Peer-to-Peer: Compute, Sensor, & Content - Burst Sharing Network with Crypto Settlement

Vision

With most modern technologies, we find that the largest changes come when complementary technologies advance to a point where all can work together in unison to change how we live. When technologies converge to achieve the same goal, at the same time, consumer adoption grows rapidly. Those who can respond to these demands, will set the standards for the innovation driven by consumer demand.

GridIron marks the arrival of technology that has been long anticipated by those in the AR and computer vision space. The network is the culmination of multiple innovations that will usher in a new era of the digital revolution - the metaverse. While many assume this means virtual reality, the team behind GridIron argues that while VR is a stepping stone to the initial integration of the metaverse, the eventual reality will be digital content overlaid in the physical world - i.e. augmented reality.

Virtual reality, while impressive, is an unrealistic standard for integrating digital content into daily life as it is totally immersive, requiring 360 degree visuals and obstructive hardware. This idea of the metaverse is unsustainable in the context of real life; however, digital renderings in physical environments allow users to experience the metaverse in a way that incorporates reality rather than abandoning it. GridIron anticipates the adoption of super light weight head-mounted displays as the primary computing device for consumers, allowing them to interact with AR content rendered in the analog world in the same way they interact with physical objects.

Numbered are the days of QR codes and content consumption via smartphone - the metaverse will seamlessly integrate the digital with the physical until the two are almost indistinguishable. However, the computing power and battery life necessary to process augmented reality content in real time requires cumbersome hardware that is unrealistic for ubiquitous consumer use in daily life. GridIron provides a solution for the issue of limited CPU within a singular device by creating a network that allows users to purchase dormant computing power from nearby devices with cryptocurrency (Carbon12). Beyond computing power, the network will feature the ability to purchase other various sensor data and share content without requiring internet connectivity.

GridIron is more than just a technology that provides metaverse capabilities, it is an opportunity for users to reclaim their data autonomy and escape from the exploitative nature of Web2.0 through the implementation of decentralized and democratized Web3.0 principles. The network will utilize the blockchain for microtransactions of Carbon12 and restore users to a position of ownership over their computation power, content and data. In that same vein, the ability to share content on a peer-to-peer network reduces the risk of censorship by centralized authority, protecting information and data from corruption and alteration.

Who We Are

Gravity Jack is the United States' oldest augmented reality and computer vision company, founded in 2009 when AR was still in its infancy. Over the last 13 years, Gravity Jack has grown to become one of the most respected digital agencies in the world. It is the holder of a strong patent portfolio and has launched hundreds of apps for major Fortune 50 companies, both in the United States and internationally. Recently, the company has partnered with Forum12 to launch Carbon12, the cryptocurrency utilized for transactions on GridIron.

Gravity Jack has always been ahead of its time, anticipating technological paradigm shifts before they reach widespread adoption. The company looks forward to stepping into the potential of Web3.0 through blockchain and peer-to-peer network technology.

Abstract

GridIron is a peer-to-peer (or peer-to-server) technology that allows users or devices to purchase computing power, sensor data, and content from one another via cryptocurrency (Carbon12). The sharing of compute power permits the use of convenient devices with compact hardware, as CPU requirements can be distributed across multiple devices. The technology includes protocols and methods for transmission, exchange, valuation, advertisement of devices' compute power, sensor data, cache memory, certain algorithmic functions, and finally settlement features for purchasing or selling the aforementioned. The network and its features provide users with the ability to display, consume, and compute augmented reality content through their devices, solving multiple issues that currently exist within the AR and computer vision space. Payments using the

cryptocurrency Carbon12 provide users with incentive to share their dormant computing power, thereby creating a network of participating nodes and ultimately restoring the user to a position of ownership over their data. Additionally, the use of cryptocurrency and blockchain technology allow users to securely exchange funds in real time without requiring verification from an outside source; thereby removing the possibility of waiting for payment verification to deliver a computation result. In that same vein, the network operates on a hyper-localized scale, utilizing processing power as geographically close to the user as possible to reduce latency and deliver feedback in real time. In summary, GridIron provides users the ability to interact with augmented reality content without being obstructed by cumbersome hardware, limited battery life and compute power, or latency.

