Towards a Dynamic and Extensible Middleware for Enhancing Exhibits

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Outline

- **Context : Interactive exhibits**
- **Motivations**
  - **functional and non-functional**
- **Proposition**
- **Architecture**
- **Conclusion**

Interactive exhibits

- **State of the Art**
  - Audio Guide
  - Passive RFID badge +/- ZigBee sensors
- **During the visit & Afterwards**

- **But**
  - Device ownership cost
    - loan, maintenance, theft, …
  - **Lack of personalization**
  - Lack of feedback to the scenographer
  - Dedicated software

New handhelds

- Consumer Electronic industry sell billions of personal interactive devices
  - iPhone, Android smartphones (Google' Nexus 1), …

- Near-Field Communication (NFC)
  - Over 50% of Japanese phones can read RFID tags

Motivations
Functional requirements

- Visitor : Enhance his experience
  - Use his personal handset
    - No ownership cost for the museum
  - Collect and exchange bookmarks on museum' pieces of art
  - Annotate the pieces of art (blog, twit, …)
  - Personalization of the scenography according to his profile and to the context

NFC-enabled phone

NFC marker

NEC Museum

Questionary
Survey:
Tell us how was you visit
Quality the museum:
1
2
3
4
5
Comments:

Options   Sélect.   Save

adele

Motivations (continued) Functional requirements

- Exhibit Designer/Scenographer
  - Get feeback from the visitor ASAP and analyze it ASAP
    - Data mining on the visitors paths, visitors answers, …
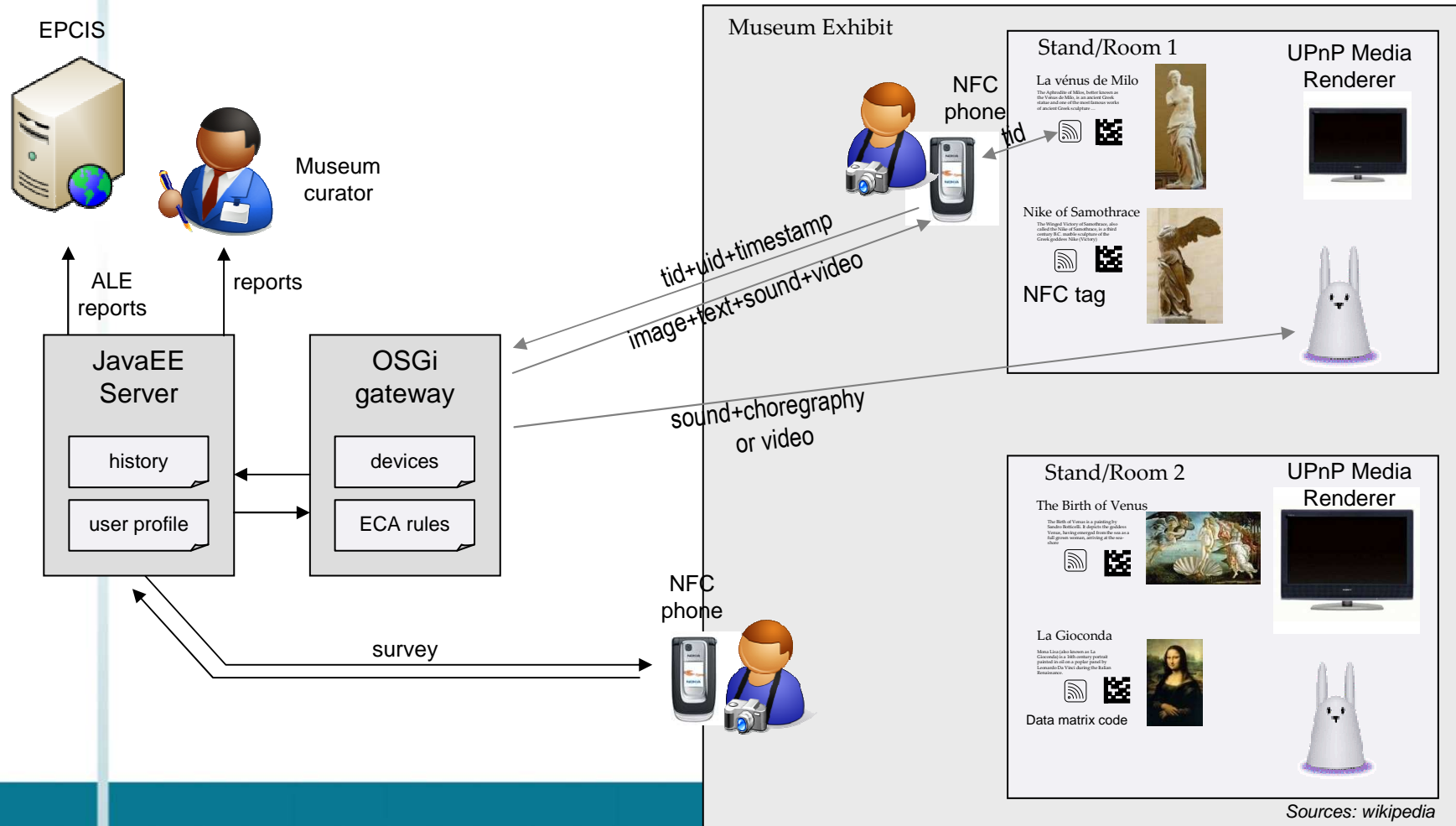 - Adapt the exhibit if necessary

