



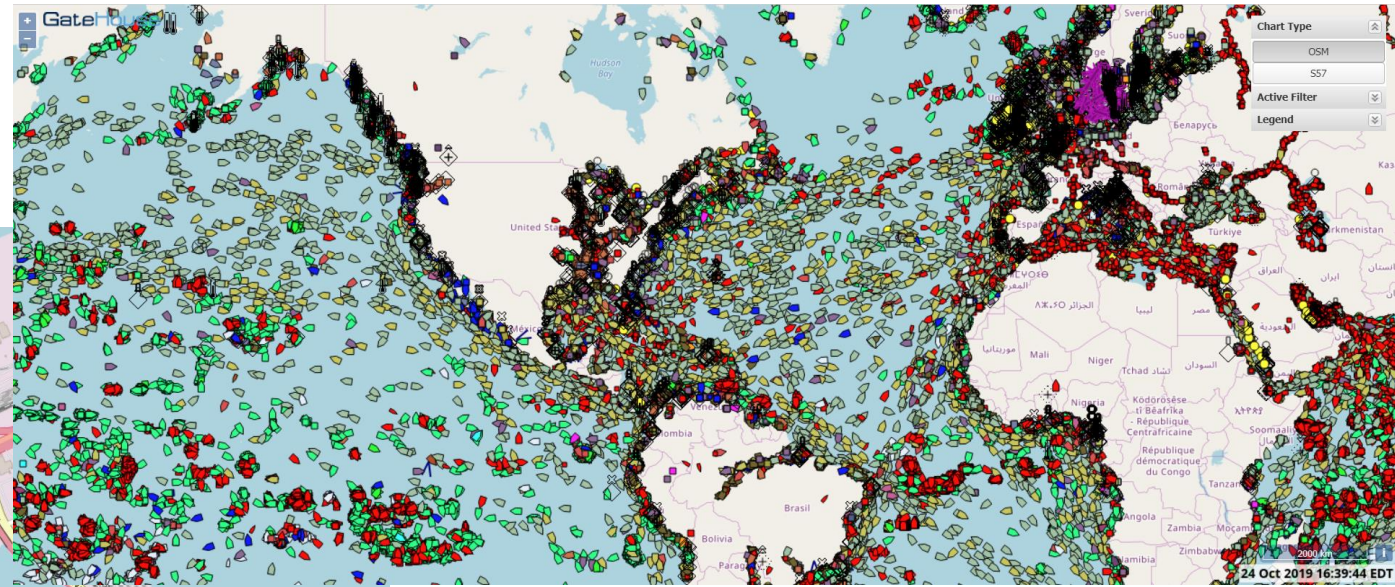
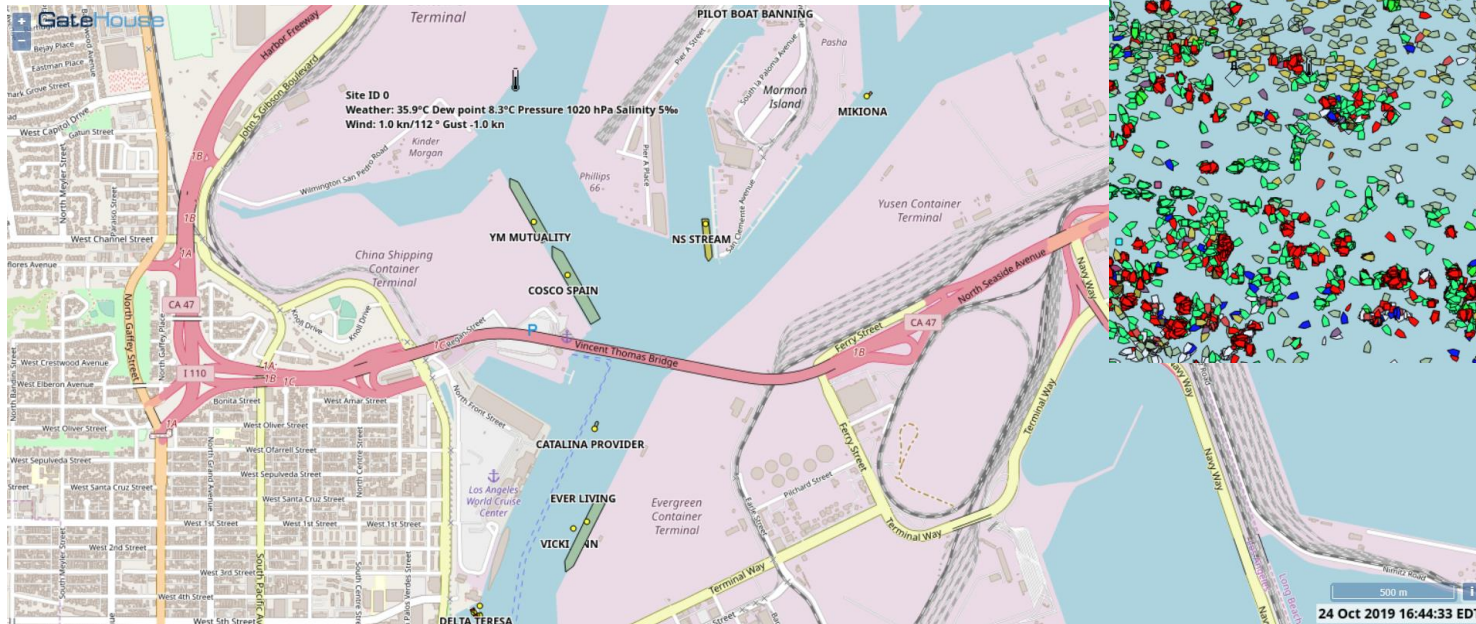
GateHouse
Maritime

The Evolution of AIS Data – Dots on a Map No Longer Cutting It!

PortCon 2019

Introduction

Dots on a map have their place...

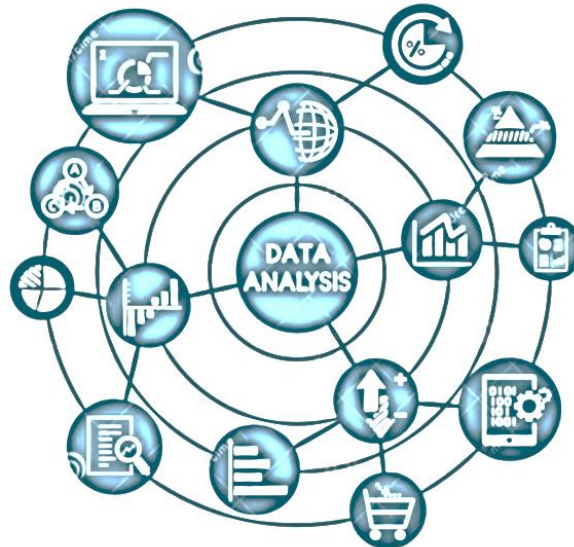


...but there so much more information that can be extracted from Automatic Identification System (AIS) data to support your business.

