Coalition for
Content Provenance
and Authenticity

Content Credentials & the C2PA

W3C Media and Entertainment IG August 20, 2024

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Today’s agenda

01. Overview of the C2PA

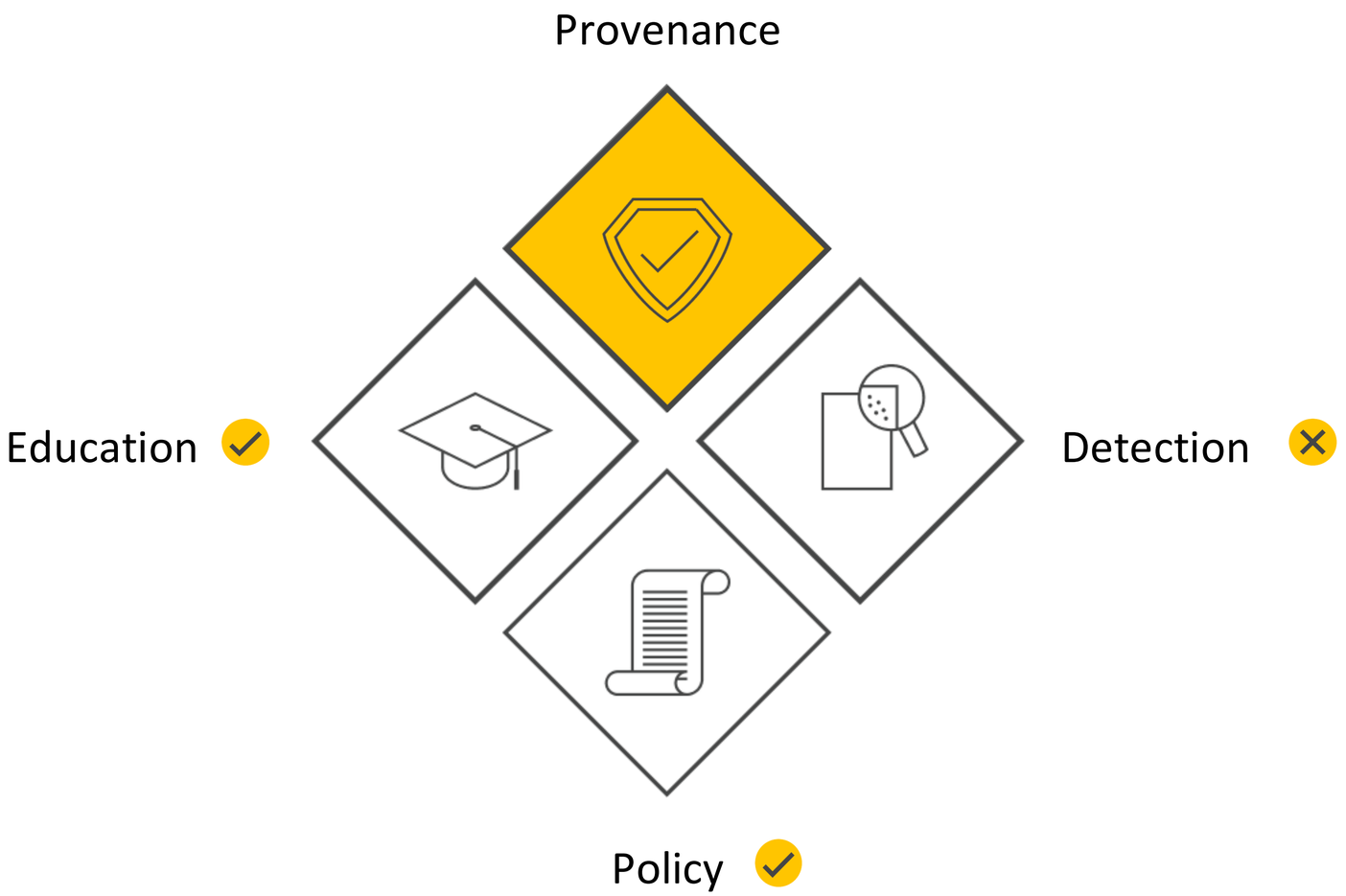
02. Content Credentials