GridIron's Solutions to Existing Challenges

While the idea of the metaverse has been well marketed by figures like Zuckerberg, there are still obstacles hindering the progress of the digital world. GridIron seeks to democratize access to digital content in a way that appeals to all users by presenting solutions for the following issues:

Hardware Limitations

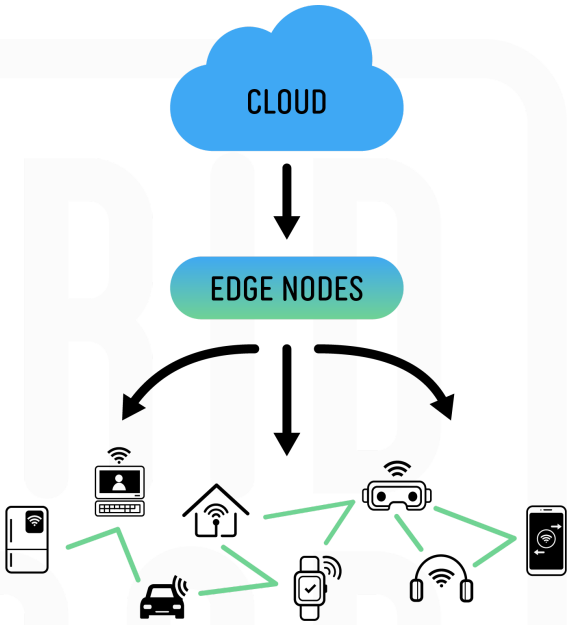
Displaying augmented reality and virtual reality content in real time requires a significant amount of processing power and battery life, necessitating bulky hardware that is incommodious to ubiquitous consumer use. Current head-mounted displays are large and awkward, and while sufficient for gaming purposes and immersive experiences, it is unrealistic to expect consumers to wear a computer on their heads for spatial computing in public arenas. The integration of the metaverse therefore demands compact devices that are comfortable for users, yet can still access the CPU of a larger computer. Recently, certain tech companies have been exploring wearable computers that are compact enough to resemble traditional eyeglasses, yet functions are limited as certain computation requirements are too robust for the hardware.

GridIron presents a solution for issues surrounding limited processing capabilities in small devices by creating a peer-to-peer network that allows devices to share compute power with one another, thereby eliminating the need for larger hardware. Computation requirements will be distributed across multiple nodes rather than overwhelming a singular device, providing the ability to process complex data in real time, delivering almost instant results. GridIron allows hardware to remain simple and convenient while also maintaining functionality, thereby opening doors for the consumer to realistically enter the metaverse. GridIron powers dynamic needs within the user's field of view, enabling interaction with digital content in the user's unique physical environment. For instance, a user could be walking through the mall and see digital

displays at storefronts they pass, digital menus and product images for nearby restaurants, and available seating at the movie theater. Eventually, computer vision and caching memory from other devices will allow devices to predict the user's field of view and provide content without requiring a user request.

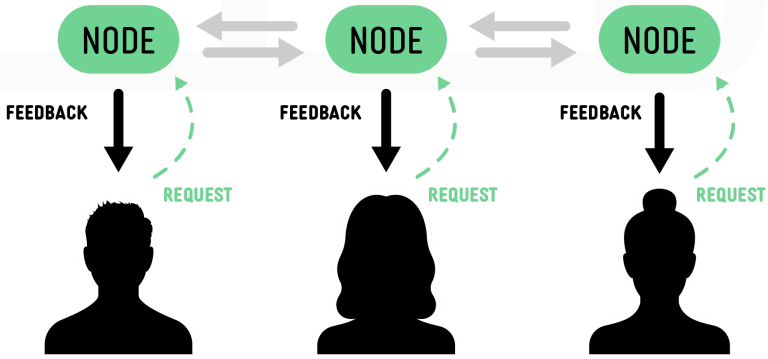
Edge Computing & Cloud Retrieval Latency

Edge computing has made significant improvements to latency in data delivery, yet usually still requires 8-10 milliseconds for round trip processing times. While this delay may be acceptable for consumption of data online, it is not conducive to an interactive and immersive metaverse experience that requires instantaneous processing and return of complex data. Bandwidth has been a consistent barrier to the efficiency of edge computing, as pathways to send and retrieve data are limited and can easily become congested with requests.



GridIron intends to bring the edge as close as possible to the user by distributing compute requests across multiple nodes, thereby creating a network that functions as a super computer right next to the user.

