Weaver Labs

adeng

adeng token

The engine of a new decentralized ecosystem
for the telecommunications industry

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Contents

01 How can Web3 bring true decentralization if we don't decentralize who owns the infrastructure?

Cell-Stack is a software platform to share and monetize telecoms infrastructure. Through the use of Cell-Stack we aim to create a network of networks integrating a diverse set of telecommunications assets which belong to different suppliers of infrastructure. Cell-Stack, aggregates all these assets into a shared pool of resources and opens it up to be consumed as a service.

Weaver Labs has been working in the Telecommunications space since 2019 and has been contributing actively since then into an Open Networks ecosystem. With several successful projects in place, and a large network of partners, Weaver Labs is an established start-up in the UK Telecommunications industry with Cell-Stack at the center. We now embark on an exciting path towards integration with Web3 technologies to reinvent the telecommunications supply chain and business models.

Cell-Stack connects the supply and the demand of telecommunications services, a marketplace of connectivity assets, Cell-Network, aka CellNet. Its main objective is to decentralize the ownership of networks, to incentivize new investment in infrastructure and improve access to connectivity. As the community expands with more contributions of telecommunications infrastructure, blockchain technology becomes an attractive solution to many problems of scalability, flexibility and security.

CellNet is the first Web3 platform for the Telecommunications industry and it is fueled by Adeno, the native platform's Token.

02 Introduction

We live in a world where everything is connected. Not only is the world population connected through at least one device, but every application requires a network: self-driving cars, healthcare advancements, education.... Even the advancements of AI require networks to deliver the challenge they're set to achieve. There is no industry, business or person that doesn't require a Telecommunications network.

Since 2010 the number of internet users has doubled, and the global internet traffic has increased by a factor of 20. It's clear that telecoms unlock digital transformation and societal development. Despite telecoms being a fundamental utility and a catalyst of innovation, there are still roadblocks in delivering it as a basic human right across the planet.

The International Telecommunications Union has remarked that the current growth in the demand for connectivity is saturating the industry, and the supply struggles to find new ways to deliver in a profitable way. In this report, Deloitte shows how growing infrastructure development, maintenance costs and an outdated supply chain are contributing to revenue pressures in the telecommunications industry. The existing Telecoms model fails to deliver because it depends on decisions made by a low number of players despite being the largest catalyser of innovation, Telcos haven't innovated in the commercial model of how they deliver connectivity: it is expensive and overbuilt.

We believe that a new era for telecoms is possible. One based on collaboration, allowing more players to build telecoms infrastructure and service providers to share. Through the use of software technologies such as orchestration tools and blockchain, it is possible to decentralize the telecoms supply chain, allowing smaller players to participate.

We developed a new model that incentivises competition, and allows us to boost connectivity. This model will allow service providers to lower their investments needed to make communications available everywhere to unlock innovation, break the digital divide and contribute to providing telecoms as a basic human right.

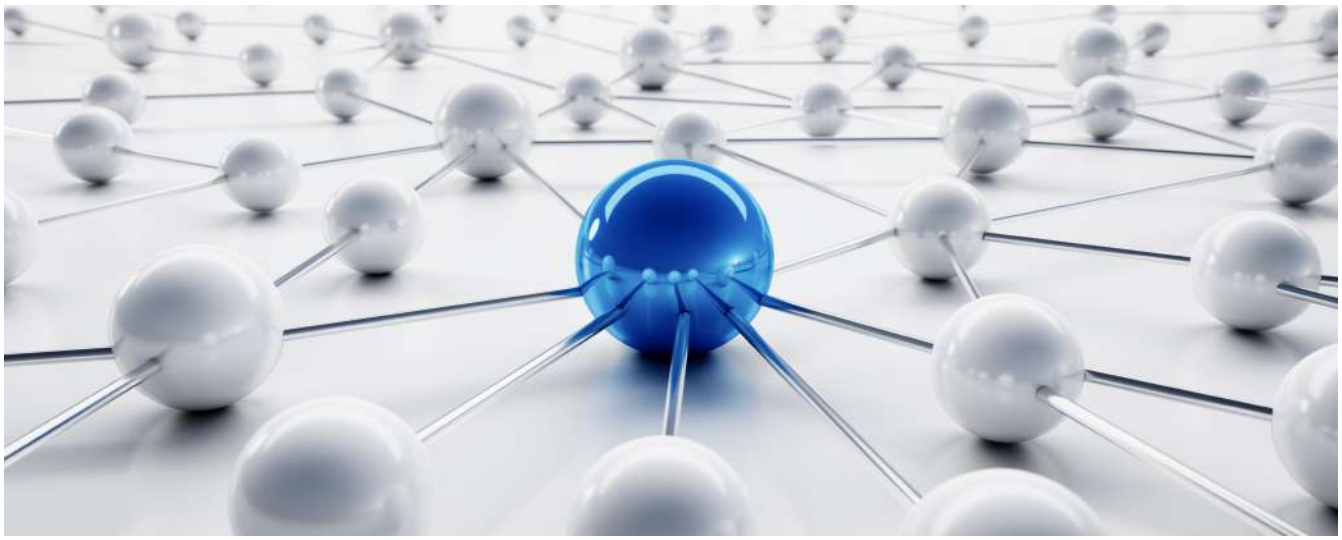
It's clear the telecoms industry is hungry for change. One way we can help satisfy this appetite is to utilize readily available technology to provide an agile and flexible system that allows people to easily consume connectivity.

03 The creation of an ecosystem

Traditional Telecommunications Industry Supply chain

Since the creation of the telegraph, and throughout the history of Telecommunications, networks are built by putting together different components that create the links that carry messages. We have evolved as an industry with hundreds of Telecommunication standards that shape the protocols that we use today: 4G, 5G, WiFi, TCP/IP... This means that every byte of information is able to be sent and received because all the devices that form the network are compliant to these standards, and for this reason, can understand the same language. The telecoms industry has achieved something no other industry has in the past: global interconnectivity and a single language for all devices to communicate. Thanks to this we have the Internet – which today is considered to be a human right and is crucial to power the economy.

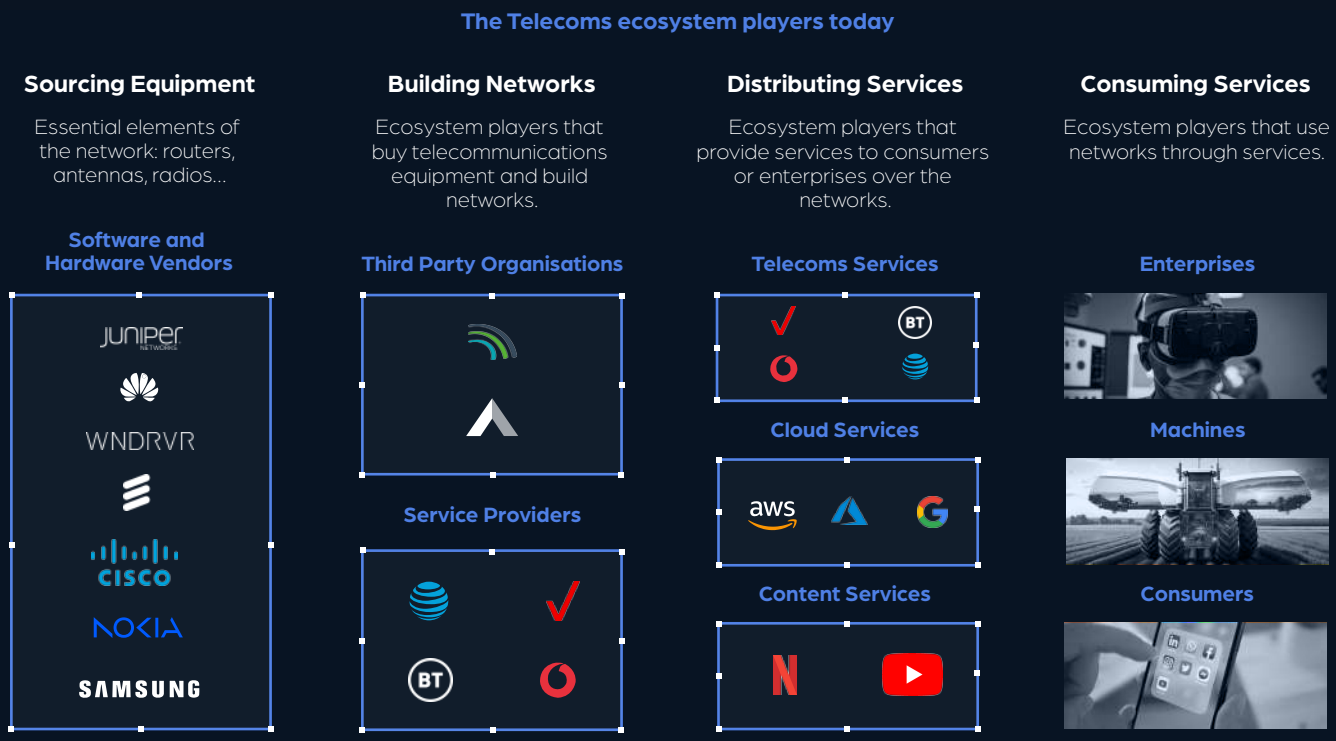
However, one thing is the technology we use to build the networks, the other is how we build them and how we deliver services to consumers and businesses. Networks are traditionally built and owned by Service Providers, which can be fixed broadband providers or mobile network operators. To build these networks, Service Providers buy equipment from suppliers and real-estate to host it.



What is this ecosystem and who participates in it?

Us, the consumers, understand the telecommunications sector from the service perspective: we consume mobile services (from our phones), or broadband services (from our home WiFi or router). However, behind these services there are a large number of players that create the telecommunications market, with the sole goal of getting us connected.

By focusing on how connectivity is delivered to users, we should clearly separate those who provide services, those who build networks, and those who supply raw materials in the form of hardware and software.



How do we consume telecommunication services?

We use devices:

We use these to connect to networks: mobile phones, laptops, robots, VR headsets.

We consume application services:

These applications use Content Delivery Networks (CDN), like Netflix or YouTube, or Cloud infrastructure such as AWS or Google to optimize their reach to consumers by distributing content optimally across the globe. This cloud infrastructure relies on networks to get everywhere.

Who provides Telecom services?

The Service Providers:

Consumers access public networks directly by purchasing mobile plans or home internet broadband. Those networks are deployed by a mobile operator or an Internet service provider.

Enterprise Private Networks:

Focused on building Private Networks, a network that is deployed for exclusive use and allows only authorized users and devices to connect.

Examples include Smart Cities, Factories, Campuses, etc.

Who builds networks?

The Service Providers:

They have been the largest owner of telecoms infrastructure. Traditionally every Service Provider would build their own network to get everywhere.

Third party organizations:

More often we are seeing that the telecommunications infrastructure is built by third party organizations with the objective of selling it "as a service" to Service Providers. These are known as Neutral Hosts, Infrastructure Operators and recently Systems Integrators as well.

