



Maritime Data Space

Value creation through data sharing

Fintraffic

The mission of Fintraffic is to ensure safe, smooth and environmentally friendly mobility in Finland by road, by rail, by sea and by air. We help people and things get where they are going, safely, smoothly and with care for the environment

Railway Traffic





- 500,000 trains per year
- 82 million passengers per vear
- Rail network 6,000 km
- 470 professionals



- at 22 airports
- Vantaa)
- 440 professionals

We produce digital services and up-to-date open-source traffic data for operators and end users in the transport ecosystem

Air Navigation Services

Road Traffic

Vessel Traffic Services

- Air traffic control services • 280,000 aircraft movements per year (190,000 at Helsinki-



- Roads carry 90% of passenger transport in Finland
- More than 120 million km driven in vehicles every day
- Road network 78,000 km
- 90 professionals



- Shipping carries 90% of exports and 80% of imports
- 30,000 visits by foreign vessels per year
- 29 ports
- 100 professionals





Fintraffic VTS – what do we do



DIGITALIZATION OF MARITIME LOGISTICS

MARITIME SINGLE WINDOW

PORT AND COASTAL VTS OPERATIONS

eNAVIGATION SERVICES



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| Sensor type | Number of sensors |
|-------------------------|-------------------|
| VHF radio base stations | 80 |
| Radars | 100 |
| AIS base stations | 60 |
| Cameras | 44 |
| DGPS reference stations | 9 |
| Sea level altimeter | 13 |
| Weather stations | 82 |



Slower at sea and faster in port

- Over 90% of Finland's trade is conducted by sea
- Globally Shipping is undergoing a major change, and the pace is historically fast
- Regulatory and customer requirements for low-emission shipping are growing
- The shift to alternative fuels, though necessary, is challenged by their high cost and limited availability
- In Global Shipping, up to 50% 80% of the ship's operating costs already come from bunker
- A better situational awareness, connectivity and the ability to optimize operations are the key to success
- Reduced logistics costs directly impact domestic product prices and are essential for maintaining a competitive edge



Fintraffic as an enabler for information sharing

Intelligent maritime vessel traffic service as part of the logistics chain

Promoting the safety of maritime traffic and the smoothness of maritime logistics by supporting digitalization and enabling the exchange of information between different operators

Taking into account exchange of information between different modes of transport

NEMO system implementation, which operates as a national Maritime Single Window (MSW) service

Fintraffic's Port Activity application functions as a digitalization platform for ports and as an end-user application for merchant vessel time information (time information service) provided by Fintraffic global exports



Development of NEMO system began through conceptualization





Concept story A story set in the future about the different stages of a ship's port call, the benefit achieved by different actors and the value produced.



Data journey Tasks, rights and responsibilities of actors in the concept story, utilization of data in the ecosystem

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UI proto A conceptual prototype of a possible future user experience



Blueprint Summary of the concept story and data journey



creating a port call

ACTIONS

Ship agent • opens the automatically created port call template • confirms the creation of the port call

captain • validates loading plans for import and export freight es information of daneerous ecods

Dynamic timeline

Havu, the ship's agent, follows the ship's dyna.. which Nemo has created, e.g. through machine la. "we the preliminary stages, times and actors of b. "a combination of related events and forecasts ents. A prospect can be created as a data produ. "manic timeline.

VESSEL SERVICE ORDERS The shipping company Nova's Eva and the ship's agent Havu can order maintenance, bunker and ship services for the ship through Nermo. The vessel can add to the dynamic timeline periods of time when deliveries cannot be made, e.g. due to a crew change.

