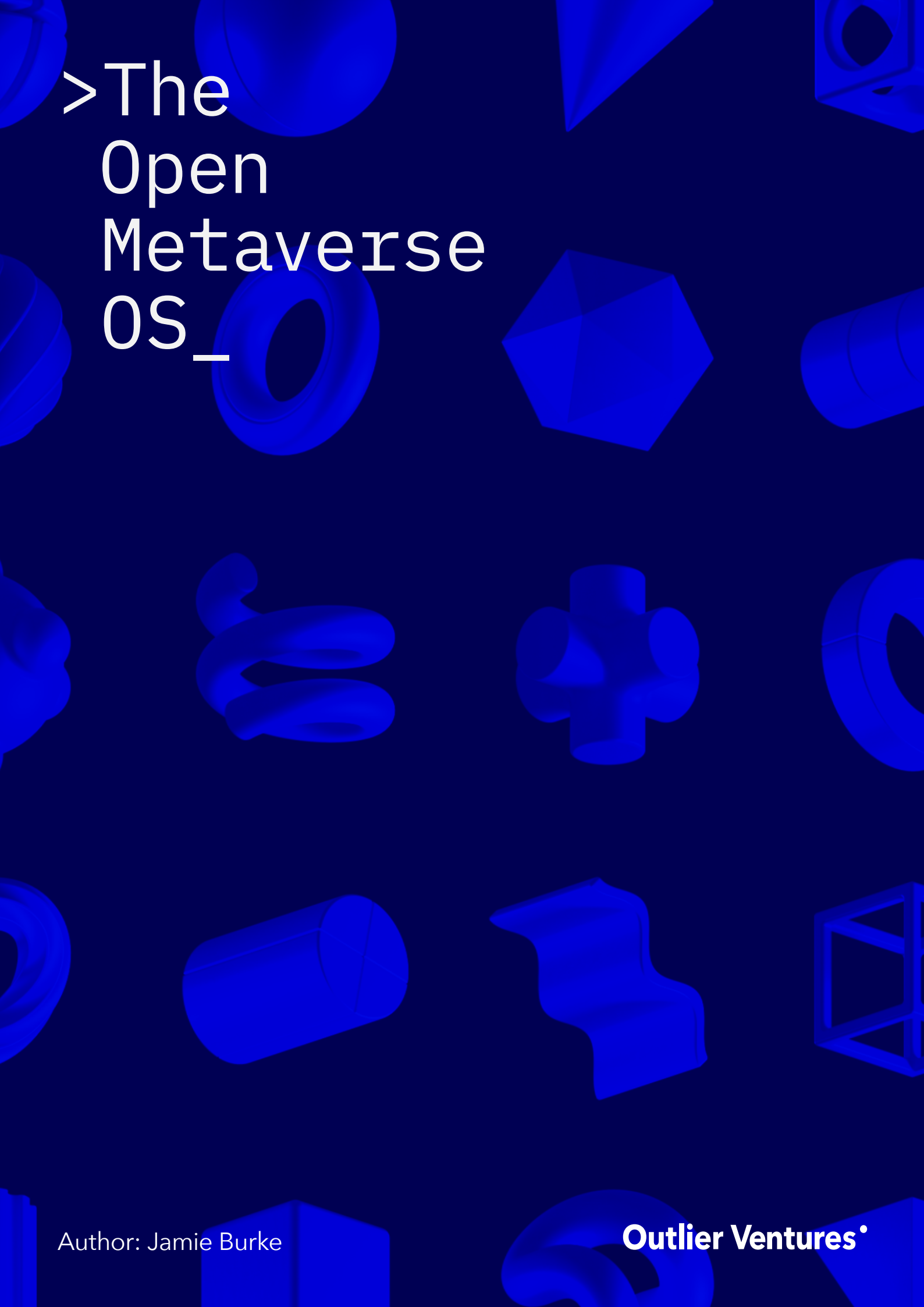


Author: Jamie Burke

Outlier Ventures

>Foreword_

Science fiction like Ready Player One has described 'the Metaverse' both as a destination and dystopic process of capture and control. In Ready Player One, IOI, a single corporation, wants to own and control the OASIS' servers and databases, where they could: delete people, access any information, change the rules of the world, and print themselves infinite currency.

> In Ready Player One, IOI, a single corporation, wants to own and control the OASIS' servers and databases, where they could: delete people, access any information, change the rules of the world, and print themselves infinite currency.

The parallels in the first virtual worlds we experience in gaming today and The Web more generally are striking: centralised, closed, proprietary and extractive, with shareholder supremacy over user centricity. Where giving away your time and data in return for 'free' access to platforms has become normalised.

This post is a collaborative work from across the Outlier Ventures network to propose an antidote and a thesis for how we can achieve an alternative Open Metaverse.

This Metaverse is going to be far more pervasive and powerful than anything else. If one central company gains control of this, they will become more powerful than any government, and be a god on Earth.

_Tim Sweeney

>Defining the Metaverse_

Technically, the original vision and definition of the Metaverse was a point in time when the blurring between the physical and digital happens. This has typically been thought of in the context of AR (Augmented Reality) and VR (Virtual Reality), together known as Mixed Reality, becoming ubiquitous.

> If we think of the Metaverse as a far off destination we will almost definitely sleep walk into not addressing some fundamental design choices.

However, we believe it's important we think of it not as a destination, but a journey or process. This is because it's important to acknowledge the beginnings of the Metaverse are already here, ''we are just experiencing it in 2D.'' This is critical to understand because if we think of the Metaverse as a far off destination, we will almost definitely sleepwalk into not addressing some fundamental design choices about the principles of how we want it to operate, and potentially replicate or deepen what is broken about the Web today.

As I will outline, this process is multi-dimensional and has already begun through the creation of new virtual worlds both in the context of gaming with MMORPG (Massively Multiplayer Online Role Playing Games), and also other social venues and experiences. Each exists on a spectrum with several conflicting characteristics; where the production of content is both by studios and independent creators, value transfer is bi-directional (from digital to physical and physical to digital), where value is both transformed entirely or just represented and is both passively or actively consumed. Much of this process is bottom-up and driven by market forces and the general direction of technical innovation. However, we also believe it will increasingly begin to interplay and be informed by top-down government policy around data rights, privacy, antitrust and, most importantly, financial legislation, all of which of course vary wildly around the globe.

Furthermore, people today still make a distinction between the physical and digital economy, even though in reality a company like Amazon is a hybrid of the two. On the one hand, direct-to-consumer has dematerialized much of the retail supply chain, but it's still both a virtual mall and network of physical fulfillment centres moving around physical goods, as well as a business with a growing number of virtual goods and services like ebooks, music, and video streaming, all of which are consumed entirely on its proprietary devices and platform. So is a company like Amazon part of the Metaverse?

> It seems one of the defining characteristics of a metaverse was that somehow it was an economic system independent of, and enjoys supremacy to, old fiat based economies controlled by nation states.

It seems one of the defining characteristics of a metaverse was that somehow it was an economic system independent of, and enjoyed supremacy to, old fiat based economies controlled by nation states. This is not true for a platform like Amazon, primarily a US-based company, that uses the local fiat currencies for customers and staff and is increasingly entwined with the US state and its various agencies, but still ultimately at the mercy of central banks and various governments policies. If we look at Facebook's efforts to launch its own digital currency with Libra (which presumably would have extended into its VR platform, Oculus), because it is a highly centralised and fiat-based company, it has been aggressively constrained and in effect neutered as a genuine disruptive and sovereign crypto-currency.

It could be considered partially true some games platforms are so big they are closed micro-economies, with their own currencies which they control centrally and value systems, like experience points systems, in-game items (skins) and marketplaces, where significant amounts of the wealth are held and traded. This is even more substantial when you think of that as a proportion of a person's wealth, when seen in younger generations. But the reality is only a few even let you transact in and out of their closed platform using fiat in order to interact with the 'real' world because of limitations imposed by governments around fears of money laundering. But even more importantly, wealth is not directly transferable between these microeconomics into a virtual meta economy with its own sovereign currencies. And you can't generally borrow against virtual wealth to buy physical assets, putting digital natives at an economic disadvantage, where 63% of gamers said they would actually spend more on skins if they had 'real world value'.

It is because of this I propose perhaps the defining characteristic of a true Metaverse is that it needs its own economy and currencies native to it, where value can be earnt, spent, lent, borrowed, or invested interchangeably in both a physical or virtual sense and most importantly without the need for a government.

