal quality value from 0 to 12.

Full MIMO modulation for 8,9,11,12 are only achievable if there are two paths from TX to RX.

**Note:** To achieve 64QAM modulation, ensure **Enable 64QAM** is enabled, see *Section 8.2.4*. The robust MIMO schemes may also be determined by the **Force robust MIMO** setting.

| Signal Quality | SNR Threshold (dB)     | Modulation                                    |
|----------------|------------------------|-----------------------------------------------|
| 12             | >23.5                  | 64QAM 2/3 robust MIMO<br>64QAM 2/3 full MIMO  |
| 11             | >23.5<br>17.4-20.4     | 64QAM 2/3 robust MIMO<br>16 QAM 2/3 full MIMO |
| 10             | >23.5                  | 64QAM 2/3                                     |
| 9              | 20.4-23.5<br>17.4-20.4 | 16QAM 2/3 robust MIMO<br>16QAM 2/3 full MIMO  |
| 8              | 17.4-20.4<br>14.4-17.4 | 16QAM 2/3 robust MIMO<br>16QAM 1/2 full MIMO  |
| 7              | 17.4-20.4              | 16QAM 2/3                                     |
| 6              | 14.4-17.4              | 16QAM 1/2                                     |
| 5              | 11.4-14.4              | QPSK 2/3                                      |
| 4              | 8.4-11.4               | QPSK 1/2                                      |
| 3              | 5.4-8.4                | BPSK 2/3                                      |
| 2              | 2.4-5.4                | BPSK 2/3                                      |
| 1              | 0.61-2.4               | BPSK 2/3                                      |
| 0              | <0.61                  | No link                                       |

- Signal quality 7-12: Excellent RF link (SNR >17.4dB)
- Signal quality 4-6: Average RF link (SNR 8.4dB to 17.4dB)
- Signal quality 0-3: Poor RF link (SNR <8.4dB)

### 6.3.2 MeshUltra-X and MeshUltra-80

The SNR of the signal is converted to a signal quality value from 0 to 7.

**Note:** To achieve 64QAM modulation, ensure **Enable 64QAM** is enabled, see *Section 8.2.4*.

| Signal Quality | SNR Threshold (dB) | Modulation |
|----------------|--------------------|------------|
| 7              | >17.4              | 64QAM 2/3  |
| 6              | 14.4-17.4          | 16QAM 2/3  |
| 5              | 11.4-14.4          | 16QAM 1/2  |
| 4              | 8.4-11.4           | QPSK 2/3   |
| 3              | 5.4-8.4            | QPSK 1/2   |
| 2              | 2.4-5.4            | BPSK 2/3   |
| 1              | 0.6-2.4            | BPSK 2/3   |
| 0              | <0.6               | No link    |

- Signal quality 6-7: Excellent RF link (SNR >14.4dB)
- Signal quality 2-5: Average RF link (SNR 5.4dB to 14.4dB)
- Signal quality 0-2: Poor RF link (SNR <5.4dB)

### 6.3.3 Single Mesh and MIMO Mesh

The SNR of the signal is converted to a signal quality value from 0 to 5.

| Signal Quality | SNR Threshold (dB)                 | Modulation |
|----------------|------------------------------------|------------|
| 5              | >17.2                              | 16QAM 2/3  |
| 4              | 14.2-17.2                          | 16QAM 1/2  |
| 3              | 11.2-14.2                          | QPSK 2/3   |
| 2              | 8.2-11.2                           | QPSK 1/2   |
| 1              | 3.1-8.2 (Single)<br>2.7-8.2 (MIMO) | BPSK 2/3   |
| 0              | <3.1 (Single)<br><2.7 (MIMO)       | No link    |

- Signal quality 5-6: Excellent RF link (SNR >14.2dB)
- Signal quality 2-4: Average RF link (SNR 8.2dB to 14.2dB)
- Signal quality 0-1: Poor RF link (SNR <8.2dB)

## 6.4 Levels

**Note:** The Levels page is not applicable in **MeshUltra-X** mode. A simplified view of SNRs and levels is provided in the **Status>Node Table** page, see *Section 6.2*.

The **Levels** page displays RF status for the Mesh network. The transmit node is indicated on the top row and the receive node at the side column.

### 6.4.1 SNR

The **SNR** view displays the signal-to-noise ratios for each of the nodes in the Mesh network.

**Note:** The radio is actually reporting signal-to-noise and distortion ratio (SINAD) which is dependent on the receive level and additional distortion introduced by the radio system.

**Note:** Full MIMO displays the SNRs for nodes which are in full MIMO mode only, i.e. MIMO antennas are deployed.

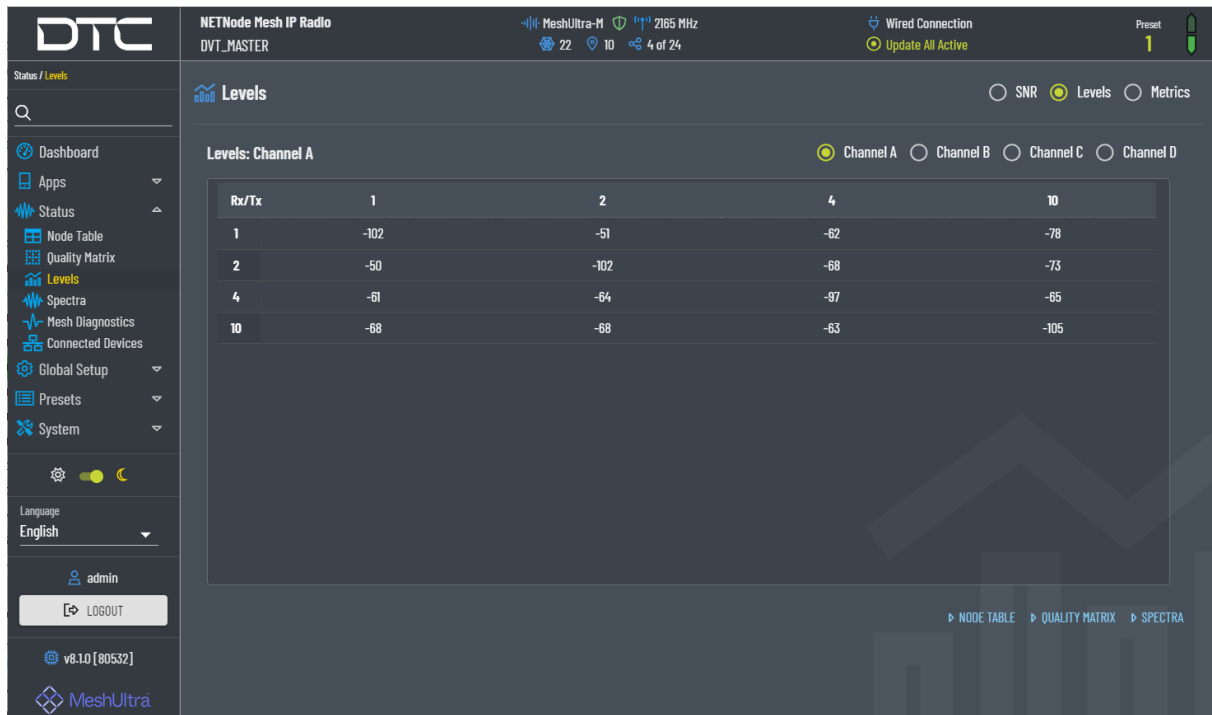
The screenshot shows the DTC Levels page. The top header includes the DTC logo, 'NETNode Mesh IP Radio', 'DVT\_MASTER', 'MeshUltra-M', '2165 MHz', 'Wired Connection', 'Update All Active', and 'Preset 1'. The left sidebar contains navigation links: Status / Levels, Dashboard, Apps, Status, Node Table, Quality Matrix, Levels (selected), Spectra, Mesh Diagnostics, Connected Devices, Global Setup, Presets, and System. The main content area is titled 'Levels' and has tabs for SNR (selected), Levels, and Metrics. Below this, there are tabs for MIMO (selected) and Full MIMO. The SNR: MIMO view displays a table with the following data:

| Rx/Tx | 1    | 2    | 4    | 10   |
|-------|------|------|------|------|
| 1     |      | 32.5 | 37.1 | 23.7 |
| 2     | 32.0 |      | 34.0 | 28.1 |
| 4     | 28.9 | 24.8 |      | 31.5 |
| 10    | 25.8 | 28.4 | 34.2 |      |

At the bottom right of the main content area, there are links to 'NODE TABLE', 'QUALITY MATRIX', and 'SPECTRA'. The footer of the page shows 'v8.10 [80532]' and the 'MeshUltra' logo.

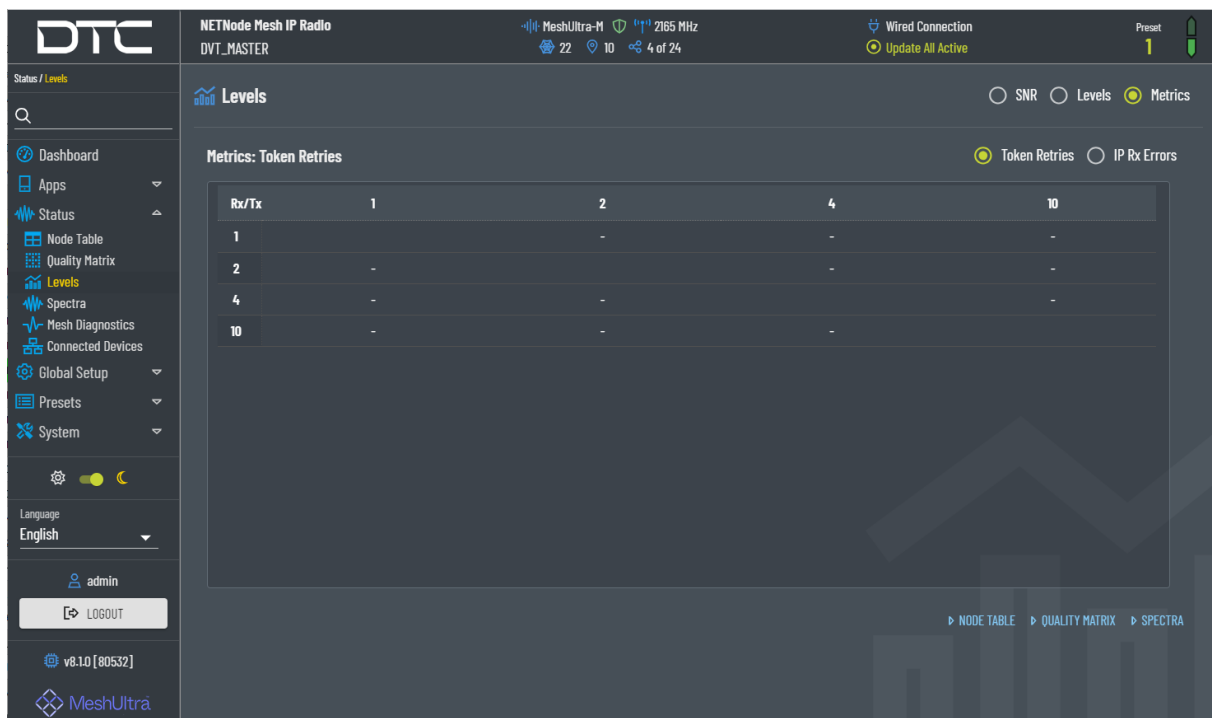
## 6.4.2 Levels

The **Levels** view displays the receive power level in dBm for each antenna.



## 6.4.3 Metrics

The **Metrics** view displays IP traffic errors between nodes. Select between **Token Retries** and **IP RX Errors**.



## 6.5 Spectra

The **Spectra** page displays up to four spectra channels and the interference being received for each node in the system depending on whether it is a NETNode (A-D) or SDR (A and B).

