{#whitepaper}
Meta Benz Whitepaper
[Whitepaper Version 1.1]

{#Abstract}

Abstract

Smart contract platforms and cryptocurrencies have captured mass attention but still have not been
able to achieve mass adoption due to scalability and user experience issues. Even on Ethereum, which
is the most widely used smart contracts platform, there have not been many examples of DApps which
have seen mass adoption. There have been a few cases where one or the other particular application
temporarily succeeded in achieving a significant user base, but it led to crippling of the entire network
during the high network load times. Essentially this means that even the most advanced and widely
used platforms are not ready for mass adoption yet.

On the other hand, there are a few smart contract platforms which boast of higher transaction
throughput, but they compromise on decentralization in order to improve transaction speeds. Also,
many of the upcoming solutions propose developing their own blockchains, neglecting the billions of
dollars of market cap that DApps and other projects have already created on platforms like Ethereum
and others. More importantly, they neglect the massive developer community and developer
ecosystem that currently exists on platforms like Ethereum.

Meta Benz strives to solve the scalability and usability issues, while not compromising on
decentralization and leveraging the existing developer community and ecosystem. It is an off/side

chain scaling solution for existing platforms to provide scalability and superior user experience to
DApps/user functionalities.

The Meta Benz development team has chosen Ethereum as the first platform to showcase its scalability
and already has a working implementation for Ethereum on Kovan Testnet. It is expected to allow
near-instant transfers, exchange and conversion of digital assets (e.g. crypto tokens) and
cryptocurrencies in the future. The Meta Benz is an adapted implementation of the Plasma
framework for Ethereum to start with, but the “vision” of the Meta Benz development team is to provide
off/side chain scaling solutions for blockchains in general. Meta Benz foundation intends to provide Meta Benz
wallet, payment APIs & SDKs, products, identity solutions and other enabling solutions that will allow
developers to design, implement and migrate DApps built on base platforms like Ethereum. One of the

key pillars that form the basis of Meta Benz’s ideology is the improvement of user experience, this
area is poorly developed for Blockchain applications as of now. The Meta Benz Development team has
already built high quality user experience Mobile/Web browser libraries which will enable businesses
to create real world end user applications on a large scale. The development roadmap of the Meta Benz

Network also includes supporting cross-chain transfers and third-party Decentralized exchanges,
liquidity pools etc.

META BENZ

Make your World with us

Why Meta Benz? {#whymeta Benz}
Decentralized Apps are being proposed in large numbers, but the current blockchain ecosystem is not
prepared to scale to match the demands of end user applications with mass adoption. Moreover the
user experience of DApps is very poor and in no way conducive for average users. Slow block
confirmations, high transaction fees, low scalability and poor user experience are some of the key
roadblocks for the mass adoption of blockchain applications. The following section explains the
problems prevailing in the current blockchain ecosystem and how the Meta Benz intends to solve
them. Detailed technical specification are provided in the further sections of the

white paper.
Slow Transactions {#slowt}

Blockchain transactions are typically very slow and have a very limited throughput. Most PoW (Proofof-Work) based blockchain protocols have a limit on the block size and it takes a certain amount of
time to generate a block. Each transaction also has to wait for multiple block confirmations due to
potential chain re-organizations.

PoS (Proof-of-Stake) based blockchains try to counter these limitations using a staking mechanism, but
the blockchains that are able to achieve high throughput with PoS are able to do so at the cost of
decentralization. These limitations are often a necessary condition for public blockchains to ensure
security and decentralization where a block needs to be propagated through the network and
validated by all the nodes to achieve finality.

The Meta Benz solves this problem by using a high throughput blockchain with consensus
provided by a selected set of Block Producers, chosen for every checkpoint by a set of Stakers. It then
uses a Proof Of Stake layer to validate the blocks and publish periodic proofs (merkle roots) of the
blocks produced by the Block Producers to the Ethereum mainchain. This helps in achieving high

level of decentralization while maintaining an extremely fast (< 2 seconds) block confirmation
times.

Low Transaction Throughput {#ltt}
Public blockchains have to maintain a certain amount of time lag between the production of adjacent
blocks so as to ensure ample time for block propagation. Also, the block size needs to be small so as
to ensure quick propagation of the block through the network. This entails that the number of
transactions in a particular block need to be fairly limited.

The Meta Benz solves this problem by using a Block Producer layer to produce the blocks. Block
Producers enable the system to produce blocks at a very fast rate. The system ensures decentralization
using PoS checkpoints which are pushed to the Mainchain (Ethereum serves as the mainchain for a
start).This enables The Meta Benz to theoretically achieve up to
transactions per second on a single side chain.

Scalability {#scalability}
As discussed in the previous section, The Meta Benz easily achieves a theoretical speed of up to
transactions per second on a single side chain. In future, The Meta Benz is expected to be able to

easily add more side chains horizontally to increase the total number of transactions on the Meta Benz
Chain while using the same decentralized PoS layer.

Theoretically the Meta Benz has the capacity for millions of transactions per second with the usage
of multiple side chains. Also, the mechanism to do so has already been demonstrated with the first
Meta Benz proof-of-concept with the first Meta Benz side-chain and new chains can be added in due course of
time.

Size of Blockchain {#sob}
Each block on the blockchain and/or compute state in case of a smart contract based blockchain must
be validated by multiple nodes. Each node has to manage a copy of the state and the blocks. While
the chain increases in size as the days go by, maintaining and validating the whole blockchain
becomes difficult and results in fewer full nodes in public blockchains, which poses a risk for
decentralization.

