

# PLASMIUM

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## 1. DISCLAIMER

This white paper is a technical document which presents PLASMIUM and explains the platform's current plans and future projections. The PLASMIUM ecosystem is therefore explained in full, with the only purpose being to set out the facts on PLASMIUM and its platform as it currently stands, not for the provision of accurate future projections. Products and technologies presented in this paper are still being developed and have not yet been implemented.

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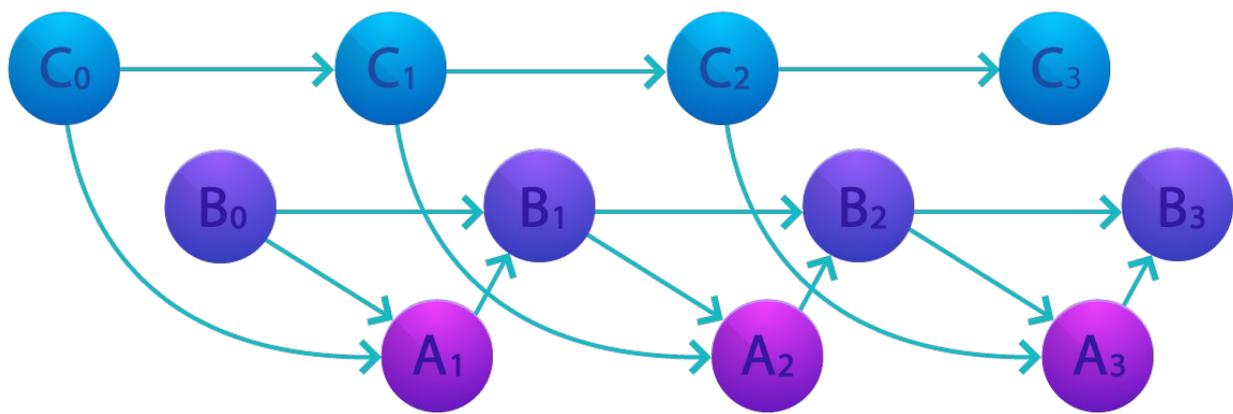
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## 2. PLASMIUM

Blockchain technologies provide a way to agree and maintain consensus across every node and without any central authority. This technology has issues, however, such as not enough real time transactions and not a good ability to scale as needed. Even with consensus algorithms have been integrated in platforms which allow it, large platforms like Ethereum and Bitcoin are still synchronizing one block at a time. This creates a slow confirmation time, which is one of the primary concerns that stop blockchain technology from being applied across many different industries.

Platforms which use smart contract have began to emerge but the most widely used is still public distributed ledgers. In order to fix these issues, a new model has been developed which his based on DBN (Dynamic Bayesian Network). PLASMIUM is a new DBN based platform ran through smart contracts which will act to solve scalability issues on public distributed ledger technologies. This platform will distinguish from the competitors by employed improved DBN based pro-tools.

The PLASMIUM platform is adopting a new protocol known as the MURION PROTOCOL in order to maintain its consensus and will be later integrated into the PLASMA chain. This will allow for built up applications to be added to the PLASMA chain to enjoy instant transactions and near zero transaction costs across the board. PLASMIUM has the mission of providing compatibility across all transaction bodies globally. This will create an ecosystem to facilitate real-time transactions and low-cost data sharing.



**Dynamic Bayesian Network (DBN)**

### 3. WHY PLASMIUM?

PLASMIUM's vision is to create compatibility across all the transaction bodies globally through the implementation of a fast DBN technology which can deploy at any scale in real time. It will also make new infrastructure with a high level of reliability which can be used on large scales across any industry. This would include finance, telecommunications, electric vehicle provisions and logistics. The foundation of PLASMIUM is created alongside a smart contract ecosystem which can be used by any company in the world to facilitate regulated global transactions reliably, and with a high accuracy level. The platform will be open-source which will allow it to be used and changed across the community in order to provide support tools for the creation of decentralised applications (DApps).

