



Digital transformation solutions for the Naval Defence sector

Table of Contents

- 1. Introduction 3
- 2. Use cases..... 3
 - 2.1 Operational centre for monitoring environments and coordinating actions... 3
 - 2.2 Connected naval base 4
 - 2.3 Remote visual assistance for e-maintenance and firefighting 4
 - 2.4 Mobility on board 5
 - 2.5 Continuing education 5
- 3. Resilient network infrastructure 6
- 4. High availability communications systems 7
 - 4.1 The Rainbow Unified Communications and Collaboration platform 7
 - 4.2 Rainbow: Data security and integrity certifications 8
 - 4.3 Embedded network and communications solutions, approved and certified.. 8
- 5. Why Alcatel-Lucent Enterprise? 9

1. Introduction

Information and communications systems in the naval defence sector are evolving to provide new real-time services such as digital collaboration and Internet of Things (IoT) connectivity. These connected services rely on interoperability, resilience, high availability and security, as well as adaptability to meet customer needs for scalability and openness for future innovation.

This white paper presents use cases for the naval defence sector, adapted solutions, and the necessary certifications for the required products and solutions.

2. Use cases

The use cases presented here exclude combat and high-intensity engagement and are in accordance with the Alcatel-Lucent Enterprise civil-military technologies that are directly and easily accessible. They rely on a dedicated ship's cloud for collaborative services for:

- Operational functions not served by a dedicated Information System (IS) such as:
 - Second-rate patrol vessels for monitoring/observation of the environment
 - Remote visual assistance for maintenance operations managed internally on board or with the support of the shore base
 - Collaboration teams to support firefighting
- Non-operational functions such as:
 - Management of everyday life on board the ship
 - Leisure activities
 - Continuing education and apprenticeship
 - Communication with family while on board

These use cases also apply to the connected naval base and the various support functions it provides.

2.1 Operational centre for monitoring environments and coordinating actions

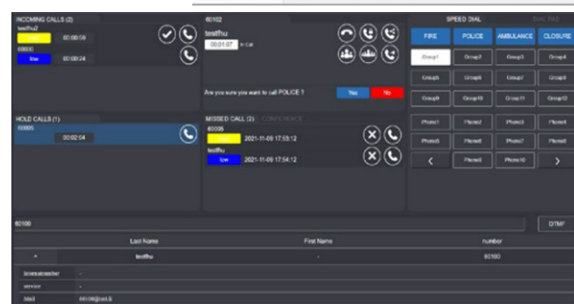
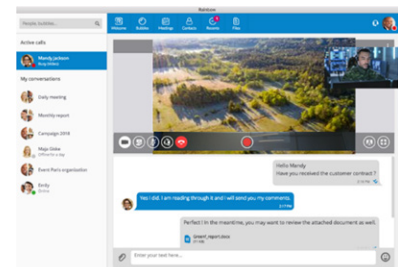
An embedded operations centre within a base is a structured environment that serves as the primary workplace to monitor, direct and coordinate operational activities, including identification and response to situations that require specific and immediate attention.

To support users and manage crises and emergencies:

- The operations centre must monitor the environment with the support of IoT and drones, analytics, Artificial Intelligence (AI) systems and machine learning
- Managers must make decisions and take action based on the context of the situation

Experience is key, however, AI is becoming increasingly useful in supporting decisions.

The controller — the human being — remains at the centre of the operations and decisions-making. Communications and collaboration are part of the foundation of the Operations Control Centre (OCC) and must be integrated into the business processes and aligned with the overall workflow mechanisms.



2.2 Connected naval base

Naval bases are at the heart of the organisation of specific operational support for ships stationed at or passing through the port. The main mission includes port support, logistical support and manpower support. They provide local operational support in military ports, bring together and federate services to:

- Receive ships
- Protect against pollution
- Provide firefighting support
- Monitor the site for marine approaches
- Receive soldiers and manage their training and care courses
- Provide refuelling operations (fuel, ammunition)
- Troubleshoot port issues or assist in installations

It is a city within the city requiring secure, real-time connectivity for buildings, people and objects, to ensure efficient and effective coordination.