KEY EVENTS • Preliminary port call stages, times and operators on a dynamic timeline • Ordering and scheduling of vessel services

ACTIONS Nemo • uutomatically creates a dynamic timeline, combining completed events and projections of future events if necessary, creates a prospectus by collecting all th necessary information and their current estimates in a simele data croduct

Ship agent • plans and orders vessel services • monitors the dynamic timeline, which shows preliminary port call stages, times and operators

Finnish Dorder Guard • provides information on such inspections by the authorities of which advance notifications are given

Other operators (e.g. port and port operators) monitors the dynamic timeline, which shows preliminary port call stages, times and operators

Port shared situational picture

At the Port of Helsinki, Sami examines all ships from shared situational picture, which allows the operator the port to plan together the services of arrival and described and the services of arrival arrival

The port shared situational picture consists of the following information:

Port traffic information: pilotage, tug services & port area icebreaking, harbour master info Activities of the port operator
 Detailed information about the berths

RECOMMENDED ARRIVAL TIME

error recommends the optimal arrival time for the sh-holds matulas. Just in Time Arrival. Based on this, in ti ort, Sami glaves a proposal for the berth location and 'rival time, which is confirmed by Captain Andre. formation about the arrival time and berth location is nonitided via Nemo to various actors. The optimal an 'ne enables the port and various actors to operate in ve efficient and benefit the environment.

KEY EVENTS Port shared situational picture for all the operators
 Optimal arrival time

ACTIONS Nemo - subonatically creates a port shared situational picture, combining the availability of pictage, towing, port inderwaking, tarlife supervisors and betths and forecasts of future events - commenda an optimal arrival time - comes the confirmed time to the various operators through the user interface

t amines the port shared situational picture ans port entry and exit services 1 the basis of the recommendation, proposes a berth/ the basis of the sharence-it

shipping company • defines ship-specific safe zones using port security

Pliotage - provides a possible time estimate for the start of pliotage Fintraffic/Traficem

• Fintraffic provides AI-based travel time forecasting service

Updating the smart fairway and harbor guidance

The ship's captain, Andre, is offered vessel-specific se fairway- and port guidance, which utilizes the port? elivational olcture. The dynamic fairway informat' Sona picture. The dynamic tarway information servic tists of information about vessels moving on the ay and combines pilotage operational data, weather and an ice chart. Nemo gives the ship all the sarv information about arrival at the Port of Helsinki.

KEY EVENTS - vessel-specific personalised fairway and port guidance with service

Nemo - automatically optimises the ETA based on assessments from different operators and the algorithm - updates the fairway and port guidance with service and provides, for example, more detailed betch information

Captain • makes use of smart fairway and port guidance with service provides an assessment of the ETA

Ship agent • tracks the dynamic timeline and the ETA optimised on the basis of the assessments from different operators Port • updates the berth information and the availability of traffic supervisors

Pilotage, towing and port kellewaiking and port operator • tracks the dynamic timeline and updates the information regarding its own schedule

ship agent - can also handle the vessel's port call in Travemünde - gives Nemo permission to make a binding pilotage order in accordance with the deadlines

KEY EVENTS

ACTIONS

Establishment of trade

Fairway and port guidance with service

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Updating preliminary information and waste management planning

smart fairway and port guidance are updat ne information. The pilotage receives prelim ation from Namo as automatic polifications. ipping company Nova's Eva updates Nemo on the ship iste management needs. Nemo provides instructions o cal waste management practices. The information from e waste advance notification is forwarded to Sami at th rt of Helainki, who is able to plan its operations.

Advance information for pilotage
 Waste management planning and advance waste
 notification information for the port
 Updating of the information on the dynamic timeline

Nemo automatically updates the crew list from the notice of departure of the previous port onto the notice of arrival automatically updates the vessel's movements as it approaches the plot boarding position

Captain
- validates the ETA to the pilot boarding position calculated by Nemo • familiarises themselves with the pliotage plan • provides actual information on waste management needs and environmental needs

Pflotage - monitors the vessel as it approaches the pflot boarding position through the use of automatic updates - provides information on when pflotage is possible

t rough Nemo, follows Pilotage's plan and the actual site and maintenance information provided by the vessel anticipates waste management needs, environmental needs and their management in the port

Shipping company • plans and enters the vessel's waste management needs and environmental needs into Nemo

Havu validates the port call data collected in Nemo. Data editing and validation is easy. The system guides the user to fill in the data according to obligations and regulations. It's easy to send the arrival notification in tim

