WAVESWAY

Professional Digital Radio System

Technology & Products

Self-organized Mobile Ad-Hoc Networks (MANET)

WAVESWAY SP
N5-Floor 2, Police Lane I, Tbilisi, Georgia
Tel: +995-558-356-722
Email: hq@wavesway.net
www.wavesway.net

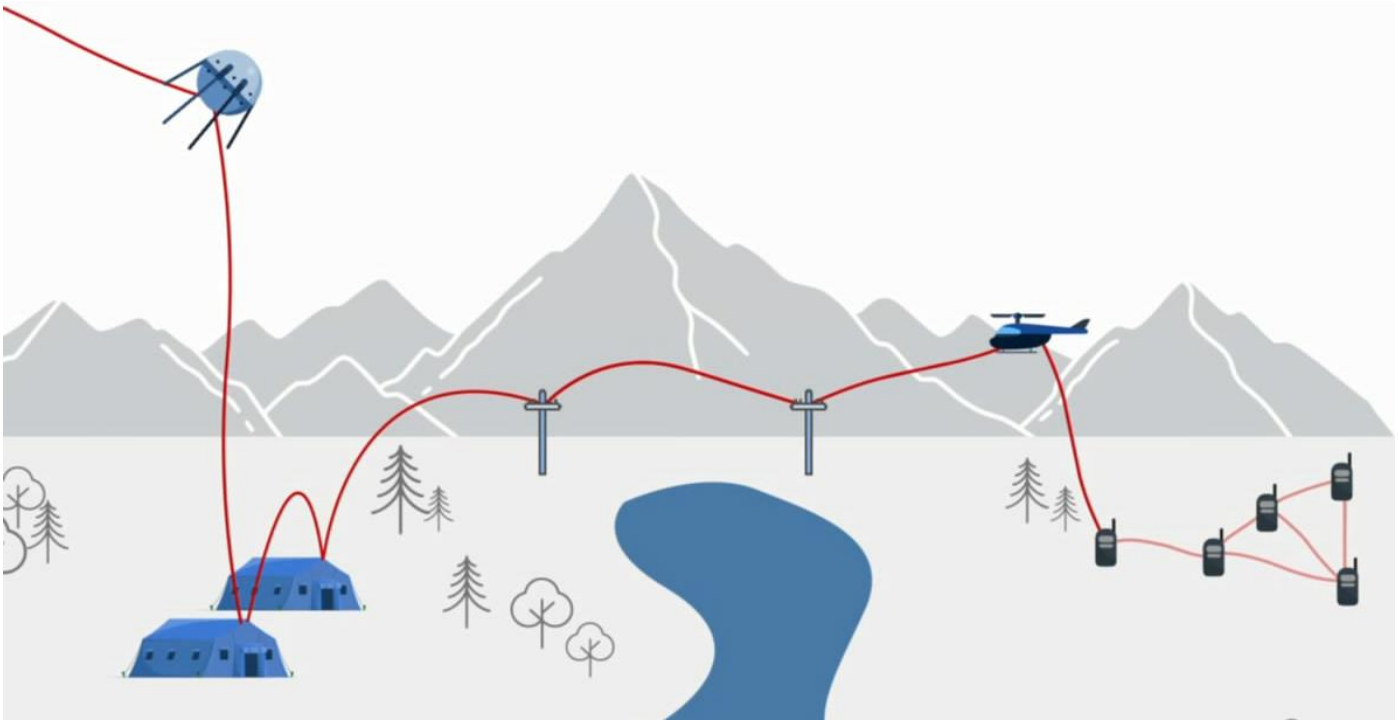
Our Mission

In today's world, reliable and efficient communications are of critical importance in a number of fields, including public safety and rescue operations, industry, agriculture, construction, and transportation.

We develop and deliver innovative communication technology and solutions for a variety of situations. Our small, lightweight, low-cost radio devices can help you connect in places where you couldn't before.

The WAVESWAY radio system provides **wireless coverage in challenging environments**, including complex sites, difficult terrain, buildings with multiple reinforced concrete floors, underground floors, basements, parking lots, and even mines.

It can be easily adapted to many different tasks.



