Impossible Cloud Network

JUL 2024

Litepaper
(v0.9)

Impossible Cloud Network:
A Decentralized Cloud Ecosystem

ICN.GLOBAL

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Abstract

The current cloud services market faces significant challenges, including centralization, high costs, vendor lock-in, and data security concerns. Dominated by a few major corporations, the market limits innovation and imposes substantial financial burdens on users. Impossible Cloud Network (ICN) proposes a decentralized solution to these issues by leveraging blockchain and peer-to-peer technologies. ICN creates a scalable, community-driven cloud infrastructure where participants - Hardware Providers (HPs), Service Providers (SPs), and SLA Oracle Nodes - collaborate to enhance network integrity and reliability. The Impossible Cloud Network Protocol (ICNP) orchestrates this ecosystem using a token-economic system that incentivizes contributions and ensures balanced resource allocation. ICN tokens (ICNT) reward HPs and SLA Oracle Nodes while enabling SPs to access network capacities. By promoting a dynamic marketplace, ICN aims to revolutionize the cloud services industry, offering a flexible, cost-effective, and secure alternative to centralized solutions, and driving the development of a comprehensive suite of decentralized cloud services.

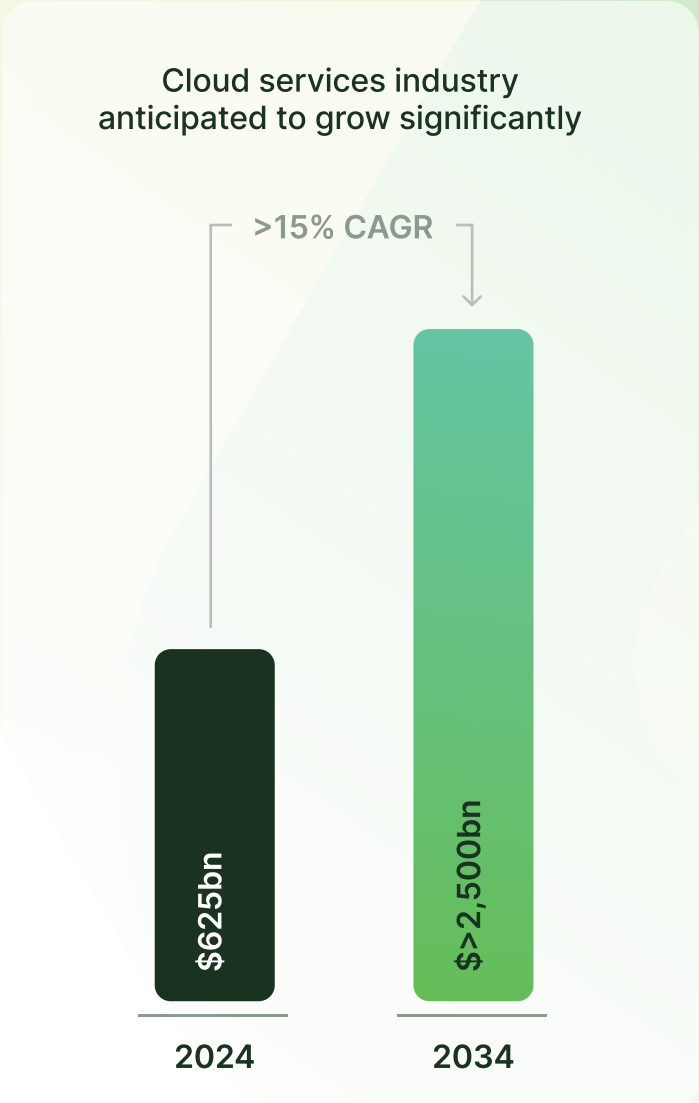
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1.0

A Golden Opportunity in the Cloud

The global cloud services market is anticipated to grow significantly, with projections estimating it will reach $2.5 to $2.7 trillion by 2034.



This growth is driven by increasing enterprise adoption of cloud-based solutions across various industries and the rise of transformative technologies such as generative AI, edge computing, 5G, VR/AR applications, and real-time analytics. Despite this potential, the market is predominantly controlled by a few large corporations, leading to concerns about market control, pricing, and innovation. These issues can be categorized into four main areas:

1. General Market Dominance and Centralization Concerns
2. Customer Challenges
3. Technical and Future Challenges
4. Market Entry Barriers

1.1

1 General Market Dominance and Centralization Concerns

The current cloud service ecosystem is a walled garden, partitioned and controlled by well-resourced tech giants such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP). This oligopolistic environment raises significant concerns:

Concentration of Power

The centralization of power among a few companies limits control and ownership by users and developers. This centralization increases cyber risks and data exploitation concerns, particularly under regulations like the US Cloud Act. The principle of "if you can, you will" applies here, as centralized control enables monitoring, espionage, and censoring of communications, financial transactions, and even de-banking individuals or companies, creating significant risks.

Economic Exploitation

Despite the cloud sector's growth, major corporations have entered an oligopolistic cash-cow stage, dominating the market and setting prices, leading to high costs for users and perpetuating their market dominance.