For the Meta Benz, the primary layer which provides decentralization may choose to store only the
blocks of Meta Benz Chain from the previous checkpoint to the next checkpoint. All previous
transaction/block proofs have been submitted to the mainchain. This enables

extremely low fidelity
PoS nodes which can be run in very low-cost machines with low storage. In future, The Meta Benz
Network intends to enable mobile device based PoS miners too.

Multiple micropayment channels with other off-chain solutions {#loooong}
Some payment channel solutions have proposed solutions to solve the problem of micro-payments.
However, the process of opening and managing channels with multiple DApps or users is complex.
Additionally, the speed and convenience of mediated payments over channels is still up for debate.
Since The Meta Benz uses a state-based architecture on an EVM (Ethereum Virtual Machine), it
does not require payment channels to be opened between two parties. In fact, any valid Ethereum
address is a valid Meta Benz Address and a receiver does not need to be on the Meta Benz chain to receive
payment. They would only need to have a Meta Benz Wallet when they want to retrieve the payments on
the main chain or spend it in the ecosystem on the Meta Benz.

High Transaction Fees {#htf}
With the rapid growth of the blockchain ecosystem, new crypto assets are increasingly being created,
transferred, and sold, often involving multiple crypto tokens. Also, most decentralized apps have their
own token and economy. Paying tokens for the services or doing any kind of

transaction on
blockchains requires on-chain transfers. Every blockchain has a transaction cost structure. For example,
Ethereum charges gas fees on each transaction.

The amount of fees is an important factor to incentivize validators and prevent certain kinds of security
attacks such as DoS. However, there is the problem of variation of fees (Depending upon the pending
transaction pool) due to the limited block size.

The Meta Benz enables low cost transactions through achieving economies of scale by doing a
large number of transactions on the Block Producer layer which ensures low cost, and then
subsequently batching the proofs of the Meta Benz blocks using the Merkle root of the blocks to a highly
decentralized mainchain (for ex. Ethereum) using a decentralized layer of PoS Stakers.

Poor Usability {#pf}
User interactions on DApps are often poor compared to their centralized counterparts. For the
Decentralization revolution to achieve mass adoption, the user experience of DApps has to be on par
with, if not better than, their centralized counterparts.

The Meta Benz Development team is expected to work on various Mobile and Web browser integration
tools and is pioneering protocols in this domain. It intends to build a ubiquitous mobile/browser app,
which will act as a secured interaction layer for blockchain interactions. The Meta Benz Development team
will be publishing the designs and prototypes of these soon.

Introducing the Meta Benz {#imn}

As discussed in brief in the section above, the Meta Benz aims to solve the problems faced by the
blockchain ecosystem through building a decentralized platform using an adapted version
of Plasma framework. This provides for fast and extremely low cost transactions with finality on a
mainchain. The current working Testnet and alpha-Mainnet of the Meta Benz works with Ethereum
as a mainchain.

The Meta Benz Development team is also building a product ecosystem including user friendly mobile
apps, desktop wallets and browser extensions which will provide a seamless experience for all users. It
is envisaged that users will be able to pay, transfer or hold crypto assets without worrying about the
complexity of the underlying system.

Architecture {#architecture}

Since the Meta Benz's core focus is on mass user adoption, it is ideal that a deep dive into the
Meta Benz's technical architecture should start from a user journey.

When a user is transferring ETH or ERC20 tokens on the Ethereum network, they have to wait for the
confirmation of the block which ranges from 14 seconds to 20 seconds. Even then the users have to
wait for multiple block confirmations to be sure of the finality of the transaction. Let’s say you are
buying a coffee or paying tokens to watch a movie. On each transaction you are not only paying a
high fee, but also waiting for it to be confirmed. That serves as a deterrent for users wanting to use the
service.

Moreover, during peak loads, a large number of transactions clog the Ethereum network and gas fees
increase on each transaction in order to obtain faster confirmations. The Meta Benz is proposed as
a solution to overcome these problems.

Here is how the Meta Benz will function:

1. A user deposits a cryptographic asset in the Meta Benz contract on the mainchain (currently
implemented with Ethereum blockchain only).

2. Once deposited, tokens get confirmed on the main chain, tokens will appear on the Meta Benz Chain
using Meta Benz Deposit bridge (technical details explained in a dedicated section below).

3. The user can now transfer tokens to anyone they want almost instantly (Meta Benz Chain has faster
blocks - approximately 1 second or less) for almost negligible fees.

4. Whenever the user wishes to, they can withdraw tokens to the main Ethereum chain by
establishing proof of remaining tokens on Root contract (contract deployed on Ethereum chain).
The same method will work for any ERC-20 token or other fungible crypto assets on the Ethereum
blockchain. The Meta Benz Development Team has already created a demo version, available
at: https://github.com/meta Benznetwork/contracts.
We expect the alpha version of the mainnet to go live very soon.
Actors {#actors}
The ecosystem of The Meta Benz will have the following actors :
1. End Users
2. DApp developers : Developers are expected to use the Meta Benz to scale their applications
and provide a better UI/UX to their end users
3. Stakers : Stakers need to deposit/stake tokens to qualify and play a very important role in the
Meta Benz. They validate the transactions and propose checkpoints on the

mainchain using
PoS consensus mechanism with a ⅔ majority. They also choose Block Producers amongst
themselves, who satisfy a certain criteria, to produce blocks on the sidechains.

4. Block Producers : These are block producers chosen by Stakers who in turn enable faster
blockchain generation times. They have to provide a significant stake to be nominated.
Consensus {#con}

The Meta Benz uses a dual strategy of Proof of Stake at the checkpointing layer and Block
Producers at the block producer layer to achieve faster blocktimes while ensuring a high degree of
decentralization by achieving finality on the main chains using the checkpoints and fraud proof
mechanisms.

