

I O T E X 2 . 0

The Rise of MachineFi

A New Vision by





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Machines
will be our
world's
future
workforce
-- who *will*
own them?

Introduction

Machines are emerging in our homes, businesses, and cities at a blistering rate. In 2020, more than 150 new machines were activated every second, connecting the physical and digital worlds like never before. By 2030, McKinsey predicts machines will outnumber humans by 10:1 and generate more than \$12 trillion in economic value. From smart thermostats and fitness trackers to connected vehicles, solar panels, and satellites, machines are being inserted into practically every facet of the global economy and our personal lives. But as we marvel at the new machine economy that is blossoming before our very eyes, we must pause and ask ourselves: who will own these billions of machines and this future machine economy?

We are at a pivotal moment in human history. Trust in our institutions is at an all-time low, while the desire for control and ownership from users is growing by the day. Over the past decade, centralized corporations have been the gatekeepers and sole beneficiaries of the largest technology revolution in human history. Tech giants control our devices, monitor our activities, mine our data, and earn huge profits with no value returned to users. Now is the time for change. By re-architecting our world using blockchain and Web3 technology, we can guarantee that the trillion-dollar machine economy provides value, control, and opportunity to everyday people, not omnipotent corporations.



This is the essence of MachineFi. With IoTeX 2.0, we are embarking on a new journey to equip machines with all of the tools they need to be self-sovereign and allow users to monetize the unique services and intelligence from their machines. Since day one, we have always believed that machines, not humans, will one day be the largest users of blockchain. With MachineFi, we will turn this belief into action.

In this Vision Paper, we are proud to share our long-term vision for MachineFi, as well as an overview of the IoTeX 2.0 protocols and products that will make our MachineFi vision a reality. By realizing this vision IoTeX will lead the masses in transitioning from centralized control to decentralized freedom, empowering users to own and control their machines, as well as the data and value their machines generate. Join us on our mission to enable millions of users to capture the value from the future machine economy and expand the possibilities of the Metaverse, Web3 world, and beyond.



MachineFi will connect the Real World and Metaverse.

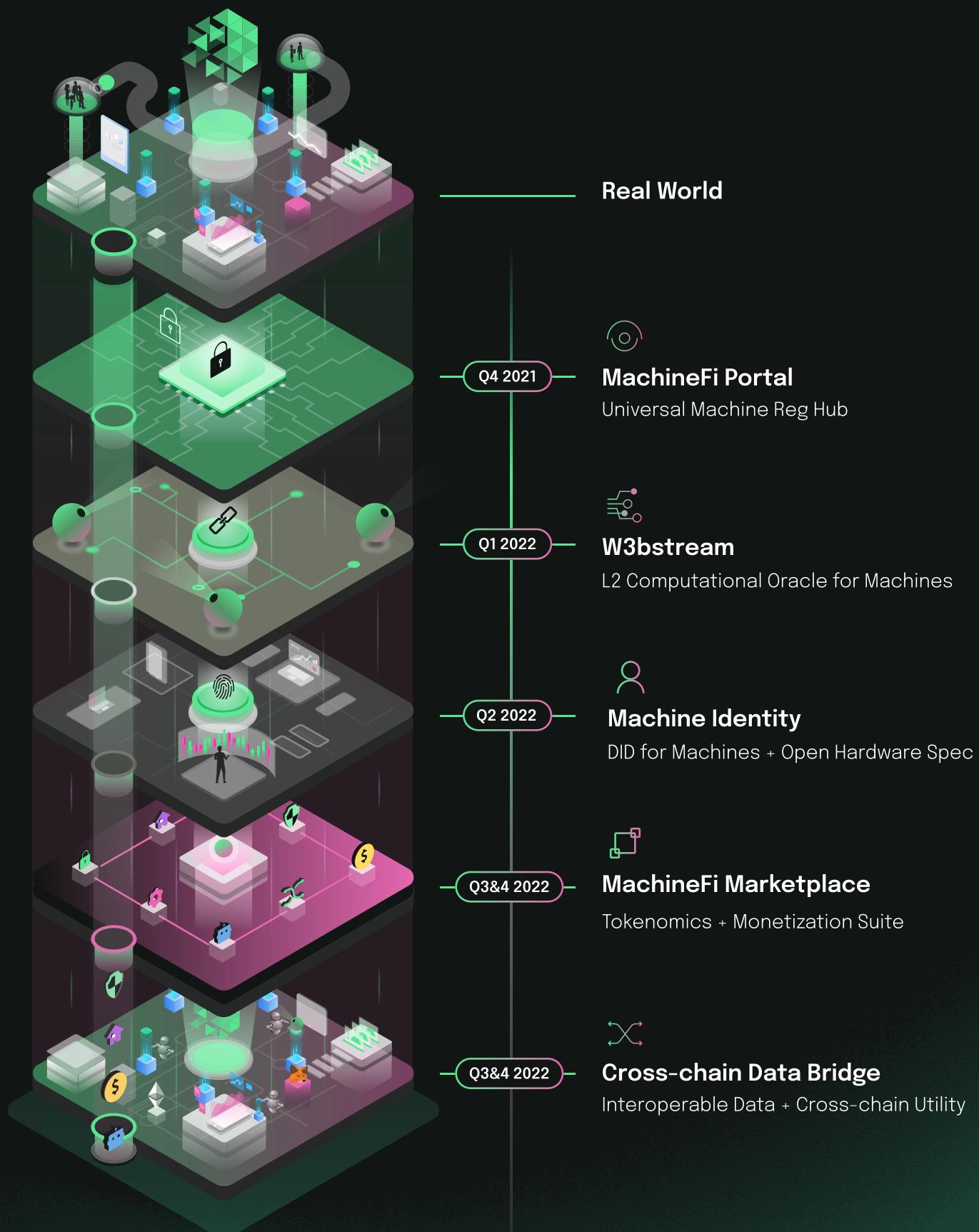


Figure 1. IoTeX 2.0 Overview

The MachineFi Vision

Machines Will Be Our Future Workforce

The convergence of artificial intelligence, blockchain, 5G connectivity, virtual reality, and other frontier technologies has sparked a technological revolution that is fundamentally transforming the way society operates. Although these technologies have evolved independently over time, they are becoming increasingly intertwined and packaged into a new productive asset: intelligent and autonomous machines.



What seemed like science fiction only a few years ago is now becoming a reality in the budding machine economy. Autonomous taxis are now delivering the first driverless rides. Doctors are now performing surgeries from thousands of miles away using remote surgical systems. Warehouses are now utilizing robots that match or even exceed the mobility, dexterity, and agility of people. Security cameras are now providing surveillance-as-a-service with alarmingly accurate facial recognition. And governments around the world are now investing heavily in the next generation of robot armies and drones. Across every industry, machines are not only collaborating with human workers, but are also replacing cohorts of human workers altogether.

PricewaterhouseCoopers (PwC) predicts that 50% of all jobs will be partially automated by 2030, and Deloitte estimates that 30% of the world's workers will be replaced entirely by machines within the next 20 years. Whether we are ready or not, machines will inevitably comprise the majority of our world's future workforce.

Which begs the question:

Who will own these billions of machines and the future machine economy?

Community-Owned Machine Networks

The infrastructure that powers our modern world, often called Web 2.0, relies on centralized servers and vertically integrated tech stacks that are controlled exclusively by corporations. The centralized nature of Web 2.0, amplified by corporations' capitalistic focus on profits over trust, has unleashed consequences for users such as data breaches, censorship, and targeted advertising that are now impossible to rein back in. If we apply this Web 2.0 philosophy to the new machine economy, our future workforce of billions of machines will be monopolized by the same corporations that have exploited our trust time and time again.

It is time to change the status quo. Thanks to blockchain technology, a paradigm shift known as Web 3.0 has come to life which aims to replace corporate-owned, centralized networks with community-owned, decentralized networks. Key benefits that are not inherent in a Web 2.0 structure, such as composability, free market incentives, and user-ownership, are built-in to Web 3.0 by design:

I. Composability

The ability for anyone in a network of distributed participants to leverage the work of others to create new solutions in a collaborative, community-driven fashion. Developers can bootstrap their own projects and communities without starting from scratch by leveraging the collective mindshare of all network participants to fuel innovation.

II. Free Market Incentives

The prices for goods and services in a Web 3.0 network are defined in a peer-to-peer (P2P) fashion by users that interact with each other without centralized intermediaries. P2P networks are self-regulated and open to everyone, where participation is driven not by top-down mandates but by transparent incentives.

III. Community Ownership

Unlike centralized networks that generally gravitate towards zero-sum relationships where value is extracted from network participants, decentralized networks reward users that contribute and utilize the network by delivering ownership/equity of the network in a meritocratic fashion.

The above benefits are paramount to ensure the future of MachineFi is open, fair, and most importantly community-owned. Only with the creativity and productivity of pioneering developers and users can MachineFi reach its full potential. Specifically for bootstrapping machine networks, which are capital-intensive with high upfront costs, the composability and community-driven nature of Web 3.0 removes significant barriers to entry by applying free-market incentives to raise capital, build communities, and scale the network to new heights.