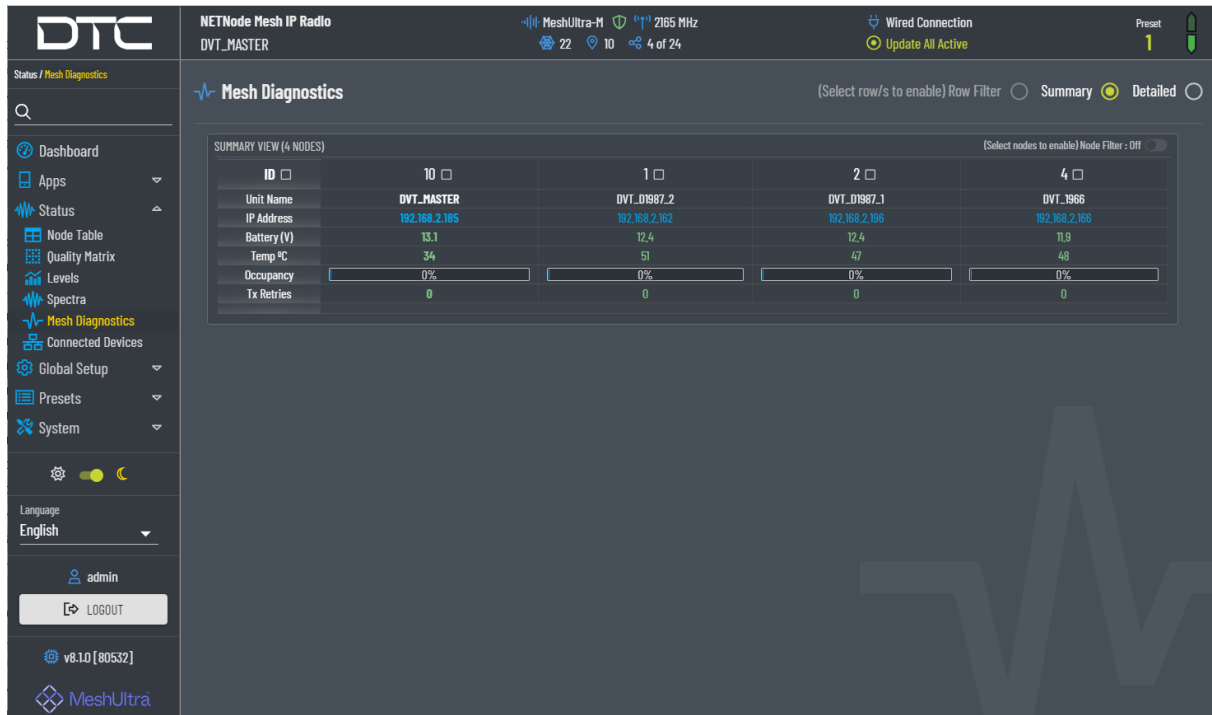
Select how much data is to be viewed using the **Show** and **Hide** options.



## 6.6 Mesh Diagnostics

The Mesh Diagnostics page provides a summary or detailed view for monitoring key Mesh parameters.

Filters can be applied for simplified viewing.



**Mesh Diagnostics** (Select row/s to enable) Row Filter ☐ Summary ☒ Detailed ☐

SUMMARY VIEW (4 NODES) (Select nodes to enable) Node Filter: Off ☐

| ID          | 10            | 1             | 2             | 4             |
|-------------|---------------|---------------|---------------|---------------|
| Unit Name   | DVT_MASTER    | DVT_01987.2   | DVT_01987.1   | DVT_1966      |
| IP Address  | 192.168.2.185 | 192.168.2.182 | 192.168.2.196 | 192.168.2.166 |
| Battery (V) | 13.1          | 12.4          | 12.4          | 11.9          |
| Temp °C     | 34            | 51            | 47            | 48            |
| Occupancy   | 0%            | 0%            | 0%            | 0%            |
| Tx Retries  | 0             | 0             | 0             | 0             |

## 6.7 Streamers

The **Streamers** page is applicable for products with built-in H.264 video encoding configured in Single Mesh or MIMO Mesh modes.

### 6.7.1 Details

The **Details** view provides an overview of the services and mux. Transport stream and elementary stream URLs can be copied into media players and JPEG URLs can be viewed in a web browser.

The screenshot shows the DTC NETNode Mesh IP Radio web interface. The top header displays the device name 'NETNode Mesh IP Radio' and 'SOL8SDR\_R\_IR'. It also shows the mesh status as 'Single Mesh' with 2 nodes, 4 links, and 1 of 16 channels. The frequency is 2025 MHz. The connection type is 'Wired Connection' and the update status is 'Update Local Unit Only'. The preset is 1.

The left sidebar contains a navigation menu with options: Dashboard, Apps, Status, Node Table, Quality Matrix, Levels, Spectra, Mesh Diagnostics, Streamers (selected), Connected Devices, Global Setup, Presets, and System. The user is logged in as 'admin' and can click 'LOGOUT'. The version is 'v8.1.0 [80678]'.

The main content area is titled 'Streamers' and has three tabs: 'Details' (selected), 'Streamer 1', and 'Streamer 2'. The 'Details' tab shows the following configuration:

- SERVICE 1:**
  - VIDEO 1:
    - Source: Automatic SDI 1
    - Bitrate: 1.43 Mbps
    - Quality: STD 960x540p 12fps
    - AV: rtsp://192.168.2.172/av1.sdp
    - ES: rtsp://192.168.2.172/video1.sdp
    - JPEG: http://192.168.2.172/image.jpg?i=1
  - NO AUDIO
- MUX 1:**
  - Source: Service 1
  - Bitrate: 1.50 Mbps
  - Encryption: Off
  - TS: rtsp://192.168.2.172/stream1.sdp
- RECORDING / SD CARD:**
  - Source: None
  - Bitrate: None
  - Encryption: None
  - Available: 51.98 GB

- SERVICE 2:**
- NO VIDEO
- NO AUDIO
- MUX 2:**
- Source: Service 2
- Bitrate: 1.50 Mbps
- Encryption: Off
- MESH:**
- Encryption: Off

At the bottom right, there are links to 'NODE TABLE', 'QUALITY MATRIX', 'LEVELS', and 'SPECTRA'.

## 6.7.2 Streamer

The **Streamer** view displays an MJPEG video stream. Video recording can be controlled by clicking the **Start/Stop** button, without needing to go to the **Preset>Streamer** page (Section 8.11.2).

The screenshot displays the DTC Streamer interface. The top header shows the DTC logo, system information (NETNode Mesh IP Radio, SOL8SDR\_R\_IR), and connection status (Single Mesh, 2025 MHz, 2 nodes, 4 channels, 1 of 16). The left sidebar contains navigation options: Dashboard, Apps, Status, Node Table, Quality Matrix, Levels, Spectra, Mesh Diagnostics, Streamers (selected), Connected Devices, Global Setup, Presets, and System. The main content area is titled 'Streamers' and features a video stream labeled 'STREAMER 1 VIDEO - [EVENT OVERLAY: YES]'. Below the video, the 'STREAMER 1 STATUS' section shows 'Video locked', 'Audio locked', and 'ASI locked' with corresponding checkboxes. A 'Recording enabled' status is also present. A 'START' button is highlighted with a red box. The bottom right corner includes navigation links for 'NODE TABLE', 'QUALITY MATRIX', 'LEVELS', and 'SPECTRA'.

## 6.8 Connected Devices

The **Connected Devices** page provides a list based on the ARP table which shows all IP and MAC addresses associated with nodes on the network.

The table will not auto update, please click the **Refresh** button to update the list.

**Note:** When devices are switched off or removed from the network, it may take up to 1 minute to be removed.

| IP Address    | MAC Address       | Node  |
|---------------|-------------------|-------|
| 192.168.2.2   | 8c-13-d5-d4-67-f9 | Local |
| 192.168.2.6   | 50-6b-8d-8f-9b-86 | Local |
| 192.168.2.8   | 98-49-9f-00-30-a1 | Local |
| 192.168.2.13  | e8-39-35-f0-d2-35 | Local |
| 192.168.2.34  | 98-49-9f-00-55-52 | Local |
| 192.168.2.59  | 00-11-6a-7a-53-1c | Local |
| 192.168.2.60  | 98-49-9f-00-02-31 | Local |
| 192.168.2.61  | 98-49-9f-00-01-71 | Local |
| 192.168.2.62  | 98-49-9f-00-04-01 | Local |
| 192.168.2.86  | 00-13-3b-e3-14-2d | Local |
| 192.168.2.135 | 00-11-6a-62-92-d6 | Local |
| 192.168.2.138 | 00-61-6c-68-73-75 | Local |
| 192.168.2.139 | 00-11-6a-01-9f-83 | Local |
| 192.168.2.142 | 50-6b-8d-f4-de-f3 | Local |
| 192.168.2.147 | 00-11-6a-57-57-0e | Local |
| 192.168.2.151 | 00-1b-21-3f-37-14 | Local |
| 192.168.2.152 | 98-49-9f-00-01-81 | Local |

To view the ARP table for a VLAN, add a **VLAN Tag** and click **Refresh** to update the list.

VLAN Tag \*  
1

REFRESH

## 6.9 Interference Avoidance

The Interference Avoidance status page can be used to monitor the Interference Avoidance Scheme (IAS) network.

When point-to-multipoint (P2MP) is also implemented, uplinks and downlinks will be represented graphically.



Figure 6-1: Status for an IAS System

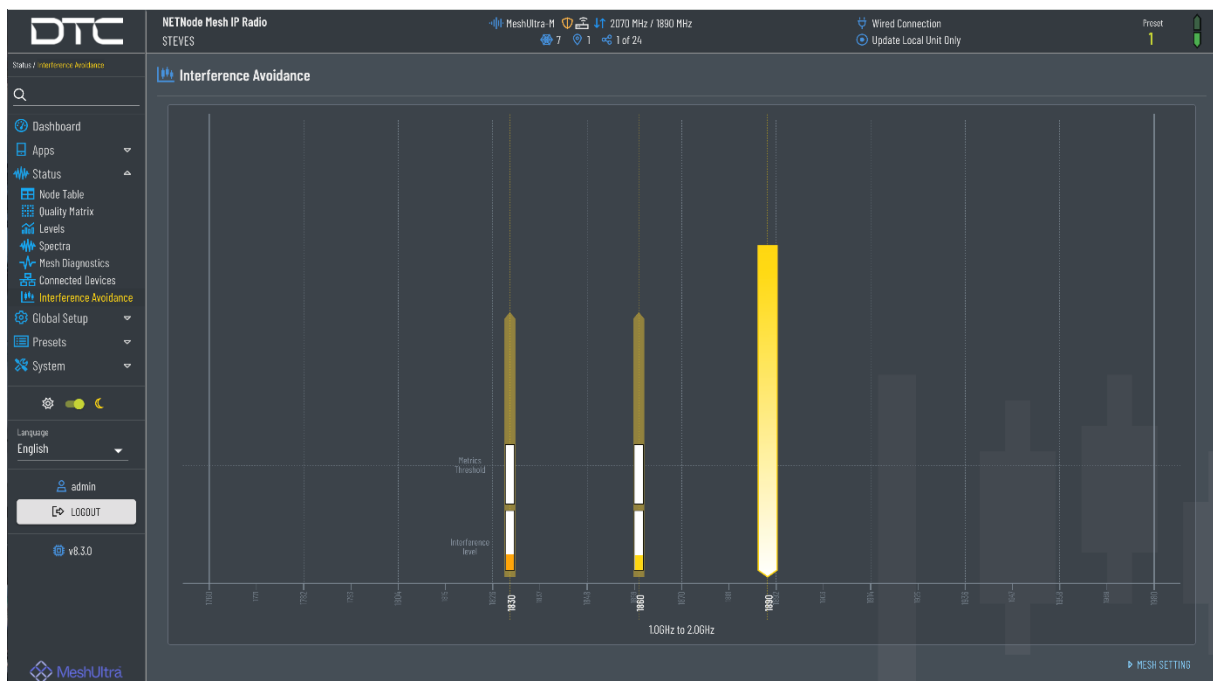


Figure 6-2: Status for an IAS P2MP System

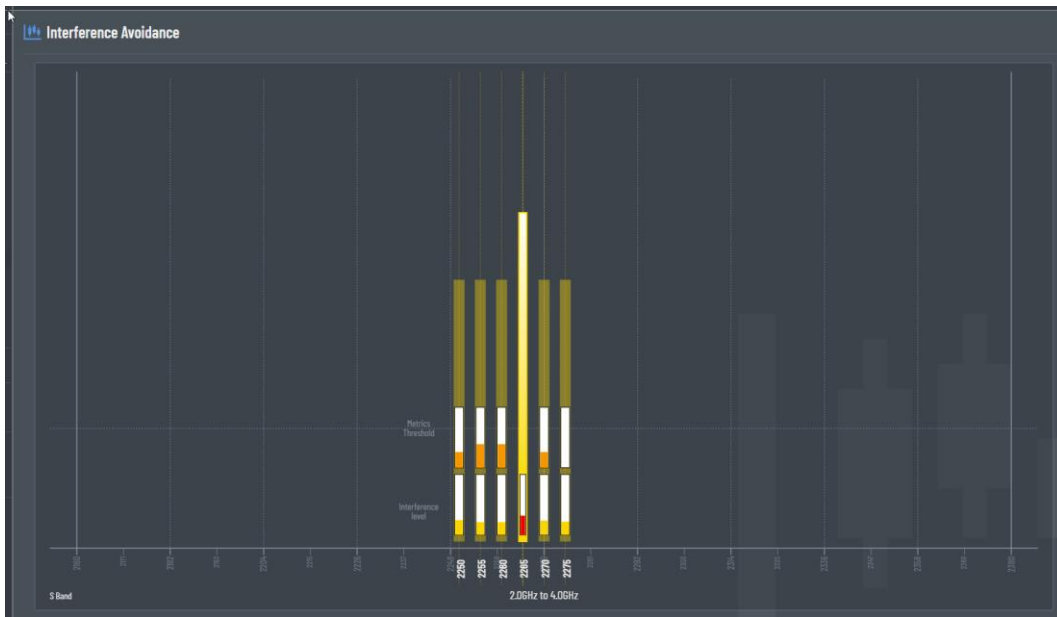
The active frequency is the dominant bar in the chart and the width is determined by the bandwidth. The alternative frequencies are shorter and thinner by comparison.

