

Measures to Enhance Shipping Safety

---- Opinions on How to Provide VTS Service and to increase safety and security with the help of IT systems

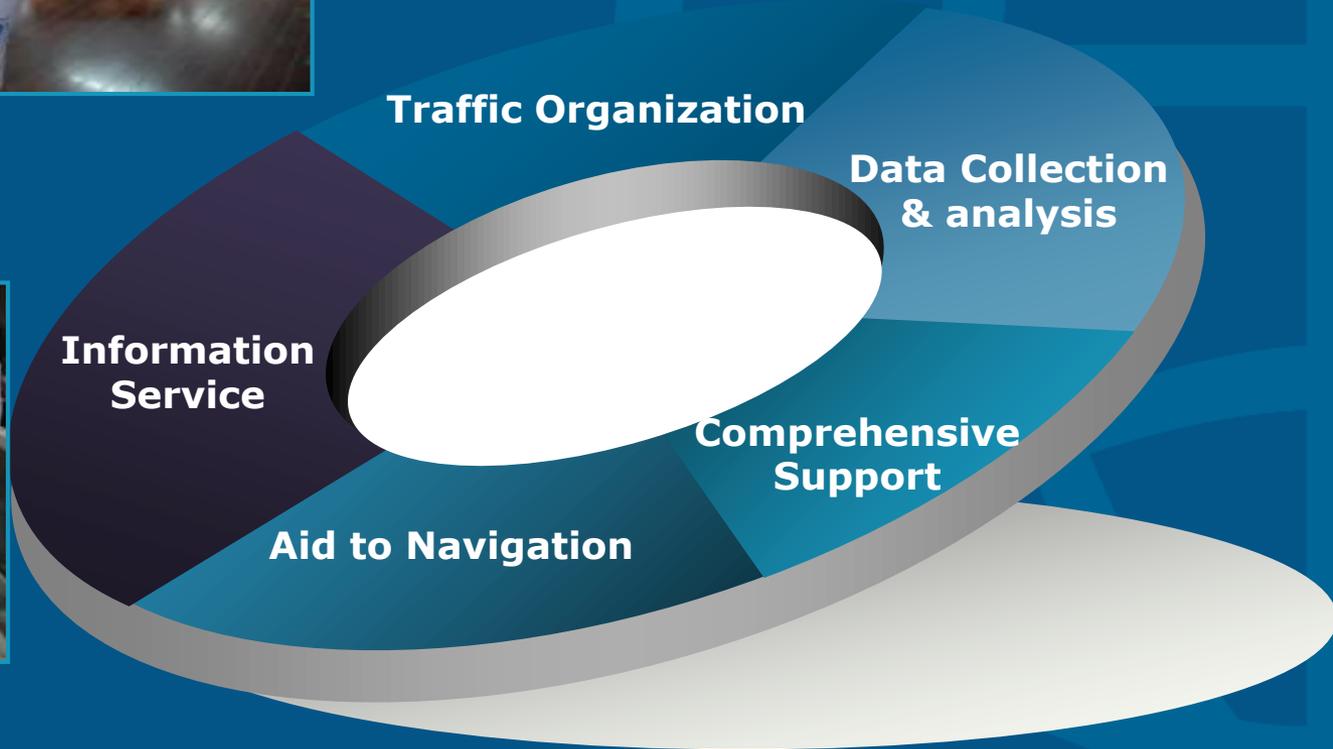
MA Jun

Former Director of Department of Rules and Regulations of China MSA

I: Basic Functions of VTS



04354



- **Traffic Organization**

32444245304354



1. Routine Surveillance

With the help of VTS, we could:

- monitor ships on water;
- track the routs of vessels reported;
- organize maritime traffic efficiently;
- maintain traffic order.



2. Fairway monitoring

Fairway is the only way for ships entering a port, which is also the essential target to be monitored.



With a view to enhancing the safety of waters affected by tide and draft limitation, VTS center carries out daily traffic control on fairway in the period of high tide. Formations are consequently made for large vessels constrained by their draughts, so that those vessels could enter the port with the same direction, as well as safe distance and speed.



Figure: Ships are queuing for enter port;
Reviewing and approving application on-line.

3. Off-peak Control

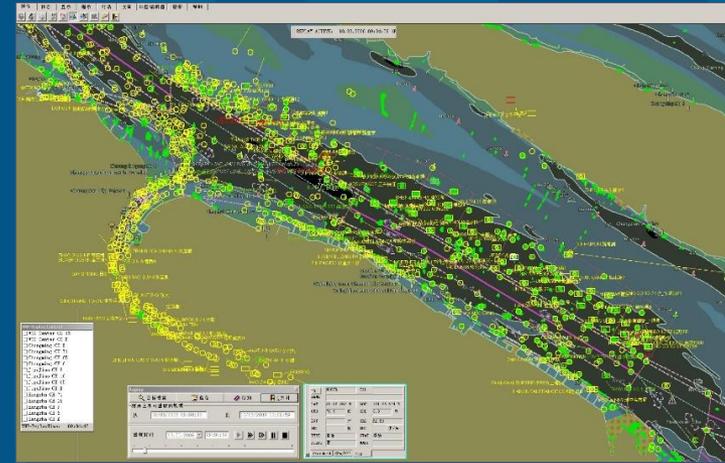
In order to reduce accident risk, VTS centers could make special managements, named off-peak control, for ships sailing on high-density water during *rush hour*.

- a specific period should be decided;
- before starting the control, details of particular off-peak arrangement should be broadcasted to vessels nearby, meanwhile, the traffic flow could be accordingly controlled;
- during the control, appropriate actions should be taken;
- after the control, notify ships to weigh anchor in turn and resume sailing into/out the port. Coordination of ships is desired, so as to make sure those vessels sailing orderly and to avoid close quarters situation.



4. Anchorage Management

In order to fulfill the anchoring demand, especially for the waters under VTS coverage, maximum time limitation requirements may be made as to reduce the burden of insufficient anchorage. Vessels those exceed the limitation should remake an application for anchorage.



As to ships carrying dangerous cargoes, dedicated or temporary anchorage for dangerous vessel should be allocated.



5. Traffic maintenance for project on water



It's always a big challenge to keep the order of projects on water, since large number of engineering ships and transport ships need to be managed.

A strategy to enhance on-site control, as an experience, is to strengthen management at source. By doing so, the order of traffic of such engineering ships and transport ships would be maintained, the corresponding risk of navigational safety could be reduced.



6. Examples of Traffic Control

Controls organized/participated by the speaker when worked for Shanghai MSA:

- APEC meeting;
- F1 Motorboat World Championship;
- Summit of Shanghai Cooperation Organization;
- 2010 EXPO;
- Chinese and foreign national leaders' visits.



• Aid-to-navigation Services

With the help of VTS, and on the basis of professional judgement, VTS operators should initiatively observe ships on water and predict any dangerous situation. Then operators shall take appropriate actions such as reminding persons who are in danger, requiring to correct violations, asking vessels to reduce speed, etc.

Responsibility →

After receiving the report from ships, VTS operators should coordinate vessels to overtake or encounter in accordance with practical situations.

Asked by ships →



• Information Service

VHF broadcast

Regularly



To be broadcasted every two hours, the information basically includes: navigational warning, notice to mariners, weather and hydrologic information, statuses of AtoN, traffic control, etc.

Immediately



To broadcast, typically under emergency circumstance, information such as warning of severe weather, status of large vessel, traffic density of related fairway, and accident or emergency occurred nearby.

As necessary

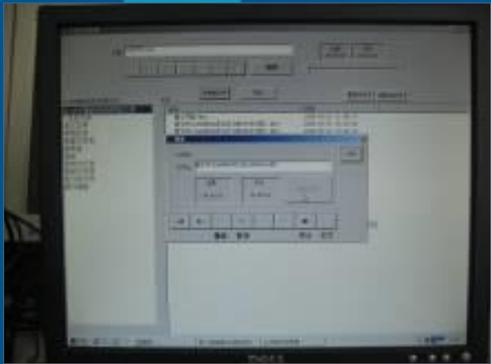


Reminding particular information to specific ship via VHF.

