Unleashing the power of data to optimise vessel performance

8 September 2020 • 09:00-09:45 BST

Presentation & sponsor documents:
Page 2: Tor Skeie, Marlink
Page 8: Juan Gil, OSM Maritime Group - Maritime & Technology
Page 12: Dr. Ranjan Varghese, Steel Ships
Page 19: Dr. Dimitrios Dalakis, World Maritime University (WMU)
Page 26: Marlink company information
Unleashing the power of data to optimise vessel performance

Tor Skeie, Vice President Maritime IT Solutions
8 September 2020
## Digitalisation@Sea Journey

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>CONNECTED SHIPS</th>
<th>Digitalisation of the production tool</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VESSEL OPERATION DIGITALISATION</td>
<td>Crew operated vessels + Remote monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OT digitisation (connected cyber-physical systems) &amp; process automation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 2</th>
<th>DIGITALISED SHIPS</th>
<th>Digitalisation of the global production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FLEET OPERATION DIGITALISATION</td>
<td>Crew operated vessels + Remote assistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industrial IoT &amp; Real time analytics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 3</th>
<th>SMART SHIPS</th>
<th>Digital transformation of the business</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SMART SHIPPING</td>
<td>Remote operated vessels + Crew assistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Integration in the overall digital transformation of the company and its activities</td>
</tr>
</tbody>
</table>

### Analytics
- Descriptive stage (report)
- Diagnostic stage (discover & control)
- Preventive stage (forecast)
- Prescriptive stage (anticipate)
Vessel operation is one of the biggest maritime digital transformation challenges... …with the largest financial impact!

Vessel operation digitalization relies on OT connectivity & security and OT digital services (real-time remote tracking, automated reporting, performance analytics, condition-based monitoring, emission management, etc.)
Real Obstacles of Smart Shipping Transformation

Data is coming from ships but...

- Large variation of data acquisition systems installed
  Ships are complicated systems with many protocols and proprietary systems
- Many providers to manage
- Data transmission is not straightforward
- Fragmented and not standardized data
- Non customisable solutions
- Data ownership and access headache

Lead to inefficiency and complexity ➔ High TCO!
Digitalisation everywhere – one value chain
Because a connected world is a better world. Marlink.com
Unleashing the power of data to optimize vessel & fleet performance

Juan J. Gil
IT Manager - OSM Maritime Singapore
Sept 8th 2020
Why data?

Not all data is valuable, but expensive.

Data without reflection/action is meaningless.

Is Data getting me closer to the corporate strategy?

Source: Data to insight

Source: The [i] Factory
<table>
<thead>
<tr>
<th></th>
<th>Optimize</th>
<th>Diffuse</th>
<th>Disrupt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEFINITION</strong></td>
<td>to introduce <strong>incremental improvements</strong> to sustain an existing product or service</td>
<td>to introduce <strong>emerging ideas and technologies</strong> into an existing category</td>
<td>to introduce <strong>new business models</strong> to reach new customer segments</td>
</tr>
<tr>
<td><strong>CATALYZED BY</strong></td>
<td>existing customer needs, unmet and emerging</td>
<td>new technological or cultural trends</td>
<td>complacent incumbents &amp; unserved segments</td>
</tr>
<tr>
<td><strong>REQUIRES</strong></td>
<td>customer obsession and an iterative design approach</td>
<td>constant outside awareness of technology and culture</td>
<td>courage and resources to challenge the status quo</td>
</tr>
<tr>
<td><strong>WATCH OUT</strong></td>
<td>know when to stop supporting an existing product</td>
<td>challenge yourself to keep innovating</td>
<td>give yourself time to change behavior and capture market</td>
</tr>
<tr>
<td><strong>EXAMPLE</strong></td>
<td>adding a better moisturizing strip to a men’s razor</td>
<td>adding an electric trimmer onto a traditional razor</td>
<td>creating a razor subscription service</td>
</tr>
</tbody>
</table>
What are the benefits of data?

Vessel Performance

- Fuel
- OPEX
- Employee Capacity
- Port Turnaround Time

Source: Veracity

Fleet Performance

<table>
<thead>
<tr>
<th>Technical Opex</th>
<th>Budget (Latest Month)</th>
<th>Actual (Latest Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.6M</td>
<td>890.7K</td>
</tr>
<tr>
<td></td>
<td>99.3K</td>
<td>55.2K</td>
</tr>
<tr>
<td></td>
<td>226.4K</td>
<td>35.0K</td>
</tr>
</tbody>
</table>

Source: OSM
Unleashing The Power Of Data To Optimise Vessel Performance

by Dr. Ranjan Varghese, Chief Executive Officer, Steel Ships Limited, Hong Kong
CONCEPT: PERSPECTIVE AS A SHIP OWNER

INTRO

01
IMO Vision
Forward

02
Fleet
Efficiency

03
Voyage
Efficiency

04
Vessel
Efficiency

+ Roadmap for developing a comprehensive IMO strategy on reduction of GHG emissions from ships
+ Establishment of company culture, Goals
+ The enriched data and analytics
+ Individual vessel data Optimization
IMO VISION FORWARD
ROADMAP FOR DEVELOPING A COMPREHENSIVE IMO STRATEGY
ON GHG REDUCTION FROM SHIPS

Phase-1 Data Collection
Year 2012-2018.

