

# A Framework for Media Adaptation Using the Web and the Semantic Web

Sébastien Laborie and Antoine Zimmermann

SMAP'07

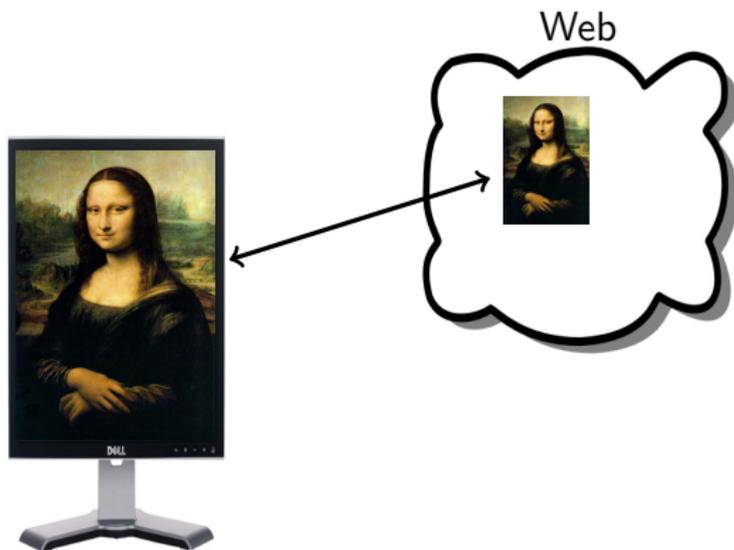
INSTITUT NATIONAL  
DE RECHERCHE  
EN INFORMATIQUE  
ET EN AUTOMATIQUE



*INRIA*

centre de recherche  
**GRENOBLE - RHÔNE-ALPES**

# Information Anytime Anywhere

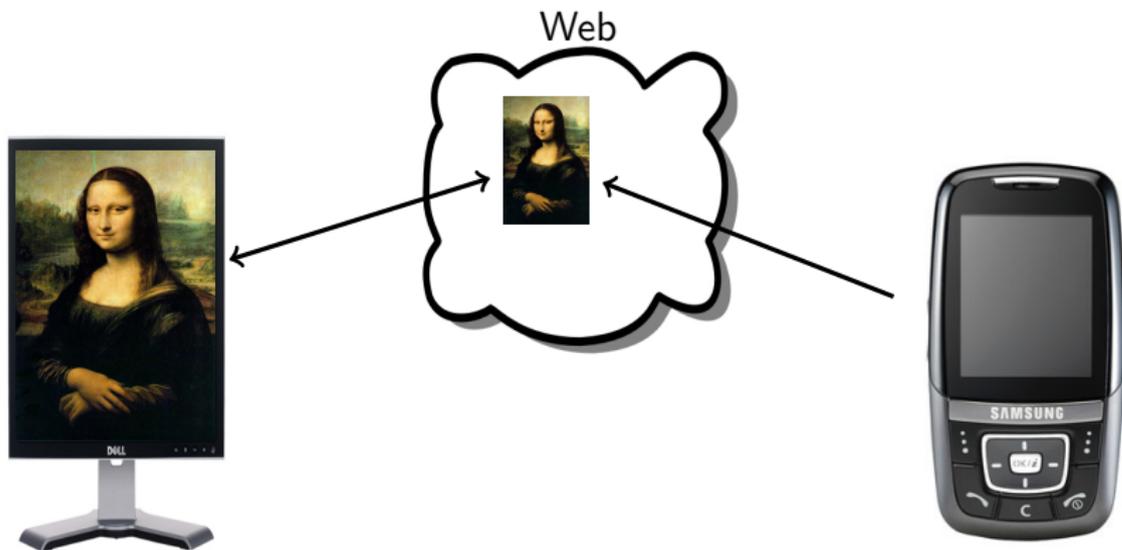


Mona Lisa Image

PNG format

560 x 864

# Information Anytime Anywhere

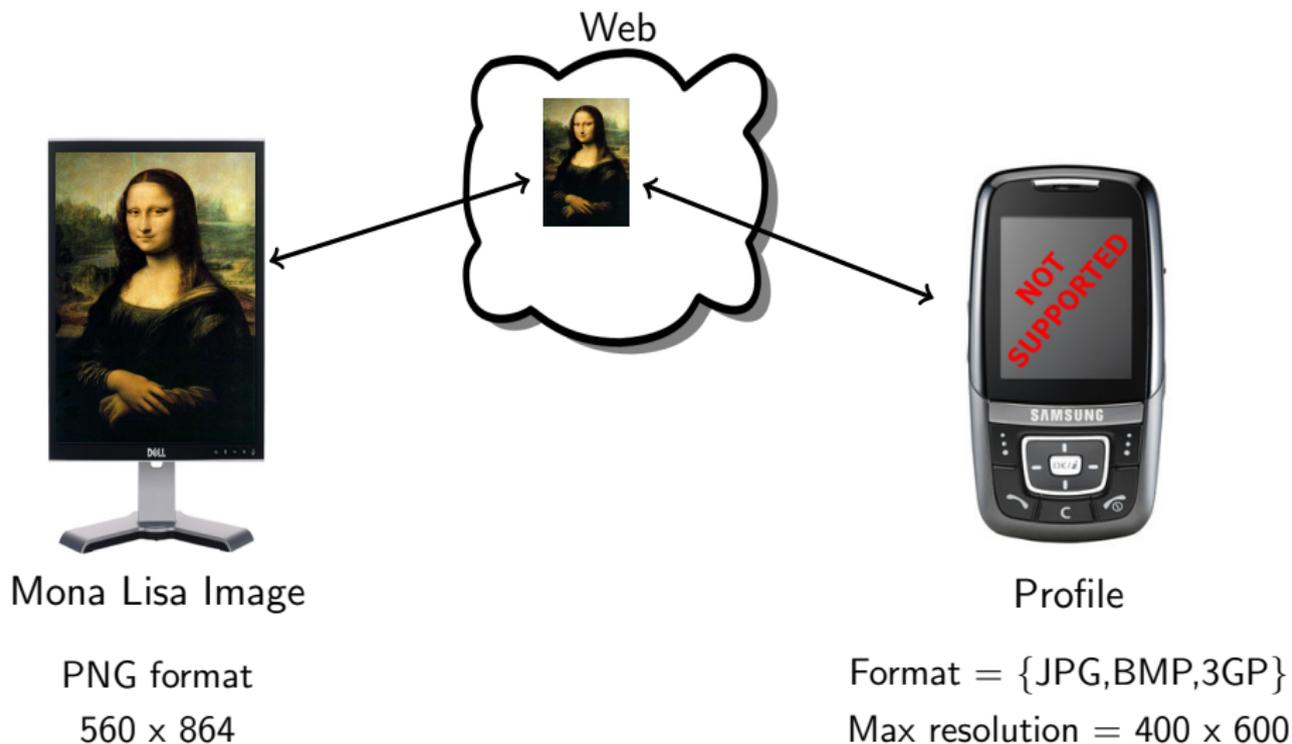


Mona Lisa Image

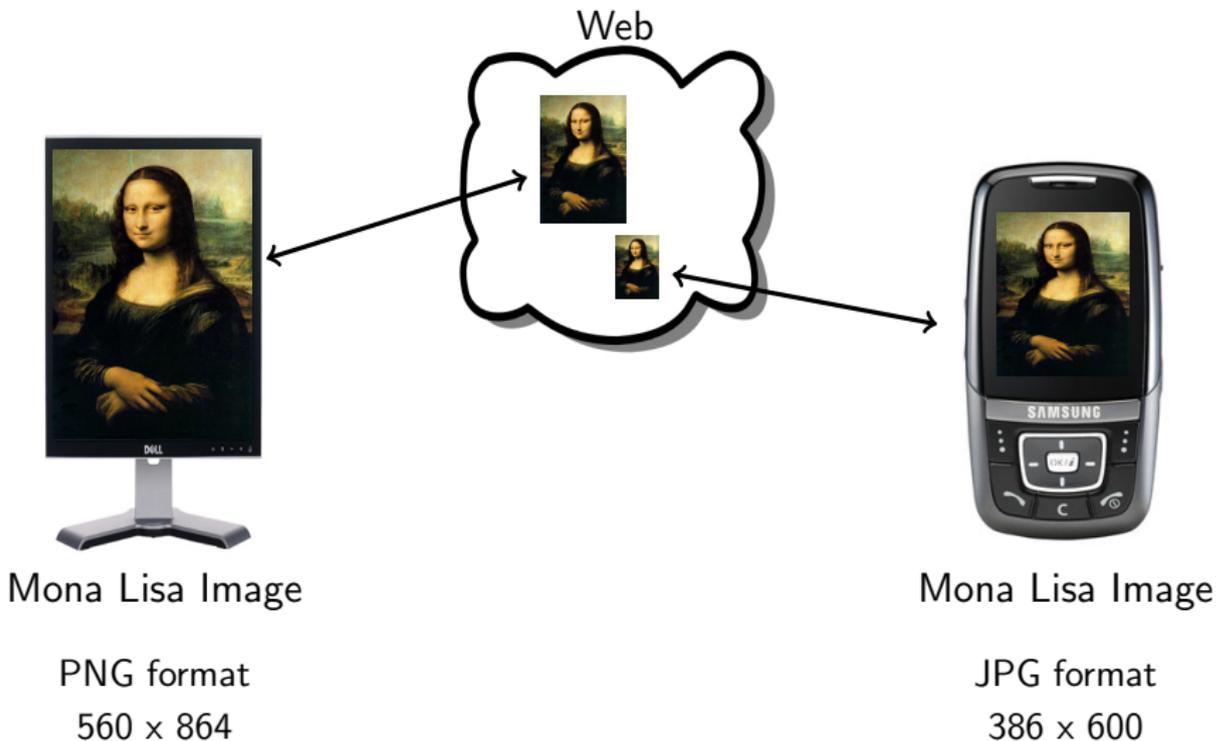
PNG format

560 x 864

# Information Anytime Anywhere



# Information Anytime Anywhere

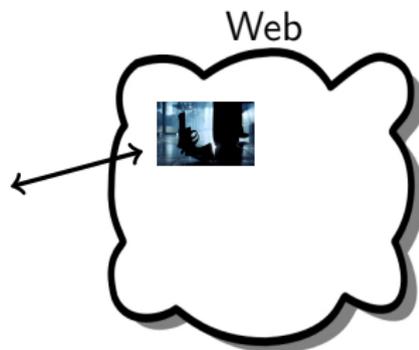


# Information Anytime Anywhere



Movie trailer

AVI format

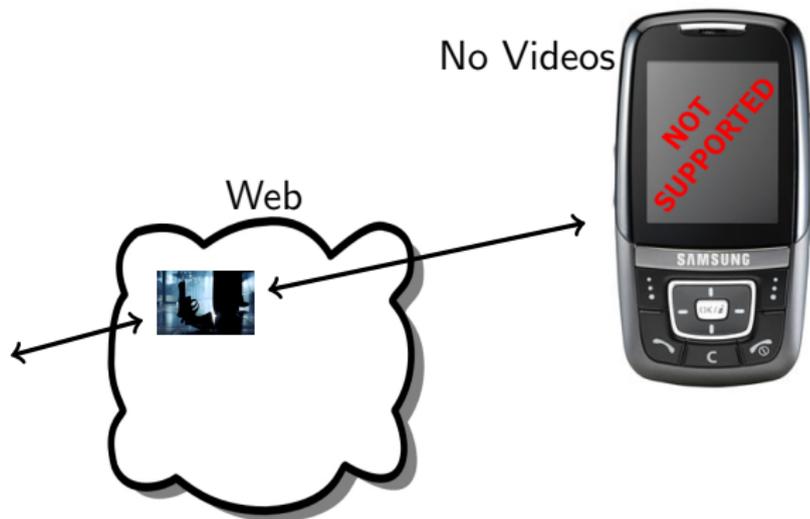


# Information Anytime Anywhere



Movie trailer

AVI format

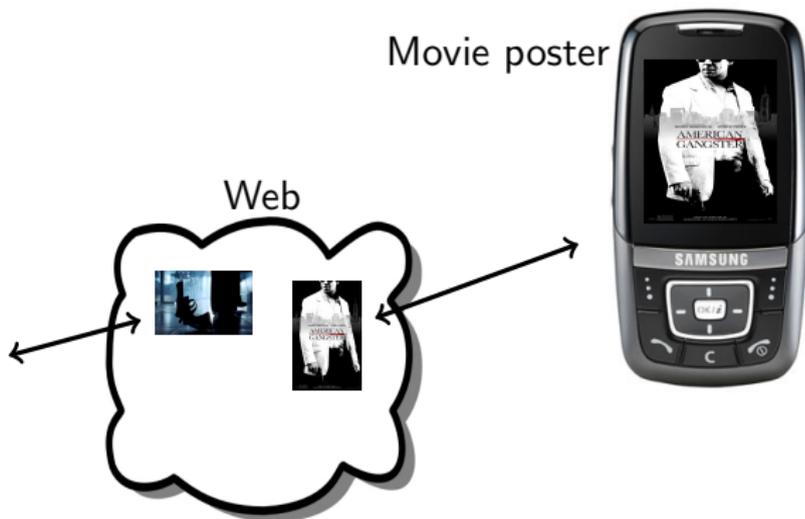


# Information Anytime Anywhere



Movie trailer

AVI format

