Navigation Cyber Security: Spoofing & Jamming Detection

Chris Loizou

Maritime Resilient Environment

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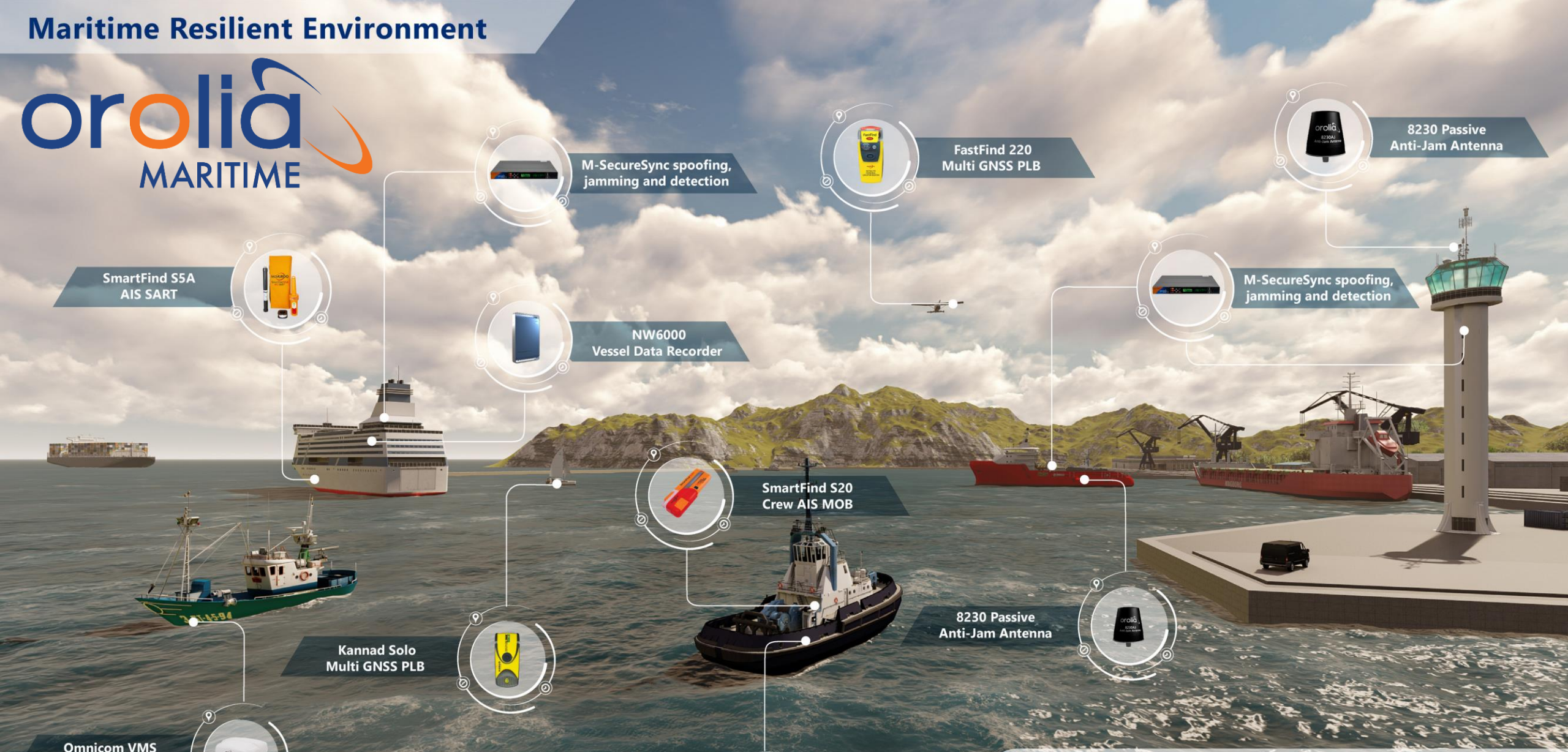
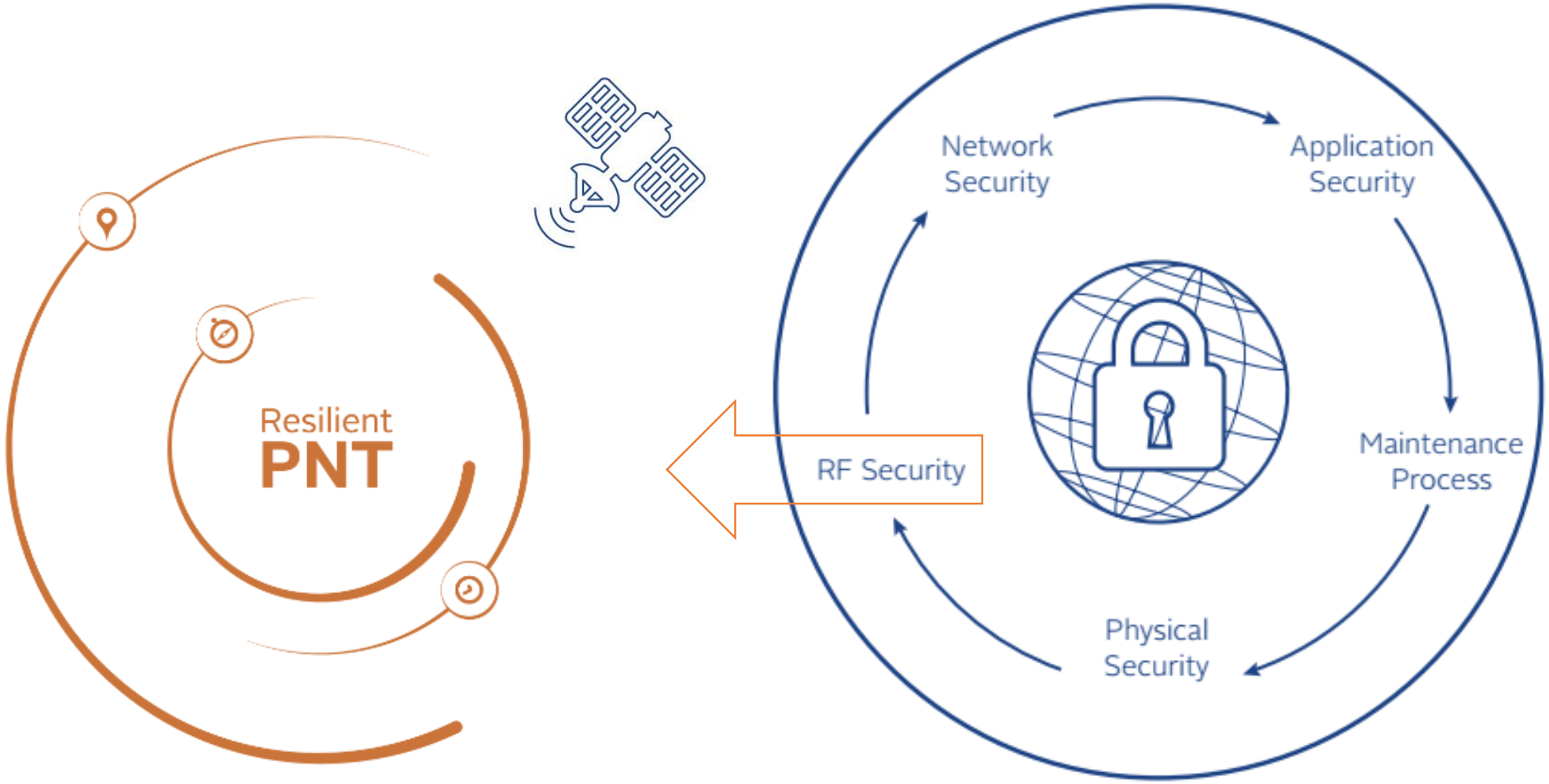


