Network Enabled Operational Communication System
for Maritime Platforms

ONC-IP1000

Scope

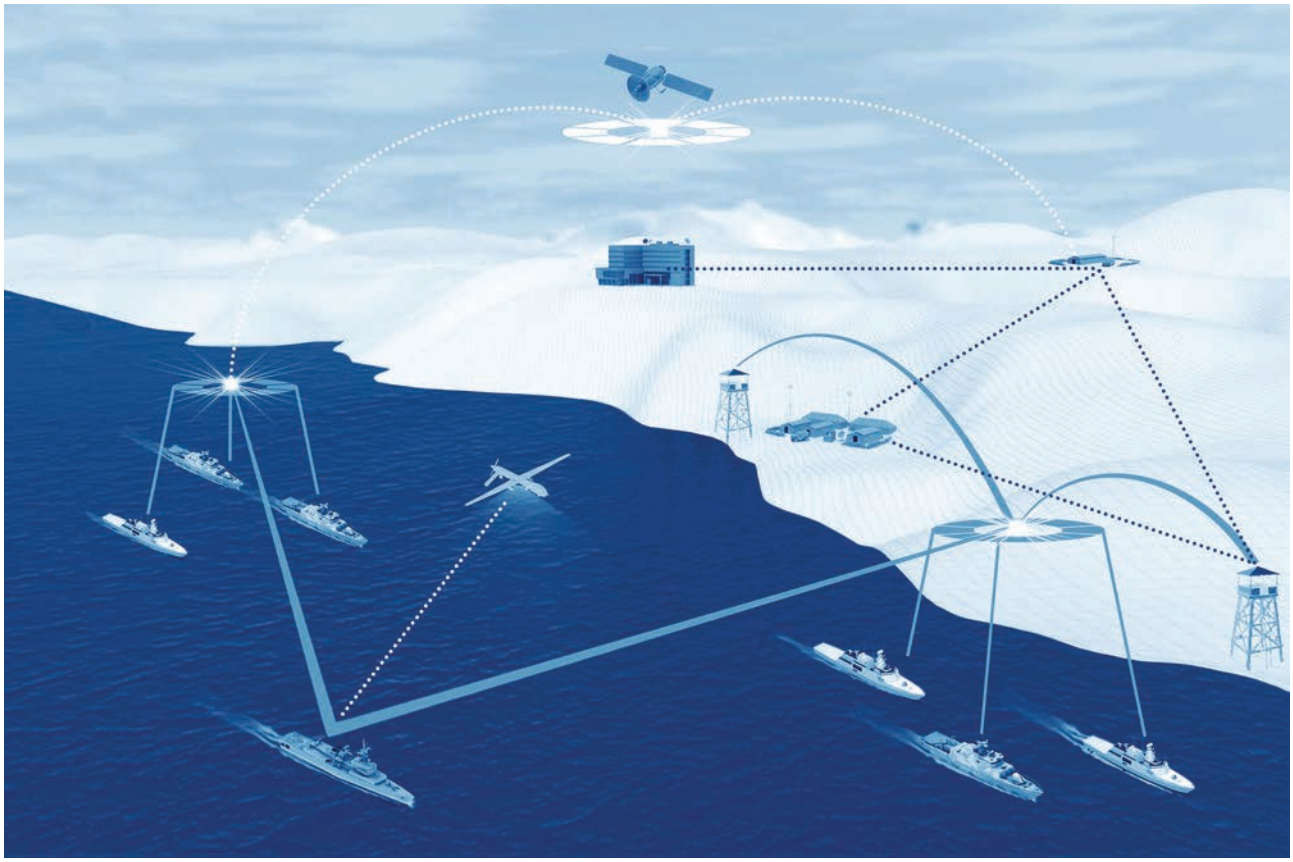
Sustainable Network, Uninterrupted Communication

Modern day maritime warfare still depends on timely exchange of accurate information, by effective provision of all suitable tactical communication systems.

The nature and capability of communication means have changed over time, where legacy systems are still deployed together with complex network equipment. In this regard, effective “command and control” depends on harmonization of and timely access to all suitable communication channels. Today’s data exchange requirement goes beyond exchanging basic voice messages.

Video calls, tele-conference and command messages add 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.

In search for an effective and affordable communications solution for maritime platforms to harmonize the entire set of external and internal communications, our powerful communication suit came forth as an answer.



ONC-IP1000 solution enables users to maintain existing communication infrastructure, while offering a smooth transition environment into network centric operations.

The system combines internal and external voice communication nets and delivers all superior advantages of IP network connectivity. It bridges the gap between legacy communication devices and new generation network centric operation requirements.

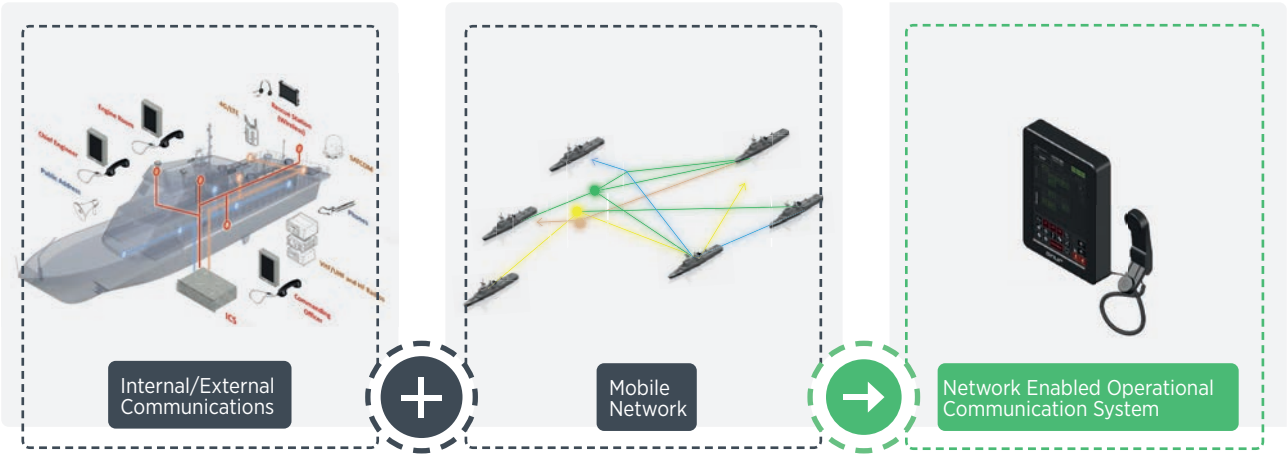
Overview

Next Generation Solution: Network Based Communications

OIC-MP2000 interconnects a broad variety of available communication channels onboard naval platforms, consisting of different architecture and communication technologies.