As requested



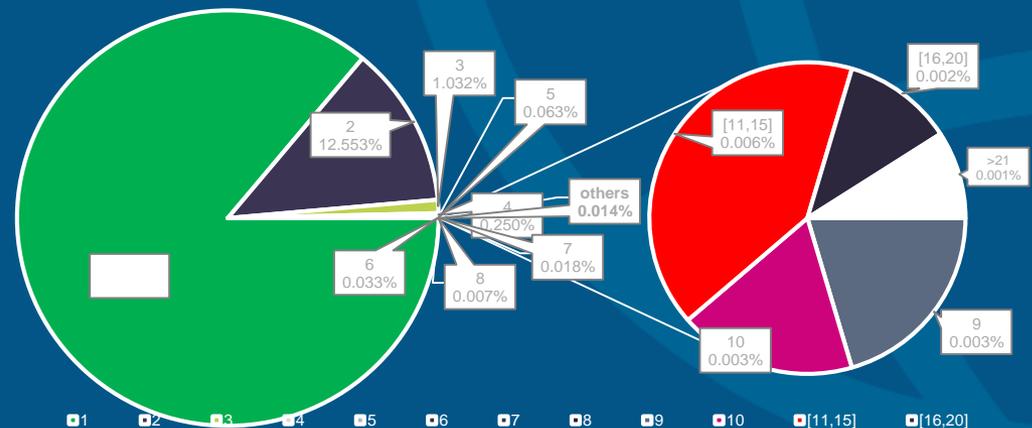
Providing information to ship which has asked for it.



• data collection and analysis

Follow certain internal work procedures, VTS data should be collected and relevant statistics should be produced, and assessments of VTS effect should be made basing on such statistic analysis.

Every VTS operator is supposed to make record of daily work, and at least one dedicate staff is necessary to collect data and make classified statistics, so as to accumulate information and/or knowledge which probably be used as valuable resources for further researches and VTS assessments.



• support for cooperative action

Play an important role in supporting cooperative actions such as emergency search and rescue.

Lives could be saved and property loss could be reduced as a result of VTS's supports which are typically the operators' immediate, accurate and decisive instructions as well as coordination.



3244424530435

II: Services provided by Chinese VTS

- provides information as requested by ships;
- arranges aid to navigation when asked by vessels;
- makes suggestion or warning to ships so as to avoid danger;
- provides contacting information about salvage or pollution clearance and coordinates SAR action, when it' s necessary or asked by ships' owners, managers or agents.
- offers other services as requested by ships ' owners/managers/agents.



maintain traffic order



serving under
severe weather



salvage ship that
is out-of-control



coordinate clearing
of shipwreck

III: VTSSs in Guangxi / Beibu Gulf Economic Zone

Thanks to the critical strategies:

- “*One belt one road*” initiative;

- China–ASEAN Free Trade Area (ACFTA); and

- Strategy of opening up;

Guangxi Province as well as Beibu Gulf Economic Zone is becoming the leading entity and comprehensive portal which directly cooperates with ASEAN countries in many economic area, while Import-Export trade and shipping are important ones of them.



III: VTSS in Guangxi / Beibu Gulf Economic Zone

Objectives of Guangxi Province to achieve steady and sustainable development in maritime sector:

By the year of 2020,

- to preliminarily build a safe, convenient, efficient, green, and full of regional competitive modern shipping system; and
- to establish a regional shipping center facing to ASEAN, which meets the requirements of domestic economic development as well as overseas trade development.



III: VTSS in Guangxi / Beibu Gulf Economic Zone

Qinzhou, as an important port in this area, is also ready to strengthen all-around cooperation, especially in maritime services as follow:

- to accelerate the establishment of Qinzhou base for cooperation network of China- ASEAN;
- to push the port's upgrade to be more professional, deep and fit for large vessel;
- to optimize a integrated transportation system;
- to support and improve the modern logistic services; and
- to actively create a demonstration area of port services.



III: VTSs in Guangxi / Beibu Gulf Economic Zone

Guangxi coastal VTS is the first VTS in the province, which was invested ¥32,920,000 RMB by the Ministry of PRC.

This VTS project was built since 2009 and construction was completed in Sep. 2013. While three sub centers were subsequently established and operated on Jan. 1st 2017.



中华人民共和国广西海事局文件

桂海指挥〔2016〕239号

广西海事局关于印发广西沿海
VTS用户指南的通知

各有关单位：

为便于各有关单位、船舶了解广西沿海VTS
相关规定，我局编制了《北海VTS用户指南》《
防城港VTS用户指南》，现印发
照执行。



中华人民共和国
2016年

III: VTSSs in Guangxi / Beibu Gulf Economic Zone

YLW
Radar Station



After a project of further expansion carried out in 2018, Guangxi Coastal VTS is now composed of **3 sub-centers** (Qinzhou, Beihai and Fangcheng respectively), **7 radar stations** (QCT, SD, WZD, YLW, TSG, DL and BLW), and **1 coordination center**.

TSG
Radar
Station



Fangcheng V



Beihai VTS



Qinzhou VTS

III: VTSs in Guangxi / Beibu Gulf Economic Zone

After a project of further expansion carried out in 2018, Guangxi Coastal VTS is now composed of **3 sub-centers** (Qinzhou, Beihai and Fangcheng respectively), **7 radar stations** (QCT, SD, WZD, YLW, TSG, DL and BLW), and **one coordination center**.

**Coordination Center
in Guangxi MSA**

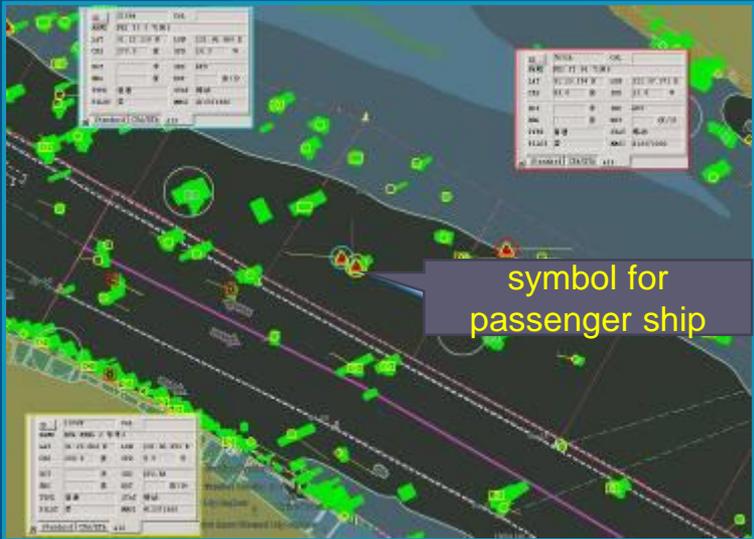


IV: Attention to research on VTS-related issues

example

challenges and opportunities led by the AIS-era

32444245304354



challenges and opportunities led by the AIS-era

1

- I、 functions
- II、 measure of data collection
- III、 limitation

Traditional VTS

2

- I、 coming of AIS-era
- II、 influence to VTS
- III、 promotion for maritime surveillance

AIS-era VTS

V: Keys to operate VTS

1

Human elements

- VTS operator ;
- VTS maintenance crew;
- VTS manager as point of contact;
- seafarer, pilot;
- harbor dispatcher, shipping agent, ship owner, etc.



V: key points for operating VTS

2

factors to keep VTS equipment in working condition and ships in seaworthiness

- advanced, adapted and applicated function natures of VTS;
- suitability of VTS facilities for specific control area.



- Whether necessary devices are equipped enough for a ship's safety;
- Whether all critical devices on shipboard are in good condition;

V: key points for operating VTS

3

environmental elements

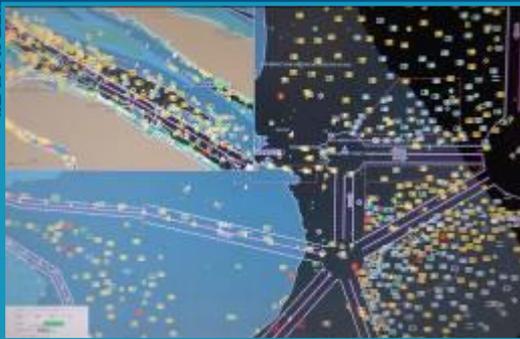
- natural environment
- Non-natural environment



weather &
oceanic condition



fairway



Traffic
density



aids to navigation



wrecks in water

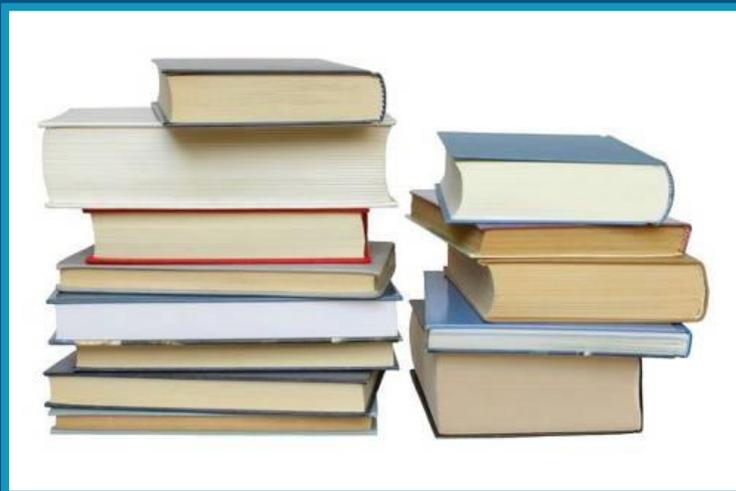
32444245304354

V: key points for operating VTS

4

regulation elements

- **practicability, scientificity, rationality and implementing possibility of legislations...**



V: key points for operating VTS

4

regulation elements

superintendence regulation

particular supervision measures for critical traffic area,
procedure manual for emergencies, requirement of information
publication, process and key work under severe weather,
regime of traffic organizing service,
method for anchorage management,
arrangement for touting scheme.



