



Development a cloud-based ship management platforms

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ABSTRACT

Major technological trends that will impact the transport field can be found in the information and communications technologies domain and constitute key enablers for the roll-out of “intelligent” transport applications also maritime. Cloud Computing (CC) is one of these technological trends, and in its various forms provides solutions for the computing and data intensive tasks. The objective of the paper is to analyse the value of new initiatives connected with the use of cloud computing technology in ship management platforms.

KEYWORDS: ship management, cloud computing, information and communication technologies

1. Introduction

There is little doubt that, over the next years, demand for mobility will further increase. Although in some geographical areas the reduction of transport is possible, in general people and goods will be moving around the globe further and faster.

Intelligent Transport Systems (ITS) and rapidly evolving information and communications technologies (ICT) are expected to play a key role in transforming transportation and delivering safe, efficient, sustainable and seamless transport options for freight and people across Europe.

Major technological trends that will impact the transport field can be found in the ICT domain and constitute key enablers for the roll-out of “intelligent” transport applications also maritime. Cloud Computing (CC) is one of these technological trends, and in its various forms provides solutions for the computing and data intensive tasks. CC is increasingly encroaching on every aspect of our digital lives.

Some companies in the maritime sector have begun to explore the potential of this technology and examine how she could benefit from applying her to the business of operating ships [1], [2].

The objective of the paper is to analyse the value of new initiatives connected with the use of cloud computing technology in ship management platforms.

2. Cloud computing concept

The benefits of CC, which is a shorter time-to-market, greater flexibility of Information Technology (IT) in supporting business strategies and the possibility of a more rapid response to competition, makes its adoption accelerates.

For example, according to the consulting firm McKinley & Company [3] “With CC technology, any computer application or service can be delivered over a network or the Internet, with minimal or no local software or processing power required. In order to do this, IT resources (such as computation and storage) are made available on an as-needed basis – when extra capacity is needed it is seamlessly added, without requiring up-front investment in new hardware or programming.”

Also according to [3] “The cloud is enabling the explosive growth of Internet-based services, from search to streaming media to offline storage of personal data (photos, books, music), as well as the background processing capabilities that enable mobile Internet devices to do things like respond to spoken commands to ask for directions. The cloud can also improve the economics of IT for companies and governments, as well as provide greater flexibility and responsiveness. Finally, the cloud can enable entirely new business models, including all kinds of pay-as-you-go service models”.

2.1 Full definition

The full definition according to the US National Institute of Standards and Technology (NIST) is as follows: “Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” [4].

NIST has explained that CC has also service model – Software as a Service (SaaS)

through which “the capability provided to the consumer is to use the provider’s applications running on a cloud infrastructure (collection of hardware and software). The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g. web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings” [4].

CC has also different deployment models: private cloud, public cloud, and hybrid cloud.

According to NIST [4]:

- Private cloud is when “the cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g. business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.”
- Public cloud is when “the cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.”
- Hybrid cloud is when “the cloud infrastructure is a composition of private and public cloud infrastructures that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g. cloud bursting for load balancing between clouds).”

2.2 Future of cloud computing

despite predictions of dynamic growth in the field of CC, both the largest U.S. companies (Fortune 500) and small companies, according to argue the need for them to keep up with growing applications pace of implementation of “cloud” business strategies. Trend will be certainly strengthened - just look at the selected forecasts of cloud computing.

For example, according to consulting firm McKinsey & Company and published its list of technologies that will change the live, business and the global economy, the fourth place is a cloud [3].

Also according to [3] “While enterprise IT use will continue to grow, the largest source of economic impact through 2025 will likely come from enabling the delivery of services and applications to Internet users”. McKinsey & Company estimated that the total

potential economic impact for cloud technology across sized applications could be \$1.7 trillion to \$6.2 trillion in 2025. Of this total, \$1.2 trillion to \$5.5 trillion could be in the form of surplus from use of cloud-enabled Internet services, while \$500 billion to \$700 billion could come through productivity improvements for enterprise IT.

Also some companies in the maritime IT sector have begun to explore the potential of this technology and will propose new initiatives. Some shipping companies have begun and will implement this technology.

Some chosen new initiatives connected with the use of CC technology in ship management platforms are presented in this paper.

3. MARSSA architecture

3.1 What is MARSSA?

MARSSA is an acronym for MARine Systems Software Architecture. MARSSA is the first Open Systems Reference Architecture (ORSA) for the maritime industry.

