

# Scalability+

# Blue Paper

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# I. Executive Summary

The Antelope Scalability+ working group has researched the current adoption of the Antelope technologies and found that there are many improvements that could be made to ensure better horizontal, vertical, as well as, operational scalability of Antelope networks. There are many different blockchains employing Antelope technology and depending on their utilization and growth patterns they all need to meet the demands of growing Web3 applications adoption.

In this document, you will find an overview of where we believe there are weaknesses in the current ecosystem and a detailed breakdown of our recommendations going forward. By improving some of these key areas we can provide more scalable and easier to operate Antelope networks for block producers, API node operators and developers and users alike. Additionally, continuous investment in this area will ensure that the Antelope ecosystem remains the fastest and most scalable blockchain platform available.

The intent of the recommended improvements to Antelope systems is to ensure that the Antelope ecosystem can support rapid growth of active wallets and adoption of new Web3 applications being deployed and operated. Antelope Scalability+ initiatives need to ensure that the growing Antelope ecosystem delivers a consistent experience for users and developers with well understood transaction throughput, instant transaction finality and efficient and transparent use of on-chain resources. These initiatives must also deliver better tooling to Antelope ecosystem operators like Block Producers allowing them to run key infrastructure components efficiently at scale.

While working through the different sections we have prioritized initiatives that will give us quick wins and also the big ticket items that we believe will bring long-lasting benefits for the ecosystem of networks based on Antelope. Each area of improvement will have a separate, detailed writeup culminating with Request For Proposal allowing for participating groups to bid and then execute on the improvements.

We hope that the ecosystem sees the value of this documentation. This working group views it as a jumping-off point for continued discussion and as a way for us to build a strategic path forward based on empirical data and Antelope community feedback.

# II. Introduction

## I. Measuring Success

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Antelope Scalability+ working group identified Key Performance Indicators that we intend to use to measure the impact and success of all Scalability+ initiatives. These KPIs can be grouped into the following areas:

### 1. Maximum Number of Wallets

The maximum number of wallets that can be created in the Antelope ecosystem is a very important scalability metric for networks that are striving for high adoption by users of Web3 applications. Today, successful Web2 applications can have hundreds of millions users; mainstream adoption of Web3 applications will require blockchain infrastructure to support such growth.

Antelope system account model requires resources to be allocated to each new account. In this model there is a minimum amount of RAM that must be allocated per new account that is not recoverable today. This RAM pool must be supplied by Block Producers ensuring that Block Producer nodes have enough physical memory to support not only all accounts being created but also all additional RAM required for Smart Contract operations.

A minimum RAM required for a new account is 1611 bytes; however, we observe an average 5400 bytes being consumed by an active account conducting smart contract operations (per WAX Blockchain). This can create scalability problems for Antelope networks that have high user adoption; for example a network supporting 100M wallets would require Block Producers with 500GB state RAM just to support the number of user wallets. There are physical hardware limitations to be able to support such growth when trying to scale Block Producer nodes vertically while horizontal scalability is not yet supported.

Enormous size of the state RAM required to maintain account growth while not being able to scale Antelope System horizontally and vertically creates one area of opportunity that Scalability+ group intends to address.

## 2. Transaction Throughput

Transaction Throughput is another important scalability metric for Antelope networks that are striving for mainstream consumer adoption.

Antelope system theoretically can support up to 8k transactions per second today. By modern standards such throughput is insufficient, however when compared to the transaction throughput of some of the Web2 applications. Scalability+ group will focus on addressing this area of opportunity by optimizing vertical, as well as, horizontal scalability of Antelope systems.

## 3. Transaction Finality

Transaction Finality in Web3 applications can be defined as the time needed for enough successful block confirmations to take place so that there is a hundred percent guarantee that network transactions cannot be altered, reversed, or canceled after they are completed.

This is an important metric when building Web3 applications as users today are used to sub second responsiveness of Web2 systems with fast data updates capabilities. Long transaction finality can result in complex systems employing eventual consistency architecture requiring compensating transactions accounting for a possibility of transaction being reversed. Such systems can erode customers' confidence in blockchain networks and ultimately can erode wider adaptation of Web3 applications.

Today, Antelope networks achieves finality by 2/3+1 block producers signing the blocks, which results in about 3 minutes waiting. In comparison, the Bitcoin network requires 60 minutes (6 confirmations) to achieve finality, while Ethereum networks require 6 minutes (25 confirmations). While Antelope networks offer one of the fastest transaction finality metrics, Scalability+ group will focus on addressing this area of opportunity as well.