Our WAVESWAY radio system uses the principles of Mobile Ad-hoc Networks (MANET) and allows the creation of self-organizing wireless networks with a dynamic topology.

What is a Mobile Ad-Hoc Network (MANET)?

- It is a decentralized type of wireless network where individual devices can connect and communicate with each other without the need for a centralized or pre-existing network infrastructure.
- It is a continuously self-configuring, self-organizing network where devices, also called nodes, can form connections and communicate on the go.
- It is a network where each node is ready to receive and forward data to other nodes, where each node acts as a host and a router, an endpoint and a relay.

This system is highly flexible in its configuration, easily adaptable to a variety of conditions, and most importantly, cost-effective to scale. It operates in the license-free band, and its devices have such low power that they can be used without licenses.

Our System

The WAVESWAY radio system is a set of different devices that communicate with each other in the **860-930 MHz** band in digital mode and have an Effective Radiated Power of no more than **100 mW**.

Each of the devices can transmit:

- voice in digital form,
- geolocations,
- information from external sensors such as alarms, door openers, or anything else.

Each can also act as a repeater, significantly reducing costs, increasing coverage, and simplifying network organization compared to other digital systems.

All devices operate on our **proprietary WAVESWAY algorithm**, an advanced solution that goes beyond standard "self-forming" and "self-healing" mesh networks. It allows incorporating vast numbers of devices into the network in which the devices themselves form the communication infrastructure.

Key Benefits

- **Mobility and flexibility:**
Unlike traditional networks (MESH and Wi-Fi) that rely on fixed infrastructure, the WAVESWAY quickly and continuously adapts to fluctuations in terrain and other difficult environmental conditions to maximize connectivity and communication performance.

- **Efficient data distribution:**
The WAVESWAY algorithm organizes packet transmission using the principle of Carrier-sense multiple access (CSMA). Rather than establishing a single route to the receiver, it distributes information through multiple nodes. Each node retransmits data packets. However, data packets propagate through the wireless network only in directions where they have not been before. This regulates the redundancy in the network.

- **Scalability and self-organization:**
WAVESWAY networks are highly scalable, providing transparent seamless operation when nodes join or leave the network. There is no limit to the number of nodes in a WAVESWAY network.

- **Security:**
Full AES128 encryption of the data packet, including service information.

- **Unique algorithm:**
Each node in the network guarantees the retransmission of data packets. A data packet is received and retransmitted by all nearby nodes, but the packets spread through the network only in directions where they have not been before. This eliminates redundancy from the network.

- **Resilience and reliability:**
If a node in the network becomes unavailable for any reason, the algorithm seamlessly reroutes network traffic along the most efficient path. This makes the network self-organizing and self-healing.

