BSN Spartan Network White Paper

Version 1.0

BSN Foundation

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1. Public IT Systems

1.1. A Brief History of Communications

In 1876, the invention of the telephone facilitated point-to-point communication between users, making sharing information from a distance more efficient. However, the original telephone technology became insufficient once more people became involved in the communication process. For communication to be successful, all users should be able to send, receive, and respond to all transmitted data. As a result, conference call technology was invented, transforming the telephone industry by operating as the streamlined communications process we have today. Another popular technology, blockchain networks, enables the same type of broadcasting to multiple IT systems using distributed databases and peer-to-peer transmissions.

Like the evolution of telephone technology to enable conference calls, the Blockchain-based Service Network (BSN) aims to transform the internet as we know it by creating new capabilities based on emerging and future technologies, with blockchain being just one of these technologies.

1.2. Current Internet Issues

1.2.1. Privacy

Today's internet is a point-to-point communication network of private back-end IT systems operated by individuals, corporations, and governments using compute and cloud resources that they control. In the wake of different scandals over how Facebook (now known as Meta) abused user data, the issue of data use and privacy has started to receive much more public attention, and the theme of how best to protect user's data in single-entity-controlled private IT systems is growing in significance as time progresses.

Government officials in some countries are beginning to introduce legislation to address data privacy issues. A notable example is the European Union passing its General Data Protection Regulation (GDPR) which regulates how user data is processed. While this is a positive development for ensuring users have more rights over how companies and governments use their data, the fundamental structure of the internet as a network of private back-end systems makes it difficult to monitor and enforce this compliance. At present, the GDPR relies on organizations' willingness to fulfill their requirements without regular enforcement mechanisms due to the sheer quantity of data

that requires policing. As we shall see later, Public IT Systems can solve this problem and reduce the need to rely on the goodwill of organizations trusted to function as custodians of our data.

1.2.2. Transparency

Another problem with private back-end systems that run on the infrastructure of a handful of large corporations is that these systems are essentially “black boxes” to users. An inherent lack of transparency provided by these systems prevents users from fully controlling what data is shared, when data is shared, with whom data is shared, and how data is shared across different networks.

The transparency problem follows as a logical consequence of the privacy problem. Ownership of user data means users control what they share, when, and how. It also requires that the IT systems through which they share this data are open to scrutiny in a way that is public and accessible to all. Not only does this lack of transparency feed suspicions about how companies use data, but it also erodes trust in the data shared with us by governments or corporations. Without consistent monitoring and verification of user data management operated by private organizations, the system that is navigated daily by millions of users cannot be trusted.

1.2.3. Connectivity

The final structural problem with the internet today is the difficulty of achieving connectivity and interoperability. While there are protocols, such as HTTP and TCP/IP, that allow for point-to-point communication between different private back-end IT systems, there is no standard that instantly enables a broadcasting form of communication among multiple IT systems.

SWIFT, the global network where users can make interbank payments, is one example of how universal IT systems could transform the global economy. SWIFT enables its members to communicate and send payment-related messages to each other in a secure and standardized format, significantly boosting the efficiency of financial services firms’ operations. With one single connection to the SWIFT system, an organization can connect to over 11,000 other organizations worldwide. However, despite demonstrating the potential of public IT systems, SWIFT is still ultimately a centralized system administered from La Hulpe, Belgium, and overseen by a consortium of central banks.

1.3. Public IT Systems

Privacy, transparency, and connectivity are inherent limitations of the internet as we know it today. Solving these problems will involve developing different modes of communication that are open and public, in contrast to the current network of private systems. In this context, the term “public” means that the systems are open and transparent in a way that existing IT systems are not. Public IT Systems have a high degree of decentralization, can be accessed by anyone, are controlled and administered by their users, and give users more autonomy over their data.

No matter what legislative protections are in place, whenever users interact with a website that requires any information from them, the user’s data is handed over to third-party corporations to process, store, and use as they see fit. This is an unsatisfactory situation for many, and due to the private nature of the systems we rely on, individual users don’t have the ability to change them.

Many see “private” systems as analogous to the concept of private property that we are all familiar with from the physical world. Whenever you interact with anything online, you engage in a transaction taking place within someone else’s “private property” and are subject to some level of control and monitoring from that person or corporation.

A “public” system looks very different and is analogous to the concept of a “public park,” with the distinction that citizens, not a centralized government, govern the public park. Unlike private property, a public park is open to all citizens and what happens in the park is on display for all to see, hear, and participate in. All information, including features and rules, is freely available to all users. Users would need to come together and make a group decision to create any restrictions, such as revoking user access in case of rule-breaking behavior.

An IT system built on this model would allow for user privacy and control. If the decentralized public park represents the Public IT System in which online activity would take place, the park could store user data in the user’s private data vault within the park. While everyone can access and interact with others within the park – by which we mean the overall online environment – the key to a user’s private data vault within this public space is owned and controlled by that specific user.

Within this system, users control how and when they choose to share their data. Rather than trusting corporations to respect user privacy, the use of smart contracts automates what can and cannot be done with any piece of data, thus removing potential enforcement problems faced by even the most carefully designed legislative efforts.

Notably, the distinction between private and public back-end systems does not mean that so-called “public” systems are government-built or operated. Public IT systems could be thought of in much the same way as open-source software development, in that the broader community contributes to the operation and continual improvement of the system in a transparent manner.

The characteristics of public IT systems will probably be familiar to those that are familiar with blockchain technology, which has the potential to revolutionize the storage, transmission, and permissioned use of data. However, it is important to emphasize that blockchain technology is not mature enough in its current state and will need to evolve to meet present and future business needs. BSN believes users should see blockchain technology as an operating system to support more types of applications far beyond just cryptocurrency and just one part of the technology portfolio that enables the Public IT Systems of the future.