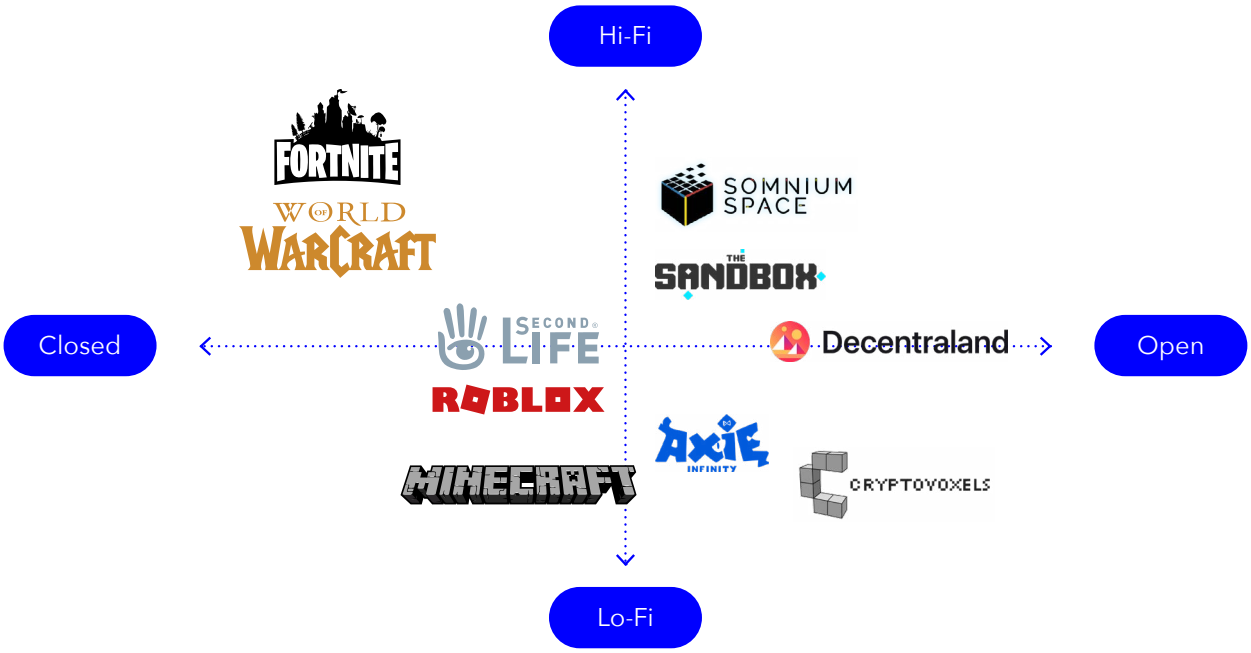
>Competing Multiverses_

> To put it simply, there are at least two versions of the Metaverse we observe emerging: one dominated by closed platforms and Big Tech like Facebook / Oculus and the other built on open protocols like Decentraland.

It is also true there are competing visions for the Metaverse and it is not yet clear if they can and will co-exist or must be in competition. To put it simply, there are at least two versions of the Metaverse we observe emerging: one dominated by closed platforms and Big Tech like Facebook / Oculus and the other built on open protocols leveraging blockchains like Decentraland.

But the distinction of open and closed isn't just limited to technology choices and the extent to which platforms embrace open source principles with their code and data, but importantly whether they have a closed economy, within or across their own proprietary games, or whether they allow transferability of value outside their ecosystem, how that interacts with fiat based systems, and to what extent they do or don't control the monetary and fiscal policy of the underlying economy itself.

Furthermore, there is also another technical and philosophical distinction between visions and emergent actualities of metaverses which could be described as "low-fi to hi-fi." There are



platforms that deliberately push the technical boundaries of the experience through both software and the hardware requirements like Oculus and those that design for the lowest possible device and bandwidth requirements for universal accessibility like Cryptovoxels. Although it must be said, to our knowledge, all of these virtual worlds still require at least a smartphone, which still currently excludes 6/10 of the global population.

You can take these as a form of axes which allow for a crude classification of metaverse platforms and virtual worlds to emerge. We believe these two axes are the most important to consider, because when combined they represent the cost to enter the economic system and the ability to offset that cost by earning value for different demographics.

It could be said there is a third classification about whether the platform allows for user generated content or not, but we think this difference will fade away with time. Most platforms to varying degrees will allow for UGC like Roblox or Minecraft, and will fall under the degree to which the virtual world is generally 'open,' so UGC is not important as a separate dimension when looking to project into the future of the Metaverse.

> With time, an open Metaverse built on shared open source protocols, open infrastructure, and a single unifying (yet open) financial system will erode, or 'eat,' and potentially eventually replace closed platforms due to powerful network effects.

It is our belief, and the thesis of this paper, that with time (the one thing we don't answer is how long) an open metaverse built on shared open source protocols, open infrastructure, and a single unifying yet open financial system will erode, or 'eat,' and potentially replace closed platforms due to powerful network effects. Leaving the only remaining distinction between virtual worlds; if they are low-fi or hi-fi. This final point is important and something that we believe we as an industry should always maintain in order to be as inclusive as possible and onboard as many people out of the old economy and into The Open Metaverse.

>Web 3, a stack for an Open Metaverse_

So why are we so convinced of this eventuality? Well, we believe there are several technology trends that are beginning to converge. This started with a trend we outlined back in 2016 which we termed The Convergence Thesis, which saw how amongst other things IoT, VR and AR, and AI would begin to interplay and reinforce one another into a new Internet because of blockchain technology and the shared data infrastructure and new open economic systems they enable.

Whilst still nascent, this trend (keeping in mind it was written in the context of decades) has, as predicted, begun to play out and form the basis of our investment thesis as a venture capital firm and accelerator going through several iterations; the second being The Convergence Ecosystem in 2018 and then The Convergence Stack in 2019.

> Web 3 is a distinct and separate Web paradigm to today's Web 2, based on centralised platform monopolies and highly regulated fiat financial systems, to one that is increasingly decentralised and based on user centricity and the sovereignty of their data and wealth.

However, this is now more generally thought of as Web 3, a distinct and separate Web paradigm shift from today's Web 2 (based on centralised platform monopolies and highly regulated fiat financial systems described earlier), to one that is increasingly decentralised and based on user centricity and the sovereignty of their data and wealth. In effect where 'the user is the platform'.

It is a paradigm ultimately based on blockchains and their atomic units of account becoming the means that value is 'minted' (created), stored, or transferred across other technologies as a form of wealth. But digital wealth that can be programmable and represent an increasingly complex range of assets from in-game items and virtual land to loan agreements or futures contracts. In aggregate representing an entirely new financial system often referred to as DeFi (Decentralised Finance).

> In an evolutionary sense, by using the Open Metaverse OS the virtual world is pregnant with Web 3.