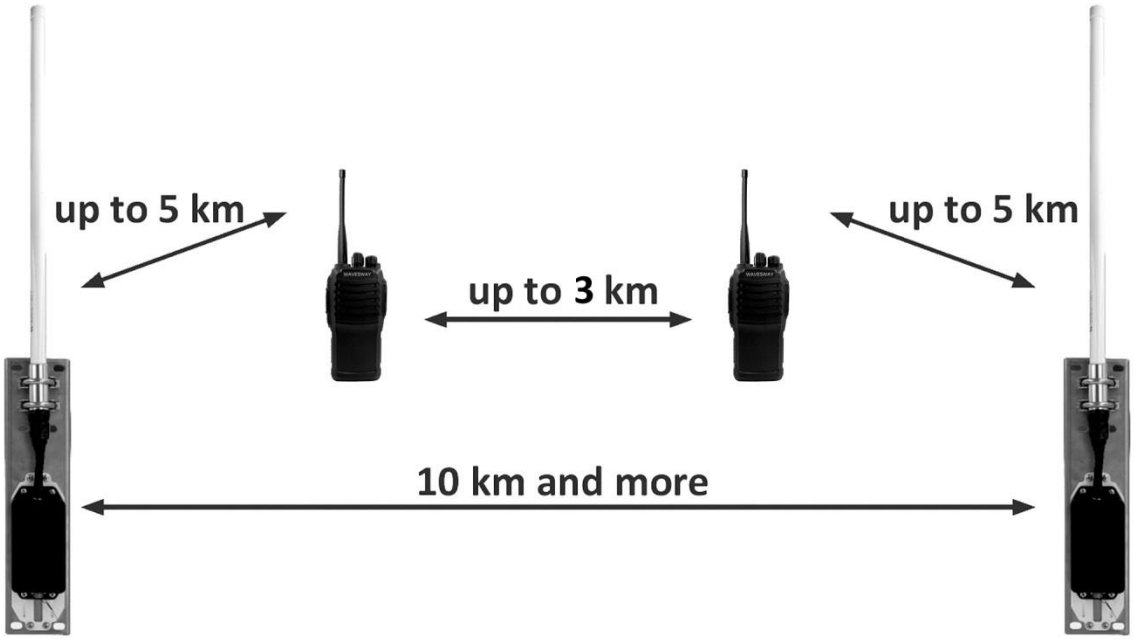
Our Products

The system consists of several different types of devices.
There are fixed, mobile and portable Smart Radios.

They all operate in the unlicensed frequency band and have the following characteristics:

- Frequency: **860-930 MHz**
- Output Power: **0,02 - 2 W**
- Sensitivity: **-105 dBm**
- Data rate: **100 - 1000 kbps**
- Delay: **5-20 ms**
- Modulation: **OQPSK**
- Secure: **AES128-bit encryption**

The range in point-to-point mode is up to 3 km for portable stations, 10 km and more for omni-directional repeaters, and up to 50 km for directional repeaters.



WAVESWAY MU3

This small device can be used as a fixed repeater with different types of antennas, including directional ones, or as a fixed, portable or vehicle radio when a headset is connected. It has a built-in high-capacity battery and can run for up to 7 days without recharging. It can also be powered by an external power supply.

Dimensions: **16 x 7 x 4 cm** (6,3 x 2,8 x 1,6 in.)
Weight: **610 g** (21,6 oz)
Operating Temperature: **-40 to 50 C** (-40 to 122 F)
Protection class: **IP67**
Secure: **AES128**-bit encryption
Battery Capacity: **10000 mAh**
Operating time: no less **150 hrs**

It can be easily modified into different versions of repeaters, such as a repeater for heavy duty applications, the so-called mine repeater, and a repeater for autonomous operation with a very high capacity battery and solar panel.

WAVESWAY MU7

The MU7 is a portable, small, lightweight, 16-channel smart radio for mobile ad hoc networks with proven performance in the most demanding environments.

It looks like an ordinary portable radio but always works as a repeater. It receives in one time slot and always transmits in the other.

Dimensions:	**13,4 x 6,4 x 3,7 cm** (5,3 x 2,5 x 1,5 in.)
Weight:	**235g** (8,4 oz)
Operating Temperature:	**-40 to 50 C** (-40 to 122 F)
Protection class:	**IP65**
Secure:	**AES128**-bit encryption
Battery Capacity:	**2000 mAh**
Operating time:	no less **12 hrs**

It is able to withstand extreme conditions in the harshest environments, meeting the highest standard ratings for temperature, shock, water and dust resistance.

It can operate for 12 hours on a single charge for standard missions. And changing the battery takes just seconds.

WAVESWAY MU2

This is the smallest universal device for mobile ad hoc networks (MANET).

Dimensions: **12,5 x 5 x 3 cm** (5 x 2 x 1,2 in.)
Weight: **200 g** (7oz)
Operating Temperature: **-40 to 50 C** (-40 to 122 F)
Protection class: **IP65**
Secure: **AES128**-bit encryption
Battery Capacity: **2000 mAh**
Operating time: no less **12 hrs**

It can be used as a fixed repeater or as a portable or vehicle radio when a remote speaker/microphone is connected.

WAVESWAY MU5

The MU5 is a portable, metal-cased, 16-channel smart radio designed for long periods of autonomous operation in harsh environments.

It is able to withstand extreme conditions in the harshest environments, meeting the highest standard ratings for temperature, shock, water and dust resistance.

