

NAVDAT and Modernizing GMDSS



Agenda

- Introduction
- NAVDAT History
- Modernization of GMDSS
- NAVDAT Advantages
- NAVDAT Field Trials
- NAVDAT Broadcast Modes
- NAVDAT Broadcast Chain
- Questions and answers

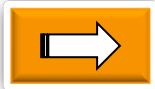


Hermann ZENSEN
Sales & Marketing
KENTA

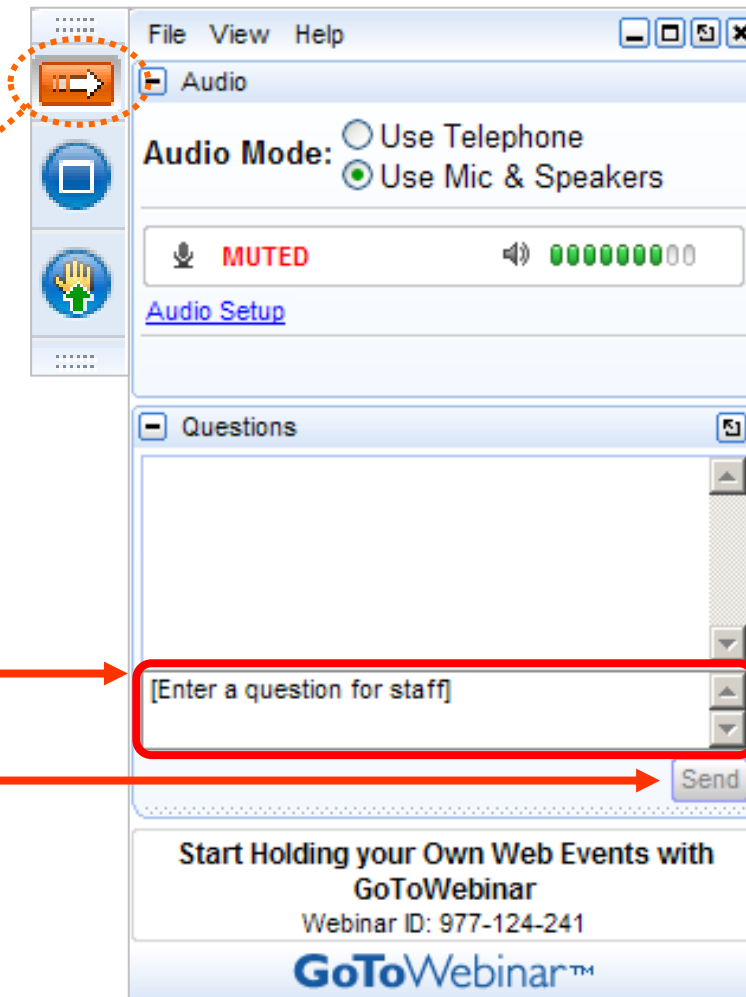


Jean Charles CORNILLOU
Director Maritime Safety Project
Cerema
French Maritime Administration
technical institute

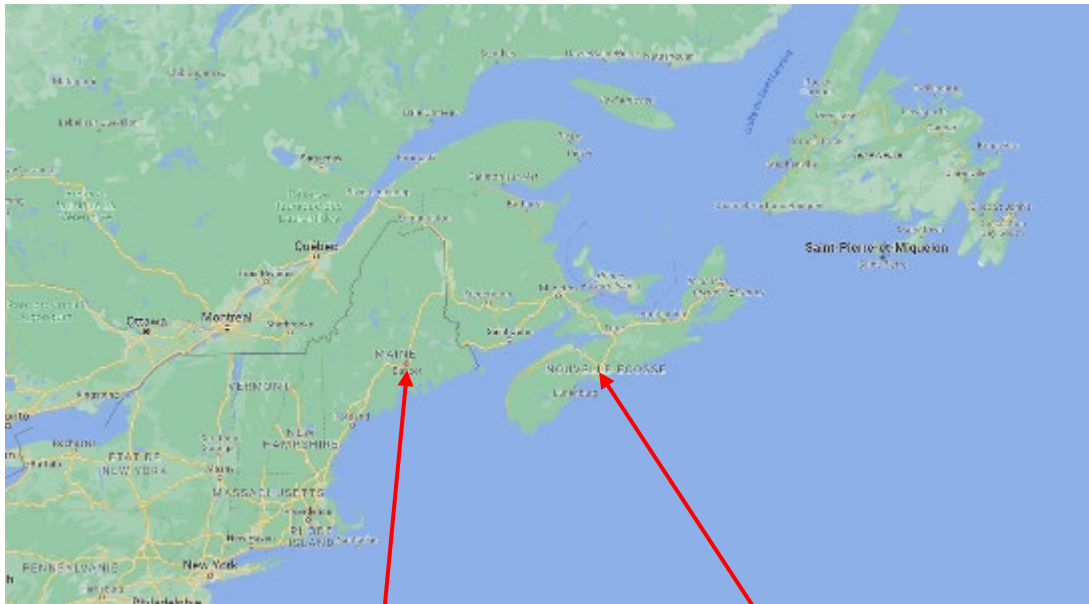
Questions & Answers

Click on  to open/close webinar panel

Enter questions here
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KENTA Technologies & NAUTEL: Shared passion for maritime communications