## 4. Maintainability and Ease of Operation

Systems maintainability can be difficult to quantify, however, time to install, configure and synchronize a node along with infrastructure costs and DevOps costs could be used to measure it.

A successful Antelope ecosystem requires not only well running Block Producers but it also requires well documented infrastructure of supporting services, ie: State History APIs like Hyperion or NFT State APIs like Atomic Assets.

The Antelope ecosystem has organically grown since the launch of the EOS Mainnet in 2018. This organic growth has resulted in a lot of innovation, however, documentation and operational tooling has not been standardized. Significant, operational technical debt exists resulting in a high barrier of entry for new node operators or Web3 application developers. This results in difficult adoption of Antelope networks by third parties like exchanges or game development studios, making it difficult for individual app developers and the ecosystem as a whole to achieve success.

Scalability+ group will focus on addressing this area of opportunity as well to reduce the barrier of entry for developers and third party integrators.

## II. Current state of the ecosystem

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As of this writing, there are many networks utilizing Antelope technology with some of these blockchains pushing the current boundaries of not only the Antelope networks but blockchain technology capabilities at large.

However, operating any Antelope network at scale can be very difficult due to the ecosystem's lack of standardized documentation, SDKs and guides. Deep institutionalized knowledge is required to run Block Producers and supporting API services. Despite the fact that the Antelope ecosystem produced the only networks that can operate at the scale of modern Web3 applications, the ecosystem as a whole is having hard time finding wider adoption and loses competition to other technologies that are easier to operate.

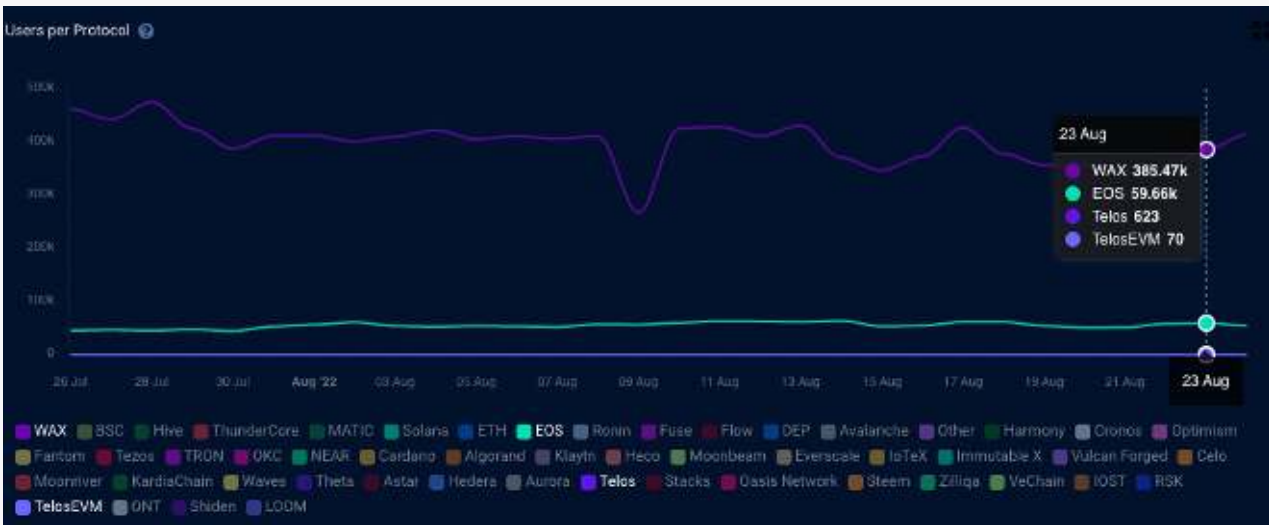
This section focuses on highlighting some of the public metrics available to showcase both current Antelope technology capabilities and adoption.

### 1. DAU Per Protocol

Daily Active Users Per Protocol measures the number of active wallets performing on-chain transactions in a given 24h time period. Notably, EOS Mainnet averages 50k daily active users with a total of 5M blockchain wallets and WAX Blockchain averages 500k daily active users with 13M total blockchain wallets.

Being able to support a high number of wallets together with an ability to support a high number of active wallets is critical in the development of Web3 applications. Mainstream consumers today use Web2 applications that support hundreds of millions of users working together; for example on-line games or social media applications. Web3 applications will have to meet similar demands once wider adoption of these technologies is realized.

