

A tall, red and white striped lighthouse stands on a dark, rocky island. Several small, white, single-story buildings are clustered at the base of the lighthouse. The island is surrounded by dark water, and a few small boats are visible in the distance. A large, bright full moon hangs in the dark, cloudy sky, casting a soft glow over the scene.

TELSCOPE

BY TELKO

The Simplicity of
e-Navigation

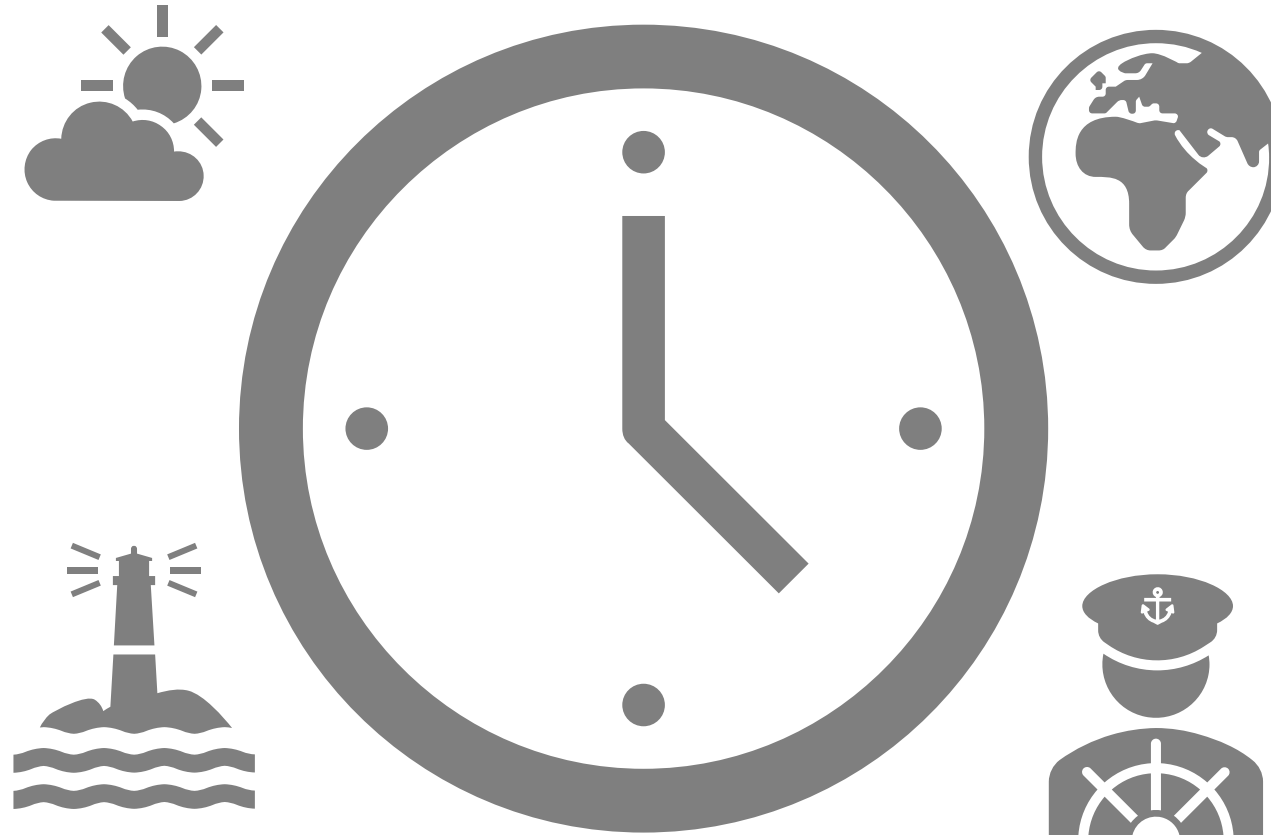


TELSCOPE

BY TELKO



This is TelScope



HOW

SHIP



TelScope Server

HOW

SHIP

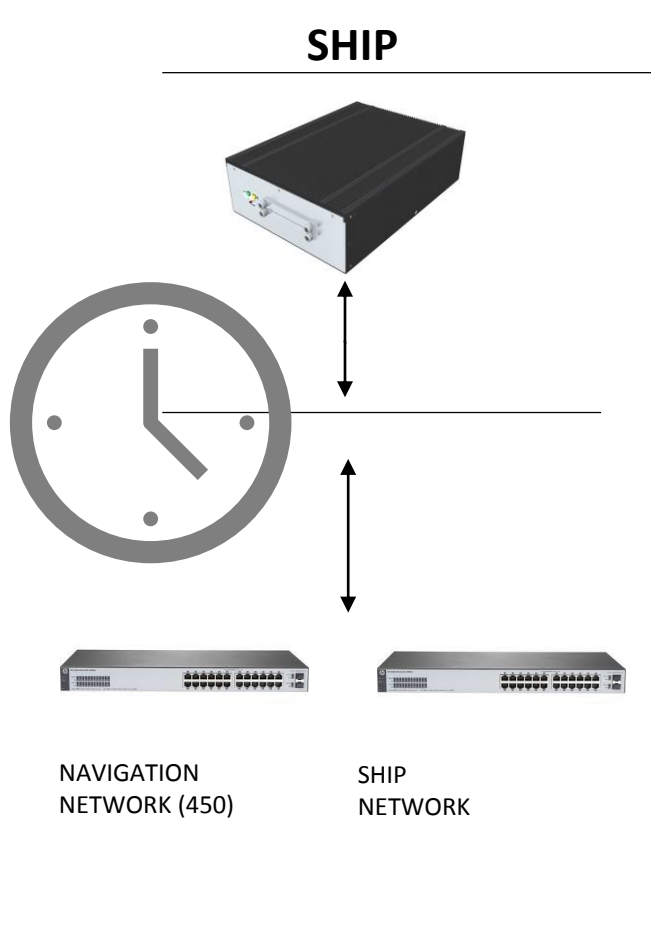


NAVIGATION
NETWORK (450)