03. The specification

04. Next steps

05. Q & A

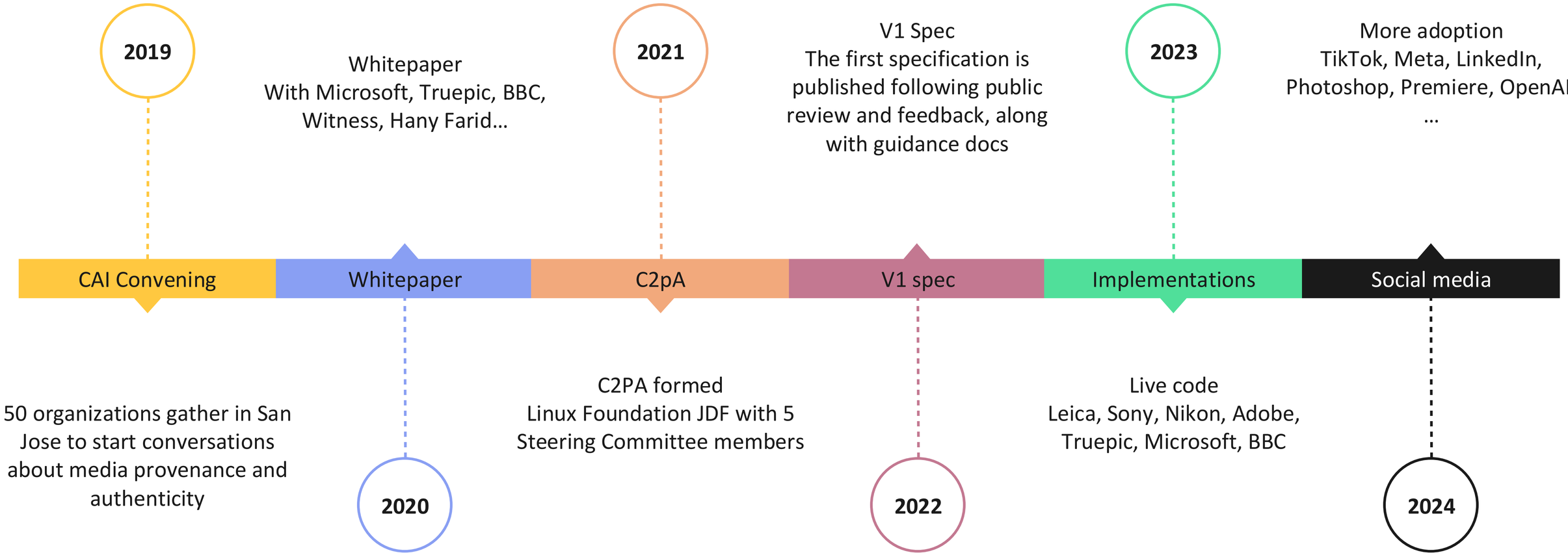
Pillars of Transparency and Authenticity



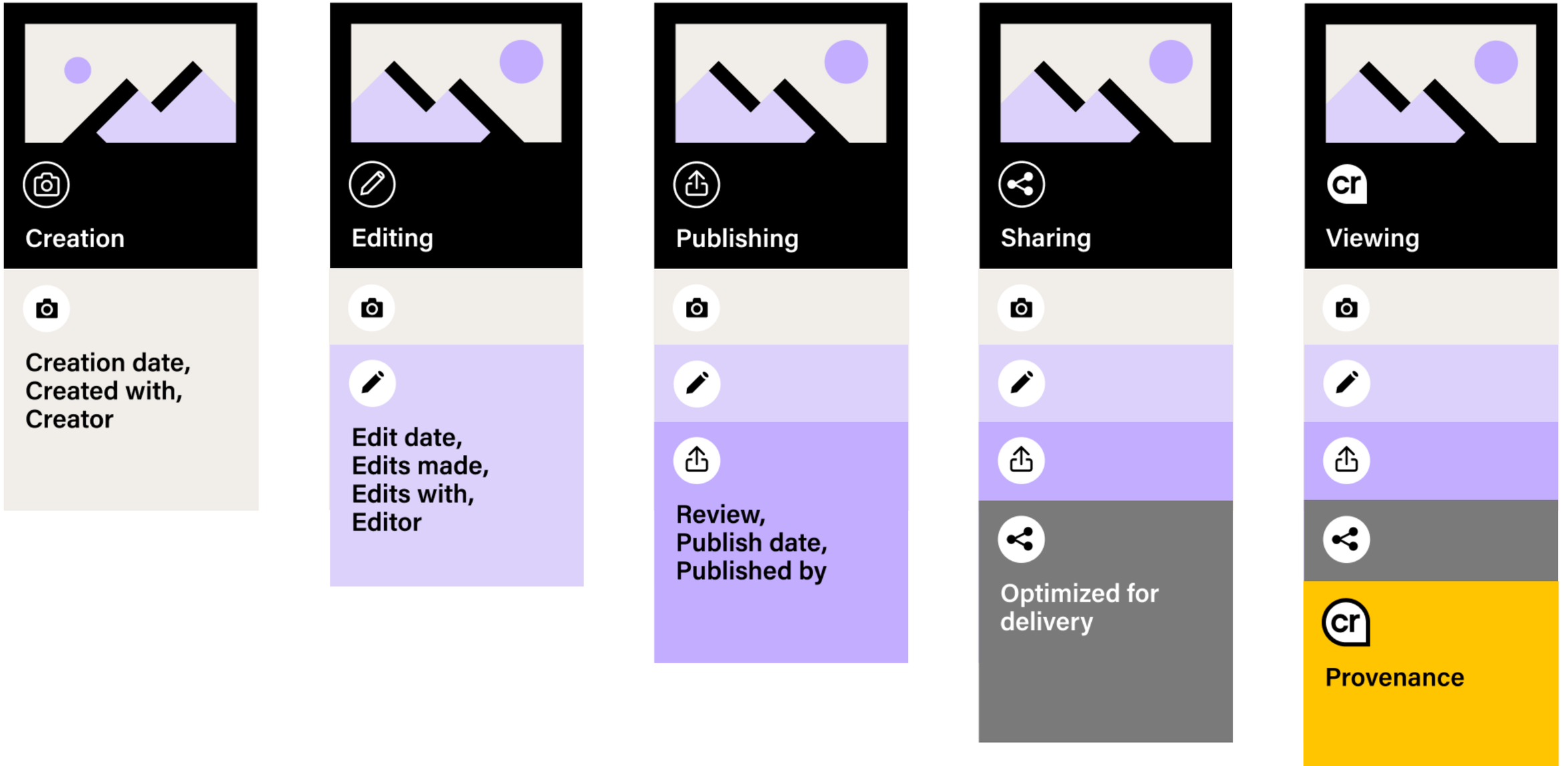
Provenance

The basic trustworthy facts about the origins of a piece of digital content (image, video, audio recording, document).

