



Towards a Standardized Framework for **Media Blockchain**

Open discussion session on Media Blockchain

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JPEG Privacy and Security - Features

- Protection features:
 1. Solutions to support **protection tools** to **protect parts of any type of JPEG images** and/or associated metadata independently, while ensuring **backward and forward compatibility** with JPEG coding technologies.
 2. Solutions to support handling of **hierarchical levels of access** and multiple protection levels for metadata and image protection.
 3. Solutions to support **file carving** systems.



JPEG Privacy and Security - Features

- Authenticity features:
 1. Solutions to support **integrity checking** of image data and/or embedded metadata.
 2. Solutions to support **avoiding stripping off metadata**, especially IPR information.
 3. Solutions to support **versioning** and/or **tracking changes** of an image and/or associated metadata and solutions to support embedding **provenance information**.
 4. Solutions to support embedding of trackable information to allow **identification and assessment of the master image** and identify derived or modified images from the master image.



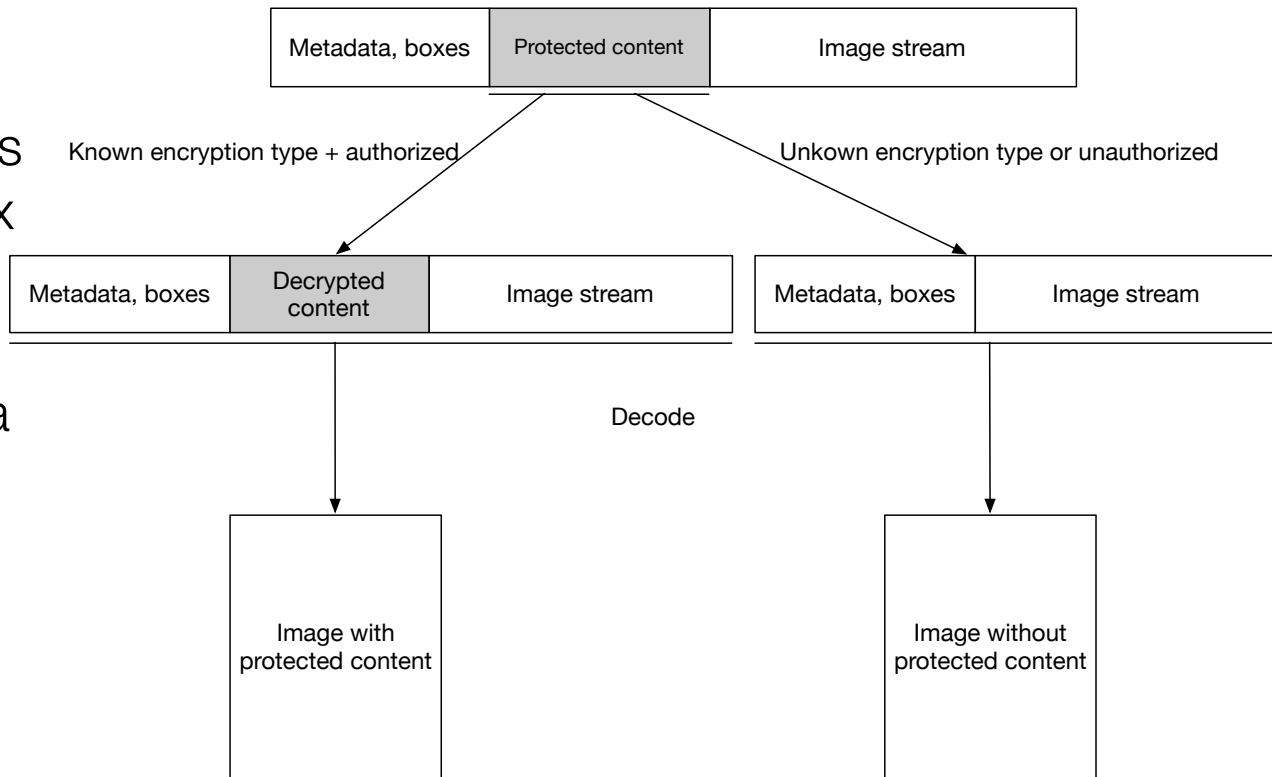
JPEG Privacy and Security - Aim & Approach

- Definition of tools to **support protection** and authenticity workflows in a **standardized way**
- Focus on **signaling syntax**
- Adoption of **existing technologies** for encryption etc.
- **Box based** approach
- Boxes wrapped in 1 or more APP11 marker segments to support JPEG-1 **backwards compatibility**
- Focus on definition of **generic boxes**
- Combined with **metadata definitions** with possibility to **reference boxes**