Nautel Bangor
Maine, US

Nautel HQ
Halifax, Canada



KENTA
— A nautel COMPANY —

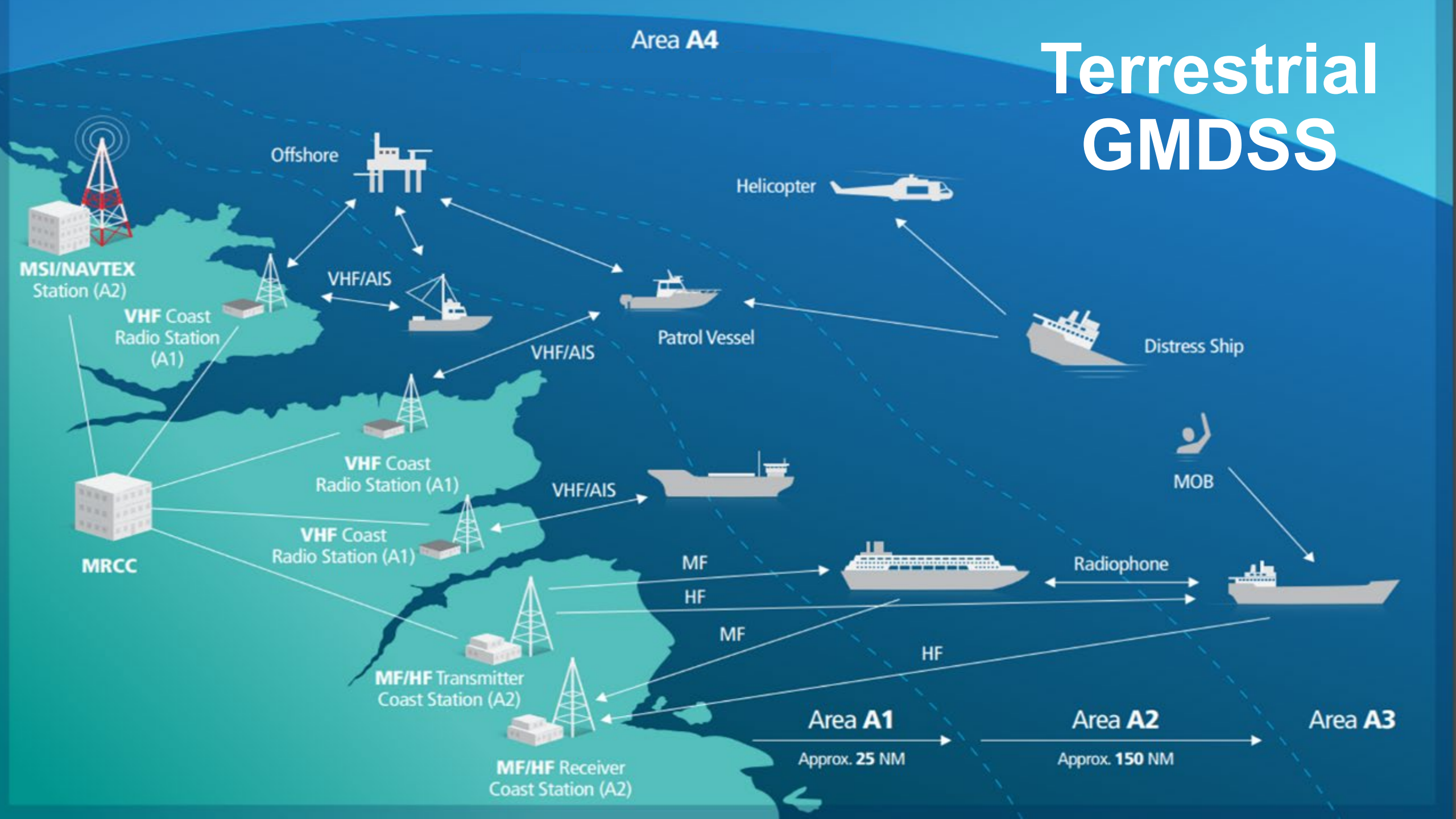
Kenta
Technologies



KENTA Technology Key Points

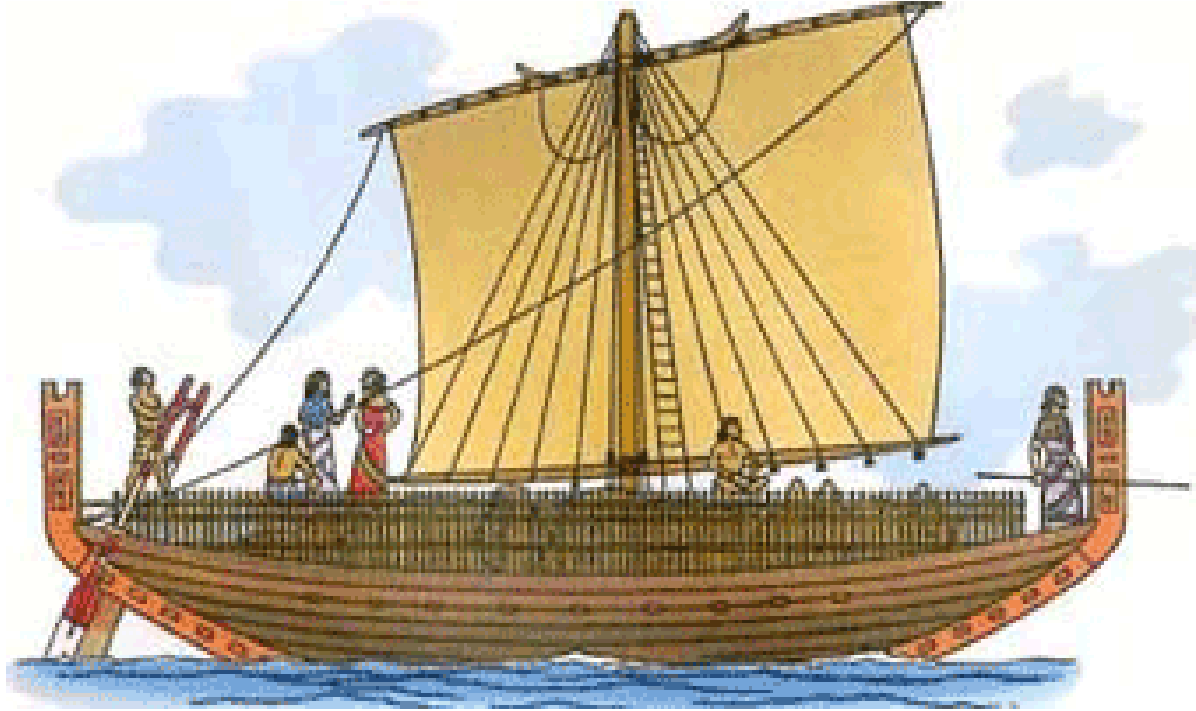
- European subsidiary of Nautel since February 2021
 - Part of a 200+ employee, RF and communications innovator
 - Outstanding financial stability, 54 years, 20,000 RF deployments
 - World's Largest NAVTEX provider
- Founded in 1990 as a Furuno spin off with focus on maritime communications
- GMDSS solutions since 2013
- Software and hardware completely developed internally
- Key competences:
 - IP Technologies & Digital Transmission (a great asset for NAVDAT)
 - Radiocommunications (MF, HF, VHF)
 - Strong field experience for frequencies MF/ HF (less than 30 MHz)
 - Software defined Radio

Terrestrial GMDSS



NAVDAT - History

-3000 BC



At that time, shipping was a **real autonomous means of transportation** for the crew was totally isolated from land and has to rely on its own resources and capacity to face the danger of navigation!