“Proof of Anything”

“Proof of Work” and “Proof of Stake” are common terms in crypto, but are often mislabeled as consensus mechanisms. In fact, these are actual proofs that an entity must provide to the blockchain in order to receive rewards, permissions, or other benefits. For Bitcoin, if a miner proves that they have done the work and calculated the correct hash, then they are granted the right to mint the next block and earn a reward. For Ethereum, if a validator proves to the blockchain they have staked sufficient ETH tokens, then they are granted permission to be a network validator. But what if the “proofs” we provide to a blockchain could also include things that everyday people and businesses did in the real world?

Proof of Anything:

IoTeX machines deliver proofs of real world activity to the blockchain

Proof of Presence:

real-time GPS location from an asset tracker like Pebble

Proof of Health:

health-related metrics from a fitness tracker or wearable

Proof of Safety:

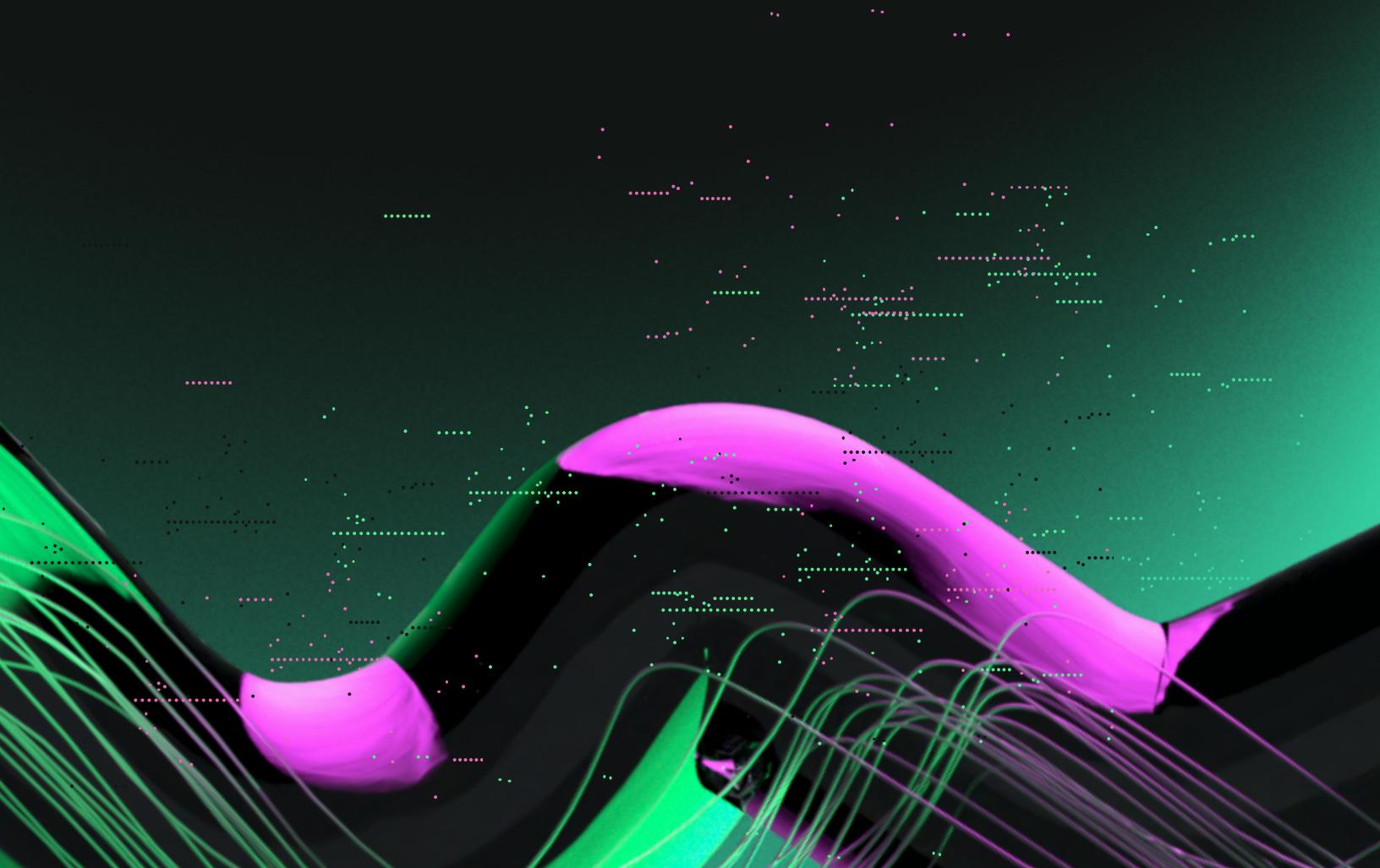
driving patterns or specific routes taken from a vehicle

Proof of Green Energy:

building's energy efficiency score from a smart meter

Just as Chainlink jump-started the DeFi renaissance by establishing a “single version of truth” of crypto-asset prices, IoTeX will establish a “single version of the truth” for things that happened in the real world. Smart home devices, wearables, vehicles, and all types of devices can adopt our MachineFi concept to become “proof generators” where the proofs will be fed as inputs to smart contracts in order to trigger on-chain actions.

For example, insurance companies can reward homeowners every time they prove they have locked their homes, which is a win-win scenario for all parties. Possibilities are also abound in gaming, where proof of real-world activity can transfer to your in-game characters -- by proving you are improving your health in the real world using healthcare wearables, your in-game character can also receive more health points. Finally, by proving your vehicle’s GPS location, you may be able to receive on-chain offers from nearby restaurants or receive token rewards for contributing intelligence to a map application like Waze.



Mirroring the Real World to the Metaverse

By connecting the real world to the digital world, MachineFi will open a brand new design space for blockchain builders where, for the first time, users can earn digital assets or digital reputation based on their real world actions that are captured/verified by machines. The impact of MachineFi grows even further when considering the Metaverse, which will be an immersive virtual world that can mirror events in the real world thanks to IoTeX:

I. Physical World

The world we experience with our bodies and five senses. In particular, the physical world contains communication, computing, and storage resources (i.e., tangible assets) that are required for supporting operations of the Metaverse.

II. Digital Transformation

By capturing the status of physical objects, we can create digital twins of every object in every place to build seamless connections and two-way interactions between the physical and virtual worlds. MachineFi will serve as a composable and user-centric computing fabric that enables real world users/machines and virtual users/machines to exchange value in a trustworthy manner.

III. Metaverse

An immersive, computer-simulated environment with specific spatial and physical characteristics. The Metaverse provides a vibrant, parallel world that enables users to participate in virtual activities, gain virtual status, and interact with other virtual beings via virtual avatars.

