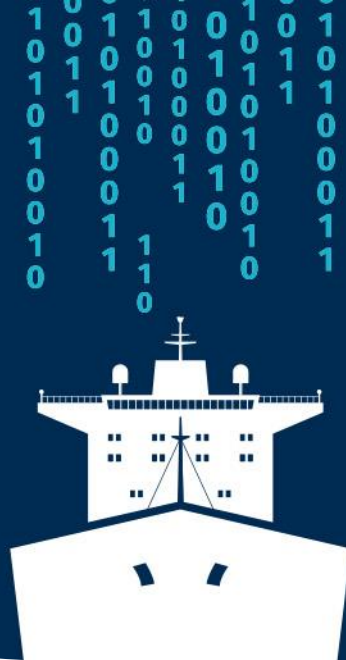




Fleet Xpress: 海事通訊服務新標準

錢聲偉: Vice President Sales, Asia Pacific, Inmarsat Maritime

01

Maritime industry trends

What's driving demand for maritime satellite communications?

The landscape of shipping is changing faster than ever

所有的進展依靠高可靠性的通信系統



Traditional shipping

Digital shipping

Smart shipping

Autonomous vessel



2010

2013

2016

2020

The data drive

Big Data is transforming business

0.05

Seconds between each motion measurement on a ship

2,800

Sensors hardwired into the Triple E vessel's main control system

5,000

Data tags on modern vessel

200

Sensors in a modern main engine room measuring temperature and pressure

7,000

Channels monitored on the Triple E for situational awareness and alarms

2GB

Data stored every day from the main control system of a Triple E vessel

2TB

Data generated every 100 days by a modern vessel

30TB

Transmitted by Maersk line fleet over satellite link every month

\$20M annual fuel cost savings

\$6000 Saving per vessel per month





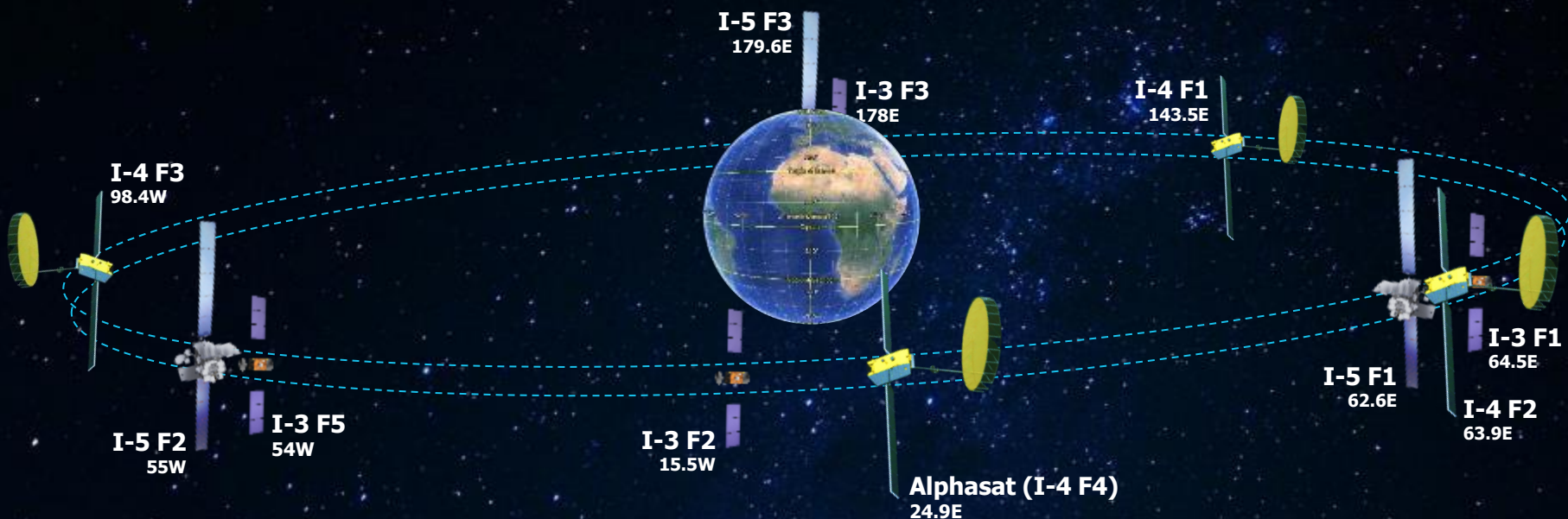
02

Inmarsat Business

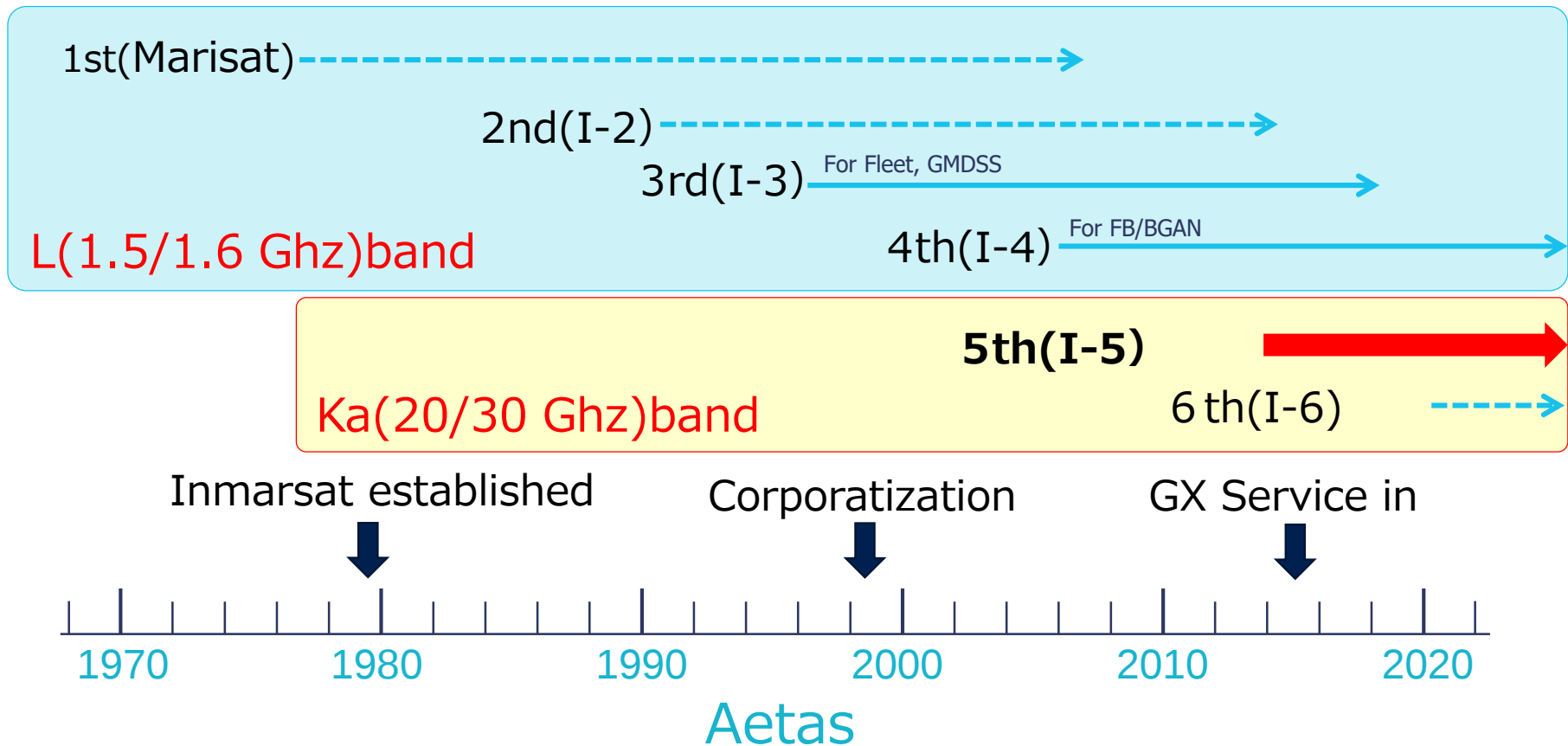
An introduction to Inmarsat

Inmarsat Fleet

Geostationary orbit: 35,786km



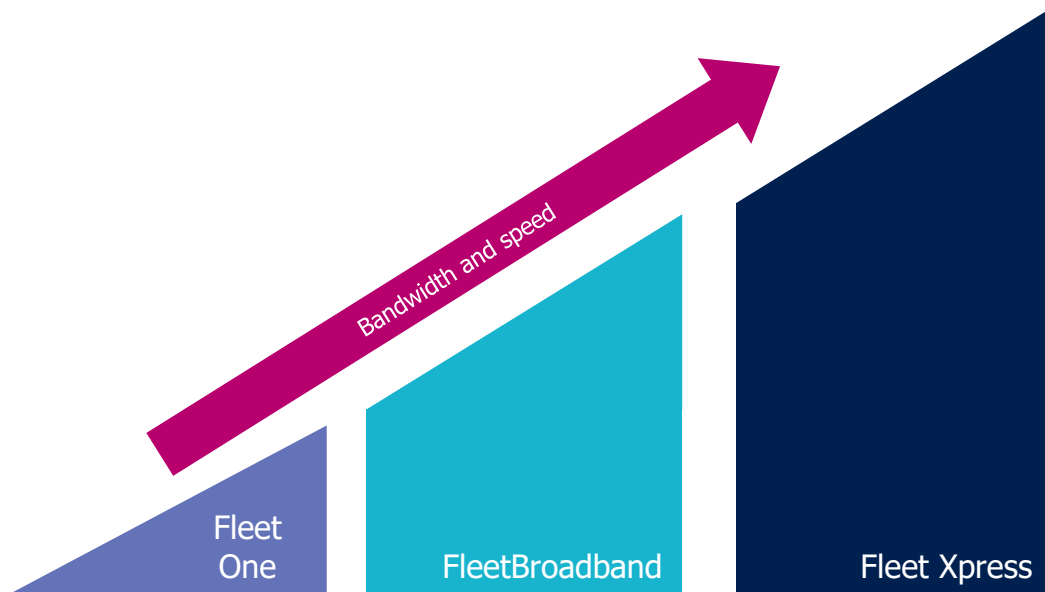
Generational change of Inmarsat's satellites



Inmarsat Maritime broadband portfolio

Satellite connectivity for all vessels

- > Inmarsat enables the maritime industry to stay connected with a broad portfolio of voice and data services
- > Fleet Xpress has been designed for customers looking for high-speed broadband connectivity



Maritime broadband services

Portfolio use cases

A solution for all use cases: Fleet One – FleetBroadband – Fleet Xpress

Use case	E-mail, voice	Entry internet	Medium internet	Advanced internet
	Fleet One	FleetBroadband	FleetBroadband	Fleet Xpress
Business email, voice	Yes	Yes	Yes	Yes
Crew messaging (email / chat)	Yes	Yes	Yes	Yes
ECDIS/ERP/PMS synch		Yes	Yes	Yes
Social media		Yes	Yes	Yes
Light browsing/prepaid			Yes	Yes
VPN/ remote access			Yes	Yes
System monitoring			Yes	Yes
High usage browsing				Yes
Engine monitoring				Yes
Managed services				Yes
Cloud solutions				Yes
Business applications				Yes
On-demand bandwidth				Yes

03

What is Global Xpress KA 服务?