1900



Marconi Wireless
Telegraph Company



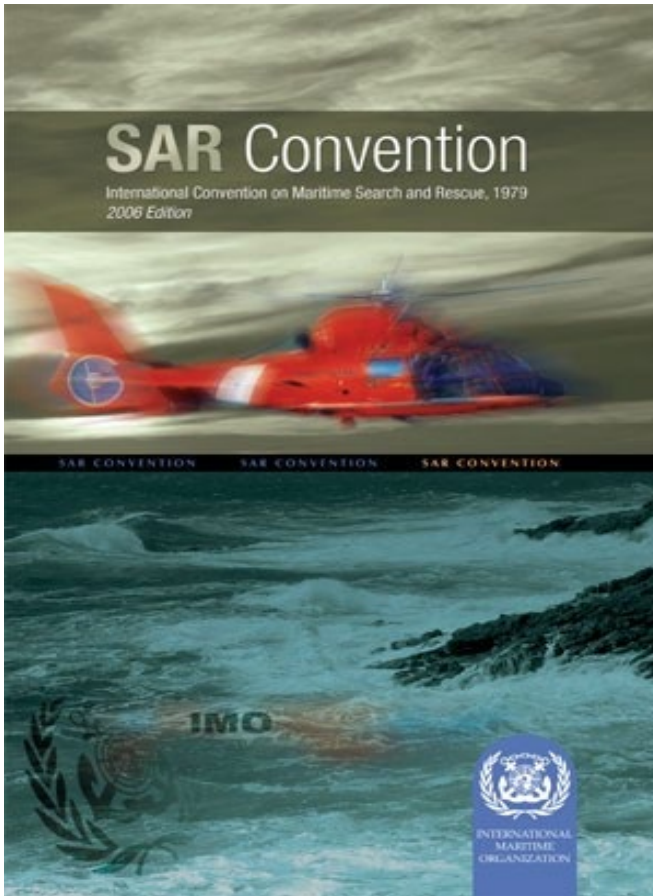
The night of the 14th
to the 15th April 1912

2023



The last safety measure at sea:
SAR

The international convention on maritime SAR



- Adopted in Hamburg in April 1979 (SAR 79)
- Resolution 6 of SAR 79 proposed to develop a global maritime distress and safety system (GMDSS)
- GMDSS was prepared at ITU in order to be used by all ships...
- GMDSS entered into force on 1st February 1999 for all SOLAS ships

Modernization of GMDSS & e-navigation

Modernization of GMDSS

In June 2009, MSC 86 agreed to include, in the work programme of the COMSAR Sub-Committee a subitem on « **Scoping exercise to establish the need for a review of the elements and procedures of the GMDSS** ». The MSC requested the Secretariat to liaise with ITU with a view to utilizing the resources of the Joint **IMO/ITU Experts Group** in the cause of this exercise.

In April 2022, the MSC 105 adopted relevant draft amendments to SOLAS chapters II-1, III, IV and V, and the appendix (Certificates); the 1988 SOLAS Protocol; the 1994 and 2000 HSC Codes; the 1983 and 2008 SPS Codes and the 1979, 1989 and 2009 MODU Codes, and ... the associated draft MSC resolutions & circulars for their adoption... for an **entry into force on 1 January 2024**.

Nevertheless, **the GMDSS functional requirements do not change**. These functional requirements are adapted to any format of communication (Telex, voice or digital) and any radiocommunication system (terrestrial or satellite).

Modernization of GMDSS

The way forward now, and in line with the strategic implementation plan on e-navigation*, is to introduce **digital communications**.

The gap-analysis of e-navigation identified the need to present information in **graphical format**.



* See MSC.1/Circ.1595

Modernization of GMDSS & e-navigation: Introduction of NAVDAT

The ITU has prepared for a long time different technical recommendations for Wide-band Digital Radio with applications in the maritime sector in particular:

- In **November 2011**, Recommendation ITU-R-M 2010, NAVDAT 500 kHz and
- In **February 2014**, Recommendation ITU-R M.2058, NAVDAT HF
- In **November 2018**, Report ITU-R M.2443, NAVDAT Guidelines.

**In November 2019, WRC 19 confirmed the use of all frequency bands for NAVDAT:
500 kHz, 4226 kHz, 6, 8, 12, 16, 18/19, 22 & 25/26 MHz**

Modernization of GMDSS & e-navigation: Introduction of NAVDAT

In **January 2020**, presentation at NCSR 7 by **China & France** of test measurements of NAVDAT system under real conditions... and full support of NCSR to include NAVDAT as a new output for GMDSS!

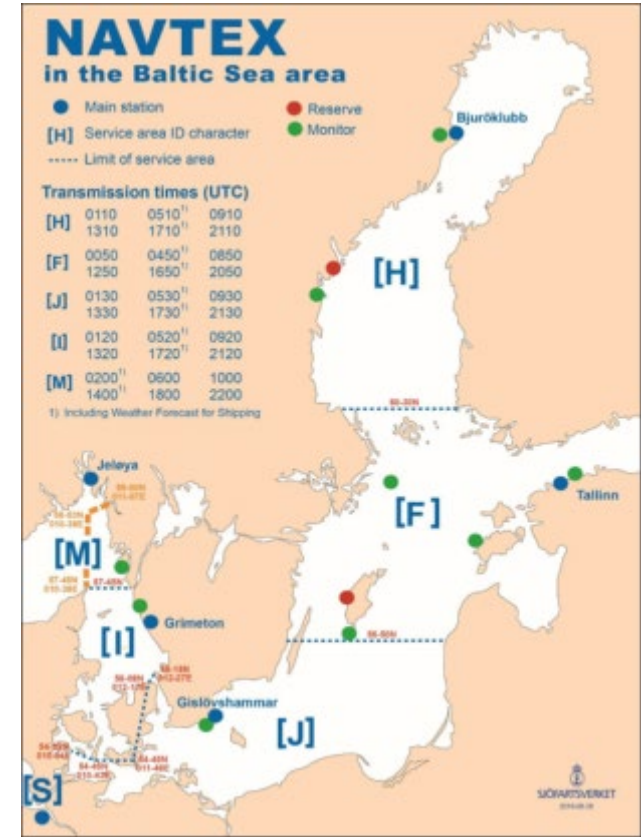
In **May 2021**, the MSC 103 agreed to include in its post-biennial agenda an output on "**Development of performance standards for a digital navigational data system (NAVDAT)**".

In **May 2023**, at NCSR 10, **proposals on NAVDAT, i.e. development of performance standards for NAVDAT receiver and NAVDAT manual** (how to broadcast info on NAVDAT and how to receive info by NAVDAT)

Broadcast the appropriate information in the appropriate area, at the appropriate time and with the appropriate communication system.