The fuel supplier, maintenance and waste management follow the arrival of the ship through the port shared situational picture and optimize their own operations based on that. Suppliers are also interested in cargo information and port operator schedules. Suppliers can use Nemo as a communication channel, where they inform the ship about the exact time and estimated duration of e.g. bunkering or waste management

KEY EVENTS - user-friendly editing, validation and sending of notices of arrival ACTIONS

Nemo - send a notification of missing port call information - guides the user in completing the notification in accordance with the obligations and regulations Ship agent - fills in the missing information - automatically validates the collected port call information

Nemo

• generates a binding plictage request order three hours
before arriving at the plictage boarding position Pliotage - receives the binding pliotage request order three hours before arriving at the pliotage boarding position

ACTIONS

Port services

Export cargo is brought to the port before the ship arrives. Captain Andre confirms that Nemo is allowed to send a binding pilotage request.

KEY EVENTS - Binding pilotage request order - The vessel services monitor the port shared situational picture

Port operator - coordinates and schedules the annual of export freight - recailes the freight this the port - handlins the cargo as agreed and prepares the paper rolls on the cassettes so that they are ready to be loaded

Vessel maintenance services - monitor the port shared situational picture and the vessel's dynamic timeline - optimise the timing of their own operations - use Nemo as a communication channel

ship agent - has confirmed the authorisation for the automatic plictage request order

Port traffic shared situational picture

A port traffic shared situational picture including information of pilotage, tag service, port icebreaking is traffic supervisors, from which different actors can set the real-time workflow situation and the preliminary estimate formed by orders and can better optimize theil own operations.

Nemo shows that the ship requires a tug when arriving at the Port of Helsinki. Nemo gives advance information about the requirement, which the ship's agent, Havu, can already acknowledge.

KEY EVENTS

• Port traffic shared situational picture
• Towing need and ordering

ACTIONS ship agent - acknowledges the possible need for towing in advance - confirms the order

Pilotage • If necessary, can suggest ordering towing • monitors the shared situational picture and optimises its own operations

Nemo

Provides advance information on the need for towing Towing and port loobreaking • monitors the port traffic shared situational picture and optimises its own operations

Port operator, wessil maintenance services, port and traffic supervisor - monitors the port traffic shared situational picture and optimises its own operations

Virtual Arrival and change communications

e crane in the port is broken, which increases the

maintenance suppliers and trucking companie to the port will receive potifications about the atments. The timeline shows who has seen the rmation. This way the ship's agent, Havu, can mak e that the information has been received. Supplier come to the port at the correct time, which redu ecessary work for them and optimizes resources.

KEY EVENTS • Virtual Arrival • Transparent change communications

ACTIONS

Pliotage - validates the ETA provided by the captain - remotely pliots the vessel into port

aptain validates a new arrival time proposal

Port operator - conveys the information about the broken crane to other operators through Nemo, as it delays the sche of the operations and the departure of the previous

eft reacts and optimises the logistics of the port area on the basis of the changed ETA maintains the order of arrival of the vessel

p agent onitors that all the necessary parties are aware of the

Arrival at the port of Helsinki

Port
- Automooring generates ATA data
- the traffic supervisors confirms the ATA through

ship agent - has confirmed the utilisation of automooring ATA data in advance - has ascertained the suitability of the ATA determined by the port in relation to the commercial need - acknowings the NOT actus

Shipping company - has assortained the suitability of the ATA determine by the port in relation to the commercial need - verifies that the NOR is correct in thems of the commercial conditions and conforms to the shippin contract of all relightment in its wording

mo utomatic forwarding to Customs on the basis of th ATA notification sends notices of readiness for unloading to the parties to the shipping contract of affreightment; the selier of the cargo and shipping company

• receives the required notifications Captain • marks the NOR status

Customs

uses the unloading report for monitoring

The ship's agent, Haru, has confirmed to Nemo that the *A* can come directly from the automooring system. Haru ha pre-completed the Customs declarations that Nemo sen automatically in the middle of the night based on ATA. Captain Andre gives Nemo a Notice of Readiness, Haru co confirm it Later and Nemo will pass the information on.

