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# A SURVEY ON ISSUES AND CHALLENGES OF MARINE COMMUINCATION USING BIG DATA

**Dr. B. RADHA[*], JAYAPRAKASH R[#], VETRIVEL S[@], SUTHA K[$]**

*[*]Associate Professor, Department of Information Technology, Sri Krishna Arts and Science College, Coimbatore, Tamil Nadu, India*

*[#]Assistant Professor, Department of Computer Technology, NGM College, Pollachi, Coimbatore, Tamil Nadu, India*

*[@]Assistant Professor, Department of Information Technology, Sri Krishna Arts and Science College, Coimbatore, Tamil Nadu, India*

*[$]Assistant Professor, Department of Information Technology, Sri Krishna Arts and Science College, Coimbatore, Tamil Nadu, India*

## ABSTRACT

The "Big Data" is often very flattering. Some companies and maritime institutions have already tried to use big data to improve maritime safety and environmental protection. Encouraging this put into practice to raise the common and imperative challenges of the entire maritime industry with regard to big data use and related solutions; First, when reviewing the definitions of big data, three key factors are identified: Big data takes the electronic form, is available with a variety of sensors, and is difficult to process. There are four elements: volume, speed, variability and accuracy. In view of these factors, the size of the manuscript such as electronic data is single-minded by the expedition. Big Data Analytics poses a grand challenge on the design of exceedingly scalable algorithms and system to integrate the data and uncover large hidden values from datasets that are diverse, complex, and of a massive scale. Probable breakthrough includes new methodologies, systems and applications in Big Data Analytics that find out useful and hidden knowledge from the Big Data efficiently and effectively. DNV-GL, Lloyd's Register Foundation and IMO e-navigation framework have been selected as such. As a result, four main areas of difficulty in the use of bulky data sets are identified. Due to the strong competitive environment, directions should be provided with rights and obligations when handling large data. With regard to staff, governments are expected to demonstrate their strategy to raise the need for professionals and encourage collaboration with professionals and related industries. Supporting research and enlargement assistance programs and measures the style of relevant data sets. The issue of security requires deep-rooted legislation and a secure and valuable system to combat cyber attacks.

**Keywords:** Big Data, E-Navigation, Data Security, Globalization, Security

## 1. INTRODUCTION

The exaggeration of the shipping industry has greatly increased shipping volume. To make sure seamless communication and other services, it's important that each one vessel within the water preserve proper maritime haulage1. Moving forward can reduce errors while maintaining the smoothness of transportation3. It also facilitates proclamation between ships and therefore the coast4. In excess of the years, various sorts of communication are used: Morse, traffic lights, flags and radio. With the advancement of technology, it's important that the announcement system on the ship must even be updated. Satellite communication may be a new and evolving communication method that has proven to be extremely useful and well-located7. Satellite communications have different guiding principle. However, there are confident necessities for the installation of satellite communications.

## 2. SATELLITE COMMUNICATION REQUIREMENTS

Satellite communication services could do with motionless satellites to connect and recital by broadcast and receiving signals. Relying on the type of satellite communication structure that has been chosen, there is a necessity for the relevant paraphernalia. This includes:

- VHF: Intolerably High Frequency or VHF transceiver for universal communication or to commence distress alerts.
- HF: High Frequency or HF transmitter for broad communication and a way superior parameter for distress alerts, i.e., worldwide distress alert.
- MF: frequency or MF transceiver for a symbol up to a medium vary and general communication.
- Navtex: Provides data and regular weather updates, alerts, forecasts, and diverse maritime safety information concerning hazards, obstacles, etcetera
- SART: These are positioning systems that identify the location of indication exploitation radar and other systems. Satellite communication allows the crew aboard ships to be able to inform other ships and groups of the changes happening in real-time, reducing errors and thereby increasing efficiency.

## 3. SATELLITE COMMUNICATION TRENDS

### (i) *E-Navigation*

International Maritime Organization (IMO) urbanized the e-navigation strategy to require care of higher communication among ships and ship-to-shore. It too facilitates larger data and knowledge swap between ships10. E-navigation reduces the margin for human error and failure by implementing a better performance programme consisting of increased guidance tools and electronics. It includes variety of reorganized systems that are ample utilized within the maritime industry, such as, Automatic Identification System (AIS), world Maritime Distress Safety System11 (GMDSS), Long vary Identification and trailing

Systems (LRIT), Automatic measuring system Plotting Aids13 (ARPA), Integrated Bridge System (IBS), Integrated Navigation Systems14 (INS) and Electronic Chart show and information system (ECDIS).