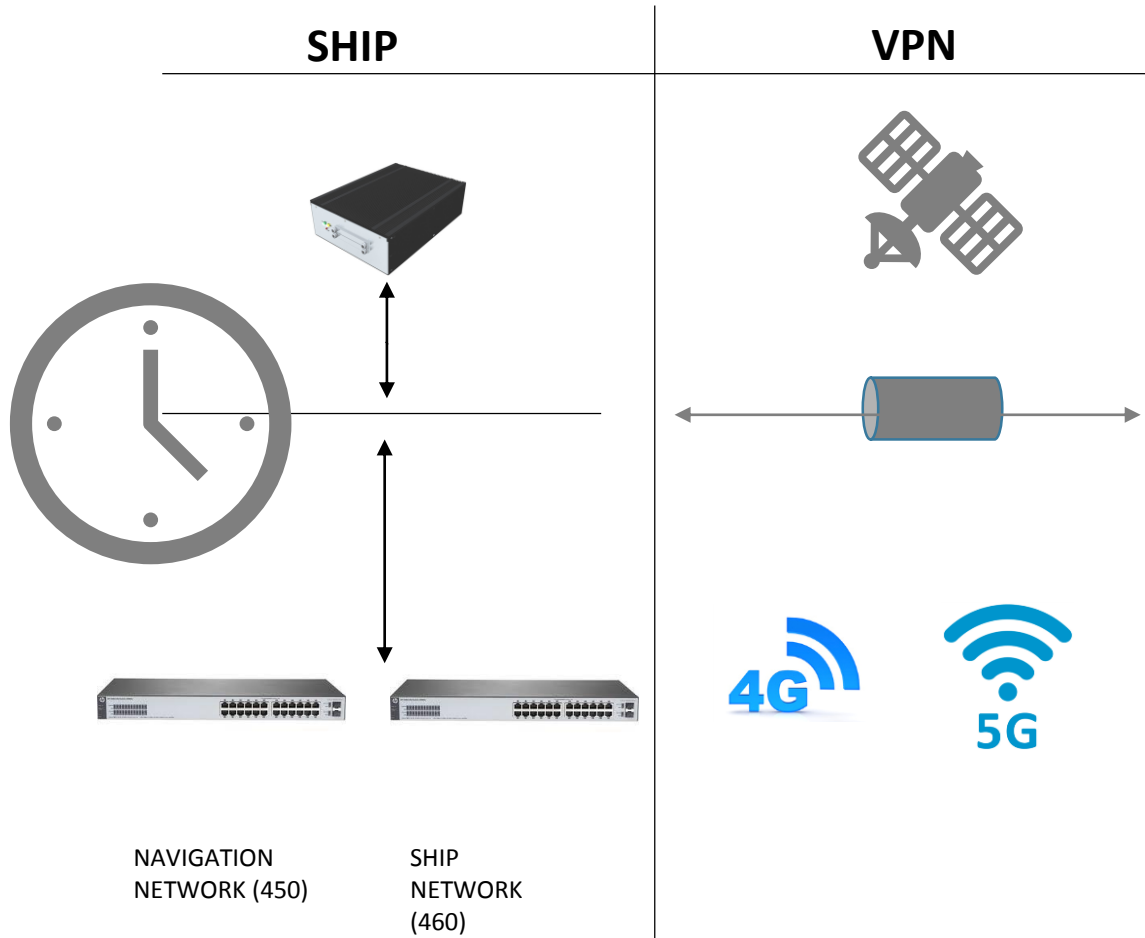


SHIP
NETWORK

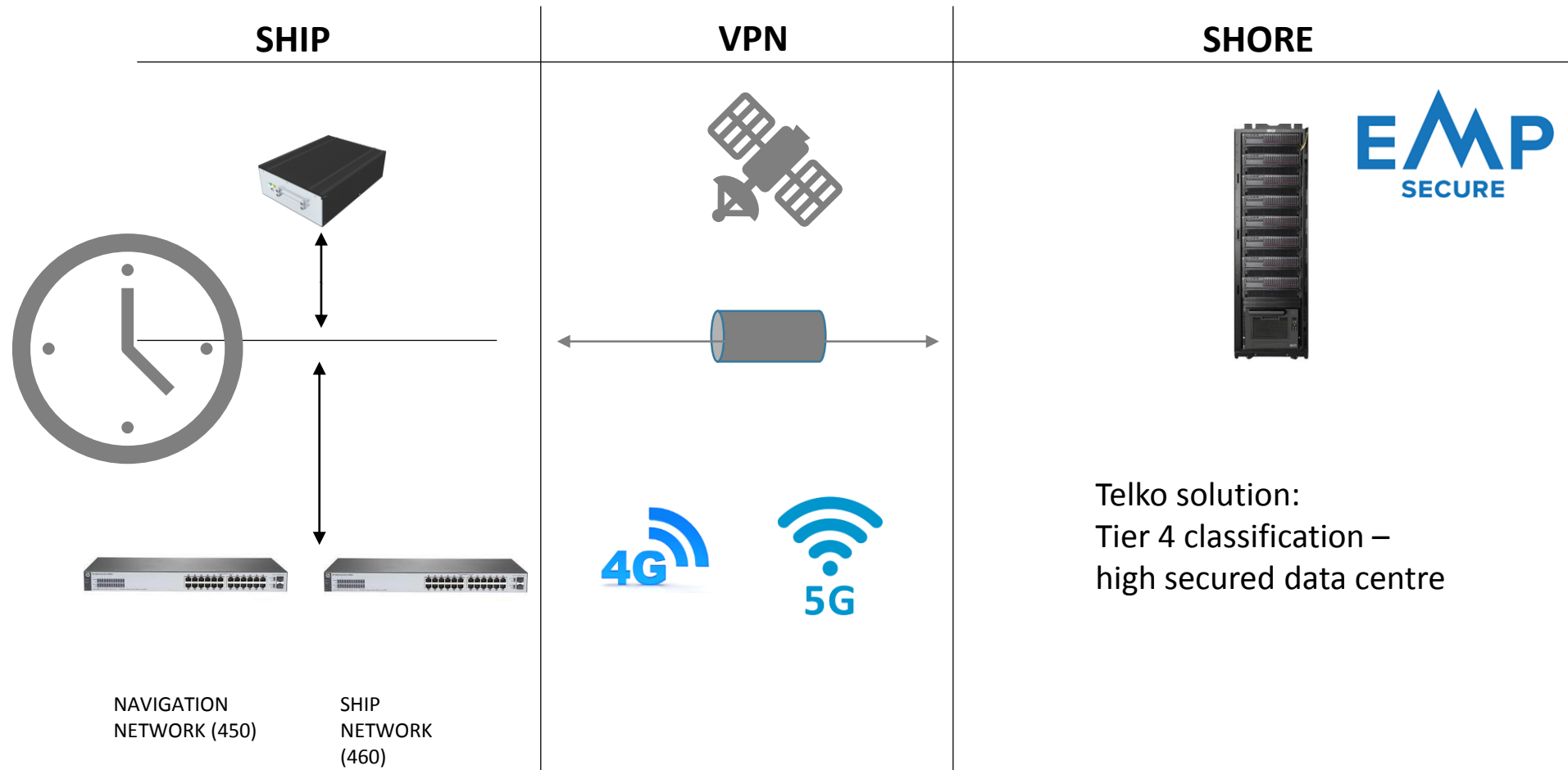
HOW



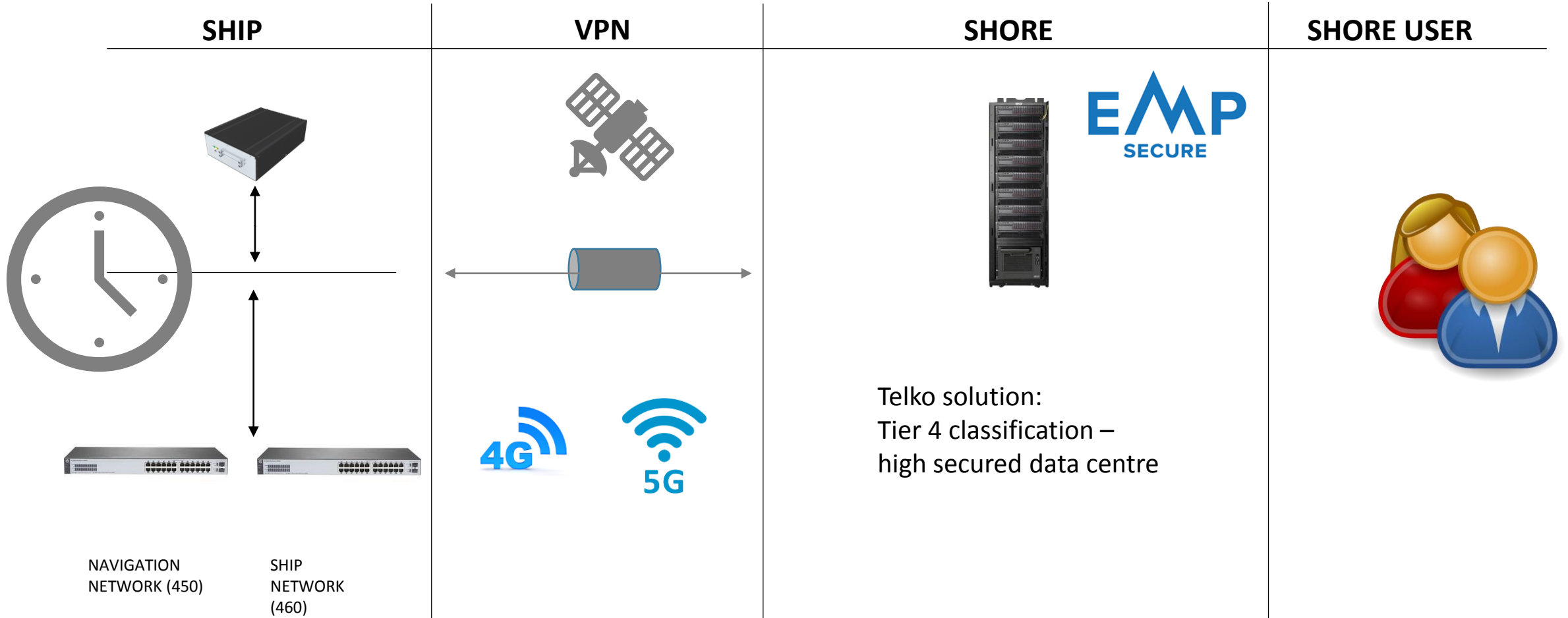
HOW



HOW



HOW



TELSCOPE

BY TELKO

Open extensible platform for onboard data
collection





TELSCOPE

BY TELKO



System availability on ship

Back of Bridge Workstation



Captain's cabin



Main access point for work in TelScope