\$1.6bn

Global broadband network

4

Global Xpress satellites

89

Ka-band beams on each satellite

Inmarsat Global Xpress

One high speed network, one trusted provider, one seamless global solution

- > Inmarsat 第五代高速通信衛星
- > 單一運營商提供全球無縫隙的服務覆蓋
- > 每個第五代衛星提供15年的衛星壽命
- > 全備份衛星網路,地面站及運營中心
- > Fleet Xpress 為Global Xpress的海事版本,提供GX同FBB服務的雙系統

Global Xpress 服务

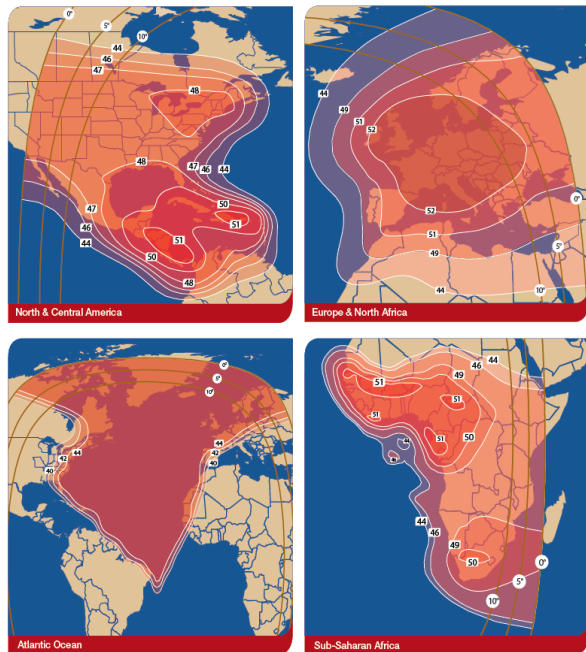
- Inmarsat 第五代衛星I-5 satellites (三顆+ 第四顆作為備用)
 - F1(IOR)于2013年十二月發射,並已經提供服務
 - F2(AOR)于2015年二月發射,已經提供服務
 - F3(POR)于2015年八月28日發射, 已經提供服務
 - F4 已經發射在軌即將提供服務
- 全球服務Global Service (基礎通訊服務)
 - 每個衛星提供89個點波束(點亮72),通過三個衛星構架出全球覆蓋網路
 - 專門為移動通信而設計
- 區域服務(高容量資料通道)
 - 每個衛星提供六個移動波束,提供多區域,動態頻寬服務
 - 同時供應商業及政府需求



04

VSAT : Ku 到 Ka

KU service: 基於以陸地為主的固定衛星服務

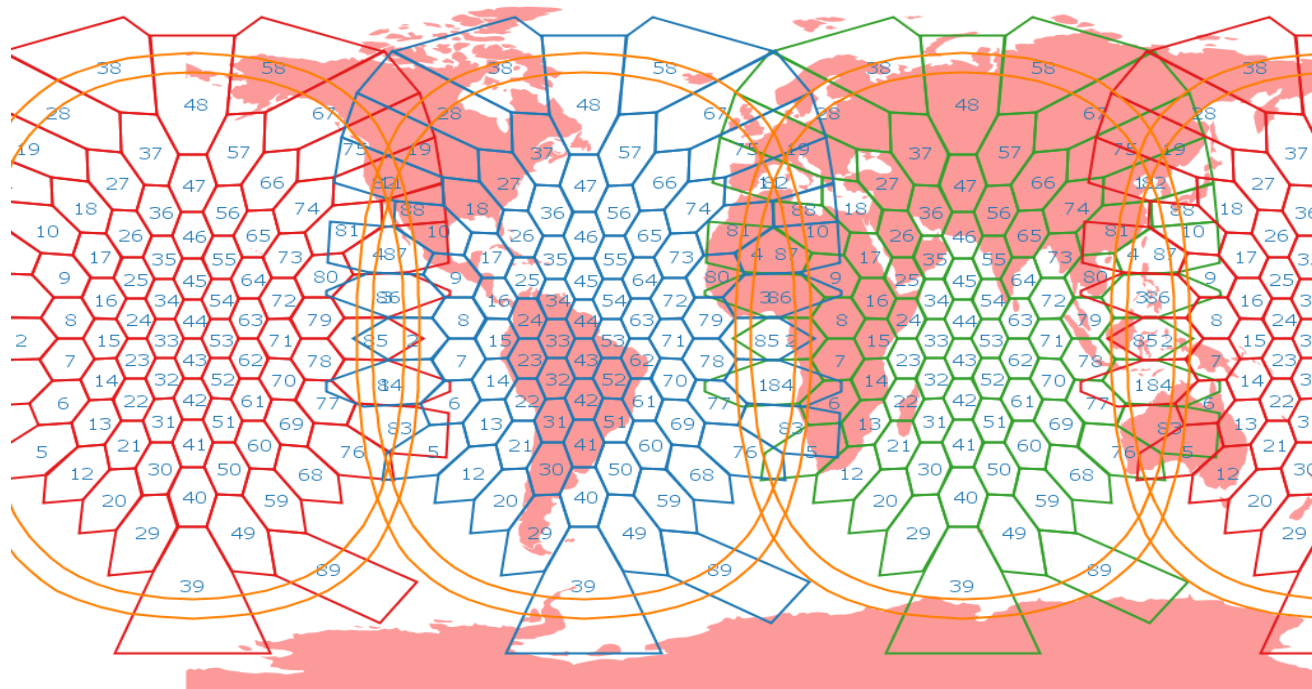


KU用於海事的主要問題:

- 雨衰
- 地面站雨衰
- 同一衛星內部信號不均勻
- 頻寬容量無法動態調節,容易堵塞
- 由多個衛星及地面站拼成的網路
- 任何節點故障造成全部網路問題
- 衛星轉換時信號丟失
- 法律限制(如印度)
- 永遠需要備用系統(只有郵件可以用)



Technology: KA, 全球点波束付覆盖图



I5F3 - POR

I5F2 - AOR

I5F1 - IOR



Ka-Band 船上之通信性能

在標準的條件下

- 比 Ku優越，頻率利用效率高的多，可以提供更高帶寬
- 在全球通過點波束提供均勻的信號覆蓋
- 點波束的中心同邊緣信號強度無區別

在惡劣的氣象條件下Performance in adverse weather conditions

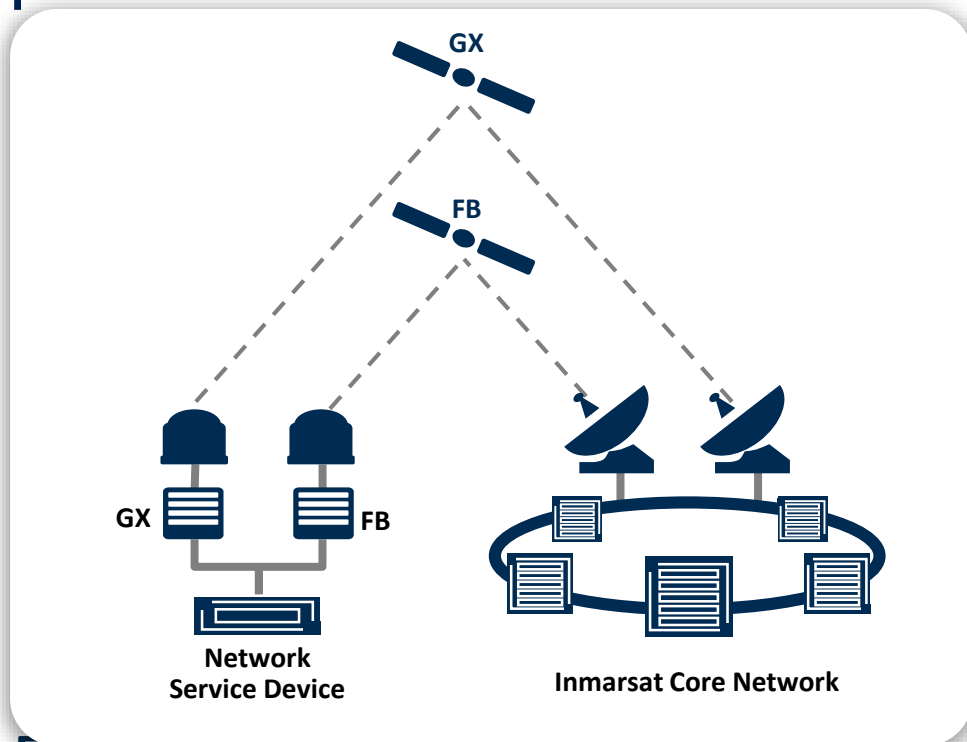
- 同KU相比區別小於1%
- 新一代adaptive code modulation已將雨衰大大減低
- 1m 天線抗雨衰能力比60cm 天線強