The **interference level** has three conditions:

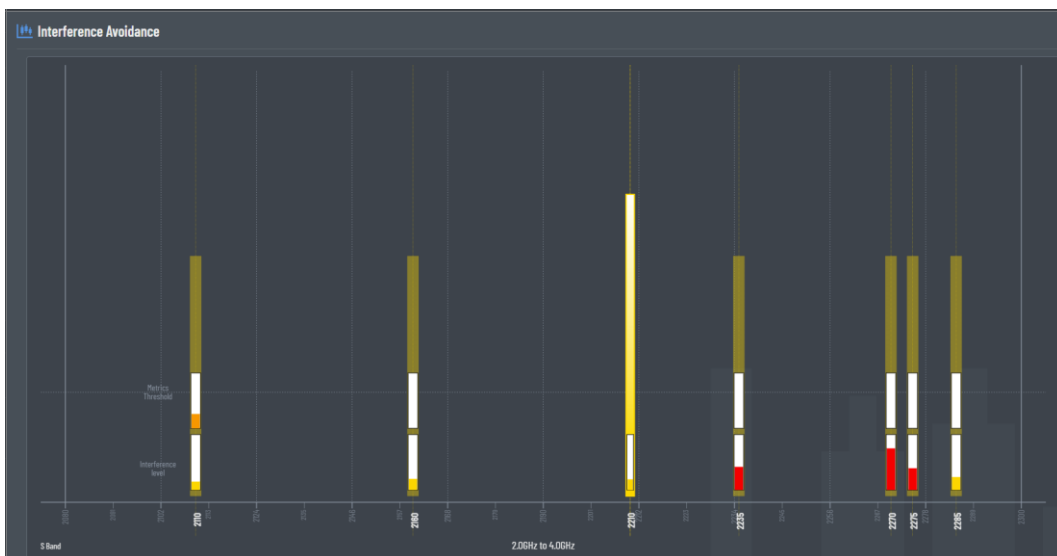
- Gold: Low level interference
- Amber: Interference threshold of -90dB
- Red: Interference threshold of -85dB

The **metric** shows the best channel to use. If the amber bar exceeds the dotted line (metrics threshold) then the unit will switch to that channel. The worst is shown as zero.

The example below shows some interference on the active channel. The best channel looks like 2260MHz; one channel lower than active.



This example shows interference at the top of the band with the best channel at 2110MHz.



## 7. Global Setup Pages

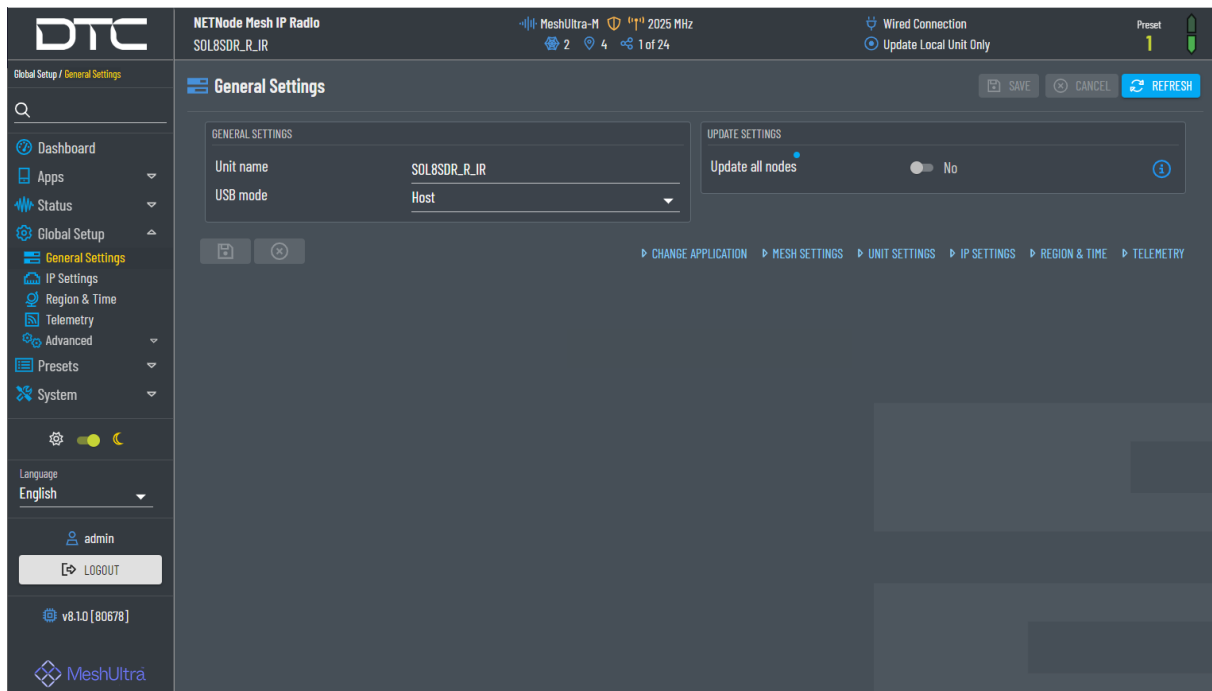
### 7.1 Introduction

The **Global Setup** pages will allow you to make changes to settings that are applied globally and are not affected by the preset settings.

Settings can be edited and must be saved to make them active.

| Item                                                                                                                                                                                 | Description                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>SAVE</b><br>   | Click the Save button to save changes.<br>There is a save button at the top and bottom of the display.                                                               |
|  <b>CANCEL</b><br> | If you make changes but do not click Save, click the Cancel button to return the current settings.<br>There is a cancel button at the top and bottom of the display. |
|  <b>REFRESH</b>                                                                                     | Click Refresh to update the browser settings.                                                                                                                        |

## 7.2 General Settings



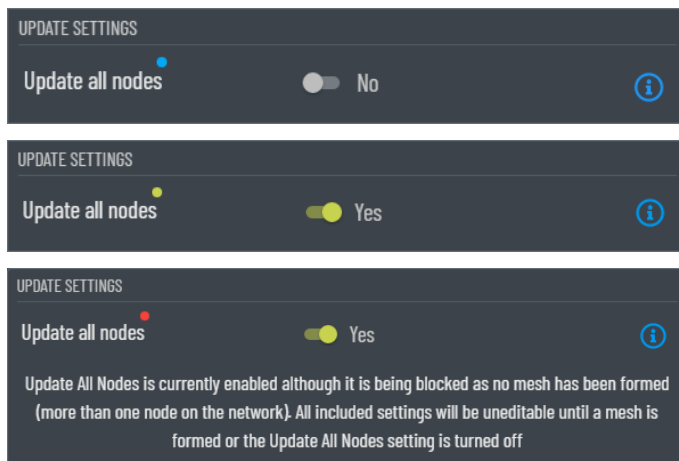
### 7.2.1 General Settings

| GENERAL SETTINGS      |              |
|-----------------------|--------------|
| Unit name             | SOL8SDR-R_IR |
| USB mode              | Device       |
| USB ethernet protocol | RNDIS        |

| Item      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unit name | A name to identify the node, this can be up to 40 characters in length.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| USB mode  | <p><b>Device</b> mode will allow you to create a virtual Ethernet port for the transfer of data to and from a laptop's USB port.</p> <p><b>Host</b> mode will allow other USB devices to be connected such as Wi-Fi or 4G dongles, or a serial adaptor.</p> <p><b>Auto</b> mode is applicable for D196x products and will auto detect as a Host or Device port but will default to Device mode with no connection. The board type and USB mode can be verified in the <b>Information</b> page.</p> <p><b>Note:</b> When switching between modes, the device will reboot.</p> <p><b>Note:</b> This is the <b>USB2</b> port for D196x based products (<b>USB1</b> is always a <b>Host</b> port) and the <b>USB-C</b> port for D1987 based products.</p> <p><b>Note:</b> Products which have USB power delivery and require power (sink), must be set to Device.</p> |

| Item                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| USB Ethernet protocol | <p>This setting is applicable when the USB mode is set to <b>Device</b>.</p> <p><b>RNDIS</b> is for connections to PCs with a Microsoft operating system, see <i>Section 11.1</i>.</p> <p><b>CDC Ethernet</b> is for connecting to devices with Linux OS.</p> <p><b>CAUTION:</b> Setting CDC Ethernet when connected to Windows OS may cause the SDR to lose communications. This can be recovered by connecting to a PC via <b>Ethernet</b> for communications.</p> |

### 7.2.2 Update Settings

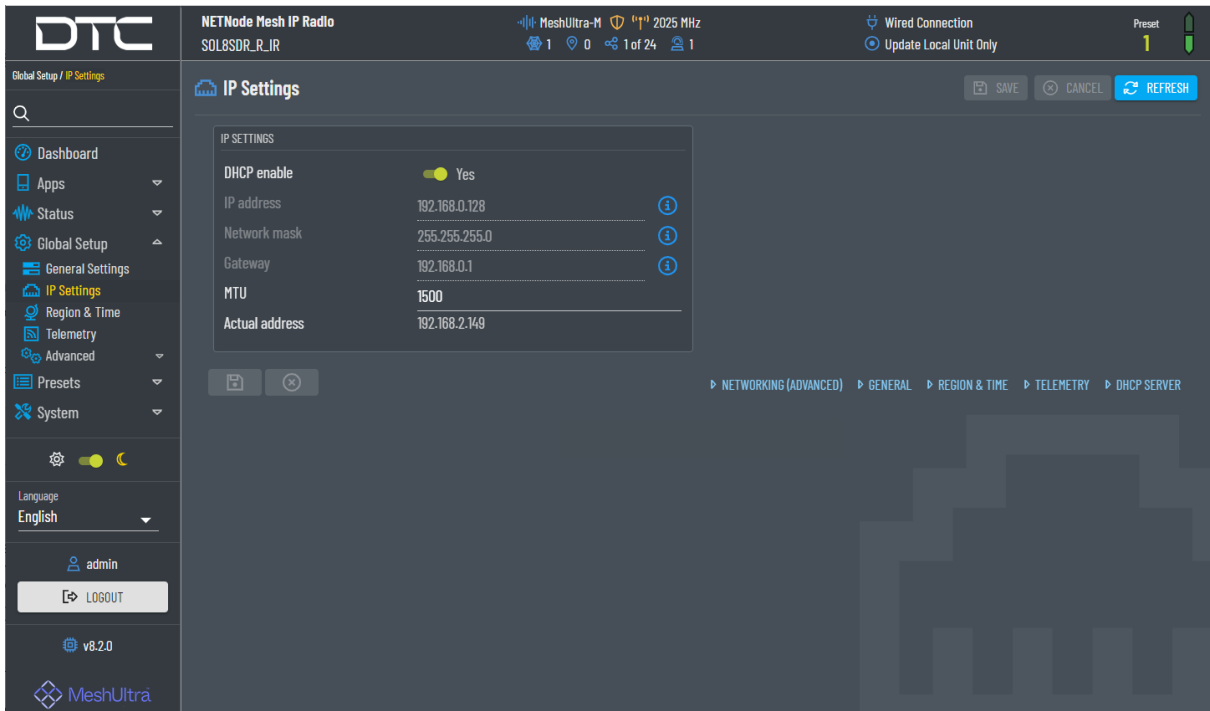


Update all parameters are indicated by a dot. These parameters must match to ensure the Mesh network forms successfully.

