

Tactical Mesh Networking System OSR-IP1000



Network Centric Warfare and Beyond

To establish a robust and adaptive network infrastructure for naval platforms, a set of various network channels have to be bound together, with distributed systems performing stringent network harmonization based on intelligent routing algorithms. Networking for naval platforms that are widely dispersed requires to push the edge of known wireless network architectures. Traditional tactical data information exchange systems can no longer support increasing amount of information to be communicated. Satellite based networking alone on the other hand, is still worryingly vulnerable and cannot meet all required aspects of tactical and strategical networking. The mobile and Ad-Hoc nature of naval task groups dictates to adapt all available operational and technical methods for networking, ranging from low-bandwidth intermittent radio connectivity to high-bandwidth Ad-Hoc self-organizing systems.



As navies may operate at increasingly vast distances, tactical level networking has to be backed up with long range strategic and operational connectivity.

Such networks that are based on different communication channels and that run on different protocols need stringent network harmonization, based on pre-set algorithms executed by autonomously acting systems. Mobility of the platforms also has a large impact on network topology. As the need for timely exchange of accurate information is rapidly increasing, the amount of information to be exchanged started to saturate traditional naval data link systems.

Data sharing among naval platforms became more critical in terms of speed and volume in recent years. In the past, it was simple tactical messages on HF and UHF computerto-computer networks. Today's networking concept however, covers a broad variety of information exchange ranging from simple text messages to video conference streams. Widely dispersed forces consisting of command centers, naval platforms and sensors have to be integrated into a highly adaptive and comprehensive network to achieve desired mission effectiveness.

To cope with the amount and variety of information to be exchanged, the networking system needs to offer simultaneous facilitation and government of all available channels such as UHF and HF radios, satellite, wideband communication systems and beyond.

> The OSR-IP1000 Tactical Mesh Networking System offers a reliable and efficient network infrastructure for strategic, operational and tactical level voice, data and video exchange. The OSR-IP1000 facilitates an intelligent routing mechanism in order to combine and manage Ad-Hoc mobile hybrid networks, running on different wireless protocols.

System Overview

Pushing the Edge of Traditional Communications

The OSR-IP1000 comes forth as a concrete solution for establishment and government of mobile Ad-Hoc networks, to effectively enhance connectivity, while offering scalability and flexibility. The system brings IP based mesh network capability for legacy radios, in addition to other newer generation IP based SATCOM, HF, UHF, and GSM systems.

Key Facts

- Integrated STANAG 5066, 4691, 4538 capabilities
- Seamless upgrade to upcoming STANAGs
- Foundation for network centric operations
- Enhanced efficiency
- Optimized performance
- Easily adaptable
- Low maintenance
- Flexible
- Cost-effective
- Civil/military application areas
- Supports legacy radios
- Adapts both legacy and new generation systems
- Modular communications
 infrastructure
- Interoperability with third party systems
- Compatibility with variety of military cryptos to ensure secure video, voice and data transfer
- Built-in redundancy

The OSR-IP1000 is a scalable, reliable, cost-effective and intelligent selforganizing mesh network solution for maritime, land and airborne platforms as well as for fixed sites, and provides network foundation for all command and control systems.

OSR-IP1000 is comprised of various components such as intelligent hybrid sub-net routers, software based modems and wireless communication modules, which may be bound with other standard IP based communication channels.



OSR-IP1000 has the capability to analyze hybrid performance metrics comprising of link, data and node parameters, and to route the data package through the most effective and economic path accordingly.

The system utilizes all available communication means such as HF radios (STANAG 5066), UHF radios (STANAG 4691), satellite and wideband wireless communication modules, to establish self-organizing multi-hop wireless networks. OSR-IP1000 has the capability to analyze hybrid performance metrics comprising of link, data and node parameters, and to route the data package through the most effective and economic path accordingly.

OSR-IP1000 uses highly flexible mesh topology, where each node operates in an independent yet coordinated manner to build the network topology. Data, voice, and video can be exchanged between nodes in a point-to-point or multi-point fashion. The system provides flexibility for establishing and maintaining reliable communications, even when network nodes are partially lost, or if one of the communications channel frequencies are being jammed or down.

The system is compatible with a variety of military cryptos and industry standard encryption modules.