Introduction

Business oriented information can be obtained from AIS through:

- Analysis of stored/real-time data
- Develop algorithms to search for patterns
- Fusion of meta data



Reducing Complexity
to Provide

➔ **Actionable
Information**



Purpose of Presentation

Raise awareness of the potential for AIS data analytics. Hopefully it will make you think of some ways that AIS data might alleviate some issues facing your port. Potential application areas could include:

- Logistics (ETA predictions, dispatch, automated event detection)
- Operations (billing, traffic management, predictive maintenance, process improvement)
- Security (zone incursions, inconsistent message data)
- Risk Assessment (navigation related)
- Regulatory Compliance
- Business Development & Sales

AIS Data Background

Initially designed for collision avoidance, but organizations quickly saw the benefits of monitoring the system

VHF system operating in 161.975 - 162.025 MHz range.

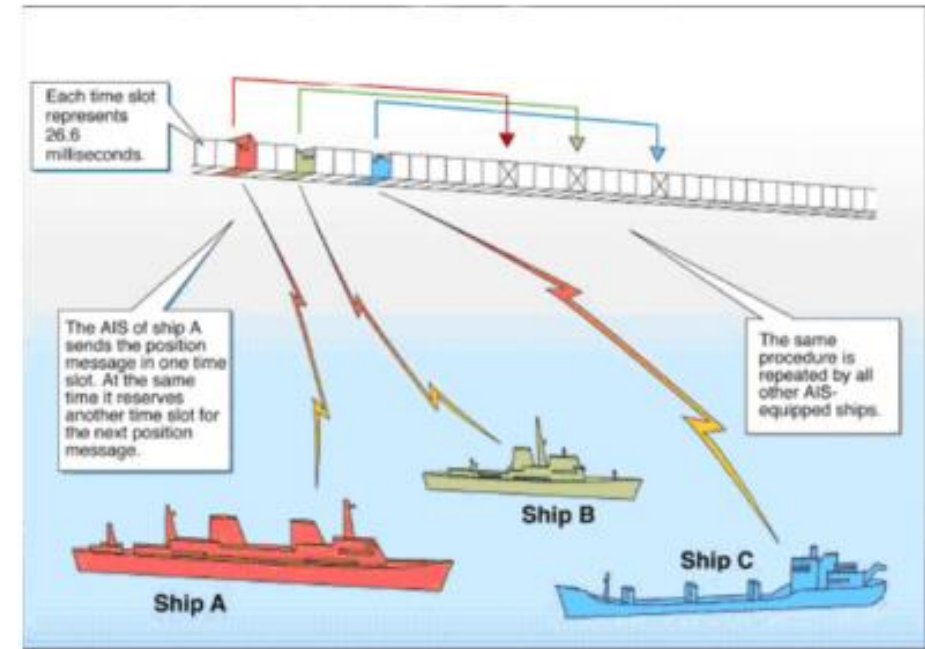
There are two types of vessel based transceivers:

- **Class A (SOTDMA)**

- Primarily commercial vessels,
- Self organizing nature of system helps ensure that messages are not lost
- Higher power transmission, fast report rates, and support for more message types

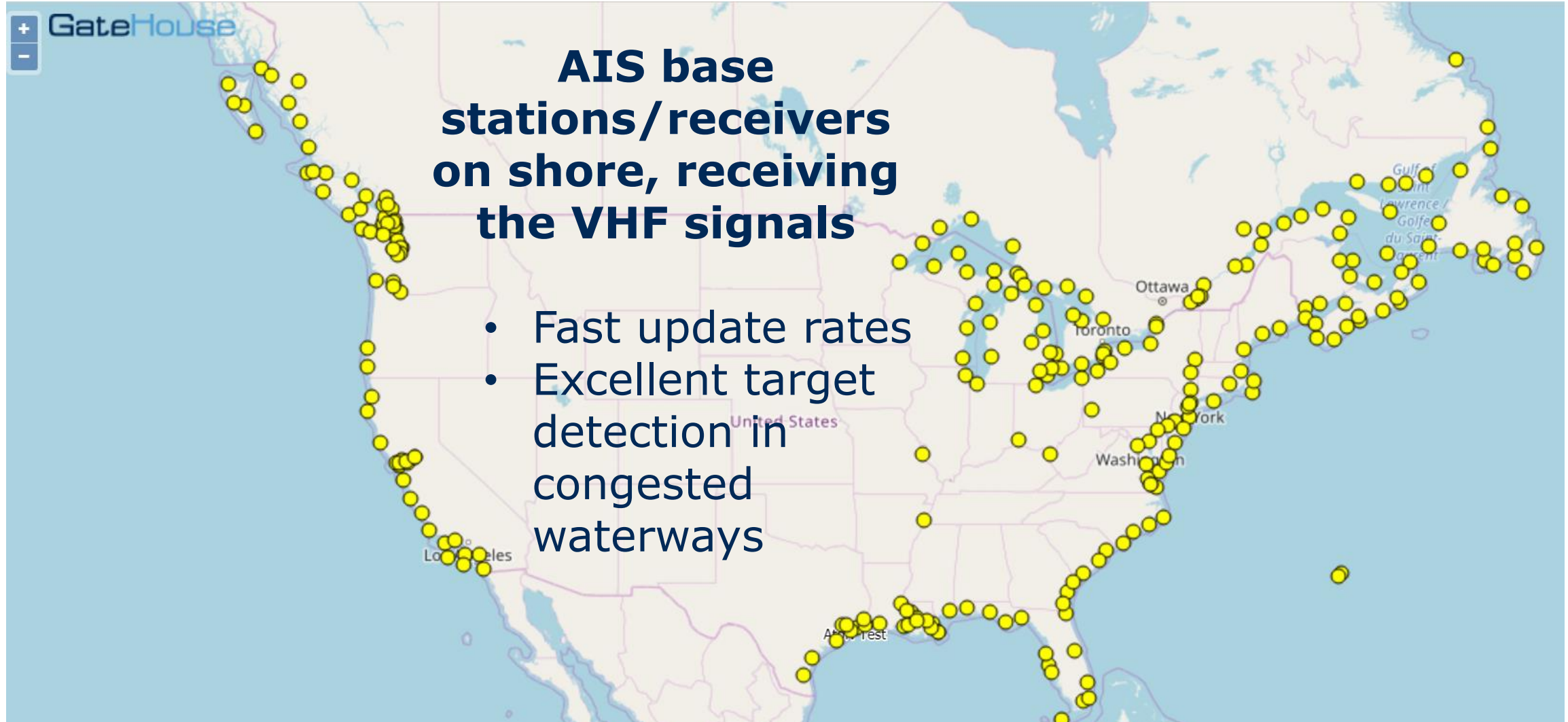
- **Class B (CSTDMA)**

- VHF Transponders on smaller vessels (generally) or those not mandated to carry Class A.
- Less power, slower report rates and only transmit when there are available slots on the data link.