V: key points for operating VTS

4

regulation elements

- emergency plan:

typhoon, thunderstorm, cold-air outbreak, fog, sandstorm, ship's out-of-control, swell damage, ship grounding (includes standing on rocks), ship collision, ship on fire (explosion),

ship sinking, loss of crew,

medical assistance,

hit-and-run case of ship,

public security maintenance,

navigational obstruction,

marine pollution.



V: key points for operating VTS

4

regulation elements

- **rules to maintain VTS equipment**
 - **operation rule of VTS devices;**
 - **maintenance rules of VTS devices, e.g.**
 - routine maintenance requirement, emergency plan for malfunction of VTS equipment, mechanism for shutting down of VTS device (unseen reason system crash, or planed switch over)**

V: key points for operating VTS

Objectives of Serving VTS

Attentions to VTS operators

rest during
off-work time

time spent
on the way to
office

Adjustment
of duty
arrangement
because of
medical leave

temporary
change of
living clock

welfare, bonus
and personal
development

V: key points for operating VTS

objective of VTS center:

VTS center / administration could, with the help of VTS, successfully control the traffic flow on critical water, effectively track targeted ships, efficiently remind and actually eliminate or reduce potential risks.



VI: IT System's Assistance to Daily Work

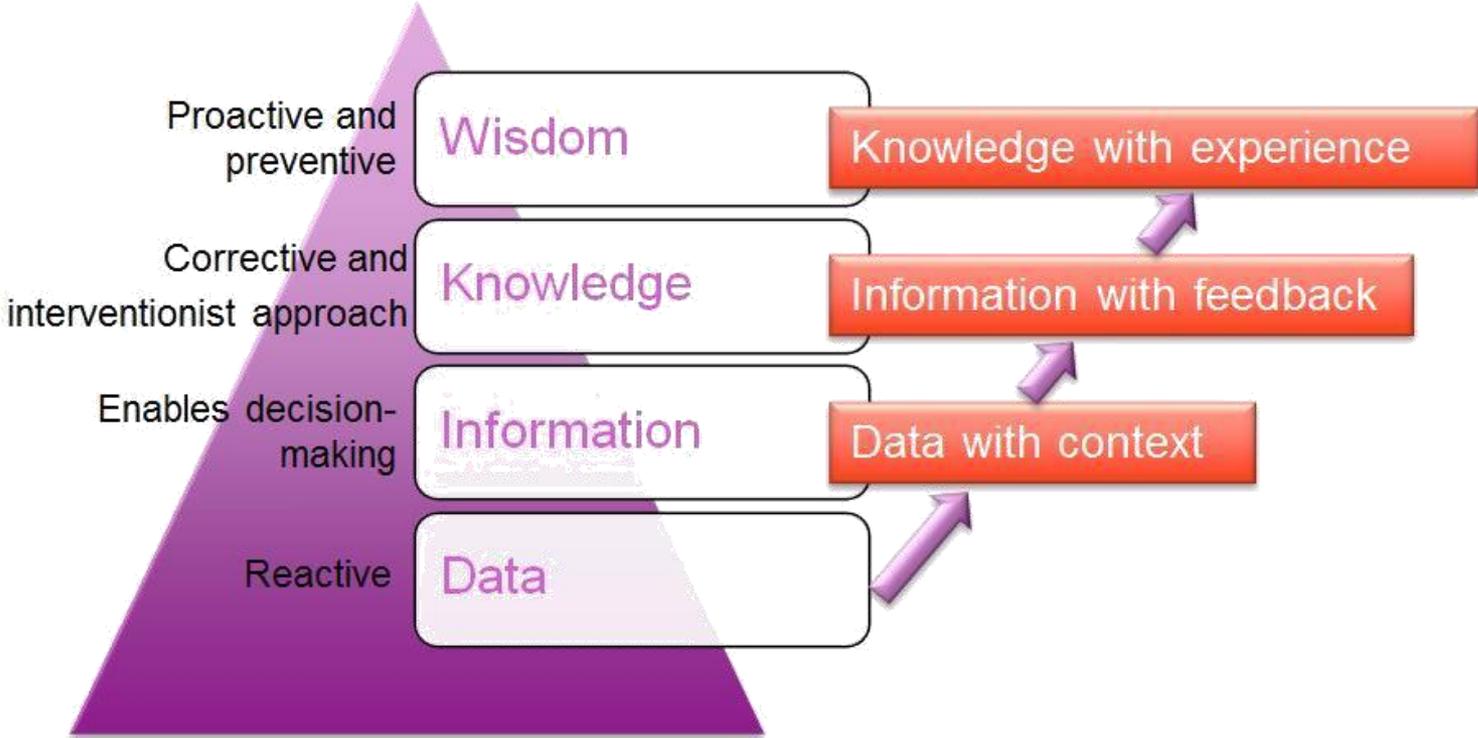
Section 6, or Second Part

In God we trust; everyone else must bring data

-- William Edwards Deming (October 14, 1900 – December 20, 1993) , an American engineer, statistician, professor, author, lecturer, and management consultant.

