The Negotiation of Multimedia Content Services in Heterogeneous Environment

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Introduction and Objectives

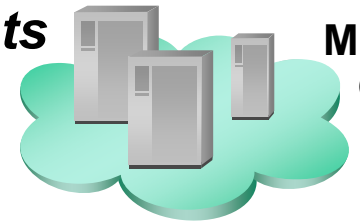
- With the explosive growth of computing technology, multimedia services (audio, video, animation, etc.) become necessary for most of the actual applications.

- 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?



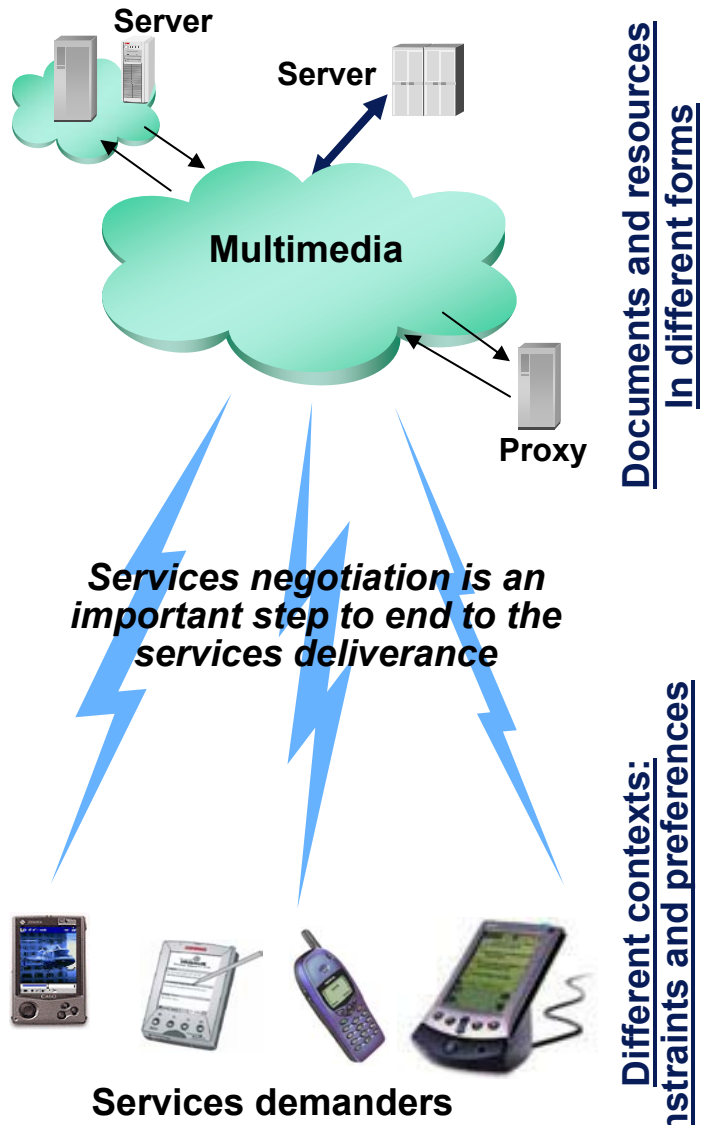
Multimedia content

Multimedia services deliverance

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----> [ ]
```

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

Documents

Document profiles definition

Document 1	} *Profile 1*
Document 2	
Document 3	- *Profile 2*
Document 4	- *Profile 3*
.	.
.	.
.	.
