TOWARDS AN INTEROPERABLE DEVICE PROFILE CONTAINING RICH USER CONSTRAINTS

Cédric Dromzée
LIUPPA / AEXIUM SAS
29 rue des Pins
F-40230 Saubion
dromzee@aexium.com

Sébastien Laborie
LIUPPA/T2I – University of Pau
2, Allée du Parc Montaury
F-64600 Anglet
Sebastien.Laborie@univ-pau.fr

Philippe Roose
LIUPPA/T2I - University of Pau
2, Allée du Parc Montaury
F-64600 Anglet
Philippe.Roose@univ-pau.fr
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HETEROGENEOUS ENVIRONMENTS

Device heterogeneity

Document heterogeneity

Execution context
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Limitations:
• Adaptation “implicit”
• No portability
• No genericity
• No explicit constraints

Our proposition

SEMANTIC GENERIC PROFILE (SGP)
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**SUMMARY**

**CONTEXT & PROBLEMS**

1. RELATED WORK

2. FACETS AND CONSTRAINTS

3. THE SEMANTIC GENERIC PROFILE (SGP)

4. DEMO

5. FUTURE WORK

6. CONCLUSION
RELATED WORK
Profile modeling approaches

- CC/PP - Composite Capability / Preference Profiles
- UAProf
- CSCP Comprehensive Structured Context Profiles
- Context-ADDICT
- WURFL Wireless Universal Resource File
- SPICE Service Platform for Innovative Communication Environment
- PPDL Pervasive Profile Description Language
- CCML Centaurus Capability Markup Language
- E²R
- MAGNET Beyond
Profile structures tend to be:

- Not extensible (yet their vocabulary needs extending)

- Domain specific (limited to one set of aspects of the context)

- Purely descriptive:
  - screen resolution, CPU Power, codecs...

- Lacking in richness (not explicit constraints):
  - no sound if the ambient noise level is high
FACETS AND CONSTRAINTS
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**Multi-Facet**

- **Contextual facet**
  - Context
  - Neighbors
  - Languages
  - Location

- **Document facet**
  - Document
  - Temporal
  - Text
  - Video
  - Audio

- **Hardware facet**
  - Hardware
  - Sensor
  - Characteristic
  - Screen
  - Type

**Facets and Constraints**
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Services

Context

Hardware

Screen

Luminosity

Battery

Provided Data

Out: 15

Required Data

In: 70
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CONRAINTS WITH PRIORITIES

getUserID()

Context

UserID

Out:

John

Constraint1

OR

<Document>

<SetTextLanguage(French), 1>

<SetTextLanguage(English), 0.8>

<TextLanguage>

Text

Media

In:
THE SEMANTIC GENERIC PROFILE
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UML modeling of our Semantic Generic Profile (SGP)
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SGP profiles encoded in RDF/XML

```xml
<?xml version="1.0"?>
  <sgp:Profile rdf:about="http://SGP#Profil_1">
    <sgp:name>John's profile</sgp:name>
    <sgp:describes>
      <sgp:Facet rdf:about="http://SGP#Hardware">
        <sgp:contains>
          <sgp:Service rdf:about="http://SGP#Screen">
            <sgp:contains>
              <sgp:Service rdf:about="http://SGP#ScreenResolution">
                <sgp:in>
                  <sgp:InputFunction rdf:about="http://SGP#SetScreenResolution">
                    <sgp:param rdf:datatype="http://www.w3.org/2001/XMLSchema#string"/>
                  </sgp:InputFunction>
                </sgp:in>
                <sgp:out>
                  <sgp:OutputFunction rdf:about="http://SGP#GetScreenResolution">
                    <sgp:return rdf:datatype="http://www.w3.org/2001/XMLSchema#string"/>
                  </sgp:OutputFunction>
                </sgp:out>
              </sgp:Service>
            </sgp:contains>
            <sgp:contains>
              <sgp:Service rdf:about="http://SGP#ScreenLuminosity">
                <sgp:in>
                  <sgp:InputFunction rdf:about="http://SGP#SetScreenLuminosity">
                    <sgp:param rdf:datatype="http://www.w3.org/2001/XMLSchema#string"/>
                  </sgp:InputFunction>
                </sgp:in>
                <sgp:out>
                  <sgp:OutputFunction rdf:about="http://SGP#GetScreenLuminosity">
                    <sgp:return rdf:datatype="http://www.w3.org/2001/XMLSchema#string"/>
                  </sgp:OutputFunction>
                </sgp:out>
              </sgp:Service>
            </sgp:contains>
          </sgp:Service>
        </sgp:contains>
      </sgp:Facet>
    </sgp:describes>
  </sgp:Profile>
</rdf:RDF>
```
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WHY RDF?

- Resource Description Framework (RDF)
- W3C Standard, 2004
- Semantic Web Technologies
- Active community

Motivation for this choice:

- Aggregations of descriptions
- Semantic concepts (ontologies)
- Frequently used by other approaches (CC/PP, UAProf, CSCP)
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DEVICES

JENA Library
SPARQL queries
SGP profiles (RDF/XML)

**Two platform:**

**Configuration 1:**
- Laptop
- Windows 7 (x64)
- 6GB of RAM
- i7-2630QM quadruple core processor (2 GHz).

**Configuration 2:**
- Tablet: Samsung Galaxy Tab 10.1
- Android 3.2
- 1 GB of RAM
- double core Tegra 2 processor (1 GHz).
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**EXPERIMENT**

**EXECUTION TIME QUERIES**

**ANDROID**

**WINDOWS**

 execution time (m.s.)

 SPARQL QUERIES REPEATED LOOPS
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SGP SIZE

**Execution time of 100 queries (m.s.)**

- **ANDROID**
  - Peak at around 500 triples
  - Generally increasing trend

- **WINDOWS**
  - Steady and low throughout
  - Approximately 50-70 m.s.

**Number of triples**

Range: 0 to 120
FUTURE RESEARCH DIRECTIONS
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SGP environment

Initial document  Adapted document

Adaptations Processes

SGP Framework

Others Profiles

A1  A2  A3  A4

SGP  OWL

CSCP  CC/PP  UaProf  OS  WURFL
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CONCLUSION

Our Goals:
• Describe multiple profile informations
• Model real-life user constraint
• A multi-platform profile

Our proposition:
• Facets: Device, document, context
• Explicit constraints
• Service-based

GENERIC
EXPRESSIVE
PORTABLE
SPARQL Queries

SPARQL

- RDF query oriented language
- retrieve and manipulate data stored in RDF descriptions
- standard by the RDF Data Access Working Group (DAWG) of the W3C
- key technologies of the Semantic Web

```sparql
PREFIX sgp: <http://SGP#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

SELECT * WHERE {?x ?y ?z .}
```

```sparql
PREFIX sgp: <http://SGP#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

SELECT * WHERE {?S rdf:type sgp:Service .}
```

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```

Query R1. List all triples

Query R2. SGP services list query

Query R3. List of services that could provide some data
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