Decentralized Web3 Services

requirements and capabilities to support Metaverse applications

1. Proposers

RiotClouds: Rabih Masri

MyNeighborAlice: Steve Hassenpflug

2. Exploratory Group Goals

Build consensus and draft a proposed charter for a “Decentralized Web3 Services requirements and capabilities to support Metaverse applications” Domain Working Group

3. Potential Working Group Goals and Deliverables

The mission of the Decentralized Web3 Services group is to accelerate the adoption of scalable, interoperable, and secure Metaverse applications by defining the foundational requirements, capabilities, and reference models for decentralized Web3 services.

Web3 is not limited to blockchain. It encompasses a broader decentralized infrastructure stack, including identity management, data storage, security, and networking protocols. The Working Group will identify and specify high-level technical and operational requirements across these domains.

Key Goals:

- **Codify Cross-Ecosystem Requirements:** Define what is needed for seamless service integration across Web 2.0 ↔ Web3 and Web3 ↔ Web3 layers, particularly in real-time, immersive environments.
- **Establish Reference Architecture:** Propose a Kubernetes-like modular framework to manage and orchestrate decentralized services—including consensus, identity, storage, and compute—abstracting complexity for developers and enterprises.
- **Advance Interoperability:** Recommend models to support interoperability across chains, platforms, and identity layers, including through “Consensus-as-a-Service” offerings and decentralized APIs.
- **Bridge Web 2.0 and Web3 Workflows:** Enable traditional Web 2.0 applications to deploy into the Metaverse and interact with Web3-native assets, identities, and economies.
- **Inform Standards Development:** Identify gaps in current protocols and align with emerging standards across storage, networking, governance, and identity.
- **Support Real-World Adoption:** Drive prototyping and testing through use cases from Metaverse companies and startups, ensuring solutions are aligned with actual business and developer needs.

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Technology Overview: Web3 Domains and Differentiation from Blockchain

Index	Category	Generic Term	Technical Protocols / Concepts	Web3 Beyond Blockchain
1	Blockchain & Web3	Decentralized Ledger	PoW, PoS, DAG, Layer 1 / Layer 2 consensus protocols	Part of Web3 infrastructure for recording transactions, but not the whole picture
2	Blockchain & Web3	Smart Contracts	On-chain execution environments, formal verification	Used in Web3 but only for logic executionâ€”Web3 includes identity, storage, etc.
3	Blockchain & Web3	dApps	Peer-to-peer networks, IPFS/Filecoin storage, on-chain logic	Web3 includes off-chain components (e.g., IPFS) not part of blockchain
4	Blockchain & Web3	Token Standards	ERC-20, ERC-721, ERC-1155, BEP-20, SPL	A blockchain feature, but Web3 includes broader digital ownership & governance
5	Blockchain & Web3	Decentralized Identity	DIDs, VCs, zk-SNARKs	A core Web3 component independent of blockchains; enabled by cryptographic protocols
6	Web 2.0 Infrastructure	Centralized Discovery Platforms	HTTP(S), REST, OAuth 2.0	Contrasts with Web3's push for decentralized and user-owned data
7	Web 2.0 Infrastructure	Monetization Channels	RTB protocols, PCI-DSS APIs, webhooks	Web3 rethinks monetization with tokens, NFTs, DAOs
8	Web 2.0 Infrastructure	Web Hosting & Delivery	HTTP/2, QUIC, TLS, DNS, container orchestration	Web3 aims to decentralize hosting (e.g., via IPFS, Swarm)
9	Metaverse Infrastructure	Virtual Worlds	WebXR, WebGL, real-time rendering engines	Often built on Web3 principles but not reliant on blockchain
10	Metaverse Infrastructure	Avatars & Identity	GLTF, VRM, humanoid rigs	Digital identity overlaps with decentralized identity in Web3
11	Metaverse Infrastructure	Game Engines	ECS architecture, scene graphs	Not inherently blockchainâ€”can integrate Web3 for asset ownership
12	Metaverse Infrastructure	Asset Interoperability	GLTF, USDZ, NFT metadata standards	NFTs link Web3 with asset management beyond

				blockchain
13	Bridge & Integration	Web 2.0 Web3 Bridges	Cross-chain messaging, oracles, light clients	Facilitates interaction between Web 2.0 platforms and Web3 systems
14	Bridge & Integration	API Gateways	JSON-RPC, WebSockets, streaming protocols	Essential for integrating off-chain Web3 data flows
15	Bridge & Integration	Authentication & Onboarding	OAuth 2.0, DID Auth, ZKP login	Web3 emphasizes self-sovereign login beyond traditional auth
16	Security & Standards	Fraud Detection & Security	ZKPs, MPC, anomaly detection, elliptic cryptography	Privacy and security in Web3 go beyond blockchain needs
17	Security & Standards	Protocol & Standards Development	EIPs, BIPs, W3C, ISO/IEC	Web3 includes governance and community-driven standardization
18	Ecosystem Tools	Developer & Analytics Tools	Indexing protocols, data query layers	Support the Web3 stack at scale, not specific to blockchain
19	Ecosystem Tools	Funding & Scaling Support	DAO governance, bonding curves, vesting contracts	Core Web3 mechanisms that function independently of blockchain tech