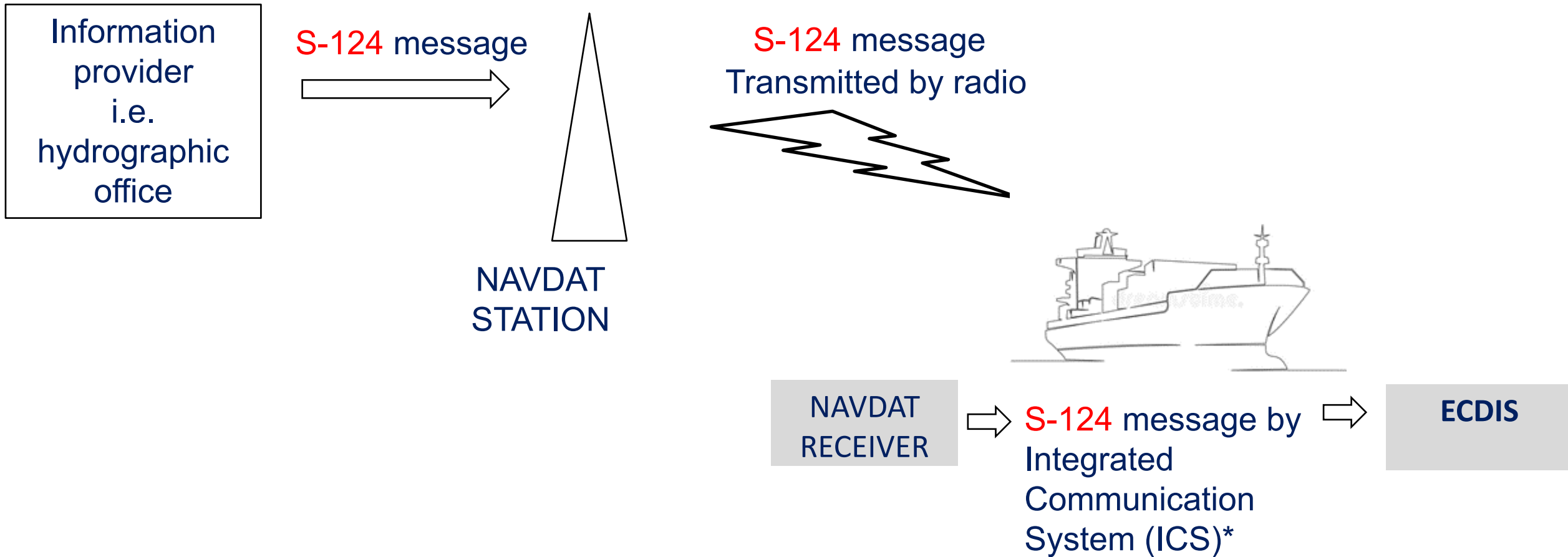
Broadcast by satellites systems
in NAV/METAREAs for coordinating and
promulgating navigational warnings under the
World-Wide Navigational Warning Service



Broadcast by terrestrial system
In coastal areas

NAVDAT - Advantages

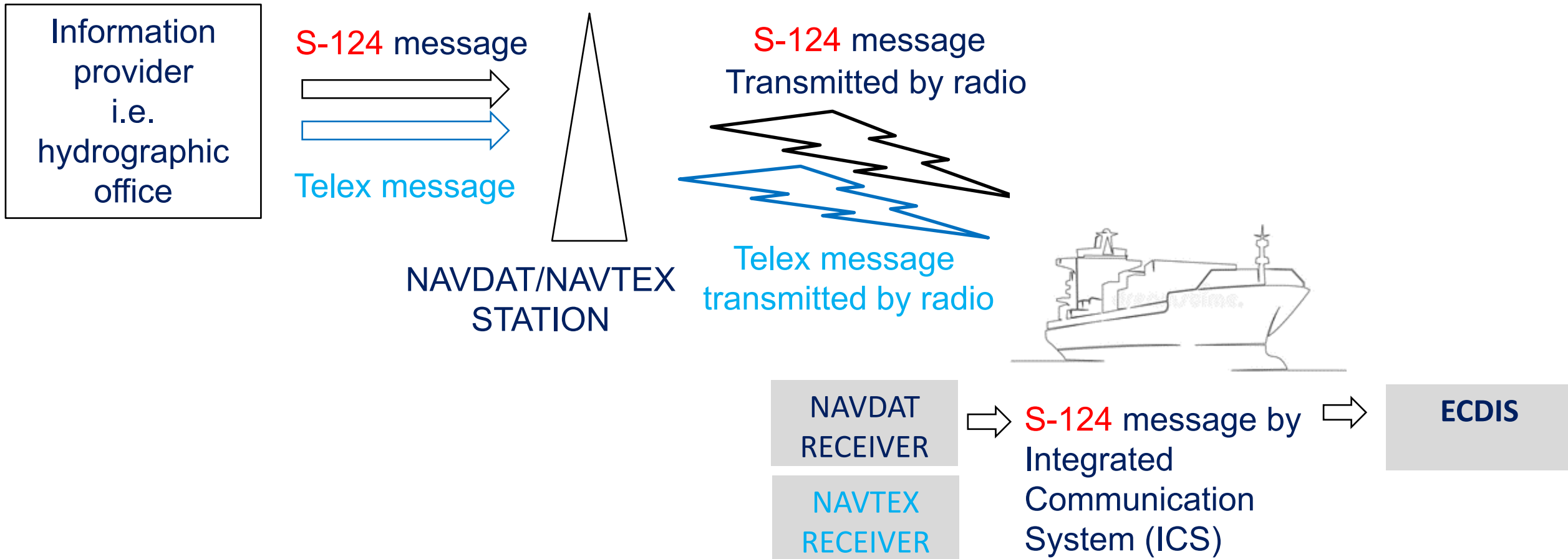
The interest of digital information



* See Res.
MSC.517(105)