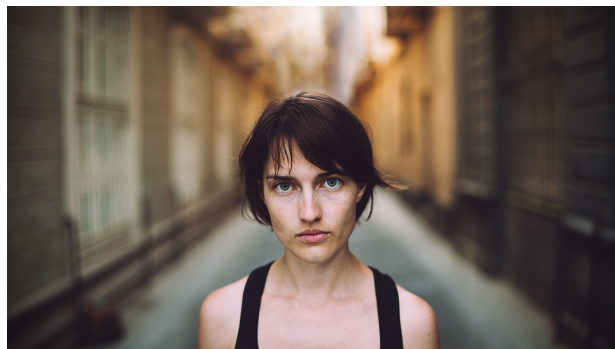
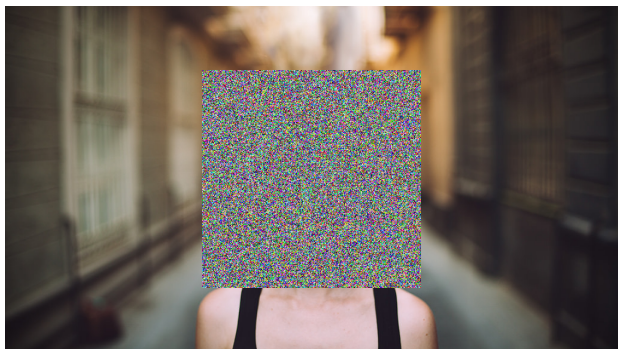
Protection

- **Protection box** wraps another encrypted box
- Since boxes are wrapped in APP11 marker segments data is split in chunks of 64kB which helps to support **file carving**



