Emerging Technologies in Ocean Freights

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Presentation Flow

- Introduction
- Analysis
- Conclusion
Immutability
Distributed Consensus
Trustless

Trust
Record Keeping
Value Transfer
# Public Vs Permissioned Blockchains

<table>
<thead>
<tr>
<th></th>
<th>Public Blockchain</th>
<th>Permissioned Blockchain</th>
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<tbody>
<tr>
<td><strong>Access</strong></td>
<td>Open read/write</td>
<td>Permissioned read and/or write</td>
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<tr>
<td><strong>Speed</strong></td>
<td>Slower</td>
<td>Faster</td>
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<tr>
<td><strong>Security</strong></td>
<td>Proof of Work</td>
<td>Pre-approved participants</td>
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<td>Proof of Stake</td>
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<td>Other consensus mechanisms</td>
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<tr>
<td><strong>Identity</strong></td>
<td>Anonymous</td>
<td>Known identities</td>
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<td>Pseudonymous</td>
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TRUST + DOCUMENTATION + VALUE TRANSFER = CONTRACT
CONNECT
Start looking for a ship/cargo

CONNECT
Connected, start negotiation

NEGOTIATE
Vessel on-sub

En-route

Cargo discharged
CALCULATE (hire, demurrage)

Funds transferred
Start looking for a ship / cargo

CONNECT

Charterer: Needs a ship
- E-mails the details to the broker
  - Broker spreads the message in the market through email or messenger apps.
    - Broker passes the information back
      - Charterer reviews and confirms.

Market:
- Remains open in market till a match is made through a chain of brokers
  - Broker passes the information back

Broker:
- E-mails the details to the broker

Ship-owner:
- Needs cargo
  - E-mails the details to the broker
  - Owner reviews and confirms
Connected, start negotiation

NEGOTIATE

Ship-Owner
- Offers a rate for hire and demurrage
  - Review T&C; agree or negotiate
    - Multiple communication on email and phone happens during negotiation till both parties agree on hire, demurrage and Charter Party wordings (T&C)
      - Vessel on-sub starts proceeding to the load-port in most cases.
        - Owners confirm the vessel is “on-hire”, sign the CP
  - Negotiate

Brokers
- Offers terms and conditions

charterer
- Charterer puts the vessel On-Sub and forwards the details to terminals for approval.
  - Terminals give a go-ahead for the vessel.
  - Charterers confirm the vessel is “on-hire” and CP is signed

Terminals
- The deal is cancelled if the terminal rejects the vessel for whatever reason at this stage.
Cargo discharged

CALCULATE (hire, demurrage)

- Cargo discharging completed
- Chartering desk collects all timings from the Master
- Calculate hire and demurrage based on the CP T&C

Prepare an invoice and passes it on to the charterers, keeping brokers in copy.

Ship-owner Ops

Ship-owner Accounts

Brokers

Charterer Accounts

Charterer Ops

- Charterers collect SoF from agents and other cargo documents from the Master
- Calculate hire and demurrage based on the CP T&C
- Receive invoice, confirm with own calculations. Confirm there is no ambiguity and no dispute.
- Approve payment for hire OR hire+ demurrage

Recieve invoice and passes it to the Ops team for approval

Process payment through the bank

Receive funds

In case of any ambiguity, recalculate, investigate and negotiate with the ship-owners till the time it is resolved.
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<thead>
<tr>
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<th>Minimum</th>
<th>25th Quartile</th>
<th>Median</th>
<th>Average</th>
<th>75th Quartile</th>
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<td>Charterers</td>
<td>Ship-owners</td>
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A web-based solution

<table>
<thead>
<tr>
<th>Charterer</th>
<th>Web-based Platform</th>
<th>Ship-owner</th>
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</thead>
<tbody>
<tr>
<td>Needs a ship</td>
<td>Enters the details in the system</td>
<td>Needs cargo</td>
</tr>
<tr>
<td>Enters the details in the system</td>
<td>System matches the requirements based on information in the database and gives a set of results in seconds</td>
<td>Enters the details in the system</td>
</tr>
<tr>
<td>Charterer reviews and confirms.</td>
<td>Owner reviews and confirms</td>
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</table>
- Natural Language Processing algorithms have limited abilities at the moment

- Blockchain applications do not help with this step
Blockchain-based self-executing smart contracts
1. Take input from a pre-defined participating node.