Through this mechanism, The Meta Benz achieves high transcation speed with a high degree of
decentralization and finality on Mainchain. In the first version which has Ethereum only as the base
chain, Ethereum root contract enforces solvency and finality through header block(checkpoints) very
efficiently. The various elements and mechanisms of the system are described below:
Checkpointing Layer {#checklayer}
Basically, anyone can stake their Meta Benz Tokens on root contract to become a

Staker in the PoS
checkpointing layer (contract deployed on Ethereum chain). This provides a highly decentralized base
layer for Meta Benz Chain.

Block Producers

At the blockchain layer of the Meta Benz, there are Block Producers, selected by PoS Stakers on
the base layer, who will be creating the Meta Benz Blocks. To achieve faster block generation times, these
Block Producers will be low in number. This layer is expected to achieve ~1 second block generation
times at extremely low to negligible transaction fees.

Checkpointing Mechanism

On Meta Benz’s checkpointing layer, the basis of Meta Benz's PoS mechanism, for every few
blocks on the block layer of the Meta Benz, a proposer will be chosen among the stakeholders to

propose a checkpoint on the main chain. These checkpoints are created by the proposer after
validating all the blocks on the block layer of the Meta Benz and creating the Merkle tree of the
block hashes since the last checkpoint. The Merkle root is then broadcasted to the Staker network for
their signatures. The other stakeholders also verify the proof. They will approve the proposed block, if
it is valid, by providing their signatures.

The system needs the approval of ⅔ of the stakeholders to propose a “header block” to the root
contract. Once the checkpoint is proposed on the mainchain, anyone on the Ethereum mainchain can
challenge the proposed checkpoint within a specified period of time. If no one challenges it and the
challenge period ends, the checkpoint is formally included as a valid checkpoint on the main chain.
Apart from providing finality on the mainchain, Checkpoints have a very important role to play in
withdrawals as they contain the proof-of-burn (withdrawal) of tokens in the event of user withdrawal. It
enables the users to prove their remaining tokens on root contract using Patricia Merkle proof and
header block proof. Note that to prove remaining tokens, the header block must be committed to the
Root Chain through PoS (Stakeholders). The withdrawal process will incur Ethereum gas fees as usual.
Through this mechanism, The Meta Benz achieves a high transaction speed, a high degree of
decentralization and finality on Mainchain. In its first version which has Ethereum as the base chain, the
Ethereum root contract enforces solvency and finality through header blocks (checkpoints) very
efficiently.
Block Producer Selection
Block Producers are chosen by Stakers in the checkpointing layer through voting on the mainchain. A
Block Producer is selected for a pre-determined interval of time until slashed/removed by the network
consensus mechanism or if it is unable to participate in the block production due

to any external issue.
Seeding of the network
Block Producer application process

1. Meta Benz will ask for applications from the public to run the Block Producer node
2. It will also run 3 Block Producer nodes itself during the seed stage of the network
3. At the epoch, the public stakers will select a total of 5-7 block producer nodes
4. These nodes will be kickstarted with a Meta Benz Chain N(number of) genesis configuration

Selection through Voting at tenure completion
Replacement of a Block Producer during the ongoing tenure
In an event of untimely removal/incapability of a Block Producer to take part in block production, a
new Block Producer from the transient pool will be recruited. An appropriate incentive mechanism to
have a prioritized/preferred list of Block Producers as per the stakers' vote will be devised to maintain
a healthy pool of Block Producers.

Multi Chain Support (Horizontal Sharding) {#multichain}
The Meta Benz public checkpointing layer supports multiple side chains by design. Theoretically
there can be an infinite number of side chains working under the secured and decentralized layer of
checkpoints. Businesses can have their dedicated side chains connected to the public checkpointing

layer having full control of their execution environments, while still retaining the immutability,
provability and security of transactions via the checkpointing mechanism.
Key factors influencing design of this sharding process are expected to be:
1. Scheduling of checkpointing layer to periodically propose checkpoints for different side chains
2. Movement of assets across multiple side chains
User will be able to send assets across side chains using chain ids and receipts
Users will be provided with an intuitive wallet interface to perform inter-chain transactions
Developers will be provided with API/SDKs to build programmable interfaces for inter-chain
transactions

1. The Block Producers have to apply by staking the Block Producer Stake requirement amou
2. The Network will maintain a pool of interested Block Producers (An incentive system fo
Criteria on the basis on which Stakers will decide to vote for a particular nominee Block
- Uptime history
- Technical specifications
- Dynamic scaling capability
- Location diversity
- Other factors under consideration (e.g. [Zcash Board Nominations](https://github.com/Zc

1. Voting process is scheduled and completed one week before the completion of one tenure
2. Existing Block Producers can re-appear in the elections
3. Stakers vote for Block Producers from the pool of Nominees

3. Movement of the assets from one chain to another will be managed at the checkpointing layer
and may not require any interaction with the mainchain. Research is currently underway to
facilitate faster (possibly instant) inter sidechain transfers.
Interoperability {#interoper}
As mentioned earlier in the whitepaper, the Ethereum mainchain is the first base/mainchain that Meta Benz
Network securely integrates with, using an adapted implementation of the Plasma framework. In
addition, the Meta Benz intends to integrate multiple leading smart contract platforms
cryptocurrencies such as Bitcoin and others to provide an universal platform for the users to be able to
use/exchange their assets from various blockchains.

It can also provide a strong foundation for large DEXs (Decentralized exchanges) hosting assets from
multiple blockchains. Also having a single platform with assets from multiple blockchains can also give
rise to drameta Benzally new use-cases, which the developer ecosystems can conceptualize their future
products on. It is an exciting area of exploration for the Meta Benz Development team.