Who supplies the Equipment?

The software and hardware vendors

They create all the necessary components such as routers, servers, antennas, to build a network. They implement the standards and are at the forefront of innovation.

There are other players involved in this ecosystem that are directly or indirectly related to delivering networks, these are:

01 The regulator and Government:

Telecoms is a heavily regulated market and every country has a government body that sets out the rules for the industry. This includes giving the rights to access the spectrum (invisible radio frequencies that wireless signals travel over) or create competition rules so that the market is not only favoring one player.

02 The Municipalities:

They play an important role giving access to the street furniture and buildings to mount the Tele-communications equipment.

03 The wider business ecosystem:

They are key users of connectivity and drive the requirements of the network. We look at them to understand where we need to evolve and adopt innovation.

The evolution of the supply chain

In the past, telecoms infrastructure was 100% state owned and the ecosystem has now evolved from that largely monopolistic model to a competitive-consolidated market that it is today. Over the last decades of the 20th century most democratic countries opened up state-owned infrastructure in an attempt to attract private sector investment and motivate innovation in networks.

This market evolution has shown great results. Today, most of the world has a competitive and dynamic market in both mobile and fixed networks with rapid technological improvements. Competition has encouraged Service Providers to deliver networks with increased performance, coverage and capacity – however, competition has not delivered ubiquitous coverage. Why?

The answer is simple: commercial incentives.

Investment in telecoms infrastructure is primarily financed by service providers most of which are part of larger groups which distribute financing. These investments are usually strategic and are always targeted to defend their competitive position.

As a result, the market liberalization that brought fast innovation through commercial incentives, has been the same reason the market has not delivered a level of coverage and service offering that's consistent with public policy objectives and the demand for faster innovation in new areas: such as Smart Cities, IoT, and a plethora of businesses requiring better connectivity to expand services.

04 The supply and demand problem

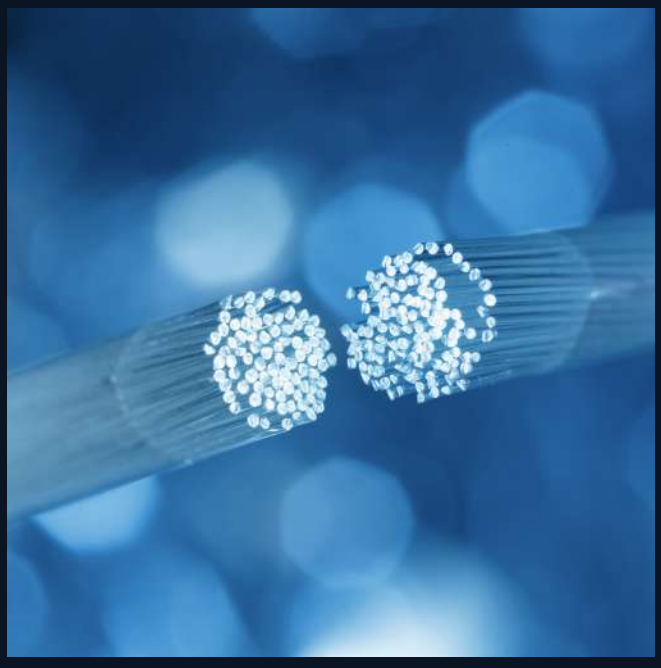
Networks power the economy, and aside from us individuals there's a growing demand from industries to access connectivity: smart cities, manufacturing, transport, office buildings, hotels, shops, etc. The reality is that current investment models and Telecom regulations are not applicable to meet the demand for all these use cases.

Having a small number of infrastructure owners, leaves the market at the mercy of a few players having to uptake all the risk of the investment in new innovative areas. There's little certainty on the return on investment and business cases for large service providers, who are largely focused on the consumer network.

Data usage is exploding and new investments need to be made. The situation is so extreme that some Service Providers are asking the big tech and applications to contribute to help build networks. There is a need to define new business models that unlock the value of connectivity across all sectors, address competition in the market and drive new sources of revenue.

We must open up the market to new investors that support the industry by building more infrastructure.

One business model that can help address the current shortcomings is to make the telecoms infrastructure available to be shared and accessed on-demand. This means multiple Service Providers can share the same physical infrastructure such as cell towers, fiber optic cables, and other networking equipment. This will allow the whole ecosystem to share the costs of building and maintaining expensive infrastructure, resulting in cost savings for each individual company.



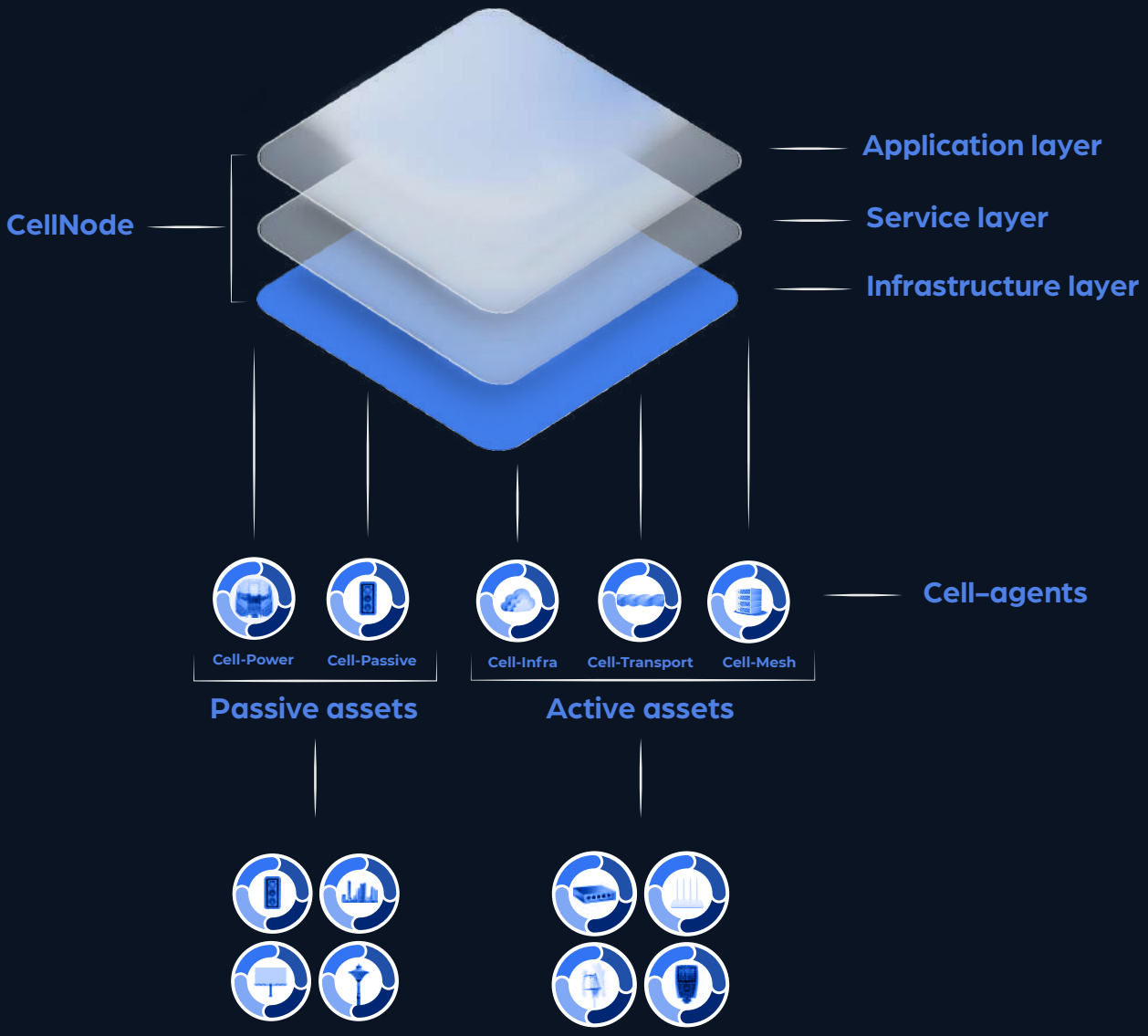
05 Cell–Stack: the software that solves the problem

The migration towards a new business model based on sharing infrastructure requires tools that enable the management of these infrastructure components.

Orchestration software enables telecommunication companies to automate and manage their network operations in a more efficient and streamlined way. It allows different network functions to be controlled and managed through software rather than requiring manual intervention for each individual function.

This means that telecommunication companies can deliver services quicker, reduce errors and costs, and improve their overall network efficiency. Orchestration software is becoming increasingly important as telecommunication networks become more complex and require more sophisticated management tools to keep up with the demands of new technologies such as 5G.

Cell–Stack is a unified platform to monetize telecoms assets, using distributed network management and orchestration allows for any telecoms related asset to be digitized, managed and consumed as a service, creating an open marketplace of connectivity assets. It's a software platform that connects the supply and the demand of telecoms assets. Cell–Stack combines the communications infrastructure into a shared asset pool, enabling its use in an open market by anyone.



Cell–Stack solves a number of business and operations problems in the Telecoms industry:

01 Enables infrastructure to be accessed as a service (IaaS) so that the Service Providers can offer connectivity services across different infrastructure providers.

02 Monetize telecoms infrastructure with a new business model.

03 Help service providers reduce their capital expenditures on physical infrastructure.

04 Speed up network deployments.

05 Respond more quickly to changing market conditions and customer needs.

In order to allow for better scalability and flexibility, we created Cell-Stack following a novel distributed multi-agent architecture. The use of agents and micro-services are essential to scale the number of assets that we digitize and support in the network.

Cell-Stack is composed of 2 core elements, Cell-Node and Cell-Agents. The node is has three core layers, from the top:

An **application layer** for users to interact with the platform.

Cell-UI is a multi-tenant platform, a single point for everyone to visualize, manage and interact with the assets. Some of the key components of the User Interface are:

- Role based access control, where organizations and users can grant access and rights to users allowing to securely separate information and key operations from one another.
- Efficient management of resources with alarms, notifications, collection of historical data of the assets.
- Geo-location of assets for easy finding and access for the consumers of connectivity.

A **service layer.**

It is the aggregation points of all the domains and the resources under management, it exposes all of them to the application layer. Some of its core functionalities are:

- Maintaining the individual asset registries for each network participant's contributions.
- Onboarding infrastructure assets, deploying compute, storage or network resources into the physical infrastructure.
- Live management of assets during runtime, which include scaling up or down resources, creating services using the resources in the infrastructure.

An **infrastructure layer.**

It aggregates all types of infrastructure under management. The lower layer of Cell-Node communicates with the agents, and collects all the information coming from the different domains or types of assets. Cell-Stack can manage and digisite through the use of agents the following types of assets:

- The **Cell-Power** software agent measures the energy consumption of any device powered by electricity. It also offers the possibility to remotely turn devices on and off from the management platform. This agent helps to turn on and off equipment based on the usage, and contributes to the overall sustainability of the telecoms infrastructure. It's also useful for infrastructure owners to know how much their tenants are consuming.
- The **Cell-Passive** software agent controls elements like towers, street lights or any sort of infrastructure used to build networks. These types of assets are crucial to build networks, and can also be digitized and offered as a service. Cell-Passive has standard data schemas to be used across all assets to accelerate the onboarding process, creating digital twins of the components in the platform.