Blockchain issues will be minimised through innovative software which was designed to establish digital trust across all users and to allow the transfer of value between entities over the network. This will allow a safety across the preservation and remitting of capital without having any need for using a traditional public middleman.

PLASMIUM will be built to be used in broad applications across real life and by using blockchain technology. In order for blockchain technology to be integrated across real life scenarios and have a wide applicability it has to be something transferable with low transactions fees and completely irreversible. This is a problem with existing technologies, who do not have unlimited features and work under slow confirmation times with higher than required fees.

Scalability issues are identified by comparing with existing technologies and identify what is not currently on offer, such as a high transfer ease, being irreversible and having a low to no transaction fee. Limitations experienced by existing blockchain technologies include limitations in these areas; slow confirmation times, and high transaction fees. In traditional blockchain confirmation is done by nodes verifying and storing a single block at a time. This is what creates the slow time frame, so no matter how many networks are connected to the platform, it cannot improve. In fact, more

transactions mean slower processing times due to the wait they experience to get to their turn. This also creates bottlenecks.

To combat this problem, PLASMIUM will utilise a parallel approach.

Fees which occur when exchanging value, including transaction confirmation fees, fees which are paid to block miners and the mine reward itself is used to incentivise participants. It also secures the network from any DDOS or staking attack. PLASMIUM believes these fees have been prohibitively expensive to offer a thriving ecosystem.

Blockchain information is traditionally stored in blocks and it cannot gain information from external sources for the prior verification of transactions. The information that is stored in the blockchains only have a limited functionality. In order for blockchain to be applicable across all real-world scenarios, PLASMIUM offers the approach of a function which manages historical information as well as transactions inside the block.

## **THE PLASMIUM SOLUTION**

To solve the above-mentioned problems PLASMIUM aims to create a new DBN based consensus for the creation of a new platform which improves upon DBN versatility. PLASMIUM technology will be intended for the creation of infinite processes, and the ability to process exponential and unlimited transactions in any given time period, with over several hundred thousand transactions per second possibility. PLASMA chain is intended for the purpose of operating at a high level of ability with any number of nodes transacting at the same time.

This will solve any scalability limits that existing blockchains experience and is intended to achieve a method wherein a single event block will verify the previous transaction, and all transactions will be verified and processed asynchronously without the need to be approved by prior blockchain miners. This means that the transactional load does not create delayed approvals or bottlenecks. Historical information will be managed singularly without a need for external database assistance, like the Oracle Database. Information stored in event blocks include multiple packages of data, which can include smart contracts, transactions, reputation management, rewards and historical information.

Creating a safe, fast processing, the PLASMIUM intends to make the overall infrastructure processing more reliable and transparent based on DBN and separate management of historical information.

## **4. INTRODUCTION**

PLASMIUM platform will use a unique technology referred to as PLASMA; the PLASMA Chain is a newly created distributed infrastructure intent on solving scalability issues within existing blockchains through large scale rapid processing blocks. Story data and transactional information will both be processed in real time within a distributed environment. A story root will be stored in the event data to allow recording of detailed historical information with the story root structure being alike to the general transaction structure only with a more extended ability. This would include the ability to inherit certain properties.