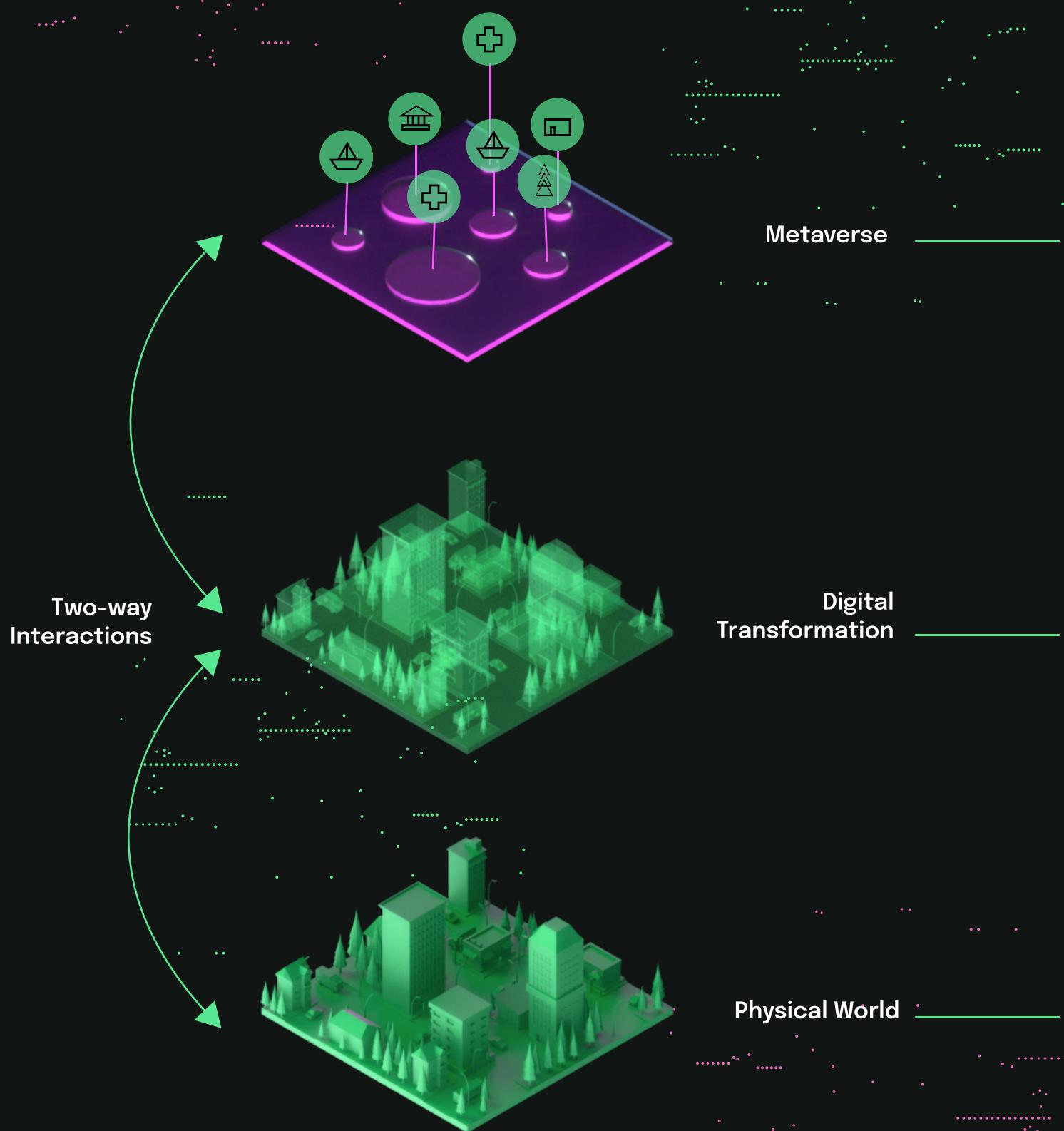
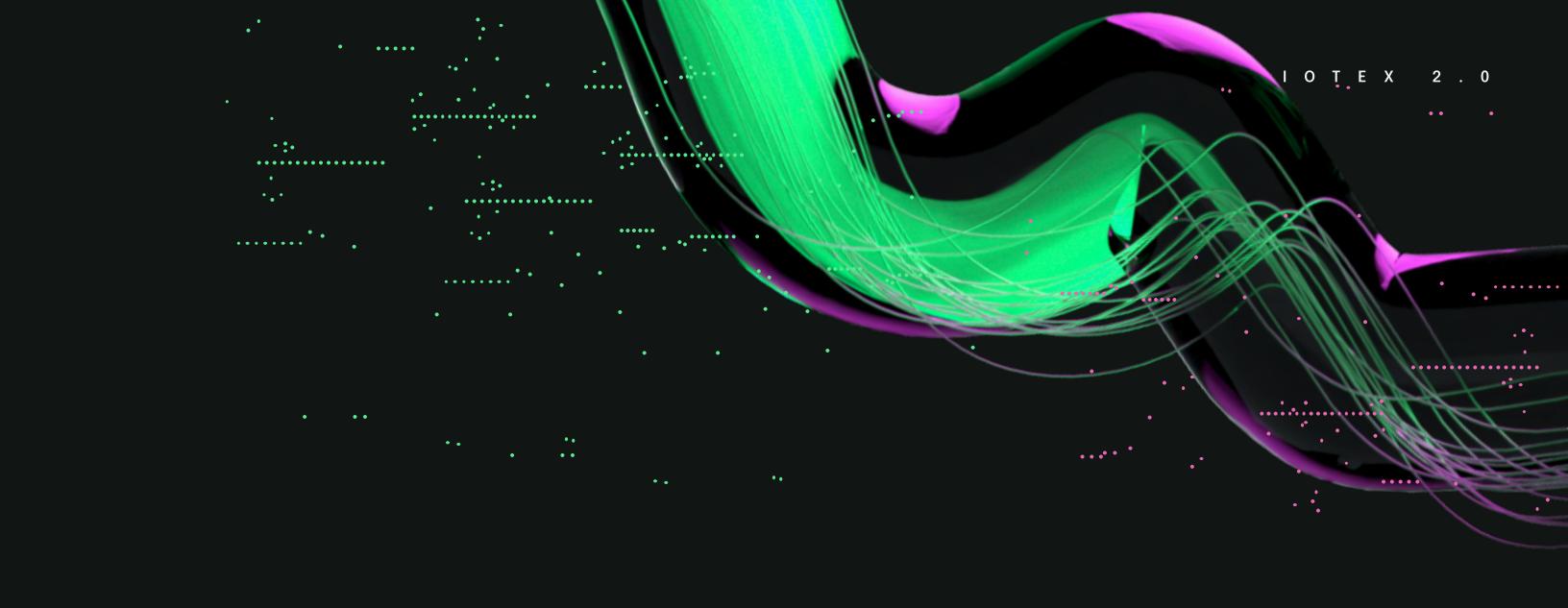


Figure 2. The Metaverse with Two-Way Interactions



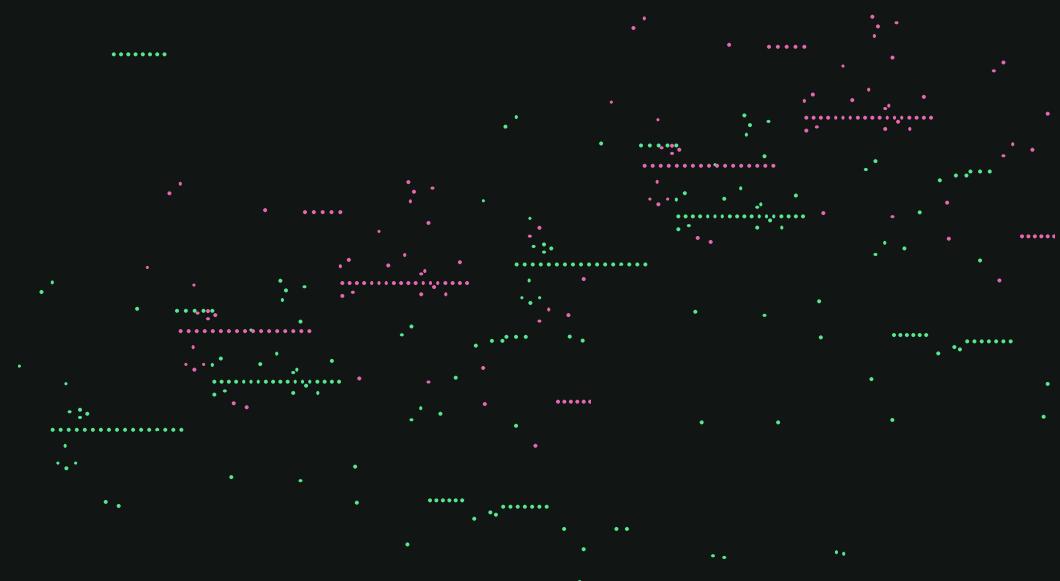
Machines, encoded with human intelligence, will soon be the dominant workforce in the real world, constantly listening, watching, and monitoring our activities.