Phase –II Data Analysis Year 2018-2020

Phase- III Decision Step Year 2022-23

Objectives

1. Avoid Pollution at Sea
2. Advanced Safety Management
3. Improve Vessel Performance at Sea
FLEET EFFICIENCY

Company culture development to promote green company

• Better situational awareness enables a top-down, fleet-wide approach

• In easy-to-digest dashboards you get an overview of fleet’s activities, including vessel location and KPIs

• Increase fleet-wide transparent situational awareness

• Transparency onshore and onboard personnel, through a single online interface

• Prudent companies exceed the IMO requirements
VOYAGE EFFICIENCY

Optimising voyage and operational performance results in concrete savings

Objectives

• To find the most efficient Ship specific combinations for all onboard variables, along with weather, sea state, and other factors like ECA/SECA zones.

• Decision Support for Crew

• Get a fuel-consumption breakdown to realize up to 10% savings per voyage hence the CO2

• Aggregate voyage performance KPI/Fleet targets that are comparable across the fleet

• Improve voyage performance through diagnostics/correction machine learning

Courtesy: Boss Optimisation
VESSEL EFFICIENCY

- Aligning with accurate **fleet goals**

- To maintain vessels’ **technical performance reliability and availability**

- Minimizing **total cost of ownership across the lifecycle.**

- Moving from time-based to truly **predictive maintenance**

- Improve energy efficiency and reduce costs,
  - including hull and propeller condition, speed fuel curves, and engine performance
POWER OF DATA TO OPTIMISE VESSEL PERFORMANCE

HEALTH - SAFETY - ENVIRONMENT

IMO Vision Forward (GLOBAL)

Ship Owner Centric

01
IMO Vision Forward (GLOBAL)

02
Fleet Efficiency

03
Voyage Efficiency

04
Vessel Efficiency

THANK YOU

STEEL SHIPS LIMITED
HONG KONG
INFO@STEEL-SHIPS.COM
Vessel Optimisation Webinar Week: Unleashing the Power of Data to Optimise Vessel Performance

Dimitrios Dalaklis

WMU - World Maritime University
Understanding “Change”:

- **1.0**: 1st revolution
  - Mechanization, steam and water power

- **2.0**: 2nd revolution
  - Mass production and electricity

- **3.0**: 3rd revolution
  - Electronic and IT systems, automation

- **4.0**: 4th revolution
  - Cyber physical systems
A smart port is an automated port that uses nascent technologies such as big data, Internet of Things (IoT), blockchain solutions and other smart technology based methods to improve performance and economic competitiveness.
Potential Areas of “Improvement”:

- Voyage planning and positioning
- People tracking
- Freight and logistics
- Energy management
An Indicative Example: The “Digital Twin”

- **Decision Making** is a very important activity for any organization; decision makers most often use the so-called “explanatory” or “causal” models.

- **A digital twin** (a dynamic digital representation of an object or a system) includes both the hardware to acquire and process data and the software to represent and manipulate these data.

- **What-if Analysis/“Optimised” Decision Making**…
Future Developments:

- **Increased Level of Safety** (keeping people away from harm’s way and minimizing human error)
- **Lower Operating Costs** (“reduction” in operational costs and improved operational efficiency)
- **Optimised Commercial Flexibility** (based on real time data mining/analytics across various domains)
• Effective manipulation of already available data?
• Qualifications/Experience of the end-user???
ITLINK: Standardise, simplify and automate IT operations at sea
The maritime industry is embracing digitalisation at an ever-increasing rate, as operations are optimised to enable growth and improve efficiency. Marlink has unrivalled expertise in supporting global IT environments in maritime and can work in partnership with you to design, deliver and manage an enhanced IT operation, according to needs and in compliance with the latest regulatory requirements (e.g. IMO 2021). Whether you want to embark on a digital transformation across your fleet or simply better manage your vessel IT infrastructure, we can help you adopt the latest technology and innovate for the future. Our approach enables you to take control, standardise, simplify and automate your IT management to maximise efficiency and reduce costs.

The ITLINK suite

Our mission is simple – to transform and connect fleet IT environments to enable more automation, saving you time and money.

