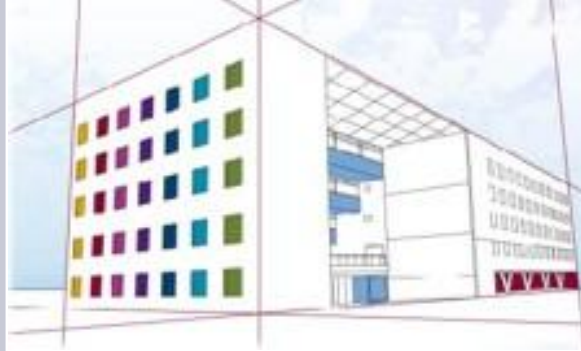




Institut de Recherche en Informatique de Toulouse

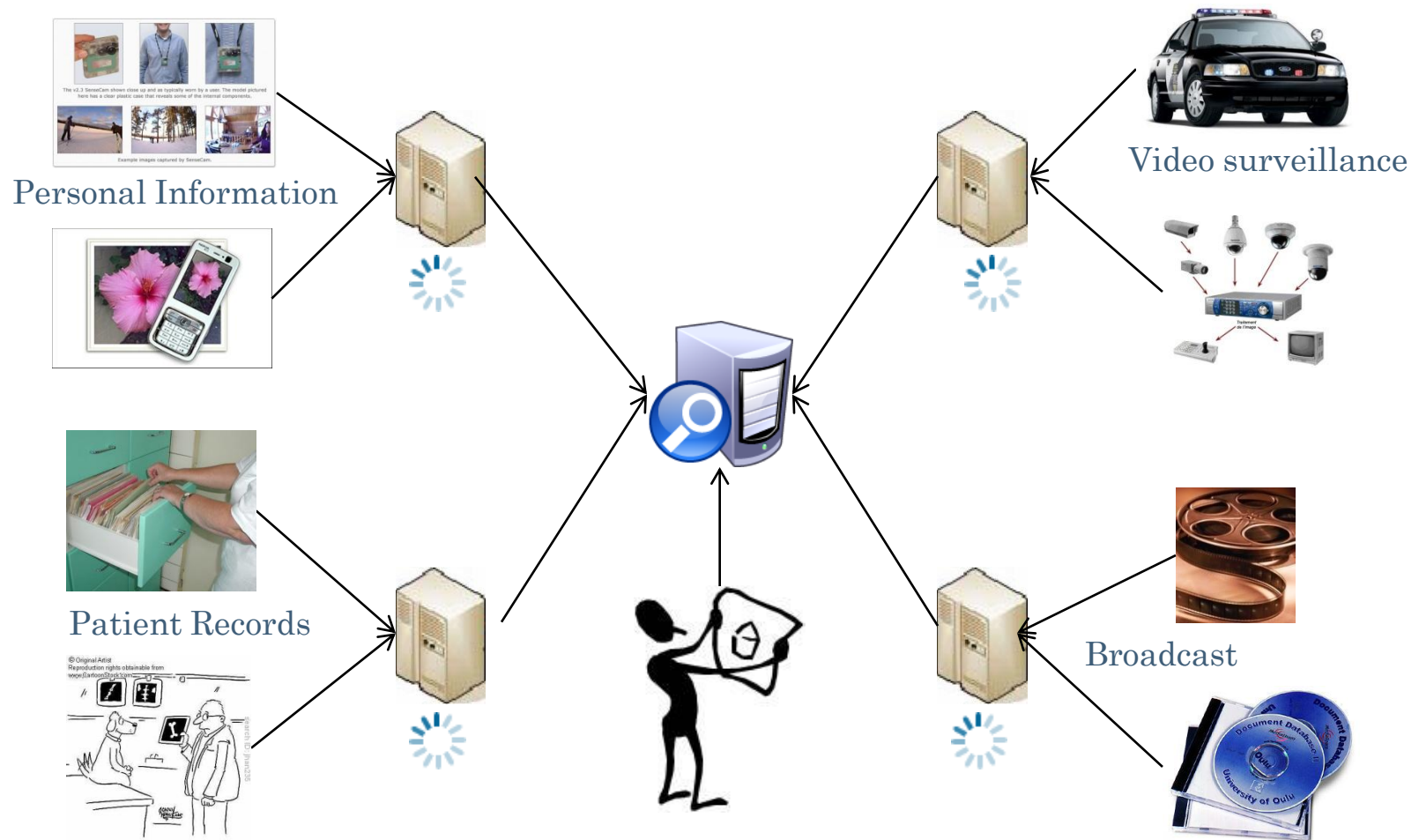
APPLYING PERVASIVE AND FLEXIBLE ACCESS CONTROL TO DISTRIBUTED MULTIMEDIA RETRIEVAL

Dana AL-KUKHUN, Dana CODREANU, Ana-Maria MANZAT,
Florence SEDES

IRIT - Université de Toulouse (France)

