

Trade Facilitation using Blockchain Technology – Building Trust and Transparency



Susmita Majumder
Business Transformation Consultant
IBM India Ltd



Agenda

- > IBM Engagement with ADB on Trade Facilitation for Govt. of Maldives
- > Fundamentals of Blockchain Technology
- > High Level Blockchain Use Cases on Trade Facilitation
- > Key Recommendations to Blockchain Adoption in Customs Administration
- > Blockchain Pilot Implementation on Trade Facilitation for Govt. of Maldives

IBM Engagement with ADB on Trade Facilitation for Govt. of Maldives

IBM-ADB Engagement on Govt. of Maldives on NSW Initiative



IBM conducted Blockchain feasibility assessment on Maldives Trade Processes in March, April 2019:

- Blockchain use cases with suitable value drivers were proposed basis understanding of the pain areas in international trade processes in Maldives
- The envisioned Blockchain solution was proposed to facilitate seamless exchange of information among various participants, government and private entities alike, including cross border exchange of data between government agencies.
- A high-level roadmap for implementation of the Blockchain technology as NSW backbone was chalked out.

IBM built the Blockchain pilot platform for Maldives Sea Import Trade Process in 2020-21 & 2022-23:

- Under ADB's NSW initiative in mid 2019 IBM proposed to build a pilot Blockchain platform for Maldives import trade process to address their then current problems in domestic and cross border trade
- Between Sept 2020 and June 2023, in 2 phases, IBM developed the Blockchain pilot platform under this NSW initiative for Maldives import trade processes.

Feasibility study findings led to proposal of a Single Integrated Blockchain Trade Platform

| # | Pain Points | Importer | Exporter | Customs | Customs Broker | Ports | Airports | Shipping Agent | Freight Forwarders | Banks | Insurance | Regulators/ CBRA's |
|----|------------------------------|----------|----------|---------|----------------|-------|----------|----------------|--------------------|-------|-----------|--------------------|
| 1 | Risk of trade document fraud | * | | * | | | | | | | | * |
| 2 | Multiple accounts lock-in | * | * | | * | | | * | | | | |
| 3 | Process Duplication | * | * | * | * | * | * | * | * | | | * |
| 4 | Compliance Enforcement | | | * | | | | | | | | * |
| 5 | Cross Border Collaboration | | | * | | * | * | | | * | * | |
| 6 | Trust & Reliability | * | * | * | * | * | * | * | * | * | * | * |
| 7 | Standardization | * | * | * | * | * | * | * | * | * | * | * |
| 8 | Security & Privacy | | | * | | * | | | | * | * | * |
| 9 | Process Transparency | * | * | * | * | * | * | * | * | * | * | * |
| 10 | Manual Payments | * | * | | * | * | * | * | | * | | * |

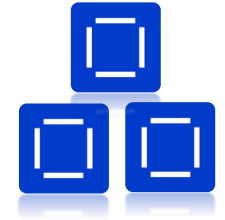
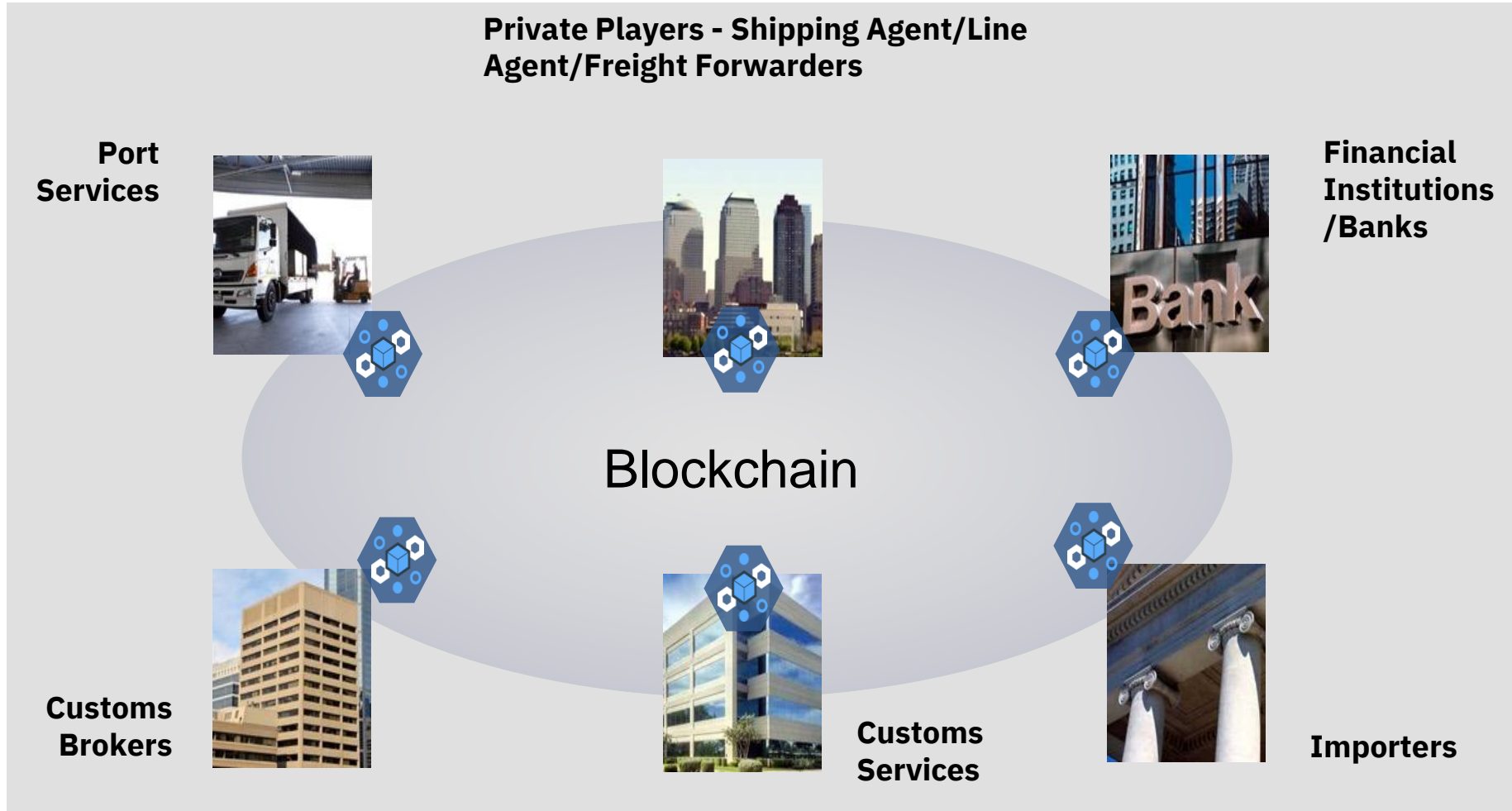
Primary Design Considerations for the Blockchain Platform were:

- **Process and data standardization** to eliminate redundancies and reduce opacity of the process
- **Single source of truth** at any point of time
- **Process and system ownership with government agencies** to ensure credibility of the system and reinforce trust amongst stakeholders
- **Single window system for all interaction between all stakeholders** – state agencies, private organizations, brokers and individuals
- **Customer centric design**
- **Digital payments and smart digital contracts** as key catalysts for domestic and regional trade facilitation.

