The Negotiation of Multimedia Content Services in Heterogeneous Environment

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Introduction and Objectives

• With the explosive growth of computing technology, multimedia services (audio, video, animation, etc.) become necessary for most of the actual applications.

• By 2002, 75 % of web document viewing will be through non-desktop devices like palm computers, televisions, and other alternative platforms.

• The actual multimedia systems, include a wide range of clients which are subject of many constraints such as:
  » Low power
  » Small user interface
  » Small storage and processing capacities
  » Limited access to the network
  » Risks of data
**Problem**

*How can we allow different clients to access and to (re)use efficiently the network content?*

User1: Marjorie  
User2: Manon
• **Ensure a negotiation strategy is equivalent to:**

  • 1- Reply to all the diversity of users contexts that exists:
    * Consider different constraints posed by the user agents set.
  • 2- Determine the target format of the service in terms of selected modules.
  • 3- Determine the transformations to apply.
  • 4- Support context changes according to:
    * Client
    * Application
    * Environment (network, etc.)
The client profile

• The client profile describes resources and capabilities of the user.

• The CC/PP model represents an efficient tool to ensure such description.

• A CC/PP profile describes client capabilities and preferences in terms of a number of "CC/PP attributes" for each component.

• A CC/PP profile can include, for example, the three main components:
  • The software plate-form upon which all applications are hosted
  • The hardware plate-form upon which software is executing
  • The individual application used by the client, such as a browser or a player
An example of a Client Profile

```
[ClientProfile]
|
+--ccpp:component-->[TerminalHardware]
|
|                   +--rdf:type--> [HardwarePlatform]
|                   .   +--display----> "320x240"
|                   
| [UADefault]
| |
| +--rdf:type--> [BrowserUA]
| +--name-------> "WinWAP"
| +--version----> "3.0.4.179"
| +--vendor------> "Slob-Trot Software Oy Ab"
| +--wmlVersionSupported--> [ ]
| |
| | +--rdf:type--> [rdf:Bag]
| | +--rdf:_1----> "1.2"
| +--ScriptsSupported----> [ ]
```
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Document Profile or service

- The concept of a document profile is complementary to the user profile.
- A document profile specifies the syntax and semantics of a document or a collection of documents (DTD or document type)
- The central aspect of this approach is the definition of elementary functionality required for the rendering of multimedia services.

Profile 1

<table>
<thead>
<tr>
<th>Document 1</th>
<th>Profile 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document 2</td>
<td>Profile 2</td>
</tr>
<tr>
<td>Document 3</td>
<td>Profile 3</td>
</tr>
<tr>
<td>Document 4</td>
<td>Profile 3</td>
</tr>
<tr>
<td>Document N</td>
<td>Profile N</td>
</tr>
</tbody>
</table>

Profile = {functionalities set}
The modularization principle

- **Objective:**
  
  resolve the heterogeneity problem and respond to adaptability needs

- A module represents a description of a set of functionalities. It can be seen as the basic element of a profile

- The modularization allows to support new devices and applications, by defining subsets of modules and recombining them
SMIL and the Modularization

- **SMIL 2.0:** Covers a wide diversity of functionalities that can exist in a multimedia document.
- A language profile must include its basic modules and all the modules on which depends other included modules.
- **SMIL Basic:** Consists of a reduced subset of the full SMIL modules, which offer a common core more generic especially for contexts which impose many constraints like PDA, wap phones, etc.
The negotiation strategy

• Must end to a consensus between the content server and the client that initiates the request.

Basic initial steps

1- Creation of profiles on the servers of content, i.e. profiles of the content susceptible to be used by client. Tool: SMIL+CC/PP

2- Preparation of profiles on the client side, i.e. profiles of different user agents. Tool: SMIL+CC/PP

3- Enrich the server environment by adaptation methods. Tool: adaptation methods: XSLT + other transformation programs
The negotiation layer

- Documents Authoring
- Definition of transformation and adaptation methods
- Apply document selections
- Help the transformation
- Services Demandes
- Requests of Negotiation
- The deliverance of services
- Clients
Principle

The delivered content:

1- mustn’t include an unsupported functionality according to the client profile

2- must cover the maximal supported functionalities

• Client side: The client supports the following atomic functionalities: \{X,Y,Z\}
• Server side: The server content is described by: \{Y\},\{X,Y\},\{X,Y,Z,T\}

* It’s clear that the use of the content described by \{X,Y,Z,T\} is not permitted, because the T module isn’t supported.
* The use of the content \{Y\} isn’t preferable, because we have another content which covers more supported functionalities

• The best negotiation strategy ends to the deliverance of the content having as profile \{X,Y\}
The ‘TL Evaluation’

- We use in our approach, a profiles evaluation method that we call “TL Evaluation”: Tailored Level evaluation.

