

# BrandMeister & TetraPack

## HAMRADIO 2025

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# BrandMeister

## Fresh changes

- Improved stability and logging 😊
- FastForward
  - Fixed link identification passthrough (to prevent cross-network looping)
  - Added QUICKACK (to improve latency)
- Moving to new encryption keys
- Improved jitter buffer scheduling
- Repeater call-sign validation
  - Check for valid UTF-8
  - Strict validation for AX.25 / APRS
- Talker Alias
  - Now accepting full valid Talker Alias only
  - Transmitting complete Talker Alias only

# Private hotspot

## New feature

- Developed to prevent looping and improve hotspot security
- Allows only owner to transmit to the network
- Will be applied soon by-default for new hotspots

The screenshot displays a configuration page for a hotspot, with two tabs at the top: '2840000 (LZ1SEO)' and '2840800 (LZ1SEO)'. The '2840800 (LZ1SEO)' tab is active. The configuration options include:

- Brand:** A dropdown menu showing 'Hytera / Kenwood'.
- APRS Interval:** A dropdown menu showing 'Off - use CPS settings (Hytera Only)'. Below this, a text block explains: 'Hytera radios only: If you use this option it activates the Network Managed Mode. This will overwrite your CPS settings. In case you want to keep using your CPS settings you have to select OFF and reprogram your radio if necessary.'
- APRS Icon:** A button with a motorcycle icon.
- In Call GPS:** A toggle switch currently set to 'Off'.
- Compact / CSBK data:** A toggle switch currently set to 'Off'.
- AirSecurity / TOTP:** A toggle switch currently set to 'On'.
- Private Hotspot:** A toggle switch currently set to 'Off'. A tooltip is visible over this switch, containing the following text:
  - Private Hotspot**
  - Enabled: only you can access your hotspots
  - Disabled: everyone can access your hotspots
  - Enabling this option helps preventing network loops in case you accidentally configured multiple hotspots on same frequency / color code

# Tellus Agent

Now as a Docker image / for arm-based Mikrotik routers

- Useful when using multiple Hytera repeaters by single IP
- .. or Hytera's repeater behind unmanaged NAT
- .. available through years 😊
- Available as:
  - Source code, compliable and runnable on Linux, FreeBSD, macOS
  - .deb packages for amd64 and arm64
  - Multi-architecture Docker image, could run on arm-based Mikrotiks (new this year)
  - Prepared for OpenWRT (but we have not motivated to create packages for it)
- Require to run instance per repeater

```
/container/add remote-image=git.brandmeister.network/public/tellusagent:latest interface=veth1  
cmd="--connect-port 50000 --control-port 50001 --media-port 5002 --server-address  
2002.master.brandmeister.network --server-port 54003" start-on-boot=yes
```

# Last Heard for TETRA

brandmeister.network

BrandMeister

User Dashboard

Last Heard (DMR)

Last Heard (TETRA)

Repeaters7408

Hotspots1980

Terminals193

Masters47

Alerts

SelfCare

Information

LastHeard (TETRA)

RegisterLoginENSettings

User DashboardLastHeard (TETRA)

Q Search

ANDOR

Link Namedoesn't containDetroitBridge

+ Add rule+ Add group

✕ Delete

Load SQLCopy Query Url

Q Search

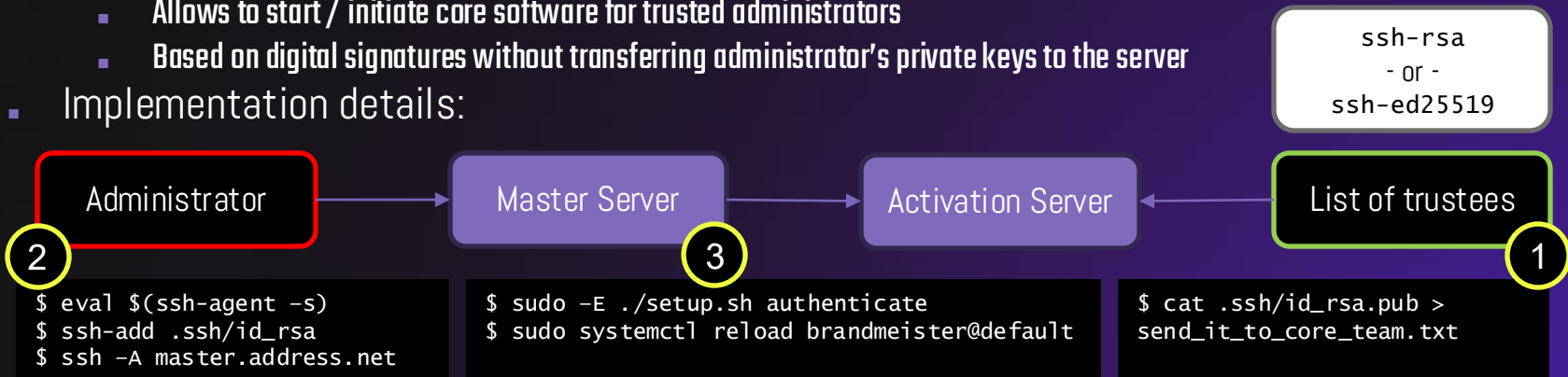
Search:

Time	Link name	My call	Source	Destination	Options	Duration
0 Seconds	SidecarLink	SP4DIR [Michal] (2602617)	SR4ONT (20052 / 4)	Regional SP4 (2604)	TETRA	0
1 Seconds	SidecarLink	SP4DIR [Michal] (2602617)	SR4ONT (20052 / 4)	Regional SP4 (2604)	TETRA	1
117 Seconds	SidecarLink	SP4DIR [Michal] (2602617)	SR4ONT (20052 / 4)	Poland (260)	TETRA	4
2 Minutes	SidecarLink	2E0HHT [Bob] (2341244)	GB7PU (20052 / 2)	(200999)	SDS TETRA	0
3 Minutes	SidecarLink	2E0HHT [Bob] (2341244)	GB7PU (20052 / 2)	(200999)	SDS TETRA	0
3 Minutes	SidecarLink	N1IFU [Nathan] (3116587)	(20052 / 51)	(200999)	SDS TETRA	0
3 Minutes	SidecarLink	DO8FT [Marco] (2629383)	DB0FLW (20052 / 7)	Leipzig (26302)	TETRA	4
4 Minutes	SidecarLink	DO8FT [Marco] (2629383)	DB0FLW (20052 / 7)	Leipzig (26302)	TETRA	6

# Master trustee

## Only for master administrators

- After some incidents with unauthorized activities on some master servers
- Will be fully released with Debian 13 out
- The main concept:
  - Will be applied on numbers of master servers
  - Allows to start / initiate core software for trusted administrators
  - Based on digital signatures without transferring administrator's private keys to the server
- Implementation details:

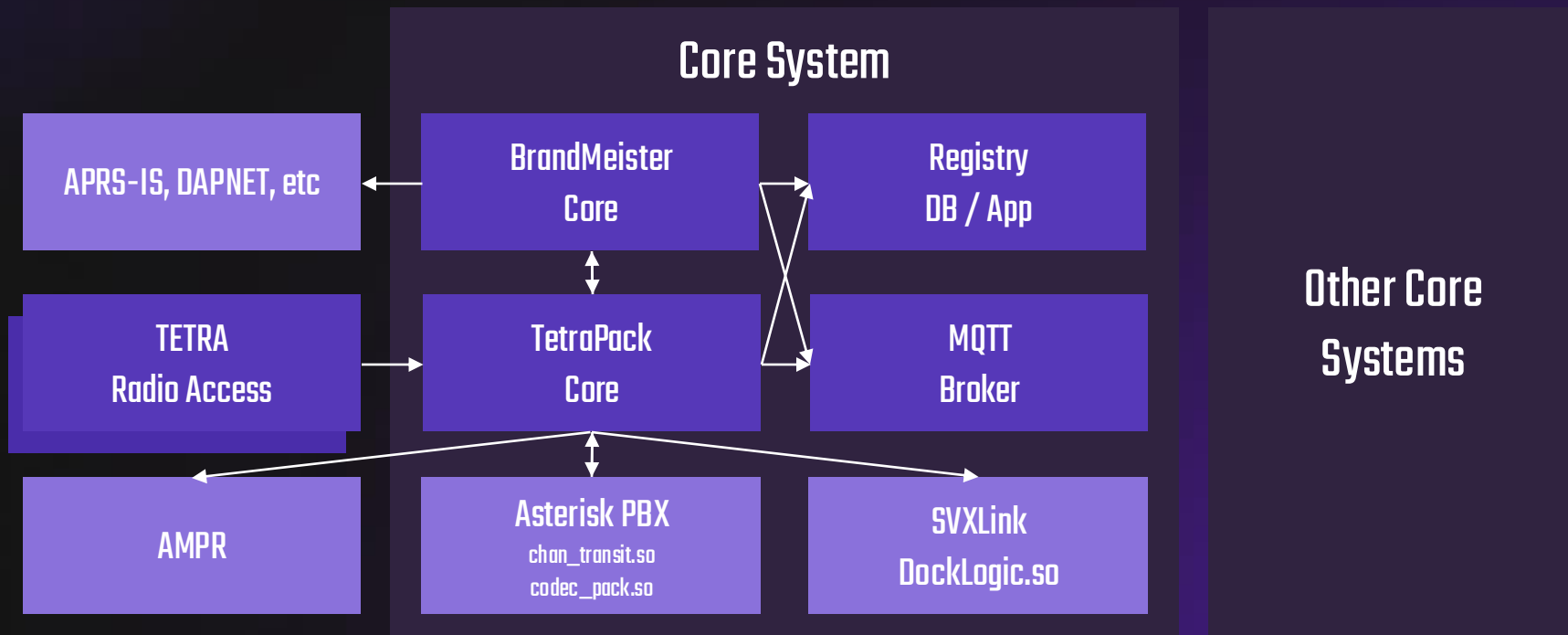


# TetraPack

## Quick reminder

- Introduced at HamRadio 2023 in Friedrichshafen
- Research started immediately after HamRadio 2022
- “multiple vendor’s TETRA TMO in one PACKage”
- The same goals like BrandMeister Network has:
  - Support of different hardware
  - Widely-available talk-groups
  - Most of services and user-experience for TETRA TMO
  - In most cases - connect network controllers (SwMI) instead of base stations
- Closed integration to BrandMeister Network:
  - Seamless exchange of group calls, individual calls, SMS
  - Almost all services available in BrandMeister Network: APRS, SMS services, etc.

# Core system architecture





# Supported hardware

	Supported since...	Notes	Group calls	Simplex individual calls	Duplex individual calls	Phone calls	Text messaging	Location	Packet data
<a href="#">Motorola CompactTETRA</a>	2023/Q2		✓	✓	✓	✓	✓	✓	✓
<a href="#">Motorola Dimetra</a>	2024/Q2		✓	✓	✓	✓	✓	✓	✓
<a href="#">Hytera RoIP</a>	2024/Q3		✓	✓	✓	✗	✓	✓	✗
<a href="#">Rohill TetraNode</a>	2025/Q1		✓	✓	✓	✓	✓	✓	✗
Brew	2025/Q1	Nonstable	✓	✓	✓	✓	✓	✓	✓

# Hytera RoIP

Directly connected radio via wide-band

- Natively implemented in TetraPack Core
- Uses BrandMeister's device password
- Tested on PTC760 (A7 3.5 and A10 4.5 firmwares) and PTC680
- Hytera PDCxxx RoIP  $\neq$  Hytera PTCxxx RoIP
  - Proprietary Hytera's PTTC proxy protocol
  - Uses native HMF TETRA SwMI signalling (ACAPI)
  - 2 TCP ports for discovery/signalling and UDP for media
- Trunking mode
- Automatic failover between narrow-band and IP
- <https://wiki.tetrapack.online/books/tetra/page/hytera-roip>