2. Calculate the hire and demurrage based on a pre-defined formula defined in the CP.

3. Receive a trigger from a pre-defined participating node or other condition as defined in the CP.

4. Execute the funds transfer.

- Self-executing smart-contract for hire and demurrage.

- Transfer Funds
1. Take input from a pre-defined participating node.
   - Information are collected from various documents such as SoF by humans.

2. Calculate hire and demurrage based on a formula pre-defined in the CP.
   - The information is entered into an excel sheet or other computer program. The formula is defined based on the individual's understanding of the CP.

3. Receive a trigger from a participating node as defined in the CP.
   - Invoice is raised by the ship-owner based on their own calculation. There are several rounds of communications till the figures are finally agreed and accounts deptt. clears the fund transfer.

4. Execute the funds transfer.
   - Accounts deptt. Passes on the information to the bank to transfer funds. The banks execute international transfer through their partner banks. It takes several days before the funds arrive.

Near future

- The third party cargo surveyor becomes a participating node and enters the values into the smart contract.
- The smart contract has a pre-defined and agreed formula based on the signed CP wordings. The figures are calculated within seconds.
- The smart contract gets a confirmation on transfer of the cargo from a trusted third party, such as the cargo surveyor or the terminal and gets triggered.
- The smart contract sends instructions to the linked bank account to transfer the funds to a pre-defined account of the ship-owner.

Distant future

- IoT devices fitted on the vessel transmit required timings and other figures directly to the contract.
- Same as above
- IoT devices confirm transfer of the cargo within pre-defined acceptable parameters triggering the smart contract to execute fund transfers.
- The smart contract uses a token (or an acceptable cryptocurrency) to transfer value from one party to another.
BILL OF LADING

Non-negotiable Document of Entitlement
1. Letter of credit issued by receiver's bank.

2. Charterers instruct the suppliers to release the cargo for shipment.

3. Ship loaded with cargo; Bill of Lading generated. True copy carried onboard.

4. Original BL sent by courier.

5. Cargo delivered to the receivers.

6. Receivers submit the BL to their bank.

7. Bank transfers funds to charterers.

BILL OF LADING life-cycle
Document Management

The BL remains accessible through the Blockchain to the right party, at the right time.
Document Management

- Charter Party Agreement
- Bill of Lading
- Certificate of Quality, Quantity and Origin
- Statement of Facts (Timesheet)
- Various Cargo documents
End-to-end process re-engineering

- Start looking for a ship/cargo
- Connected, start negotiation
- Vessel on-sub
- Cargo discharged
- Calculate (hire, demurrage)
- Funds transferred

Trust
Record Keeping
Value Transfer
- Consortium-based approach
- End-to-end solution
All processes merging together
The Blockchain of Shipping
## Legal Aspects of Smart Contracts

<table>
<thead>
<tr>
<th></th>
<th>Traditional</th>
<th>Smart</th>
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<tbody>
<tr>
<td><strong>Specification</strong></td>
<td>Natural Language + “legalese”</td>
<td>Code</td>
</tr>
<tr>
<td><strong>Assent</strong></td>
<td>Signatures</td>
<td>Digital Signatures</td>
</tr>
<tr>
<td><strong>Dispute resolution</strong></td>
<td>Judges, Arbitrators</td>
<td>Decentralized platform, Arbitrators</td>
</tr>
<tr>
<td><strong>Nullification</strong></td>
<td>By judges</td>
<td>???</td>
</tr>
<tr>
<td><strong>Payment</strong></td>
<td>As specified</td>
<td>Built-in</td>
</tr>
<tr>
<td><strong>Escrow</strong></td>
<td>Trusted third party</td>
<td>Built-in</td>
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Adopted from the MAS.S62 (Course instructor – Dr Neha Narula)
Future Research

- More scalable Blockchains making transactions faster and cheaper

- Natural Language Processing (NLP) algorithms
Document Management

Contract Management
Document Management
Contract Management
Certification Management
Value/Fund Transfers
Identity Management
Cargo Trading Platform
Marketplace for cargo and ships
Conclusion

- Consortium-based approach
- End-to-end solution
Thank You

Q & A