According to [5], [6] MARSSA “sets out to provide an open platform, which will serve as a base for the development of standards and, at the same time, an architecture to support the integration of all software-dependent devices and systems on all types of ships as well as shore-based electronic systems. Seamless interoperability will be achieved and a platform stimulating innovation and competitiveness will be provided on a high quality framework based on proven industry standards.”

3.2 When was marssa created and who host it?

A team of marine software engineering experts and passionate mariners at MARSEC-XL started to work on MARSSA in 2008. On the 14th of February 2011 MARSEC-XL donated the very first version of MARSSA to the Open Source Community and the work on MARSSA has continued as an open source project hosted by MARSEC-XL Foundation since then [6].

MARSSA v. 1.0 was developed as a community effort with the help of over 150 contributors around the globe. The MARSSA community gathers software engineering experts, software and system architects, mariners, commercial sea officers, naval architects, engineers, ship builders, as well as students, enthusiasts, and commercial companies active in the IT and maritime sectors.

MARSSA is contributing to improving safety at sea and to the MONALISA 2.0 project also.

The Swedish Maritime Administration has initiated an extension of the on-going MONALISA project, called MONALISA 2.0, which aims at developing efficient, safe and environmentally friendly maritime transport in the European Union [7].

With a budget of 24 million Euros for the 2012-2015 period, MONALISA 2.0 will build on the Motorways of the Sea concept and look at sea traffic management tools and operations, among other areas.

Actions taken will include: testing of concrete applications and services which would allow rapid commercial deployment; integration of route planning; elaboration of better standards for route information exchange; and demonstration of hands-on services using new technology to enhance maritime safety.

One possible implementation of MARSSA is in a hybrid cloud environment including a private cloud onboard a ship. Some figures can be found in [6],[8].

3.3 Cloud computing on board a vessel

What are the major benefits of utilizing cloud technology on board a vessel? According to [5], [6] “Empirical data show that cloud solutions based on Open Architecture, such as MARSSA, achieve up to 80% savings in Total Cost of Ownership with increased quality. It means easier system integration and shorter commissioning times for builders. Data sharing across on board electronic devices (and vessels) and continuous pushing of raw sensor data into the cloud allows for the prediction of the onboard behaviors enabling optimization of the yacht’s e.g. energy generation, and contributing to improvements in the vessel’s performance attributes such as fuel and/or hybrid-electric efficiency. Cloud’s scalable computation power and information storage make it possible to convert historical navigation data into useful real-time predictors.”

Are security risks attached to the use of cloud technology on board a superyacht? How are these risks negotiated? According to [5] “A robust system software architecture is key in assuring that the cloud-based services do not have an impact on the safety critical features on board the vessel. The onboard systems must be split over multiple separate networks; one for safety critical applications, and the others for infotainment and other services. The multiple networks and sets of components are physically or otherwise separated with highly advanced firewalls, preventing any of the applications to interfere with one another. Signing software components with digital certificates and requiring encrypted data transports also contribute to achieving security.”

Can a yacht be built to accommodate developments in wireless technology and enhanced connectivity? How future-proof a yacht? According to [5], [6] “To future proof a yacht the “third architecture”, i.e. systems software architecture, such as MARSSA, must be adopted, next to naval and interior architecture. The three architectures must co-exist seamlessly. Data interfaces must be open allowing for interoperability. By using COTS (Components Off The Shelf) and Open Architecture system integration and refits become easier and cheaper. This allows for rapid and frequent technology insertion and refresh.”

4. Shiptech in the cloud

Inatech is a global provider of intelligent cloud-enabled and on-premise consulting, ERP implementation, managed services and marine solutions.

According to [9] “Inatech’s Marine Solutions Division is a leading provider of intelligent shipping and bunker procurement

management solutions. Shiptech, its flagship solution, Inatech’s software portfolio includes Shiptech, Shiptech Premium and Shiptech Optimizer. All solutions are available ‘in the cloud’ as a Software as a Service or can be hosted on-site and are designed to easily integrate (and scale) with other standard shipping software systems.”

4.1 What are the benefits of using shiptech in the cloud?

According to [9] benefits of cloud technology include:

- Flexibility: Inatech has built flexibility right into Shiptech from cloud hosting to customisable fields to ensure that he capture user’s entire fuel ecosystem to ensure maximum adoption by all parties.
- Scalability: The SaaS technology provides the facility to scale the application to any number of vessels /locations / users through the web.
- Mobility: The system is designed to be accessed through the latest handheld devices to capture and display information “real-time”.
- Fast set up: This technology makes user set up quick and easy.
- Easy user provisioning and usage metering.
- Little upfront investment in hardware compared to on-premise: Shift from heavy initial Capex to more predictable Opex.
- 24x7, highly reliable application hosting: User get to choose the best data centres in the world.
- Easy monthly subscription of services.