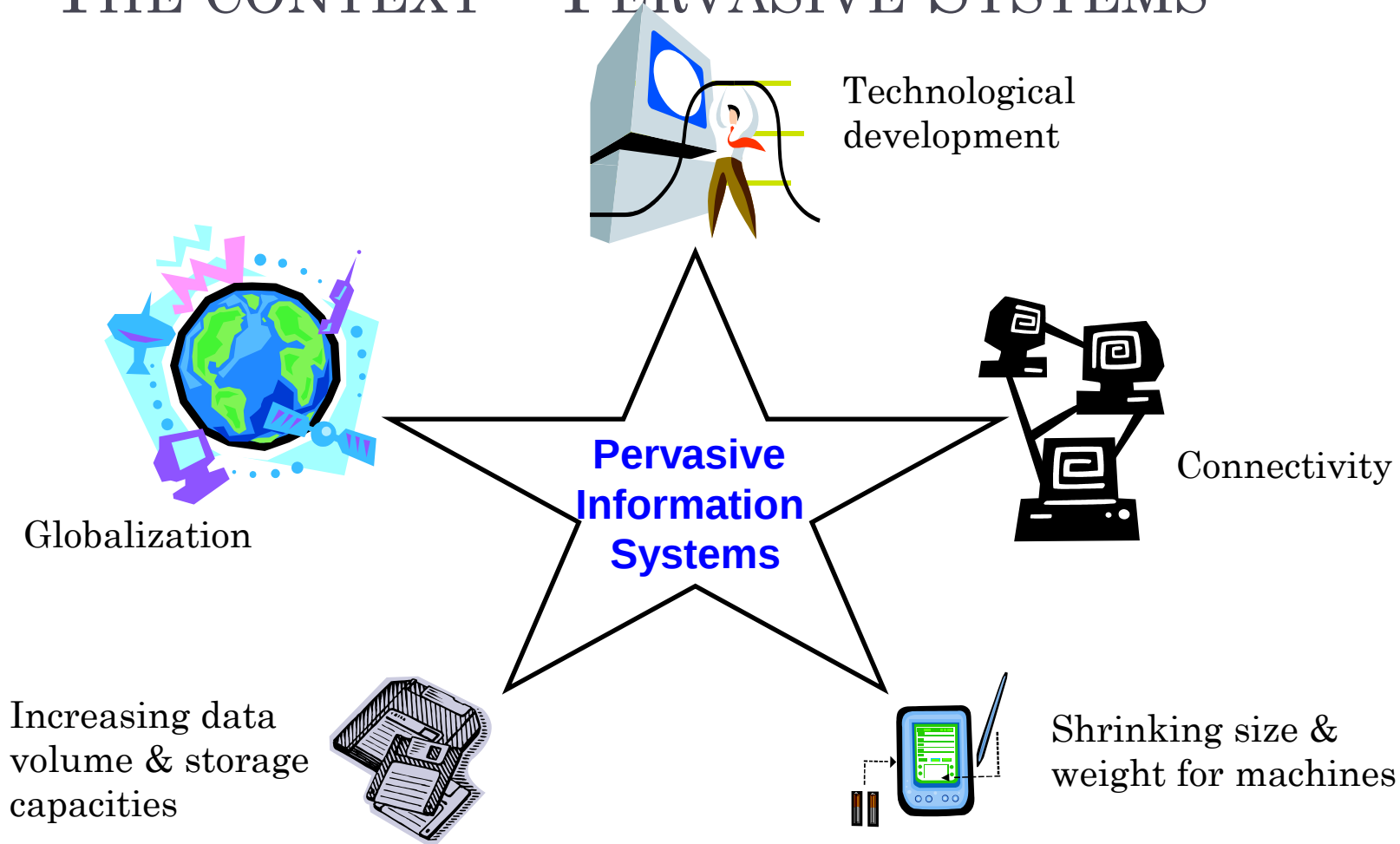
{Dana.Al-kukhun, Dana.Codreanu, Ana-Maria.Manzat, Florence.Sedes}@irit.fr,

THE CONTEXT – DISTRIBUTED MULTIMEDIA SYSTEMS



Question: How to take into account the **data and users mobility**, the **privacy** and the **access control**, and to have a **reduce resource consumption**?

THE CONTEXT – PERVASIVE SYSTEMS

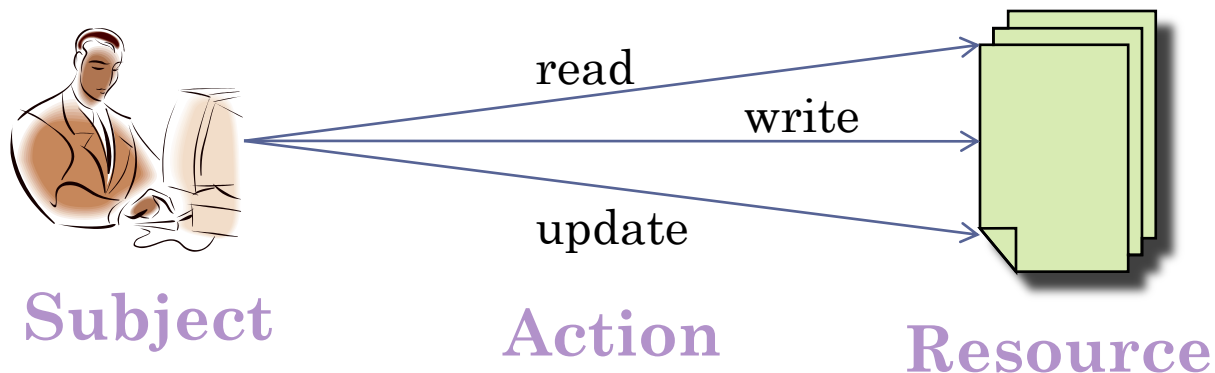


Provide a transparent accessibility to different distributed data sources at:

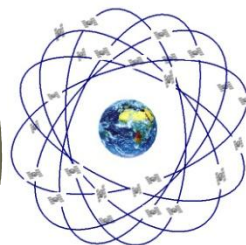
- Any **time** → Real-time systems
- Any **how** → Intelligent systems
- Any **where** → Mobile Systems

THE CONTEXT – THE ACCESS CONTROL

- A **subject** (person, computer process, machine, ...)
- Perform an **action** (Read, write, update,...)
- Access a **resource** (record, printer, ...).



- An access decision should take into account:
 - Time of access
 - Location of access
 - Environment



THE CONTEXT



o **LINDO project** - Large scale distributed INDexation of multimedia Objects

- **Objective:**

- to create a Generic Architecture for the distributed multimedia content storage, indexation and retrieval

- **Aim:**

- to guide the design of the distributed multimedia information systems from different application domains

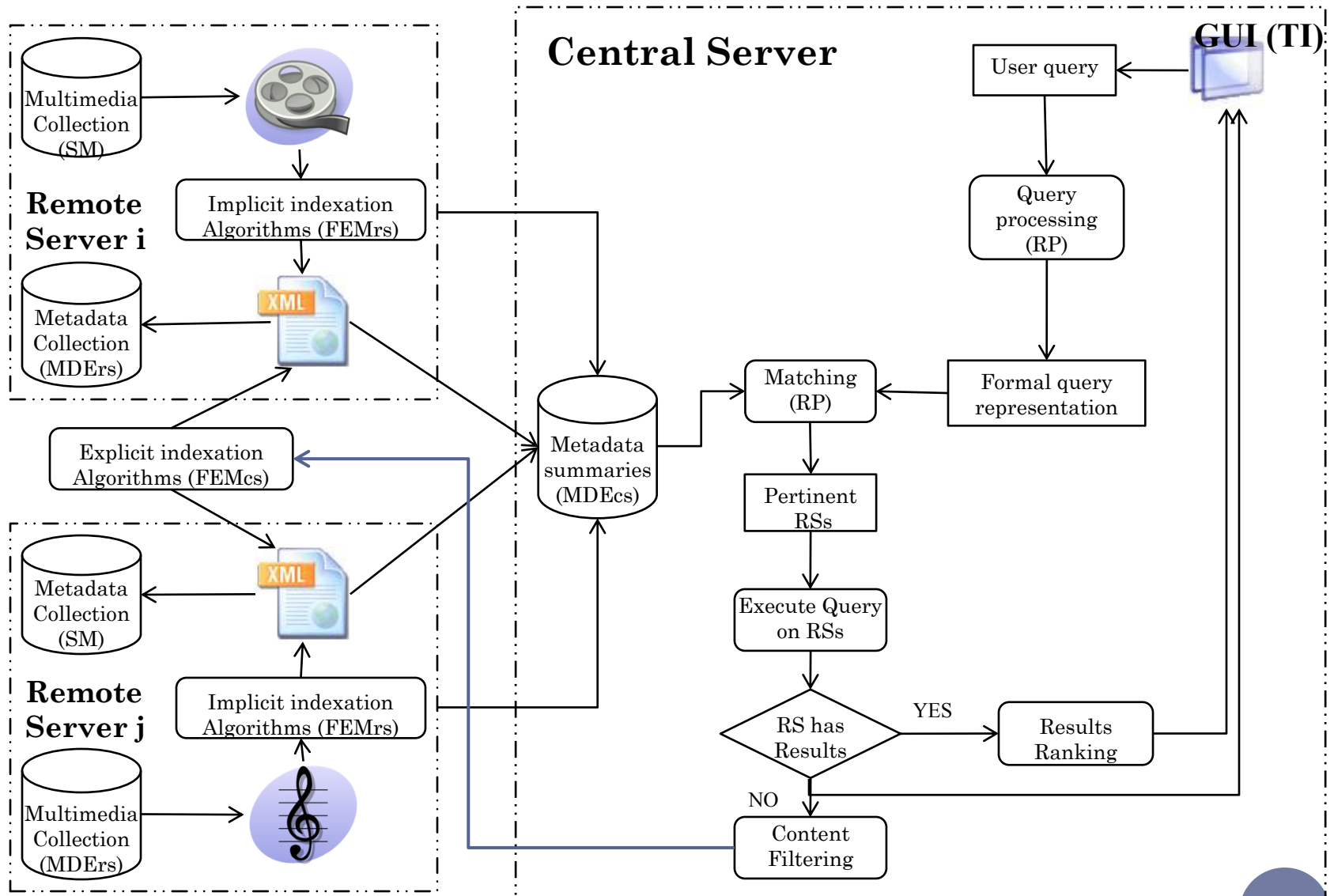
- **Main concern:**

- to enable reduced resource consumption and to develop a favorable context for obtaining relevant results to the user query

