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BitOoda

Orchid Multi-chain Compatibility:
Reduced Tx Fees Support Adoption

Orchid is a Peer-to-Peer programmable bandwidth marketplace, serving as Web3 infrastructure. The initial application is a decentralized virtual private network (VPN) delivery platform, which saw rising Ethereum transaction (Tx) fees as a factor that was inhibiting the ability of users to access the Network. This challenge is common to many decentralized apps, where increasing network congestion causes fees to be a significant proportion of small payments. We view the Orchid Network's support of multiple tokens as mitigating the Tx fee challenge, allowing for more people to use the Network.

This report is intended for use by VPN providers on the Orchid network, and follows our initial report found here.

Recent growth in Ethereum transaction volumes (slide 3) have resulted in rising gas prices (slide 4). Combined with the rise in ETH price, the gas price – a payment per unit of computation on the network, measured in gas volumes – has resulted in transaction fees averaging over $40.

On the Orchid platform, users purchase credits that are used to pay VPN providers, in many small microtransactions called nano payments, for small increments of bandwidth (slide 7). The notion is that each payment made against a randomly selected "ticket" covers the cost of a much larger number of tickets, where each ticket represents a 256kB of data. If the proportion of tickets with a payout is high, each payment can be small and the revenue flow mirrors the actual bandwidth delivered.

As fees rise, the minimum payment that makes sense rises to unsustainable levels. For example, the current bandwidth cost equates to ~16GB per 1USD, so each payment (incurring a ~$40 Tx fee) needs to be for a very large amount of bandwidth. This also means that the proportion of payout tickets needs to be very small, which makes payments very lumpy and poorly mimics the actual bandwidth used.

The high fees resulted in many user balances falling below the transaction threshold, and large initial purchases needed to establish new accounts, inhibiting Network usage in global markets where many clients would struggle to find that much liquidity. Tx fees represent friction costs that charge the customer without offering service or driving provider revenue.

The Orchid Network now supports all Ethereum-compatible chains. This allows users to hold purchased fiat currency credits in tokens such as the stablecoin xDAI (the default option for in-app purchases), AVAX, MATIC and BSC. Multi-chain support results in a >98% reduction in fees (slide 12), which allows the Orchid Network to return to its original vision where accounts are charged more frequently for small amounts of bandwidth used – true pay-as-you-go and not "randomly, occasionally, pay a lot," which could be before or long after users consume the bandwidth they are charged for.

The core token economics remain unchanged: providers stake OXT to gain traffic proportional to their share of staked tokens (slide 14). The one difference is that they receive payments in different tokens. We assess that the value accrual mechanism for OXT tokens is enhanced by reducing slippage costs. More user funds flow through to providers, and the minimum purchase of bandwidth credits is now just $1 (slide 13), which we see as benefitting users.

In summary:

- Ethereum's rising transaction fees have inhibited the ability of users to access the Network by making payments large and lumpy, and raising minimum buy-ins to unsustainable levels
- We applaud support for multiple Ethereum compatible tokens with much lower fees that re-enable the original vision of frequent, probabilistic nanopayments
- This reduces minimum buy-ins to $1, which helps users, including lower/middle income users in Asia
- The core value accrual mechanism is unchanged, where providers stake OXT to receive a proportional share of the network traffic and revenue

Advisory

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Key Takeaways

- Rising ETH transaction fees inhibit payments adoption
- Pay-as-you-go services need microtransactions to closely match payments to service delivery
- Orchid Network now supports multiple tokens to reduce fees
- Users can now purchase bandwidth credits with one of several tokens
- Vendors continue to stake OXT to gain traffic
- Revenue share ***still*** equals staked OXT share

Ethereum's Barrier to Adoption: Tx Fees

Rising Daily Transactions Lead to Ethereum Network Congestion

- Transaction activity on Ethereum accelerated with the DeFi boom in 2020
- This has led to increased network congestion and contributed to Tx fees that are as much as 80x higher today than they were during the development and early release of Orchid