**(ii)** ***Arctic communication***

The renunciation of ice within the Arctic has accrued marine traffic within the region for trade, research, associated different purposes. The extreme climate creates the Arctic an undiscovered area, wherever communication choices there are extraordinarily limited. In such conditions, satellites play an important role in providing economical suggests that of communication and guarantee a graceful exchange of data. The maritime dealing has been developing sort of systems to watch and guide vessels within the region. Radio-based communication systems for shorter distances are expected to be helpful for in sequence and knowledge transfer. Unmanned aerial vehicles and satellites are the only choices which can provides a forceful enough association to require care of announcement within the Arctic.

***(iii) Autonomous Ships***

The thought of autonomous ships aims to make ships self-driven, to increase ability and productivity therefore sanctioning swish functioning of tasks. It reduces the manpower needed within the operations of the ship, minimizing human errors. Such kinds of ships are presently being experimented on; however they seem shows potential for the longer term16. These ships are in receiving of to be principally unmanned and prepared with many new and upgraded items of technology, akin to pursuit systems, advanced sensors to avoid obstacles; a position system to keep informed them concerning alternate routes, management systems thus that the ships could also be operated from groups on the shore if necessary18. These ships connect perpetually with the team onshore and thus need advanced instrumentation and systems.

***(iv) Evolutions of GMDSS***

The world Maritime Distress and Safety System, or GMDSS, could also be a system that has been in agreement on internationally. It consists of set safety procedures, communication protocols, and instrumentation to help ships in distress. Initially, the GMDSS administrated ship-to-ship communication via Morse due to an lack of technical progression. Introduction of radio systems, ships current creating use of radio signals combined with Morse as a kind of distress call. It helped save varied lives over the years17. The launch of HF and MF signals, the United Nations agency issued how that better maritime distress communication significantly. The GMDSS provides a sort of an enquiry and rescue plan, that each one the nations within the planet are currently implementing. It's supported a mix of radio services on ground and colony signals, facultative the rescue operations to be ship-to-shore18. The GMDSS provides distress info beforehand, alerting operators and ships within the area, repeatedly preventing a disaster from

occurring within the first place. The system as well needs USA to endow all the ships with NAVTEX and different GMDSS equipment20. The advancement in communication technology has diode to fast globalization and an increase in international coordination.

***(v) Globalization and Communication***

Globalization has brought the earth nearer and has so formed it vital to stay up robust associates with everyone. Communication aboard ships has improved drastically in excess of the past few years, although the modification has been a slow one. Some years ago, smaller ships and vessels that did not need to be compelled to voyage such a lot had to be operating physically. Since there was a restricted crew aboard such ships, there was no want for computers and different technology for communication. However, process has opened the doors for trade across the planet and it's thus become essential for ships to be equipped with the newest sorts of communication and technology.

Shoppers stipulate quicker service and knowledge regarding each event that's happening. Radio, internet, and satellite telephones have expedited this instant exchange of knowledge. These economical resources of communications confirm that the journey goes swimmingly and conjointly encourage be extraordinarily helpful for the security of ships. Maintaining sturdy communication is probably the foremost required a neighbourhood of guaranteeing the safety of vessels within the maritime business. Over the years, mariners have taken many measures to make certain that maritime communication happens with none obscurity. With the modernization in technology, we would like to form varied updates to the pre-existing equipment, so on upgrade the industry and assurance higher limit productivity.

## 4. CHALLENGES AND ISSUES IN MARITIME

Today, most seafarers working on ships belongs to countries cherish Philippines, Ukraine, China, Bangladesh, Pakistan, and Sri Lanka , and are used on flags of countries like Central American nation, Marshal Islands etcetera one of the foremost problems round-faced by the shipping trade nowadays is that the Emergency of registries like Belize and Marshal Islands. All of North American nation would have seen advertisements claiming to concern COC and agency of Belize and Marshal Islands expeditiously. However, it's to note that the accomplishment and training of seamen has been vitiated thanks to the emergence of such registries. Advertisements in outstanding newspapers concerning accomplishment of seafarers from unknown and improperly registered entities are increasing. Beneath the Maritime Shipping (MS) Act, it's our duty to eradicate such unscrupulous recruiters, trainers, and issuers of documents; however it's quite evident that we've a bent to be failing miserably.