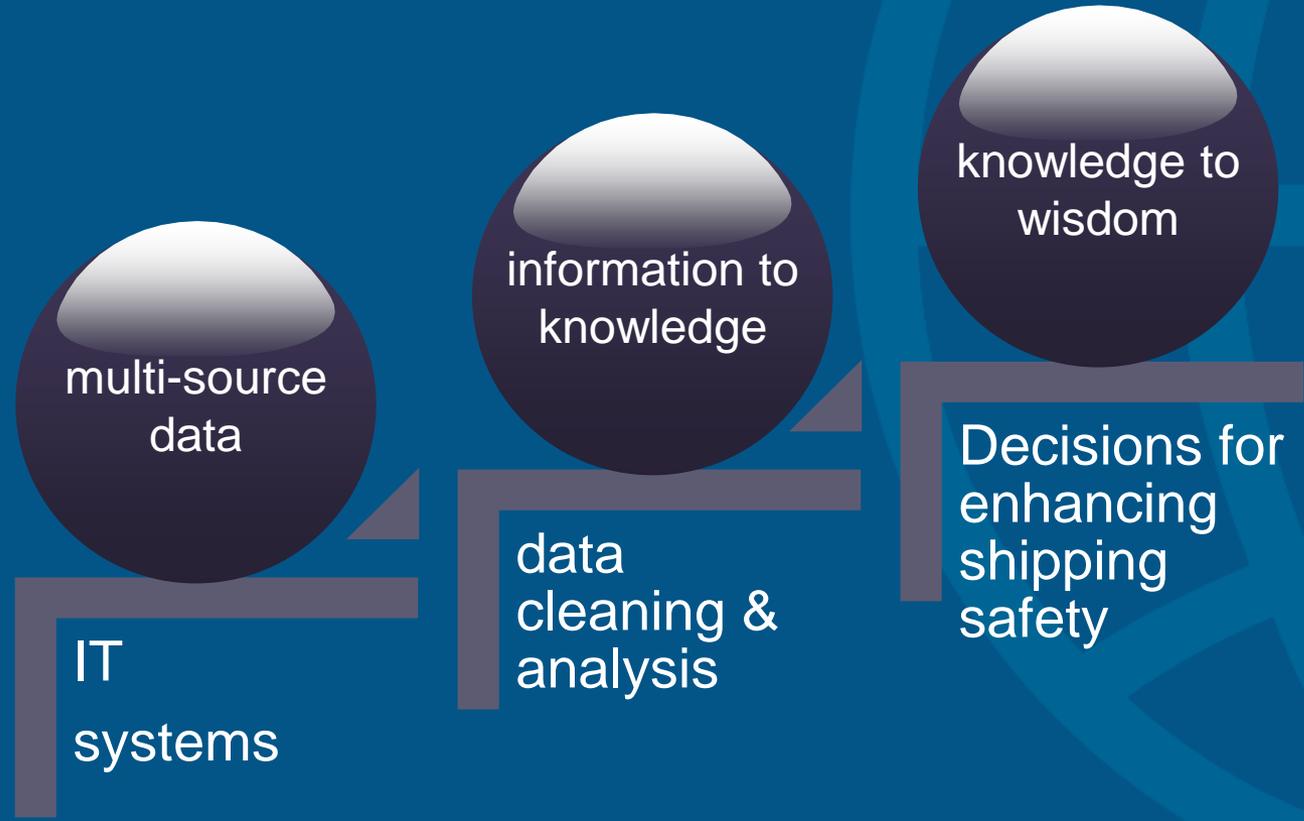
Knowledge management hierarchy

Data value stack



VI: IT System's Assistance to Daily Work

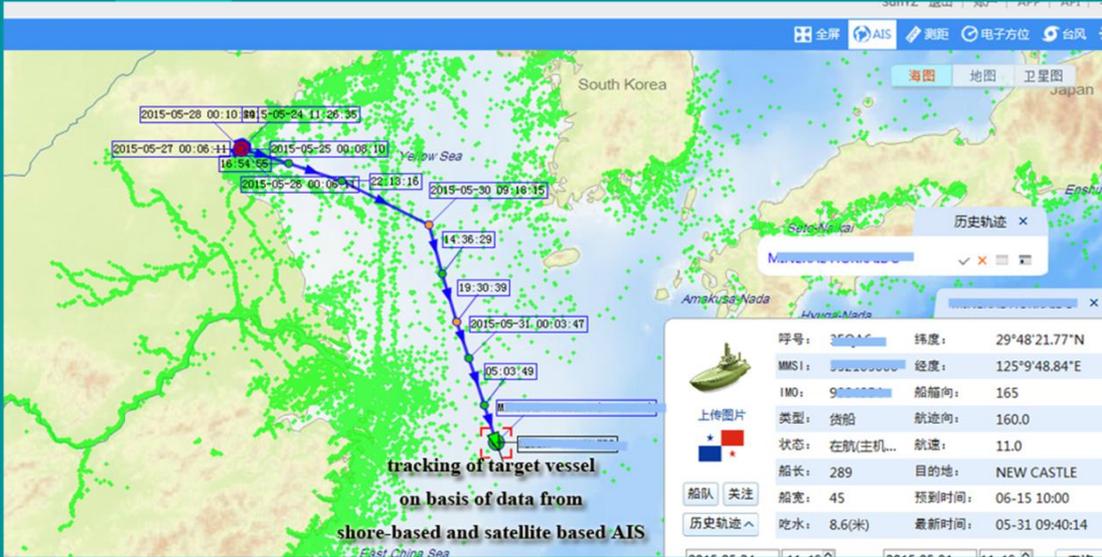
By means of IT systems to help enhancing shipping safety as well as security.



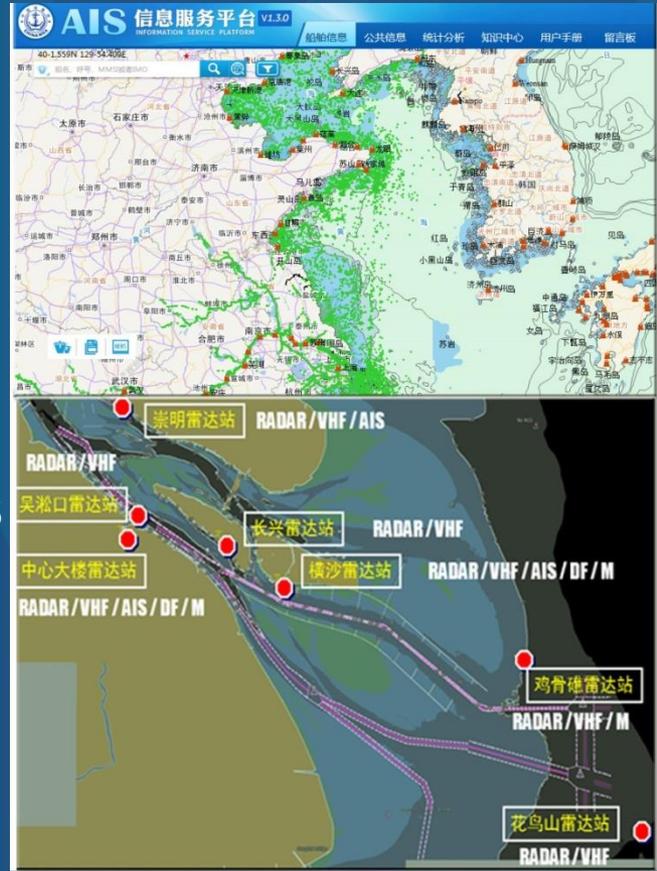
32444245304354

VI: IT System's Assistance to Daily Work

3244424



AIS



VTS

Commercial ship tracking platform

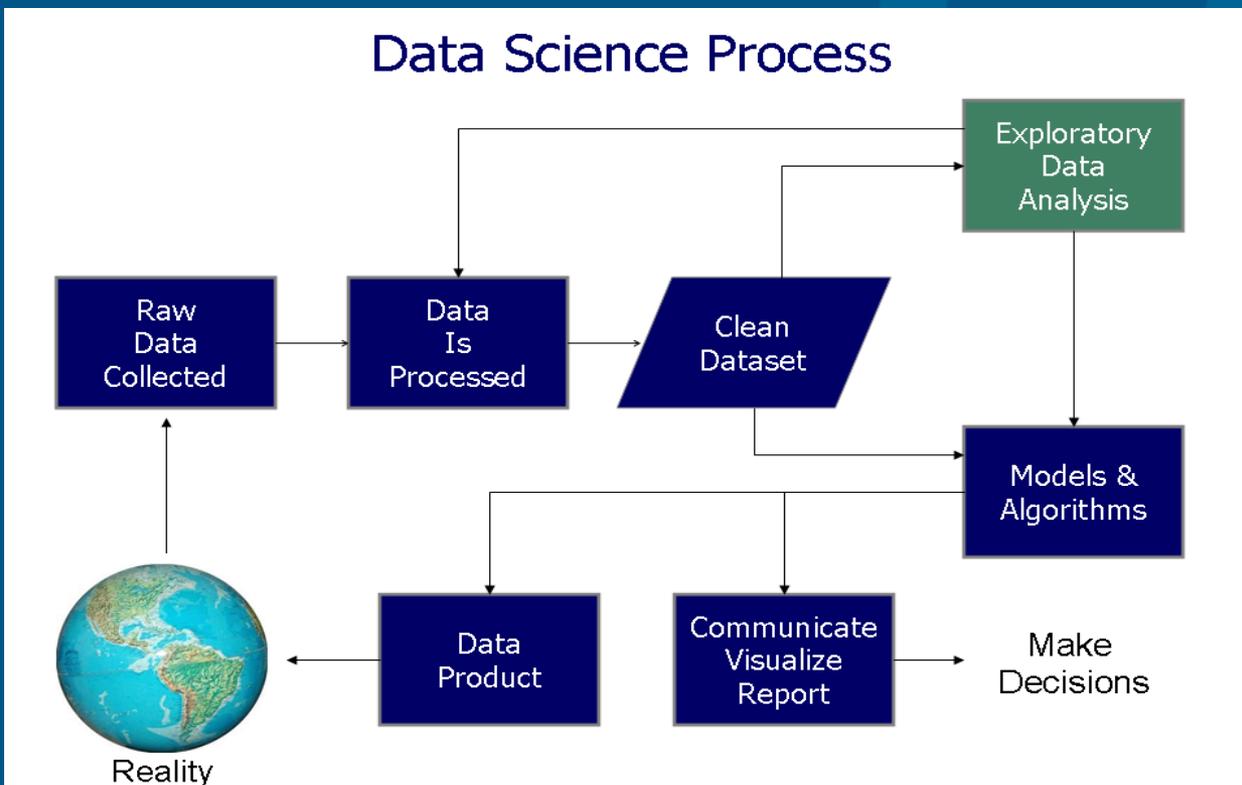
VI: IT System's Assistance to Daily Work