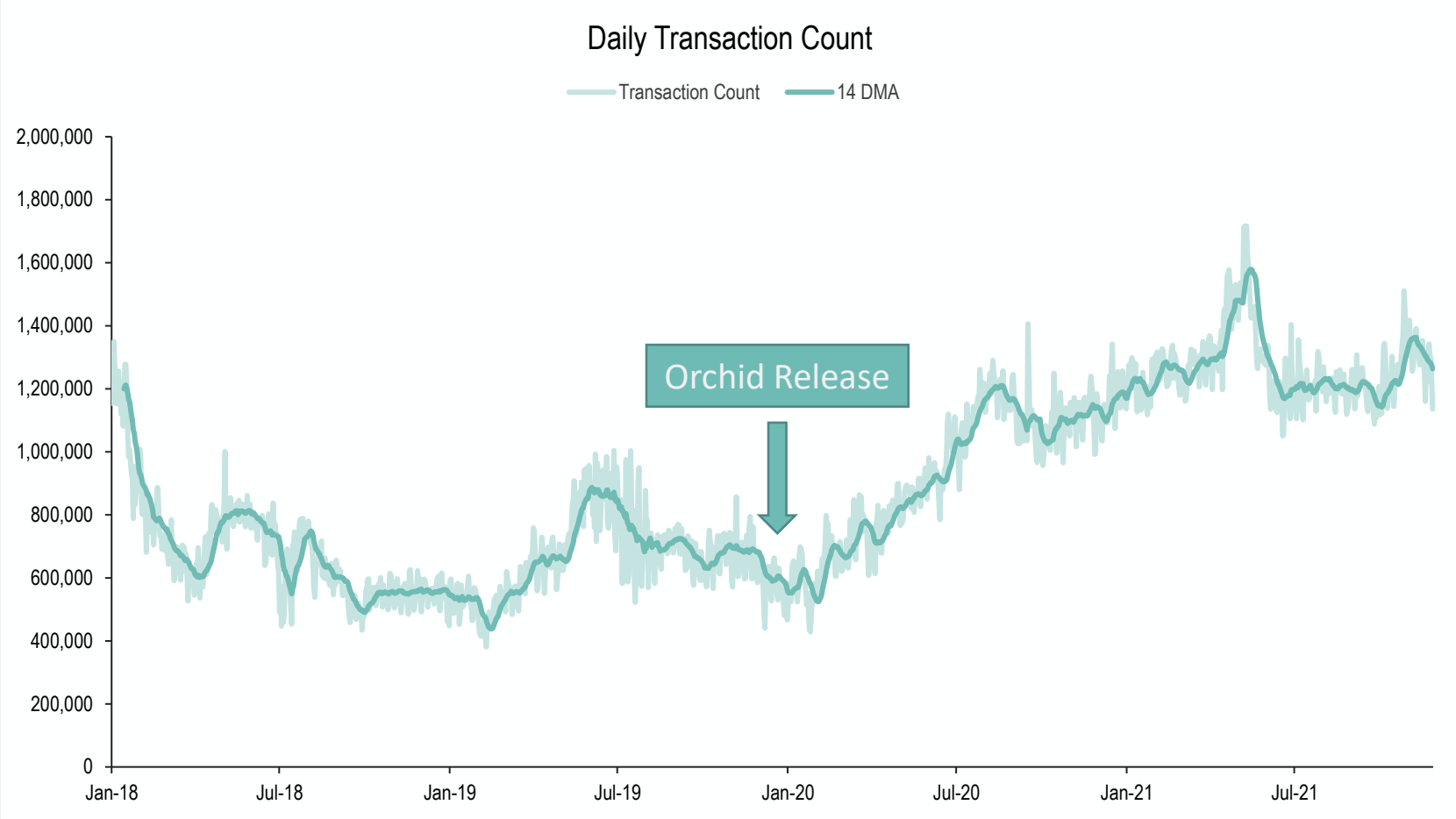


Figure: Daily and 14 day moving average of Ethereum network transaction count

Source: CoinMetrics, BitOoda

Congestion Drives Gas Prices Up = More ETH Paid per Transaction

- ETH Tx fees are a combination of gas price and gas used
- Gas is considered a unit of work in the ETH network: more work requires more gas
- While the amount of gas per transaction has not changed significantly, increased network activity manifests in a rising gas price – the amount of ETH needed to perform a unit of work – measured in "gwei" or 10^{-9} ETH

