

Securing Maritime 4.0 Toolkit

Dr. Mohamed AbdelFattah | MBA, NSE7, C|CISO, C|TIA, E|CSA, CHFI
Senior Security Architect
OT Security SME

Why is the Maritime Industry being Attacked?

The digital transformation initiative propelling Maritime 4.0 forward is revolutionizing the shipping industry. This digital revolution can make all the difference in ensuring a shipping company's future viability and competitive edge by way of optimizing ship operations and voyages, improving ship system efficiency, lowering its environmental footprint and reducing fuel consumption and costs. However, what does digital transformation actually entail for the shipping industry?

The Maritime Industry is a Cornerstone of National and Economic Security

"80 percent of global trade by volume and more than 70 percent of its value is being carried on board ships and handled by seaports worldwide, which represents a staggering role in the global economy."

The United Nations Conference on Trade and Development (UNCTAD)



Why is the Maritime Industry being Attacked?

- Increased networking and connectivity (e.g. ship-to shore communications, IT-OT connectivity, remote control of offshore and onboard operations, cloud applications, etc.)
- Ship bridges as automation control centers (e.g. navigation, cargo information or declaration, administrative data, etc.)
- Smart ships and intelligent fleets (e.g. route planning, unmanned shipping, the EU Sea Traffic Management initiative seeking to synchronize shipping operations using communications, networking and Big Data)
- Intelligent and linked sub-systems using industrial automation (e.g. ballast water system, alarm and monitoring systems, etc.)
- Unifying network technology for advanced ship systems(e.g. in the case of reefers, allocating ship costs according to the source rather than uniformly distributed)

The Maritime Industry is a Cornerstone of National and Economic Security

"80 percent of global trade by volume and more than 70 percent of its value is being carried on board ships and handled by seaports worldwide, which represents a staggering role in the global economy."

The United Nations Conference on Trade and Development (UNCTAD)



Who is targeting the Maritime Industry?*



Threat Actors

Foreign Sovereign States

Non State Entities

- Criminals
- Terrorists
- Pirates
- Organized Crime
- Activists
- Hacktivists
- Cybercriminals
- Spies
- Competitors
- Illegal Fishers

Insiders

- Employees
- Contractors
- Partners

*Source: "Trojan horse risks in the maritime transportation systems sector"—
Journal of Transportation Security, May 2018

Which Systems are Vulnerable?



Targets

Shipboard Systems

- Ship Operations
- Access Control & Security Systems
- Communication Systems
- Crew Internet Access

Critical Control Systems

- Cargo Control Room & Its Equipment
- Level Indication
- Valve Remote Control
- Water Ingress Alarm
- Ballast Water
- Gas Liquefaction
- Fire Suppression System
- Engine Governor
- Power Management
- Alarm System
- Emergency Response System

GPS & Navigation Systems

- Bridge Systems
 - TGPS
 - ECDIS
 - DP
 - AIS
 - GMDSS
 - Radar
 - VDRs

What are the Consequences of a Cyber Attack?

Impacts on

- Shipment Efficiency (i.e. speed, cost, volume)
- Shipment Reliability (timely delivery with minimal loss)
- Cargo Legitimacy
- Fault Tolerance (withstand disruptions & failures)
- Data Legitimacy
- Environmental and Human Safety



Examples

- Corrupting the records for a container's dimensions & weight resulting in an "uneven keel" which can sink the ship
- Compromising the fire suppression system and releasing CO2 which can kill crew
- Ransomware shutting down a bulk carriers' control board rendering the vessel inoperable

Effects

- Loss of Business
- Fines and Penalties
- Reputational Damage
- Supply-Chain Disruption
- Global Economic Loss
- Compromised Health, Safety and Security



What is Driving The Maritime Industry to Adopt Stricter Cybersecurity Measures?

- The adoption of new technologies radically transforming the way the maritime sector does business at the cost of an expanding attack surface.
 - Increased connectivity and reliance on digital components
 - Increased levels of autonomous controls
 - Globally accessible navigation systems

The need to address resolutions and regulations regarding cyber risks while protecting critical assets, infrastructure and data.

As OT and IT environments converge and become more connected and with cyberattacks increasing on the IT side, the vulnerability of the OT environment being exposed to these IT security threats is increasing.

MO Resolution

Ship owners and managers risk having ships detained if they don't incorporate cyber risk management into ship safety by 2021



Getting to Know Your Environment

OT Environment

- Do you have remote monitoring for the following systems...