2. Blockchain-Based Service Network

2.1. A Brief History of BSN

Due to the different regulatory environments inside and outside China, the Blockchain-based Service Network (BSN), originating in China, took fundamentally different technology and governance approaches to cater to the needs of the business systems outside of China. BSN's international efforts launched on August 10, 2020, under the governance of the BSN Foundation in Singapore. Red Date Technology, one of the four founding members of BSN, is responsible for BSN's international development strategy and conducts the research required to continually improve and manage the network's daily operations.

During the BSN Hong Kong Summit, Yifan He, Founder and CEO of Red Date Technology, announced that BSN would launch the BSN Spartan Network with three Non-Cryptocurrency Public Chains: non-cryptocurrency Ethereum, non-cryptocurrency Cosmos, and non-cryptocurrency PolygonEdge. The BSN Spartan Network aims to reduce the cost of using public chains so that traditional IT and business systems can leverage public chain technologies as part of their infrastructures.

2.2. BSN Mission and Vision

While the concept of Public IT Systems as distinct from private ones is new, our view at BSN is that we will begin seeing the internet evolve into a multi-layered system. The first layer will comprise

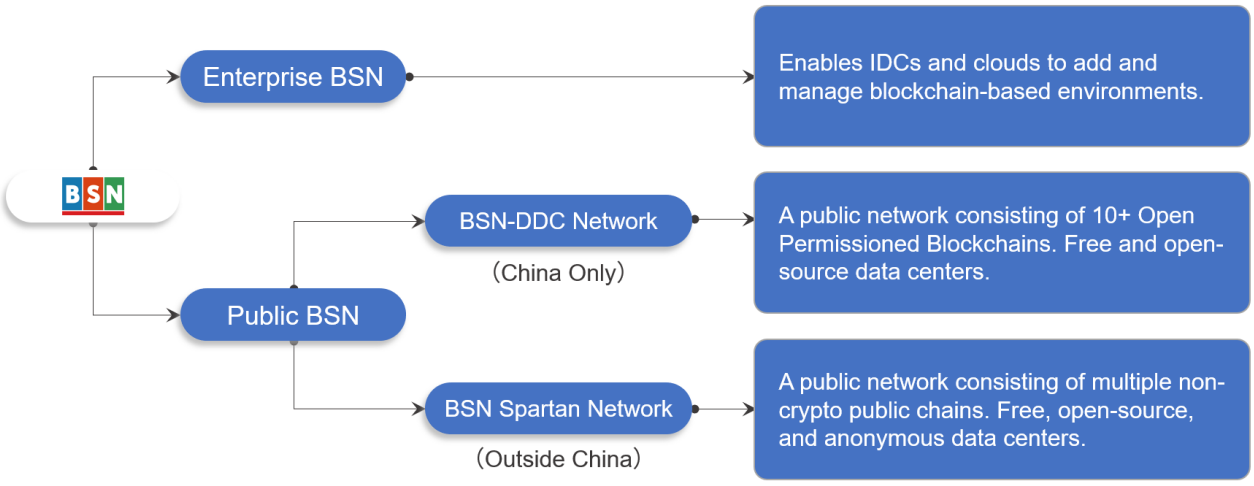
private back-end systems based on those we are familiar with today. BSN is encouraging the emergence of a new public layer of the internet made up of systems capable of broadcasting communication where multiple systems engage simultaneously, rather than the traditional point-to-point communication that underpins today's systems.

BSN's mission is to promote the concept of the new public layer of the internet by building a cloud environment software and providing a foundation to create new operating systems, communication protocols, database technologies, development tools, and applications for Public IT systems.

Public IT Systems are therefore best thought of as an upgrade or an enhancement for the internet as we know it today. In the future, a critical debate will be on which type of system – private or public – works best for each task faced by organizations and individuals.

2.3. BSN Technology Stack

The BSN provides data center management software to enable traditional clouds, data centers, or intranets to operate blockchain environments for applications and services. These software platforms enable organizations to integrate virtual data centers into their physical data centers to manage blockchain operations more efficiently and cost-effectively. BSN provides three data center software platforms: Enterprise BSN, BSN Spartan Network, and BSN-DDC Network.



2.3.1. Enterprise BSN

Enterprise BSN is an enterprise software platform installed on any public cloud, private cloud, or intranet to embed blockchain-based environments into their existing systems. The new environment manages cross-cloud virtual machines and resources directly on top of OpenStack, integrates more than 30 different blockchain frameworks as operating systems, orchestrates all permissioned and permissionless nodes with docker technologies, and provides API services for existing portals to integrate with, including robust microservice-level monitoring and billing systems.

2.3.2. BSN-DDC Network

The BSN-DDC Network is the BSN Spartan Network's equivalent in China. Instead of Non-Cryptocurrency Public Chains, the BSN-DDC network supports more than ten Open-Permissioned Blockchains, modified from popular public chain frameworks to comply with Chinese regulations fully but keep as many public chain characteristics as possible such as transparency and ownership of data. The BSN-DDC Network data center software is open source and free to install.

3. BSN Spartan Network

3.1. Overview

The purpose of the BSN Spartan Network is to build an easily accessible Public IT Network that consists of multiple Non-Cryptocurrency Public Chains to bring blockchain technologies to the broader IT industry, far beyond cryptocurrencies. The Spartan Network is open-sourced, anonymous, and free to participate in by establishing a Spartan Network Data Center locally or accessing an existing Spartan Data Center. The nodes of the Non-Cryptocurrency Public Chains, such as Spartan-I Chain (Powered by Non-Cryptocurrency [NC] Ethereum), Spartan-II Chain (Powered by NC Cosmos), and Spartan-III Chain (Powered by NC PolygonEdge), can be selectively installed on a locally run Spartan Data Center for access. These NC Public Chains are hard forks of their corresponding regular public chain frameworks.