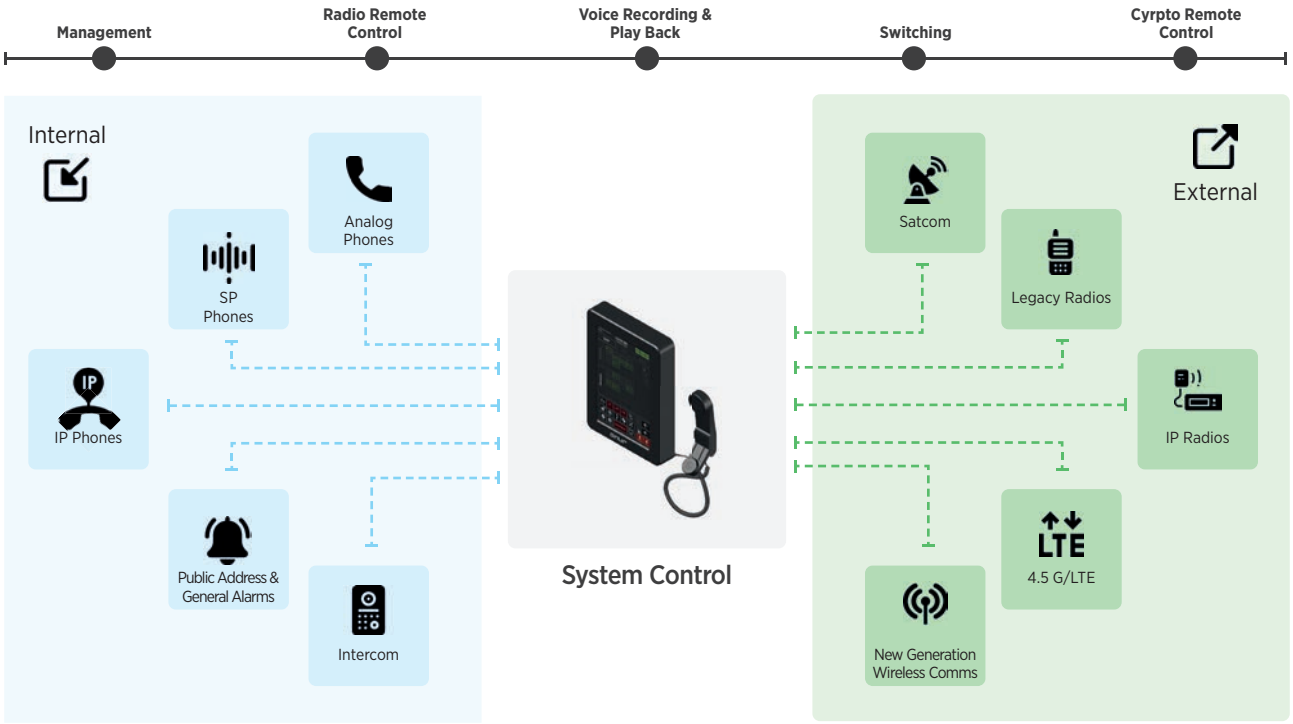
The system combines platform's internal and external communication suit with resillient mobile network backbone. This powerful combination offers flexible and efficient use of existing communication channels and delivers extended networking capabilities.

The typical configuration aims to bring all legacy equipment such as HF, VHF and UHF radios, sound powered phones, phone lines, voice crypto devices and data crypto devices to a single IP based pool. The resources are then shared by relevant user stations, in line with dynamic role-selection based rules.



The communication suit, namely Integrated Voice Communication System, provides integration of entire internal and external communication. Together with Tactical Mesh Networking System, these capabilities are extended to Operation Centers, and other platforms.

The system may also deliver ad-hoc networking capability for maritime platforms within or between battle groups. This capability is extended to strategic commands through satellite, or coastal radio stations.



System Overview

ONUR's "Tactical Mesh Networking System" together with its complementary communication channels sit at the heart of the solution. "Tactical Mesh Networking System" bounds various communication channels to provide field proven reliable communication network for mobile platforms.

The system delivers full-scale communication backbone, based on network centric design. The communication system relies on uninterrupted, ad-hoc mesh network, that is established and maintained without human interference.

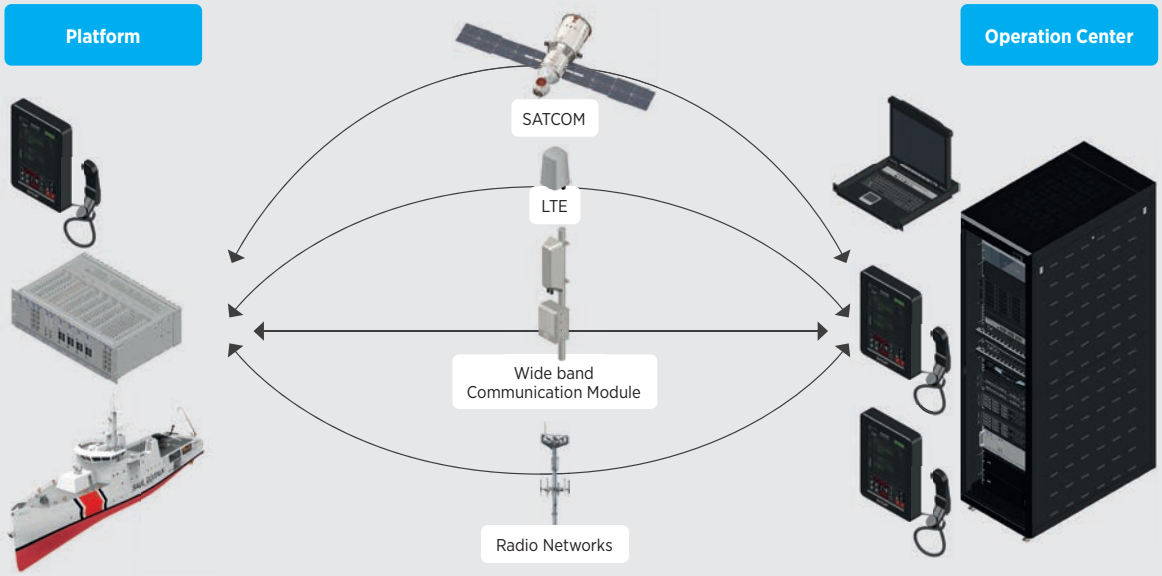
The system consists of two main sub components:

- Integrated Voice Communication System
- Tactical Mesh Networking System with its communication channels

These systems work together to provide full scale communication functions based on network enabled capabilities. The communication services include point to point voice calls, multi-node conference, video calls, video conference, text messages, email and file transfer.

