JSCC’s Besu Production Launch and its Next Steps

6th March, 2024
About JSCC and JPX Group

1) Equity
   - Tokyo Stock Exchange

2) Listed Derivatives
   - Osaka Exchange
   - Tokyo Commodity Exchange

3) OTC Derivatives
   <IRS & CDS>

4) JGB
   <OTC market>

JSCC (Japan Securities Clearing Corporation)
Clearing House, Central Counterparty (CCP), as a Financial Market Infrastructure (FMI)

<FMI in Japan>
- Central Bank: Bank of Japan
- Central Counterparty (CCP): JSCC
- Central Securities Depository (CSD): JASDEC

<JSCC daily average notional values of trades cleared (Q4 2022)>
11.6T yen  5.4T yen  4.4T yen  108.9T yen
DLT project in JSCC

2020～
Use of DLT for “Asset Tokenization”
Ⅰ Production use of DLT Tokenization <Jan 2023～>

2018～
Use of DLT for “Data Platform”
Ⅱ POC for future use of DLT Tokenization
Ⅲ POC for future use of DLT Data Platform

Short-term Vision

Long-term Vision
Physical delivery process for commodity futures’ final settlement

- **Phase 1**: RSS (Rubber) **Launched in January 2023**
- **Phase 2**: Precious Metal (Gold, Platinum, Silver) **Now under design**

**Key Concepts:**

1. Scope within a narrow area where possible
2. Obvious benefit of operational efficiency
3. Physical delivery risk reduced under pandemic circumstances
4. Globally standardized DLT for future expandability
5. Quick & low-cost launch
Short-term Vision (The First DLT Production Use - Overview)

- **Token**
  - JSCC Wallet
  - CM A Wallet
  - CM B Wallet
  - Client C Wallet
  - Client D Wallet

**Issue Token**
- Client C (Sell)
- CM A (Sell)

**Physical Delivery**
- Warehouse Receipt
- Storage Company

**Cash**
- (by physical delivery)

**ERC1155**
(NFT with bulk function)

**Consume Token**
- Client D (Buy)
- CM B (Buy)

**Manual Operation**
- JSCC

**Cash**
- (by bank transfer)

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Long-term Vision (Possible digital asset flow at CCP)

1) Collateral Deposit
   - ex. Initial Margin
   - CCP
   - Clearing Member A
   - Deposit
   - Withdraw

2) Cash Settlement
   - ex. Variation Margin
   - Payer
   - Receiver
   - CCP
   - CM A
   - CM B
   - CM C
   - Digital YEN
   - Digital Equity
   - Digital USD
   - Digital T-Bond

3) DVP Settlement
   - ex. Equity Settlement
   - Seller
   - Buyer
   - CCP & CSD
   - CM A
   - CM B
   - CM C
   - Digital YEN
   - Digital Equity

*CM’s option, as multiple assets are eligible
Backup and Token Bulk Processing - Challenges
Non-functional Requirements for backup/bulk upload

• No down time and data loss toleration during failure of any one availability zone
• Backup creation should be seamless and automated.
• Consider future growth of Besu ledger
• Ledger backup data should be secure and not accessible by outside parties
• Bulk processing of up to 50 tokens in a single transaction
• Retention of logs for a minimum of two years
• Recovery time within two hours in case of region failure
Challenges faced with Bulk processing and Backup

- Growth of data in ledger
- Besu read-only node state during backup
- Frequency of backup
- Nonce challenges with Orchestration layer during bulk processing
- Handling the retention of backup files on S3
Disaster Recovery
Our requirements for disaster recovery

Why implement disaster recovery?
• Japan is a high-risk zone for natural disasters.
  • Earthquakes, Tsunamis, Typhoons

JSCC Requirements & Policies
• In case of an incident, system recovery needs to be completed within less than 2 hours
• Backup system needs to be in a separate region
• All systems need to be hosted in Japan
  • Authority proof need to be QBFT
  • No gas fee
  • We need to have 2/3 of validators running to have a valid network
Future Initiatives
Future Initiatives: multi-region and multi-cloud setup

Why multi-region?
• Minimize data loss in case of entire region failure
• Ability to work with organizations other than JSCC
• Higher resiliency and lower down time

Challenges:
• Secure communication between Besu Nodes
• Latency within Besu nodes spread across multiple clouds
• Integration of cloud specific services.
Future Besu Architecture – Multi Region / Multi Cloud

AWS Cloud - Tokyo

AZ 1
- EKS
- Storage
- Orchestration/Blockchain services
- Blockchain Node
- RPC Node
- Boot / Validator Node
- Validator Nodes
- S3

AZ 2
- EKS
- Storage
- Orchestration/Blockchain services
- Blockchain Node
- RPC Node
- Boot / Validator Node
- Validator Nodes

AZ 3
- EKS
- Storage
- Orchestration/Blockchain services
- Blockchain Node
- Backup Node
- Validator Nodes

AWS Cloud - Osaka

- EKS
- AZ 3
- AZ 2
- AZ 1
- Read-Only Standby Node
- Blockchain Backup

RDS Cluster
- Elasticache
- S3
- S3 Cross-Region Replication

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