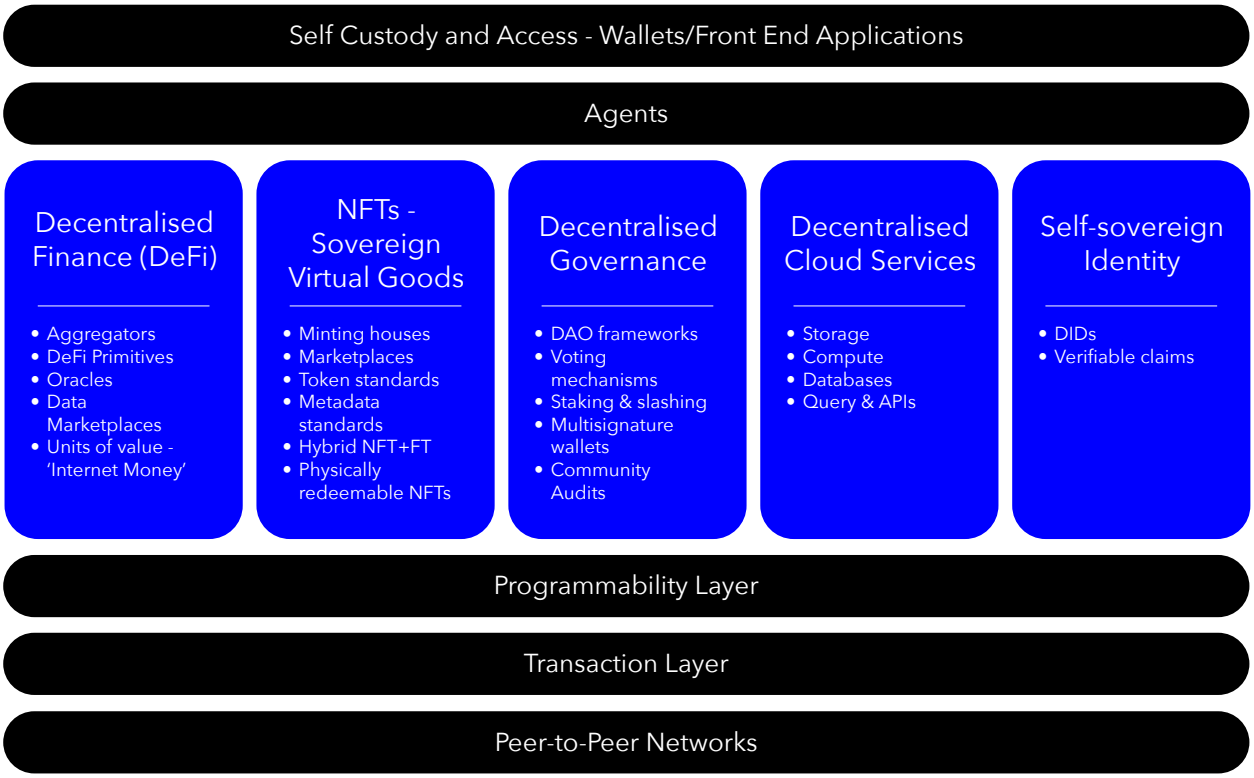
You can think of this confluence of convergent technologies as a common operating system for an Open Metaverse that sits between the hardware, application software, and the user; and because of its open source characteristics, and anything that exists on-chain (on a blockchain) is transferable and its metadata visible, the DNA of the virtual worlds that build on top of it fully or even just partly is passed on or inherited. In an evolutionary sense, by using the Open Metaverse OS the virtual world is pregnant with Web 3.

>The Web 3 Toolbox_

Web 3 consists of several principles, protocols and standards which could be said to form a stack that will inform and can and is being leveraged by the entrepreneurs and architects in The Metaverse.

In combination these technologies can be seen as a highly composable **Web3 Toolbox** for The Open Metaverse, where they are one and the same thing.

The Web 3 Toolbox



The Web 3 Toolbox brings a number of core innovations and building blocks, located in the middle of the diagram:

Internet Money: Bitcoin introduced a form of internet money and since then has served as a hedge to deflation, and increasingly for institutions as a treasury instrument, in fiat based systems due to loose monetary policies after a series of negative economic events and a gateway for many into a new virtual economy (at the time of writing estimated at 1 trillion USD in market capitalisation).

Decentralised Finance (DeFi): Ethereum extended Internet Money through the introduction of smart contracts to allow for stablecoins, that is virtual currencies which unlike Bitcoin are designed to be a stable rather than a speculative asset. The generic programmability has allowed for an

explosion in open, decentralised financial instruments often referred to as DeFi. These include borrowing and lending without the need for banks, as well as more sophisticated instruments such as options and decentralized exchanges, and some entirely novel structures, such as automated market makers. This has formed a proto-capital-market, at the time of writing estimated at $25 billion in total value locked.

Sovereign Virtual Goods: Bitcoin introduced digital scarcity for a fungible asset ("internet money"), where each token is interchangeable for another. Similarly, digital scarcity for unique assets has been realised through NFTs (Non Fungible Tokens). Here, unlike with a currency, the underlying assets are not interchangeable but unique in some way. The innovation in this area has concentrated on Ethereum, and as the result of a handful of simple standards for NFTs and their metadata there has been an explosion of innovation initially in a creator economy context of; art, music, tickets, virtual land, collectibles and gaming items.

Whilst not new, their mainstreaming began late 2020 and have proven to be a powerful mechanism for the world builders and content creators of the Open Metaverse. They act as a gateway through digital consumption and play that will suck in the masses of users primarily because any activity in the Open Metaverse can be gamified and rewarded with NFTs, which can in turn have value on the open market. Virtual goods are ultimately easier to sell than physical goods, and will have significant and increasing value. Core technologies and entities around NFTs include minting houses, which facilitate the initial creation of the goods, marketplaces, which similar to real-world auction houses, enable price discovery and trading.

Digital to Physical Redemption: Beyond purely digital sovereign virtual assets, new specialised protocols like Boson Protocol solve the digital to physical redemption problem, by representing physical items as NFTs, which can be redeemed in the real world without the need for intermediaries. Enabling decentralized autonomous commerce across the Metaverse blurring the distinction between virtual and physical.

Decentralized Governance: As a result of both the necessity for governing the growing landscape of decentralized technologies

and networks and the ideals of its community, a class of tools and concepts for decentralized governance has emerged. The concept of a Distributed Autonomous Organization (DAO) enables individuals and entities to form groups, jointly own assets, make decisions, and participate in the economics of the DAO. Several mature building blocks for DAOs have emerged, including Aragon and DAOStack. They include and extend to tools like voting structures, and multi-signature wallets for joint custody of assets. On the level of protocols, mechanisms for staking and slashing have emerged to incentivise participants in these open networks to behave benevolently. The Open Metaverse can benefit from insights and tools from decentralized governance both for governing metaverse platforms and their components, and enabling economic participation in each, as well as for people to organize themselves within it, such as with gamer guilds or clans.
Distributed Compute & Storage aka Cloud 2.0: The idea that The Cloud of distributed storage and compute could also be decentralised by specialised protocols like Filecoin or CUDOs, so not reliant on or giving any advantage to any one company for example Amazon, Google, or Microsoft, which control 66% of the market. It almost means people that invest in expensive hardware to access the Metaverse and increase performance can offset some of the cost by renting out capacity and in turn earning crypto-currencies and joining the virtual economy. It is also believed at a certain scale, and density in a given physical locale, it could increase the proximity of physical hardware to The Cloud at any given time as we unlock the bandwidth and compute of neighbouring connections, and therefore allow greater 'edge computing' for Metaverse ubiquity.

Self Sovereign Identity & Verifiable Claims: For a truly Open Metaverse, it is crucially important for people to have security of an online identity with which they can protect and accumulate value. Sovereignty and, by consequence, self custody of what the user owns are core principles to Web 3. However, for what is called a true SSI (Self Sovereign Identity), we need dedicated protocols solely for the preservation of privacy of identity itself, versus being public and on-chain when identity and its data are treated as just another digital asset. Innovations in Self Sovereign Identity and Verifiable Claims specifically mean we can identify ourselves, transact, and prove things about ourselves (attest) without revealing the underlying or associated data. This is critical to avoid the role of a government or platform as the sole arbiters of our online identities, deplatforming or even state violence. And being applied to gaming and the Metaverse by teams such as Crucible.

People, organizations, and machines access these capabilities directly through wallets and applications, and by delegation through automated agents, always following the principles of sovereignty and self custody:

Self Custody - Wallets and Applications: The self custody of digital assets and wealth through user-controlled private keys and open source wallet software (free of any platform form of censorship and control) is foundational to crypto and as a consequence the Open Metaverse. This is sometimes referred to as sovereign wealth. The infrastructure was initially purely for the administration of crypto-currencies but is now being used for the management of other digital assets like data and NFTs (Non Fungible Tokens).

Agent based Web: Computer programs with economic agency or autonomous agents that live and transact on blockchains to carry out increasingly complex automatic programs, such as AEAs (Autonomous Economic Agents) via Fetch.ai

>Web 3 is built upon foundational elements:

Peer-to-Peer networks:

Network structures where nodes find each other and form stable network configurations without the need for a central server. P2P network technology builds on decades of history, including the likes of Napster and BitTorrent, but also the low-level protocols of the internet, which is itself a peer-to-peer network.

Transaction layer:

Blockchains and other forms of distributed ledger technologies in their simplest form allow for transfer of units of value from one network participant to another. Blockchain technology and the consensus algorithms part of it have enabled secure transactions between parties which don't trust each other, in a decentralized manner, under adversarial circumstances. Bitcoin is an example of a blockchain which is mostly a transaction layer.