System Overview

State-of-the-art routing algorithms are utilized to enable seamless data, voice, and video transfer over the most suitable communication channel via any node available in the system if there is no direct connection with the target node.

The system enables sharing of the communication resources among the points/nodes, based on user needs and priorities.

The system can automatically utilize all available communication lines, and delivers the data package to target address with dynamic selection of relays and bandwidth provisioning.



The system with its intelligent software, can route the audio, video, and data packages based on user specified parameters such as the shortest path, the most reliable path, the most secure path with ultra-low latency performance.

Various communication channels with different natures such as legacy HF communication channels or new generation wideband communication links can be integrated under a single umbrella for a substantial interoperable networking infrastructure. OSR-IP1000 has autonomous and reliable messaging infrastructure using delivery confirmation algorithms and data periodization, and allows any kind of IP data such as web browsing, e-mail, messaging, chat, video stream transmission.

OSR-IP1000 allows the users to utilize their own cryptographic equipment to assure end-to-end encryption over the network.



- Self-forming and self-healing networks
- Multi-channel network infrastructure
- Military industry standard encryiption
- End-to-end IP based networking
- Multicast traffic management
- Smart, Ad-Hoc networking
- Adaptive routing, path selection capability
- Multi-hop relaying capability
- Dynamic transmission
- Congestion avoidance
- No single point of failure
- High-data rate/broadband connectivity
- Ultra-low processing latency
- Open system architecture
- Vertical and horizontal scalability
- Redundant network topology

System Architecture

Next Generation Cross-Domain Network for Unprecedented Connectivity

OSR-IP1000 has been designed and developed to integrate all narrowband and wideband communication means on a naval platform, and provides an "all-IP" communication backbone for the services to be used by the operators. The OSR-IP1000 is a scalable, reliable, cost-effective and intelligent self-organizing mesh network solution for maritime, land and airborne platforms as well as for fixed sites, and provides network foundation for all command and control systems. OSR-IP1000 is comprised of various components such as intelligent hybrid sub-net routers, software based modems and wireless communication modules, which may be bound with other standard IP based communication channels.



The OSR-IP1000 connects all of the platforms in an area of operations, so that all assets can communicate digitally with all others in the area and with out-of-area assets. A coherent set of interoperable and sustainable communication channels are facilitated and effectively governed to operate together in any environment.

A typical OSR-IP1000 configuration consists of:

- Hybrid Sub-Net Router
- Software Based ModemsWireless Communication
- Modules Maintenance and
- Configuration Terminals



The system with its intelligent software, can route the audio, video, and data packages based on user specified parameters such as the shortest path, the most reliable path, the most secure path with ultra-low latency performance.

System Components

HSNR-500 Hybrid Sub-Net Router

A Network that Runs on Distinctive Capabilities

Our Hybrid Naval Subnet Router provides cutting-edge and transparent tactical IP networking infrastructure without location limitations. The system is able to aggregate and converge existing radios (HF/VHF/UHF) for narrowband communications while supporting broadband newer generation wireless systems under a single solution.

The distinctive capabilities of the system come from hybrid use of reactive and proactive algorithms for the routing, which handles complex routing process of the mobile Ad-Hoc network.

OSR-IP1000 has the capability to analyze hybrid performance metrics comprising of topology, link, data (QoS and related policies) and node parameters, and to route the data package through the most effective and the economic path accordingly.

It is a scalable, reliable, cost-effective and intelligent self-organizing mesh network solution for maritime, land and airborne platforms, as well as for coastal stations and headquarters, and provides foundation for network-centric warfare.

HSNR-500 also offers a user-friendly interface for management of subsystems and wireless communication tools.

- Ad-Hoc mesh technology
- Mission flexibility
- Multi-mission, multi-user
- Integrated relay functionality extend operational communications range
- Dynamic bandwidth allocation in response to reported requirements



The system delivers appropriate bandwidth over the communication channels available and provides autonomous share of the data communication resources with other nodes of the network.

The system with its intelligent software, can route the voice, video, data packages along the shortest path until it reaches its intended node, therefore works with extremely low latency performance.