Motivations (continued)
Non functional requirements

- Reuse general-purpose SW design patterns
  - Touch-and-collect, Event Condition Action, …
- Reuse (robust) generic middlewares instead of *dedicated* softwares
  - Time-to-Market
  - Software quality
- Enable dynamic changes
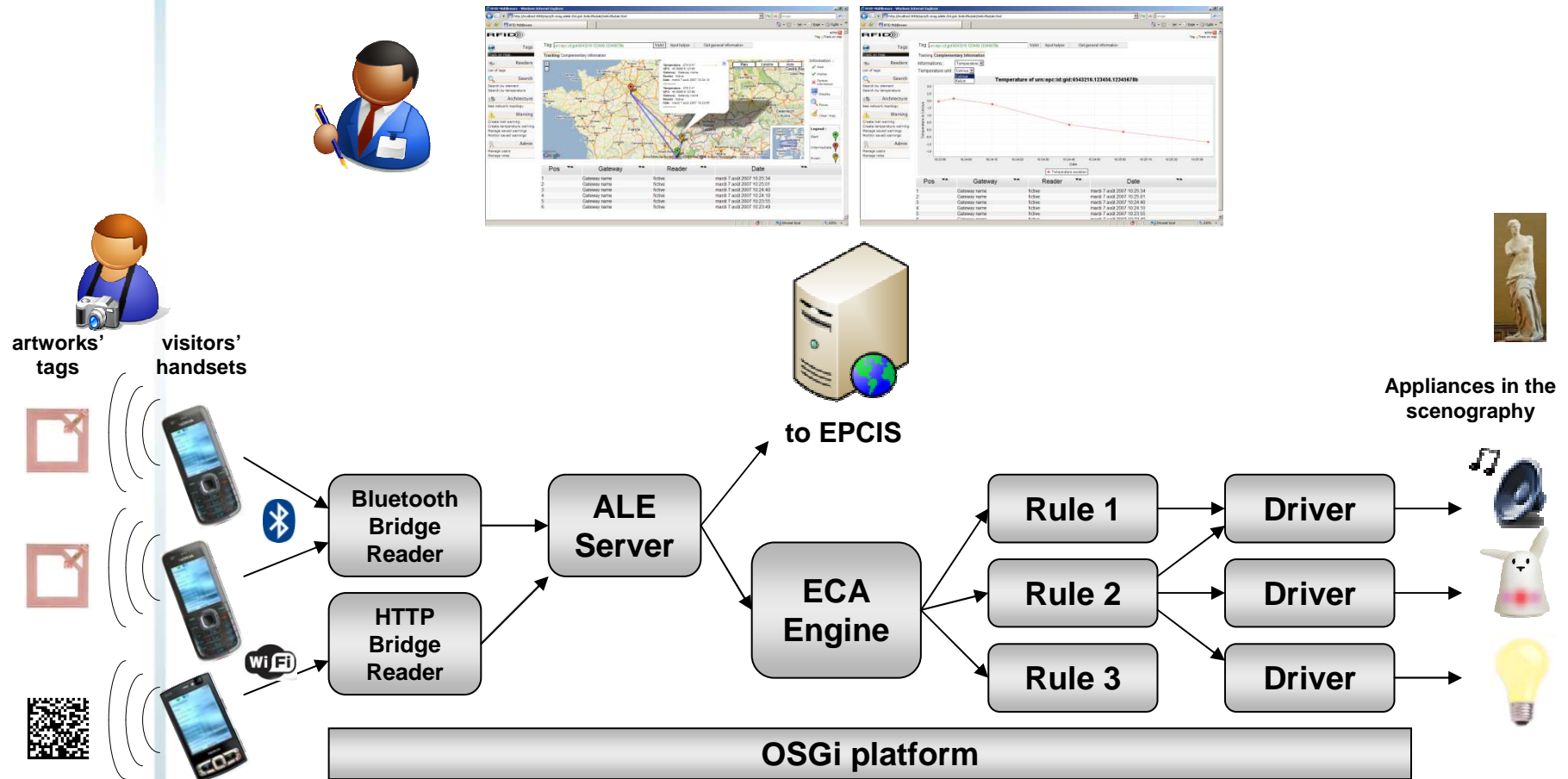 - Add new actuators in a scene

