Adapted Content Delivery for Different Contexts

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Outline

Introduction

- **Actual multimedia systems become more and more heterogeneous**
- **A wide diversity of devices => Contexts**

- **Displaying capabilities**

- **Access methods**

- **Media support (images, video, text, etc.)**

- **Languages (SMIL, MMS, WML, cHTML, etc.)**

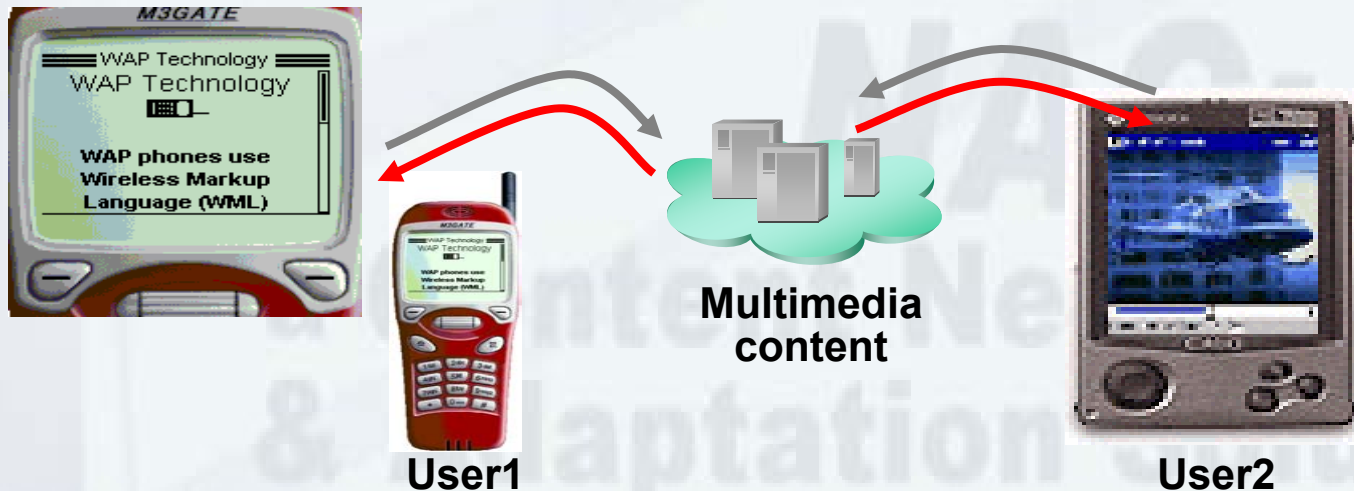- **Protocols: HTTP, WAP, UDP, etc.**

Introduction

Problem: Original content that exist in the server side can not be used directly by all the clients

Need: Adapted content must be delivered according to end <u>user context</u>: preferences and capabilities

A good architecture should ensure:
- Server content adaptation
- Content negotiation according to clients profiles
- Enabling the delivery of one content in different forms