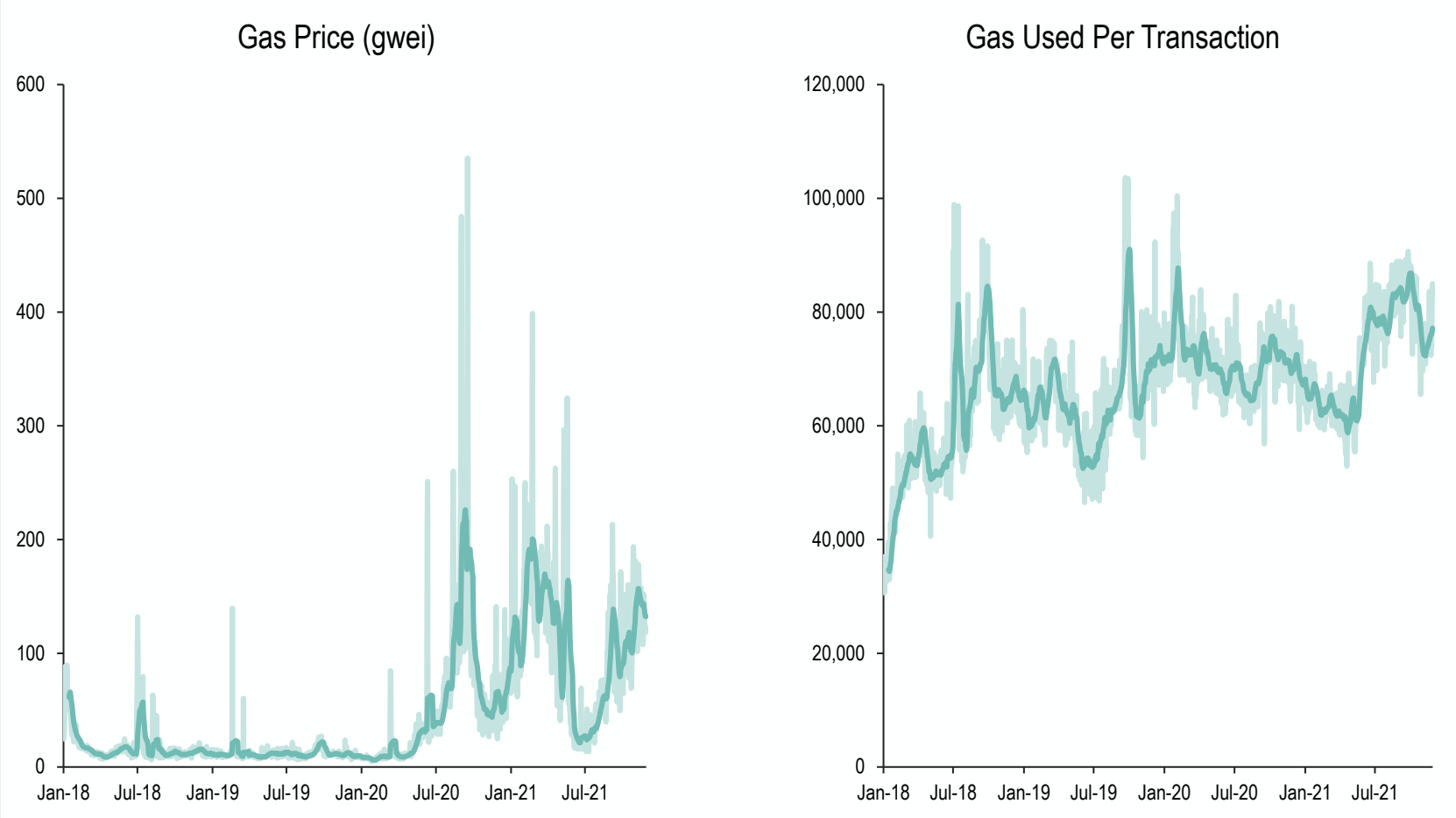


Figure: Daily and 14 day moving average of gas price and gas used per transaction

Source: CoinMetrics, BitOoda

Rising Gas + ETH Price Make Microtransactions Too Expensive

- We have seen a significant rise in the price of ETH
- Thus, transaction fee growth has outpaced both gas price and ETH price – It takes slightly more gas than in the past, but the gas costs more ETH and the ETH itself is worth a lot more
- Recently, a 14-day moving average of ETH Tx cost exceeded $40
- This is particularly challenging for microtransactions: the smaller the value of ETH being transferred, the greater the Tx fee acts as friction or slippage, deterring the actual ETH transfer transaction

Figure: Daily and 14 day moving average of Ethereum price and transaction fee in USD

Source: CoinMetrics, BitOoda

Understanding
Nanopayments

Scaling the Orchid Network through Nanopayments

Off-chain Validation and Probabilistic Value Transfer

The nanopayment system acts to reduce on-chain transactions, reducing fees. The nanopayment system reduces large transaction and gas fees required by Ethereum, while still utilizing its network and security.