- The **Cell–Infra** software agent lives in the servers, computers and machines that run the logic of the telecoms network: like the 5G software, satellite nodes, WiFi modules... Cell-Infra provides control and monitoring for any type of cloud or bare-metal machine. With Cell-Infra we are able to control and manage all the active network equipment, and it's key to offer infrastructure as a service through Cell-Stack.

- The **Cell–Transport** software agent is in charge of sending instructions to the transport network, that is through a software defined network controller or any type of wide area network controller.

- The **Cell–Mesh** software agent creates a mesh-type network using direct communications between nodes. Cell-Mesh can aggregate different networks like WiFi, 4G, Satellite, LoRa and extend the connectivity using a peer-to-peer topology. It provides autonomous authentication and registration amongst peers and it also allows hopping traffic between one node to another until it finds a gateway to the Internet.

All the assets digitized and managed by Cell-Stack can be separated into two broad categories:

- **Active Assets:** assets that represent active equipment on the network which includes equipment like switches, wireless routers, radio transmitters, networking hardware, energy equipment and other active equipment required to have your network running efficiently and reliably.

- **Passive Assets:** assets that represent an enclosure or a physical piece of infrastructure used to support active assets, this can be masts, ducts, power sources or street furniture.

06 Cell-Stack with blockchain

As we have seen, the telecoms ecosystem is complex, full of participants and messy in the separation of who does what. The evolution of telecoms is driven by software with tools that help improve reliability, security and availability of networks.

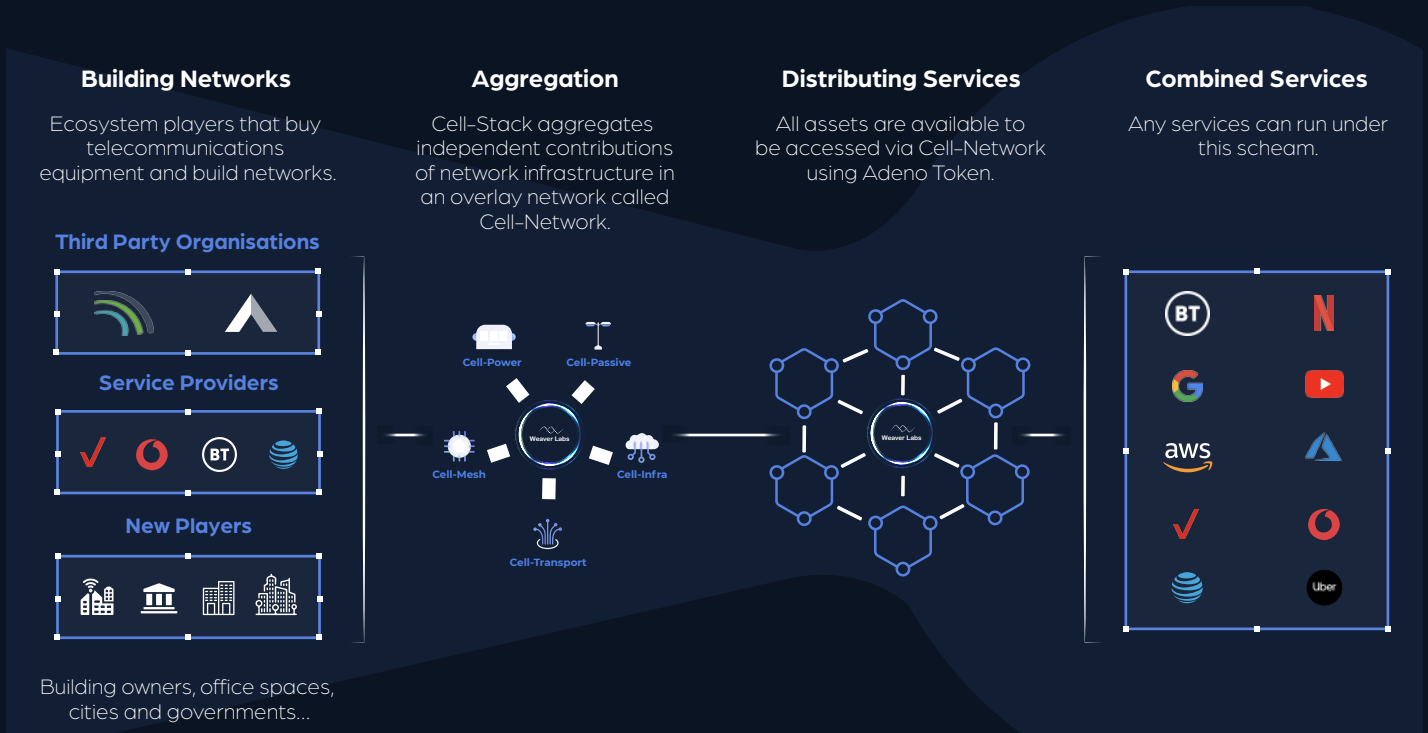
Software tools like Cell-Stack can be created following a centralized architecture, where the network infrastructure is fully orchestrated and managed following a single point of control that manages all aspects of the platform.

This solution comes with some disadvantages:

- ✕ A centralized architecture can provide greater control and visibility into the platform, but also creates a single point of failure.
- ✕ A service layer that is fully centralized requires high levels of customization to grow, limiting the number of integrations of the types of infrastructures that can be managed.
- ✕ As the platform grows, the infrastructure to maintain Cell-Stack can be very expensive to maintain, facing prohibitive operational costs.
- ✕ As the network grows, it will also require a large amount of resources to run, impacting scalability.

As we move on to coordinating an Infrastructure as a Service marketplace, the idea of decentralized architectures becomes more attractive:

- ✓ It provides a distributed control system that can help to improve the reliability and resiliency of the platform by eliminating a single point of failure.
- ✓ It will be less expensive to maintain and operate as the infrastructure grows and the number of participants of the network grows with contributions.
- ✓ Blockchains allow for secured, shared, and distributed recording and tracking of resources and processes, ensuring immutability of the data, without the need of a centralized trusted authority.
- ✓ Blockchains are the keystone of decentralized identities and verifiable credentials, providing the ability to identify organizations and assets without central authorities and across ecosystems.
- ✓ The use of smart contracts can help to automate many of the processes involved in Infrastructure as a Service, like renting physical assets like street lights or towers, or maintaining the registry of the marketplace assets.



This new way of organizing the ecosystem looks like this:

Ecosystem players who were building networks continue to do so, and run Cell-Stack to put their assets into a shared pool.

All assets are aggregated into an overlay network, called "CellNet" which is a result of all the physical infrastructure contributed by those building it. Because we integrate infrastructure that belongs to different owners, we're incentivising even the smallest contributions, like a building owner fitting an apartment building with neutral network infrastructure.

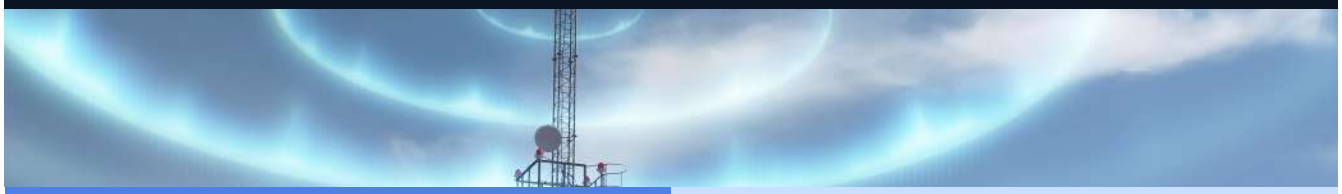
The blockchain layer is in charge to coordinate the access to this infrastructure to whoever wants to provide services, that being a Mobile Operator using it to serve their users or a Smart City application using a Government-owned network. The blockchain will handle a variety of transactions related to the different functionalities from the network, like the deployment of resources, allocation of resources to the different users, scaling up/down of resources, payment of services, monitoring the performance or usage, reporting on usage, and governance of the resources.

All transactions are settled in Adeno (ADE), the ecosystem's native token.

By leveraging the power of blockchain and communications assets technology, the overall goal of CellNet is to create a more efficient, sustainable and robust communications network to service demand.

Who benefits from this?

The Telecoms industry



This new ecosystem offers a new way to sell and access infrastructure as a service for those who build infrastructure and those who sell connectivity services.

Sustainable approach to build and use Networks.

Government, Regions and Regulators

They can have a role building telecoms infrastructure for the citizens.

Services can evolve faster and have an impact on the economy: healthcare, education, transportation...

The Businesses

The open marketplace will allow businesses to get connected faster, choose the right connectivity to deliver services to everyone.

The Consumer/individual

Better services, enhanced connectivity and improved digital experience.

Have the ability to participate in this new ecosystem.

07 Use cases for CellNet

Our experience working with the telecommunications ecosystem as well as innovators that require connectivity gives us a good understanding of where CellNet can help. Some straight-forward examples are:

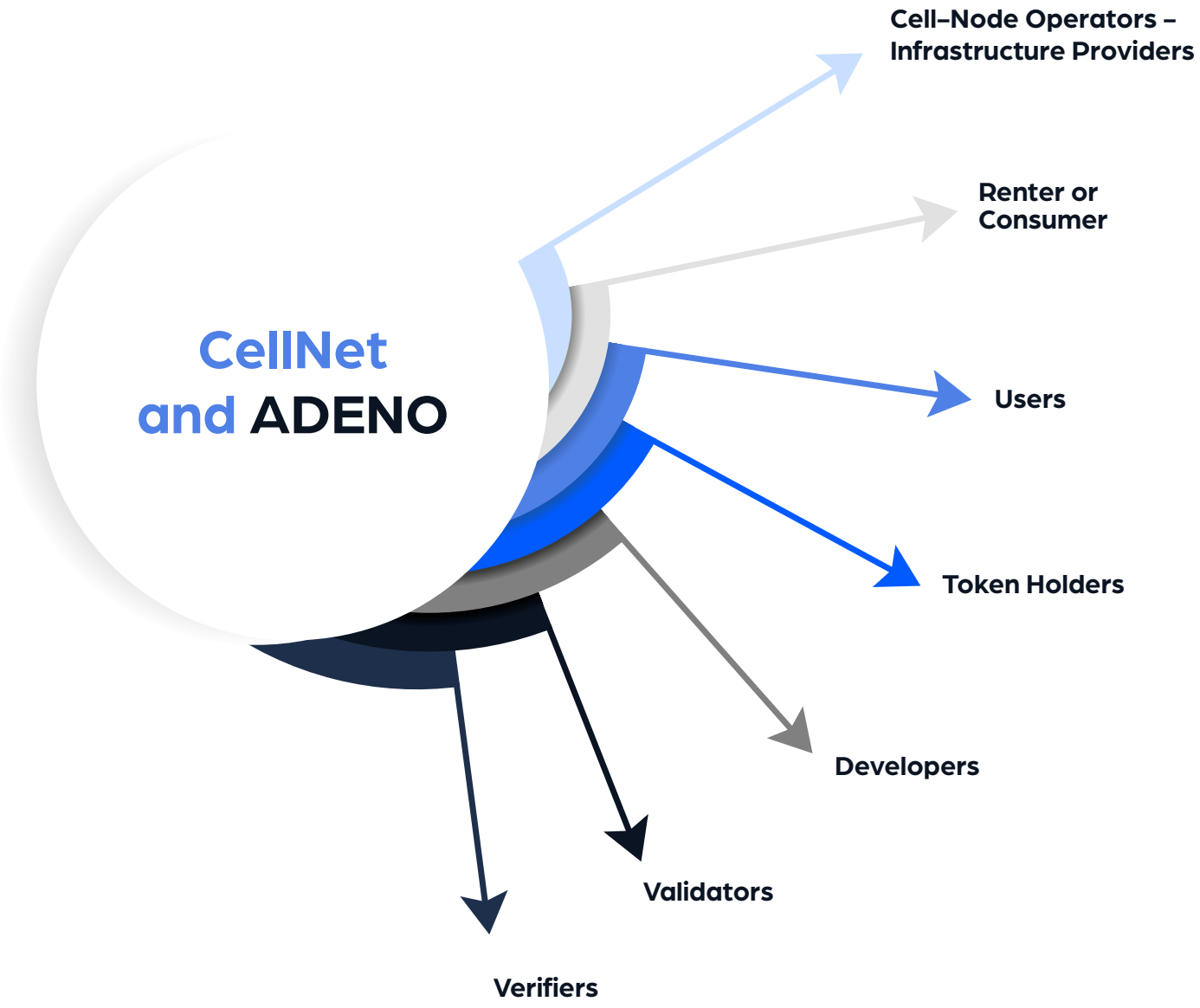
Smart Cities					
What?	Services like CCTV, Air quality sensors, waste management or traffic congestion need telecom networks to work.	**How?**	They usually use the public network which is not built for these use cases and it's unsecure, not flexible and expensive. CellNet helps in two ways: it allows for new infrastructure to be built leveraging existing resources, and fast-tracks services to be connected to the network.	**Impact**	Better adoption of smart city services, innovation in cities can expand impacting growth and productivity.
Public Sector Services					
What?	Healthcare, Education, Transport or Emergency response all require connectivity to improve how services are delivered to the people.	**How?**	Currently the Public Sector relies on public 4G for outdoors. It's not reliable, scalable and sometimes not available. Using CellNet the Public Sector can accelerate connectivity by renting their assets via NFTs for others to build networks, or they can build the network for themselves.	**Impact**	The Public Sector will be able to modernize and offer a better user experience. Will benefit from innovations such as remote healthcare or education which allows them to cut costs and promote efficiency.
Internet for Everyone					
What?	Coverage is a big problem in rural areas, indoors and some urban left-behind areas.	**How?**	Investment of infrastructure is based on cost-benefit and many non-profitable areas remain unconnected or have low quality Internet access. CellNet brings a new model for cooperation and collaborative investment.	**Impact**	Reduce the big digital divide that exists even in first world countries.
Enterprise Networks					
What?	Connectivity underpins value generation for all businesses, and there's a prolifery of solutions that improve manufacturing, logistics tracking or even stadiums.	**How?**	Connectivity is usually provided by proprietary and custom made solutions that are often not flexible, difficult to manage and expensive. With CellNet, private networks can be built leveraging existing infrastructure on-demand. New owners of networks also can expand their assets for enterprise users, like office buildings.	**Impact**	Less networks are built on silos to connect these applications - CellNet makes it scalable and affordable to make the business case.

08 The CellNet ecosystem

With CellNet and Adeno (ADE), we're building a community around the telecoms ecosystem. Telecom networks are central to all our lives and businesses and we want to open the ecosystem to a vibrant and diverse set of players.

The ecosystem is made up of a diverse group of actors who all play a role in providing secure, decentralized, and affordable communications infrastructure for use in connectivity services.

Who are the key ecosystem players?



Cell-Node Operators – Infrastructure Providers:

These are entities that own and operate physical telecommunications infrastructure, such as data centers, fiber optic networks, and wireless towers.

They make their infrastructure available for use by other players in the ecosystem and earn Adeno as a compensation for providing assets to the network.

Renter or Consumer:

These are entities that provide services on top of the infrastructure, such as mobile coverage, internet services, cloud computing, virtual private networks (VPNs), and content delivery networks (CDNs).

They use the infrastructure provided by the Cell-Node operators to deliver their services. They pay node operators in Adeno in exchange for the assets consumed. Note that Renters or Consumers can get Adeno in the secondary market or use a Payment Gateway to gain access to the platform using fiat.

Users:

These are individuals or organizations that use the services provided by the Renter or Consumer. They can access these services through various devices, such as smartphones, computers or IoT devices.

Token Holders:

These are individuals or entities who hold Adeno tokens as a store of value or as a means of proving asset ownership.

Developers:

These are individuals or organizations that develop applications, tools, or services that are built on top of the infrastructure and services provided by the ecosystem. The developers have access to information from the network, and can leverage information to optimize their applications. These are also individuals or teams who work on Cell-Stack and help to improve and maintain the network. Developers can contribute to the open-source codebase, create new tools and applications, and help to ensure that the network remains secure and scalable.

Validators:

These are Cell-Nodes that validate and process transactions on the blockchain. Validators earn Adeno as reward for their service, as well as ensure the security and integrity of CellNet as a whole.

Verifiers:

These are Cell-Nodes who do not provide metered services but contribute to the network by periodically auditing and verifying the integrity and quality requirements by Cell Node Operators.

09 The Adeno token

Adeno Token is the cryptocurrency created for the Telecommunications industry to monetise access to telecoms infrastructure. With Adeno, we create a decentralized physical network, shifting the existing ownership model and empower infrastructure as a service.

Adeno transforms the telecoms sector, by providing a more flexible, on-demand payment mechanism that includes governance and service level metering. Adeno provides a layer of governance to access physical network infrastructure, bringing together elements of network usage monitoring, metering of assets, SLA upkeep and payments.

What is the Token Flow?

The token economic model demonstrates how a diverse set of infrastructure owners can operate within this network; contribute resources and receive compensation while satisfying the new levels of connectivity demands. We explain the flow from the perspective of the owner of passive and active assets using a simple example, as they will have different flows within the network:

Passive asset owner perspective of registration in CellNet:

ONE

Pam owns a mini-data center (a passive asset) where she hosts space for networking hardware like switches or servers and wants to contribute to cell-network.

TWO

Using Cell-Stack, Pam creates an NFT of the asset and places it in the resource registry of CellNet.

THREE

Pam specifies attributes of the asset such as the available space, the lease duration, the price and other unique inputs for the generation of the NFT.

FOUR

Pams mini-data center is added to the resource registry maintained by Cell-Network and is now available for rental. Pam becomes a Cell-Node operator in the network.

Active asset owner perspective of renting a passive asset in CellNet and registering active assets in CellNet:

ONE

Bob and Chad own servers and telecommunications equipment like a 5G Radio transmitter and other networking equipment and wish to find a space to place these assets.

TWO

Bob and Chad visit the CellNet registry for available space to lease and place these assets.

THREE

Bob and Chad find Pam's lease, price and duration and commit to a lease, by acquiring Pam's NFT.

FOUR

Using Cell-Stack, Bob and Chad can put their active assets up for rental in the resource registry, and they become Cell-Node operators in the network.

Renter or Consumer perspective to access infrastructure to provide a service:

ONE

Alice is a Service Provider, and comes into the ecosystem as a Renter or Consumer because she wants to run a service like a virtual private network, a mobile service, a content server or an Ethereum node and needs access to infrastructure to do so.

TWO

Alice uploads her request to access infrastructure on CellNet, specifying the amount of storage, compute and network resources she needs, including the duration of the rental.

THREE

Cell-Node operators, like Bob and Chad who are offering services receive a notification from CellNet that there is a request for network, compute and storage resources. They can accept it or reject it based on their available resources, requirements or pricing preferences.

FOUR

Once a Cell-Node operator accepts the service provisioning request, the applications that Alice needs to run begin consuming resources from the infrastructure and Alice starts offering services.

FIVE

At any point during the rental period, Alice can request and access information from her applications running in the infrastructure through Cell-Stack's dashboards. She will use her private key to do that since all the information and data stored in the third party infrastructure is encrypted.

SIX

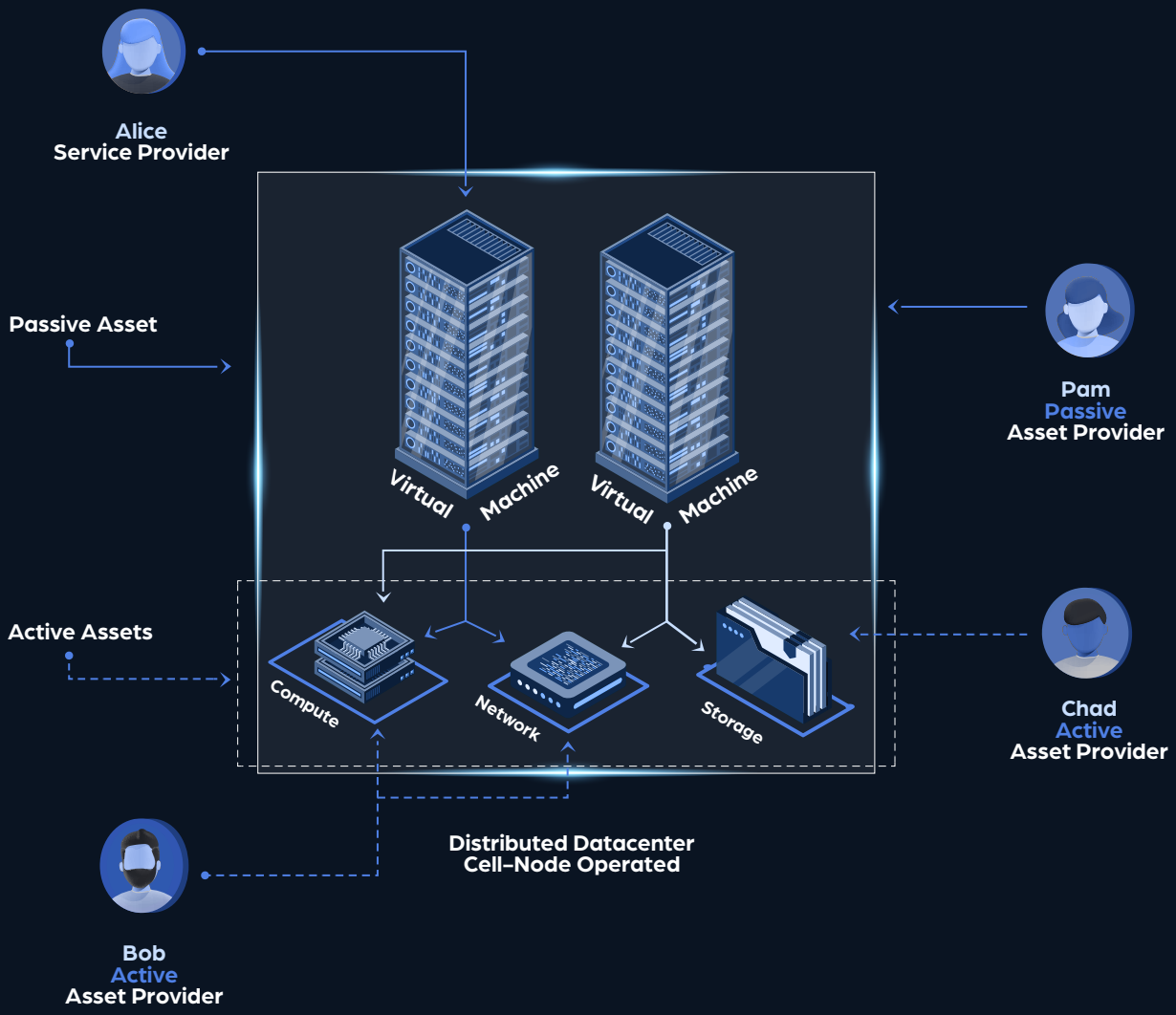
When the reservation period has expired and no additional request for resources has been made, the application stored in the infrastructure is removed.