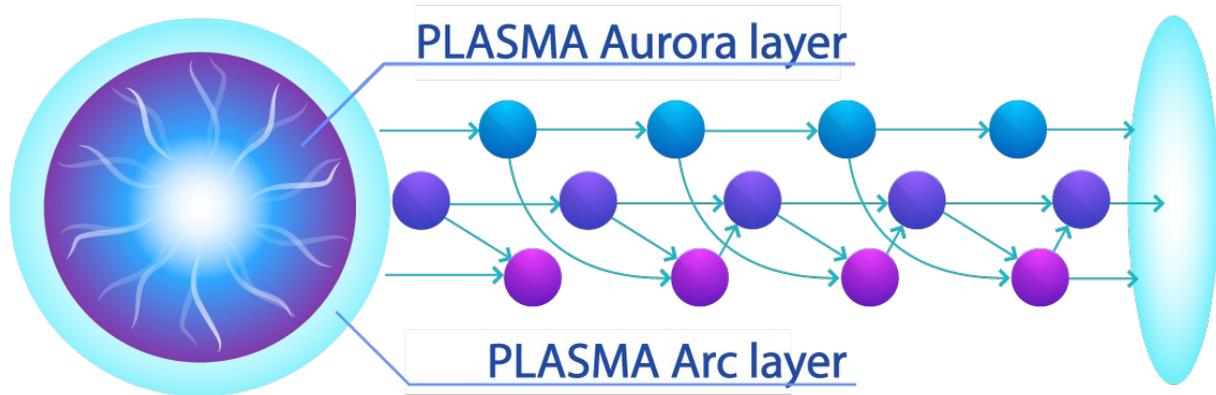
The PLASMA Chain will use a high level of functional programming language compiled through smart contract bytecode on the PLASMIUM network. There will be two distinct layers – a core layer (AURORA) to process transactions at scale and the ARC layer which will support the smart contracts and other functions, including third party application support. The AURORA layer will have the objective to operate consistent transactions in PLASMIUM's ecosystem, and to be used as core chain technology to facilitate information exchange. In theory the core layer will be able to process up to 200,000 transactions per second.

## **5. PLASMA CHAIN**

The PLASMA Chain will incorporate a consensus algorithm called the Murion Advance Algorithm (MAA) that is for the purpose of vastly improving performance through the use of DBN based, distributed ledger technologies. MAA will be a technology that guarantees a comparable level of consensus as any existing blockchain has by incorporating Byzantine Fault Tolerant (BFT) technology. This will prevent attacks occurring when a node fails and will allow for the processing up of to a half million transactions per second. Cryptographic techniques will be used in the PLASMA Chain which will enhance security as nodes communicate between one another and will use programming language which is functional for full support of smart contracts.

A Murion DBN will be formed that is based on the Murion Protocol by creating a set of links between event blocks that form a DBN. This is a distributed system for storing arbitrary data which

cannot be changed. Information like transactions, stories and smart contracts will be contained in the event block, including the values of any previous event. Previous rounds of event blocks will create more verifications as event blocks on future transactions are added. The MAA will be an asynchronous technology and after two identical transactions are requested in a double spending issue, only the first transaction will be facilitated and validated. Transaction order will be arranged on the main chain list.



**Plasma Chain with dual layer (Aurora and Arc layers)**

MAA components which will operate on AURORA and ARC layers will be structured in this way:

- Stored data in an event block will be able to contain multiples of data packages, including smart contracts, reputation management, compensation and history information.
- Signatures of users who create an Event Block will be included and users will be identifiable through account addresses.
- Hash values relating to the previous event block will be included to be able to provide links within the event blocks. Once the new event block finishes verifying all previous event blocks, any new event block will only verify the parent event block. A new block will be connected to the parent event block through a hash, with all hashes derived from the parent event blocks. This will make it impossible for any user to delete or modify any previous event block. Once the event blocks are connected another node will build another new event block on the top of the existing event block.

## **AURORA Table**

AURORA Table is the data structure which can save the connection data from any specific event block. Data structures include the AURORA Index, which holds the index information on each layer, and connectivity which contains connection information for each layer. The AURORA event block can see most of the blocks created in the previous event block path.

AURORA blocks make up the main chain, which is intended for use as an event block validation and for the maintenance of the overall network. The Murion technology will achieve a high performance and also act to secure stored data. Event blocks can all be created asynchronously and each of these nodes will consist of a transaction set. This includes remittance, payments, story, reputation, smart contract and rewards. New event blocks are connected to a parent event block which is the last block and is for the purpose of generating blocks at high speed.

AURORA event blocks work to complete new main chains by generating information for the existing main chain connection. AURORA event block will check the validity of a specific round and all of the blocks within that round. The main chain is asynchronously completed through MAA. The subsidiary block to the parent block will not be able to link to another parent block so this allows for knowing there will be no generated blocks being modified or being deleted.