Nanopayments are important to trustless systems, and result in concurrent payment and service delivery, unlike traditional post-paid or pre-paid service models where one party has exposure to the performance of the other. Nanopayments pay for small amounts of bandwidth usage in a pay-as-you-go system. This means that the bandwidth payment might fluctuate ahead or behind the actual consumption by very small quantities. As a result, the value at risk is tiny, and either party can cut off the other for non-payment or non-delivery of bandwidth at any time, with only a tiny mismatch between payments made and service delivered.

Increase in payout variance is slightly increased as a tradeoff for efficiency. While nanopayments reduce the frequency of on-chain transactions, thus reducing transaction fees (which have high variance as well), the nanopayment ”winner” system increases balance variance. With each ticket sent, there is a small independent probability that it is a “winner” ticket. As such, there is a small chance that the ”winner” ticket does not come for a week, as there is the chance it comes in within minutes. If the winner ticket comes early, there is risk that the receiver’s account balance will decrease earlier than expected.

Even with the nanopayment system, there remains lack of complete payment anonymity. As winning payments are transacted on-chain on Ethereum, full anonymity is not achieved.

Transaction fees and transaction speed prevent Layer-1 based DApps from being scalable. Solely using the Ethereum network is not a scalable solution for Orchid. For the system to function, payments must be regularly exchanged for bandwidth. Due to the increase in gas and ETH prices, small-value transactions are no longer viable.

Additionally, as network activity increases, transaction speeds decrease as a result of high demand, hurting the user experience for DApps that rely on efficiency and speed. Layer-1 chains can also be incredibly difficult to edit, due to the sensitivity and security involved. As such, Layer-2 chains have been used to complement Layer-1 chains in scaling DApps.

The Orchid Network supports scalability to ETH through Layer-2 nanopayments.

The Orchid Network has an efficient and scalable nanopayment system. Instead of using on-chain payments while the Orchid app is running, payments are constantly being streamed from the user to bandwidth providers. Providers use a small amount of their own computing power to authenticate this payment. These payments, in the form of tickets, are conducted off-chain. Each ticket has a low probability of being a “winner.” Only when the providers receive a winning ticket does the on-chain transaction occur, and they can redeem their accumulated payments.

Source: Orchid, BitOoda

Nanopayments Reduce Transaction Volume and Fees

- As users use a VPN, each unit of data – 256kB – used generates a "ticket" being sent to a network provider, as a measure of the bandwidth being provided
- A percentage of tickets are designated "winning" tickets, with a vendor payment
- This probabilistic approach allows for a measurement of bandwidth consumption in small increments, coupled with a less frequent payment to the vendor that compensates for the approximate entire bandwidth provided, without overloading the underlying network or generating large transaction fees