Mobile use platforms



- Create reports and sign events/operations
- All from the comfort of the cabin

- Work wireless or offline at any location on ship
- Fill in the checklist on site instead of afterwards

TIME

UTC: 08:49

Local: 08:51

POSITION

55° 37.28' N

12° 59.3' E

MA

Martin Ekholm

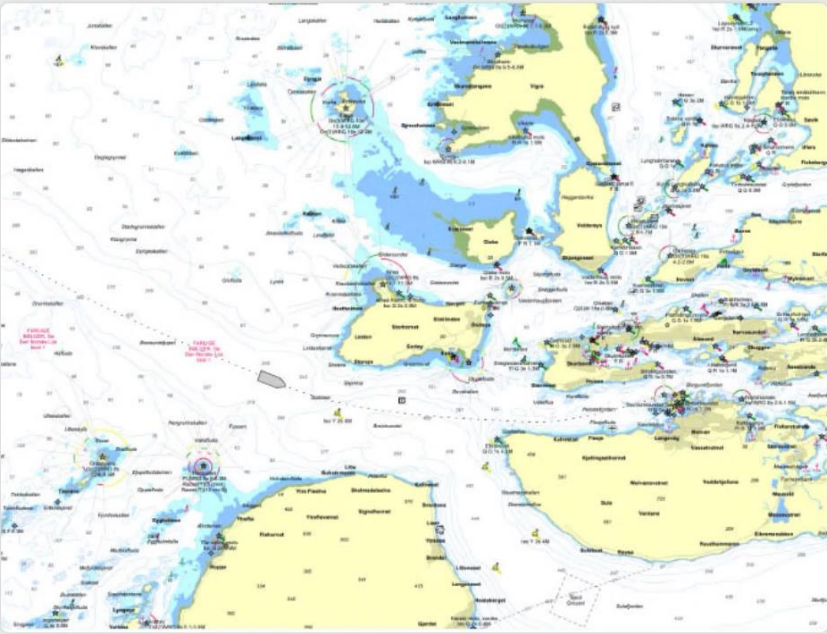
- Dashboard
- Voyage
- Logbooks
- MARPOL Record Books
- Checklists