## **6. MAIN ALGORITHM**

The main Murion algorithm is intended for clarity and simplicity with each node being able to freely create new asynchronous events at the same time. This would be different from other blockchain created technologies, where the consensus mandates that every node participates. In the Murion algorithm each node can create parallel blocks and send messages to each other, wherein this new information exchange creates a solid new chain. This clear messaging protocol will be able to create a bet, when node messages are sent and received they are always kept in that order within the event blocks.

Nodes are quickly generating new event blocks and during this time frame the algorithm will employ two different procedures for the creation of the main chain and for the rapid determination of the order of event blocks. The procedures will not require any communication within each node. Main chain creation is key, and Murion is built to maintain the chain, which is crucial for keeping the block in the proper order. The speed of the main chain will be improved through the finding function as described above. The completed main chain will make the PLASMA Chain secure and will be a key implementation function.

Safety is at the core of the PLASMIUM technology; it will use an ultra-secure Edwards-curve Digital Signature Algorithm (EdDSA) technology which will enhance security in the transmission of data between nodes and signatures. EdDSA has an advantage of being able to ensure a high security within a short key size and allow high speed computations during signing. This makes it simple to design a secure cryptosystem through the application of the highest efficient algorithms which will solve any logarithm problem. This is highly efficient and provides the same security with less keys as compared to other cryptographic systems. The EdDSA operation is easy to implement for hardware and software.

PLASMIUM can use EdDSA to add support for both hardware and software wallets, and to enhance security features on the wallets.

## **7. ATTACK RESPONSES**

The protocol will be prone to attacks from malicious groups that try to gain profit or destroy the system. A few possibilities in this regard can be outlined and the preventative measures which PLASMIUM can institute through the use of EdDSA.

Parasite chain attacks can also be made for malicious ends by trying to connect through making it appear like a legitimate event block. After the main chain is created under the above listed protocol the event block verification is completed. Within the verification process a block which is not connected to the main chain will be considered invalid and will be ignored, such as in the case of a double spend attempt.

Sybil attacks are a likely type of attack, where the purpose of the attack is to create hundreds of chain nodes within a single computer. This will be stopped through the node operation method of the PLASMA Chain, which is like the Delegated Proof of Stake (DPOS). In this regard, voting system outcome will be for the purpose of identifying incorrect nodes. Attackers shouldn't obtain any additional votes for adding new nodes after this. Sybil attacks will be impossible under the P chain since they rely on a single computer and within the chain any single computer will be limited to be a single node.

Transaction flooding is another possibility which a malicious participant could attempt. This would be done through running many valid transactions from their account which are under their control for the sole purpose of trying to overload the network. This will be prevented on the PLASMA Chain by imposing a minimal transaction fee. If a transaction fee is required, then the malicious user will not be able to continue performing the attack. Node participants will be rewarded and participants contributing to the ecosystem, like by running transactions. Participants will be continually rewarded so the reward will be expected to be enough to run transactions for regular purposes. This type of abnormal attack would be very expensive to perform and would therefore be hard for malicious users to create any type of transaction flooding.

## 8. PLASMIUM VIRTUAL MACHINE

To facilitate a functional language and attract a high number of developers, PLASMIUM intends to create a virtual machine to write contracts through using languages which already exist. A well-known programming language like Rust will be a good choice for this use and is intended to be integrated into the first language presented. Strengths of using this system include removing Java, which is known to be inconvenient, and allows for users to create easy to understand, clear code. Rust's strongly typed functions will improve performance and promote development including the tuples, macros and functions. The language is popular because of its keen design and it integrates object oriented and functional programming. The language has a comprehensive documentation and PLASMIUM believes it is the perfect choice due to the functional and object-oriented paradigms. Functions and closers are included in the business

There is a choice between two methods which developers can use to write functional and concise programs. The development and testing are both convenient and it can do the same work as Java with the use of less lines of code. Even though Java does have a method for reducing code length, it also slows the process down and thus decreases productivity. It would also deviate from the conventional coding style, so the properties contained in Rust are better for PLASMIUM's purposes.