05

Fleet Xpress 服务

The Fleet Xpress Solution：海事專用服務



Empowering Maritime Community Solutions

Fleet Xpress

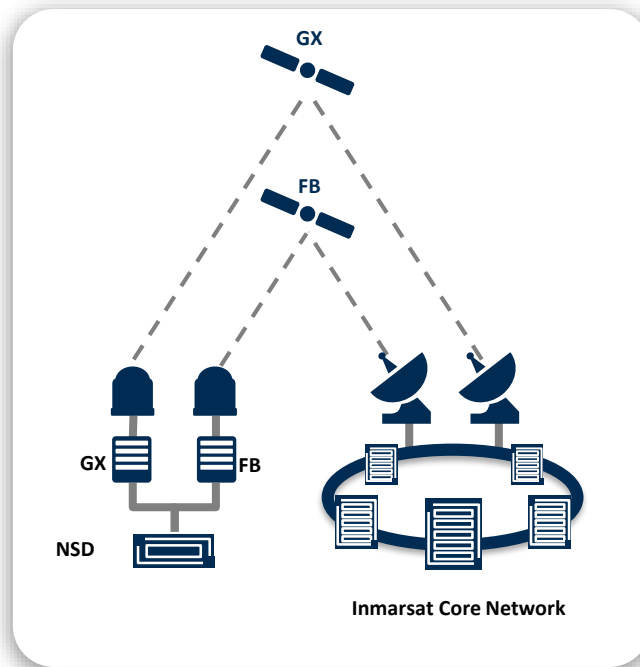
Global Express 同Fleet Broadband 的組合網路

> GX的海事服务称为Fleet Xpress

- GX 终端
 - iDirect core module included
- FB 终端
- 網路管理裝置
(Network management device) NSD
- Inmarsat 主网服务core services
- 分销商的增值服务VAS

> 卫星網路

- GX (KA波段) 網路的全球覆盖
- FB (L波段) 網路的全球覆盖



Fleet Xpress

设计

- 地面站双系统备用 Redundant
 - Dual Teleport design
 - 提供天气，保养及系统故障的备用
- 可以按通信量扩展Expandable
 - 第(五，六 ?) 颗卫星可以随时发射提供额外的通信容量
 - Ka-band satellites can be added as needed
- 船上全免费的FleetBroadband 备用服务
 - GX网路中断时
 - 卫星阻挡，覆盖区外，恶劣天气，通信法规限制, 频率干扰及GX设备故障时提供备用服务
 - 完全免费 (no extra data or voice charges)

Fleet Xpress

服务概况

> Internet Access

- 高性能 · 快速的网路浏览
- 通过压缩及加速优化浏览体验
- 船东及船管控制网站及内容过滤
- 允许普通的船员通信工具 (微信 · Skype, Viber, What's App, etc...)

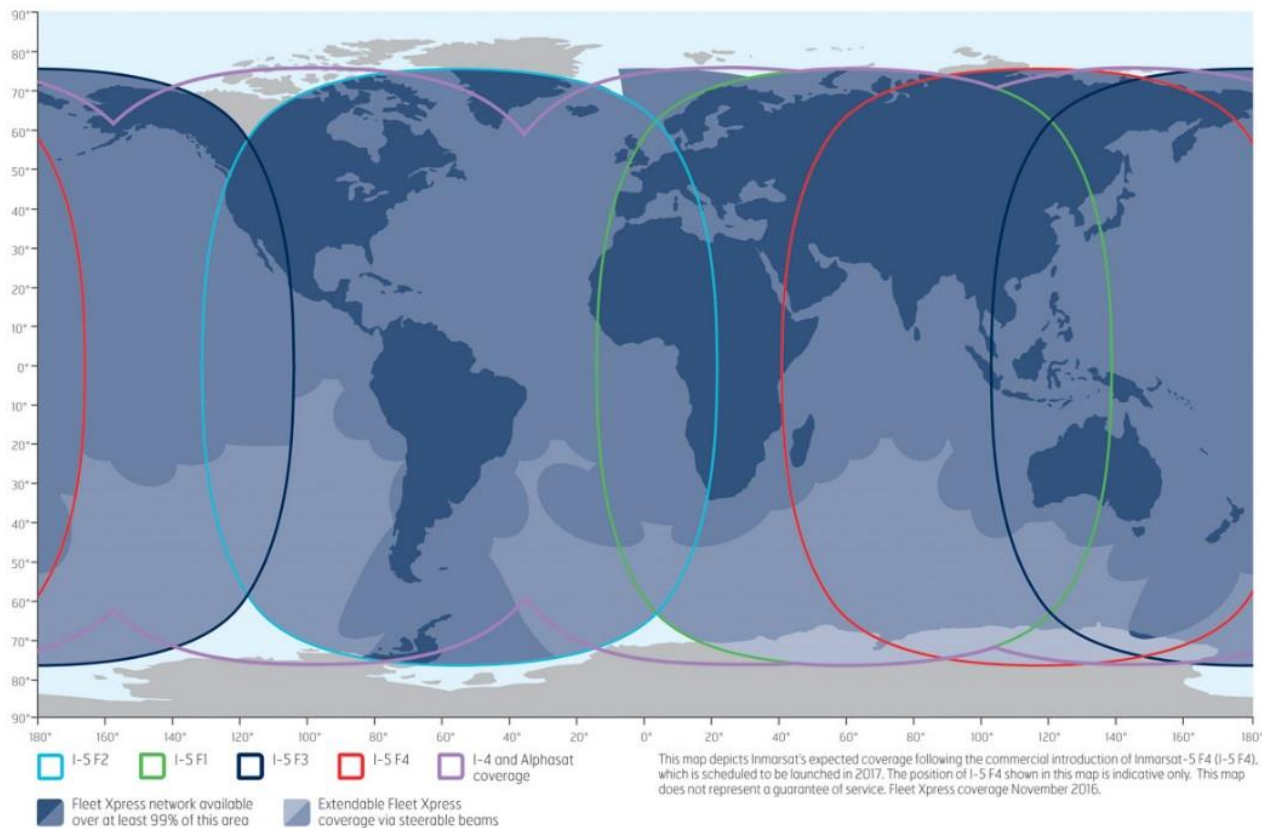
> 多路语音服务 Multi-line Voice Service

- 非常低成本的语音可以拥有商业及船员私人通信
- Smart phone apps will enhance service
- 提供本地电话号码
- 不占用资料频宽 (no impact on data traffic)
- 允许协力厂商 VoIP应用

> Video Chat

- 提供已经优化的视频服务

Fleet Xpress coverage



Fleet Xpress equipment – GX terminal

Photos from installed ships



JRC JUE-60
GT:36,000 dry bulk carrier



Cobham 100GX
5,200 unit Pure Car Carrier



Intellian GX100
GT:136,000 dry bulk carrier

Fleet Xpress equipment – Below deck equipment(Rack)

Mount units on 18U/19 inch rack



Bold module: standard unit

GX ACU
(Antenna Control Unit)

FBB BDU space

HP Switch (Option)

Wti PDU
(Power Distribution Unit)
Infinity (Option)

Cisco 2901
INSD (Dell R420xr)

Space for UPS

Rack Spec

H:900mm x W:600mm x D:600mm

Weight: 43kg

19" free –standing cabinet with IP20 protection

Rack color RAL9005 (black)

Maximum recommended load = 300kg



Photos from installed ships



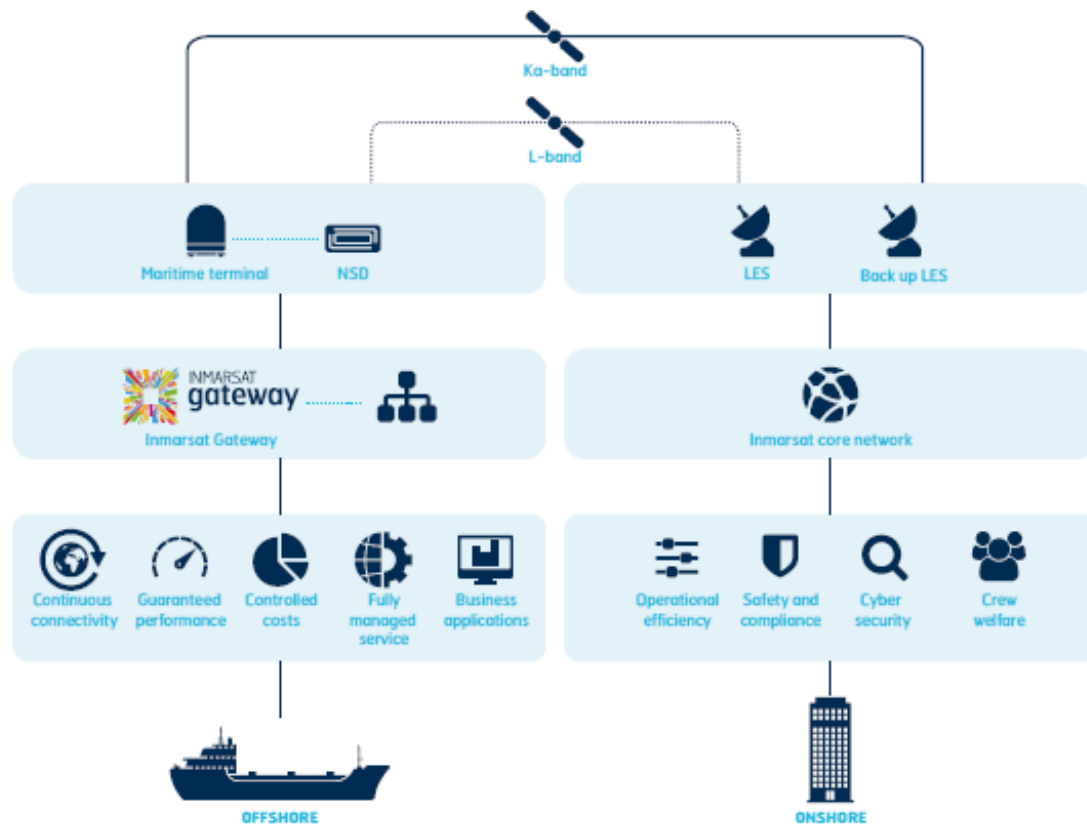
06



Why is Fleet Xpress so unique?