Some countries cherish Philippines and Ukraine has started taking this issue seriously then their seafarers are being benefited by increased quality coaching provided to them. Sadly, Indian institutes don't seem to be

paying enough attention on talent development and are those lacking in quality of seafarers. Altogether probability that's conjointly the reason that fresh deck cadets and junior engineers don't seem to be obtaining jobs easily.

Mindless Security Measures at Ports: Until some years back, before the International ship and port facility security (ISPS) code, it absolutely was terribly convenient for ship's crew to finish the work by late afternoon so simply withdraw to refresh them ashore. However, currently with mindless security the freedom of a mariner to travel ashore has been well curtailed.

Lack of correct Training: within the matter of seafarer coaching, larger stress needs to tend to on-board training involving marine instrumentation makers and work personnel. Shore-based training by conventionally certified Masters and Chief Engineers although smart isn't enough associated even useless if such instruction is being imparted in an improperly registered faculty travel by people that haven't set their feet aboard ships in last few decades. Lately, good ship maintenance work movies are developed and firms need to guarantee that they are shown on board with regularity and honesty. Staying faraway from Family, Untimely Sign-Offs: the most important emotional challenge which each and each sailor must face is that they have to live apart from their friends, loved ones and family. Longing might be a continuing worry that overpowers the sailor most of the days. To beat these fear sailors to bond with crew on the ship or the officers operating with him and treat them like family.

Ship Safety in impulsive Weather: Maneuvering of the ship is typically a challenge regardless of be the weather either calm or severe. However the degree of challenge will increase with severe weather associated build it tough for the sailor to sail the ship in stormy weather. Also, the weather turns from smart to unhealthy unpredictably, that it why weather is typically a mendacious challenge for the ocean farer.

Never-ending Pirates and Piracy: We detected the stories of sea pirates from the times of our forefathers. However its extent is reduced in recent years but not eradicated completely. As per a report, annually thirteen to sixteen bucks are lost from marine revenue because of piracy. Not solely piracy however the ocean pirates cause nice threat to the lives of the crew on a ship, as they're equipped with tons of advanced and dangerous weapons.

Maintaining social Relationship – dealing with Politics: once we tend to measure faraway from our cherished ones or family for a protracted amount of some time it becomes tough for us to stay up those self same feelings of affection and lookout of them we tend to urge connected with shipmates and feel nearer to them than to our circle of relatives. Thus maintaining interpersonal relationships with one's marital partner or with other members of his family is additionally a big challenge.

Monotony and Lack of Extra-curricular activities: it's that the main challenges that a Jack-tar utilized on identical regular routes need to face. They feel impassive in seeing identical views and also an equivalent faces to the moon and back. however to beat this drawback Jack-tars got a midway and work on their temperament improvement, completely different dressing themes, encourage themselves for work and keep them totally engaged in ship help or alternative involved works. This monotonous feeling makes the lifetime of seafarer agitated and faded their social circle.