A rough Content Credentials timeline

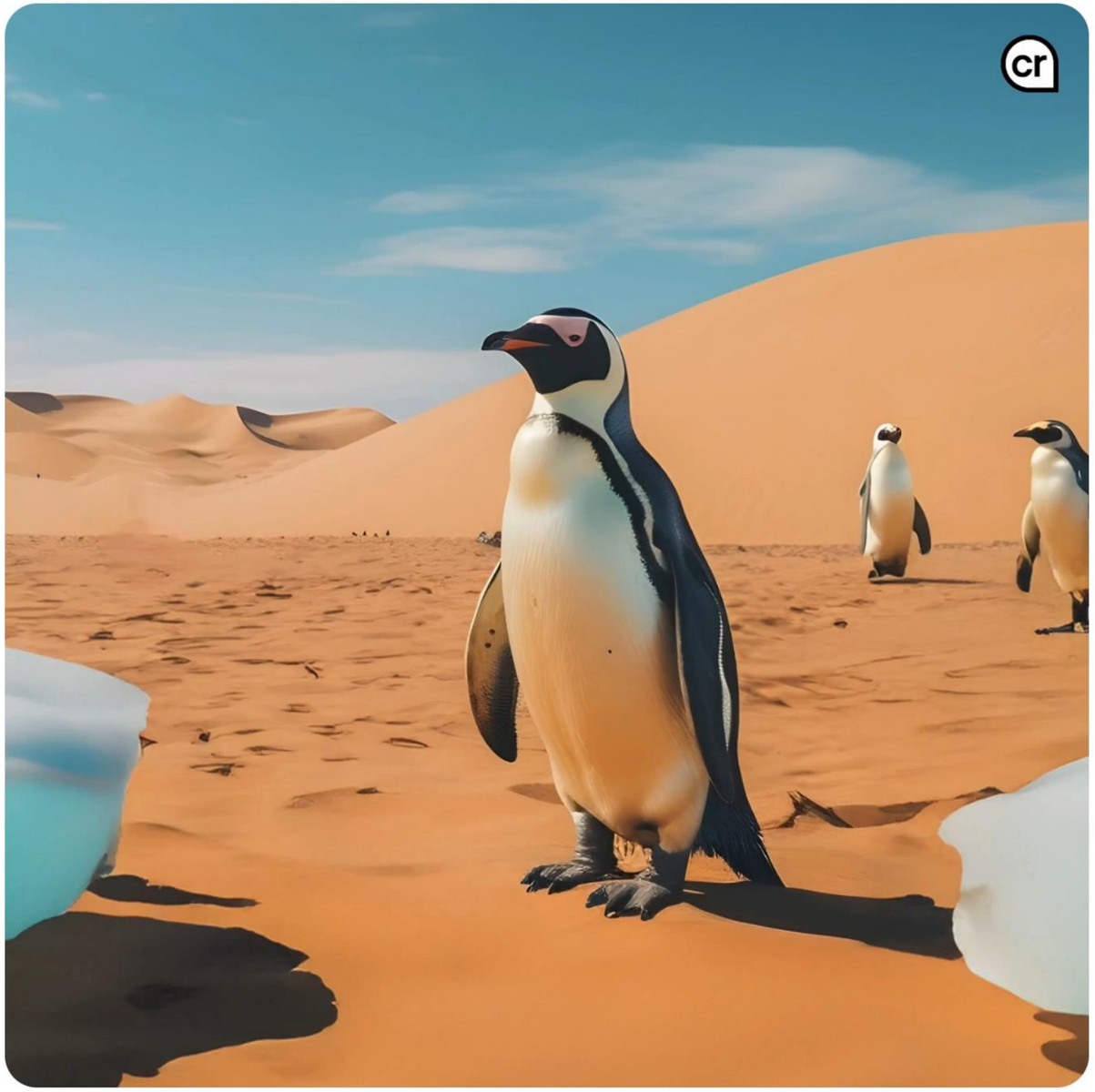


Content Credentials



Wait, where did this image come from?

Deepfakes. Voice cloning. Synthetic media. It's hard to tell what's accurate and authentic these days.



DASH support

2 Invalid video Content Credentials or assets

This sample shows how the Content Credentials player can surface important information to viewers when there are issues with a video's Content Credentials or segments within a video.

The Coalition for Content Provenance and Authenticity (C2PA)