Additionally, the implementation of RLUE, a Gravity Jack protocol that determines the location of each node relative to other nodes on the network ensures that compute requests will be issued to nodes as geographically close to the user as possible (accounting for motion of nodes), preventing the delays that result from communication with an edge device or a distant node. Individual devices will no longer be



burdened by complex compute requests and will instead serve as an access point to a network with almost unlimited processing power. The delegation of compute allows each node to only perform small calculations for each processing request, increasing feedback speed. For instance, if the user wanted to interact with an augmented reality store front display that featured a family playing a game of soccer, the user would send the processing request to the GridIron network and the network would delegate different computations to each participating node. One node would calculate the soccer ball, one node would calculate the goal, one node would calculate the children playing, etc. By bringing the edge close to the user, GridIron further reduces latency and increases bandwidth capability by creating new pathways for data exchange between nearby individual nodes, rather than relying on the limited pathways from the edge device to the user.

Cache Memory Sharing

Beyond the sharing of compute power, GridIron protocols allow devices to share cache memory, thereby making frequently requested data readily available to users without requiring communication with edge devices or the cloud. Dynamic location determination through RLUE allows the network to predictively determine which nodes will be near each other, while caching recognizes which data is frequently requested in that area. For example, if a storefront in the mall has an augmented reality display, the stationary nodes near the storefront will recognize the display as frequently requested data and cache it. Because the nodes never move, users walking by and requesting the display data will receive results instantaneously without communicating with a server. Each node on the network has access to the advertised cache memory of other nearby nodes, making cache storage almost limitless. The idea of shared caching also eliminates the need for consistent internet connectivity, as data is essentially memoized in specific nodes. This protocol serves to further reduce latency and minimize complexity of compute requests, while ensuring data will remain available in the event of internet issues.

Exploitation of User Data

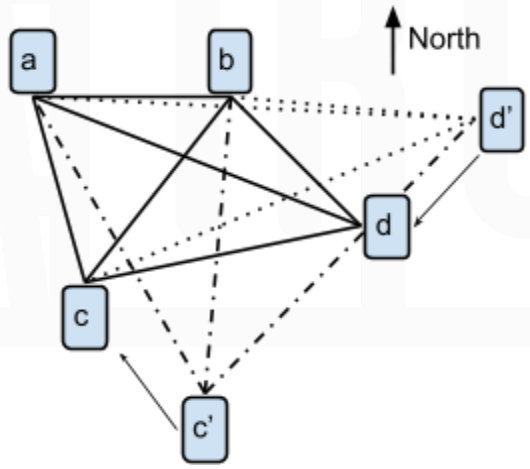
Web2.0, the era loosely defined as 2005 to 2020, was characterized by advancements in web technology, allowing for the provision of more complicated services and changing the landscape of the internet from the ‘read-only’ environment of Web1.0 to a ‘read-write’ environment. Companies like Facebook attracted users who in turn created massive amounts of data. However, a fundamental question arose: who owns all this data? Recent years have featured heated discourse surrounding this question and the unethical exploitation of user data, exampled by the infamous Cambridge Analytics incident where the information of up to 87 million public Facebook profiles was harvested without user consent. The incident revealed the true relationship between users and Big Tech - users are the product rather than the customer (Vitalik Buterin), as platforms take user data and exploit it for profit without user consent or compensation. GridIron presents users with the opportunity to reclaim autonomy over their data, in that they finally see the profit from sharing their data and determine which data is advertised to

the network. As GridIron is peer-to-peer, users will pay one another to utilize shared data and compute power, creating an ecosystem that circulates funds among users rather than funneling profit to corporations.

Technology

RLUE - Relative Location in an Unprepared Environment

Gravity Jack has invented a process for determining the relative location between users in an unprepared environment. It can determine the bearing (relative to magnetic north or purely relative to nearby devices) of each user from every other user's device. Our method works with or without GPS data, and does not require pre-mapping of the environment. Additionally, the protocol works without any existing network infrastructure in the environment such as beacons or Wi-Fi access points. Meaning, the process is capable of working without an internet connection as long as the user's devices can form an ad-hoc network between them (currently via WiFi direct, Ultra Wideband or Bluetooth Low Energy signaling). RLUE uses movement information from each user to determine location and distance relative to all nodes on the network, measuring changes in the graph as users enter and move about an environment. Movement is detected and measured from accelerometer data, while the *direction* of movement is obtained from the compass in the device.
The following illustrates how the graph changes with movement, demonstrated by the northwest movement of user ***c***, and the southwest movement of user ***d***.