Additionally, the system brings legacy equipment such as HF, VHF and UHF radios, sound powered phones, phone lines, voice crypto devices and data crypto devices to a single IP based pool. The resources are then shared by relevant user stations, in line with dynamic role-selection based rules.

This delivers unique features where traditional communication meets advanced IP based network capabilities in the most affordable way.



The system offers scalable and flexible military grade network infrastructure, which enables its use in operational area. The solution is being currently operated by Turkish Coast Guard Command.

Typical design is comprised of three base configurations:

- **Operations Center**
- **Radio Stations** for Wideband Communication Module and HF/VHF/UHF Radio Networks
- **Platform**

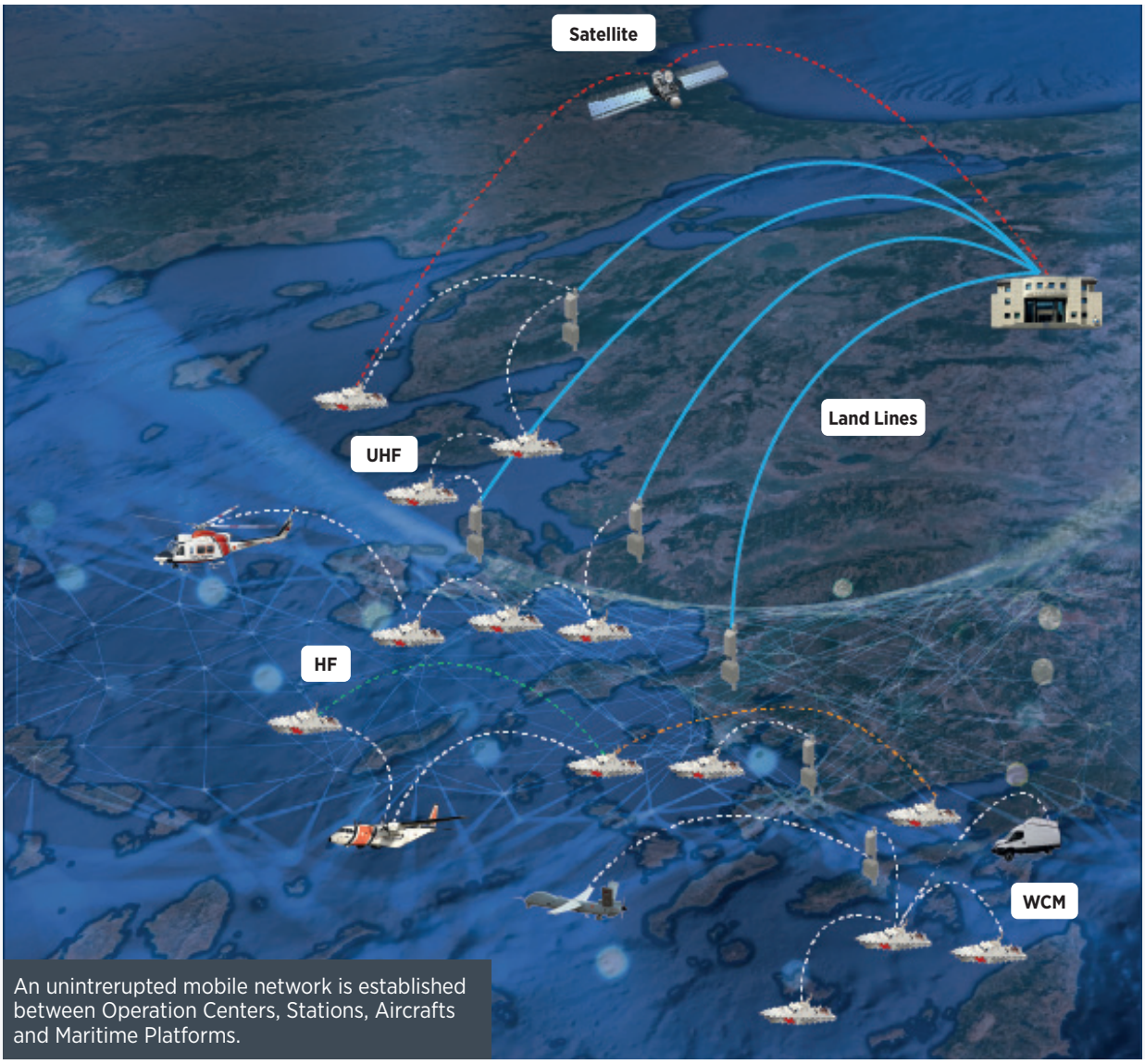
Once established, all routine system services such as video calls, voice calls, web browsing, email, file transfer, chat and location tracking may be carried out between Operations Centers and maritime platforms to an end-to-end basis. These features also include “platform to platform” data exchange.

The features may be extended to land platforms (such as mobile command posts, mobile surveillance stations, embarking teams etc.) and airborne units (such as rotary and fixed wing aircrafts, unmanned systems etc).

The additional stations such as Shore-Ship Radio Stations or Oil-Rigs may be used to extend the range of the network. Every station acts as relay nodes and assists in achieving over the horizon ranges.

Any data exchange through the established network is military or industry level encrypted. Any further need to establish additional security layers may be fulfilled by military grade crypto systems as required.

As the network is based on multi-layer communication channels, the network is maintained to extended ranges.



An unintrerupted mobile network is established between Operation Centers, Stations, Aircrafts and Maritime Platforms.

The system delivers full-scale communication backbone, based on network centric design. The communication system relies on uninterrupted, ad-hoc mesh network, that is established and maintained without human interference.

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

Its modular design offers compatibility with existing infrastructure. The MANET capable system forms, configures and maintains ad-hoc IP networks, without requiring operator interruption. This connection may remain inside the battle group, between various battle groups, or may be extended to main HQ by using HF radio network or SATCOM communication channels.

Tactical Network is provided by ONUR's Tactical Mesh Networking System, which is comprised of;

- Tactical Router
- Network Communication Channels (WCM, HF, VHF, UHF, Satellite etc.)