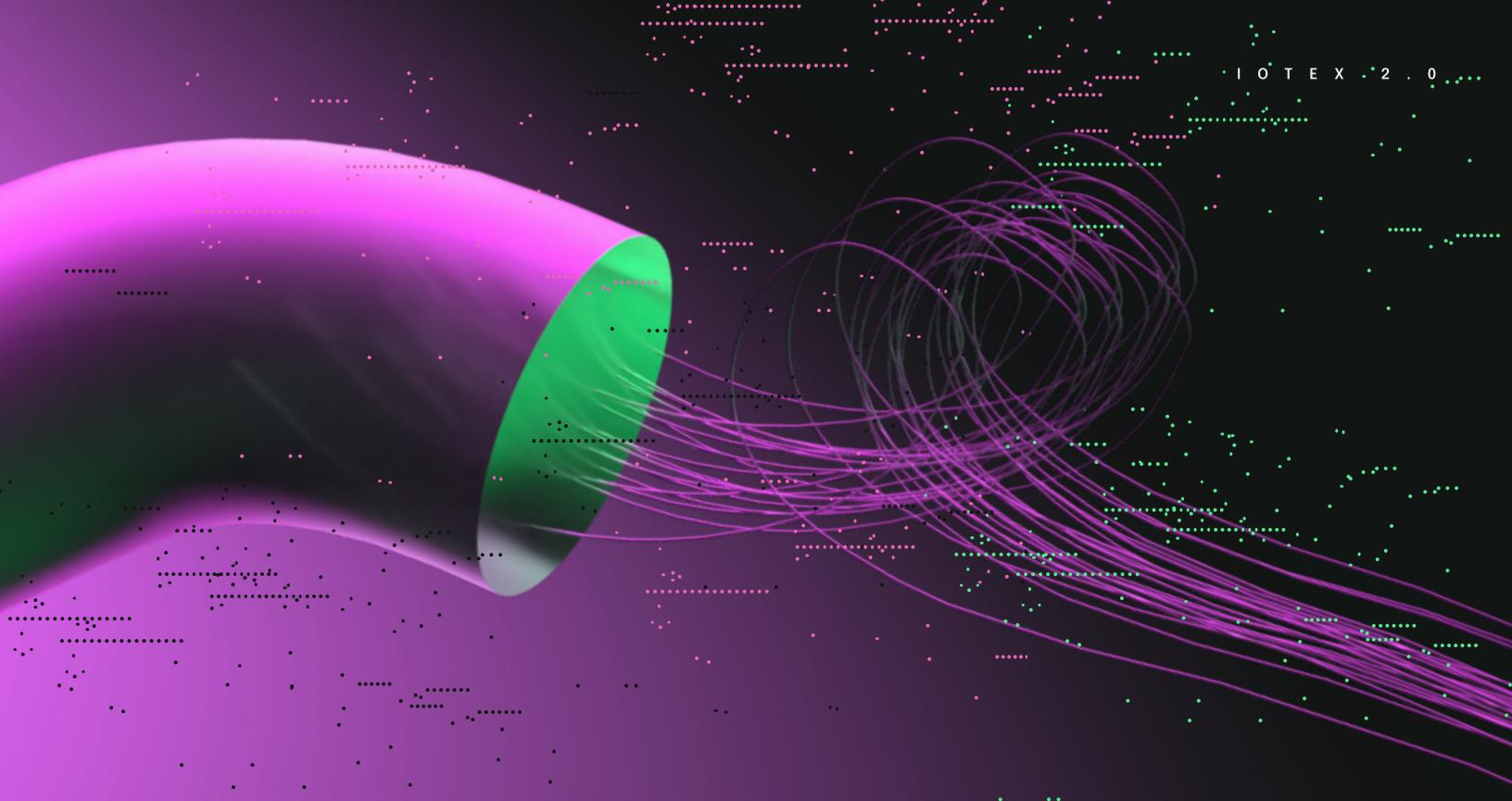
These facts can be used to program the metaverse, enriching virtual applications with real world information. For example, if you prove you have lost 10 pounds in the real world by connecting your smart scale to IoTeX, then your metaverse avatar may look slimmer as well. If you prove that you have traveled to many countries in the real world, then your metaverse avatar may also gain this real world perspective and unlock new “countries” in the metaverse. And finally, if you prove that you are a good driver via your vehicle’s telemetry data, your metaverse avatar may receive permissions in the metaverse to use new types of virtual vehicles. An infinite number of possibilities awaits!

Enabling the Metaverse to Program the Real World

Play-to-Earn is one of the most innovative concepts in crypto today. Within this new GameFi industry, users can perform actions in the digital world to earn digital assets and digital reputation. By mirroring events in the real world to the metaverse, IoTeX expands on the Play-to-Earn concept by enabling users to perform actions in the real world to earn digital assets or digital reputation. This is an innovative concept, but even more groundbreaking is the opportunity to use the metaverse to program the real world. In other words, enabling users to perform actions in the virtual world (metaverse) to earn rewards and benefits in the real world.

The metaverse is still in its infancy, and there is much to discover about how the metaverse will be built, adopted, and scaled. Regardless of how the metaverse evolves from here, one thing is clear: building a two-way bridge between the real world and the metaverse will enable all types of intelligence to be synchronized and massive network effects to be captured. By instituting incentives in the metaverse to complete missions, contribute mindshare, or provide resources, metaverse builders will be able to leverage the borderless user base and open incentives that crypto has popularized to bootstrap new virtual ecosystems.





Imagine you are the owner of a virtual space in the metaverse, and want to attract new users to experience it for the first time.

With the advent of intelligent and autonomous machines, the metaverse can be used to program real world machines to deliver services and value upon completion of virtual tasks. For example, if you attend a musician's concert in the metaverse, then the metaverse can instruct an autonomous drone to "airdrop" an exclusive t-shirt or other swag to your doorstep. If you are one of the first beta-testers of a new metaverse environment, then the metaverse can instruct an autonomous vehicle to pick you up and bring you to a secret, exclusive party for early adopters. And finally, if you boost your in-game character to a certain level in the metaverse, then the metaverse can instruct neurological devices like Neuralink to boost your real world cognition abilities, either permanently or temporarily. As the metaverse evolves, IoTeX is committed to establishing new concepts and primitives with MachineFi that will deliver new forms of utility across the real world and the virtual world.



The Machine Economy will Generate \$12.6 Trillion in Value by 2030

Source: McKinsey & Company

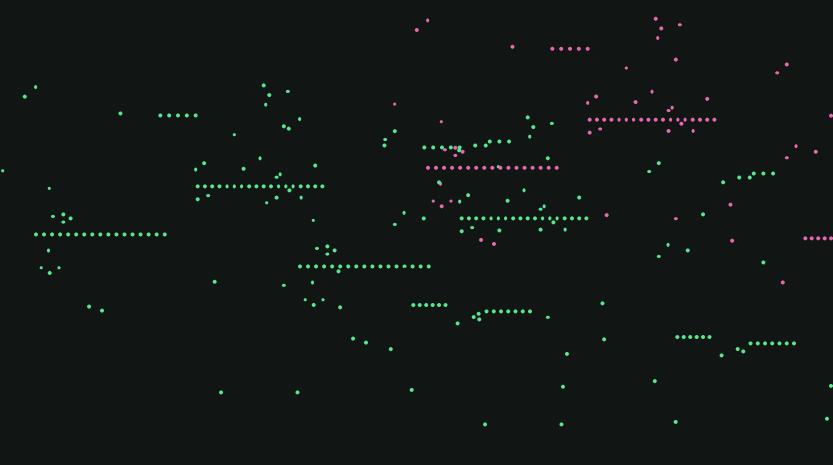
IoTeX 2.0 - The Network to Power MachineFi

New MachineFi Innovations

Our vision for MachineFi requires more than just blockchain technology. That is why IoTeX 2.0, the network to power MachineFi, will be a full-stack platform across hardware, firmware, and software that is designed to enable trusted data from trusted devices for use in trusted Dapps. The IoTeX 2.0 network will combine new innovations in blockchain, identity, oracles, hardware, and tokenomics to bring real world machines to Dapps for the first time. Over the coming year, we will introduce core components of IoTeX 2.0 starting with the MachineFi Portal to register and bind human/machine identities, followed by a first-of-its-kind real world oracle called W3bstream to bring verifiable machine intelligence to IoTeX Dapps. This umbrella of new IoTeX 2.0 innovations that enable MachineFi will be constantly improved over time, starting with beta launches and maturing to fully decentralized protocols that will be governed by IoTeX stakeholders.

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I. MachineFi Portal

Universal machine registration hub for users to connect IoTeX devices like Pebble Tracker and Ucam, universal dev-boards like Raspberry Pi and Arduino, and other open hardware.

II. W3bstream

A Layer 2 computational oracle that synchronizes with all types of machines to collect data, generate proofs, monitor on-/off-chain events, and execute tasks via digital signatures. Proofs are streamed to W3bstream nodes which send endorsements to the IoTeX blockchain.

III. Machine Identity

The first machine-oriented decentralized identity (DID) and access management (IAM) framework, empowering machines to have their own on-chain identity and enable data ownership/authorization, device authentication, and access control.

IV. MachineFi Marketplace

A decentralized hub where users can connect a fleet of machines to Dapps, as well as offer developers a machine studio (e.g., templates, modular tools) to incorporate real world machines/data into their own Dapps without cumbersome coding.

V. Cross-chain Data Bridge

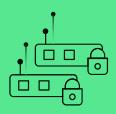
A new data interoperability bridge to transmit machine data that originates on IoTeX to other top blockchains, positioning IoTeX 2.0 as the universal hub of machine intelligence for the entire blockchain industry.

We will share full details on each innovation soon, and stay tuned for more MachineFi components.

Virtual World



Machine Learning



Machine Turk



Machine Games



Connected Cars



Community Building

MachineFi

SSI



DAO



DeFi



NFT



DDM

Internet Account Systems



Physical World



People



Devices



Data



Events



Tasks

Figure 3. IoTeX 2.0 MachineFi Architecture

The Workflow of MachineFi

MachineFi enables an entirely new category of use cases where users can earn digital assets based on their real-world data and actions. Here is how it works at a high-level:

Phase I

Device Onboarding

The user interacts with the MachineFi portal to register machines on the IoTeX blockchain and bind the machines with his/her wallet address utilizing the DID component in MachineFi. After this phase, the user is ready to join the machine economy and receive rewards.

Phase II

Device Initialization

The user interacts with the MachineFi portal to download an app and install it to their machine. Each app running on the device corresponds to a MachineFi Dapp and covers a set of capabilities. Users can choose any app that is compatible with their machines from the app store hosted on the MachineFi portal. After this phase, the machine is ready to earn tokens for its owner.

Phase III

Proof of Anything

The initialized machine captures real world information and generates proofs that it has collected data, monitored events, and/or completed tasks via digital signatures. These proofs are delivered to W3bstream nodes which send endorsements to the IoTeX blockchain. After this phase, the machine completes the proof collection and submission processes, and is ready to receive rewards.