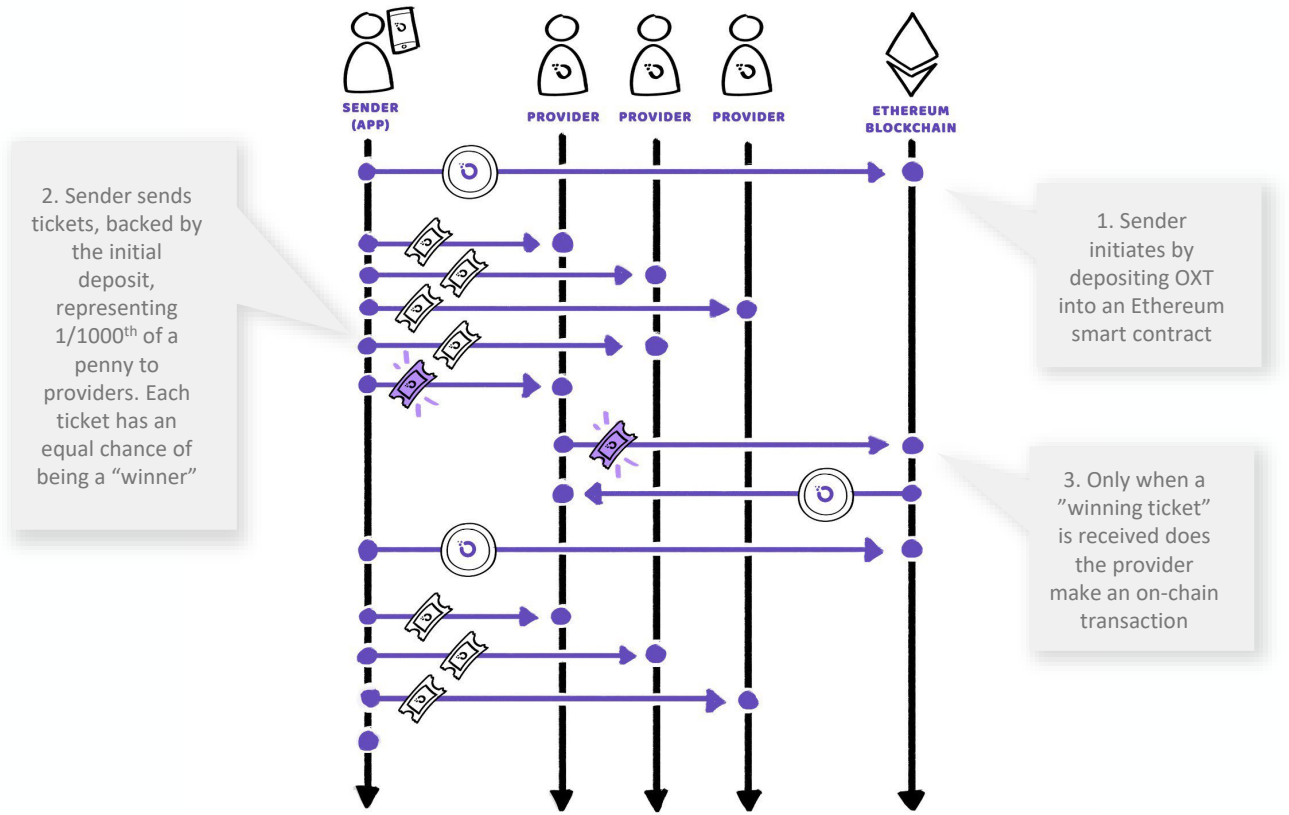


Figure: Orchid's nanopayment system

Source: Orchid, BitOoda

Transaction Fee Rise is a Structural Problem for Ethereum DApps
Inhibiting Adoption and Making Small Payments Infeasible

Transaction fees create a structural problem with the Ethereum network in its current configuration, and may take the broad deployment of sharding post the Proof-of-Stake transition to sustainably rationalize transaction fees.

The transaction fee issue affects a wide variety of applications across the decentralized applications / decentralized finance universe, with the fees presenting a friction cost most users would like to avoid.

Current >$40 ETH transaction fees can overwhelm the actual amounts being transferred – and this is especially true for micro- and nano-payment protocols such as Orchid.

For Orchid, the bulk of an initial buy-in of bandwidth credit would go to establishing the Ethereum smart contract, and it would only take a small handful of payment transfers from the buyer to the VPN provider to draw down the account balance to below the ETH transaction fee, at which point the remaining balance becomes unusable.

This incentivizes an increase in the unit amount of bandwidth being paid for, along with a reduction in the number of bandwidth transactions – essentially stepping away from the concept of nanopayments. This increased lumpiness of payments could mean that the payments received by VPN providers poorly mirrors the actual bandwidth provided.

An associated issue is that the volatility of both OXT price and ETH price / fees results in an uncertain amount of bandwidth credit: since bandwidth is priced in fiat amounts per gigabyte of data, it is unclear how much bandwidth the OXT balance can buy. Each bandwidth charge takes place at a different rate, and a decline in OXT price from the original creation of the credit could erode balances faster.

In the interim, micro- or nano-payment based protocols such as Orchid face a threat to the viability of the business model on the Ethereum network. Similarly, applications developed on Web 3 (e.g. NFTs, Metaverse, gaming) will require scalable chains with low transaction fees. It is not practical for a user to pay $40 in overhead for basic usage. **Transaction fees do not directly provide the service to the customer, nor do they represent revenue for the provider.**

Multi-chain Reduces Barriers to Use of Orchid Network

Low Transaction Costs
With Multi-chain Acceptance on the Orchid Network

The Orchid Network is now compatible with any EVM-compatible chain. This allows a minimum viable trial purchase of just $1. We think the $1 price point to try a VPN without a contract is crucial for a number of groups of users, especially lower-income users in Asia.

By selecting new Ethereum Virtual Machine compatible protocols that have significantly lower transaction fees – many orders of magnitude lower **–** a much larger share of customer spending goes to bandwidth purchases, improving efficiency and reducing friction.

Enabling a large number of microtransactions on alternative protocols is consistent with the Orchid Network's original nanopayment vision. The probabilistic payments can thus more closely replicate system cash flows that would exist in a frictionless, infinitesimally small-payment deterministic model. The pay-as-you-go model benefits from this expansion of tokens.