The most emerging feature of the system is the ability to bind existing network infrastructure with new high-capacity channels. This capability is achieved by the "Tactical Router", the heart of Tactical Mesh Networking System.

Tactical Router offers a reliable and efficient network infrastructure for strategic, operational and tactical level voice, data and video exchange. The system facilitates an intelligent routing mechanism in order to combine and manage ad-hoc mobile hybrid networks, running on different wireless protocols.

The Tactical Mesh Networking System 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.

Tactical Network: Unified Data Exchange Platform

Connected: Various communication means are brought to the IP world to form a managed network.

Integrated: The operators can access monitoring and control functions of internal and external communication devices.

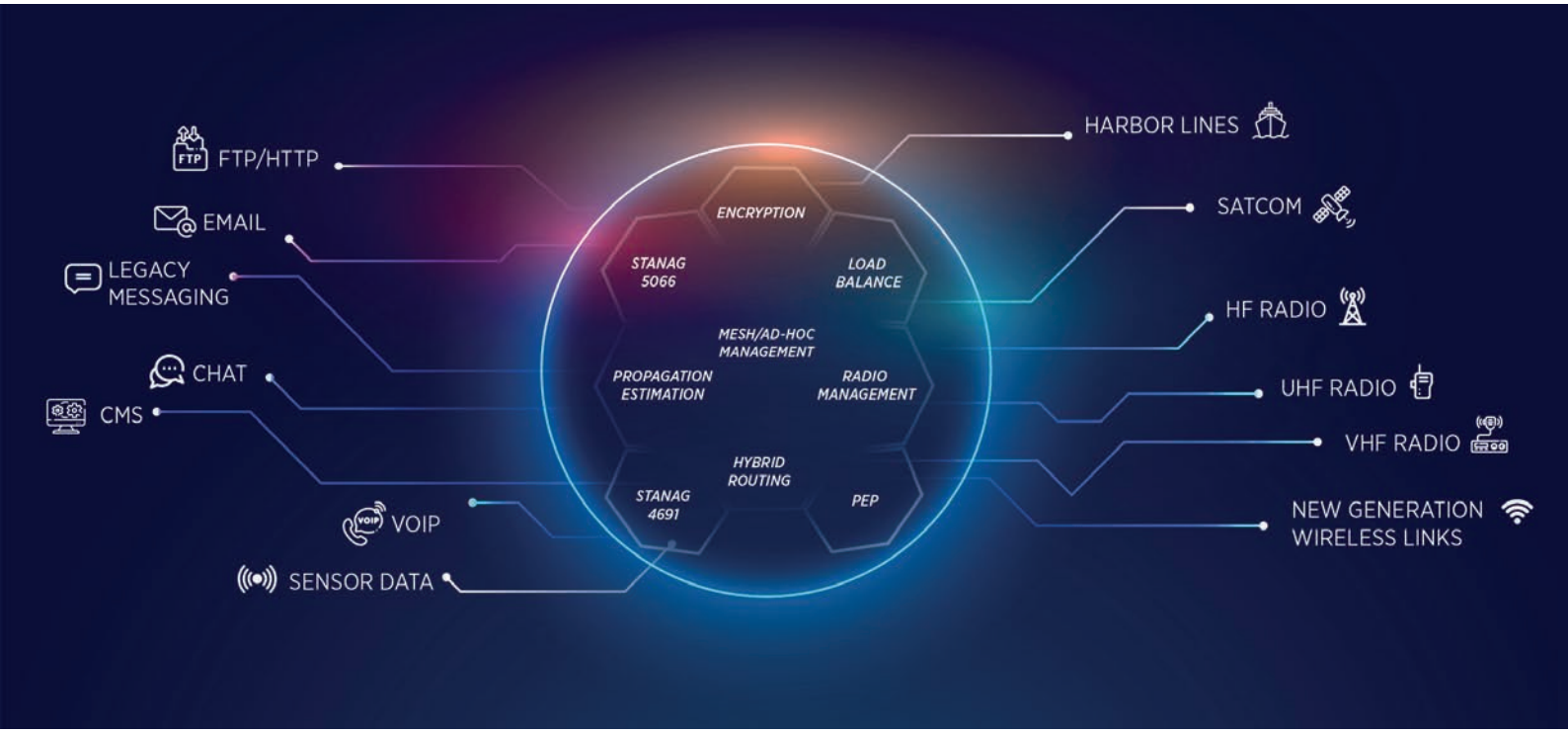
Reliable: Vital subsystems and connections provide redundancy to ensure uninterrupted operations.

Scalable: The system can be tailored from low profile to high capacity versions to meet different user requirements.

Cost Effective: All the advantages of IP network are provided without the need of upgrading the existing communication systems such as legacy radios.

The Tactical Mesh Networking System provides foundation for IP based voice, video, text communication.

Typical system services such as e-mail, file transfer, chat, web browsing, video conference may also be utilized over provided hybrid network.