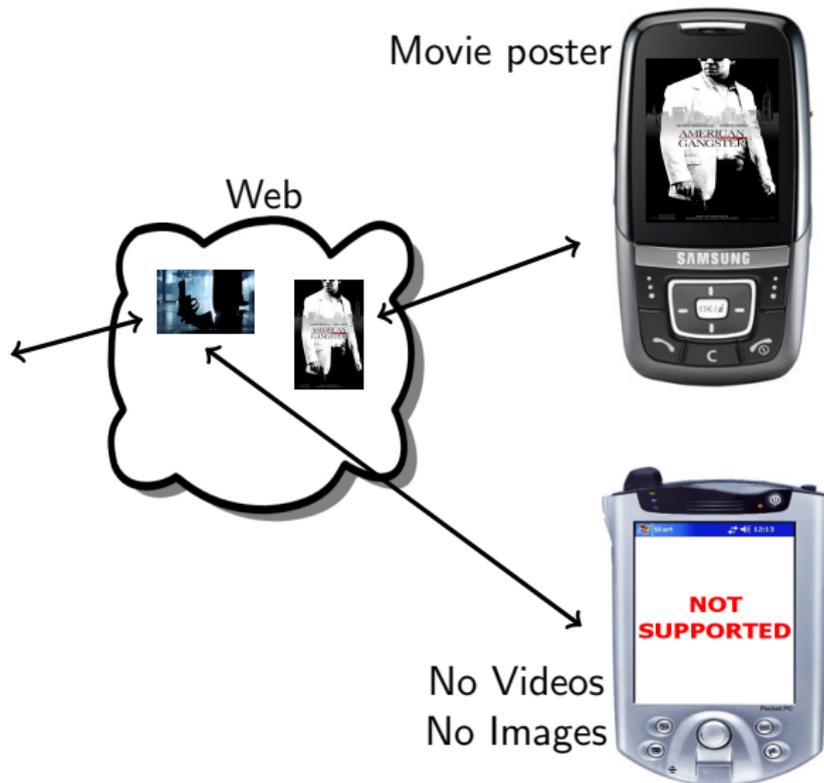


# Information Anytime Anywhere



Movie trailer

AVI format

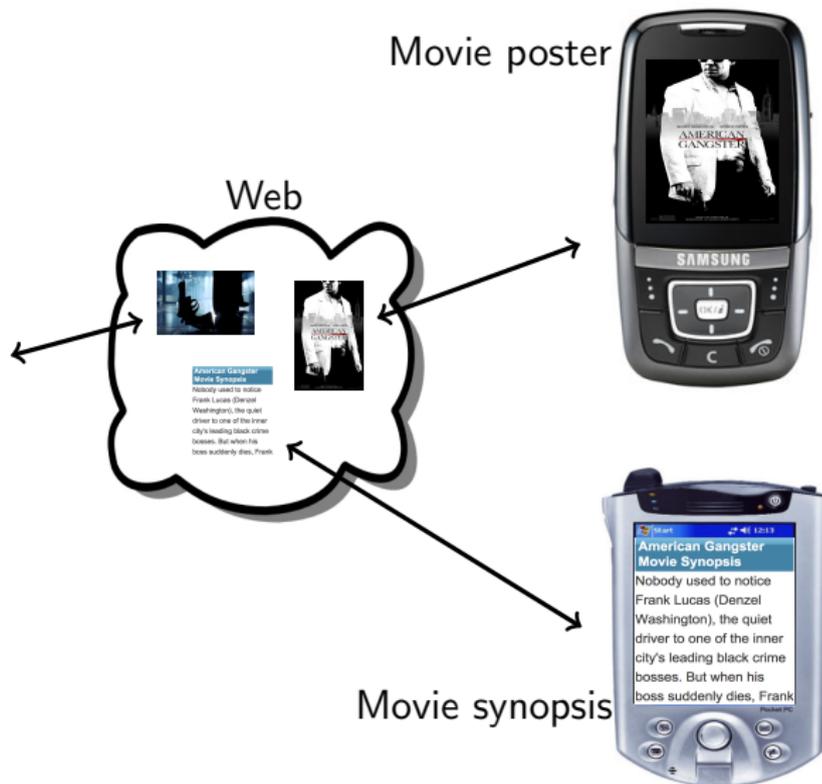


# Information Anytime Anywhere



Movie trailer

AVI format



# Our adaptation approach



## Approach

## Solutions

- Find alternatives on the web.
- They must convey the same meaning (or at least be as much similar as the original).
- Select the ones which satisfy a profile.

# Our adaptation approach

## Approach

- Find alternatives on the web.
- They must convey the same meaning (or at least be as much similar as the original).
- Select the ones which satisfy a profile.

## Solutions

- Use information retrieval techniques.

# Our adaptation approach

## Approach

- Find alternatives on the web.
- They must convey the same meaning (or at least be as much similar as the original).
- Select the ones which satisfy a profile.

## Solutions

- Use information retrieval techniques.
