

Copyright and AI are at the centre of intense debate. Generative AI (GenAI), trained on vast datasets that often include copyrighted works, has amplified concerns over fair compensation and proper attribution for creative rightsholders. Current approaches to data licensing for GenAI rely on ad hoc agreements with a small number of large dataset owners who have the resources to broker such deals. These models lack transparency, control, and inclusivity in a modern creative economy where content production and consumption are increasingly decentralized. To address these challenges, we present a decentralized platform built on the Content ARCs (Authenticity, Rights, Compensation) framework [1] to enable creators to manage provenance, licensing, and monetisation of their media assets on distributed ledgers using open standards such as C2PA [4] and Open Digital Rights Language (ODRL) [5].

Preliminaries. Content Credentials are an emerging technical standard for embedding media provenance information inside asset metadata called a ‘manifest’, developed by the Coalition for Content Provenance and Authenticity (C2PA). C2PA manifests contain provenance facts called ‘assertions’ and are signed using public-key (X.509) infrastructure. Assertions might include who created content, how, and using which sources. To ensure durability against metadata stripping, content identification techniques like watermarking and fingerprinting robustly bind assets to manifests. Rights expression languages such as ODRL complement this by offering a machine-readable vocabulary for permissions, prohibitions, and obligations associated with creative assets.

Distributed ledger technologies provide a tamper-evident medium for recording asset identifiers and license transactions in a transparent and auditable manner. Smart contracts extend this functionality by enabling programmable, automated execution of licensing terms and compensation flows without reliance on central intermediaries. Together, these primitives establish the technical foundation for a decentralised marketplace in which authenticity, rights, and remuneration can be enforced at scale.

Demonstrator. Our prototype instantiates a decentralized ecosystem of repositories, each independently hosting creative assets with provenance manifests expressed via C2PA, and licensing contracts expressed via ODRL. The system is the first to implement the decentralised watermark resolution protocol defined by C2PA [3], enabling federated discovery of provenance manifests across repositories. This allows users to take an image encountered online, resolve it via its embedded watermark, and discover the repository where it is registered. Once resolved, they can fetch provenance manifests, verify authenticity, review license terms, and execute transactions directly against the repository’s smart contract. In this way, creators can register and monetise their work, while consumers gain a transparent pathway to authenticity verification and lawful use.

Beyond resolution, the platform supports: manifest generation (C2PA v2.2); invisible watermarking of assets using TrustMark [2]; on-chain registration of watermarks, assets, and license terms; verification of authenticity via manifest or watermark lookup; on-chain licensing transactions via smart contracts with escrow; licensing options spanning personal, commercial, derivative, distribution, and AI training uses; multiple compensation mechanisms—one-off fees, revenue sharing, pay-per-use.

The architecture (Fig. 1) comprises:

- 1. Asset Registration:** Users upload media, which is watermarked and embedded with a C2PA manifest. The watermark ID and manifest URI are registered on-chain in two stages: (1) watermark registration in the main contract, which maintains the decentralised lookup table of repository endpoints and (2) asset and license registration in the smart contract of the respective repository, linking the C2PA manifest to ODRL terms.
- 2. Verification Flows:** (A) Extract and verify manifest from asset, parse contract address, query smart contract for licensing options; (B) Extract watermark, resolve to server URL via decentralised K-V store, verify manifest, extract contract address, and query for options.

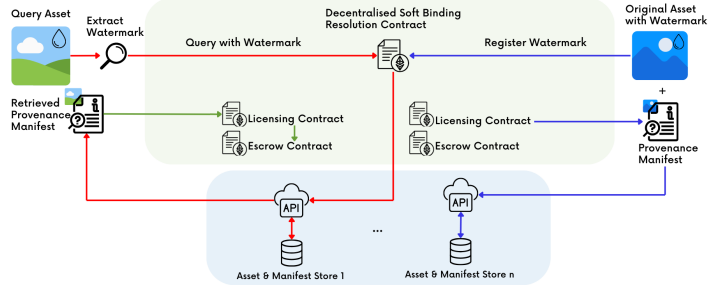


Figure 1: Architecture diagram and user flows: creative asset registration (blue), querying using an asset (red), acquiring licenses (green).

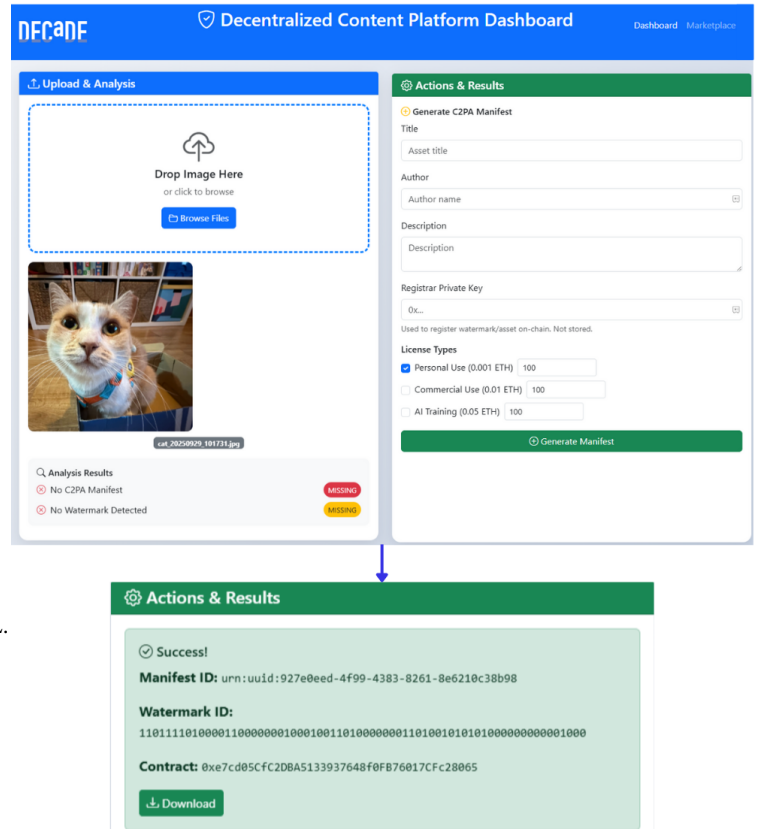


Figure 2: Registration and license specification.

3. Licensing and Escrow: Licenses use ODRL terms (e.g. USE, COMMERCIALIZE, DERIVE, REPRODUCE, DISTRIBUTE). Smart contracts enforce conditions and handle payments: buyers lock funds in escrow at purchase, and authors receive payment when license terms are actioned.

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- [1] Kar Balan, Andrew Gilbert, and John Collomosse. Content ARCs: Decentralized Content Rights in the Age of Generative AI. In *IEEE International Conference on AI and the Digital Economy*, 2025.
- [2] Tu Bui, Shruti Agarwal, and John Collomosse. Trustmark: Universal watermarking for arbitrary resolution images. *IEEE International Conference on Computer Vision (ICCV)*, 2025.
- [3] Coalition for Content Provenance and Authenticity. C2PA implementation guidance: Decentralised soft binding resolution protocol.
- [4] Coalition for Content Provenance and Authenticity. C2PA technical specification v2.2, 2025.
- [5] Open Digital Rights Language (ODRL) Community Group. ODRL information model version 2.2, 2023.