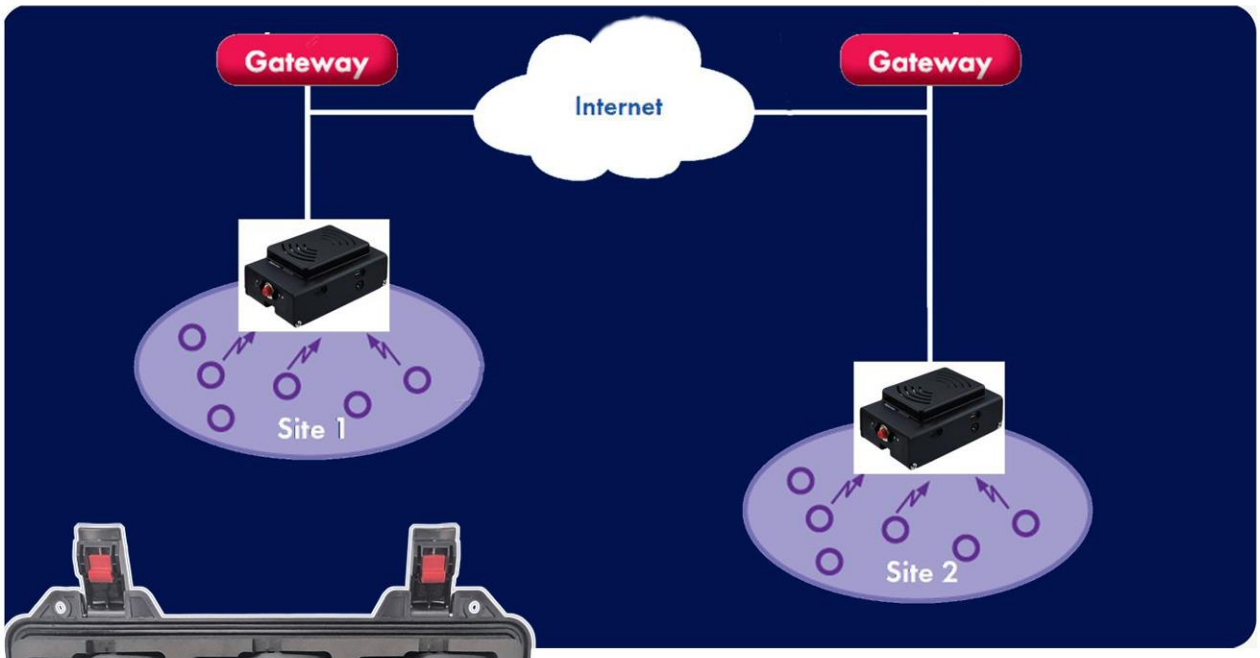
Dimensions: **13,4 x 6,4 x 3,7 cm** (5,3 x 2,5 x 1,5 in.)
Weight: **425 g** (15 oz)
Operating Temperature: **-40 to 50 C** (-40 to 122 F)
Protection class: **IP67**
Secure: **AES128**-bit encryption
Battery Capacity: **3350 mAh**
Operating time: no less **24 hrs**

Its small, lightweight 18650 batteries allow it to run for up to 24 hours without recharging. And changing the battery takes just seconds.

MS-2.0 Network Gateway

The MS-2.0 Network Gateway is designed to connect local networks to global networks.

It carries network traffic over the Internet, cellular, satellite, and other networks, enabling the integration of geographically dispersed radio zones into a single communications system.



Fast Deployment Kit

Portable charging station for up to 12 MU7 devices.

Its environmental ruggedization and external charging options extend onboard power support, ensuring sustained operational coverage without the need for expensive and cumbersome installations.

Applications

In today's world, traditional networks serve us well in most situations. However, there are times when they are inadequate or unavailable. In these situations, WAVESWAY comes to the rescue:

Disaster response and critical operations

- when traditional infrastructure is down

Natural disasters can cripple traditional communication systems. In these critical situations, WAVESWAY provide a lifeline for first responders, allowing them to establish networks on the fly and coordinate rescue efforts and providing crucial information.

Rural and remote areas

- where traditional networks do not exist

In remote regions where traditional networks do not exist, WAVESWAY provide an affordable and practical solution for connectivity.

