USING BIG DATA TECHNOLOGIES IN MARITIME SHIPPING INDUSTRY TO ACHIEVE COST EFFECTIVENESS

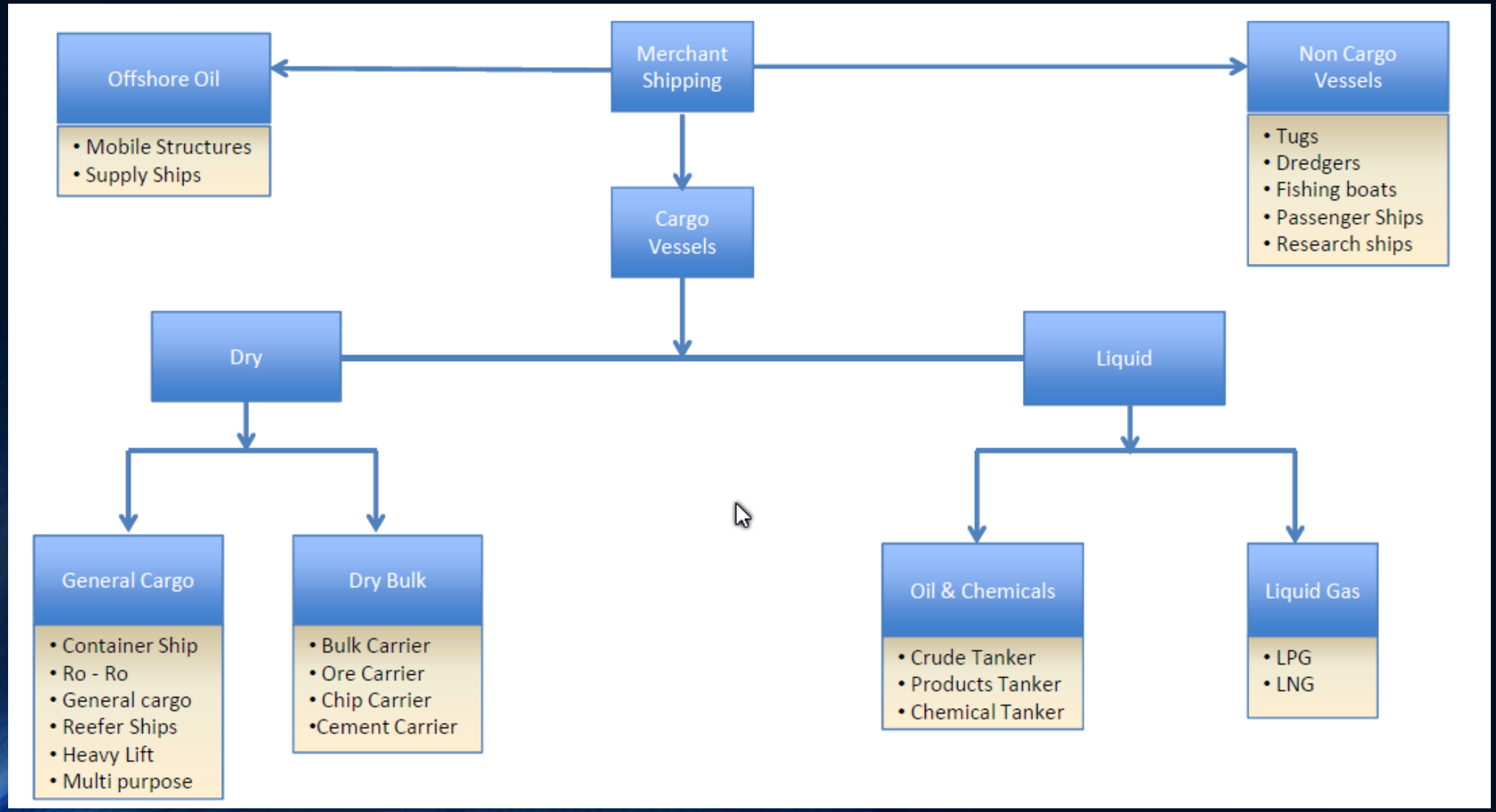
STUDENT PAVLOS VERNIKOS
PROFFESSOR PANAGIOTIS DEMESTIXAS – KONSTANTINOS TSAGARIS

Introduction of Maritime Shipping Industry

Maritime Shipping Industry includes companies that are focused on the shipping function and we can say that they are split in three major categories:

- Ship-owner
- Shipping Company
- Shipping Management Company

Vessel Types

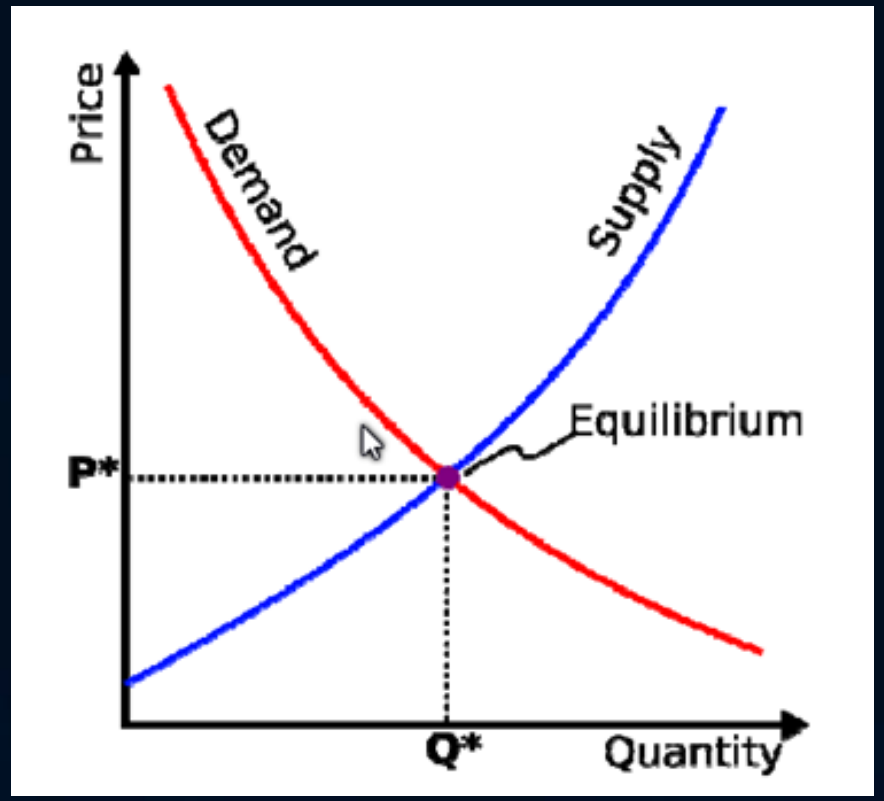


Shipping Companies economy

There are four basic laws for Supply & Demand:

- If demand increases and supply remains unchanged, a shortage altogether, thus leads to a higher equilibrium price.
- If demand decreases and supply remains unchanged, a surplus altogether, thus leads to a lower equilibrium price.
- If demand remains unchanged and supply increases, a surplus altogether, thus leads to a lower equilibrium price.
- If demand remains unchanged and supply decreases, a shortage altogether, thus leads to a higher equilibrium price.