- Identify proximity between metadata.

# Our adaptation approach

## Approach

- Find alternatives on the web.
- They must convey the same meaning (or at least be as much similar as the original).
- Select the ones which satisfy a profile.

## Solutions

- Use information retrieval techniques.
- Identify proximity between metadata.
- Use filtering techniques.

# Our adaptation approach

## Approach

- Find alternatives on the web.
- They must convey the same meaning (or at least be as much similar as the original).
- Select the ones which satisfy a profile.

## Solutions

- Use information retrieval techniques.
- Identify proximity between metadata.
- Use filtering techniques.

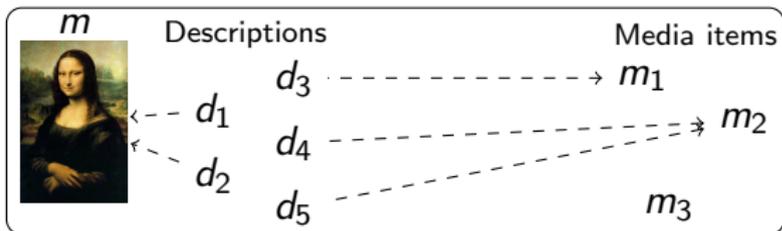
**Automatize this process!**

# Outline

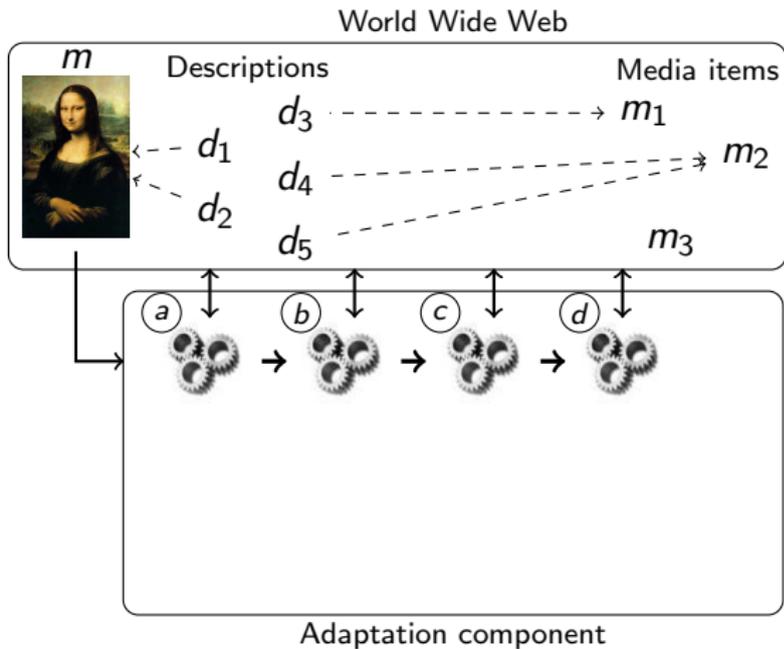
- 1 Software Architecture
- 2 Simulating with current technologies
- 3 Improving the process with Semantic Web technologies