32444245304354



VI: IT System's Assistance to Daily Work

Data analysis is a process of inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, informing conclusions, and supporting decision-making (Source: Wikipedia)

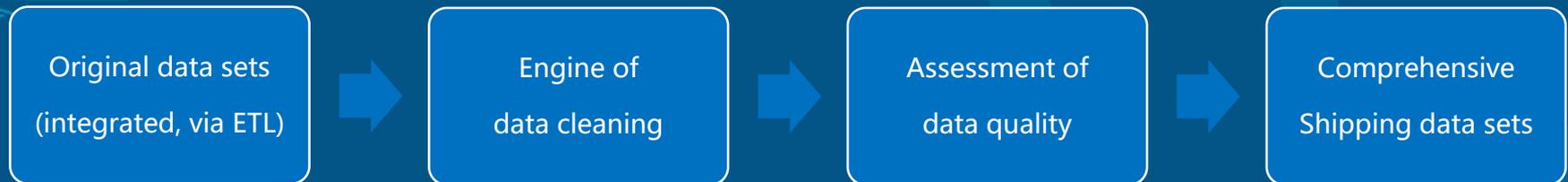


VI: IT System's Assistance to Daily Work

Data Cleaning and Quality Assessment

For INSTANCE

50 billion ships' positions, through: format transfer, space-time correlation, quality assessment. Period (capability): **3~5 days**.



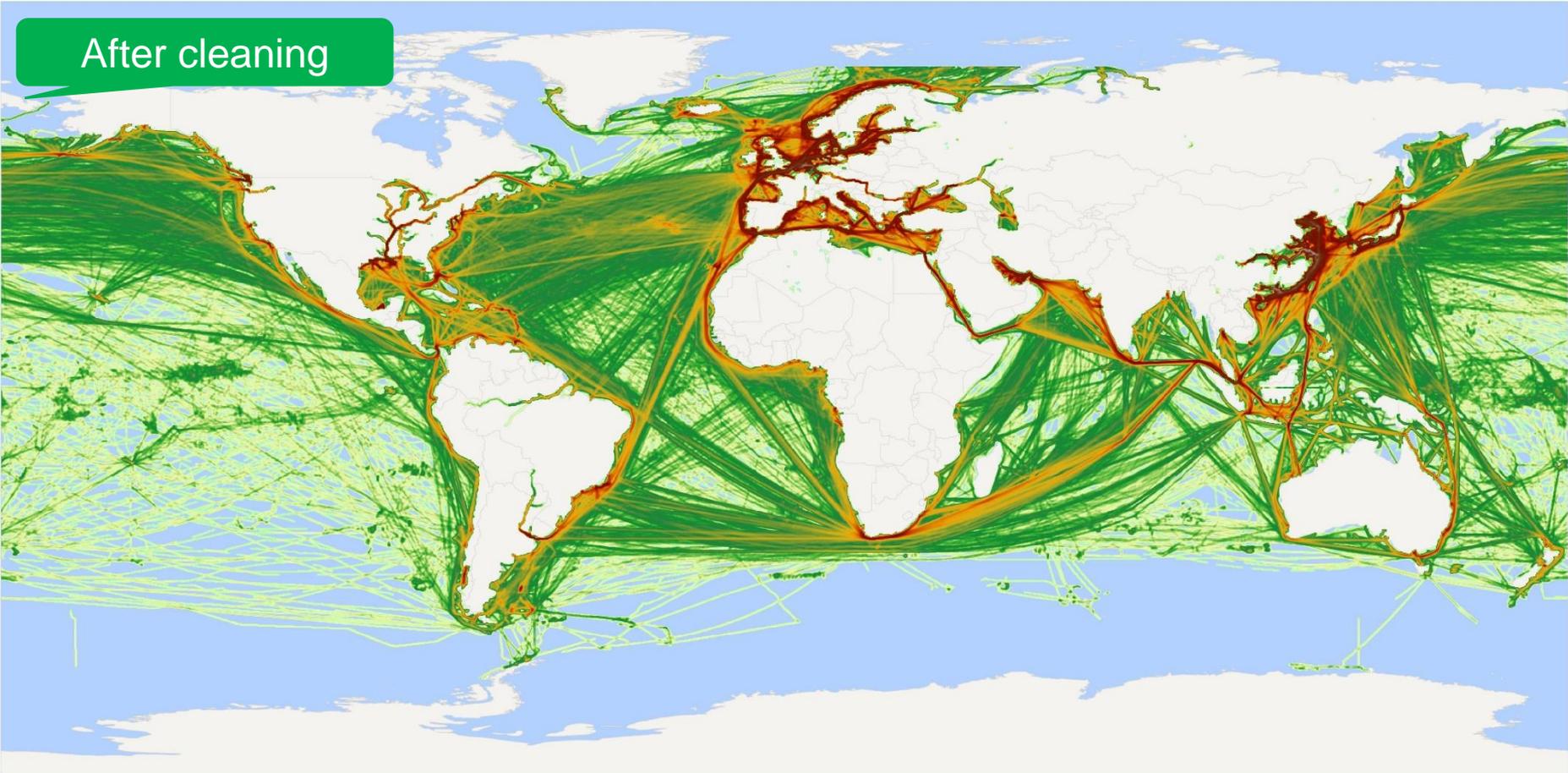
VI: IT System's Assistance to Daily Work

Illustration of cleaning effect

original



After cleaning



VI: IT System's Assistance to Daily Work

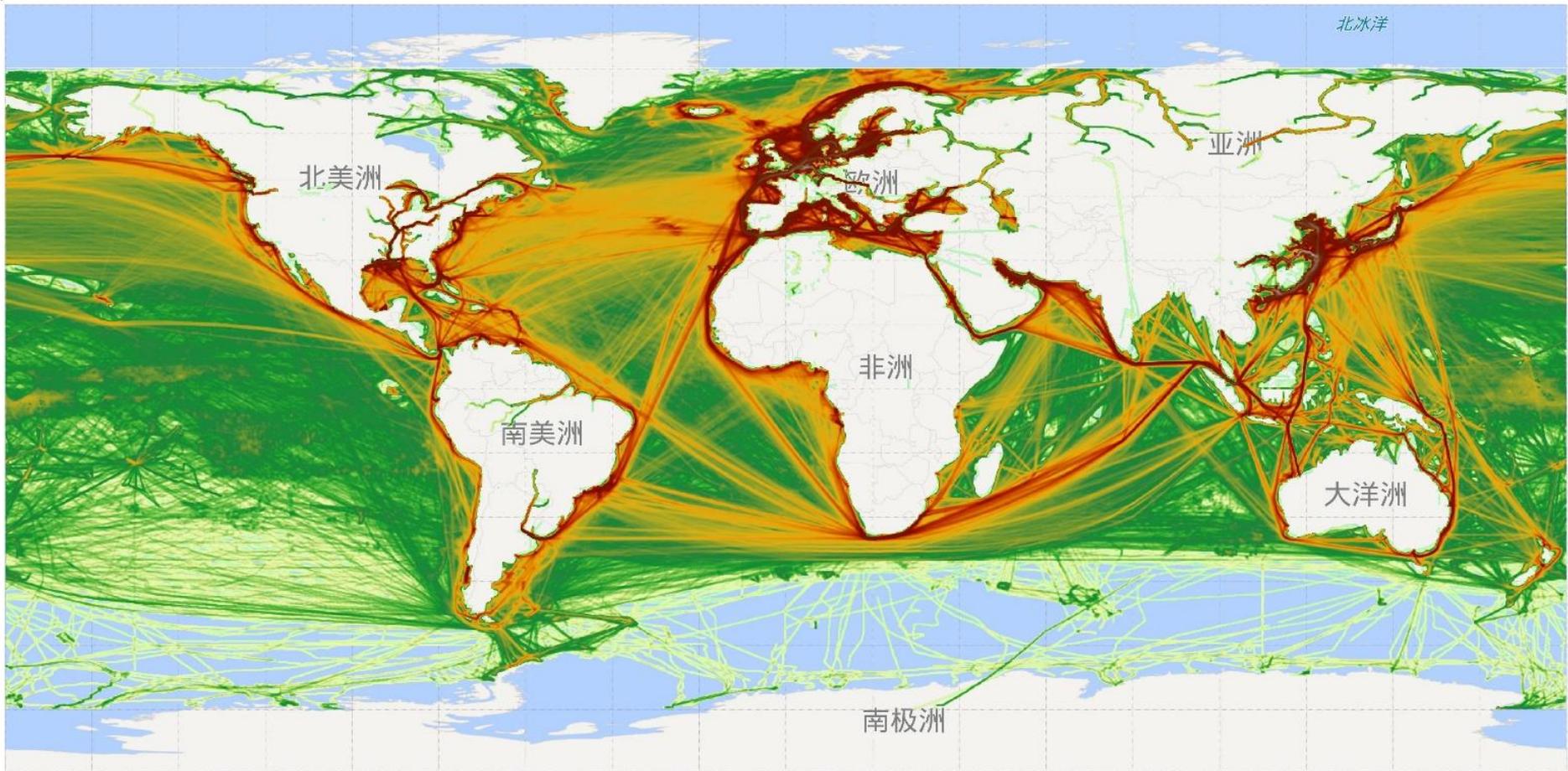
3
2
4
4
4
2
4
5
3
0
4
3
5
4

item	detail
Space accuracy	1 Degree × 1 Degree, 10 Minutes × 10 Minutes, 1 Minute × 1 Minute, 1 Meter × 1 Meter (only in specific area)
Space coverage	global
Time accuracy	month, season, year ...
Time range	From June 2013 to present
Ship type	15, as categorized by AIS-related standard
Calculation type	AIS frequency, ship concentration/density, traffic flow (density), others as demanded
Output format	Jpg, png, ps; Txt, xml, csv; shp