Fundamentals of Blockchain Technology

Fundamentals of Blockchain Technology

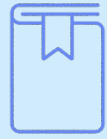
A shared, replicated, permissioned ledger ...



Blockchain follows the concept of distributed database deployed across **a network**

... with consensus, provenance, immutability and finality

Requirements of Blockchain for Business



SHARED LEDGER

IDENTITY

ENDORSEMENT

CONFIDENTIALITY

Participants decide which assets to share

Participants know who they are dealing with

Participants give provable endorsement

Information shared is need-to-know

The business network decides what to share on the ledger...

- **Assets** - anything of value
- **Transactions** – that change state of an asset and are recorded on the blockchain
- Transactions underpinned by **smart contracts**

Identity - knowing who you're dealing with, Identity allows transactions to be signed and encrypted

Transaction Endorsement - Provable endorsement by relevant participants

Privacy and Confidentiality- mechanism to make the blockchain private and confidential

Blockchains for business are generally permissioned, private and prioritized with smaller no. of participants

Key Value Drivers of the Blockchain Network



- ❑ Eliminates silos, **creates single source of truth**
- ❑ **Supports data encryption** and permission settings for network members, hence tamper proof system
- ❑ **Provides trust in source and provenance** of who did what when
- ❑ **Enforces consistent process** - reducing risk and ensuring compliance
- ❑ Network partners **collaborate with increased trust** through shared process and record keeping
- ❑ **No single point of failure**, higher levels of availability, highly scalable, Easy to integrate
- ❑ **With off chain DB facility** - capability for Cognitive Analytics

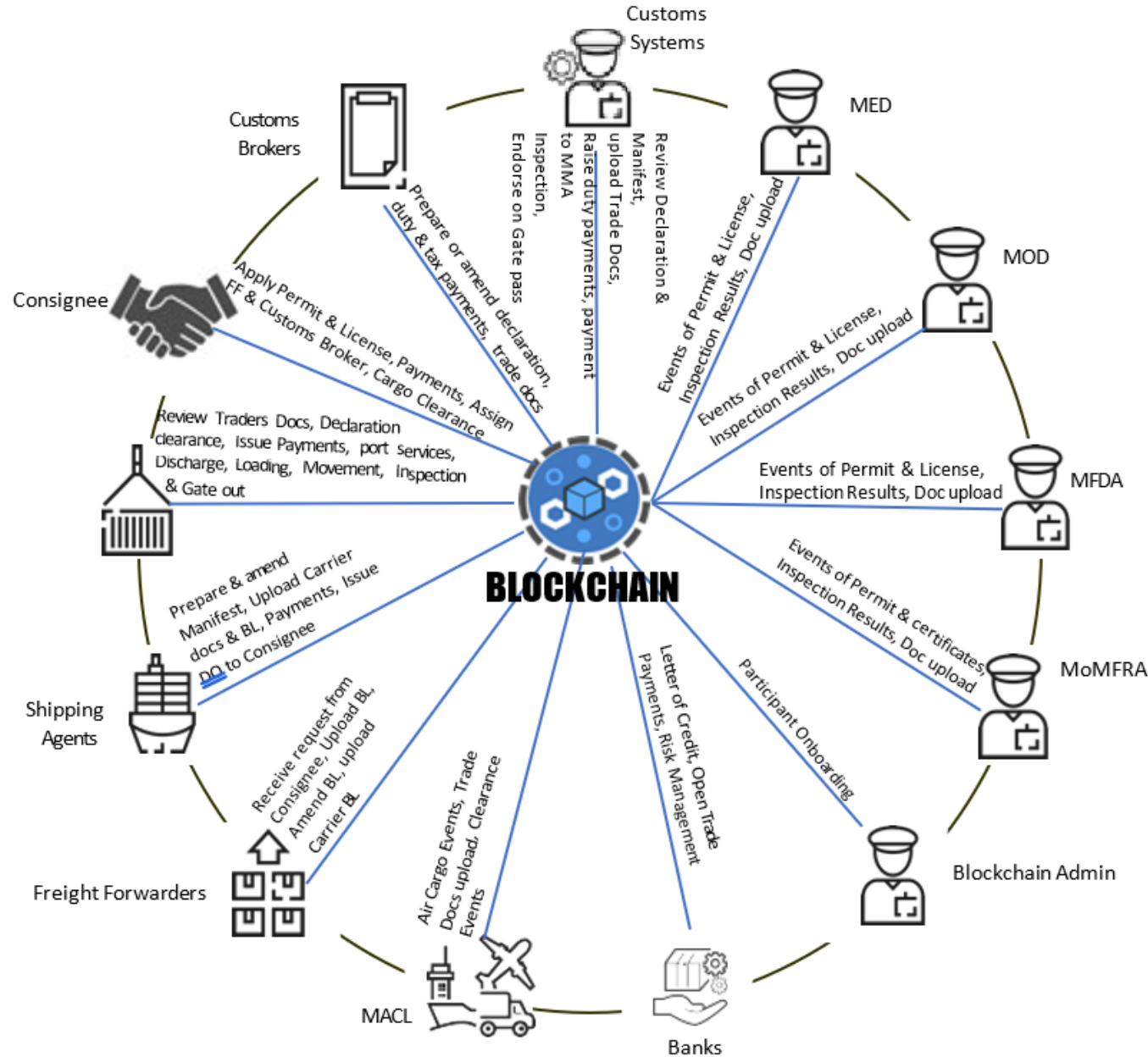
High Level Blockchain Use Cases on Trade Facilitation

High Level Blockchain Use Cases of Trade Facilitation



| # | Use-case Title | Use-case Description |
|---|--|--|
| 1 | Single platform for digital trade document exchange with end-to-end visibility into trade process | <ul style="list-style-type: none"> • Single platform for trade registrations & certifications, trade document exchange, common payments for trade, goods clearance and cross border trade collaboration. • Common platform for all trade network participants - Customs, Port, Air Cargo, Consignee, Customs Broker, logistics players to interact with each other. • Improved risk management. Invoices, PO and other price determination documents can be traced back to its source, reducing chances of document fraud improving confidence in the system. • Single version of truth of all trade documents like MBL, HBL, Manifest, Packing List, etc. the moment it gets uploaded/generated onto the network and gets available to all different agencies. • Cross border collaboration between government agencies and port/airport operators. |
| 2 | Single platform for import permit processing and issue | <ul style="list-style-type: none"> • End-to-end transparent process for issuance of digital permits from multiple government agencies - MED, MCS, MFMRA, MFDA, MoD. • Improved process level transparency, reduce cross collaboration with seamless workflow between multiple govt agencies along with automated payments mechanism. |
| 3 | Single platform for CBRA's-clearance of goods | <ul style="list-style-type: none"> • Delivery Order issuance by CBRA at the point of physical inspection can be inputted directly to the distributed ledger which can be viewed by other CBRA's, MPL/MACL, eliminating physical stamping at gate pass process. |
| 4 | Online payments, single payments account, improved working capital. | <ul style="list-style-type: none"> • Near real time/real time settlement of accounts between the participating bank, Customs/Port and the customer (trader, shipping agent, customs broker, etc.) using the Payment Gateway for online banking • Ready availability of payment reconciliation reports at any point of time |
| 5 | Single platform for export permits and certifications | <ul style="list-style-type: none"> • Issuance of export permits and certifications on one single platform where applicant can apply and pay the fee only one time. • Certificates like catch certificate and health certificate issued by MFMRA & MFDA can be processed with proper workflow automation for inter-organization or intra- organization collaboration on the platform eliminating multiple visits to the concerned offices. |