Judging from the proliferation of Layer 1 blockchains, it is a given that there might be more than 2-3
public blockchains that will be adopted by the mainstream eventually, rather than

only a single
winning blockchain platform. Therefore, the Meta Benz Development Team expects to see hitherto unseen
use-cases, arising from the Decentralized application movement across these blockchains. The vision
of the Meta Benz Development Team is to provide infrastructure and interfaces such that anyone who
wishes to build decentralized applications on any blockchain, will be able to do it easily - and
communicate and transfer value across multiple blockchains.

Generalized State Scaling on Plasma {#genscaling}
Generalized State scaling is the next frontier for the Meta Benz, once the Meta Benz Development Team
is done with implementing micropayments, asset transfers and swaps in the first phase of
development of the Meta Benz. This is a research problem, and it will take time and effort to
accomplish a breakthrough here.

There are mainly 3 different approaches that the team has been researching on:
Stateful object programming model (separating code and state)
State transition verification through zk-snarks
State transition verification using an EVM-in-an-EVM construction
One of the main approaches that the Meta Benz Development Team has been researching on is the Stateful
object programming model for Plasma. The main problem with applying the Plasma model to
contracts on a sidechain is of the "ownership" of states/assets on the sidechain.

One fundamental
property of Plasma is that state represented on a Plasma chain must be able to be withdrawn to the
root chain (e.g. Ethereum) in a way that maintains the integrity of that state. You should be able to
freely move assets/state from the Plasma chain to the root chain, and vice versa. This functionality is
particularly important when a consensus mechanism on the sidechain goes “bad” and users are forced
to withdraw their assets/states from the Plasma chain.

States/assets belonging to a user (Externally Owned Accounts) are easy to deposit/enter and
withdraw/exit from the mainchain to the sidechain and vice versa. However, in terms of contracts, it is
not easy to identify the ownership of the state - because the state might be owned/controlled by
multiple parties. The most promising approach to solving this problem is basically separating state and
code.

What this approach entails is to enable writing code which reads/writes into "stateful" objects. Stateful
objects are representation of states which have a clear owner. For example, a contract has a set of
states controlled by n parties, then stateful objects will be derived by encapsulating state into nonfungible tokens having clear ownership - this way a stateful programing model is introduced that

enables these objects to be exitable and therefore Plasma-ficable.

The second approach entails the usage of zk-snarks for verifying state transitions for a sidechain.
Basically one could operate a roll-up style chain, which can perform any state transitions, and a zkproof can be submitted.
A valid state transition is proven within the snark by opening one or several leaves of the merkle
tree describing the current state, checking the user’s signatures, doing predefined operations,
updating the leaf and finally recalculating the stateRootHash. DApp-specific roll-up style chains on the
plasma chain can allow developers to have secure, high-throughput DApps without worrying about
liveliness, data-availability issues or withdraw issues. We can store any information we want
in merkle leaves of the trees and write the snark logic on how they should be updated, since invalid
snark proofs cannot be pushed and so it's inherently secure and simple. We are actively researching on
this area and trying to come up with a secure and scalable construction.

The third approach involves a Plasma sidechain implementation that can run EVM-compatible smart
contracts - i.e. the Meta Benz Virtual Machine. Since the philosophy of the Meta Benz heavily revolves
around an incentive mechanism of security deposits on the main chain, it can be instructive to think
about an efficient way of identifying the data involved in fraud challenges.

Validation of consensus rules can be enforced through a system of challenges, using a TrueBit-like
verification. The main motivation is to run software in a similar manner as we currently do on the
Ethereum mainchain. The security deposit makes it easier to estimate the security of the sidechain in
monetary terms. When working correctly, the stakers will frequently commit the sidechain blocks to
the root chain.

A set of validations is expected to keep the stakers honest. There are a number of insurance contracts
incentivizing the verification of the chain. Together these contracts combined would make for a
complete set of consensus validation rules on the root blockchain. Such rules include:
Withholding challenges: The Block Producers might have submitted blocks to the blockchain but
have withheld the contents. The stakers must present a preimage or risk getting slashed.
Parsing challenges: The Block Producers submitted an invalid block structure.
Transaction censorship: Submit a transaction on the root chain, requesting for it to be included in
the sidechain within a certain timeframe.

Invalid block signature: The stakers provided an invalid signature of the block.
Invalid previous block hash, height, or previous state, among other block verifications.

Any other consensus failure checks, like transaction receipts posting an invalid after state.
Invalid transaction execution: an on-chain way to verify a transaction.
The last step is the most complex technically, but using a Truebit-like binary search, there would only
be a need to verify one EVM state transition.

A precompile is required to run the EVM inside an EVM. This is done through a stepper contract that
can compute a EVM state transition.

Some work on this already started (see solevm), but the focus will be to correctly encode the whole
EVM state in such a way that it can fit inside a transaction in the root chain, for the purposes of
verifying it with an interactive Truebit game. The Meta Benz Development Team believes that a large
security deposit, plus other economic interests that participants might have in the correct operation of
the sidechain, would lead to less risks.

Overall, if one can efficiently identify the problemeta Benz EVM state transition for verification, through an
EVM-in-an-EVM construction, one can subject it to challenges, and thereby securing it.
Security

Fraud Proofs {#fraud}

To enhance the security of the transactions, Meta Benz also provides Fraud Proofs on the
mainchain. The mechanism enables any individual on the mainchain to submit the details of the
transactions which he/she thinks is fraudulent. If the challenge is successful, the stakes of the parties
involved in the fraud are slashed and the challenger receives the slashed funds as an incentive for
detecting the fraud. This can be considered as an always-running high reward bounty program for any
parties who wish to investigate the veracity of the transactions on the Meta Benz.