Phase IV

Rewards & Benefits Issuance

The DApp verifies the endorsement received from the W3bstream node. If the verification succeeds, a reward in cryptocurrencies is issued to the owner of the smart device accordingly. After this phase, the device owner has received rewards successfully by participating in the machine economy.



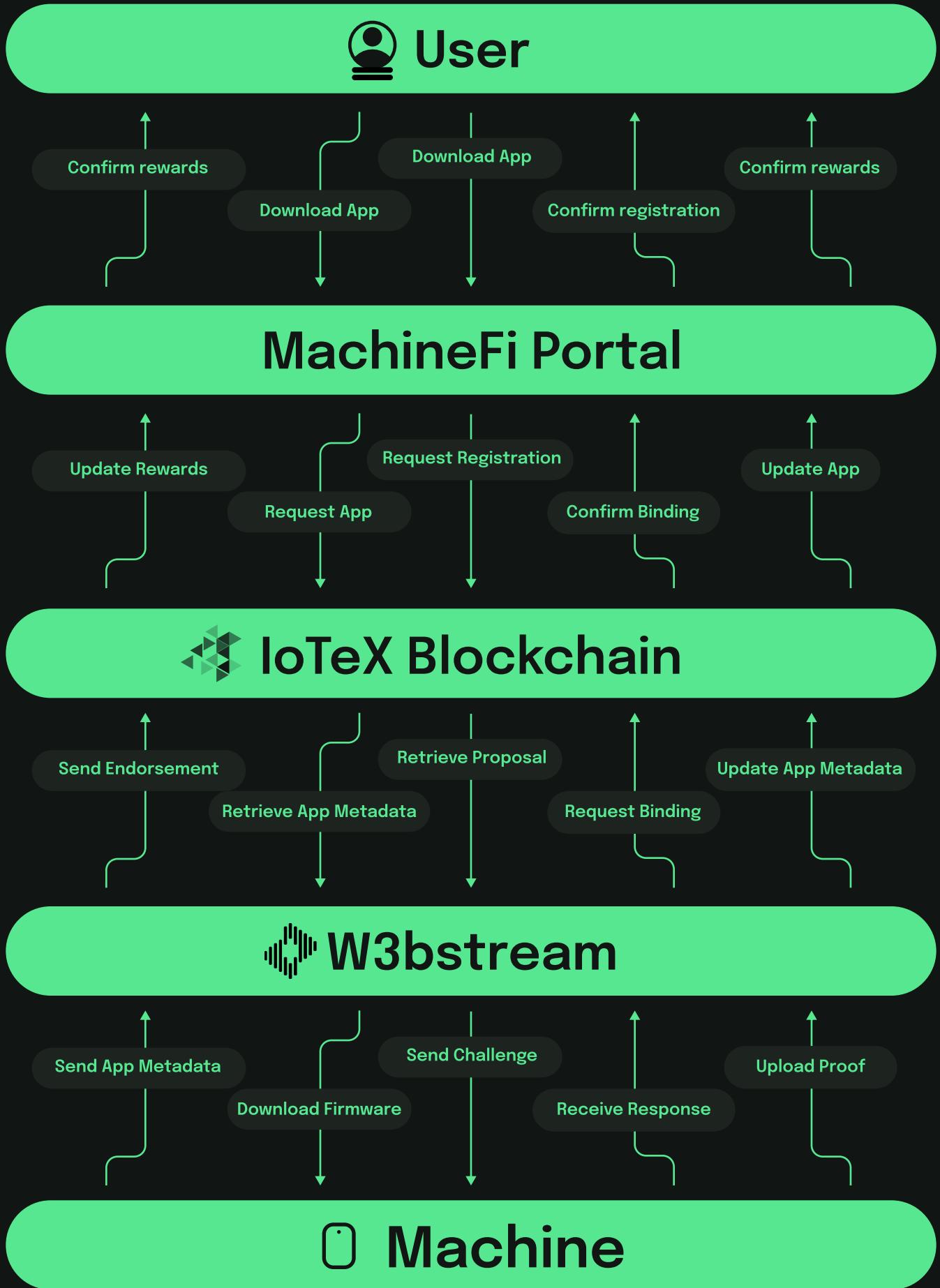
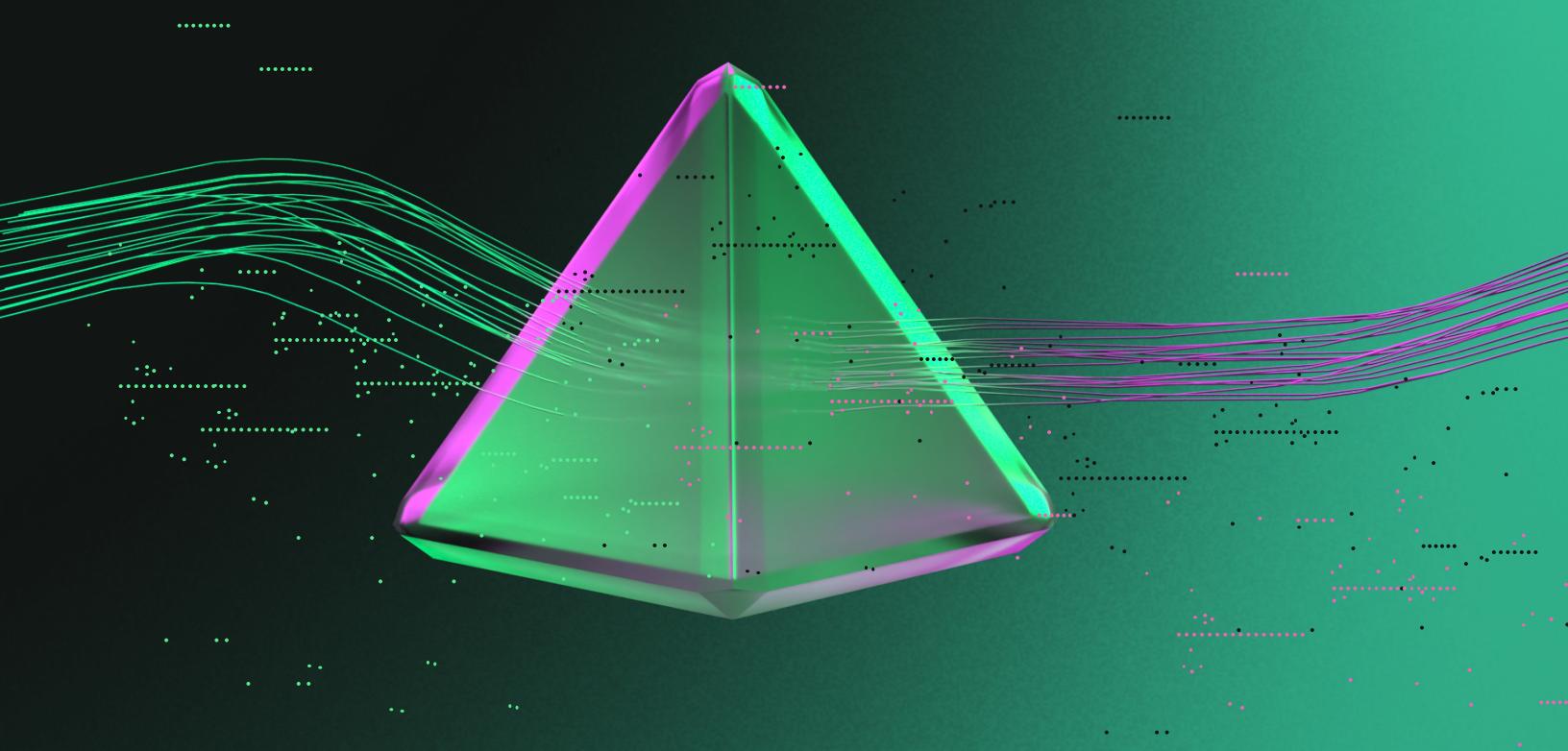


Figure 4. The General Workflow of MachineFi

MachineFi Use Cases

A New Design Space for Dapps

MachineFi is creating an entirely new category of Dapps that utilize an entirely new data source: real-time, real world data from machines. With more than 100 billions devices activated by 2030, the world's fleet of machines will find new utility in the IoTeX Network to monetize their resources, services, and data in a decentralized fashion. This new design space for Dapps will enable incredible value to be generated, and flow freely between the real world and the digital world to capture unthinkable network effects. Here are just a few of the exciting categories of use cases that MachineFi will enable.



I.

Machine “If This, Then That” (IFTTT)

Utilize machine intelligence (“Proof of Anything”) as inputs to smart contracts to trigger pre-defined business logic, where “If This” is a machine proof and “Then That” is a self-executing smart contract. This concept can be used to settle payments, manage service level agreements (SLAs), trigger notifications, and much more. With IFTTT, there are truly an infinite number of permutations of proofs and smart contracts to create new MachineFi use cases.

II.

