

JPSearch metadata and its use for Security & Privacy in JPEG images

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- Background and Introduction
- JPSearch
- JPEG Privacy & Security needs
- Use of JPSearch in JPEG Privacy & Security

The background

- Add privacy to images → describe privacy rules.
- Rules expression standards. Example:
XACML (eXtensible Access Control Markup Language).
- Where to store the rules?:
 - related to the image metadata
 - embedded or not in the image file itself
- Use the **JPSearch's core metadata set** for JPEG images?
→ Possible to express and include privacy rules to control access to images?

Introduction

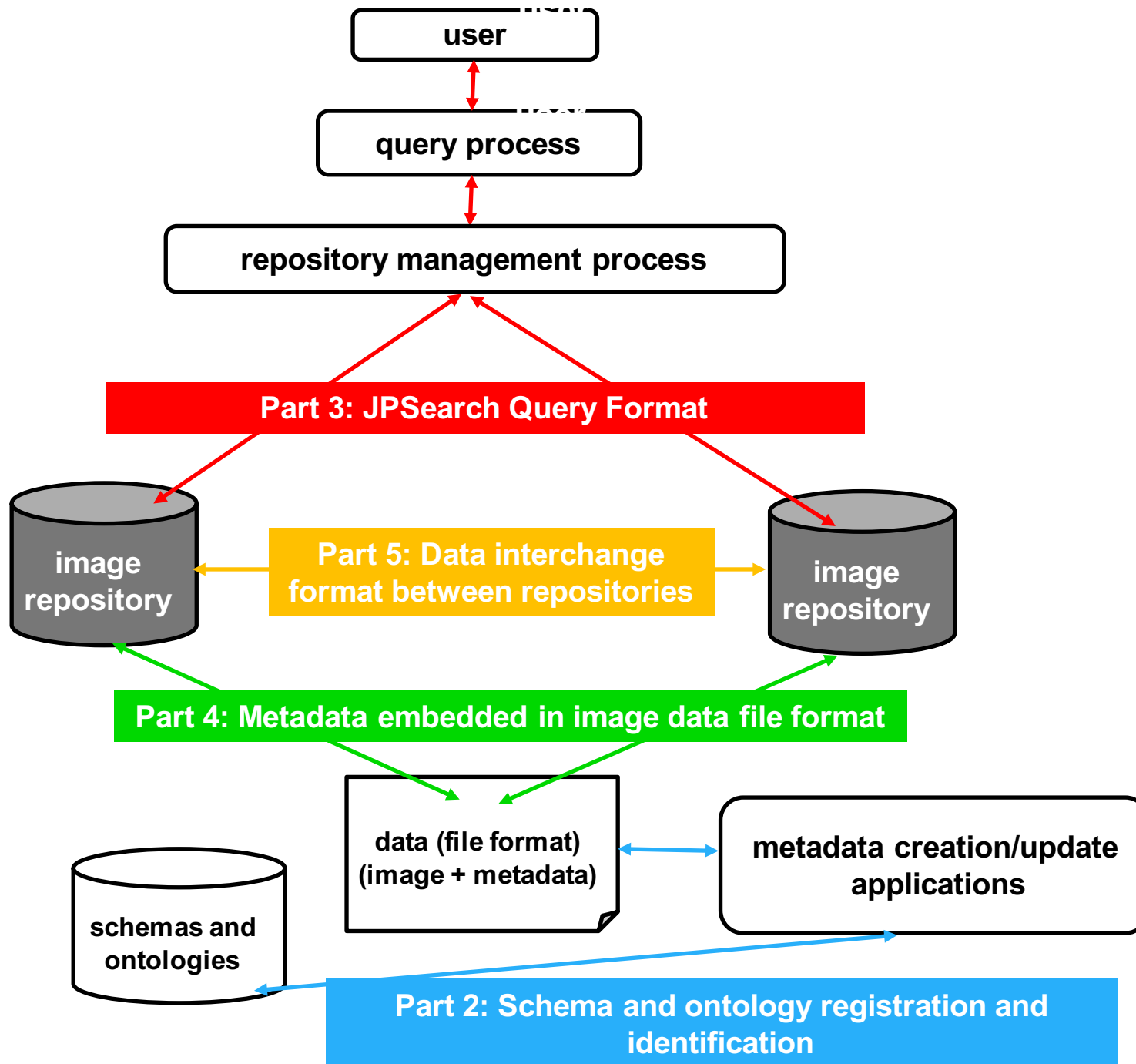
- ***The objective***: Analyze use of JPSearch metadata to express and include privacy rules to control access to images.
- What does JPSearch provide?
- Which are the JPEG Privacy needs?