- When update all nodes is set to **No**, all parameters marked with a blue dot must be configured manually for all units in the network.
- When update all nodes is set to **Yes**, all settings marked with a green dot will be updated automatically for all nodes in the network.
- When update all nodes is set to **Yes** but the node is not in a Mesh network, the settings will be marked with a red dot to indicate that *automatic update all* is not active.

## 7.3 IP Settings

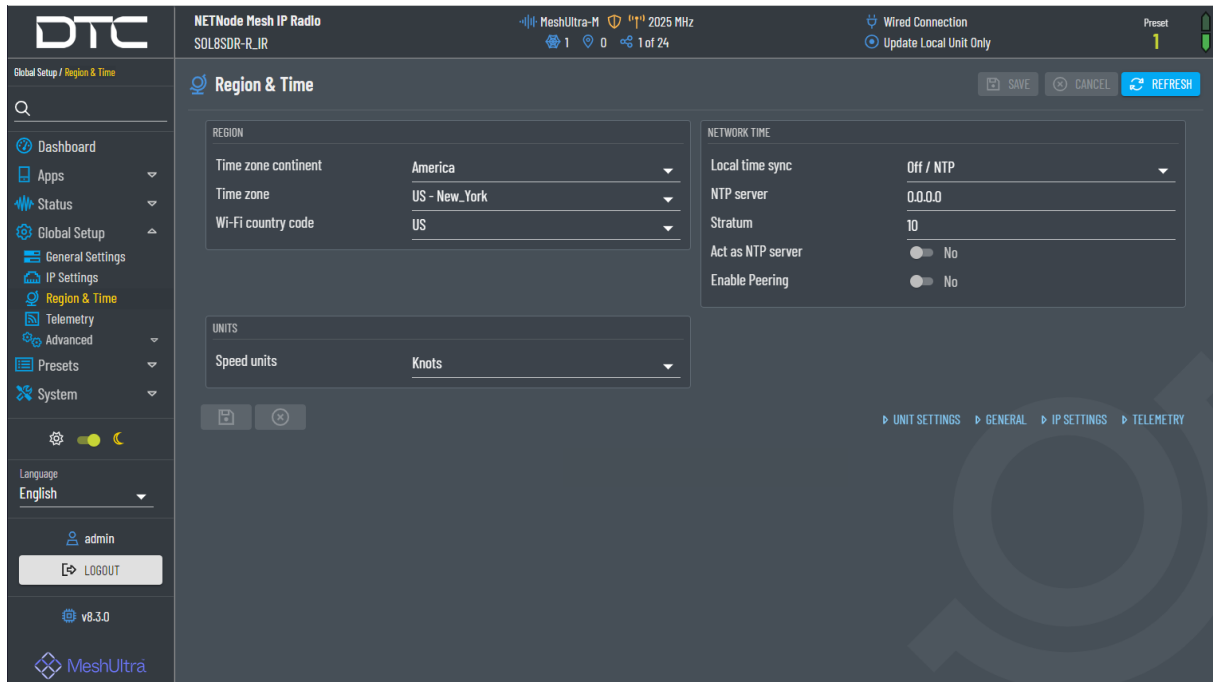
The IP Settings page allows you to make basic IP settings. Advanced IP and Ethernet settings can be found in the **Setup>Advanced** pages.



| Item           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DHCP enable    | <p>If set to <b>Yes</b>, the IP address is automatically allocated by a DHCP server and all other IP settings are greyed out.</p> <p>If set to <b>No</b>, the remaining IP settings will have to be entered manually. The node can be configured as a DHCP server for a LAN or VLAN, see <i>Section 7.7</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| IP address     | If the radio is not automatically acquiring its IP address through a DHCP server then a fixed IP address needs to be assigned to the unit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Network mask   | The network mask divides a network into smaller more efficient subnets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Gateway        | A gateway is an access point to another network. The gateway address is usually a router interface to send IP packets out of the local network.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| MTU            | <p>The maximum transmission unit (MTU) should be set to the highest value that the network infrastructure supports. For most LANs and public networks this would be 1500 bytes, but networks that use links that encapsulate IP packets within IP packets (e.g., a VPN), or cellular networks, will have a reduced MTU. Max and min settings are 1200-1500.</p> <p><b>Note:</b> If packets are being dropped, a ping length can be sent to discover the maximum MTU, i.e., ping <code>&lt;ip_address&gt; -f -l 500</code>. The number can be adjusted until the maximum is found. Because the length of the ping does not take account of 28 bytes of IP and ICMP packet headers, a length of 1472 creates packets that have 1500 bytes of payload. Therefore, the MTU should be set to the <math>L_{max} + 28</math> where <math>L_{max}</math> is the largest ping that will go through the network unfragmented and without timeout.</p> |
| Actual address | This is the IP address that has been allocated to the node.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## 7.4 Region & Time

The Region & Time pages allow you to configure settings which can be used for GPS, Wi-Fi, and timestamps.



### 7.4.1 Region

| REGION              |               |
|---------------------|---------------|
| Time zone continent | America       |
| Time zone           | US - New_York |
| Wi-Fi country code  | US            |

| Item                | Description                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time zone continent | Select the time zone for the continent.                                                                                                                          |
| Time zone           | Select the time zone for the country. No selection will default to UTC time. This will be displayed on the OSD, if selected.                                     |
| Wi-Fi country code  | If you are using a Wi-Fi dongle, you will need to select the country code. This will ensure that channel selection is valid for the country it is being used in. |

### 7.4.2 Units

| UNITS       |       |
|-------------|-------|
| Speed units | Knots |

If you have a GPS receiver connected to a node it can supply speed data. Select the preferred speed units to be displayed.

### 7.4.3 Network Time

NETWORK TIME

Local time sync

Off / NTP

NTP server

0.0.0.0

Stratum

10

Act as NTP server

☐ No

Enable Peering

☐ No

**Note:** Time status can be viewed in the **Status>Node Table** page, see *Section 6.2.6*.

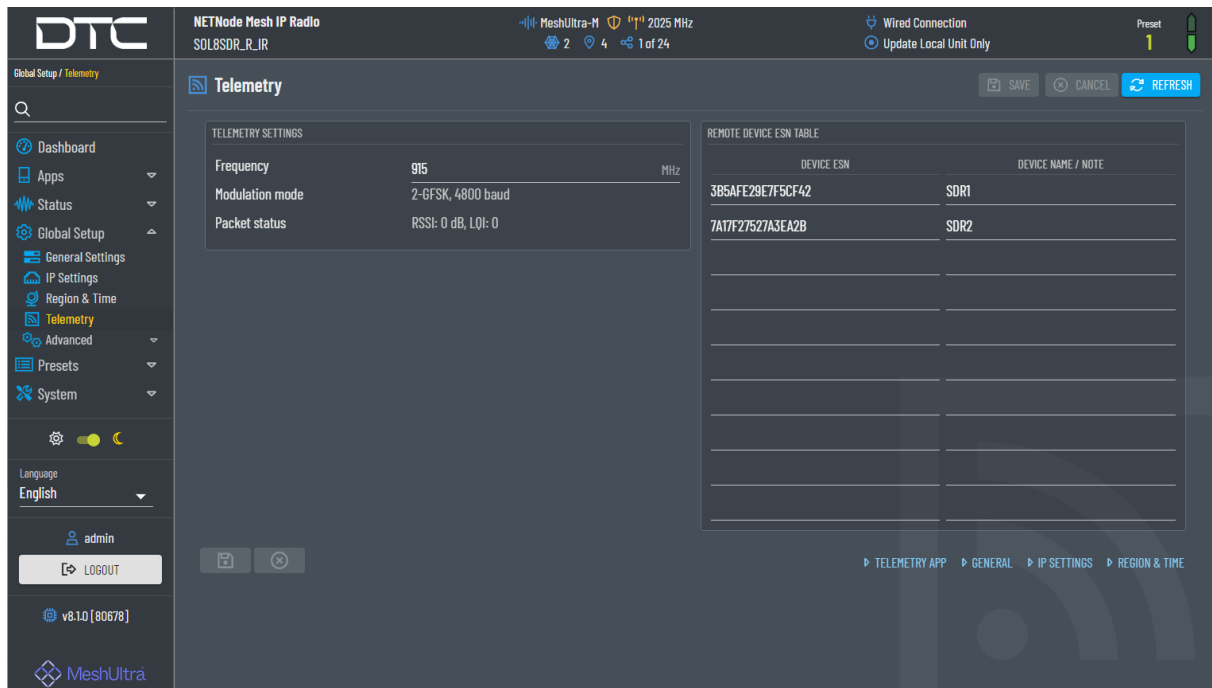
| Item              | Description                                                                                                                                                                                                                                                                    |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local time sync   | Select the source for time synchronisation.                                                                                                                                                                                                                                    |
| NTP server        | Enter a Network Time Protocol (NTP) server IP address for clock synchronization. This can be verified in the <b>System&gt;Information</b> page.<br>If the address is 0.0.0.0, the clock will align to the PC time and will have to be set manually, see <i>Section 9.4.2</i> . |
| Stratum           | The stratum indicates how many hops away from a computer with an attached reference clock we are. The default setting is low enough to ensure the external server is referenced.                                                                                               |
| Act as NTP server | Set to <b>Yes</b> to allow the node to act as a time server for the Mesh network. All other nodes in the network will need to reference this node as the NTP server.                                                                                                           |
| Enable Peering    | Peering ensures the Mesh network maintains the clock synchronisation if connection to the time reference fails. The node with the lowest IP address will be nominated as the reference.                                                                                        |

## 7.5 Telemetry

### 7.5.1 Introduction

**Telemetry** is applicable for products with built-in telemetry modules. These nodes have an internal 10mW telemetry transceiver which can be used to send and receive telemetry data or control a remote device. The range is compatible with the range for 100mW RF COFDM signal. DTC's SOL8TELTRX product will achieve greater ranges for use with nodes with 1W amplifiers.

The Telemetry page allows you to setup communications with remote telemetry modules. The Telemetry application can then be used for remote device control, see *Section 5.7*.



### 7.5.2 Telemetry Settings

| TELEMETRY SETTINGS |                    |
|--------------------|--------------------|
| Frequency          | 915 MHz            |
| Modulation mode    | 2-GFSK, 4800 baud  |
| Packet status      | RSSI: 0 dB, LQI: 0 |

| Item          | Description                                                                                                                                                                                                                         |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency     | Enter a frequency in the range of the telemetry transceiver.<br>The telemetry module will be in the ISM band 433MHz or 915MHz. This is defined by the part number of the unit.                                                      |
| Mod mode      | 2 GFSK, 4800 baud is the only mode currently available.                                                                                                                                                                             |
| Packet status | Displays the Received Signal Strength Indication (RSSI) and colour-coded Link Quality Indicator (LQI) of the telemetry signal.<br>Initially, the packet status will be 0 but will display RSSI and LQI figures when data is passed. |