The interest of digital information

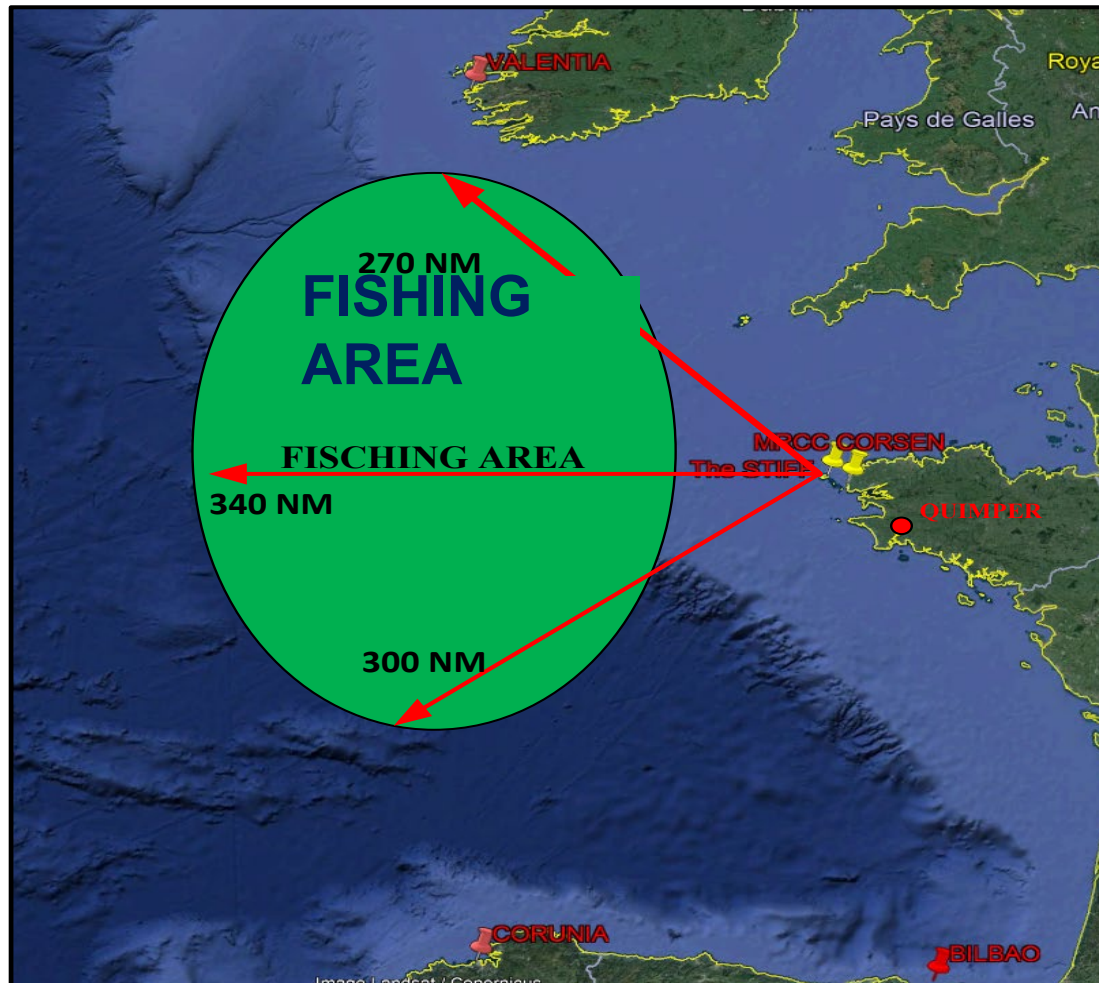
And the necessity to renew NAVTEX stations with a new technology!