Basic proofs {#basicp}

Each proof must be submitted with the following corresponding proofs whenever necessary:
Merkle proof for transaction inclusion: This type of proof is needed to prove that the given
transaction is included in the block
Merkle proof for block inclusion: This type of proof is needed to prove that the block is included
in the given checkpoint

Block {#blockp}

This proof is needed to prove that the block is in sequence with a valid referenced hash.
Transaction

Single level txn proof {#singletp}

Nonce validation {#noncevp}
To check if there are transactions with duplicate nonces
To check for transactions with missing nonce values (skipping multiple nonces in between) This is
an interactive fraud proof. The Block Producer must submit missing nonce transaction in certain
amount of time when challenged for this type of transaction.
To check for transactions with non-ordered nonces

```
// validate ERC20 TX
function validateERC20TransferTx(
uint256 headerNumber,
bytes headerProof,
uint256 blockNumber,
uint256 blockTime,
bytes32 txRoot,
bytes32 receiptRoot,
bytes path,
bytes txBytes,
bytes txProof,
bytes receiptBytes,
bytes receiptProof
) public {
// validate tx receipt existence
}
```

Receipt validation {#recvalp}
To check receipt fields, events, topics and data types in given receipt
Deposit {#depositp}
Validate deposit transactions Validates deposit transaction on the mainchain and see if it matches

with DepositBlock object in rootchain.
Duplicate deposit transactions This proof validates if there are duplicate transactions that have the
same DepositId and that each DepositID is included only once
Validate deposited amount and the depositor address
ERC20 transfer {#erc20tp}
To validate ERC20 transaction data, receipt logs and values
To check if UTXO-style input in log receipt log equals that of an UTXO-style output of a recent
transaction log receipt

```
function validateMisMatchedNonce(
bytes tx1,
bytes tx2
) public {
// check if both transactions are not the same
...
// validate first transaction
...
// validate second transaction
...
// check if sender is the same in both transactions
...
// make sure 2 is included after tx1
...
// check if both nonce values are same or nonce2 < nonce1, just call slasher
...
// revert the operation
...
}
```

Iterative txn proof
Details to be updated in a later version of the whitepaper
Network Economics {#economics}
Transaction Fee Determinative Factors and Trade-off
1. Block Size = (Average Transaction Amount)/(Block)
100Txs/Block is insanely expensive.
ETH is 600~1000Txs/Block
If The Meta Benz permits 3000Txs/Block, this variable is going to be the predominant factor
over other factors.
2. Number of Block Producers
If there are more Block Producers, transaction fee allocation will be more.
Block Producer setting of 7 is cost efficient.
If the number of Block Producers is increased to say, 120, the transaction fee increases.
3. Number of Checkpoint stakers
If number of stakers is 10,000, then it will be expensive to structure incentives.
100-150 stakers will result in an optimum transaction fee.
Having fewer stakers than this is better, but decentralization in such a setup is lower.
4. Block Time
The Meta Benz Development team could assign 2~3sec for block time.
0.5sec block time still works with regards to block propagation, and it has no effect on user
experience.
Let's say, a single Meta Benz sidechain aims to achieve 35k Tx/sec on a chain. If node through-put is
the bottleneck, then blocksize would be 70k105k Tx/Block.
5. Checkpoint duration
A checkpoint duration of ~300sec (256 blocks on sidechain) has been determined to be optimum.

A shorter duration means faster Maliciousness detection, but it also means a higher committed
Gas fee.
If a Byzantine behavior (e.g. Double Spend through Tx deletion) occurs just after checkpoint
creation, this duration is the worst-case time until the Ceremony. If some Block Producers delete
transactions, the Meta Benz can recover the cancelled transaction, and the double spend
attack would be foiled.

Focus on User Experience {#usere}
The Meta Benz Development Team is developing a wallet by implementing the WalletConnect protocol,
which is an open protocol to connect web-based distributed applications to mobile crypto assets.
This wallet will help users to interact with DApps and sign transactions easily, while still helping users
keep their private keys safe on their mobile. This should go a long way in making blockchains
accessible to mainstream users.
Other than this, the team is also looking at context specific ether-less accounts and Gas relay
abstraction on identity to enable ether-less sign transactions, which can be a huge boost for
mainstream user adoption.
Meta Benz Stack {#stack}
This section details out various parts of the Meta Benz chain and components in

the Ethereum chain.

Meta Benz contracts on mainchain {#mcontracts}

The Meta Benz smart contracts on the mainchain provide the core logic for the Meta Benz. The contracts contain various mechanisms such as deposit and exits from the mainchain to the sidechain and vice versa. They also contain the exit priority queue, the periodic state commitments from the Validator layer, fraud proof mechanisms, bonded exit challenge logic and various other components.

The Stake Manager also resides here.

Meta Benz Deposit Bridge {#mdb}

The bridge(s) of the Meta Benz are part of Block Producer nodes that listen to the RootContract events on the mainchain and monitor any token/ether transfer events happening to the RootContract.

This bridge utilizes Meta Benz's famous tool named Dagger. Once the bridge detects a deposit on the mainchain, it fires a Deposit event on the Meta Benz chain and the user's address on the Meta Benz is allocated the deposited amount.

Meta Benz PoS {#mpos}

The checkpointing mechanism of the Meta Benz is a PoS enabled layer which has Stakers who propose the checkpoints to the mainchain. There will be about 100-150 Stakers at the checkpointing layer to start with. In future with the advent of more efficient signature mechanisms on the Ethereum blockchain, the Meta Benz will be able to significantly increase its number of stakers on the checkpointing layer which is expected to further increase its degree of

decentralization, perhaps
rivalling that of the leading public blockchains like Ethereum and Bitcoin.
More details of the PoS checkpoint layers will be given in a later version of the Whitepaper.