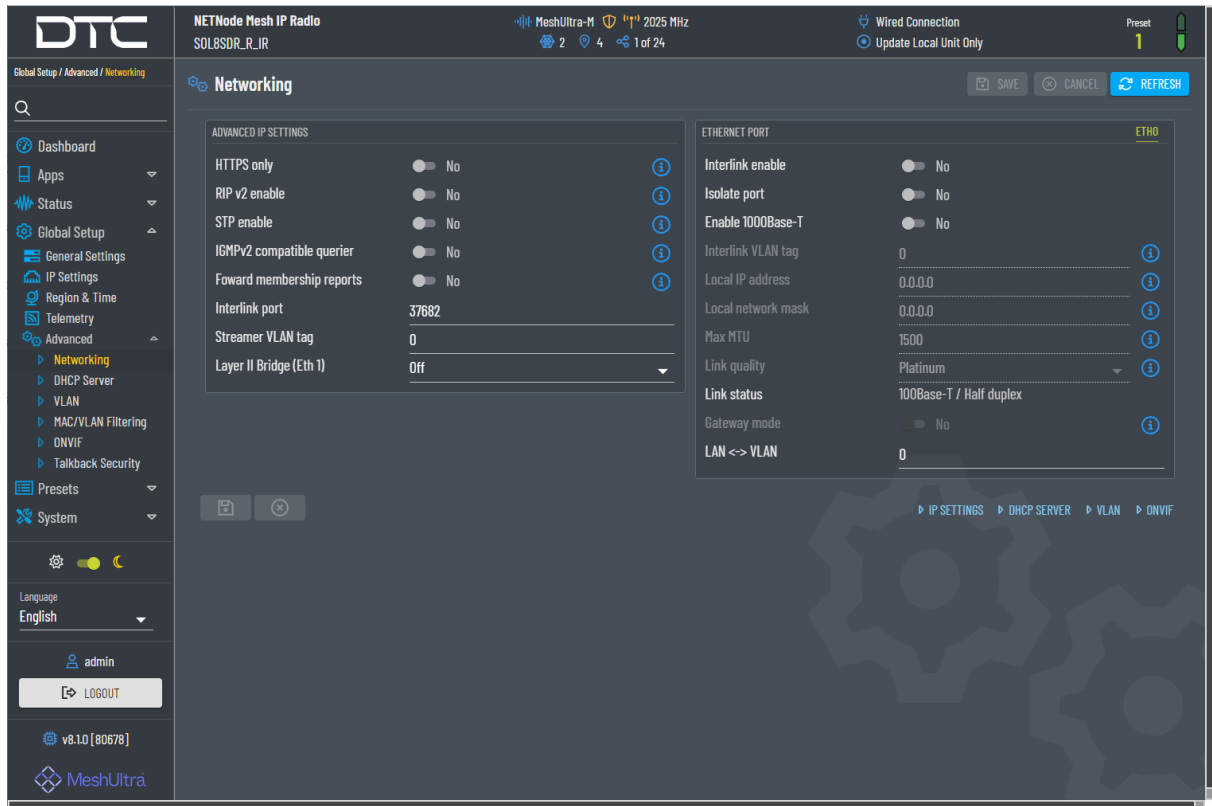
### 7.5.3 Remote Device ESN Table

| REMOTE DEVICE ESN TABLE |                    |
|-------------------------|--------------------|
| DEVICE ESN              | DEVICE NAME / NOTE |
| 111222233334444         | Node1              |
| 5555666677778888        | Node2              |
| 9999aaaabbbbcccc        | Node3              |
|                         |                    |

| Item             | Description                                                                                                                                                                                                                                    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device ESN       | Enter the electronic serial number (ESN) of a compatible telemetry device. Up to ten device ESNs can be entered.<br><br>Telemetry commands can be sent to the device ESN selected from the dropdown menu in the <b>Apps&gt;Telemetry</b> page. |
| Device Name/Note | Enter an identifying name or note for the device.                                                                                                                                                                                              |

## 7.6 Advanced>Networking

The **Advanced Networking** page allows configuration of miscellaneous IP parameters and Interlinking.



### 7.6.1 Advanced IP Settings

| ADVANCED IP SETTINGS       |                             |                   |
|----------------------------|-----------------------------|-------------------|
| HTTPS only                 | <input type="checkbox"/> No | <a href="#">?</a> |
| RIP v2 enable              | <input type="checkbox"/> No | <a href="#">?</a> |
| STP enable                 | <input type="checkbox"/> No | <a href="#">?</a> |
| IGMPv2 compatible querier  | <input type="checkbox"/> No | <a href="#">?</a> |
| Forward membership reports | <input type="checkbox"/> No | <a href="#">?</a> |
| Interlink port             | 37682                       |                   |
| Streamer VLAN tag          | 0                           |                   |
| Layer II Bridge (Eth 1)    | Off                         |                   |

| Item       | Description                                                                                                                                                                                                                                                                  |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HTTPS only | <p>HTTPS is a licensed feature which is used for secure communication over a computer network between a web browser and server. <b>HTTPS only</b> will ensure that only HTTPS communications are possible.</p> <p>Please see the <i>Hardware Guide</i> for full details.</p> |

| Item                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RIP v2 enable                                                     | <p>Routing Information Protocol prevents loops by limiting the number of hops in a path. RIP v2 carries subnet information supporting CIDR.</p> <p>If selected, this will enable snooping of RIP v2 packets to automatically identify gateways to different subnets.</p>                                                                                                                                                                                                                                                                                                                                                                                                      |
| STP enable                                                        | <p>Spanning Tree Protocol (PVST Cisco) allows external routers to check for IP loops in the network.</p> <p>DTC devices do not support Rapid STP (RPVST Cisco).</p> <p>Please read <b>Note</b> and <b>Caution</b> below.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IGMPv2 compatible querier                                         | <p>IGMP protocol is used to establish multicast group membership which allows more efficient use of resources. One device on a network is elected to be a querier.</p> <p>Mesh supports IGMPv3 by default. This may need to be enabled when streaming IP multicasts in systems that only support IGMPv2.</p>                                                                                                                                                                                                                                                                                                                                                                  |
| Forward membership reports                                        | <p>The default behaviour for Mesh IGMP networks is NOT to forward membership reports. This is the preferred setting when the node is connected to an unmanaged switch, hub or computer to prevent unintended cancellation of reports causing intermittent loss of multicasts.</p> <p>However, if the node is connected to a layer 2 or 3 switch or router, membership reports will need to be forwarded to allow the IGMP report suppression mechanism to operate.</p>                                                                                                                                                                                                        |
| Interlink port                                                    | The Interlink port number for UDP/TCP packets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Streamer VLAN tag                                                 | A VLAN tag is an identifier for a VLAN network. This number is the VLAN used for IP streaming.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Layer II Bridge (Ethn)<br>(Eth1 for an SDR or Eth2 for a NETNode) | <p>This licensed feature will allow Ethernet layer 2 communications over a Mesh network. The layer 2 bridge device must be connected to the node using a USB to Ethernet adaptor (must support Jumbo frames for larger MTUs). The USB mode should be set to host, or device if using RNDIS.</p> <p>Select <b>802.11AE MACsec</b> for protocols that require media access independent security or <b>All protocols</b> to allow any protocol to be passed.</p> <p>It is highly recommended to set this to Off when not being used.</p> <div> <p><b>Notes:</b> When enabled, the <b>Eth(USB)</b> settings will be hidden. Occupancy will increase when in this mode.</p> </div> |

**STP Note:** A packet entering a port of the Mesh network is forwarded on to all other ports on the Mesh in the same way as a broadcast packet. A fixed value of 5000000 is added to the current route path cost for STP packets which go across the radio interface. This allows a router to favour non-Mesh radio routes when a direct Ethernet path is available.

**STP CAUTION:** It is recommended to disable STP in Interlink mode. During a leader-follower switch it is possible for an STP packet originating from a router port to be sent back to the same port. This may cause the port to shut down.

## 7.6.2 Ethernet Port

ETHERNET PORT

ETH0 ETH1(USB)

Interlink enable ☒ Yes

Isolate port ☐ No

Enable 1000Base-T ☐ No

Interlink VLAN tag 0

Local IP address 0.0.0.0

Local network mask 0.0.0.0

Max MTU 1500

Link quality Platinum

Link status 100Base-T / Full duplex

Gateway mode ☒ Yes

LAN <-> VLAN 0

GATEWAY SETTINGS: 1

Remote address 0.0.0.0

Gateway 0.0.0.0

CLEAR 1 CLEAR ALL

**Eth0** port is the default port for IP communications with the node.

**Eth(USB)** settings will show when:

1. The **USB Mode** is set to **Device**.
2. The **USB Mode** is set to **Host** and a USB to Ethernet adaptor is attached into the USB port.

**CAUTION:** A USB to Ethernet adaptor may be used as an Ethernet port. However, only one port can be physically connected otherwise IP loops may occur.

3. The **USB Mode** is set to **Host** and a 4G dongle is attached into the USB port. 4G dongles that are currently supported are detailed in the *Hardware Guide*.

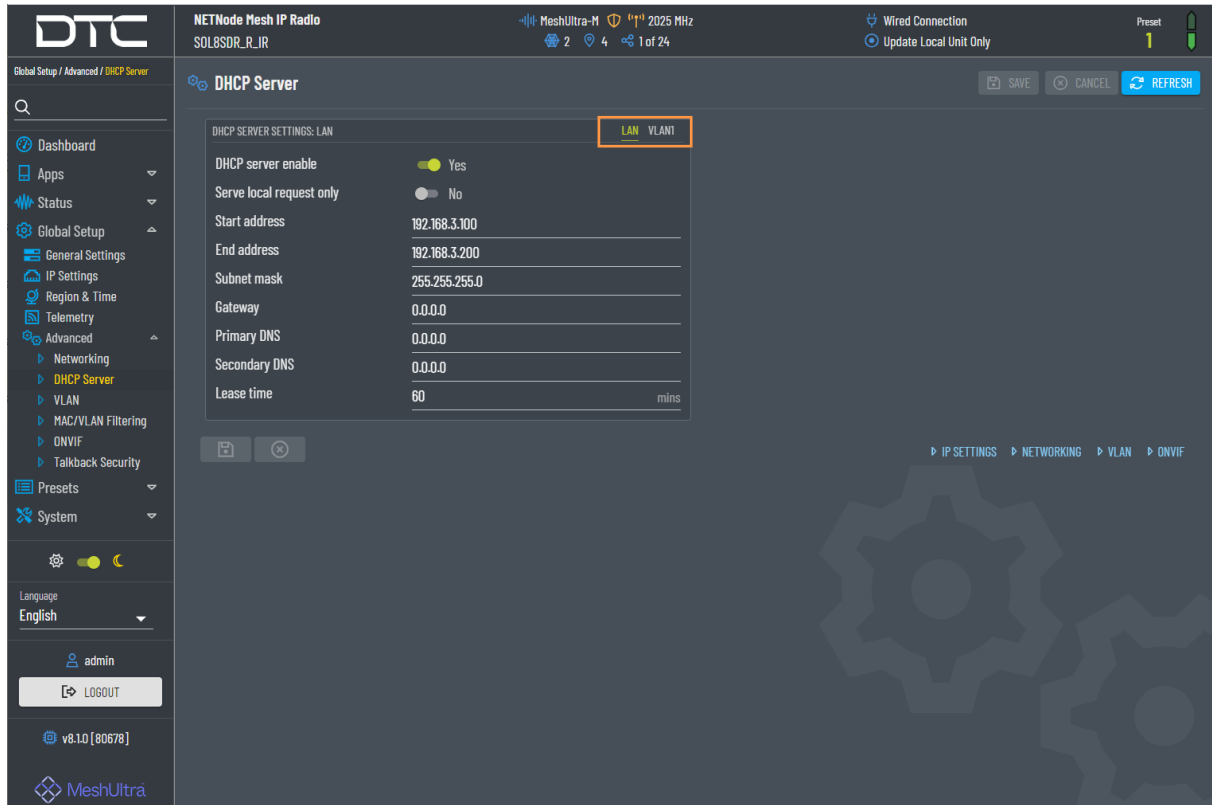
| Item               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interlink enable   | Interlink allows nodes to forward IP data through a backbone network as if this were an additional radio link.<br><br>Please read <i>Chapter 10</i> for detailed Interlink operation.                                                                                                                                                                                                                                                                                     |
| Isolate port       | If set to <b>Yes</b> , all incoming and outgoing traffic is removed from the port except the Interlink data, acting like a firewall.<br><br>Care should be taken not to block all ports and have no IP connection. Do not block ports which have IP cameras attached which require IP data to pass. Node Finder can be used to manually unblock ports.<br><br><b>Note:</b> If only one port is available for IP and Interlink, see the <b>Interlink VLAN tag</b> setting. |
| Enable 1000Base-T  | If set to <b>Yes</b> , the IP port will support Gigabit Ethernet data rates.                                                                                                                                                                                                                                                                                                                                                                                              |
| Interlink VLAN tag | Interlink data is sent over the internet or a layer II network.<br><br>When only one Ethernet port is available for both local IP and Interlink data, it will be necessary to isolate the Interlink data from the main network. See example in <i>Section 10.3</i> .                                                                                                                                                                                                      |
| Local IP address   | A fixed IP address needs to be assigned to the unit in Interlink mode. This must be different between all nodes and from the main IP address of the unit.                                                                                                                                                                                                                                                                                                                 |

| Item               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local network mask | The network mask divides a network into smaller more efficient subnets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Max MTU            | <p>The maximum transmission unit (MTU) should be set to the highest value that the network infrastructure supports. For most LANs and public networks this would be 1500 bytes, but networks that use links that encapsulate IP packets within IP packets (e.g., a VPN), or cellular networks, will have a reduced MTU.</p> <p><b>Note:</b> If packets are being dropped, a ping length can be sent to discover the maximum MTU, i.e., ping &lt;ip_address&gt; -f -l 500. The number can be adjusted until the maximum is found. Because the length of the ping does not take account of 28 bytes of IP and ICMP packet headers, a length of 1472 creates packets that have 1500 bytes of payload. Therefore, the MTU should be set to the Lmax + 28 where Lmax is the largest ping that will go through the network unfragmented and without timeout.</p> |
| Link quality       | Link quality is the fall over condition at which Interlinking will be enabled. Platinum is a permanent Interlink but all other settings are based on the RF link quality defined in <i>Section 6.3</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Link status        | Displays the transmission speed and physical port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Gateway mode       | Up to eight gateways can be specified. Gateway mode is used when Interlink is operated over a firewall or Layer 3 network such as an ADSL router over the Internet. Layer 3 networks are sometimes deployed at remote sites with private ADSL connections.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| LAN <-> VLAN       | <p>This will add a VLAN tag as a packet enters the port. Only VLAN packets with the correct tag will exit the port, this will need to be configured in the VLAN settings for the connected node and for the endpoint node.</p> <p>This feature may be used where a camera is connected to an IP port so that other users cannot view the video.</p> <p><b>Note:</b> Mesh devices do not support native VLAN on a trunk port.</p>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Remote address     | Valid when <b>Gateway Mode</b> is enabled. The <b>Remote Address</b> is the external address of the network or node you are trying to connect to. The IP address of the fixed end point behind which the Interlink end point node is located.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gateway            | Valid when <b>Gateway Mode</b> is enabled. The gateway allows you to setup an independent network with the router or 4G dongle and will be on the same subnet as the <b>Local IP Address</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## 7.7 Advanced>DHCP Server