- Emergency Board
- Sensor overview
- Settings

Voyage status

START NEW VOYAGE

| | | | |
|----------------------|----|----------------------------|----------------|
| Distance Log | | Port Call | EDIT |
| Day distance (Nm): | 10 | Helsinki | |
| Trip distance (Nm): | 50 | Planned time of arrival: | 30.08.19 00:04 |
| Watch distance (Nm): | 4 | Estimated time of arrival: | N/A |
| | | Current SOG (m/s) | 0 |
| | | Speed to go (Kn): | - |



Vessel performance

| | |
|-------------------------|------|
| STW (m/s) | 0 |
| SOG (m/s) | 0 |
| True wind speed (m/s) | 16.1 |
| True wind direction (°) | 0.4 |
| Air temperature (°) | 5.3 |
| Air humidity (%) | 41.8 |
| Depth (m) | 1.7 |

Ongoing work

| Time | Work type | Name | Started by | |
|----------------|-----------|------------------------|---------------------|---|
| 30.08.19 14:12 | Checklist | Departure Checklist | Martin Ekholm | > |
| 30.08.19 11:42 | Checklist | Departure Checklist | Bill Clinton | > |
| 30.08.19 11:20 | Checklist | FIN Test | Henrik Ramm-Schmidt | > |
| 30.08.19 11:19 | Checklist | Departure Checklist | Henrik Ramm-Schmidt | > |
| 30.08.19 11:18 | Bwm | Ballasting of tanks | Henrik Ramm-Schmidt | > |
| 30.08.19 10:29 | Checklist | Departure Checklist 01 | Martin Ekholm | > |
| 30.08.19 08:27 | Checklist | Martin 1 | Martin Ekholm | > |
| 30.08.19 08:26 | Checklist | Martin 1 | Martin Ekholm | > |
| 30.08.19 04:10 | Bwm | Ballasting of tanks | Martin Ekholm | > |

Logbook

| Time | Work type | Summary | Recorded by | |
|----------------|-----------------|----------------------------------|-------------|---|
| 01.09.19 01:44 | Position manual | Pos: (55° 37.46' N 12° 59.05' E) | ME | > |
| 30.08.19 17:03 | Sensor failure | Sensor: test | HRS | > |
| 30.08.19 16:16 | Pilot on board | Pilot: Hansen | ME | > |

Special instructions

| | | | |
|----------------|-----|-------------|---|
| 30.08.19 10:54 | ME | Night Order | > |
| 30.08.19 15:59 | HRS | Anmälan | > |

ADD NEW

Persons onboard

| | |
|------------|-----------------|
| Crew: | 6 |
| Officials | 12 |
| Passengers | 39 |
| Total | 57 |
| Master: | Capt. Andersson |

Quick Settings

- Daysignals:
- Lookout: PORT side
- Deck Light:
- Navigation Light:

TIME

UTC: 09:03

Local: 09:05


POSITION


55° 37.28' N


12° 59.3' E


MA


Martin Ekholm


- 


Dashboard
- 


Voyage
- 

Logbooks
- 



















MARPOL Record Books
- 

Checklists
- 

Emergency Board
- 

Sensor overview
- 

Settings

| Time | Event type | Summary | Recorded by | Status | | |
|-------|---------------------|------------------------------------|-------------|----------|---|---|
| 17:03 | Sensor failure | Sensor: test | HRS | Verified |  | ▼ |
| 16:16 | Pilot on board | Pilot: Hansen | ME | Verified |  | ▼ |
| 16:00 | Work permit | N/A | HRS | Verified |  | ▼ |
| 14:35 | Position manual | Pos: (55° 40.77' N 12° 54.68' E) | ME | Verified |  | ▼ |
| 14:08 | Start watch | Officer: JJ | HRS | Verified |  | ▼ |
| 13:31 | Entering 4 NM limit | Pos: (55° 54.39' N , 12° 44.41' E) | HRS | Verified |  | ▼ |
| 12:08 | Pilot on board | Pilot: Anders Boman | ME | Verified |  | ▼ |
| 10:53 | Pilot on board | Pilot: Heitmann | KVL | Verified |  | ▼ |
| 10:01 | Pilot on board | Pilot: Mr Andersson | ME | Verified |  | ▼ |
| 09:13 | Position manual | Pos: (55° 57.82' N 12° 41.70' E) | ME | Verified |  | ▼ |
| 09:02 | Pilot on board | Pilot: Mr Telko | ME | Verified |  | ▼ |
| 07:55 | Port departure | Port name: SE GOT | BC | Verified |  | ▼ |
| 07:05 | Position manual | Pos: (55° 50.92' N 12° 45.05' E) | ME | Verified |  | ▼ |
| 07:00 | Pilot on board | Pilot: Mr Telko | ME | Verified |  | ▼ |
| 06:43 | Position manual | Pos: (55° 51.92' N 12° 44.59' E) | ME | Verified |  | ▼ |
| 06:00 | Pilot on board | Pilot: Mr Telko | ME | Verified |  | ▼ |
| 05:46 | Position manual | Pos: (55° 54.66' N 12° 44.33' E) | ME | Verified |  | ▼ |
| 03:51 | Pilot on board | Pilot: Anders Larsson | ME | Verified |  | ▼ |