VI: IT System's Assistance to Daily Work

Examples

Ship Type: all; Time Accuracy: one year; Space Accuracy: 10 Minutes; Space Range global; Calculated Data: 11 billion; Calculating Type: **Traffic Flow / Concentration**



VI: IT System's Assistance to Daily Work

Identification of ship activities
for example

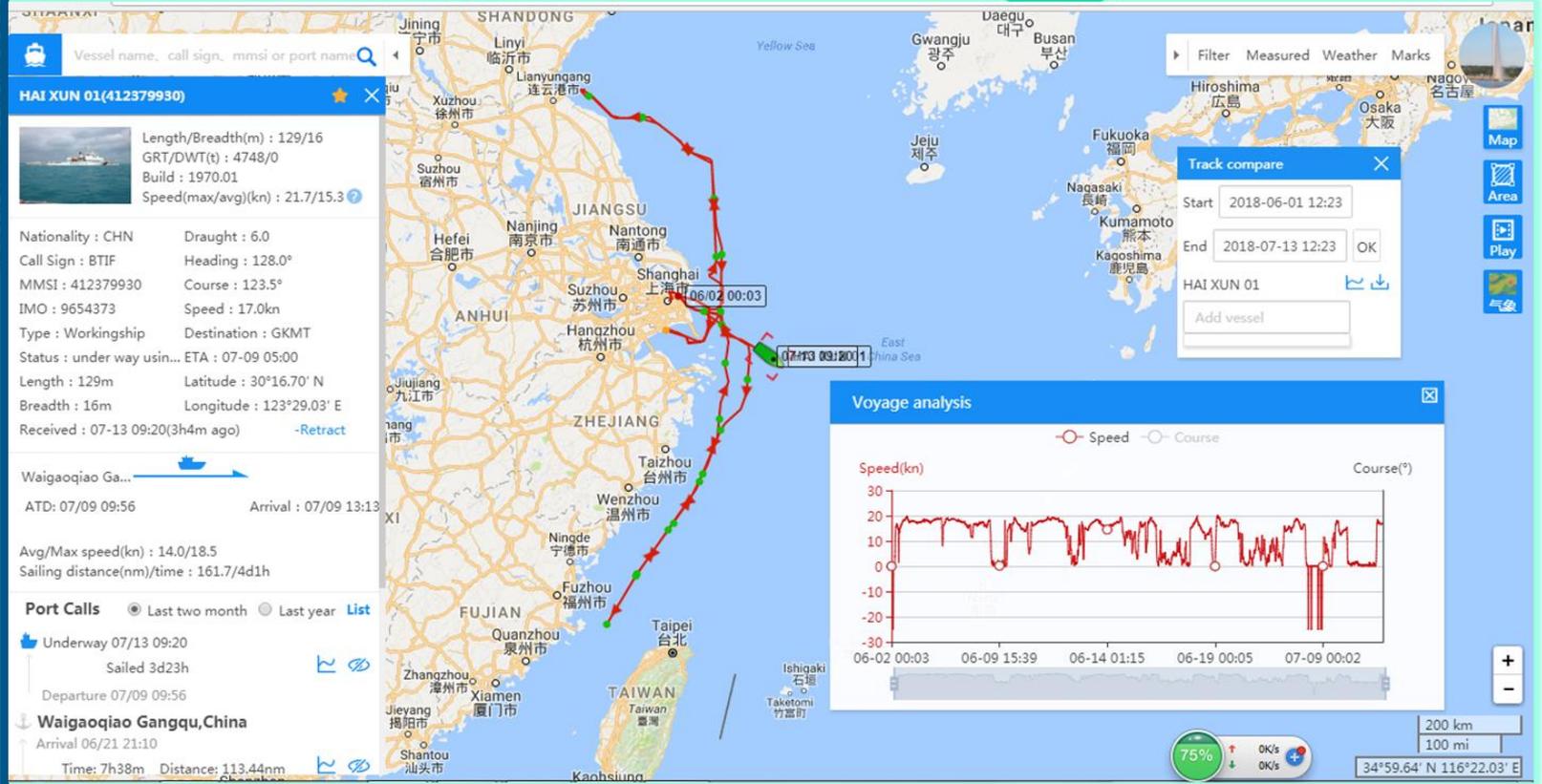


Comparison
& analysis

Voyage & Position information
+ Detailed GIS

- 1 Arrival
- 2 Departure

32444245304354



VI: IT System's Assistance to Daily Work

32444245304354

Identification of abnormal behaviors



Voyage & Position
information
+
Detailed GIS &
navigation
knowledge

- 1 over speed
- 2 turning with high speed
- 3 out of control
- 4 grounding
- 5 AIS intentionally switched off
- 6 suspect gathering
- ...

Value of identified behavior compared with preset thresholds

Send warnings to relevant stakeholders (ship owner, maritime authorities...)



VI: IT System's Assistance to Daily Work

With the help of maritime monitor systems, shipping security has been enhanced.

Cases of IT system used for anti-piracy.

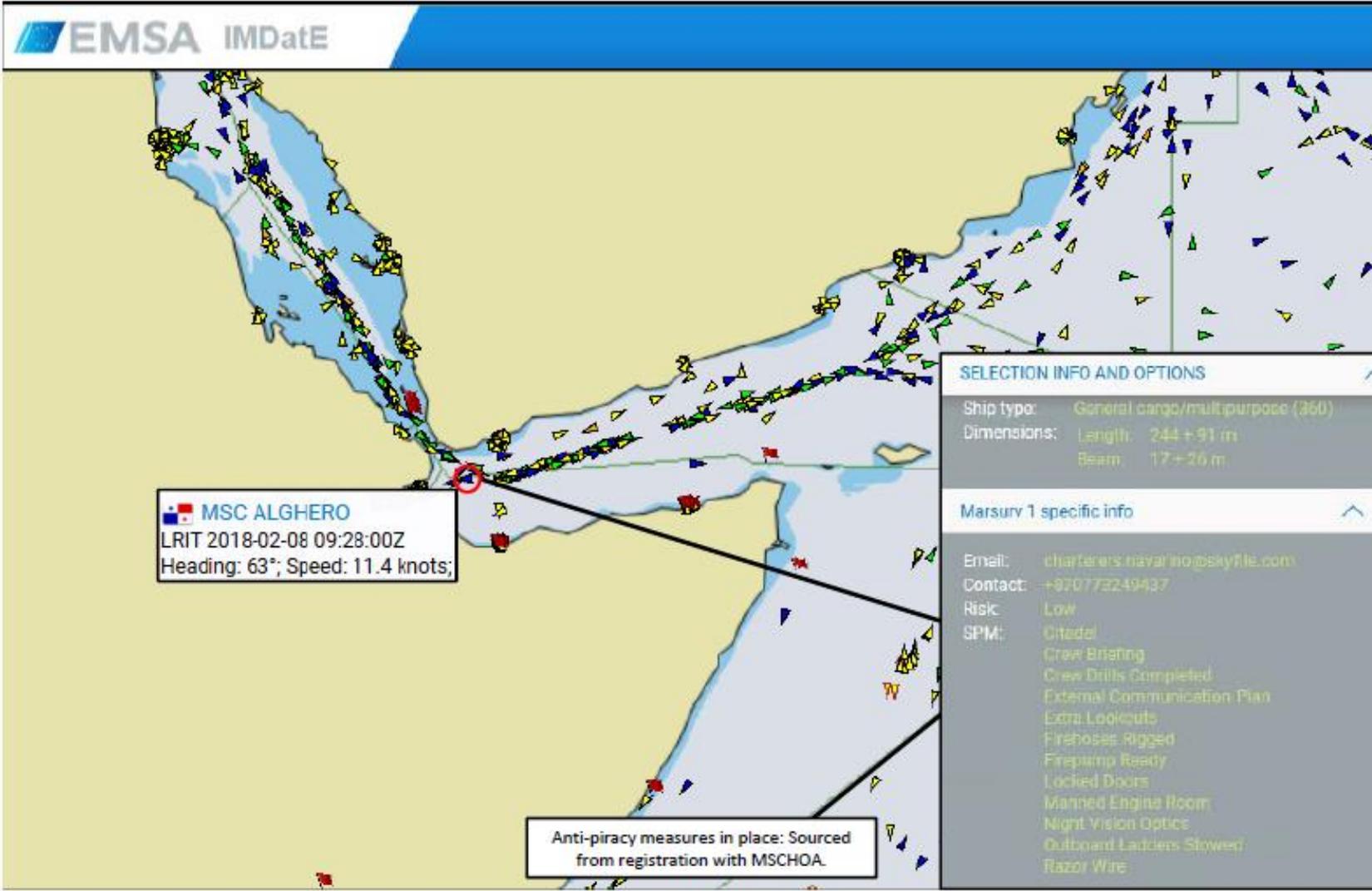
M/V "Y**"
(flag: Hongkong
China, registered
in China LRIT
NDC) was
embarked by 12
armed pirates in
water of Lagos,
Nigeria.