SEVEN

Cell-Node operators offering resources (compute, network and storage) to CellNet receive Adeno as Payment.

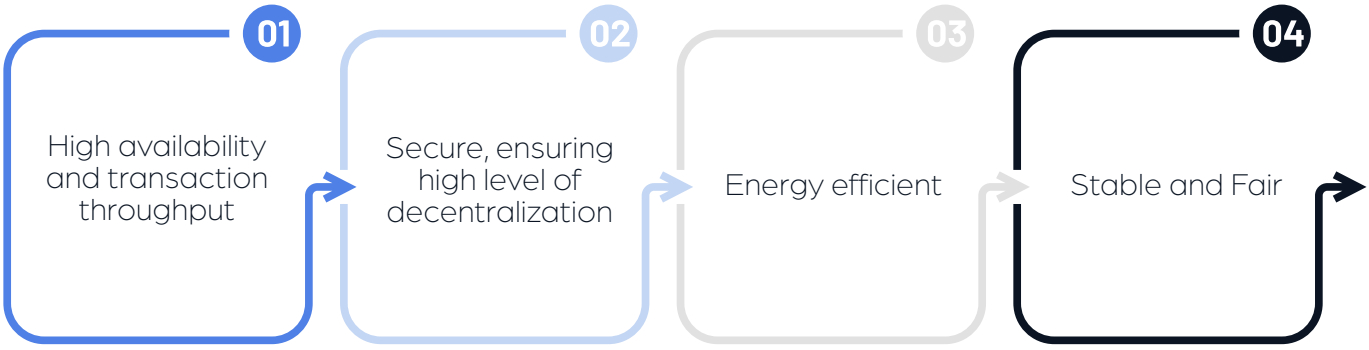
EIGHT

Cell-Node operators can require payments to be made in intervals and can make use of payment gateways to mitigate against volatility.


Alice
Service Provider
Passive Asset
Pam
Passive
Asset Provider
Virtual Machine
Virtual Machine
Active Assets
Compute
Network
Storage
Chad
Active
Asset Provider
Distributed Datacenter
Cell-Node Operated
Bob
Active
Asset Provider

10 Selection of consensus

Consensus protocols play an important role in the fundamentals of blockchain technology. In blockchain systems, the security and the fault tolerance were guaranteed by the consensus protocols. As a distributed infrastructure with decentral coordination, CellNet's consensus requirements are:



CellNet requires awareness and proof of assets beyond the transactions generated, these proofs need to validate the existence of the cloud and communications networks assets being placed by the Cell-Node Operators into the marketplace. In this case, rather than solely relying on computation power or token holdings, as the most well-known consensus mechanisms do, CellNet requires Proof of Resource which aligns with the Node Operator's contributions to the marketplace. The Proof of Resource includes a combination of assets that are required to create an end to end network: compute, storage and network.

To that end, Proof of compute, storage and network are consensus mechanisms that are combined to assert proof of end to end connectivity by leveraging the transmission capacity, storage and computational power to validate transactions and add new blocks to the blockchain. These combined proofs are designed in alignment to the service offering of nodes in the infrastructure in a way to ensure data integrity, transmission, storage and compute in their advertised capacity and prevent any abuse of the network.

Proof of compute: a mechanism to verify a Cell-Node operator's contribution with infrastructure assets that relate to compute

01 **Compute commitment:** To participate in the Proof of Compute consensus mechanism, a Cell-Node Operator must first make a compute commitment by reserving a certain amount of computing power on their computer or device. The Cell-Node operator must then prove that they have reserved the computing power by submitting a compute proof to the network.

02 **Compute proofs:** A compute proof is a cryptographic proof that demonstrates that the Cell-Node Operator has reserved the required amount of computing power committed for rental, and used it in accordance with the commitment and for the duration of the Rental period. The Proof of Compute captures work done in a public and verifiable way without having to re-execute the work. To ensure continual service, network verifiers periodically query Cell Node operators with challenge/response exchanges to ensure continual compute service and data integrity.

Proof of storage: a mechanism to verify a Cell-Node operator's contribution with infrastructure assets that relate to storage

01 **Storage commitment:** To participate in the proof of storage consensus mechanism, a Cell-Node Operator must first make a storage commitment by reserving a certain amount of storage space on their device. The Cell-Node Operator must then prove that they have reserved the space by submitting a storage proof to the network.

02 **Storage proofs:** A storage proof is a cryptographic proof that demonstrates that the Cell-Node Operator has reserved the required amount of block storage space and is storing data on it. The Node operator is required to convince the requesting party that the reserved storage block is reserved and available for the Renter. This is achieved through a series of challenge-response exchanges between the Node Operator and network verifiers.

Proof of network: a mechanism to verify a Cell-Node operator's contribution with infrastructure assets that relate to network capacity and transmission

01 **Network commitment:** To participate in the proof of Network consensus mechanism, a Cell Node Operator must first make a Network commitment by providing Quality of Service (QoS) metrics for their network. The Cell-Node operator must then prove that they have reserved the bandwidth and transmitted data, amount and at the committed quality by submitting proof to the network.

02 **Network proofs:** Network proofs are cryptographic proofs that qualify the Network commitment made and maintain the requested QoS for data transmission. Verifiers randomly query the Node operator for quality metrics to ensure the Renter's Quality of Service requirements are fulfilled. At the end of the rental period, the proof of Transport (containing the transmission metrics) is maintained within the transaction receipt and submitted to CellNet for validation.

For every proof submitted to the network, compute, storage, network or access, there will be a validation and block creation process:

03 **Validation:** Once a Cell Node Operator submits a proof it is validated by the network. The validation process involves checking the proof against a predefined challenge, and verifying that the data is processed correctly.

04 **Block creation:** Once enough Compute, Storage and Transport have been validated, a new block is created and added to the blockchain. The block includes a list of validated proofs, along with any new transactions that have been submitted to the network.

To participate in any one of the proof of resource consensus mechanisms, a Validator/Verifier must first become a node on the network by running a software client that connects to CellNet and contribute to the overall ecosystem by validating transactions.

Each node in the network is assigned a connectivity score based on its historical resource contributions, valid service offering and overall level of connectivity to other nodes in the network. The connectivity score is calculated based on factors such as the number of connections, the quality of service offered and realized for serviced connections, and latency, jitter and packet loss incurred during transmission of serviced connections.

11 Token flow economic model

The core components of our macroeconomic model are:

Treasury, which has the role of:

01 Allocation of funds to essential network functions.

a) Liquidity Provisioning (e.x. onboarding gateways)
b) Release allocations to fund contract entities (for example, pre-main net network rewards)

02 Holding network reserve funds required for:

a) Airdrops
b) Grants
c) Partnerships
d) Bounties (social media, blogs, influencers, articles, translators, bug bounties, design elements)

ADE Token Holders, who play an essential role in CellNet. They help to validate transactions, maintain the blockchain, offer metered services, drive adoption of the currency and secure the network. The main role of the Token holders is:

01 Access to the marketplace. Create bids and asks for physical assets using NFTs. Hosting and Rental agreements are brokered and serviced in Adeno.

02 Payment for transaction fees. ADE holders can use their tokens to pay transaction fees on the network. These fees are paid to users validating and processing transactions in Cell-Net.

03 Payment for services. Holders of ADE can pay for infrastructure services.

04 Access to metered Services. Adeno holders can use their tokens to access Storage compute and Transport services within CellNet.

05 Participate in governance. Token holders may choose to vote on proposals affecting key elements of the network, such as deciding on expanding network coverage for under-serviced regions.

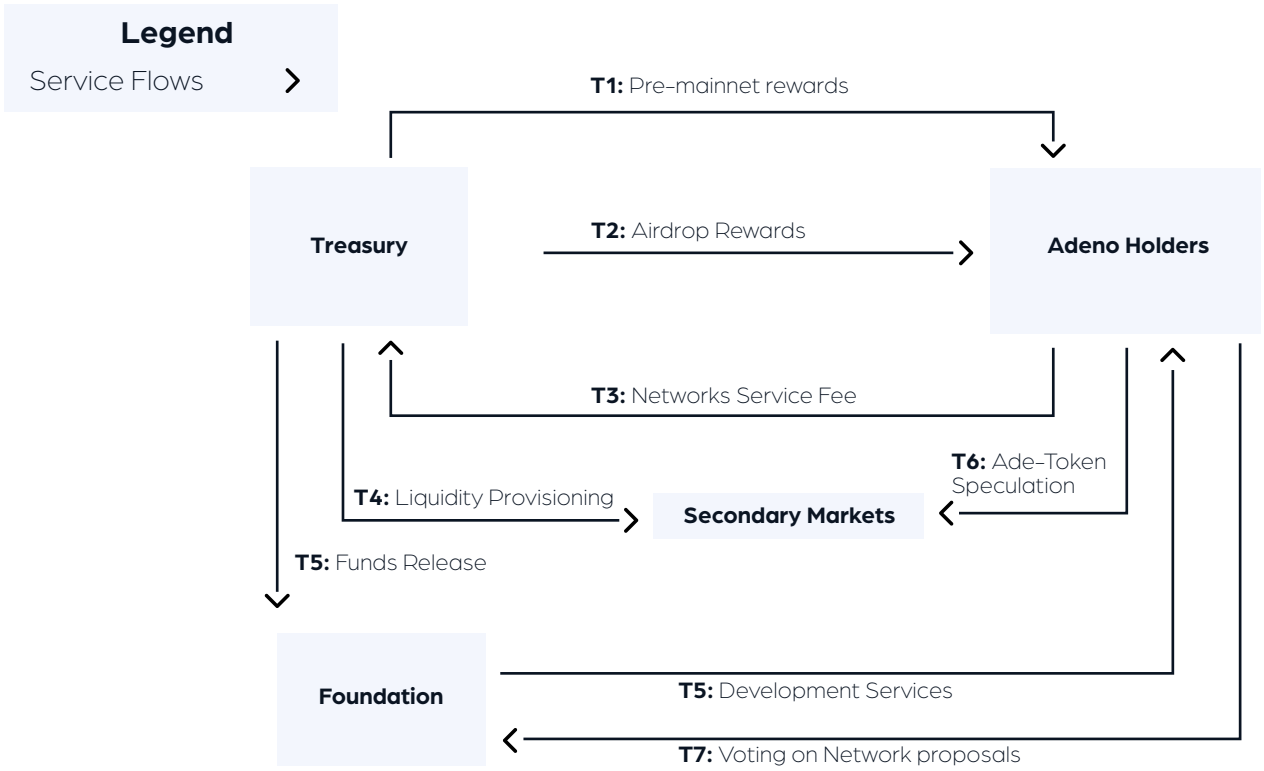
06 Earning rewards. Cell-Node Operators earn rewards by providing Transport, Compute and Storage to the network.