User1

Multimedia content

User2

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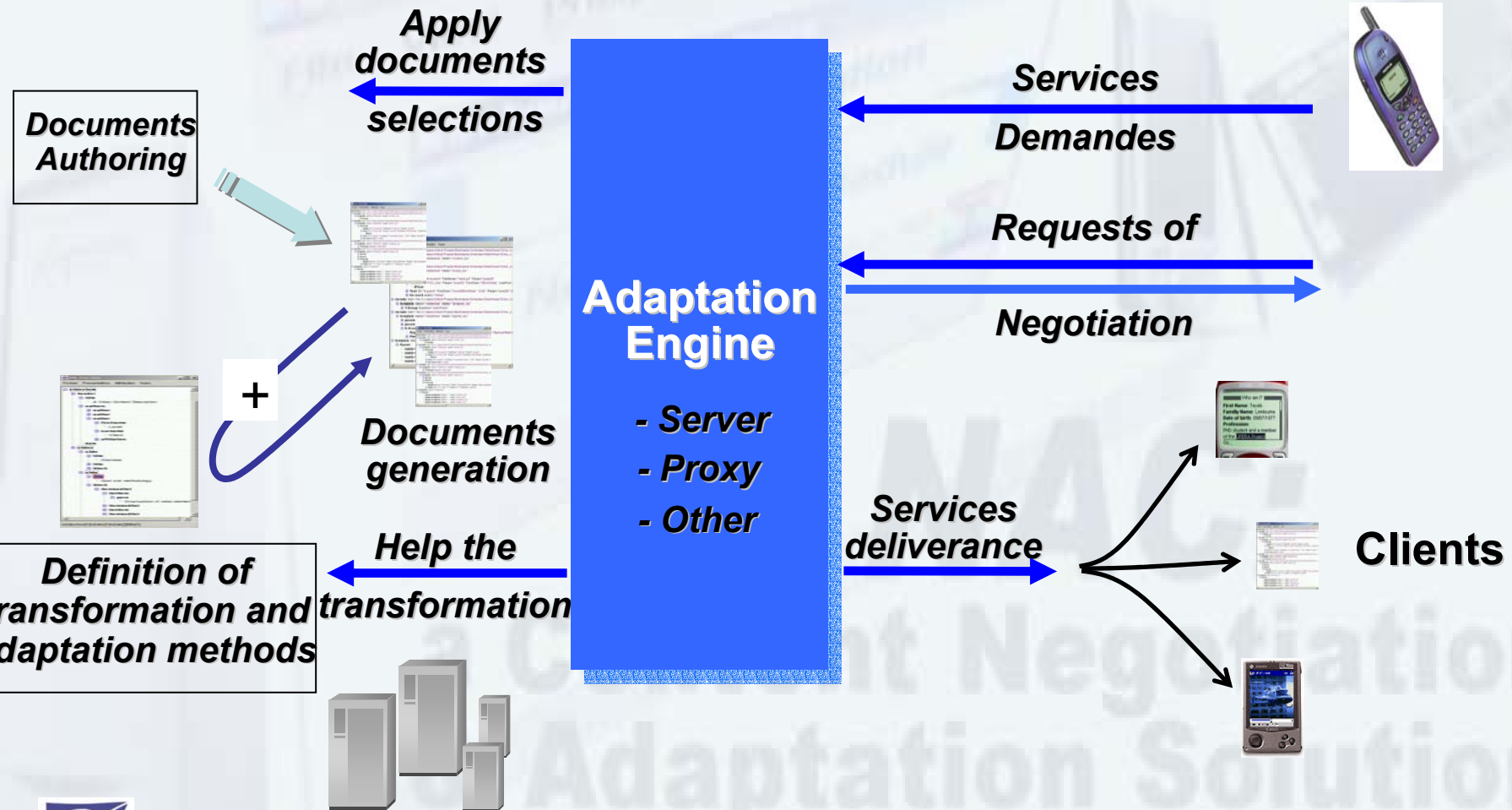
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The Adaptive System

- **A basic solution for multimedia content negotiation and adaptation for heterogeneous systems.**

- **Based on several recent technologies: XML, RDF, CC/PP, SMIL …**

- **Matching and negotiation algorithms are flexible and so the solution can be enriched at any time to meet particular needs**

The Adaptation Layer

Apply documents selections

Documents Authoring

+

Documents generation

Definition of transformation and adaptation methods

Help the transformation

Adaptation Engine

- Server
- Proxy
- Other

Services Demandes

Requests of

Negotiation

Services deliverance

Clients

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Context Description

- ## What is a context ?
  "Any information that can be used to characterize the situation of any entity" (Dey A. K.)

  ## Why?
  - Document context
  - Device context

- ## The absence of useful tools (HTTP limitations)
  ## => UPS schema : CC/PP model and RDF semantic

UPS: Universal Profiling Schema

New framework that completes CC/PP and HTTP for content adaptation

The definition is based on

➤ **CC/PP**: Composite Capabilities/Preference Profiles
http://www.w3.org/2000/07/04-ccpp#

➤ **RDF**: Resource Description Framework
http://www.w3.org/1999/02/22-rdf-syntax-ns#

+

➤ **Extension: Six new schemata
Proper to the Content Negotiation**
http://www.inrialpes.fr/opera/people/Tayeb.Lemlouma/
NegotiationSchema/*03012002#