Maritime Resilient Environment

Precision Navigation Safety via GNSS Threat Detection & Prevention Systems
Innovative Multi-Signal Search & Rescue Solutions
Dynamic Data Capture Systems
Robust, Cost Effective, Fleet Monitoring & Management Solutions

Maritime Focus on Cyber Security



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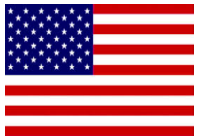
Resilient **PNT**

GNSS – Global Navigation Satellite Systems



GPS

- Since 1980s
- 31 sats
- GPS III Launch Dec 2018

GLONASS

- Cold war relic
- Refurb 2012
- Operating well with 24 sats

Galileo

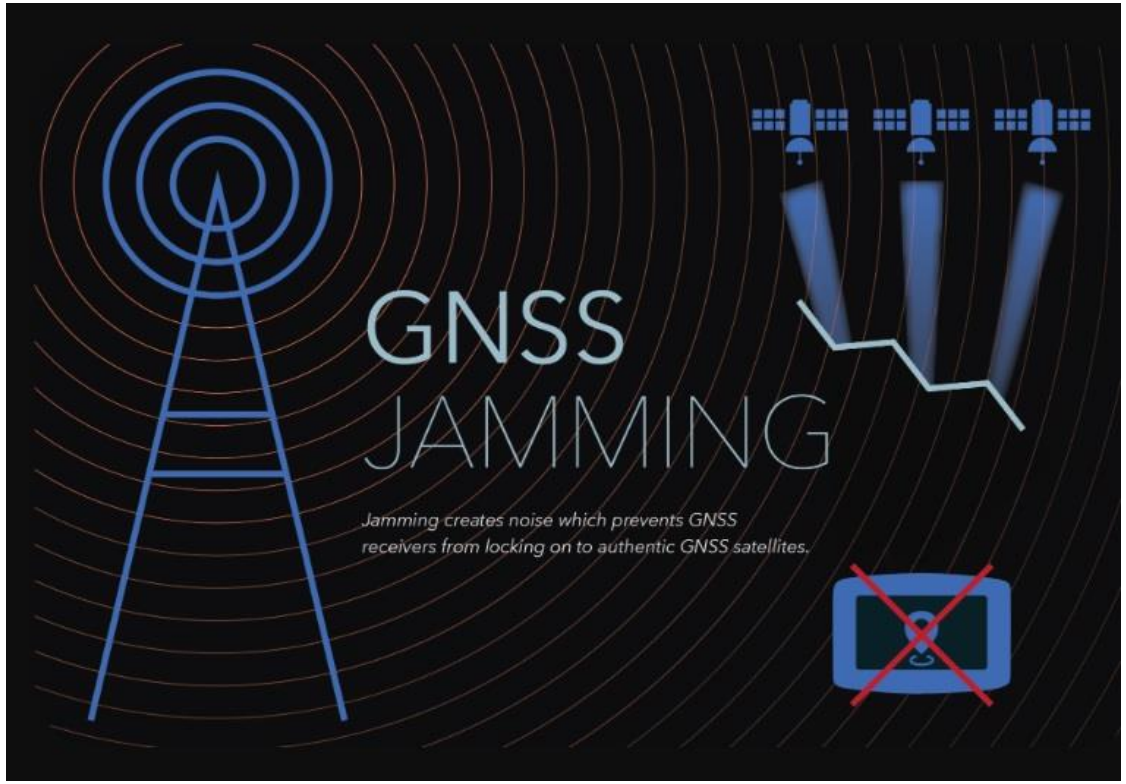
- 18 of 24 sats operational since 2016
- Full capability 2020

Beidou

- Regional initially, building out to full global coverage by 2020

Threats to GNSS Navigation Cyber Security:

Does Your Cyber Security Plan Include Navigation Protection?