To better serve traditional IT processes and procedures in a Public IT System-based environment, all native cryptocurrencies are eliminated from these NC Public Chains, and the gas consumption to execute transactions is calculated with fixed prices, similar to the business model of a traditional cloud service. All gas consumption is paid for by the Spartan Network's utility token called Non-Tradable Token (NTT). NTTs can only be stored inside one single wallet for each Spartan Data

Center and can't be transferred to any other wallet except when they are used to purchase Gas Credits for end-users on each chain. The Gas Credits, also not transferable, can only be spent to execute transactions and are destroyed after use.

The Spartan Network can be seen as a decentralized NC Public Chain-based cloud service network. It is designed so that it is not controlled by one single entity as part of the effort to experiment and build the public layer of the internet. The BSN Foundation, a non-profit organization, is registered in Singapore as the governing body of the Spartan Network. The BSN Foundation will start with five founding members and expand to 20 members by the end of 2023. Each member will operate a Governance Data Center on the Spartan Network, which contains the validator nodes of all NC Public Chains. All important matters, such as adding new members, onboarding new NC Public Chains, and changing the exchange ratio of NTT and Gas Credits, will be voted on and decided by all members. In the future, we plan to expand the validator node operation eligibility to regular Data Center Operators who have spent a certain amount of gas consumption on NC Public Chains so that we can continue to strengthen the decentralization, governance, and transparency of the Spartan Network.

3.2. BSN Spartan Data Center

There are two types of data centers on the Spartan Network: regular data centers and governance data centers (note: this is further explained in the Foundation chapter). The source code of regular data center software is available on BSN Spartan Network's GitHub Account here: https://github.com/BSN-Spartan. Spartan Network users can download the source code and install the data center software locally on their cloud environment or on-premises. The operators of the regular data centers are resource contributors to the Spartan Network, and the data centers become access points to the Spartan Network for the operators and their end-users. All the data centers together form the Spartan Network.

During the data center installation, the Data Center Operator must install the Default Node, which is the full node of the Spartan I Chain (Power by NC Ethereum). The Default Node functions as the data center's management data ledger. The operator can then install any other full nodes of other NC Public Chains or multiple full nodes of any chain. For each full node installed, the operator must register it to the corresponding chain by submitting the required information to the chain via the data center management interface. The installation process is relatively complex and requires specific system administration experience. For a detailed guide, please refer to the Quick Guide on Spartan Network's official site: http://spartan.bsn.foundation.

The data center software provides an admin interface for operators to easily view and monitor data center activities, including node status, NTT account details, blockchain info (blocks, transactions, etc.), and the newest Gas Credit top-ups. The locally installed data center software only interacts with locally installed full nodes and never exchanges data with external third-party systems or Spartan-related centralized systems, such as the official Spartan website. There are only two actions where operators must go to the official site:

1) Register an email address with data center IDs to receive the necessary certificates after installing the data center software. (Note: This email address is the only user info collected);

2) Receive free NTT during the beta trial or find the USDC address or Credit Card/PayPal methods to purchase NTT after the commercialization.

The entire Spartan data center software and all full nodes are open source and accessible on the GitHub website. Our goal is that the Spartan Network will become an open-source community-based project, and we welcome other interested developers to review and contribute to the code.

3.3. Non-Cryptocurrency (NC) Public Chains

The Spartan Network is not a blockchain network but a decentralized cloud service network built on all the data centers operated by its users. The network uses Non-Cryptocurrency (NC) Public Chains as different operating systems for Data Center Operators and end-users to deploy and execute smart contracts.

As stated in previous sections of this white paper, the reason for creating NC Public Chains is to change the highly volatile prices associated with cryptocurrencies on public chains to lower and more stable prices by eliminating cryptocurrencies from layer one of public chains. The removal of cryptocurrencies from layer one is the only way to enable traditional IT systems to begin using blockchain and public chain technologies as part of their overall IT architectures.

We expect to have dozens of NC Public Chains on the Spartan Network in the future. At launch, there will be three chains: Spartan-I Chain (Powered by NC Ethereum), Spartan-II Chain (Powered by NC Cosmos), and Spartan-III Chain (Powered by NC PolygonEdge). All three chains are hard forks of their original public chain frameworks. Aside from the modifications to remove cryptocurrencies and add NTT as the non-transferable universal utility token on the Spartan

Network, they are the same as the original chains. The following table provides information on these NC Public Chains. Interested developers can download and compare the modified and original code.