## Antelope Chains tracked by dappradar



Data provided by [dappradar](#)

## Top 5 protocols tracked by dappradar



Data provided by [dappradar](#)

## 2. Daily Transactions Per Protocol

Transactions per protocol measures the number of on-chain transactions in a 24h time period. Notably, EOS Mainnet averages 600k daily transactions with 4k transactions per second peaks and WAX Blockchain averages 22M transactions with 2.5k transactions per second peaks.

Being able to provide high concurrency, low latency transaction throughput is yet another requirement when developing Web3 applications. Mainstream consumers today use Web2



applications that can scale to hundreds of thousands of requests per second; wider Web3 adoption will put similar pressure on all blockchain networks including Antelope systems.

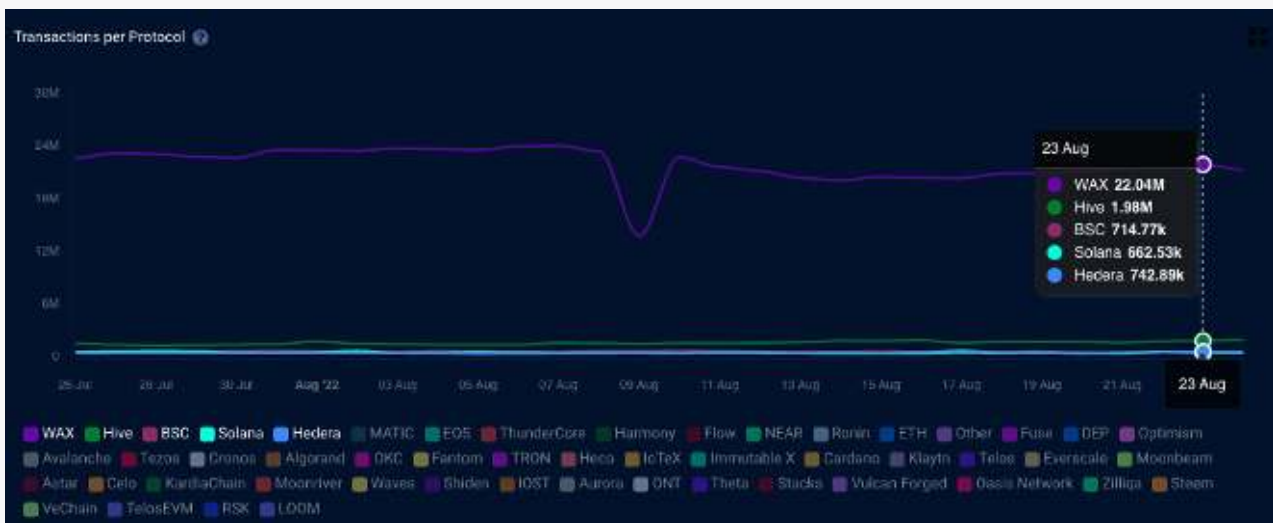
Antelope ecosystem is the only blockchain protocol that has been able to support such high transaction rates in a production environment.

### Antelope Chains tracked by dappradar



Data provided by [dappradar](#)