**ROHILL**

**TetraNode**

# Rohill TetraNode

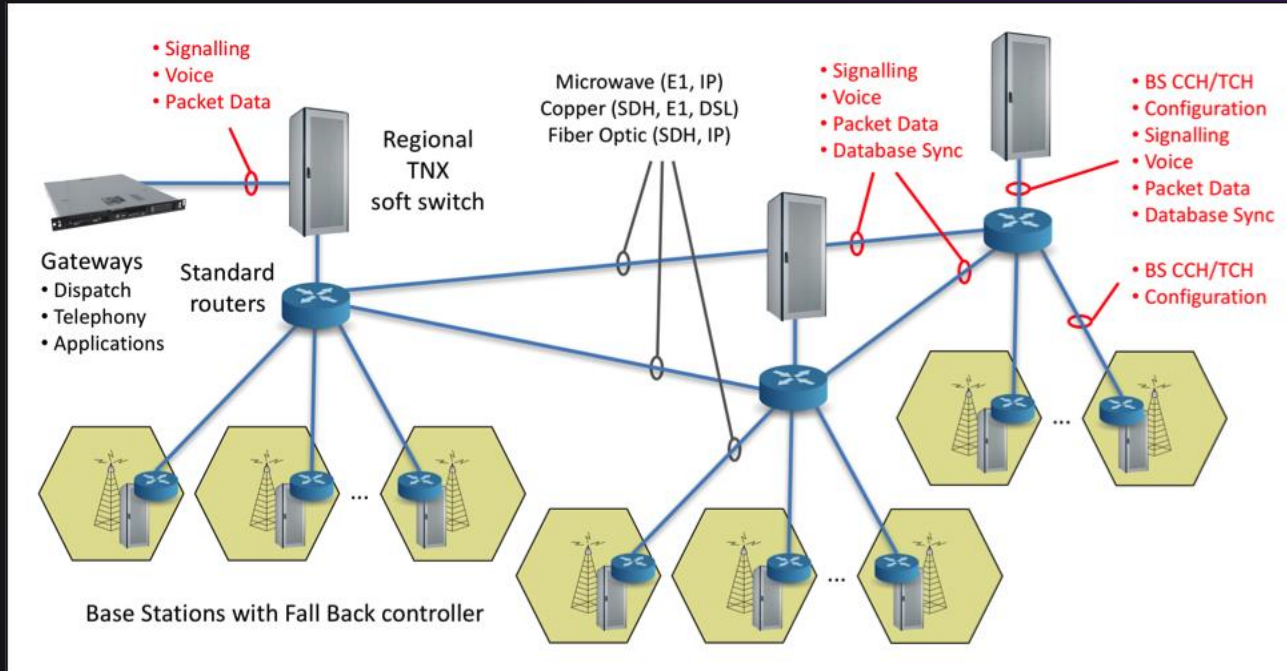
## Overview

- **Our research and development is done using Rohill R-8060 and TetraNode 2.28.37**
- **TetraNode system contains following components:**
  - Base station transceiver (BSS) module with IP connectivity
  - TetraNode eXchange (TNX) SwMI which is normally a Linux-based server
  - Several optional systems such as Dispatch Server, Logging Server, etc.
- **Each TNX can handle traffic from BSSs on different sites**
- **TNXs could form a redundant distributed network**
- **Normally applications should be connected to TNX using proprietary TIGv2 protocol**



