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RMESH MRX.vehicle

Backhaul and Client Mesh Wireless Router

x **Wireless Router / Wireless Switch**

x **Mobile Ad-Hoc Network (MANET)**

x **High Throughput (up to 400 Mbit/s)**

x **Encrypted and meshed radio based on 802.11s (Mesh)**

x **Additional Wi-Fi Access Point to connect mobile devices**

x **Roaming supported for mobile devices**

x **Uplink in public mobile network (2G, 3G, 4G, 5G)**

x **LAN/WAN Ethernet-Ports (1000Mbit/s)**

x **GNSS support for localization and supervision**

The RMESH "wireless mesh" is an ad-hoc and mobile network based on Wi-Fi technology. Each RMESH MRX station serves as relay point as well as access point within the mesh. The mesh can be arbitrarilyenlarged and designed redundantly. New MRX stations are automatically recognized and integrated into the mesh. All user data and communication within the mesh are encrypted. Only devices that know the mesh-key can log in, collaborate and send/receive data.

The mesh can be used as a supply network which is flexible and very easy to expand. Places hard to reached are easily accessible through a daisy chain of RMESH MRX stations.

Introduction

The RMESH MRX technology for wireless mesh allows for an extensive, flexible, and robust radio network based on IEEE802.11 s (Mesh) standard. A uniqueprotocol allows for combining lots of RMESH MRX stations to a meshed network, with redundancy and autonomous path-finding. The communication andpayload traffic within the mesh is encrypted, and only stations, which know the mesh-key, can enter the network and get part of the system.

Any new station, which gets into the mesh's reach and knows the correct mesh-key is automatically integrated into the system, and the potential new paths are considered for usage. When stations disappear from the mesh, either because of power down or the radio distances are too high, the changed setup of the mesh is recognized, considered, and an autonomous re-route is done. There is no need to define alternative ways to prepare such cases.

The mesh is working without any external help or interaction - this makes it so robust and flexible. The RMESH MRX is the entry point into the mesh and offers different interfaces to connect the mesh towards WAN and connected clients. The WAN-port can either be a mobile uplink (2G, 3G, 4G) or the Ethernet link to an external router (TP, cable, mobile). Clients can be connected via a second Wi-Fi port, which is acting as a standard access-point. It uses non-meshed Wi-Fi, and laptops, mobile phones, or tablets can be connected via the wireless interface. Two Ethernet interfaces (1000BaseT) offer the possibility to connect PCs and external switches to the mesh.

The RMESH MRX can be installed in vehicles (ground, sea, air) and wall-mounted. Special housing is available to fit even the harshest environments.

Features

- Mesh acc. IEEE 802.11s
    - PHY compliant to IEEE 802.11 a/b/g/n
    - 2,4GHz and 5GHz supported
    - SDR integrated
    - Mesh operates in 2x2 MIMO

- High Bandwith (up to 300Mbps)

- High Distances (up to 2000m and more)
    - max.TX power limited by law (30dBm)
    - higher distances possible

- Mesh-Encryption AES256 (Auth-SAE)

- Traffic separation (user-groups) possible

- 2x 10/100/1000BaseT interfaces
    - LAN or WAN port

- Optional Wi-Fi AccessPoint (802.11 a/b/g/n/ac)
    - Operates in 3x3 MIMO

- Optional mobile uplink
    - EDGE, HSPA, UMTS, LTE

- Optional satellite navigation module

- Web-GUI (http/https)
    - local and remote access

- Redundant

- Easy to use
    - short installation time
    - easy to expand/modify
    - stations are free to move

- Fully autonomous operation
    - self-finding
    - self-healing

- Low power demand (<20W)
    - It depends on installed Wi-Fi and mobile features

- IP42 hardened housing

- azgMesh-Graph to show topology and peering
    - auto-discovery of all stations
    - RX power and throughput is visible
    - performance monitoring
    - direct access to stations
    - open for 3rd party equipment
    - Support of OpenStreetMap

Application Example

The RMESH MRX is designed to build a mobile ad-hoc network (MANET) for special situations where authorities or rescue forces need a reliable infrastructure. The RMESH MRX mesh is quickly installed and flexible in operation. When local infra- structure is destroyed, or during special missions, the need for an own data- and communication setup is needed in disaster areas. It must be robust, easy to install, simple to use, dynamic to establish, and reliable to operate. Seismic or flood areas, humanitarian disasters, or special operation forces need the MRX mesh to set up an independent network.