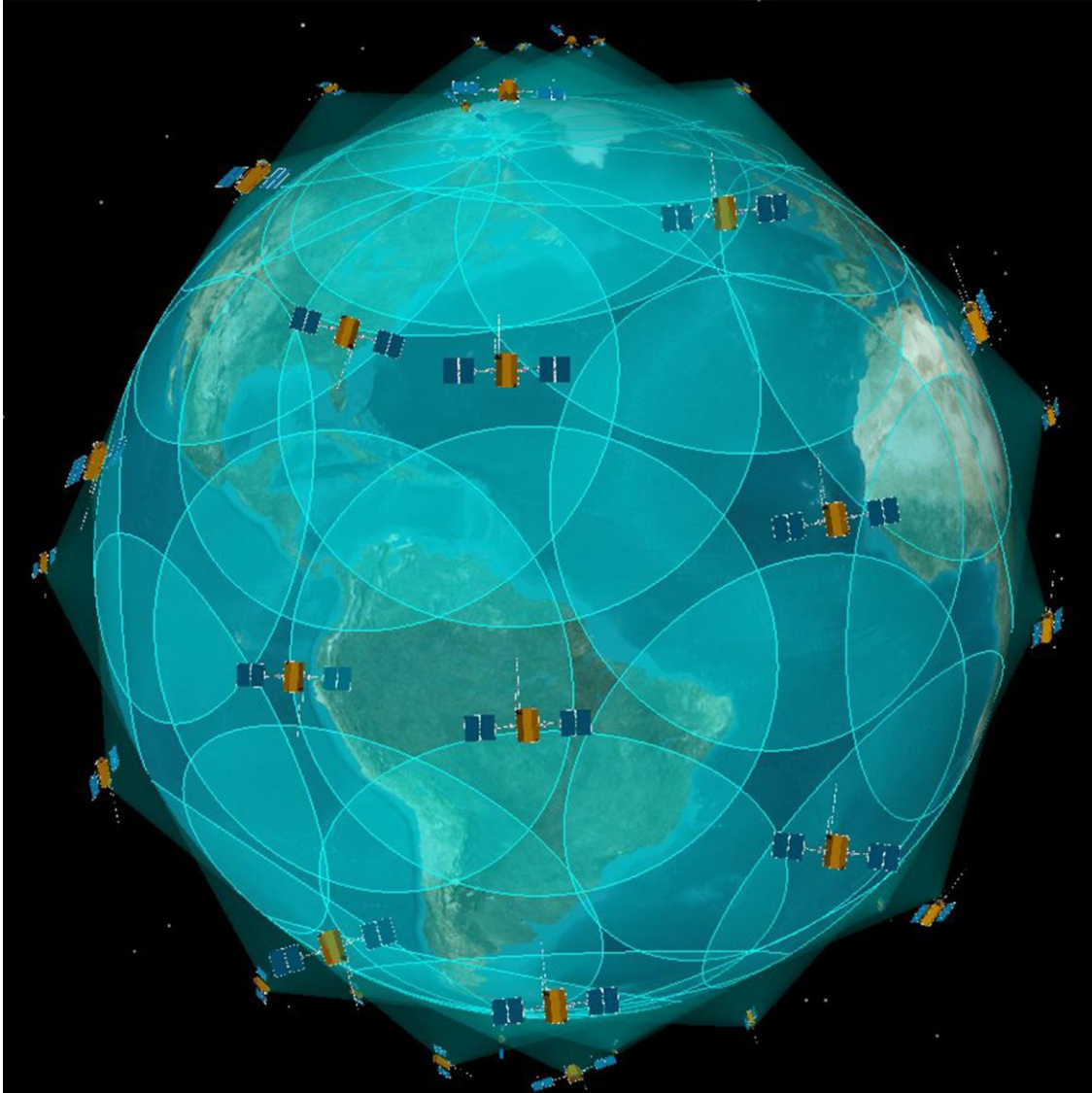
AIS Data Background

Terrestrial AIS



AIS Data Background


Satellite AIS



- AIS receivers on satellite constellations.
- Worldwide coverage
 - Coverage beyond shore-based VHF data range.
 - great for open water and non-congested waterways.
- Data delivery latency under a minute.

AIS Data Background

What's in the AIS data

Name	Value
MMSI	577238000
AIS Unit	Class A
Name	ORIENT DYNASTY
Callsign	YJTT3
Latitude	28°30.2000'N
Longitude	093°19.5000'W
IMO	9799757
Source Type	AIS-S
Ship Type	Cargo
Cargo	
Country	Vanuatu
Flag	
SOG	10.0 kn
Draught	8.9 m
COG	296.0 °
Heading	301 °
ROT	0.0 °/min

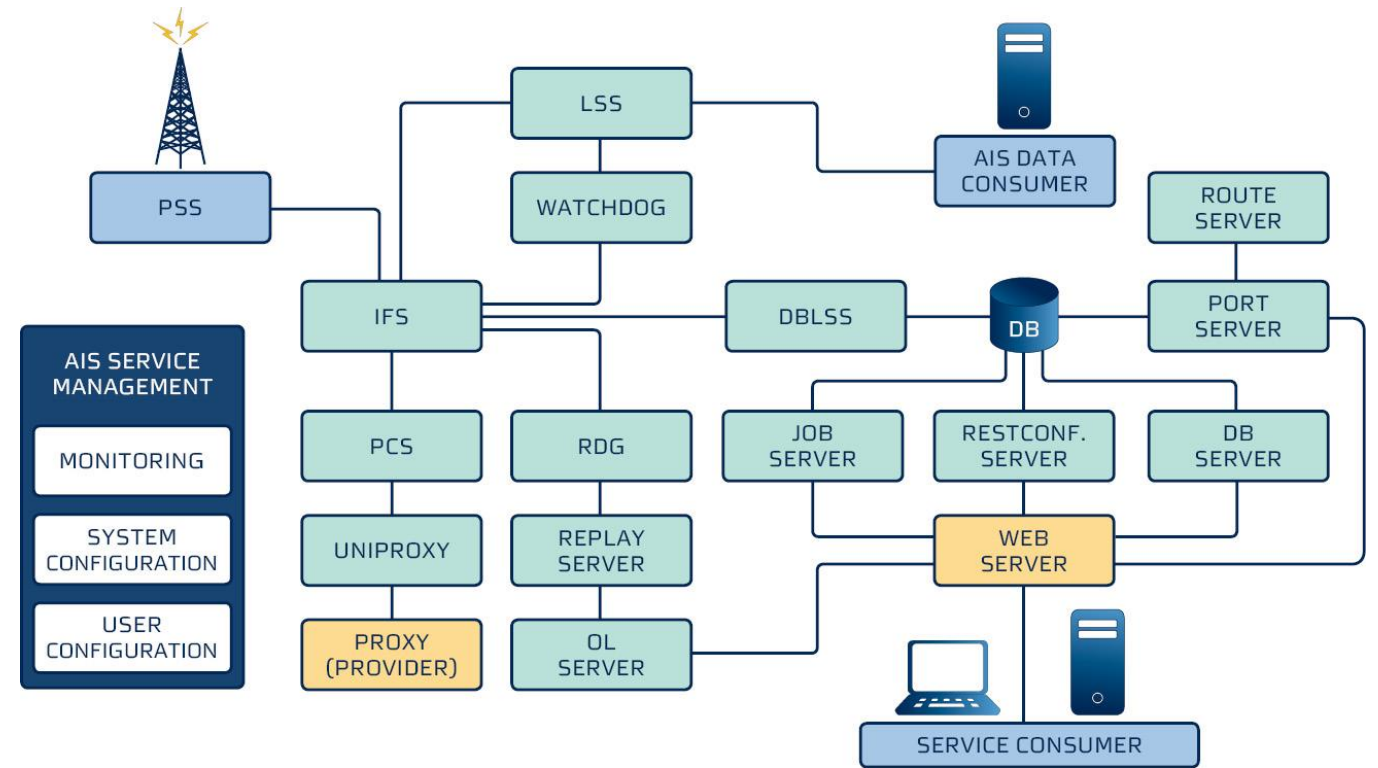
Width	32.0 m
Length	190.0 m
Destination	US HOU
Nav. Status	Engine
ETA	26 Oct 2019 11:00
Pos. Accuracy	High
Last AIS Report	25 Oct 2019 21:09:36 EDT
Last AIS Latitude	28°30.1503'N
Last AIS Longitude	093°19.3068'W
Last AIS-Sat Report	25 Oct 2019 21:11:16 EDT
Last AIS-Sat Latit...	28°30.2000'N
Last AIS-Sat Lon...	093°19.5000'W

Dynamic vs. Static Data and issues to be aware of – especially ‘garbage in – garbage out’!