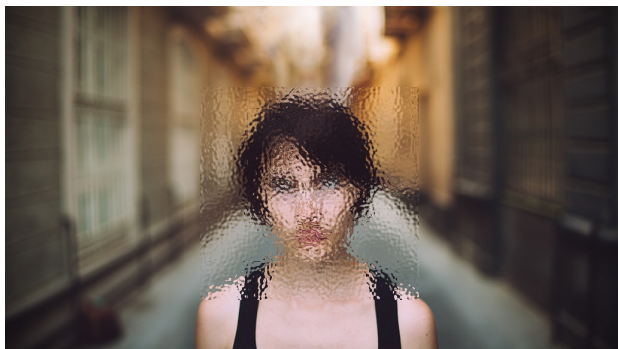


Partial protection support



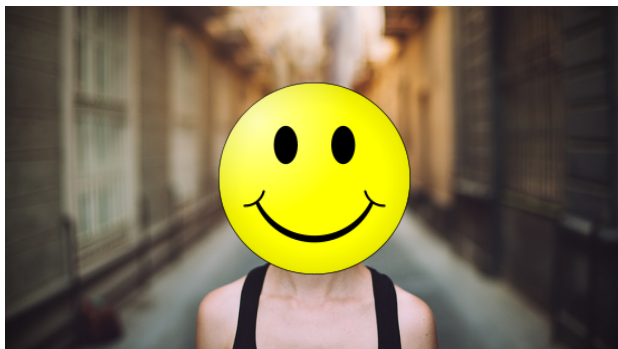


Partial protection support





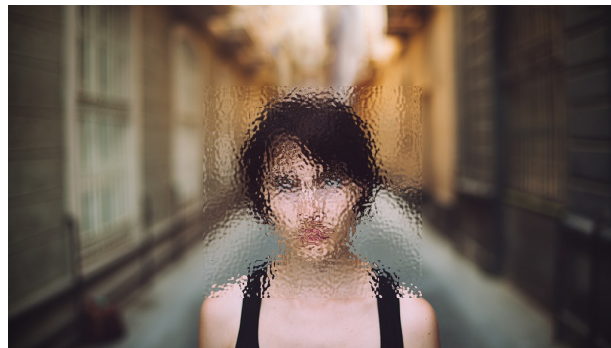
Partial protection support





Partial protection

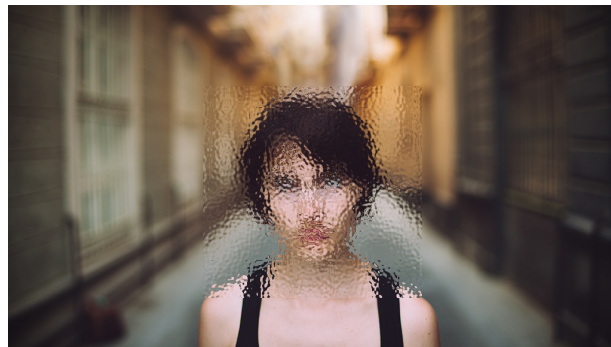
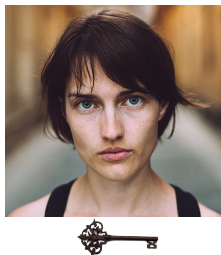
Header, metadata	Encrypted data (Original content)	Image stream (Protected image)
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Partial protection

Header, metadata	Encrypted data (Original content)	Image stream (Protected image)
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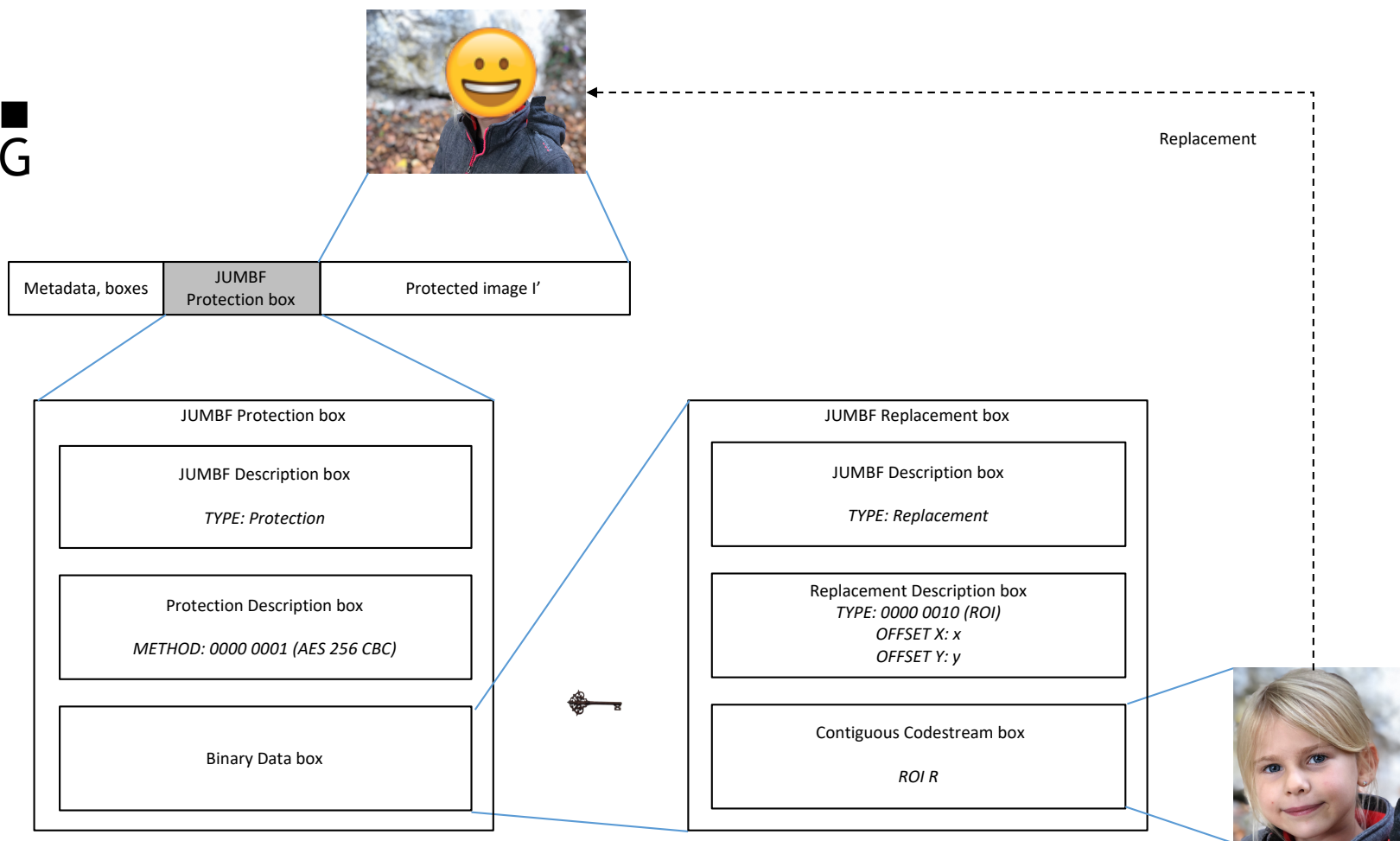




