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C2PA

Coalition for Content Provenance and Authenticity

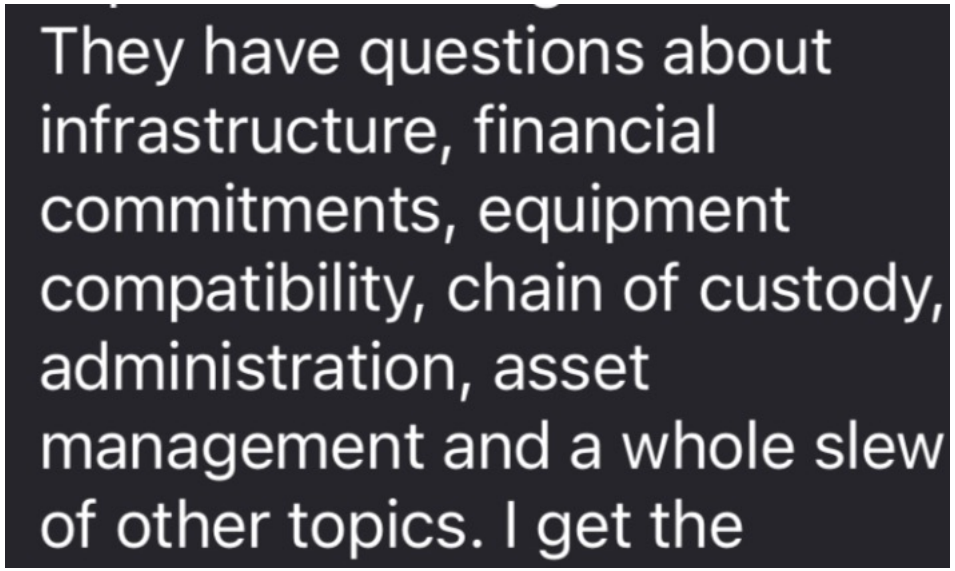
Today's agenda

- Introduction
- C2PA Architecture
- Specifications
- Technical Specification
- Signing Manifests

Client Asks

Internal – Delete Later

- Infrastructure – Can we go S3/serverless/Step Functions?
- Financials (One Time Cost) – Cost of processing 1000 images/5 minutes videos, Certificates with validity dates
- Equipment – We need adobe photoshop/truepic to enable appending metadata. No special hardware equipment. Using cloud services we can build pipelines to handle information. Question – Do we need photoshop to enable metadata writing for C2PA
- Chain of custody – Tools in chain during edit need to be c2pa compliant.
- Asset management - Tagging
- Administration – Read/Write/Consumer



What is C2PA, Why C2PA?

Components involved, Systems

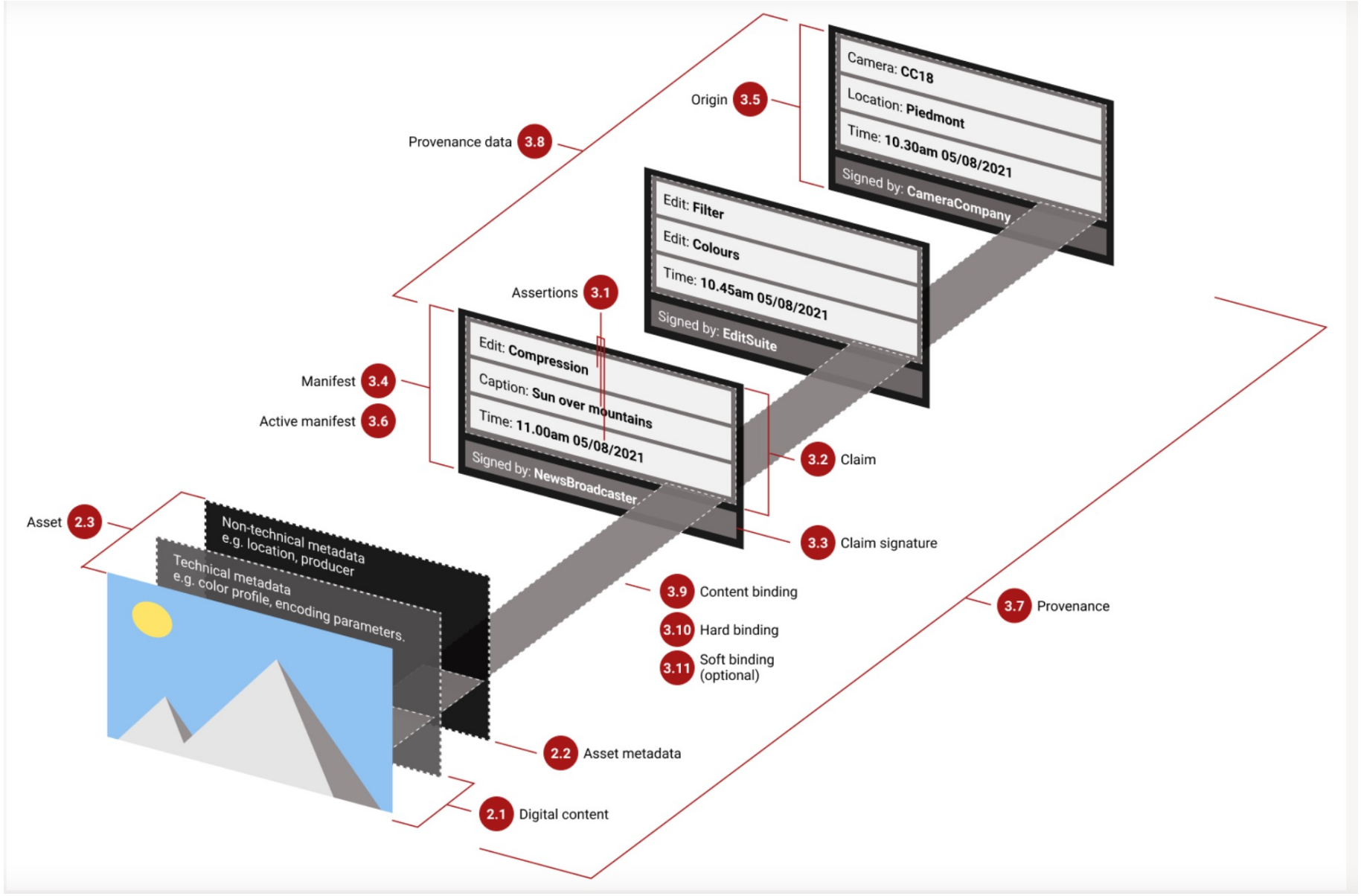
Is C2PA right for you?