Example Scenario: Web 2.0 Company Enabling Metaverse Presence via Consensus-as-a-Service

Use Case Title:

Web 2.0 Media Company Launches Decentralized Metaverse Governance with Consensus-as-a-Service

Overview:

A traditional Web 2.0 media company—formerly reliant on centralized social platforms and ad revenue—decides to expand into the Web3-enabled Metaverse. Their goal: create an interactive virtual environment for users to engage, vote on content decisions, and co-own digital assets.
Rather than building their own blockchain infrastructure, they adopt a Consensus-as-a-Service (CaaS) solution provided by a decentralized Web3 services layer.

Implementation Steps:

- **Deployment of CaaS Node Cluster:**
  - The media company spins up lightweight consensus nodes via a decentralized provider.
  - Nodes are geographically distributed and maintained by the CaaS layer, removing operational burden.

- **Integration with Metaverse Platform:**
  - The company deploys its 3D world in a shared Metaverse space.
  - CaaS nodes are integrated into the environment to support:
    - Verifiable user voting (e.g., content moderation decisions).
    - Proof-of-attendance tokens for live events.
    - Digital rights governance for NFTs.

- **Use of Web3 Identity & Tokens:**
  - Users authenticate with decentralized identifiers (DIDs).
  - The platform issues soulbound tokens for reputation and fungible tokens for micro-tipping content creators.

- **Web 2.0 ↔ Web3 Bridging:**
  - Legacy user accounts from the company's Web 2.0 app are linked to Web3 identities via ZK-based login bridges.
  - Social interactions and posts are mirrored across both Web 2.0 and Metaverse environments.

Outcomes:

- **Decentralized Governance:** Users collectively moderate community content using a verifiable voting system powered by CaaS.
- **User Incentivization:** Fans earn NFTs and tokens based on participation, boosting loyalty and retention.
- **No Blockchain Complexity:** The company leverages decentralized trust without maintaining its own infrastructure.
- **Interoperability:** The digital assets and identity systems are compatible with other Metaverse platforms and wallets.

4. Non Goals

The Group will not develop or propose formal protocols, APIs, or finalized technical specifications within the MSF Forum. Instead, the focus will remain on identifying gaps, collecting cross-industry requirements, and aligning stakeholder priorities. While solution concepts and architectural patterns may be discussed to inform future standards, the creation or ratification of technical standards is best handled by dedicated organizations such as the Ethereum Foundation, W3C, or relevant protocol working groups.

The intent is to support and inform those bodies by feeding them real-world use cases, interoperability needs, and ecosystem alignment data—ensuring that standards evolve in response to practical requirements.

5. Coordination

The Group will collaborate with the Standards Register team to integrate the use cases and requirements developed by MSF members of the Decentralized Web3 Services group into the Integrated Use Cases and Requirements section of the Standards Register. This will ensure continuous updates and alignment with the evolving standards, maintaining consistency with the broader standards framework.

Align with Digital Assets Management Group.

6. Risk factors

Member-Driven Alignment Risk
The success of this group depends on its ability to accurately reflect the priorities and challenges of MSF members. If member engagement is low or their input is not well integrated, the group risks developing solutions that lack relevance or adoption. Ongoing collaboration, transparent feedback loops, and active

participation are essential to ensure the group's work remains aligned with the needs of its stakeholders.

7. Target timeline to create proposed Working Group

Fall 2025

8. Additional Contributors

None at this time.

9. Candidate Organization Engagement

The success of this initiative depends on active participation from a broad range of stakeholders across both Web 2.0 and Web3 ecosystems. The Working Group seeks to engage companies from the following domains:

- **Web 2.0 platform providers** (e.g., social, e-commerce, cloud)
- **Web3 infrastructure and tooling vendors**
- **Metaverse creators and game studios**
- **Identity and authentication service providers**
- **Media and content governance platforms**
- **Research institutions and standardization bodies**

Interested organizations are invited to:

- Contribute use cases and requirements
- Test infrastructure on shared prototypes
- Participate in drafting interoperability guidelines
- Provide feedback on technical frameworks

A formal expression of interest can be submitted via the MSF coordination process. Participation may also include access to reference implementations, testbeds, and early drafts of proposed specifications.

