

## 1 Project Overview

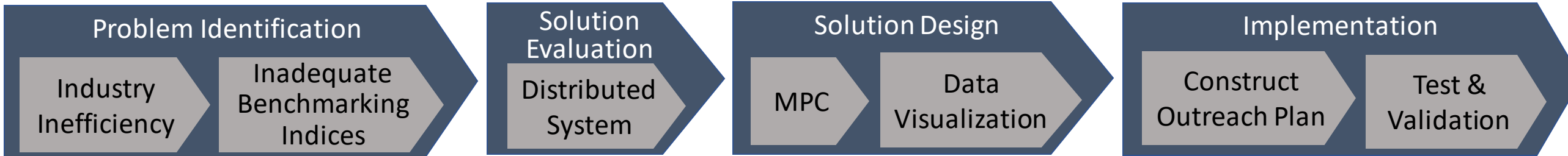
### Background

Maritime industry transports \$16Tn of goods yearly, with a 4.7% y-o-y growth. The top 10 merchant fleet alone has a market value of \$450Bn, illustrating the scale of the industry. However, the maritime industry is filled with multiple inefficiencies. Centre for Maritime Study wants to study these inefficiencies and propose solutions for the market.

### Objective

- Validate inefficiencies in maritime shipping industry
- Validate technology and design of MPC proposed by CMS
- Improve and implement the current solution design

### Methodology



### ISE Skill Sets Applied

- System Thinking and Design
- Data Analytics
- Project Management
- Decision-making Analytics
- Human Factor Engineering

## 2 Problem Identification

### Inefficiency of Maritime Industry

- High fluctuations in freight rates
- Lack of effective communication between ship charterers and cargo owners
- Reluctance of companies to share information due to risk of data leakage

### Lack of Information Sharing

#### Interviews with industry professionals

"We need more transparency in data sharing."

"People don't want to share information in fear of low cyber security."

"Brokers cut off the information sharing channel between charterers and customers."

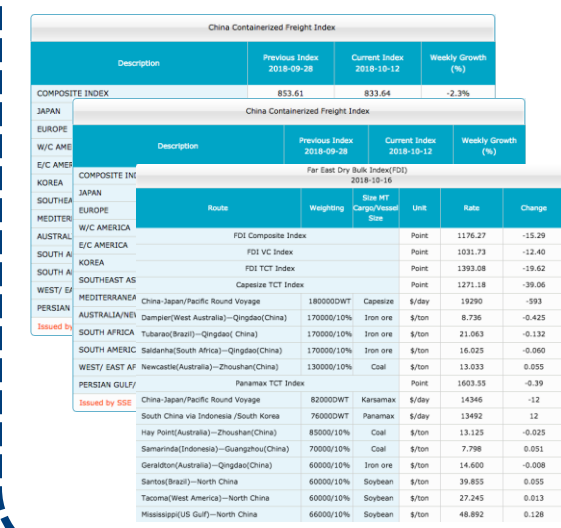
"The industry is old and introverted. People are reluctant to get changed."

### Inadequacy in Existing Benchmarking Indices

#### Xinhua-Baltic Index

- Only focuses on port performance
- Macroscopic general research, no suggestive information for companies

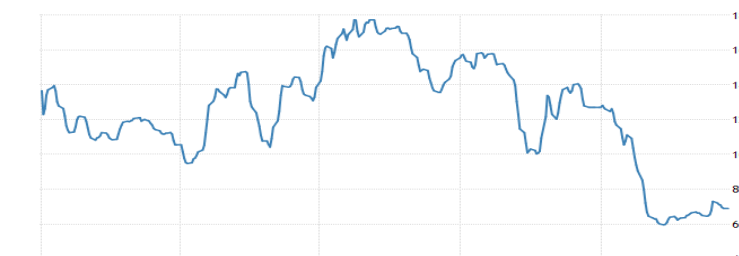
#### Shanghai Shipping Exchange Index



- Limited information on SG or SEA market
- Historical data not readily available

#### Baltic Dry Index

- Focus on dry bulk commodities
- Only tracks overall market performance
- Cannot be applied to individual company



## 3 Solution Evaluation

### Requirements for Benchmarking Index

- Information connection between charterers and companies
- High confidentiality and security in data sharing and communication
- Ability of processing data of global shipping routes
- Easy to use and adapt to the current industry