# Rohill TetraNode

## Network topology



# Rohill TetraNode

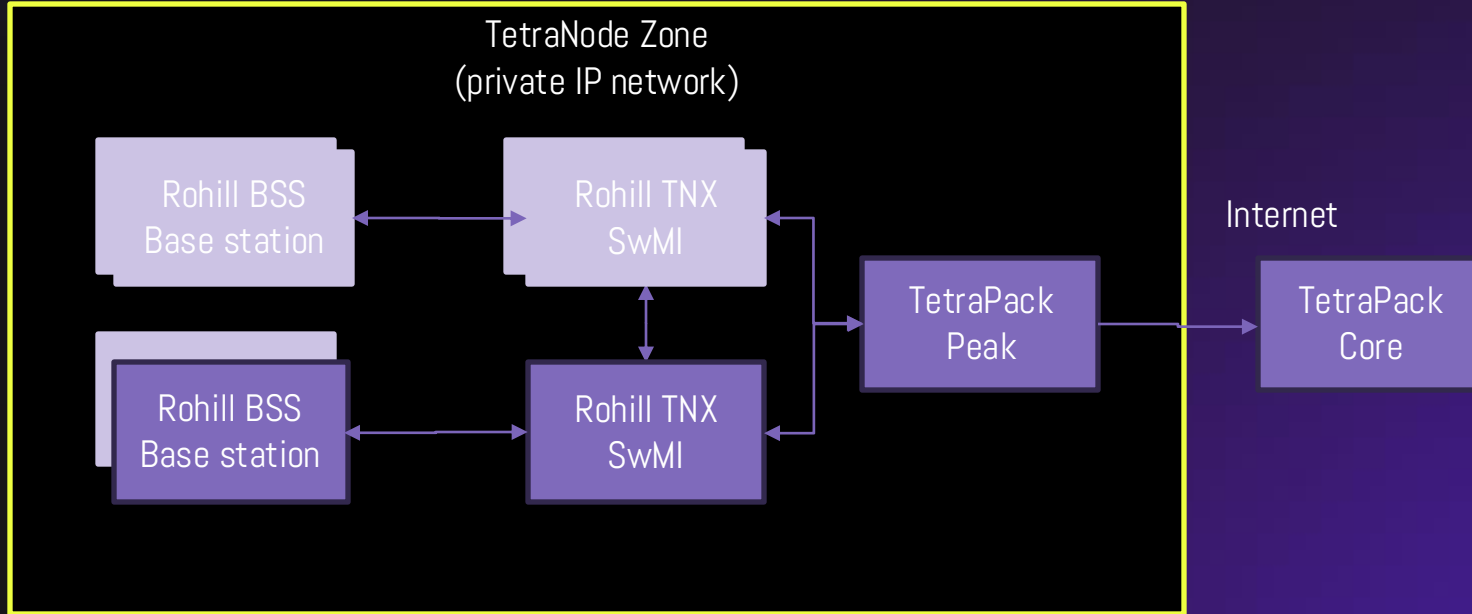
## Integration

- **We decided to avoid TIGv2**
  - TIGv2 uses XML over UDP for everything, mostly very abstracted from TETRA-specific
  - TIG is very restrictive, allows to emit traffic from limited ISSIs
  - Requires licensing by capacity
- **We decided to emulate TNX through Internode protocol**
  - Covers our typical cases for TetraPack integration
  - Has many advantages such as database synchronization and ISSIs routing
  - Less CPU overhead on message processing
- **Internode protocol**
  - Proprietary
  - Uses XML over UDP only for (automatic) discovery and keep-alive
  - Uses own UDPCP-based transport and proprietary IPC

# TetraPack Peak

- Client software to connect Rohill TetraNode zones
- Emulates Rohill TetraNode, supports up to 61 nodes in zone
- Has next requirements for zone:
  - TetraPack Peak should be run inside TNX' private network
  - It requires separated Debian Linux host with amd64 or arm64 architecture (could be dedicated PC, Raspberry PI or virtual machine)
  - All TNX nodes inside zone have to use numeric node names from 1 to 62
  - TetraPack phone trunks should have numeric names that equal to corresponding ISSIs (16777184, 16777186)
  - At least TetraNode 2.28
  - Good license to pass as much ISSIs as possible :)
  - Every ISSI to be accepted by TNX from TetraPack should be added to TNX database (e.g. to make a Group Call, every ID involved in the call needs to be in TNX database)
- <https://wiki.tetrapack.online/books/tetra/page/tetranode>

# Rohill TetraNode + TetraPack Peak





# What is Brew?

Open protocol for TETRA cells and client connection

- Based on WebSockets transport protocol
  - Better NAT-traversal
  - TCP\_NODELAY, TCP\_QUICKACK
  - HTTP Digest Access Authentication
- Suitable for
  - Home-made TMO cells
  - Dispatch console / monitoring (hoseline)
- We have ported TETRA CodecPack as a WebAssembly library in 2022
- Specification is still nonstable (waiting for the first client implementation)
- <https://wiki.tetrapack.online/books/tetra/page/brew>



# Debian 13

## Our roadmap regarding to its release

- Breaking changes:
  - `io_uring` 2.3 → `io_uring` 2.9 (still have issue with `IOWAIT`, will be fixed in 2.10)
  - `pcre3` (aka PCRE 1.3, discontinued) → `pcre2`
  - `php` 8.2 → `php` 8.4
- Core systems (BrandMeister Core, TetraPack Core)
  - Already prepared and tested
  - Support of Debian 12 will be immediately discontinued when we publish releases for Debian 13
  - Smooth upgrade this time
- Client systems (FRED, Dummy, Sidecar, Peak)
  - AMD64: Support of Debian 12 will be immediately discontinued when we publish releases for Debian 13
  - ARM64: Debian 12 support will be discontinued next to Raspberry Pi OS based on Debian 13 outs
- ...