We structure the ITLINK suite of solutions around three distinct phases: DESIGN - DELIVER - MANAGE

Did you know…?

• Outdated applications are unsustainable and vulnerable
• Competitors investing in IT are well placed to increase market share
• Regulation is happening and can require fast implementation of updates
• Disconnected and slow processes could lead to operational risk
• Manual IT updates onboard are slow and expensive

ITLINK can help you:

• Comply with IMO 2021 resolution MSC.428(98) Safety Management System regulations
• Update applications across the fleet in a matter of hours
• Reduce the total cost of ownership
• Improve system and cyber security
• Increase uptime
• Implement automation, saving time and money
• Standardise and simplify your IT environment

Are you IMO2021 Compliant?

Applicable to commercial ships with over 500 gross tonnage, the IMO resolution (MSC.428, 98) confirmed all shipping companies need to have cyber security in their safety management system. Flag states are encouraged to check this in the first annual audit after January 2021. Marlink’s solutions support all the functional elements of the IMO2021 regulation and help address the recommended NIST cyber security framework of Identify, Protect, Detect, Respond and Recover.

Contact us to learn more.

Marlink provides IT services on 1,000+ vessels
Take control of your fleet IT

Working in collaboration with you, our team will empower you to adopt best practice IT and future proof your fleet. Marlink has the expertise as the only provider in maritime with a complete satellite communications, IT and cyber security portfolio and 20 years’ experience of onboard IT.

ITLINK begins with an assessment of your IT needs and the design of the right IT solutions for your fleet and business. Our team will immerse themselves in your IT operations and work with you to scope and plan a scalable, flexible and automated vessel IT environment.

**IT Consultancy & Project Management**
Working with you and your budget, the ITLINK team will use best practice experience to tailor our suite of IT solutions to your needs. Your own dedicated project manager will steer the planning phase, providing advice, system design, hardware recommendations and a knowledge of industry standard solutions to recommend the right solutions for you.

**IT Policy & Compliance**
In consultation with you, we’ll review and define your IT governance policy and recommend solutions to create and enforce rules that address your specific risks. We’ll turn your policy framework into a set of rules and processes for your IT environment, ensuring that you have compliance visibility, and nothing slips through your net.

**IT Hardware & Architecture**
A key element of the ITLINK suite is an examination of your fleet’s IT hardware, how it’s connected and the provisions in place to maintain operations should a single piece of hardware fail. We can guide you to optimise your hardware architecture, ensuring your systems are recovered in the event of a power or hardware failure. We’ll assess your service level agreement (SLA) and equipment for satellite communications to make sure they are adequate for your needs and include a standby (redundant) server in your infrastructure to mitigate the risk of server failure.

**DESIGN**

**ITLINK Solution**

**Problem**
New device or hardware is not synced with agreed fleet standard

**ITLINK Solution**
Automatic installation of agreed standard (blueprint) when device is first connected

**DELCVER**

**ITLINK helps you utilise technology to maximise your business productivity and create the platform for success.**

**Hardware Choices**
We can advise you to make best value selections when you are purchasing hardware for your fleet, such as servers, PCs and antennas. If you need extra support, we can arrange the order, delivery and installation of selected hardware, too.

**Worldwide Logistics & Warranty**
Our extensive, reliable logistics operation means that we can meet deadlines and deliver equipment when and where required. With warehouses located around the globe, we can get hardware to you fast, whether you are in Europe, America, the Middle East or Asia.

**Support continues after installation as we can provide you with warranty support and even manage any claims for you.**

**Global Installations**
Whatever the scope of the project, our skilled and experienced team can deliver a reliable, flexible installation solution to meet your needs, wherever you are. From the physical installation of hardware and network equipment to testing and configuration, our professional engineers will ensure a smooth installation and train your onboard crew as needed.

**Problem**
Deal with various providers for satellite communications, cyber security and IT solutions

**ITLINK Solution**
Deal with Marlink for satellite communications, cyber security and IT, and have compatible, integrated systems

**Problem**
Addressing the logistical challenges of remote sites, or vessels on a busy sailing schedule.

**ITLINK Solution**
Marlink has a service network of 1250 service points worldwide and employees in 22 countries. Our global supply chain gives us unique efficiency and speed in serving the maritime industry.
Remote Access
We understand that your fleet management team and crew may need remote access to your network and can help set up a secure, virtual private network (VPN) to provide them safe access. Centrally managed configuration and reconfiguration on one, some or all vessels can be performed simultaneously, meaning changes to Windows settings, such as user profiles and credentials, amending or adding applications and updates to network settings couldn’t be simpler.

Application Management
We can take the hassle out of the management of your business-critical applications, from initial installation to administering updates. Marlink provides a fully transparent solution allowing you to conveniently track extra important updates, all via the web-based interface onshore. As software updates are automated, the human factor during implementation of updates on board is removed from the equation, significantly reducing the transition time from first vessel being updated to the last across the fleet.