A non-expanding API library is also included in Rust, that has all the necessary functions listed. Using Rust to write software makes the code writing, testing, debug and distribution much easier with the use of a versatile language. This can be used in desktop software, web applications, games, software services and mobile solutions. Smart contracts are easily created with this library. The web app framework in Rust has been used on many IT platforms like. Strengths of Rust were proven through these uses and many more.

Coding errors are identified ahead of time by removing side effects and that will also allow for code to be easily transferred into a distributed network. Coding techniques will be stringent in order to compile and formalise the verification, which is a mathematical based methodology that is used for proving accuracy of computer programs. Military systems have used this methodology for hardware and software protection, encryption, microprocessors and transport infrastructure. Formal smart contract verification codes are recognised, including on the Ethereum network.

## **9. TURING COMPLETE VIRTUAL MACHINE**

We cannot foresee what operations will be needed to facilitate future operations, Turing completeness is a necessity for creating the DApp ecosystem. Providing this will create a decision impossibility which is addressed through the concept of GAS in order to cancel the problem. Gas consumption in this method is already hard coded into the Ethereum network as is impossible to change without a hard fork. A cheaper program would likely not have the capacity to perform these same operations and the intent of PLASMIUM is to create an FVM with an easy to use execution style that is flexible with operation node authority limited. PLASMIUM believes that through the use of the MAA there will be no need for executing the same set instruction by each node. It would also limit the impact of any possible attack due to being so flexible.

Feasibility and security issues are common in all distributed ledger products, including Bitcoin and Ethereum, and are mitigated through limiting or removing the completeness of Turing or through the provision of a high number of smart contract templates which enable a formal verification process. The lack of outcome functionality does make it harder to implement a DApp properly. Core functionality is provided which allows for properly creating the DApp ecosystem, like library and import or the external code linking. It also has a strong ability to scale and work on a supercomputer. PLASMIUM based smart contracts will be able to work in a stand-alone mode but can also work in conjunction with other contracts in a component style function.

### **PLASMA CHAIN STRUCTURE**

PLASMA Chain will be similar to other blockchain structures which currently exist but will also carry unique characteristics. Story is added to the data structure intended to include time stamps, hash, signatures, transactions, addresses, smart contracts, index information and stories. In the PLASMA Chain event block data structure, a hash will refer to the value of the last block and a transaction is considered a value which is filled with every transaction in the list of transactions by blocks.

AURORA layer will record constantly changing, detailed information, such as distribution history information. It will refer to the event block transaction value previously stored. This will be much like transactions and inherited properties have been expanded. Duplicate storage prevention algorithms are then added. The PLASMA Chain will consist of an external owned account that is controlled by a private key and a control code contract account. An account will possess PLASMIUM and address tokens that have already been used by PLASMA Chain. Accounts which are owned externally will have addresses that can be controlled through the use of a private key and

will be able to facilitate approved transactions for transaction level tokens and on to other accounts. The external accounts will be able to create further contract accounts, which will be executed by the use of a pre-programmed order through sending a specific message once time conditions have been reached. Contract accounts can call other contract accounts, but they cannot do so without being called by an external account. The smart contract functionality within the PLASMA Chain will be designed to execute automatically by accordance of a pattern that is pre-approved. It will then run after certain conditions have been reached.

## **10. PLASMA CHAIN ACCOUNT INTERACTIONS**

An application which operates within the distributed environment of an PLASMA Chain is called a distributed application. Using PLASMIUM network resources, the distributed application will provide safety and reliability as well as functionality for executing the contract code stored in PLASMIUM from users' browsers. Through supporting a free web ecosystem, PLASMIUM will contribute to bringing a new infrastructure and will be effective in the use of hyperconnection networks.

Efficient changes in business processes can be created by through these networks by acting as a central control authority or broker and through the provision of non-border services which can travel across jurisdictional lines. The PLASMA Chain structure will store data once a new block is created and if the status of the account changes. A block head will use a hash tree structure to save each status value, based on a Tiger Tree Hash. PLASMA Chain can also provide an environment for smart contract implementation and through conducting transactions. It will also save a head note into the root each time a new block is made.