Partial protection

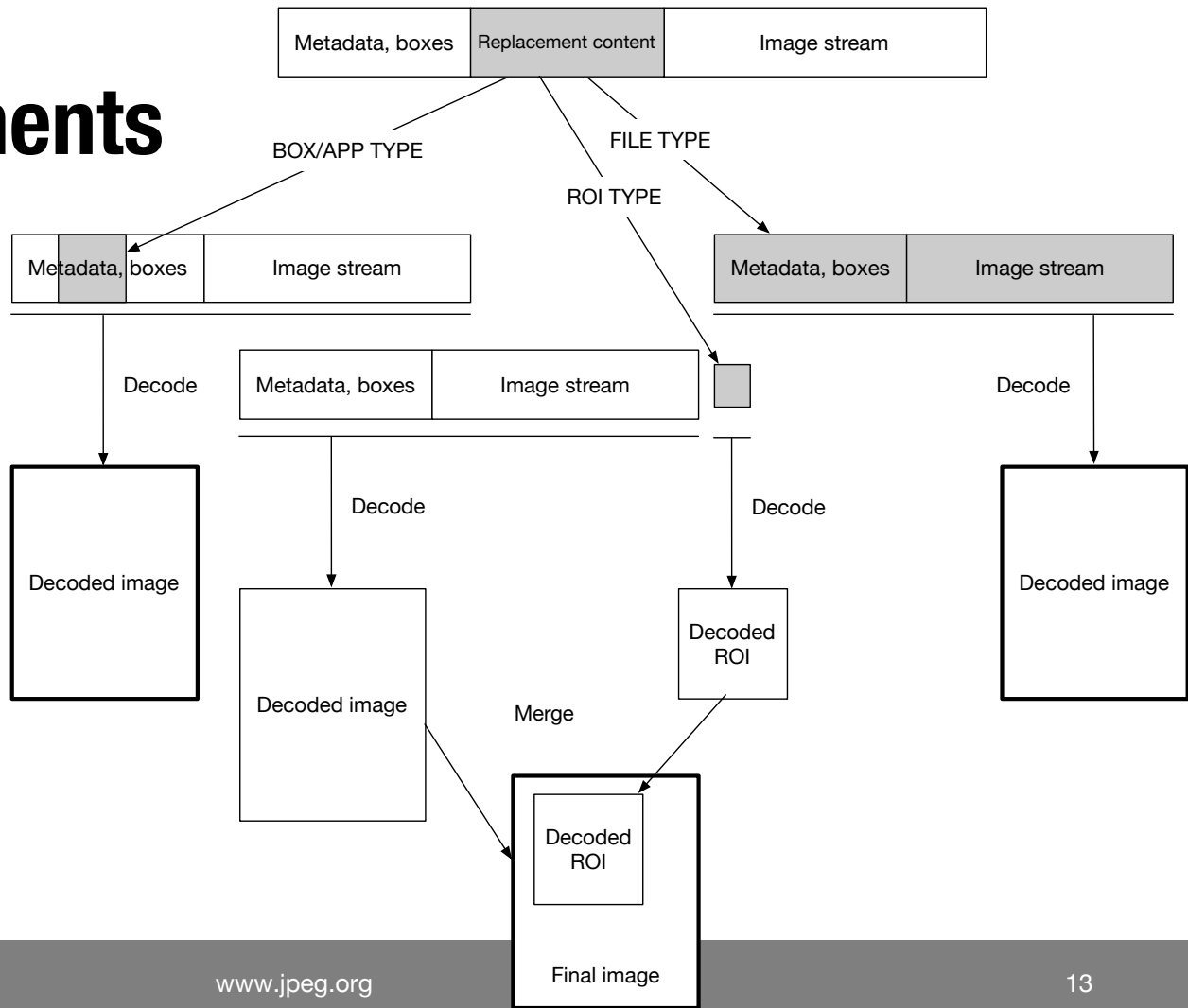
Header, metadata	Image stream (Original image)
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Replacements





Metadata applications

- Metadata features
 - Access rules
 - IPR information
 - Provenance
- Adoption of **JPEG Universal Metadata Box Format** (JUMBF)
 - Wraps **metadata** and/or **associated content**
 - Mechanism for **referencing** boxes within metadata



