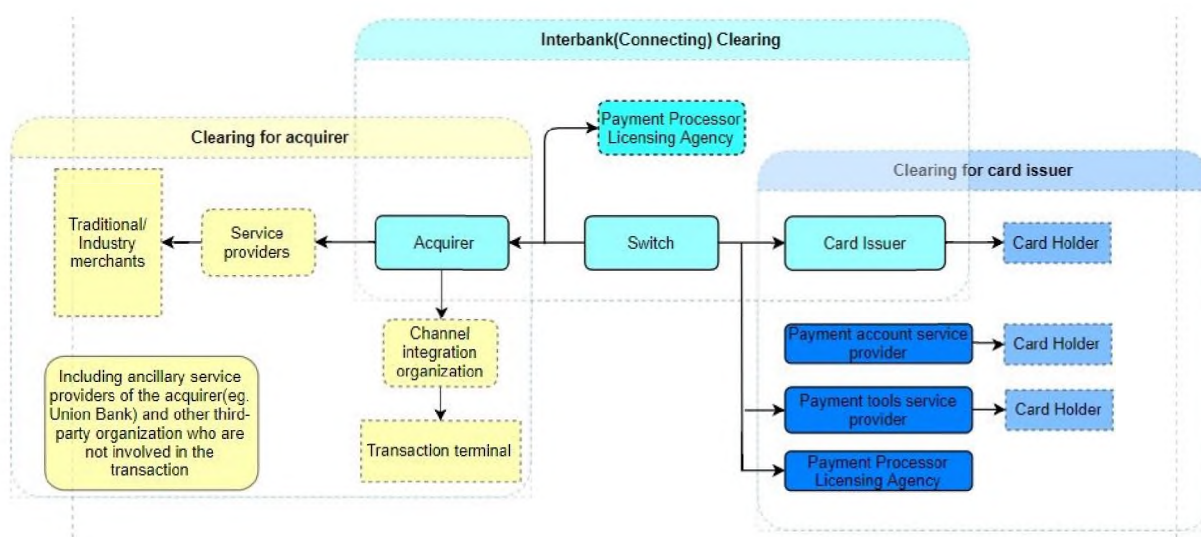**Cypherium Clearing System**

Some of the more crucial functions that banks provide include clearing, settling, and transferring funds between separate ledgers. A single bank cannot provide these services alone. Instead, these tasks are accomplished through communicating and sharing liquidity among different banks in different countries and regions. In this way, clearing systems can be thought of as a network of channels and hubs connecting bank liquidity.

This traditional, centralized clearing process for bank cards works the following way:

With the advent of more recent payment innovations, people rarely remember all of the numbers associated with their bank cards, mobile broadband services, water meters, or landlines. Such payment innovations have brought about the proliferation of virtual payment accounts, which has slowly made obsolete the kinds of bank accounts once rigidly controlled by their issuing institutions. Individuals are now able to utilize a number of accounts to operate the various payment needs of our evolving society. This portends that banks' influence over the future of payment systems will continue to wane, while non-bank payment institutions (especially e-commerce platforms) who understand better the needs of their users will play an increasingly significant role.

Online settlement systems will continue to disrupt existing structures of the payment clearing market, especially in the retail sector. Rules and procedures that govern traditional card payments will soon become irrelevant in our digital era. However, viewed from another perspective, these same developments in ICT also enable bank card clearing systems to engage in cross-border developments. This will facilitate competition between card issuers all over the world and therefore promote innovation in payment clearing technologies.

For the finance industry as well as for traditional centralized clearing systems, blockchain technology will become an obvious and inevitable pillar of the payment stack.

Firstly, blockchain can make data both more credible and more traceable. Decentralized data processing and storage is better positioned in avoiding a single point of failure in these systems. So, data can be proven authentic, and that authenticity lastingly secured.

Secondly, decentralized bookkeeping and recording must follow strict and transparent rules. Before a transaction gets recorded in the system, it must acquire consensus among all participating nodes. This can minimize or even eliminate the additional steps of cross-checking because all data captured must be approved and validated by all participating agents at the point of transaction.