Document N	- *profile N*

Profile

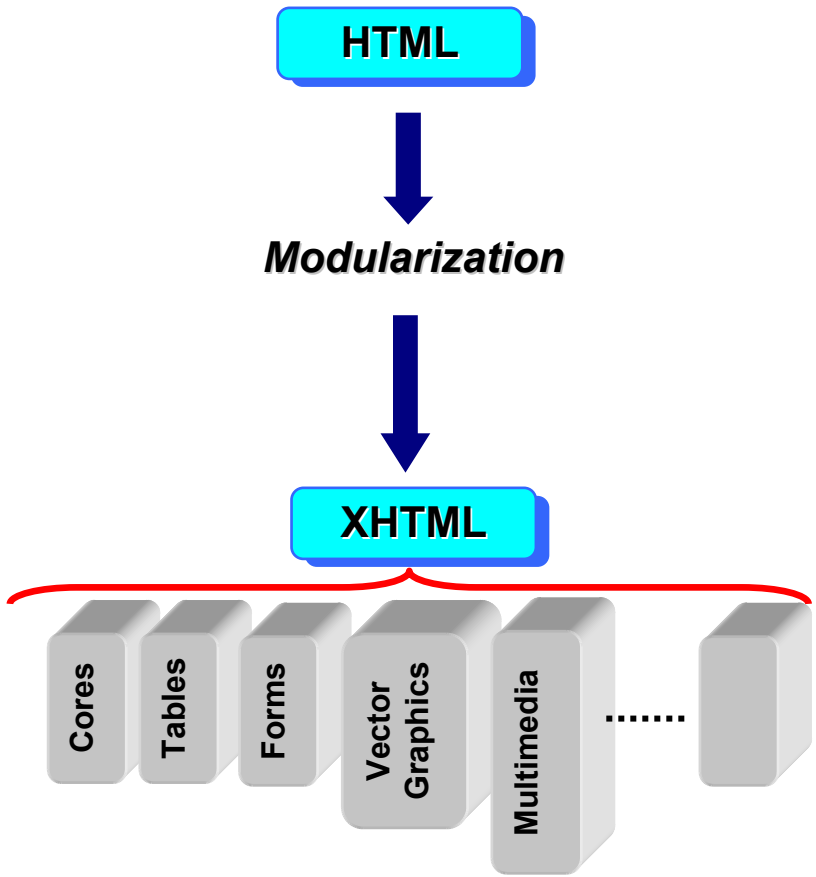
= { functionalities set }

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, bye defining subsets of modules and recombining them

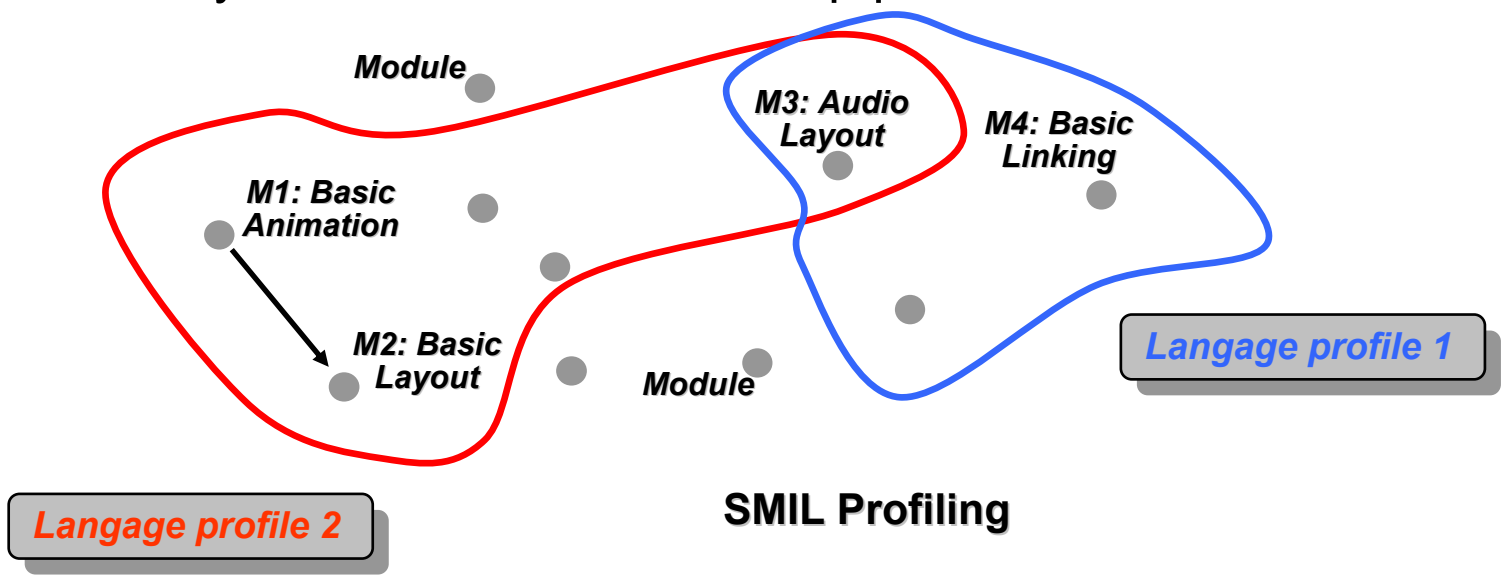


XHTML: An Example of modularization

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.



SMIL Profiling

The negotiation strategy

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

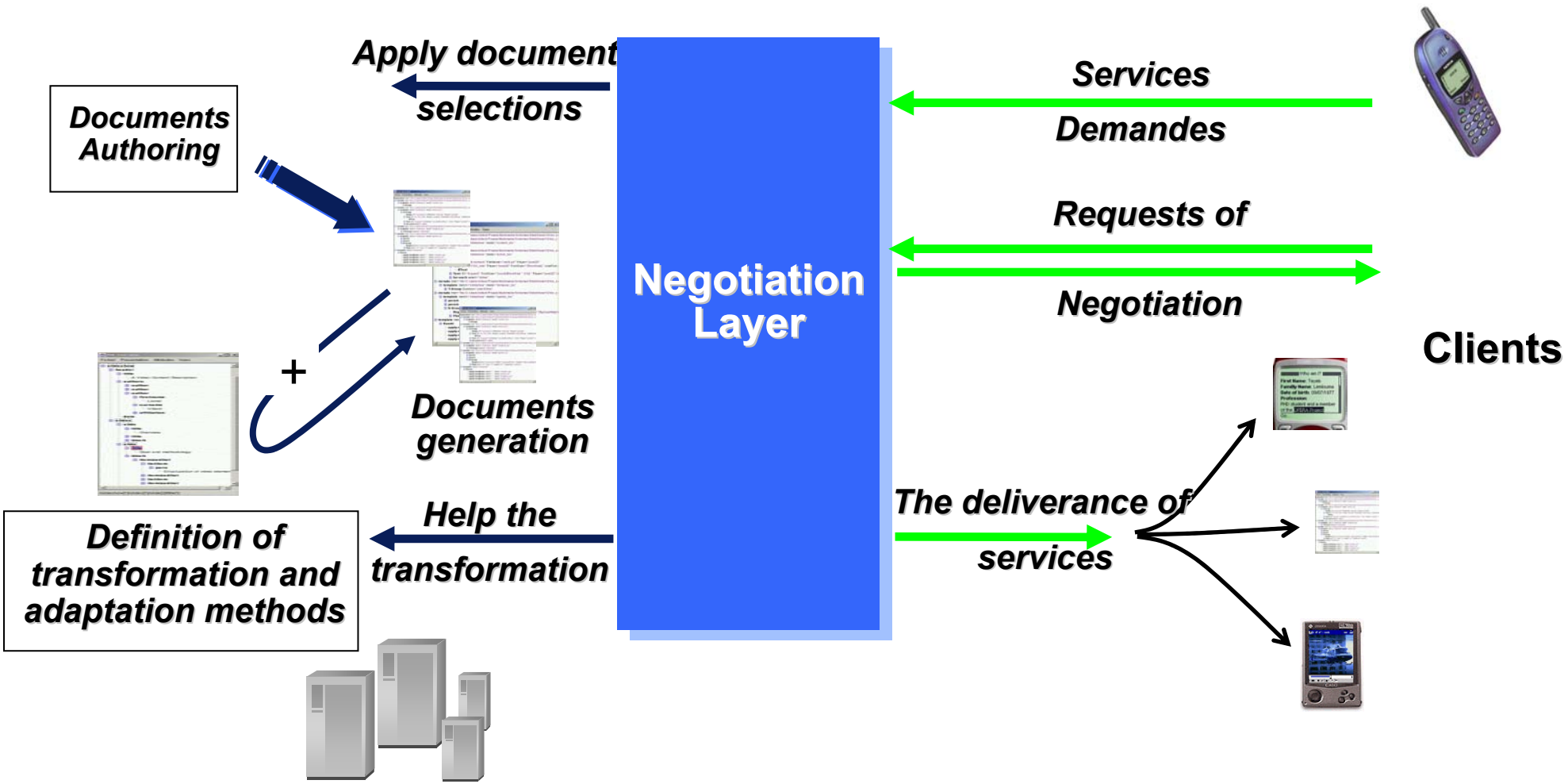
Basic initial steps

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



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

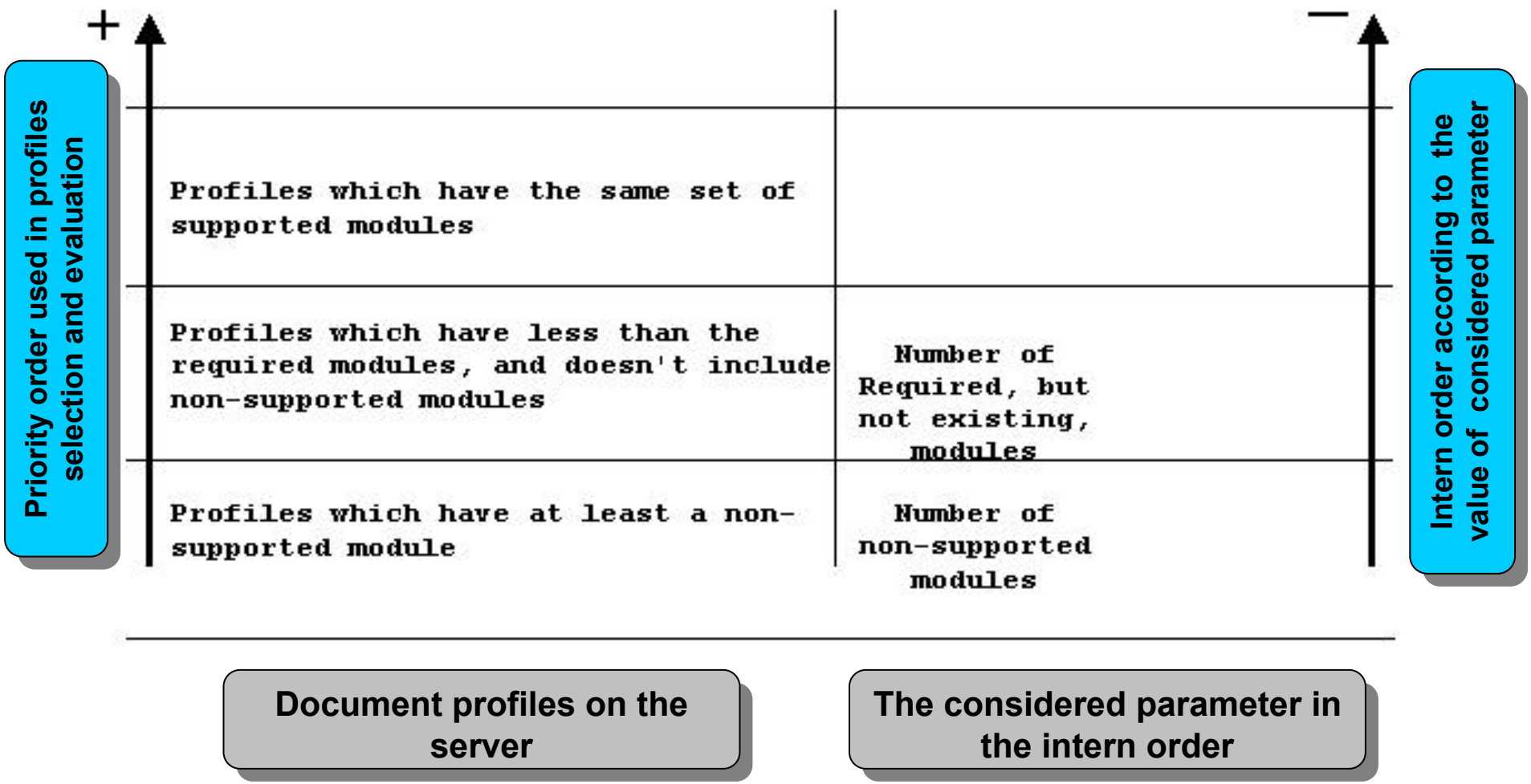
- The best negotiation strategy ends to the deliverance of the content having as profile **{X,Y}**