32444245304354

VI: IT System's Assistance to Daily Work

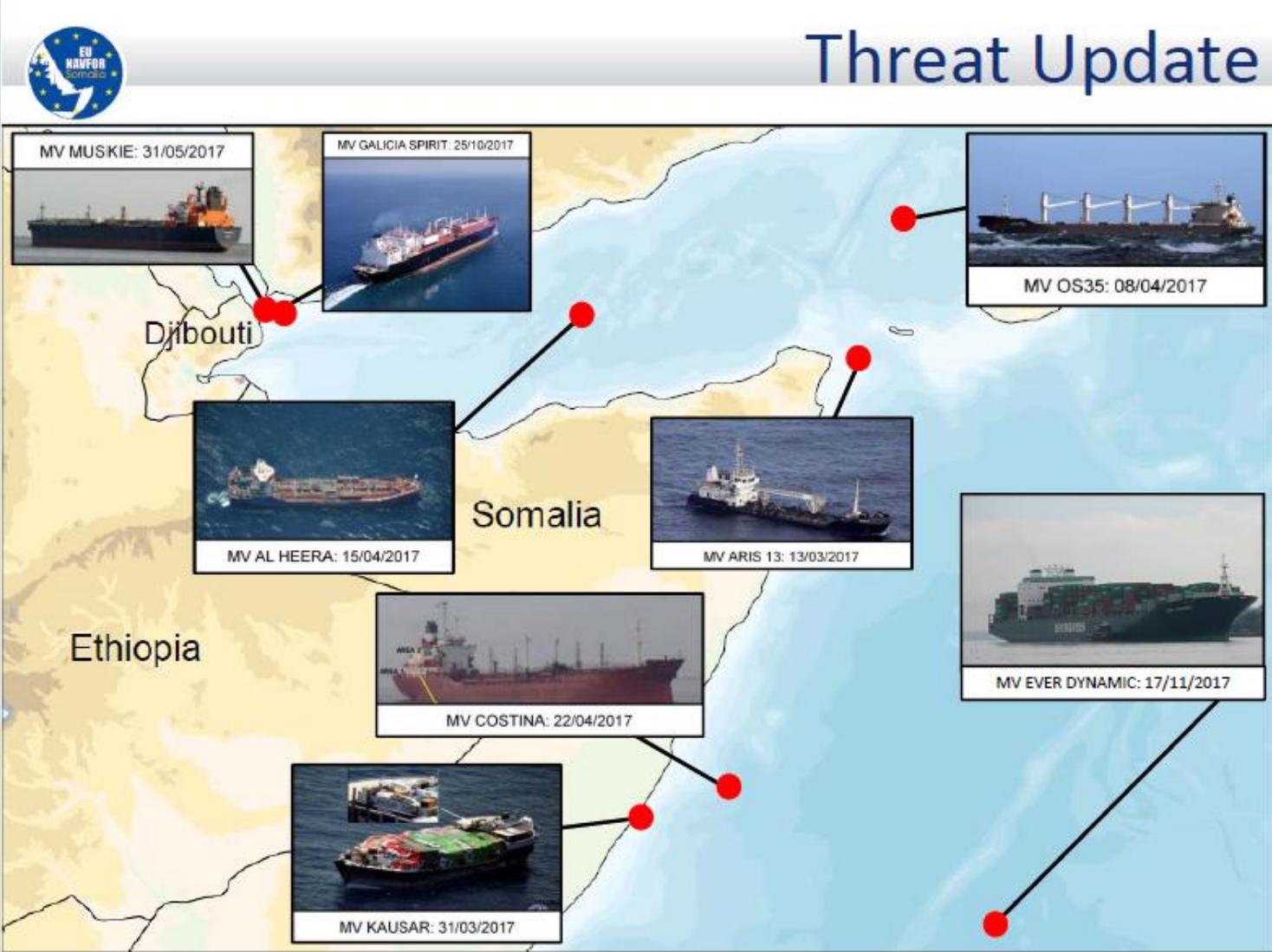
Similarly, IT system (basically LRIT) used by EMSA to increase security.



32444245304354

VI: IT System's Assistance to Daily Work

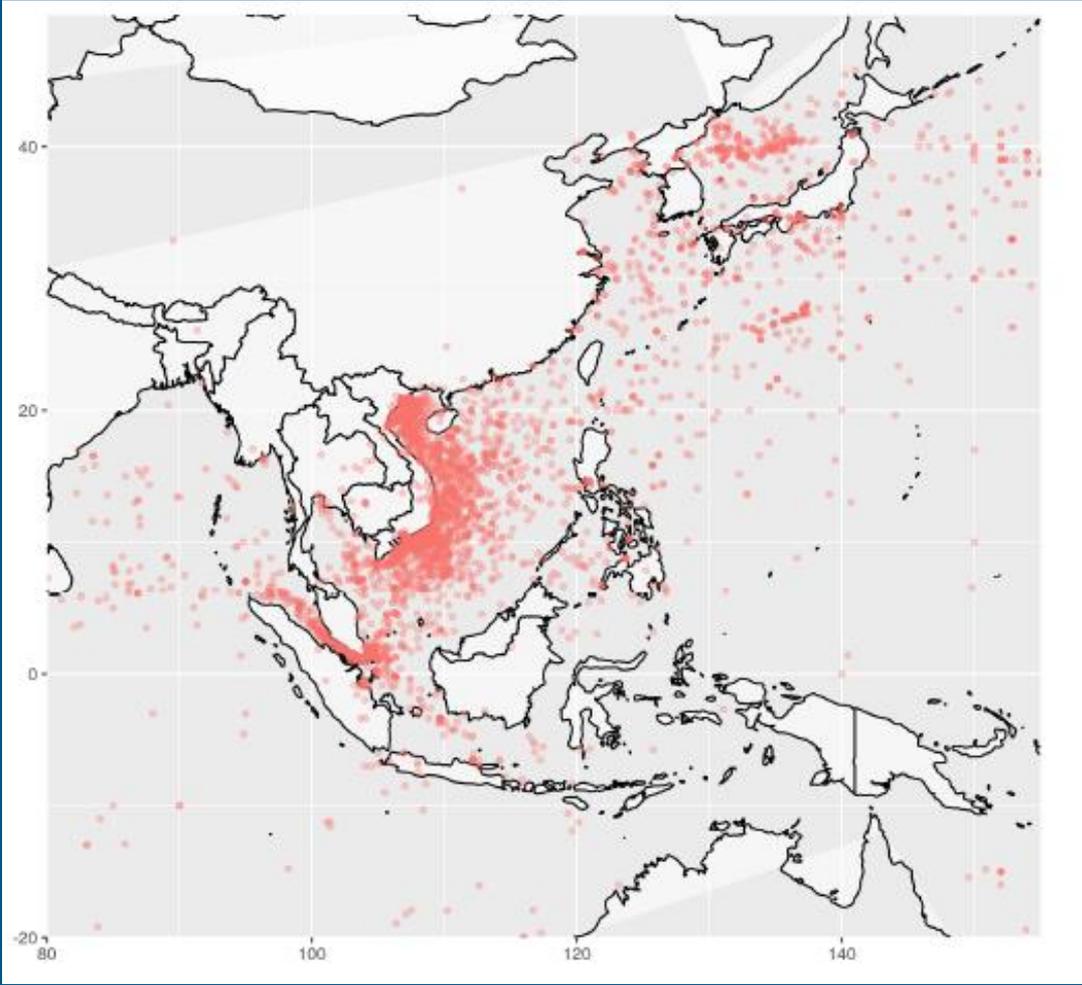
Similarly, IT system (basically LRIT) used by EMSA to increase security.