The node can be set up to be a DHCP server for nodes and devices on the local network or for VLANs. Select the relevant tab for the network.

**Note:** The DHCP enable setting in the **IP Settings** (Section 7.3) or **VLAN** page (Section 7.9) must be set to **No** to configure the DHCP server settings.



| Property                     | Description                                                                                                                                                                                                       |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DHCP server enable           | When set to <b>Yes</b> , this node will act as a DHCP server.                                                                                                                                                     |
| Serve local requests only    | When set to <b>Yes</b> , will prevent DHCP requests flooding the RF network. This setting will serve IP devices which are physically connected to a node, i.e., not wireless.                                     |
| Start address<br>End address | The DHCP address range.                                                                                                                                                                                           |
| Subnet mask                  | The subnet mask divides a network into smaller more efficient subnets.                                                                                                                                            |
| Gateway                      | A gateway is an access point to another network. The gateway address is usually a router interface to send IP packets out of the local network.                                                                   |
| Primary DNS<br>Secondary DNS | The DNS server addresses will allow local DHCP devices to perform domain name lookups. Where any upstream nodes permit the DNS traffic, routing is available, and the internet is connected via a gateway router. |
| Lease time                   | The length of time an IP address is reserved for a device.<br><b>Note:</b> To ensure the DHCP address pool remains available, either increase the address range or decrease the lease time.                       |

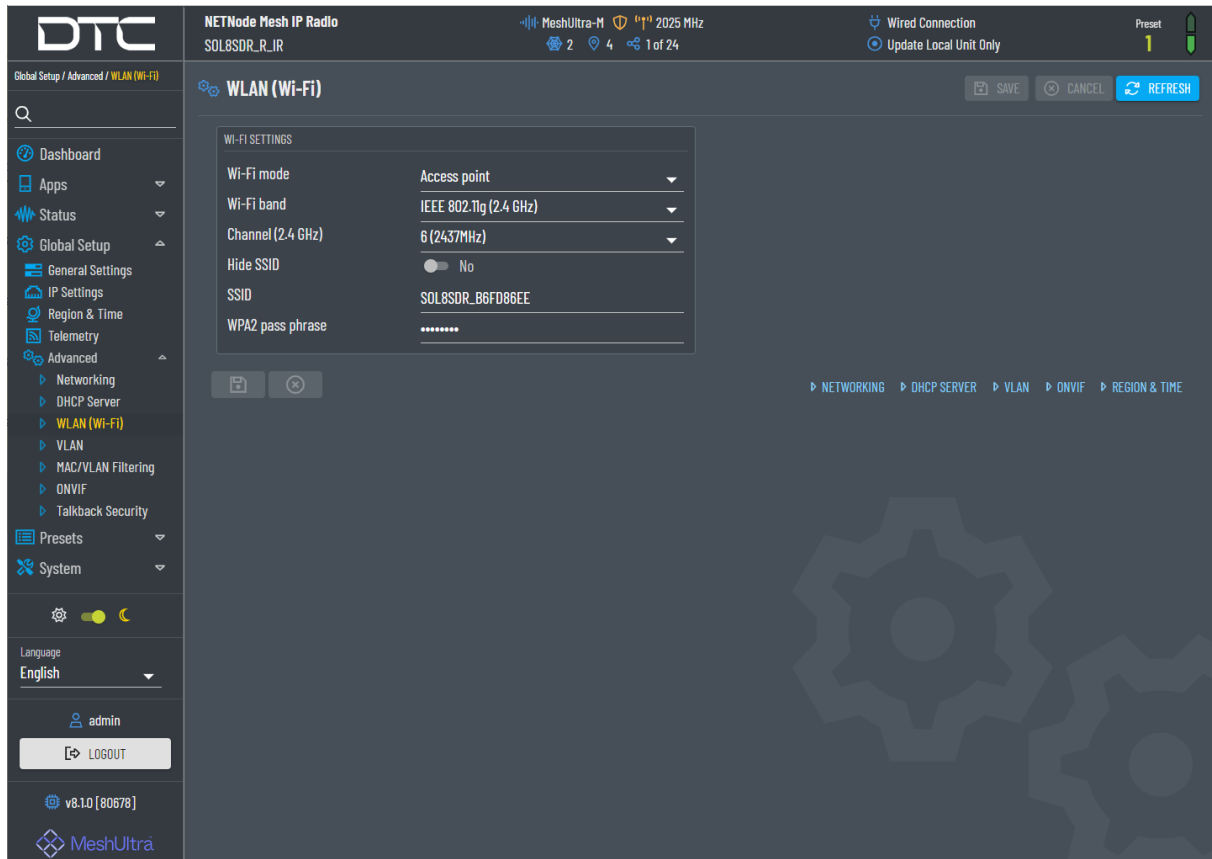
## 7.8 Advanced>WLAN (Wi-Fi)

Wi-Fi dongles can be used as access points for communications when attached to the USB port. The **WLAN (Wi-Fi)** page will open when a Wi-Fi dongle is inserted into the USB port.

The USB port must be set to Host in the **Global Setup>General Settings** page and the W-Fi country code can be configured in the **Global Setup>Region & Time** settings.

Wi-Fi dongles that are currently supported are detailed in the *Hardware Guide*.

**Note:** If the node is not connected to a DHCP server, the IP address of the node and the Wi-Fi connected device will need to be fixed.

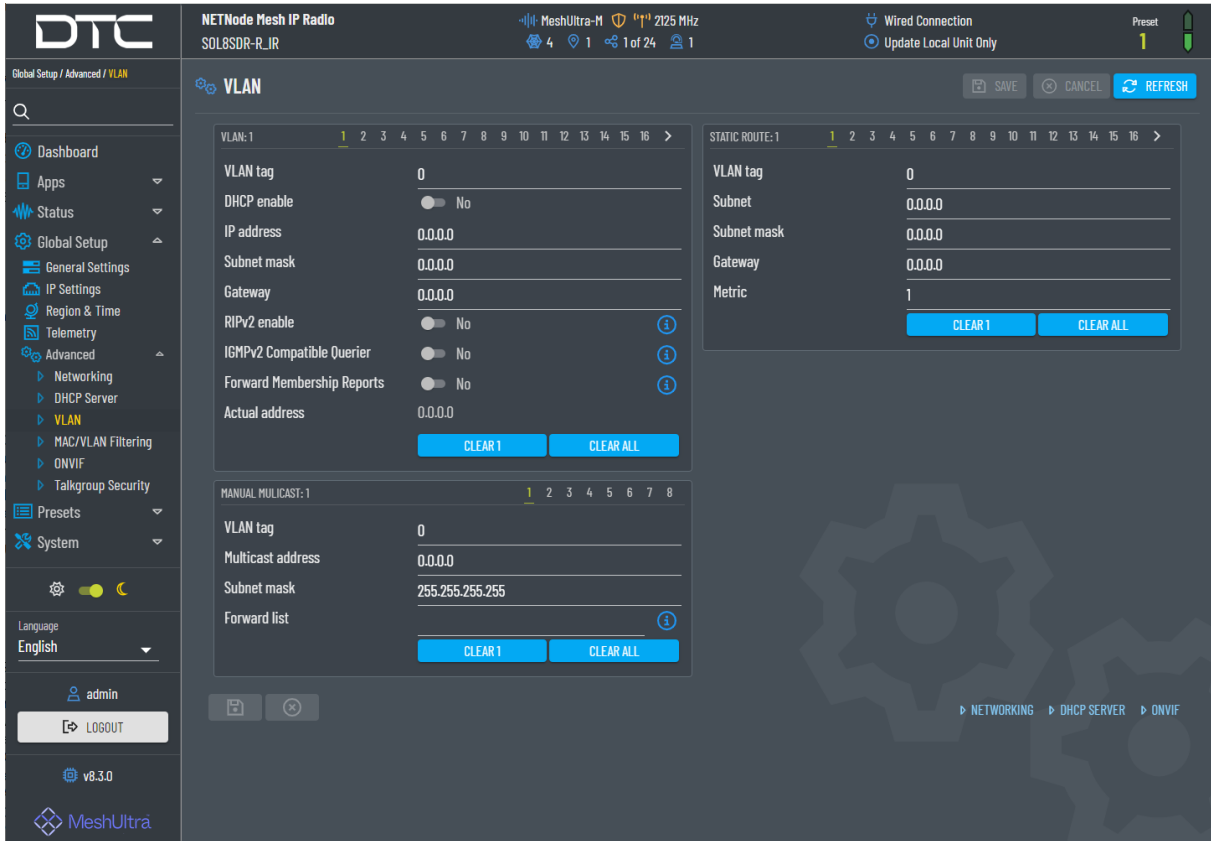


| Property         | Description                                                                                                                                                                                                                                          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wi-Fi mode       | Set to Access Point to allow the node to connect to other Wi-Fi enabled devices.                                                                                                                                                                     |
| Wi-Fi band       | Set the Wi-Fi Band for the system.                                                                                                                                                                                                                   |
| Channel          | In the 2.4GHz band, channels 1, 6 and 11 are primary Wi-Fi channels.<br>For further information on WLAN channels, please see <a href="https://en.wikipedia.org/wiki/List_of_WLAN_channels">https://en.wikipedia.org/wiki/List_of_WLAN_channels</a> . |
| Hide SSID        | When this is set to <b>Yes</b> , the Wi-Fi device will appear as a Hidden Network.<br>The SSID will need to be entered manually on connection.                                                                                                       |
| SSID             | A Service Set Identifier (SSID) is the public name to identify the wireless network.                                                                                                                                                                 |
| WPA2 pass phrase | The password must be a minimum of 8 characters.                                                                                                                                                                                                      |

## 7.9 Advanced>VLAN

A **VLAN** (virtual local area network) enables several networks to share the same physical resources such as routers and cabling while remaining fully independent of each other.

The settings described are for Mesh nodes with a physical Ethernet connection, nodes connected wirelessly will pass all VLAN traffic.