KEY EVENTS - Automatic ATA reporting - Notice of Readiness

ACTIONS

Other operators (e.g. vecsel maintenance services, pilotage, towing, port loebreaking) - make use of the port traffic shared situational picture to optimise the port call chan - optimise their own operations for an improved shared result Nemo • sends the buyer of the import cargo a notification of the status of the cargo, e.g. "goods in port", "loaded aboard the vessel", "on sea voyage"

Buyer and seller • receives a notification of the cargo having been unloaded and being on its way to the delivery point

KEY EVENTS Optimizing port calls through the use of shared situational pictures
 Tracking of fraint ACTIONS

Cargo flow optimization

If it is a stand of a

Aronen, the buyer of the cargo, receives notifications that the imported cargo has arrived at the destination port, ha been unloaded from the ship and transported orward.

Port operator • starts loading after having monied a loading permit • uses the cargo plan and loading instructions • updates the information on the progress of the port operation work into the snapshot optimises its own operations for an improved shared

abip agent makes use of the port shared situational picture to monitor the progress of the port call and to optimise the chain uses the unloading report for making the cargo manifest

Integrations with authorities

The systems of the authorities are integrated into Nerno. The ship receives information about official inspections already conducted as well as upcoming official inspections, which are announced in advance.

The toll payment process has been automated and clarified. Nemo provides most of the information needed for toll fares directly. Requests for additional information and the status of decision are displayed in Nemo. Custom confirms the decisions proposed by Nemo.

RECORD OF GARBAGE DISCHARGES AND WASTE RECEIPT The ship's record of garbage discharges is in Nerno, where Trafficorn can check it if necessary. The waste service company issues a waste receipt electronically. Based on these, the shipping company retains the acquired Green Value certificate.

KEY EVENTS Communications regarding inspections by the authorities Electronic record of garbage discharges and waste receipt Automated fairway payment process and status of decision-maker

ACTIONS Feet
- monitors data on disposed waste and grey water
- monitors the dates of possible inspections by the authorities

waste service company - issues an electronic waste receipt for the waste left on board taficom/Nemo If necessary, checks the record of garbage discharges information om Nerno erno enables non-staggered discounts erno collects and combines the necessary information for claion provides a calculator for the advance assessment of

upping company monitors the wasel's waste management and compliance with the Given Value certificate conditions t farway dues r view of the progress of the process and the need for any

Capitaln/vessel crew
- completes/monitors the automatically completed record of garbay es s the dates of possible inspections by the authorities

p agent contors the dates of possible inspections by the authorities in predict fairway dues is a clear view of the progress of the process and the need for any

ms firms the decisions proposed by Nemo municates directly with the ship's agent regarding an tional information access all the necessary information in one place

0000

NEMO AS AN EXABLER sprovides integrations with the system within any calculations and communic-ments of the decision-making process

Optimized departure time

activities of pilotage, tug service, port icebre fic supervisors are described in the port traff

KEY EVENTS - Optimized departure time - Updating the dynamic timeline with departure estimates

ACTIONS Nemo

• updates the port traffic shared situational picture
• updates the vessel's dynamic timeline Pilotage, towing, port loobreaking, traffic supervisors follow the snapshot - optimise their own operations Captain/ship agent - assesses the time required to prepare for departure after loading is completed

Utilization of data products

After departure, Nemo compiles a Statement of Facts data product directly from the system, to which comments can be added before approval and signing.

Reports and statistics can be created automatically fror Nemox data, e.g. related to the key performance indicat of different actors. Traficoms & Bibping Traffic statistics receives high-quality, correct and reliable information. Instead of manual checking and correction, Traficom can focus on producing data products for Statistics Finland and further to Eurostat.

