Embracing AI-Powered Collaborative Intelligence

IAPH Sustainability Award Submission 2024

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Port of Montréal and GSTS Collaboration

4+ years of successful collaboration and partnership

Multiple industry initiatives resulting in several capabilities

Results from Digitization Projects

- **ETA Prediction** – accurately predict ETA of all vessels arriving at port up to 28 days in advance
- **Intelligent Geofences** – automatically receive alerts and updated ETA predictions when ships cross pre-defined checkpoints
- **Ice Management** – predict harsh ice conditions up to 7 days in advance
- **GHG Emissions Calculator** – calculate carbon footprint within port boundaries
- **Digitized Trade Routes** – tabulate emissions for all vessels globally; report on vessel voyages between two or more ports where Green Shipping Corridors are established
- **PMIS System Integration** – integrate ETA Predictions
Current Digitization Initiatives and Innovation Opportunities

• World's First AI-Powered Predictive Collaborative Berth Scheduler

• Supporting Port Operations
  • Daily operations
  • Monthly planning
  • Long term planning

• Supporting collaboration with stakeholders
  • Pilotage
  • Tug Companies
  • Terminal Operators
  • Shipping Lines
  • Government Agencies
OCIANA™ incorporates the latest developments in **Artificial Intelligence** and **Big Data Analytics** to improve maritime situational awareness and provide real-time decision-making intelligence.

**Multi-Source Data Analytics**
- Designed to ingest a **wide range of data sources** including global AIS data, an array of satellite data, and weather data; OCIANA also ingests IoT data
- OCIANA spatially and temporally correlates the data and employs **AI algorithms**
- Output from the AI/ML trained models can be accessed through the **web-based application or API**
  -- Integration with existing systems (e.g., PMIS, shore-based coordination platforms)

**Partner Communication**
- An embedded communications channel enables **multiple users to share information** in real time
- Advanced **chat and collaboration tools** to facilitate coordinated response -- adherence to digitization standards
Enabling Digital Planning and Operational Optimization

To allow ports, pilotage, and shipping lines real-time data exchange

Facilitating JIT Arrivals aimed at:

- minimizing time at anchorage and therefore reducing congestion in the port area
- enabling ships to optimise steaming speed, thereby lowering fuel consumption, and reducing emissions
Connect all stakeholder involved in the port call process via a common platform, OCIANA to:

• receive more accurate information in real-time on vessel movements and vessel berthing delays
• enhance planning and coordination as it pertains to the maritime supply chain
• provide decision-making intelligence for dynamic environments
• support route optimization for shipping lines
Incoming Vessels Screen
Leveraging OCIANA’s ETA Prediction and Intelligent Geofences
In the Harbour Screen
Leveraging OCIANA's Port Analytics
## Schedule Entries Screen

### Leveraging OCIANA’s Liner Service Automation

### Schedule Entries Screen

#### OCIANA

<table>
<thead>
<tr>
<th>Service</th>
<th>Port of Call</th>
<th>Vessel Name</th>
<th>Schedule Date</th>
<th>Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example Service</td>
<td>Port A</td>
<td>Vessel A</td>
<td>2023-06-15</td>
<td>08:00</td>
<td>02:00</td>
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<tr>
<td>Example Service</td>
<td>Port B</td>
<td>Vessel B</td>
<td>2023-06-16</td>
<td>12:00</td>
<td>03:00</td>
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</table>

#### Properties Table

<table>
<thead>
<tr>
<th>Service</th>
<th>Port of Call</th>
<th>Vessel Name</th>
<th>Schedule Date</th>
<th>Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example Service</td>
<td>Port C</td>
<td>Vessel C</td>
<td>2023-06-17</td>
<td>16:00</td>
<td>04:00</td>
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<tr>
<td>Example Service</td>
<td>Port D</td>
<td>Vessel D</td>
<td>2023-06-18</td>
<td>09:00</td>
<td>05:00</td>
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</table>