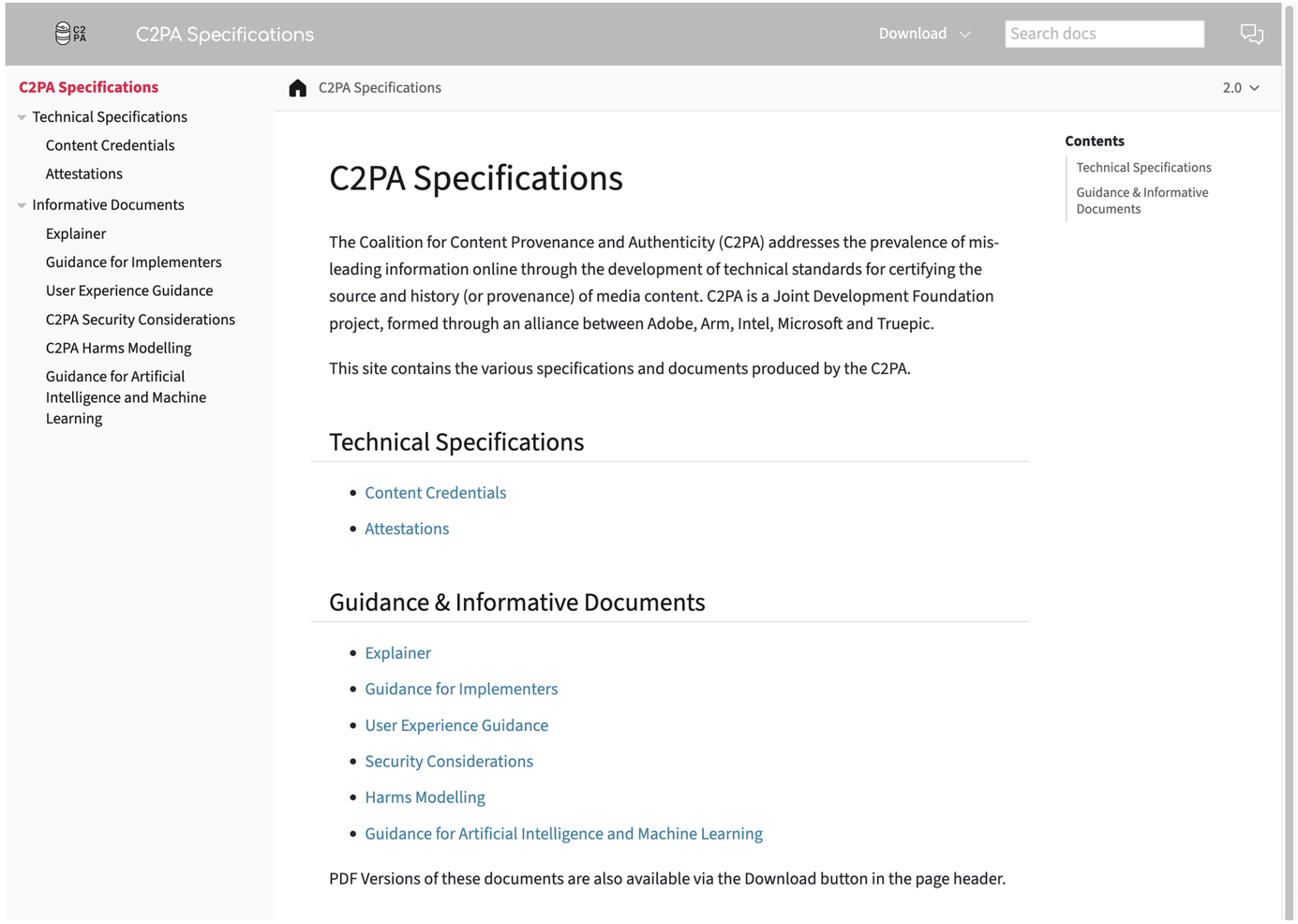
- Standards organization (SDO)
- Linux Foundation JDF
- 9 Steering Committee members
- V1.0 specification: Jan 2022
  V2.1 DRAFT: August 2024

What is the C2PA Specification?

content credentials

An **open standard** for storing and accessing cryptographically verifiable and tamper-evident information whose trustworthiness can be assessed based on a defined trust model.

Specification (v2.0) Available - https://c2pa.org/specifications/



Towards 2.1

- Currently in **public draft review**
  - https://c2pa.org/specifications/specifications/2.1/index.html
- Sent to **ISO TC 171/SC 2 for Fast Track** standardization (DIS)
  - WG 13 – meeting to take place in Prague in Nov.
  - Update to final 2.1, then off to publication
- **W3C Review**
  - W3C task force for the express purpose of returning a review of 2.1, the scope of this review should be how C2PA fits into the web and how it makes use of web technologies.

Technical Review of C2PA

(Some of our) Design Goals

- Create only the **minimum required novel technology** by relying on **prior, battle-tested techniques**.
- **Do not require cloud storage** or distributed ledgers/blockchain **but allow for it**.
- **Maintain an audit trail across multiple tools**, from asset creation through all subsequent modification and publication/distribution.
- **Support all standard asset formats** supported by common authoring tools, across media types such as images, videos, audio, and documents.

Core Technologies w/Open Standards

- JPEG universal metadata box format (JUMBF)
- JSON-LD & CBOR
- Cryptographic Message Syntax (CMS)
- CBOR Object Signing and Encryption (COSE)
  - NOTE: working with ETSI on an AdES for COSE, *cbAdES*