Programmability layer:

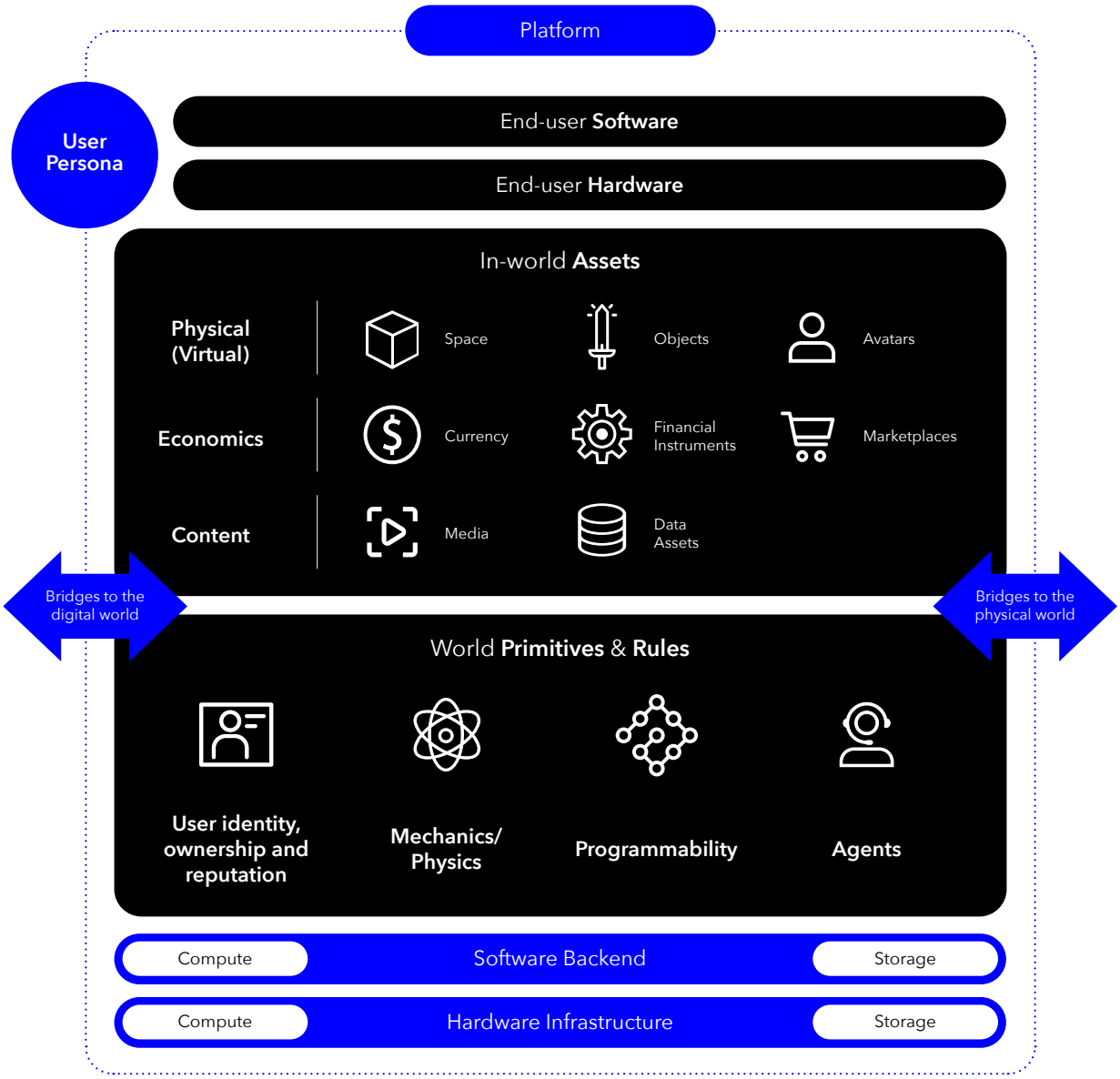
Building on the transactional capabilities, some blockchains offer rich, generic programmability to enable a wide array of use cases beyond simple transactionality, while preserving the properties of being decentralized and highly secure. Ethereum was the first mover in establishing a programmable decentralised ledger, and is still far ahead of its competitors in terms of adoption by developers and users, and is the foundation under many of the core innovations of Web 3 as we present them here. That said, there are now dozens of competitive and collaborative ecosystems besides Ethereum, many of which are highly mature and also enabling some combination of DeFi, NFTs, Decentralized Governance, Decentralized Cloud Services, and Self Sovereign Identity.

>Building in the Metaverse_

Were you to be using this toolbox to build an entirely new instance within the Metaverse (such as a virtual world), or looking to evolve an existing Web 2 platform, you would be presented with a set of design decisions and trade-offs at several levels of your stack between open / shared or closed / gated and proprietary. You might reasonably elect for an open solution at one level and closed at another, either permanently or temporarily based both on the immediate needs of your business and its stakeholders (like shareholders), users, or a philosophical principle. In the end, there will always be a tension to be imperfectly resolved.

A way to approach this is to look at the anatomy of any given instance of the Metaverse as a platform at its various levels of the stack as we have outlined below.

Anatomy of a Viritual World



User persona:

the identity and properties of end users, including their name, avatar, ownership of assets, and reputation.

End-user hardware and software:

the hardware devices and software through which end users experience the world, including VR / AR headsets, PCs, gaming consoles, and client software.

In-world assets:

the assets that exist within the virtual world.

Physical (virtual):

the space of which the world is composed, such as sections and parcels. The objects that can exist within it, such as buildings, furniture, vehicles, wearables, collectibles, and avatars as a special case.

Economics:

economic elements of the world including in-world currency, financial instruments, and marketplaces.

Content:

content that can be introduced into the world, including media such as images, audio and video, and structured data assets.

World primitives and rules:

how does the world work? The model for user identity, ownership, and reputation. The mechanics and physics of the world. Can users fly? Run? How fast? Can objects be stacked on top of each other? Attached to buildings? Programmability and agents - in what ways can elements of the world be automated - and can autonomous digital agents interact with the world?

Software backend:

the backend components that make the world work.

Hardware infrastructure:

the hardware on which the backend components of the world run. Servers in data center, cloud services, networking.

Bridges:

ways in which the world can connect to external systems and environments.

To digital worlds:

using shared layers for assets and economics, external programmability via APIs, teleporting to different virtual environments.

To the physical world:

including AR based activities such as in Pokemon Go, and digital elements that have a physical counterpart, such as physical redemption for digital assets.

Each of these elements can exist in any virtual world, in some form or another, open or closed. Many centralized virtual worlds have in-game currencies, some have forms of in-game financial instruments, for example mortgages in Animal Crossing.

The foundational idea of humanistic computing is that provenance is valuable. Information is people in disguise, and people ought to be paid for value they contribute that can be sent or stored on a digital network.