Future State with Blockchain Technology for Trade Facilitation



Key Recommendations to Blockchain Adoption in Customs Administration

❖ **Making Blockchain as the National Single Window backbone for both domestic and cross-border trade:**

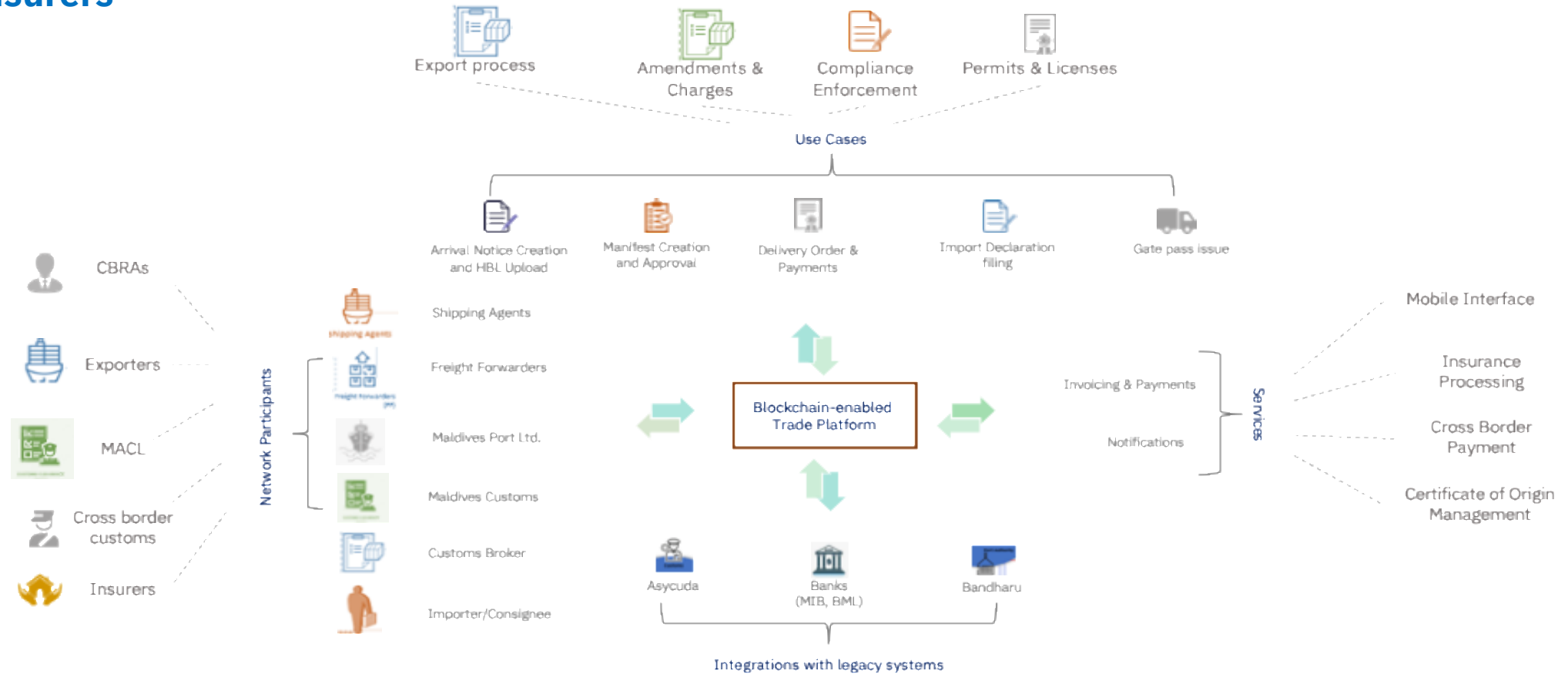
Blockchain is a distributed network platform offering a single digital workflow across domestic organizations and network cross-border agencies. It can seamlessly integrate with existing NSW architectures across multiple countries providing a common platform to share data & documents and transact through its in-built ledger movements.

Key features of a Blockchain network to be the backbone for multiple NSW networks across different countries :-

- **It does not disrupt the national single window architecture** or any other domestic systems or processes that may be required to integrate with the backbone
- **Supports API endpoints for easy integration**, also supports file-based data transfers
- **Offers superior performance and data security.** Blockchain, with redundant node architecture, offers high fault tolerance with superior system durability and availability.
- **It is future proof.** Blockchain offers improved levels of network automation, immutability, and scalability features.
- **It improves overall trust in the system.** Blockchain as an NSW backbone improves overall trust and transparency in the international trade ecosystem.
- **Seamless onboarding onto the network.** Cross border participants from Southeast Asian countries can join the network seamlessly, without any friction arising from cross-border exchange of data.