Equilibrium Price



Shipbroking

Shipbroking is a financial service, which forms part of the global shipping industry. Shipbrokers are specialist intermediaries/negotiators (i.e. brokers) between shipowners and charterers who use ships to transport cargo, or between buyers and sellers of ships.nd purchase.

Shipbroking can be categorized as follows:

- Dry cargo broking
- Tanker broking
- Container broking

Chartering

Chartering is the main activity in shipping industry and include all necessary actions in order for goods to be transferred. Charterer's main concern is to contact end customers and make the necessary arrangements for the shipping, sometimes he may own a cargo and employ a shipbroker to find a ship to deliver the cargo for a certain price, called freight rate.

Charter types:

- Voyage charter
- *Contract of Affreightment*
- *Time charter*
- *Trip time charter*
- *Bareboat charter or demise charter*

Maritime communications

Main problems to solve:

- Cover of long distances
- Safety of the vessel
- Efficiency of transportation
- Port security
- Whether reports
- Crew welfare

History of Maritime communications

Technologies used:

- Morse code
- Radio waves
- Satellite connection

Satellite Communications

The International Mobile Satellite Organization (IMSO) is the intergovernmental organization that oversees certain public satellite safety and security communication services provided via the Inmarsat satellites. Some of these services concern:

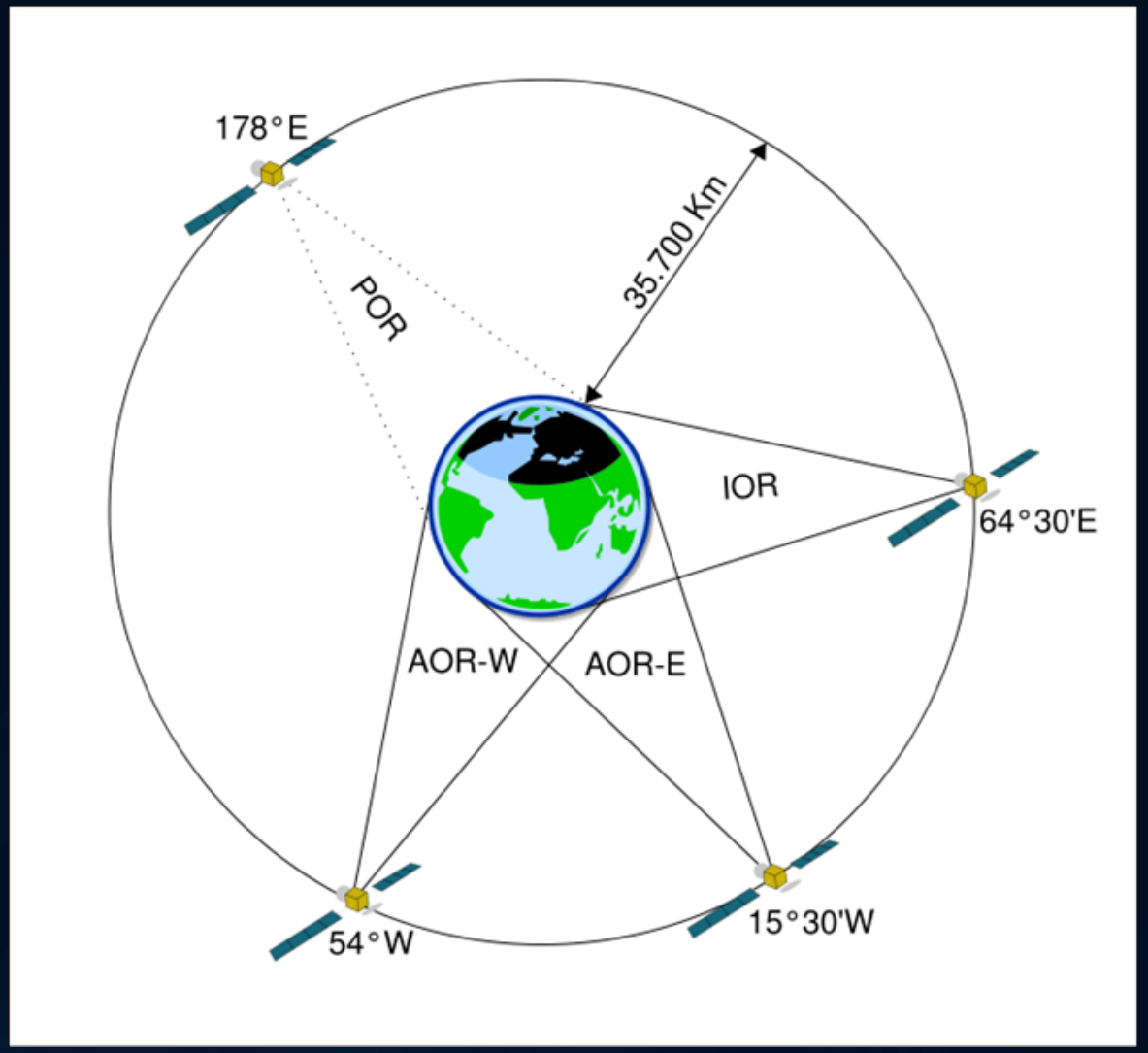
- Global Maritime Distress Safety System (GMDSS) established by the International Maritime Organization (IMO)
- Search and rescue coordinating communications
- Maritime safety information (MSI) broadcasts
- Aeronautical mobile satellite (route) service, or AMS(R)S, in compliance with the Standards and Recommended Practices (SARPs) established by the International Civil Aviation Organization (ICAO)
- General communications