COSE

stands for

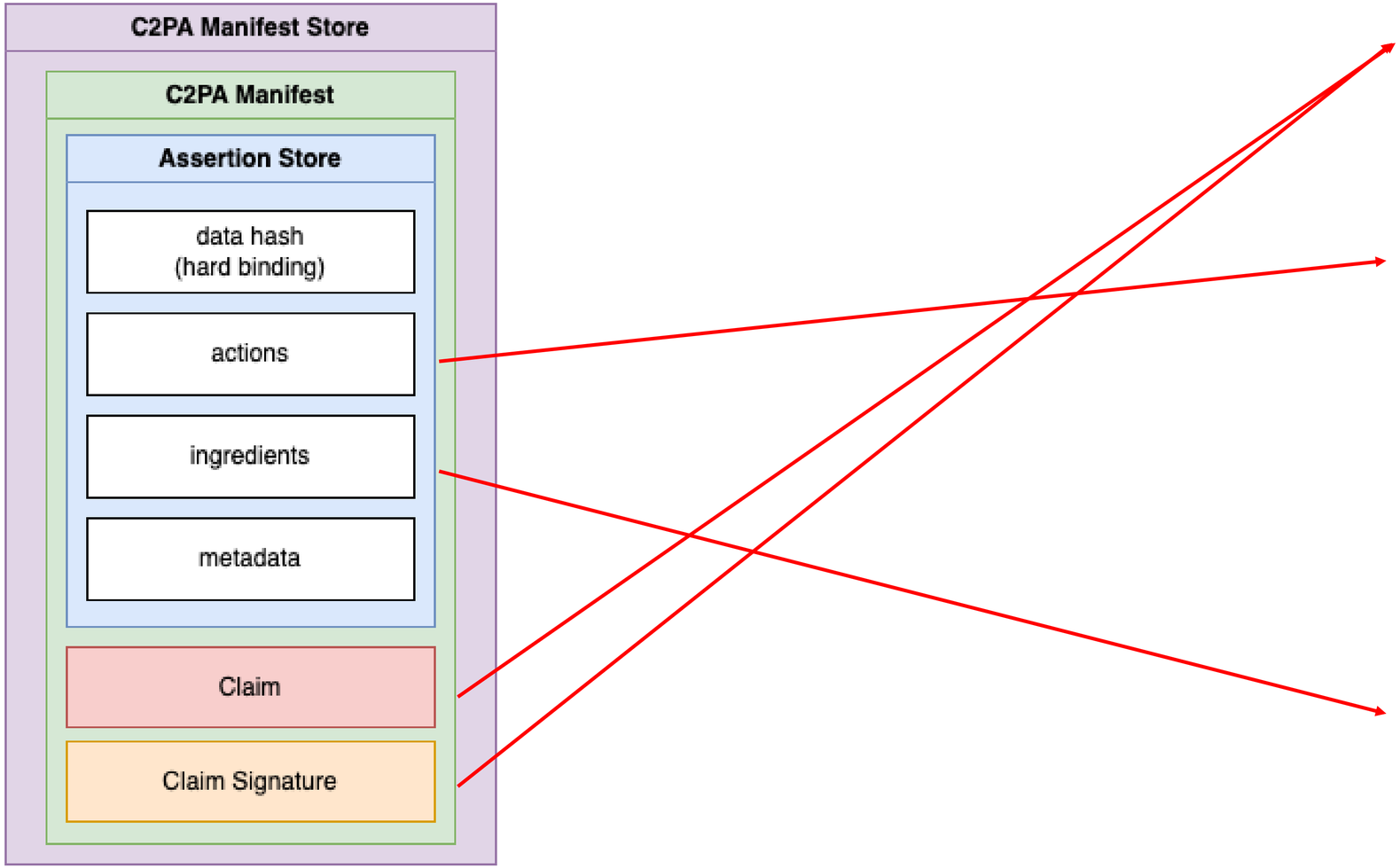
CBOR Object Signing and Encryption

CBOR

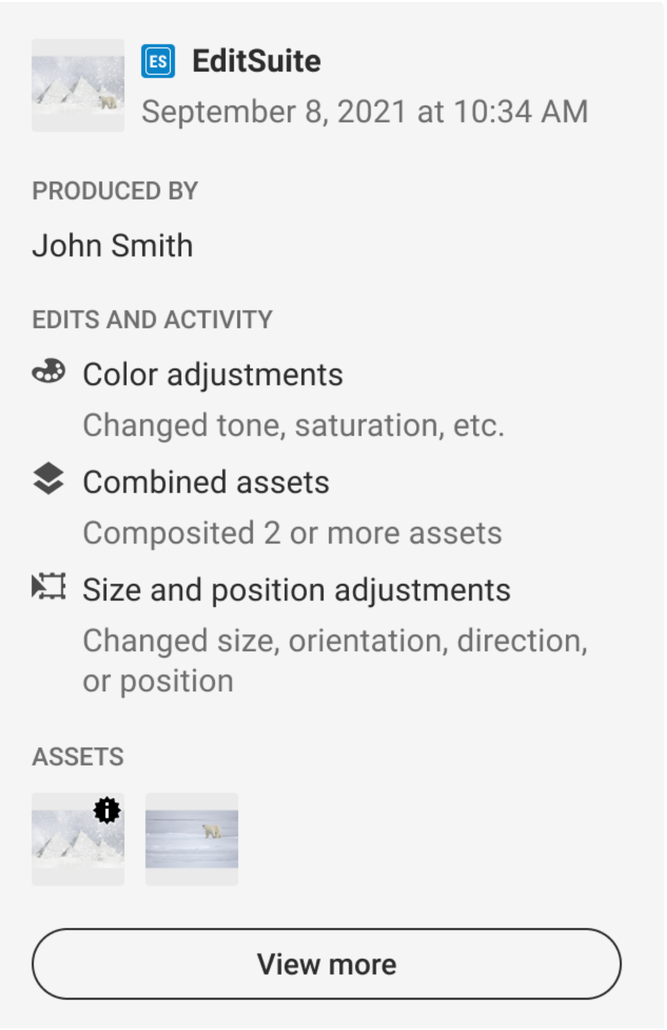
RFC 8949 Concise Binary Object Representation