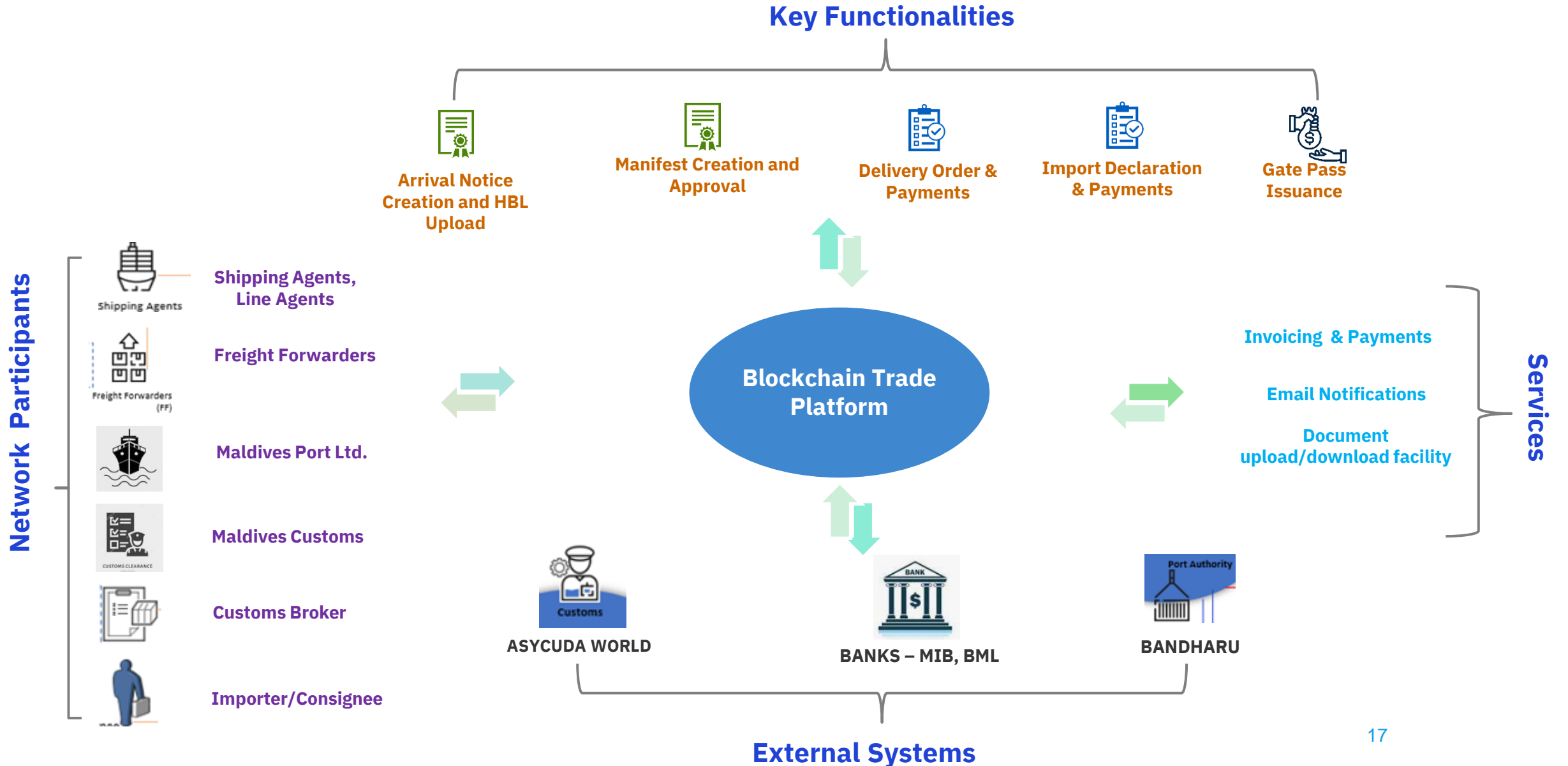
Key Recommendations to Blockchain Adoption in Customs Administration

- ❖ **Scaling up the Blockchain network to integrate with additional touch points for mobile interfacing, insurance processing, cross border payments, contact center, helpdesk, value added analytical reporting, advance search capabilities, GenAI Chat BOT facility...etc**
- ❖ **Adding more network players onto the Blockchain network like CBRAs, MACL, Cross border customs, Global insurers**



Blockchain Pilot Implementation on Trade Facilitation for Govt. of Maldives

Blockchain Pilot Trade Import Platform Implemented for Govt of Maldives



Key Functionalities - Blockchain Pilot Trade Import Platform



User on-boarding & registering on Blockchain platform

- On-boarding users from MCS, MPL, logistic players, Custom Broker organization
- Consignee/Importer registration

Gate Pass Issuance to Importer

- Digital workflow to pre-approve cargo items by MCS
- Enable MPL to create new online gate pass for release of goods.
- Importer to download the gate pass document

Online Payments

- Online payment for delivery order and import duties by the importer/consignee and customs broker.
- Capture payment done by cash or credit mode.

Arrival Notice Creation

- Shipping agent to create arrival notice with ETA.
- Upload of Master Bill of Lading by Shipping Agent/Line Agent/Freight Forwarders

HBL Upload, Manifest Creation & Approval

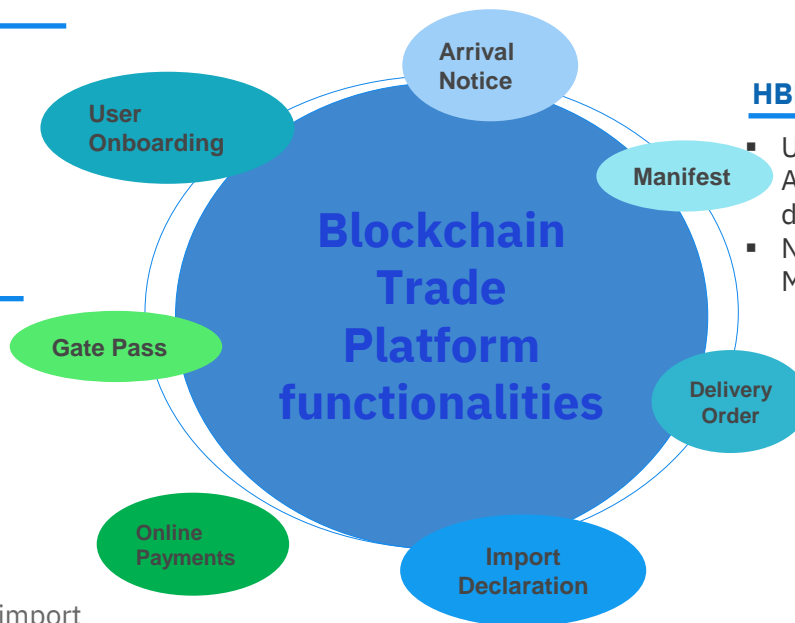
- Uploading of House Bill of Lading (HBL) by the logistics players. Automatic generation of the complete complied Manifest document.
- Notification to MPL and MCS for download of the complete Manifest document.

