

# JPSearch

An emerging standard for image  
search and retrieval

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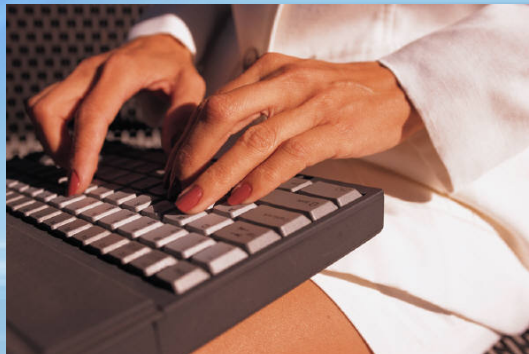
EPFL

Chair of JPEG requirements subgroup

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A two decade old desire...

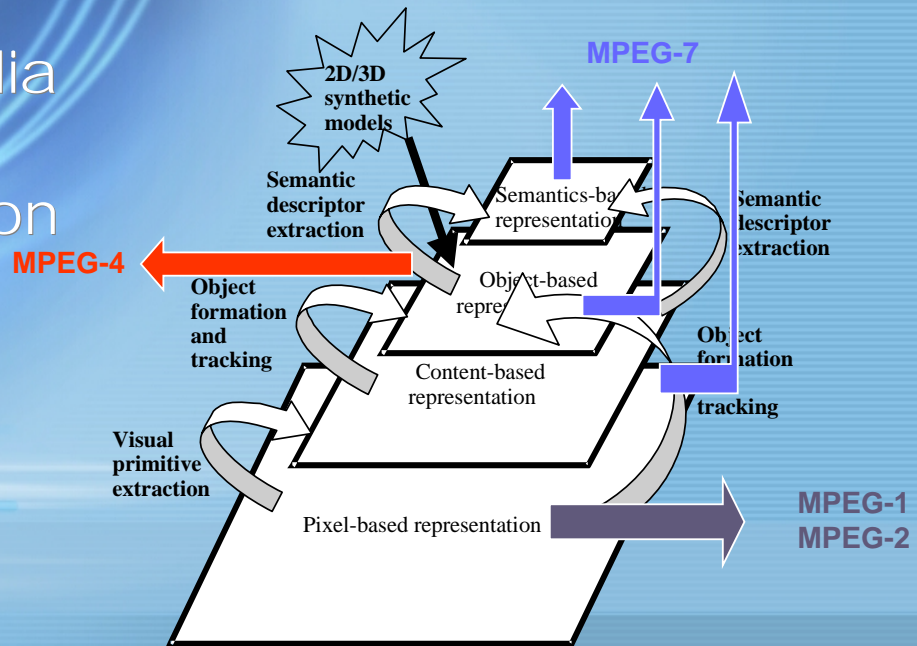
- Search, and retrieve multimedia content as easily as for text



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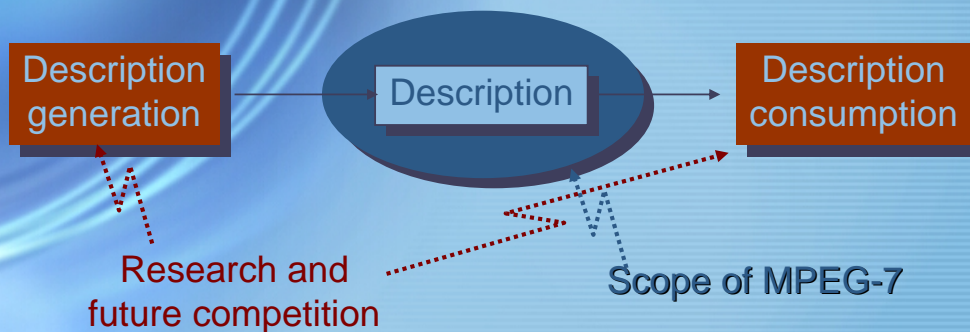
# First standardization attempt from ISO ... MPEG-7

- Multimedia Content Description Interface



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## Scope of MPEG-7



- The description generation (feature extraction, indexing process, annotation & authoring tools,...) and consumption (search engine, filtering tool, retrieval process, browsing device, ...) are non normative parts of MPEG-7.
- The goal is to define the minimum that enables interoperability.