**Cargo Control
Room & Its
Equipment**



Level Indication



**Valve Remote
Control**



**Water Ingress
Alarm**



Ballast Water



Gas Liquefaction



**Fire Suppression
System**



Engine Governor



**Power
Management**



Alarm System



**Emergency
Response
System**

- Are these systems accessible from shore based locations?
- Do these systems have SLAs that require remote monitoring?

Maritime 4.0 Requires a Security Transformation

It's clear from the continued breaches that the traditional methods of securing a shipping company's network no longer work. Traditional engineering methods have focused entirely on safety with little thought to security. As a result, both safety and security must be integrated in the engineering lifecycle to ensure ship safety from accidents and security from cyber threats.

In order to deliver a secure environment, shipping companies need to rethink their security posture and move towards a seamless and comprehensive cybersecurity strategy. As shipping companies adapt their IT and OT infrastructure to account for digital transformation, they must also undergo a security transformation to protect against the evolving cyber threat – the biggest risk to digital transformation. Fortinet provides companies in the maritime industry with a proactive and transformative approach to cybersecurity, the Fortinet Security Fabric which promises security that is:

Broad

Visibility and protection of the entire digital attack surface to better manage risk

Integrated

Solution that reduces management complexity and shares threat intelligence

Automated

Self-healing networks with AI-driven security for fast and efficient operations

The Fortinet Security Fabric Protects Maritime 4.0

Fortinet is well positioned to accompany shipping companies on their digital transformation journey with security transformation provided by the Fortinet Security Fabric. The Fortinet Security Fabric architecture (Figure 1) consists of a wide set of technologies that work together and are supported by a single source of threat intelligence to eliminate security gaps in the network and respond to any attack vector.

Key Benefits

- Secures the core infrastructure
- Ensures business activities are uninterrupted and sustained via internal segmentation
- Security interwoven throughout the different areas of a shipping company's network (i.e. both IT and OT and including third parties)
- Reduces network complexity and simplifies security
- Supports regulatory compliance
- Provides visibility and detection across networks.