07 Network Participation Rewards. This is the pre-main net rewards for early stage network contributions and testing.

Foundation, **Team** and **Advisors** are participants of the network who operate and promote the network promoting growth and research and development. The foundation plays a role in the sourcing of external entities required for passed governance mandates.

Ecosystem

(Token Flow Economic Model)



T1 Pre-mainnet rewards for participating in transaction validation.

T2 Airdrop rewards are used to incentivize early adoption, participation and community growth. Initially, these rewards are recognized through:

- Community bounties
- Development & Security Bounties
- Marketing bounties

T3 Cell-Node Operators who offer metered services are compensated for their work by the Service Provider. The network service fee is taken from the exchange of services/infrastructure by the Cell-Node Operator and the Renter/Consumer. It is redirected to the treasury to fund (i) proposals requiring funding (including those proposed in votes) (ii) development of features and operation.

T4 Treasury may provide liquidity to secondary markets paying secondary market fees for B2B service provisioning for fiat onboarding.

T5 The Foundation requests the release of funds from treasury for rewarding actions taken by community members for executing mandates specified in proposals. Actions include project development, community development and network extensions.

T6 Adeno Holders trading tokens on Secondary Markets.

T7 Adeno-Token holders Adeno holders participate in the network governance by means of voting on and creation of proposals.

12 Governance

Our primary objective is to enrich all network users' engagement through our governance framework. At launch, CellNet will have informal off-chain governance. Initially, the core team will operate independently with the primary mandate of delivering the decentralized infrastructure communications network. The community can participate and enact change throughout the ecosystem through the submission of Improvement proposals which will be subject to a voting process. The team will create "call for proposals" for different topics, and the community can submit their ideas via an online form. The team will then review and progress those that are more meaningful to the ecosystem.

How do Improvement proposals work?

Proposals can be submitted by any Adeno holders. At this stage we define three broad categories for the community to submit changes:

01 Ecosystem proposal: the community can use these to request changes or additions to actions related to ecosystem building and engagement with the ecosystem. Some proposals that can be brought up by the community are:

- Allocation of grants set by foundation
- Prizes and bounties set by the foundation
- Minimum % Voting for a proposal

02 Network Connectivity proposal: the community can suggest investing in certain areas for improvement of connectivity with funds taken out of Treasury. Weaver Labs is committed to taking connectivity everywhere and we will work with the community to make sure we make this happen. These proposals will result in infrastructure projects taking place using our network of partners and our full expertise to deliver connectivity.

03 Protocol and Policy proposal: the community can also submit specific proposals that relate to the overall functioning of CellNet, like rewards schemes or related to specific protocols.

The flow of the proposal is the following:

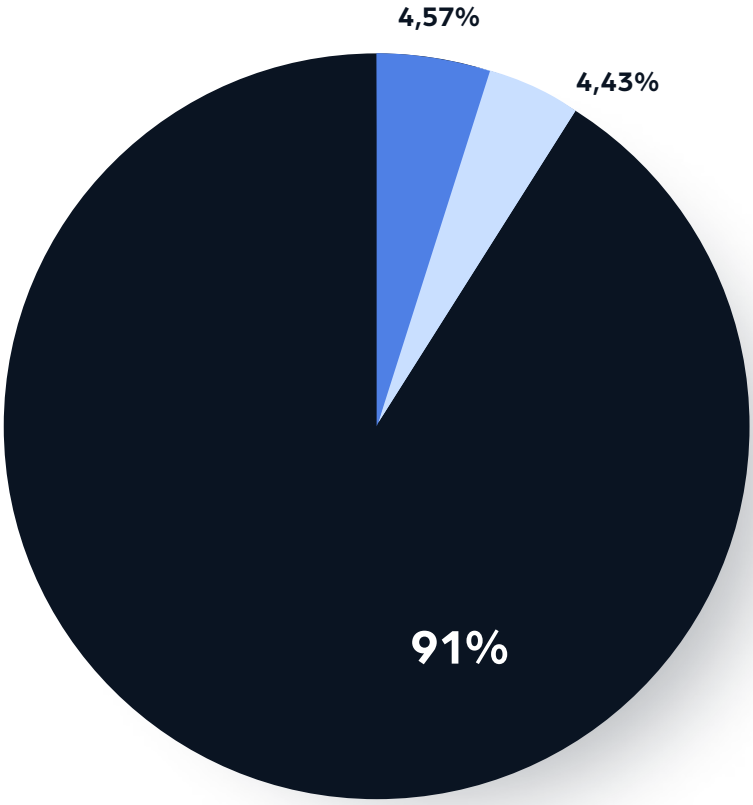
01 Proposal is created based on its type
02 Submitting the proposal
03 Review of proposal
04 Creation of contract
05 Voting period starts for the proposal
06 Holders vote with a "YES" or "No"
07 Based on the outcome of voting we have on of the proposal states

Each proposal must follow this specified form:

01 Short Description
02 Why the proposal in needed
03 Steps to be accomplished
04 Entity making the proposal and the responsibility of each participant
05 Proposal milestones, completion and schedule

13 Tokenomics

The total Token supply of the network is 2.625 billion ADE. From the total supply, we will initially mint 9% to bootstrap the network, which will be distributed as follows:

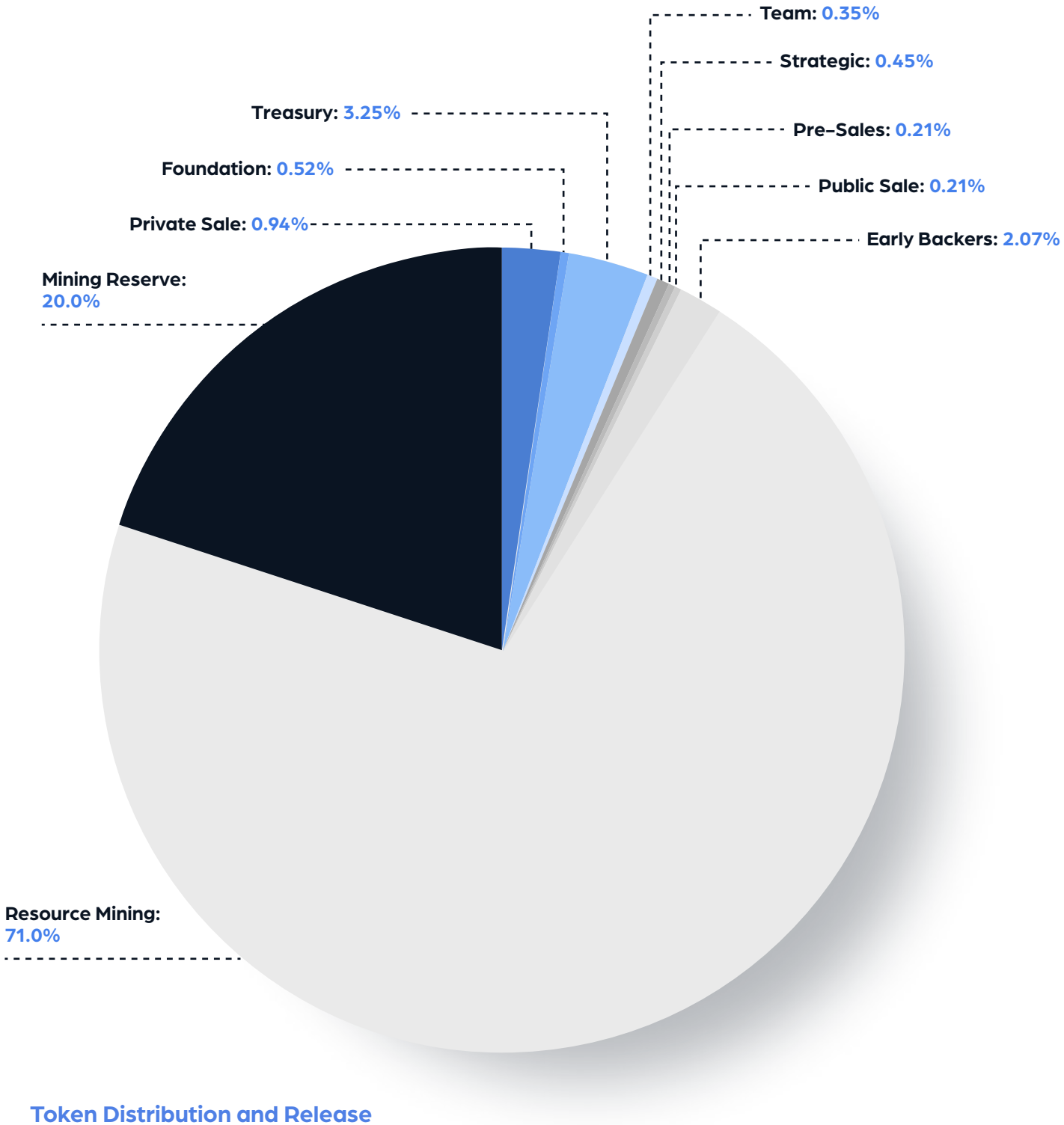


- **4.57%** distributed amongst foundation, team, advisors, treasury, initial rewards, and strategic sale.
- **4,43%** will be allocated to early supporters, aswell as private, pre-, and public sales.

The remaining **91%** will be used for block producing rewards. Tokens unsold will be allocated for ecosystem development and treasury.