32444245304354

VI: IT System's Assistance to Daily Work

Heat map based on statistic gained from IT system for the actions of **Search and Rescue (SAR)**

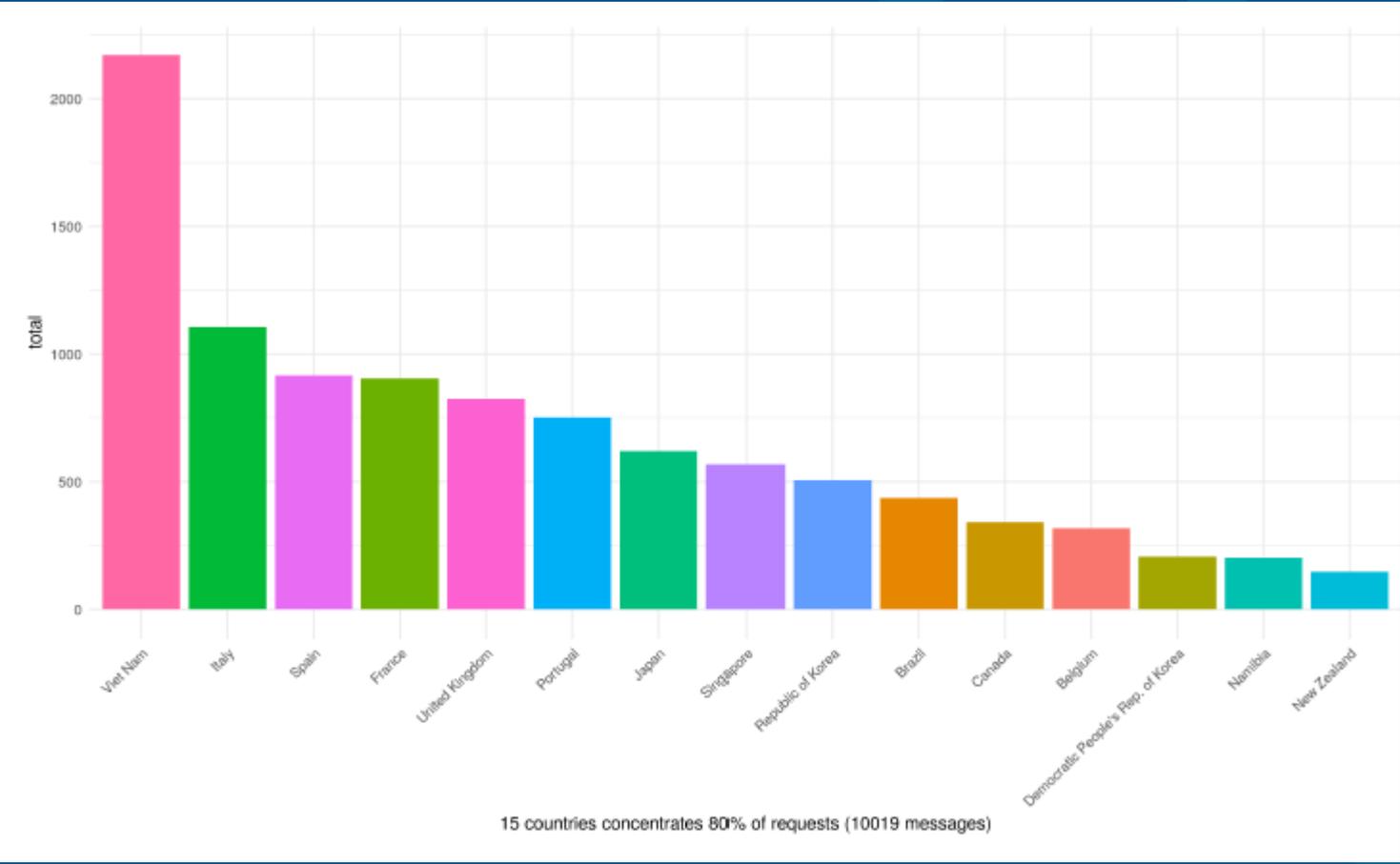


32444245304354

VI: IT System's Assistance to Daily Work

Heat map of SAR

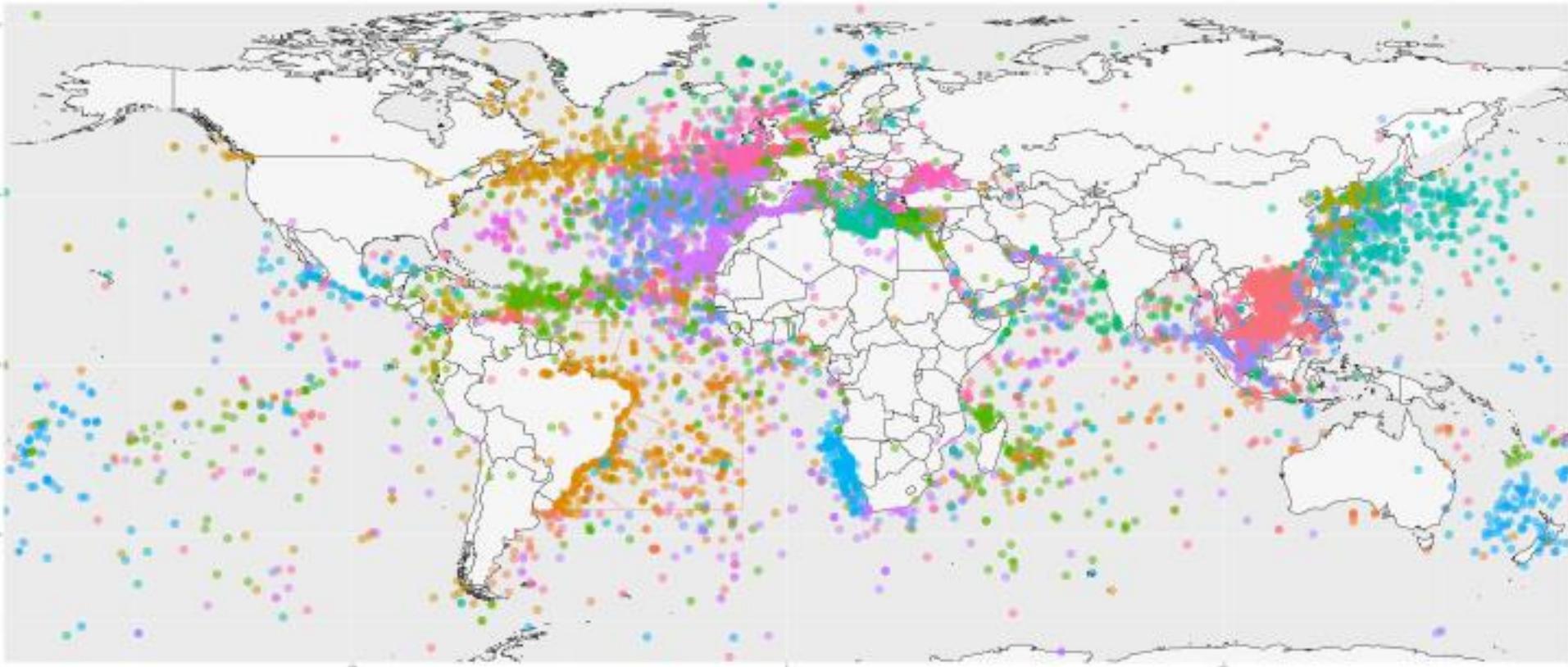
(world wide, 2010-2018, near 12,500 requests, top 15 counties)



32444245304354

VI: IT System's Assistance to Daily Work

Heat map of SAR
(world wide, 2010-2018, near 12,500 requests, top 15 countries)



324

32444245304354



Thanks for your time!

majun@ctticsh.cn