# Software Architecture

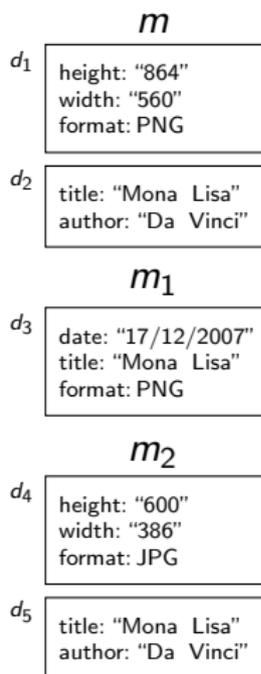
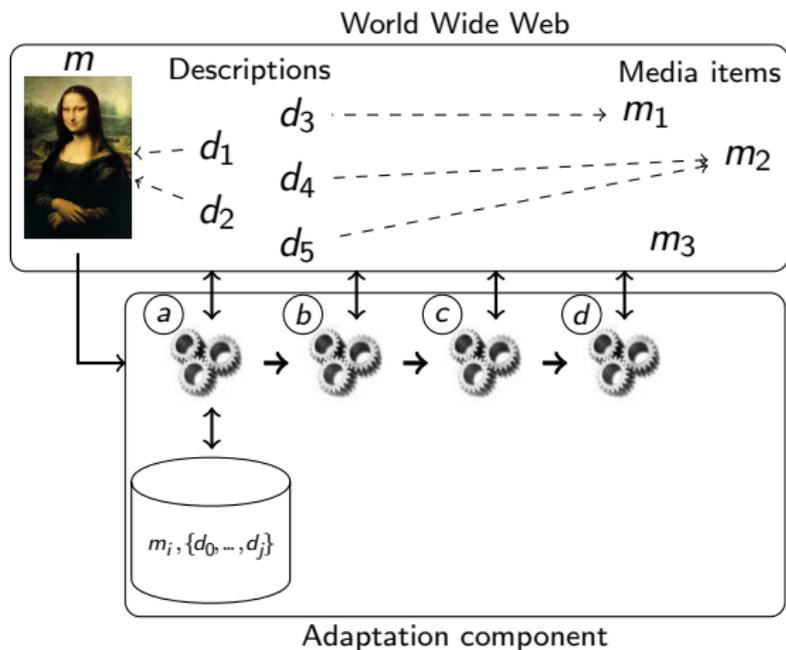
## World Wide Web



# Software Architecture

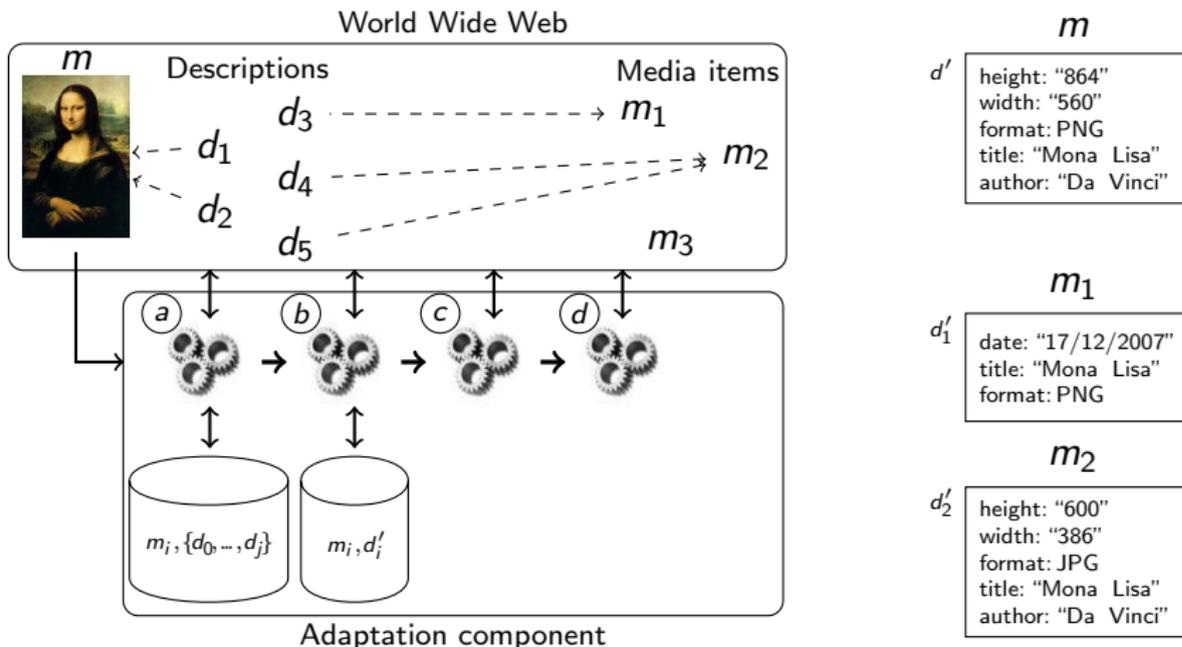


## Software Architecture



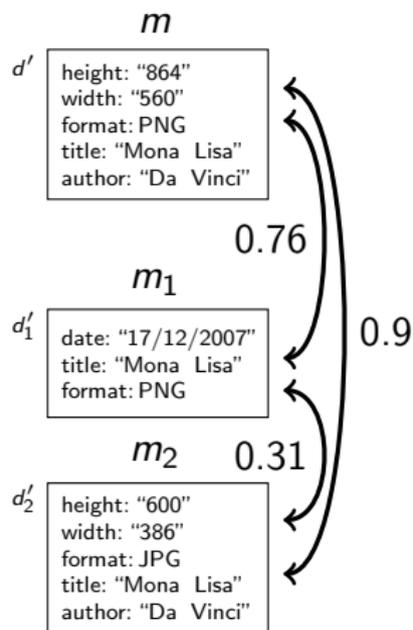
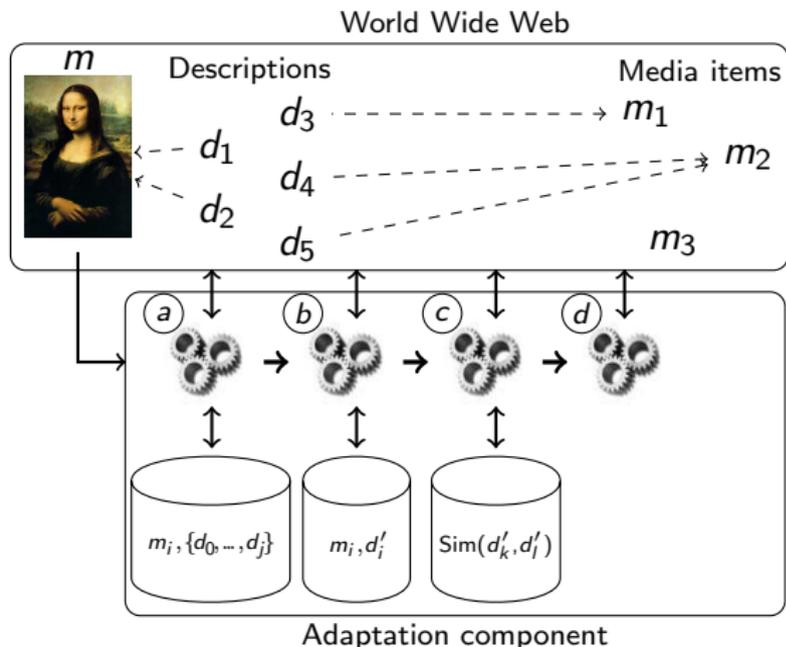
Ⓐ: Description association