Sale Allocation:	
Early Supporters:	This is 2.07% of the total supply for investors who have been with Weaver Labs since its very early days.
Private Sale:	This is 1.94% of the total supply sold to investors and has taken place across two different stages, the first held in early 2022 the second in Q2 2023.
Pre-Sale:	This is 0.21% and the first community pre-sale will take part in Q3 2023. The second pre-sale will be done in Q2 2024.

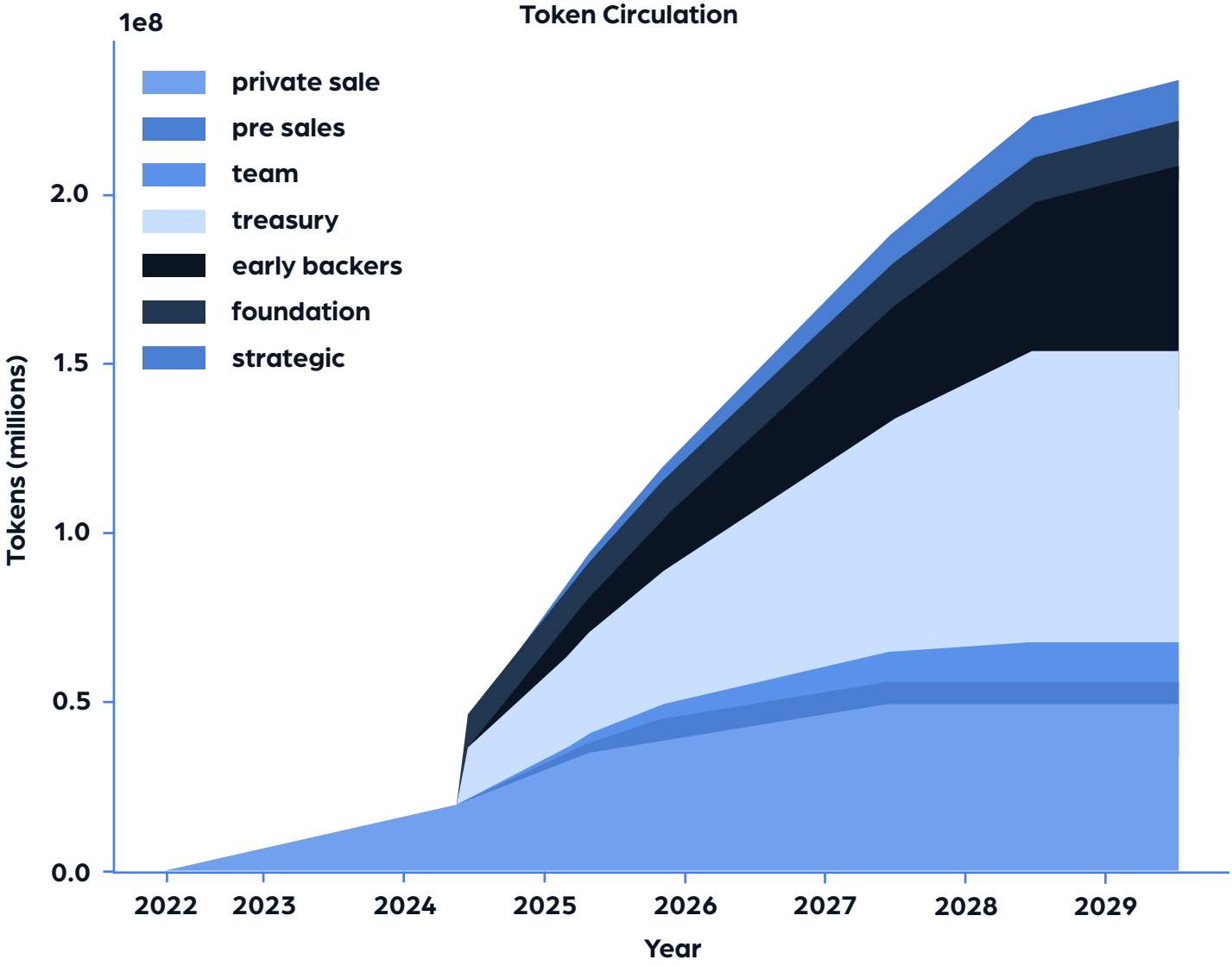
Public Sale:	This is 0.21% of the total supply.
Strategic Sale:	This is 0.45% of the total supply and is reserved for a sale with Telecoms partners or strategic users of Adeno Tokens.
Pre-allocations:	
Treasury:	Holds 3.25% of the total supply. It's main role is to drive adoption and network participation.
Foundation:	Holds 0.52% of the total supply, which is used for airdrops and operational expenses.
Team:	Tokens distributed to the team members, a total of 0.35%
Network Rewards:	
Pre-Mainnet rewards:	From the Treasury allocation Tokens will be delivered to users for initial phase protocol testing. These tokens are used to test and reward those participants engaging in consensus protocols and core network functions.
Resource Mining:	71% At network launch, the only block-producing group with rewards will be resource providers. This is the earliest group of block producers, and the one responsible for maintaining the core functionality of the network. This will primarily cover block rewards for maintaining the blockchain, running Cell-Stack as CellNet operators and subsidizing reliable, available and useful resources.
Mining Reserve:	20% these are reserved to ensure that economic incentives exist to support healthy economic participation in the future. For example, to support the addition of block-producing nodes in the form of validation and staking nodes external to those offering metered resources, as a means to overcome throughput or scaling issues. The mining reserve is not yet scheduled to be released, it will be up to the community to decide how to best distribute these.



Token Distribution and Release

Some allocations of Adeno Tokens come with lockup and monthly release periods. These are specifically designed to control the flow of tokens into the supply and ensure the market stays healthy.

Vesting		
First Private Sale Vesting	36 months	Monthly release equally distributed
Second Private Sale Vesting	36 months	Reverse cliffed
Pre-Sales	8 months	Monthly release equally distributed
Public Sale	None	
Treasury	48 months	15% Unlock upfront, Monthly release equally distributed
Pre-Mainnet Reserve	48 months	Monthly release equally distributed and delive-red to Treasury
Foundation	36 months	25% Unlock upfront, Monthly release
Teams	36 months	Monthly release equally distributed
Advisors	36 months	Monthly release equally distributed


Token Circulation
1e8
private sale
pre sales
team
treasury
early backers
foundation
strategic
2.0
1.5
1.0
0.5
0.0
Tokens (millions)
2022
2023
2024
2025
2026
2027
2028
2029
Year

14 Roadmap

Milestones to date

What have we achieved to date?

September 2020

First partnerships for pilot deployment with TfGM and Vivacity and funding for Smart City Trial. Beginning of Cell-Stack product development.

March 2021

Seed Investment from early-stage backers.

August 2021

Second pilot project with ESA with funding to develop WireMQ for Mesh networks in partnership with Datarella and Ororatech.

December 2021

First use of NFTs for Public Sector - extension of Cell-Stack to support rental of passive assets.

January 2022

Strategic private sale with early backers. Third pilot project for Cell-Stack for Neutral Hosting in partnership with Cellnex and University of Bristol.

July 2022

Demonstration of first UK Smart City trial with presence of Minister.

October 2022

ITS Awards Nomination.

January 2023

Weaver Labs leading cybersecurity in REASON a £12m investment in Open Networks.

March 2023

Cell-Mesh successful in Lab testing and integration with partners in Track & Trust.

May 2023

- Announcement of London trial with key stakeholders in the telecoms space.
- White Paper release.
- Private Sale with more strategic investors.

July 2023

Adeno Pre-Sale is on!
Hosting our first in-house AMA

September 2023

Weaver Labs Teams Up with Liverpool City Region in £9m project to install Cell-Stack in 5 different venues.

October 2023

Celebrating 5 Years of Weaver Labs!

November 2023

Cell-Mesh Prototype Passes European Space Agency's FAT Test, moving to MVP - Next Milestone is testing from Vienna to Ukraine in May.

December 2023

London Trial: Cell-Stack Integrated into Urban 5G Network, bridging uncovered areas.

February 2024

Weaver Labs at the MWC24.
Weaver Labs won £800K to lead software development for unprecedented levels of experience for fans in stadiums in project Arana.

Roadmap ahead

2024 Roadmap

Q1 – Jan to March

- Onboarding new partnerships for Adeno and Cell-Stack, we will announce those as contracts allow us.
- We aim to secure more deployments for Cell-Stack and one large partnership for ADE.
- Team growing to support new developments: in marketing and tech development with two new roles.
- Alignment of roadmap: we expect to align Cell-Stack development, projects and new deployments with ADE sales and launch. For us everything is connected - product, customers and ADE.
- 3 high-quality events in the context of Telecoms, AI and open networks ecosystem with speaker slots.
- Delivery of first 6G demo with WireMQ at Mobile World Congress.

Q2 – April to June

- New partnerships: Onboarding new partnership for Crypto development and adoption of
- Adeno expanding the use of Cell-Stack and supporting the creation of a proposal based market to bridge the gap relating to connectivity access.
- Cell-Stack deployment in first venue in Liverpool in partnership with the Liverpool HDD project partners.
- Trial of Cell-Mesh in Munich with partners delivering goods towards Lebano.
- Second public pre-sale.

Q3 – July to September

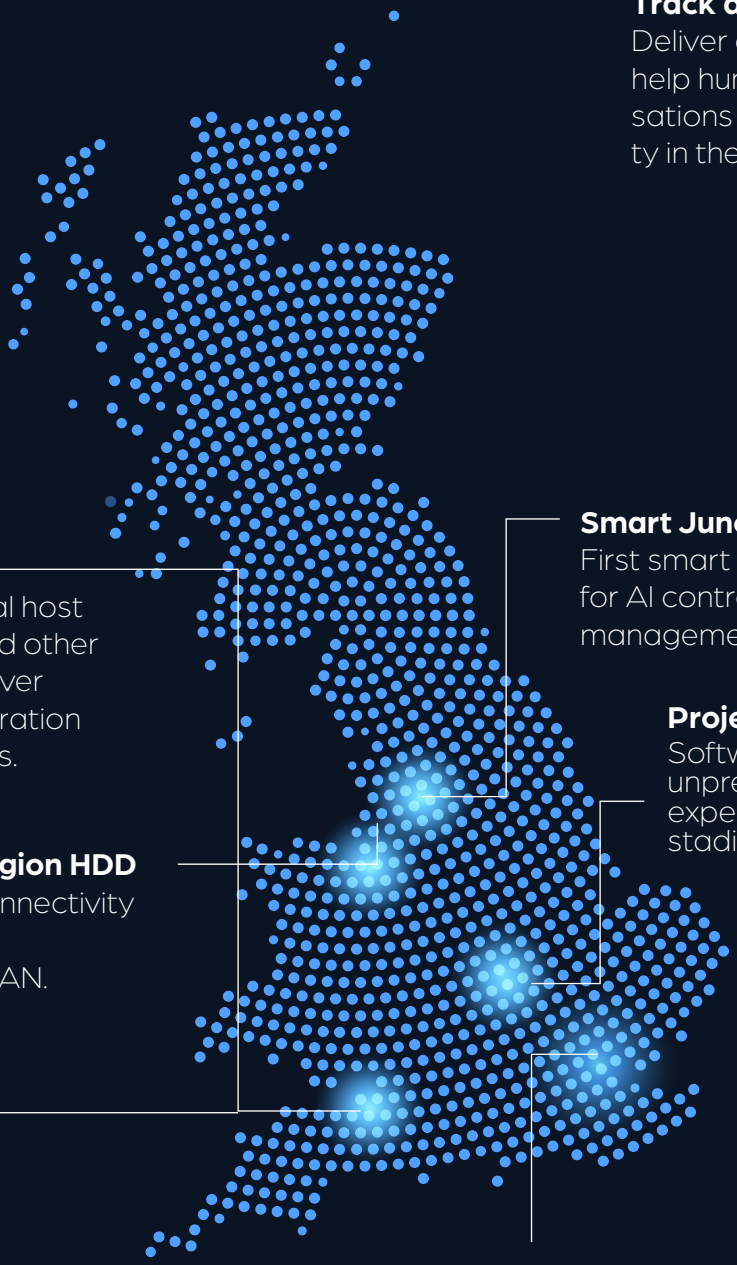
- Cell-Stack deployment in 3 new venues (stadiums, train stations...) and test of new service layer integrating isolated use cases in the venues: camera monitoring, ticketing services, broadcasters.
- Release of new version of the White Paper with more information about the marketplace, governance and ADE use case details.
- Release of new version of Cell-Mesh including WiFi 6 and 5G.