A new standard in maritime communications

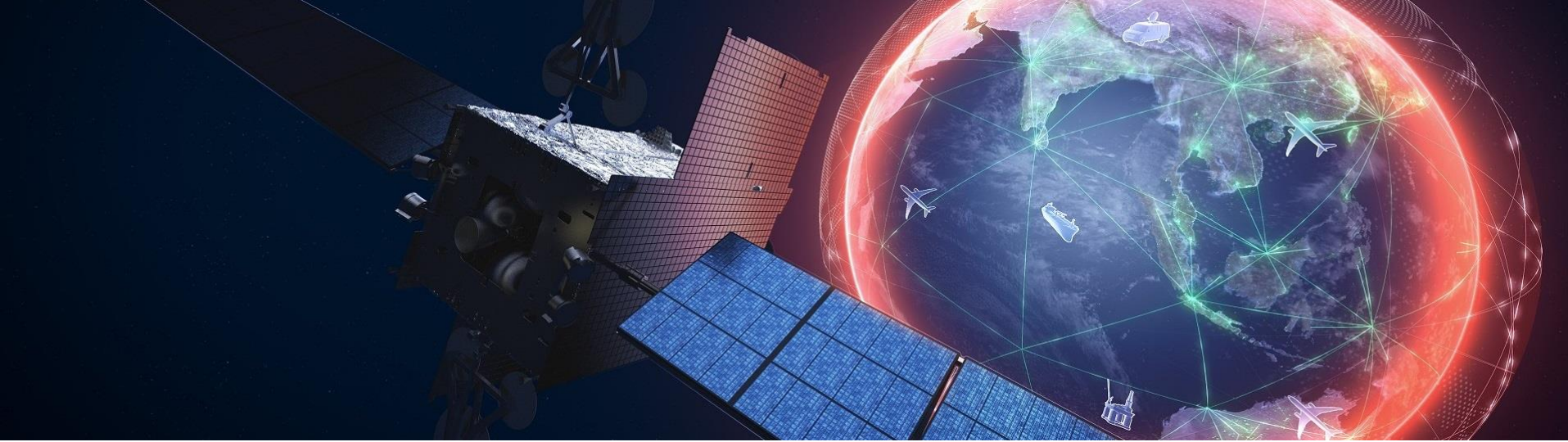
Fleet Xpress service 架构



海上通信服务的新标准

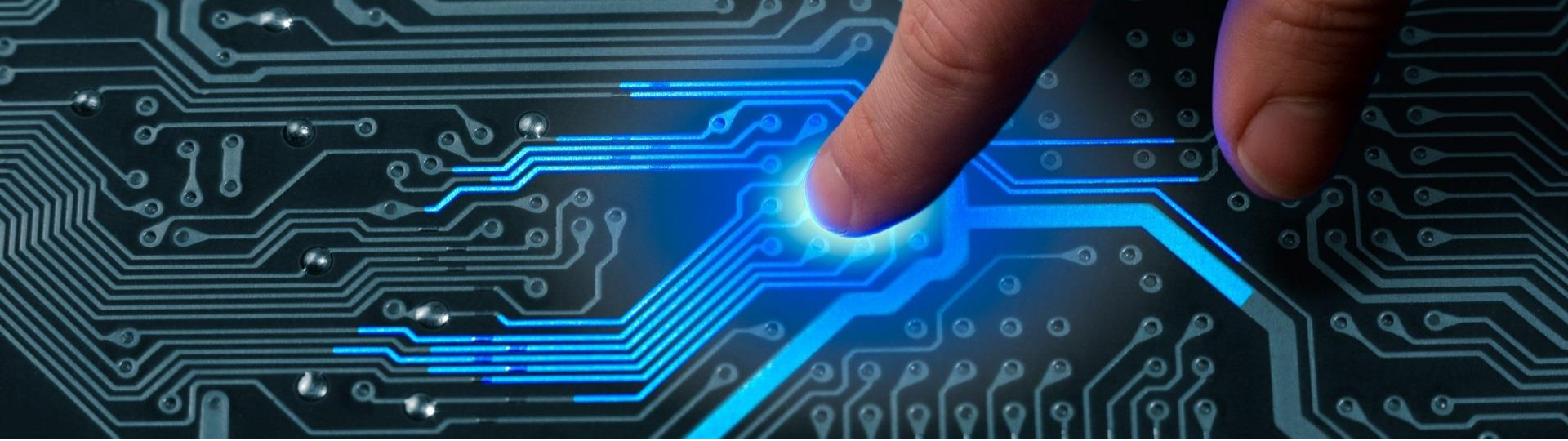
Five powerful sets of benefits that together make Fleet Xpress unique





CONTINUOUS
CONNECTIVITY

- > 由單一服務商提供的全球組合衛星網路, 專門為海上移動衛星通信而設計的衛星及點波束之間無縫隙全自動轉換。
- > 在航行中永遠連接在高速的Global Xpress網路及無限流量的FleetBroadband 備用網路双地面站设计,
- > 永遠有備用與穩定的網路,保證服務**永遠線上**



Service level agreements 保證網路的可用性:

- > 99.5% : Global Xpress
- > 99.9% : Fleet Xpress
- > 95% : 達到最小頻寬保證 (Committed Information Rate)



**CONTROLLED
COSTS**

- > 無限流量一個固定月費
- > 電話不佔用**FX**頻寬,使用一個單獨的頻道
- > 提供無限流量的**FBB**備用



**FULLY MANAGED
SERVICE**

- > Inmarsat 擁有並運營全部的FX網路保證使用者在衛星同點波束轉換時無縫隙的通訊連結
- > 標準化的設備終端同配置簡化了安裝,使用, 培訓及支援流程
- > 24/7/365 服務管理, 監控及支援
- > 全時間監控服務品質及表現以保證服務的最高可用性



BUSINESS APPLICATIONS

- > **Fleet Xpress** 為商船的管理應用提供了一個創新的生態系統進而可以有效的改進船公司的運營體系
- > 即時的遠端能效監控(Real-time performance monitoring) 及預測性維修(condition based maintenance service), 以改進船舶的績效,節省時間成本,推進綠色船舶
- > 保證安全,規範,並有效的保護船舶對抗 **cyber threats**
- > 為船員提供網路,改進船員的福利及工作士氣

07



Fleet Xpress Performance

A new standard in maritime communications

October 2016 – North Passage – Heavy Lift vessel

83.6

GX NET Availability (%)

96.2

Total Availability including FB (%)

3.8

OTA Packet Loss (%)

0

Last GX Satellite

968

Average Latency (ms)

80.07

% of time online on GX

39

Switches to FB

0

Beam Switches

39

OTA lost connection

VSAT

Current LinkType

1.87

Max CM CPU 30 min period

34.19

GB Downloaded

7.96

GB Uploaded

0

CM not responding

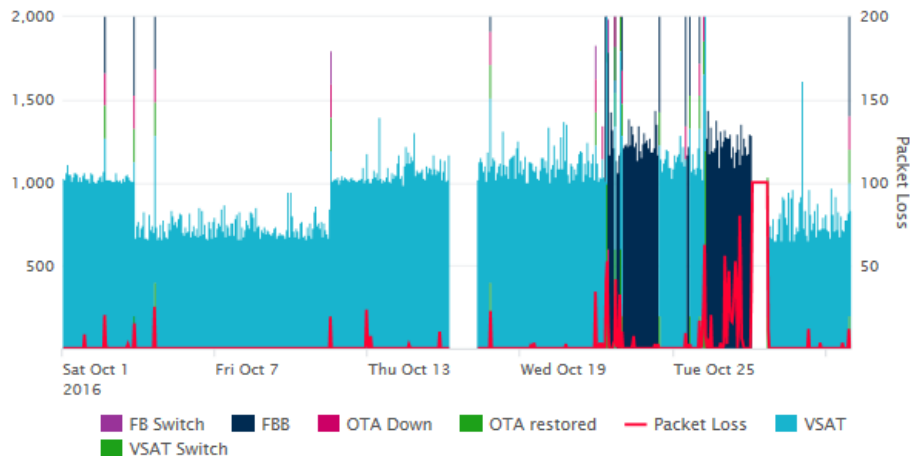
1

Sourcetypes missing

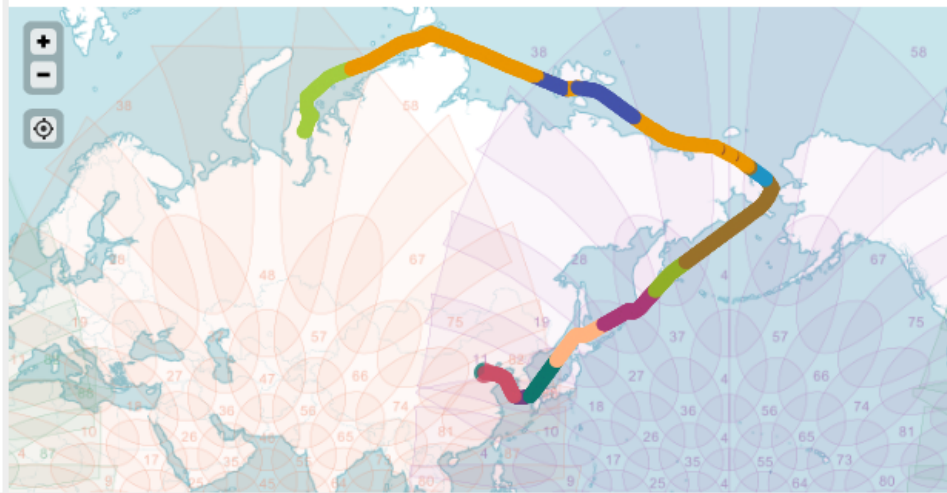
0

Core Module Version

Latency + important events



Vessel Tracker by Beam Number

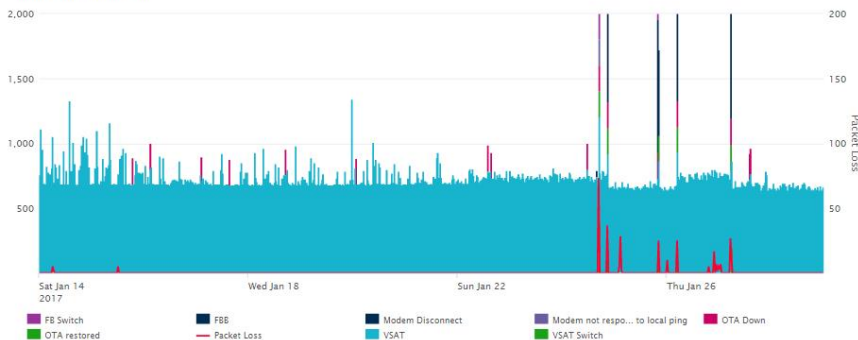


Car Carrier - Atlantic Crossing – 2 weeks in Jan 2017

➤ 7 beam handovers, 1 satellite handover - 71 GB downloaded, 30 GB uploaded

100 GX NET Availability (%)		100 Total Availability including FB (%)		0 OTA Packet Loss (%)		15-AOR Last GX Satellite
732 Average Latency (ms)	99.84 % of time online on GX	6 Switches to FB	14 Beam Switches	5 OTA lost connection	VSAT Current LinkType	
2.07 Max CM CPU 30 min period	71.16 GB Downloaded	29.66 GB Uploaded	2 CM not responding	1 SourceTypes missing	1.4.0.197 Core Module Version	