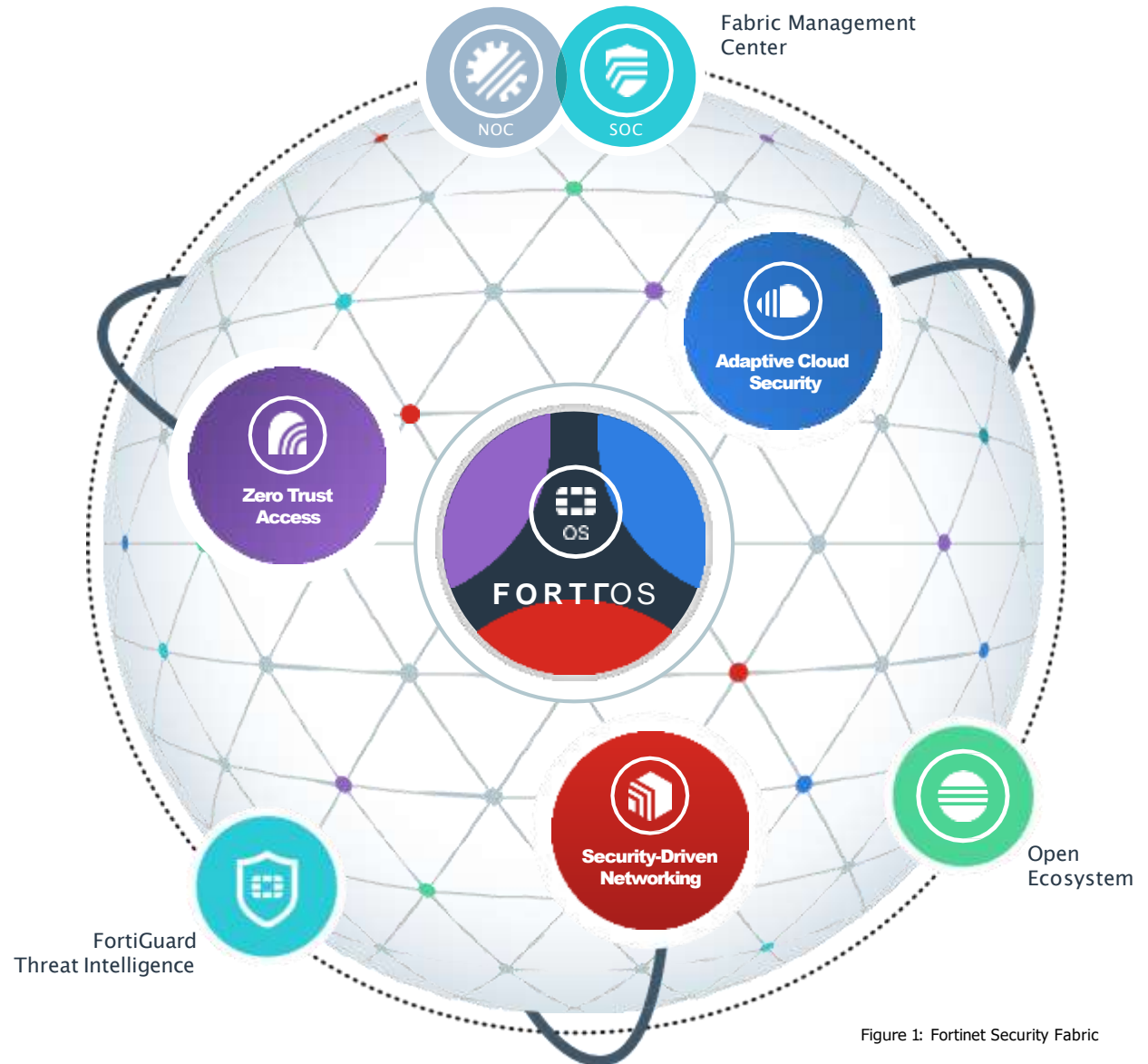
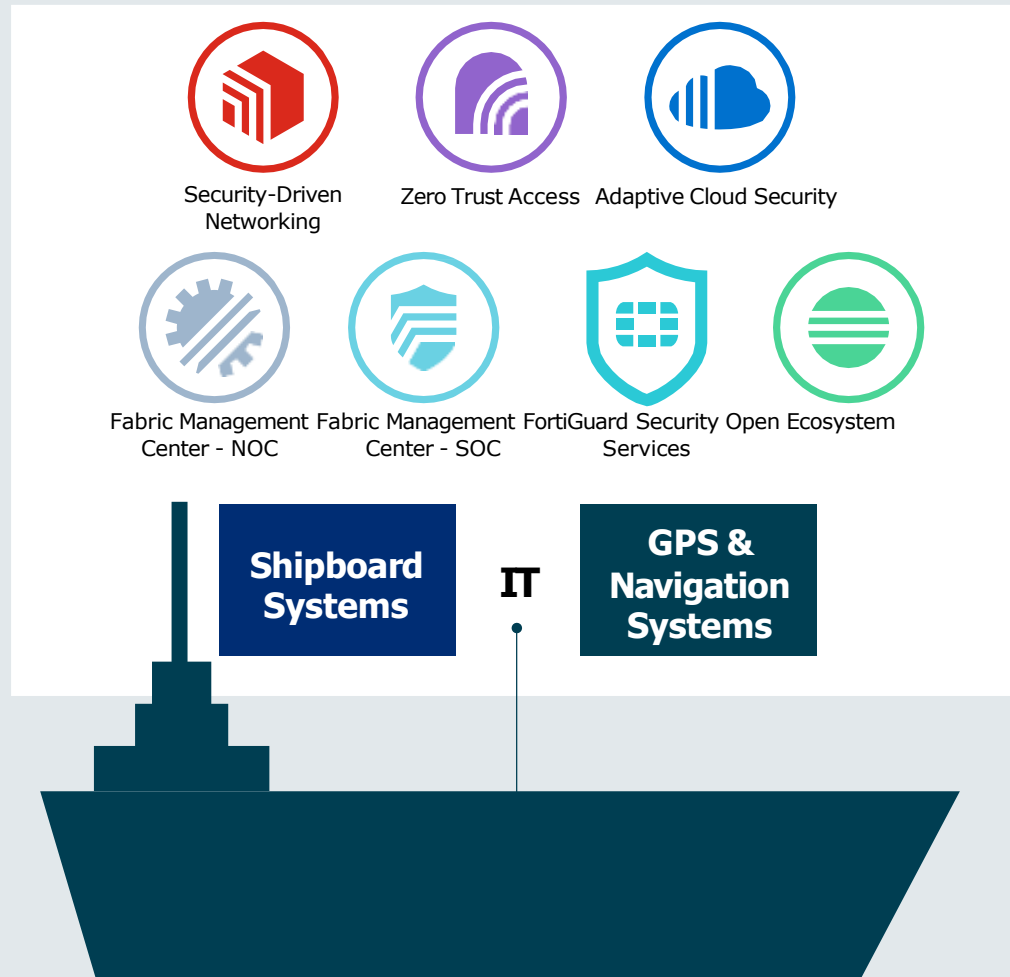