Stifled Innovation

Dominance by a few large players stifles innovation, making it difficult for smaller companies to compete or introduce new technologies. This reduces market diversity and limits the dynamic progress essential for a vibrant technological ecosystem.

1.2

2 Customer Challenges

Businesses and individuals worldwide rely heavily on cloud services from major providers but face significant challenges affecting their operations and efficiency.

High costs are a major concern, as users often face escalating cloud budgets due to complex pricing structures and high fees (up to 10x higher compared to decentralized solutions [1], [2]). Most companies have experienced budget overages and a steady increase in cloud and infrastructure costs, which highlights the financial burden imposed by current providers [3]. This financial strain can limit the ability of businesses to invest in other critical areas, impacting their growth and innovation [4].

Vendor lock-in: Current cloud services impose a strong lock-in effect, restricting users' flexibility [5] and hindering their ability to switch to alternative solutions [6]. Data egress fees and the difficulties in moving data create a lack of flexibility, which can further reduce innovation and adaptability, as businesses may find it challenging to leverage newer, potentially more efficient technologies from different providers.

Data security, privacy, and sovereignty: Clients worry about data security and compliance with local regulations like GDPR and the US Cloud Act [7], [8]. To mitigate these risks, many end users adopt inefficient multi-cloud strategies, distributing data across multiple providers and often running their own on-premises solutions. While aimed at enhancing security and compliance, this approach often leads to increased complexity and management overhead, further complicating the cloud environment for businesses.

These issues underline the necessity for a more flexible, cost-effective, and secure cloud ecosystem to meet the diverse needs of businesses and individuals worldwide.

1.3

3 Technical and Future Challenges

Moreover, current centralized cloud architectures face several critical technical and future shortcomings:

World's Transition to Distributed Networks

Data is growing exponentially and predominantly at the edge. This growth at the edge will change the world, as it will inevitably lead to a corresponding demand for nearby compute power as well as a huge demand for distributed networks overall. The underlying effect is often described as "data gravity", the ability of a body of data to attract applications, services, and other data [9]. The reason is simple: Moving computation to the node where that data resides ("data locality"), instead of vice versa, is way more efficient, as it minimizes network congestion and improves computation throughput [10].

Scalability Issues

Rapid growth and technological advancements in the cloud sector demand scalable and flexible solutions. Storing and computing data in distributed networks is much more scalable and current providers will struggle to offer these capabilities [11]. Bitcoin is currently, with around 630 Exahashes/s (equivalent to more than 80,000 ExaFLOPS [12]), a few orders of magnitude higher than the most powerful non-distributed computer system in the world, Frontier with 1.7 ExaFLOPS [13].

Emerging Technology Demands

AI computing [14] and real-time data enrichment require immediate localized processing, which centralized systems cannot efficiently support [15]. Single points of failure in centralized solutions risk widespread service disruptions during outages. To address this issue, decentralized networks, such as IPFS, have been proposed as off-chain storage for AI models that can be invoked through smart contracts [16].

Energy consumption

In cities, like Frankfurt, data center operators reported that limited power availability poses significant planning risks [17]. AWS is already restricting power-hungry instances that make use of GPUs in certain locations like Dublin due to power limitations [18]. To avoid this issue, data center infrastructure is often geographically distributed to reduce peak power demand on the local power grid and reduce the cost of ownership [19].

1.4

4 Market Entry Barriers

Although innovation in the cloud market is overdue, disrupting the cloud industry cannot be achieved by a single company or startup.

Incumbents like AWS, GCP, and Azure have created formidable barriers to entry with extensive investments averaging $20-$50 billion annually in their hardware, infrastructure, and data centers.

The spending power of current cloud incumbents, and their vast software ecosystems create significant moats, making it nearly impossible for new entrants to outcompete them. Consequently, successful cloud competitors typically specialize in niche markets, such as Wasabi for affordable, high-performance storage, CoreWeave for GPU-accelerated compute resources, and OVH for diverse, cost-effective cloud services with a strong presence in Europe. Regulatory intervention to break up these oligopolistic companies is also unlikely due to geopolitical factors, particularly US-China tensions.

2.0

The Problem: The Need for a Collective Approach

A decentralized cloud ecosystem, built and owned by many, could effectively address the challenges mentioned above.

In recent years, projects such as Akash, Filecoin, Fluence, and Dfinity have started utilizing blockchain and peer-to-peer technologies to manage physical infrastructure in a decentralized manner. These initiatives, known as Cloud DePINs (Decentralized Physical Infrastructure Networks), feature distributed hardware ownership and geographically dispersed infrastructure. They leverage blockchain-based incentives and are designed to operate in a trustless manner.

Web3 technologies provide the necessary framework of open-source development, incentivization, and distributed ownership, promoting composability and innovation at the edge, and maximizing control and incentives. DePINs also offer a practical solution for the substantial hardware investments needed to compete with incumbents. A decentralized cloud ecosystem, developed through a collaborative effort can represent a superior approach. As Bill Joy, co-founder of Sun Microsystems said, “There are always more smart people outside your company than within it.”

