dPID: A Persistent Identifier for Machine Actionability

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1 Introduction

Machine agents are transforming the way we interact with information. The dPID (Decentralized Persistent Identifier) is designed to support machine actionability while adhering to the FAIR principles. It guarantees global uniqueness, an immutable designation to their mapped resource, and consistent resolution to their (meta)data for both humans and machines.

2 Key Features of dPID

2.1 Globally Unique

dPIDs are based on content identifiers (CIDs), which are cryptographic fingerprints of their resource. This architecture provides strong probabilistic guarantees of global uniqueness.

2.2 Persistent Mapping

dPIDs uniquely identify any hash-based data object and ensure that the same logical object always maps to the exact same sequence of bits.

2.3 Deterministic Resolution

Data cannot change its fingerprint. The data indexed by dPIDs always resolves to its mapped resource, without reliance on social contracts.

2.4 Versionability

PID owners can version the data indexed by the PID while maintaining a transparent and secure log of "who, what, and when" something has changed.

2.5 Convenient and Human-Friendly

dPIDs provide a human-friendly, compact URL alias that is secure and decentralized. Minting a single dPID creates a unique PID for every resource in a file system.

2.6 Trust-Minimizing

The dPIDs and their indexed data are replicated on a distributed data storage and indexing network. The network is open and opt-in, ensuring long-term access and minimizing trust requirements.

3 FAIR Digital Objects: Layers of Encapsulation

dPIDs encapsulate digital objects within a structured framework that supports resolution for both humans and machine agents. This layered approach supports long-term accessibility and machine actionability.

4 Conclusion

The dPID system represents a significant advancement in persistent identifiers, focusing on machine actionability, version control, and secure resolution. By adhering to FAIR principles, dPIDs ensure that data remains findable, accessible, interoperable, and reusable.