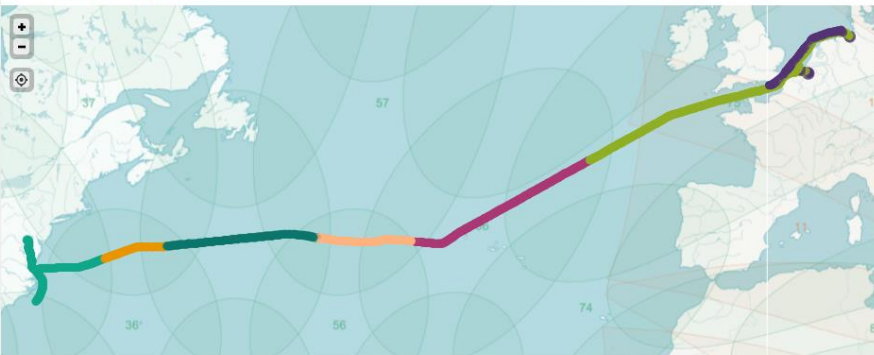
Latency + important events



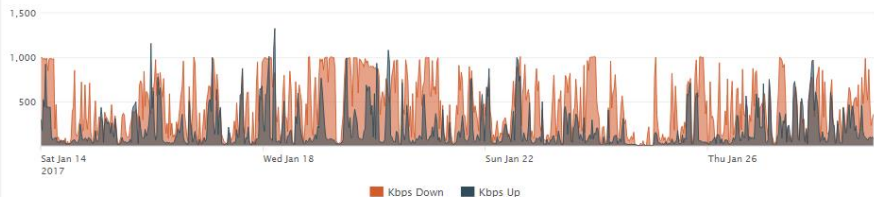
Active Beam Timeline



Vessel Tracker by Beam Number



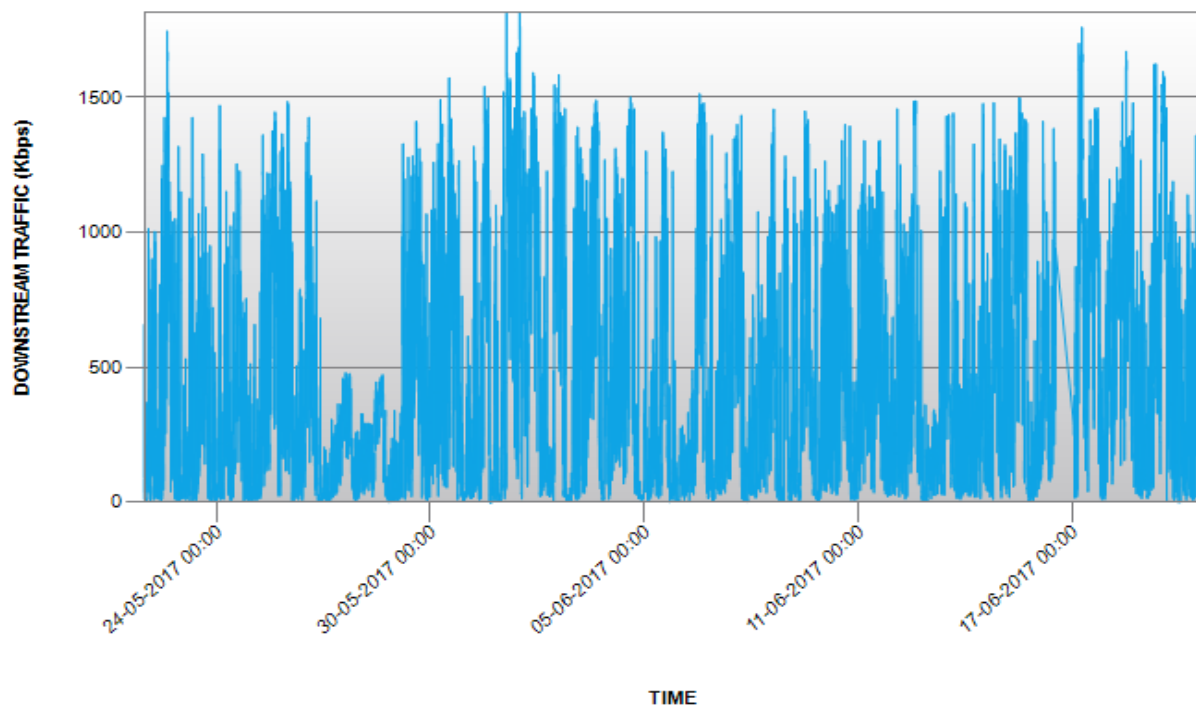
CORP and CREW Bandwidth Utilization



115391 - CESI GLADSTONE

DOWNLOAD SPEED

Visual fractures in the graph may appear, and is caused by temporary unavailable information from our database. This does not indicate that the VSAT has lost its connection.



TOTAL DOWNLOADED

(21/05/2017 23:16 - 20/06/2017 23:16)

134.21 GB

从 Fax到 FX — 在K-line的数据革命

尽管像区块链和无人船等这样的前沿创新技术可能占据了现代海事技术的头条，但是航运业数字化进程的真正开始，还是以电子邮件作为数据传输方法的开始。

Shinta Masuyama, “K” Line, 讲述了一家日本航运公司20年的数据革命

2016年下半年，日本三大船运公司之一的Kawasaki Sisen Kaisha, 人们熟知的“K”Line，成为第一家使用Inmarsat最新一代旗舰型卫星Xpress(FX)Ka波段服务的亚洲船东，目前，在不断增加的船舶与岸端之间的数据连接的工作中，这是该公司现在在其绝大多数的船舶上增加各种类型的VSAT系统的最新举措。

在安装第一套FX系统时，“K”Line大约一半的船已经安装了VSAT设备，2017上半年末，随着新增加的FX系统和使用别的VSAT服务的船按部就班的执行安装计划，这个比例已达到约80%。

铺开VSAT服务是“K”Line一直寻求更有效传输和使用数据的方法的一部分。这个过程可以追溯20年前，我们首次在船上和岸端引入电子邮件服务。

“K”Line 的Shinta Masuyama先生

都可以直接发彩色照片给公司。在我们了解新事物之前，往往会墨守成规，曾今那些说‘我们不需要电子邮件’的人现在都会改口说‘我们当然需要电子邮件’。”

适当的时机，用数字图像代替模糊的传真，“K” Line 开始探索在其他潜在数字化方面可能可以更简单的收集和處理船舶信息的方法，提供一个新层次的业务决策支持。

Masuyama先生说：“拿管理航海日志这件事来说，我们曾今会把所有的航行记录数据放在一起，一次性发送，但是后来我们开始保留这些日志，可以每天通过电子邮件发送”。

“另一件事，我们可以随时发送机舱记录仪的数据到公司，这样岸端就可以直接观察到机舱的数据，这全都要感谢电子邮件”

寄给总部。”

“我们开发了SPAS软件来处理这个问题，2001年我们开始通过电子邮件发送这些信息，因为那时我们已经有了电子邮件。你可以在SPAS输入ab - log，然后有一个单独的系统来分析



November 30, 2017



MOL Succeeds in 'Visualization at Sea,'
Marking a Step toward Remote Vessel Operation Technology
- Sharing Voyage Data Recorder (VDR) Data with Onshore,
Enhancing Safe Operation -