Block Producer Layer {#bplay}
At the base layer, the Meta Benz has Block Producer nodes chosen by the Stakers of the PoS layer
through voting for every checkpointing interval. These Block Producers will also run the Meta Benz Deposit
bridge.
Block Producers accept transactions through the Meta Benz VM and are expected to create a block every
~1 second.
More technical and code level details of the Block Producer layer will be added in a later version of the
whitepaper.
Meta Benz Virtual Machine {#vm}
The Meta Benz uses a standard EVM based state machine, which is run by the Block Producer
nodes to generate blocks. Using the EVM allows the Meta Benz to be able to build and deploy
protocols such as ERC protocols as well as other protocols like Kyber Network, ZRX etc.
The beauty of the Meta Benz architecture is that since it uses an EVM-compatible state machine, it
becomes very easy to port DApps and smart contracts running on the Ethereum blockchain to the
Meta Benz. The Meta Benz Development Team intends to support generalized

state transitions on the
Meta Benz, and this architecture provides a smooth foundation to build upon.
Meta Benz Withdrawal Bridge {#mvb}
When an address on the Meta Benz submits a withdrawal request to the network, the
corresponding tokens are burnt (withdrawn from) on the Meta Benz chain and this transaction is pushed on
to the Meta Benz chain. After the specified checkpoint interval, the PoS checkpoint layer will publish the
checkpoint to the main chain, which will include the proof of burn (withdrawal) of these tokens on the
Meta Benz chain. Once this checkpoint is committed on the mainchain, the user can claim their withdrawn
tokens.
Spam Protection {#spam}
The Block Producers running the block producer layer of the Meta Benz will watch the transfer
state of the assets to identify frivolous transactions. They reject any incoming transactions with zero
amount in payments thereby foiling any DoS/spam attacks with zero cost transactions. Even if the
Meta Benz tokens are very low in cost and the fees being very low, due to the high TPS of Meta Benz, it
would not be economically viable to run sustained DoS attacks on the Meta Benz.
The Meta Benz maintains payment transfer event logs in a UTXO-like data structure, which allows
for efficient verification of inputs and outputs. This allows for a variety of security measures.
Additional checks are run to mitigate spam based on this:
For each input, the referenced output must exist and cannot already be spent
Check if the sum of input values is less than sum of output values.

Check if transaction fee is too low.
Check for duplicate transactions with same outputs in the transaction pool.
Check for duplicate transactions with same transaction fee in the pool.
Potential Use Cases {#potential}
Meta Benz Pte. Ltd. (The Governing body) is committed to provide a scalable and user- friendly
ecosystem for third party Decentralized applications to thrive on. The governing body, like Ethereum
and other platform foundations, will promote various Base chain DApps (like DApps built on Ethereum
currently, and NEO, EOS in future) to build and migrate their user facing applications / transactions on
the Meta Benz. It will also award grants and funding to third party app developers to build various
use cases on top of the Meta Benz like:
Payments {#payment}
The Meta Benz will provide an interface for users, payment APIs and SDKs for DApps, merchant
and users to instantly accept or pay in crypto assets (e.g., ERC20 tokens, Ethers, ERC721 tokens).
The Meta Benz Development Team has plans to roll-out this system in three phases:
1. Ether and ERC20 token payments
2. Multi-asset cross chain transfer and payment through atomic swaps and liquidity providers
3. Fiat enabled off-ramp payment system integration through fiat liquidity providers
Atomic Swaps {#atom}

Meta Benz contract allows users to pay with any crypto token they prefer, and receiver will receive payment
in assets they prefer. The Meta Benz can handle conversation through atomic swaps between
cross-chain crypto assets.
Liquidity providers {#liquidity}
Third parties can use the Meta Benz to exchange any tokens for other tokens by leveraging 0x
liquidity pool or other liquidity providers while transferring crypto assets. In the case of fiat, the Meta Benz
Development Team is planning to collaborate with fiat liquidity providers in currencies of major
countries.
Decentralized Exchange (DEX) and Marketplace support {#dex}
The Meta Benz is expected to have all characteristics which an exchange platform should have—
faster and cheaper trades. The Meta Benz is capable of supporting decentralized exchanges and
enabling trust-less, reliable and easy crypto trades. The decentralized exchange is the future for digital
assets and provides better security and solvency than the centralized exchanges.

Lending & Credit Scoring platform {#lcsp}
The Meta Benz will enable platforms for merchants to assess the creditworthiness of connected
users via their transaction history. This enables merchants to lend tokens to users on the network when
transacting with users that do not have sufficient funds. The Meta Benz expects to use the Dharma

protocol to provide tokenized debt to users.

Identity {#identity}

Users need a utilitarian yet user-friendly interface where MetaMask or web3 enabled browsers are not required. They do not need to understand how Ethereum works under the hood. Decentralized apps need a way to sign transactions, but that must happen without submitting private keys on each DApp on web browsers or mobile apps. The Meta Benz Development Team believes that users must have control over their private keys without worrying about the security. The Meta Benz will solve that with an Open-Identity system and will deliver a seamless experience to users.

This system will also provide a way to auto-approve certain kind of transactions depending upon the criteria chosen by the users. This will drive the recurring payments on the Meta Benz.

Games {#games}

We expect games to be a big part of the Meta Benz. In-game assets represented as NFTs (ERC721) are expected to be bought, sold and traded in huge numbers on our sidechains. Developers will also be able to save game state on the sidechains, if they choose to. Along with the NFT marketplace that we will enable, developers and users will truly have a fast, efficient and secure sidechain to build and play games on.