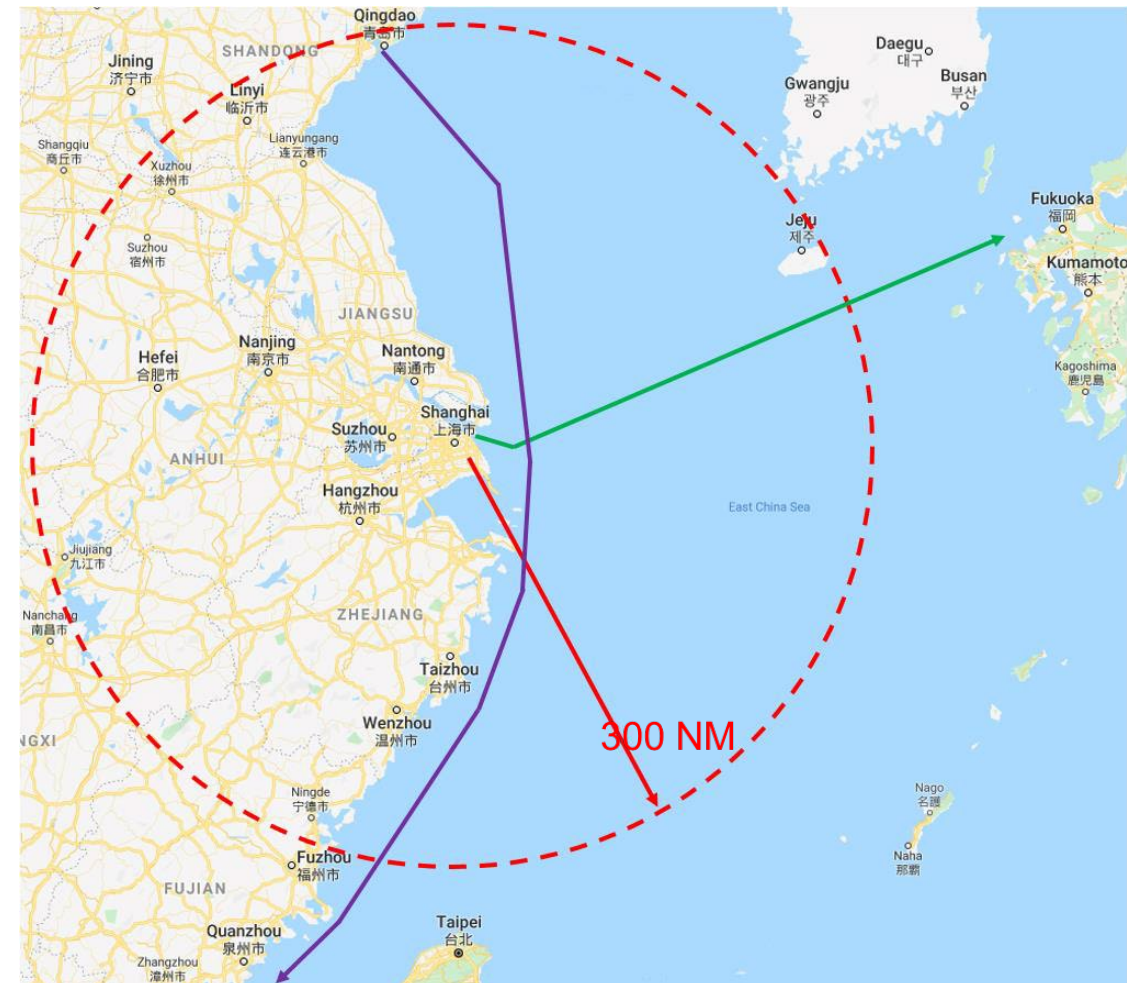
NAVDAT – Field Trials

Test measurements of NAVDAT system under real conditions

In France – Ushant island
NAVDAT 4 MHz test

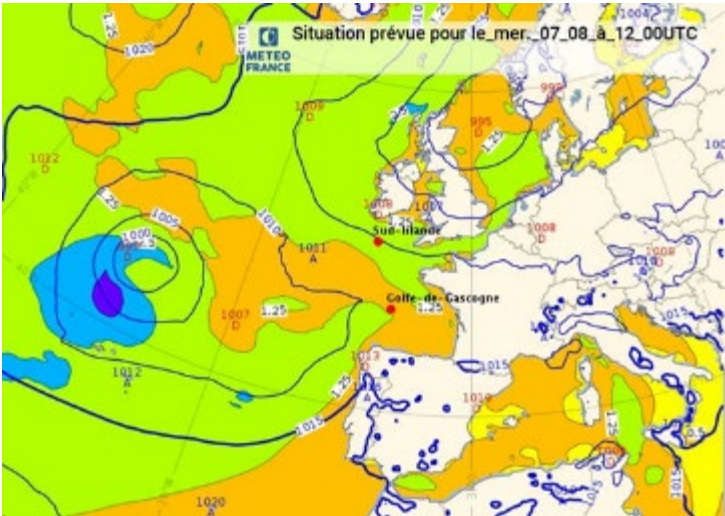


In China – Shanghai
NAVDAT 500 kHz test

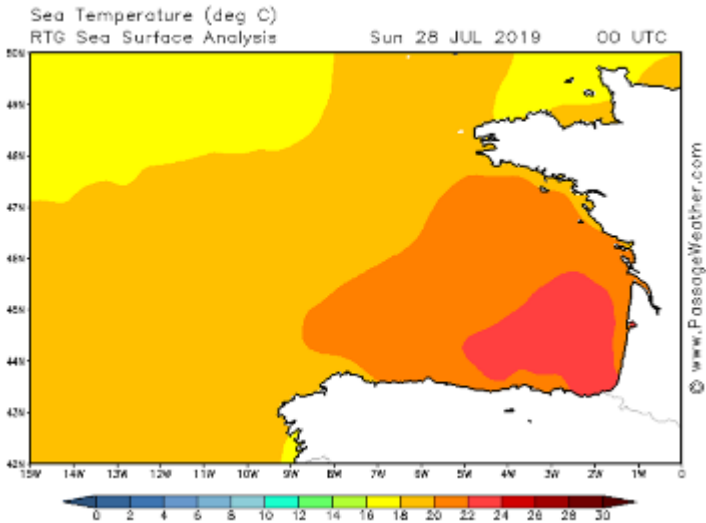


Test measurements of NAVDAT system in HF

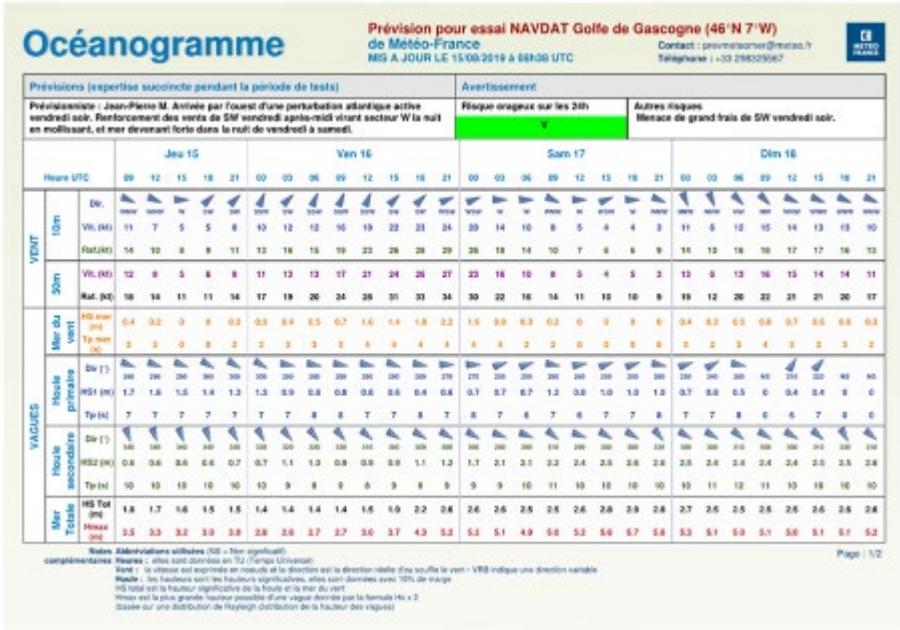
Examples of decoded files transmitted



isobaric weather chart
(Météo France)



temperature chart
(Passage Wheeler)



data and forecast in Biscay Bay
(Météo France)

NAVDAT – Broadcasting modes

The NAVDAT broadcasting modes

Broadcasting NAVDAT files can be done by:

- **General broadcast**
 - (to all ships);
- **Selective broadcast**
 - (to ships located in a specific area, or for groups of ships according to the ship's position, MMSI or group identification); and
- **Dedicated message**
 - (according to ship's MMSI).

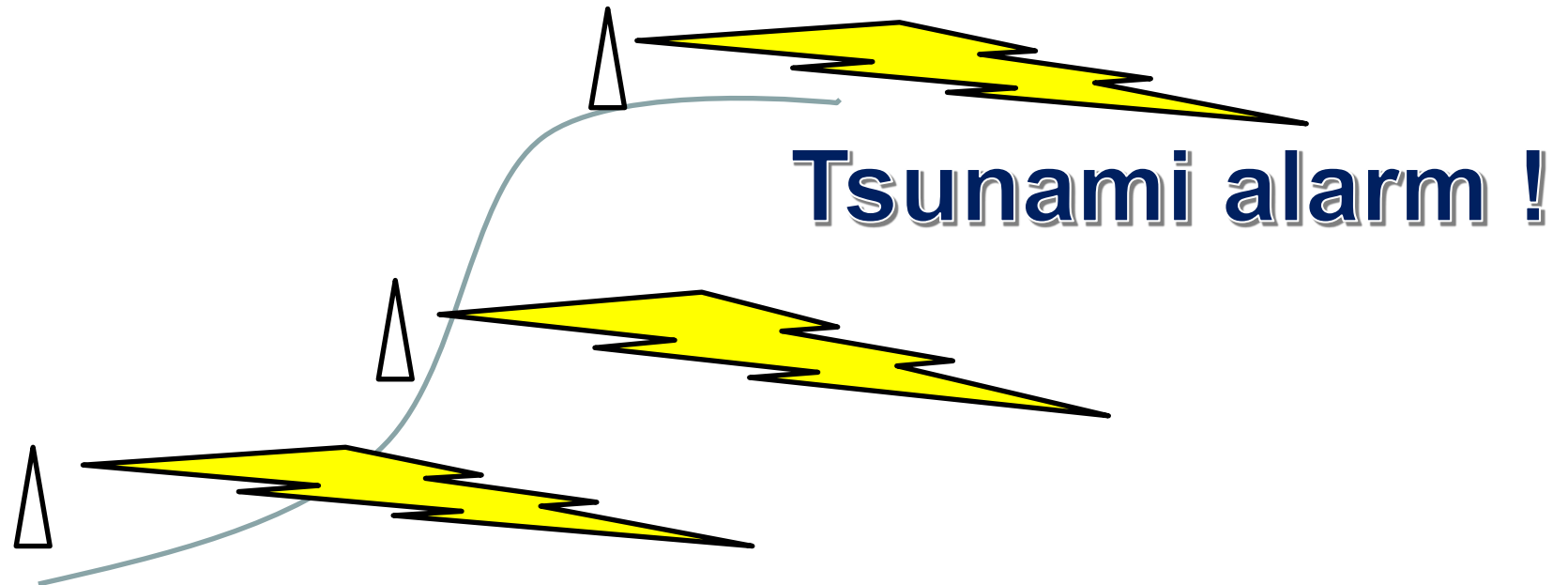
There are possibilities of **encrypting** sensitive files in the **three modes** of broadcasting.