KEY EVENTS Nemo's data to the shipping traffic statistics Making use of the information in Nemo in the form data products for the needs of operators

ACTIONS Shipping company - adds notes and specifications manually if needed - signs the scor on its part, thereby accepting the information therein - receives information into its own system through an interface erface politors that the vessel has remained within the limits of 9 Green Value certificate es the available key figure reports directly from the data tered into Nermo for its own commercial needs

der f necessary, adds notes and specifications manually signs the SOF on its part, thereby accepting the normation therein

Traficom/Neme • Nemo processes a data product from the collected port call information • Nemo conveniently provides the necessary information, for example, for port invicing • The maritime transport statistics get high-quality, accurate and reliable information

essary, adds notes and specifications manually perator cessary, adds notes on the progress of the loading

• rt eceives information on the number of SOF trailers see the relevant data from Nerno as a basis for port fe

All operators - can also make use of the key figure reports for their own operations

ncreasing productivit

KEY EVENTS • Reliable real-time data allow for the optimisation of covertings

ship agent - has time to focus and meet their customers and to visit the vessels - remembers Nemo's development workshop thanks to a calendar reminder

All operators are able to optimise their own operations based on the data can provide benefits to other operators working to improve the common ecosystem

NEMO AS AN ENABLER The snapshot and information trank offind the optimal time of departure

AS AN ENABLER

00000000

NEMO AS AN ENABLER Nemo enables a data ecosystem that makes work more effi all the operators.

Data space for marine traffic and logistics data

Ship port control

- Ship mooring, unmooring and hauling services
- Pilot order
- Tua order
- Harbor icebreaking
- Information on restrictions on port assistance

METOC and port information

- Weather data: Water level, Wind data
- Pier information: minimum length and draft
- Preliminary information on the port: situation and schedule of berths, moorings
- Winter shipping materials (ice charts, etc.)

Crew related services

Crew transportation Time information services for various Crew changes (customs) events: VTS area, pilot station, pier, etc. Crew accommodation services Announcements of registration numbers of Catering orders future cars Health testing and COVID testing Making a maritime health declaration Comprehensive crew lists for authorities (PTR) FAL Supplementing passenger and crew information with shipping company information Commodities and waste Passenger related services Water sales Passenger transport Subscription for assisted passenger (disabled) Waste collection or receipt Bunker order assistance service Shore power Health testing and COVID testing

- Desired lead time window related to ship deliveries
- Continuous transmission of realtime vessel time data (intelligent FFA times)
- Port-specific ISPS formalities
- driving licenses, security regulations, route signs, port maps
- Transmission of unloading time information to all ro-ro units

Ship operation services

Maintenance - related services

Ship security services, eq law

Orders for various inspections

Icebreaking assistance plans

restrictions for VA cargoes

Receipt of dangerous goods

Time of service deliveries

Billing services for paid services

Various reporting services (waste, security

Preliminary inquiries and instructions /

Up-to-date ship depth information

Sanitation inspection order

enforcement

screening)

- From land to sea: land consignment note (eFTI) linked to the cargo unit in question Messaging service between the land freight side and the shipping companies
- Port billing information freight
- charge discounts, congestion charges, etc. information needs Comprehensive (more accurate) cargo, ie cargo manifest
- information for Customs

Transmission of ship and cargo information to port operators

- (currently only for trailers) Ro-ro traffic: a standard databas for ship traffic for professional
- traffic

Value-added services for land logistics operators

- Real-time scheduling information related to the arrival of the vessel for land transport operators
- Traffic light rhythm and traffic control solutions
- Maps and routes of the port area compiled for land transport operators
- Preliminary information on traffic disruptions and estimated additional time, eq by SMS message
- Route guidance optimized for conditions for freight traffic
- Land cargo tracking data to port: time of arrival of cargo or unloading equipment
- Cargo tracking solution in port: the time

General information services and functionalities

- Interfaces to historical data
- Communication services between actors
- Alarm function related to NEMO data
- Age of assessment data and providing authority
- Wolt-like service for goods obtained from outside the port
- Automation of bus charges

Maritime Data Space

Data Spaces Start-up Checklist

Business

- How does the data space create value?
- Who are the active stakeholders or participants of the data space?
- What is the business and governance model of the data space?
- What are the individual and collaborative business models (Incentives) for actors in the data space?