System Architecture

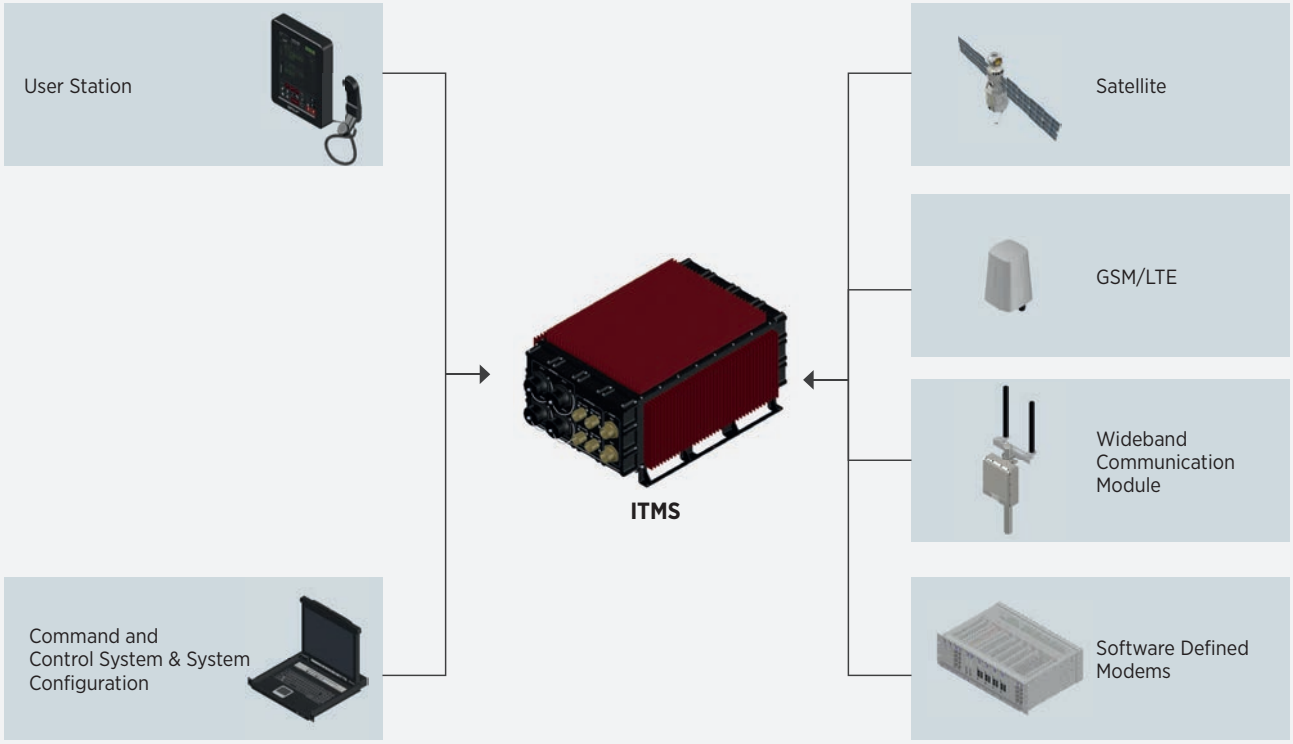
Next Generation Cross-Domain Network for Advanced Communications

The system has been designed and developed to integrate all narrowband and wideband communication means on a naval platform, and provide an "All-IP" communication backbone for the services to be used by the operators.

The system is specifically designed to provide end-to-end IP based service architecture for widely dispersed mobile platforms, which ensures high-availability of networking. Flexible architecture of the system can deliver ad-hoc secure network channels over various wireless communication systems for instantaneous collaboration both on tactical and strategical levels.

The platform systems are fully scalable and are typically comprised of;

- Integrated Tactical Mission System (ITMS)
- Communication Channels
- Wideband Communication Module
- SATCOM
- LTE
- Radio Networks (Software Defined Modems)
- Communication Panels for voice calls, video calls, and text messaging
- Command and Control Console



Integrated Tactical Mission System (ITMS)

“Integrated Tactical Mission System” (ITMS) sits at the core of the system. ITMS runs necessary tactical software such as Command and Control, Tactical Communications, Radio Control, and Tactical Router. ITMS also delivers necessary interfaces for Communication Channels, Radios and Internal Services.

ITMS is an integrated platform to primarily provide the communication and computing power backbone for the operational and strategic (mobile or static) units in the field.

ITMS has the ability to consolidate all voice/video switching, Analog/IP radio integration, LAN/WAN data communications, hybrid network tactical routing and computing power for C4I applications.

“Integrated Tactical Mission System” (ITMS) may be in different forms in line with required capacity and space availability. For high capacity and redundant services, 19” rack mount compatible 3U solution may be preferred. Rugged versions of ITMS is also available for smaller vehicles with space and power restrictions.

As “Tactical Router”, ITMS 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. A tactical router is essential particularly where hybrid networks running on different protocols and different bandwidths are formed.

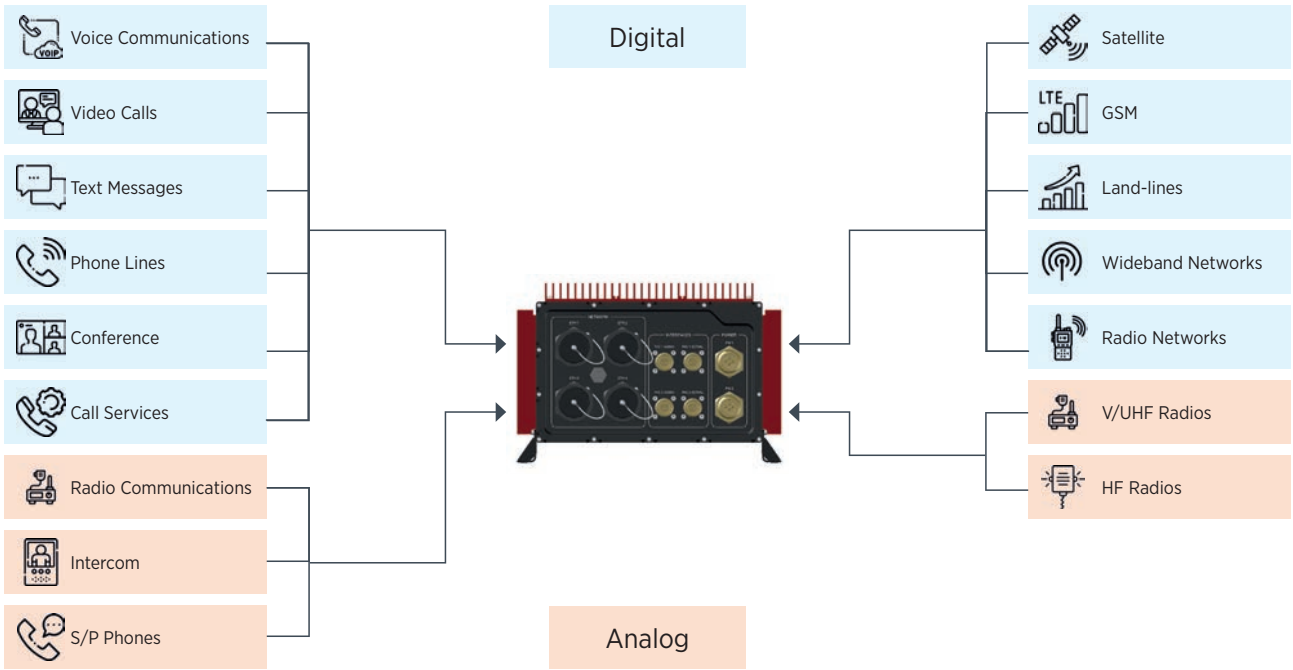
ITMS carries out following functions:

- Command and Control
- Tactical routing
- Radio interface and control
- Voice communication and recording
- System maintaining and configuration
- Physical interface for devices (network switches)

“Integrated Tactical Mission System” (ITMS) is also where the integration of existing legacy communication infrastructure is integrated with new generation IP networks.