LINDO ADOPTED SOLUTION

- An **architectural solution** that is applicable in multiple use cases;
- The architecture is composed of:
 - **Remote servers:** store and index the multimedia contents
 - **A central server:** has a general overview of the system and manages the query and indexing processes
- A **distributed and dynamic indexing management**
 - **Implicit Indexation:** adapted to each servers' characteristics;
 - **Explicit Indexation:** dynamic algorithm selection and deployment, adapted to the user query;

THE INDEXATION AND QUERY WORKFLOWS



ADDING AN ACCESS CONTROL LAYER TO THE LINDO ARCHITECTURE

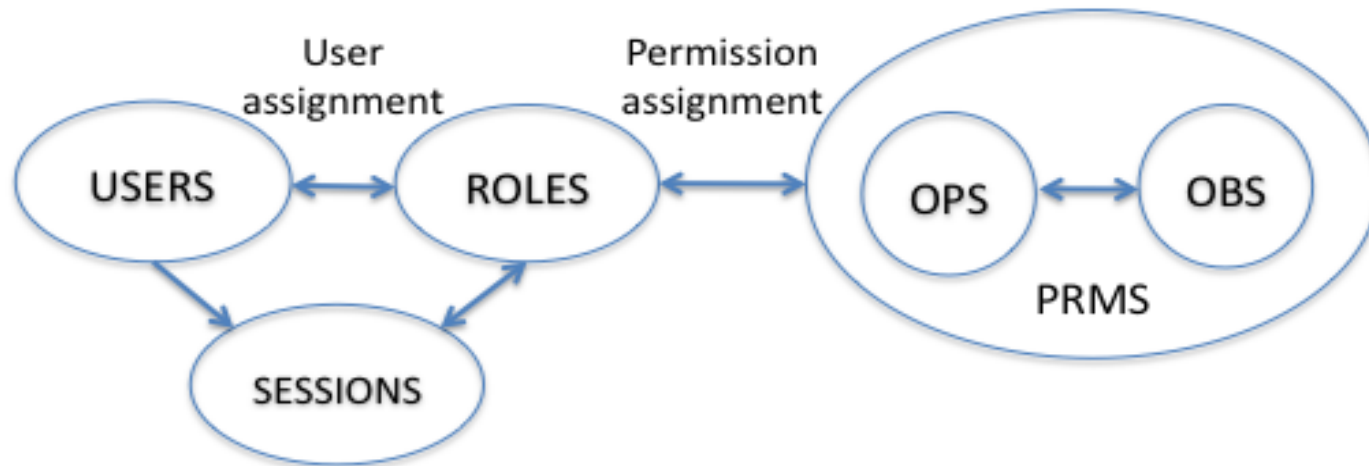
- Permit to the user can access the system
 - from anywhere,
 - at any time,
 - with any device.
- Limit his/her access to :
 - Certain multimedia contents
 - Resources
- Allow a flexibility in the access to the system, in certain emergency situations

USED TECHNOLOGIES

- **XACML**: eXtensible Access Control Markup Language
 - ❖ Describes access control policies and permits to standardize access control decisions in the form of XML documents.
 - ❖ Define the user privileges on system resources.
 - ❖ Ensures authenticated and secure access to information sources.
- **Advantage** : An interoperable language
 - ❖ Keeps access control policies in a separate reference physically distinct from the document.
 - ❖ Has a profile that supports RBAC (XACML - RBAC)

USED TECHNOLOGIES

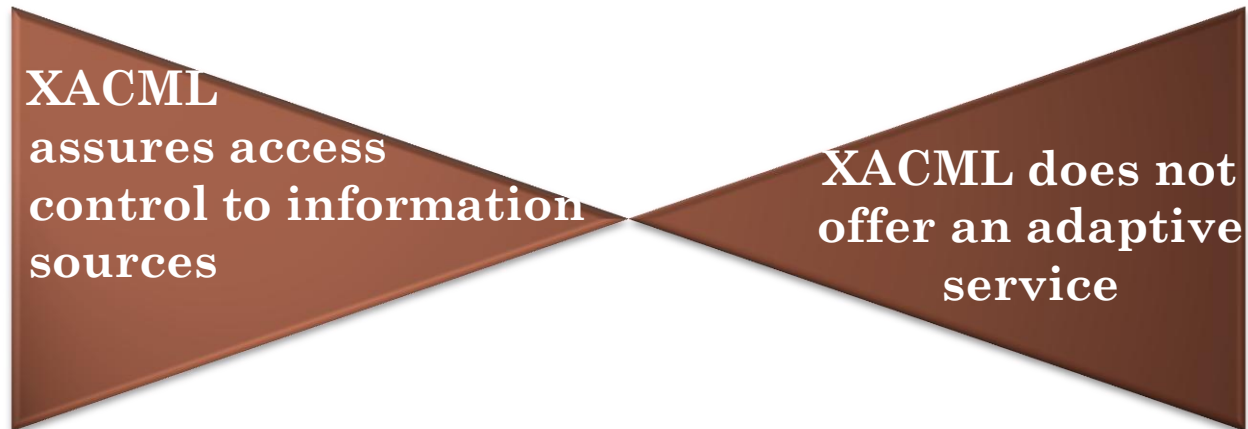
- RBAC (Role Based Access Control) model:



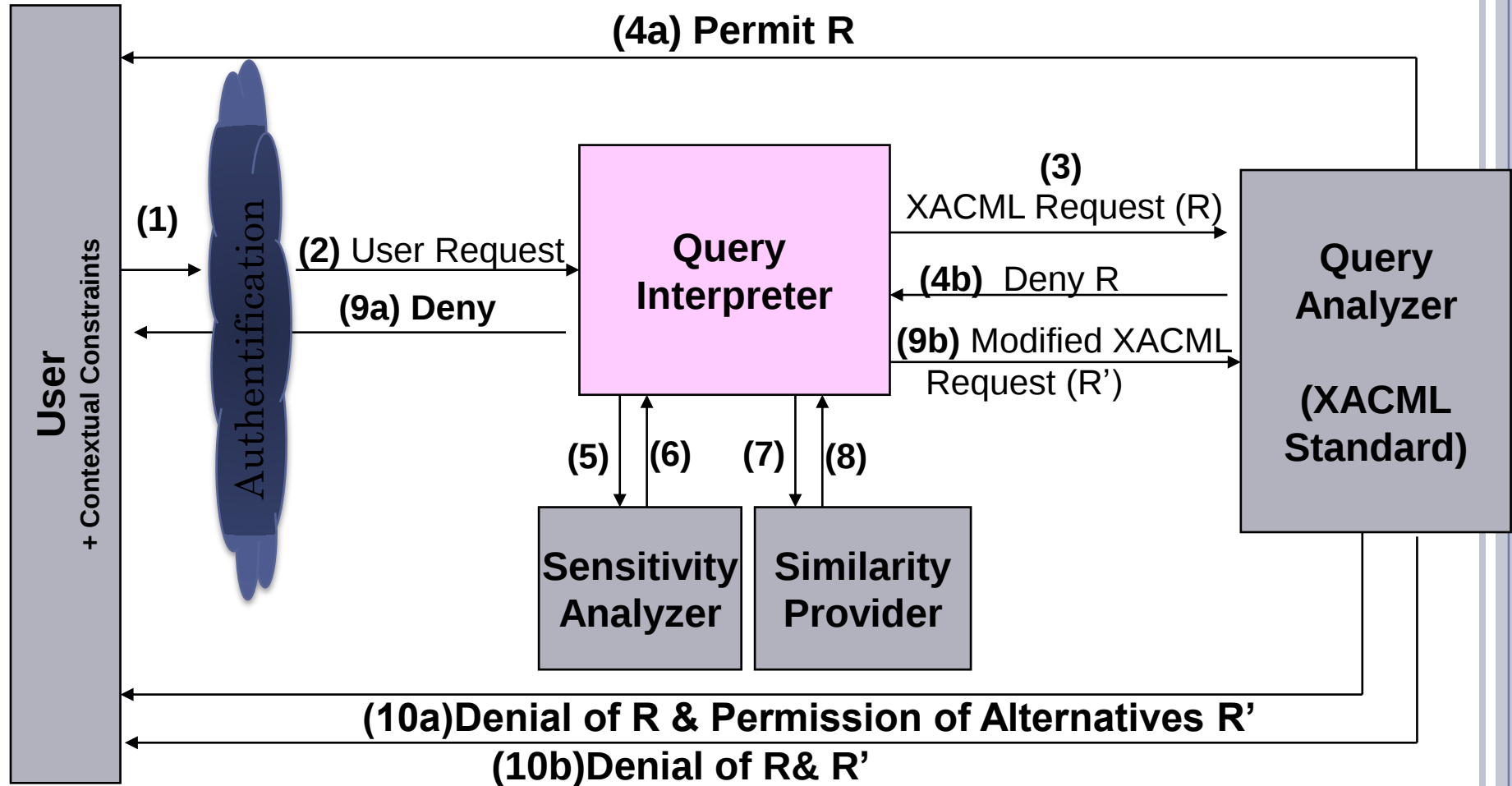
XACML & QUALITY OF SERVICE

System perspective

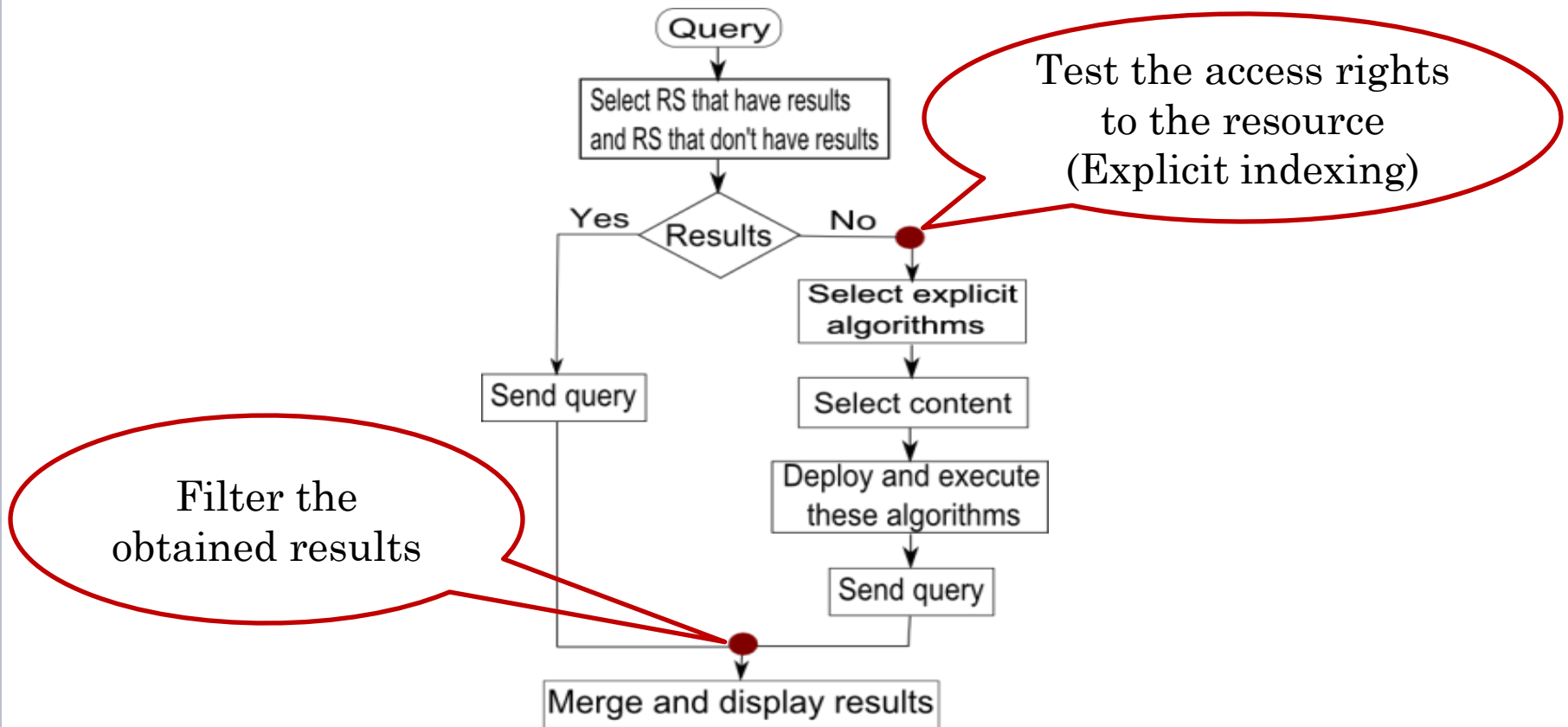
User perspective



THE PSQRS (PERVASIVE SITUATION-AWARE QUERY REWRITING SYSTEM)