Despite the potential benefits of web3 technologies, Cloud DePINs have struggled to compete effectively in the cloud marketplace so far. Their services often fail to meet the demands of the majority of businesses and customers. Simply put, most Cloud DePINs are still searching for product-market fit. A comparison between successful AI compute cloud competitors from both web2 and web3 worlds can illustrate how this lack of product-market fit impacts market acceptance: CoreWeave, a web2 company founded in 2017 reported $465 million in revenue for 2023 and anticipates $2.3 billion in revenue for 2024, whereas the Akash Network, a web3 company founded in 2015 self-reported $0.14 million in Q1 2024 as an all-time revenue record.

How can the promising collaborative approach overcome the barriers posed by current centralized cloud architectures and finally build a robust alternative?

In order to build a successful decentralized cloud ecosystem, there are five main challenges to overcome:

2.0

Ecosystem vs. Silo

Many DePIN solutions try to build a vertical slice from top to bottom, focusing on specific hardware or a single use case, such as cloud storage or GPU compute. An ecosystem approach is more difficult but essential to create a mass-market cloud product. A diverse range of services is necessary to attract a broad customer base and build network effects that can disrupt incumbents. This ecosystem approach leverages the strengths of web3 in collaboration and open-source resources. Therefore, interoperability and standardization are needed in many places.

Starting with Storage

Data gravity and data locality are crucial. Most services require some form of storage, and it is cheaper and more efficient to run services close to their data. Therefore, starting with a robust storage foundation, similar to Amazon's approach, starting with AWS S3 object storage, is critical for building a comprehensive ecosystem. As data accumulates, it becomes increasingly challenging to move, leading to a concentration of computing resources, analytics, and applications in the same location to minimize latency and improve performance. Starting with storage is essential for the success of the ecosystem and it naturally creates demand for further services.

Enterprise Hardware

The enterprise market for cloud services is significantly larger than the consumer market. To win enterprise customers, issues like security, scalability, decentralization, performance, and compliance must be addressed. This requires enterprise-grade hardware operated in high-tier data centers to form the backbone of the network.

Demand Focused and Customer Access

While web3 projects have proven they can scale hardware supply, the demand side is critical. Cloud DePIN projects must prioritize usability, security, and market complexity while understanding and meeting user needs. A demand-focused, user-centric approach is essential to persuade customers to adopt new technology and to ensure the growth and sustainability of the ecosystem. Offering customer access to other ecosystem participants is the essential ingredient to creating the network flywheel.

DePIN Verification Problem

The "DePIN verification problem" refers to the challenges involved in monitoring the reliability and trustworthiness of DePINs. These networks rely on multiple, independently operated hardware nodes to provide services such as storage and computation. Ensuring that these nodes perform their tasks correctly and consistently is critical for maintaining the network's integrity and performance.

3.0

The Solution: Impossible Cloud Network (ICN)

Based on these challenges, this Litepaper introduces **Impossible Cloud Network (ICN)**, a decentralized ecosystem designed to capture a significant share of the global cloud market by addressing a wide range of customer needs.

ICN operates in **layers** managed by different **participants**, all connected by the **ICN Protocol (ICNP)** and **incentivized in a blockchain-based marketplace.** This marketplace aims to balance hardware supply and cloud service demand, minimizing subsidies and helping service providers find their product-market fit.

The ICNP is a decentralized, trustless protocol designed to revolutionize the cloud services market by integrating various stakeholders into a cohesive ecosystem. Leveraging blockchain technology and the power of the community, ICNP aligns incentives among hardware providers, service providers, and SLA oracle nodes, creating a secure and efficient cloud service infrastructure. This approach not only addresses the challenges of traditional centralized cloud systems but also introduces a scalable and resilient model essential for future technological demands.

3.1

ICN Participants

The Impossible Cloud Network (ICN) takes a layered approach, consisting of a hardware layer, a service layer, and a monitoring layer:

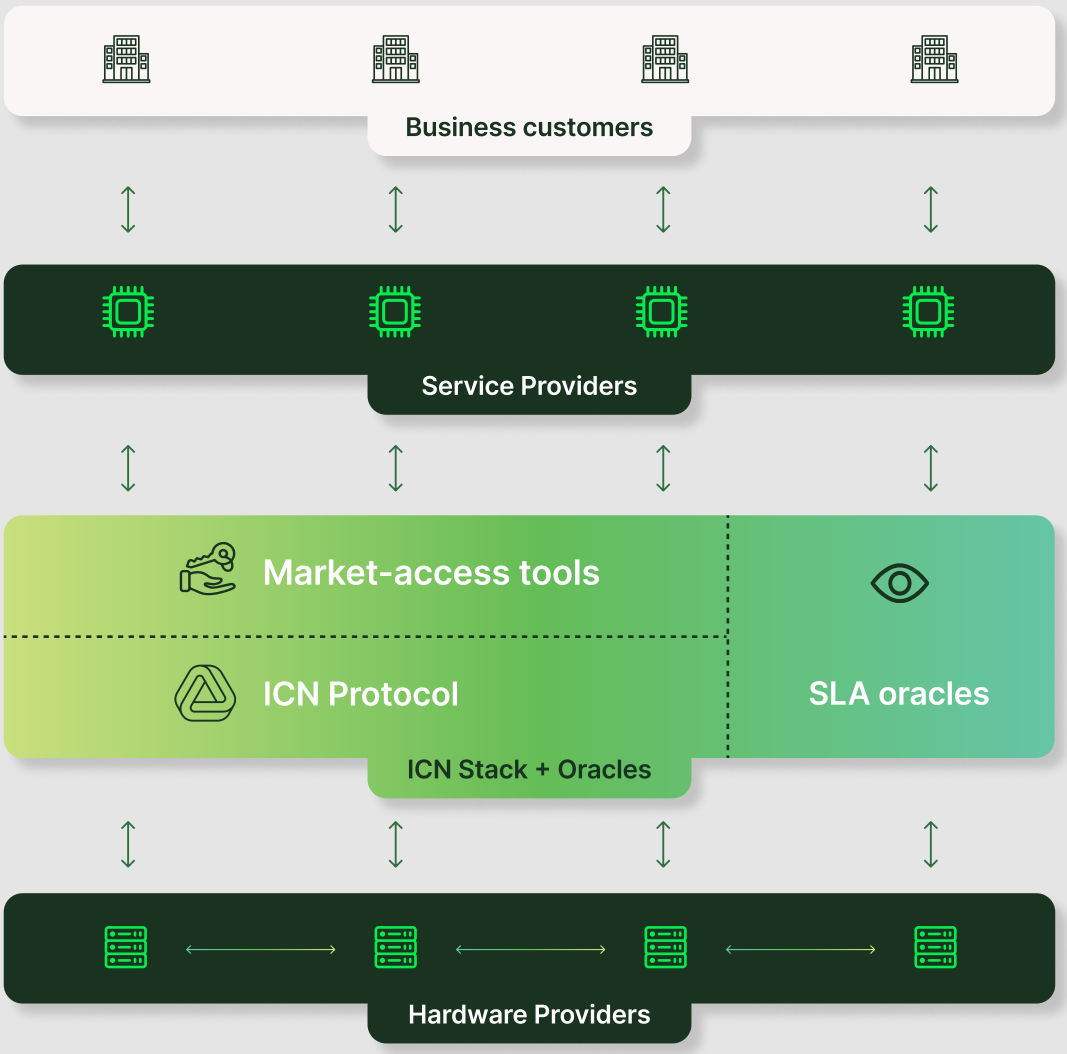
1. **Hardware Layer:** This layer ensures unprecedented **scalability**, with the potential to surpass the combined infrastructure of Amazon, Google, and Microsoft developed over the last 15-20 years. By leveraging decentralized hardware contributions, ICNP can scale its infrastructure efficiently and sustainably.

2. **Service Layer:**The service layer enables **composability**, allowing open-source software to combine into larger constructions, similar to Lego bricks. This fosters a global knowledge store that grows at a compounding rate, enhancing innovation and service diversity.

3. **Monitoring Layer:** The monitoring layer, consisting of SLA Oracle nodes, serves as the **layer of trust**. By implementing a best-in-class set of verifiable proofs, as they become available, ICNP will effectively address the DePIN verification problem. SLA Oracles ensure that hardware performance and compliance are continuously monitored and verified, maintaining the network's integrity and reliability.

Correspondingly, ICN comprises three main participants: Hardware Providers (HPs), Service Providers (SPs) and SLA Oracle Nodes (SLA-ONs). Each participant plays a critical role in ensuring the network's scalability, composability, trust, and overall success. The interaction among these participants creates a powerful flywheel effect, driving continuous growth and innovation:

3.1



1. **Hardware Providers** (HPs) add hardware capacity to the network. Each HP can operate one or more Hardware Nodes (HNs) across different hardware classes, such as Storage, GPUs, and CPUs, at multiple locations. For example, an HP could operate three HNs in two locations with a combination of hardware classes at each site. Contributions from each HN are calculated separately based on resource provision and utilization over specific periods. This decentralized hardware contribution ensures unprecedented **scalability**, leveraging the community's power to surpass traditional cloud infrastructure investments by orders of magnitude.

3.1

2. **Service Providers** (SPs) use ICN's hardware capacity across different hardware classes to build services, offerings, and products for business customers. In some cases, partnering Cloud DePIN projects could directly act as SPs. The composability aspect is crucial here, as SPs can seamlessly integrate multiple hardware resources and software functionalities to create complex, value-added services. This approach allows SPs to combine Infrastructure as a Service (IaaS) and service offerings with their proprietary software, Independent Software Vendor (ISV) integrations, and additional services like support and consulting. By leveraging the composability of the ICN ecosystem, SPs can innovate rapidly and provide highly customized solutions, while not having to build the stack from the bottom up.

3. **SLA Oracle Nodes** (SLA-ONs) monitor, verify, and report network performance and reliability metrics. They establish a critical layer of trust by using verifiable proofs. SLA-ONs enforce Service Level Agreements (SLAs) through automated penalties and rewards, ensuring high reliability and performance. This monitoring layer creates a feedback loop that continuously improves network integrity and user trust.