4.2 What are the differences between the three shiptech solutions?

According to [9] in order to match the diverse fuel procurement needs of different sized shipping companies Inatech has developed three unique offers. For ship operators with small operations and simple buying strategies Inatech has created Shiptech. For larger shipping operators with high volume purchases and who use advanced buying strategies there is Shiptech Premium and then for any operator looking for real-time, fuel optimisation Inatech has Shiptech Optimizer.

In the case of Shiptech the modules covered with this package include [9]:

- Procurement – Optimise processes, maximise efficiency
- The procurement system means that the user can manage the entire purchase cycle from requisition to fulfilment. Optimise business functions across all levels through the integration of technology, data and people-centric processes.
- Claims - Automated and effortless
- With the claims module automate user’s entire claims cycle and record, track, analyse and retrieve quality, quantity and demurrage claims, effortlessly.
- Bunker Delivery Receipts (BDR) – Tracking activities made easy

The BDR records the delivery of the bunker starting from the point for payments, through to the quality/quantity test and claims processes.

- Reporting – Decision making simplified
- Reporting gives the user everything in one location so decision making is quick and easy.
- Business hours support – Problems/questions sorted
- When the user needs help Shiptech is with business hours support as standard with each Shiptech licence sold.

In the case of Shiptech Premium user get all the functionality of Shiptech plus [9]:

- Risk Management – Minimise risk, maximise profits
- The trade and risk management module gives user access to the critical real-time information required to make profitable transactions.
- Advanced Analytics (dashboard reporting) – Turns data into action-orientated knowledge
- Sophisticated analytics mean that the user has the most comprehensive view of his fuel procurement operations in one, easy to access location. Need detailed analysis then the user has got it with interactive dashboards, drill down reports and ad-hoc reporting capabilities for the strategic, tactical and operational workforce.

As a stand-alone solution or as part of the Shiptech fuel procurement portfolio, Shiptech Optimizer offers user advanced, real-time fuel procurement optimisation. Optimizer takes the guesswork out of user's fuel purchasing decisions by providing user with real-time guidance on the three key factors of quantity, location and price strategy by answering three questions:

- How much fuel to buy for each ship in the fleet,
- The best port to bunker at,
- The right price strategy (spot versus contract).

5. Value added voyage experience

Maritime Communications Partner (MCP), the Telenor-owned on-board communications specialist, has announced the launch of Value Added Voyage Experience (VAVE), a unique digital platform that creates a ship-wide cloud on board cruise or ferry ships. The news follows the successful completion of an eight-month technical trial on the Corsica Sardinia vessel Mega Express Five [10].

VAVE has been conceived to bridge the digital divide between land and sea mobile behaviour. By utilizing a vessel's GSM signal and Wi-Fi network it creates a ship-wide 'on board cloud' that all mobile devices (smartphones, tablets, laptops etc.) fall under [10].

Users can then access a range of services – such as free messaging (if desired) over Wi-Fi, or on board retail/booking systems – while shipowners can target individual handsets with personalised messages.

According to MCP's Senior Vice President of Business Innovation Ole Kristian Sivertsen [10] "Smartphones and mobile devices have changed our behavioural patterns, in terms of both business and personal interaction. However, at sea handsets go into hibernation. VAVE reawakens their potential by providing the same sort of connectivity on sea as on land, only with a package that is customized for the unique environment of every individual vessel."

Sivertsen says the list of services VAVE can enable is as endless as a device's potential. For passengers and crew members this

means, for example, accessing on-demand entertainment, VoIP messaging and calling, location-based services (to find their way around, or take advantage of special offers nearby), connections to onboard social networks to make new friends, booking tables, trips or treats, using social media, and so on.

According to Sivertsen "The benefits for the ship owner are even more compelling" "MCP's CellAtSea mobile network identifies every phone on board. This means that ship owners can use VAVE to send tailor-made marketing messages to individuals. It opens up a channel of one-to-one communication to engage with guests and enhance their enjoyment, while increasing revenues, enriching the overall brand experience, and boosting loyalty" [10].

Developed in partnership with iES Italia and exclusively licensed to MCP, the system utilises GSM and Wi-Fi to create a vessel-wide network driven by a VAVE delivery and platform engine. Users, both passengers and crew, can access the platform on large screen public TVs, in-cabin screens, and all personal mobile devices (phones, tablets, laptops etc.). VAVE is available on Apple and Android devices, as well as through web browsers [10].