Legal

- What legal aspects are relevant to navigate when setting up a data space?
- What are the legal requirements and challenges?
- What are the legal dimensions of data governance?
- How can data spaces ensure the full uptake of EU values?
- Operational
- What is the operational governance framework for the data space?
- What day-to-day activities and processes are essential for sustaining a data space?
- Functional
- What core functionality should a data space offer?
- What are the essential building blocks that make up each functionality?
- Technical
- What are the formal and de-facto standards that should be followed when deploying a data space?
- What software requirement specifications to use as references when implementing a data space?
- Which open source software implementations are compliant with the recommended standards and specifications?

DATA SPACES SUPPORT CENTRE

| Data Space operator | Just-in-Time arrivals Optimizing the arrival and departure times in | Virtual port arrival Agree vessel line-up and schedule port | |
|------------------------|---|--|-----------------------|
| Fintraffic | predictive analysis. | focused collaboration and information sharing among stakeholders. | gaia-x |
| | Business case: Reduce time at port Optimise fuel consumption | | |
| | 🔗 awake.ai | SIILI. | Data space Partner |
| | ES Tankers | ESL Shipping | Shipping company |
| | BOREALIS | SSAB ((() YARA | Cargo owner |
| | | Oxelösunds Hamn AB | Port |
| | | RAAHEN SATAMA | |

The four technology pillars of a dataspace

- A dataspace is a way for organizations to securely share with other participants
- Dataspaces are built on identity, truest, policy and interoperability

Each participant remains in control of their identity Each participant decides who to trust

Each participant decides under what policies data is shared Each participant remains in control of their infrastructure

Data Space Basic Flow

| | Data Owner | Legal entity or natu |
|--------------------------|-------------------------|---|
| ICIPANT | Data Provider | Data Provider mak Data Owner, but n |
| RE PARTI | Data Consumer | A participant that rec |
| 00 | Data User | Similar to the Data data of a Data Owr |
| | App Provider | App Providers deve |
| | Broker Service Provider | Stores and manage |
| RMEDIARY | Clearing House | Provides clearing a these activities are |
| | Identity Provider | Service to create, n operation of the D |
| INTE | App Store Provider | The App Store prov participant to join t |
| | Vocabulary Provider | Manages and offer |
| WARE / RVICE VIDER | Service Provider | lf a participant doe available to a Servi |
| SOFT SEI PRO | Software Provider | Provides software delivered over the |
| ERNANCE ODY | Certification Body | The Certification Body These Governance Bo the actions and decisi |
| GOVE | Evaluation Facilities | |

kes data available for being exchanged between a Data Owner and a Data Consumer. Data Provider is in most cases identical with the not necessarily.

ceives data from a Data Provider, in the form of a Data Product. The data is used for query, analysis, reporting or any other data processing.

a Owner being the legal entity that has the legal control over its data, the Data User is the legal entity that has the legal right to use the mer as specified by the usage policy. In most cases, the Data User is identical with the Data Consumer.

velop Data Apps to be used in the Data Spaces. To be deployable, a Data App has to be compliant with the system architecture

ges information about the data sources available in the Data Spaces (metadata repository)

and settlement services for all financial and data exchange transactions. Clearing activities are separated from broker services, since e technically different from maintaining a metadata repository

maintain, manage, monitor, and validate identity information of and for participants in the Data Spaces. This is imperative for secure Data Spaces and to avoid unauthorized access to data.

ovides Data Apps. These are applications that can be deployed inside the Connector, the core technical component required for a the Data Spaces. Data Apps facilitate data processing workflows.

rs vocabularies (i.e., ontologies, reference data models) that can be used to annotate and describe datasets

es not deploy the technical infrastructure required for participation in the Data Spaces itself, it may transfer the data to be made vice Provider hosting the required infrastructure for other organizations

for implementing the functionality required by the Data Spaces. Unlike Data Apps, software is not provided by the App Store, but Software Providers' usual distribution channels

dy, together with selected Evaluation Facilities, is in charge of the certification of the participants and the core technical components in the Data Spaces. Nodies make sure that only compliant organizations are granted access to the trusted business ecosystem. In this process, the Certification Body supervises sions of the Evaluation Facilities.