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# MPEG-7 elements

- **Descriptors (D)**: to represent Features. Descriptors define the syntax and the semantics of each feature representation.
- **Description Schemes (DS)**: to specify the structure and semantics of the relationships between their components, which may be both Ds and DSs.
- **Description Definition Language (DDL)**: to allow the creation of new DSs and ,possibly, Ds and to allows the extension and modification of existing DSs.
- **System tools**: to support multiplexing of descriptions, synchronization of descriptions with content, transmission mechanisms, file format, etc.

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# MPEG-7 – ISO/IEC 15938

- Multimedia content description interface
  - Part 1 Systems
  - Part 2 DDL - Description definition language
  - Part 3 Visual
  - Part 4 Audio
  - Part 5 Multimedia description schemes
  - Part 6 Reference software
  - Part 7 Conformance
  - Part 8 Extraction and Use of MPEG-7 Descriptions
  - Part 9 Profiles
  - Part 10 Schema Definition

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# Image description example



Unstructured news image

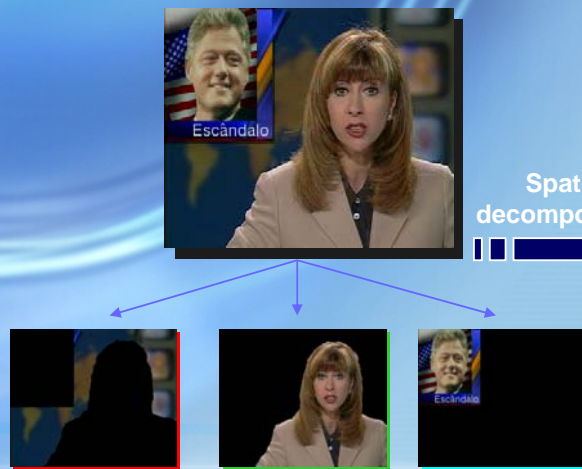
# Image description example



Title  `<StillRegion id = "news">`  
`</StillRegion>`



# Image description example



Spatial  
decomposition

```
<StillRegion id = "news">  
  <SegmentDecomposition  
    decompositionType = "spatial">  
    <StillRegion id = "background">  
    <StillRegion id = "speaker">  
    <StillRegion id = "topic">  
  </SegmentDecomposition>  
</StillRegion>
```

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# Image description example



Background  
feature

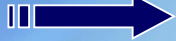
```
<StillRegion id = "news">  
  <SegmentDecomposition  
    decompositionType = "spatial">  
    <StillRegion id = "background">  
      <DominantColor> 10 10 250 </DominantColor>  
    <StillRegion id = "speaker">  
    <StillRegion id = "topic">  
  </SegmentDecomposition>  
</StillRegion>
```

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# Image description example



More features



```
<StillRegion id = "news">
  <SegmentDecomposition
    decompositionType = "spatial">
    <StillRegion id = "background">
    <StillRegion id = "speaker">
      <TextAnnotation>
        <FreeTextAnnotation> Journalist Judite Sousa
      </FreeTextAnnotation>
    </TextAnnotation>
    <SpatialMask>
      <Poly>
        <CoordsI> 80 288 100 200 ... 352 288 </CoordsI>
      </Poly>
    </SpatialMask>
  </SegmentDecomposition>
</StillRegion>
```

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# Image description example



```
<StillRegion id = "news">
  <SegmentDecomposition decompositionType = "spatial">
    <StillRegion id = "background">
      <DominantColor> 10 10 250 </DominantColor>
    </StillRegion>
    <StillRegion id = "speaker">
      <TextAnnotation>
        <FreeTextAnnotation> Journalist Judite Sousa </FreeTextAnnotation>
      </TextAnnotation>
      <SpatialMask>
        <Poly>
          <CoordsI> 5 25 10 20 15 15 10 10 5 15 </CoordsI>
        </Poly>
      </SpatialMask>
    </StillRegion>
    <StillRegion id = "topic">
      <TextAnnotation>
        <FreeTextAnnotation> Clinton's affair</FreeTextAnnotation>
      </TextAnnotation>
    </StillRegion>
  </SegmentDecomposition>
</StillRegion>
```

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# MPEG-7 challenges

- Deployment in applications
- How to ensure interoperability at levels beyond content description
- Intellectual property rights (IPR)

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# JPSearch ... a step further

- Objectives
  - Define a framework for image search and retrieval systems, describe its components, their interactions, and data flow
  - Define a flexible architecture for image search and retrieval and identify its components and interfaces between them
  - Identify parts in the above where standardization is desired
  - Create specifications for the identified parts