Satellite Coverage

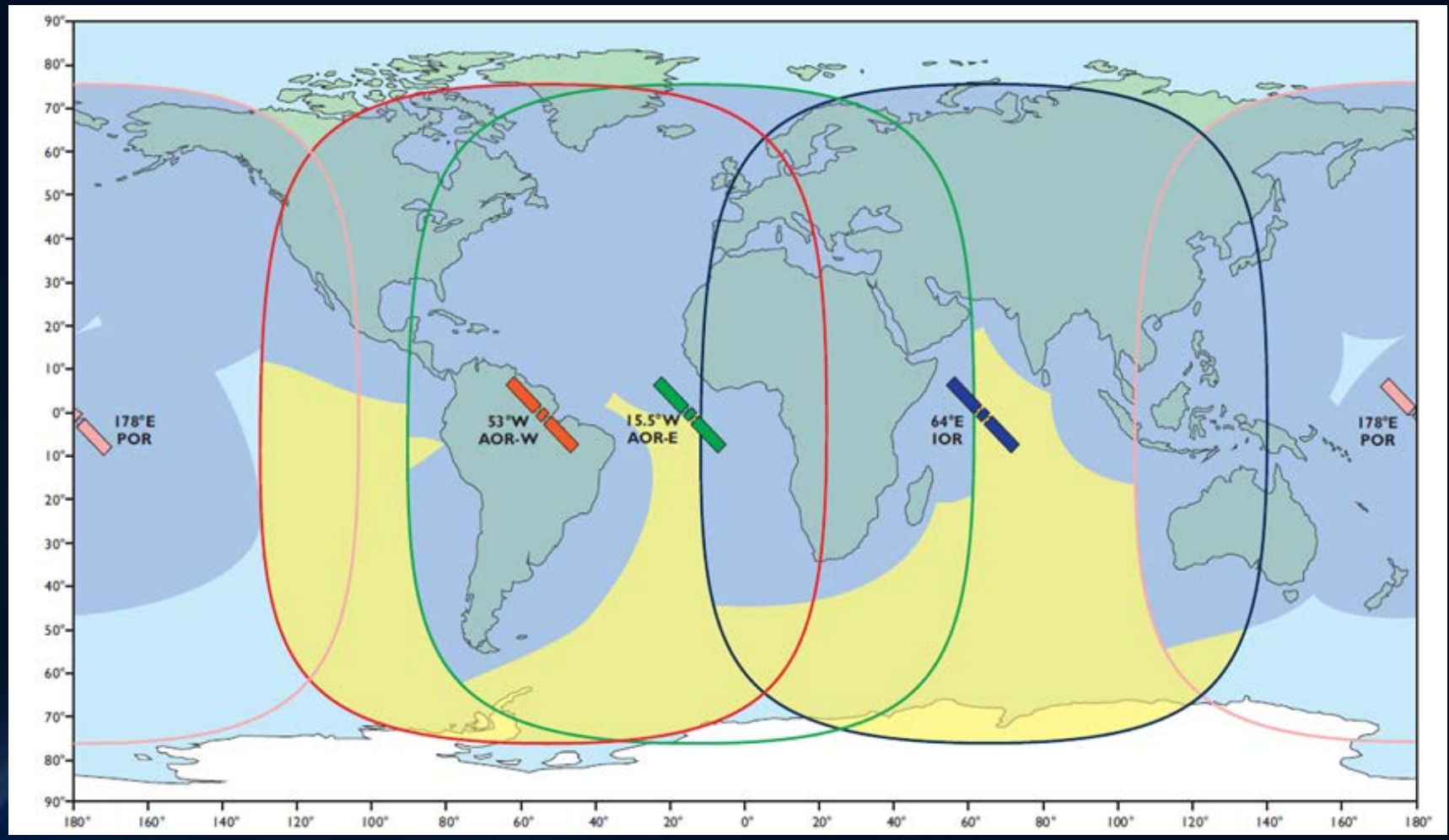
Inmarsat as a maritime communications operator was the first with wholly-owned constellations – the Inmarsat-2 and Inmarsat-3 series – are located above the world's sea-lanes form four ocean regions:

- Atlantic Ocean Region West (AOR-W), at 54 degrees West
- Atlantic Ocean Region East (AOR-E), at 15.5 degrees West
- Indian Ocean Region (IOR), at 64 degrees East
- Pacific Ocean Region (POR), at 178 degrees East