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 base on the following priority order:



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 (*Client_Request*) to *Content Server* ;

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

- Select the best profile of the server proposed profiles:
  Selected Profile = **TL_evaluator** (server set, client constraint profile);
- Send (. . . Service identifier, Selected Profile, . . .) to server;

---- After receiving server reply :
(client identifier, server identifier, D: document) ----

- If D is not empty then use the service;

Server -1

--- When receiving a client request ---

Determine the supported and preferred modules (USP)

- Determine existing profiles that respond to supported functionalities:

  TL_evaluator(Supported functionalities, server profiles);

- Add profiles after applying existing transformations methods:

  TL_evaluator(Supported functionalities, profiles after adaptation);

- Apply further evaluation according to:
  - 1- client preferences: **TL_evaluator**(profile set, USP);
  - 2- server & network constraints:

    TL_evaluator(profile set, Server constraints);

- Send result profiles to the client

Server -2

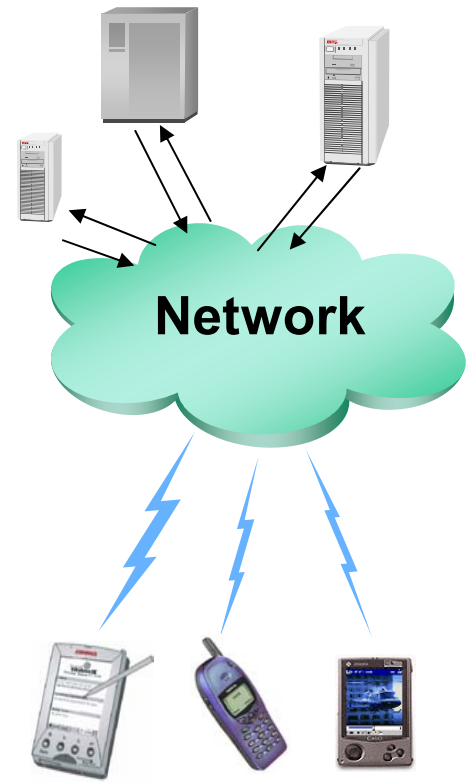
--- After receiving the client reply ---

- 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?

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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

Saviez-vous que les arbres parlent ?
Ils se parlent entre eux et v
L'ennui, c'est q
ils n'ont jamais appris à écouter les Indiens,
aussi je doute qu'ils écoutent les autres voix de la nature.
Pourtant, les arbres m'ont beaucoup appris :
tantôt sur le temps, tantôt sur les animaux,
tantôt sur le Grand Esprit.

Tatanga Mani ou Walking Buffalo,
Indien stoney (1871-1967)

Thank you for visiting this page

ex2.xsl | transfgen.xsl | XML2LaTeX.xsl | t1.smi | HTML2WML.xsl

```
<?xml version='1.0' encoding="iso-8859-1"?>
<xsl:stylesheet xmlns:xsl='http://www.w3.org/1999/XSL/Tr
<xsl:output doctype-public="-//WAPFORUM//DTD WML 1.3//EN

<xsl:template match="html">

<wml>
<card id="main" title="{head/title/text()}" newcontext="
            <xsl:apply-templates select="body/node()" /
        </card>
</wml>
</xsl:template>

<xsl:template match="h1">
<big><b><xsl:value-of select="."/></b></big><br/>
```