Delivery Order Issue to Consignee

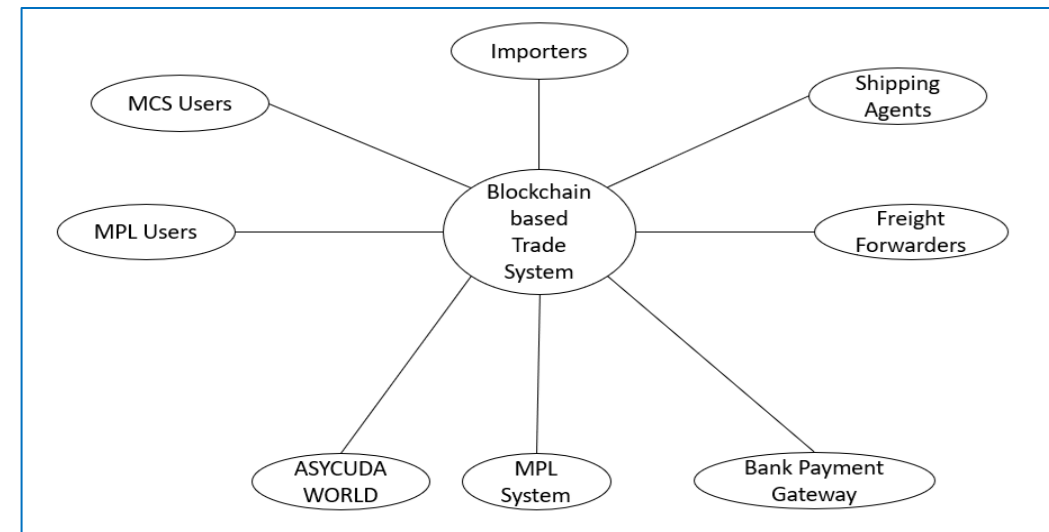
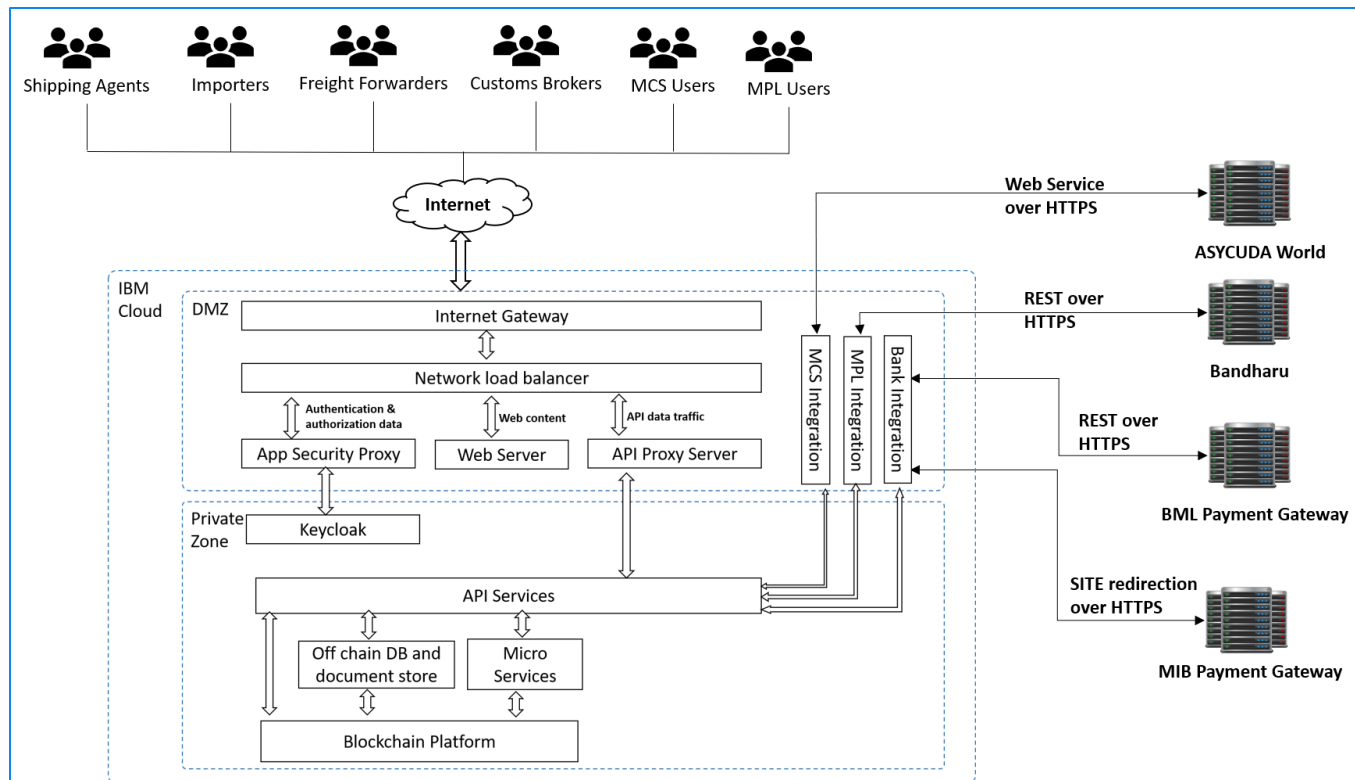
- Shipping Agent/ Line Agent to create new Master Delivery Order(MDO).
- Receive online payment from Freight forwarder against the MDO.
- Freight Forwarder to create House Delivery Order(HDO) and share delivery order with importer and receive payment against the HDO.
- Make delivery order available to MCS and MPL post approval from Shipping Agent/Shipping Line Agent.
- Allow importer to raise request for delivery order extension.

Import Declaration

- Importer and Customs Broker to create new, view and modify existing import declarations before assessment, make online import duty payments against a declaration.
- MCS to register, view, raise clarification, assess, post-entry modification (amendment after assessment)
- Receive online duty payments



Overall Architecture, Technical Components & Network Details of Blockchain Pilot Trade Import Platform



Network Details:

3 Peers:

- MCS
- MPL
- Other organisations (Logistic Players, Brokers)

4 Orderers:

2 Channels:

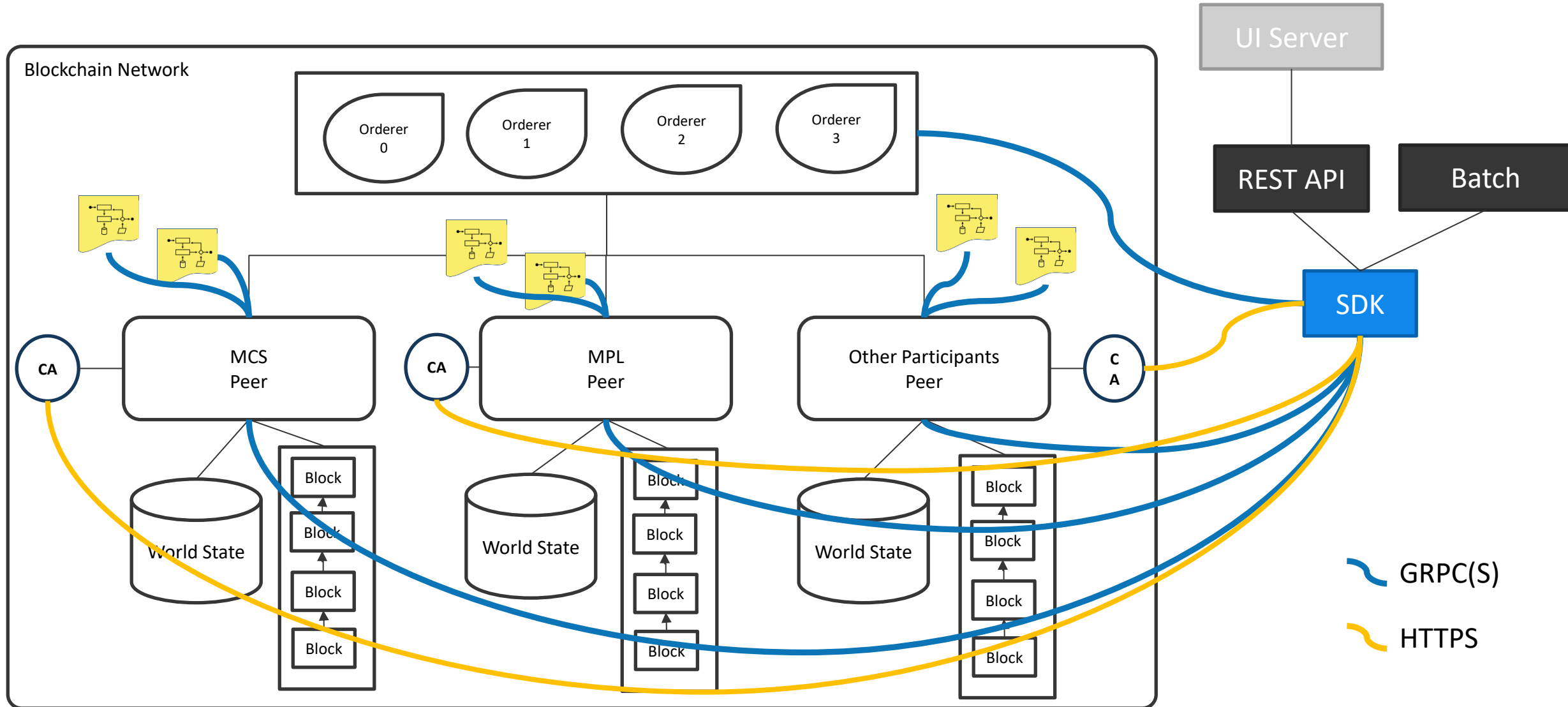
- reference data assets
- trade data assets e.g., Arrival notice, manifest, DO, Gate-pass etc.