Figure 1: Fortinet Security Fabric

Step 1: Focus on Securing the IT Systems First (Vessel & Shipping Network)

Key Benefits

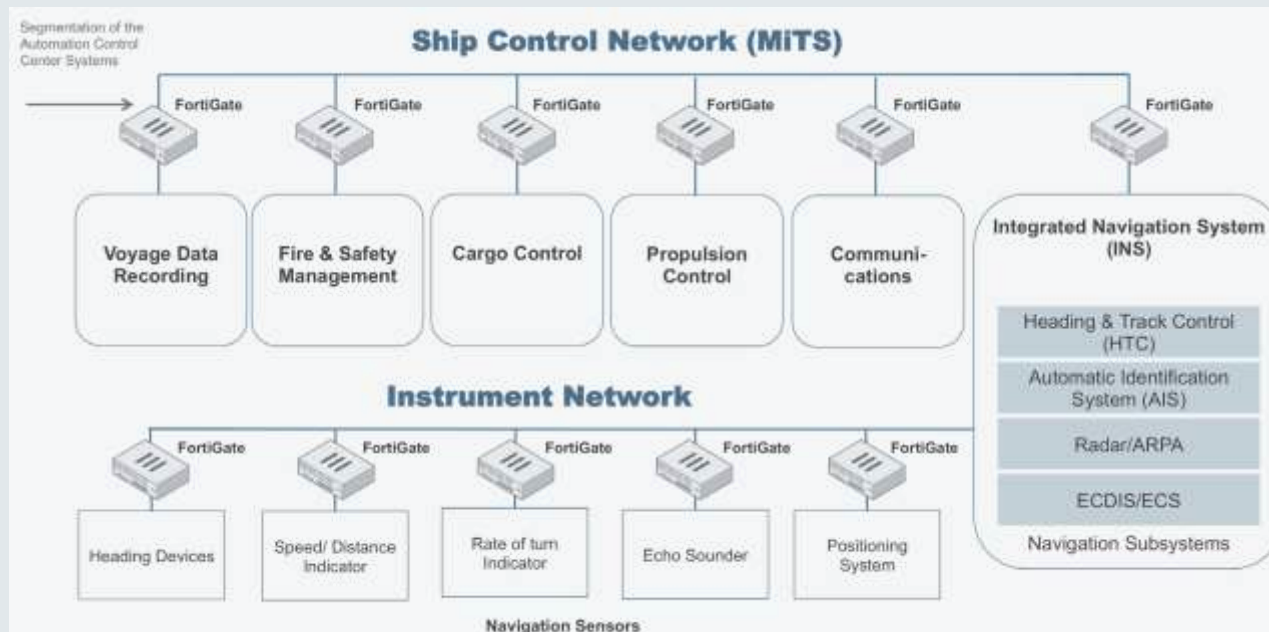
- Secure the first point of attack
- Protect against advanced threats
- Control access and gain visibility



Secure the Vessel IT Infrastructure and Onboard Systems

Shipping networks are subject to a large number of cyber attacks. Once inside the network, hackers can easily move among resources while hiding from perimeter focused security which is why using firewalls to segment the network is a critical component to network security. Layering a vessel's defenses allows prioritizing assets that need the

highest degree of protection without impacting performance. This dramatically improves visibility into possible attacks and provides complete internal segregation of data, resources and systems so that if one area of the network is compromised, other areas remain unaffected.



