The Benefits of Cloud Computing in the Maritime Transport

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Abstract. Maritime transport is the prominent mode of trade between European Union (EU) and non-EU member countries. As a result, EU ports and government administrations are under constant pressure to increase the efficiency and quality of their services, recognising the critical role of Information and Communication Technologies (ICT). Cloud computing (CC) as significant advance in ICT development is expected to dominate the maritime transport development landscape in the coming years. The advent of CC where applications are served with data that is stored on the Internet "in the clouds" and can be accessed and shared by the parties involved in the supply chain operation has evoked various degree of interest. It can be explained some of the benefits and challenges of using cloud services in maritime transport which are presented in this paper, particularly the first benefits of some Maritime Transport Single Window implementation initiatives already making use of cloud technology. Also are described the benefits of using CC in maritime transport concerning its technical fleet management operations.

Keywords: Cloud Computing, Maritime Transport, Information and Communication Technologies.

1 Introduction

Maritime transport is the prominent mode of trade between European Union (EU) and non-EU member countries. As a result, EU ports and government administrations are under constant pressure to increase the efficiency and quality of their services.

The EU's member states represent a diverse and fragmented network of trade stakeholders, ranging from ship owners, shipping agents, and freight forwarders, to port authorities and terminal operators, further complicated by required adherence to both national and EU-level trade policies and regulations. Companies and government authorities have traditionally faced challenges in providing the technology needed to ensure interoperability, standardization and availability of information between trade stakeholders.

In the short to medium term, the most promising development for maritime transport is e-Maritime, which is becoming the focus for the simplification and cohesion of administrative requirements and procedures, with a spill-over into commercial

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applications [1, 2]. The EU e-Maritime initiative, is seen as a cornerstone for the achievement of the strategic goals of the EU Maritime Transport Strategy 2018, recognising the critical role of Information and Communication Technologies (ICT) for productivity and innovation.

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The advent of CC where applications are served with data that is stored on the Internet "in the clouds" and can be accessed and shared by the parties involved in the supply chain operation has evoked various degree of interest. It can be explained some of the benefits and challenges of using cloud services in maritime transport which are presented in this paper, particularly the first benefits of some Maritime Transport Single Window implementation initiatives already making use of cloud technology. An example is SOGET operator which announced development of its e-Maritime Port Single Window project on Microsoft Cloud Technology. Also are described the benefits of using cloud computing in maritime transport concerning its technical fleet management operations, on the example MESPAS software.

2 The Term "Cloud Computing"

The term "cloud computing" refers to several different computing paradigms, not all of which are completely new [3]. For example, as the U. S. National Institute of Standards and Technology (NIST) has explained, cloud computing has three service models [4]:

- **Software as a Service** (SaaS) through which applications are provided in the cloud;
- **Platform as a Service** (PaaS), through which a cloud provider permits users to create or run applications using languages and tools supported by the provider while the provider delivers the underlying infrastructure such as servers, operating systems, or storage; and,
- **Infrastructure as a Service** (IaaS), through which a customer can deploy a computing infrastructure similar to a virtualized environment.

The essential characteristics of all three models include self-service (a customer can access new capabilities), shared resources, and rapid elasticity (i.e., as a business grows, it can rapidly add additional processing power and storage).

Additionally, cloud computing provides IT resources, as a service, in a dynamic and scalable manner over a network. It has five essential characteristics:

- on-demand self-service;
- broad network access;
- resource pooling;
- rapid elasticity;
- measured service.

The following list identifies the two main deployment models:

- **Private cloud**. The cloud infrastructure is operated within a single organization. In this case, internal groups such as business units consume resources and services provided by a single internal (i.e. the IT department) or external cloud computing provider;
- **Public cloud**. The cloud infrastructure and services are available to the general public or a large industry group and is owned by an organization selling cloud services.

3 Cloud Computing in Maritime Transport Single Window Initiatives

3.1 The Initial Idea behind the Single Window Concept

Global trade expanded rapidly during the 1980s and 1990s. The resulting complexity and speed of the modern supply chain and the number of parties involved greatly increased the requirements for information controlling the flow of goods. But despite the breakneck developments in information and communications technologies (ICT) and trade data-exchange standards during the same time, trade documentation exchanges remained mostly paper-based. However, in the modern trade environment such paper-based exchanges cannot satisfy the need for efficiency and security.