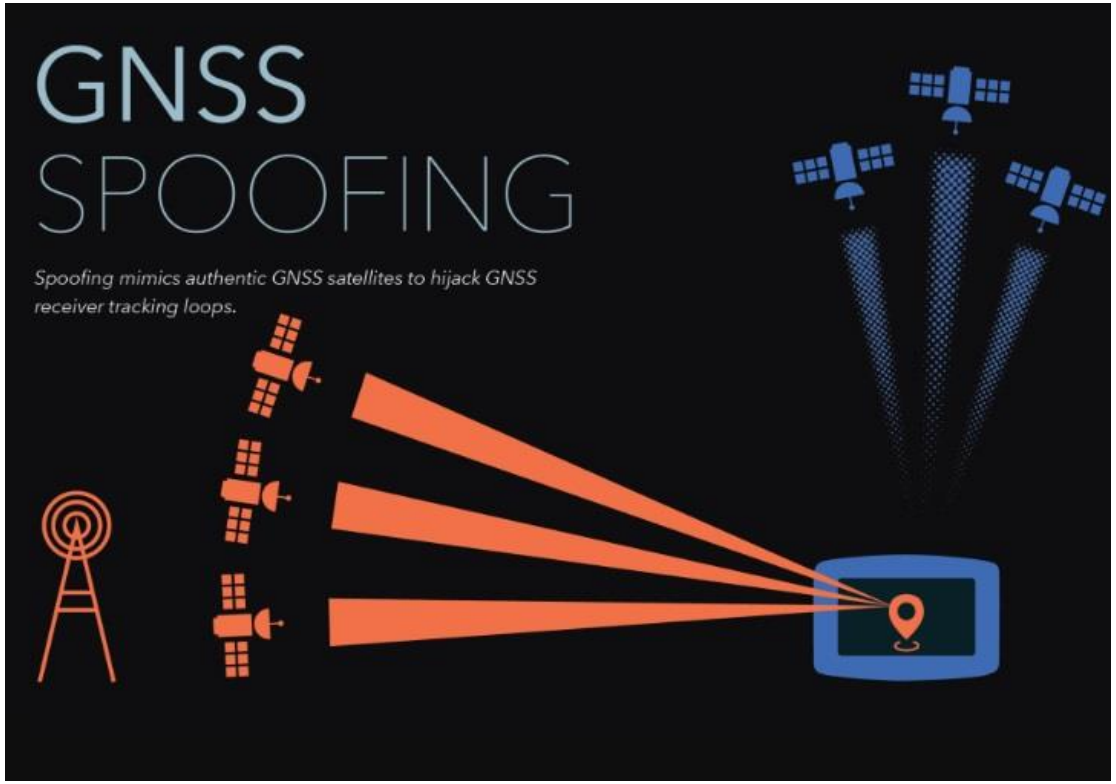


Image Source https://www.c4reports.org/aboveusonlystars

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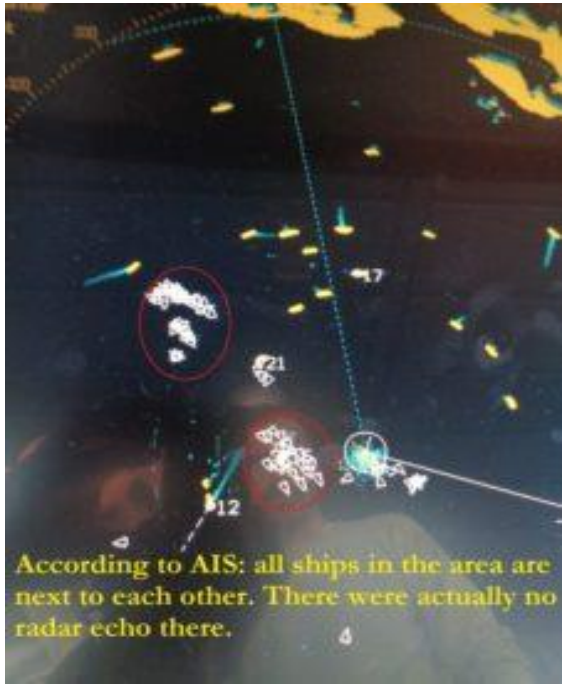
Recent GNSS Interference Examples