This technology is essential to the GridIron network, as determining the relative location of each user allows devices to transact with nodes nearest to them, thereby reducing latency and circumventing bandwidth issues. Additionally, the network can perceive which nodes near the user have cached the data they are requesting, eliminating the need for communication with the server. As this technology measures the direction a user is moving, it is used to *predictively* determine which nodes will be nearest to the user at any given time, ensuring quick transaction

times and compute results. Similarly, RLUE can be utilized to predict which data the user may potentially request based on the cache memory of nodes the user is approaching.

Settlement Features with Carbon12

GridIron will utilize the cryptocurrency Carbon12 for transactions of compute power, sensor data, cache memory, and content sharing on the network. Transactions will be recorded on the blockchain to ensure security and integrity of the GridIron network, while crypto provides users with the ability to transact quickly without requiring verification from an external source. Users will have the power to decide how much they buy and sell CPU for as they are setting up their advertisement packets for the network. The user who needs computing power sends a request to the network, which will find users with available CPU for the desired price and automatically create a settlement between the involved parties. Settlement will occur in the background, while compute feedback can be delivered immediately so that users will never be waiting on payment verification to receive a compute result. GridIron protects users against "theft" of computing resources by blocking bad actors from the environment if settlement is not reached. GridIron will take a small fee from each transaction that will be used to cover losses from bad actors who do not settle. The peer-to-peer nature of GridIron reflects the paradigm shift toward web3.0, empowering users to take ownership of their data in a real way and see profit. The GridIron network will use multiple chains, one for commerce and transactions, the other for data retrieval. The latter operates using an Arweave backend in order to maintain the integrity and security of user content and data.

Arweave Backend

GridIron uses an Arweave "blockchain" based backend to retrieve cached data, rather than URL. Arweave peer-to-peer hypermedia protocol technology financially incentivises nodes across the network to share their unused storage space to store user files. The network encourages creating and storing duplicates of files across multiple nodes, so that users may access files quickly regardless of internet connectivity. Each file is given a unique "digital fingerprint", protecting it from being tampered with or altered.

"The core technology that powers the Arweave is the blockweave. Just as a blockchain is a linked collection of blocks containing transactions, a blockweave -- specifically designed for the Arweave protocol -- is a set of blocks that contain data, linking to multiple previous blocks from the network. This data structure allows the network to enforce that miners provide a 'Proof of Access' (PoA) to old data in order to add new blocks.

Unlike in a traditional blockchain, where miners are forced to expend electricity in order to earn tokens, in the Arweave network miners are also encouraged to replicate valuable data (the information stored in the network) in order to gain tokens. This mechanism offsets the value that is normally wasted in blockchain networks, with useful, energy efficient storage of data." (arweave.org).

GridIron's use of Arweave allows for secure file storage and expedient data retrieval with or without internet connectivity, protecting user data from exploitation by Big Tech or alteration by bad actors and centralized authority, while ensuring a convenient and efficient experience for the users themselves.

Burst Sharing

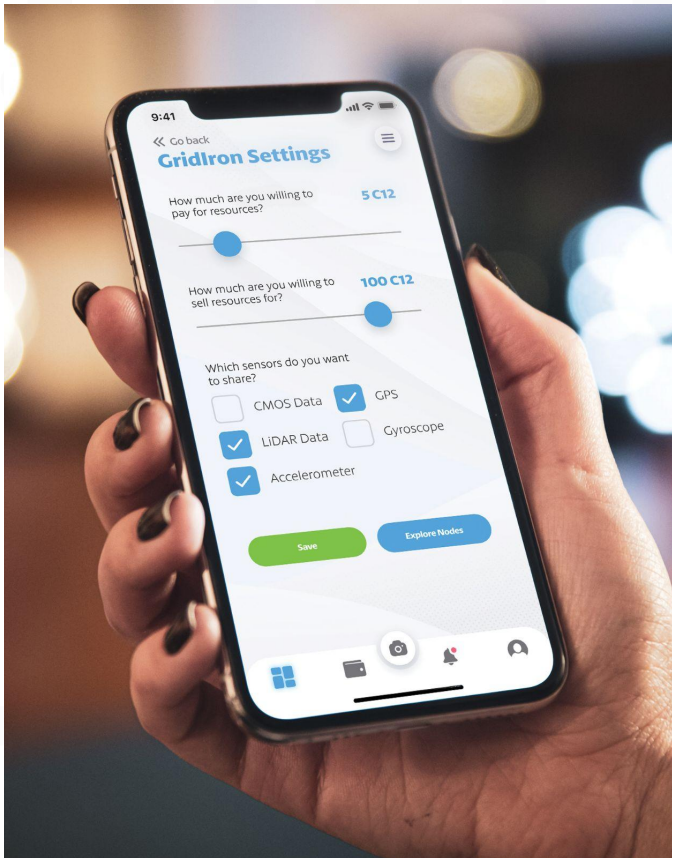
Grid computing technology distributes computing resources (CPU, memory, storage) across nodes on a network, creating a powerful supercomputer that expedites complex or demanding compute requests. One computer can access and utilize the collected power of all computers on the network, or multiple computers can work in tandem to complete calculations. Grid computing is typically utilized for supercomputing, and requires that every node on the network dedicates itself entirely to providing resources at all times. Meaning, if a computer is on the network it is not available for standard usage or regular computations as its entire CPU is directed toward grid calculations.