_Jaron Lanier, VR Futurist

>The Open Metaverse OS_

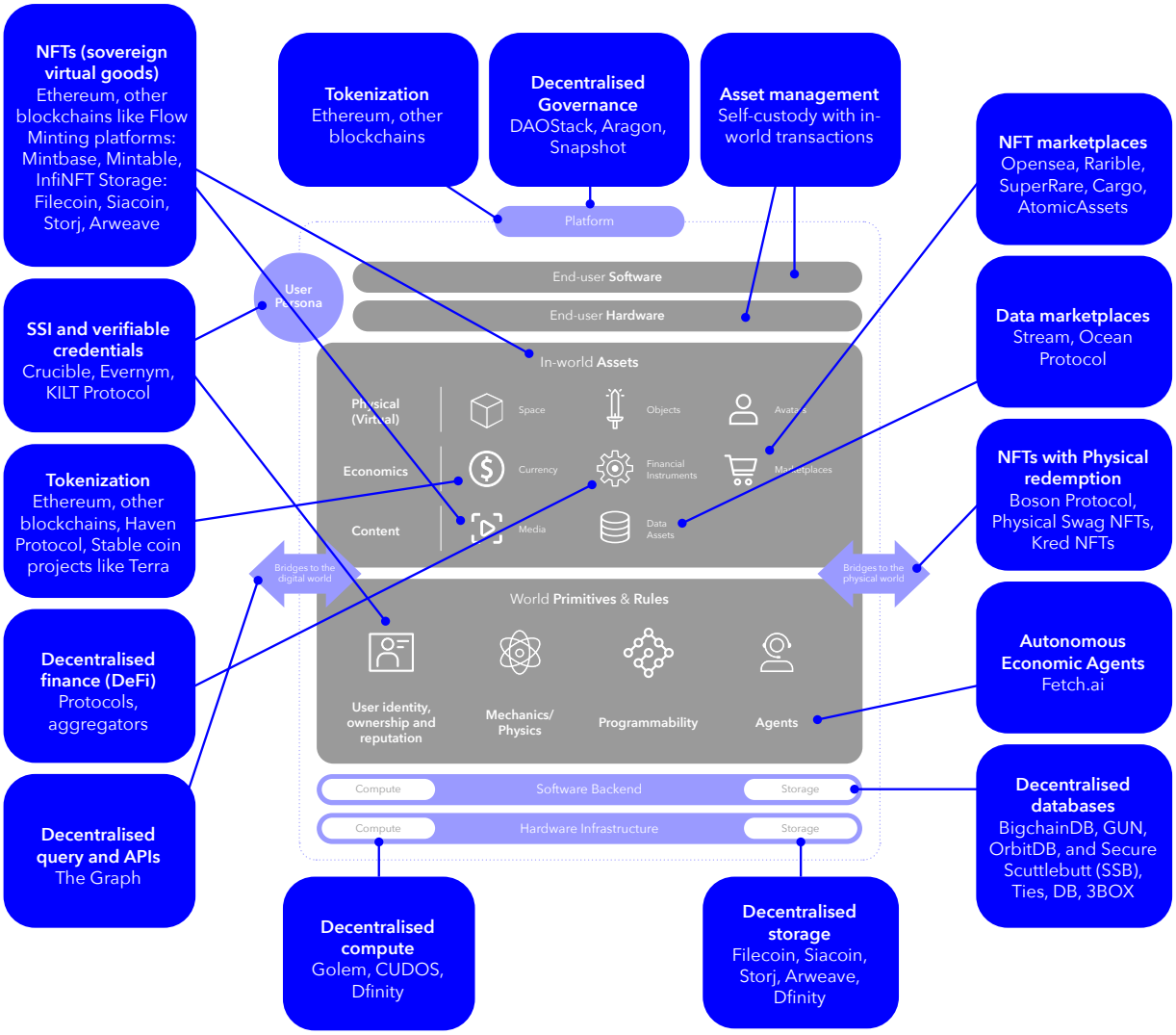
So how ready is Web 3, and consequently an Open Metaverse OS, for prime time? Well, on the one hand the Web 3 ecosystem is thriving with several nascent technologies that can enable many aspects of an Open Metaverse, and could and is being deployed in virtual worlds right now, albeit in an incremental fashion. But on the other it's still significantly behind on several measures such as performance and cost when compared to Web 2, which has had decades to mature and where the benefits of economies of scale have been achieved by platform monopolys.

Equally, Web 3 technology has instead optimised primarily for high degrees of decentralisation and transaction security rather than and sometimes at the expense of enabling smooth, real-time interactions, and its applications for more 2D web based experiences on desktops and mobiles. As a consequence, user experience in Web 3 has to date been poor and required a high degree of technical literacy due to both the radically different security model of self custody and the nascency of the industry; with frictionless user experience of Web 3 technologies within gaming engines even further away. This narrative gradually changes as we observe the world of Web3 and crypto technologies being deployed within gaming and VR environments at at growing rate. This provides further proof of a generational shift away from Web 2 platforms.

Therefore, the Open Metaverse OS is best understood as an evolving collection of highly composable technologies that will increasingly, but selectively, be used to make aspects of an Open Metaverse possible as it seeks to serve a greater global population across several use cases and environments. It is also meant as an invitation and inspiration for teams to build those components that don't exist yet, or aren't ready for the needs and sheer scale of ambition we have for The Open Metaverse.

As it stands, the Open Metaverse OS is concentrated on the critical lower layers of the stack, including non negotiable features such as user-sovereign identity and assets, in world economics and bridges into and out of its economy, and between each themselves leaving the intricacies of gaming engines, 3D modelling toolchains, and rendering stacks to the primarily centralized world. However, over time we expect the Open Metaverse OS to eat further downwards to decentralise those aspects as well.

The Open Metaverse OS



>An Oppenness Framework_

This way of thinking about the Open Metaverse OS also allows a framework through which to assess the openness or, otherwise, design choices and trade-offs made by a given instance of the Metaverse including; is the code open source, are the assets portabile, is the data platform proprietary or user controlled, who can create value, and the degree of UGC versus platform made and how can it be monetized.

>Open Metaverse Framework_					
For each box ask these questions: **Access control** What's the access model? Who controls access? How is ownership and access control made transparrent, if at all? **Data** Where and how is the data stored? Which standards are supported? Can data be accessed externally? Can data be imported?	Platform	What's the ownership model? What's the model to control it? Who controlls it? What are the financial models? Who Bears the costs? Who gets the financial returns?			
	End user	User persona Where are user persona created and stored? Who can grant/deny access to the world? Which part is open and user sovereign vs closed?		Hardware Do users own their hardware? Are there many different options on suppliers? Is it affordable?	Software Open Source? How is client software distributed? Any gatekeepers?
	In-world assets	Physical (Virtual)	Space How is space divided? (Section, parcels...) How is new space created? Who can create it?	Objects What types of objects exhist? Buildings, Furniture, Wearables, collectbles, vehicles... How are new types of objects created? How are new objects created? Can objects be transferred and traded? Can objects be introduced and taken out of the world?	Avatars What rules are avatars subject to? Who decided these rules?
		Economics	Currency Which currencies can be used? Is there a native currency? Who can mint it? Can someone put the currency out of use "press the pause button" How does this currency relate to fiat? Is it stable?, is it fluctuating? Is it tradable on external exchanges?	Financial instruments Which can be used? Royalties, renting, mortgages... Who can create them? Can they be used outside of the world? What regulation and governance applies to them?	Marketplaces Can marketplaces be treated? Who can create and operate them? Who can list items on them?
		Content	Media Which types of media can be used? Can media be introduced and taken out of the world?	Data assets Can data assets be added to the world? What can be done with them?	
	Bridges	Digital Which connections to the digital world are possible, how? Which standards are used?		Physical Which connections are possible, how? Who can create? Who can use?	
	World primitives and rules	User identity,ownership and reputation What's the model for user identity, ownership and reputation? Who determines these rules	Mechanics/Physics How are world mechanics established? How are they governed?	Programmability Which mechanisms exhist to program and automate parts of the world? Who can use them?	Agents Can digital agencts interact with the world? Can they have economic agency? What capabilities can they have?
	Software Backend	What are the main components? Who operates them? How are they incentivised? Which components are peer-to-peer? Which are distributed ledgers?			
Data Collection Which data is collected? Tracking, biometric,...	Hardware Backend	What type of Hardware? Who operates? How are they incentivised?			

It is important to stress, however, it is unlikely openness is absolute and its choices binary, but rather on a spectrum. And even within those virtual worlds and platforms we could classify as the most 'open,' there will be significant nuance, often driven by technical limitations both of being an early adopter as well as dependencies on underlying protocols like Ethereum which require workarounds for improved usability comprising what happens on-chain, impacting 'openness.'

For example, it seems Decentraland is the only Metaverse project thta has a fully open source approach but still takes a more restrictive approach to avatars and wearables. E.g. like Cryptovoxels, it doesn't store avatar files on-chain, nor is their system available to outside avatar models and wearable minting is curated.

Equally, we presume any given instance will shift over time towards openness based on pragmatism rather than dogma. And we expect and highly encourage existing closed virtual worlds to gradually adopt components out of the Open Metaverse OS to increasingly open up and reap its benefits.

>So why build in the Open Metaverse?_

So why build or integrate a virtual world or good with the Open Metaverse OS at all? Especially, when compared to a more convenient closed and centralised approach, it comes with so many tradeoffs and limitations to mass adoption?

Well, firstly there is a general direction of travel towards open standards in the Metaverse even by what you might at first glance regard as its closed participants, including:

Open 3D object media standards: There are a number of now well-established standards around 3D object media including Pixar's USD (Universal Screen Description) and NVIDIA's MDL (Material Definition Language), and NVIDIA's Omniverse (Open Beta) and GLTF.