ICN disentangles an otherwise fully integrated network operations ‘stack’ into separate roles (‘hardware’, ‘service’, and ‘monitoring’), each focusing on different parts of the network stack, while contributing to the common ecosystem. The system enables SPs that have already found product-market fit to focus on their strengths, specializing in specific services and market development, while expanding hardware resources as needed. It allows HPs to compete in a fair, non-monopolized market by specializing in operating and managing reliable hardware that can be offered as a resource to SPs with existing business customers. And it allows SLA-ONs to take on the role of an external, unbiased network ‘auditor’, ensuring high network performance, contributing to and benefitting from a thriving ecosystem.

3.2

ICN Partner Projects

ICN partners with various projects from both the Cloud DePIN space and the traditional cloud sector. Each partnership is uniquely designed to benefit both sides. Generally speaking, all partners fulfill a function as one of the aforementioned participants or provide benefits to these participants in some way.

The underlying principle of ICN partnerships is to strengthen the evolution of the ecosystem and provide all parties with more demand than they would otherwise have. Arguably, the most important type of partnership is with projects that add additional cloud services to the network. For end users, the ability to combine multiple cloud services is often a crucial decision factor. Impossible Cloud's object storage service is merely a foundational building block for more complex use cases. For example, many use cases require a combination of data storage and GPU-compute functionalities. Multiple SPs could be used directly by customers to achieve this functionality. Alternatively, a new, further upstream, SP might combine the Infrastructure-as-a-Service (IaaS) offerings from multiple SPs into a new integrated product and offer it to end customers and clients. In every case, all ecosystem participants (SPs, HPs, and SLA-ONs) benefit.

3.3

Examples of projects partnering with ICN

- **On the SP layer:** Cloud DePIN projects can use the ICN network for their hardware needs, and enrich the ecosystem with more services en route to a truly decentralized multi-service cloud. As an example, the ICN team and Aethir, a prominent decentralized GPU project, are already working together on a possible cross-operation design. Aethir could act as an SP within the network, benefiting from market access tooling resulting in more demand for their service, and adding GPU computing capabilities to the network. A combination of cloud storage and GPU compute can unlock new use cases and, hence, even more demand.

- **On the SLA-ON layer:** DePIN Verification projects have the potential to offer their services to the ICN Protocol, enhancing the development of an increasingly trustless environment that validates the physical characteristics of connected hardware. For instance, the ICN team collaborates with Witness Chain, a prominent web3 tech stack, to integrate and collectively enhance network trust and reputation.

- **On the HP layer:** OEM Hardware manufacturers could partner with ICN, offering ready-to-order hardware class blueprints that would simplify and speed up hardware provisioning for HPs. The ICN team and Supermicro, a provider of IT solutions and bare metal servers, have struck a partnership aiming to develop the first blueprints.

- **On the Customer- / market access tools layer:** ISV Software companies, such as Acronis, a leading provider of cybersecurity and backup software, integrate Impossible Cloud's object storage solution into their products. This directly benefits the ecosystem by opening up new use cases, markets, and revenue opportunities. This type of integration will also make it easier for other service providers (SPs) to leverage these ISVs.

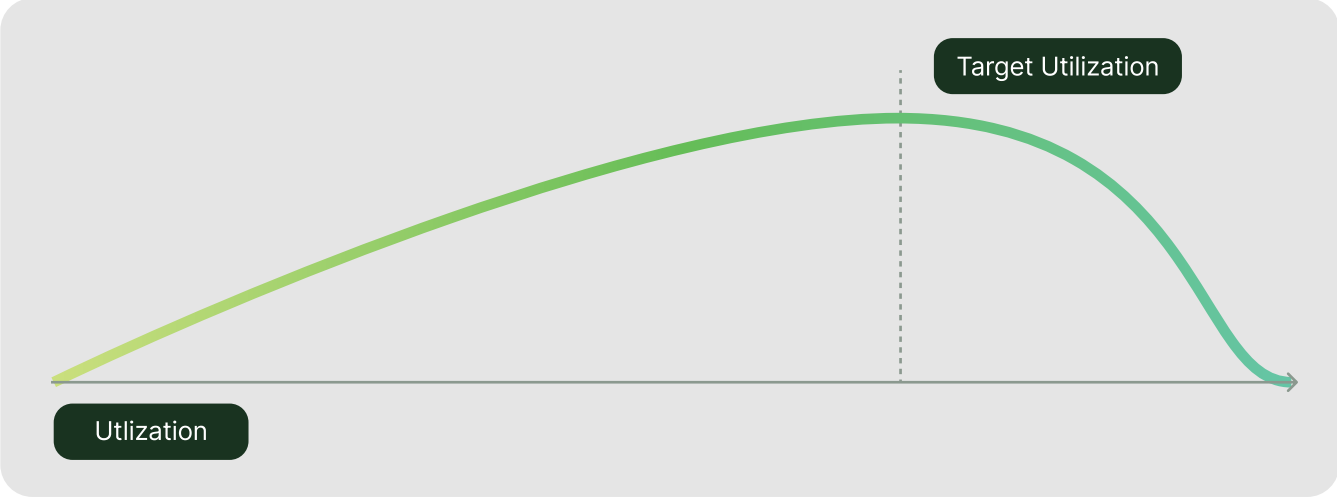
3.4

ICN Protocol (ICNP)

The Impossible Cloud Network Protocol (ICNP) is a set of rules and standards that facilitate hardware node coordination, formation, monitoring, and access among the network participants.