**NETNode Mesh IP Radio**  
SDL8SDR-R\_LR

MeshUltra-M 2025 MHz  
4 1 1 of 24 1

Wired Connection  
Update Local Unit Only

Preset 1

Global Setup / Advanced / **VLAN**

**VLAN**

VLAN: 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 >

VLAN tag 0

DHCP enable ☐ No

IP address 0.0.0.0

Subnet mask 0.0.0.0

Gateway 0.0.0.0

RIPv2 enable ☐ No ⓘ

IGMPv2 Compatible Querier ☐ No ⓘ

Forward Membership Reports ☐ No ⓘ

Actual address 0.0.0.0

CLEAR 1 CLEAR ALL

STATIC ROUTE: 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 >

VLAN tag 0

Subnet 0.0.0.0

Subnet mask 0.0.0.0

Gateway 0.0.0.0

Metric 1

CLEAR 1 CLEAR ALL

MANUAL MULTICAST: 1 1 2 3 4 5 6 7 8

VLAN tag 0

Multicast address 0.0.0.0

Subnet mask 255.255.255.255

Forward list ⓘ

CLEAR 1 CLEAR ALL

admin

LOGOUT

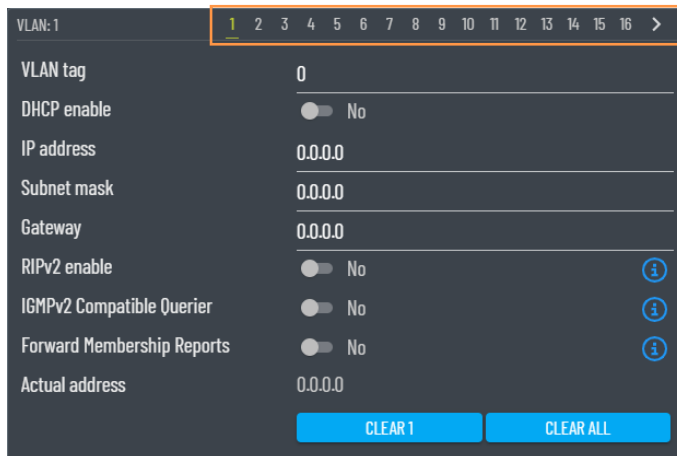
v8.3.0

MeshUltra

▶ NETWORKING ▶ DHCP SERVER ▶ ONVIF

### 7.9.1 VLAN

The Mesh supports up to 32 VLAN configurations. See *Section 11.4* for further details.



| Property                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN tag                   | A VLAN tag is an identifier for a VLAN network.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DHCP enable                | If set to <b>Yes</b> , a DHCP server on the network will allocate the IP address.<br>If set to <b>No</b> , the remaining IP settings will have to be entered manually.<br>If set to <b>No</b> , the node can be configured as a DHCP server for the VLAN, see <i>Section 7.7</i> .                                                                                                                                                                              |
| IP address                 | If the radio is not automatically acquiring its VLAN IP address through a DHCP server then a fixed IP address needs to be assigned to the unit                                                                                                                                                                                                                                                                                                                  |
| Subnet mask                | The subnet mask divides a network into smaller more efficient subnets.                                                                                                                                                                                                                                                                                                                                                                                          |
| Gateway                    | A gateway is an access point to another network. The gateway address is usually a router interface to send IP packets out of the local network.                                                                                                                                                                                                                                                                                                                 |
| RIP v2 enable              | Routing Information Protocol prevents loops by limiting the number of hops in a path. RIP v2 carries subnet information supporting CIDR.<br>If selected, this will enable snooping of RIP v2 packets to automatically identify gateways to different subnets.                                                                                                                                                                                                   |
| IGMPv2 Compatible Querier  | IGMP protocol is used to establish multicast group membership which allows more efficient use of resources. One device on a network is elected to be a querier.<br><br>Mesh supports IGMPv3 by default. This setting may need to be enabled when streaming IP multicasts in systems that only support IGMPv2.                                                                                                                                                   |
| Forward Membership Reports | The default behaviour for Mesh IGMP networks is NOT to forward membership reports. This is the preferred setting when the node is connected to an unmanaged switch, hub or computer to prevent unintended cancellation of reports causing intermittent loss of multicasts.<br><br>However, if the node is connected to a layer 2 or 3 switch or router, membership reports will need to be forwarded to allow the IGMP report suppression mechanism to operate. |
| Actual address             | This is the IP address that has been allocated to the node.                                                                                                                                                                                                                                                                                                                                                                                                     |

### 7.9.2 Manual Multicast

If the external multicast router management interface is not accessible and the multicast router has a lower IP address than all Mesh nodes, then multicast routes can be set up to forward IGMP membership reports for both LAN and VLANs. This will cause the external multicast router to continue to forward IGMP membership reports to the Mesh.

This may also be useful when the user wishes to override the default behaviour of the Mesh of selecting the node with the lowest IP address which may have poor RF connectivity, instead the user can choose the node which has good RF connectivity.

A querier can be setup for each VLAN. The presence of a forced querier will automatically prevent any other (non-forced) queriers starting up on the local (but not on a remote) Mesh network.

The **Manual Multicast** settings allow you to manually set up forwarding rules for multicasts and VLANs. The Mesh supports up to 8 configurations.

| Property          | Description                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN tag          | A VLAN tag is an identifier for a VLAN network. Leave as 0 if on the main LAN.                                                                                                                                                                                                                                                                                                 |
| Multicast address | The address used by the unit for multicasting.                                                                                                                                                                                                                                                                                                                                 |
| Subnet mask       | The subnet mask divides a network into smaller more efficient subnets.                                                                                                                                                                                                                                                                                                         |
| Forward list      | <p>A comma separated list (with no spaces) of destination unit names and/or Ethernet ports.</p> <p><b>LocalEth</b> will allow the multicast to come out of all local Ethernet ports rather than specific ones.</p> <p><b>All</b> will forward multicasts messages to all nodes without relying on an external IGMP router. This may be useful for large Mesh ATAK systems.</p> |

#### Multicast Forwarding Rules for Nodes

To send multicast packets across the Mesh a set of rules are applied:

1. IP packets with destination address 224.0.0.0 are blocked; these are used internally within the Mesh.
2. IP packets with destination addresses 224.0.0.1 to 224.0.0.255 and 239.255.255.250 (SSDP) are flooded to all nodes and interfaces regardless of being members of the group or not.
3. All other multicast packets are forwarded only to nodes and interfaces which are members of the group.

Although non-registered groups should be forwarded to all destinations, this is prevented in the Mesh to control bandwidth.

There are two types of interface as far as IGMP is concerned:

- Multicast-router interfaces: these interfaces lead towards multicast routers or IGMP queriers
- Group-member interfaces: these interfaces lead towards hosts

### 7.9.3 Static Routes

**Static routes** can be added for subnets which are not part of the Mesh subnet. Any packet which matches the subnet specified will be forwarded to that gateway rather than the default gateway. See example in *Section 11.5*.

The Mesh supports up to 32 configurations.

STATIC ROUTE: 1

VLAN tag: 0

Subnet: 0.0.0.0

Subnet mask: 0.0.0.0

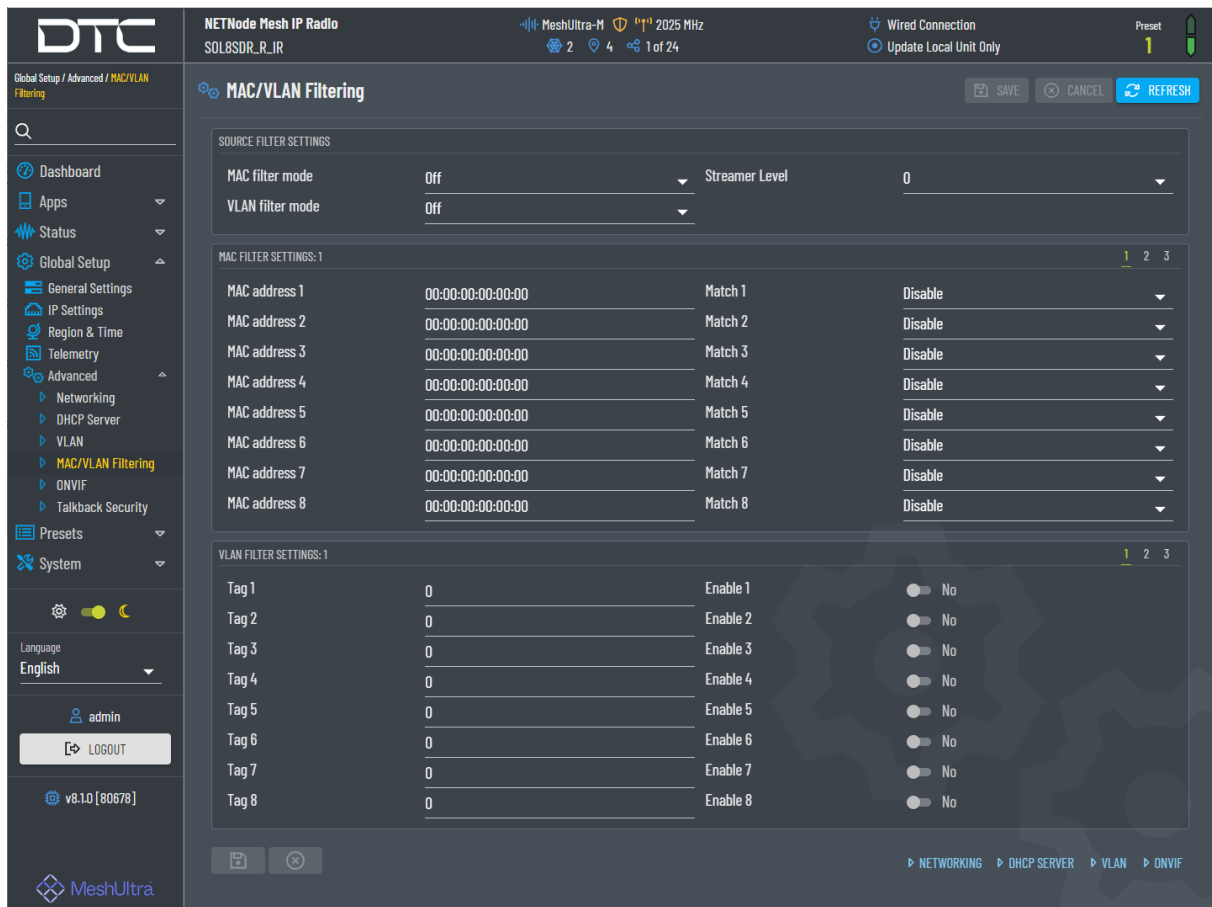
Gateway: 0.0.0.0

Metric: 1

CLEAR 1 CLEAR ALL

| Property    | Description                                                                                                                                           |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN tag    | A VLAN tag is an identifier for a VLAN network. Leave as 0 if on the main LAN.                                                                        |
| Subnet      | An IP address on the subnet physically connected to the static router.                                                                                |
| Subnet mask | The subnet mask divides a network into smaller more efficient subnets.                                                                                |
| Gateway     | A gateway is an access point to another network. The gateway address is usually a router interface to send IP packets out of the local network.       |
| Metric      | A metric is a field in a routing table which helps choose the best route to a destination. The route will go in the direction with the lowest metric. |

## 7.10 Advanced>MAC/VLAN Filtering



**NETNode Mesh IP Radio**  
SOL8SDR\_R\_IR

MeshUltra-M 2025 MHz  
2 4 1 of 24

Wired Connection  
Update Local Unit Only

Preset 1

**MAC/VLAN Filtering**

SAVE CANCEL REFRESH

**SOURCE FILTER SETTINGS**

MAC filter mode Off Streamer Level 0

VLAN filter mode Off

**MAC FILTER SETTINGS: 1**

| MAC address   | Match             | Action          |
|---------------|-------------------|-----------------|
| MAC address 1 | 00-00-00-00-00-00 | Match 1 Disable |
| MAC address 2 | 00-00-00-00-00-00 | Match 2 Disable |
| MAC address 3 | 00-00-00-00-00-00 | Match 3 Disable |
| MAC address 4 | 00-00-00-00-00-00 | Match 4 Disable |
| MAC address 5 | 00-00-00-00-00-00 | Match 5 Disable |
| MAC address 6 | 00-00-00-00-00-00 | Match 6 Disable |
| MAC address 7 | 00-00-00-00-00-00 | Match 7 Disable |
| MAC address 8 | 00-00-00-00-00-00 | Match 8 Disable |

**VLAN FILTER SETTINGS: 1**

| Tag   | Enable | Action      |
|-------|--------|-------------|
| Tag 1 | 0      | Enable 1 No |
| Tag 2 | 0      | Enable 2 No |
| Tag 3 | 0      | Enable 3 No |
| Tag 4 | 0      | Enable 4 No |
| Tag 5 | 0      | Enable 5 No |
| Tag 6 | 0      | Enable 6 No |
| Tag 7 | 0      | Enable 7 No |
| Tag 8 | 0      | Enable 8 No |