Slalom View Point

Use cases

Time and skills required?

C2PA Architecture



Key Concepts

- **Asset**: A file or stream of data containing *digital content*, asset metadata and optionally, a *C2PA manifest*.
- **Composed asset**: An *asset* created by building up a collection of multiple parts or fragments of digital content (referred to as ingredients) from one or more other assets. For example, a composed asset could be an image (image A) with another image (image B) imported and super-imposed on top of it. In this example, image B is referred to as an *ingredient*.
- **C2PA manifest**: The set of information about the provenance of an asset based on the combination of one or more *assertions* (including content bindings), a single *claim*, and a *claim signature*. A *C2PA manifest* is part of a *C2PA manifest store*.
- **C2PA manifest store**: A collection of *C2PA manifests* that can either be embedded into an asset or be external to it.
- **Active manifest**: The last manifest in the list of *C2PA manifests* inside of a *C2PA manifest store* which is the one with the set of *content bindings* that are able to be validated.
- **Assertion**: A data structure which represents a statement asserted by an *actor* concerning the *asset*. This data is part of the *C2PA manifest*. For a list of standard C2PA assertions, see C2PA 1.1 Technical Specification.
- **Ingredient**: Part of a *composed asset*, such as an image superimposed on top of another image.

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Which tool is right for you?

Implementation	JavaScript SDK	C2PA Tool	Rust SDK
Display C2PA data on your site or app	✓	✓	✓
Link C2PA data displayed on your site to Verify	✓	✓	✓
Write C2PA data into files		✓	✓
Quickly create and inspect C2PA data		✓	✓
Customize displaying and creating C2PA data			✓
Deploy on Web, mobile, and desktop			✓

Explainer and Guidance for Implementers

- The C2PA also created their Guiding Principles that address areas such as respecting privacy and personal control of data with a critical eye toward potential abuse and misuse.
- Each of the actors in the system that creates or processes an asset will produce one or more assertions about when, where, and how the asset was originated or transformed.
- **Recommend to create manifest for an asset as infrequently as possible**. This is not lightweight operation (digital sign the claim, retrieve credentials from online service). Validation will also be easier.
- One can update manifest if digital content is not impacted for example updating of assertions.
- **Replacing an existing manifest store with a different manifest store is not recommended** since doing so would completely change the provenance of an asset.
- **Manifests for existing media** - keeping the C2PA Manifests externally to the asset is an acceptable model for providing providence to assets.
- The C2PA specification supports the inclusion of W3C Verifiable Credentials(VC) into a C2PA Manifest to represent a human or organisation that may be directly associated with an asset in some way, such as the author or publisher.
- For hard bindings recommended to use SHA-256

Explainer and Guidance for Implementers and Security

- C2PA prescribes cryptographic algorithms permitted for hashing (or message digest), and digital signatures both of manifests and of signing credentials.For hashing, C2PA recommends using SHA2-256
- C2PA strongly recommends that claim generators retrieve and attach time-stamps and credential freshness information at signing time
- Both Claim and Claim Signature are digitally signed. Manifest is created using digital signatures.
- **C2PA doesn't recommend to over ride manifests or remove manifests altogether**.