Operational and End User Support
We provide customers with 24/7 technical support to troubleshoot issues and provide installation and upgrade assistance. Our technicians can also provide training programs and act as an extension to your own IT team, freeing them up to focus on key tasks and minimising end user and business disruptions.

Change Management
Implementing change in any company can pose challenges and transforming your IT operations needs careful planning, despite the advantages it brings. We can make your digital transformation easy by managing the planning, distribution and implementation for you, using our many years’ experience of managing IT projects in maritime applications.

Cyber security
At the heart of ITLINK, and cutting across every phase and solution, is our knowledge and expertise in cyber security. Not only will we consider cyber protection, detection and resolution as an integral element of your IT services, but we can provide a whole suite of cyber security solutions with our CyberGuard portfolio.

So, you can rest assured that, whatever your business, we can provide the most appropriate cyber security solutions for your needs. and support your compliance with IMO2021 regulations.

Managed Service
We can provide a high quality, managed IT service that fits with your business needs. Whether you need to fully outsource or work collaboratively with your existing IT resources, our service enhances fleet and business performance.

Problem
Unknown status of software updates, antivirus protection and backups onboard each vessel.

A software or hardware problem causes an unexpected outage.

Outdated software contains security vulnerabilities which allow attackers to enter your network.

A long distribution and implementation phase for Windows security patches across entire fleet.

A field engineer is sent to execute complex updates manually on board.

A new regulatory requirement means that new software for reporting must be implemented manually per vessel.

ITLINK Solution
The KeepUp@Sea Monitor is a web-based onshore dashboard, monitoring the status of critical applications across your fleet.

Monitor software and hardware across the fleet with our simple centralised, shore-based tool.

KeepUp@Sea monitors software on all PCs in your fleet and updates to mitigate known vulnerabilities are swiftly distributed to all vessels.

KeepUp@Sea OS Update Manager will ensure the entire fleet receives patches speedily.

We manage the roll-out remotely, to eliminate HR, overtime and travel costs.

KeepUp@Sea facilitates centrally managed, automated deployment from shore across your whole fleet.
Marlink is a true partner, who goes Above and Beyond to help you run your remote operations in ever smarter, more profitable and sustainable ways and give you the competitive edge.
CYBERGUARD: Safeguarding your business in the Digital Age
Sophisticated cyber security solutions to support your vessel digitalisation

Broadband connectivity at sea and the increasing use of digital systems for everything from navigation to container inspection has led to reduced operational cost and improved efficiency in the shipping industry, but it has also created a new type of threat – cyber risk. While increasing communication provisions have enabled seafarer’s to use an average of three devices onboard, insecure private devices may provide a vulnerability in the vessel’s IT system. Whether in regard to the protection of data, potential damage and loss, liability, compliance, or the impact on insurance, companies need to be aware and well covered as they seek to balance digital opportunity with new cyber threats.

A holistic approach to security is needed that enables response to new and ever-evolving risks. To support your IMO2021 compliance and help protect you from potential business disruption caused by a cyber attack, Marlink’s CyberGuard security portfolio supports your business’ digitalisation and enables you to focus on your core business.

CyberGuard Solutions Portfolio - Our Framework

Marlink’s vision is an automated and standardised architecture converging IT and Operational Technology (OT). Our communication experts are eager to understand your requirements and consult on the ideal blend of services. Protecting a Maritime IT & OT network against cyber threats requires a combination of proven tools and processes. This avoids you being in a position of having to pay hackers a ransom, pay a fine to national bodies or suffering from a severe loss of reputation. To secure the entire network, an assessment has to be conducted at each layer and a continuous cyber security process followed.

Our solutions support the functional requirements indicated the IMO2021 regulation regarding cybersecurity. The IMO has indicated that maritime companies must be able to demonstrate that they follow the NIST cyber security framework of Identify, Protect, Detect, Respond and Recover.

Cyber risk management should: IDENTIFY key stakeholders’ responsibilities, identify the systems, assets, data and capabilities, which if disrupted, could pose risks to the ship’s operations and safety. Establish technology such as a firewall and anti-virus and procedures to PROTECT against a cyber incident and ensure operational continuity. Combine more advanced network-based hardware and software solutions and expertise to DETECT vulnerabilities. All while implementing procedures to RESPOND to and RECOVER from cyber security incidents, using a contingency plan that is assessed and re-evaluated regularly, as well as by giving regular training.