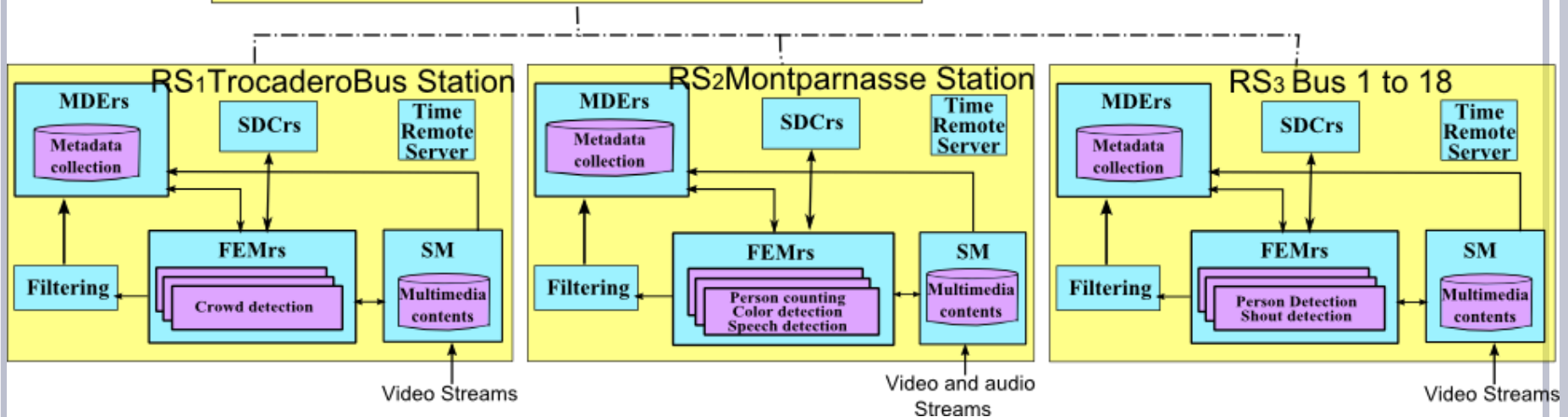
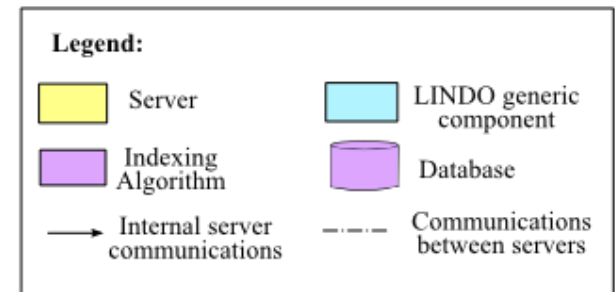
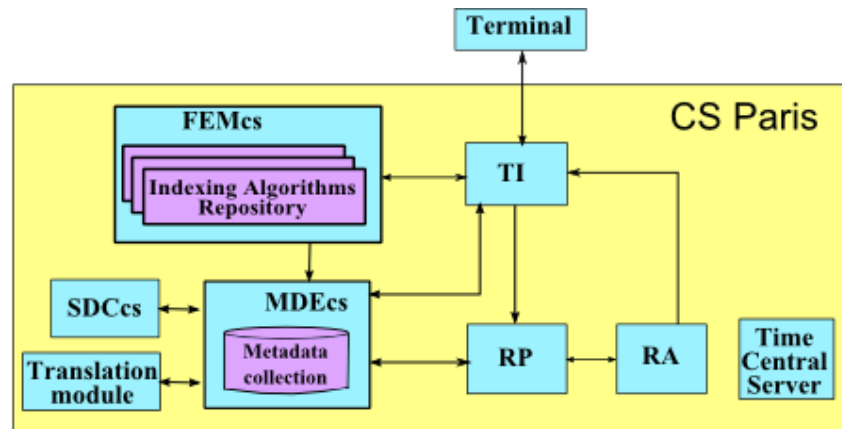
THE INSERTION OF THE PSQRS IN THE LINDO QUERY PROCESSING