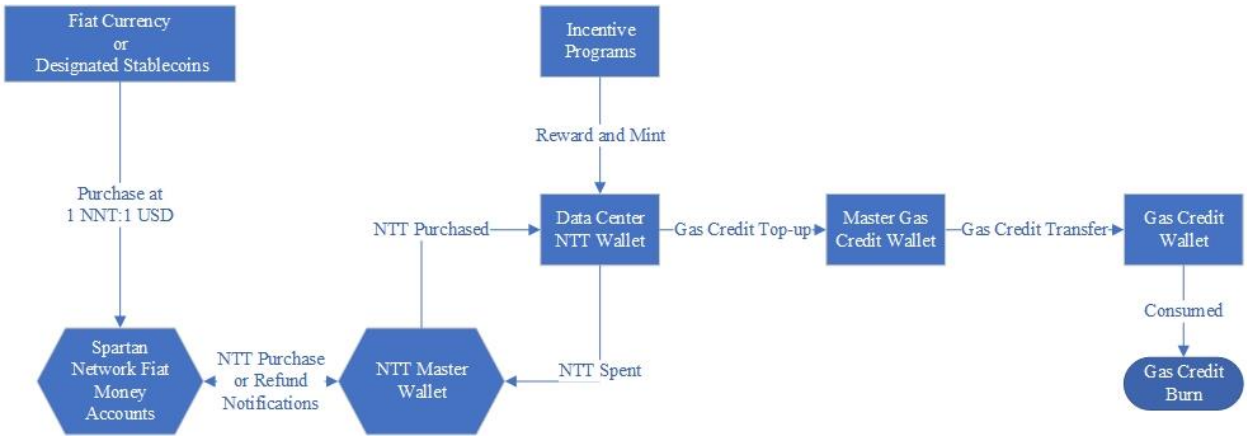
	Spartan-I (Default Chain) (Powered by NC Ethereum)	**Spartan-II (Powered by NC Cosmos)**	**Spartan-III (Powered by NC PolygonEdge)**
Version	v1.10.17	v0.45.1	v0.5.0
GitHub	https://github.com/BSN-Spartan/NC-Ethereum	https://github.com/BSN-Spartan/NC-Cosmos	https://github.com/BSN-Spartan/NC-PolygonEdge
Consensus	POA	PBFT	IBFT POA
Cryptography	secp256k1	secp256k1	secp256k1
Browser	https://spartanone.bsn.foundation	https://spartantwo.bsn.foundation	https://spartanthree.bsn.foundation
Original Chain GitHub	https://github.com/ethereum/go-ethereum/tree/v1.10.17	https://github.com/cosmos/cosmos-sdk/tree/v0.45.1	https://github.com/0xPolygon/polygon-edge/releases/tag/v0.5.0

3.4. Non-Tradable Token (NTT)

Non-Tradable Token (NTT) is the universal utility token used on the Spartan Network to pay for Gas Credits on any NC Public Chain. Each data center only has one NTT Wallet created on the Default Chain during the installation of the data center software. As its name indicates, trading between two NTT Wallets is not allowed. NTTs are transferred into an NTT Master Wallet managed by the BSN Foundation after being used to purchase Gas Credits.

NTTs can only be minted in Spartan Network's regular data centers as a one-time reward from the Node Establishment Incentive Program or as the result of the Data Center Monthly Incentive Program (see below). When a data center operator needs more NTT than the amount granted by the Incentive Programs, the operator must purchase NTT from the NTT Master Wallet with fiat money (credit cards/PayPal) or anonymously using USDC. The price of 1 NTT is fixed at 1 US dollar. The purchased NTT will be moved from the master wallet back to the data center's NTT Wallet for future purchases of gas credit. The BSN Foundation never mints new NTT in the master wallet.

For Data Center Operators to execute transactions on NC Public Chains, they must have Gas Credit Wallets on corresponding chains. These wallets function just like native cryptocurrency wallets. When a transaction executes, the Gas Credits within the wallet are deducted. The deducted Gas Credits will be transferred out and destroyed. Like the NTT Wallet, Gas Credits are not transferable between wallets, and end-users can only purchase Gas Credits with NTTs from data centers. The following diagram shows the entire NTT process starting from minting and then circulating between the master wallet and data centers' wallets.



3.5. Gas Credit Pricing

When the price of an NTT is fixed at 1 US dollar, the purchase prices of Gas Credits on these NC Public Chains in terms of NTT are also fixed, so that end-users benefit from low-cost and non-volatile public chain services. The Transaction per Second (TPS) capacities of NC Public Chains are limited, and because of its low cost, the Spartan Network may experience a high number of transaction requests from time to time. As a result of waiting periods potentially lasting several hours, the Spartan Network supports gas price bids, which means the highest-price transaction would be processed first. To maintain the Spartan Network as a low-cost infrastructure, bids are always capped at 1 NTT after the commercialization of the Spartan Network. The following shows the gas credit prices for all initial NC Public Chains at launch. For the following example, we use the gas consumption in units of NTT for minting a standard ERC-721 NFT as a benchmark:

Chains	**1 NTT: Gas Credit**	**Benchmark cost to mint an ERC721 NFT (200 bytes metadata)**
Spartan-I	1:3333333 (Gwei)	0.03 NTT (0.03 USD)

Spartan-II	1:4000000 (Ugas)	0.03 NTT (0.03 USD)
Spartan-III	1: 3333333 (Gwei)	0.03 NTT (0.03 USD)

The ratio between NTT and Gas Credits can only be adjusted once per quarter with an 80% voting threshold passed by BSN Foundation members. There is a 20% cap on all quarterly adjustments. This mechanism is intended to balance the market demands and stability of Spartan Network prices.

3.6. Data Center Monthly Incentive Program

The expansion of the Spartan Network relies on new users to establish and operate new data centers. A Data Center Monthly Incentive Program encourages end-users to set up data centers and become Data Center Operators themselves rather than merely accessing the Spartan Network via other operators' data centers. The philosophy behind the Spartan Network's incentive program is different from the ones that other public chains offer, as only end-users who have real business needs that they will pay for will access the Spartan Network.

The primary purpose of the Data Center Monthly Incentive Program is for Data Center Operators to receive a monthly NTT reward, similar to loyalty points from shopping malls, airlines, or hotels. The amount of the NTT reward is calculated based on the gas credit usage that occurred in the previous month in a progressive way as shown below. These reward NTT are minted directly on the Default Chain to the data centers' NTT Wallets. The amount of the final reward is also subject to regular health checks of all the full nodes installed within the data center. If some nodes are only partially operational during the entire month, only partial or no reward will be granted.

Incentive Level	**Gas Credit Consumption (NTT) in Previous Month**	**Progressive Loyalty NTT Ratio**
Tier 1	0 - 200	100%
Tier 2	201 - 3000	60%
Tier 3	3001 - 20000	40%
Tier 4	20001 - 100000	20%
Tier 5	More than 100000	10%

The following shows how the reward calculation increases progressively when 210,000 total NTT of Gas Credits are consumed in the previous month.