The Radio IP Gateway modules (RIG) on the ITMS brings HF, VHF, UHF radios to IP world for ensuring a versatile switching of all available systems.

The system aims to integrate entire selection of communication means found onboard naval platforms. These options vary from traditional sound powered telephones to new generation IP radios.



Wideband Communication Module (WCM-500)

The system fulfils to a great extent the operational requirement for network enabled capabilities. The scalability of the system further offers full scale compatibility to any command and control system or IP based digital communication means. This capacity delivers the use of daily IP services such as video stream, video calls, e-mail, file transfer, voice calls etc.

The WCM-500 is a trustworthy ad-hoc mobile network solution for units such as stations, ships, oil-rigs, aircrafts, tactical vehicles or personnel to remain connected in operational theatre. It offers wideband self-forming and self-healing mesh network for stationary and mobile platforms.

WCM-500 offers distinctive features for Military Operational Forces, such as use of tactical level command, control and communication systems 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 delay sensitive missions.

The scalability of the system offers use of different WCM systems in combination of operational requirement. These options may cover mobile, vehicular, stationary and hand-held variations of WCM.

Since the networks are formed as an ad-hoc and the system is designed to be masterless, the network self-organizes itself 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.

Key Features

- 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)

Additional wide band 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 100 Mbps throughput. The system range extends beyond 50 km, depending on LOS availability.

The system may be used with different radios to adopt various frequency ranges. 4.4-5 GHz radio is widely used for military applications.

For greater ranges and meteorological resistance, 900 MHz (904-926 MHz) band radio may be used. This frequency provides additional penetration capability through buildings and other obstacles.

WCM supports a various set of antenna systems. Stationary systems may facilitate high gain sector antennas. Mobile platforms are equipped with high gain or wide coverage omni antenna systems.

The output power may be optimized to support stationary use (high output power) or mobile use (optimized output power for battery life).

WCM provides various interface options such as Ethernet and USB. The system also delivers Wi-Fi hotspot to enable smart wireless system integration.

Wideband Communication Module Family

Stationary, delivers high resistancy to environmental conditions, high output power, and high gain directed radiation.

Mobile, designed for mobile platforms, offers omni radiation antenna, and lightweighr rugged casing. Extra mobility may be acgieved with optional battery pack.

Hand-held, delivers personel use with low output power.

User Stations

As part of the Voice Communication System, User Stations deliver full-scale communication suit including voice calls, video calls, text messages as well as access and control of legacy radios.

User Stations provide user friendly access to integrated internal and/or external communication channels through a user-friendly touchscreen interface.

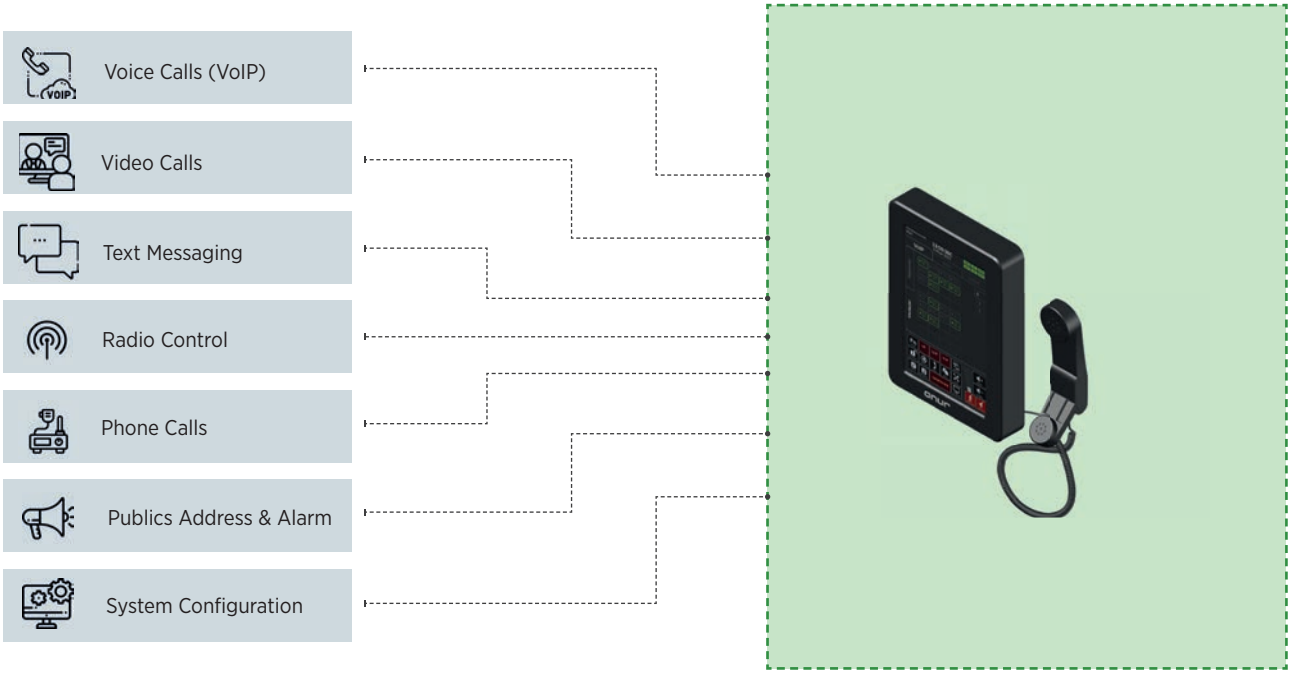
Layout designs can easily be altered to fit different operational necessities. The optimal size of the touch screens can be determined according to operators' functional requirements, space constraints, and configuration. Starting from "5 up to 17", COTS product touch screens can be used.