- Allows selection and evaluation of profiles usable by a client and ordering them according to a priority level and constraints that can change.
• The evaluation used in our approach is based on the following priority order:

<table>
<thead>
<tr>
<th>Priority order used in profiles selection and evaluation</th>
<th>Intern order according to the value of considered parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profiles which have the same set of supported modules</td>
<td>Number of Required, but not existing, modules</td>
</tr>
<tr>
<td>Profiles which have less than the required modules, and doesn't include non-supported modules</td>
<td>Number of non-supported modules</td>
</tr>
<tr>
<td>Profiles which have at least a non-supported module</td>
<td></td>
</tr>
</tbody>
</table>
Requests formats

Client request

Client Identifier | Server Identifier | Document Identifier | User Agent Supported Functionalities | User Agent Preferred Functionalities

Client reply

Client Identifier | Server Identifier | Document Identifier | Selected Profile

Server Request

| Client Identifier | Server Identifier | Document Identifier | Profiles Set

Server reply

| Client Identifier | Server Identifier | Document
Overall view: Client

- Determine actual user agent supported functionalities;
- Determine actual user agent preferred functionalities;
- Determine document server;
  - Send \((\text{Client\_Request})\) to \text{Content Server}\;

  ---- After receiving server reply ----

- Select the best profile of the server proposed profiles:
  \[\text{Selected Profile} = \text{TL\_evaluator} (\text{server set, client constraint profile});\]

- Send \(\ldots\) Service identifier, Selected Profile, \(\ldots\) to server;

  ---- After receiving server reply:

  \(\text{client identifier, server identifier, D: document}\) ----

- If \(D\) is not empty then use the service;
--- When receiving a client request ---
Determine the supported and preferred modules (USP)

- Determine existing profiles that respond to supported functionalities:
  \[ TL\_evaluator(\text{Supported functionalities, server profiles}) \]
- Add profiles after applying existing transformations methods:
  \[ TL\_evaluator(\text{Supported functionalities, profiles after adaptation}) \]

- Apply further evaluation according to:
  - 1- client preferences: \[ TL\_evaluator(\text{profile set, USP}) \]
  - 2- server & network constraints:
    \[ TL\_evaluator(\text{profile set, Server constraints}) \]

- Send result profiles to the client
--- After receiving the client reply ---
• If the selected profile “SP”, is directly available:
  • Send the service having as profile SP
• Else: find the adaptation method “t” that corresponds to “SP”:
  • Apply t to the service denoted by the document identifier
  • Save the document profile (optional)
  • Save the service version (optional)
  • send the adapted document

send(Client Identifier, Server Identifier, Document) to Client;
Conclusion

• The problem posed by the Web, is that its content is made to be used in the classical model by desk top PCs

• An adaptation and negotiation architecture aims to allow small and limited devices such as: cell phones, personal device assistants, workstations etc. to access to multimedia services

• XML and related tools represent a good model to guarantee such architecture

• In a multimedia system, the negotiation permits to orient the adaptation process to offer the best service to clients

• The negotiation strategy that we have proposed:
  • Ensures an efficient opened multimedia system
  • Supports heterogeneity
  • Guarantees the extensibility (support new devices)
  • Supports environment changes (with changing declared profiles)
Future work

• The implementation of an XML protocol of services negotiation covering multiple of existing protocols (WAP, HTTP, etc.)
• Developing an XML-based proxy architecture
• Integrating a SMIL player (developed locally) of the overall architecture
• The enrichment of the server side by adapting methods: XSLT slide sheets (ex: SMIL 2.0 to SMIL Basic and XHTML), transformation programs (ex: HTML to WML, etc.)
• Developing an approach of automatic generation of XSLT style sheets according to client profiles
Thank you
Any questions?

More information on latest news:
www.inrialpes.fr/opera/people/Tayeb.Lemlouma/index.html

Contact:
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WAP Technology

WAP phones use Wireless Markup Language (WML) instead of HTML.

WML is very simple by comparison of HTML, and easy to be automatically created from monitoring scripts.
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[IMAGE: thank you for visiting]