Machine-as-a-Service

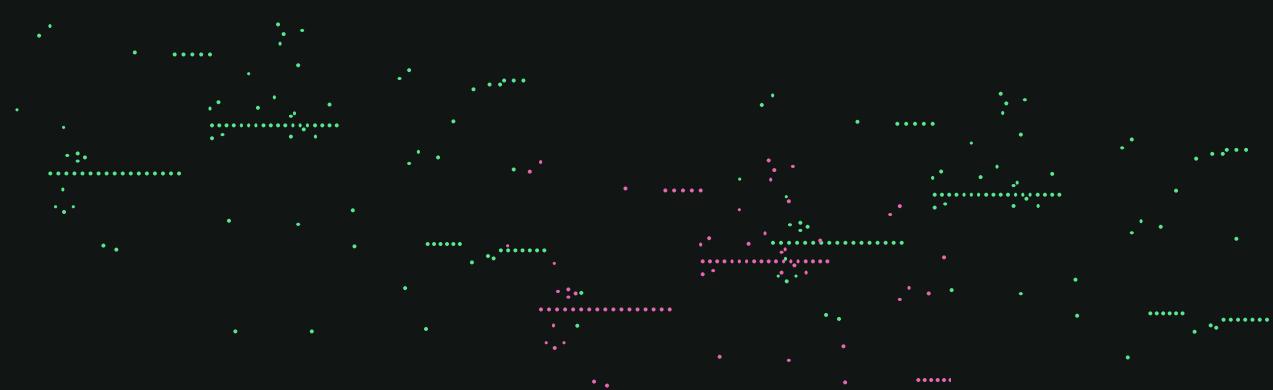
With IoTeX 2.0, machines will be able to deliver data, services, and intelligence to humans, businesses, and other machines and receive payment in a peer-to-peer fashion. Each machine can set its own terms and pricing for its unique menu of services, as well as select which counterparties they wish to authorize to use their services. This concept will sprout an army of useful and/or autonomous machines that can service society in a decentralized and transparent fashion.

III.

Fractional Ownership of Machines

machines that generate cash flows autonomously, such as robo-taxis, solar panels, and satellites, can be tokenized as non-fungible tokens (NFTs) and purchased by investors. NFT holders will own both the principal value of the machine as well as any future cash flows generated. This enables new financing opportunities -- Initial Machine Offerings (IMO) -- where capital for new machine networks is raised in exchange for future cash flows.

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IV. Machine Intelligence Pools

Fleets of similar machines can band together to create standardized intelligence pools, replicating the massive data pools controlled by centralized organizations but from a bottoms-up, community-owned perspective. Similar to DeFi liquidity pools, those that contribute the most intelligence will receive the most ownership of the pool, as well as the most amount of revenue when third parties query these intelligence pools in a permission-less fashion.

V. Machine Resource Marketplaces

A crowdsourcing-based approach that allows an entity to employ any number of machines to complete specific tasks. For instance, an environmental research institute can employ a distributed set of weather stations to monitor weather conditions of a specific geographic region without ever owning a weather station themselves, while weather station owners will be able to receive rewards in crypto for renting out their machine resources.

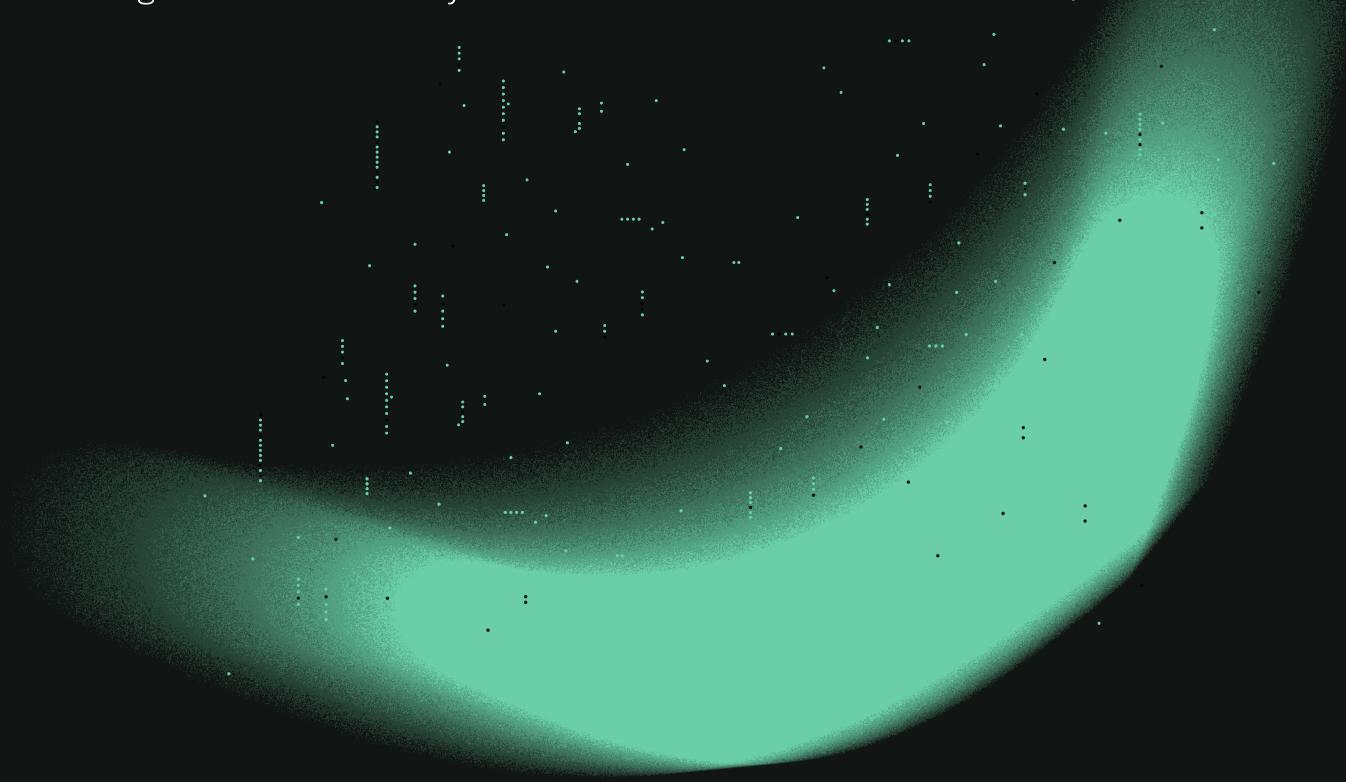
Considering the diversity of machines on the planet, as well as free market incentives and crypto-economics, the use cases that can be powered by MachineFi are unlimited. It's worth noting that the above categories of use cases are not industry-specific; in fact, these use cases can be applied to virtually any industry where machines are utilized -- agriculture, automotive, manufacturing, supply chain, smart homes, smart offices, smart cities, renewable energy, healthcare, transportation, telecommunications, and the list goes on. We look forward to sharing our favorite MachineFi use cases within specific industries to showcase the vast potential of IoTeX in separate case studies and deep-dives.

MachineFi x DeFi

MachineFi is an entirely new design space that will enable brand new machine-based use cases that are outside the realm of possibility today.

However, MachineFi will also play a critical role in bringing decentralized finance (DeFi) to new heights. In other words, real world insights from machines have the ability to be seamlessly incorporated into the broad landscape of existing DeFi Dapps. Within DeFi, prediction markets that, until now, have been settled based on a validator group's consensus can eventually be settled by an unbiased, tamper-proof machine. For example, a weather insurance Dapp can pull data directly from an IoTeX weather station and evaluate whether or not the pre-defined settlement terms have been met. A consortium of Bitcoin miners can use the metadata from their mining rigs to prove energy efficiency and earn carbon credits.

Autonomous machines can be financialized and fractionalized, enabling anyone to invest in autonomous, revenue-generating machines such as satellites, robo-taxis, vending machines, and more. This new wave of MachineFi x DeFi assets will be backed by and derive their value from machine intelligence and real utility.