An additional benefit of supporting stablecoin-based protocols such as xDAI is more predictability of available bandwidth credit. When a user funds an account with a prepaid credit, it is possible to predict precisely how much bandwidth the credit can buy. Since these credits do not expire, this feature becomes more important the longer the estimated redemption period is on these credits. There are no changes to the core functionality, although the user experience is more streamlined and usability sees a large improvement.

It is important to highlight that the core token economics remain unchanged (slide 14). VPN providers receive traffic and share revenue proportional to their share of staked OXT. While the revenue received now takes the form of multiple tokens, the staking mechanism itself remains the same. Users absorb transaction fees, so provider revenue would not be affected by this change.

Most VPN providers need their revenue in fiat to match their expense obligations, so receiving diverse and especially stablecoin revenue streams **helps derisk the business model for VPN providers by reducing the currency exchange rate exposure as well.**

>98% Transaction Fee Reduction Re-enables Orchid Model

- Transaction costs shown below emphasize just how much of a reduction is possible compared to Ethereum
- This is what drives the reduced minimum buy-in costs, which in turn makes Orchid accessible to more users
- The low fees create a significant margin of safety that keeps "available bandwidth credit balances" stable
- Stablecoins such as xDAI are optimal for Orchid's nanopayment system
- **xDAI is the new default choice for Orchid in-app purchases**