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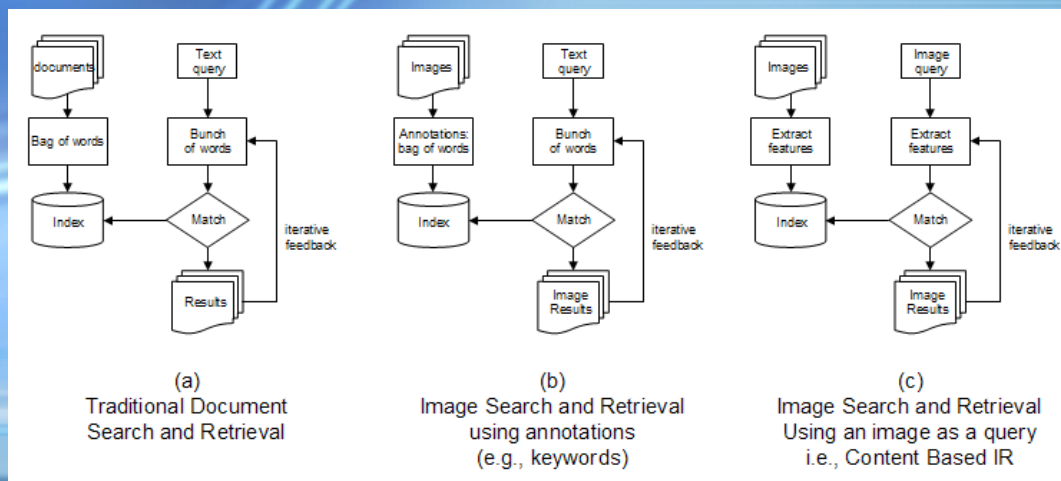


# JPSearch specifications

- Part 1: Technical Report (Type 3)
  - Framework and system components
  - ISO/IEC 24800-1
  - PDTR as of November 2006

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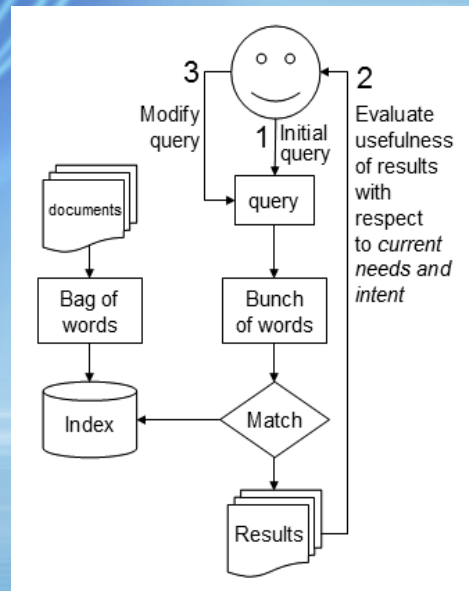
## Typical search and retrieval systems



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# User centric search and retrieval



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## JPSearch use cases

- Searching images in stock photo collections for usage in magazines
- Searching for and publishing authoritative themed sub-collections of images
- Mobile Tourist Information
- Surveillance Search from Desktop to Mobile Device with Alerts
- Ad hoc search without time-consuming housekeeping tasks

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## JPSearch use cases (II)

- Rights clearance to publish a compliant business document
- Tracking an object creation process using a temporal series of photos
- Finding illegal or unauthorized use of images
- Finding the best shots or filtering out of the worse shots
- Context searching without human annotation
- Image search based on image quality

