Artificial Intelligence helps Shipping become even SMARTER & more EFFICIENT

By Mike Konstantinidis
CEO METIS Cybertechnology

mike@metis.tech
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1 Introduction

For the global maritime industry, in the past there was a considerable delay in adopting modern technologies due to several deficiencies, particularly in the communications field.

Today, more than ever, all the conditions are ideal for the successful implementation of Information Intelligence to address the specific requirements of Global Maritime. The employment of advanced technologies and techniques is a necessity to enable data driven decision making, better predictions and faster diagnostics, reducing the risk of failures, accidents and ensuring compliance to environmental regulations.

2 METIS Platform

METIS changes the typical data-flow at Maritime Companies. The system becomes with us vessel centric, securing the reliability of data and the direct access of proper stakeholders at the right time, based on their responsibilities and authorization levels, avoiding delays and interference.

![Figure 1 - METIS Data Flow](image)

Artificial Intelligence helps systems establish direct communication with people, in a natural, human-like way. We created virtual assistants which take over specific, complicated and time-consuming tasks, optimizing and simplifying the operations at a minimum cost, working restlessly 365 days/24 hours/7 days. METIS provides a collaboration platform between machines and humans aiming to optimize work procedures.

At METIS, Artificial Intelligence is implemented by software elements called Analysis Agents. Each METIS Agent is specialized in a definite and specific field like Weather Analysis, Hull Fouling, FO Consumption, Energy Analysis, M/E Efficiency, Electrical Power Monitoring, etc. Each METIS Agent is specialized and capable to detect significant events, calculate Key Performance Indicators, make complex prognostics and diagnostics and propose corrections to achieve the desired optimum performance. Moreover, METIS Agents have the
intelligence to select the best data source from the available alternative sources by evaluating the current conditions. Data sources can be

- Manual inputs by the personnel
- External information providers (for example, Weather data)
- Real-time monitoring systems

Additionally, optionally but not necessarily, METIS provides the solution for real-time monitoring based on a wireless network of smart collectors to secure the reliability of the data and the proper information for a sustainable and powerful analysis system. METIS Agents communicate with the personnel of the Maritime Company and the crew through the collaboration platform used in each Maritime company. **METIS interacts with the users** through the same channels, like virtual colleagues-assistants, exchanging text messages in plain English, restlessly Watching, occasionally but timely Alerting and promptly Answering questions and Responding to requests.

**FIGURE 2 – METIS AGENTS (VIRTUAL ASSISTANTS)**
In other words, the shipping company can “hire” METIS Agents for optimizing its operations, increasing the efficiency of the company, improving productivity and securing operational safety.

METIS Agents is adaptable to the procedures of each company.

The customer sets:

- the Rules and the Criteria for any event detection
- the Reporting Format and period
- the Communication Channels i.e. e-mail, Skype, Yammer, SharePoint, Teams or other collaboration tools
- the KPIs needed.

Each METIS Agent knows to whom an information must be sent to, in which way to communicate with the recipient and when is the proper time to do it (based on the events’ priority ranking).

METIS Agent respect the employees’ work-flow and function discreetly.

The role of the METIS platform is to support the personnel in their scope of work.
2.1 METIS Data Flow

METIS is an aggregation of smart devices and cloud based microservices. The smart devices GET, FETCH and CLEAN the data from any equipment, instrument and sensor on board the vessels and transmit them to the METIS Cyberspace where the microservices implement all the functionality of the Analysis Agents and the interoperability with third party systems to get additional data or share the results of the analysis. The users interact with the system through well-established channels like e-mails, Skype, Yammer, Sharepoints, Teams and other collaboration tools.

METIS encapsulate three major services to the Maritime Company, the Data Acquisition, the Qualitative Analysis and the Quantitative Information for further investigation on critical aspects.

2.1.1 Data Acquisition

The scope of the Data Acquisition system is to GET, FETCH, CLEAN and STORE any measurements directly from the onboard equipment and sensors and even from the crew.

- Get data from any equipment, sensor and instrument.
- Fetch data with different format, modulation, accuracy and time stamp.
- Keep only the valuable data.
- Store and secure them for very long period.

METIS is designed according to the Maritime standards and fulfills any issues for data acquisition on board the vessels like:
• Diversity of equipment makers and data sources
• Significant Low Installation Cost and Time
• Cyber threads
• High demands in data storage capacity
• Maintainability of monitoring equipment

The current level of the equipment interconnection on board is very low. A major issue for any Analysis system is the Information Fusion in a system with a lot of devices with heterogeneous interfaces. METIS implements a solution to this problem based on Wireless Networks and Smart Devices. METIS WIC (Wireless Intelligent Collector) is a smart device with enough processing power to collect and analyze analog and digital signals and transmits the results through a mesh robust wireless network. The general architecture of the system on board is depicted in the follow diagram.