A Client Profile Example

```xml
<?xml version="1.0"?>
<rdf:RDF          xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
                  xmlns:ccpp="http://www.w3.org/2000/07/04-ccpp#"
     xmlns:neg="http://www.inrialpes.fr/opera/people/Tayeb.
     Lemlouma/NegotiationSchema/ClientProfileSchema03012002#">

<rdf:Description ID="ClientResourcesProfile">

<ccpp:component>
     <rdf:Description rdf:about="TerminalHardware">
     <rdf:type rdf:resource="http://www.inrialpes.fr/...
      HardwarePlatform"/>
               <neg:DeviceName>Ericsson-R320</neg:DeviceName>
               <neg:screen>30x23mm</neg:screen>
               <neg:PixelStretch>1.24</neg:PixelStretch>
               <neg:PhoneNumber>+33610987326</neg:PhoneNumber>
     </rdf:Description>
</ccpp:component>

 <ccpp:component>
               <rdf:Description rdf:about="MultimediaServicesRequierement">

     ……
     </rdf:Description>
</ccpp:component>

</rdf:Description>
</rdf:RDF>
```

Structural Transformations

- From a structure to another: e.g. HTML to WML for mobile phones

- Problem requires one transformation per couple of context:

  > <document context, device context>

- Generic Transformations

  Objective:

  - Minimize the transformation complexity: The number of authored transformation methods
 - Enable automatic adaptation

Ideal Solution

- One transformation method for every:
  <client request, document context, device context>

- The method should be able to adapt any requested document for any target device context

- Very difficult to provide one global transformation due to the High complexity:

(devices complexity) X (clients requests) X (server content)
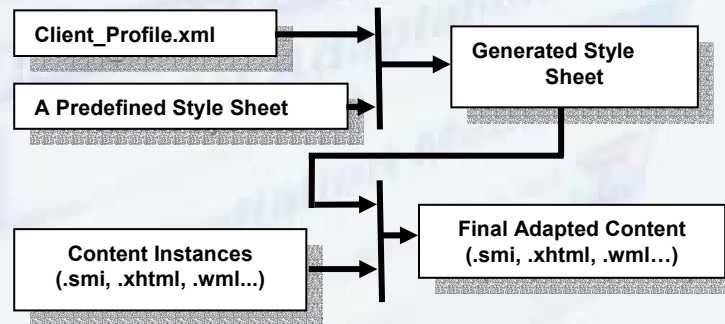
Proposed Solution

- Ensuring generic transformation using a two-step based transformation:

- Generate a transformation *T* for

<requested document, device context>

Client profile   generated transformation
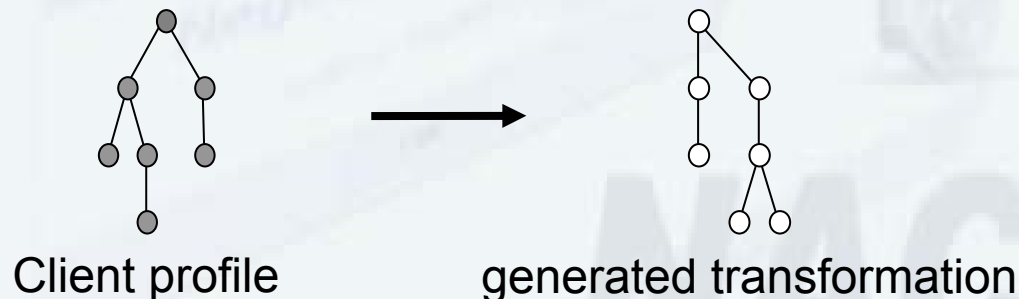
- Apply the transformation on the requested document

Application using XSLT

- Client profile: device context
- Predefined style sheet: a set of generic templates
- Generated style sheet: a set of static templates

Media Transformation

- Includes non structural transformation and applied directly on medias: e.g. image compression, video resizing, etc.