The required ranges are achieved on low frequency channels, where higher frequency modules offer high-capacity information exchange. This versatility ensures resilient connectivity on a broad selection of ranges and bandwidths. The system provides flexibility for establishing and maintaining reliable communications, even when the network nodes are partially lost or if one of the communications channel frequencies are being jammed or down; it has various TRANSEC features for link and physical layers and various ARQ mechanisms for link and transport layers.

The system brings IP based mesh network capability for legacy radios, in addition to other newer generation IP based SATCOM, HF, V/UHF, and 4G-LTE systems. HF Network

Communication Module

Wireless



Bandwidth vs. Range Comparison

The system offers distinctive capabilities for Operational Naval Groups, such as use of strategic, operational and tactical level sensors in a single network.

System Components

WCM-500 Wireless Communication Module

Foundation for Engagement Networks

Wireless Communication Module provides the rapid exchange of critical data through high-capacity wireless Ad-Hoc IP centric network. The system combines multiple nodes into a self-forming self-healing mesh, and adjusts itself for finding the best route to deliver the data to the target node.

Since the networks are formed in an Ad-Hoc manner and the system is designed to be masterless, the network self-organizes the network in a distributed manner. This includes the admission of new members to an existing network, and the connection of two or more nodes as they come within range. Based on mesh topology, extended 'Beyond-Line of Sight' ranges are achieved by using nodes as repeaters.

- Broadband wireless IP based communication channel
- Point-to-point or point-to-multipoint IP based audio, video, message, and data transfer
- Self-improving (Ad-Center/Ad-Hoc) and self-organizing architecture
- Compliance with military environmental standards (MILSPEC)
- Suitable for stand-alone operations
- Available in different frequency ranges
- Extended ranges (>50 km) for NATO-C Band frequency, with high data output (UDP Data Throughput >50 Mbps)

WCM-500 offers distinctive features for Operational Naval Groups, such as use of tactical level sensors in a single wideband network for supporting distributed fire capability and full spectrum situational awareness. High-speed and high-volume data exchange capability offers a collaborative execution process to prioritize, deconflict and synchronize maritime missions. Additional wideband subnets may be established by deploying more than one WCM-500 modules, working on different frequency bands for specific purposes. WCM-500 can provide frequency ranges varying from sub GHz to NATO C Band. WCM-500 operates at high data rates, exceeding an average of 50 Mbps throughput. The system range extends beyond 50 km, depending on LOS availability.

Airborne versions are available to be used as deployable payload on rotary or fixed wing aircrafts.



System Components

ONUR OSBM-200 Software Based Modem

IP Over Radio: Timely Access to Critical Information over Tactical Radios

ONUR Software Based Modem provides IP network infrastructure over legacy radios, based on leading NATO STANAGS for HF, VHF and UHF. OSBM-200 consists of modem modules and network controllers, which also provide extended remote control and monitoring features. OSBM-200 is a powerful radio data network solution for enabling IP based applications to communicate via HF, VHF and UHF networks.

The hardware of the OSBM consists of Network Controller Modules, Modem Modules, and Power Supply Cards.

The Modem Module provides appropriate waveforms for legacy radios, based on NATO STANAG 4691 Annex-B. The Network Controller Module carries out Automatic Repeat Request networking functions, in line with the standards set in STANAG 5066, STANAG 4691 and STANAG 4538. The system fully supports Mobile Ad-Hoc Relay Line of Sight Networking (MARLIN) implementation.

The system offers IP networking capability on VHF, UHF and HF legacy radios, by interfacing between OSR-IP1000 and tactical radios.



The Mobile Ad-Hoc Relay Line of Sight Networking (MARLIN) profile describes the system concept and set of protocols that provide Internet Protocol (IP) data transfer in multiple-node, multiple-hop dynamic networks employing line of sight (LOS) radio bearers.

MARLIN provides an alternative link to connect two or more ship networks, and OSR-IP1000 executes tailored IP routing protocols in order to facilitate end-to-end connectivity.

The 3U OSBM subrack is specifically designed to host up to 4 sets of OSBM modules, powered by 2 sets of redundant power supplies.

All system components are modular in nature, such as:

- Network Controller and Modem Modules are designed as modular cards for 3U subrack chassis and the system capacity can be increased by adding additional modules.
- Each subrack chassis is capable to hold 8x modem and/or network controller modules, which gives the flexibility to get connected to 4 different (HF/VHF/UHF) legacy radios in a single subrack configuration or 8 different radios in a dual subrack configuration of separate Network Controller and Modem Subracks.