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Appendix A: Glossary of Terms

Term	Definition
Web 2.0	The second generation of the web characterized by user-generated content, social media, and centralized services.
Web3	Web3 refers to the next generation of the internet focused on decentralization, user ownership, and peer-to-peer interactions. While blockchain is a foundational component, Web3 is broader in scope. It includes decentralized identity (DID), distributed storage networks (e.g., IPFS, Filecoin), smart contracts, token economies, DAOs, and privacy-enhancing technologies like Zero-Knowledge Proofs. Blockchain supports parts of Web3, but Web3 also integrates off-chain protocols, Web 2.0-Web3 bridges, and interoperable APIs to build a more open, user-centric internet.
PoW (Proof of Work)	A consensus algorithm that requires computational work to validate transactions and add new blocks to the blockchain.
PoS (Proof of Stake)	A consensus mechanism where validators are chosen to produce blocks based on the amount of cryptocurrency they stake.
DAG (Directed Acyclic Graph)	A data structure used as an alternative to blockchain for achieving distributed consensus without linear chains.
Layer 1 / Layer 2 Consensus Protocols	Layer 1 refers to base blockchains (e.g., Ethereum), while Layer 2 adds scalability by operating on top of Layer 1.
On-chain Execution Environments	Blockchain-native virtual machines (e.g., EVM) that execute smart contracts directly on the chain.
Formal Verification	A mathematical method used to prove the correctness of smart contract logic.
Peer-to-Peer Networks	Distributed networks where nodes share and validate information without a central authority.
IPFS/Filecoin Storage	Decentralized storage systems where IPFS handles file sharing and Filecoin adds blockchain-based incentives.
ERC-20	A standard for fungible tokens on Ethereum.
ERC-721	A standard for non-fungible tokens (NFTs) on Ethereum.
ERC-1155	A multi-token standard that supports both fungible and non-fungible assets.
BEP-20	A token standard on Binance Smart Chain similar to ERC-20.
SPL	Solana Program Library token standard used on the Solana blockchain.
DIDs	Decentralized Identifiers, which enable self-sovereign, cryptographically verifiable identities.

VCs (Verifiable Credentials)	Digital credentials that can be verified cryptographically without exposing private data.
zk-SNARKs	Zero-Knowledge Succinct Non-Interactive Argument of Knowledgeâ€”used for private, trustless proof validation.
HTTP(S)	The standard web protocol for transmitting data securely (HTTPS) or non-securely (HTTP).
REST	A software architectural style for APIs that uses HTTP requests.
OAuth 2.0	An open standard for delegated authorization, allowing third-party services to exchange credentials securely.
RTB Protocols	Real-Time Bidding protocols used in programmatic digital advertising.
PCI-DSS APIs	Application interfaces that comply with Payment Card Industry Data Security Standards.
Webhooks	HTTP callbacks used to trigger actions between systems.
HTTP/2	An updated version of HTTP for faster, multiplexed web communication.
QUIC	A low-latency transport protocol that enhances HTTP/3.
TLS	Transport Layer Security, used to encrypt internet communication.
DNS	The Domain Name System translates human-readable domains into IP addresses.
Container Orchestration	Automated management of containerized applications, commonly using Kubernetes.
WebXR	A browser API for building immersive experiences in AR and VR.
WebGL	A JavaScript API for rendering 3D graphics in web browsers.
Real-time Rendering Engines	Engines that dynamically render interactive environments, typically used in gaming and simulations.
GLTF	Graphics Language Transmission Format, a standard for 3D models.
VRM	A 3D avatar file format optimized for use in virtual reality environments.
Humanoid Rigs	Skeletal frameworks that enable character animation.
ECS Architecture	Entity-Component-System design used in game development to organize code modularly.
Scene Graphs	Hierarchical data structures used to manage spatial representation in 3D environments.
USDZ	A 3D file format optimized for AR and supported by Apple platforms.
NFT Metadata Standards	Standards that define how metadata is structured for NFTs to ensure compatibility.
Oracles	Third-party services that bring off-chain data onto the blockchain.
Light Clients	Blockchain clients that do not store the full blockchain but can verify transactions.

JSON-RPC	A remote procedure call protocol encoded in JSON used for communication with blockchain nodes.
Streaming Protocols	Data transfer protocols for real-time data such as WebSockets or gRPC.
DID Auth	Authentication method using Decentralized Identifiers.
ZKP Login	Authentication mechanism based on Zero-Knowledge Proofs.
ZKPs	Cryptographic proofs that allow verification without revealing the underlying data.
MPC	Multi-Party Computation, allowing secure computation across multiple parties without exposing inputs.
Elliptic Cryptography	Cryptographic systems based on the algebraic structure of elliptic curves.
EIPs	Ethereum Improvement Proposalsâ€”standards for changes to the Ethereum protocol.
BIPs	Bitcoin Improvement Proposalsâ€”similar to EIPs but for Bitcoin.
W3C	World Wide Web Consortium, an international standards body for the web.
ISO/IEC	International standards for information technology set by ISO and IEC.
Indexing Protocols	Frameworks that organize and allow querying of blockchain data.
Data Query Layers	APIs and services that allow retrieval and filtering of structured data from blockchain or dApps.
DAO Governance	Decision-making frameworks within decentralized autonomous organizations.
Bonding Curves	Mathematical curves used to define token price based on supply.
Vesting Contracts	Smart contracts that release tokens over time or based on milestones.