Jun 2017 – Black Sea

Alleged Spoofing Attack in the Black Sea From the Resilient Navigation and Timing Foundation

Aug 2013: Newark Airport

Truck driver has GPS jammer, accidentally jams Newark airport

March 2018 Eastern Med GPS disruption

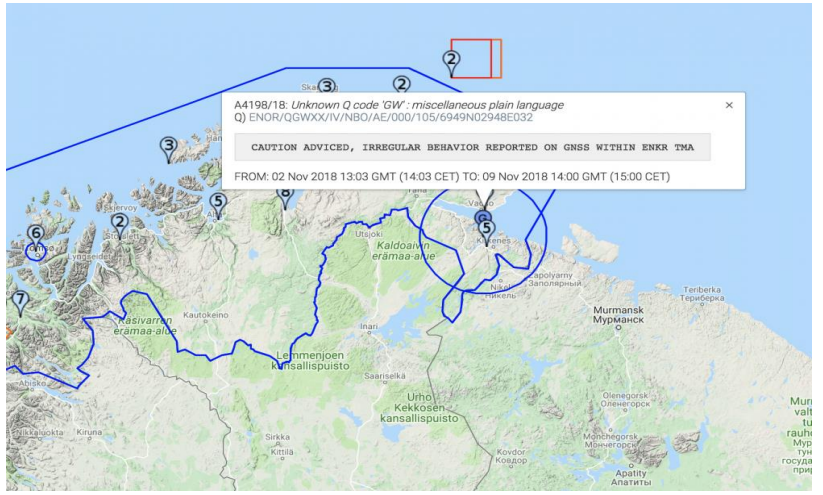
US MARAD, reports a number of incidents in the Eastern Mediterranean Sea

Recent GNSS Interference Examples

Oct 2018 Hong Kong

Jamming of Drones in Hong Kong

HK$1 million in damage caused by GPS jamming that caused 46 drones to plummet during Hong Kong show.



Nov 2018: Northland Finland

Finland Jamming
Warning on possible GPS jamming for Northern Finland in the Arctic Sea

Impact of GNSS Disruption

2017 UK Study on the Economic Impact to UK of a disruption to GNSS calculated

5 days without GNSS = cost £5B

5.4.1 Severely-affected applications

Loss of GNSS would imply severe disruption to a handful of industries and applications, and the dominoes triggered by the loss in those industries and applications would be wide-ranging, and affect the majority of society. The table below restates those particular uses of GNSS.

Infrastructure	Aspect	RAG	Loss of GVA (direct+secondary) (five days)	Loss of utility benefits (five days)
Space	Satellite communications		£22.5m	*See Maritime transport infrastructure*
Transport infrastructure	Maritime transport infrastructure		£1,069.3m	*See Maritime usage applications*