Network level red/black separation can also be established by using individual OSBM-200 subrack units for modems and network controllers.

- Beyond-Line of Sight (BLOS) data connection over the HF radio communication channel (STANAG)
- Multi-waveform
- Line of Sight (LOS) data connection via V/UHF radio communication channel (STANAG 4691)
- Integration to legacy radios with its independent architecture
- Intelligent relaying and routing
- Seamless integration to upcoming standards/STANAGs

System Components

System Integration: From Radio towards Platform Services

For each V/UHF/HF network channel access, a dedicated modem is used to connect to relevant radio. If data security is required CFE/GFE provided data encryption devices can be used between to modem and network controllers for RED/BLACK separation. Each modem has a dedicated network controller for proper operation. Network controller features an ethernet based IP connectivity, which can be consolidated via a COTS switch. A System Management Terminal with a suitable application is used for the management of the overall system including

- Modem configuration and management
- Radio remote control and management (via modems or directly ETH interface of CMS)
- Network Controller Management

Platform data services can be integrated to the solution via a router. To achieve desired mobile network performance, ONUR'S HSNR-500 solution is used. HSNR-500 has been developed particularly for this application and supports very advanced and highly specific functions for naval applications to complement hybrid mobile network.





DETTA: NAVY SOLUTION

ONUR OSR-IP1000 solution will form the basis of Turkish Navy's IP based network structure, within the scheme of Turkish Navy Maritime Tactical Radio Network (DETTA) Project.

DETTA Project has started with the purpose of providing intelligent routing mechanisms for hybrid Ad-Hoc networks. Within the scope of the DETTA Project, ONUR designed and developed audio, data, image and message exchange infrastructure for Turkish Naval Forces Command that is compatible with the concept of network enabled capability. The project will also involve the design of a terminal structure that allows the establishment of an IP based network by using HF, VHF, UHF and SHF communication media.



DETTA will provide flexible bandwidth management through IP based networking infrastructure, where the information will be transferred on and off the ship as efficiently as possible.





- IP based networks on HF, V/UHF and SATCOM
- High data transfer speeds provided by WCM-500 Wireless Communication Module
- Smart Ad-Hoc networking
- Adaptive routing, path selection capability
- Multi-hop relaying capability
- Fully compatible with combat management systems and existing radios
- Compatible with a variety of IP/ data cryptos for secure information exchange

COAST-NET: COAST GUARD SOLUTION

ONUR is carrying out Coast-Net Project for Turkish Coast Guard Command, in which it is developing a hybrid system that can utilize multiple communication channels, based on Maritime Radio Tactical Network (DETTA) Project. The aim of the Coast-Net is to establish the necessary infrastructure for the intercommunication of Coast Guard Command's afloat units and units on the shore.

The system with its intelligent software, can route the audio, video, and data packages based on user specified parameters such as the shortest path, the most reliable path, the most secure path with ultra-low latency performance. Flexible architecture of the system can deliver Ad-Hoc secure network channels over various wireless communication means for instantaneous collaboration both on tactical and strategical levels. The outcome is high availability of networking, which provides facilitation of mission critical services such as voice communication, video streaming, instant messaging and file-transfer.

Within the project, ONUR developed an integrated communication recording and archiving solution, which is of critical importance, as records of communications may be required as evidence for use in judicial processes, given Coast Guard Command's status as a law enforcement agency.



Coast-Net will deliver IP based network infrastructure and full-scale communication suite, where HF, VHF, UHF radios, wireless communication modules, 4G/LTE channels and SATCOM will be facilitated to form an Ad-Hoc hybrid network.





- Full-scale communication suite with advanced controls on user friendly communication panels
- Tailored network suits for platforms, stations and operation centers
- IP based networks on HF, VHF, UHF and SATCOM
- Scaled to fit small boats, without performance compromise
- Additional coverage with 4G/LTE
 network capability
- High data transfer speeds provided by WCM-500 Wireless Communication Module
- Smart Ad-Hoc networking
- Adaptive routing, path selection capability





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