It plays a crucial role in defining interactions between Hardware Providers (HPs), Service Providers (SPs) and SLA Oracle Nodes (SLA-ONs). ICNP is the backbone of a two-sided marketplace, enabling healthy competition both among HPs offering similar classes of hardware and SPs bidding for that hardware. This competition drives up quality and drives down prices over time, ensuring a dynamic and efficient ecosystem. Through its implementation, ICNP not only coordinates the technical aspects but also aligns economic incentives, promoting a robust and scalable decentralized cloud service.

The protocol's design encourages contributions from protocol participants and community members, jointly developing a decentralized cloud ecosystem. To align incentives across protocol participants and to implement the protocol's incentive layer, ICNP relies on a tokenomic system that is described in the following sections in more detail.



3.5

Impossible Cloud Network Token (ICNT)

ICNP relies on a token-economic system to contribute, allocate, and access network resources and to ensure network reliability and performance levels. At the heart of this system lies a protocol-native utility token, the Impossible Cloud Network Token (ICNT).

ICNT's primary function is to provide access to ICN network hardware capacity. HPs are awarded access tokens for their hardware capacity commitments to the network, while SPs acquire access tokens and use this currency to access hardware capacity. SLA Oracle Nodes are rewarded for monitoring, verifying, and reporting tasks.

ICNT interacts with ICNP's incentivization layer, which encompasses various smart contracts for provisioning hardware capacity, including contracts focused on reward structures, auction-based mechanisms for allocating capacity, and a slashing system to ensure network reliability and performance. The incentivization layer will be deployed to a smart-contract-enabled blockchain environment, allowing interactions and integrations with other DePIN projects and leveraging existing tooling and protocols.

3.6

Supply Side: Providing Capacity to ICN

HPs can commit hardware capacity to the network in exchange for ICNT rewards. Once their capacity is onboarded, HPs participate in the protocol's capacity marketplace to serve the capacity needs of SPs.

The protocol relies on a dynamic reward mechanism that allows rewards to differ across geographic or topological network clusters. In addition, it can adjust rewards based on usage in specific network clusters. This allows the protocol to attract additional hardware capacity in regions that exhibit strong demand and to discourage the onboarding of additional resources in regions that already exhibit idle capacity.

To ensure the continued availability of committed hardware capacity, the protocol requires HPs to deposit ICNT for the time they commit their hardware to the network. As ICNT deposited by an HP is subject to a slashing mechanism in case committed capacity is no longer available, HPs are incentivized to keep availability up and are disincentivized to withdraw capacity before the end of their commitment period.

3.7

Demand Side: Requesting Capacity from ICN

ICNP will allow SPs to access ICN hardware capacity through a fully integrated capacity marketplace, in which SPs have to acquire access tokens and spend them to secure hardware capacity. At the heart of this marketplace is a dual auction procedure, combining a tendering process and a reverse auction.

In this procedure, SPs are intended to post requests for capacity in a tendering process, sourcing bids, for example, for 6 months of storage capacity in a certain geographic location, and HPs could bid to fulfill requests by locking additional ICNT for the requested period beyond the HP's initial ICNT deposit requirement (reverse auction). As any HP's deposited ICNT position is subject to slashing, a higher bid indicates that an HP is willing to put more at stake beyond what is required through the initial ICNT deposit requirement, signaling high hardware availability and reliability. This conscious design intends to give priority to higher-quality HPs rather than only filtering by rewards. ICNP's capacity marketplace therefore favors highly reliable HPs, ensuring overall network quality and availability, leading to higher trust and reputation in the long run.

Once an SP secures capacity through this procedure, the SP can integrate the secured capacity into its service offerings. At the end of the commitment period, the SP and the HP can either agree to prolong the existing arrangement or participate in a new tendering process.

3.8

Network Monitoring: SLA Oracle Network

A common problem within DePIN networks is ensuring the authenticity and integrity of resources and participants within the network, where traditional centralized validation methods are not applicable.

This ‘DePIN verification problem’ includes verifying the availability, performance, and reliability of distributed resources, as well as maintaining trust among numerous independent and potentially anonymous entities.

For ICN to offer competitive service levels, HPs must operate at peak levels and consistently meet required SLA standards to maintain high network performance. ICNP therefore includes a network of external SLA Oracle Nodes (SLA-ONs) that constantly monitor, verify, and report network health metrics, verifying availability, capacity, or specific service-level metrics such as bandwidth or latency. Due to their independence and the transparency of all data they obtain, SLA-ONs create a layer of trust and objectivity within a network that is trustless by design.

The functionality available to SLA Oracle nodes will evolve from permissioned to trustless and from measuring simple metrics to applying DePIN proofs.