Layered Protection for Navigation Cyber Security

Layered Protection for Critical Ship & Shore Navigation Signals

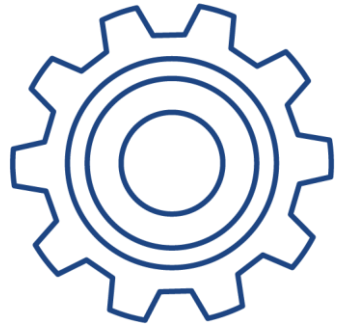
M-SecureSync Solution

Precision GNSS

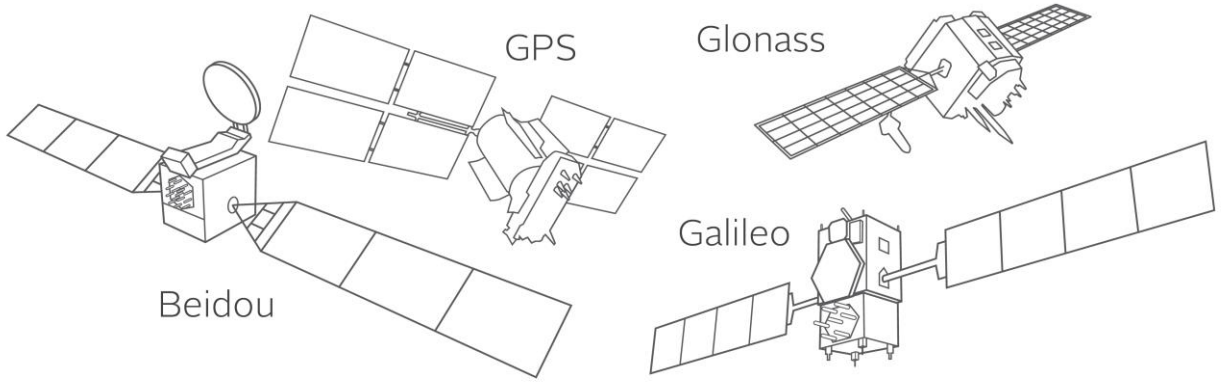
RF Threat Detection & Alerts

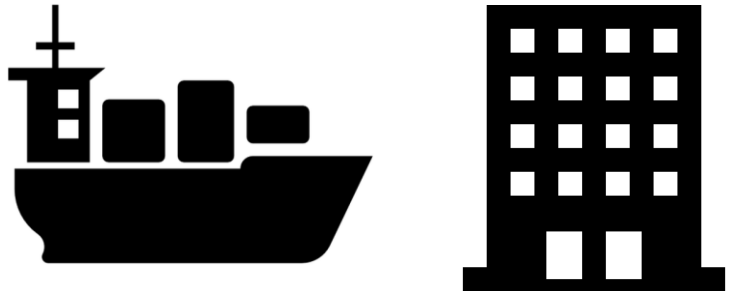
GNSS Augmentation

Signal Protection



Precision PNT Source





Ultra precise time server that allows multiple configurations, including

- **GNSS Comparison Source**
- **Platform for Navigation Security Signal Monitoring**
- **Time stamped transactions**
- ***GNSS Weather* indication, highlighting disruption or malicious attacks can be detected and corrective action taken**

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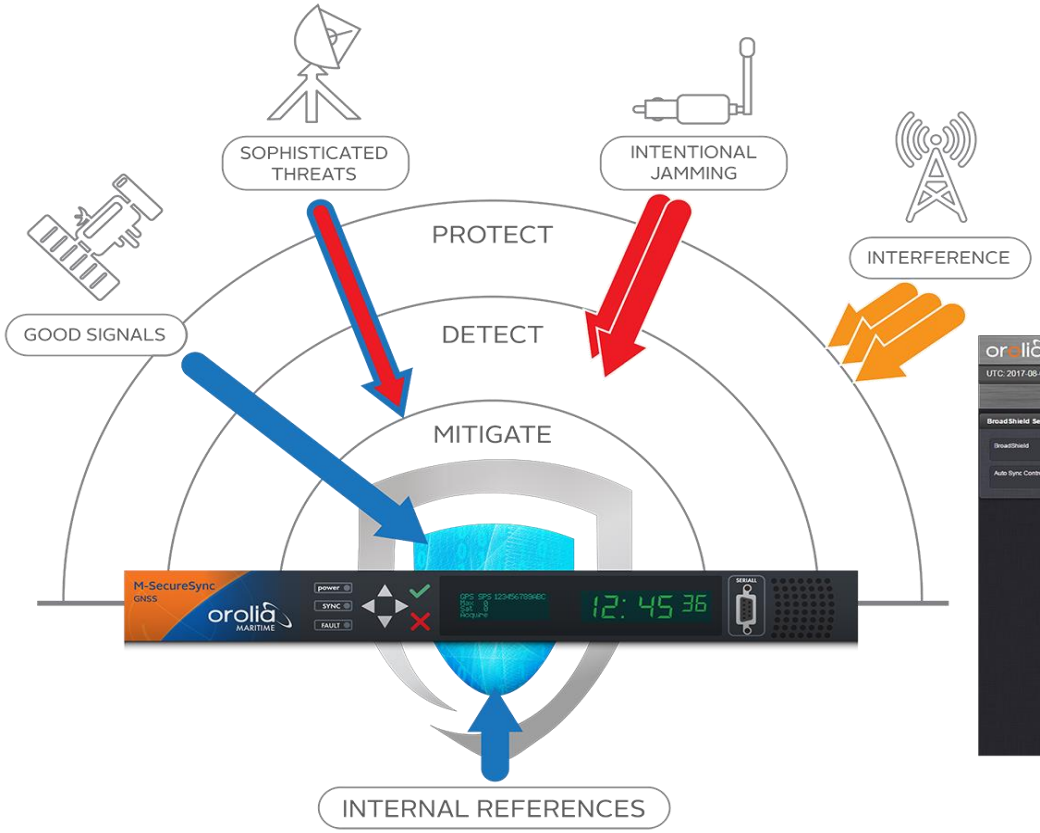
RF Threat Analysis & Alerts