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JPSearch

- Access to image repositories (interoperability problem):
 - Diversity of Image Metadata Descriptions
 - Diversity of Image Retrieval Interfaces
- **Main objective of JPSearch:**
**Address interoperability in
image search and retrieval systems.**
- JPSearch ...
 - Focuses on image metadata
 - Focuses also on metadata portability
 - Allows users taking their metadata away



JPSearch: structure of the standard

- **ISO/IEC 24800 JPSearch**
 - Part 1 (**TR**) System framework and components
 - Part 2 Schema Registration & Identification
 - Core Schema + expansion mechanism
 - External Schema registration interface
 - Transformation rules
 - Part 3 JPSearch Query Format
 - Based on ISO/IEC 15983-12 (MPQF)
 - Part 4 JPSearch File Format
 - Based on JPEG and JPEG2000
 - Part 5 Data Interchange Format between Image Repositories
 - Binary file structure based on photo player application format ISO/IEC 23000-3 (MPEG-A)
 - XML interchange format based on Core Schema and the Collections Schema (both from Part 2)
 - Part 6 Reference Software



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JPSearch Core Metadata

- Core metadata schema:
 - Root schema for common image metadata.
 - XML extensible mechanism for annotating image content.
19 main elements, including for regions of interest.
- Metadata conversion:
 - Mechanism for translating metadata from one schema into another: **Translation Rules Declaration Language (TRDL)**.
 - Mapping metadata at structural and syntactic level for transforming descriptions.

JPSearch Core Metadata Schema

- Identifier
- Title
- Description
- OriginalImageIdentifier
- Keyword
- CreationDate
- ModifiedDate
- RightsDescription
- Source
- CollectionLabel
- PreferenceValue
- Rating
- RegionOfInterest
- Modifiers
- Creators
- Publisher
- GPSPositioning
- Width
- Height

Metadata formalization

- ISO/IEC 24800-2 (JPSearch metadata)

```
<ImageDescription xmlns="JPSearch:schema:coremetadata" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  <ImageInstanceLocator locatorName="medium">Normal/image 189.jpg</jpcs:ImageInstanceLocator>
  <ImageInstanceLocator locatorName="large">Normal/image 189.jpg</jpcs:ImageInstanceLocator>
  <Identifier>urn:unique:identifier:1</jpcs:Identifier>
  <Creators xml:lang="en-us">
    ..... <GivenName>Dr. Jorge Vera</jpcs:GivenName> </Creators>
  <creationDate>1293227422421</jpcs:CreationDate>
  <Description>Normal cells.</jpcs:Description>
  <Keyword>String</jpcs:Keyword>
  <title>Normal</jpcs:Title>
  <CollectionLabel>String</jpcs:CollectionLabel>
  <PreferenceValue>2</jpcs:PreferenceValue>
  <GPSPositioning latitude="25.0" longitude="23.0"/>
  <RegionOfInterest>
    ..... <RegionLocator>
      ..... <region dim="2">105 60 186 131</jpcs:Region>
    ..... </RegionLocator>
    ..... <ContentDescription/>
    ..... <ExternalDescription>
      ..... <TagName>Descripcion</jpcs:TagName>
      ..... <LiteralValue>Endomicroscopy leads to identification of crypts</jpcs:LiteralValue>
    ..... </ExternalDescription>
    ..... </RegionOfInterest>
  <RegionOfInterest>
    ..... <RegionLocator>
      ..... <region dim="2">166 237 50 50</jpcs:Region>
```

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JPEG Privacy and rules

- Access control to specific images is defined with rules (privacy policies).
- Policies are defined either by the service provider or by the image owner.
- Policies/rules follow a standard for its representation and enforcement:
XACML (eXtensible Access Control Markup Language)

Privacy rules/policies

- Rules / Policies could be based on conditions over information on:
 - **User**: individual, group, location, role, ...
 - **Context**: date and time, number of accesses, action (view, download, ...), ...
 - **Image**: quality, geo-location, author, date, semantic information, ...
 - **Action**: read, update, delete, ...

Privacy rules/policies example

- A specific example could be:
“only my workmates can see the Christmas Dinner photo album and only during this month”
- In this case, the conditions are:
 - User: *my workmates*
 - Context: *this month*
 - Image: *Christmas Dinner photo album*
 - Action: *read* (“see”).

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A possible use - Inclusion of privacy policies

- Where to keep (XML) privacy policies?
- RightsDescription element (JPSearch Part 2).

```
<RightsDescription>  
  <RightsDescriptionInformation>  
    Location of the rights description standard.  
  </RightsDescriptionInformation>  
  <Description>  
    Textual description.  
  </Description>  
  <ActualRightsDescriptionReference>  
    Actual rights description.  
    It can be embedded or referenced.  
  </ActualRightsDescriptionReference>  
</RightsDescription>
```

A possible use - Inclusion of privacy policies

- Inserting privacy information inside a JPEG image →
Use of the `RightsDescription` element of the JPSearch Core Metadata.
- Privacy policies applying to the image should be expressed in a XML-based language. We propose to use XACML for this purpose.
- *This is one of several possible options.*

A possible use - Inclusion of privacy policies

RATIONALE:

- Fully compatible with JPEG-1 and JPEG 2000.
- JPSearch standard defines how to embed metadata in both formats.
- Semantics of the `RightsDescription` element flexible enough to support XACML privacy policies.

Conclusions

- JPSearch addresses interoperability in image search and retrieval systems.
- Access control to images defined with privacy rules.
- JPSearch metadata can be used to express and include privacy rules to control access to images.
- Use of the `RightsDescription` element of the JPSearch Core Metadata.
- JPSearch metadata as placeholder for privacy policies in XACML.