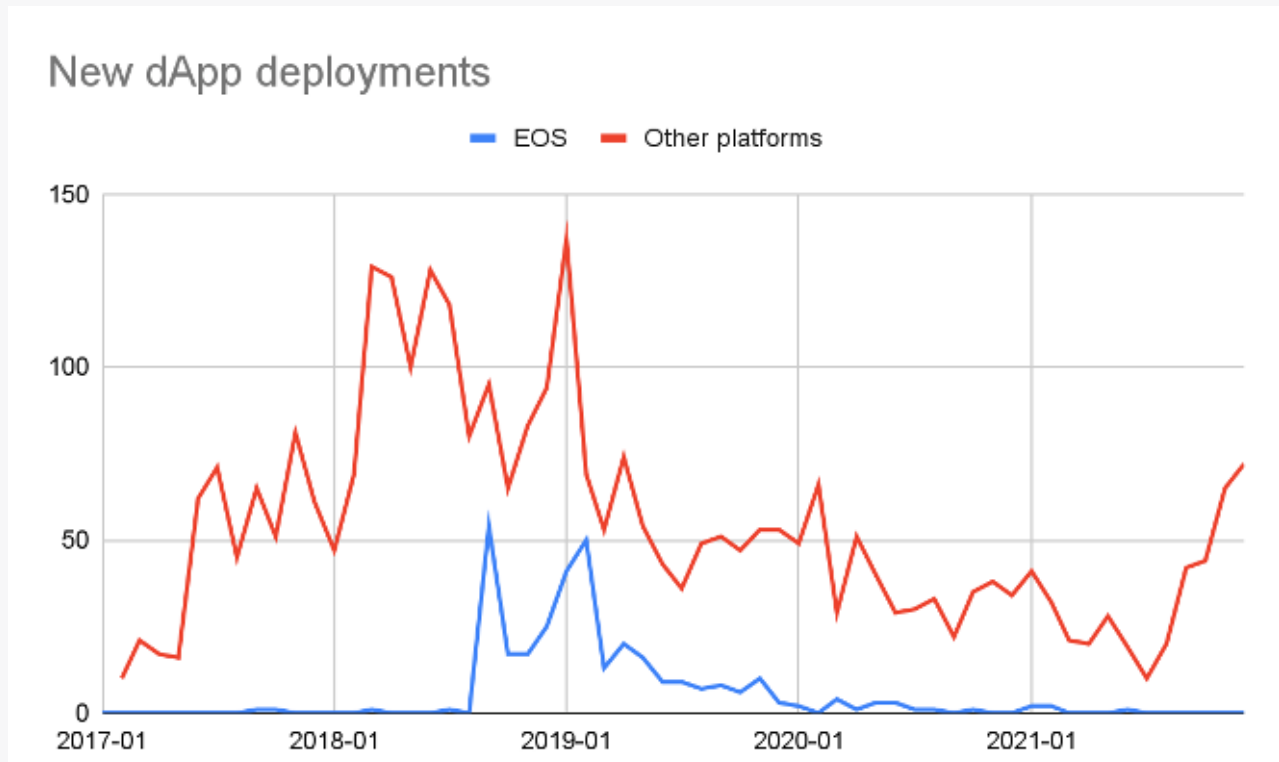
### Top 5 protocols tracked by dappradar



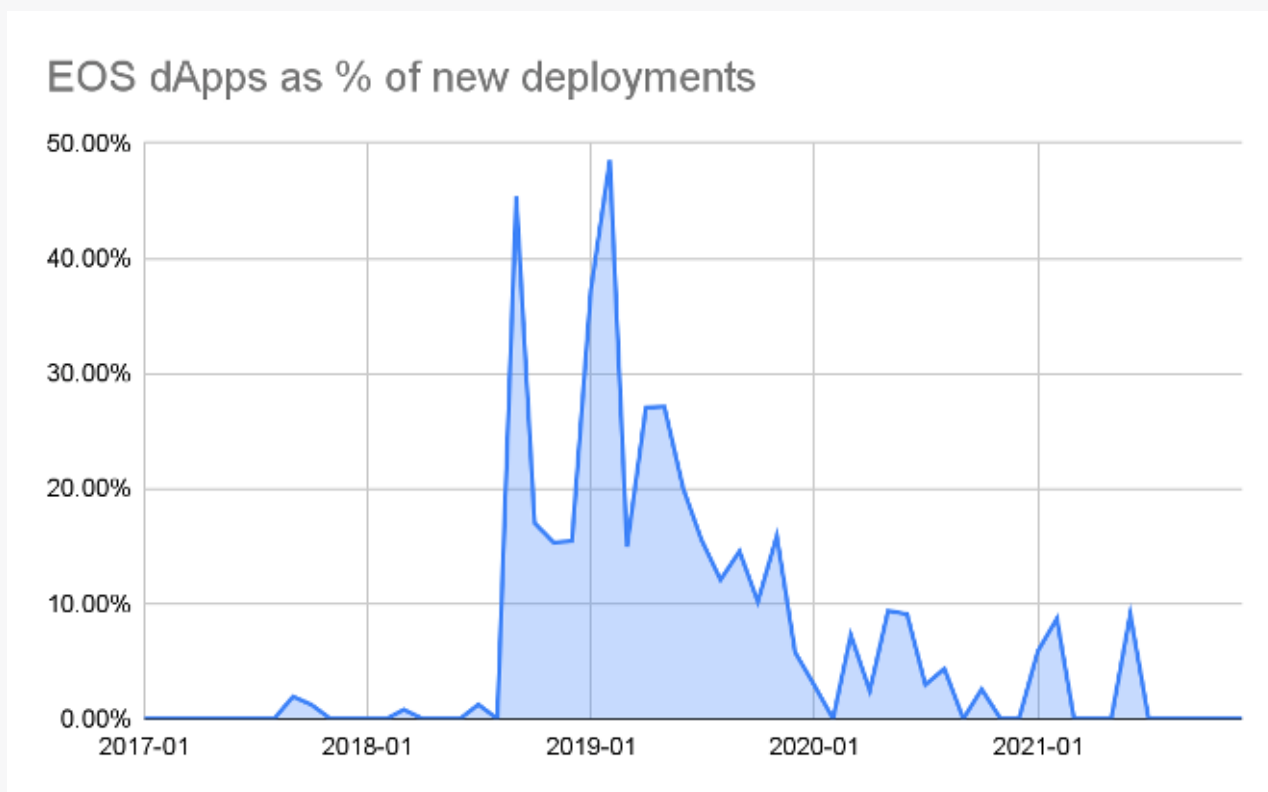
Data provided by [dappradar](#)