Metaverse Web Browsers: There are increasing in-browser capabilities being developed from Google Gaming Browser and Mozilla VR, with WebGL now widely supported and WebXR on the verge of enabling generic support to VR and AR devices, as well as crypto-currency browser wallets like Metamask. Although we are not quite there with seamless in-world transactions.

But also, as alluded to earlier, we believe there will be both top-down and bottom-up reasons driving a move towards openness. Let's start with bottom up because we believe this will be the primary driver for innovation in its early stages. As described, the principle of self sovereignty, sovereignty of identity and associated digital wealth (including assets and increasingly data) are based on the concept of user centricity: where a user takes precedence over any given platform. Where some may argue the user in aggregate is the platform. In this context virtual worlds become the interface to create, trade, or experience virtual goods and services which are portable and not restricted to a single platform. This is a powerful economic driver and a fundamental paradigm shift away from the Closed Metaverse and its business models we see dominate the Web today.

> When creations, wealth, and assets can have a life 'off platform' and be exchanged and become infinitely interchangeable with one another freely in open markets, they grow in liquidity and consequently value, simply because more value can be exchanged between itself without limitation. You could consider it a 'value squared'.

When creations, wealth, and assets can have a life 'off platform' and be exchanged and become infinitely interchangeable with one another, freely in open markets, they grow in liquidity and consequently value, simply because more value can be exchanged between itself without limitation. You could consider it a 'value squared'.

Many creators like artists are experiencing this for the first time where assets with NFTs (Non Fungible Tokens) are sold for more off-platform in secondary markets than in their primary sale (where they are minted). And this will be extended even further as we develop standards for royalties and can be translated to memes themselves into forms of social currencies rewarding not just the creation of a thing, but its value chain of evolution and amplification through sharing in social channels. This brings powerful network effects not experienced in closed systems and it is our belief as creators, and this increasingly includes established popular brand franchises looking to new mediums to monetise their assets, begin to follow the money the open virtual worlds that allow for economic interoperability will win out.

Discord is becoming a social bridge between metaverses. Enabling a form of Open Metaverse 1.0

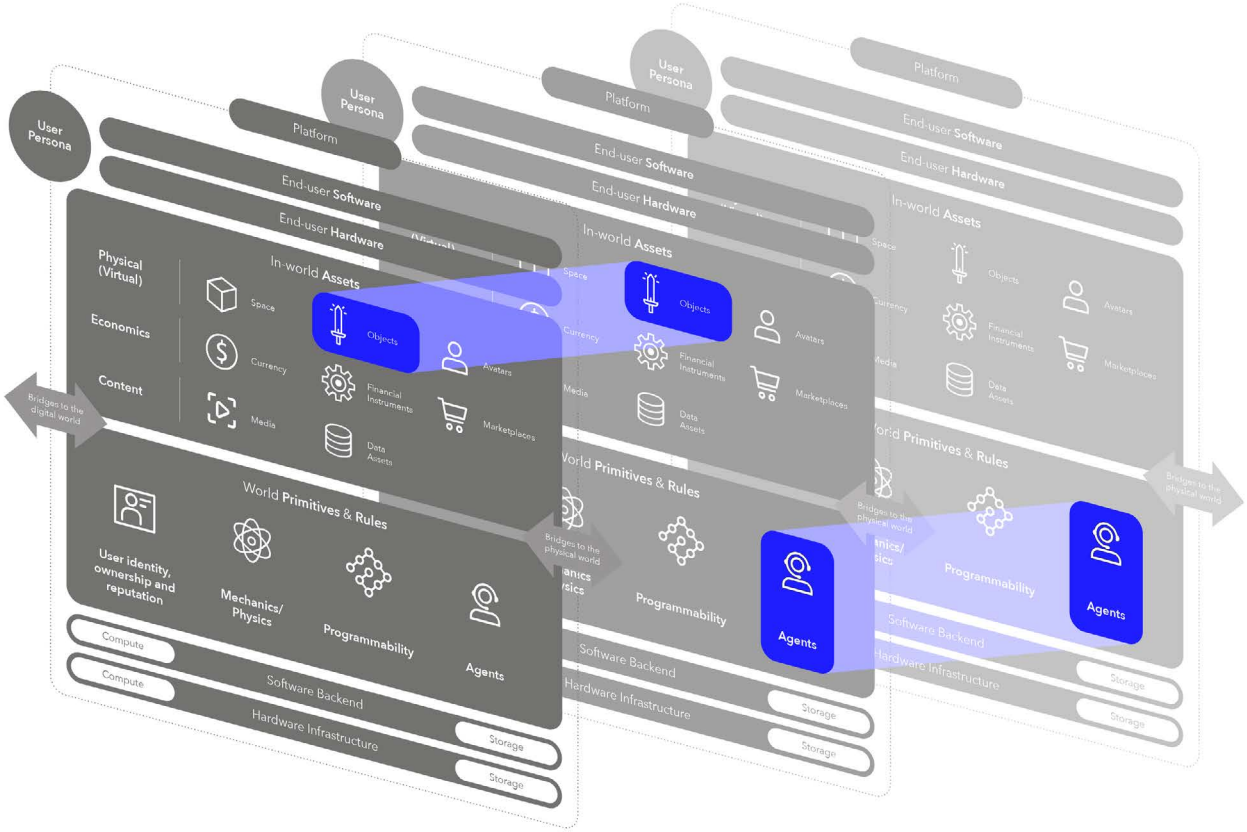
And we are already seeing early but increasing forms of integrations of the Open Metaverse OS into established social channels like Discord, including crypto wallets and NFT marketplaces and exchanges. Discord brings with it 250m+ gamers who will most likely first experience Web 3 technologies, and the Open Metaverse economic layer, without ever leaving Discord. It's important to remember Discord's rise coincided with the growth of esports through games like League of Legends, Overwatch, and Fortnite, which all initially had limited communication tools for streaming, which Discord elegantly solved outside of those closed worlds in an open environment. And the same is happening with nascent Open Metaverse virtual worlds like Decentraland, which at the time of writing does not support in world audio requiring in world events to use Discord for the audio streaming. So cross world social, and increasingly economic layers, will run in parallel to virtual worlds initially until they become embedded with them. But even once these limitations are resolved, in these new virtual worlds Discord is likely to continue being the social layer around and between worlds and likely to play host to the convergence of Web 3 and gaming communities.

We can also regard different virtual worlds, open or closed, as slices of a larger whole. Users can and will by design interact with and be part of one or more of these worlds. And whilst a single world could outgrow all others and become a significant part of the Multiverse, they do not enjoy the same defensible 'moats' seen in Web 2 of locking users and their data into their platforms and holding them ransom. The only challenge to this being closed hardware that is so desirable and performant, end users will tolerate a more closed approach as has been seen with Apple. That

aside this could be a significant break from the cycles of bundling and unbundling we typically see in internet-based technology paradigms. And the only real moat can be the degree of openness, economic incentive design and verified trust in the rules of the virtual world.

This later point around incentives is critical because one of the powerful things about blockchains as we have seen with Bitcoin, Ethereum, and its various DeFi protocols is that you can hardcode economic incentives for early adopters to join a network into the system itself. Systems for bootstrapping adoption, compute power, storage, and even financial capital to develop the network can be coded into the protocol itself. We are seeing this with many early virtual worlds both creating their own crypto currency or selling virtual land, or offering NFTs as rewards all of which is easily tradable off platform with and for other crypto-currencies. In effect, the Open Metaverse is its own bank and can create any number of incentives and games to grow adoption.

Therefore it is more likely virtual worlds in The Open Metaverse are increasingly interoperable and interconnected to the point it will be hard to distinguish them as separate but rather different instances of a whole.



>The empty World Problem_

Despite all of this, however, today it is fair to say The Open Metaverse, especially when compared to the Closed Metaverse, is one full of empty worlds. The number of daily active users across all platforms is still estimated to be in the low thousands, and is almost irrelevant when compared with Fortnite alone which has 350m+ monthly users. This is primarily because the former model predates the latter by at least two decades as well as the sheer venture capital and cash piles these franchises have at their disposal to create great content. As an example, Epic Games' Fortnite is projected to generate $5 billion in revenue with a profit of $1 billion in 2020, accelerated by a year of COVID. Rather than the model itself having any kind of long-term superiority and where its closed nature is a temporary form of moat that frustrates users and creators alike.