ALE connectivity, network, communications and collaboration platform solutions are integrated into business processes and connected objects (IoT) to provide:

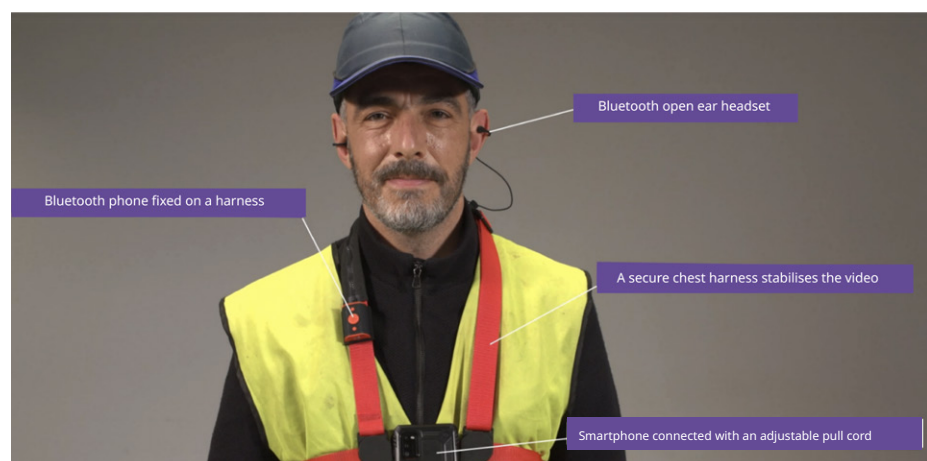
- A secure network for resilient connectivity
- A high availability communications system
- Real-time collaboration for better management of interference and co-activities
- Integration into control systems for greater efficiency
- An operational centre to supervise and manage various interactions within the base

[Rainbow™ by Alcatel-Lucent Enterprise](#) connects the teams to enable efficient real-time collaboration.

For example, when an alert is triggered a Rainbow bubble can be dynamically created and stakeholders invited to join the bubble. Information collected by surveillance systems, IoT, or video streams is brought back into the bubble and shared with everyone to facilitate decision-making.

2.3 Remote visual assistance for e-maintenance and firefighting

Remote Visual Assistance (RVA) makes it possible to optimise interventions and increase success rates. It is an easy-to-use, secure and an ultra-mobile solution. It strengthens collaboration by allowing support teams to see what the response agents see. Capturing and sharing visual content significantly improves operational efficiency by enhancing in situ interventions associated with connected objects such as headsets, control buttons and other sensors. The solution makes it possible to capture photos and videos with a single click during the intervention, accelerating reporting and securely automating and centralising data.



2.4 Mobility on board

Connecting the ship to the Internet has completely changed the management of a ship and its crew. This connectivity is essential to on board personnel who no longer conceive of being isolated from their loved ones and not being able to access their families and friends through social networks.

The use of Wi-Fi on board a military vessel is still fragmented due to speed limitations, costs and security. However, in the commercial navy, the provision of a permanently accessible Wi-Fi Internet network, with no other restriction than one's individual subscription is becoming widespread. Connectivity allows on board personnel to stay connected with loved ones and promotes positive morale and better performance.

New technologies have been introduced including the latest Wi-Fi 6 standards, which offers significant improvement in Quality of Experience (QoE) compared to Wi-Fi 5. New features include:

- **OFDMA:** Orthogonal frequency-division multiple access offers greater granularity in bandwidth resource allocation, resulting in increased throughput up to four (4) times per user.
- **MU-MIMO:** This feature existed in the previous 802.11 Nn and ac standards. Wi-Fi 6 has increased the number of spatial streams that can be used simultaneously to serve connected users. Up to eight (8) uplinks and two (2) downlinks while Wi-Fi 5 only supported a maximum of four (4) downlinks and one (1) uplink.
- **1024-QAM:** A new modulation technology that allows greater transmission capacity over the network with a 25 percent to 39 percent increase in raw speed compared to Wi-Fi 5.
- **The Basic Service Set (BSS) Color:** Allows Wi-Fi 6 access points to detect radio transmissions from nearby access points belonging to a different WLAN network and take steps to minimise radio collisions and interference on the same channels. This results in better transmission quality, especially in very dense environments.
- **Targeted wake-up time (TWT):** Allows connected devices to go to sleep when they are not sending or receiving data, resulting in device battery life optimisation of up to 67 percent.
- **WPA3:** The latest security standard, is mandatory on Wi-Fi 6. It addresses various vulnerabilities observed in the WPA2 standard.

2.5 Continuing education

Ongoing training allows personnel to embark on a vessel for a long-term mission without interrupting training sessions that they may have previously been enrolled in while on land.



[Rainbow Classroom](#) offers a wide range of distance learning features for instructors and attendees including video conferencing, virtual whiteboard, classroom sub-workspaces, learning analytics and presence.

In addition to on board training, Rainbow Classroom allows peer training as well as the ability to record exercise videos, and broadcast and comment on them in real-time for immersion during practical work or maintenance exercises on board the vessel.