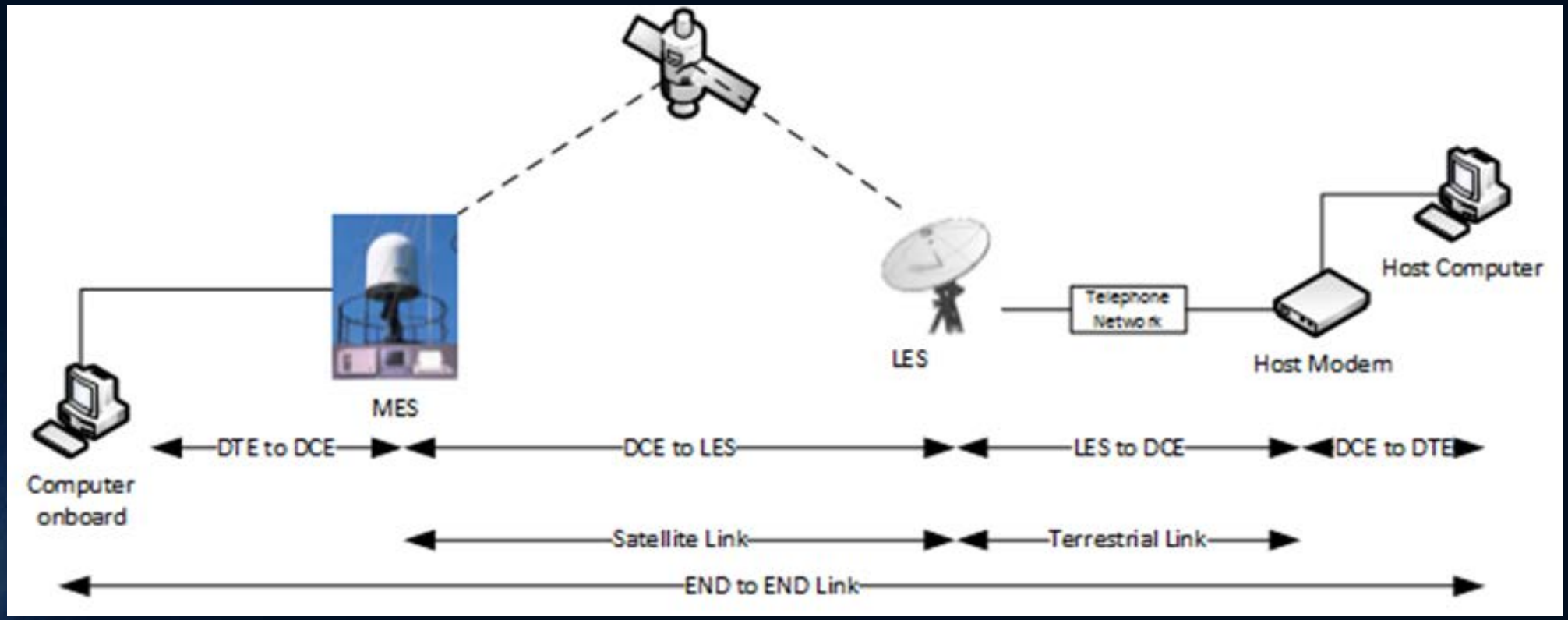
Satellite's Position



Coverage Map



Main satellite communication diagram



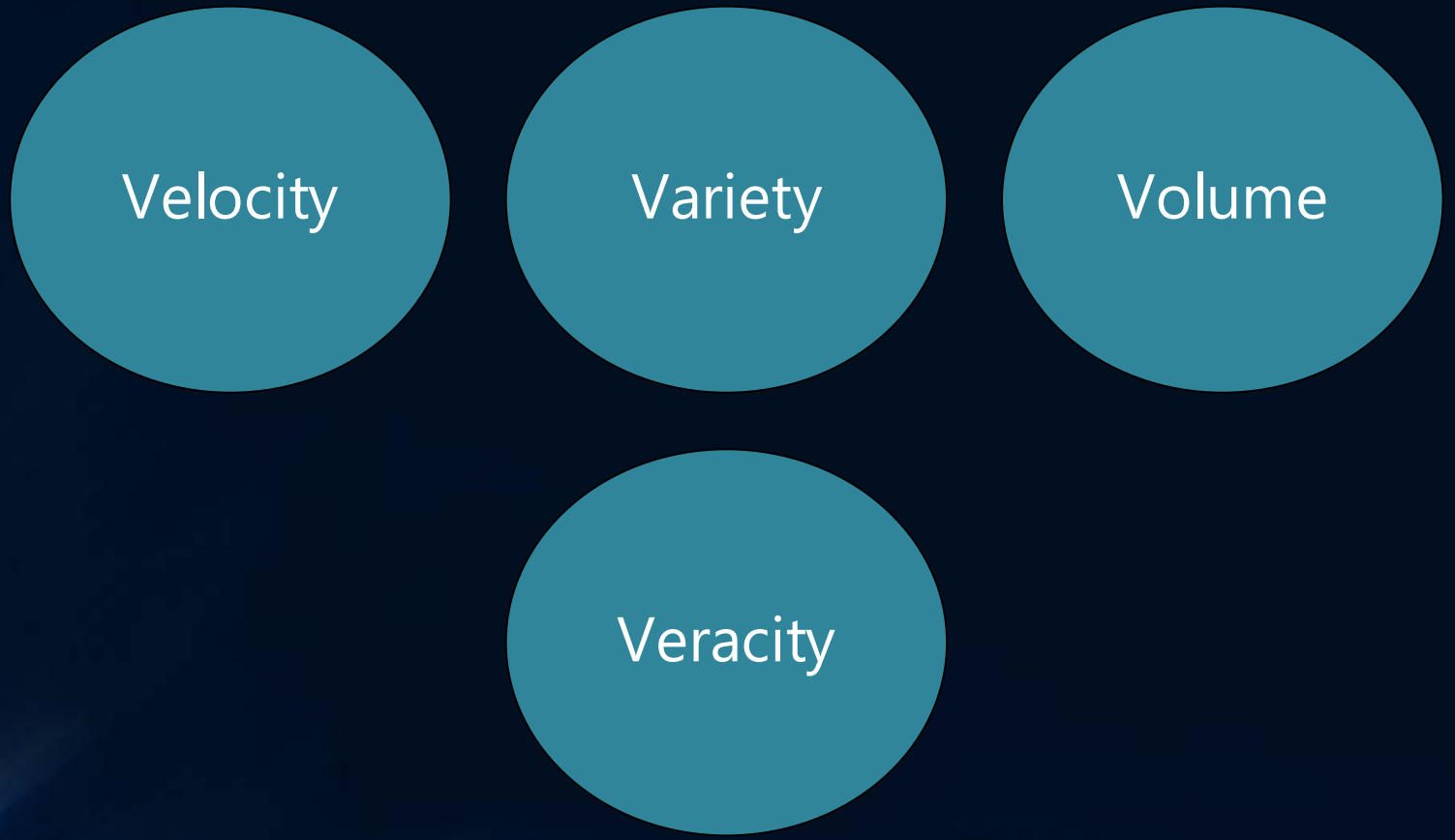
Satellite terminals

- Inmarsat A
- Inmarsat B
- Inmarsat C
- Inmarsat D/D+/IsatM2M
- Inmarsat-M
- Mini-m
- Fleet 33/55/77
- FB 150/250/500
- XpressLink
- GX

What Big Data is?