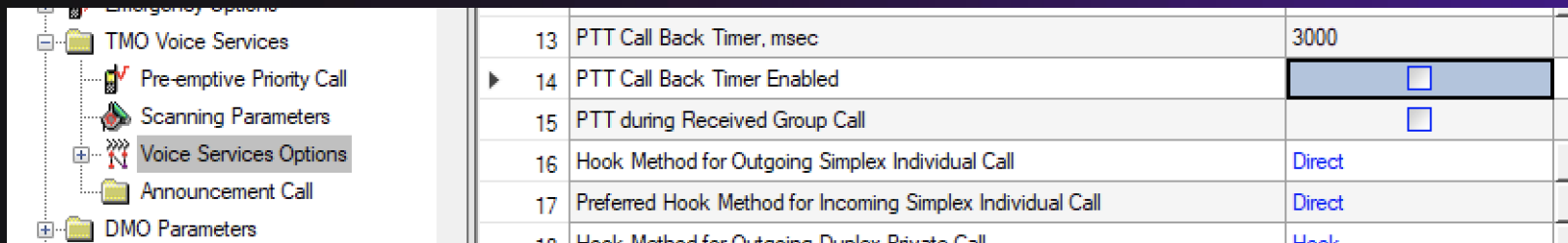
**TETRAPACK**

**User Experience**

# DMR <-> TETRA

## Individual calls

- TETRA -> DMR: DOUBLE PTT TO SETUP A CALL AND THEN TO TRANSMIT
- Recommended settings:
  - PTT Call Back Timer – Disabled  
(respond for initial delay on call DMR->TETRA)
  - Hook Method for Outgoing Simplex Individual Call – Direct  
(respond only for transmitted call capabilities, the bridge is tolerant to this setting)
  - Preferred Hook Method for Incoming Simplex Individual Call – Direct  
(allows TETRA radio to hook a call automatically - DMR side doesn't know about when the call hooked)



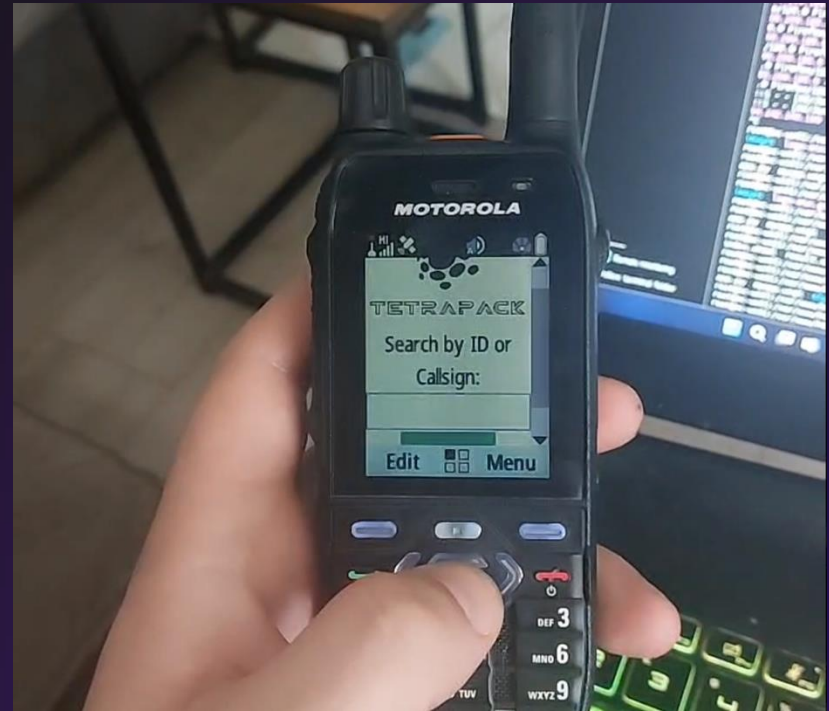
The screenshot shows a configuration window with a tree view on the left and a settings table on the right. The tree view includes 'Emergency Options', 'TMO Voice Services', 'Pre-emptive Priority Call', 'Scanning Parameters', 'Voice Services Options' (selected), 'Announcement Call', and 'DMO Parameters'. The settings table lists various parameters and their values.

13	PTT Call Back Timer, msec	3000
▶ 14	PTT Call Back Timer Enabled	<input type="checkbox"/>
15	PTT during Received Group Call	<input type="checkbox"/>
16	Hook Method for Outgoing Simplex Individual Call	Direct
17	Preferred Hook Method for Incoming Simplex Individual Call	Direct
18	Hook Method for Outgoing Duplex Private Call	Hook

# Mobile IP-data and WAP

## Updated features

- Static IP allocation (172.16.0.0/22)
- WAP gateway based on Kannel ([kannel.org](http://kannel.org)) now with ISSI via HTTP header X-WAP-Network-Client-MSISDN
- Single IP and settings for any access types
- Pool 172.16.1.0/24 interconnected using NAT1:1
  - HAMNET (44.148.206.0/24)
  - ARDC (BGP, 44.32.147.0/24)



# Links

- <https://tetrapack.online/>
- <https://t.me/TetraPackGeneralSupport>