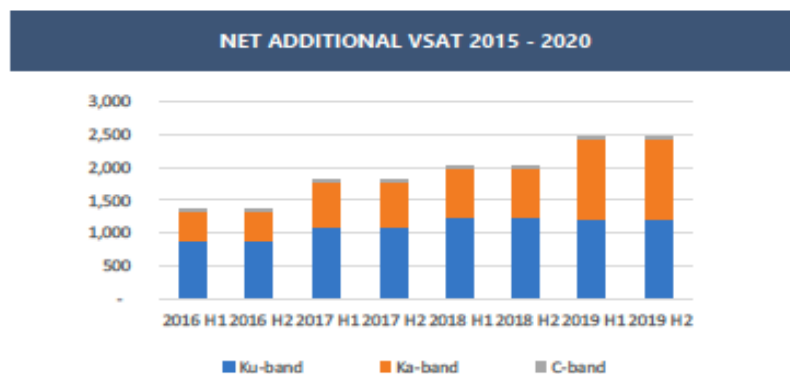
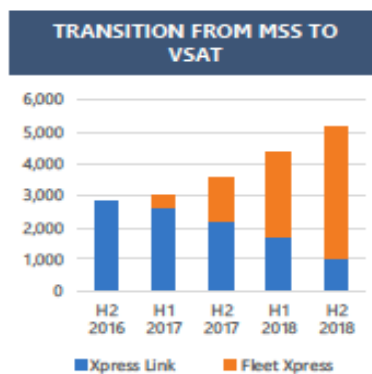
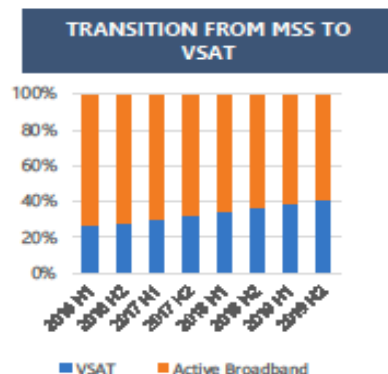
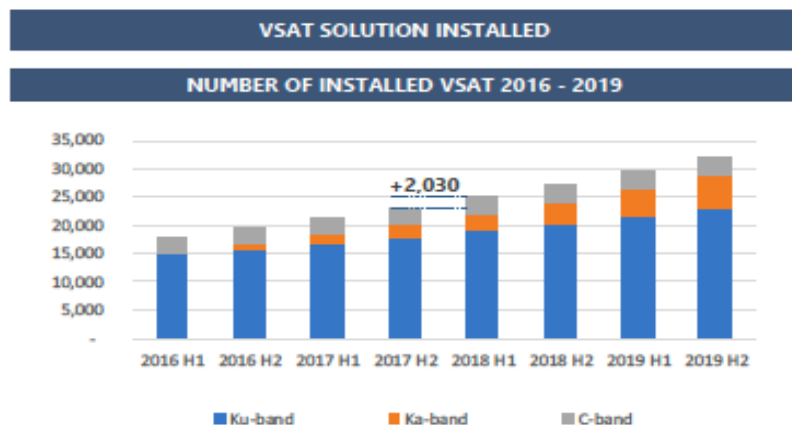
TOKYO—Mitsui O.S.K. Lines, Ltd. (MOL; President & CEO: Junichiro Ikeda) today announced a joint success with JSAT MOBILE Communications Inc. (President & CEO: Eiichi Yoda, Headquarters: Minato-ku, Tokyo) in building a network that shares data recorded in sharing Voyage Data Recorder (VDR) by using Fleet Express provided by Inmarsat, a high-capacity, high-speed satellite telecommunication service.

VSAT INSTALLATION STATUS: YE 2017 VERSUS H1 2018

VSAT installation status: YE 2017 versus H1 2018

Euroconsult estimates that 23,020 VSAT were installed at YE 2017. The VSAT market has shown a steady and accelerating growth in the last years and is expected to accelerate in the coming 5 years. Most of the currently installed VSAT are operating in Ku-band (around 17,000 of them). The rest being split between C-band (as a legacy technology used in maritime communications) and Ka-band which is gaining market interest.

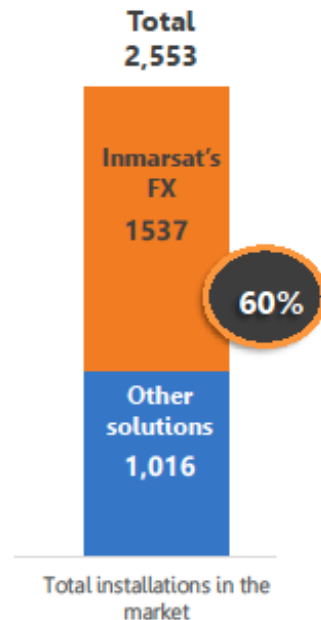
At H1 2018, Euroconsult estimates that the total number of VSAT is estimated around 25,050 VSAT terminals operated. Figure #2 shows that the market is witnessing a switch as since 2017 and 2018 more Ka-band than Ku-band terminals are being installed and activated. As the study will show in the second part of the presentation, the new Ka-band installations are being driven by the accelerating installation of FX solutions by Inmarsat (Inmarsat being the main provider of Ka-band technology. O3B also provides Ka-band but is estimated to have installed less than 50 terminals at H1 2018).



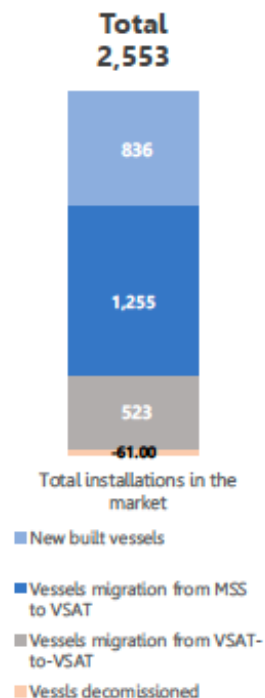
CONCLUSION

- **Inmarsat Fleet Xpress (FX) terminals stand for 60% of the maritime VSAT installation in H1 2018.** With more than 1,500 FX terminals installed in H1 2018, the solution represented more than half of the 2,550 installations.
- Migrations from MSS broadband to VSAT terminals have been the main driver, with more than 1,200 migrations, in H1 2018. The decrease in capacity price, has a growing impact on VSAT solutions. For a similar bandwidth level, VSAT packages are becoming more affordable than large MSS broadband packages. Also, around 800 new built vessels have been equipped with VSAT solutions. **In total, Inmarsat has been able to capture more than half of these new VSAT customers.**
- **FX tremendous growth has also been driven by vessel migration from Inmarsat's Xpress Link (XL) terminals to FX, representing 370 vessels.** Inmarsat continue to migrate customers to the new Ka-band solution with almost 400 migrations per semesters.
- Competition level is increasing in the VSAT market, and more customers migrate from one solution to another. In H1 2018, 500 vessels have changed their VSAT terminal, and 100 chose FX solution.

FX SHARE OF THE VSAT
INSTALLATION, IN H1 2018



VSAT INSTALLATION,
DRIVERS, IN H1 2018



Over 10,000 vessels have
already committed to Fleet Xpress
and 5000 vessels installation in
less than 2 years



NISSEN KAIUN	MAERSK TANKER
Fleet Management Limited	MSC
EAGLE STAR	Front Line
KAWASAKI KISEN KAISHA	CHINA COSCO SHIPPING
Mitsui O. S. K.	Wan Hai Line
BSM SHIP MANAGEMENT	EVERGREEN
Hapag Lloyd	YANG MING
Wallem Ship Management	OOCL
ANGLO EASTERN	TROM



Inmarsat

**developments
2018 and beyond**

**Ongoing
Diversification**

**Enable
Digitalisation**

**Maritime ECO
Environment**

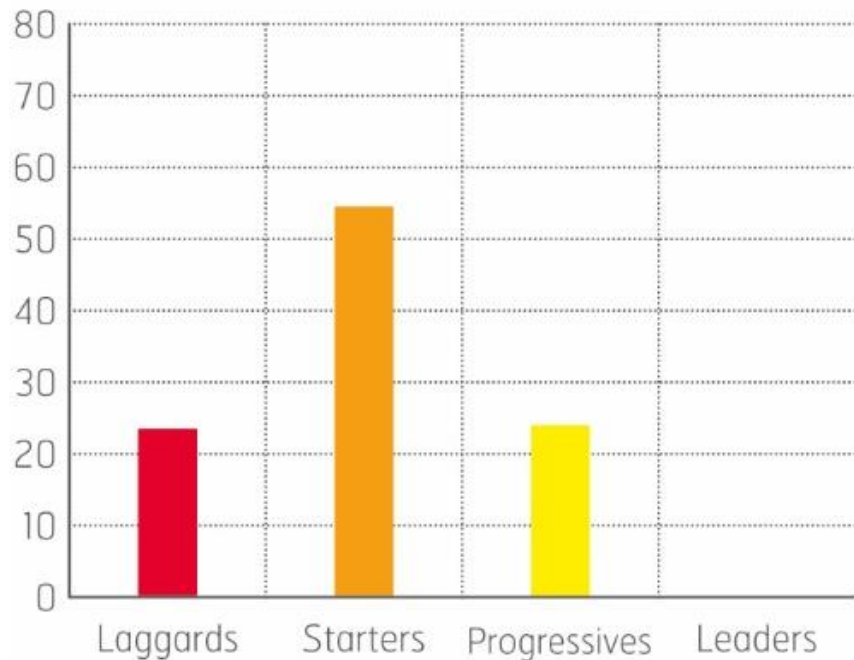


08

Inmarsat Fleet Secure (UTM cyber) service

Coming soon

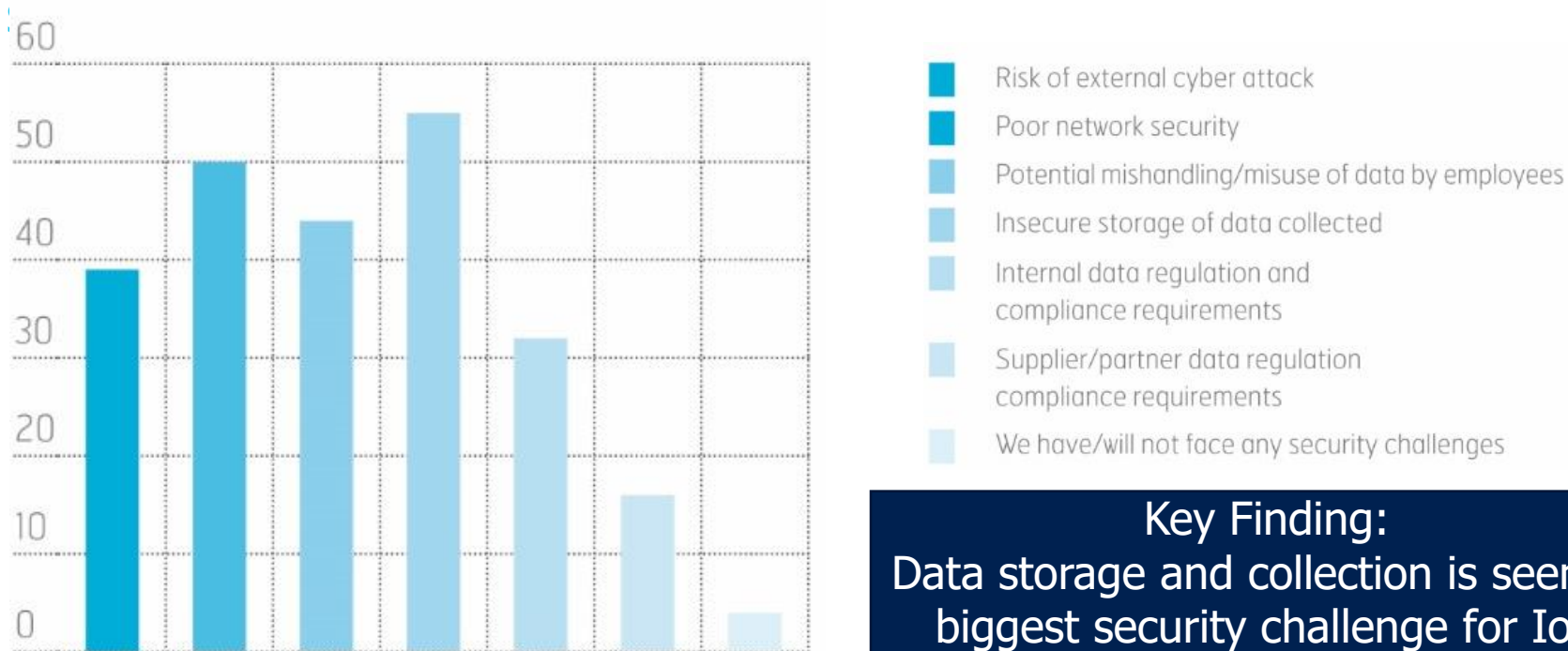
How mature is the maritime sectors approach to maritime security?