VIDEO SURVEILLANCE USE CASE

- Concerns a **public transportation company**, that has placed surveillance cameras in their buses, around the bus stations and the bus ticket machines.
- Each video stream is recorded with a **real time** association to a common time stamp and GPS location.
- Not only the content is mobile, but also the user is mobile
- Several level of emergency have to be treated.
- Privacy constraints have to be taken into account.
- Some access rights:
 - A security agent, when he is out of the control room, has **not the right to see passengers' faces** nor **to execute the explicit indexation**

VIDEO SURVEILLANCE USE CASE

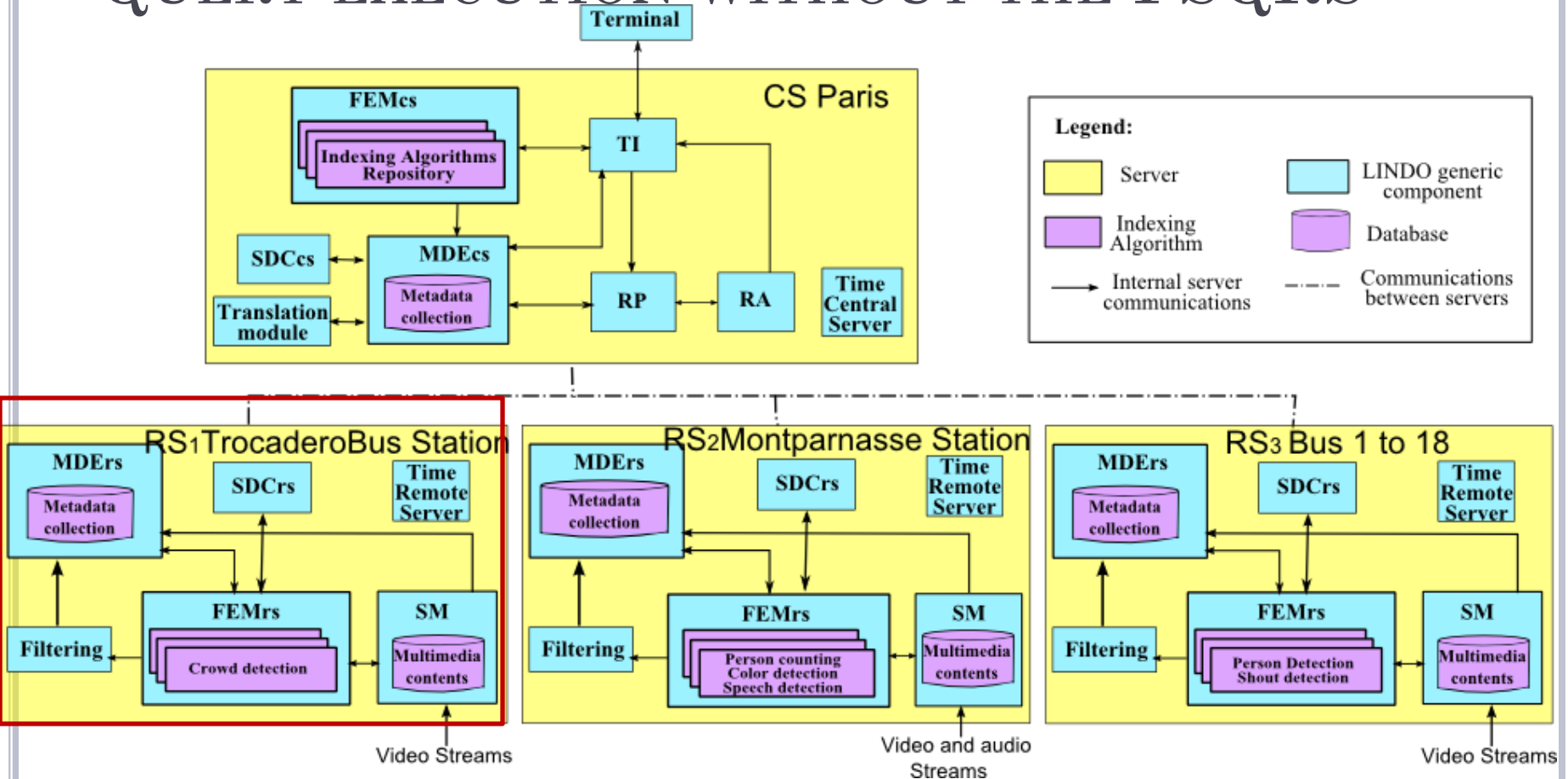


SITUATION EXAMPLE

- Taking the bus from « Trocadéro » station to « Place d'Italie » station at 14:15, Helen has forgotten her red bag on a bench at the waiting line. She contacted an security agent in the station in order to report the problem.
- On his PDA, the agent:
 - Creates an incident report (with the emergency level=1)
 - Executes a query

```
<UserQuery>
<QueryInText> find all videos containing a red bag,
forgotten in Trocadéro, Paris station, on Friday, 31
August, between 2:00pm and
3:00pm.</QueryInText>
<MediaLocation>Bus station, Paris, Trocadéro
</MediaLocation>
<MediaFormat>Video</MediaFormat>
<TimeSpan>
<From>2012-08-31T14:00:00</From>
<To> 2012-08-31T15:00:00</To>
</TimeSpan>
</UserQuery>
```

QUERY EXECUTION WITHOUT THE PSQRS



Query: find all videos containing a red bag, forgotten in Trocadéro, Paris station, on Friday, 31 August, between 2:00pm and 3:00pm.

QUERY EXECUTION WITHOUT THE PSQRS

○ Conclusions:

- The explicit indexation is not realized
- The results containing passengers faces are eliminated from the returned list
- If the same request is executed by the agent from the control room :
 - The explicit indexation is accomplished
 - The results will be displayed to the user

EMERGENCY SITUATION

- A parent is reporting to an officer in the Trocadéro station that his boy wearing red shirt and a blue backpack has disappeared from the station.