Core Components to C2PA

Content Credentials



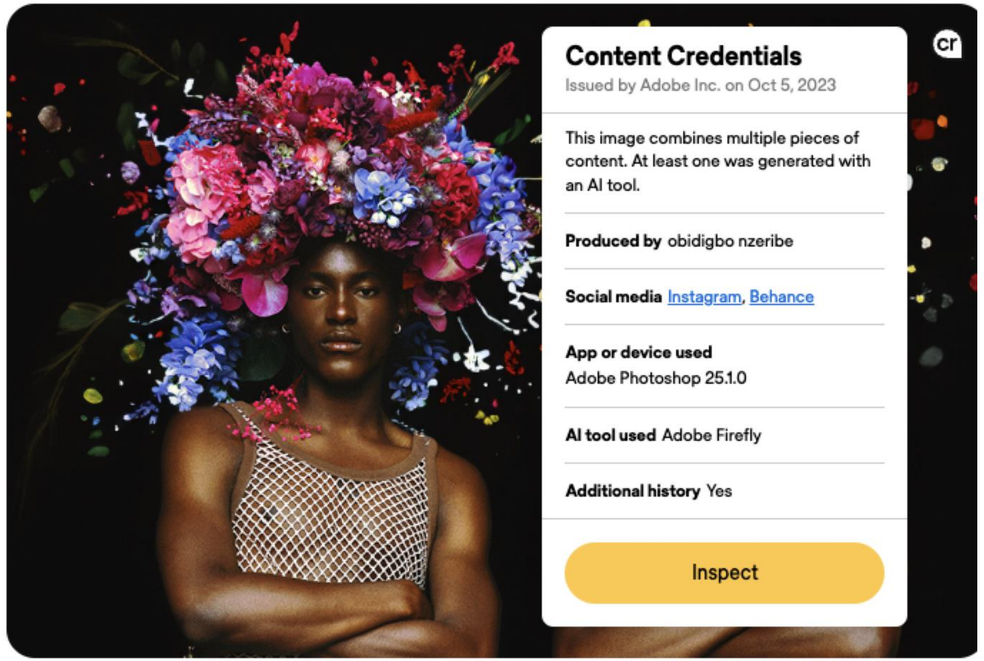
https://contentcredentials.org/



Functionality around Generative AI

Identifying assets & regions of interest
that have been created/modified by AI

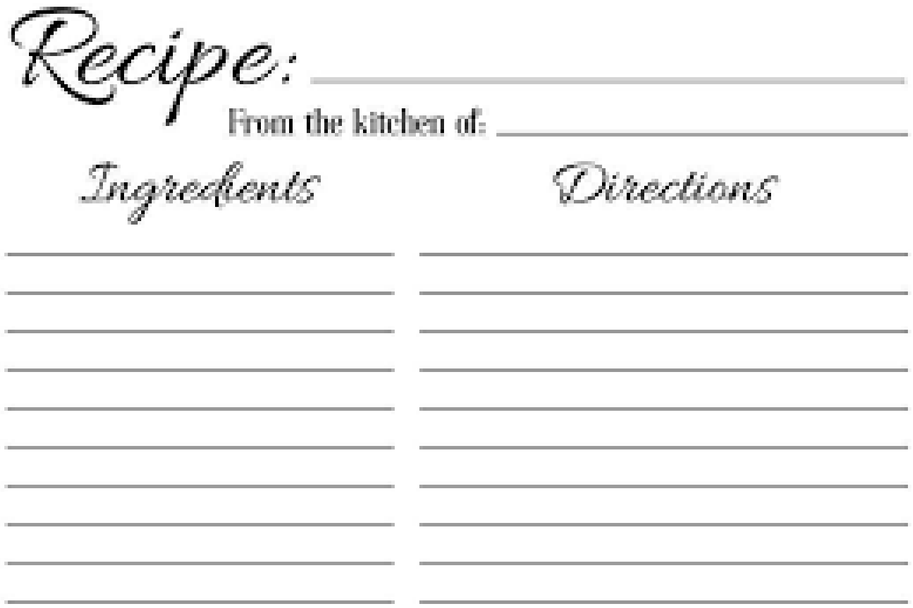
Information about the "recipe"



The How not the Who

- Focus on the ”recipe” of how the manifest came to be
- Removed from C2PA any reference to human/organization identity
- Removed `Do Not Train` assertion (related to authorship/ownership)

- The Who has moved to the CAWG (Creator Assertions Working Group)
  - Identity
  - ”Training & Data Mining”
  - Metadata



Cryptography - a Trust Model

- Modelled on the **same approach as PDF and the Web**
- Cryptographic foundation
  - Hard bindings between metadata and content (e.g., SHA256, SHA3,…)
  - X.509 certificates for signing
  - Certificate authorities and trust lists
  - Hardware attestation for cameras/mobile devices
- Soft bindings allow recovery of stripped metadata