#### External Request

<table>
<thead>
<tr>
<th>Service</th>
<th>Port of Call</th>
<th>Vessel Name</th>
<th>Schedule Date</th>
<th>Time</th>
<th>Duration</th>
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</thead>
<tbody>
<tr>
<td>Example Service</td>
<td>Port E</td>
<td>Vessel E</td>
<td>2023-06-19</td>
<td>11:00</td>
<td>03:00</td>
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<tr>
<td>Example Service</td>
<td>Port F</td>
<td>Vessel F</td>
<td>2023-06-20</td>
<td>14:00</td>
<td>02:00</td>
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</table>

#### Summary Request

<table>
<thead>
<tr>
<th>Service</th>
<th>Port of Call</th>
<th>Vessel Name</th>
<th>Schedule Date</th>
<th>Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example Service</td>
<td>Port G</td>
<td>Vessel G</td>
<td>2023-06-21</td>
<td>07:00</td>
<td>01:00</td>
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<tr>
<td>Example Service</td>
<td>Port H</td>
<td>Vessel H</td>
<td>2023-06-22</td>
<td>10:00</td>
<td>02:00</td>
</tr>
</tbody>
</table>

#### Planned

<table>
<thead>
<tr>
<th>Service</th>
<th>Port of Call</th>
<th>Vessel Name</th>
<th>Schedule Date</th>
<th>Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example Service</td>
<td>Port I</td>
<td>Vessel I</td>
<td>2023-06-23</td>
<td>13:00</td>
<td>04:00</td>
</tr>
<tr>
<td>Example Service</td>
<td>Port J</td>
<td>Vessel J</td>
<td>2023-06-24</td>
<td>16:00</td>
<td>03:00</td>
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</table>

#### Actual

<table>
<thead>
<tr>
<th>Service</th>
<th>Port of Call</th>
<th>Vessel Name</th>
<th>Schedule Date</th>
<th>Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example Service</td>
<td>Port K</td>
<td>Vessel K</td>
<td>2023-06-25</td>
<td>19:00</td>
<td>02:00</td>
</tr>
<tr>
<td>Example Service</td>
<td>Port L</td>
<td>Vessel L</td>
<td>2023-06-26</td>
<td>01:00</td>
<td>01:00</td>
</tr>
</tbody>
</table>
Gantt Chart View of the Collaborative Berth Schedule
Leveraging OCIANA’s Predictive Analytics

- Display Pre-Arrival Notification (ePAN) and ship ETA
- Allow shipping lines to submit initial requests and port to confirm berth availability
- Enable collaboration with terminal operators, pilotages and tug operators
- Streamline communications for change requests and confirmation for revised BTW – eliminate calls and emails
OCIANA: Select Use Case Analysis
Lock Scheduling First In First Out

- Two vessels are travelling towards Wellend Canal where FIFO is used
- FIFO causes the incentive for vessels to "race" which burns more fuel
- This case shows Vessel 2 travelling 13.4 knots overtaking Vessel 1 to get to the lock first. Vessel 1 still had to wait 1 hour to go through.
## Lock Scheduling Analysis

<table>
<thead>
<tr>
<th></th>
<th>Lock Scheduling FIFO</th>
<th>Lock Scheduling with OCIANA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed</strong></td>
<td>13.4 Knots</td>
<td>11 Knots</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>5.4 hours</td>
<td>6.6 hours</td>
</tr>
<tr>
<td><strong>Time Difference</strong></td>
<td></td>
<td>1.2 hours</td>
</tr>
<tr>
<td><strong>Total Fuel Consumption</strong></td>
<td>5.65 MT</td>
<td>4.79 MT</td>
</tr>
<tr>
<td><strong>Cost of Fuel</strong></td>
<td>$7,346</td>
<td>$6,227</td>
</tr>
<tr>
<td><strong>Net Profit</strong>*</td>
<td></td>
<td>$1,119</td>
</tr>
</tbody>
</table>
With no confirmed Berthing Time Window, a vessel may rush to anchor to make sure they get the next available slot.