CyberGuard Highlights

- Vessels not compliant with the IMO 2021 Safety Management System (SMS) regulation risk detention by port control
- The most common motivation of cyber attacks is financial gain (29%), using ransomware, card theft and illicit transfers
- The second most frequent objective is data theft (espionage, intellectual property)
- Vessel operators have reported a 400% increase in cyber attacks since the coronavirus pandemic began
- On average, advanced attackers are on a network for almost three months before being detected
- Business disruption costs of a network outage caused by a cyber attack are likely to exceed $50k per vessel per day
- Most hull insurances exclude consequences of cyber attacks

Sources: Allianz Safety Shipping Review 2020, FireEye M-Trends 2020

Our comprehensive portfolio of cyber security solutions means whatever your business, we can provide the best-fit, most suited option for your requirements
Maintain full control and ensure IT and OT security

Marlink’s CyberGuard security solutions portfolio effectively protects your vessel from cyber risk

Your first layer of defence: Sealink Network Security

Marlink’s VPN Interconnect solution securely connects vessels to shore to keep data transmissions over the public internet private, protected and uncompromised through standard encryption technologies, including IPsec, VPN and OpenVPN.

Data Manager helps you to protect your VSAT and MSS connectivity and Digital Solutions through a Global Secure Network Gateway, managed via an intuitive online portal. The solution empowers you to customise your firewall to allow only desired IP traffic and web page categories, while compressing and blocking selected media content.

XChange acts as your integrated communications management platform providing integrated communications and user access management. XChange separates Crew and Corporate networks physically, which secures your corporate system from threats by crew devices. The multi-stage firewall shields your onboard networks, while its settings may be managed remotely. Via XChange Universal Remote Access (URA), all devices on board can be securely accessed from any PC onshore. Meanwhile, XChange Cloud provides the ideal solution for Secure Content Delivery between ships and shore. All the while, your onboard computers are protected from harmful viruses thanks to SkyFile® Anti Virus. The program automatically distributes signature updates to all onboard PCs while compressing them by up to 50%. Through behavioral monitoring, SkyFile Anti Virus will block even new ransomware not yet recognised by the signatures.

Cyber Detection scans your communication traffic for threats that may be putting your business operations at risk. Threats are viewed via an intuitive online dashboard, while notifications on incidents may be received by email or SMS. In parallel, Marlink’s Security Operations Centre (SOC) is hunting for sophisticated attacks designed to stay “under the radar”.

As a comprehensive IT Infrastructure and Software Management solution, KeepUp@SEA enables you to standardise and automate your entire onboard IT environment across the fleet. The sophisticated IT operational platform has a proven track record of increasing IT network resiliency by improving operational stability, reducing operational costs and efforts to a minimum, while maintaining the necessary flexibility to handle future growth and changes.

Your Cyber Security partner for end-to-end protection

Addressing Cyber Risk - Marlink’s CyberGuard Solutions Portfolio

<table>
<thead>
<tr>
<th>SLOPE</th>
<th>CYBERGUARD SOLUTION</th>
<th>IDENTIFY</th>
<th>PROTECT</th>
<th>DETECT</th>
<th>RESPOND</th>
<th>RECOVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Encryption</td>
<td>VPN Interconnect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secure end-to-end transmission</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet-wide</td>
<td>Data Manager</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shore based gateway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onboard Network</td>
<td>XChange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Centralised communication platform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onboard Computers</td>
<td>SkyFile Anti Virus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Essential antivirus layer onboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet-wide</td>
<td>Cyber Detection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Network threat monitoring service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onboard IT</td>
<td>KeepUp@SEA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comprehensive IT management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Your first layer of defence: Sealink Network Security

Your Cyber Security partner for end-to-end protection

Addressing Cyber Risk - Marlink’s CyberGuard Solutions Portfolio

<table>
<thead>
<tr>
<th>SLOPE</th>
<th>CYBERGUARD SOLUTION</th>
<th>IDENTIFY</th>
<th>PROTECT</th>
<th>DETECT</th>
<th>RESPOND</th>
<th>RECOVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Encryption</td>
<td>VPN Interconnect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secure end-to-end transmission</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet-wide</td>
<td>Data Manager</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shore based gateway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onboard Network</td>
<td>XChange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Centralised communication platform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onboard Computers</td>
<td>SkyFile Anti Virus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Essential antivirus layer onboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet-wide</td>
<td>Cyber Detection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Network threat monitoring service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onboard IT</td>
<td>KeepUp@SEA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comprehensive IT management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Key Benefits:
- Universal Connectivity: Provides a variety of interconnect and secured on demand access solutions such as:
  - On Demand VPN to establish a secure remote connection
- Remote maintenance: Effective and inexpensive web filtering, enhanced firewall and more.
- Permanent VPN to secure regular transport data
- Saves time and costs: No need for additional hardware or intervention on board