SLA-ONs work by probing metrics from hardware nodes and, depending on proof availability and integration, performing checks via verifiable DePIN proofs. Providing robust and performant proofs (Proof-of-Storage, Proof-of-Bandwidth, etc.) is one of the core challenges that the DePIN space faces. Overcoming these challenges is the goal of hundreds of open-source projects and research initiatives.

The network of SLA-ONs includes a modular proof interface, which allows the integration of additional or new verification methods over time as they become available.

The SLA Oracle Network will perform a variety of tasks, ranging from monitoring (collecting and processing service performance metrics) to proof generation (producing verifiable proofs using local hardware metrics), to aggregation (collecting and aggregating reports, interfacing with smart contracts logic). In exchange for performing those tasks, SLA-ONs are rewarded with ICNT.

3.9

Network Reliability and SLA Enforcement

If the SLA-ONs detect a network anomaly (i.e. a significant and persistent deviation from expected network performance and availability levels), ICNP allows for the initiation of a slashing protocol.

The definition of a network anomaly can vary depending on the hardware class and an anomaly event can be triggered by multiple trigger events (e.g. committed capacity no longer available, bandwidth below threshold, etc.).

In case of an anomaly report, HPs must restore their faulty node within a limited time window before the deposited ICNT slashing starts. When the slashing process begins, the HP's deposited ICNT is gradually reduced and rewards are put on hold until the anomaly is resolved. SPs can claim back unreleased rewards as compensation for loss of uptime.

3.10

ICN network growth cycles

ICNP is at the heart of the ICN decentralized cloud ecosystem. ICN is built in layers composed of different participants, all connected by the ICNP and co-incentivized with a common set of rules.

These rules and the resulting marketplace are conceived to balance hardware offered in the network and cloud services consumed by design. Unlike many other DePIN projects which rely on an initial surge in token supply distributions to kickstart network capacity (e.g. to build out cellular network coverage), ICN does not require extensive overcapacity and can follow demand more closely. Consequently, ICN becomes commercially viable at a lower threshold, allowing for a more utilization-based token distribution schedule closely tracking network capacity demand.

To further explain this point, let's consider ICN's token economy dynamics in relation to various network growth cycles. When the network has a lot more capacity than SPs need in a certain geography and for a certain hardware class, there is low utilization. Beyond a certain threshold, HPs are only weakly incentivized to add more of this particular hardware and geography combination, protecting the network from building up and overspending on idle capacity. The reverse is true for a hardware class and geography combination experiencing high demand from SPs. In this case, the network's hardware capacity expands as the amount of ICNT inflow from access fees increases, translating into higher rewards. This prompts HPs to add more capacity, reducing utilization and initiating a new growth cycle for the protocol.

4.0

Roadmap

Phase
0

Phase
1

Phase
2

Phase
3

Phase
4

Phase
5

The "ICN Platform" is the integrated technical architecture that combines the ICN Protocol, all the connected Hardware Nodes offering various market-requested hardware classes, the SLA Oracle Nodes (SLA-ONs) for quality assurance, a user-friendly front-end, and the software components not yet decentralized. The ICN Platform is the backbone of the Impossible Cloud Network (ICN) ecosystem, which encompasses the entire ICN world, including the protocol, participants, resources, and the team.

This section outlines the anticipated evolution of the ICN Platform. Currently, the core team is developing an open-source platform for HPs and SPs to join the ecosystem, and have smart-contract-guaranteed economic transactions.

The first version of the platform will support the existing object storage solution and HPs. Subsequent steps will include supporting demand-based incentives, enhancing the SLA engine, and integrating partnering projects and software.

Eventually, ICN will automate hardware and software provisioning and deployment, and SLA enforcement will be an integral component in creating trust and reliability in the system. As the platform evolves, governance will become increasingly open and inclusive, making the platform more trustless and decentralized, in line with technological advancements.

4.0

How we got here

Impossible Cloud has successfully developed a fully functional and robust enterprise-grade object storage service as the foundation of the ecosystem. This service is supported by several hardware providers and caters to numerous business customers, who collectively upload up to 50 million files daily. The system is designed for scalability, capable of handling billions of file uploads daily and beyond.

Founded by entrepreneurs who **generated over a billion dollars in total revenue** followed by a successful **IPO**, Impossible Cloud has accomplished what many web3 projects find challenging: creating a successful enterprise-grade cloud service. This accomplishment positions Impossible Cloud as a leader in the DePIN space today, offering a highly usable and reliable enterprise-grade product. With a growing network of hardware providers meeting real-world demand, the launch of ICN will now expand the suite of decentralized services available.

Why Start with Storage

Starting with storage leverages data gravity and locality, foundational principles for any cloud service ecosystem. Data storage is a critical component as it is required by nearly all other services, such as AI GPU compute and data processing.

By establishing a robust storage foundation, ICN ensures that customers can run their main services close to where their data is stored, enhancing performance and efficiency. From this solid base, the roadmap includes expanding into other services like AI GPU compute, gradually building towards a fully decentralized cloud service. This approach allows for seamless integration and composability, creating a comprehensive and scalable cloud ecosystem.