One “omnibus” means of addressing this problem that has gained considerable momentum over the past 10 years is the so-called “ Single Window” [5].

3.2 An Introduction to Single Window

In 2005 The Recommendation and Guidelines on establishing a Single Window, United Nations (UN) Economic Commission for Europe United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) Recommendation 33, was published. This recommendation defines an Single Window as a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export, and transit-related regulatory requirements [6].

If information is electronic, then individual data elements should only be submitted once. In practical terms, the single window aims to expedite and simplify information flows between trade and government and bring meaningful gains to all parties involved in cross-border trade. The single window is generally managed centrally by a lead agency, enabling the appropriate governmental authorities and agencies to receive or have access to the information relevant for their purpose. In addition, participating authorities and agencies should co-ordinate their controls. In some cases, the single window may provide facilities for payment of relevant duties, taxes and fees.

A single window does not necessarily imply the implementation and use of ICT, although facilitation can often be greatly enhanced if governments identify and adopt relevant ICT for a single window.

This paper addresses the enhanced single window through the use of some trend in the use of ICT for Single Windows in maritime transport. Cloud computing as significant advance in ICT development is expected to dominate the Single Window development landscape in the coming years.

3.3 Examples of Single Widow

Some Single Window initiatives already make use of cloud technology in maritime transport. Microsoft applies cloud computing principles to single window.

Trans-Kalahari Corridor Regional Single Window. On May 11, 2011, the World Customs Organization held its annual IT Conference and Exhibition, featuring the theme of cloud computing – a technology expected to revolutionize trade and customs operations. At the conference, representatives from United States Agency for International Development (USAID) and the government of Namibia unveiled plans to create the Trans-Kalahari Corridor Regional Single Window (RSW). A partnership between USAID, Microsoft, and the Customs Agencies of Namibia and Botswana, the RSW will be a cloud computing-based trade application – built on Microsoft technology – that will link customs processes between the governments of Namibia, Botswana, and South Africa [7].

A single window provides a platform creating a single entrance point for all data and documents necessary to import or export goods – with the goal of creating a more efficient and secure customs process. The Trans-Kalahari Corridor RSW will automate customs connectivity, reduce trade costs, and increase compliance between the customs authorities of all three countries. By enabling faster and more secure trade, this initiative aims to facilitate economic growth and development in the region.

With the RSW, the three countries will be able to leverage their existing customs platforms, while making their data available in the cloud for the first time. The RSW also allows for the integration of additional border agencies, enabling future development of an Integrated Border Management solution in the future.

Cloud computing is where the future of customs technology lies because it transcends national boundaries, creates greater IT efficiencies and helps trade stakeholders such as importers, exporters, border agencies access distant markets. It offers scalability, flexibility and unprecedented interoperability which will help trade grow as never before. Microsoft is excited to work with USAID and its partners to develop the Trans-Kalahari Corridor RSW.

SOGET's e-Maritime Port Single Window Project. An example is one of different forms of Single Window - Port Single Windows and Port Community Systems. Other authorities with a substantial role in trade—such as the Port Authority—have established a limited, port-centric, "Single Window", commonly referred to as either a "Port Single Window" or a "Port Community System" [8].

Headquartered in Le Havre, France, since 1983, SOGET is the leading Port Community System (PCS) operator in France and a public-private partnership between the Port Community of Le Havre, Port of Le Havre Authority and French

Customs. SOGET PCS is in operation throughout French ports as well as overseas. SOGET also partners with Bureau Veritas, a world leader in conformity assessment and certification services, to offer a concession service to implement and operate Port Community Systems.

This project, originally launched in June 2010, as the next generation of Port single window solutions, is supported by European Regional Development Fund (ERDF) and is addressing the European Union's "Maritime Transport Strategy 2018".

The e-Maritime Port Single Window provides a single sign-on allowing all major maritime, port, logistics, and government trade stakeholders to access real-time data application modules. This solution also aims to improve the efficiency of business processes, by standardizing exchanges and providing interoperability with European and international port and government single window systems.