Technical Specifications

Common

- Wireless Router/ Wireless Switch
- Full encrypted wireless meshed network
- 1x Mesh-IF
- 1x WiFi AP (optional)
- 1x mobile uplink (optional)
- 1x GNSS (optional)
- Battery/UPS available (optional)

Mesh Radio

- 2x2 MIMO
- IEEE 802.11s
- Dual Band
    - 2.4GHz
    - BW: 5/10/20/40 MHz
    - Std: 2.412 - 2.472 GHz
    - SOR: 2.19 - 2.73 GHz(BOS)
    - max. 30dBm
  - 5GHz
    - BW: 5/10/20/40 MHz
    - Std: 5.180 - 5.825 GHz
    - SOR: 4.92 - 5.92 GHz(BOS)
    - max. 30dBm
- Throughput: up to 300 Mbit/s
- Modulation Techniques
  - OFDM: BPSK, QPSK, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM
- Support of radar detection
- Connector: 2x RP-SMA

Mesh Features

- IEEE 802.11s
- Full encrypted (AES 256)
    - Auth-SAE
    - AES-SIV (RFC5297)
- HWMP routing
    - Self-forming, self-healing
- Up to 255 notes per mesh network

Access Point (optional)

- 3x3 MIMO
- IEEE 802.11a/b/g/n/ac
- Dual Band
  - 2.4GHz
    - BW: 20/40 MHz
    - 2.412 - 2.472 GHz
    - max. 20dBm
  - 5GHz
    - BW: 20/40/80 MHz
    - 5.180 - 5.825 GHz
    - max. 20dBm
- Throughput: up to 1.300 Mbit/s
- Support of radar detection
- Connector: 3x RP-SMA
- Handover
- Mobile Controlled Handover (MCHO)
    - Fast Transition (IEEE802.11r)
- Security: WPA2 (WPA3)

Mobile Uplink (optional)

- EDGE, HSPA+, UMTS, LTE
- Network Bands:
    - LTE (FDD): B1,B2,B3, B4, B5, B7, B8, B20
  - DC-HSPA+/HSPA+/ HSPA/ UMTS: B1,B2,B5,B8
  - EDGE / GPRS / GSM: 850 / 900 / 1800 / 1900 MHz
- Speed/ Bandwidth:
    - DC-HSPA+ : Downlink: 42 Mbps, Uplink: 5.76 Mbps
    - LTE FOO: Downlink: 150 Mbps, Uplink: 50 Mbps @Bandwidth 20M
- 1x SIM
- Connector: 1x SMA

LAN/WAN Interfaces

- 2x 10/100/1000BaseT
    - IEEE 802.3
    - Auto-MDIX
    - Auto-Negotiation
- Connector: RJ45

Satellite Navigation GNSS (optional)

- GPS, GALILEO and/or GLONASS
- -166 dBm Navigation sensitivity
- TCXO based
- Up to 18 Hz Navigation Rate
- Active CW jamming detection
- Connector: 1x SMA

Other HW Interfaces

- 3x USB2.0 (host)
- 1x Serial
    - UART; RS-232
    - D-SUB9, male
- 1x Voice
    - MIC; Line OUT
- 1x Video
  - DVI-I (dual link)
- 4x GPIO (2x In/2x Out)
    - Relay 12V; 100mA

Security

- Encryption of all wireless traffic
- Hidden SSID
- IP Firewall @WAN-ports
- Traffic Separation (802.1ad)
- Login to device always secured

System Management

- Web-GUI

Build-in Servers and Clients

- DHCP server/ client
- NTP server / client

X
Technical Specifications (contd)

Physical

- Weight: 1440g
- Dim: 210x190x50mm
- Housing: Aluminium Alloy
- Mounting: vehicles (ground, sea, air) and Wall-mount

Power

- Power-Supply: 9-36VDC
  - ext. power supply (AC) available

- Power demand: <20W
  - peak demand up to 60W
- Fanless design
- Power management: Vehicle power ignition

Environment

- Operation: -40 .. +70°C, ambient w/air
- Storage: -40 .. +80°C
- Rel. Humidity: 10-90%, non-cond.