AIS Data Background

Data Management to Support Analytics & System Integration

- Incoming AIS data must be organized and stored in a structured fashion.
- Stored in a geospatial (preferably GIS enabled) database to support analytics tools and rapid creation and retrieval of information.
- Designed to provide the information via standardized services (Data as a Service).



More Than Dots On A Map

Potential Analytics Applications

- Essentially, we are dealing with time stamped data points that contain location and information about the asset (both static and dynamic).
- These data points can be used to generate **information to support your business**
 - What information and how it's applied is up to you.

Potential Applications Area	
Logistics support	Risk Assessment
Operational support	Regulatory Compliance
Security	Business Development & Sales



Analytics – Logistics Support

Automatic ETA Predictions

Predict Estimated Time of Arrival of vessels to designated ports or user-defined locations.

- Reduce waiting time for employees and business partners due to unreliable ETAs
- Optimize utilization of assets, e.g. cranes, tugs, pilots etc.
- Optimize utilization of berth capacity

Port Everglades - Arrivals list - Last update: 04 Apr 2018 14:58

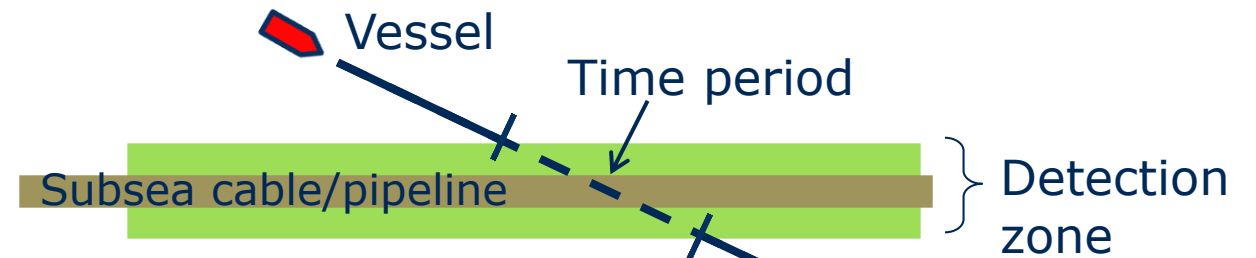
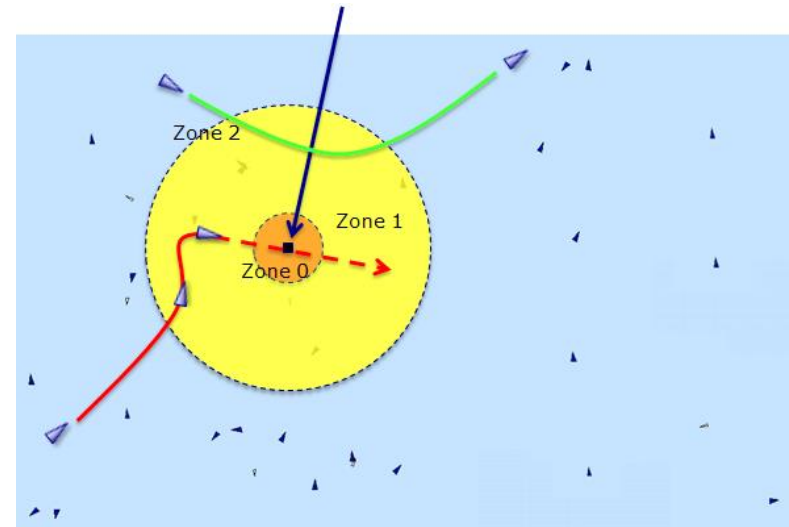
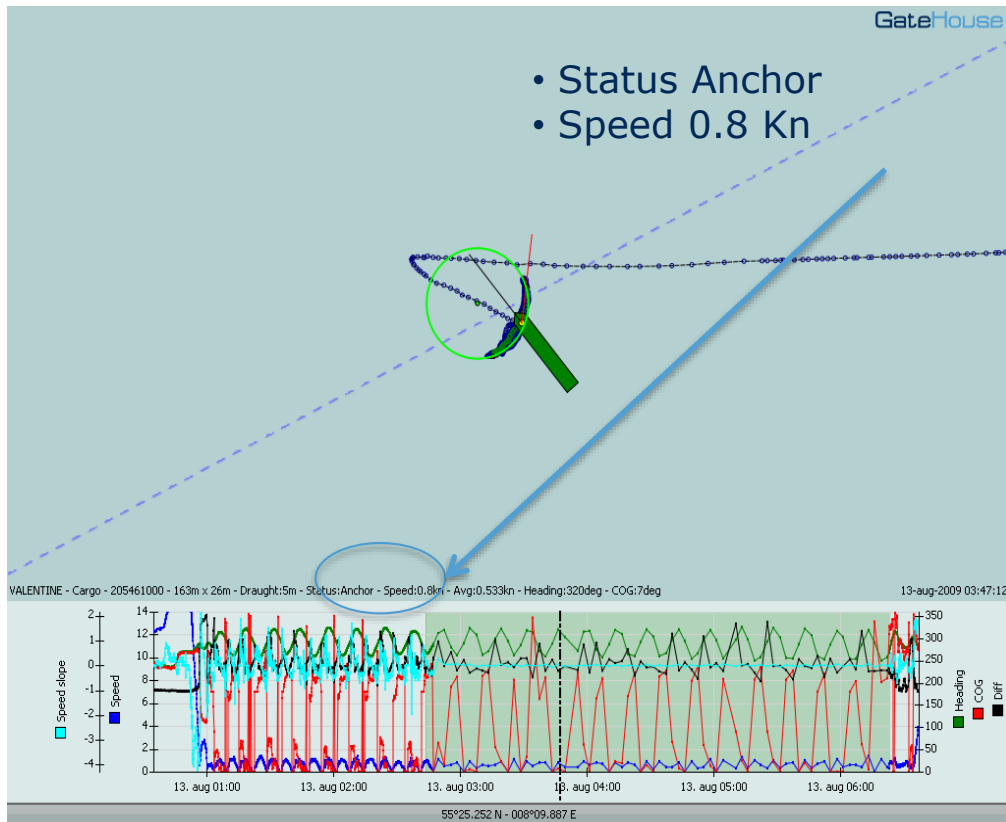
Vessel	MMSI	IMO	Callsign	Flag	ETA (Calculated)	ETA (erp)	Quay
OVERSEAS NEW YORK	367381000	9353541	WGEH		04 Apr 2018 17:15	04 Apr 2018 19:00	-
HTC DELTA	538005156	9679385	V7BK4			05 Apr 2018 03:00	-
VANTAGE	244985000	9375111	PBMC			05 Apr 2018 14:00	-
CHIQUITA EXPRESS	636017218	9304758	D5FR8		05 Apr 2018 20:30	06 Apr 2018 04:00	-
CARIBE MARINER	304010618	9110547	V2PM2		04 Apr 2018 16:45	06 Apr 2018 06:00	-
OVERSEAS NIKISKI	368445000	9353577	WDBH		06 Apr 2018 15:00	06 Apr 2018 12:00	-
TEXAS VOYAGER	369142000	9719886	WLIY			06 Apr 2018 17:00	-
HAMMONIA PALATIUM	636091176	9336165	A8KD9			07 Apr 2018 10:00	-
WESTERN BOHEME	210261000	9609691	5BSZ3		11 Apr 2018 11:00	11 Apr 2018 18:00	-
SIDER BILBAO	232977000	9338151	MPXF5		14 Apr 2018 09:45	14 Apr 2018 10:30	-