Lastly, all financial institutions require the utmost privacy and protection for their data. Blockchain's additional technical protocols and solutions, for that reason, can ensure that only relevant parties may access particular information.
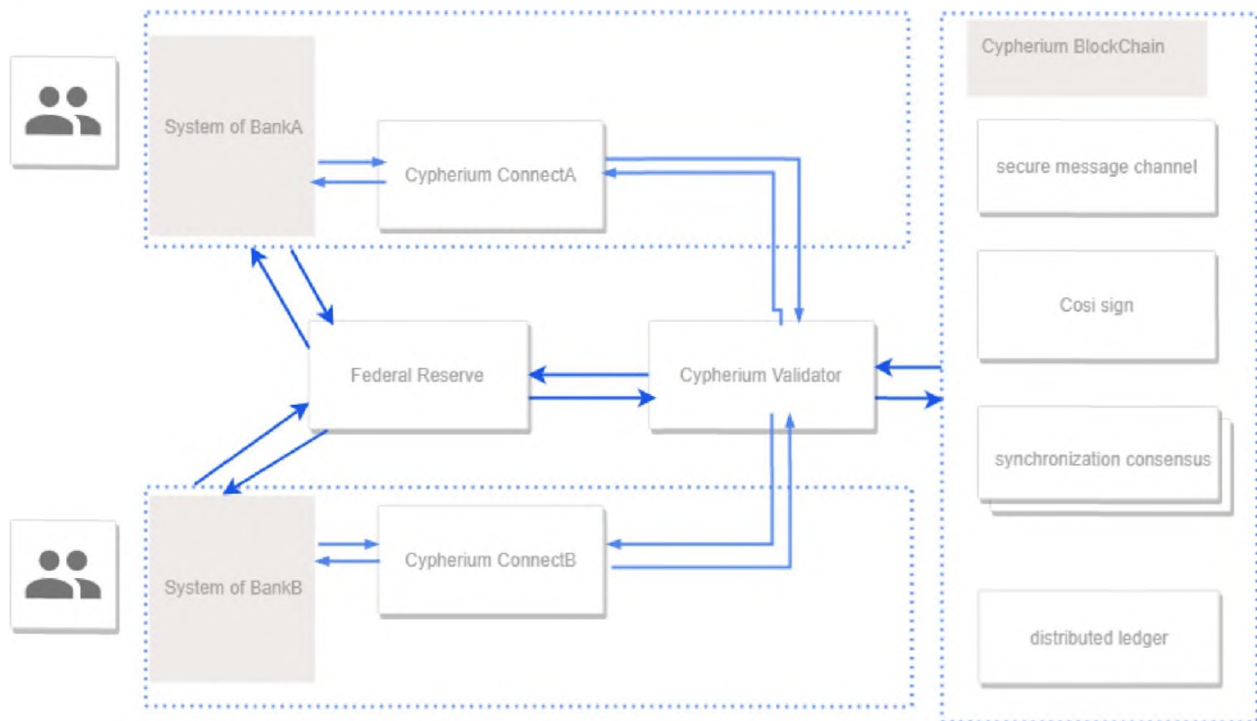
Through connecting banks, payment service providers, digital asset exchanges, and enterprises, Cypherium provides a seamless global payment experience. When information from banks enters the Cypherium chain, the Cypherium consensus algorithm can perform the final validation of transactions, allowing any two organizations to clear the pending settlement between them. This saves financial organizations a huge amount of manpower and resources, compared to the traditional model in use by financial institutions today. Our blockchain has a unique capacity to improve financial organizations' business flow, overall competitiveness, and the diversification of development activities.

The Cypherium clearing settlement solution has the following benefits:

1. Thorough integration of payment network and channels, enabling more variety of services provided.
2. Transfer of funds made faster through speedy information processing, resulting in lower liquidity costs.
3. By making available a richer quality of data, including attached e-receipts, account reconciliation can be more comprehensive.
4. Real-time, on-demand clearing settlements can be made available, even for transactions on non-traditional payment networks like e-wallets. Cypherium can trace and verify fund-transfer information across these various channels.
5. Security of the general ledger. The general ledger cannot contain duplicate entries; it is immutable and updated in real-time with information stored by all participating nodes. This reduces the risk of concentrated attacks or force majeure caused by centralization.
6. Supporting Java smart contract deployment. Because Cypherium runs a Java virtual machine, any upgrades and changes to smart contract execution tools will not affect the

functionality and performance of the chain. This brings convenience to bank system integration and makes available potential customized solutions based on the bank's needs and current technology.

Cypherium Payment Settlement Solution:

The core component of the solution is Cypherium Connect and Cypherium Validator.

Cypherium Connect

Cypherium Connect is a plug-in module which processes Cypherium payment transactions that are integrated into the bank systems, similar in operation to payment front-end systems. Cypherium Connect helps to build a communication channel between remitting and recipient banks in order to exchange information regarding KYC/AML, risk management, transaction fees, exchange rates, and other relevant information pertaining to the payment transaction. For KYC/AML, Cypherium incorporates adaptability within its design so that banks can customize solutions according to their needs. Before a transaction is initiated, Cypherium Connect will send all information to the counterparty of the trade. As long as all information can be verified, the transaction will be executed and payments will be cleared.