Tiers & Range in units of NTT	Incentive Amount in NTT
Tier 1 [0 - 200]	200 * 100% = 200
Tier 2 (201 - 3000]	(3000 - 200) * 60% = 1680
Tier 3 (3001 - 20000]	(20000 - 3000) * 40% = 6800
Tier 4 (20001 - 100000]	(100000 - 20000) * 20% = 16000
Tier 5 >100001	(210000 - 100000) * 10% = 11000
Total Reward	200 + 1680 + 6800 + 16000 + 11000 = 35680

If an end-user accesses the Spartan Network via another operator's data center, the incentive reward goes to the Data Center Operator. This program not only reduces the cost for Data Center Operators' own usage but also presents a business opportunity for the operators to provide external services to other end-users in addition to their own use. The operator can offer the same Gas Credit rates to end-users as the Spartan Network offers, or even higher rates with additional services, so the operator can accumulate a large amount of gas credit usage each month and receive the incentive reward as profit the following month.

3.7. Node Establishment Incentive Program

The primary purpose of the Node Establishment Incentive Program is to encourage Data Center Operators to install full nodes of all NC Public Chains on the Spartan Network, or in some cases, even multiple full nodes of one NC Public Chain can be installed to fulfill large transaction demands from end-users. For each full node installed successfully, 50 NTT will be minted into the Data Center's NTT Wallet as a one-time reward if the new node passes the health checks over a certain period of time. To prevent this incentive program from being manipulated, mechanisms are set up to make sure that Data Center Operators are acting in good faith when installing more full nodes. For example, a Data Center Operator who repeatedly took some full nodes off-chain would not be allowed to get the reward in a certain period of time for new full nodes or possibly not be allowed to register new full nodes in the future.

4. Access Spartan Network

For an end-user to deploy smart contracts or execute transactions on any NC Public Chain of the Spartan Network, the end-user must have a Wallet Address for that specific chain, and the Wallet needs to have enough Gas Credits. If the end-user is not a Data Center Operator, they must go through a data center to top up the wallet with Gas Credits. The Data Center Operator can provide end-users with the necessary permissions and APIs manually or set up a more user-friendly interface or website as a SaaS business described in the previous chapter.

Once the end-user has set up a wallet and owns the related private key and enough Gas Credits, they can connect to the APIs of the data center's specific chain node to execute transactions. The remaining steps should be the same as accessing the corresponding public chains. If end-users are unfamiliar with accessing and using public chains, they should refer to our Spartan Network User Manual or the documentation of each public chain at http://spartan.bsn.foundation/.

During the beta trial period, end-users can use a test service on the Spartan Network website to easily learn how to create a wallet, receive free daily Gas Credit, and find the access information of the test data center's full nodes on the Spartan Network in production.

5. Governance

5.1. BSN Foundation

The BSN Foundation, registered in Singapore as a Non-Profit Organization, is the governing body of the Spartan Network. There are three committees in the Foundation:

- The Technical Committee oversees coordinating efforts on R&D activities to further develop the Spartan Network's technical stacks as an open-source project.
- The Governance Committee oversees coordinating member meetings and executing member voting results.
- The Business Committee oversees coordinating reconciliation, income distribution, and the Foundation's business development efforts.

The Foundation plans to have ten members by the end of 2022, 30 members by the end of 2023, and, eventually, 40 members. Each member must install and operate a Spartan Network Governance Data Center, which can deploy the validator nodes of all NC Public Chains and a

governance system. The decentralized governance systems will be used to vote on all significant matters related to the Spartan Network and each NC Public Chain. The following is the list of matters members can vote on and their passing thresholds.

Topics	Threshold
Change NTT: Gas ratio on Chains	80% (Once a quarter and max. 20% up or down)
Integrate new chains	60%
Distribution rule of NTT income	80%
Distribution rule of cash income	60%
Onboarding new members	60%
Upgrading existed chains	60%
Adding new voting topics	80%

When 30 leading international companies govern the Spartan Network as Foundation members with equal voting rights, the network will become one of the most decentralized IT infrastructures in the world, serving traditional IT industries to progress the Public IT Systems concept.

In the future, the Foundation will expand the right to establish validator nodes and voting to regular Data Center Operators when their data centers have a certain amount of monthly average Gas Credit consumption in a certain period. The broad idea is to include parties that truly care about the mission of the Spartan Network in the decision-making process and make the network increasingly more decentralized. While we intend to expand voting rights to Data Center Operators in the future, the Foundation members will always maintain 60% voting power.

For any company interested in participating in the R&D effort and joining the technical committee, please go to http://www.bsn.foundation to contact us. Becoming a formal member of the Foundation is not required to join the technical committee.

The first round of Foundation members will be announced on the official Foundation website at the commercial launch of the Spartan Network in the fourth quarter of 2022.

5.2. Network Income Distribution

NTT are continuously minted on the Default Chain (Spartan-I Chain) in the data centers' single NTT Wallets under the Node Establishment Incentive Program and Data Center Monthly Incentive Program. Once spent to purchase Gas Credits, NTT transfer into an NTT Master Wallet, and when the Data Center Operators need more NTT, they must purchase NTT from the master wallet with fiat currency or USDC.

The NTT in the master wallet, cash in the fiat currency bank account, and the USDC in the Foundation's authorized wallets are the total income of the Spartan Network. All income, including both cash and USDC, is distributed monthly in three parts after a 5% donation to the Foundation: one-third to the Foundation members to be shared equally, one-third to each NC Public Chain operator that maintains the chain codes and provides technical support, and the last third goes to Spartan Network operators who maintain the network's daily maintenance and provide technical support and customer service to users. The 5% donation to the Foundation is used for administration, promotion, and technical grants.