Analytics – Operational Support

Automatic Event Detection

- User specified vessels entering/exiting zones, crossing lines
 - Pattern detection (e.g. anchor dropped, changes in speed)

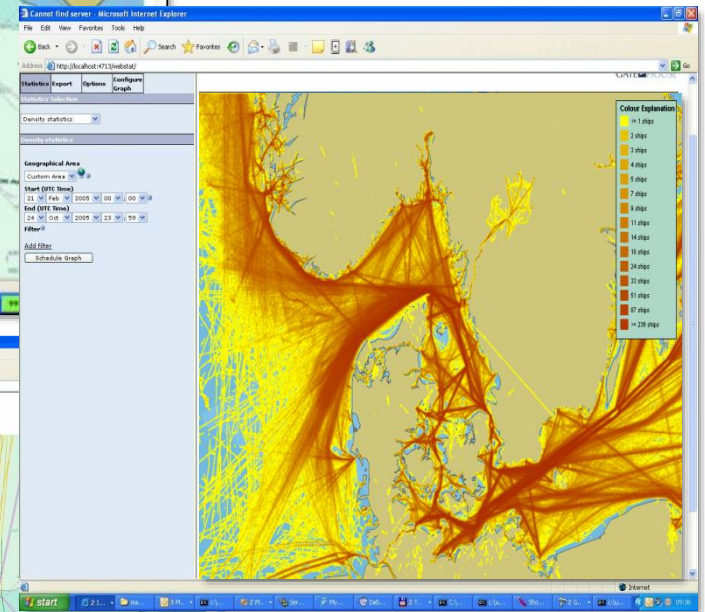
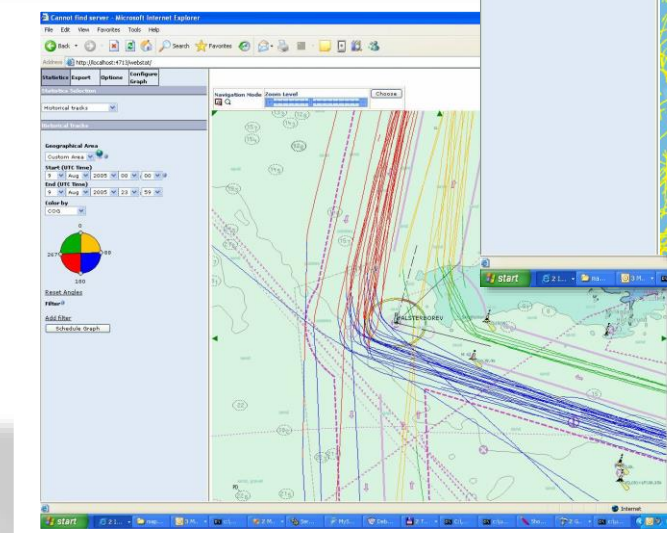
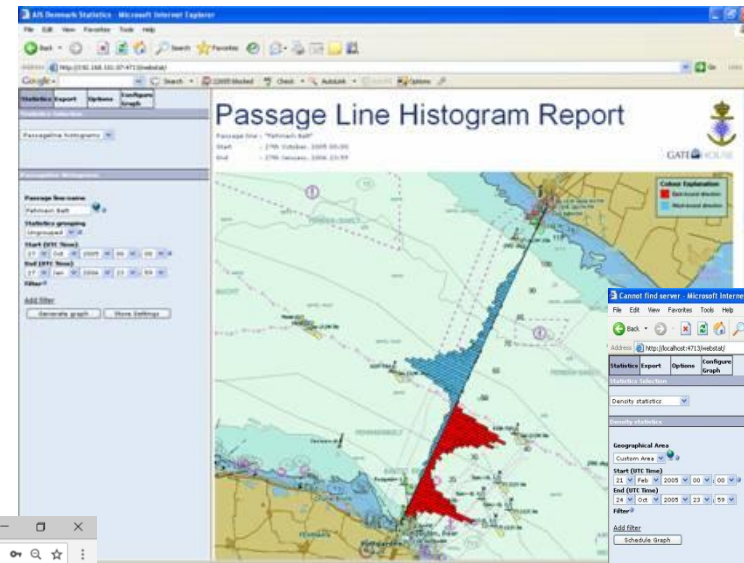
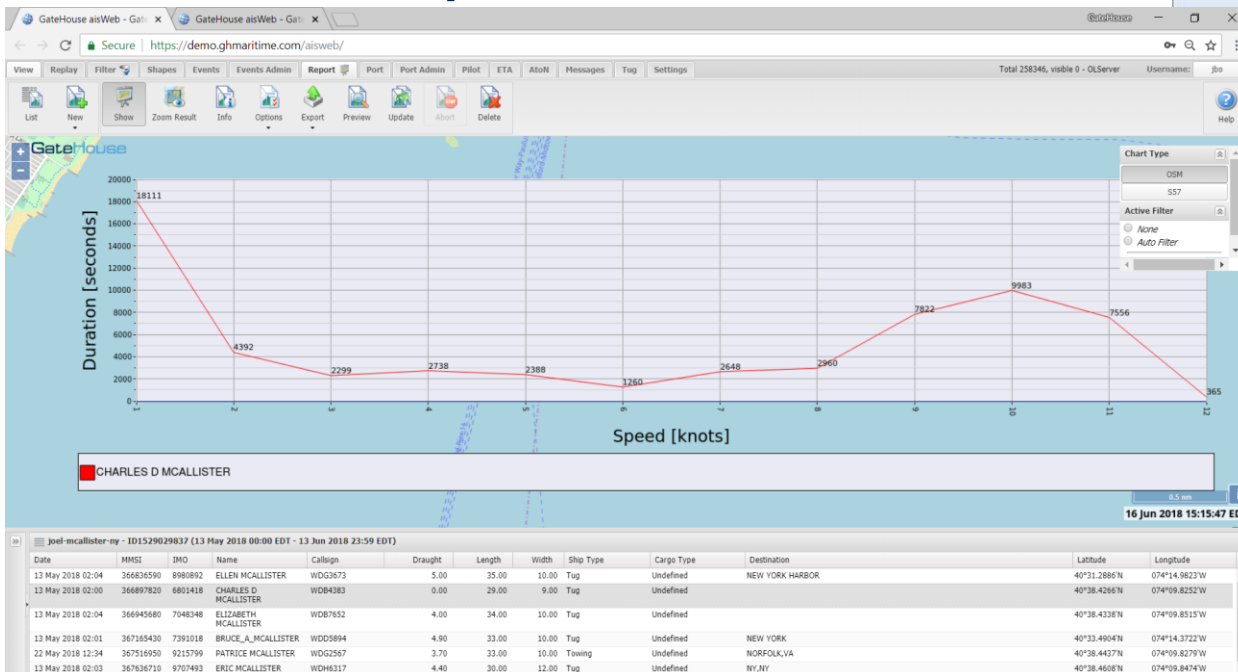