One size does not fit all

The EDC Connector is divided into two subsystems, a control plane and data plane

Control Plane and Data Plane

Control Plane

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- Verification
- Contract negotiation
- Policy enforcement
- Provisioning

Moves bits

- Big Data
- Streaming
- Events

• Utilize Data Plane technology that best meets the requirements

Value potential

Maritime Logistics value chain currently compensates individual parties for inefficiencies resulting in costs and CO2 emissions that could be avoided with more accurate value chain wide scheduling capabilities. Maritime Data Space could act as an overall "benefit broker" using its data capabilities to optimize overall costs and emissions across the different stakeholders.

Just In Time (JIT) & Virtual Port Arrival (VPA) value mapping

How value is created?

Understanding the value drivers that drive shareholder value creation.

What can you do?

What are the levers that are available to you to positively impact the value drivers?

Change what you do!

Use the available Data enablers to change what you do?

Revenue Growth

Acquire New Customers

Retain / Grow Current Customers

Monetize Data Assets

Optimize Revenue

Innovate New Data-Enabled Service

Optimize Revenue Across the Value Ch

A "benefit broker" type of a new service could create new revenue streams bas on its ability to create value to all stakeholders and improve the overall competitiveness of maritime logistics.

Do what you do, but better!

Use the available Data enablers to do what you already do, but better. Increase Volume via Optimization

The overall cost efficiency improvement maritime logistics will make the overall services more cost competitive across to value chain helping increase volume.

Maritime Value Creation

| | Operating Margin | Asset Efficiency | Future Expectations |
|------|--|---|--|
| | Improve Customer Efficiency | Increase Fixed Asset Utilization | Improve Strategic Positioning |
| | Improve Vessel Efficiency | Improve Inventory Efficiency | Improve Corporate Governance |
| | Improve Port Efficiency | Improve Payables / Receivables | Improve Performance Mgmt |
| | Improve Value Chain Efficiency | Reduce Other Working Capital | Leverage Future Expectations |
| | Reduce Fuel Consumption | Optimize Cross-Mode Logistics Speed | Increase Data Sharing |
| in , | Introduce SeiLin/Sei | Optimize Cross-Mode Logistics Energy | Apply Shared Data Standards & Rulebook |
| | Reduced fuel consumption is a key cost efficiency driver for overall maritime | Optimize Cross-Mode Logistics Revenue | Market-Enable Data Monetization |
| יך | logistics value chain. | Optimize Vessel Size & Payload | Market-Enable CO2 Emissions |
| | Implement New Port Energy Solutions | Improved accuracy will help reduce | Reduce Data-Related Risks |
| | Improved accuracy will help drive multiple cost & emission efficiencies. | downtime and drive increased asset utilization rates across the maritime logistics value chain. | Use Insights to Reduce Strategic Risks |
| | Optimize Port Operations | Reduce Unplanned Downtime | Improve Regulatory Compliance |
| 51 | Optimize Voyage Speed | Increase Overall Asset Utilization Rates | |
| f | Optimize Sail-In/Sail-Out Timing | Improve Inventory Turnover Speed | |
| 2 | Improve Arrival / Departure Accuracy | Reduce Working Capital | |
| _) | Reduce CO2 Emissions | | Improved accuracy will help drive |
| | Optimize Port Feed-In/Out Logistics | | positive sustainability impact across the maritime logistics value chain. |
| | Increase Health & Safety | | |

Overall Positive Sustainability Impact

IT Case: Identified value potentia Data Enablers

Situational awareness Shared situational awareness and dictions through user interface and APIs. Planned leg schedules Global vessel location and metadata (terrestrial & satellite AIS) Data Elements Global port location and route prediction models / Models Vessel bunker consumption data (total consumption + consumption vs leg average draught and speed estimates)

Identified data requirements

JIT Case: Identified value potential

Virtual Arrival

Virtual Arrival as a Method to Cut Down Bunker Consumption

Bunker consumption with and without Virtual Arrival based on last 5 legs utilizing VA

| nout VA | With VA | Difference |
|---------|---------|------------|
| 00 % | 82 % | 18 % |

Credits: ESL Shippi

What next?

Thank you

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