- On his PDA, the agent:
 - Created an incident report (with the emergency level=5)
 - Executed a query

```
<UserQuery>
<QueryInText>Find all videos containing a boy
wearing a redshirt and a blue backpack in
Trocadero station, on Friday, 31 August, between
10:00am and 4:00pm
</QueryInText>
<MediaLocation>Bus station, Paris, Trocadéro
</MediaLocation>
<MediaFormat>Video</MediaFormat>
<TimeSpan>
<From>2012-08-31T10:00:00</From>
<To> 2012-08-31T16:00:00</To>
</TimeSpan>
</UserQuery>
```

THE PSQRS ADAPTIVE SOLUTIONS

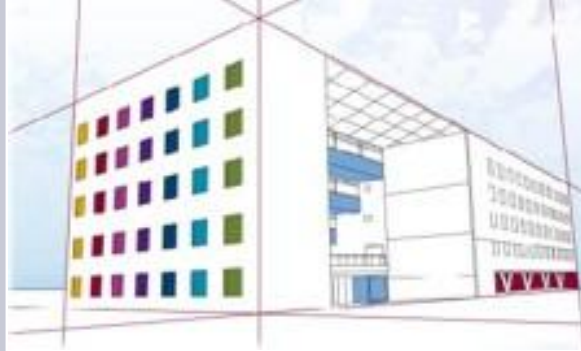
- For each level of emergency, a different strategy can be accomplished:
 - For level 5: the access to the resources is restored
 - For the other levels: adaptive solutions are applied

Problem	The adaptive solution
The privacy law imposing the protection of anonymity of audiovisual contents	
Passenger faces are not authorized	Display the content after the execution of an algorithm that applies a blur face function.
Voices are not-authorized	Use an algorithm for speech-to-text transcription

- For each specific location different adaptive solutions can be adopted.

CONCLUSIONS & FUTURE WORK

- We have
 - Presented an adaptive approach for access control management within multimedia distributed systems.
 - Overcome the access denials that take place in real time access demands by providing adaptive solutions to bypass the access control constraints.
 - Validated the proposal within the LINDO framework in the context of a video surveillance use case.
- We will:
 - extend our proposal by taking into account different contextual elements that might also influence the accessibility to multimedia content
 - apply the adaptive process not only at the presentation level but also at the choice of the explicit indexing algorithms that are protected by RBAC constraints.



CNRS - INPT - UPS - UT1 - UTM



Institut de Recherche en Informatique de Toulouse



**THANK YOU FOR YOUR
ATTENTION!**

Ana-Maria.Manzat@irit.fr