Analytics – Operational Support

Statistical Reports

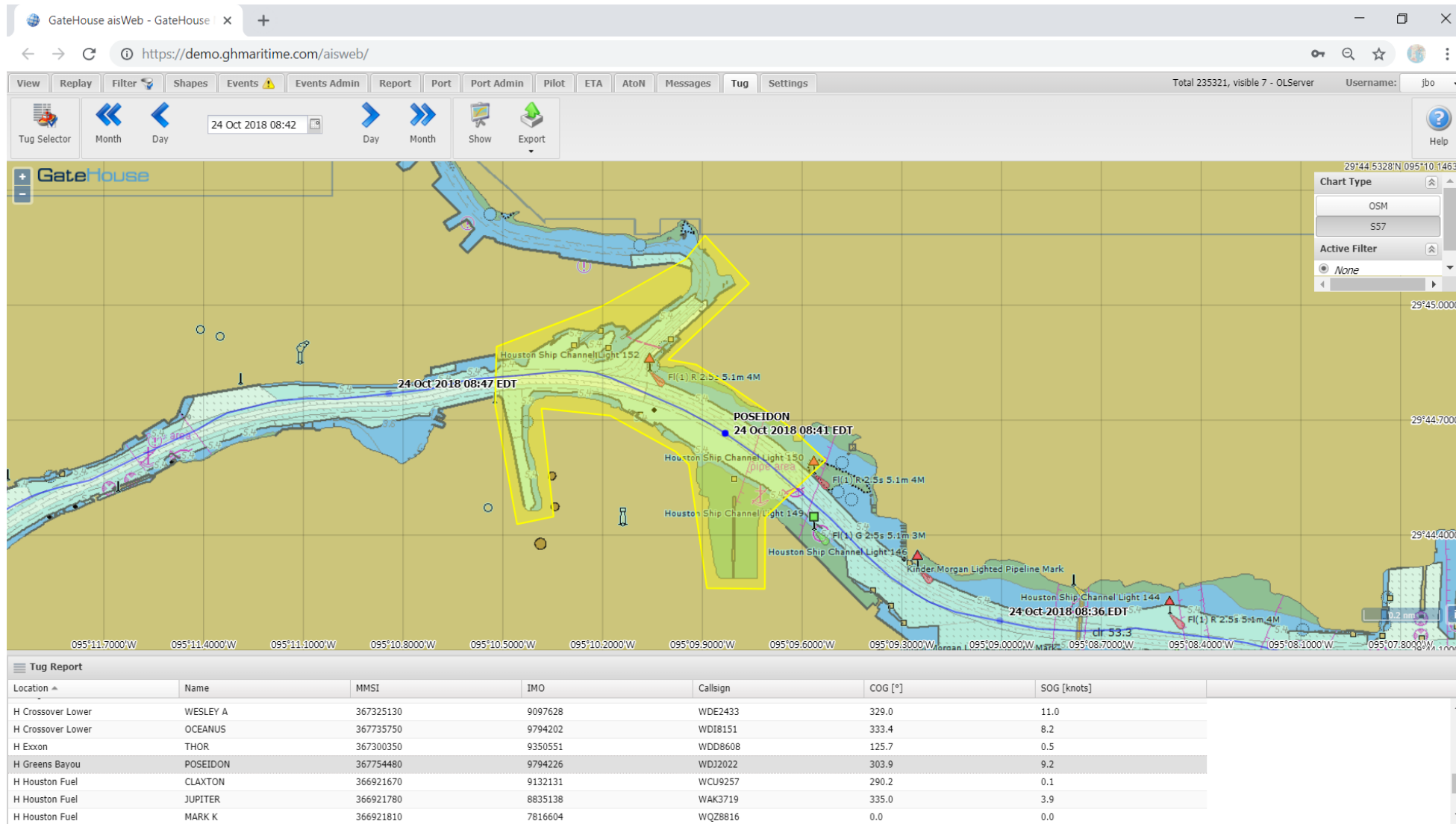
Examples include:

- Historical tracks
- SOG Distribution
- Near miss reports
- Area reports (time spent in areas)



Analytics – Operational Support

Billing



Display of vessel location (associated with billing zone) at specified time.

Analytics – Security

Potential applications include

- Comparison of vessel data against authoritative database
- Identifying “black-listed” vessels approaching port
- Notifications when vessels turn their transponders off
- Monitoring of speed, rate-of-turn, in sensitive or prohibited areas
- Identification of air-gap issues



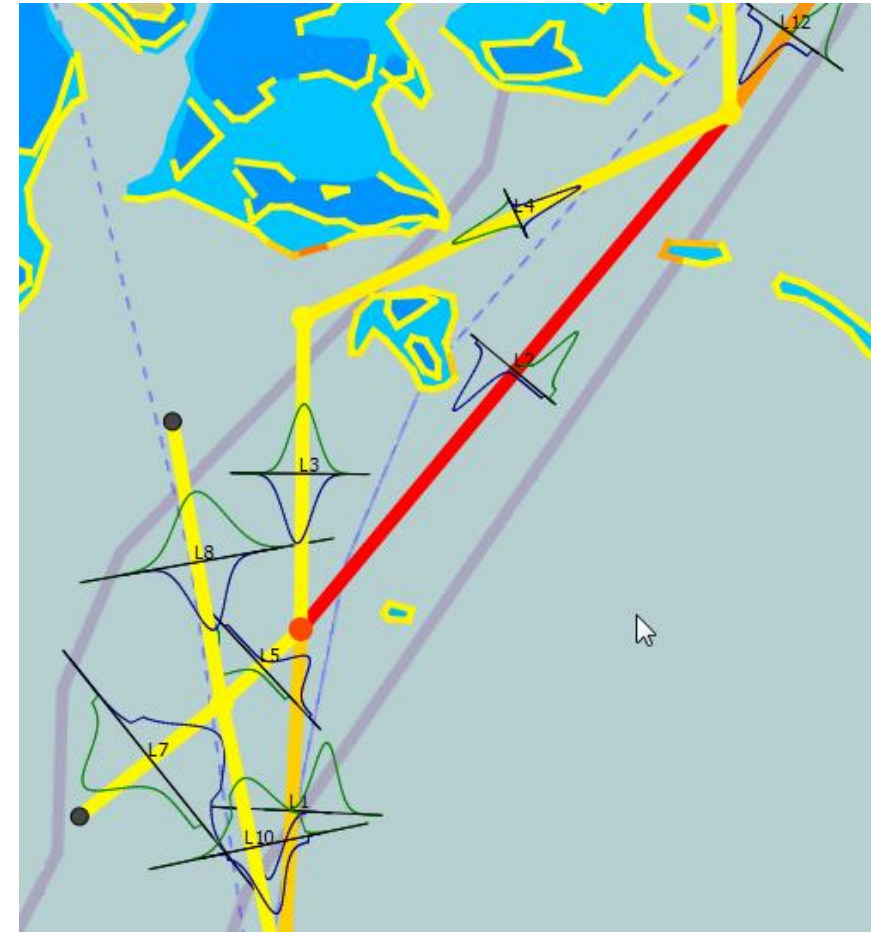
Analytics – Risk Assessment

Tools for estimating the collision, allision and grounding frequencies of shipping routes.