- So large data that it becomes difficult to process it using the Traditional systems

Big Data characteristics



Big Data big data is typically broken down by four characteristics:

- Variety – Includes unstructured data of all varieties: text, audio, video, click streams. Log files and more
- Velocity – Frequently time-sensitive, how fast the data is processed
- Volume – Huge amount of data in size or terabytes and even petabytes
- Veracity – To screen out spam and other data that is not useful for making business decisions

Types of Big data

- Structured data
- Unstructured data
- Human generated

Big Data Implementation Principals

- Performance
- Availability
- Scalability
- Flexibility
- Cost

Big Data components based on their relationship

Operational Databases

It is very important to understand what types of data can be manipulated by the database and whether it supports true transactional behavior. Database designers describe this behavior with the acronym ACID. It stands for:

- Atomicity
- Consistency
- Isolation
- Durability

Organizing Data Services and Tools

Organizing data services is a set of tools and technologies that can be used to gather and assemble data in preparation for further processing. Such technologies include:

- A distributed file system
- Serialization services
- Coordination services
- Extract, transform, and load (ETL) tools
- Workflow services

Big Data Analytics

Big data analytics is the process of examining big data to uncover hidden patterns, unknown correlations and other useful information. We list three classes of tools that they can be used independently or collectively. The three classes of tools are as follows:

- Reporting and dashboards
- Visualization
- Analytics and advanced analytics

Security Infrastructure

Most important arising challenges when big data becomes part of the strategy

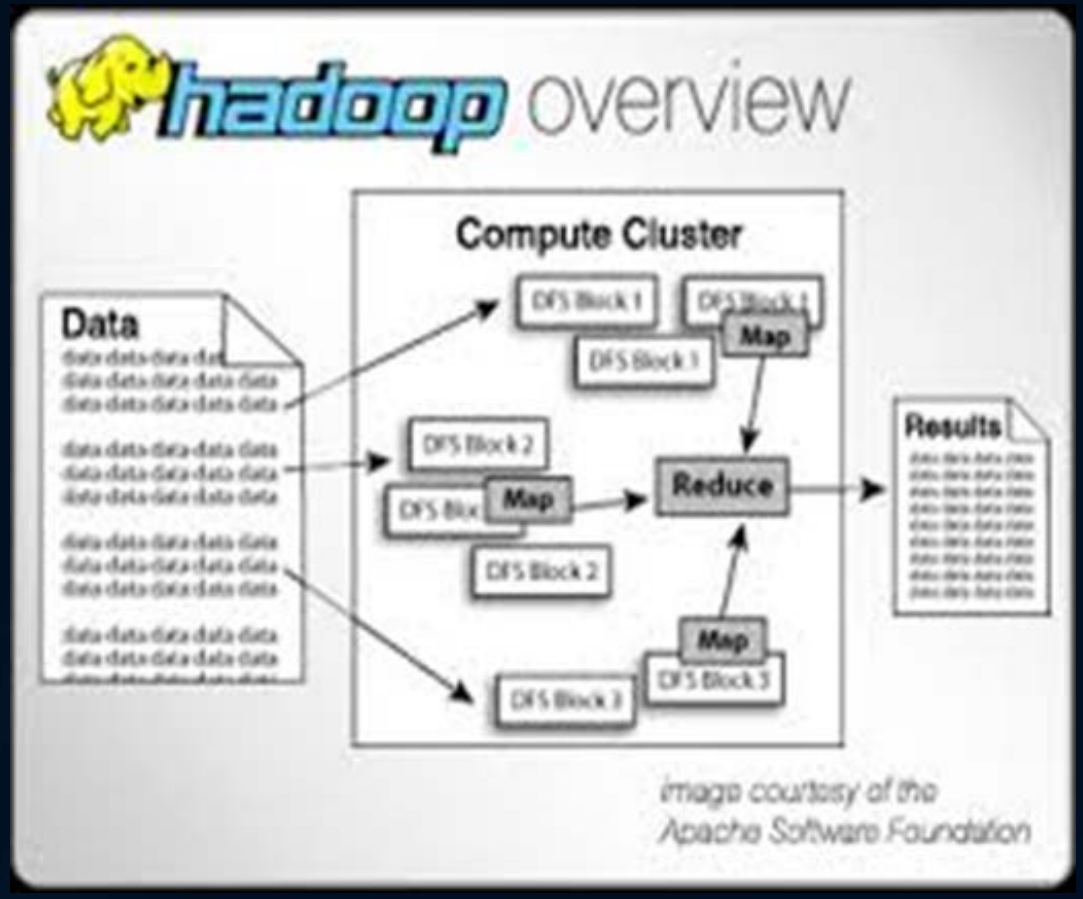
- Data Access
- Application access
- Data Encryption
- Threat detection

Handoop Implementation

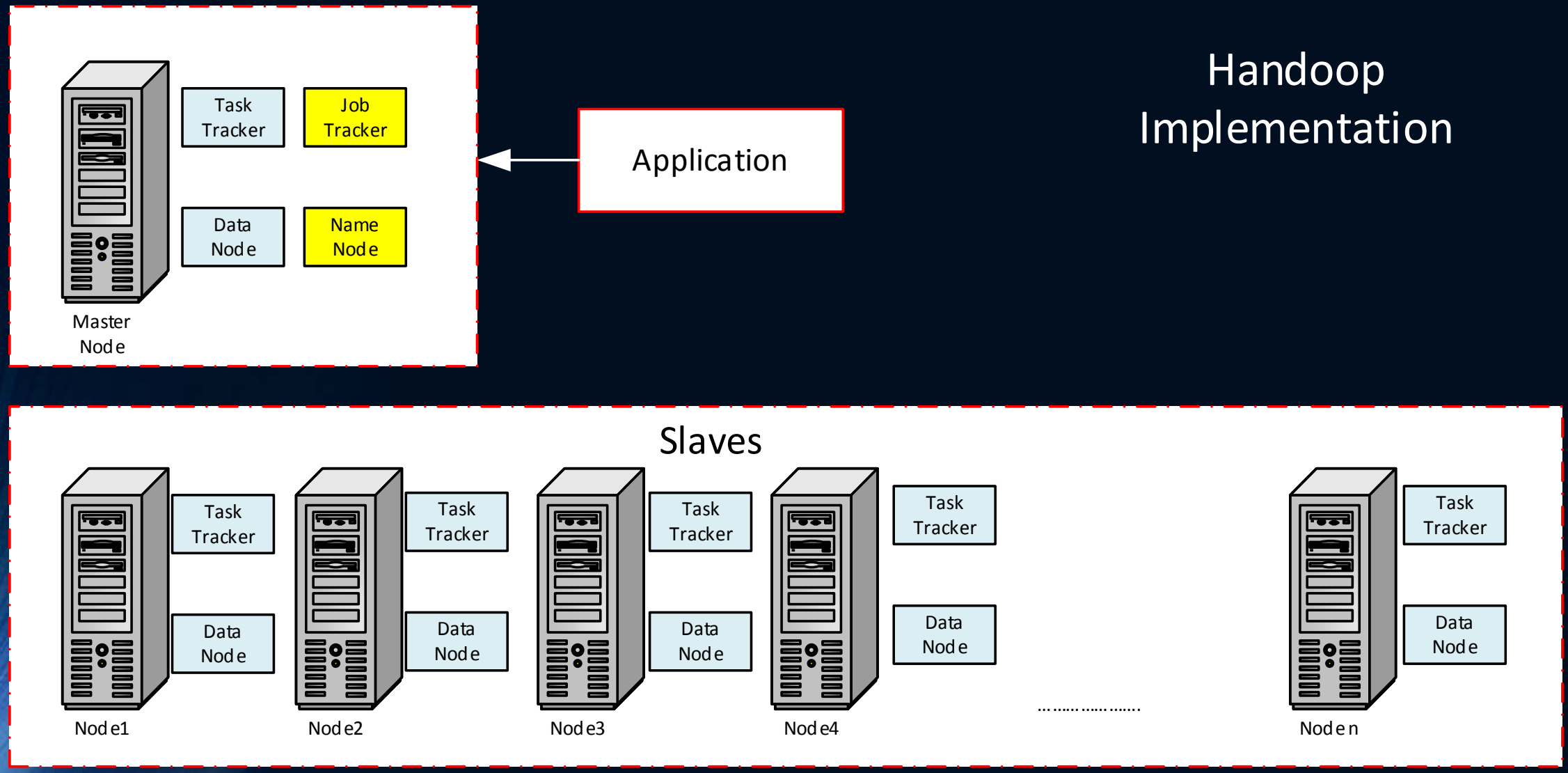
Hadoop is an open source software stack that runs on a cluster of machines. It was originally developed and open sourced by Yahoo. Today Hadoop has evolved to an Apache Foundation project and has numerous renown contributors which refine its unique characteristics:

- Hadoop clusters scale horizontally which means that more storage and computer power can be achieved by adding additional nodes to the cluster. This eliminates the need of more powerful and more expensive hardware by utilizing commodity hardware, reducing the overall cost.

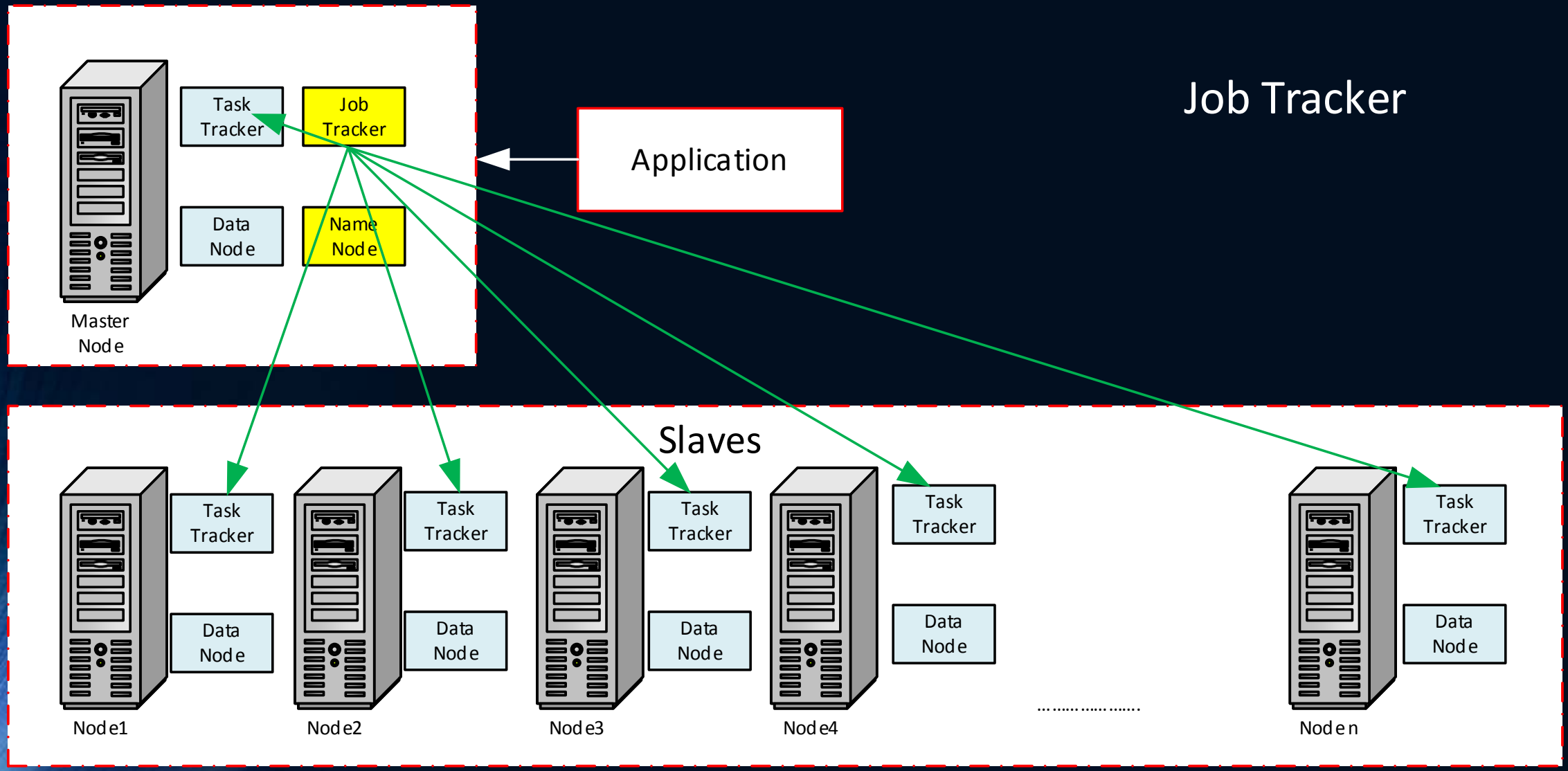
Hadoop Distributed File System (HDFS)