## 11. PLASMA CHAIN PERFORMANCE

Through the use of the Murion Protocol algorithm the PLASMA Chain will solve the scalability issue through processing blocks quickly. Third generation blockchain technology will show an improvement on performance as compared to any prior blockchain technology implementation but the speed through which the blocks are created can still be slow. The PLASMA Chain, on the other hand, will solve this problem through ensuring a high creating and processing performance reaching 200,000 transactions per second.

PLASMIUM will avail of the highest levels of scalability and reliability by working on a third generation blockchain technology that will be used on a large scale and across many industries and domains. The PLASMA Chain will process large transaction numbers per second at scale and will also historical data which will guarantee the transaction reliability. The PLASMA Chain that will be based upon the Murion Protocol algorithm of PLASMIUM, is for the intention of performing a multiple of simultaneous verifications whilst conducting tests on the directions and validate the transactions at the same time. Each node will be able to process all transactions which are broadcast to the PLASMIUM network and will offer the highest transactions processing speeds available.

Previously, participants would need to verify each block in a sequential manner, but the Murion Protocol algorithm has been asynchronously designed to process and verify blocks in a concurrent, distributed method. Each event block size process through the MAA will be intended for the expansion of up to 50KB. PLASMIUM believes this will be enough, due to the quickness of block propagation. For example, if we assume that each transaction is 130 Bytes, a single event block will include up to 220 transactions. If the time it takes each to create an even block is 0.5 seconds, each node can create between 1 and 2 event blocks each second. Each time the event block numbers reached two thirds of the entire participating nodes, the Murion protocol then adds and verifies another main chain. If 100 nodes are available, then around 100-200 different event blocks should be able to reach fruition each second and verified at the exact same time. If each stage runs 500-1000 event blocks there will be a performance which is above 200,000 TPS. Network latency could act to reduce the TPS.

PLASMA Chain will have a dual layer: AURORA core layer to process event blocks with payment, reservation, commerce, reputation and delivery data. The AURORA core layer will also be where the core chain technologies are located in order to ensure reliable transactions within the ecosystem as well as the exchange of information.

The PLASMA Chain infrastructure will be the primary core of the PLASMIUM ecosystem, which will act to collect and sell blockchain data through a distributed ledger environment and will provide a higher level of functionality as compared to other blockchains.

Information on smart contracts, transactions will be stored in the ARC layer which will arise through different applications in areas including payments, deliveries, reservations, reputation and commerce. It will also include the operating data outcome of previous and current event blocks at a computation layer, this will include the data which indicates value placed on the last block and will be individually mapped and stored within the control layer.

A main chain of event blocks will occur in every application created as well as in the event block index directly connected to the main chain, and the event block index that are connected and stored indirectly. Smooth and reliable transfers will be assured through the infrastructure layer of data, between the entities outside the physical network, providing a procedural and functional means of to transfer event block data and to find and fix errors. To be able to verify data which identifies or transfers physical equipment will not be faked, it will provide an ability to fix errors.

This will modify after checking and finding errors through grouping and transferral of event block data into frames, which will then recalculate and compare the check sum of every frame. It will also perform a flow control to prevent any frame loss through verifying and regulation of data transfer speed including an error control task for the processing of errors. This will be accomplished by checking if all the frames were delivered in the correct order to their destinations and will manage any potential collision occurrence.

PLASMIUM would guarantee certain platform services where applications were run by an existing platform, such as conversion to a commission free network during maintaining the strengths of the PLASMA Chain ecosystem. The AURORA layer will control the ARC layer and map the processed results. It also evaluates if certain operations for given transactions were accurately recorded and reliable, including within any given transaction story, smart contract, reputation management or reward. It will also verify the operations that were performed and map each event block data.

Other AURORA layer functions include the assignment and mediation of the transfer route for all data between network systems which control flow and error. It will provide a congestion control function which arises upon data transfers and the ability to establish, maintain and terminate network connections on data lines between systems and super system communications. Event block data will be divided across packets which are reunited once transferred. To determine the best data communication route, an algorithm is used to route the assigned logical address and packets will be delivered.