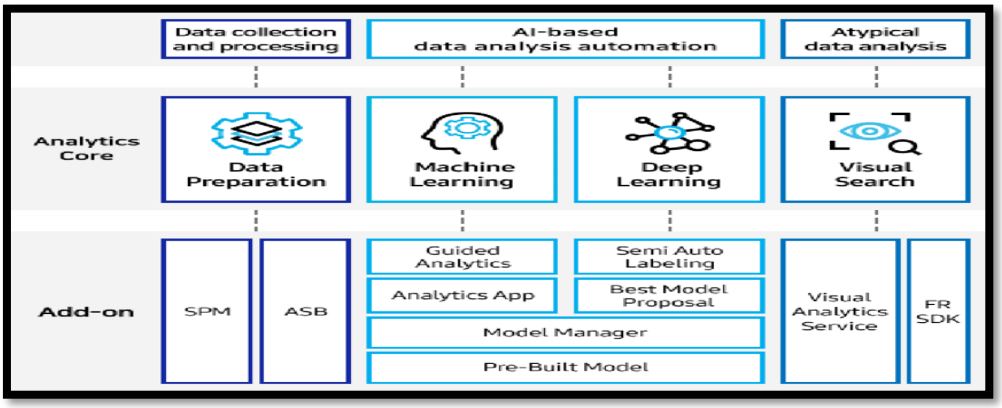


**Figure 1: Architecture of marine communication using Big Data model**

## 5. SOLUTIONS TO BEAT THE PROBLEMS OF MARITIME COMMUNICATION

In today's digital age, competition is fierce in an exceedingly sort of industries, also because the maritime industry, and corporations are perpetually finance in solutions which can facilitate them increase productivity whereas lowering overall costs. Consequently, the demand for advanced solutions like marine in sequence psychotherapy is growing at a formidable rate among business shippers and different finish users. Within the shipping industry, massive data is used to manage sensors on a ship and to perform prognosticative analysis to avoid delays and improve efficiency19. Increased higher process through big data analytics is being actively implemented to avoid and predict extra prices and could be used all the way through the lifetime of a ship. The Port of Hamburg (Germany), the Port of Cartagena (Colombia), the Port of metropolis (the Netherlands) and variety of other ports in geographical area are actively victimization massive information analytics solutions for his or her port and terminal operations.

Predictive analytics solutions have the potential to transform the shipping business by up overall shipping operations, enhancing ship safety and protective the environment. Additionally, the high level of customization offered by these solutions, relying on the precise wants of any port or company, is predicted to fuel demand over the forecast period. With the expansion of globalization, the demand for freight transport will increase considerably within the approaching back years. Consequently, the demand for advanced processing and prognosticative analytics will grow among maritime corporations to maximize time potency and price savings.

These factors are driving the demand for marine analytics around the world. The distribution business might be a sophisticated network of individuals, countries, agencies and authorities. These embody ship owners, port authorities, maritime authorities, classification societies, freight traders, oil corporations and trade organizations to call however a couple of issues20 . This makes the business a really world enterprise. For instance, a ship in-built South Korea, owned by a Greek man of affairs registered in Panama, manned by a crew from the Philippines, Singapore and Norway, may carry cargo owned by a USA global company from a port in China to a port in Europe. Passing through the waters of a dozen different countries. The need to trace economic flows during this global offer chain whereas eliminating any legal nightmares has led to thorough business record keeping. Variety of those includes:

1.Each ship incorporates a loading manifest and a crew manifests
2. Each ship additionally maintains a captain's log, a ships log and alternative logs that record the inner and external condition of the ship, also as instrumentation and environmental conditions.

Ports, canals and waterways have several forms that you simply just need to fill bent collect info regarding the vessel, voyage and cargo transported. Supplementary records are maintained by shipping agents, companies, traders, marine insurers, certification agencies, etc. Finally, ships generate vast amounts of electronic data like AIS, LRIT, radar, etcetera Electronic data is additionally generated by separate instrumentation on board as IoT sensors become additional prevalent21. Given the variability and volume of data generated, huge information in maritime and marine data analytics could also be roughly divided into three groups: Vessel administration mistreatment data offered in numerous logs, manifests, system parameters, bunker statistics, etc. this might embody economical bunkering, higher vehicle maintenance using digital twins, crew management, etc. Port and cargo management mistreatment information command by port authorities, freight forwarders, commercialism houses, etcetera this might embody economical loading handling, pursuit goods, optimizing port facilities, etc.

Analysis of spatial mind's eye using data from position tracking systems like AIS and LRIT, pictures from ships, coastal and house radars, optical sensors, etc. this might include efficient routing, fleet tracking, pattern analysis, and anomaly detection. Until lately, records were largely unbroken for short-run dealings history or for autopsy within the event of any incident. Trendy analysis ways currently enable US to use this information to predict and provide info to reinforce the system and stop future disruptions.

## 6. CONCLUSION

To adapt to the persistently changing data and software atmosphere, there's still tons of labor to be prepared. A bit like the web 20 years ago, data analysis and therefore the Internet of Things will change the planet around

us. No business can do another one. Smart technology decisions and funds are the key to digital renovation. Collaborative innovation will support the event of today's industry and steel oneself against future development. The COVID-19 crisis is developing rapidly and poses a serious challenge to logistics, supply chain, transportation and transportation. During this case, it's expected that data analysis and technology introduction will develop into more and more important within the post-COVID phase, which can stabilize the maritime industry and promote its development.

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