## Software Architecture



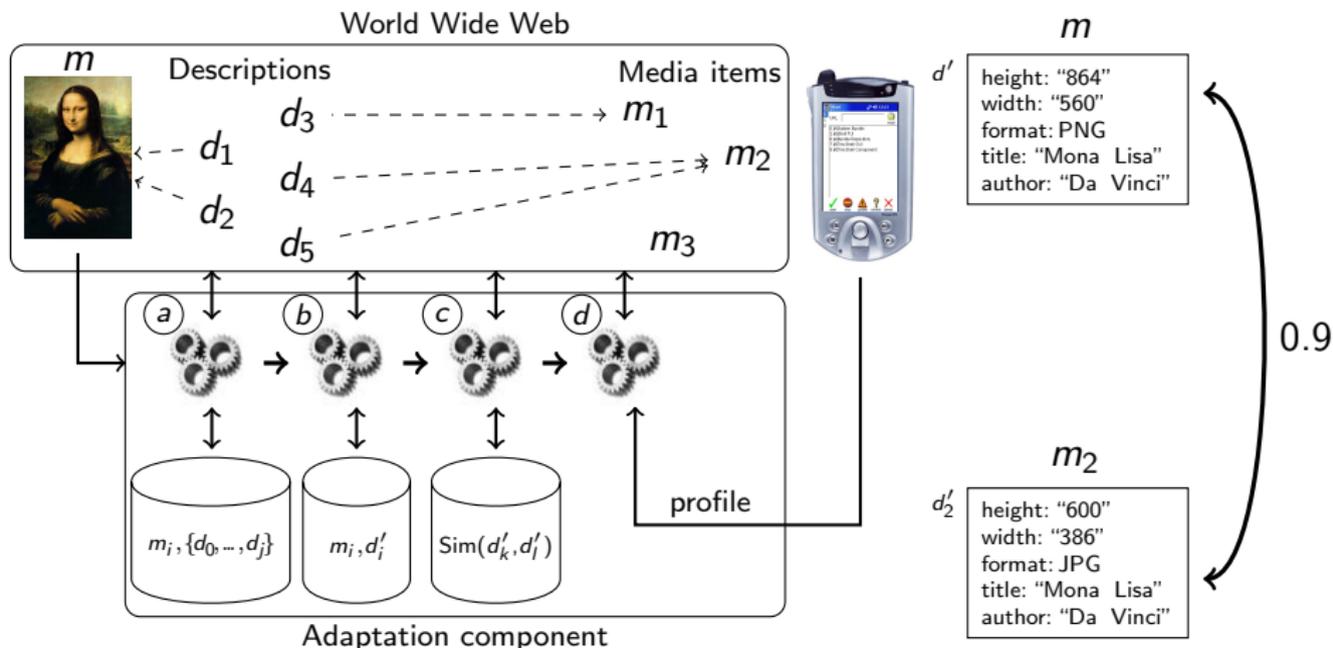
(b): Description aggregation

## Software Architecture



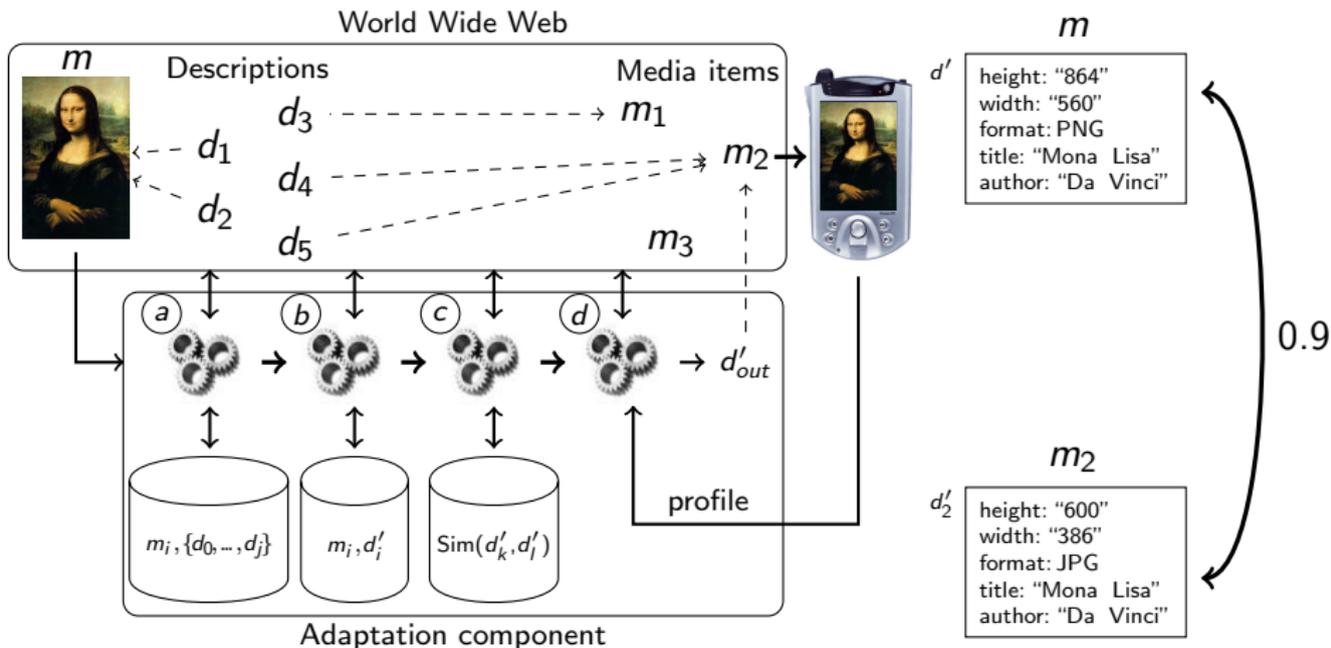
©: Description similarity

## Software Architecture



ⓓ: Description selection

## Software Architecture



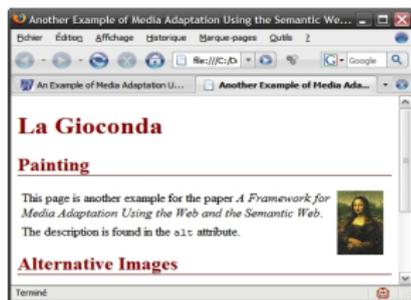
# Simulating with current technologies

<http://ex.com/mona.png>



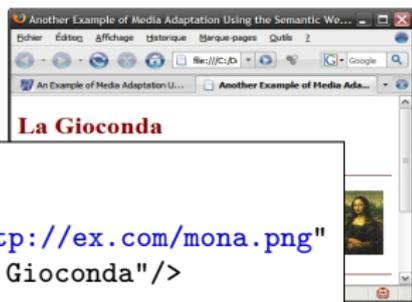
# Simulating with current technologies

<http://ex.com/mona.png>



# Simulating with current technologies

<http://ex.com/mona.png>

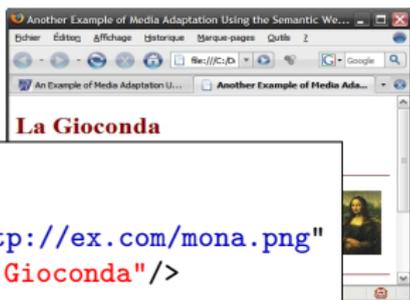


```
<div>

...
</div>
```

# Simulating with current technologies

<http://ex.com/mona.png>

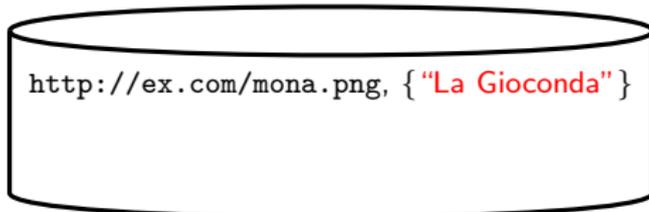


```
<div>

...
</div>
```

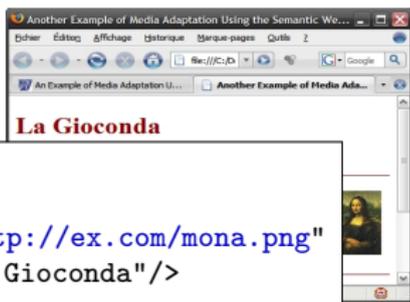


Ⓐ



# Simulating with current technologies

<http://ex.com/mona.png>

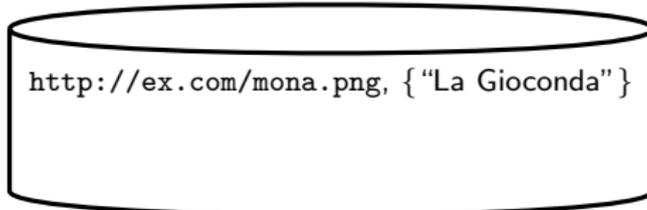


```
<div>

...
</div>
```

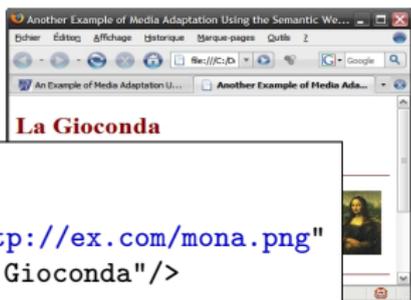


(a)



# Simulating with current technologies

<http://ex.com/mona.png>



```
<div>

...
</div>
```



```
<div>

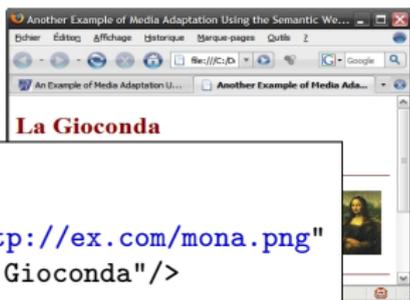
...
</div>
```

(a)

<http://ex.com/mona.png>, { "La Gioconda",  
"Mona Lisa" }

# Simulating with current technologies

<http://ex.com/mona.png>



```
<div>

...
</div>
```



```
<div>

...
</div>
```

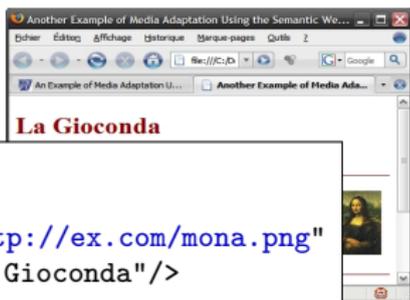
ⓑ

<http://ex.com/mona.png>,