Key Findings:

- Notable maritime cyber security breaches and limited resilience measures highlight lack of maturity in respondent's answers
- 87% believe their security processes could be improved

What are the biggest security challenges associated with IoT solutions within your organisation?



Key Finding:
Data storage and collection is seen as
biggest security challenge for IoT
solutions

Fleet Secure Portfolio

Powering Cyber
Resilience at sea



Fleet Secure Unified Threat Management



**24/7 NETWORK
PROTECTION**



**CYBER RISK
VISIBILITY**

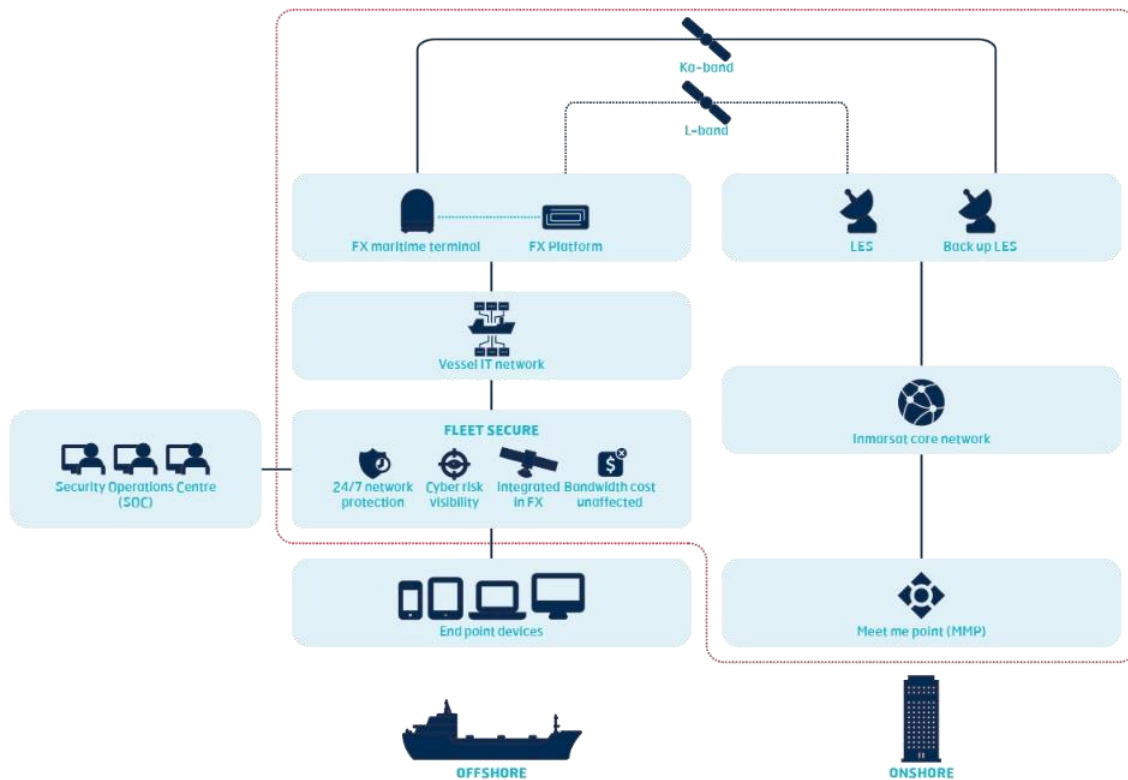


**INTEGRATED IN
FLEET XPRESS**



**BANDWIDTH COST
UNAFFECTED**

Fleet Secure UTM zone of protection for Fleet Xpress



Fleet Secure Endpoint



The landscape of threats has evolved and antivirus software alone cannot defend the ships network against malicious cyber attacks



NO ADDITIONAL
HARDWARE



MULTI-LAYERED
SECURITY



OVERSIGHT OF
ALL ENDPOINTS



PORTAL VIEW OF
SECURITY ALERTS



SUPPORTED BY
24/7 SOC



LOW BANDWIDTH
CONSUMPTION



TAILORED FOR
MARITIME

09

Fleet Data Services

Maritime IoT trends

\$2.5m

Average shipowner spend on IoT solutions over the next three years

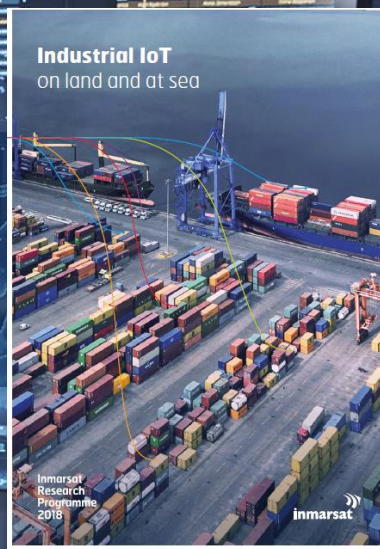
100%

Of owners surveyed will be using IoT for fuel consumption monitoring by 2023 to meet emissions regulations

51%

Say getting data off the ship in real-time is biggest obstacle to IoT adoption

Source: Industrial IoT: Land and Sea
Picture: Courtesy of Rolls-Royce Marine



How advanced is the maritime sector's approach to using IoT data?



Key Findings:

- Data will be used by 43% of respondents for improving health and safety
- Getting access to real-time data is big obstacle to data usage – still time lag between collection and usage

Solving a real challenge

Why Fleet Data?

Challenge

Ship operators intending to ramp up in IoT infrastructure development and digital practices have been facing the difficulty of aggregating vessel data on-board and getting it efficiently onshore in a fleet wide scalable way.



Solution

Fleet Data is the effective ship-to shore automation solution allowing ship operators and managers to access, control and exploit their own data via a secure platform that is easily and fully scalable, fleet-wide

Serving multiple customer segments

Who will want Fleet Data?

Ship Operators

to access their data in order to increase business intelligence and to remove cost from their operations

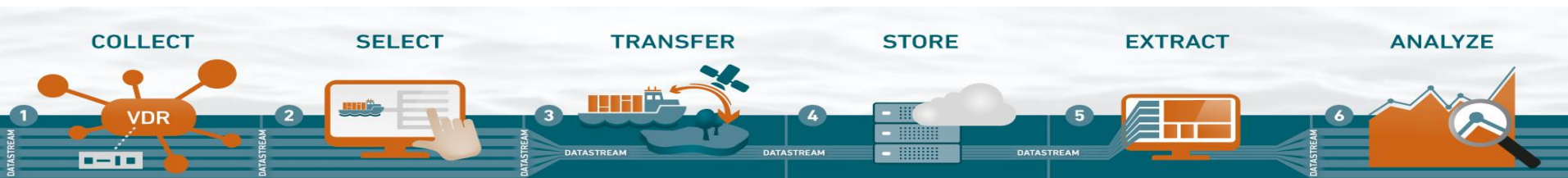
3rd Party App Providers

to work with ship operators on data-driven service optimization and the development of other new digital services.

Fleet Data – how does it work

A 6-step intelligent and cost efficient ship-2-shore data solution

1. A Fleet Data IoT infrastructure collects on-board vessel data
2. Data is pre-processed on board and saved in reports
3. Variable number of reports (up to unlimited) can be transferred to shore
4. Data is stored on a Fleet Data server on-shore
5. Data is extracted from the Fleet Data server via an API
6. Data can be easily shared with third party analytics applications and service providers



1. Collect

Fleet Data IoT infrastructure collects on-board vessel data

Connectivity modules

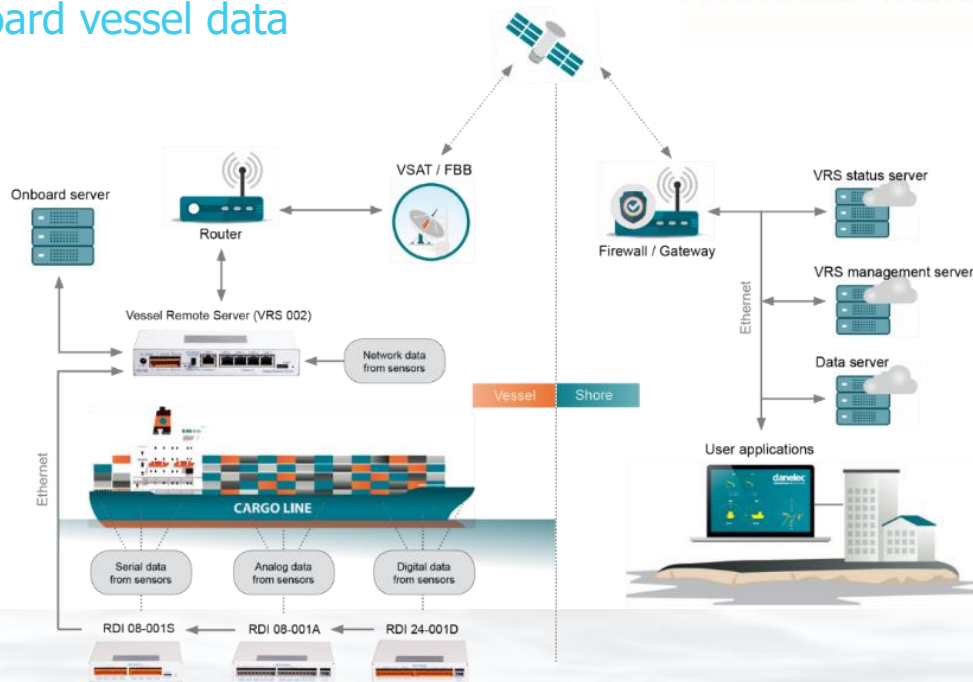
- Data is collected via a **Vessel Remote Server (VRS)** (mini VDR technology)