3. Resilient network infrastructure

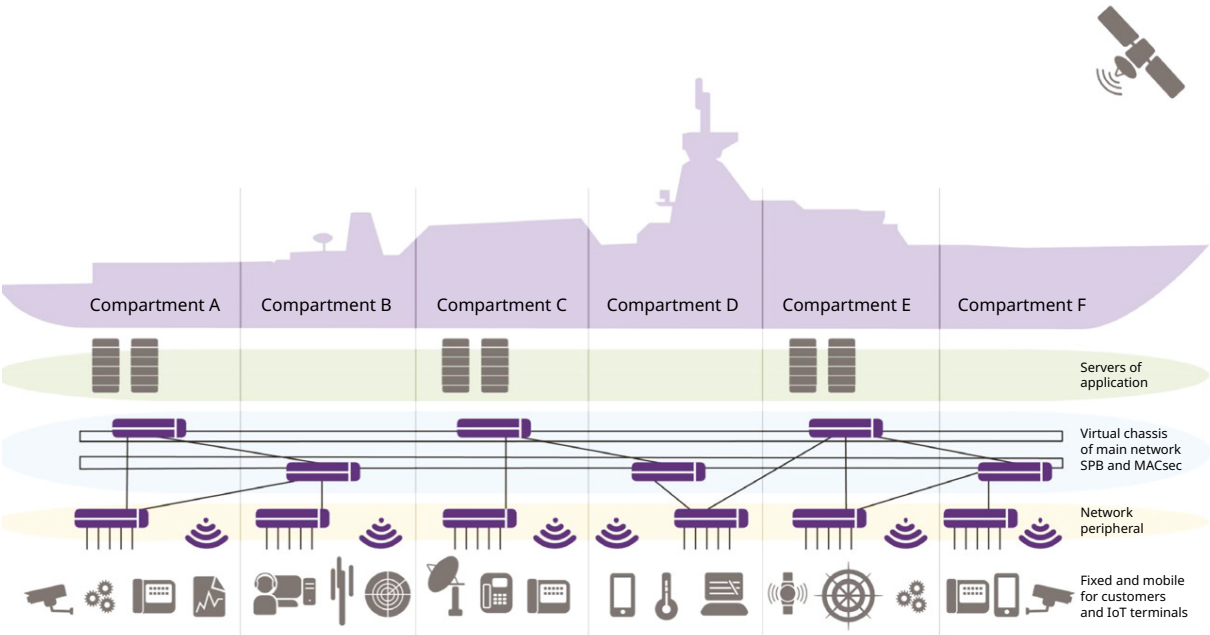
A ship’s network must be resilient and capable of meeting the highest standards without a single point of failure, taking into account the compartmentalisation of the ship. The data network must continue to function in the event of a failure in one of the compartments.

ALE’s Digital Age Networking three pillars address the challenges of connected defence with:

- The Autonomous Network, which is the foundation for a reliable, yet simple to operate and maintain network infrastructure that interconnects the various networks on board a ship, personnel on board and off, as well as connected devices, securely and efficiently
- Secure integration, management and monitoring of any IoT device, enabling the integration of monitoring systems, sensors and other objects needed on board the vessel
- Business innovation to accelerate digitisation with automated processes, capable of integrating network equipment, people, objects and applications, working and interacting together securely for increased efficiency, safety and security

A number of critical network technologies and designs can be used on board ships, including Shortest Path Bridging (SPB), Ethernet Ring Protection (ERP) and Media Redundancy Protocol (MRP), as well as system virtualisation switching.

Figure 1. Detailed diagram of the SPB (Short Path Bridging) of a main peripheral network for ships.



Ships require robust, multi-service, rapidly converging strategic network technology. That’s why ALE recommends SPB technology. It is highly scalable, secure and designed to support multiple networks on the same physical infrastructure while keeping investments to a minimum. SPB can also route multicast traffic for audio and video announcements, which are essential to the vessel’s operation. It simplifies deployment and maintenance by automatically assigning services and devices with the appropriate network segregation. New services can be created instantly without having to rethink the network design or reconfigure it. A second technology that can be deployed is Ethernet Ring Protection (ERP), which offers faster convergence times but is not as flexible as SPB. However, it may be easier to deploy this technology depending on the fibre deployed in a ship.

4. High availability communications systems

The naval sector relies on proven communications and collaboration platforms to communicate and deliver critical information on and off its vessels.

Professionals in the defence sector choose ALE solutions for the superior quality of communications and a security of exchanges, whatever the conditions. Alcatel-Lucent Enterprise's communications systems are designed to support virtualised and non-virtualised environments. They:

- Operate in the event of hardware, software and network failures
- Offer geographic redundancy, with backup servers that can be in different buildings or cities to ensure recovery in the event of a data centre outage
- Incorporate a fully automated backup and recovery mechanism and instant switching completely transparent to the end user
- Ensure call retention with no significant call loss when switching to emergency services

A variety of functionalities allows for a range of telephone uses, from reception to the group working stations and conferencing, accessible by the different workstations, with a comprehensive portfolio of mobile and desk phones, adapted to a variety of usage profiles.