"La Gioconda Mona Lisa"

# Simulating with current technologies

<http://ex.com/mona.png>



```
<div>

...
</div>
```



```
<div>

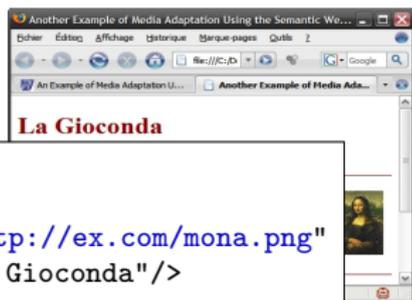
...
</div>
```

©

Similarities: String comparison  
Vector comparison  
...

# Simulating with current technologies

<http://ex.com/mona.png>



```
<div>

...
</div>
```



```
<div>

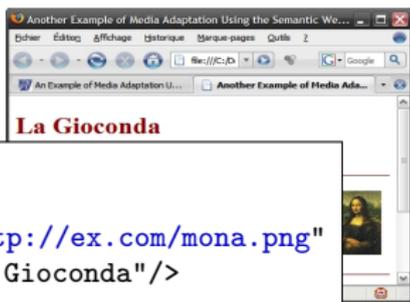
...
</div>
```



Filtering / Preferences

# Simulating with current technologies

<http://ex.com/mona.png>



```
<div>

...
</div>
```



```
<div>

...
</div>
```

Web search engines partially implement (a), (b), (c) and (d)

# Improvement

Using current techniques is not enough.

⇒ Semantic Web technologies can improve this...

... by adding expressivity:

- e.g., “Da\_Vinci is\_a Painter”.

... by providing deductive capabilities:

- e.g., “Mona\_Lisa was\_painted\_by Da\_Vinci” implies that “Mona\_Lisa is\_a Painting”.

... by solving heterogeneity problems:

- e.g., “La\_Gioconda same\_as Mona\_Lisa”.

# Improvement

Using current techniques is not enough.

⇒ Semantic Web technologies can improve this...

... by adding expressivity:

- e.g., “Da\_Vinci is\_a Painter”.

... by providing deductive capabilities:

- e.g., “Mona\_Lisa was\_painted\_by Da\_Vinci” implies that “Mona\_Lisa is\_a Painting”.

... by solving heterogeneity problems:

- e.g., “La\_Gioconda same\_as Mona\_Lisa”.