Trust Lists in 2.0

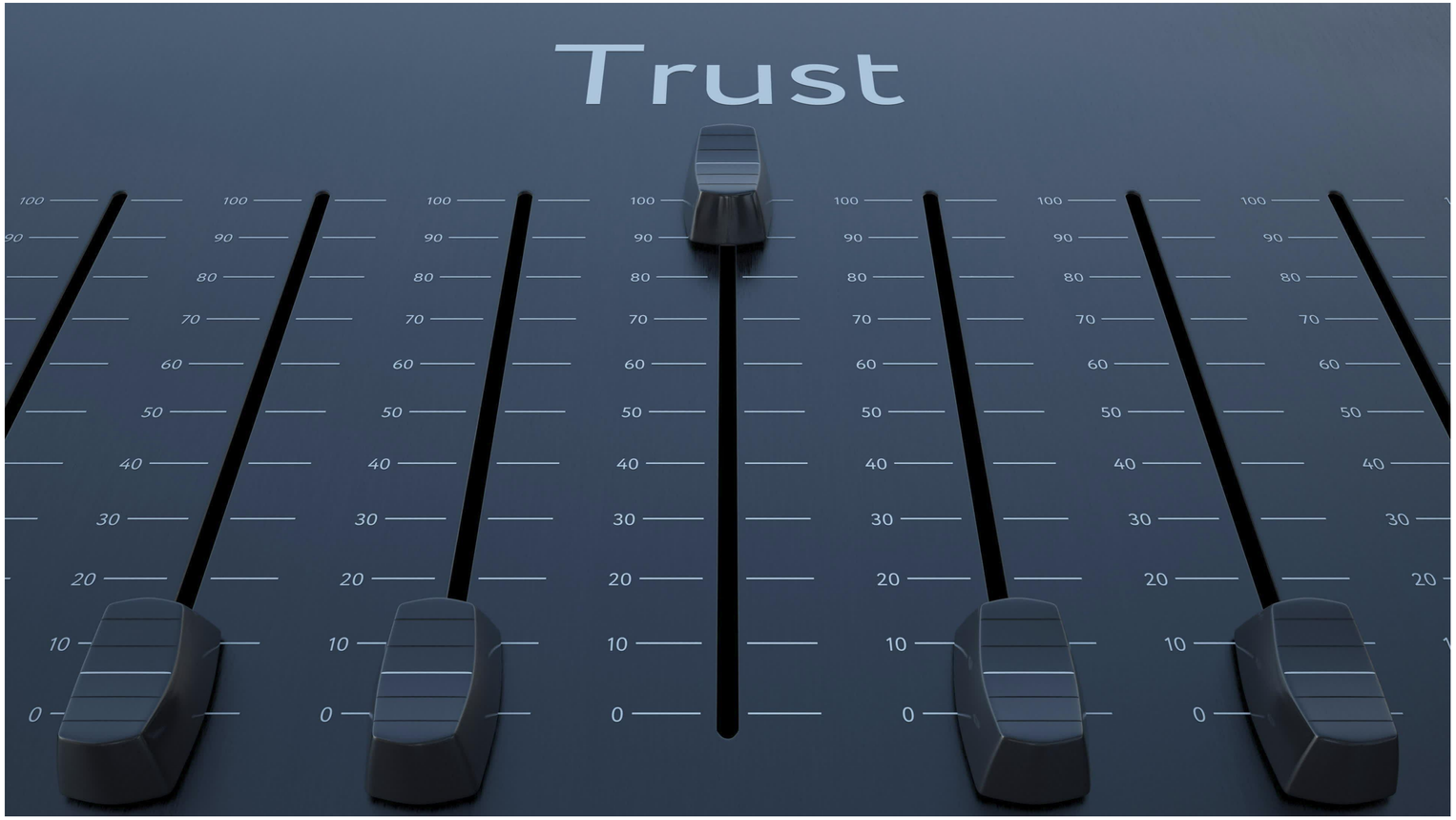
- C2PA Trust List
  - Official trust list from the C2PA
    - LOTS of details to work out!
  - Will represent the trust anchors for compliant hardware/software
- Additional Trust Lists
  - E.g., Project Origin
- Private/Personal Trust Lists

Well-Formed & C2PA Valid

- **Well-Formed Manifest**
  - All the bytes are intact & nothing missing or added
    - All the hashes match.
    - Complete set of assertions
    - Etc.
  - Validation section is more complete & includes success codes

- **C2PA Valid Manifest**
  - The signer of the Manifest is on one of the Validator’s Trust Lists

Enhancing Trust with Trust Signals



- Trust isn’t binary (true|false)
  - Determined by a human, not a machine!
- Based on a series of “signals” that aid in the decision-making process

Embedded or Referenced

- Content Credentials can be embedded into
  - Images (JPEG, PNG, GIF, WebP, AVIF, HEIC/HEIF, TIFF, DNG, SVG)
  - Videos (MP4, MOV, AVI, BMFF)
  - Audio (FLAC, MP3, WAV, BWF)
  - Documents (PDF, Office, EPUB)
  - Fonts (OTF, TTF)

- They can be stored separately in file systems, the cloud, DLT/Blockchains & referenced by URL, HTTP headers, file system paths and more.