Additionally, encrypting communications and prioritising and pre-empting calls in an emergency situation can be useful. The ability to call emergency numbers or deploy emergency call terminals and disseminate information on a set of stations makes it possible to improve the safety of the personnel on board a vessel.

4.1 The Rainbow Unified Communications and Collaboration platform

Alcatel-Lucent Enterprise has a strong background in unified communications and collaboration and a portfolio that includes Rainbow, Rainbow Office powered by RingCentral* and Rainbow Edge. Rainbow provides cloud services for two-person or group collaboration, voice and video communications (up to 120 people), screen and file sharing, storage file, as well as real-time contact presence management. Rainbow can also be deployed as a hybrid platform that simply connects to the enterprise communications server (IPBX) to converge IP communications with digital communications. Rainbow is recognised for its openness to various ecosystems. This facilitates mobility and makes it possible to enhance existing infrastructures independent of whether it is ALE or another vendor.

Rainbow connects to the ecosystem and provides services that simplify daily life (for example; automatic meeting creation and meeting slot proposals). Connectors to major Software as a Service (SaaS) platforms are available to integrate real-time communications directly into daily use applications.

Rainbow Edge brings the flexibility of the Rainbow architecture providing the ability to deploy the solution in the customer's private data centre (creating a private cloud) to ensure an even higher level of security for specific environments. Rainbow Edge can be deployed on a base or embedded in autonomous mode in a building and does not require permanent Internet access.

*In the countries where Rainbow Office powered by RingCentral is available.

4.2 Rainbow: Data security and integrity certifications

ALE provides a secure by design, enterprise-grade collaboration solution, fully certified General Data Protection Regulation (GDPR) compliant. We are in progress in the certification process for a High-Level certification from ANSSI, ensuring Rainbow cloud platform compliance for the government and defence sector.

	<p>ISO27001 A certification, requiring, requiring ONE deep audit, of personnel, of organisation of processes, and in Secure Management in IT.</p>
	<p>ISO27001 – HDS (Hosting of Health Data) In France, the hosting of Data in Health (HDS) certification guarantees data security Patient and their Storage in secure environments.</p>
	<p>The General Data Protection Regulation European Regulations in Data Management and Protection for the European Union And the economic zone. This regulation also regulates the transfer in C flat data Outside the European zone.</p>
	<p>First Level Safety Certification (CSPN) at the National Agency for Systems Security Information (ANSSI) Process In progress In CSPN Validation with ANSSI. Letter Official disposable - certificate H2 2021/2022</p>
	<p>ANSSI SecNumCloud Very High Level In Security For Cloud Infrastructure Providers Underway with Our OVH partner.</p>

4.3 Embedded network and communications solutions, approved and certified

ALE defence certifications for network and communications solutions include: ANSSI Common Criteria Certification, NIST, U.S. Department of Defense Interoperability Certification (JITC), FIPS140-2, TAA.

 <p>ISO 9001 = ISO 14001</p>		  <p>JITC certified</p>
	 	

Four types of LAN switches are used by NATO and NATO countries: Traditional Enterprise LAN switches, rugged switches, tempest switches and tactical switches (in the field).

The solutions are adapted to the most restrictive conditions including extreme temperatures, dust and smoke, EMI/EMC, humidity, vibration and shock. Certifications include DNV maritime certification.

5. Why Alcatel-Lucent Enterprise?

Alcatel-Lucent Enterprise digital age networks and communications solutions for both civilian and military environments, provide secure connectivity and communications to meet needs of both military ships and naval bases.

ALE also provides a portfolio of communications and collaboration solutions to ensure connectivity in harsh and hazardous environments, as well as ruggedised [LAN](#) and [WLAN](#) equipment for mission-critical networks. These solutions are based on the same operating system as the enterprise equipment and provide the same advanced functionality controlled by the same network management system.

IoT data also helps in strategic decision-making. ALE [Digital Age Networking](#) simplifies the integration of IoT networks with automation, advanced security and high availability while ALE [Digital Age Communications](#) allows the processing of IoT information and integration into a task process.

The ALE vision is based on experience gained through its ecosystem of more than one million customers and 3400 business partners and distribution network worldwide. At ALE we:

- Contribute to the improvement of existing networks within customers' budget constraints, and develop advanced and scalable solutions adapted to their needs
- Improve user experiences and Quality of Service (QoS), increase productivity, and ensure the well-being of crew and passengers
- Help reduce the IT team workload, allowing them to focus on optimising workflows to ensure efficiency and availability