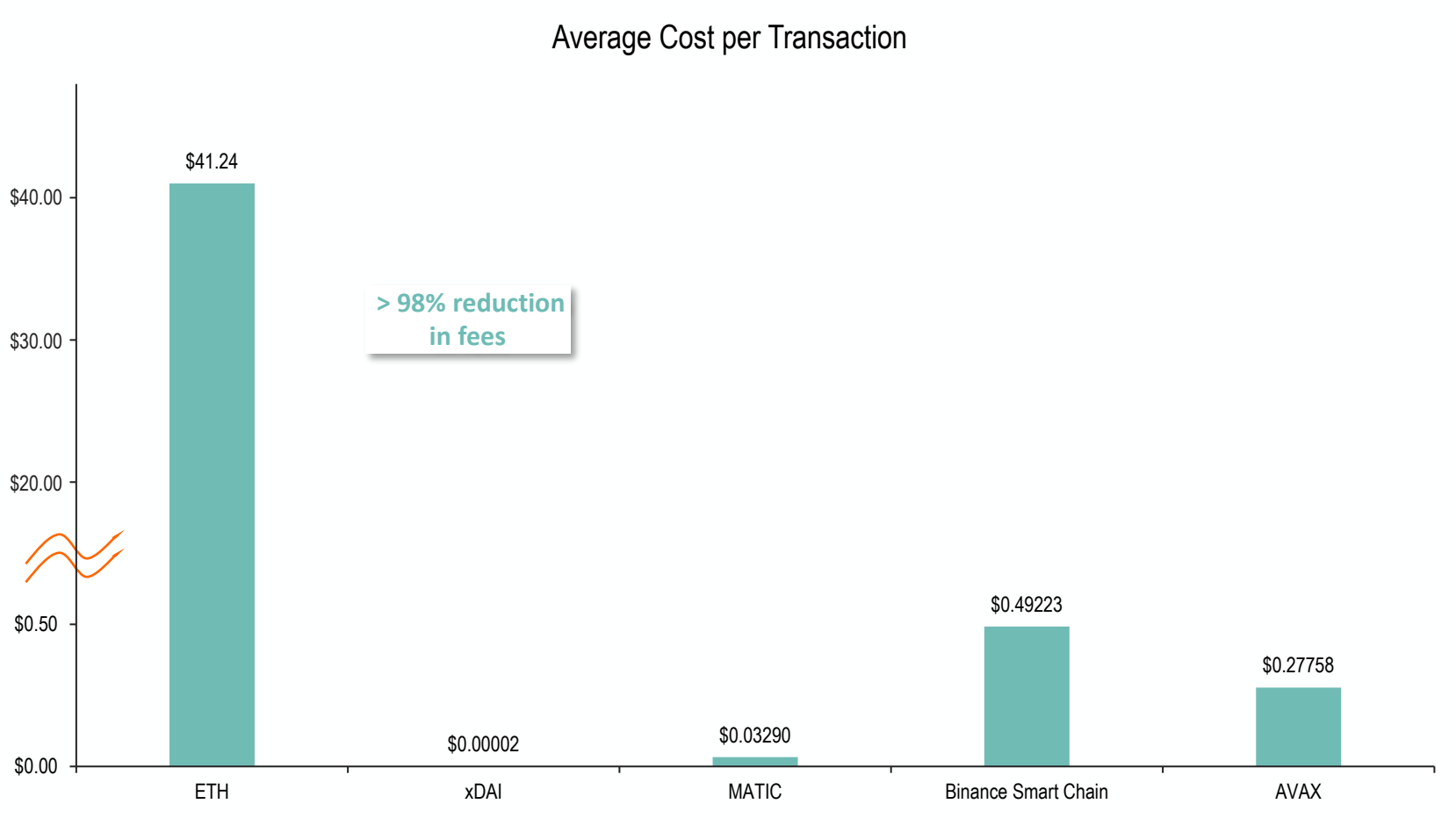


Figure: Average cost per transaction for possible payment methods

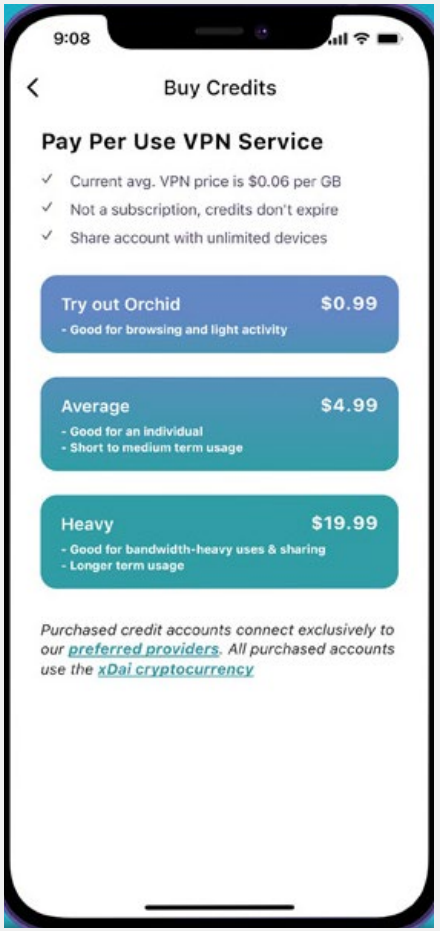
Source: BitOoda, Etherscan, Avascan, xDaiChain, Polygonscan, BscScan

Lower entry cost for Prepaid Access Credit:
Using xDAI as the Default Coin for In-App Purchases

- Prepaid access credit is the purchase of a fixed fiat value of VPN service, with the purchased value never expiring
- The current cost is $0.06 per GB, so users buy approximately 16GB of data per US Dollar
- Multi-chain allows prepaid access credit in smaller denominations of $1, $5 or $20
- The 2/1000th of a penny xDAI transaction fee enables virtually the entire credit to go to VPN bandwidth
- Furthermore, the xDAI stablecoin allows for high visibility into how much bandwidth a user's PAC balance represents

Coin	Cost (USD) Per Transaction
ETH	$41.24
xDAI	$0.00002
MATIC	$0.03290
Binance Smart Chain	$0.49223
AVAX	$0.27758