The NAVDAT broadcasting modes (Following)

SFN mode (Single Frequency Network)

The NAVDAT system offers the possibility of operating in SFN mode. This network uses several transmitters operating on the same frequency and broadcasting the same information at the same time. This simplifies the distribution of the time slots, increases the effectiveness of the broadcast which can be longer and limits the potential interference.

Example:



When building an SFN network, messages should preferably be generated by a common server.

Comparison between NAVTEX and NAVDAT flow

(if we may compare 2 different technologies)

For a 10 min NAVTEX slot at 50 bits/s the maximum data volume transmitted is:
30 kbits or **3,75 kB** ... but **in telex only**.

For a 10 min NAVDAT slot at an average flow of 20 kbits/s the maximum volume transmitted is:
12 000 kbits or **1 500 kB** ... and **in different data format!**



Text

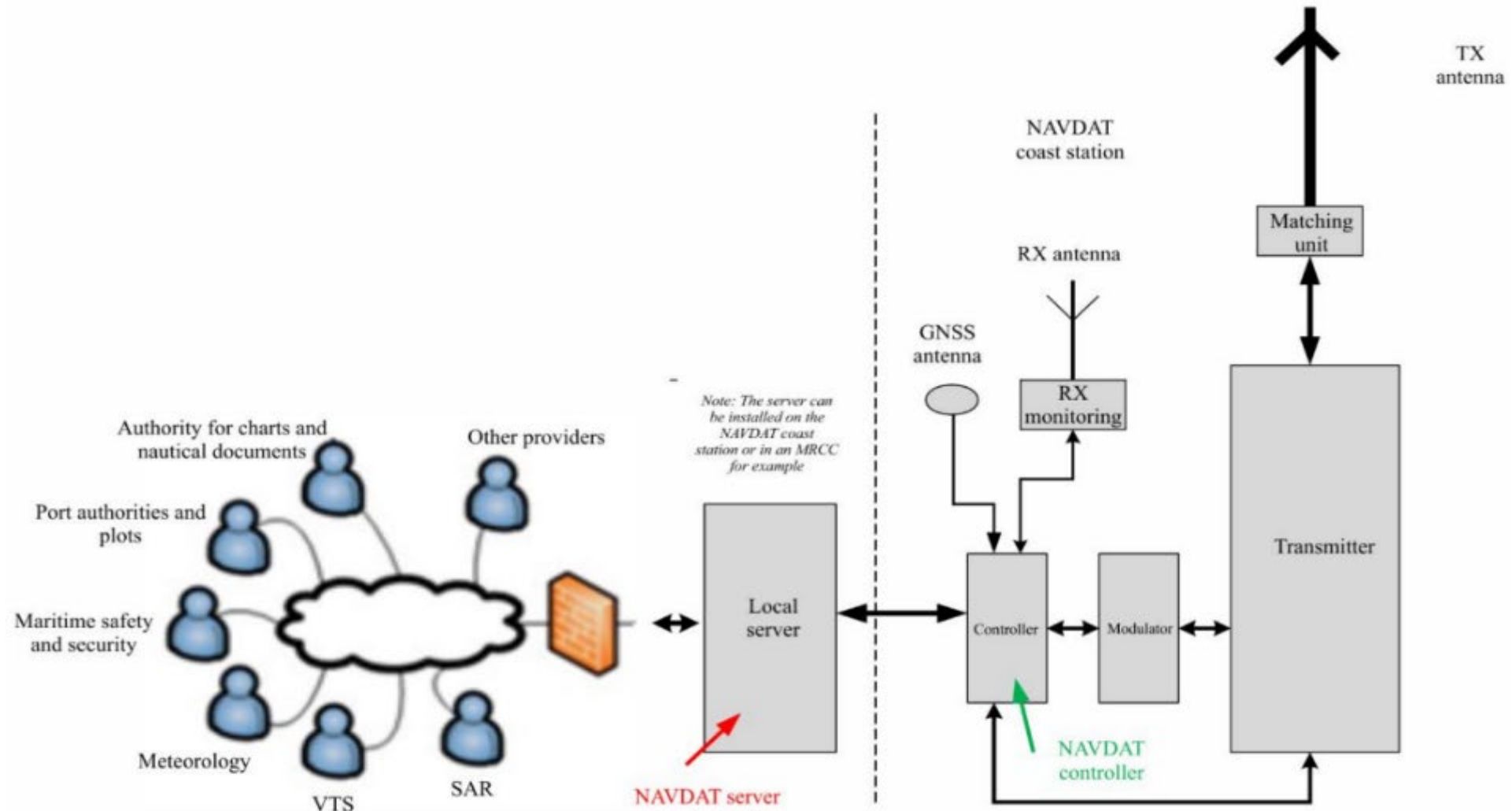
...010101010101110...