DECK

ENGINE

GMDSS

<

2019-08-30

>

Quick filter

All entries

Show crossed-out entries

ADD LOG ENTRY

Favourite log entries

POSITION MANUAL

PORT DEPARTURE

PORT ARRIVAL

PILOT ON BOARD

PILOT OFF BOARD

WORK PERMIT

Tools

VERIFY

SIGN

FILTER AND PRINT

EDIT LOGBOOK SETTINGS



TIME

UTC: 09:11

Local: 09:13

POSITION

55° 37.28' N

12° 59.3' E

MA

Martin Ekholm



Dashboard



Voyage



Logbooks



MARPOL Record Books



Checklists



Emergency Board



Sensor overview



Settings

Voyage status



START NEW VOYAGE

Distance Log

Day distance (Nm):10

Trip distance (Nm):50

Watch distance (Nm):4

Port Call

Helsinki

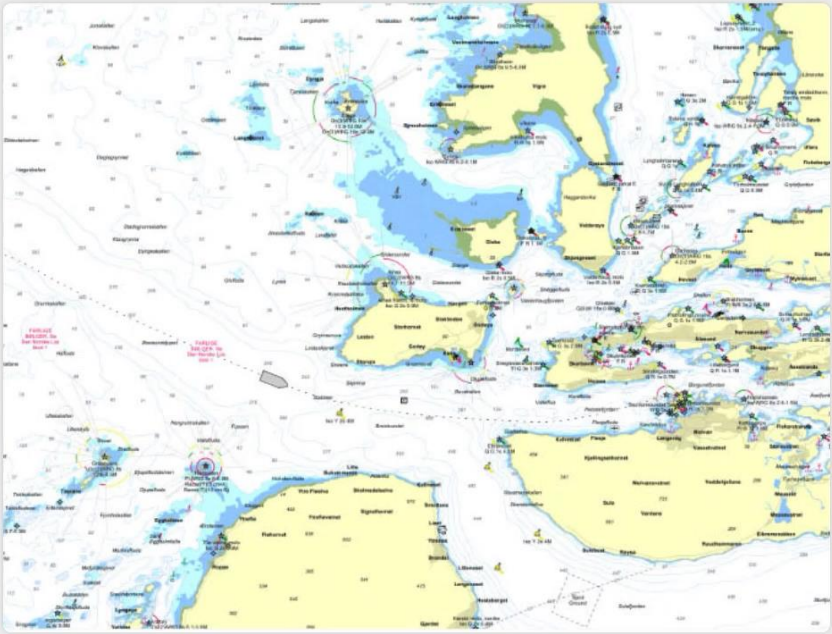
Planned time of arrival:30.08.19 00:04

Estimated time of arrival:N/A

Current SOG (m/s):0

Speed to go (Kn):-

EDIT



Vessel performance

STW (m/s)0

SOG (m/s)0

True wind speed (m/s)16.1

True wind direction (°)0.4

Air temperature (°)5.3

Air humidity (%)41.8

Depth (m)1.7

Ongoing work

| Time | Work type | Name | Started by | |
|----------------|-----------|--------------------------------|---------------------|---|
| 01.09.19 09:09 | Checklist | Pre Departure - Sensors & COMS | Martin Ekholm | ⋮ |
| 30.08.19 11:18 | Bwm | Ballasting of tanks | Henrik Ramm-Schmidt | ⋮ |
| 30.08.19 04:10 | Bwm | Ballasting of tanks | Martin Ekholm | ⋮ |

Logbook



| Time | Work type | Summary | Recorded by | |
|----------------|-----------------|----------------------------------|-------------|---|
| 01.09.19 10:50 | Position manual | Pos: (55° 37.46' N 12° 59.05' E) | ME | ➤ |
| 01.09.19 01:44 | Position manual | Pos: (55° 37.46' N 12° 59.05' E) | ME | ➤ |
| 30.08.19 17:03 | Sensor failure | Sensor: test | HRS | ➤ |

Special instructions

| | | | |
|----------------|-----|-------------|---|
| 30.08.19 10:54 | ME | Night Order | ➤ |
| 30.08.19 15:59 | HRS | Anmälan | ➤ |

ADD NEW

Persons onboard

EDIT

Crew:6

Officials12

Passengers39

Total57

Master:Capt. Andersson

Quick Settings


Daysignals:☒

Lookout:PORT side

Deck Light:☒

Navigation Light:☒

SYSTEM STATUS NOT OK

9

RAID Drive 2 is damaged

Position sensor is missing

Start pre arrival checklist

Toggle Nightmode

TIME

UTC: 09:15

Local: 09:17

POSITION

55° 37.28' N

12° 59.3' E

MA

Martin Ekholm

Dashboard

Voyage

Logbooks

MARPOL Record Books

Checklists

Emergency Board

Sensor overview

Settings

portside-stern

0%

700 m3

Tank #8

0%

1200 m3

Tank #5

0%

1000 m3

Tank #4

0%

500 m3

starboard-stern

0%

700 m3

Tank #7

0%

600m3

1200 m3

Tank #6

0%

1000 m3

Tank #3

0%

500 m3

| Time | Event type | Summary | Recorded by | Status |
|----------------|------------------------------------|---|---------------------|-----------|
| 30.08.19 11:18 | Ballasting of tanks | Operation under way 55° 52.24' N 012° 44.44' E | Henrik Ramm-Schmidt | ongoing |
| 30.08.19 04:10 | Ballasting of tanks | Operation in Got | Martin Ekholm | ongoing |
| 30.08.19 14:19 | Ballasting of tanks | Operation in Got | Martin Ekholm | completed |
| 30.08.19 10:16 | Internal transfer of ballast water | Operation under way 55° 55.21' N 012° 43.98' E | Martin Ekholm | completed |
| 30.08.19 10:14 | Ballasting of tanks | Operation under way 56° 00.45' N 012° 41.14' E | Martin Ekholm | completed |
| 30.08.19 08:53 | Ballasting of tanks | Operation under way 55° 58.72' N 012° 40.87' E | Martin Ekholm | completed |
| 30.08.19 08:13 | Ballasting of tanks | Operation in GOT | Martin Ekholm | completed |

BWR

GARBAGE

OIL RB I

OIL RB II

Select view

BALLAST WATER OPERATION

BALLAST WATER RECORD BOOK

Add new operation

BALLASTING OF TANKS

DISCHARGE OF BALLAST WATER INTO SEA

EXCHANGE OF BALLAST WATER

INTERNAL TRANSFER OF BALLAST WATER

DISCHARGE OF BALLAST WATER TO SHORE

TREATMENT OF BALLAST WATER

ACCIDENTAL UPTAKE OF BALLAST WATER

ACCIDENTAL DISCHARGE OF BALLAST WATER

CLEANING OF TANKS

Tools

SIGN

Thank you!