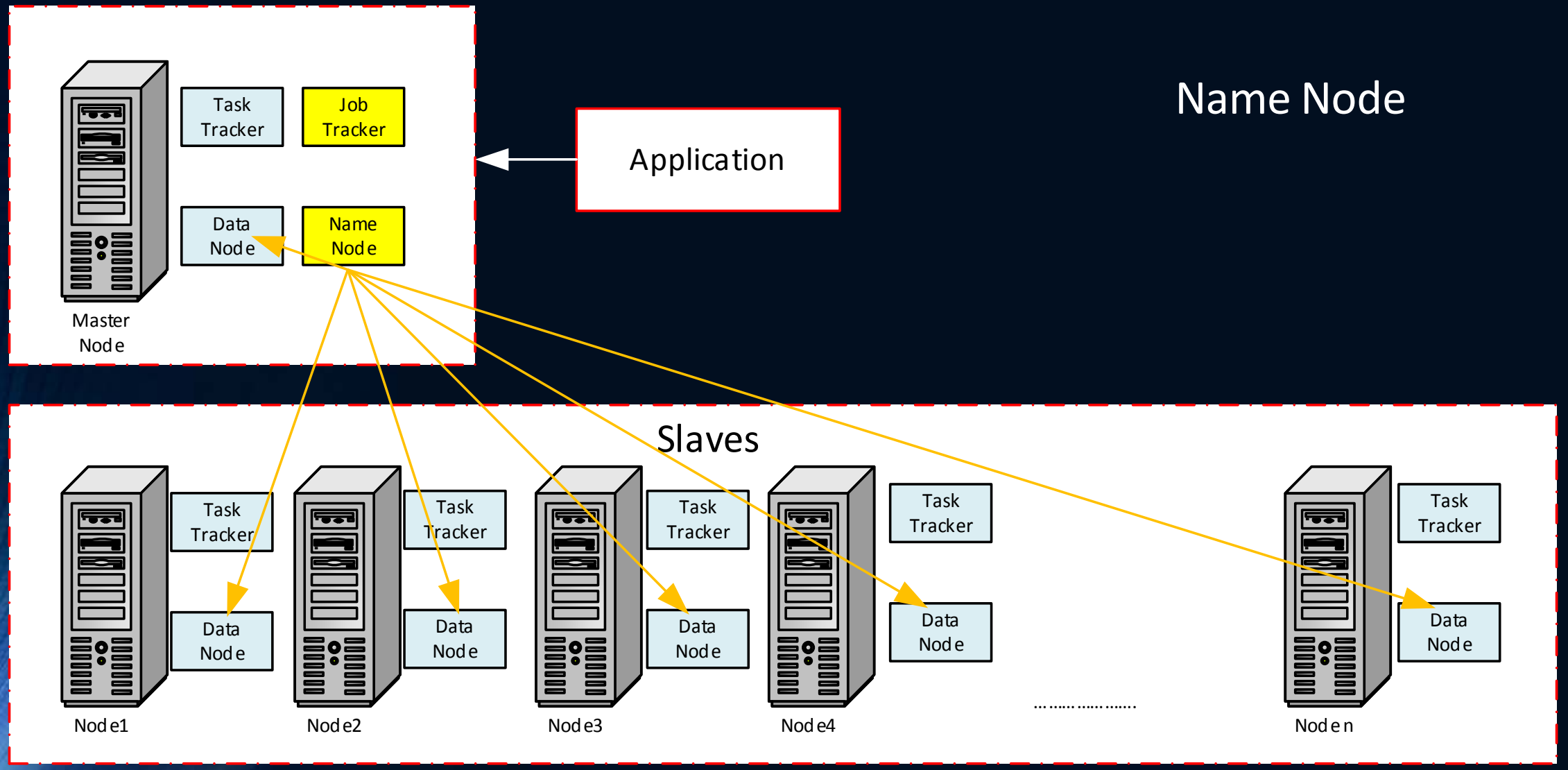
Handoop Implementation



Job Tracker


Task Tracker
Job Tracker
Application
Data Node
Name Node
Master Node
Slaves
Task Tracker
Data Node
Node1
Node2
Node3
Node4
Node n

Name Node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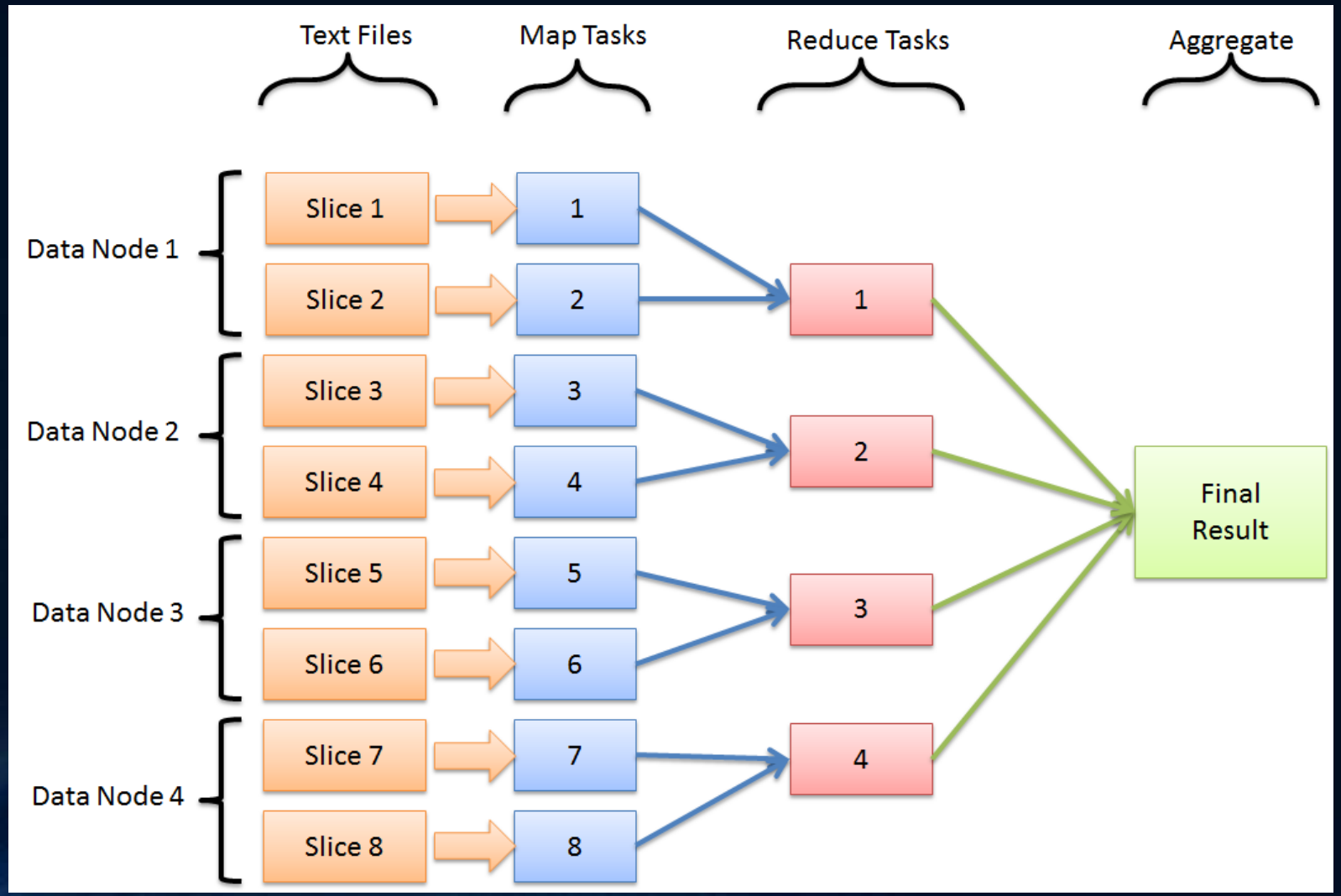
Advantages of HDFS