GridIron uses a new form of grid computing, which we have termed Burst Sharing. Burst Sharing provides access to a grid network on a need basis, rather than requiring that nodes remain on the grid at all times. Users needing extra compute power may submit a request to the network, and Burst Sharing will automatically distribute the compute requirements across available nodes, prioritizing which nodes will be utilized based on available CPU, distance from the requesting user, and price point of the required resources. While grid computing requires a node to be running and online at all times, Burst Sharing can pull resources from dormant devices, enabling the user to profit off of compute power while their device is not in use. Additionally, Burst Sharing allows users to use their device as they typically would and still participate in the grid, rather than demanding the entire CPU of all devices. Advertisement packets allow nodes to display only what compute resources are currently available, meaning a user can scroll through social media, send emails and messages, even stream shows and still provide their remaining CPU to the grid.

Advertisement Packets

Each node will display an advertisement packet to the network, detailing what features are available for peer usage based on user preference. The packets include how many dynamic teraflops or microteraflops are available for compute power at the time of advertisement, distance from nodes it is advertising to, whether or not each node is stationary or in motion, and which sensors the node is willing to share. Advertised compute power units will range depending on how much power is available at any given time - dormant devices will advertise more available microteraflops than a device in use. Time of flight packets and RLUE are combined to calculate advertised distance. Sensor advertisements can include accelerometer, gyroscope, and CMOS (Camera) and LiDar data.

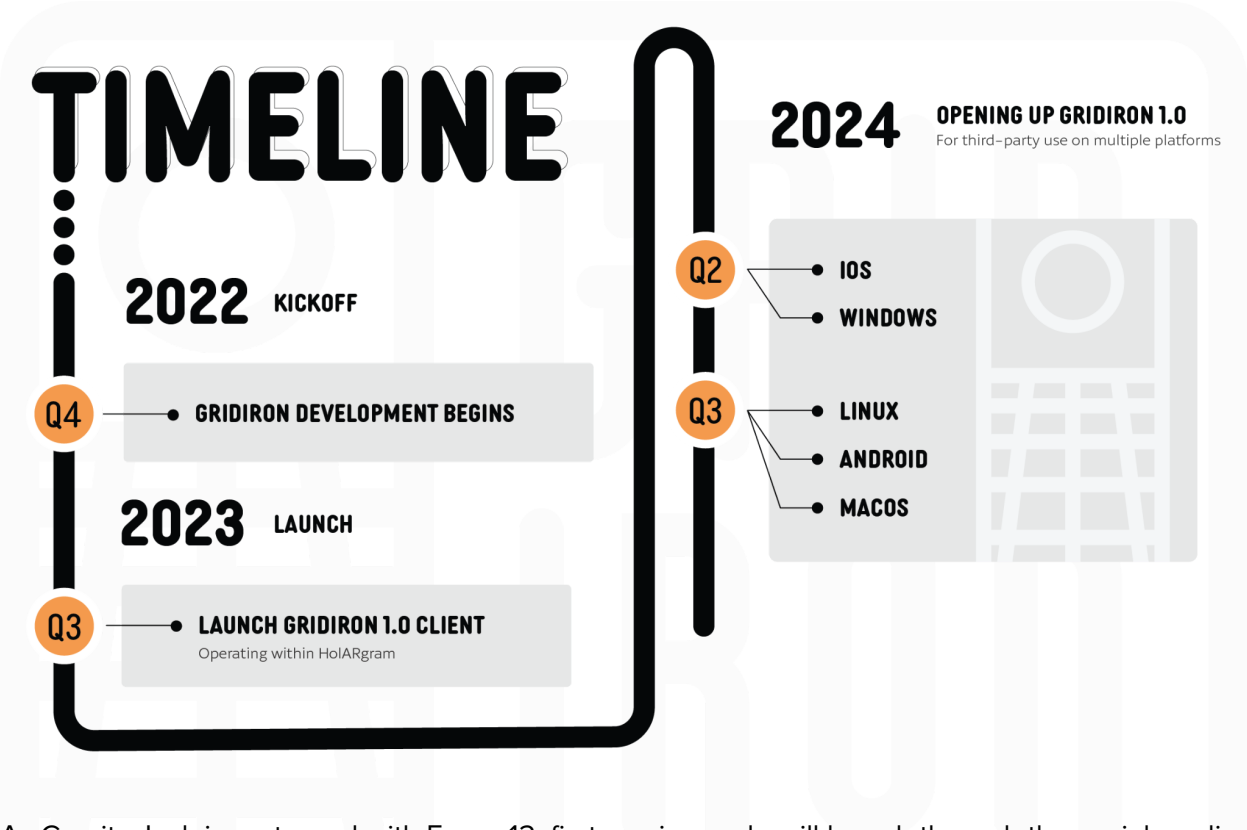
Additionally, users can opt to advertise their device to the network as “node only”, allowing them to participate in the network and see profit without sharing sensor data or compute power. These devices will solely be utilized to transfer traffic within the network to reduce congestion or bridge distance between transacting nodes.