- The client context is considered as:

  "a set of variables that reflect the state of the client capabilities and preferences"

- Context values are taken as input and the corresponding adaptation methods are applied

- Example:

  - Device Context (PDA) ={screen_width = 240, screen_height = 320, … }
  - Content Context (image)= {width = 500, height = 309, …}
  - Applied method = Image resizing from (500,309) to (240,320)

Implemented Architecture

1. **ANM Proxy**
2. **UCM Module**
3. **SMIL Player used for the experimentation**
4. **Adaptation Engine**
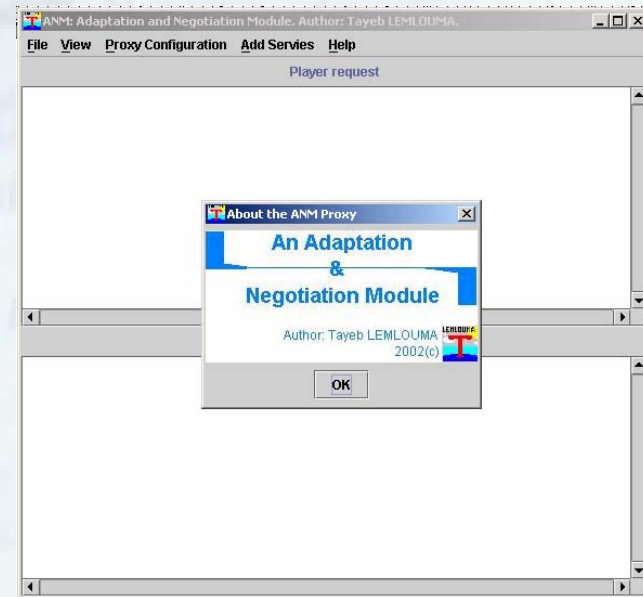
Adaptation Methods

- Allows to transform an original service to another format which matches well client characteristics

1) Can adapt the document structure:
   Example:
   1- Adapting HTML (XHTML) documents to WML for WAP devices
   2- Adapting SMIL 2.0 to SMIL basic (switch evaluation), which can be used for clients that support MMS for instance

2) Or adapt the different used media:
   Example:
   1- Image Transcoding
   1- A method that transforms text to speech
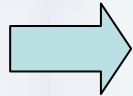   2- Text to SMS messages

Adaptation Method Example

xalan.bat –IN HTML000.html –xsl HTML2WML wmlpage.wml

How does It work?

- **The proxy perform in a session one or several adaptations**

    - Context of the current session:
        - Client profile
        - Content
        - Server capabilities
        - Proxy capabilities, etc.

- **To give a general idea:**

    - Example1:   Image adaptation
    - Example 2: SMS sending
    - Example 3: Language adaptation

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Example 1

- **After the NAC installation:**
  - **The device (Pocket PC here) selects its profile:**

  - **The client requests the content: a JPEG image**

Example 1

- **Result:**
  - **The device receives an image adapted to its displaying capabilities**

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Example 1

ANM Proxy ← **UPS profile** ←

Profiles matching:

- UPS Profile

+ HTTP Request

+ Image Profile

Device Screen: 240X320

Original Image: 682X909

Proxy is able to resize images
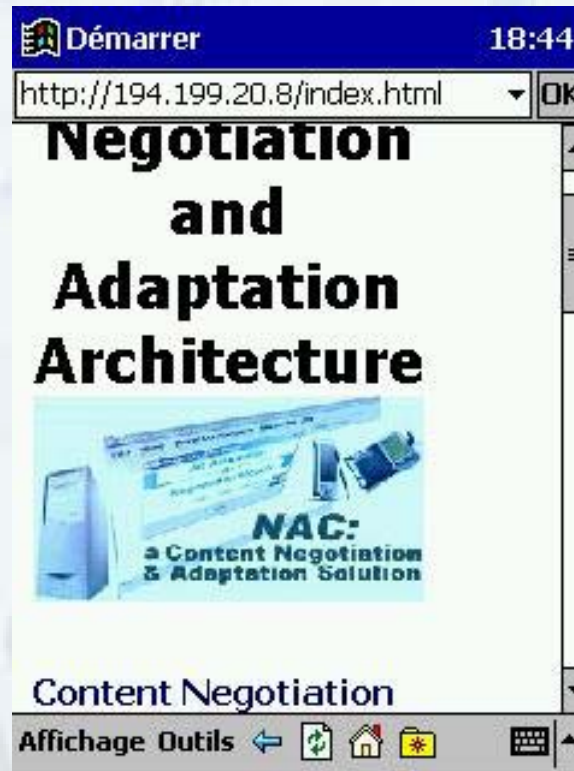
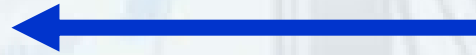Decision: Adapt the image and send the adapted content