Our proposition

- Provides a generic and flexible middleware for enhanced exhibit (SW) development
- Implementation relying on well-known specifications
  - EPC Global specifications (ALE, EPCIS)
  - NFC Forum specifications (NDEF RTD)
 - OSGi and JavaEE platforms

Global Architecture

EPCIS

Museum curator

Museum Exhibit

Stand/Room 1

La vénus de Milo

The Aphrodite of Milos, better known as the Venus de Milo, is an ancient Greek statue and one of the most famous works of ancient Greek sculpture ...

NFC phone

tid

UPnP Media Renderer

Nike of Samothrace

The Winged Victory of Samothrace, also called the Nike of Samothrace, is a third century BC marble sculpture of the Greek goddess Nike (Victory)

NFC tag

ALE reports

reports

JavaEE Server

history

user profile

OSGi gateway

devices

ECA rules

tid+uid+timestamp

image+text+sound+video

sound+choregraphy or video

NFC phone

survey

Stand/Room 2

The Birth of Venus

The Birth of Venus is a painting by Sandro Botticelli. It depicts the goddess Venus, having emerged from the sea as a full grown woman, arriving at the sea-shore

UPnP Media Renderer

La Gioconda

Mona Lisa (also known as La Gioconda) is a 16th century portrait painted in oil on a poplar panel by Leonardo Da Vinci during the Italian Renaissance.

Data matrix code

Sources: wikipedia

Detailed Architecture

artworks' tags **visitors' handsets**

to EPCIS

Appliances in the scenography

Bluetooth Bridge Reader → ALE Server

HTTP Bridge Reader → ALE Server

ALE Server → to EPCIS

ALE Server → ECA Engine

ECA Engine → Rule 1 → Driver

ECA Engine → Rule 2 → Driver

ECA Engine → Rule 3 → Driver

OSGi platform

Markers

- **NFC Tags**
  - ISO 14443 A/B
  - NFC Forum NDEF RTD
    - for Smart Poster (Text+URL)
    - for Bluetooth/WiFi pairing
    - for Geolocation
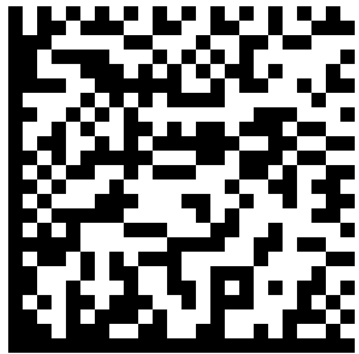- **Datamatrix (the backup solution)**
  - URL
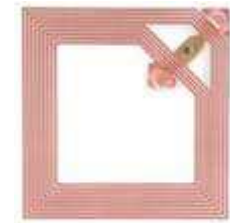
Conclusion & Perspectives

- Shorten development time
  - Experiment on a basic exhibit
    - 2 profiles and 2 langues
  - Some new SW patterns were found

- Invivo validation
  - exhibit in Grenoble (2010Q4)
  - Study reporting

- Part of the open-source OW2 Aspire project
  - Funded by EU

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Bonus Track

EPC Global Architecture