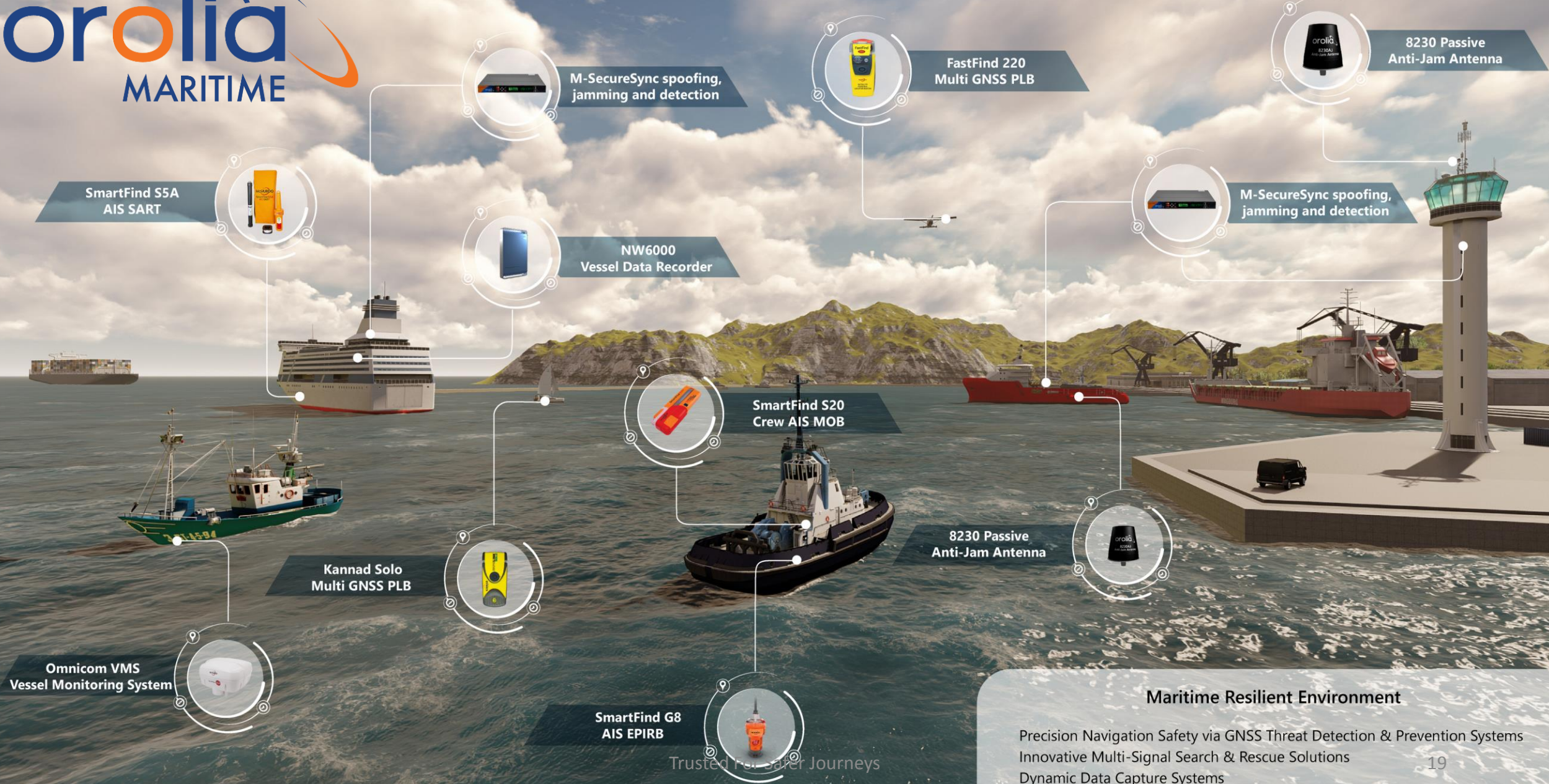
TELKO



Navigation Cyber Security: Spoofing & Jamming Detection

Chris Loizou

Maritime Resilient Environment



Maritime Resilient Environment

Precision Navigation Safety via GNSS Threat Detection & Prevention Systems

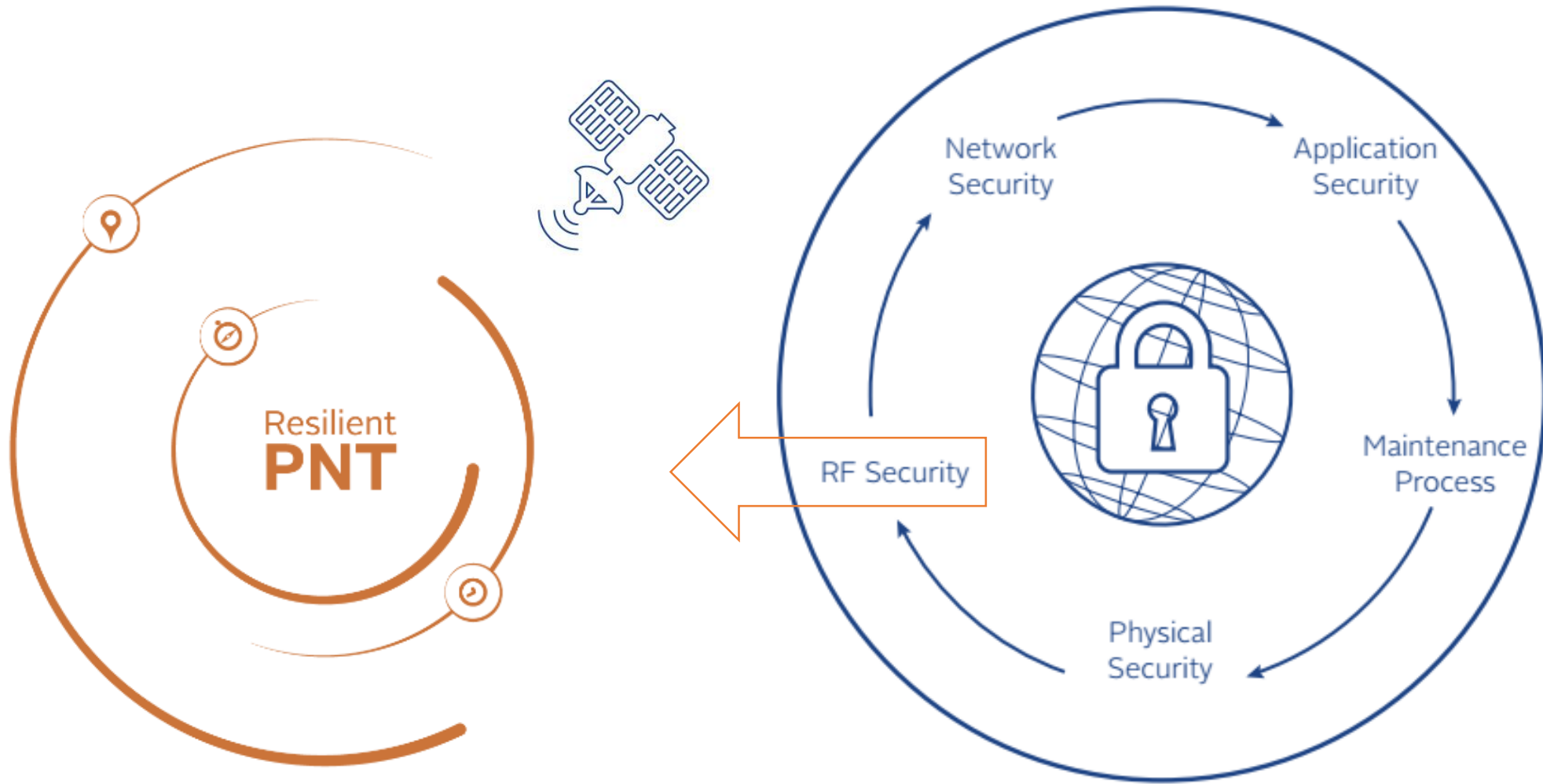
Innovative Multi-Signal Search & Rescue Solutions