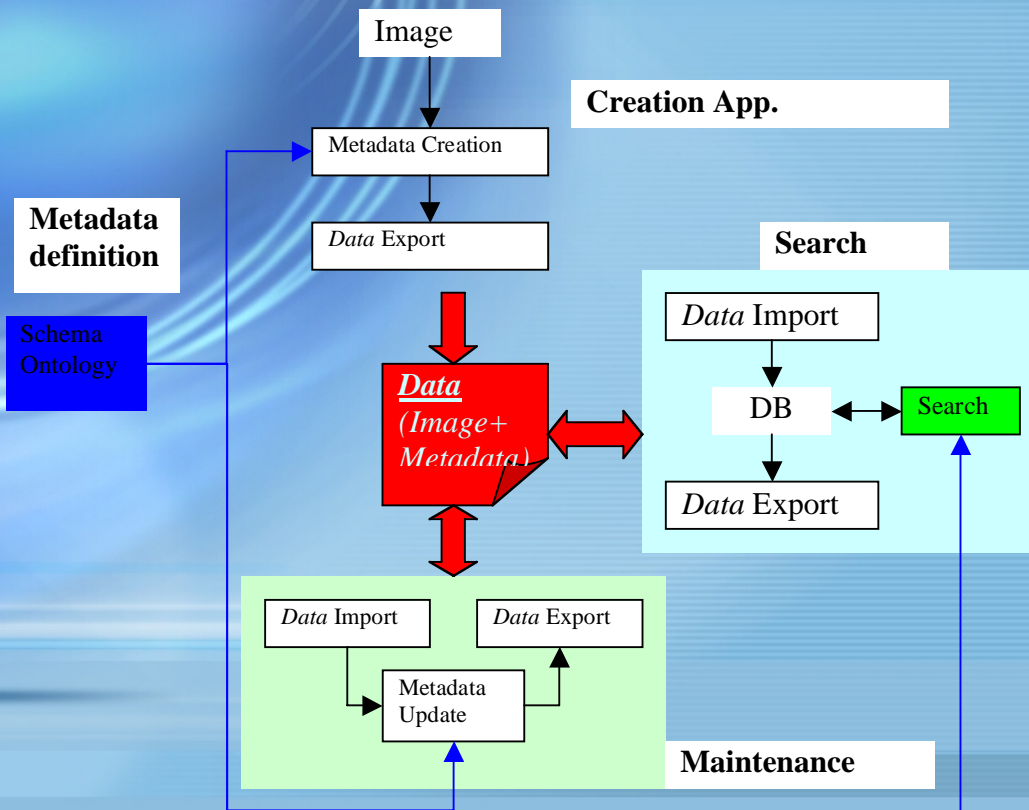
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## JPSearch use cases (III)

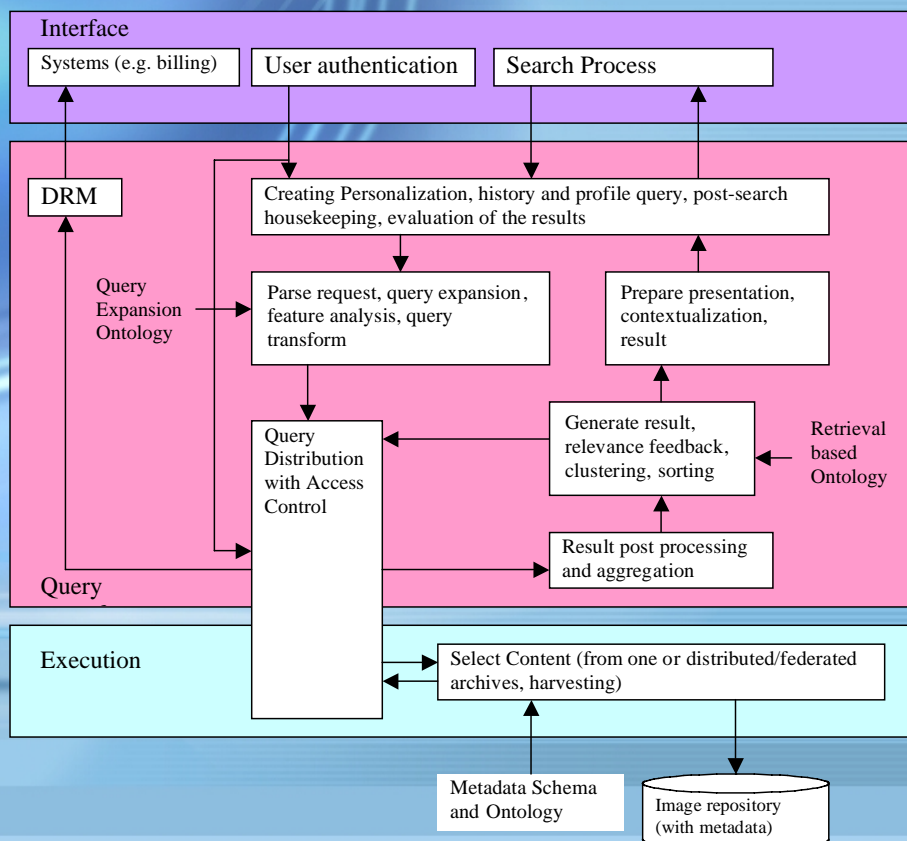
- Image search with deduplication
- Matching images between collections for synchronization
- Social metadata updating and sharing of images for searching
- Image search in the medical domain
- Servants image searchers
- Open federated repositories

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# Metadata flow between applications