2 Smart Contracts:

- Reference data management
- Trade data management

| Component | Open-source tool used |
|--------------------|----------------------------------|
| Blockchain network | Hyperledger fabric 2.2.0 |
| Database server | postgres:12.4 |
| Smart Contract | GOLANG 1.14.9 |
| UI | Angular 10 |
| API | GOLANG 1.14.9 with gin framework |
| Identity Server | Keycloak |

Elaboration on the Interactions within the Blockchain Network



Key Pointers to Implementation Success of Blockchain Technology



Higher no. of use cases for domestic & cross border trade with many network participants - *to make the trade platform cost effective by on-boarding many participants onto the network, serving not only trade within its geographical boundaries but also onboarding other countries for cross border trade.*

Scaling up cloud infrastructure to maintain platform speed and performance for increased transactions on the network

High implementation cost - *Blockchain is costlier compared to traditional database, even when Hyperledger is an open source, it requires enough investment to pursue a Blockchain initiative.*

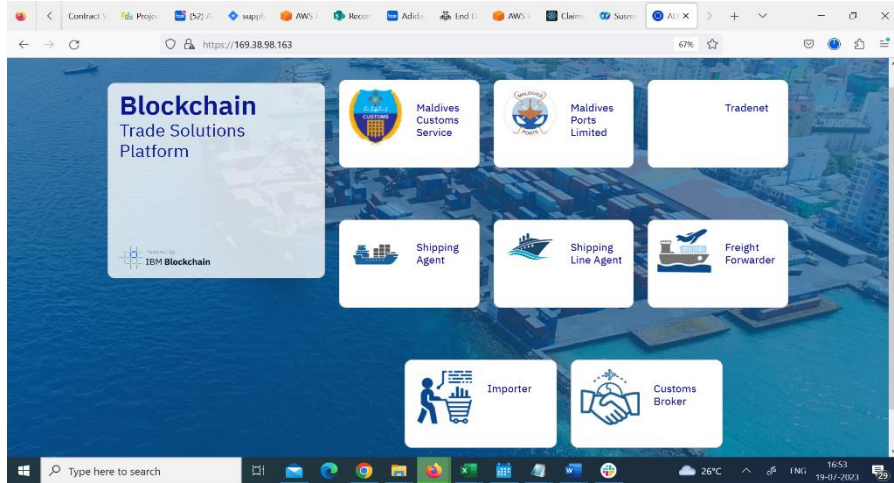
High storage cost - *Blockchain databases are stored permanently on all network nodes. As the volume of transactions increase, so does the size of its state databases and Blockchain ledgers become extremely bulky over time. Hence voluminous storage is required amounting to higher storage cost.*

Capacity building to manage Blockchain technology - *requires specific skills to build and maintain the network and to run it for ongoing use and on-boarding more participants. Hence skilled resources with technical expertise and business understanding are required for integrating Blockchain into processes.*

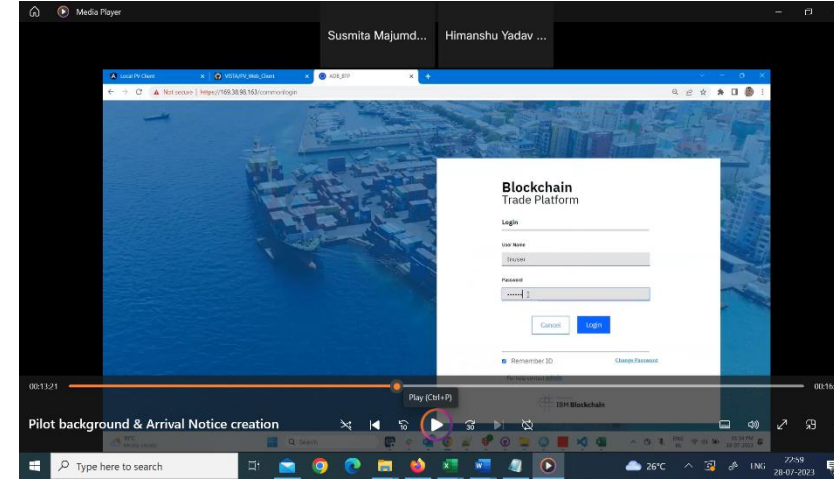
Screenshot Snippets - Blockchain Pilot Trade Import Platform