- Vibration: MIL-STD810F, Method 514.5
- Shock: MIL-STD810F, Method 516.5
- Crash: MIL-STD81OF, Method 516.5
- IP42 protection

Certification

- CE, eMark Compliance

azgMesh Graph

The Mesh Graph is a graphical tool to show the mesh, stations, and wireless connections between them. All discovered MRX stations are shown in the Graph, plus the active links between them. Different colors and line widths show the attenuation and data throughput in between. This makes it very easy tounderstand the mesh and watch its operation.

Area-sensitive tooltips can be shown to get more details about each station. If this is not sufficient, the symbol of the station gives direct access to log into the single device to gain full access.

The Mesh Graph is based on HTTP(s) connection, and a standard web browser is sufficient to use this mightytool.

In the example below, five RMESH MRX stations are discovered. The position of the devices is shown on a map and the quality of the connections between the individual nodes. Changes in the location of the nodes are shown in the Graph.
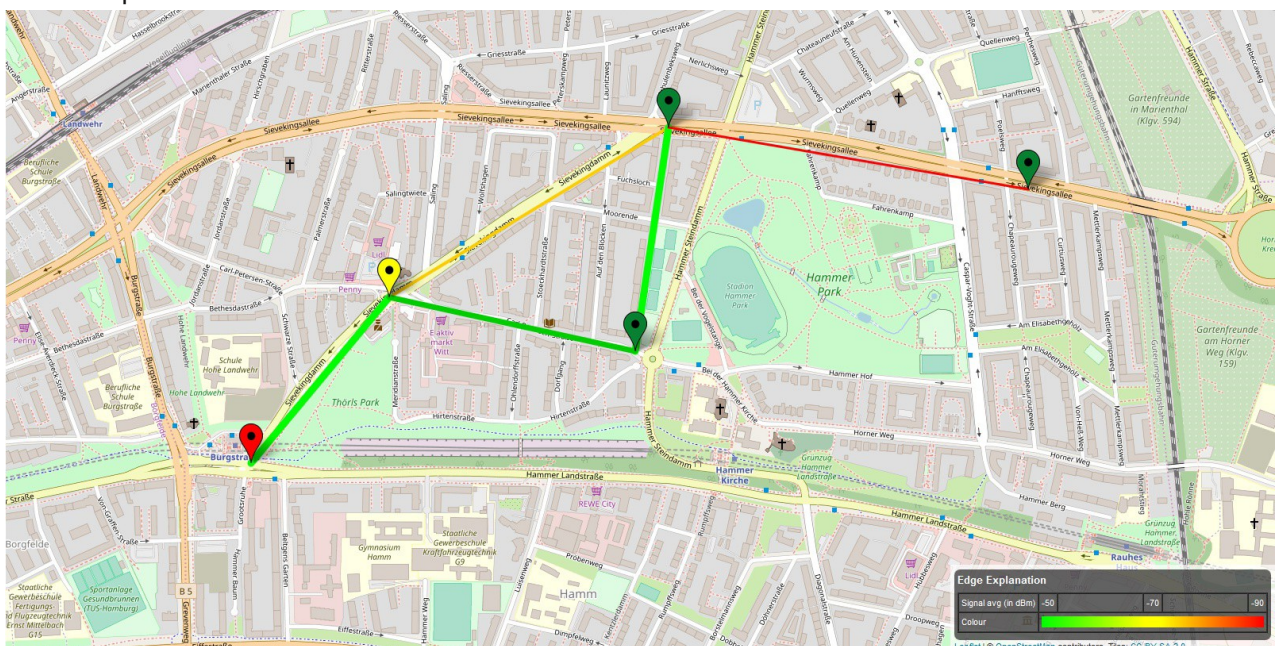
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We Serve all Global Locations: Basingstoke, U.K. & Urbandale, Iowa U.S.A.
Telephone: U.S.A.: Direct: Mobile: (515) 661-8299
(U.S.A. Central Time) U.K. 07469 186855

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