Dynamic Data Capture Systems

Robust, Cost Effective, Fleet Monitoring & Management Solutions

19

Maritime Focus on Cyber Security



GNSS – Global Navigation Satellite Systems



GPS

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



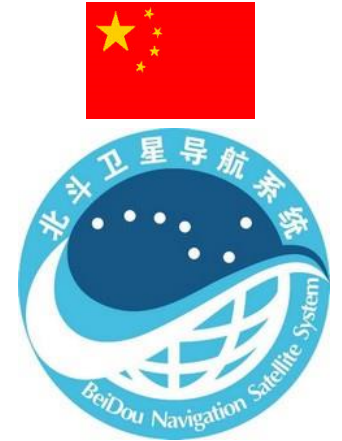
GLONASS

- 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

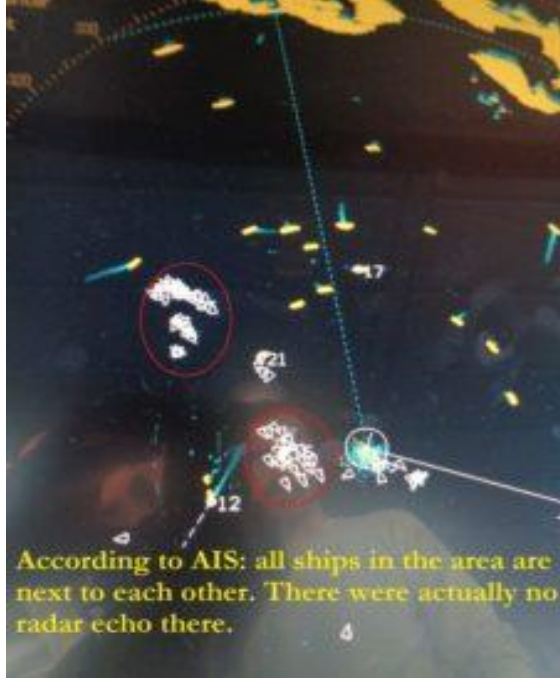


Threats to GNSS Navigation Cyber Security:

Does Your Cyber Security Plan Include Navigation Protection?