Creation

= Creation date, Created with, Creator

Editing

= Creation date, Created with, Creator + Edit date, Edits made, Edits with, Editor

Publishing

= Edit date, Edits made, Edits with, Editor + Review, Publish date, Published by

Sharing

= Review, Publish date, Published by + Optimized for delivery

Viewing

= Creation date, Created with, Creator + Edit date, Edits made, Edits with, Editor + Review, Publish date, Published by + Optimized for delivery

Coming soon (2.1)

Security Improvements

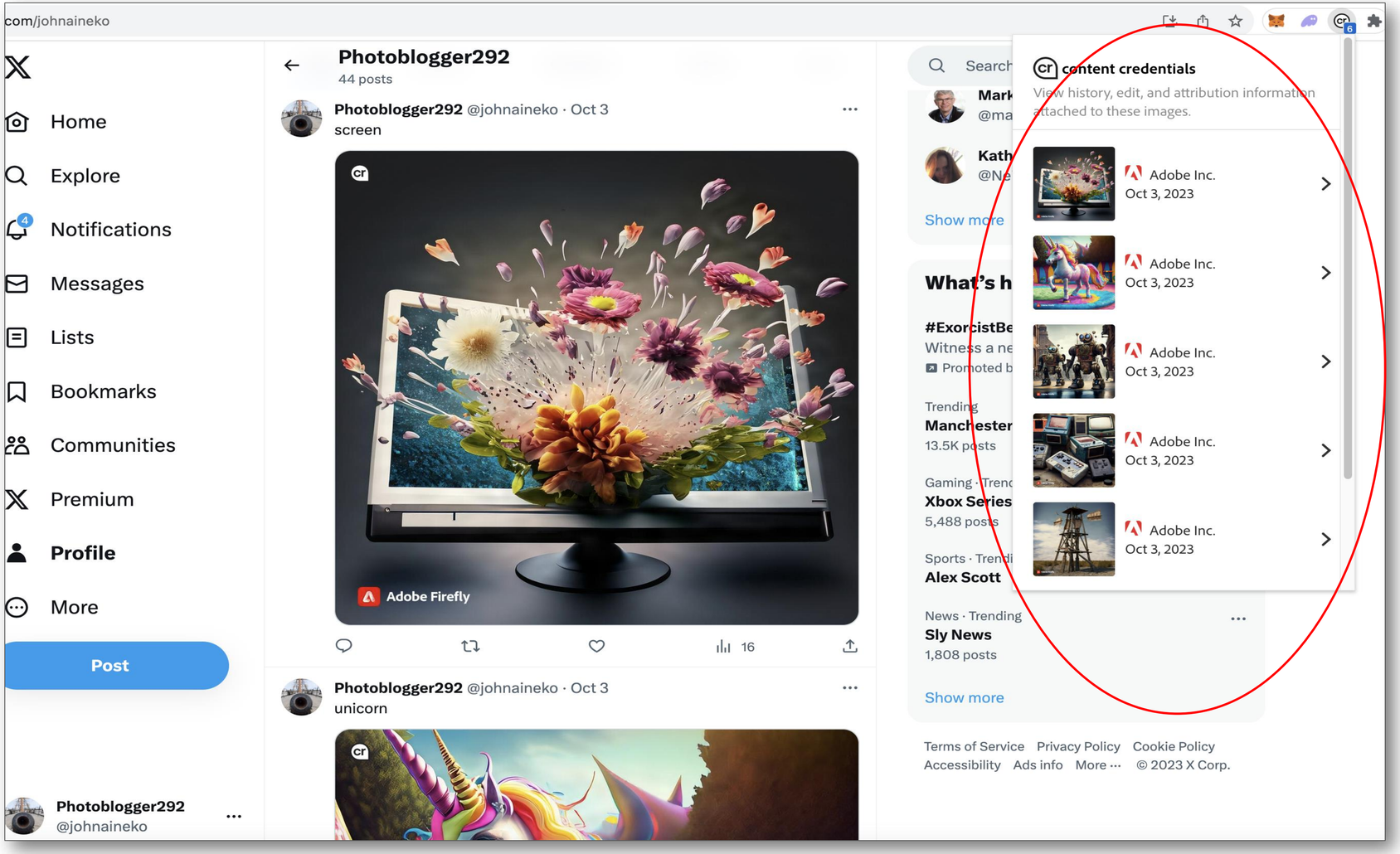
- Stricter & better spelled out validation algorithms
- Mandatory validation of Ingredients
- Improved Timestamping
  - Incl. new “TimeStamp Manifest”
- Improvements in hashing of BMFF and ZIP-based formats

Improvements with Actions

- Required Actions - Created or Opened
- Deeper integration of Actions & Digital Source Types
  - Improves identification of various uses of AI

Durable Content Credentials

Browser detects invisible watermarks and recovers stripped content credentials from cloud



Content Credentials recovered

https://contentauthenticity.org/blog/durable-content-credentials

Attestations

- https://c2pa.org/specifications/specifications/1.4/attestations/attestation.html

- Attestation is a platform security feature that allows software to prove its identity and the identity and/or security characteristics of the device or platform on which it is running.
- This specification describes how to add attestation signals and measurements to C2PA-marked assets. C2PA seeks feedback on this proposal, especially from implementers.

Work beyond the Core Specification

C2PA Task Forces

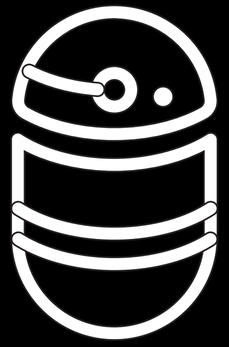
- AI/ML
- Conformance
- Ledgers
- Live Video
- Text
- Threats and Harms
- User Experience
- Watermark

Extensions to C2PA

- Creator Assertions Working Group (CAWG)
  - Identity
  - Training & Data Mining
  - Metadata
- PDF Association
- SCITT
- IPTC
- Etc..

Thank you!

Questions



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