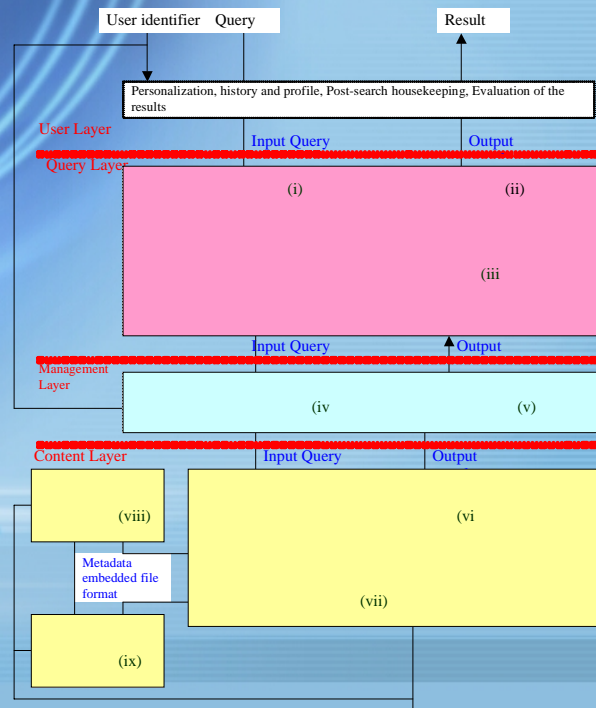


# Query data flow

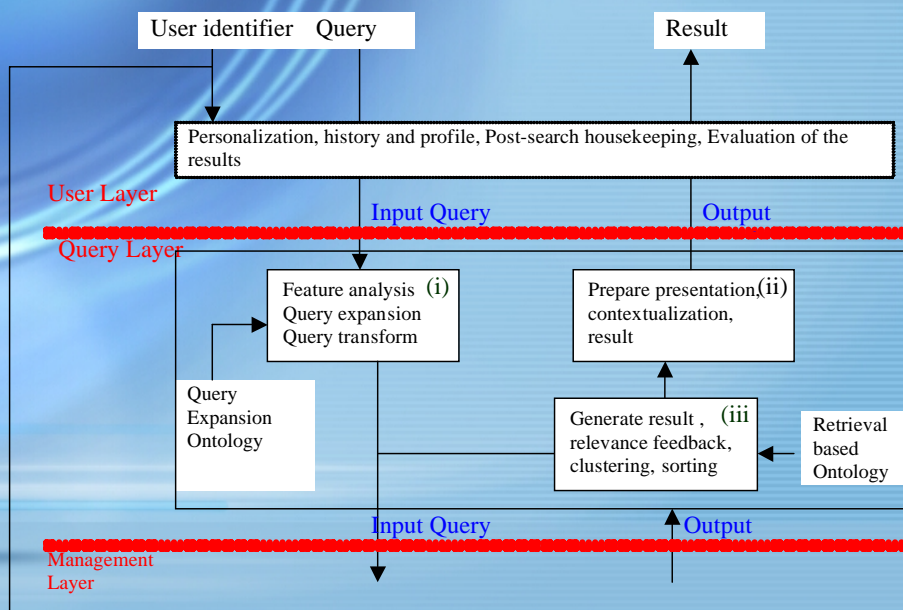




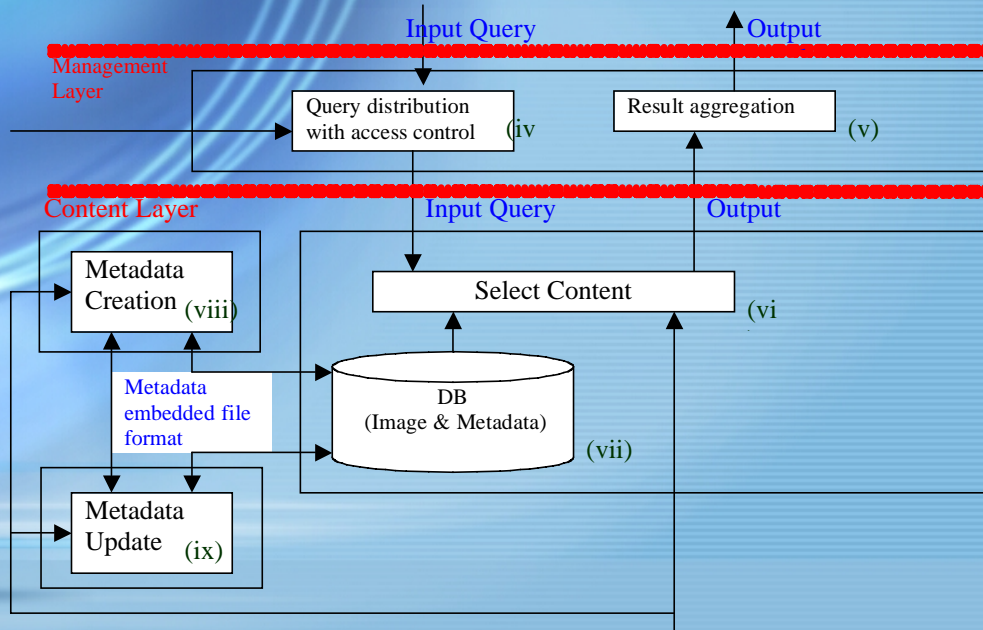
# JPSearch architecture



# JPSearch Architecture (II)



# JPSearch architecture (III)



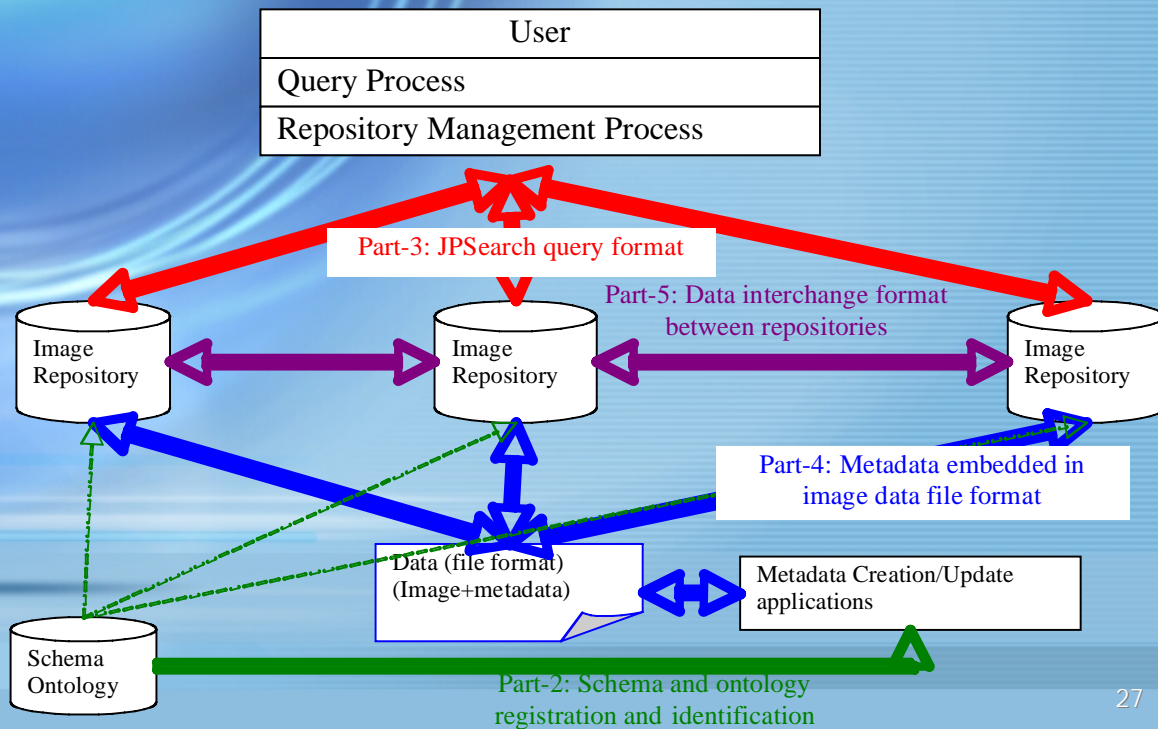
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# JPSearch normative parts

- Part-2: Schema and ontology registration and identification
- Part-3: JPSearch query format
- Part-4: Metadata embedded in image data (JPEG-1 and JPEG-2000) file format
- Part-5: Data interchange format between image repositories

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# JPSearch current structure



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## Implementation examples

- Call for proposals for image search and retrieval systems implementations
- Issued November 2006
- Expect input by April 15th, 2007

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# Final words

- JPSearch is a major activity in JPEG group now
- JPSearch is promised to become a successful standard
- Part 1 (framework and components) quite finalized
- Four new parts have been initiated

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*Thanks for your attention !  
Questions, discussions, ...*



**Acknowledgement to JPSearch experts for their contributions**

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