Example Scenarios

<table>
<thead>
<tr>
<th>Threat</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A third-party intercepts confidential data sent over the public internet</td>
<td>Marlink provides several satellite optimised end-to-end as well as terrestrial VPN Solutions routing traffic over secure private network lines</td>
</tr>
<tr>
<td>A crew member visits undesired/dangerous websites</td>
<td>Data Manager offers a large number of categories simplifying access management to Websites</td>
</tr>
</tbody>
</table>

Scope: Data Encryption

VPN Interconnect

Marlink’s Virtual Private Network (VPN) solutions offer encrypted communication, protecting from sniffing attacks during data transmission over public Internet. Marlink provides a variety of interconnect and secured on demand access solutions such as:

- On Demand VPN to establish a secure remote connection to equipment or computers on-board, typically used for debugging, maintenance and configuration.
- Permanent VPN to secure regular transport data traffic to a corporate network.

Key Benefits:
- **Flexible security protocols**: Flexible integration with multiple options (IPsec, OpenVPN).
- **Remote maintenance**: Essential and inexpensive.
- **Universal Connectivity**: Supports Sealink VSAT, Fleet Xpress, FleetBroadband, Iridium OpenPort and Certus and other broadband connections like Marlink’s 4G service.
- **Concealed Network**: Hides your vessel from public browsers supported.
- **Saves time and costs**: No need for additional hardware or intervention on board.

Scope: Fleet-wide

Data Manager

Data Manager provides a variety of versatile features to make managing data traffic more efficient, including web filtering, enhanced firewall and more. Managed via a secure and simple online portal, the solution combines complex and powerful IP management capabilities with administrative simplicity for ease of use and secure communications.

Key Benefits:
- **Security**: Full security package to protect your terminals from internet attacks.
- **Flexibility**: Customisable features like firewall, web filtering.
- **Universal Connectivity**: Supports Sealink VSAT, Fleet Xpress, FleetBroadband, Iridium OpenPort and Certus.
- **Simplicity**: No installation required, all standard web browsers supported.
- **Concealed Network**: Hides your vessel from public internet and potential cyber attackers.

Scope: Onboard Network

XChange

Marlink’s integrated communication management platform, XChange has been expertly designed to empower your connectivity and manage all satellite networks (VSAT and MSS). Among its many features, within the context of IT, OT and Network Security, XChange supports the following:

- **Segregated LAN Management**: The network is split into multiple local networks (LANs) typically separating business from crew communication and avoiding infection caused by private equipment.
- **User Access Management**: XChange acts as a gateway permitting or declining access to applications depending on preset policies and access rules - managing who is able to communicate through which terminal, at what time and for how long.
- **Multi-Stage Firewall**: XChange includes 2 firewall stages, which filter IP-based data communication based on ports, IP protocols and addresses:
  - **Level 1: Terminal level Firewall**: Blocks certain traffic types per terminal (VSAT, MSS).
  - **Level 2: User-group Firewall**: Determines traffic type per specific users or groups of users.
  - **Level 3: Combined with Data Manager**: Provides a third layer of firewall protection at shore.
- **XChange Cloud**: Avoiding exposure to risks by the public Internet, XChange Cloud is a secure content delivery infrastructure from shore to vessel. This service streamlines and enhances business, logistical and vessel operations by providing a reliable, easy to manage platform to share and automatically synchronise important files of any size or type throughout a fleet.

Key Benefits:
- **Secure**: Multi-stage firewalls guard what traffic is routed to and from the vessel.
- **Access Control**: Set group policies on access rules, time frames and time limits.
- **Split networks**: Separate and prioritise business critical communication over crew data traffic, thereby reducing cyber threats to operations.
- **Full Remote Management**: Administrator XChange remotely or locally.
- **DMZ Content Delivery**: Transfers and synchronises files using XChange Cloud.

Example Scenarios

<table>
<thead>
<tr>
<th>Threat</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A malware infection spreads from the crew welfare to the operational business network</td>
<td>XChange splits the physical network into multiple LANs ensuring business remains unaffected</td>
</tr>
<tr>
<td>A crew member connects an unauthorised device onboard, which may potentially be infected by viruses</td>
<td>XChange can limit access to known pre-entered MAC addresses of approved devices only</td>
</tr>
<tr>
<td>An onboard device is accessed remotely via a public, static, IP exposing the device to cyber attackers</td>
<td>Instead of using a public IP, URA uses secure authentication and an encrypted connection to remotely access devices</td>
</tr>
</tbody>
</table>
SkyFile Anti Virus

SkyFile Anti Virus is Marlink’s complete anti-virus software package, providing remote onboard PCs with protection against viruses and other external threats. Fully automatic anti-virus updates, notification and version verification ensure your computers and LAN safe even while at sea.