### 3. Impact to the ecosystem

Despite Antelope performance advantages, developer deployment metrics have plummeted on EOS since mid-2020, with fewer and fewer developers choosing to deploy their products and services on Antelope networks. Competing networks however have, during this period, largely flourished despite their scalability and gas fee challenges. We believe that the state of the ecosystem has played a significant role in this lack of interest from the wider blockchain community.



## Antelope dApps as % of new deployments



Data provided by [stateofthedapps.com](https://stateofthedapps.com)

Lack of established standards, confusing technical requirements, and no quality of life improvements for developers and network operators have discouraged many when evaluating Antelope as an option. Some Antelope networks that have addressed these shortcomings have seen higher adoption in recent years. This shows us that improvements to these core systems can help facilitate growth and Antelope adoption. Many critical issues today are without solutions and have yet to be addressed within the broader Antelope ecosystem.

#### 4. Purpose of the Scalability+ Initiative

Our goal for this initiative is to provide a detailed overview of the current Antelope scalability challenges while outlining common Web3 applications requirements that need to be addressed. This will act as a structure for generating and managing the further research that we believe will be necessary for Antelope to succeed over the coming years.

A holistic, honest approach to understanding the current Antelope ecosystem scalability state and its weaknesses will allow invested parties to work together to form a strategic, community-wide opinion about what we should focus on building together and what the expected output

of that should be. This should be defined by our ecosystem's needs, and also by having a deep understanding of what does and does not work within the context of the larger crypto industry.

We must try to outline the projects that we believe are achievable today, define reasonable expectations for them, all while having in mind a view of the wider vision of what the Antelope ecosystem could become.

## 5. Scalability+ Workgroup Mandate

To create this working group document, the teams from EOS, WAX, TELOS, and UX chains worked together to understand the broad scope of requirements for Antelope ecosystem to achieve the Maximum Number of Wallets, improve Transaction Throughput, shorten Transaction Finality and improve Maintainability and Ease of Operation of Antelope networks.

Based on that initial research, this working group defined and prioritized the high level scope of work to improve each of the above success criterias. Resulting projects are then being translated into detailed documents outlining all of the requirements and deliverables for the purpose of publishing formal Requests For Proposals to be bid on by the members of the Antelope community.

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# III. Proposals

## I. Instant Finality

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Implement near-immediate byzantine fault-tolerant deterministic finality as part of the core Antelope protocol in order to improve responsiveness of applications, reduce confirmation times for deposits on exchanges, atomic swap and interchain communications. In addition, this serves as a prerequisite for improved horizontal scalability of transactional throughput via parallelization.

## II. Trustless Cross-Chain IBC

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Implement an inter blockchain communication protocol, allowing for any action taking place on an Antelope blockchain (chain A) to be cryptographically provable to another Antelope blockchain (chain B). This feature aims to facilitate a multitude of use-cases, such as trustless sidechains, wrapped tokens, distributed governance, interchain resource models, single-application chains, specialized CPU mining chains, and so on. In addition, implement a reference wrapped token smart contract and a reference light client.

## III. RAM Limitation Fixes

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Revise Antelope RAM resource to reduce the amount of state RAM that is necessary to be kept in Block Producer node physical memory. With the growing popularity of Antelope based blockchain platforms comes increasing vertical scalability constraints placed on operators of supporting infrastructure like Block Producer nodes. If all blockchain state needs to be kept in BPs physical memory then we may run out of available hardware capable of delivering on this requirement.