Figure: Average USD transaction fee for possible payment methods

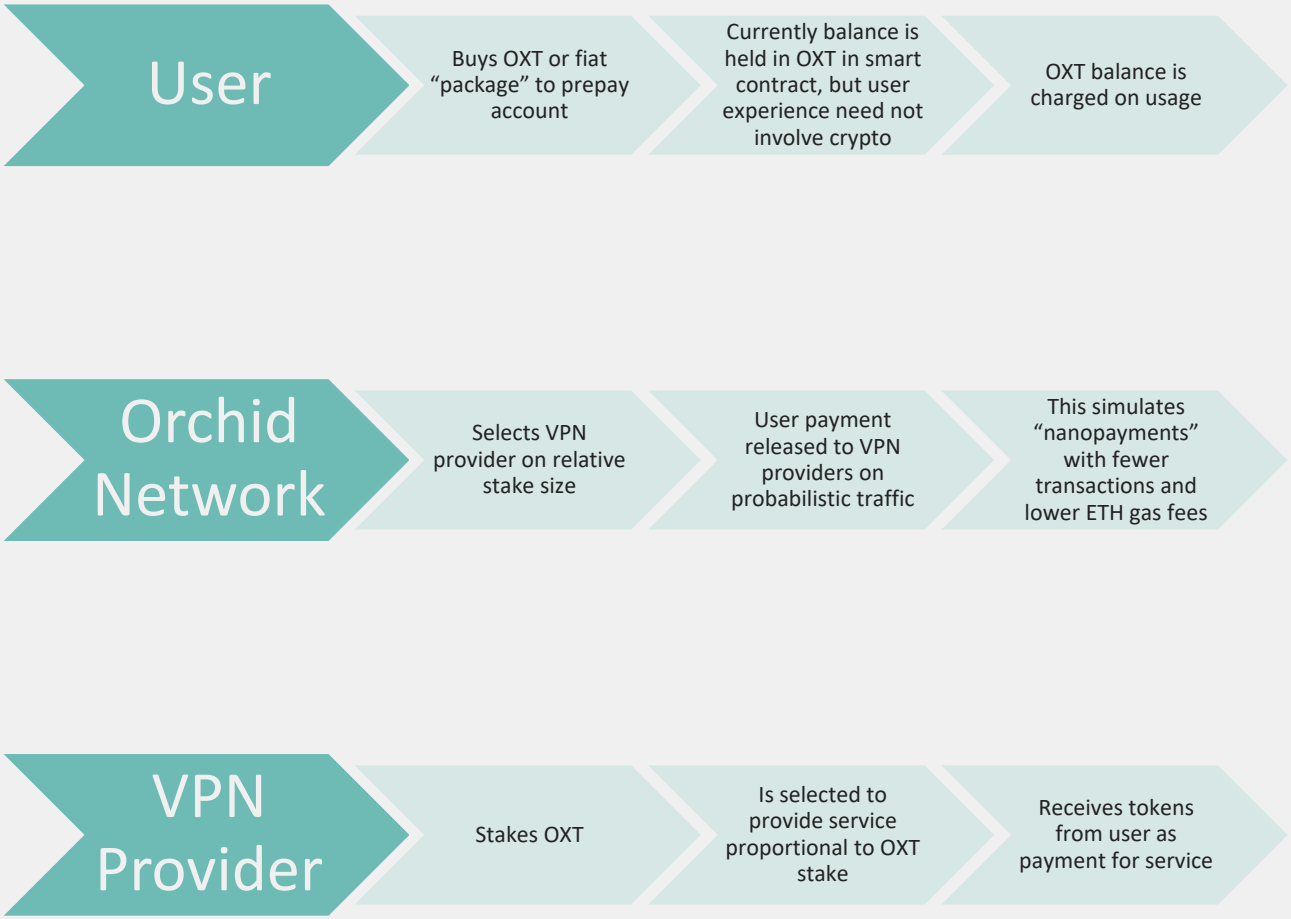


Source: BitOoda, Orchid

Token Model Unchanged

Staking Share = Revenue Share

- VPN providers acquire and stake OXT tokens
- User account balances are charged for services provided
- Providers receive network and revenue share proportional to staked OXT; VPN providers receive revenue according to delivered bandwidth
- It takes 3 months to unbind tokens, during which those tokens do not count toward the revenue share
- Revenue earned is not bonded and can be liquidated to pay expenses
- **The only difference is that revenue is now diversified across multiple tokens**



The Larger Trend Toward Ethereum Compatible Chains
To Enable Decentralized Apps (DApps) to Scale

Recently, Decentralized Applications (Dapps) have been adding support for Ethereum-compatible chains for added scalability. As high transaction fees have hindered growth and scalability of Ethereum-based projects, many Layer-2 chains have emerged and are looking to work with Ethereum to help DApps scale.

xDAI is one such example of an Ethereum-compatible chain that is attempting to reduce transaction fees. xDAI is fully compatible with the Ethereum Virtual Machine and operates a two-way bridge model, which allows seamless conversion between xDAI, DAI, and any other ERC20 token. The benefit of this approach is it allows any project currently running on Ethereum to migrate easily. xDAI also significantly reduces transaction times, making it ideal for small payments.

Avalanche (AVAX) is another example of a scalable, compatible chain. Avalanche is a Layer-2 chain whose mainnet launched in Sept. 2020. AVAX developed a new consensus protocol with a chain compatible with the Ethereum Virtual Machine. On top of this chain, called the C-Chain, Avalanche supports both a P-Chain and an X-Chain. By splitting its architecture among three blockchains, AVAX optimizes flexibility and speed. AVAX can process 4,500 transactions per second, compared to the 14 of Ethereum.

The Orchid Network is an early adopter of the diversification trend supporting compatible alternatives to Ethereum and demonstrates the viability of utilizing Ethereum for small payments while avoiding its high, volatile transaction fees.

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