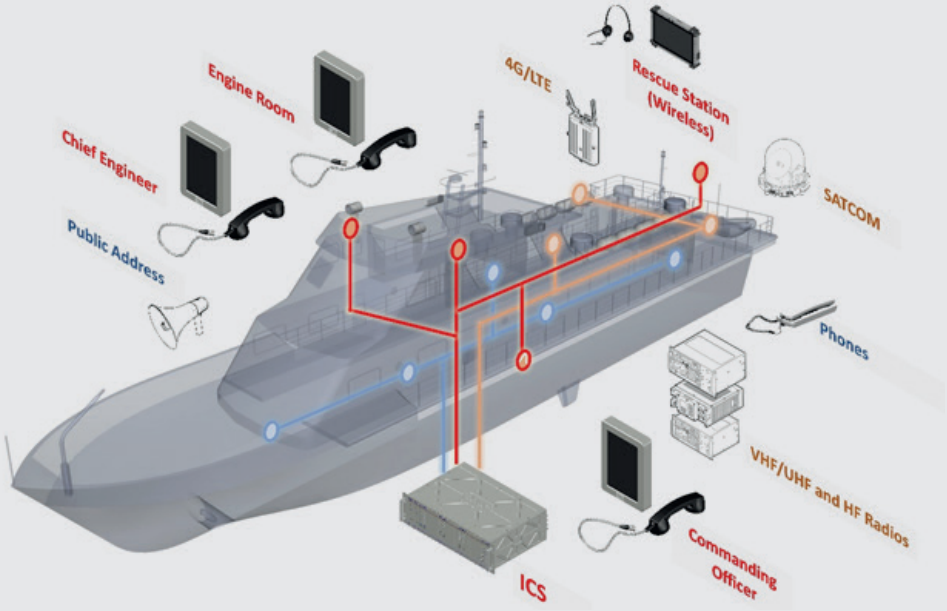
With the "User Station", operators can remotely set, select and use radios, telephones, GSM, intercom and SATCOM channels. The status of these devices can be monitored from the "User Station". It is also possible to manage and configure selected communication channels.

The user interface of the system inherits from years of operator experience and offers a broad capability set, ranging from basic to advanced.

The users can easily construct their own interfaces to contain all necessary communication circuits.
Once constructed, stations, operators, radio circuits, phone lines or VoIP panels may be accessed by a single touch virtual button. These options include;

- Speed dial for any phone onboard
- Speed dial for external stations
- Access to provided sound powered networks
- Speed dial for any external VoIP station within network
- Broadcasting pre-recorded messages on selected circuits
- Conference call with selected stations
- Alarms
- Public and zone announcements





Advanced Set-Up and Controls

In addition to communication channels, advanced set-up options are also offered, in accordance with provided authorization.

The pages are structured in line with traditional naval communication essentials.

All internal and external circuits are combined in operator's private working space to provide quick access to desired stations.

The user interface has necessary display options to meet naval requirements, including night mode and downgraded mode. The outlay of the interface may be adjusted to specific needs, such as enlarging the buttons for quick access.

Subject to role definition and authorization, all user stations have following capabilities:

- Basic controls of legacy radios (such as frequency adjustment)
- Tx/Rx on all assigned radios
- Point-to-point intercom with other user stations
- Direct call to phone lines
- Radio-telephone conference with any user station
- Direct message exchange with any user station
- Simultaneous monitoring of multiple external and internal communication channels
- Access to internal sound-powered communication lines
- Access to ship's public address system
- Access to ship's general alarm system
- Internal and external broadcasting of pre-recorded messages

Recording Service

Two-way conversation voices are combined with the phone calls and recorded in integrated recording service. In addition to voice packs, incoming / outgoing call direction, search priority, caller-ID, dialled number, and start time of a conversation are also recorded with time-stamps.

ORS-IP2000 Integrated Recording Service can expand its recording capability to include other systems such as:

- Radar video screens
- Avionic screen recording
- CCTV systems
- Payload video streams
- Datalink messages
- System security and warning events
- Access control
- Information from external systems

OSBM-200 Software Based Modem

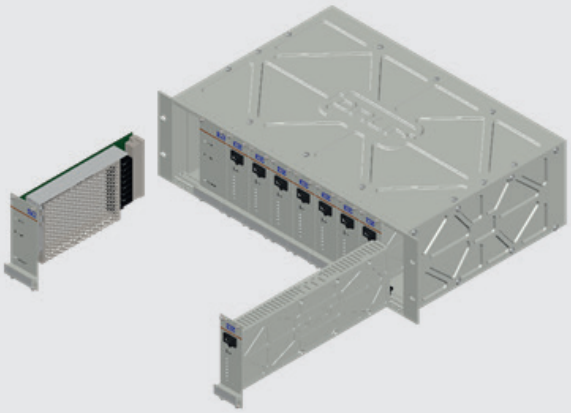
IP Over Radio: Timely Access to Critical Information over Tactical Radios

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.

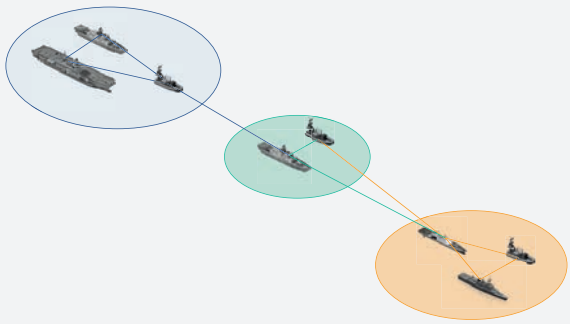
The Mobile Ad Hoc Relay Line of Sight Networking (MARLIN) profile describes the system concept and set of protocols that provide Internet Protocol (IP) data transfer in multiple-node, multiple-hop dynamic networks employing line of sight (LOS) radio bearers.

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.

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

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.



Key Features

- Beyond Line of Sight (BLOS) data connection over the HF radio communication channel (STANAG 5066)
- 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

Added Values

Designed for naval vessels, applicable to all types of military and civilian maritime platforms

The system delivers full-scale integrated command, control and communication solutions, that can be gradually obtained in accordance with operational requirement and allocated resources.

By the provision of multi-layered hybrid mobile network, Network Enabled Operational Communication System delivers following services for Operation Centers and Platforms:

- High quality and quick access Voice Communication via VoIP,
- Video calls and video stream
- Facilitation (transmit/receive and configuration) of legacy radios via user friendly Communication Panel
- Text messaging and exchange of command messages
- Continuous voice recording
- Daily IP services such as email, file transfer, chat etc.