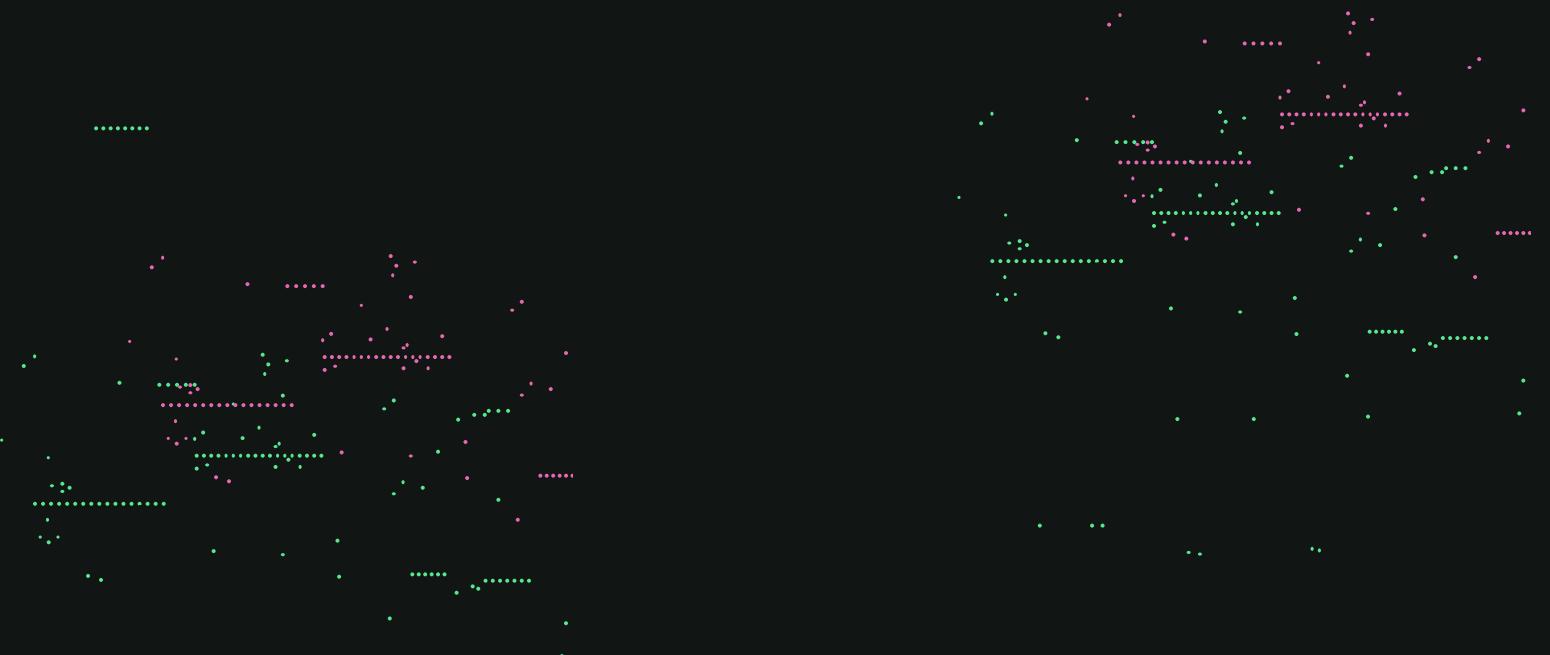


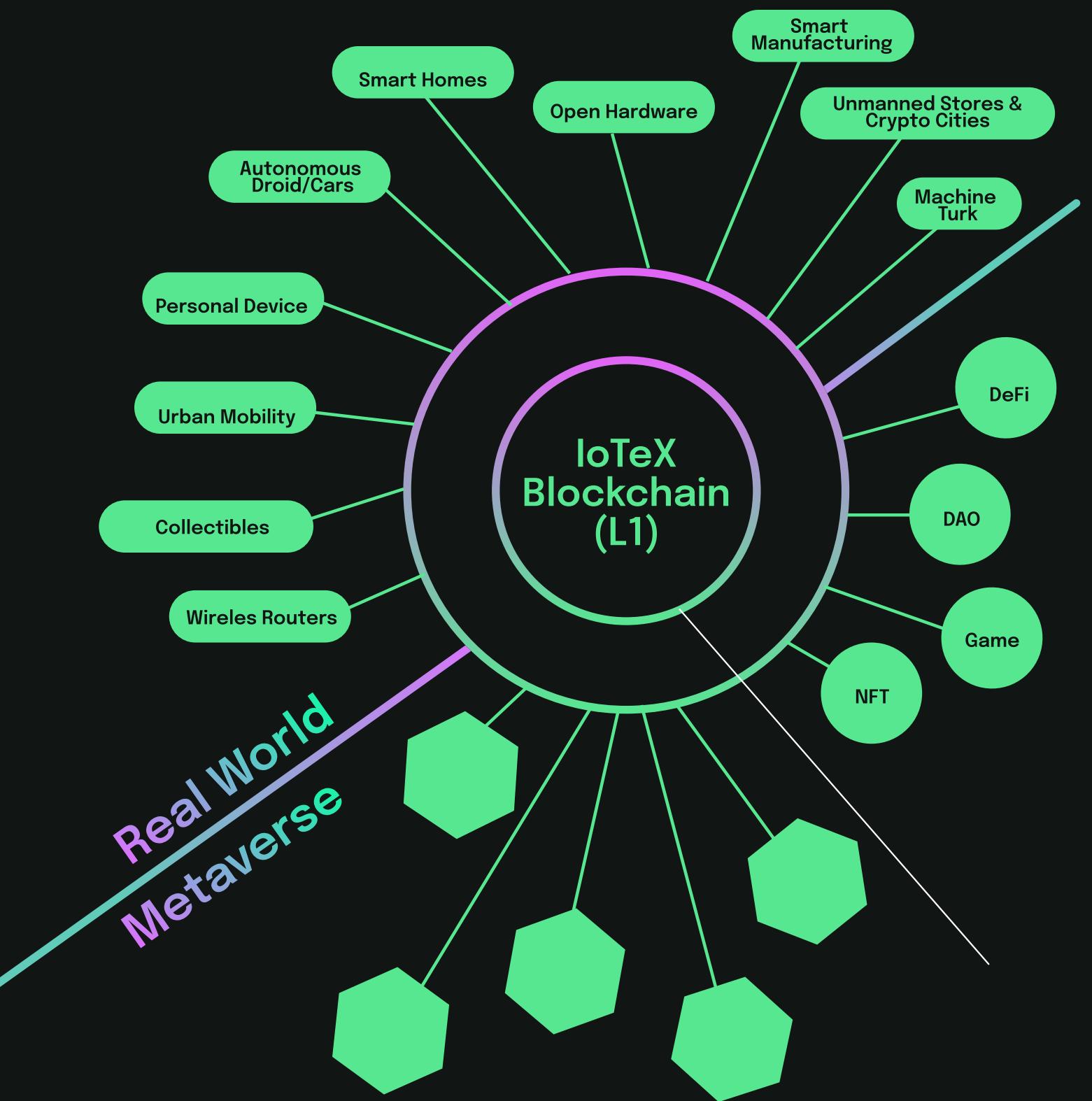
MachineFi x GameFi & NFTs

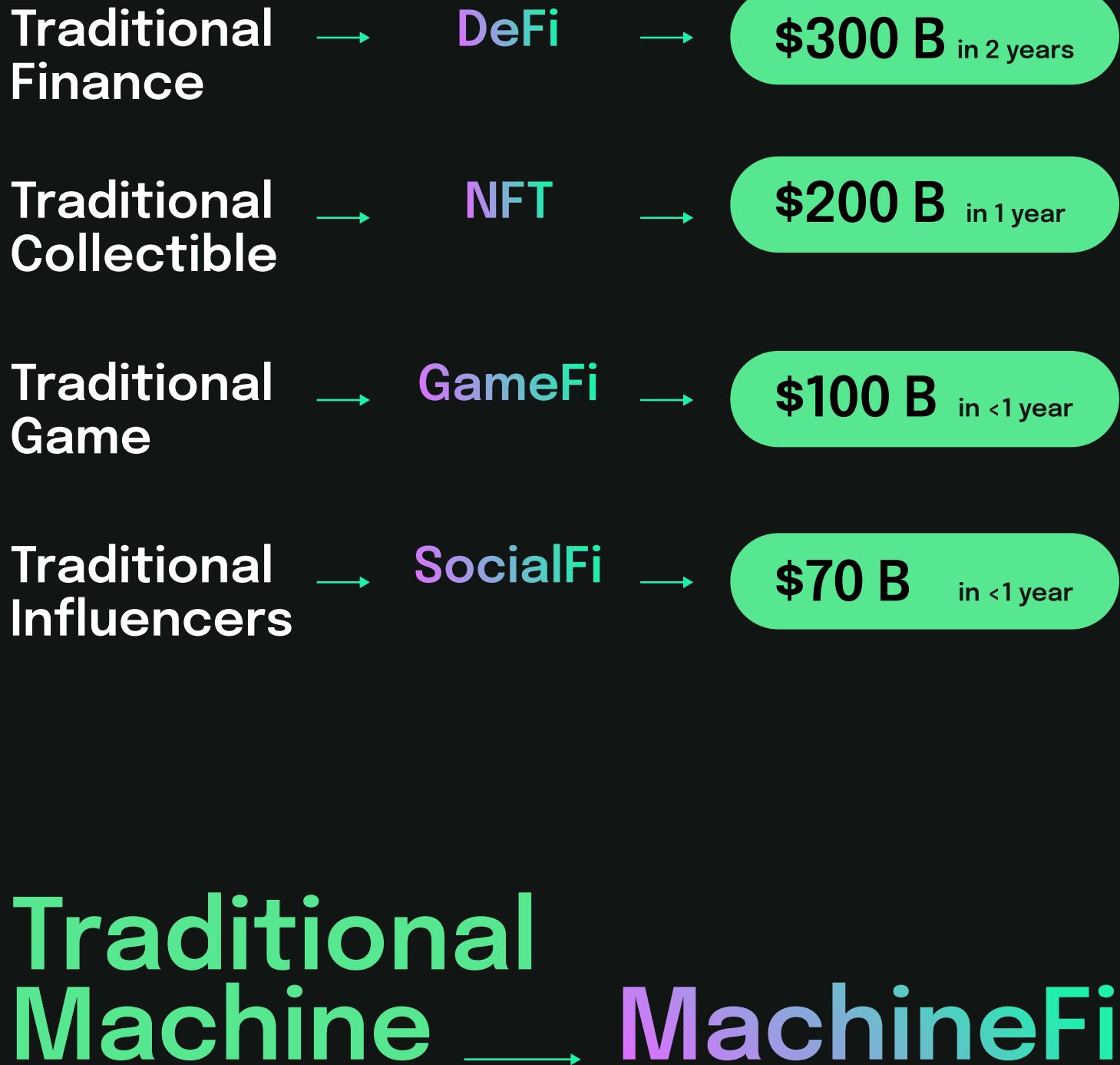
GameFi & NFTs have taken the world by storm, driving mass adoption of blockchain-based games from both mainstream and crypto-native users. In this Play-to-Earn phenomenon, anyone can perform actions in the digital world to earn digital assets and digital reputation. MachineFi will expand the possibilities of Play-to-Earn by enabling anyone to use real world actions to earn digital assets (e.g., fungible tokens) or digital reputation (e.g., NFTs). For example, users that prove they attended an event or concert via GPS location can claim location-based NFTs, similar to Pokemon GO. The ability to register real world actions to the blockchain greatly expands the incentives that can be offered to game players. From gamifying workouts and living a healthy lifestyle with healthcare wearables to incentivizing use of green transportation with electric vehicles to holding scavenger hunts with token rewards to encourage travelers to experience new travel itineraries, machines will bring GameFi to the next level.