References

https://c2pa.org/specifications/specifications/1.2/explainer/Explainer.html#_what_does_provenance_mean_in_the_c2pa_specifications

https://c2pa.org/specifications/specifications/1.2/guidance/Guidance.html#_introduction

https://c2pa.org/specifications/specifications/1.2/explainer/Explainer.html#_what_does_provenance_mean_in_the_c2pa_specifications

https://c2pa.org/specifications/specifications/1.2/guidance/Guidance.html#_introduction

Adding a Manifest

```rust
use c2pa::{
    assertions::User,
    create_signer,
    Manifest,
    SigningAlg,
};

use std::path::PathBuf;
use tempfile::tempdir;

let mut manifest = Manifest::new("my_app".to_owned());
manifest.add_assertion(&User::new("org.contentauth.mylabel", r#"{"my_tag":"Anything I want"}"#))

let source = PathBuf::from("tests/fixtures/C.jpg");
let dir = tempdir()?;
let dest = dir.path().join("test_file.jpg");

// Create a ps256 signer using certs and key files
let signcert_path = "tests/fixtures/certs/ps256.pub";
let pkey_path = "tests/fixtures/certs/ps256.pem";
let signer = create_signer::from_files(signcert_path, pkey_path, SigningAlg::Ps256, None)?;

// embed a manifest using the signer
manifest.embed(&source, &dest, &*signer)?;
```

https://docs.rs/c2pa/latest/c2pa/index.html

Reading Manifest Store

```rust
use c2pa::{assertions::Actions, ManifestStore};

let manifest_store = ManifestStore::from_file("tests/fixtures/C.jpg")?;
println!("{}", manifest_store);

if let Some(manifest) = manifest_store.get_active() {
    let actions: Actions = manifest.find_assertion(Actions::LABEL)?;
    for action in actions.actions {
        println!("{}\n", action.action());
    }
}
```

https://docs.rs/c2pa/latest/c2pa/index.html

Introduction

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- https://opensource.contentauthenticity.org/docs/introduction/ - Do use all 3 tools to check capability

- https://c2pa.org - done

- Manifest (C2PA manifest) consists of Provenance (historical) data.

Tools

- https://opensource.contentauthenticity.org - done

Javascript SDK

- Use Javascript SDK to display manifest data on a website or web application.
- Link manifest data on your site to verify.

C2PA command-line tool

- Write C2PA data to supported file format
- Read json manifest data.

Rusk SDK

- Embed Manifest in certain file format
- Parse and validate manifest
- Create and sign manifest

Specifications

- https://c2pa.org/specifications/specifications/1.2/index.html

Manifest Definition File - Schema

- https://opensource.contentauthenticity.org/docs/c2patool#manifest-definition-file

- Example file - https://opensource.contentauthenticity.org/docs/c2patool#example-manifest-definition-file

Generate Manifest

- Using JUMBF (JPEG universal metadata box format) This works for JPEG and PDF
- Manifest consists of – Claim, Claim Signature, C2PA Assertion store
- https://c2pa.org/specifications/specifications/1.0/specs/C2PA_Specification.html#_manifests – Tells what is included in manifest
- https://opensource.contentauthenticity.org/docs/c2patool#appendix-creating-and-using-an-x509-certificate – Tells create manifest
- https://github.com/contentauth/c2pa-rs - June 2022

Types of Manifest

- https://c2pa.org/specifications/specifications/1.0/specs/C2PA_Specification.html#_types_of_manifests

Technical Specification

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- https://c2pa.org/specifications/specifications/1.1/specs/C2PA_Specification.html#_introduction

- Cargo is Rust Package Manager.
- In Rust, a library or executable program is called a *crate*. Crates are compiled using the Rust compiler, rustc
- Cargo.toml is about describing your dependencies in a broad sense, and is written by you.
- Cargo.lock contains exact information about your dependencies. It is maintained by Cargo and should not be manually edited.

C2PA command line

- Display Manifest data - c2patool sample/C.jpg

Manifest Definition File

- https://opensource.contentauthenticity.org/docs/c2patool/#manifest-definition-file

Signing Manifests

- https://opensource.contentauthenticity.org/docs/signing-manifests/

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- https://github.com/contentauth/c2patool
- https://github.com/contentauth/c2patool/tree/main/sample
- https://github.com/numbersprotocol/pyc2pa (Python implementation)
- https://verify-beta.contentauthenticity.org/inspect
- https://download.blender.org/demo/movies/BBB/

Thank you!

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