**This does not change our software architecture!**

# Improvement

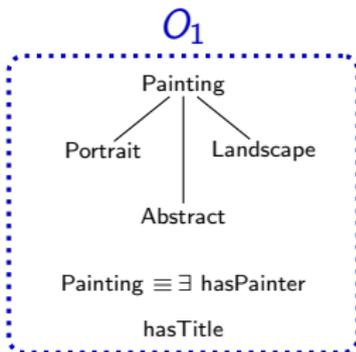
  
Indexing



$d_1$   
height: "864"  
width: "560"  
format: PNG

# Improvement

**a**  
Indexing RDF  
(+OWL ontologies)



$d_1$

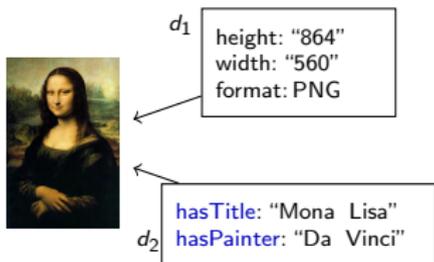
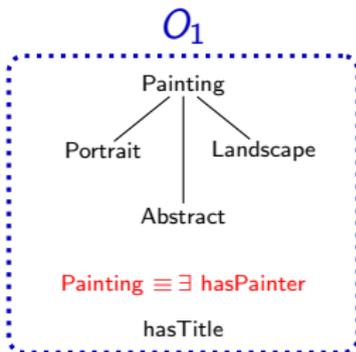
height: "864"  
width: "560"  
format: PNG

$d_2$

hasTitle: "Mona Lisa"  
hasPainter: "Da Vinci"

# Improvement

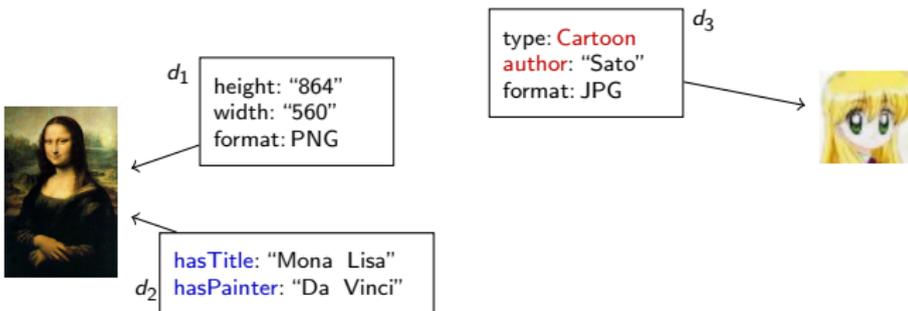
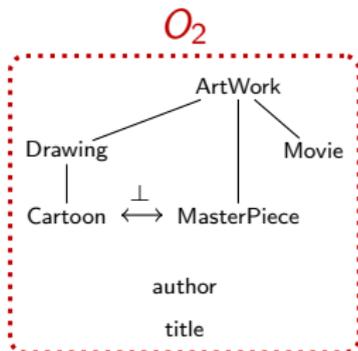
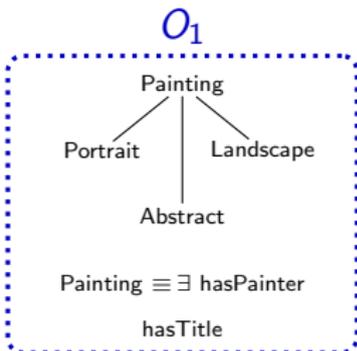
**(a)**  
Indexing RDF  
(+OWL ontologies)



**$\models$  type: Painting**

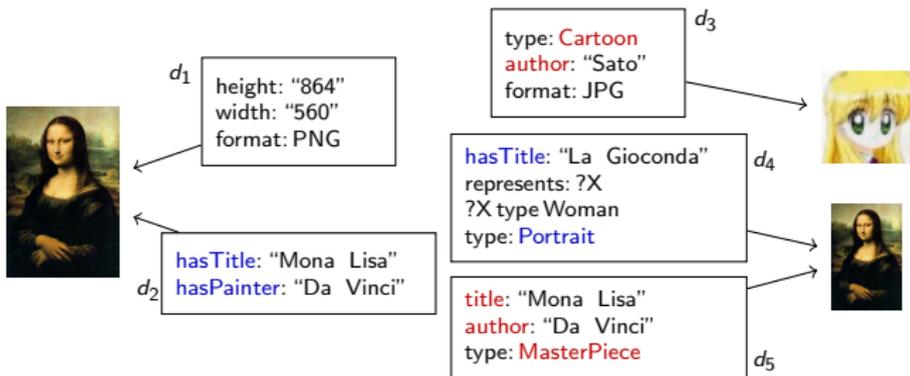
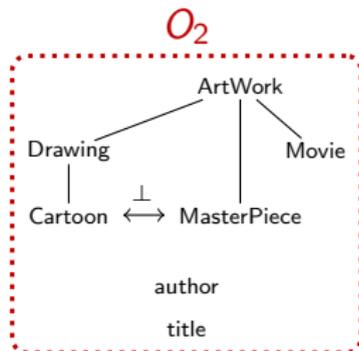
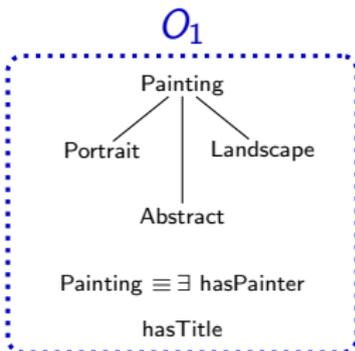
# Improvement

**(a)**  
Indexing RDF  
(+OWL ontologies)



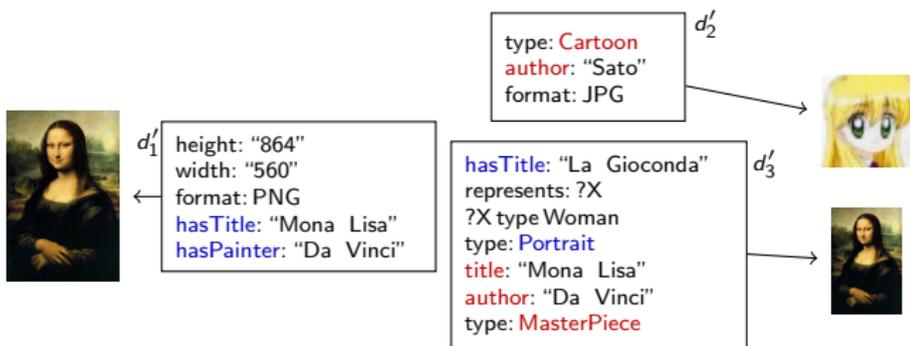
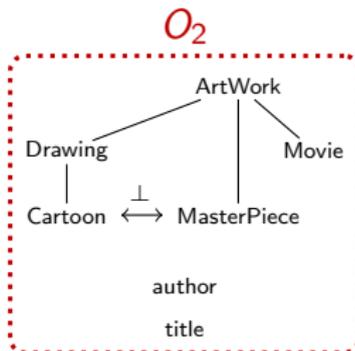
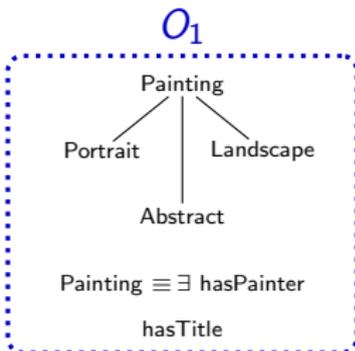
## Improvement