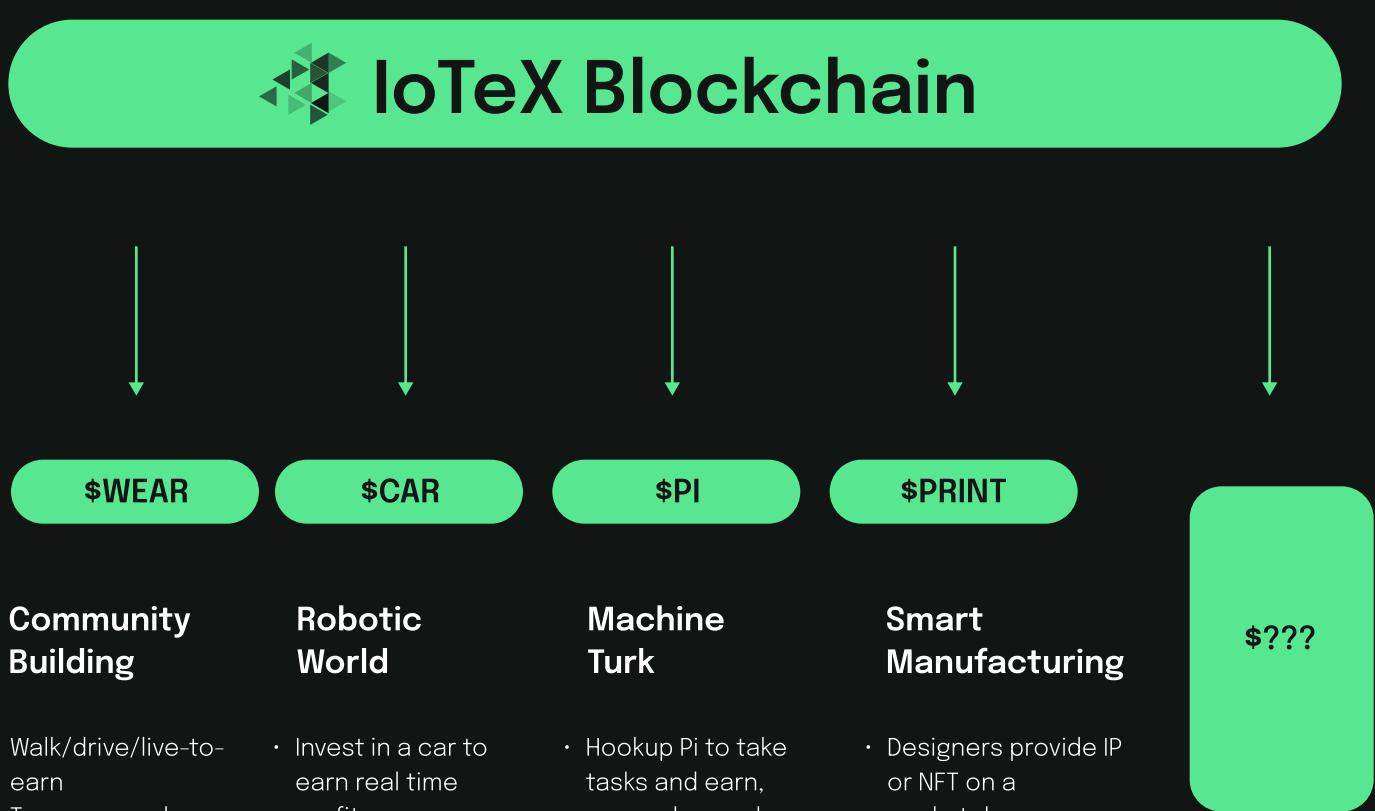
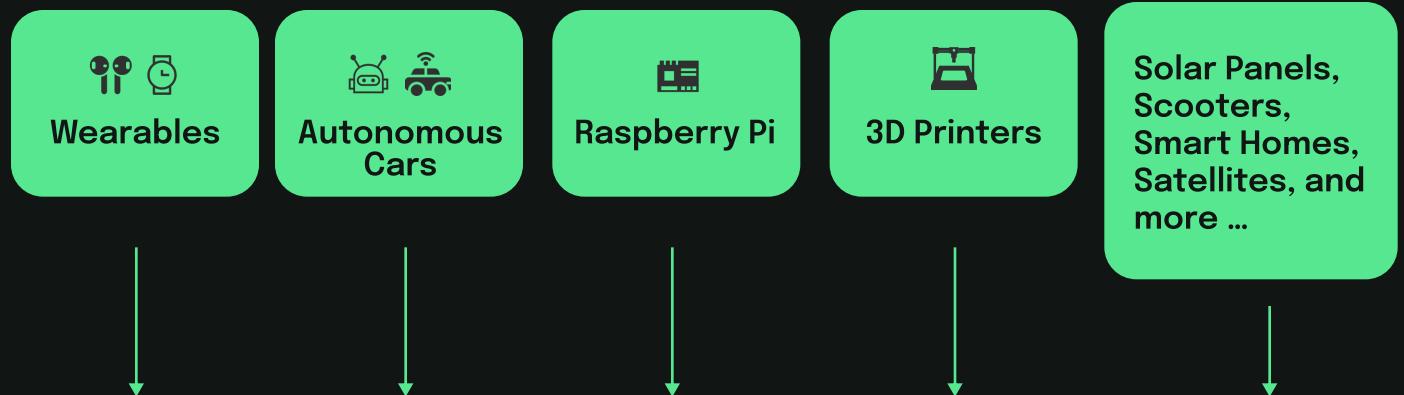
MachineFi x DAOs

Decentralized Autonomous Organizations (DAOs) are powered by transparent, encoded rules that are collectively decided by DAO members and not influenced by any centralized entities. Since IoTeX started, we have always believed that intelligent machines will be the largest users of blockchains, and the intersection of MachineFi and DAOs is the primary reason. A simple way to understand DAOs is that ‘you get out what you put in’ based on predefined rules; however, attributing human contributions to a DAO always has a tinge of subjectivity, often requiring DAO members to deliberate on who has added the most value, which removes the “autonomous” aspects of DAOs. With intelligent machines, it is fully transparent what contributions a machine has made to a collective goal, removing any subjectivity and enabling machine DAOs to be truly autonomous. For example, a group of autonomous vehicles can deliver unbiased, verifiable information regarding the number of rides they gave and how much value they generated, enabling DAOs to split revenues amongst vehicle owners in a fully decentralized and autonomous fashion.









Community Building

- Walk/drive/live-to-earn
- Turn personal achievement to NFT
- Incentive people to do certain things
- Grow the community using \$WEAR

Robotic World

- Invest in a car to earn real time profit
- Collateralize cars to borrow crypto
- Traffic info turns to defi derivatives
- Gov by \$CAR

Machine Turk

- Hookup Pi to take tasks and earn, e.g., web-crawl, keep3r, health check
- To command this powerful army, builders publish tasks while the community curate
- Unleash the creativity of builders and productivity of the machine network with \$PI

Smart Manufacturing

- Designers provide IP or NFT on a marketplace
- Consumers purchases IP or NFT on demand
- 3D Printers manufacture owned by ppl actual products
- Hold \$PRINT to use the network

\$???



MachineFi.com