Cypherium Validator

Cypherium Validator is a validation bot. Before a transaction enters the Federal Reserve and the blockchain ledger system, the Validator must approve it. Cypherium Validator has very strict
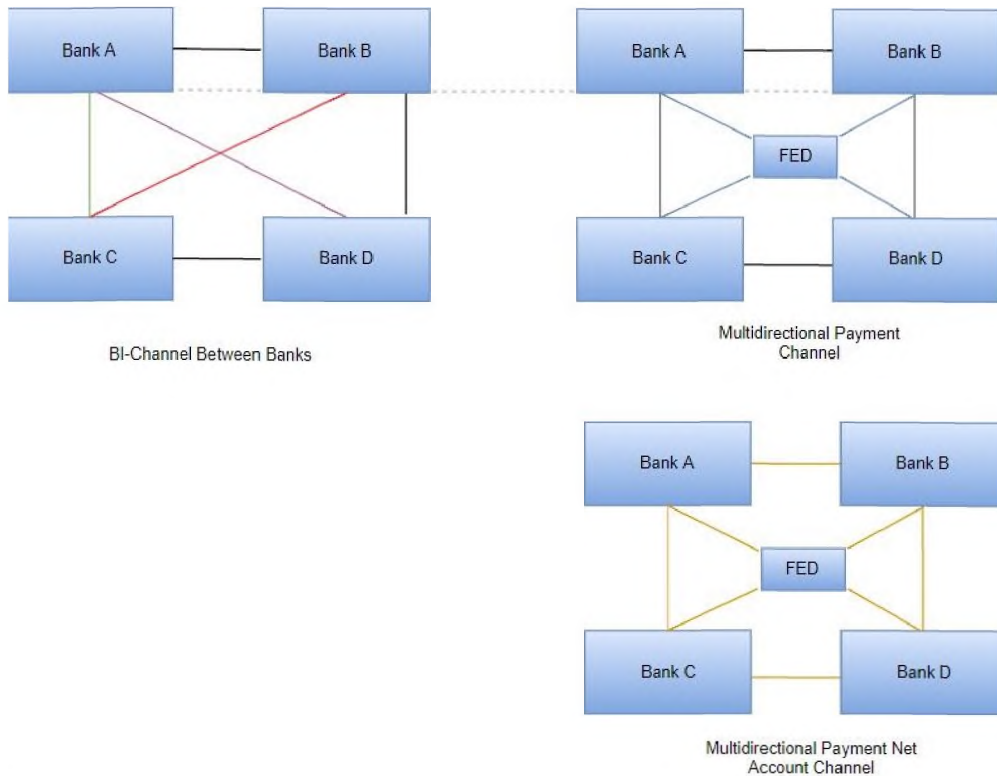
verification mechanism, and its validation rules can be customized according to the needs and parameters of the given system. Cypherium adopted a scalable MultiSig solution CoSi, meaning that signatures from all parties in the communication network will be required in order to send and receive crucial information. Without additional burden to the communication cost, the system can validate the authenticity of all information transmitted across multiple parties in the network in real-time.

Cypherium chain uses the PBFT+COSI consensus algorithm which ensures that there is no double spending and participating nodes also revise the ledger to ensure the completeness of all data recorded. The system also has a queue manager, which consolidates all signed transactions and puts them on the blockchain before broadcasting the block to all participating nodes within the same channel. Nodes in the channel will receive the broadcast, and then validate the transactions once again, finally updating the newly formed block into the ledger.

To ensure the privacy of the transaction, banks will have to build a two-way communication channel with each other in the system. In each channel, participating banks have to create an account and allocate funds to that account to ensure that its transaction can be completed. Every transaction will need to acquire signatures from both banks in the channel before its validation.

Design of Cypherium Payment Channel

Every bank also has to include two multi-way channels: a payment channel and a net payment channel:

BI-Channel Between Banks

Multidirectional Payment Channel

Multidirectional Payment Net Account Channel

Shown above:
Banks: A, B, C, and D
Two-way payment channels between banks: 6
Multi-way payment channel: 1
Multi-way net payment channel: 1

A multi-way payment channel enables account funds that were originally in the two-way payment channel between banks to be transferred to a third party bank that was initially outside their two-way channel.

Cypherium smart contract requires digital signatures of both participating parties in order for their transaction to be validated, which this ensures the legality of the exchange in funds. Again, because Cypherium supports Java smart contract deployment, any upgrades or changes to smart contract execution tools will not affect the functionality and performance of the chain.

The net payment channel is used to solve the issue of liquidity gridlocks: all participating banks in the payment network have to agree to a final resolution and this agreement needs to be signature-backed by all the banks. To this end, the Fed also participates in all two-way and multi-way payment channels as it allows them to monitor all transactions and perform audits in the future. Although the Fed is not directly involved in two-way transactions, it plays a crucial role in resolving the issue of liquidity gridlocks.