NETWORKING DHCP SERVER VLAN ONVIF

### 7.10.1 Source Filter Settings

**SOURCE FILTER SETTINGS**

MAC filter mode Off Streamer Level 0

VLAN filter mode Off

| Property         | Description                                                                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC filter mode  | Select whether to Block or Allow MAC addresses.                                                                                                                                                                                                                                                   |
| VLAN filter mode | Select whether to Block or Allow VLAN tags.                                                                                                                                                                                                                                                       |
| Streamer Level   | <p>The Streamer Level allows streams to be prioritised (<b>level 1</b> is the lowest). The streamer will be blocked if MAC/VLAN filter level is greater than the Streamer Level.</p> <p><b>Note:</b> The MAC/VLAN filter setting is applied for each preset, see <a href="#">Section 8.3</a>.</p> |

### 7.10.2 MAC Filter Settings

Up to three MAC Filter Settings are supported.

| MAC FILTER SETTINGS: 1 |                   |         |         |
|------------------------|-------------------|---------|---------|
| MAC address 1          | 00:00:00:00:00:00 | Match 1 | Disable |
| MAC address 2          | 00:00:00:00:00:00 | Match 2 | Disable |
| MAC address 3          | 00:00:00:00:00:00 | Match 3 | Disable |
| MAC address 4          | 00:00:00:00:00:00 | Match 4 | Disable |
| MAC address 5          | 00:00:00:00:00:00 | Match 5 | Disable |
| MAC address 6          | 00:00:00:00:00:00 | Match 6 | Disable |
| MAC address 7          | 00:00:00:00:00:00 | Match 7 | Disable |
| MAC address 8          | 00:00:00:00:00:00 | Match 8 | Disable |

| Property    | Description                                                                                                    |
|-------------|----------------------------------------------------------------------------------------------------------------|
| MAC address | MAC address entries for the system.                                                                            |
| Match       | Select <b>First 3 bytes</b> to match to an organisation.<br>Select <b>Full</b> to match the whole MAC address. |

### 7.10.3 VLAN Filter Settings

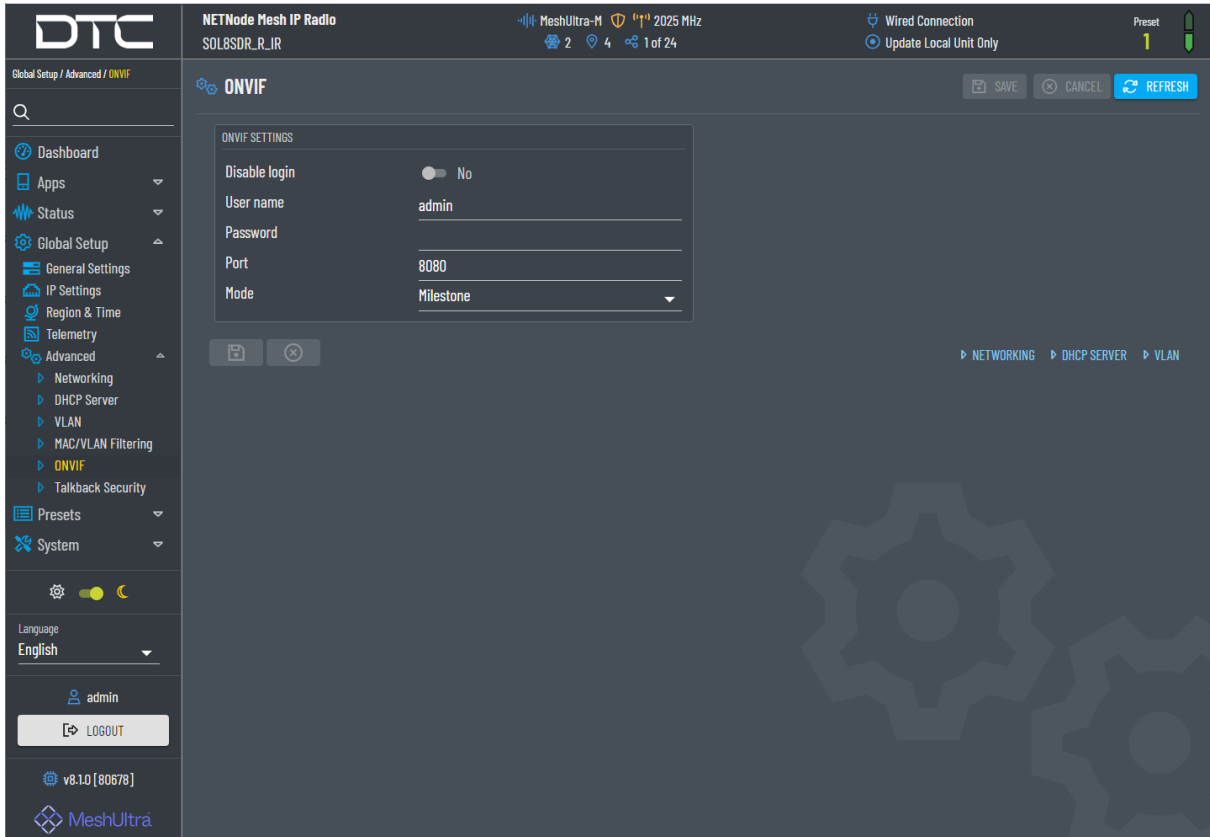
Up to three MAC Filter Settings are supported.

| VLAN FILTER SETTINGS: 1 |   |          |    |
|-------------------------|---|----------|----|
| Tag 1                   | 0 | Enable 1 | No |
| Tag 2                   | 0 | Enable 2 | No |
| Tag 3                   | 0 | Enable 3 | No |
| Tag 4                   | 0 | Enable 4 | No |
| Tag 5                   | 0 | Enable 5 | No |
| Tag 6                   | 0 | Enable 6 | No |
| Tag 7                   | 0 | Enable 7 | No |
| Tag 8                   | 0 | Enable 8 | No |

| Property   | Description                               |
|------------|-------------------------------------------|
| Tag 1-8    | VLAN tag entries for the system.          |
| Enable 1-8 | Set Enable to <b>Yes</b> to apply filter. |

## 7.11 Advanced>ONVIF

The ONVIF settings may be necessary for Video Management Software (VMS) users.

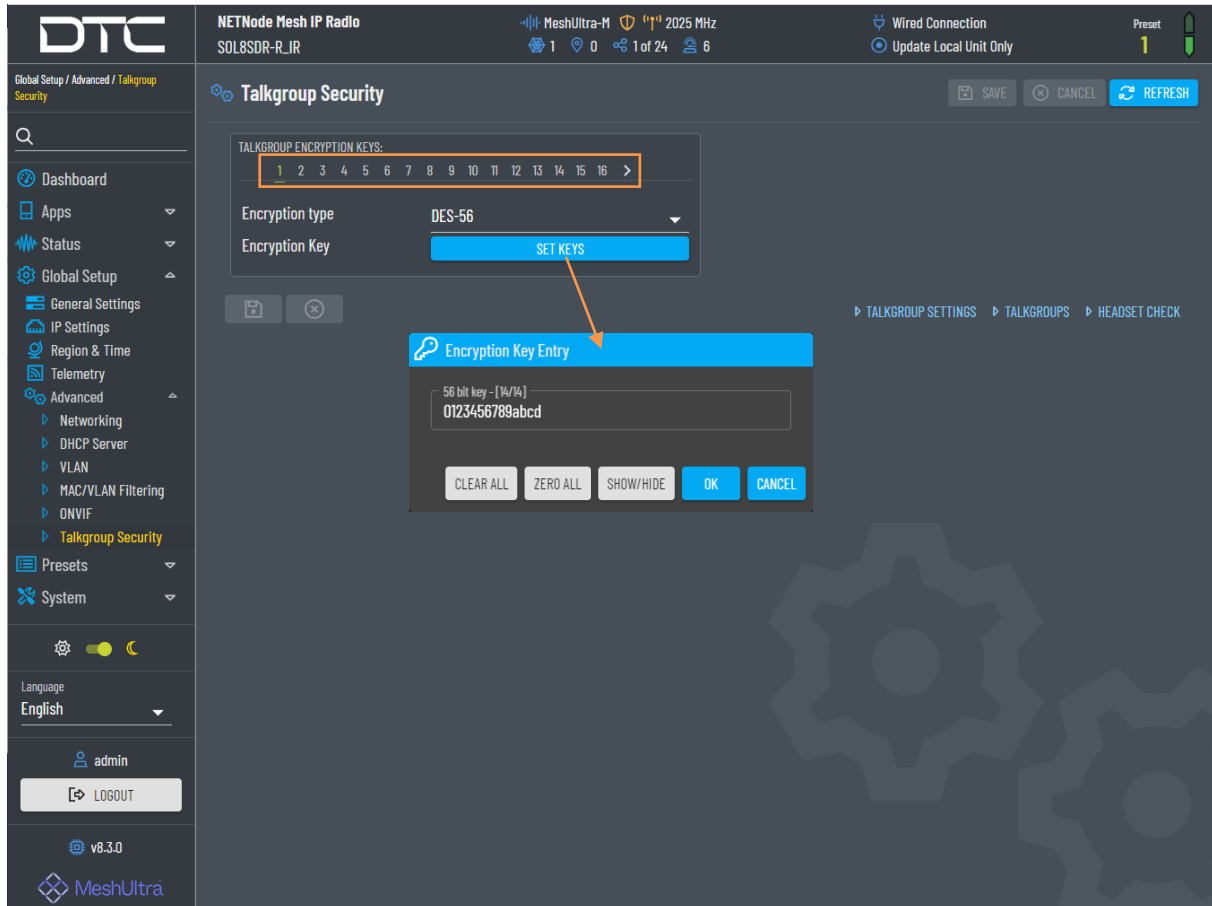


| Property      | Description                                                                                                                                                                                                                                                                                                                                         |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disable login | If set to <b>Yes</b> , the VMS will not be password protected.                                                                                                                                                                                                                                                                                      |
| User name     | The default user name is admin but can be user defined.                                                                                                                                                                                                                                                                                             |
| Password      | The default password is <b>Eastwood</b> but can be user defined.<br><b>Note:</b> The ONVIF password is set independently from the WUI password.                                                                                                                                                                                                     |
| Port          | The default port number is 8080 but can be edited.                                                                                                                                                                                                                                                                                                  |
| Mode          | <b>Milestone:</b> uses RTSP. Video and audio are on the same URL:<br>rtsp://<device_IP_address>/av1.sdp (or av2.sdp)<br><b>Genetec:</b> uses RTSP. Video and audio are on separate URLs:<br>rtsp://<device_IP_address>/video1.sdp (or video2.sdp)<br>rtsp://<device_IP_address>/audio.sdp (or audio2.sdp)<br><b>Off:</b> ONVIF server will not run. |

## 7.12 Advanced>Talkgroup Security

Encryption can be applied to talkgroup audio and applied to talk channels, see *Section 8.6*. Up to 32 key ring configurations are supported.

**Note:** Further information on encryption in DTC Mesh products, including details of FIPS accreditation, is provided in *Section 12.8*.

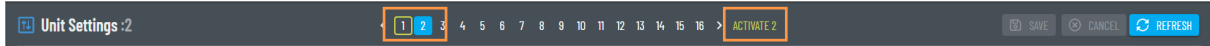


| Property        | Description                                                                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Scrambling mode | Select the encryption type from the dropdown menu.<br>DES encryption comes as standard on all variants but AES128 and AES256 are licensed features. |
| Scrambling key  | Click <b>Set Keys</b> to enter the key code.                                                                                                        |

## 8. Presets Pages

### 8.1 Introduction

Up to 16 presets that can be configured. The active preset will be outlined, and the selected preset will be highlighted blue. The selected preset can be edited without becoming active. **Activate** will make the highlighted preset active.



Settings can be edited and must be saved to make them active. Copy preset can save time on repeated entries.

| Item                                                                                                                                                                          | Description                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  SAVE<br>   | <p>Click the Save button to save changes.</p> <p>There is a save button at the top and bottom of the display.</p>                                                               |
|  CANCEL<br> | <p>If you make changes but do not click Save, click the Cancel button to return the current settings.</p> <p>There is a cancel button at the top and bottom of the display.</p> |
|  REFRESH                                                                                     | <p>Click Refresh to update the browser settings.</p>                                                                                                                            |
|  COPY PRESET 2                                                                              | <p>Click Copy Preset to copy settings to other presets. You can choose to copy the selected settings or all preset settings.</p>                                                |