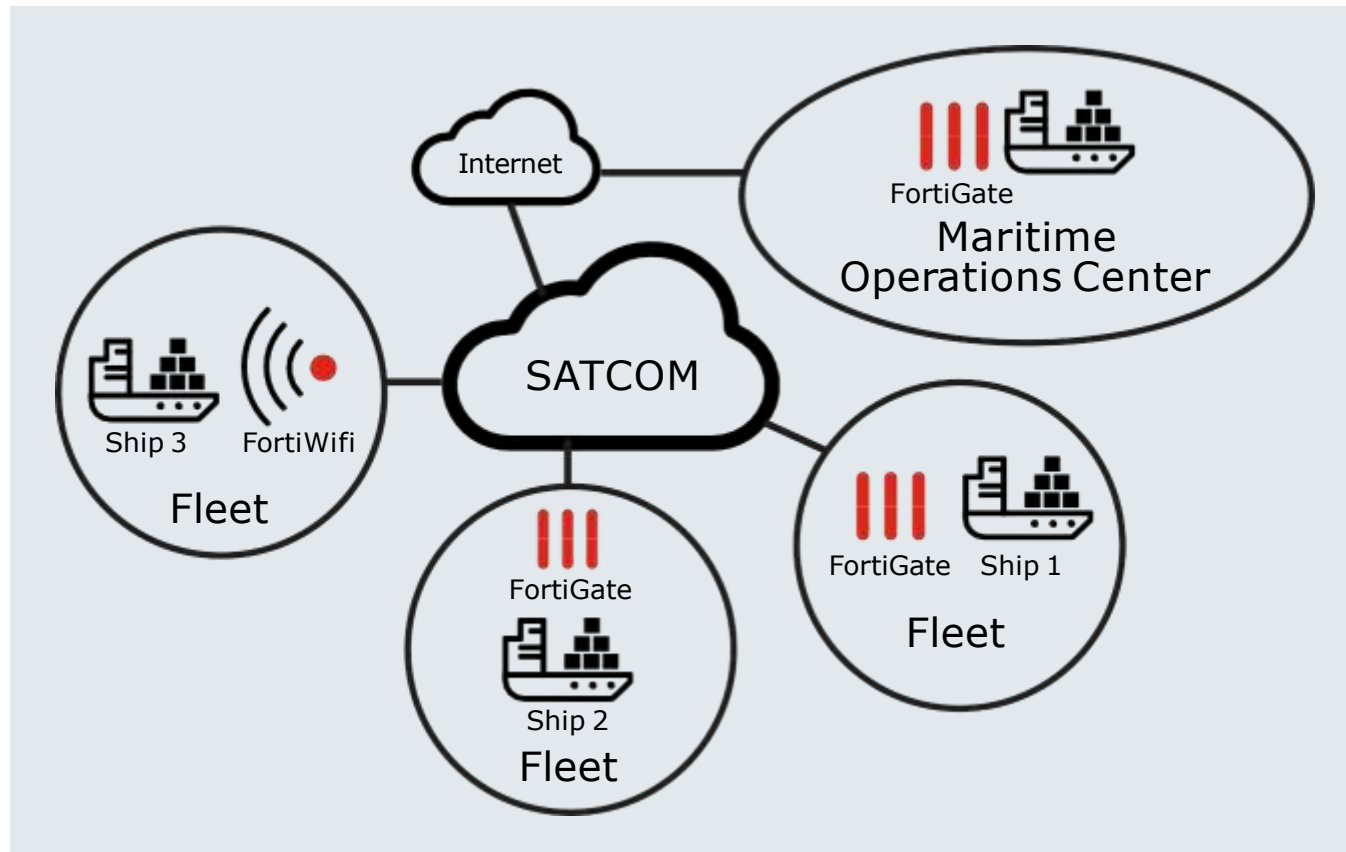
Layer A Vessel's Defenses

- Increase Visibility
- Preserve Data Integrity
- Stop Threats from Propagating
- Ensure Marine Operations Continue Unaffected

Secure the Shipping Network & Eliminate Complexity

Fortinet's Network Security solution eliminates the complexity associated with securing the distributed nature of a shipping company's network environment. How? With the FortiGate Firewall, shipping companies can deploy cybersecurity across all parts of their shipping network while maintaining the same level of protection throughout. Depending on the location in the network and the required functionality, the solution provides shipping companies a range of deployment modes to meet their individual requirements.

Finally, for more comprehensive protection, the FortiGate seamlessly integrates with additional Fortinet solutions extending its overall capability to protect against advanced threats as well as secure the entire attack surface including satellite communications, wireless access, web applications, email systems, cloud environments and endpoints (e.g. mobile devices).