**(a)**  
Indexing RDF  
(+OWL ontologies)



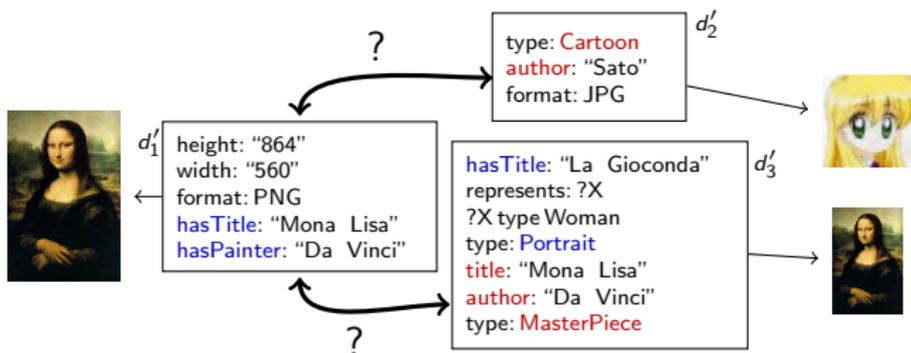
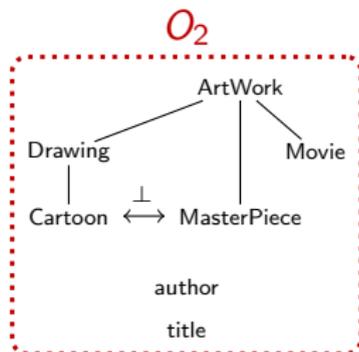
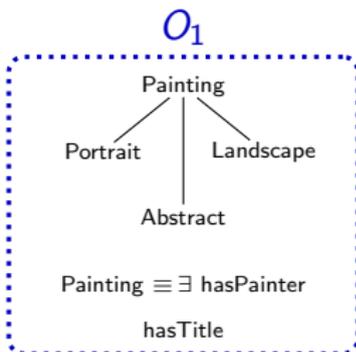
## Improvement

**(b)**  
RDF Merge



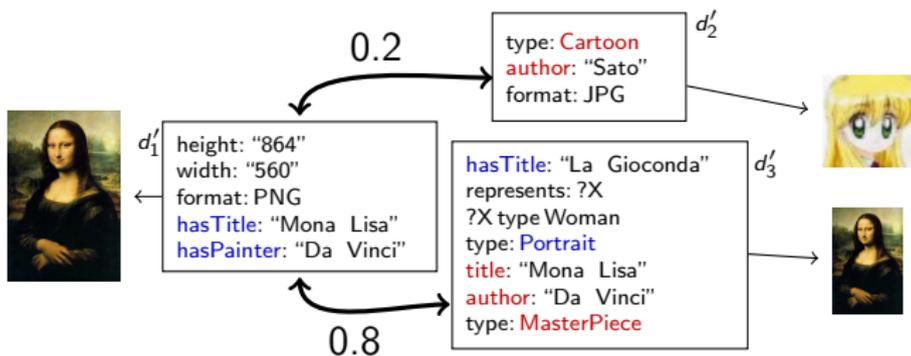
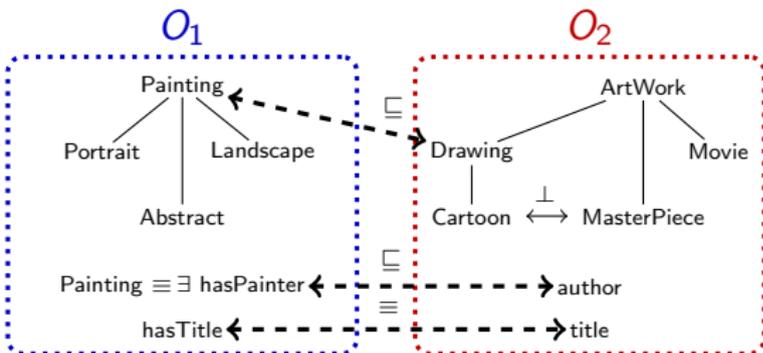
## Improvement

©  
Similarity  
?



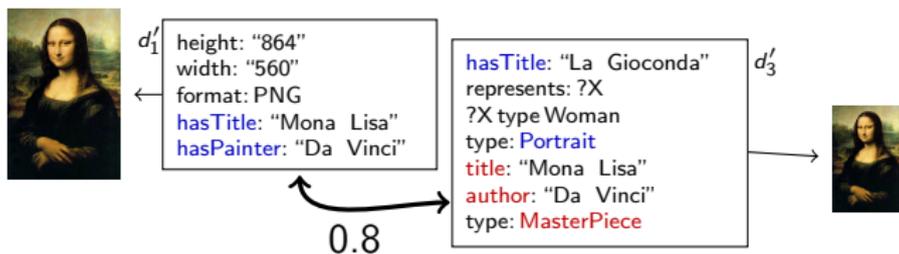
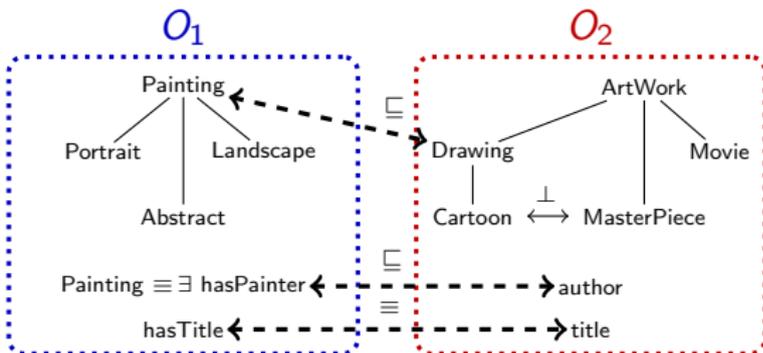
# Improvement

©  
 Semantic similarity  
 based on  
 ontology matching



## Improvement

$\textcircled{d}$   
 Semantic filtering  
 (e.g., only masterpieces)



# Limitations

- ☹ Limited efficiency for:
  - private media items;
  - multimedia document.
- ☹ The semantic implementation needs further research:
  - automatic semantic annotations;
  - merging semantic annotations;
  - semantic similarity.
- ☹ Not implemented yet

# Summary

- ☺ It is practically implementable;
- ☺ The approach is flexible:
  - no need to implement it for each new format;
  - it encompasses cross-media adaptation.
- ☺ It is potentially an efficient solution:
  - fast (everything is pre-computed);
  - use information profusion on the Web.

*Thank you for your attention !*

sebastien.laborie@inrialpes.fr  
antoine.zimmermann@inrialpes.fr