As part of SkyFile Anti-Virus Premium, ransomware and exploit mitigation enables even more advanced endpoint protection. Eliminate malware, prevent exploit vulnerabilities and get a deep clean on any potentially hidden malware using our premium options.

SkyFile Anti Virus works seamlessly with one of Marlink’s most popular solutions - SkyFile Mail to deliver daily malware signature updates. With more than 40,000 mariners utilising the service daily, SkyFile Mail provides reliable and cost-effective email, fax and SMS messaging. Viruses and spam are eliminated based on typical properties (blocked HELO, grey listing, etc.) reducing email threats - the most growing method of cyber intrusion.

Key Benefits:
- **Security:** Reliable detection using Sophos-based engine
- **Ransomware protection:** detects and blocks even brand new ransomware threats
- **Cost efficient:** several compressed low data volume anti-virus updates per day
- **Universal Connectivity:** Supports Sealink VSAT, Fleet Xpress, FleetBroadband, Iridium Open Port

Example Scenarios

<table>
<thead>
<tr>
<th>Threat</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A crew member connects a malware-infected USB stick to the bridge PC</td>
<td>SkyFile Anti Virus detects and blocks viruses and other malware such as Trojan horses or spyware using a Sophos-based virus detection engine</td>
</tr>
<tr>
<td>New ransomware which is not yet detected by the anti-virus signatures is executed on a computer</td>
<td>SkyFile Anti Virus Premium uses behavioural monitoring to detect and block even new, previously unknown ransomware</td>
</tr>
<tr>
<td>Fraudulent spam and phishing emails are received onboard which direct crew members to websites stealing confidential information</td>
<td>SkyFile Mail scans mail attachments for infections and moves spam to quarantine before delivery to the vessel</td>
</tr>
</tbody>
</table>

Cyber Detection

Marlink’s Cyber Detection service monitors your communications for any threats that may be putting the confidentiality and continuity of your business operations at risk.

**Threat Monitoring:** the service monitors all network traffic around the clock and provides an overview of threats affecting your vessels through an intuitive, web-based dashboard. Each threat description gives practical counter-measure suggestions to remedy the incident, while notifications on critical threats may be received by email.

The Marlink Security Operations Centre (SOC) is operated by highly-skilled cyber security experts. Being focused exclusively on maritime satellite communications enables our agents to understand and track how attackers operate and impact shipping companies.

**Full visibility:** Cyber Detection can uncover a multitude of threats and is continually evolved to keep up with the latest threat landscape, including:
- Malicious applications
- Abusive usage
- Intrusion attempts
- Confirmed intrusions
- Social engineering, etc.

**Versatile Package Options:** Choose your ideal service package in accordance with your preferences and in-house resources:
- **Entry Package** + full Cyber Dashboard access, with suggested standard counter-measures following the detection of threats.
- **Business Package** + full Cyber Dashboard access with our Maritime SOC performing managed threat validation, contextual countermeasure suggestions as well as being your point of contact for any questions and investigations.

Key Benefits:
- **Threat detection:** uncovers advanced cyber-attacks targeting your company
- **Maritime SOC Monitoring:** dedicated maritime cyber surveillance expertise
- **Actionable reporting:** clear alert description and suggested countermeasures
- **IT and OT conformity:** detects abusive usage onboard circumventing safeguards
- **Scalable:** subscription model, no investment required

Example Scenarios

<table>
<thead>
<tr>
<th>Threat</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A targeted attack exploits a unique weakness and stays undetected for a long time</td>
<td>Marlink’s Security Operations Center (SOC) is specialised in hunting sophisticated 0-day attacks</td>
</tr>
<tr>
<td>A crew member finds a method to access a blocked application or website bypassing all protection solutions</td>
<td>In tune with your IT and OT Policies, the Cyber Dashboard reports any breach even if the onboard protection is inactive</td>
</tr>
<tr>
<td>A device has been infected by malware and is wasting bandwidth, slowing down communication onboard</td>
<td>Marlink’s Cyber Detection Service reports on infected devices in the Cyber Dashboard</td>
</tr>
</tbody>
</table>
KeepUp@SEA is a unique IT operational platform and solution to standardise, simplify and automate your vessel IT environment, permitting central remote management, IT resilience, fast migration, and effective operation of IT services across the fleet.

The solution combines expert advice and proactive support, with practical tools for system design, installation, logistics, and operational services. The solution can either be adopted to be supported by your internal IT team, or as a fully outsourced service, and comprises the following key modules:

KeepUp@SEA Dashboard: presents fleet-wide health status for critical components on board – verifying that e.g. backup is performed successfully and antivirus protection and application versions are up to date.

KeepUp@SEA Appstore: helps crew locate business applications and trigger automated install, update, repair of single-application(s) or full reinstallation of a computer if required.