Technical support

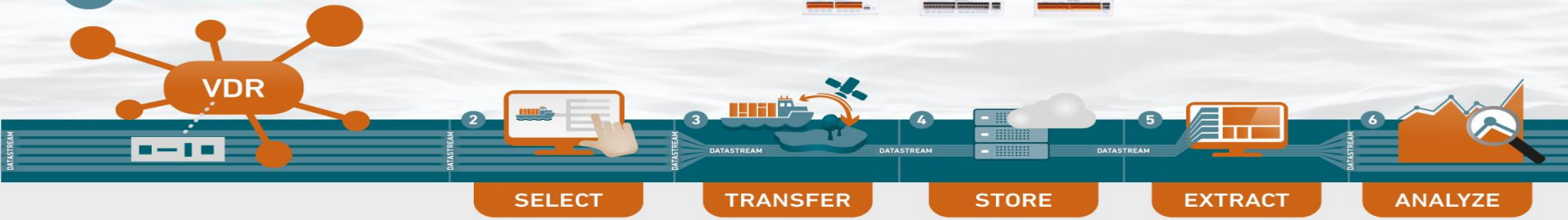
- **Installation** is supported and checked by specialized technical support team

Installation time

- **Installation time** is **1-2 days** and is locally performed by the global authorized service network of **(600 certified technicians)**.



1 COLLECT

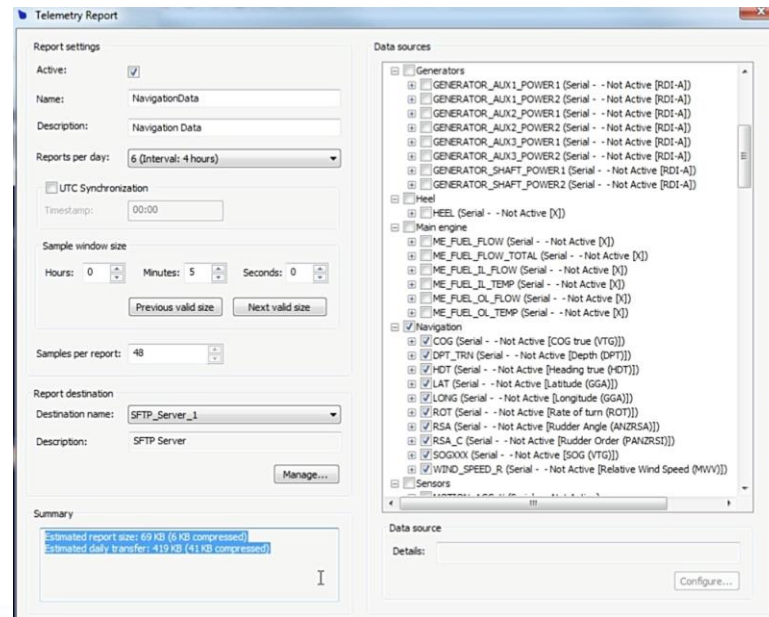


2. Select

Data is pre-processed onboard and saved in reports

Reports are fully customizable

- Selected Data Tags
 - First value - Last value
 - Minimum – Maximum
 - Trend
 - Mean - Circular mean
 - Standard deviation - Circular standard deviation
- Transfer interval (down to 1 minute)
- Unlimited reports can be made



2 SELECT



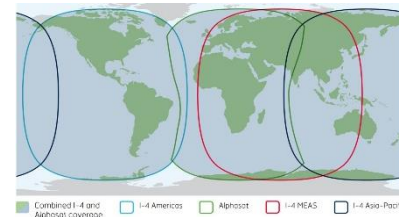
3. Transfer

Reports are transferred to shore via the Inmarsat system

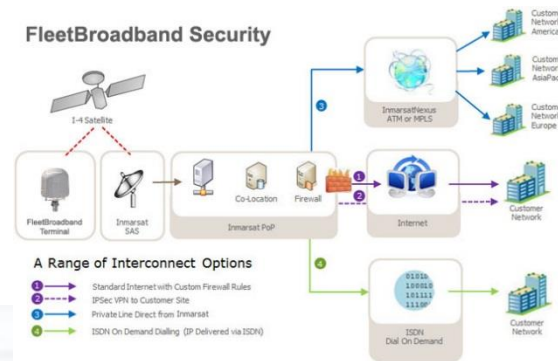


Connectivity

The Vessel Remote Servers (VRS) is connected to **Fleet Xpress** or **Fleet Broadband** and reports are transferred to shore at fixed intervals (user defined).



FleetBroadband Security



3 TRANSFER



4. Store

Data is stored on the Fleet Data on-shore server



Data quality

- Inmarsat ensures data quality check upon data receipt in the Fleet Data server on-shore.

Remote data report configuration

- Data reports can be customized and modified from shore (an updated report configuration file is loaded to the Fleet Data on-shore server and sent back to the Vessel Remote Server (VRS) installed onboard).

Automated Remote Software update

- The Vessel Remote Server (VRS) software is automatically updated from shore (a new VRS software file is sent from the Fleet Data on-shore server to the Vessel Remote Server (VRS) installed onboard).



5. Extract

Data is extracted from the Fleet Data server via an API

API data format

- REST JSON.

User administration determines user access rights

- Vessels, sensors, time frame, data export rights, software applications.

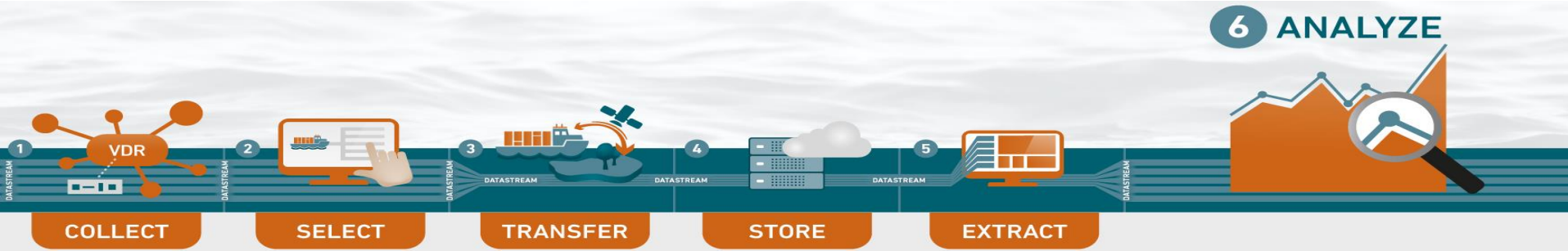
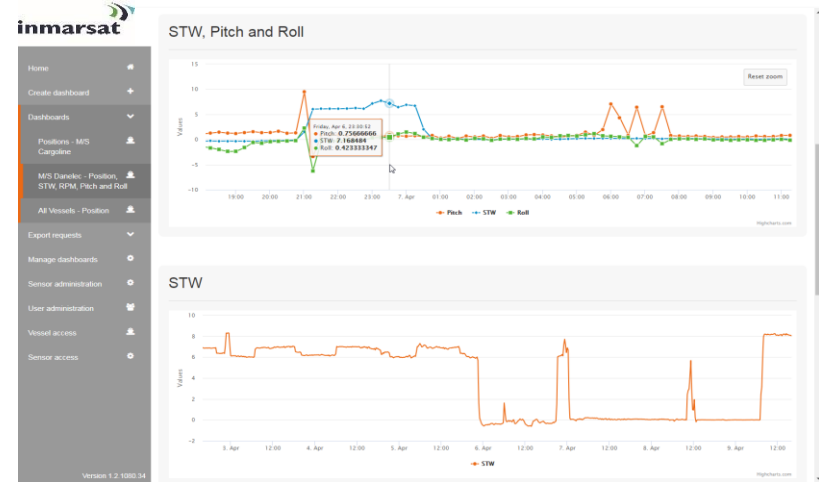
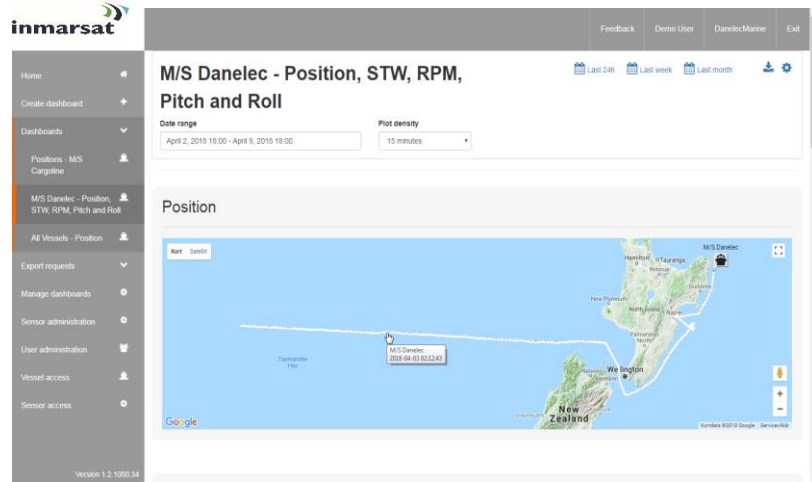
Data hosting flexibility

- Data may also be transferred to another database.



6. Analyse

Fleet Data Dashboard – Cloud-based user customisable data visualisation dashboard



What's on the horizon



Automation, Sea-to-shore based integration and Digitalisation

Defining connectivity at sea