4.1

Phase
0

Phase 0: v0.1 ICN Platform

This phase represents the project's current state as of the release of this Litepaper. Initiated in early 2024, it encompasses the following activities:

- Engage hardware providers and establish the initial enterprise-grade hardware network (in progress).
- Design the economic incentive layer, protocol, SLA Oracle network, and system architecture (in progress).
- Write and share this Litepaper with the community for iterative and collective improvement.
- Define the features for the first release of the ICN platform (“MVP”, in progress).
- Design and open-source develop the MVP (in progress).
- Define the initial governance structure and its proposed evolution.

Phase
1

Phase
2

Phase
3

Phase
4

Phase
5

4.2

Phase 1: v0.x ICN Platform in Testnet

Starting in Q3 2024, this phase will involve releasing various alpha and beta versions of the ICN Platform on the testnet. The deployment steps include:

- Sequentially releasing ICN Platform functionality to the testnet, including SLA Oracle nodes.
- Tuning the protocol data schema, optimizing performance and scalability, and fixing bugs.
- Optimizing protocol execution costs and conducting security audits.
- Conducting public testing by partners and the community.

By the end of this phase, the platform will be production-ready. A rigorous testing and refinement process will ensure the robustness and reliability of the ICN platform before its official launch.

4.3

Phase 2: v1.0 ICN Platform

Phase 0

Phase 1

Production deployment of the MVP and the ICNT token on the mainnet. ICN Platform v1.0 will include the following functionalities:

Phase 2

- Capacity onboarding with rewards restricted to provable capacity and usage metrics only.
- Access fees and Capacity rewards.
- Tendering process.
- HP deposit and controlled slashing mechanics for SLA violation.
- SLA Oracle nodes, with initial “proof of performance metrics”.

Phase 3

Phase 4

Phase 5

4.4

Phase 3: Extension of ICNP Functionality

Expand the protocol logic to fully support the economic vision, particularly the demand-based incentives that drive geographical and hardware-type expansion. The protocol will become progressively decentralized by:

- Removing any remaining centralized components in the ledger layer.
- Extending the functionalities of SLA Oracles and introducing more trustless proofs as technically feasible without compromising service levels.
- Increasing the trustless domain of the protocol.
- Further developing protocol components to support the added functionality.

Partners already collaborating with the project, along with potential new partner projects, will cross-operate with the ICN platform, which will support different hardware classes operationally.

4.5

Phase 4: Partnering Projects' Software

In this phase, the protocol will gain the capability to recognize and integrate with partnering projects. The ICNP will become aware of:

- The list of partnering projects.
- The software each partner project utilizes and should be installed on hardware nodes.
- The specific hardware class requirements for each partner project.

The provisioning of hardware and the installation of the relevant project software will be automated., streamlining the process, and making partnerships and cross-utilization seamless and protocol-enabled. The goal is to facilitate easy integration and cooperation between the ICN platform and various partner projects, enhancing the overall ecosystem's functionality and reach.

4.6

Phase 5: Service Awareness

Until now, the SLA guarantee in ICN has been tied to hardware classes. While maintaining its role as a decentralized hardware layer, ICN will need to become more service-aware to enhance the effectiveness of SLA guarantees and enforcement. Collaboration with partner projects will introduce service-aware functionalities to the protocol, making the decentralized advantages directly usable by the service stack. During this phase, the SLA interface between ICNP and Services will be developed and integrated.

4.7

Decentralization and Governance

Community involvement will help develop the protocol and ecosystem.

To support network expansion and hosting expenses, a treasury will be established, funded by an initial token allocation and a small percentage of network access fees. This treasury is intended to be directed by community proposals to further develop the protocol and ecosystem. This governance model ensures a strong commitment to decentralization and community involvement, nurturing sustainable growth through the network effects and benefits provided to participants. By moving to an autonomous governance structure, we ensure that the Impossible Cloud Network remains innovative, adaptable, and community-driven in perpetuity.

4.8

Long-term Vision

The long-term vision of the project rests in the hands of the community, however, the logical steps would include introducing programmability to the ICN platform through a virtual machine, allowing SPs to program protocol actions.

This would include hardware and software provisioning on hardware nodes and potentially the provisioning and deployment of “ancillary” Cloud services, such as load balancing and scheduled (distributed) background jobs.

Similar to how Infrastructure as Code (IaC) tools like Terraform and Ansible interact with cloud provider APIs, using an ICNP Virtual Machine, SPs could define the necessary infrastructure and task lists using a high-level configuration language. The openness of the platform, combined with its versatility and programmability, could attract service providers, cloud providers, and developers, unleashing true and disruptive innovation in the cloud market.

5.0

Get Involved

You can follow our progress on X **<@ICN_Protocol>**.

We are open to partnerships at all layers of our ecosystem to fuel its growth. If you're interested in contributing hardware resources, using the network for various cloud services, or collaborating with us, please send us a message on X or via email **<web3@impossiblecloud.com>**.

Whether you're a hardware provider, service provider, or simply enthusiastic about decentralized cloud technology, we'd love to chat and explore how you can be part of the Impossible Cloud Network's journey towards decentralized cloud services.

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