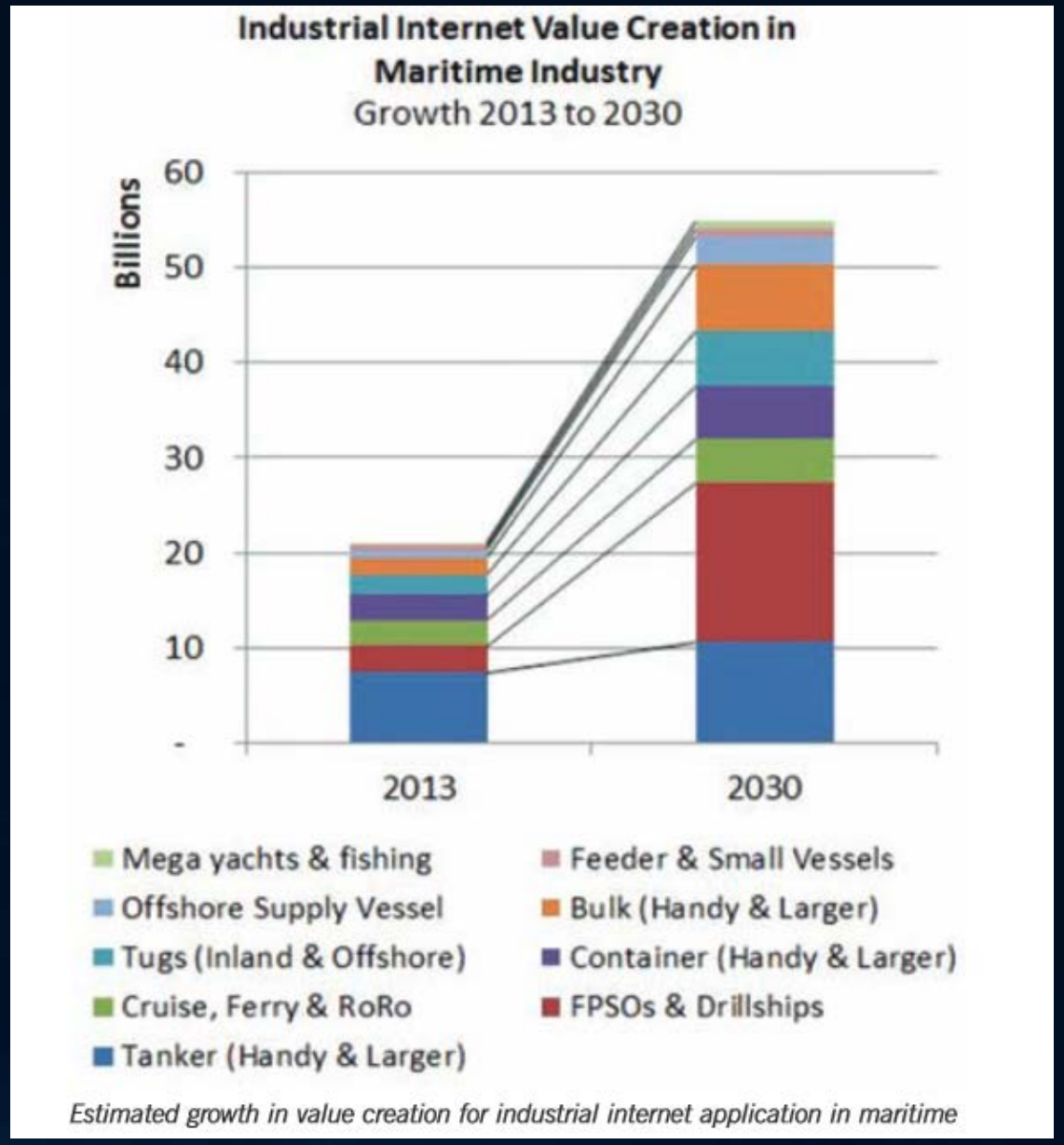
- *Horizontal scalability*
- *Commodity hardware*
- *Fault tolerance*

MapReduce


Text Files
Map Tasks
Reduce Tasks
Aggregate
Data Node 1
Data Node 2
Data Node 3
Data Node 4
Slice 1
Slice 2
Slice 3
Slice 4
Slice 5
Slice 6
Slice 7
Slice 8
1
2
3
4
5
6
7
8
1
2
3
4
Final Result

Big data in Maritime Shipping Industry

It has been estimated that the opportunity across industries only from internet will exceed US$10 trillion per year in the next 15 years, the opportunity for asset owners, operators and managers to reduce costs, improve fuel efficiency, and increase uptime and reliability is approximately US$20 billion today and will exceed US$50 billion by 2030



Estimated growth in value creation for industrial internet application in maritime

On board data

- Video from VDR/SVDR systems
- Steaming text from various sensors on board the vessel
- Video from cameras
- Data for maintenance software
- Data from emails
- Online vessel via VPN
- Vessel’s GPS positions

Benefits from data

- Efficient Communication with the vessel
- Safety
- Maintenance Cost Management
- Fuel Cost Management
- Vessel’s real time route tracking