Interference Detection and Mitigation (IDM) Suite

- **Unintentional interference**
- **Malicious attacks**



RF Threat Analysis & Alerts

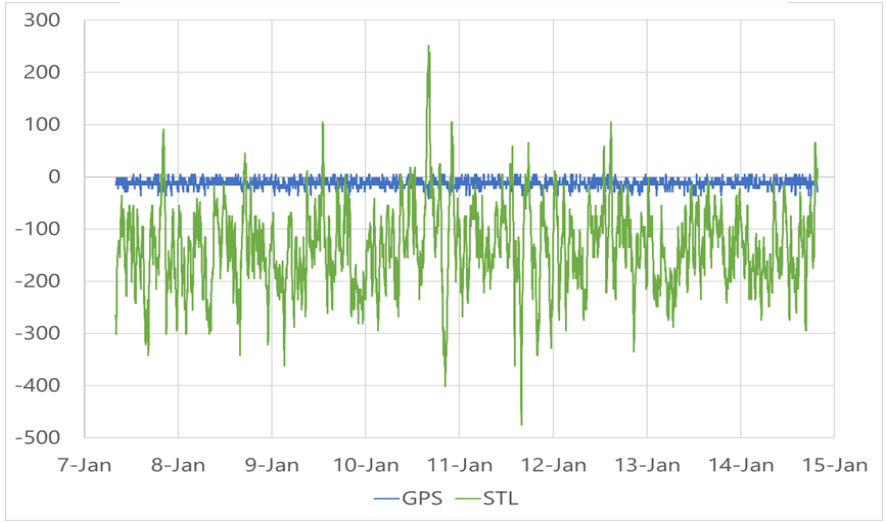
The **IDM** component of M-SecureSync detects advanced Spoofing and Jamming techniques

RF Threat Analysis & Alerts

Orolia and Telko have partnered to create the **worlds first ECDIS system with integrated navigation Cyber security alerts**

M-SecureSync has been added to Telko's TECDIS system to help inform the ship's bridge of potential position spoofing and deliberate jamming.

GNSS Augmentation



STL is an alternative positioning signal broadcast on Iridium satellites

- **Encrypted Signal 1000x stronger than GPS**
- **Inherently anti-spoof**
- **Higher Jamming Resistance**
- **Subscription based service**

GNSS Augmentation

STL

- **Works indoors**
- **No rooftop antenna needed**
- **Delivers timing even in GPS-denied environments**

Signal Protection with Anti-Jam Antenna

Anti-Jam Antenna helps to prevent jamming by signal saturation at ports or on vessels

- **Most interference come from land sources**
- **Anti Jam removes *on the horizon* interference by rejecting signals from a lower elevation angle**
- **Allows only signals from satellites to be received**

Navigation Cyber Security Solution

TELKO

Learn more
on Telko Stand B04

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