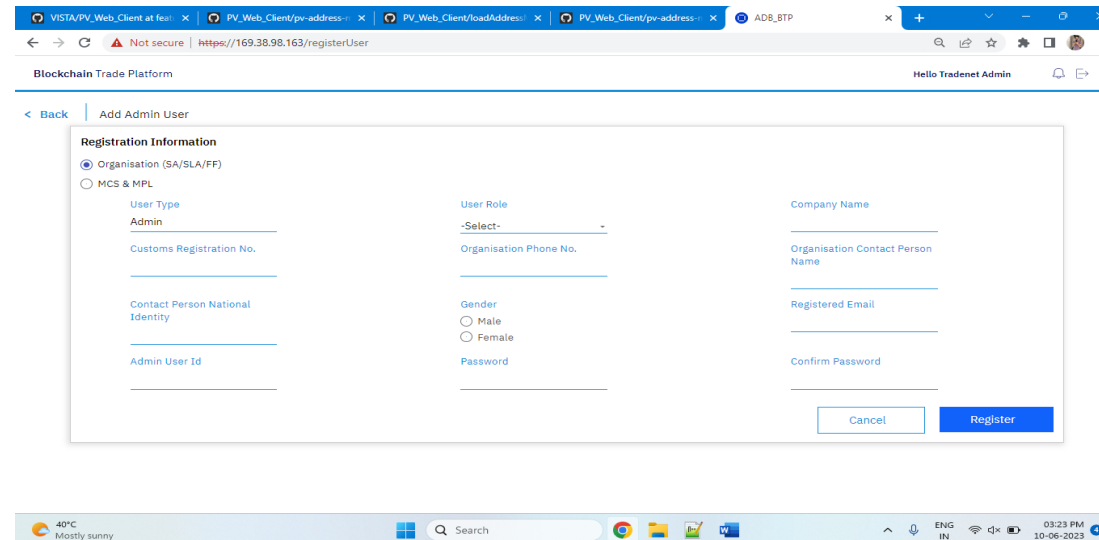
Pilot Home Page



User Login Page



User On-boarding & Registration Page



Screenshot Snippets - Blockchain Pilot Trade Import Platform



Create Arrival Notice screen

Multiple MBL Upload using Excel facility

List all Arrival Notices created by the Shipping Agent

| Arrival Notice No. | Vessel Name | Voyage No. | Vessel Flag | Place of Departure | Place of Arrival | Arrival Date/Time | MBL Cut-off | HBL Cut-off | IMO No. | Net Tonnage | Gross Tonnage | Status |
|--------------------|-------------|-------------|-------------|--------------------|------------------|-------------------|------------------|------------------|---------|-------------|---------------|---------------|
| AN660442 | SALSA | VY100601 | Armenia | IDSUB | MVMLE | 13-06-2023, 11:00 | 13-06-2023 01:00 | 13-06-2023 06:00 | 678987 | 18 | 20 | Pending HBL |
| AN074236 | SELENE | vy08062301 | Barbados | IDSUB | MVMLE | 08-06-2023, 13:50 | 08-06-2023 03:50 | 08-06-2023 08:50 | 9576818 | 7876 | 11383 | Completed HBL |
| AN080348 | SALSA | vy29052301 | Anguilla | IDSUB | MVMLE | 30-05-2023, 00:22 | 29-05-2023 14:22 | 29-05-2023 19:22 | 65 | 5 | 20 | Completed HBL |
| AN627484 | SALSA | VY25052302 | Austria | IDSUB | MVMLE | 27-05-2023, 11:00 | 27-05-2023 01:00 | 27-05-2023 06:00 | 8 | 8 | 20 | Pending HBL |
| AN314976 | BLUE SKY | VY25052301 | Bhutan | IDSUB | MVMLE | 26-05-2023, 19:49 | 26-05-2023 09:49 | 26-05-2023 14:49 | 8 | 8 | 11.5 | Completed HBL |
| AN892681 | SELENE | VOY213231 | Afghanistan | IDSUB | MVMLE | 22-05-2023, 23:40 | 22-05-2023 13:40 | 22-05-2023 18:40 | 9576818 | 3 | 11383 | Completed HBL |
| AN046124 | BLUE SKY | VOY22052301 | Bolivia | IDSUB | MVMLE | 22-05-2023, 15:10 | 22-05-2023 05:10 | 22-05-2023 10:10 | 12211 | 10 | 11.5 | Completed HBL |

Screenshot Snippets - Blockchain Pilot Trade Import Platform



HBL xml & Cargo xls upload before HBL cut-off

Blockchain Trade Platform | Hello FF Admin2

Arrival Notice No: AN660442 | MBL Cut-off Date: 13-06-2023 01:00 | HBL Cut-off Date: 13-06-2023 06:00 | Voyage No: VY100601

Bill of Lading Details | Vessel Details

Reassign MBOLs to Operational User: [Reassign](#)

Bill of Lading Details

| Master Bill of Lading No. | Container Count | Container No. | Shipping Agent/Line Agent Document | #HBLs For MBL | #HBLs Uploaded | HBL Upload Date | View or Upload Documents | Status | Action |
|---------------------------|-----------------|----------------------|------------------------------------|---------------|----------------|-----------------|-------------------------------------|-------------|--|
| M100601 | 2 | C10060101, C10060102 | No Documents | 1 | | | Upload / O Document | Pending HBL | Upload HBL & Goods description |
| M100602 | 2 | C10060201, C10060202 | No Documents | 2 | | | Upload / O Document | Pending HBL | Upload HBL & Goods description |

1 - 2 of 2

[Cancel](#) [Submit](#)

40°C Mostly sunny | Search | ENG IN | 03:34 PM 10-06-2023

HBL details against MBL

Blockchain Trade Platform | Hello FF Admin2

Arrival Notice No. AN660442 | Master Bill of Lading No. M100601

House BL Details

House Bill of Lading Details

| HBL No. | Port of Origin | Place of Delivery | Container No. | Type of Container | Empty/Full | No of Packages | Package Type | Gross Mass | Volume in cu.mt | Goods description | Status |
|-----------|----------------|-------------------|---------------|-------------------|------------|----------------|--------------|------------|-----------------|----------------------|----------------------------------|
| M10060101 | THLCH | MVMLE | C10601,C10602 | 22B0 | 1/1 | 10 | Package | 10 | 10 | MAGAZINE, NEWSPAPERS | HBLs Uploaded, Awaiting Approval |

1 - 1 of 1

Elements | Console | Sources | Network | Performance | Application | Security | Lighthouse | Recorder | Performance insights | Redux

Filter: Invert Hide data URLs All FetchXHR JS CSS Img Media Font Doc WS Wasm Manifest Other Has blocked cookies Blocked Requests 3rd-party requests

49 / 141 requests | 3.1 MB / 13.4 MB transferred | 3.0 MB / 14.0 MB resources | Finish: 3.5 min | DOMContentLoaded: 3.3 min | Load: 3.3 min