Based on Microsoft technology, SOGET is providing port communities with the building blocks of e-maritime transactions and processes. The solution leverages several Microsoft technologies including BizTalk 2010, SQL server 2011 and Hyper V 2008, creating an open, integrated and innovative solution specifically tailored for the e-maritime industry.

The e-Maritime Port Single Window improves the efficiency of business processes, by standardizing exchanges and providing interoperability with European and international port and government single window systems.

Using the Port Community System, it takes 6 minutes and 19 seconds on average to gain customs clearance of goods.

SOGET announced development of its e-Maritime platform on Microsoft cloud technology in May 2011 and is currently under development.

Bureau International Maritime. Belgian-based, Microsoft partner, Bureau International Maritime (BIM) creates tailor-made solutions for the public and private sector using new technologies in the areas of training, certification, security, cargo tracking and single window [9].

With several training centres located in Belgium, France and Congo, and an international network of partners cross Europe, Asia, America and Africa, BIM benefits from localized expertise.

In 2005, BIM began research on the Guichet Unique Maritime (GUMAR) Single Window application, and in 2009 the development of the Project began. Based on Microsoft technology, including Microsoft SharePoint Server and Microsoft BizTalk Server, the single window solution significantly improves efficiency by allowing transactions to become paperless and simultaneous.

Every participant in the trading process, from buyer to receiver to forwarder to maritime actor, is able to access the GUMAR Single Window application and work in parallel, speeding up the process enormously. The solution provides a single entry point for standardized information and documents, which all parties involved in trade and transport can access and therefore fulfil all import, export, and transit related regulatory requirements.

Users can access the GUMAR Single Window application in a public single window office, on their own PC or on their company's computer running the

application securely through the interface system. For convenience, users are notified by SMS when their files have been sent and received.

Average time (5–7 days) required for one container to gain clearance in Congo with GUMAR, reduced from 15–17 days before.

4 Benefits of Mespas R5 Cloud Computing in Terms of Fleet Management in Maritime Transport

The benefits of using cloud computing in maritime transport concerning its technical fleet management operations can be described on the example MESPAS software.

Today, MESPAS (located in Switzerland) is the world's leading fleet management software provider based on cloud computing and the fastest growing software as a service (SaaS) company in the maritime transport.

Mespas R5 is a cloud-based software system and allows you to access and operate data, applications and IT infrastructure as a service via the Internet, the so-called 'cloud'. It's the most efficient, scalable and innovative way of running technical fleet management software – and presents a low-cost, flexible alternative to the have your own software approach.

The following list identifies the essential benefits [10]:

- **Keep Your Costs in Check.** Using the mespas R5 software means you don't need to run your own server infrastructure for your technical fleet management system. This reduces your capital and operational expenses. Since the software is run on a subscription basis (software as a service), your expenses become transparent and predictable. The costs for running the central hardware is spread across all users of the system, making the mespas R5 system far more cost-efficient than maintaining your own server infrastructure.
- **Improve Efficiency.** All relevant people have access to the same up-to-date information (technical information, work instructions, manuals, supplier infos, etc.), and the software is easy to use. This improves efficiency by leaps.
- **Reduce Time and Costs Spent on IT.** The software is maintained and updated centrally at MESPAS. You don't need to worry about central hardware (server), security, backups, and IT personnel for the technical management software.
- **Speed of Deployment.** Adding or removing vessels is a matter of days or weeks, and not months. Save time while scaling up, and save money by scaling down when additional resources are no longer needed. Your company becomes more agile and flexible.
- **Central Data Storage, Accessible by all Relevant People.** Master data (OEM data, manuals, spare parts, etc.) is provided by MESPAS on the central server. Your own business data is kept securely on the central server. It's accessible by all relevant stakeholders via the Internet. You own your data, but you don't need to own the central server. All you need is standard IT equipment, an Internet connection (office) or ship/shore connection (vessel), as well as the Mespas

Cube. The Cube was developed to enable the secure operation of the software aboard the vessel, and to enable multi-user functionality for the crews.

- **Generate Your Own Key Performance Indicator (KPI) Reports or Choose from Standard Reports.** Since data is stored in one secure place, it becomes comparable: across your products, vessels, or across the entire company. With real-time data at your fingertips you are able to monitor KPIs across the fleet, and thus make informed decisions.

Benefits of mespas cloud solution involved from comparison to other solutions, according to concept and costs, are given in the Table 1.