The NTT in the master wallet must be maintained at a certain level to support circulation. When too many NTT are in circulation, Foundation members vote to distribute extra NTT to members for their own use, gift them back to Data Center Operators, or destroy them. The decision is dependent on how well the Spartan Network performs. If there is a surge in demand for NTT, there might not be enough NTT in the Master Wallet to meet demand, which would cause an NTT Reserve Wallet to be introduced. When there are insufficient NTT in the Master Wallet to fulfill demand, some NTT will be minted automatically in the Reserve Wallet and lent to the Master Wallet. These loaned NTT will be returned to the Reserve Wallet and destroyed after the Master Wallet has enough NTT to support circulation.

Since the NTT Master Wallet and Reserve Wallet are both on the Default Chain, they are transparent to the public, as are all transaction details. All balances and transactions in accounts that hold fiat currency and USDC wallets are transparent to all Foundation members.

6. Scalability Problems

It is common knowledge that most public chains today have relatively small Transactions Per Second (TPS) compared to traditional centralized IT systems, which can handle up to half a million TPS. For example, Ethereum's TPS capacity is less than 20. Furthermore, most of the transactions on public chains are just transfers between cryptocurrency wallets, which are considered relatively simple transactions in terms of IT data operations and processes. All NC Public Chains are forked from the original corresponding public chain frameworks, and, as such, the TPS capacity on the Spartan Network is initially very limited.

Since the Spartan Network aims to serve traditional IT industries and developers in a decentralized Public IT Environment, it will process much more complex and unpredictable transaction types and scenarios. For this reason, and because of the low-cost nature of the network, we expect the Spartan Network will face scalability problems at some point after the commercial launch. As such, transactions could wait up to hours in the queue to get processed. In a worst-case scenario, the network might overload and crash some locally installed nodes or jam the validator nodes.

One of the technical goals of the BSN Foundation is to improve blockchain frameworks to handle more TPS capacity and more complex transactions and eventually build them into the true operating systems for public IT systems. In the foreseeable future, we will work with all NC Public Chain operators and interested developers to address Spartan Network's scalability problems in the following aspects:

First, the BSN Foundation can grant permission to deploy new NC Public Chains converted from other regular public chains onto the Spartan Network. Usually, only one non-cryptocurrency version from each mainstream public chain will be allowed. The more NC Public Chains are on the Spartan Network, the more choices end-users will have and the larger capacity of TPS the network can handle.

The second approach is to improve the core systems of each NC Public Chain on the network. Because most transactions on public chains today are simple transfers, they don't require the public chain communities and developers to build more advanced core engines. The complex and high-volume characteristics of the transactions on the Spartan Network will push NC Public Chain development teams and communities to advance the technologies to reach new heights, motivated by the gas income the chain operators earn from the network. We require each NC Public Chain to reach at least 200 TPS.

Thirdly, the BSN Foundation can grant permission for any NC Public Chain operator who can reach the target of 200 TPS over a sustained period to set up and operate a side chain. The side chains would be identical to the main NC Public Chain and have the same NTT pricing structure. But the NC Public chain operators will have more power and responsibility in the governance of their side chains.

By working with various technical partners around the world, the teams involved in the Spartan Network project will continue to advance blockchain technologies to be more suitable for all types of IT systems and operations. We believe it will eventually become one of the main infrastructures of the public layer of the internet.

7. Beta Launch

The BSN Spartan Network is set to launch on September 6th, 2022, from Hong Kong. After the initial launch, the network will have a two-month beta trial where users will not be charged for network use. The network aims to be commercialized by November 1, 2022.

During the beta trial, Data Center Operators can go to the Spartan Network's official site to get 10 free US dollars' worth of NTT daily. End-users who don't operate their own data centers can also go to the official site to access the network via the Spartan Network's testing data centers. End-users can create their own Gas Credit Wallets, receive free Gas Credits, and deploy/call smart contracts on any NC Public Chains during the beta period.

After the beta trial ends, all NC Public Chains, all data on chains, NTT, Gas Credits, and deployed smart contracts will remain as-is after commercialization. The only difference will be that Data Center Operators must buy NTT with credit card/PayPal or anonymous USDCs if they need more than those received from Incentive Programs and the free NTT from the beta period. The free end-user testing service will end, and for these end-users who don't want to install data centers but want to continue to use Spartan Network, they will be referred to third-party data center services. Spartan Network customer support will also help them migrate their existing wallets.

During the beta trial, the Spartan Network development team and NC Public Chain operators will continue to work together to develop interoperability among NC public chains as well as between NC Public Chains and original public chains via an interchain hub service based on Poly Network and Cosmos technologies.

8. Network Security

8.1. General Public Chain Security

All NC Public Chains on the Spartan Network are forks of three popular public chains with almost no modification to their core systems and security mechanisms, and all NC Public Chains are fully open source. Anyone can download and compare the code and their original public chain code. The security, data privacy, and cryptographic integrity of the NC Public Chains remain as strong as the original ones.

Furthermore, the Spartan Network aims to serve traditional IT needs beyond cryptocurrencies. The Gas Credits in wallets cannot be transferred, which means they can't be stolen and usually remain in small amounts. If end-users use private keys to sign all transactions and keep their private keys safe, even sensitive business data in the smart contracts are as protected as cryptocurrencies on public chains. Due to the cryptographic aspects of blockchain and the public chains' transparent structure, data on the Spartan Network is more secure than those in most private IT systems.

8.2. Local Data Center Security

Many may think that one of the potential breaching points might be in the data centers, which are locally installed and operated by Data Center Operators who might not be technically savvy enough to properly secure their systems. By design, there is very little critical data stored off-chain in the data center software. The user interface of the data center management area is primarily for viewing data queried from the full nodes of the NC Public Chains. The most important security concern for Data Center Operators is to store their locally generated private keys and certificates safely in their local systems and periodically make backups. Furthermore, except for the connections to the locally installed full nodes of the NC Public Chains, the data center software and its management area never connect and pass data to any third party or the Spartan Network's centralized systems.