Infrastructure {#infrastructure}

The Meta Benz Development Team will act on the simple mantra - make it simple and seamless. For that, the team will provide new infrastructure around the Meta Benz including user-

friendly wallets for
individual users and merchants, payroll dashboards, payment SDKs and other open source tools.

Dagger {#dagger}

The Meta Benz Development Team already has started building infrastructure for developers, starting with
Dagger. Dagger is a tool or engine to track Ethereum accounts and events in real-time.

Developers can use Dagger to track their own smart contracts, accounts, and transactions. They can
create custom service or integrate with third-party services through IFTTT or Zapier.

Further information about Dagger can be found here:
https://medium.com/meta Benz-network/ethereum-in-realtime-dagger-98ee2d717c76
and check how it works:
https://medium.com/meta Benz-network/understanding-dagger-453d90480c51

https://github.com/meta Benznetwork/whitepaper/?tab=readme-ov-file#whitepaper 19/22

Meta Benz Wallet {#mwallet}

The Meta Benz development team is working on building an easy-to-use Plasma wallet mobile app,
integrated with WalletConnect, to ensure secure storage of keys, intuitive access to the features
provided by the Meta Benz, as well as a seamless mechanism to connect browser-based DApps to
the mobile app. Users can interact with DApps on browsers and in the future many more devices, while
still keeping their keys secure in their mobile wallet.

The Meta Benz wallet will act as a ready tool for DApp developers to get their

users onboarded and
working with Meta Benz sidechains quickly and efficiently.

Meta Benz Tokens

The native digital cryptographically-secured utility token of the Meta Benz (Meta Benz Token) is a major
component of the ecosystem on the Meta Benz, and is designed to be adopted for use as the
primary token on the network. Meta Benz Token will be issued as ERC-20 standard compliant digital tokens
on the Ethereum blockchain.

Meta Benz Token is designed to be a utility token which functions as the unit of payment and settlement
between participants who interact within the ecosystem on the Meta Benz. Meta Benz Token does not
in any way represent any shareholding, participation, right, title, or interest in the Governing body, the
Issuer, its affiliates, or any other company, enterprise or undertaking, nor will Meta Benz Token entitle token
holders to any promise of fees, dividends, revenue, profits or investment returns, and are not intended
to constitute securities in Singapore or any relevant jurisdiction. Ownership of Meta Benz Token carries no
rights, express or implied, other than that which may be afforded by the Meta Benz and/or any
other third parties whom may use such Tokens.

Meta Benz Tokens are expected to provide the economic incentives to encourage participants to contribute
and maintain the ecosystem on the Meta Benz. Computational resources are required for
performing various functions on the Meta Benz such as validating blocks and publishing proofs,

thus providers of these services / resources would be rewarded with Meta Benz tokens for providing these
resources to the network (i.e. "mining" on the Meta Benz) to maintain network integrity. Meta Benz
Token will be used as the unit of exchange to quantify and pay the costs of the consumed
computational resources. Meta Benz Token is an integral and indispensable part of the Meta Benz,
because without the Meta Benz Token, there would be no incentive for users to expend resources to
participate in activities or provide services for the benefit of the entire ecosystem on the Meta Benz
Network. Only users which have actually contributed to network maintenance would receive token
incentives. Users of the Meta Benz and/or holders of Meta Benz Token which did not actively participate
will not receive any Meta Benz Token as rewards.
In order to participate in the consensus process on the Meta Benz, users would be required to
stake Meta Benz Token as an indication of that user's commitment to the process. Meta Benz Token would thus
also be used as a deterrent for punishing stakers for various offences (e.g. invalid blocks, illegally
verifying blocks, or invalid transaction execution) by requiring them to first put up a stake of Meta Benz
Token before being entitled to participate in the ecosystem. Meta Benz Token would be deducted in the
event that an offence was committed by a staker.

In particular, it is highlighted that Meta Benz Token:
1. is non-refundable and cannot be exchanged for cash (or its equivalent value in any other virtual
currency) or any payment obligation by the Governing body, the Issuer or any affiliate;
2. does not represent or confer on the token holder any right of any form with respect to the
Governing body, the Issuer (or any of its affiliates), or its revenues or assets, including without
limitation any right to receive future dividends, revenue, shares, ownership right or stake, share or
security, any voting, distribution, redemption, liquidation, proprietary (including all forms of
intellectual property or licence rights), or other financial or legal rights or equivalent rights, or
intellectual property rights or any other form of participation in or relating to the Meta Benz,
the Governing body, the Issuer and/or their service providers;
3. is not intended to represent any rights under a contract for differences or under any other
contract the purpose or pretended purpose of which is to secure a profit or avoid a loss;
4. is not intended to be a representation of money (including electronic money), security,
commodity, bond, debt instrument or any other kind of financial instrument or investment;
5. is not a loan to the Governing body, the Issuer or any of its affiliates, is not intended to represent
a debt owed by the Governing body, the Issuer or any of its affiliates, and there is no expectation
of profit; and