Maritime

Large Combatant Platforms

Naval Support Vessels

Patrol Boats

Merchant Vessels

Oil Rigs

Land Based

Communication Centers

Command and Control Center

Surveillance Stations

Airborne

Fixed Wing

Rotary Wing

UAV

The design of the system ensures minimum human involvement for establishment and maintenance.
The operation centers acquire additional capabilities such as:

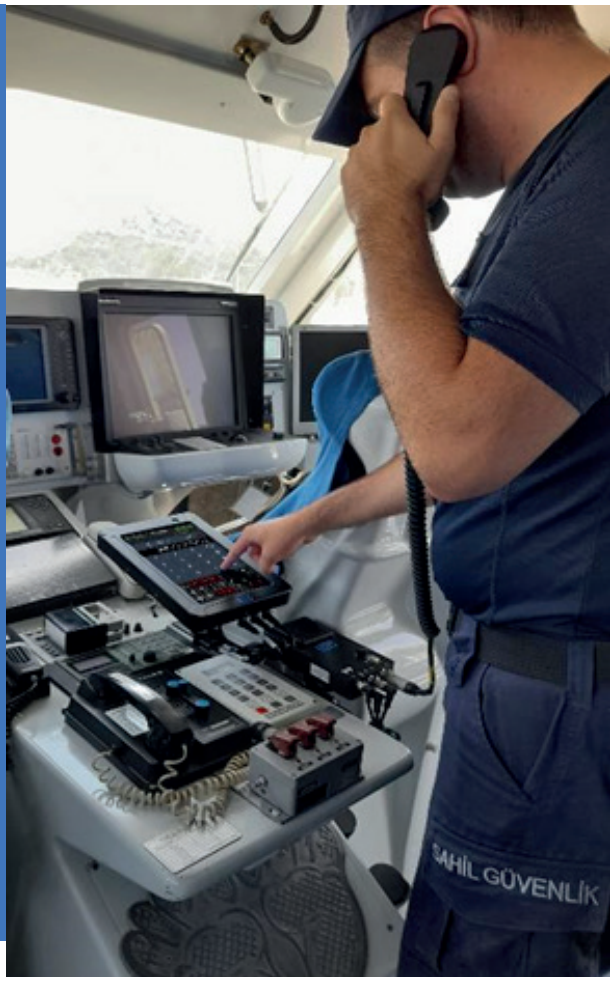
- Remote monitoring and configuration of all mobile platforms
- Access to all communication records of mobile platforms
- Remote monitoring of command-and-control services (location, speed, course, track history etc.)

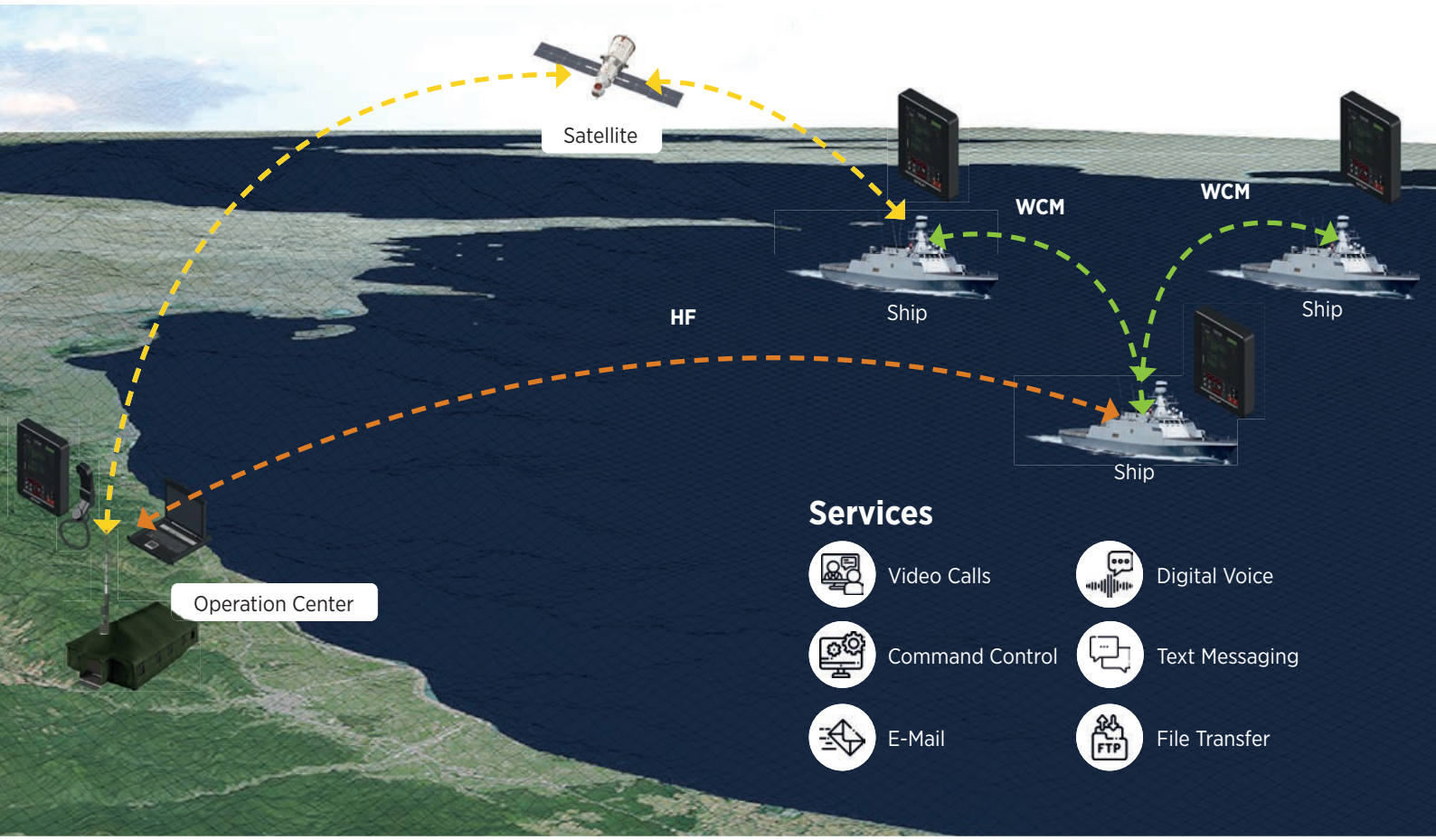
ONUR Network Enabled Operational Communication System delivers a coherent transition to network enabled command, control and communication capabilities. With state of art mesh networking capabilities, advanced information exchange backbone is achieved.

The scalability of the system offers the foundation for advanced command and control systems for stationary and mobile platforms.

With gradual additions, the wireless network backbone may easily be upgraded to a complex hybrid network that runs on different protocols with various communication channels. A further upgrade includes full-scale communication system that consists of voice communication, voice recording and video conference capabilities. These upgrades may be added without costly design efforts.

The use of software-based encryption allows remote use of systems without compromising from secure communication. Additional military level crypto systems are also available to ensure required level of security.





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