Types of incidents estimated

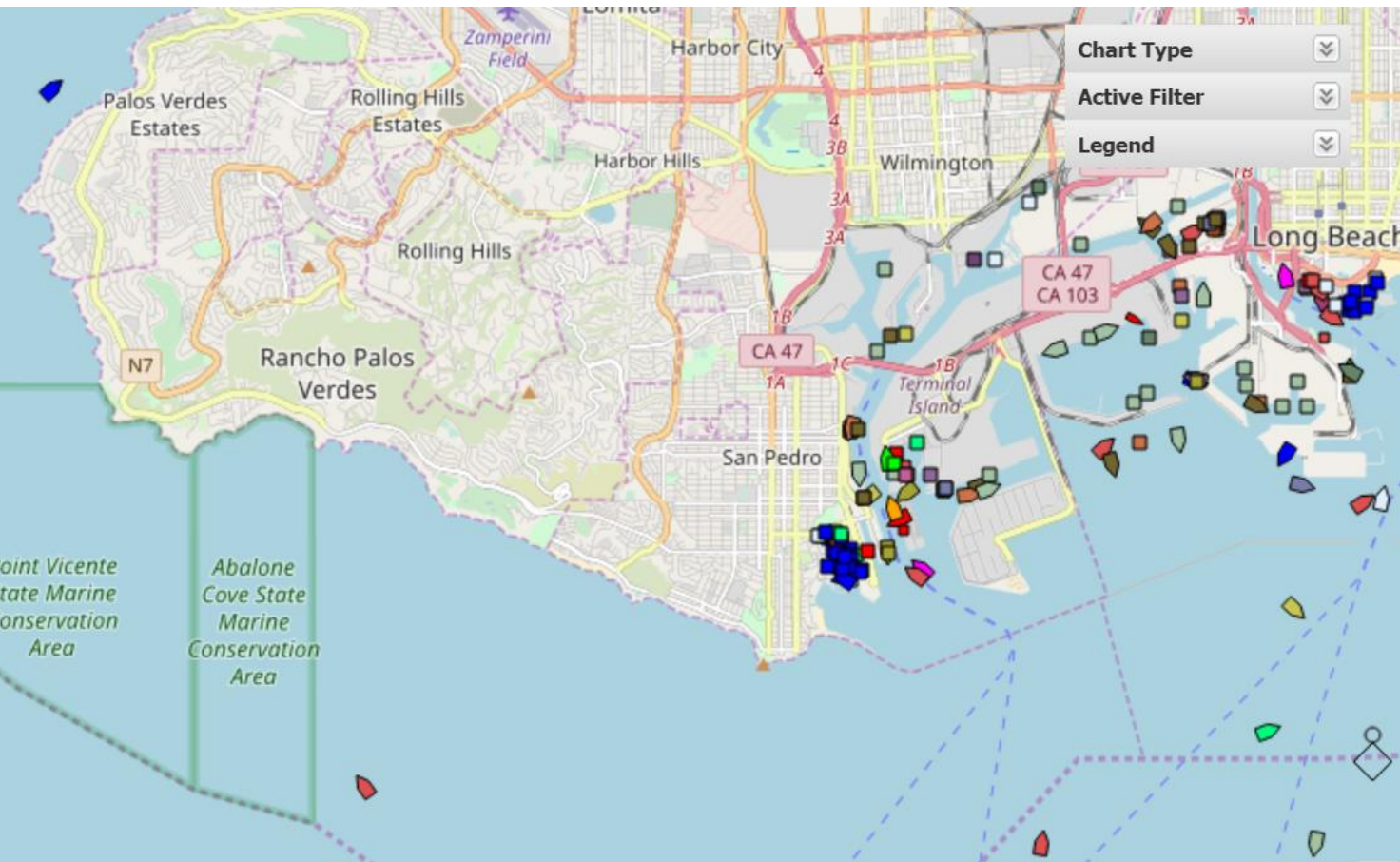
1. Head-on
2. Overtaking collision
3. Crossing, merging & bend collision
4. Area traffic collision (ships not on routes, e.g. fishing)
5. Powered grounding
6. Drifting grounding

Item	Crude oil tanker	Oil products tanker	Chemical tanker	Gas tanker	Container ship
Crude oil tanker	0.000755902	0.000326592	0.000658663	3.7102e-05	0.000559216
Oil products tanker	0.000359288	0.000166267	0.000453952	2.39363e-05	0.000370792
Chemical tanker	0.00117153	0.000626526	0.00164856	0.000107483	0.00173098
Gas tanker	4.21641e-05	2.35578e-05	7.70011e-05	3.55511e-06	5.70441e-05
Container ship	0.00039703	0.000206595	0.000695889	2.89057e-05	0.000387504
General cargo ship	0.000994166	0.000544339	0.00172212	8.96641e-05	0.00134074
Bulk carrier	0.000784025	0.000415358	0.00112078	6.95708e-05	0.00109947



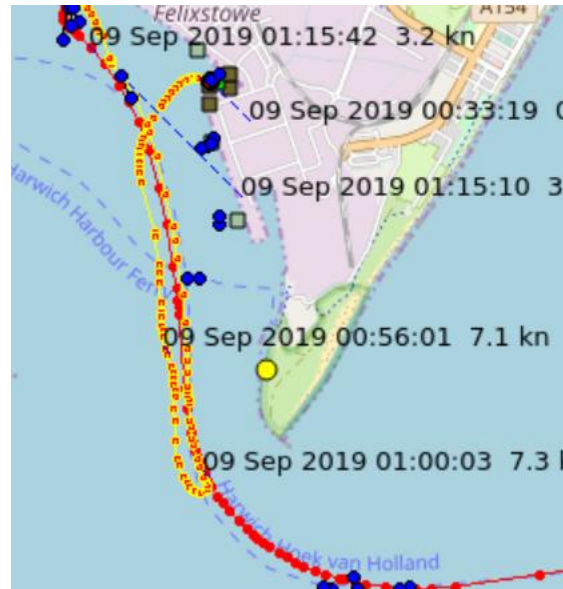
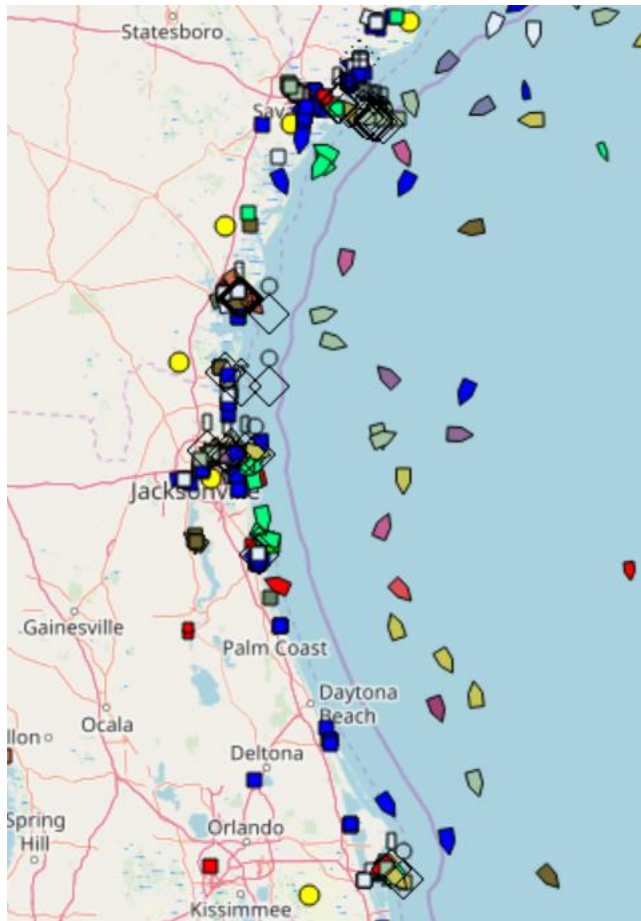
Analytics – Regulatory Compliance