If we look at the High Tech end of the closed spectrum, the time and cost to develop and launch an AAA game on average is between $60-80 million and can take 2-3 years, requiring a team of 150-250 people although advances in both Unity and Unreal gaming engines, whilst still a duopoly, are dramatically reducing these numbers down. This makes creating content extremely expensive and therefore the industry highly concentrated and difficult for new players to enter and challenge the status quo.

However, if we look at the explosive growth in user-generated content (UGC) as a trend in gaming and virtual worlds generally through platforms like Roblox, which based on our earlier definition would still be classified as part of the closed metaverse, you can see the power of letting independent creators build games (a micro virtual world) on a shared technology stack and economic layer (albeit centralised) as a powerful way to bootstrap growth and user stickiness. Today, with 150m monthly users and creators earning $250m in 2020. They do this by making their world builder kit Roblox Studio available for free but, importantly, you can not clone and fork the entire platform where it still serves as a closed ecosystem. And even then Roblox still has 850 full time staff to operate and recently needed to raise $530 million of capital at a $30bn valuation to grow.

It seems obvious that the creatively excluded will be more than willing to experiment in open and permissionless economic systems especially when they can derive a greater return on their time not just in the creation of work but in perpetuity through secondary sales through 'on-chain royalties'.

So how can open virtual worlds first catch up and equal the content and rich experiences of today's dominant virtual world and gaming platforms? Well firstly there are a longtail of millions of creators (in all forms of media production) currently locked out of participating and monetising their work at all in today's virtual worlds, and they dwarf the industry's staff working for closed platforms. Many of them are already contractors who would prefer to be doing their own thing. It seems obvious that the creatively excluded will be more than willing to at least experiment in open and permissionless economic systems, especially when they can derive a greater return on their

time not just in the creation of work but in perpetuity through secondary sales through on-chain royalties.

We have already seen bluechip artists like Beeple, who in and of themselves are almost complete markets of both supply (with large back-catalogues of work) and demand with audiences in the millions, begin to move into open NFT platforms and convert their body of work into NFTs for millions of dollars, in the process bringing millions of curious buyers and sellers into this shared open economy.

As a new channel this is also beginning to be leveraged by global franchises such as the NBA and the Top Shot NFTs. And as NFTs become less about things to just passively store in a wallet and more about things to experience socially in open virtual worlds. And very quickly they will onboard ready-made audiences of hundreds of millions of users from the Web 2 social channels such as Twitter, Instagram and TikTok. And the rich base of music artists on these platforms such as DeadMau5 are already experimenting with audio and mixed media NFTs introducing their millions of followers to this new medium with value they understand. But I would argue even more important to mass adoption of The Open Metaverse as a creator economy is the hip hop industry, which has already shown a keen interest in Bitcoin and represents a large percentage of global streaming as a genre and culture. This could be the killer app for NFTs.

> But I would argue even more important is the hip hop industry, which has already shown a keen interest in Bitcoin and represents 1/3 of global streaming as a genre and culture could be the killer app for NFTs.

Where in the closed virtual worlds of platforms like Fortnite, because of their sheer reach, they have become powerful channels for entertainers like Travis Scott to reach new audiences, very quickly artists, as content creators, will realise rather than just being paid to play in someone else's virtual world they can build and monetize their own virtual communities through NFTs where they retain direct and full creative and financial control. This will only be accelerated by new NFT platforms that specialise in media types and / or genres of entertainment serving as an onramp into the Open Metaverse, in the same way crypto-currency exchanges like Coinbase and Binance brought crypto generally to millions of retail investors through the sale and exchange of ERC20s and ICOs in 2017 driving media attention and a virtuous hype cycle.

Furthermore, with LiDAR technology now available to anybody with the latest iPhone, the physical world can be mass rendered, translated into machine readable 3D models and converted into tradable NFTs to be uploaded into open virtual worlds very quickly populating them with avatars, wearables, furniture, and even whole buildings and streets. And because they are machine readable leveraging open source standards like Pixar's USD, NVIDIA's MDL, Khronos Group and NVIDIA's Omniverse, they can be fed into AI to spit out infinite variations which again can be better monetised in global and open markets than any one closed platform.

When combined with promising innovations like GPT-3 from Open AI, which currently allows for an open form of autoregressive language model that uses deep learning to produce human-like text, such as Fable and DALL-E which uses a 12-billion parameter version of GPT-3 will begin to power virtual beings and stories we can interact with. And when it extends to other forms of media, virtual worlds and their content will be able to be automatically produced infinitely.

This means we can expect to dramatically reduce the time and cost to produce games or whole virtual worlds and economies whilst also tapping into a global workforce of millions of creators allowing seamless and decentralised collaboration well beyond the capabilities of a single gaming studio, record label or virtual platform.

>Humanity's greatest economic experiment_

One of the most exciting and intellectually interesting things about an Open Metaverse is that you can openly and in a permissionless way experiment with its underlying economics, and the rules of the game that underpin it both at the protocol layer but also within each virtual world itself. And each experiment can be done in parallel to the other; in concert and / or direct competition.

For example a project like Axie Infinity by design makes sure you can not derive value in the system through pure speculation, only by buying and holding Axies (playing cards). To earn a yield or at the very least not see your investment decay you must put them to use regularly in play. If you don't want to or lack the skill to do that yourself you must create jobs by lending your NFTs to players to put them to work.

> Whilst play-to-earn is nothing, new it is now going mainstream where 'play as work' and innumerable variations including; hold to play, share or curate to earn, and play for keeps, could become the primary income for hundreds of millions of people as a form of financial emancipation rather than digital feudalism with sweatshops.

This means you can participate in the system by productive capital or through the work itself. The consequence is there are whole villages in Southeast Asian countries like the Philippines doing just that, where the income available is better than many 'real world' jobs if they exist at all. And you can imagine it will be the same for the great unemployed youth from the COVID economic fallout.

Video games are going to completely alter the way our culture operates. It’s drastically important to our society in a way that we need to wake up to.

_Heman Narula

This doesn't just replace the economy proper, it creates entirely new wealth in a purely virtual sense but which puts bread on the table and roofs over people's heads. Whilst play-to-earn is nothing new, it is now going mainstream where 'play as work' and innumerable variations including; hold to play, share or curate to earn, and play for keeps, could become the primary income for hundreds of millions of people as a form of financial emancipation rather than digital feudalism.

>Top down_

Finally, there is an increasing top down mandate by governments to limit the power of social platforms like Facebook and other various Web 2 platform monopolies from an antitrust perspective but also from a Data Trade and abuse motive and a drive to unbundle platforms. Currently this has been limited to social media but will quickly extend to closed virtual worlds where the competitive advantage enjoyed by data monopolies, and as a result AI monopolies, are challenged and then removed.

> And whilst regulators are still trying to come to terms with what crypto-currencies mean and what their impact to their fiat based economies will be, in the end they will realise their success is both inevitable but also beneficial bringing about a form of open, permissionless hyper-competition both technically but also in financial services and inclusion which are undoubtedly in the interests of consumers.

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>Conclusion_

Whilst at first glance many of the conclusions we've drawn to the uninitiated may feel fanciful or wishful thinking as we watch the convergence of Web 3 and the Metaverse happen in realtime: first slowly then exponentially many of its conclusions in retrospect will feel both obvious and inevitable.

> We can not assume it is both a panacea for the world's ills nor a utopia without its problems. But perhaps its saving grace is that everyone can finally have the ability to directly contribute to the first truly universal and permissionless economy humankind has ever known.

However, as pioneers and active participants in this future we must also not go into this blind to the fact that, like Web 2's social media, whilst it benefits likely outweigh its dangers it is a seismic societal shift that will cause immense disruption including, and perhaps most especially, in the context of the nation state and fiat based economies of today. We cannot assume it is both a panacea for the world's ills nor a utopia without its problems. But perhaps its saving grace is that everyone can finally have the ability to directly contribute to it and control their personal destiny as a user, creator and consumer in the first truly universal and permissionless economy humankind has ever known.