Mines and large enterprises

- where traditional communications are expensive to install

In mines and large enterprises where traditional communications are very expensive to install, WAVESWAY helps reduce the cost of reliable communication.

Large public and ad-hoc events

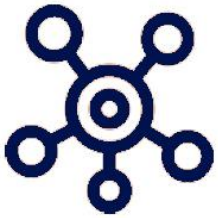
- where traditional networks are overloaded

At massive gatherings, such as concerts, sports events, or political rallies, WAVESWAY offer temporary communication solutions to ensure that attendees, organizers, and security personnel can communicate seamlessly.

Integration with other Radio Systems

One of the key advantages of our technology is the ability to integrate WAVESWAY equipment with networks using other radio standards such as **DMR, Tetra, P25** and **LTE POC**.





WAVESWAY has a number of advantages over these systems, the most important of which are
- **No licensing requirements**
- **No single point of failure**
- **Cost-effective, easy-to-deploy equipment to extend coverage areas**

Due to these advantages, the integration of other radio systems with the WAVESWAY opens up new possibilities for users.

Increasing coverage area

WAVESWAY equipment can be used to extend the coverage of existing communications networks without the need to invest heavily in new infrastructure.

Communication in hard-to-reach areas

LTE POC networks based on the infrastructure of cellular operators offer extensive coverage and low equipment costs.

However, in areas where cellular signals are unavailable, LTE POC communication is not feasible.

In such instances, WAVESWAY equipment integrated into a common network can be utilized.

Communication at temporary sites

WAVESWAY equipment is invaluable when you need to organize communications in a temporary facility, such as a construction site.

Its quick and easy deployment and low cost make it an optimal choice for such scenarios.

Backup communication

In the event of a main network failure, WAVESWAY can serve as a backup communication solution, ensuring an additional level of reliability and redundancy in the event of an emergency.

Key differences from other Mesh/MANET protocols:

1. **Zero packet control** (Service information is a part of the transmitted data packets).
2. **The absence of node tables**, often used in other routing protocols, removes restrictions on the possible routes of packets (in previous generation protocols, node tables specified routing and thus reduced the possible paths of data).

These solutions free up CPU resources and reduce network congestion. The result is high scalability, improved packet delivery, and longer battery life.

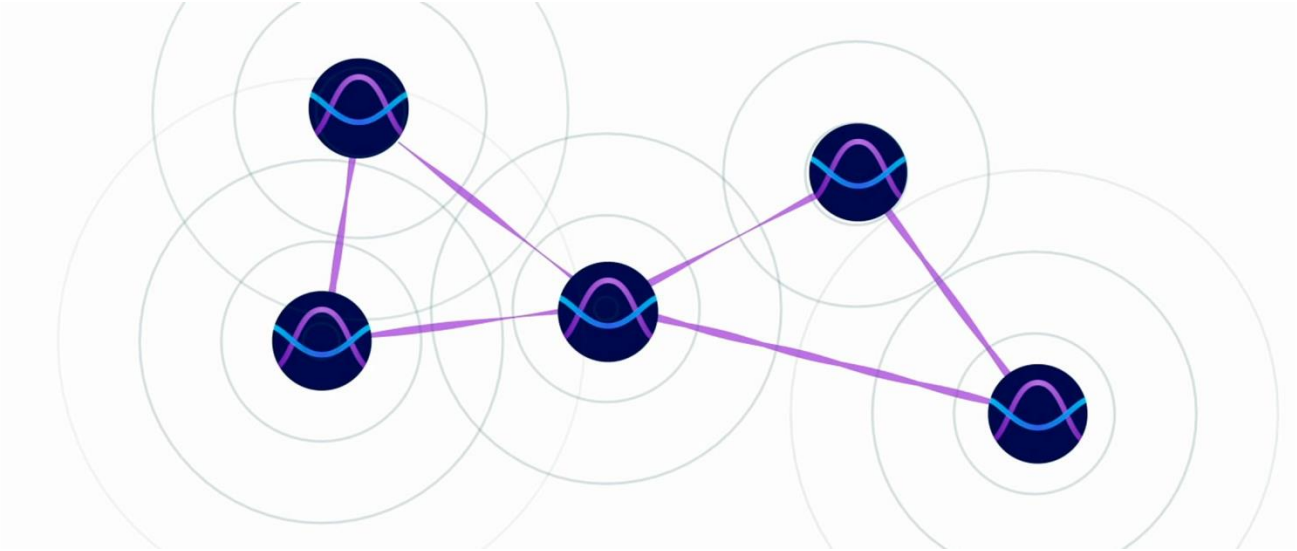
Each data packet contains:

- Service information
- Vois information in digital form
- Digital data from sensors

In most MANET networks, if the number of nodes in the network is large enough, there is a huge amount of redundancy as all nodes in the network repeat the received data packets. Therefore, manufacturers of such systems often limit the number of nodes in the network.

The WAVESWAY algorithm solves the problems of redundancy and looping, and also makes it possible to organize a multi-level structure in a peer-to-peer network.

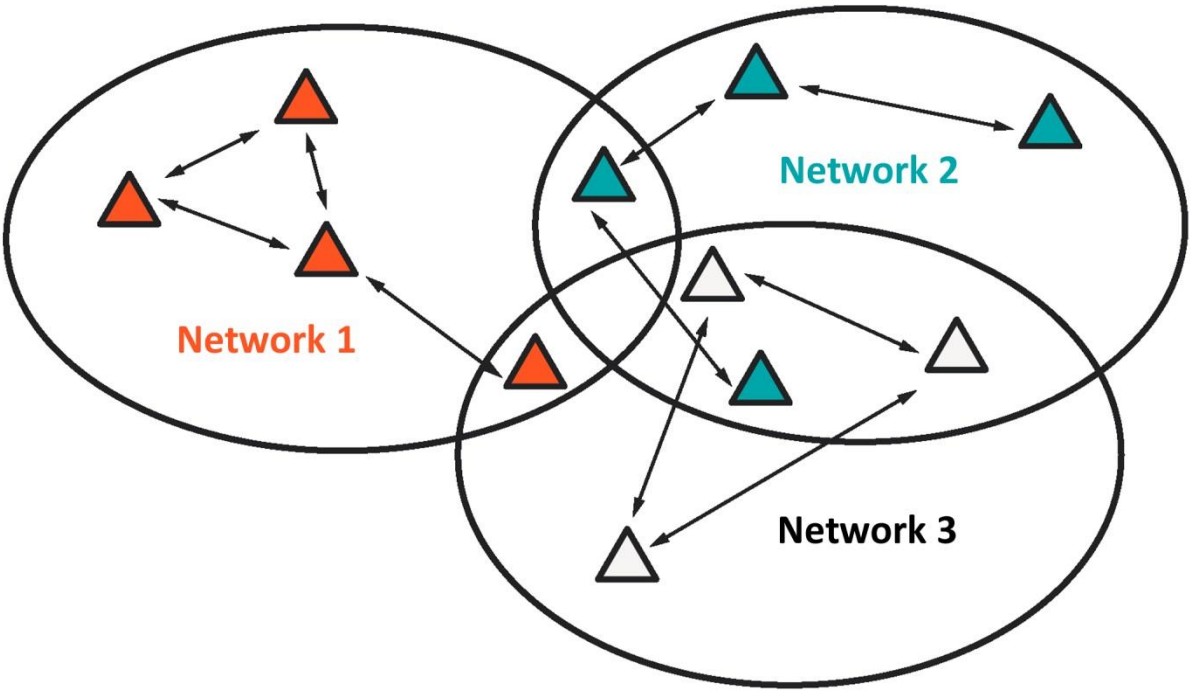
Distribution of data over the network



Algorithm provides:

- Protection against looping
- Transmission by the shortest path
- Ability to set channel priority

Building multilayer networks on peer-to-peer architecture



Algorithm allows:

- Organise independent operation of different networks in overlapping coverage areas
- Optimise network resources and increase network resilience without carrying unnecessary traffic
- Protect the network by encrypting service information

Want to know more about WAVESWAY?
Please contact us:

WAVESWAY SP
N5-Floor 2, Police Lane I, Tbilisi, Georgia
Tel: +995-558-356-722
Email: hq@wavesway.net
www.wavesway.net