The utilization of advertisement packets creates a need-based network that selects nodes based on user requirements and location. GridIron determines which nodes best fulfill each request, ensuring that users receive the quickest feedback for the lowest price. As a result, GridIron successfully creates a grid network that intuits the needs of the user and judges which nodes can efficiently satisfy those needs without pulling unnecessary resources from every member of the network.

Timeline

Gravity Jack anticipates 3 versions of advertising packets for the GridIron network. The initial focus of V1 for the GridIron network will be the ability to share CPU between participating nodes, with V2 featuring the ability to share content, and V3 allowing for the sensor sharing. Versions 2 and 3 will be backwards compatible, meaning that a node operating with a V3 advertisement packet will still be able to purchase CPU from a node operating on V1.



As Gravity Jack is partnered with Forum12, first version code will launch through the social media app HolARgram, and will be iOS compatible. The HolARgram app will feature a Carbon12 wallet that prompts users to set up their advertisement packets that determine their desired role on the network (node only, just purchasing CPU, just selling CPU, etc). Eventually, after V2 and V3 are launched the configuration panel for advertisement packet setup will allow users to determine which sensors to share with the network. HolARgram operates with an arweave backend, and its incorporation of GridIron will allow users to share content, CPU, and sensors using blockchain addresses rather than URL addresses, eliminating the need for user communication with the cloud.

After GridIron launches with HolARgram, Gravity Jack will publish APIs that allow third parties to use GridIron. Gravity Jack plans on giving GridIron code to third parties in order to populate the network with nodes and create a peer-to-peer ecosystem. After the publishing of APIs, GridIron

will seek compatibility with all platforms (namely, Android, Windows, Mac, and Linux) by developing executables for each operating system. Additionally, Gravity Jack will actively pursue relationships with companies for the inclusion of GridIron, as they could profit just by installing the software[1]. Users will install an app that has GridIron embedded or install the GridIron program itself, thereby giving them access to the network and prompting them to create an advertisement packet that will allow for participation in the grid.

Conclusion

GridIron creates an interoperable network that allows users on any platform to access the compute power of a supercomputer based on need. Burst Sharing enables nodes to access the network and provide or purchase data upon request, but does not necessitate that nodes are devoted entirely to grid calculations. The network uses advertisement packets to prioritize which nodes will best complete a compute task for the user in terms of speed and cost, with RLUE creating a predictive mechanism that anticipates the needs of the user and intuits the best distribution method to fulfill those needs. The use of cryptocurrency ($C12) and the blockchain for settlement features incentivize users to participate in the network, while providing the ability to transact efficiently and securely without verification delay. In that same way, the implementation of an arweave backend securely stores files and user data in a manner that is incorruptible and immutable. Eventually, the adoption of GridIron by every platform will render user-to-cloud communication almost obsolete and the network will function independently from the internet and centralized authority.

[1] Gravity Jack has several large name companies in the wings at the time of writing, and announcements surrounding “partnerships” will follow after deals are solidified

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