ARC layer will operate the transactional running, smart contracts, data from applications, and AURORA layer will analyse the traffic which comes in to the ARC layer and classify the type of service it is. AURORA layer will then use the TCP/UDP protocol and communicate with the ARC layer. This will send and receive various data, including the smart contract, transaction, history data and reward data. It will also include the assignment of a logical address through a routing algorithm, delivering packets from the sender to the receiver node and reward data in the event block. An impartial operational processing will be assured through the provision of multiple communications which distinguish trustable transfers from non-trustable transfers. It will act to optimise the network overall and provide scalability in the system.

## 12.INTERFACE

The interface will create a layer environment wherein each application will access the PLASMA Chain. It will supervise and manage all accounts which participate in every network and limit by certifying the authority of each node. It will confirm data including the PLASMIUM wallet address and transaction signatures for the purpose of checking whether certain account was authorised properly.

PLASMA Chain will operate through interfacing in the TCP/IP channel and the DBMS channel in the environment, to send and receive transactional data. The verification and management of AURORA layer manage all transactions for every application and can map and send the verified data to the ARC layer of PLASMA Chain in order to perform the operations. The AURORA layer will work by providing a control structure and by maintaining and synchronising account settings. It will adjust and manage the dialogues which the ARC layer will require for transfer data in different nodes.

Blocks will synchronise as they combine for the establishment, adjustment and termination of dialogue channels between application layer units. ARC layer is an open source API, script, smart contract, functional programming language, reward and reputation. The fundamental transaction component in the PLASMA Chain network is the PLASMIUM token which is based on the transaction record for each participant, including firms, producers and consumers, and the record score.

PLASMA Chain facilitates payment of appropriate rewards linked with transactions. These payments will be made through PLASMIUM token based on transactional score and reputation record. PLASMA Chain as a whole is in reference to protocols, APIs linking DApps. These are made up of APIs, Rust functional language, smart contracts, e-wallets and other protocols like the payment, reward, story and reputation.

PLASMIUM middleware architectures includes the development of the PLASMIUM environment and the virtual machine. PLASMIUM middleware platforms are made up of module layers of the major services which is created to allow the platform to be modified, expanded and for future service integration in the easiest possible way. For the integration of existing payment services like PG services and the easy use of the PLASMIUM services, a web or native client SKD, like existing types, will be provided to integrate existing service environments.

The languages included, such as the PLASMIUM script language and the functional programming language, will allow for smart contract services to be developed easily. An integrated development environment will be provided for the development language.

Base infrastructure services will be provided through the PLASMIUM API layer which will allow for the expansion and connection of facilities and other coin into other service areas. PLASMIUM API will include modules which process blockchain, transaction and smart contracts. The transaction processing available in PLASMIUM API will be equipped with an ability to detect and forecast any type of suspicious recordings of PLASMIUM coin payments in domestic PG companies or card companies. This will allow the prevention of illegitimate transactions on a systematic basis.

PLASMA Chain will provide smart contract production tools through a script editor which allows for the writing of smart contracts through various transaction conditions which must all fit the DApp characteristics. The PLASMA Chain script will chain process transaction types that are normally arising in each participant for various industries like finance, logistics, communications and electric vehicle provision. Smart contracts are coded through the use of Rust and will be compiled to bytecode through the FVM, which in essence allows it to have Turing completeness.

The smart contract protocol will be a code piece to facilitate, verify or execute contract requirements, without contract documents (online) or third parties. Smart contracts which run on a distributed ledger and reproduce the contract provision logic will allow for the exchange of stock, assets, money or any other type of valuable in a manner that is transparent, and without need to use a broker. This technology works in the same style as a vending machine, since they are designed to run automatically in accordance with pre-programmed rules and the determined output is certain once specific conditions are met. When a person uses a vending machine, they would deposit money in the machine and then input a precise amount. After that their desired product appears on the other side. Money will be in escrow in the smart contract and will be preserved in the chain. They will be designed to immediately transfer once certain conditions are met and the contract is fulfilled, with the details stored in the story data segment for smart contract transactions.