In addition, MCP says that the cloud created by VAVE's onboard server solution allows content to reside locally. This limits pressure, and costs, relating to a vessel's VSAT connection.

MCP's VAVE promises new digital reality for ship owners, passengers and crew. Ship owners can easily [10]:

- Reach any individual or group onboard,
- Deliver personalized experiences to every guest,
- Attract, engage and connect with customers on a new level,
- Increase sales through targeted mobile marketing,
- Gather insight on guest behavior (habits), interests and satisfaction,
- Enable new revenue opportunities such as advertising and content sales.

6. Initiative of orange business services

Orange Business Services (OBS) has announced that it has joined a European Union-sponsored initiative to develop a cloud-based ship management platform.

As part of the EIS (Exzellenz Initiative Schiffsmanagement) initiative, OBS will provide ship-to-shore, vessel-based and land-based communication infrastructure which will be used to implement a cloud-based satellite solution on several vessels run by COLUMBIA Ship Management, one of the four largest ship managers worldwide [11].

The solution provided by OBS comprises the communication hardware for the vessels, the onshore data centre, as well as the design and development of traffic optimisation tools. The integration of satellite communications with a Business VPN, a fully managed IP-based VPN service, with private access to cloud services will enable COLUMBIA Ship Management to benefit from a high performance, secure solution without relying on the Internet [11].

According to Timothy Scheller, project manager at COLUMBIA Ship Management [11] "Communication at sea constitutes specific challenges and was historically a source of problems in terms of cost,

performance and support. With the help of OBS, this project can be used to test and design solutions that help the industry take a giant leap forward and set new standards in maritime IT. With this initiative it is possible to build a remotely managed, integrated communication and application infrastructure on board that intelligently connects the vessel to the office at the lowest possible cost.”

According to Michel Verbist, head of International Business Development, Satellite at OBS [11] “With the new cloud-based platform in this project, it is possible to demonstrate how improved communication between vessels and their management will streamline business tools and decisions. Real-time ship-to-shore communication can provide a competitive advantage for both large and small shipping companies around the world”.

The EIS initiative is supported by the European Regional Development Fund (ERDF) and the City of Hamburg, Germany. Other subprojects of EIS will be implemented by partners such as DNV/GL Group, Evidanza, Humance Maritime Services, MarDynamics and Portal Systems.

The consortium of partners plans to establish joint sales activities and agreements in order to conduct joint research and development activities from Hamburg.

7. Conclusion

Analysis the value of new initiatives connected with the use of cloud computing technology in ship management platforms shows many advantages.

For example, Shiptech shipping solution provides a scalable cloud-based real-time fuel procurement solution with an intelligent approach that streamlines the buying process, reduces fuel costs and enhances profitability.

The cloud version is easy to integrate (and scale) with other standard shipping and bunkering technology management systems and is appealing because it enables shipping companies to move away from making old fashioned capital expenditure (CAPEX) investments in technology towards adopting an operational expenditure (OPEX) model.

The Shiptech shipping solution is a feature-rich, cost-efficient, integrated solution designed specifically to address the bunker procurement needs of modern shipping and cruise companies. Developed to integrate easily with 3rd party applications, it provides sophisticated analytical and reporting tools and efficient workflows and processes for key functions, including bunker procurement, claims management, trading and risk management.

VAVE is smart maritime solution for smart devices. Mobile engagement, mobile marketing and digital experience are the cornerstone of VAVE. This solution allows communication with

passengers on a rich digital experience and engagement platform that provides entertainment, Internet access and much more. The innovative platform ensures that on board customer experience is vastly improved, passenger satisfaction and loyalty is increased, and new revenue sources can easily be rolled out. VAVE adds value to the voyage to any ship and all individuals. The service allows forward-thinking ship owners to introduce services that meet customers’ needs and wants, as well as introduce mobile marketing and digital customer engagement.

Orange Business Services has joined an initiative sponsored by the European Union to play a key role in the development of new business intelligence and IT standards set to improve management tools in the shipping industry [11]. According to [11] “the key goal of the initiative is to help shipping companies take complex decisions on the basis of valid, up-to-date information across all ship management lifecycle processes. This will not only make it easier for companies to manage vessels and will also integrate them into a corporate infrastructure thereby facilitating real-time business decisions, enabling cost savings and improving safety and crew welfare”.

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