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

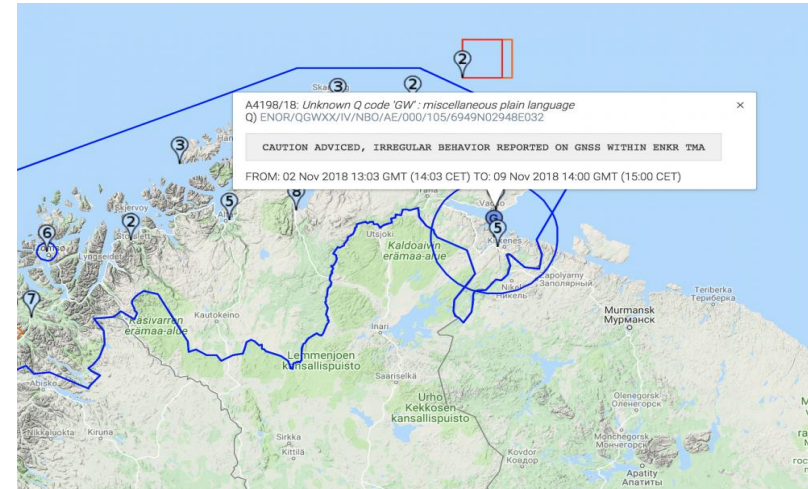
Recent GNSS Interference Examples



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

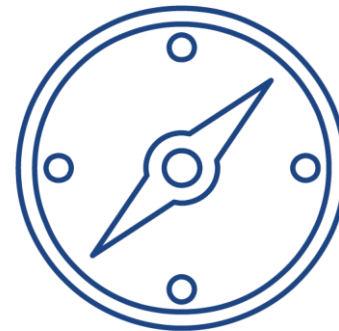
Precision GNSS



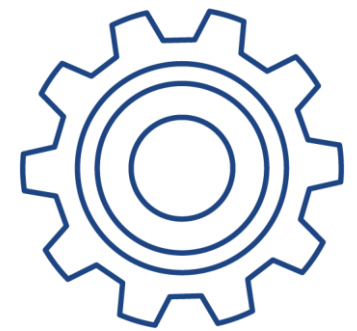
RF Threat Detection & Alerts



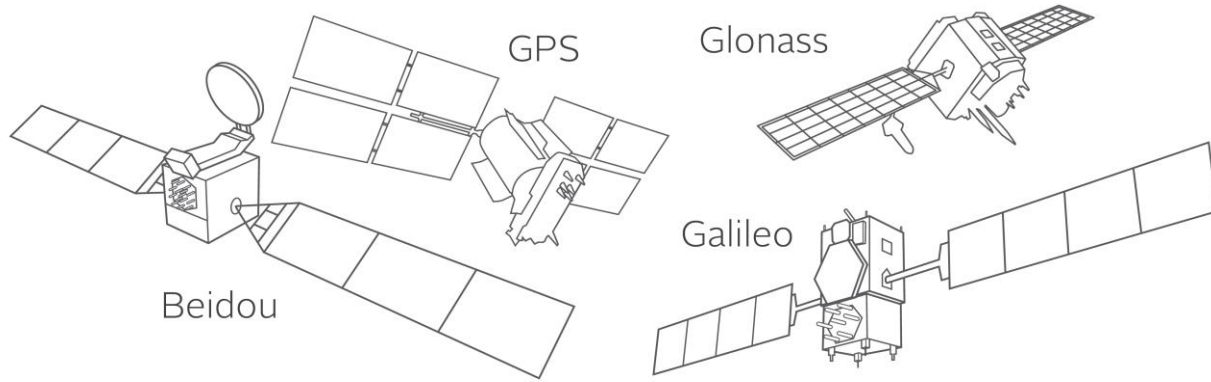
GNSS Augmentation



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**

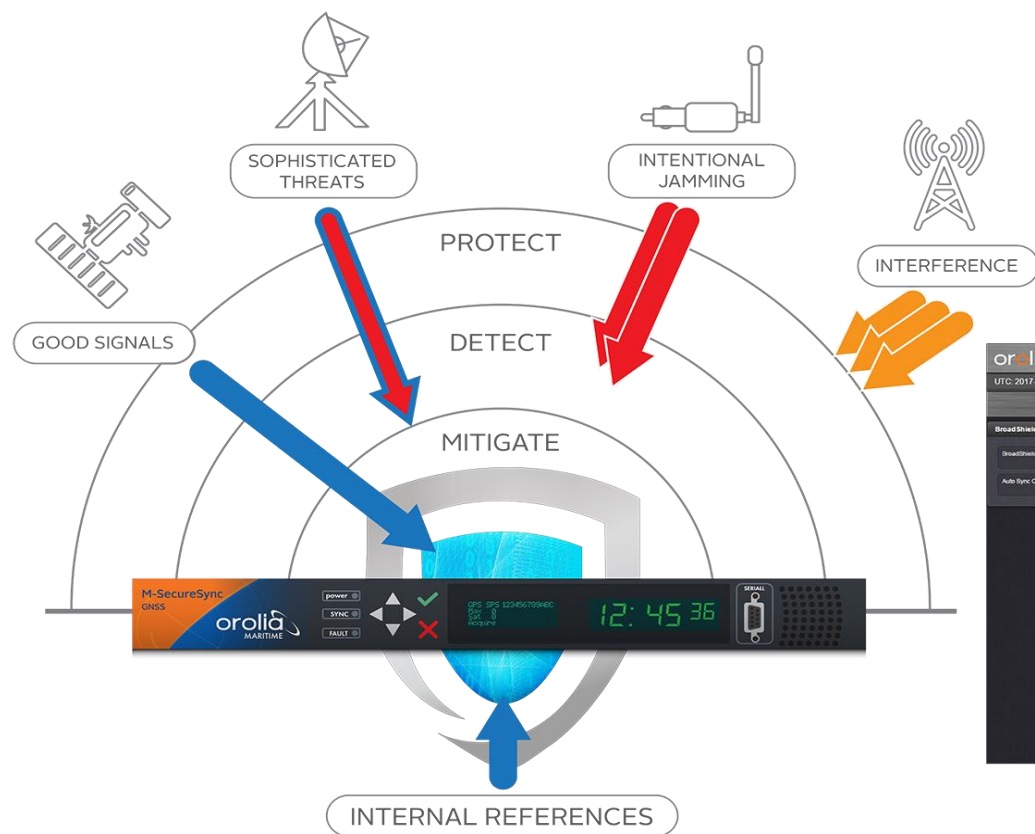


RF Threat Analysis & Alerts



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

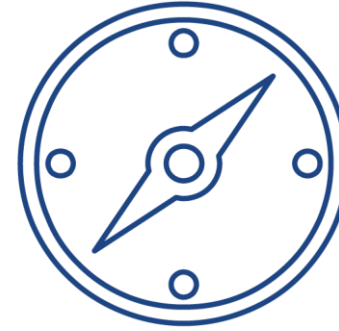
RF Threat Analysis & Alerts



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

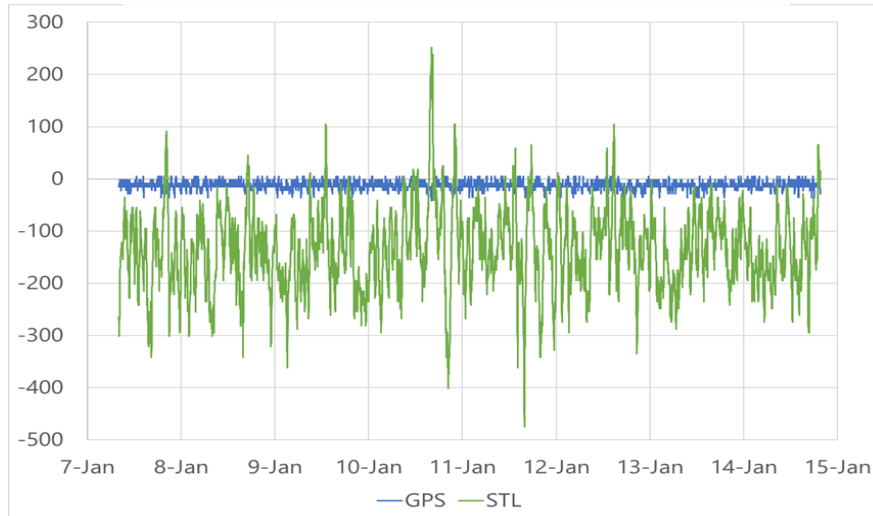
M-SecureSync has been added to Telco's TECDIS system to help inform the ship's bridge of potential position spoofing and deliberate jamming.

GNSS Augmentation

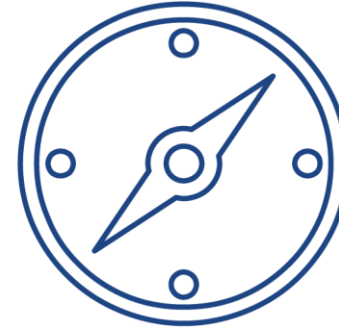


STL is an alternative positioning signal broadcast on Iridium satellites

- **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



Navigation Cyber Security: Spoofing & Jamming Detection

Chris Loizou