6. does not provide the token holder with any ownership or other interest in the Governing body,
the Issuer or any of its affiliates.
The contributions in the token sale will be held by the Issuer(or its affiliate) after the token sale, and
contributors will have no economic or legal right over or beneficial interest in these contributions or
the assets of that entity after the token sale. To the extent a secondary market or exchange for trading
Meta Benz Token does develop, it would be run and operated wholly independently of the Governing body,
the Issuer, the sale of Meta Benz Token and the Meta Benz. Neither the Governing body nor the Issuer
will create such secondary markets nor will either entity act as an exchange for Meta Benz Token.
Features on our development roadmap {#future}
The Meta Benz Development team expects to conduct various additional research based on topics
proposed by the community, including but not limited to:
1. Generalized state scaling and fraud proofs/cryptographic mechanisms for the same.
2. Evaluate the approach to expand Staker base in the checkpointing layer with the future Threshold
based signatures implementations on Ethereum, if any.
3. Robust structure and design pattern for upgradeable smart contracts.
4. Context specific Ether less accounts and Gas Relay Abstractions on Identity
5. Privacy-enabled transactions
6. Blockchain interoperability
7. State channels on top of the sidechain

https://github.com/meta Benznetwork/whitepaper/?tab=readme-ov-

Team {#team}
Jaynti Kanani. Co-founder and Chief Executive Officer. Contributor to Web3, Plasma,
WalletConnect. Previously data scientist at Housing.com.
https://www.linkedin.com/in/jdkanani/
Anurag Arjun. Co-founder and Chief Product Officer. Previously AVP (Product Management), IRIS
Business. Stints at SNL Financial, Dexter Consultancy and Cognizant Tech.
https://www.linkedin.com/in/anuragarjun/
Sandeep Nailwal. Co-founder and Chief Operating Officer. Blockchain Programmer and
Entrepreneur. Previously CEO Scopeweaver, CTO (Ecommerce) Welspun Group.
https://www.linkedin.com/in/sandeep-nailwal-60709a33/
Risks {#risks}
You acknowledge and agree that there are numerous risks associated with purchasing Meta Benz Token,
holding Meta Benz Token, and using Meta Benz Token for participation in the Meta Benz. In the worst
scenario, this could lead to the loss of all or part of the Meta Benz Token which had been purchased. IF YOU
DECIDE TO PURCHASE Meta Benz Token, YOU EXPRESSLY ACKNOWLEDGE, ACCEPT AND ASSUME THE
FOLLOWING RISKS:
1. Uncertain Regulations and Enforcement Actions : The regulatory status of Meta Benz Token and
distributed ledger technology is unclear or unsettled in many jurisdictions. The regulation of
virtual currencies has become a primary target of regulation in all major countries in the world. It
is impossible to predict how, when or whether regulatory agencies may apply

existing regulations
or create new regulations with respect to such technology and its applications, including Meta Benz
Token and/or the Meta Benz. Regulatory actions could negatively impact Meta Benz Token and/or
the Meta Benz in various ways. The Foundation, the Distributor (or its affiliates) may cease
operations in a jurisdiction in the event that regulatory actions, or changes to law or regulation,
make it illegal to operate in such jurisdiction, or commercially undesirable to obtain the necessary
regulatory approval(s) to operate in such jurisdiction. After consulting with a wide range of legal
advisors and continuous analysis of the development and legal structure of virtual currencies, a
cautious approach will be applied towards the sale of Meta Benz Token. Therefore, for the token sale,
the sale strategy may be constantly adjusted in order to avoid relevant legal risks as much as
possible. For the token sale, the Foundation and the Distributor are working with Tzedek Law LLC,
a boutique corporate law firm in Singapore with a good reputation in the blockchain space.
2. Inadequate disclosure of information : As at the date hereof, the Meta Benz is still under
development and its design concepts, consensus mechanisms, algorithms, codes, and other
technical details and parameters may be constantly and frequently updated and changed.
Although this white paper contains the most current information relating to the Meta Benz, it

is not absolutely complete and may still be adjusted and updated by the Meta Benz Development team
from time to time. The Meta Benz Development team has no ability and obligation to keep holders of
Meta Benz Token informed of every detail (including development progress and expected milestones)

https://github.com/meta Benznetwork/whitepaper/?tab=readme-ov-file#whitepaper 22/22
regarding the project to develop the Meta Benz, hence insufficient information disclosure is
inevitable and reasonable.
3. Competitors : Various types of decentralised applications are emerging at a rapid rate, and the
industry is increasingly competitive. It is possible that alternative networks could be established
that utilise the same or similar code and protocol underlying Meta Benz Token and/or the Meta Benz
Network and attempt to re-create similar facilities. The Meta Benz may be required to
compete with these alternative networks, which could negatively impact Meta Benz Token and/or the
Meta Benz.
4. Failure to develop : There is the risk that the development of the Meta Benz will not be
executed or implemented as planned, for a variety of reasons, including without limitation the
event of a decline in the prices of any digital asset, virtual currency or Meta Benz Token, unforeseen
technical difficulties, and shortage of development funds for activities.
5. Security weaknesses : Hackers or other malicious groups or organisations may

attempt to interfere
with Meta Benz Token and/or the Meta Benz in a variety of ways, including, but not limited to,
malware attacks, denial of service attacks, consensus-based attacks, Sybil attacks, smurfing and
spoofing. Furthermore, there is a risk that a third party or a member of the Foundation, the
Distributor or its affiliates may intentionally or unintentionally introduce weaknesses into the core
infrastructure of Meta Benz Token and/or the Meta Benz, which could negatively affect Meta Benz Token
and/or the Meta Benz. Further, the future of cryptography and security innovations are highly
unpredictable and advances in cryptography, or technical advances (including without limitation
development of quantum computing), could present unknown risks to Meta Benz Token and/or the
Meta Benz by rendering ineffective the cryptographic consensus mechanism that underpins
that blockchain protocol.
6. Other risks : In addition, the potential risks briefly mentioned above are not exhaustive and there
are other risks (as more particularly set out in the Terms and Conditions) associated with your
purchase, holding and use of Meta Benz Token, including those that the Foundation or the Distributor
cannot anticipate. Such risks may further materialise as unanticipated variations or combinations
of the aforementioned risks. You should conduct full due diligence on the Foundation, the
Distributor, its affiliates and the Meta Benz Development team, as well as

understand the overall
framework, mission and vision for the Meta Benz prior to purchasing Meta Benz Token.