WIC Device

WIC (Wireless Intelligent Collector) is a smart device with enough processing power to collect and analyze analog and digital signals and transmits the results through a mesh robust wireless network. The embedded processing engine of the WIC prototype is programmable to support different operations such as the pre-processing of the data, the generation of synthetic data for real use case simulation, the logging of QoS parameters. These operations are embedded in the smart devices and will enable local intelligence of the system for reliable and robust communication of data. The WIC device estimates the signals’ features that are required for the further analysis without transmitting all the raw data to the backend system.
2.1.2 Qualitative Analysis

None of the available systems on the market offer extensive qualitative analysis. METIS brings a revolution in this through the Analysis Agents.

The scope is to offer to each stakeholder of the Maritime company Virtual Personal Assistants to support daily work tasks.

Each METIS Agent performs a definite task that serves a specific purpose. This purpose can be:

- The investigation of an abnormal vessel’s operation behavior
- The prediction of a future vessel’s operation behavior
- The prediction of a future effect of an external factor on the vessel’s operation
- The alert regarding an abnormal vessel’s operation behavior
- The alert regarding the influence of an external factor in the vessel’s operation
- The notification regarding the change of the vessel’s operation
- The scheduling of maintenance operations
- The planning of vessel operations and voyages
- The monitor of vessel operations
- The analysis of vessel operations
- The optimization of vessel operations and performance
2.1.3 Quantitative Analysis

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In cases that further analysis is required to make a diagnosis or take a decision, METIS provides the required data homogenized, synchronized, filtered, and in the proper format to make the further data handling easy through any reporting and analysis tool like Tableau, Power BI, MATLAB etc.

3 Conclusions

"The benefits of the METIS solution in terms of the potential reduction in operational expenses could have a significant impact on the financial performance/bottom line of a Maritime Company." METIS solution, affects all company's activities and departments. The implementation of our system inside a Maritime Company gives the ability to the management team to quantify the additional costs that could be reduced, to understand the causes of these costs and to take proper actions to reduce them.

METIS brings, significant added-value on minimizing effort of Reporting Procedures and Claims Handling, assisting on Damages Prevention and optimizing Fuel Oil Consumption.

METIS has the intelligence to offer the right information to the right person, in the right way at the right time to estimate, understand and reduce any additional costs concerning the vessels' operation and management.

On top of those, METIS strongly improves Collaboration of onshore and onboard workforce. The unique and revolutionary METIS' human-like interface makes the system itself easy to use even from Day 1. People interact with METIS like they do with each other! Sending and receiving messages occasionally, with proper attachments, understanding and instantly replying to questions and requests.

METIS helps on maximizing Time Charter Equivalent Revenues (TCER). METIS constantly monitors and analyses the data from the vessels, 24 hours / 7 days/ 365 days a year, as opposed to taking unstructured or fragmented feedback i.e. a daily noon report or fragmentary manual indications. Maritime companies lacking the ability to monitor (and therefore analyse) basic real-time data of their fleet performance, apparently lack the knowledge of whether it is being well, satisfactorily or badly operated! Since they do not have proper visibility, they cannot control it, consequently.

Maximizing Profitability is about using minimum resources for ensuring maximum efficiency of engines, optimizing routes, improving cost-effective operation of equipment onboard and of course, minimizing fuel consumption.
4 The company

METIS CYBERSPACE TECHNOLOGY SA is an innovative company specialized in the field of IoT and Cloud Computing adapted to the Maritime sector. Our personnel include skillful engineers and researchers with considerable knowledge and experience in all sectors of this field.

METIS builds systems with human-like interface. Capitalising on Artificial Intelligence, Cloud Computing, Messaging busses, Bots, Learning Machines, Natural Language Generators, Image Processing and Text Recognition Engines, METIS puts at your disposal, Virtual Personal Assistants with high expertise and tireless consistency and accuracy.

Our vision is to set at the disposal of maritime transportation our high expertise and innovative thinking in the fields of Information Intelligence to strengthen the safety of maritime routes, to minimize damage to the environment and to reduce the sea transport cost of products and people.

Our mission is the development of products that will apply the technologies of the 4th Industrial Revolution in Maritime Transportations, playing a leading role in the inevitable evolution of Maritime sector that induces rapid technological progress in all aspects of human activity.

For more information please refer to www.metis.tech, or ask info@metis.tech.