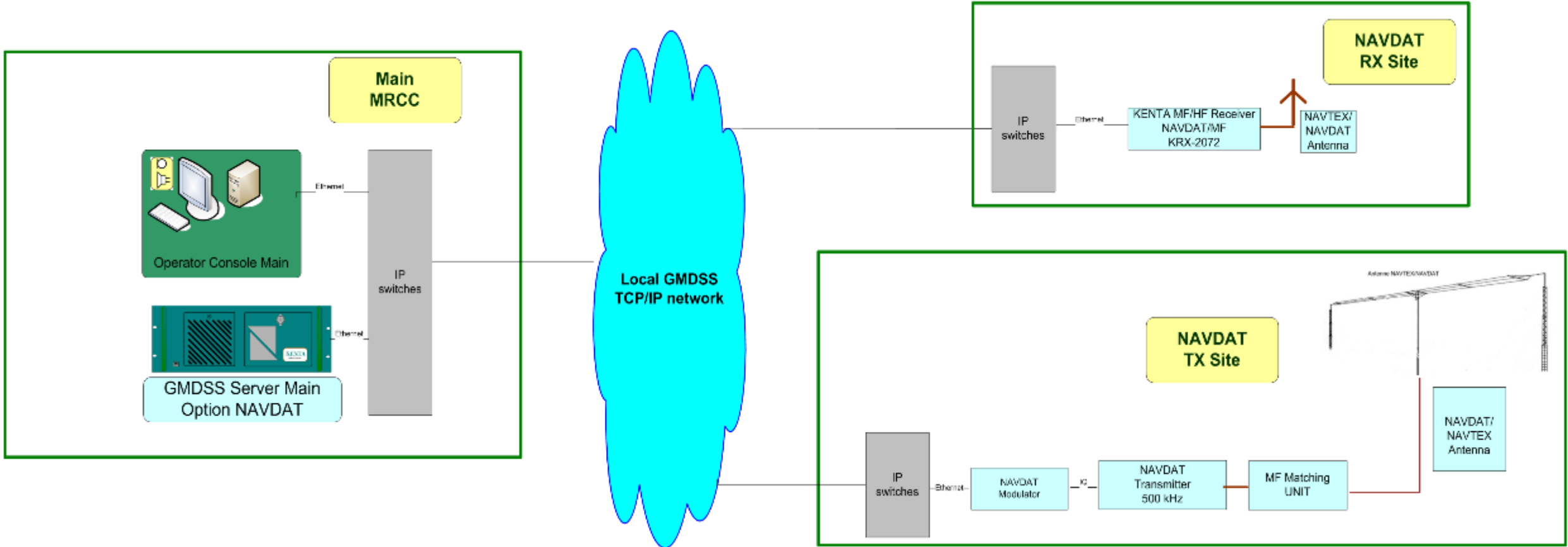
Multimedia

NAVDAT – Broadcast Chain

NAVDAT Chain as per R-REC-M.2010-1-202302



Single NAVDAT System



What TX Power Level do you Need? MW

Example: 220 NM (407 km) with 10 kHz Bandwidth

QAM	Data Rate	10 min data block	Weather Charts in 10 min	Average Power	Est Transmitter Size Peak Envelope Power
4 QAM	6-10 kbps	450 - 750 kB	2 - 3	0.7 kW	3.5 kW
16 QAM	12-19 kbps	900 -1425 kB	4 - 7	1.6 kW	10.1 kW
64 QAM	19-29 kbps	1425 -2175 kB	7 - 10	6.4 kW	50.8 kW

More data, more power needed
Less bandwidth, lower transmitter power
Limited by atmospheric and ship board noise
(ITU-M.2443)

Table 4 Maritime transmission records

Local time	Distance (NM)	SNR (dB)	Modulation/Code rate	File type	File size (KB)	Reception
6:20	293	5	4 QAM/0.5	TXT	20	Correct
5:20	273	7	4 QAM/0.5	PNG	208	Correct
1:25	196	15	16 QAM/0.5	TXT	20	Correct
23:20	157	16	16 QAM/0.5	PNG	208	Correct
20:20	103	22	64 QAM/0.5	TXT	20	Correct
20:20	103	21	64 QAM/0.5	PNG	208	Correct

Chinese trial (NCSR-7/INF 13): 500 W RMS 5 kW Peak

Summary

- NAVDAT is the logical outcome of long history
- NAVDAT ITU standards exists and are currently completed
- NAVDAT can broadcast any type of data
 - large variety of applications and users
- Different broadcast modes:
 - General, selective and dedicated
- Digital Modulation and SFN
- Field tests done, coverage and power estimations are available

Next Steps

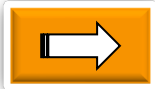
- Learn more
 - Next Webinar:
 - NAVDAT vs NAVTEX: Myths & Misconceptions
 - Stay informed:
 - <https://nautelnav.com/newsletter/>
- Request an assessment/consultation
 - Coverage, Transmission Upgrade Options
- Plan for a trial
 - Contact us on nav@nautel.com



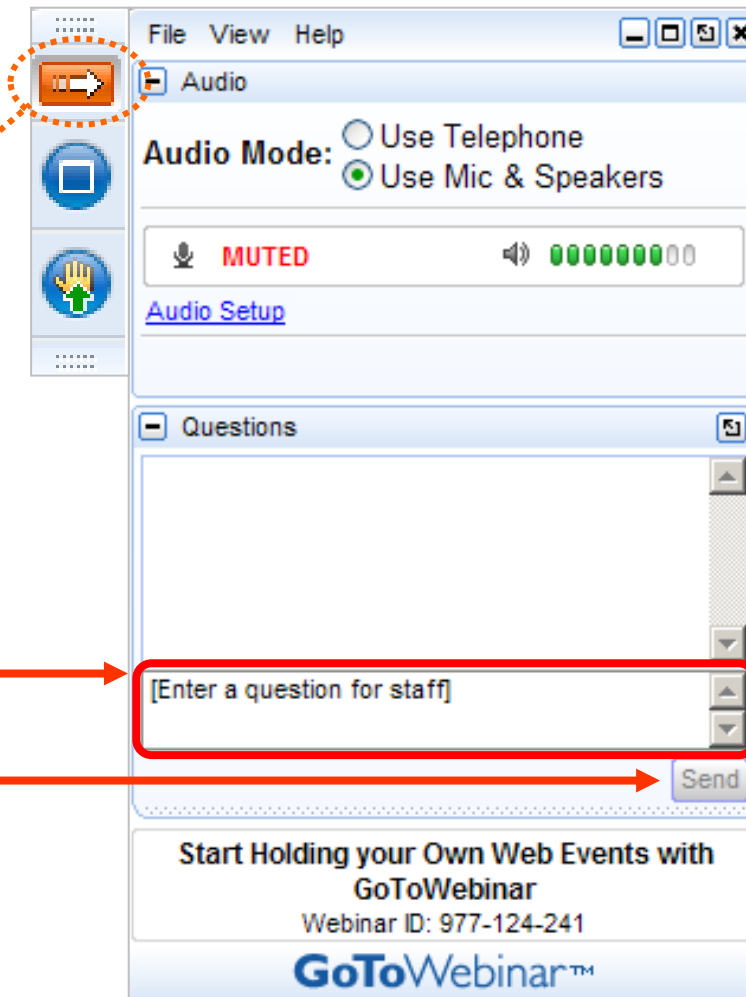
5 – 8 December 2023

Shanghai New International Expo Centre (SNIEC), China
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Questions & Answers

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