### Multi-criteria decision analysis for different system design

Rank	Attribute	ROC Weights	Centralize	Decentralize	Distribute
1	Data Security	0.2929	10	100	100
2	Hardware Failure Tolerance	0.1929	10	100	100
3	Fault Tolerance / Stability	0.1429	10	100	100
4	Data Integrity	0.1096	100	60	70
5	Data Reliability	0.0846	30	100	100
6	Performance	0.0646	60	70	80
7	Scalability	0.0479	30	90	100
8	Maintain	0.0336	100	70	80
9	Design Difficulty	0.0211	100	80	90
10	Data Transfer Rate	0.01	10	40	40
Aggregate Benefits		1.0001	30.668	91.179	93.947

### Distributed System



- Encrypted:** Data cannot be accessed without authorizations from all parties
- Secure:** Data transfer between participants and nodes are encrypted and secure
- Confidential:** Multiparty Computing architecture ensures computational outcomes to be shown only to the participant himself



### MPC

Multiparty Computing

Innovative technology that allows nodes to jointly compute any function without learning the inputs and enables secure secret sharing between participants

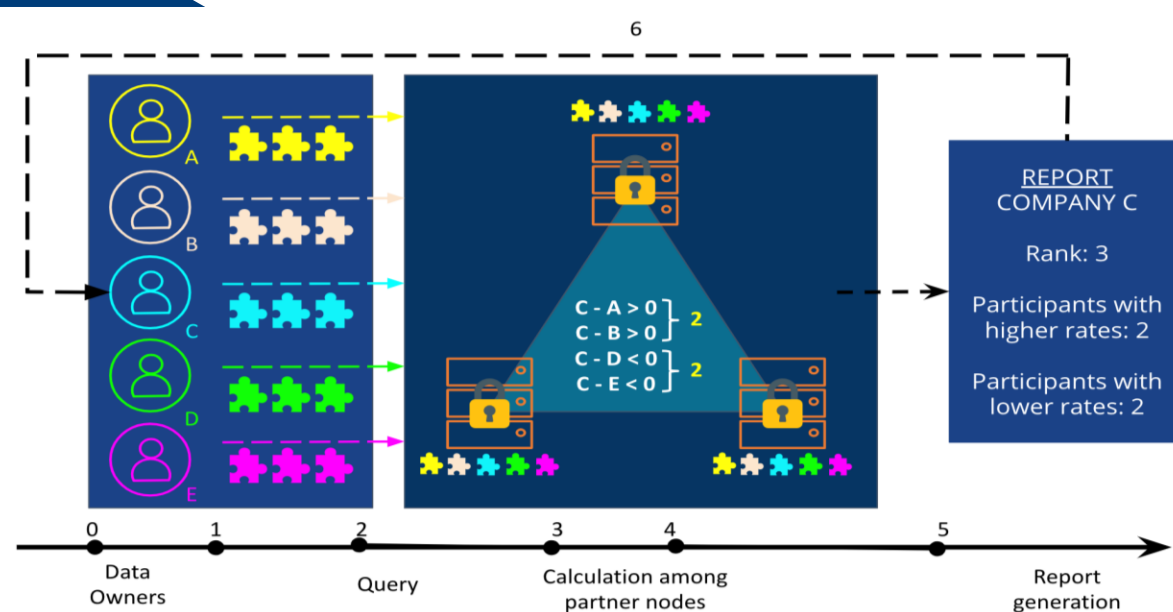
- Nodes:** Unbiased third parties (e.g. NUS, NTU, MPA)
- Participants:** Companies using shipping services

## 4 Solution Design

### Multi-Party Computing

#### Workflow for MPC Ranking

- Company query for ranking
- Separate randomly
- Encrypt and send to parties
- Calculate difference matrix
- Calculate ranking
- Generate Report
- Send report to company



### Visualization

- Indicative summary from different perspectives (e.g. min, average, rank)
- Interactive interface to ensure user-friendly experience delivery
- Exclusive reports specific to each company, ensuring high relevance to company performance



## 5 Test and Validation

1

### Target Audience

- Fortune 500 Companies with large shipping volume
- Procurement Managers dealing with FCL shipping business

2

### Goal

- Gather feedback to feel company sentiments
- Transfer cold lead to warm lead

3

### Channel

- LinkedIn
- Email
- Phone

4

### Approaches

- Leverage on PI's reputation
- Highlight the industry problem and business gap

5

### Evaluation

- Response rate
- % of companies that shows interest
- Critical feedback

### Response Rate

- Overall approach number: 200
- Show interest: 10



JABIL



- Reject proposal: 8
- Main reject reason:
  - Concerns about data security
  - Concerns about host reputation

### Insights

- Demand for data security is poised to increase. Focus on improving MPC technology will be beneficial.
- Improve on host reputation and system reliability is the key to success

### Recommendations

- Invite reputable organizations or agencies to be the nodes of the system
- Conduct smaller scale trial to enhance credibility and raise market sentiment
- Continuous improvement on the platform according to market feedback