Example 1

Example 2

- The device requests an HTML document

Example 2

```
- <rdf:Description ID="HardwarePlatform">
    <rdf:type rdf:resource="http://www.inrialpes.fr/ope
      03012002#HardwarePlatform" />
    <neg:DeviceType>Mobile phone</neg:DeviceType>
    <neg:DeviceName>Nokia-3310</neg:DeviceName>
    <neg:PhoneNumber>0610987326</neg:PhoneNumber>
    <neg:screen>30X23mm</neg:screen>
    <neg:display>101X52Pixels</neg:display>
    <neg:PixelStretch>1.24</neg:PixelStretch>
    <!-- composed elements are not supported until
  </rdf:Description>
```

Client

```
  <!-- A transform to SMS Form -->
- <rdf:li rdf:parseType="Resource">
    <neg:ResourceType>method</neg:ResourceType>
    <neg:ResourceName>MobileSMS</neg:ResourceName>
    <neg:ResourceFormat>java</neg:ResourceFormat>
    <neg:OutputResourceType>SMS</neg:OutputResourceType>
    <neg:OutputResourceFormat>sms</neg:OutputResourceFormat>
  </rdf:li>
```
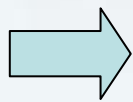
Server

Apply the method on the content

=

Send SMS to the phone

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Example 3

- The client requests a SMIL 2.0 document

    ⮕ The proxy adapts the SMIL presentation with respect to the client profile: language

```
– <switch>
    <audio id="sound" src="../media/audioVersions/russian.mp3" begin="1" dur="30" systemLanguage="ru" />
    <audio id="sound" src="../media/audioVersions/japanese.mp3" begin="1" dur="30" systemLanguage="jp" />
    <audio id="sound" src="../media/audioVersions/english.mp3" begin="1" dur="30" />
  </switch>
– <switch>
    <text src="Privyet. Menya zovout Dominique." region="lyrics1" dur="30" systemLanguage="ru" />
    <text src="Konnichi-wa! Boku wa Dominiku desu." region="lyrics1" dur="30" systemLanguage="jp" />
    <text src="Hello, my name is Dominique." region="lyrics1" dur="30" />
  </switch>
– <switch>
    <text src="Ya zhivou v Kanade." region="lyrics2" dur="30" systemLanguage="ru" />
    <text src="Kanada ni sunde-imasu." region="lyrics2" dur="30" systemLanguage="jp" />
    <text src="I live in Canada." region="lyrics2" dur="30" />
  </switch>
```

Example 3


```
<neg:display>101x52Pixels</neg:display>
<neg:PixelStretch>1.24</neg:PixelStretch>
<!--   Here the language    -->
<neg:systemLanguage>ru</neg:systemLanguage>
</rdf:Description>
</ccpp:component>
<ccpp:component>
```

UPS profile

accept-language: fr

HTTP request

**SMIL content is adapted
(UPS override HTTP
parameters)**

Conclusions

- Considering the context and resolving the problem of content adaptation in heterogeneous multimedia systems represents actually a very important topic.

- Ensuring such solutions needs the use of several technologies that ensure handling multimedia content and adapting it for different contexts.

- Architecture development has allowed:
  - The creation of new profiling schema: "UPS" for the context (environment) description
  - Definition of a negotiation protocol: client and server (or proxy)
  - Making the transformation more generic using a two steps transformation approach
  - Ensuring a flexible architecture that accept the enrichment by additional adaptation methods proper to a particular need

- Outgoing:

  - Defining a new context (environment)-based transformation language (extending XSLT?)
  - Developing the device independence principles
  - Adaptation of SMIL (ICME 2003) and considering the network state

Thank you

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http://opera.inrialpes.fr/people/Tayeb.Lemlouma/index.html