40°C Very hot weather | Search | ENG IN | 04:24 PM 10-06-2023

Screenshot Snippets - Blockchain Pilot Trade Import Platform



List of Manifest

Blockchain Trade Platform | Hello Bloodstone SA Admin

Search By: Select Title

| Manifest No. | Arrival Notice No. | Vessel Name | Voyage No. | Departure Date/Time | Arrival Date/Time | HBL Cut-off | Place of Origin | Place of Delivery | No. of MBLs | Total No. of Packages | Total No. of Containers | Gross Wt | Status |
|--------------|--------------------|-------------|------------|---------------------|-------------------|-------------------|-----------------|-------------------|-------------|-----------------------|-------------------------|----------|-----------------|
| 57-2023-000P | AN660442 | SALSA | VY120602 | 10-06-2023, 12:00 | 10-06-2023, 20:51 | 10-06-2023, 18:51 | MVHLE | IDSUB | 2 | 30 | 4 | 30 | Approved by MCS |
| --- | AN627584 | SALSA | VY2002202 | 24-05-2023, 12:00 | 27-05-2023, 11:00 | 27-05-2023, 06:00 | MVHLE | IDSUB | 1 | 0 | 1 | 0 | Rejected by MCS |
| --- | AN547267 | BLUE BAY | VY1 | 18-05-2023, 08:00 | 20-05-2023, 07:00 | 20-05-2023, 02:00 | MVHLE | KRI | 1 | 1 | 1 | 12 | Rejected by MCS |
| --- | AN682958 | SPL NINGSHI | 146/S | 24-04-2023, 12:00 | 27-04-2023, 11:00 | 27-04-2023, 06:00 | MVHLE | MVHLE | 0 | 0 | 0 | 0 | Rejected by MCS |
| 57-2023-000P | AN608156 | SALSA | VY17052201 | 17-05-2023, 12:00 | 17-05-2023, 16:47 | 17-05-2023, 10:47 | MVHLE | IDSUB | 1 | 1000 | 1 | 6500 | Approved by MCS |
| --- | AN374508 | SALSA | VY18053301 | 18-05-2023, 12:00 | 19-05-2023, 11:00 | 19-05-2023, 06:00 | MVHLE | IDSUB | 1 | 120 | 1 | 2823 | Rejected by MCS |

View Manifest with download option

Blockchain Trade Platform | Hello Bloodstone SA Admin

Manifest No: 57-2023-00MP | Manifest Completeness Status: Complete

Download Manifest

| Master Bill of Lading No. | Container Count | Container No. | Shipping Agent Document | Freight Forwarder Document | #HBLs For MBL | #HBLs Uploaded | HBL Upload Date | HBLs Uploaded By | Status |
|---------------------------|-----------------|----------------------|-------------------------|----------------------------|---------------|----------------|------------------|------------------|----------------------------------|
| M100601 | 2 | C10601, C10602 | No Documents | No Documents | 1 | 1 | 10-06-2023 16:20 | FF Admin2 | MBLs Uploaded, Awaiting Approval |
| M100602 | 2 | C10060201, C10060202 | No Documents | No Documents | 2 | 2 | 10-06-2023 16:08 | FF Admin2 | MBLs Uploaded, Awaiting Approval |

Manifest Compliance Report Screen for MCS

Blockchain Trade Platform | Hello Susmita Majumder

Manifest No: 57-2023-00MP | Manifest Completeness Status: Complete

| MBOL No. | Container Count | Container No. | MBOL Upload Timestamp | Shipping Agent/Line Agent Name | Compliant/Non-Compliant | Freight Forwarder Name | No of HBOLs | HBOL Upload Timestamp | Compliant/Non-Compliant | Status |
|----------|-----------------|----------------------|-----------------------|--------------------------------|-------------------------|------------------------|-------------|-----------------------|-------------------------|----------------------------------|
| M100601 | 2 | C10601, C10602 | 10-06-2023 11:01 | Bloodstone SA Admin | Compliant | FF Admin2 | 1 | 10-06-2023 16:20 | Compliant | MBLs Uploaded, Awaiting Approval |
| M100602 | 2 | C10060201, C10060202 | 10-06-2023 11:01 | Bloodstone SA Admin | Compliant | FF Admin2 | 2 | 10-06-2023 16:08 | Compliant | MBLs Uploaded, Awaiting Approval |

Amend Manifest

Blockchain Trade Platform | Hello FF Admin2

Arrival Notice No. AN660442 | Master Bill of lading No. M100602

| HBL No. | Port of Origin | Place of Delivery | Container No. | Type of Container | Empty/Full | No of Packages | Package Type | Gross Mass | Volume in cu.mt | Goods description | Action | Status |
|-----------|----------------|-------------------|---------------|-------------------|------------|----------------|--------------|------------|-----------------|--------------------|--------|----------------------------------|
| H10060201 | THLCH | MVHLE | C10060201 | 2280 | 1/1 | 10 | Package | 10 | 10 | LAPTOP | Amend | MBLs Uploaded, Awaiting Approval |
| H10060202 | THLCH | MVHLE | C10060202 | 2280 | 1/1 | 10 | Package | 10 | 10 | LAPTOP ACCESSORIES | Amend | MBLs Uploaded, Awaiting Approval |

Screenshot Snippets - Blockchain Pilot Trade Import Platform



Create Master Delivery Order by Shipping Agent/Line Agent

List Master Delivery Orders released to Freight Forwarders

| MDO No. | MBL No. | MDO Expiry | Vessel Name | Voyage No. | Arrival Date/Time | Origin / Port of Loading | Freight Forwarder Name | No. of Packages | MDO Amount (MVR) | Payment Status | Mode of Payment | HBL Status | MDO Status | Action | HBL Ext Stat |
|----------------------------------|---------|------------|-------------|------------|-------------------|--------------------------|------------------------|-----------------|------------------|----------------|-----------------|----------------|--------------------------|------------------------------|--------------|
| HBL: 75517251311 | H131 | 04-04-2023 | SALSA | VY2003201 | 04-04-2023 | MYMLE | FF Admin2 | 10 | 1224 | Done | Cash | Original Bl... | Pending Payment Approval | Download | |
| HBL: 8716480311 | H100802 | 30-04-2023 | SALSA | VY100801 | 10-04-2023 | MYMLE | FF Admin2 | 20 | 8737 | Done | Cash | Surrender... | HDO Released | Download HDO | |
| HBL: 78808882311 | H120901 | 15-04-2023 | SALSA | VY100901 | 10-04-2023 | MYMLE | FF Admin2 | 10 | 1224 | Done | Cash | Surrender... | HDO Released | Download HDO | |

Create House Delivery Order

List House Delivery Orders released to Consignee

| HDO No. | Name | Voyage No. | Arrival Date/Time | Origin / Port of Loading | Consignee Name | No. of Packages | HDO Amount (MVR) | Consignee Payment Status | Payment Mode | HBL Status | HDO Status | Action | HDO Expiry Extension Status |
|----------------------------------|------|------------|-------------------|--------------------------|---------------------------|-----------------|------------------|--------------------------|--------------|----------------|--------------------------------|------------------------------|-----------------------------|
| DO: 330552424748 | | VY100601 | 10-04-2023, 21:29 | MYMLE | PP GROUP PRIVATE LIMITED | 10 | 8765 | Done | Cash | Surrender... | HDO Released | Download HDO | |
| DO: 178420445201 | | VY100601 | 10-04-2023, 00:22 | MYMLE | PP GROUP PRIVATE LIMITED | 10 | 1280 | Pending | | Original Bl... | DO Expired | | Extension Requested |
| DO: 29082301 | | VY2908201 | 30-08-2023, 00:22 | MYMLE | PP GROUP PRIVATE LIMITED | 20 | 0 | Pending | | Original Bl... | DO Expired | | |
| DO: 81588044226 | | VY14032302 | 14-03-2023, 18:30 | MYMLE | MALDIVEST PRIVATE LIMITED | 999 | 110 | Pending | | Original Bl... | Pending Payment with Consignee | | |



THANK YOU