KeepUp@SEA Backup: enables proactive, vessel-optimised protection of business-critical data through automated synchronisation, and complete data recovery in case of an incident.

KeepUp@SEA Disaster Recovery: enables full restoration of entire vessel server to either the same hardware, a dedicated spare server or a designated low computer without requiring a costly and complex dual server design.

Additionally, KeepUp@Sea embeds incident prevention barriers, such as blocking USB storage devices, revoking local admin rights, access control management, and so on; reducing the probability of unwanted or critical situations, and reducing the consequences and damage caused by a cyber incident.

KeepUp@Sea Monitor is an entry level package available to meet the needs of customers seeking only basic hardware and software monitoring. Features include a dashboard overview, KPI reporting and software installation status.

Key Benefits:

- Full configuration control: centrally managed track changes, upgrades and the operational status of vessels’ IT service across the fleet.
- IT resilience & recovery: proactive safeguarding of all vulnerable data and automated recovery if needed.
- IT Standardisation: support in achieving harmonised computer and server configuration across the fleet.
- Reduce onboard workload: routine tasks are automated and no specialised onboard IT competence is required.
- Proactive support: from vessel IT experts with the capabilities to promptly resolve challenges.

Example Scenarios

<table>
<thead>
<tr>
<th>Threat</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdated software contains security vulnerabilities which allow attackers to enter the network</td>
<td>KeepUp@Sea monitors software on all PCs onboard. Updates to mitigate known vulnerabilities can swiftly be distributed to the fleet.</td>
</tr>
<tr>
<td>A crew member has modified a PC’s configuration for a leisure application without approval of the IT department</td>
<td>KeepUp@Sea will present installation activity via the monitoring tool and support automatic removal of unapproved applications.</td>
</tr>
<tr>
<td>A malware has modified the IT system and/or deleted important business documents</td>
<td>KeepUp@Sea supports automated Windows OS &amp; applications repair, restoring full endpoint functionality via simple, user-friendly procedures. KeepUp@Sea Backup saves all business-critical data to external device(s) according to agreed data retention policy.</td>
</tr>
</tbody>
</table>

Creating a secure culture

Today’s shift towards increasing interconnectedness at sea is continuing to enable significant efficiency gains and new capabilities for maritime operations. Running in parallel to this trend is an increase in vulnerability to cyber-attacks within the maritime industry. Although historically not considered part of the critical infrastructure sector, considering that now more than 50% of global trade is carried by sea, maritime has increasingly become a cyber target, as proven by recent high-profile, damaging cases.

To remain safe and competitive, ship operators should aim to employ not just a short-term incident resolution, but a blend of tools and complementary solutions to cover all aspects of the Protect, Detect and Resolve process.

Marlink’s more than 70 years’ experience in the maritime sector has been harnessed into designing sophisticated, straightforward and easy to roll-out solutions to precisely fit this purpose.

The Human Element

In addition to technical cyber security solutions, it is essential to create awareness among staff through regular training and a clearly defined IT system usage policy. Whilst the technology and solutions onboard are essential elements to addressing cyber security, only by combining training, technology, regular reviews of business processes and implementation of the correct policies can a shipping company hope to reduce its cyber risk level.

Protecting Your Business in the Digital Age

- Comprehensive solutions portfolio
- Focus on ongoing protection, detection and threat resolution
- Efficient, quick deployment technology
- Remote management from shore
- Optimisation for satellite environments
- Customer consultants located in regional offices worldwide
- Support available 24/7/365
- Regional, cultural and technical understanding

Are you IMO2021 Compliant?

Applicable to commercial ships with over 500 gross tonnage, the IMO resolution (MSC 428, 98) confirmed all shipping companies need to have cyber security in their safety management system. Flag states are encouraged to check this in the first annual audit after January 2021.

Our solutions support all the functional elements of the IMO2021 regulation regarding cyber security. Contact us for a free consultation.
Marlink is a true partner, who goes Above and Beyond to help you run your remote operations in ever smarter, more profitable and sustainable ways and give you the competitive edge.

- **1000+ employees**
  - in 23 countries
- **Unique solutions portfolio**
  - IT & OT and Cyber services
- **Global customer support**
  - 365/24 service
- **Strong partnerships**
  - with all satellite network operators and hardware partners
- **Managed services**
  - fully operated for our customers
- **Future-ready network of networks**
  - for secure and resilient connectivity
- **Global service network**
  - 1250+ in-country service points
- **24/7/365**
- **7000+ VSAT**
  - leading edge multi-band connectivity

Marlink Service Desk

EMEA: +33 (0)1 70 48 98 98
Americas: +1 (310) 616 5594 | +1 855 769 39 59 (toll free)
Asia Pacific: +65 64 29 83 11
Email: servicedesk@marlink.com
Web: www.marlink.com

CG 01 20