- Monitoring of conservation areas
- Speed restrictions (whales, wakes near environmentally sensitive area)
- Restricted draught
- Emissions
- Operations outside territorial waters



Analytics – Business Development & Sales

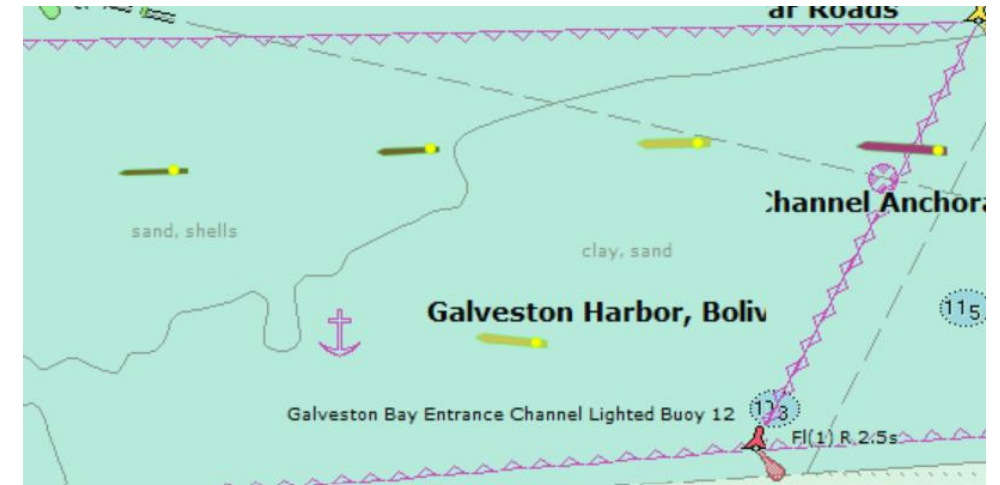
What vessels bypass your port and head to the next port on the coast?



How many tug operations has your competitor completed in the past 30 days?



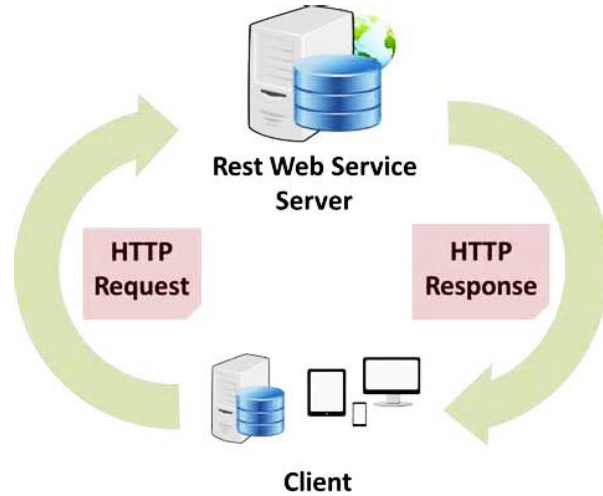
How long are vessels waiting at the sea-buoy or anchorage areas before entering the port?



How long are berths unoccupied?

Integration/Sharing of Data

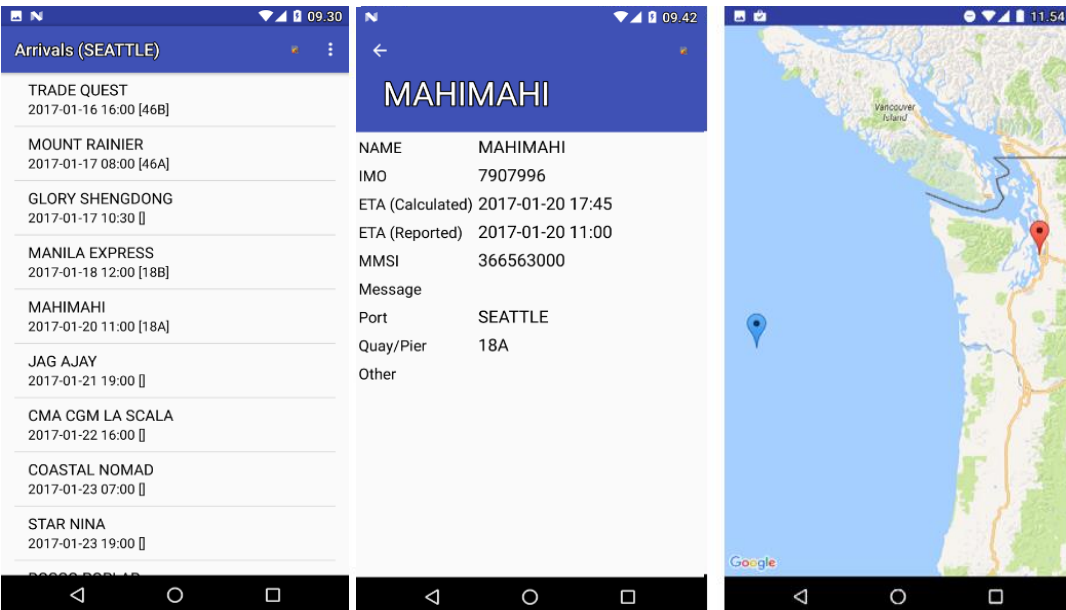
Web services



```
{
  "source": {
    "ship": {
      "imo": 9313917
    }
  },
  "destination": {
    "port": {
      "id": 31560
    }
  },
  "erp" : {
    "warp" : [{ "quay" : [{ "name" : "412"}, {"name" : "414"} ], "starboard" : true, "eta" : "2016-07-10T12:00:00Z" }, "color": "FFFF00"},
    "attributes" : [{"key" : "Require Pilot", "value" : "No"}, {"key" : "Last port", "value" : "Singapore"}]
  }
}
```

Data contained in a proprietary solution has a limited value.

Data and information can be made available via web services (e.g. REST API) to facilitate integration with in-house solutions, partner systems, or to provide a community with operational insight.





Summary

- Large volumes of AIS data are being streamed, collected and are available.
- Live AIS data can automatically support logistics and operations.
- Historical data can be analysed to extract business information.
 - *The value of the information is defined/determined by the client*
 - *Appropriate information drives decision making*
- The information can be incorporated into existing solutions through data services.



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Questions & Discussion

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