8.3. Validator Node Safety

Many public chains are hacked by taking over a majority of the validator nodes. One of the goals of the BSN Foundation is to expand the members and governance data centers to as many as 20 in the first year after launch. Eventually, high-usage Data Center Operators can also have the right to participate in validator node operations and related voting rights. Each member's governance data center is installed and operated in the member's own cloud account or on-premises, which increases

the difficulties of hacking multiple governance data centers in a short period of time. Even with the worst-case scenario in which most validator nodes of an NC Public Chain are hacked and taken over, all private-key-protected data are still safe and intact. Also, an illegal hard fork would not cause catastrophic results to any end-users because the Spartan Network is not a cryptocurrency network.

9. Spartan Network Use Cases

The BSN team engaged with traditional IT leaders from a wide variety of enterprises prior to the official launch of the BSN Spartan Network and was met with nearly universal enthusiasm for the potential of the network. These early engagements resulted in over 20 different proof-of-concept use cases that demonstrate what users can build on the BSN Spartan Network infrastructure. We have selected three of the use cases to demonstrate specific benefits of the BSN Spartan Network.

9.1. Use Case 1 – Data Ownership

A leading health testing company is leveraging the Spartan Network to create a platform that allows an individual to give permissioned access to other parties, such as labs, clinics, or doctors, to interact with the individual's health diagnostic report that is stored in the individual's private data vault. In addition to giving an individual ownership of his or her personal data, this use case demonstrates the benefits of enhanced security, traceability, and improved efficiency.

9.2. Use Case 2 – Transparency

A global provider of professional solutions and services to help organizations achieve successful digital transformations built a service that securely stores and tokenizes digitally signed documents and then validates the documents using the Spartan Network. The company's platform calls a smart contract on the Spartan Network to store the signed document and create an NFT representation of the document. The benefits associated with this use case include traceability, enhanced security, improved efficiency, and reduced cost.

9.3. Use Case 3 – Connectivity

A global financial services firm uses the Spartan Network to give business participants in their network the ability to have their business workflows submit payment instructions to the financial services firm to process payments. The benefits of using the Spartan Network, in this case, include

easy partner connectivity, enhanced security, improved efficiency, reduction in service costs, traceability, and minimized payment disputes.

10. Competitive Ecosystems

Competition among organizations in different industries helps drive innovation with the products and services we regularly use to meet current and emerging business needs. For example, car manufacturers benefit from competition with other manufacturers because it forces them to ensure that their cars are the safest, most economical, and have the best features on the market.

The BSN Spartan Network is designed to foster the same type of competition to encourage innovation to build out key technologies that will enable public IT systems. The BSN Spartan Network will integrate three different NC Public Chains at launch and will continue to integrate additional NC Public Chains as the network grows and matures. Each chain operator will compete with the other operators in such areas as scalability, developer tools, pricing, and customer support to grow their respective businesses. Similarly, Data Center Operators will compete with one another for end-users based on the quality of their user interfaces, customer support, value-added services, and pricing. At the application layer, developers will compete with smart contracts designed for different industries and functions.

Ecosystems without competition stagnate and die, so it is essential that the Spartan Network create opportunities for organizations to compete with one another to move the network forward.

11. Future Research and Development

One of the missions of the Spartan Network is to develop public chain technologies to be better suited for mainstream IT systems. To support this effort, the BSN Foundation established the Technical Committee that oversees coordinating future research and development efforts among all Foundation and committee members. Some of the areas the future R&D will focus on include:

11.1. Multi-layer Consensus

For cryptocurrencies, the universal consensus is required to safeguard the universal ledger and wallet balances and perform transfers between wallets through entire public chains. However, a universal consensus is not always needed for every business requirement, process, or scenario. We believe that for NC Public Chains to fulfill mainstream business needs, they must support multi-layer

consensus, including complete consensus (universal), private consensus (partial, like R3's Corda) among any number of nodes, and zero consensus mechanisms.

11.2. Broadcasting Protocols

Unlike P2P-based broadcasting protocols, such as Gossip and LibP2P, we believe there will be broadcasting protocols like HTTP, which should be very light and function like a plug-in on web servers so that developers can use one line of code to create or participate in a data broadcast network with multiple (even unlimited) parties without considering consensus or smart contract virtual machines.

11.3. NFTs as Decentralized Databases

Traditional relational databases don't fit well into a decentralized environment. We believe that NFT technology functions like an object-based single database technology which has the potential to become a more robust data management format on the public layer of the internet. The current use of NFT technology is very limited, and further development is needed to bring out its full potential.

Individuals or organizations are not required to become BSN Foundation members to join the BSN Foundation Technical Committee. We welcome technology companies and developers to join us if you are interested in the above directions. Please contact us at http://www.bsn.foundation.

12. Conclusion

Despite Public IT Systems being an emerging concept, BSN sees them as an enhancement for the internet, allowing it to evolve into a two-layered system. With the first layer comprising the private systems we are familiar with today, BSN encourages the development and emergence of a second, public layer of the internet that transitions from peer-to-peer to a broadcasting style of communication where multiple IT systems engage simultaneously. Removing cryptocurrencies from layer 1 of public chains will help stabilize and secure operations so that public IT systems can be more accessible and beneficial for mainstream businesses. BSN's early engagement with traditional IT organizations has proven to us the value of a Non-Cryptocurrency Public Chain infrastructure as a way to enable revolutionary new applications and services.

The rise of new technologies like the telephone and the internet ushered in new eras of innovation that changed the way that people interacted and societies operated. In the nascent stages of both

technologies, there was initially a small group of “true believers” who saw the early flaws but also grasped the potential for these technologies to have a profound impact on humanity. Gradually, more people came to understand the potential of the technologies and began to improve and innovate the early versions. We believe the launch of the BSN Spartan Network will be the first big step toward developing the second layer of the internet in the form of public IT systems. We invite all “true believers” to join us on this quest to build the next generation of the internet.