Network Security In Action

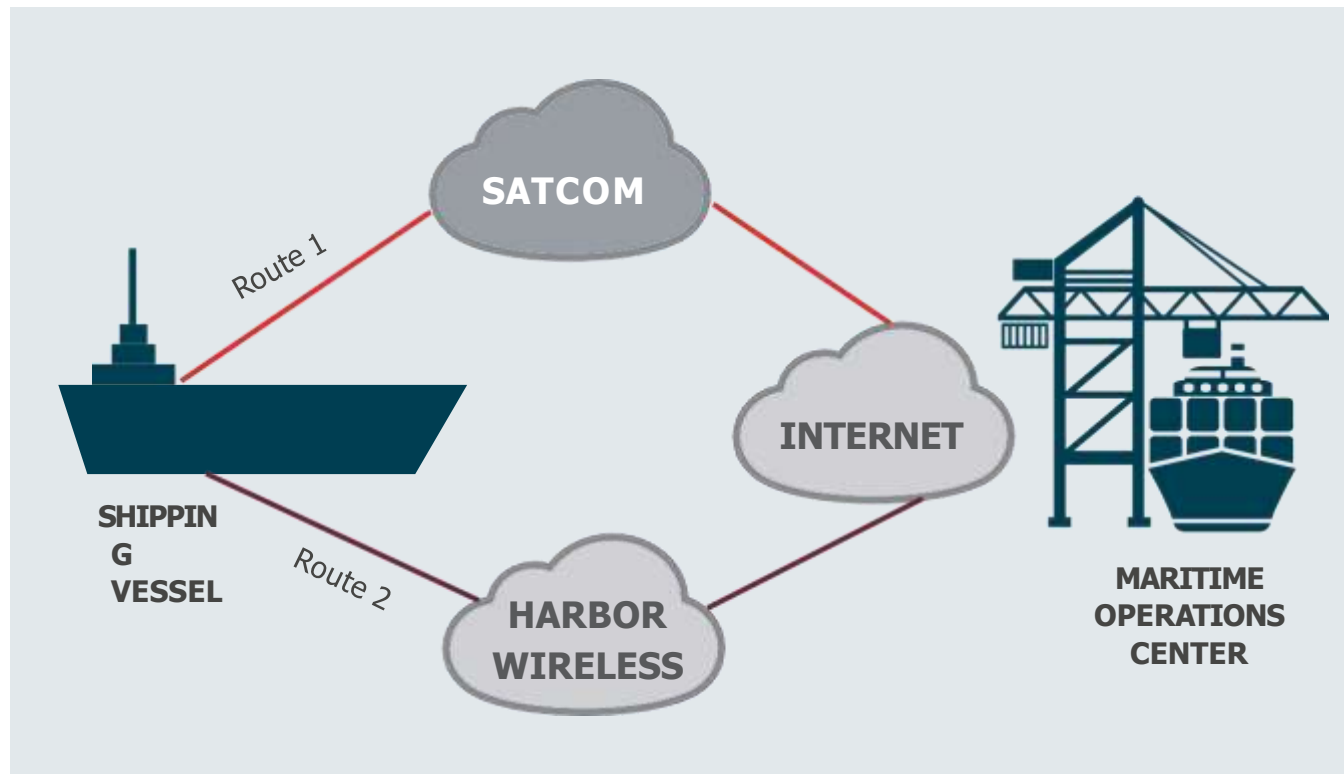
- High Performance & Scalable Network Solution
- Fine Tune Security Services (e.g. antivirus, application control, antispyware, antimalware, etc.)
- Multi-factor Authentication
- Access Control (e.g. device policies)
- Network Segmentation to Preserve Data Integrity
- Robust Visibility & Protection
- Service Availability

A Focus on Fortinet's Secure SD-WAN Solution

Today's shipping company typically spends a lot of time and resources on overly complicated security deployments that may not even be effective. As bandwidth requirements continue to increase at an alarming rate, many shipping companies are moving to the Internet to increase bandwidth and reduce costs which can raise serious security concerns.

Fortinet makes it easy to deploy and manage the right security in all the right places with our secure Software-defined WAN (SD-WAN) solution.

The solution links network and security paths across the world through the Internet, 3G/4G, or SATCOM links, making it a truly borderless infrastructure for a shipping company. It provides application visibility for encrypted traffic and smart load balancing which helps to reduce WAN cost without impacting the SLA for business applications. With Fortinet's SD-WAN solution, shipping companies can securely adopt digital business models and easily manage the growing volume of data and increasing number of endpoint and IoT devices.



Secure SD-WAN Solution Highlights

- Simplify Deployment with Zero-Touch Provisioning
- Optimize Application Performance
- Reduce SATCOM Costs
- Increase Network Agility and Flexibility with Connectivity Optimization
- Reduce Business Critical Applications & Network Downtime

FORTINET®