Q4 – October to December

- Liverpool last venue deployment, with Cell-Stack at the centre of the 5G Private Network.
- Cell-Stack deployment in one new area of the UK covering a city centre.
- AI integration with Network as a Service platform with new partners.
- Trial of AI Network as a Service platform using Cell-Stack in Stadium.
- Integration of Cell-Mesh with new customers that expand the applications of the device.
- Trial of connectivity using ADE with partners.
- Public sale and listing.

15 Weaver Labs track record

Commercial pilots of Cell-Stack



Outside of UK:
Track and Trust
Deliver a mesh network to help humanitarian organisations reach connectivity in the last mile.

Smart Junctions
First smart city installation for AI controlled traffic management.

Project Arana
Software development for unprecedented levels of experience for fans in stadiums

ORANOs
Working with neutral host provider Cellnex and other key partners to deliver Cell-Stack for integration with public networks.

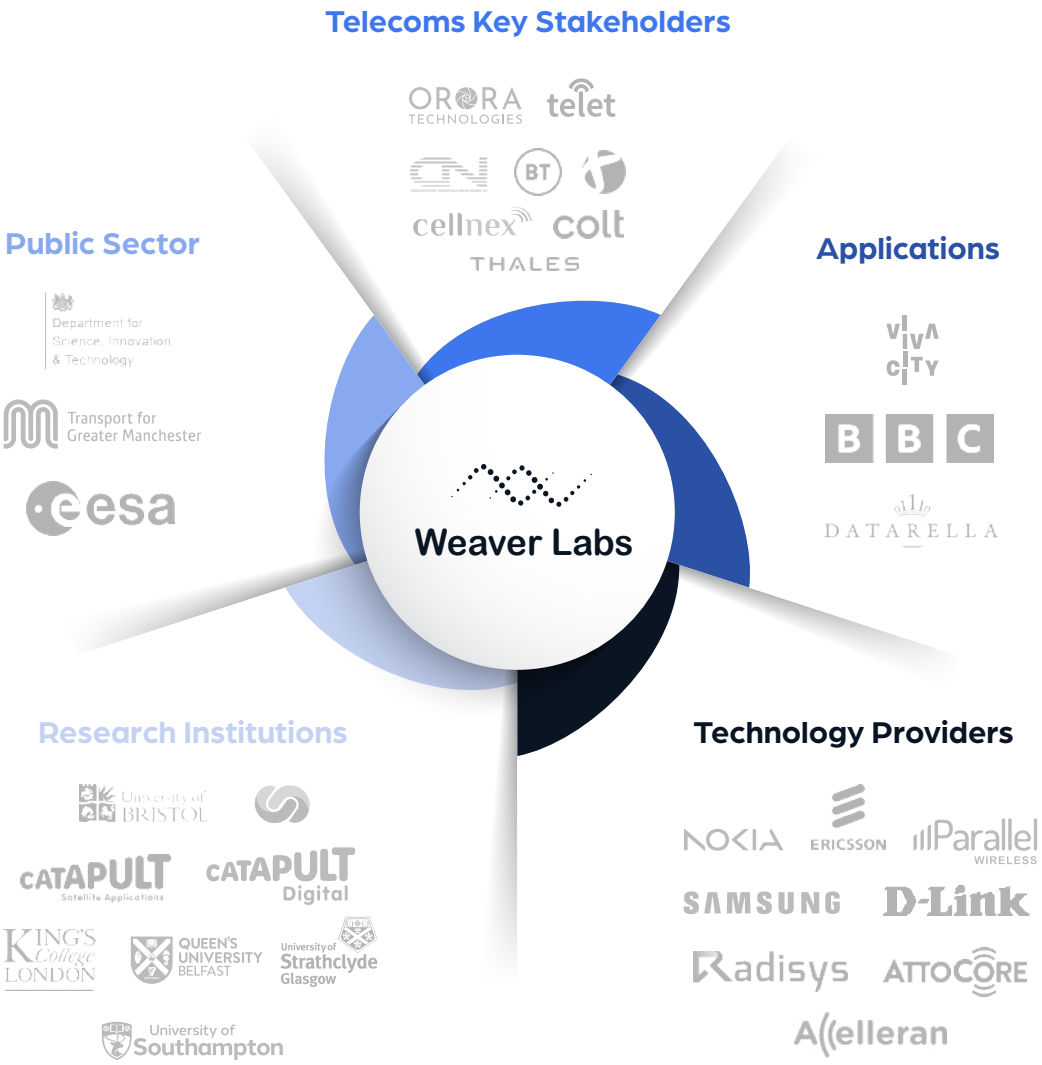
Liverpool City Region HDD
Revolutionizing connectivity in high-density areas with OpenRAN.

REASON
Working with over 20 partners to deliver an integrated connectivity platform based on Open Networks.

London Trial
Targeting indoor coverage in urban areas with key partners.

Partners

Through our existing projects and commercial engagements we have created a vibrant ecosystem of partners that includes everyone in the sector. We expect this to continue growing as we advance with the development and adoption of CellNet.



16 Team

Meet the **Team**

Maria

Previously leading Growth and Operations at 5G Tactile Internet Lab at King's College London. Grew team from 2 to 20 people. PhD in Telecoms.

Meet the **Team**

Anthony

Previously Leading Orchestration and Software team at 5G Tactile Internet Lab at King's College London. Maths and Cybersecurity. Blockchain.

Meet the **Team**

Alexandros

Previously leading blockchain and AI applications at 5G Tactile Internet Lab @ King's College London. Computer Engineering & Informatics.

Meet the **Team**

Ran

He was an intern at the 5G Lab working with the founders. He's a software developer, very experienced with python and solidity.

Meet the **Team**

Tom

He had a Postdoctoral position at University of Cardiff before joining the software team. He's a civil engineer and has worked as a software developer.

Meet the **Team**

Dafne

She's our head of marketing and social . She has extensive experience in the field and joined us after having worked for AAA brands.

Meet the **Team**

Lap

He's a front-end software developer. He's in charge of Cell-UI and has extensive experience in other crypto projects dealing with de-fi applications and NFTs.

Meet the **Team**

Raman

He's our community manager for our crypto/blockchain community. He has experience in web3 and joined our team to level up Adeno Token.

Meet the **Team**

Menino

DevOps Engineer, having worked with private cloud technologies, for 15 years. Currently working on 5G technologies in Weaver Labs and working towards building private cloud infrastructures.

17 Disclaimer

This Whitepaper is intended to provide general information on Cell-Stack and Adeno Token. Cell-Stack and Adeno Token are each currently under development and may undergo significant changes. Changes may be made to the design, features and uses of Cell-Stack and Adeno Token without any notice. This Whitepaper is not intended to be an exhaustive description of the design, features, uses, future performance, future plans, business, operations, risks and uncertainties in respect of Cell-Stack, Adeno Token or Stratum Foundation.

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(b) any risk factors disclosed in this Whitepaper and any damage, loss, claim, liability, demand, punishment, cost, expenses or other adverse impacts that are caused by, associated with, in connection with, incidental to or consequential to that risk factor;
(c) any changes made to this Whitepaper or to the technical nature of Cell-Stack or Adeno Token or any temporary or permanent cessation or unavailability or failure or abortion in the development, delivery, distribution or activation of Cell-Stack or Adeno Token;
(d) any error, bug, flaw, defect or otherwise of the source code of Cell-Stack or Adeno Token; and
(e) failure to completely disclose any information relating to the development of Cell-Stack or Adeno Token on a timely basis.

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All statements contained in this Whitepaper that are not statements of historical fact, constitute "forward looking statements". Some of these statements can be identified by words that have a bias towards, or are forward-looking such as "aim", "target", "anticipate", "believe", "could", "estimate", "expect", "forecast", "if", "intend", "may", "plan", "possible", "probable", "project", "should", "would", "will" or other similar terms. However, these terms are not the exclusive means of identifying forward-looking statements. All statements regarding Cell-Stack, Adeno Token and Stratum Foundation (including but not limited to financial position, features, business strategies, plans and prospects thereof) and the future prospects of the industry which Cell-Stack is in are forward-looking statements.

These forward-looking statements, including but not limited to statements as to Cell-Stack and Adeno Token proposed uses, proposed features, growth, prospects, future plans and/or partnerships, future features, other expected industry trends and other matters discussed in this Whitepaper are matters that are not historical facts, but only estimations and predictions. These forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause actual future results, performance, features or achievements of Cell-Stack and Adeno Token to be materially different from any future results, performance, features or achievements expected, expressed or implied by such forward-looking statements. These risk factors and uncertainties include, but are not limited to, the following:

(a) There may be changes in legal, political, social, economic, and stock or cryptocurrency market conditions and the regulatory environment that negatively impact Cell-Stack, Adeno Token or Stratum Foundation; (b) Cell-Stack and Adeno Token are each under development and may undergo significant changes. There is no assurance that a completed version of Cell-Stack or Adeno Token will be released and/or operational, due to any number of reasons, including but not limited to failure of commercial relationships;

(c) There is no certainty that the source code of Cell-Stack or Adeno Token are error-free. It may contain certain flaws, errors, defects and bugs, which may disable, interrupt or adversely affect Cell-Stack or Adeno Token;

(d) Cell-Stack or Adeno Token may experience system failures, unplanned interruptions in the network and/or services; and

(e) Projects such as Cell-Stack are a relatively new and dynamic technology. There are other risks associated with Cell-Stack and Adeno Token that cannot be anticipated, and these risks may adversely affect the availability of Cell-Stack and Adeno Token.

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