13. Appendix

13.1. Appendix A: Glossary

This glossary is a collection of key words, important phrases, and specific processes needed to fully understand BSN’s Spartan Network.

Glossary	**Definition**
Non-Cryptocurrency Public Chain (NC Public Chain)	A Non-Cryptocurrency Public Chain is a transformed public chain framework based on an existing public chain. Gas Credit transfers are not permitted between standard wallets. There will be no cryptocurrency incentives for mining or participating in consensus.
End-user	An end-user is a person or company that deploys or calls smart contracts on the BSN Spartan Network.
Virtual Data Center	A Virtual Data Center is a set of locally installed software systems that contains one or more registered full nodes of different NC Public Chains. Each Virtual Data Center has one NTT wallet and is eligible to receive Node Establishment and Data Center Monthly Incentives.
Foundation Member	Foundation Members refer to the members of the BSN Foundation. Each member must operate a Governance Data Center that contains all NC Public Chain consensus nodes and has the right to vote on governance matters of the BSN Spartan Network.
Consensus Node/Validator Node	Nodes are used for proposing new blocks and voting for consensus mechanisms on NC Public Chains. Consensus Nodes can only be installed on Governance Data Centers operated by BSN Foundation members.

Full Node	A Full Node on an NC Public Chain does not participate in consensus. Upon registering a Full Node on the BSN Spartan Network, it synchronizes all data on the specific chain. The data center to which the Full Node belongs will receive relevant incentives under the Node Establishment Incentive Program.
Default Chain	The Default Chain is the only NC Public Chain on the BSN Spartan Network with NTT governance smart contracts. In addition to providing all regular NC Public Chain services, it also hosts the NTT economic system and governance system of the BSN Spartan Network. The current default chain is the Spartan-I Chain (Powered by NC Ethereum).
Spartan-I Chain (Powered by NC Ethereum)	The Spartan-I Chain is an NC Public Chain version of Ethereum and serves as the default chain of the BSN Spartan Network.
Spartan-II Chain (Powered by NC Cosmos)	The Spartan-II Chain is an NC Public Chain version of Cosmos.
Spartan-III Chain (Powered by NC PolygonEdge)	The Spartan-III Chain is an NC Public Chain version of PolygonEdge.
Gas	In NC Public Chains, Gas is the resource consumed during the execution of a transaction or smart contract.
Gas Credit	In a similar fashion to cryptocurrencies, Gas Credits are used as a means of paying the gas fee on NC Public Chains. However, Gas Credits cannot be transferred between standard wallets. Only the data center operator’s NTT wallet can be used to purchase Gas Credits with NTT.
Non-Tradable Token (NTT)	A Non-Tradable Token (NTT) is a digital token that is issued on the default chain of the BSN Spartan Network. Each BSN Spartan data center has only one registered NTT wallet to manage and hold NTT, which can be purchased with fiat currency or designated stablecoins or acquired through incentive programs. NTT can be used to purchase Gas Credits on any NC Public Chain of the BSN Spartan Network. NTT can neither be traded nor transferred between data centers.

Wallet	Wallet refers to the wallet address or smart contract address of an NC Public Chain on the BSN Spartan Network, which can be generated arbitrarily by users. The wallets are used to hold non-transferable Gas Credits.
NTT Wallet	As a special Default Chain wallet, the NTT Wallet refers to the only wallet address owned by the Virtual Data Center operator on the BSN Spartan Network, which can be used to purchase Gas Credits with NTT or receive NTT incentives.
Gas Credit Master Wallets	A Gas Credit Master Wallet refers to the wallet address or smart contract address used to mint, top up, or destroy the Gas Credits of NC Public Chains. A Gas Credit Master Wallet can only be generated by the Spartan Network operator with permission from the BSN Foundation.
NTT Master Wallet	Used to receive all the NTT consumed when data center operators purchase Gas Credit and to send NTT that data center operators purchase with fiat currency.
NTT Reserve Wallet	The NTT Reserve Wallet will mint and lend NTT to the NTT Master Wallet when there is insufficient NTT to support the circulation of NTT on the BSN Spartan Network. Repayment will be made when sufficient NTT is available in the NTT Master Wallet. The transaction details of the NTT Master Wallet and Reserve Wallet are transparent to the public.
Governance System	The governance system is an off-chain system installed locally by each Foundation member and is responsible for managing the voting and governance of the Spartan Network.
Foundation Website	The official website of the BSN Foundation at https://www.bsn.foundation
Node Establishment Incentive Program	A one-time NTT reward will be received by the Data Center operator's NTT wallet when a new full node is established and passes the Node Registration Test.
Data Center Monthly Incentive Program	Monthly incentive rewards will be issued to data center operators' wallets on the first day of each month based on the data center's previous month's total Gas Credit consumption amount.

Data Center Registration	Data Center operators must register the Data Centers to the Spartan NTT economic system. The registered Data Center will obtain a unique Data Center ID and a Data Center Token and can then use on-chain functions such as node registration and Gas Credit Top-Up. In addition, registered Data Centers can earn incentives. Data Center Operators only need to provide an email address for registration.
Node Registration	Data Center operators register new full nodes to the NTT economic system via the locally installed Data Center management area. After registration, the NTT wallet of the Data Center operator to which the node belongs will receive one-time incentives, and the node status can be checked by the Data Center Management System.
Node Registration Test	When a full node is registered, a test is performed to confirm that the node has indeed connected to the NC Public Chain.
Node Health Check	Each NC Public Chain has a mechanism to perform periodic checks on registered full nodes to confirm the health status of the nodes. This is a crucial factor in determining the reward amount from the Data Center Monthly Incentive Program.