Image integrity

- Support **embedding of signatures** of image content or metadata
- Allows to **identify if changes** were made in combination with:
 - Private key
 - Watermarking
 - Third party registration authority
 - Blockchain / distributed ledger
- AhG on **Blockchain** initiated in January 2018



Blockchain in a multimedia context

- Provides a **solution for authenticity use cases** without need for a third party register or watermarking
- Proven to be **immutable** and **community driven**
- Can provide a novel solution for **rewarding photographers**
- **Camera manufactures** could make a closed blockchain of all pictures taken with a particular camera
- **Registering image** in a blockchain as a **signature or feature vector**
- **Embedding a reference** to a blockchain inside an image



Challenges

- **Privacy concerns** and right to be forgotten
- **Incentive** for mining?
- **Environmental impact** due to computational power / energy needs
 - Current estimate for Bitcoin is 73TWh/year, almost equal to energy consumption of Austria (72TWh/year)¹
- **Alternatives for proof of works** still under investigation
 - **Consensus models for blockchain media transactions** (Stephen Swift, 1st JPEG Workshop on Media Blockchain Proceedings, ISO/IEC JTC1/SC29/WG1, wg1n81033, Vancouver, CAN, October 16th, 2018)

¹ <https://digiconomist.net/bitcoin-energy-consumption>



Standardization efforts

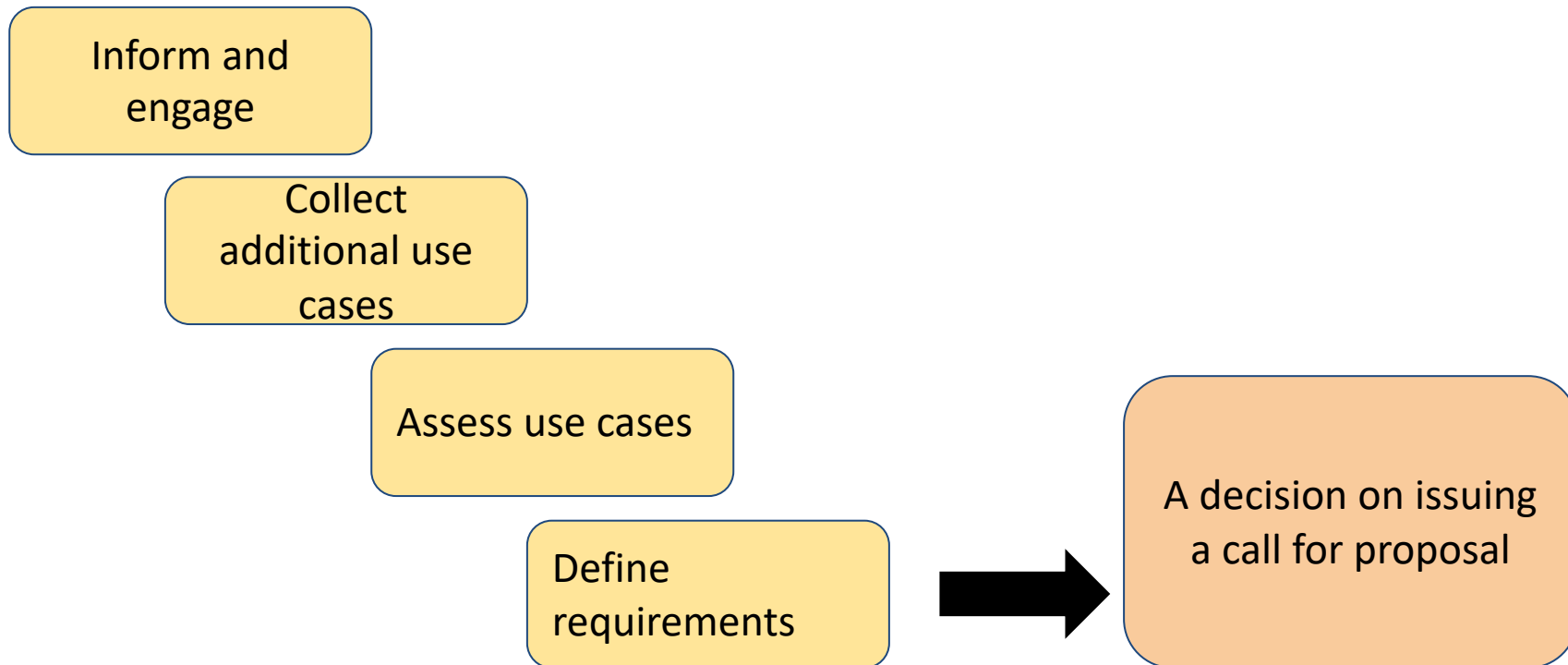
- ISO TC 307 Blockchain and distributed ledger technologies
- CEN-CENELEC Focus Group on blockchain and distributed ledger technologies
- ITU-T Focus Group on Application of Distributed Ledger Technology (FG DLT)