Table 1. MESPAS cloud solution wins over inhouse-installed software [10]

MESPAS Cloud Benefits	**CONCEPT**	Traditional / inhouse-installed software
Cloud-based system 1 off-site central server infrastructure, i.e. software and central server hardware accessible via standard IT equipment from anywhere with Internet access State of the art / future proof solution	Technology	Traditional software Clients run multiple servers, maintained and hosted on-site. Software installed on local computers; changes and enhancements to be implemented individually. Cost and time intensive
Multi tenancy to share hardware, memory and software among multiple tenants (clients) Software can easily be updated for all users via central server	Multi tenancy vs. single tenancy	Single tenancy means the system houses data and software for each company or vessel on a separate server. Time and infrastructure consuming; difficult to compare data and to ensure that users run the same version of the software
Available 24/7 via secure internet connection; server-farm that meets highest standards re: server redundancy, power backup, data backup, internet connection, fire protection, environmental control	Availability, security and disaster recovery	Local solution features significant lower physical and digital security. Higher disaster recovery costs
MESPAS software is constantly being enhanced and advanced. Improvements and additions are made available to customers free of charge, and deployed with little or no client involvement.	Software development	Software updates incur costs such as upgrade fees to software provider, deployment costs, as well as considerable costs for testing in own environment.
IT is core competence of MESPAS	Status of IT	IT is not core competence of company

Table 2. (continued)

COSTS		
- No CapEx - capital expenditures (only standard IT equipment needed) - Predictable OpEx - operating expenditures. according to actual usage	Cost types	- Large initial CapEx - CapEx for upgrades and adding new users/vessels - Large and unpredictable OpEx

5 Conclusion

Cloud computing services play now and will play an increasingly important role in the maritime transport in the future.

In this paper presented some of the benefits and challenges of using CC in maritime transport. Cloud Computing is enabling the next generation of customs solutions, expanding global trade, economic growth and opportunities.

These benefits, based on examples, are connected with application of CC in Maritime Transport Single Window initiatives and fleet management operations.

Main characteristics of SaaS can be found in mespas R5 solution also. In terms of fleet management in maritime transport, there are two distinctive features the SaaS software possess: high quality data management and easy to manage offline availability [11].

In terms of data management, the SaaS provider manages – on behalf of customers – the data and documents that are shared by all users of the application. Since this is done centrally and for all clients, the costs for this are very low for each client, i.e. definitely much lower than if each customer would have to do this on his own.

Having offline availability means that office staff access the central database in real-time through a secure internet connection – no matter when and where they are located. Crews aboard the vessels work offline by accessing the database on board, which is mirrored to the central server's database ashore. Regular synchronization as part of the standard sync schedule of each vessel ensures that both ship and shore work with the same up-to-date information.

References

1. Lynch, G.: e-Maritime Overview. Periodic Study, SKEMA Interactive Knowledge Platform for Maritime Transport and Logistics (2010)
2. McLaughlin, H.: e-Maritime Periodic Study Summary. SKEMA Interactive Knowledge Platform for Maritime Transport and Logistics (2010)
3. Franclin, J. C., Chee, B.J.S.: Cloud Computing. CRC Press Inc., Taylor & Francis Group, Boca Raton (2010)

4. Babcock, Ch.: Management Strategies for the Cloud Revolution. McGraw-Hill, New York (2010)
5. Koh, J., Tsen, T.: Ten years of Single Window Implementation: Lessons learned for the future. Global Trade Facilitation Conference, Connecting International Trade: Single Windows and Supply Chains in the Next Decade (2011)
6. e-Freight D3.2 – Reference Solutions for Next Generation National Single Windows (2011)
7. Trans-Kalahari Corridor regional Single Window, http://www.oecd.org/dataoecd/37/56/48367286.pdf
8. SOGET's e-Maritime Port Single Window Project, http://www.microsoft.com/publicsector/ww/international-organizations/projects/Pages/enabling-maritime-trade-automation.aspx
9. Bureau International Maritime, http://www.bimv.com/en/SingleWindow/
10. MESPAS, http://www.mespas.com/
11. Thoma, Ch.: Software as a Service - revolutionizing fleet management. Digital Ship 42(1), 40–42 (2011)