This cases shows wait time at anchor for this vessel was over 28 hrs with the current berth occupied.
## Berth Scheduling Analysis: St. Lawrence Seaway

<table>
<thead>
<tr>
<th></th>
<th>Berth Scheduling FIFO</th>
<th>Berth Scheduling with OCIANA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed</strong></td>
<td>10.6 Knots</td>
<td>9 Knots</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>33 hours</td>
<td>38 hours</td>
</tr>
<tr>
<td><strong>Anchorage Time</strong></td>
<td>28 hours</td>
<td>25 hours</td>
</tr>
<tr>
<td><strong>Demurrage Fees</strong></td>
<td>$15,166</td>
<td>$13,541</td>
</tr>
<tr>
<td><strong>Total Fuel Consumption</strong></td>
<td>34.5 MT</td>
<td>-$1,625</td>
</tr>
<tr>
<td><strong>Cost of Fuel</strong></td>
<td>$44,850</td>
<td>$7,800</td>
</tr>
<tr>
<td><strong>Net Profit</strong>*</td>
<td>$6,175</td>
<td></td>
</tr>
</tbody>
</table>

*Net Profit can extend if speed is reduced prior to entry to the St. Lawrence Seaway.

**Net Profit if extended to JIT for Trans-Atlantic Voyage**: $38,000
Berth Scheduling First In First Out: Trans-Atlantic Voyage

• With no confirmed Berthing Time Window, a vessel may rush to anchor to make sure they get the next available slot.

• This case shows wait time at anchor for this vessel was over 28 hrs with the current berth occupied.
## Berth Scheduling Analysis: Trans-Atlantic Voyage

<table>
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<tr>
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<th>Berth Scheduling FIFO</th>
<th>Berth Scheduling with OCIANA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>13.5 Knots</td>
<td>12.7 Knots</td>
</tr>
<tr>
<td>Duration</td>
<td>440 hours</td>
<td>468 hours</td>
</tr>
<tr>
<td>Anchorage Time</td>
<td>28 hours</td>
<td>0 hours</td>
</tr>
<tr>
<td>Demurrage Fees</td>
<td>$15K</td>
<td>-$15,000</td>
</tr>
<tr>
<td>Total Fuel Consumption</td>
<td>605 MT</td>
<td>542 MT</td>
</tr>
<tr>
<td>Cost of Fuel</td>
<td>$544K</td>
<td>+$53,000</td>
</tr>
<tr>
<td><strong>Net Profit</strong></td>
<td><strong>$38,000</strong></td>
<td></td>
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</tbody>
</table>
Continued industry collaboration and development of the Collaborative Berth Scheduler

• Leveraging Canada's Ocean Supercluster project
• Bringing together more maritime stakeholders globally
  • Ports
  • Pilotage Authorities
  • Waterways Management Authorities
  • Ship Operators

Digitization Ambitions

• Maritime Single Window
• Expanding into landside operations to enhance coordination in shipping
Enhanced Maritime Collaboration Platform

- Ships
- Terminals
- Environmental and Fisheries Agencies
- Exporters
- Forwarder
- Security Agencies
- Ports
- Pilots
- Truck
- Rail
- Vessel Data
- Cargo Data
- Weather Data
- Emissions Data
- Compliance Data
- Protected Species Data

Data Analysis and Intelligence

OCIANA™

Validated data
Key Takeaways

Collaboration and Communication

- **Multi agency** collaboration -- bringing together agencies operating in separate locations
- **Improved transit times** for ships
- **Reduction of delays** to maritime stakeholders
- **Reduced fuel consumption** and inherent reduction of GHG
- **Human resource schedule optimization** through enhanced coordination
- **Optimization of berth occupancy**
- **Support day-to-day** planning for Harbour Masters