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Standardization steps





1st JPEG Workshop on Media Blockchain

16 October 2018, Vancouver, Canada

15:00-15:05 ISO JPEG committee overview (Touradj Ebrahimi)

15:05-15:30 Overview of JPEG Privacy & Security and relation to Blockchain (Frederik Temmermans)

15:30-16:00 The multimedia blockchain: challenges and perspectives (Eric Paquet)

16:15-16:45 Managing Digital Information on Blockchains and Distributed Ledgers as Evidence (Victoria Lemieux)

16:45-17:15 Consensus models for blockchain media transactions (Stephen Swift)

17:15-18:30 Panel Discussion (Moderator: Fernando Pereira)



2nd JPEG Workshop on Media Blockchain

22 January 2019, Lisbon, Portugal

16:00-16:20 JPEG in a Nutshell (Touradj Ebrahimi)

16:20-16:40 JPEG Privacy and Security Activities (Frederik Temmermans)

16:40-17:20 Blockchain, Distributed Trust and Privacy (Zekeriya Erkin)

17:20-17:50 An overview of ISO/TC 307 - Blockchain and distributed ledger technologies (Carlos Serrão)

17:50-18:30 Panel Discussion (Moderator: Fernando Pereira)



3rd JPEG Workshop on Media Blockchain

20 March 2019, Geneva, Switzerland

14:00-14:05 **Overview of JPEG Activities** (Touradj Ebrahimi)

14:05-14:20 **Privacy-preserving photo sharing based on blockchain** (Pablo Pfister)

14:20-14:35 **JPEG Privacy and Security Activities** (Frederik Temmermans)

14:35-15:00 **Adopting Blockchain in Image Security** (Deepayan Bhowmik)

15:00-15:30 **Use of blockchain for data privacy and protection**, (Bryan Ford)

16:00-16:30 **An Introduction of ITU-T DLT Standardization** (Wei Kai)

16:30-16:45 **Image forgery detection - A use case for blockchain and distributed ledger technologies** (Anthony Sahakian)

16:45-17:00 **FabToken: Tokenization on HyperLedger Fabric** (Kaoutar Elkhiyaoui)

17:00-18:00 **Panel Discussion** (Moderator: Fernando Pereira)



4th JPEG Workshop on Media Blockchain

16 July 2019, Brussels, Belgium

14:00-14:05 **Overview of JPEG Activities** (Fernando Pereira, IST-IT)

14:15-14:30 **JPEG Privacy and Security Activities** (Frederik Temmermans, imec-VUB)

14:30-15:00 **Blockchain & Privacy: Two cases from the government field** (Kristof Verslype, Smals)

15:00-15:30 **Trusted Archives of Digital Public Documents** (John Collomosse, University of Surrey, CVSSP)

16:00-16:30 **Blockchain for content licensing** (Robert Learney, Digital Catapult)

16:30-17:00 **Blockchain Application Domains & Use Cases for Media & Entertainment** (Jérôme Pons, Music won't stop)

17:00-18:00 **Panel Discussion & Closing** (Moderator: Fernando Pereira)



Whitepaper

- Background: Relevant JPEG activities
- A Brief Overview of Blockchain and DLT
- Example Systems Relevant to Media Blockchain
- Current Blockchain Standardization Efforts and Initiatives
- Use Cases and Functionalities for Media Blockchain
- Next Steps



Potential outcomes

- ~~Do nothing ...~~
- Provide input in form of use cases, requirements and contribution to other standardization bodies that are better fit
 - Best practices: Technical report(s) on how JPEG existing standards can interact with blockchain and DLTs
- Initiate standardization activities in JPEG to create specifications for media blockchain
 - Extension of existing specifications: How amend and/or extend existing JPEG standards to better cope with blockchain and DLTs
 - Initiate standards and specifications to enable interoperability between new applications that benefit from blockchain and DLTs

Standardization steps