>Thanks to_

In alphabetical order:

Adrian Bierdrzycki
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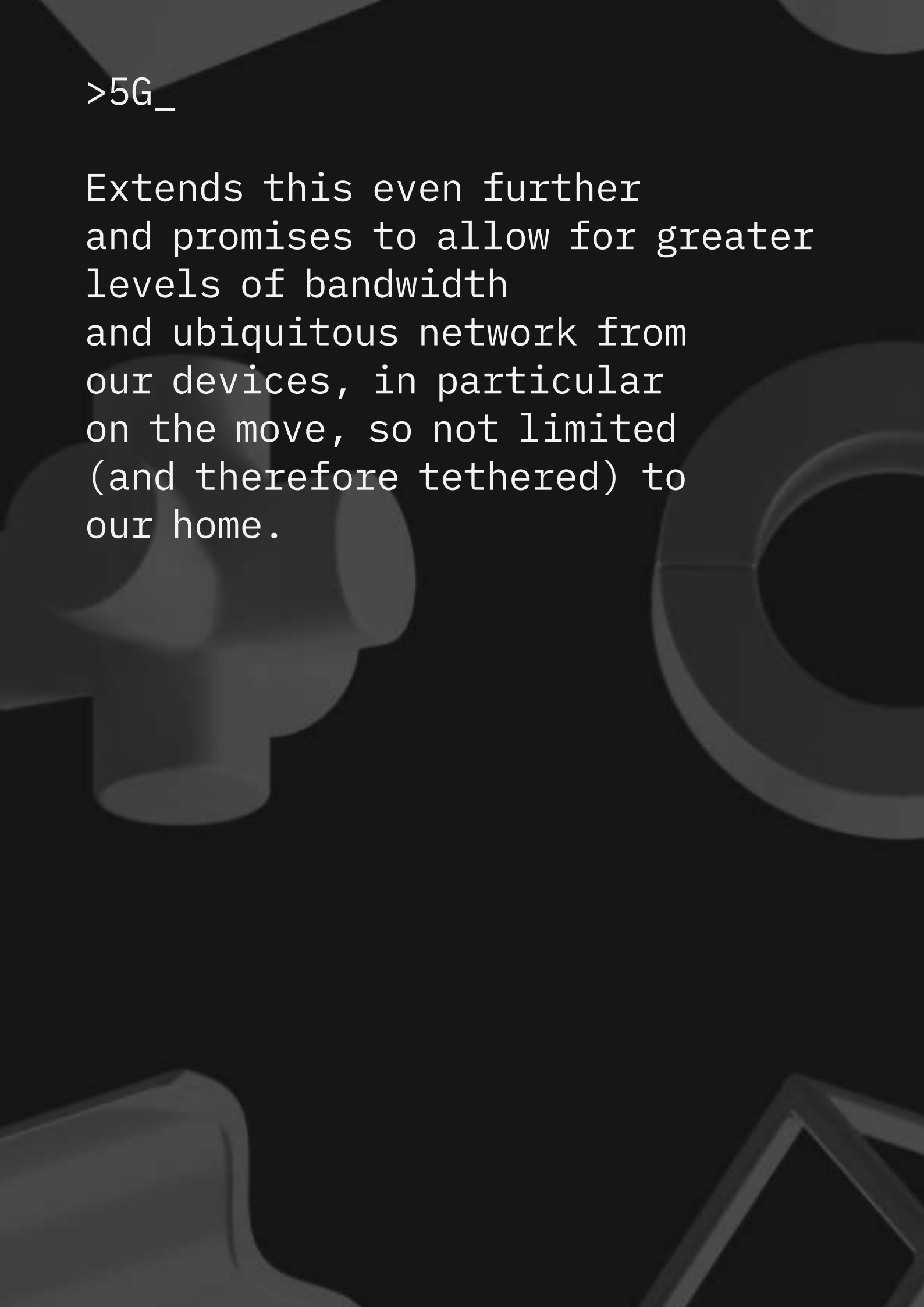
>5G_
Extends this even further
and promises to allow for greater
levels of bandwidth
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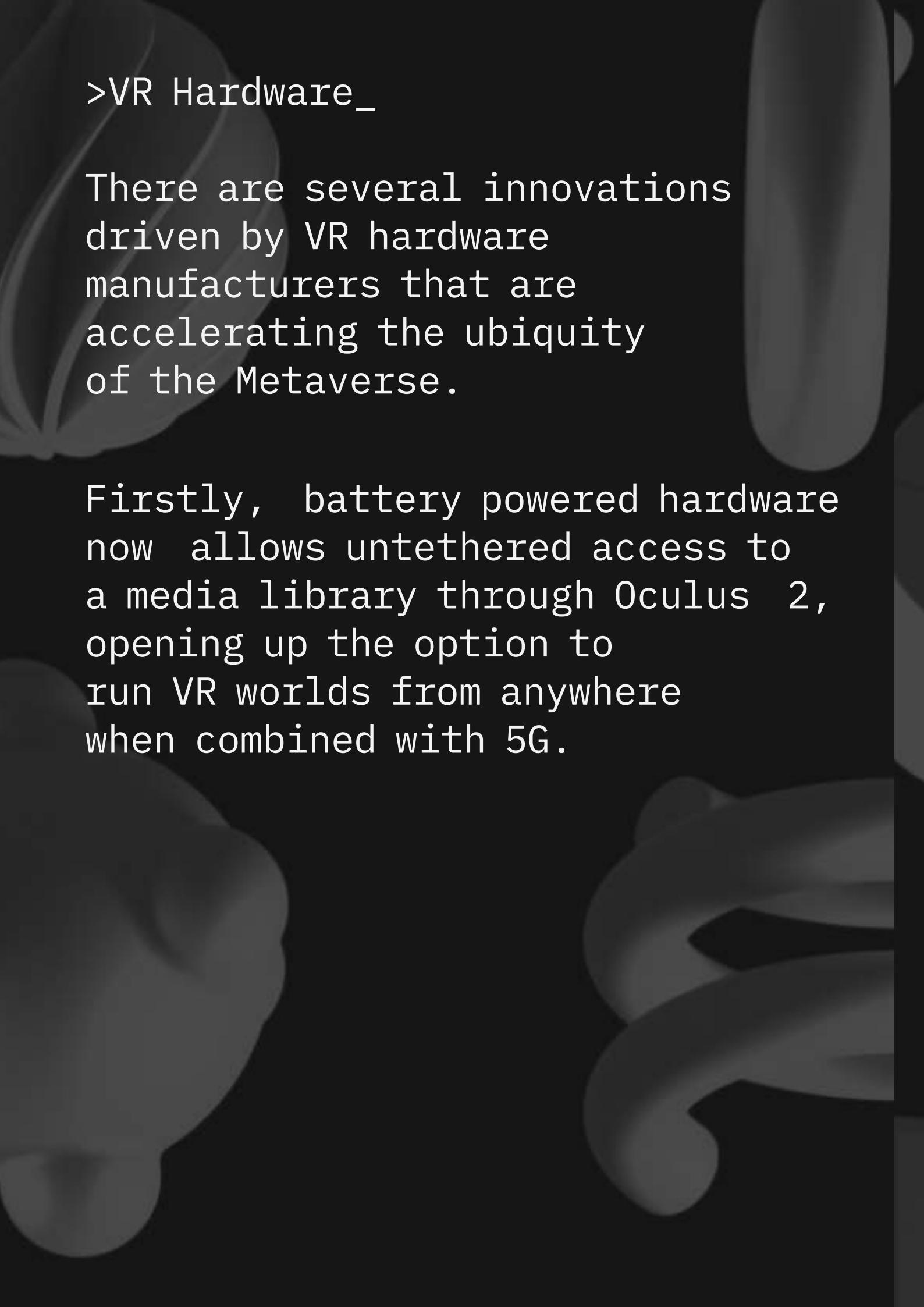
our devices, in particular
on the move, so not limited
(and therefore tethered) to
our home.



>VR Hardware_

There are several innovations driven by VR hardware manufacturers that are accelerating the ubiquity of the Metaverse.

Firstly, battery powered hardware now allows untethered access to a media library through Oculus 2, opening up the option to run VR worlds from anywhere when combined with 5G.

Whilst competitors like Valve are focusing on higher tier presentation coupled with facial and body tracking to make experiences more immersive and Hololens (and possibly Apple maybe later this year, 2021) are working on AR passthrough to present these digital items on physical surfaces in users' environments.

Whilst these are generally high end devices companies like HP with their Reverb 2 are attempting to bring a lot of the advanced features to market at a lower price point commodifying VR.

This can be combined with advances in hardware (like Graphcore and other AI-specific chips_ as well as open source hardware for BCI and haptics which accelerate the ubiquity and performance of virtual goods, services and worlds and enable a way to better capture and transform and render physical objects into virtual ones.