

Media Resources Adaptation for Limited Devices

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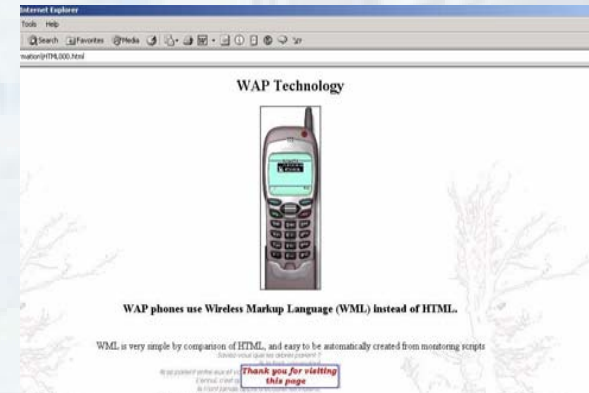
Outline

- 1 Introduction
- 2 Related Media Resources Approach
- 3 Document Instances
- 4 Client Profiling
- 5 Content Negotiation
- 6 Profiling-Based Media Delivery
- 7 The Evaluation of Media Adaptation
- 8 Conclusions



Introduction

- Increasing demand for using rich content by small devices



- Several constraints

- Displaying capabilities
- Access methods
- Media support (images, video, text, etc.)
- Languages (SMIL, MMS, WML, cHTML, etc.)
- Protocols: HTTP, WAP, UDP, etc.

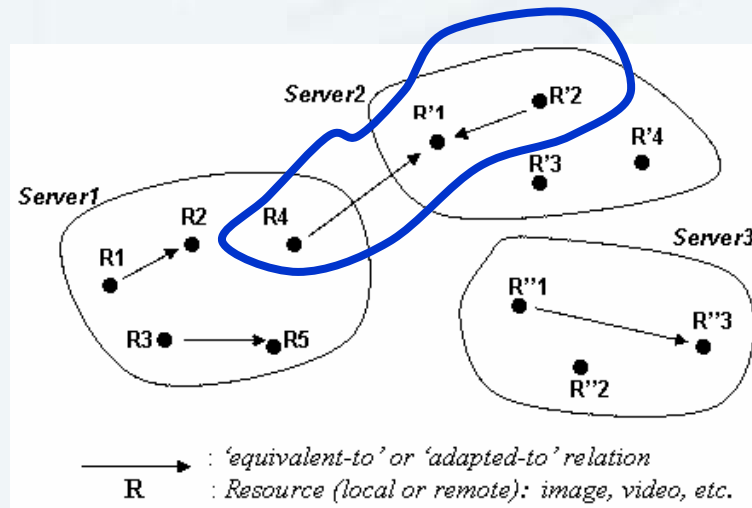


Adaptation of the content according to the client constraints

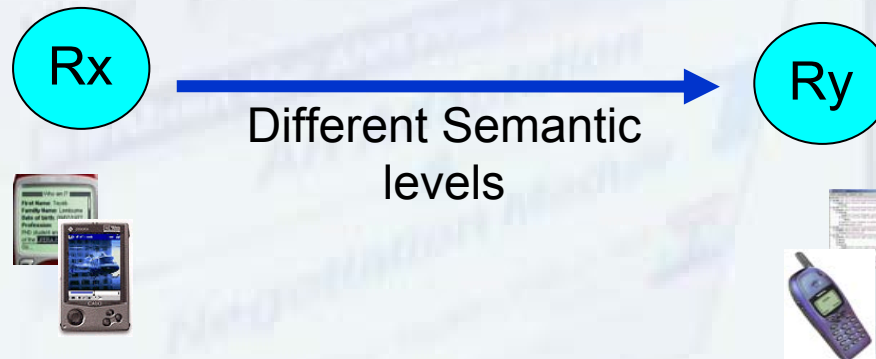


Related Media Resources Approach

- Transformation techniques can not be applied always (avoid semantic content distortion, lack of transformations)
- The approach of **related resources** enriches the adapting system by semantic substitution possibilities rather than transformations
- A relationship gathers two resources that exist in the same server or in different servers



Related Media Resources Approach



- Semantic considerations

Based on the semantic of the original resource, i.e. what does the resource give as understandable information

- Presentation considerations

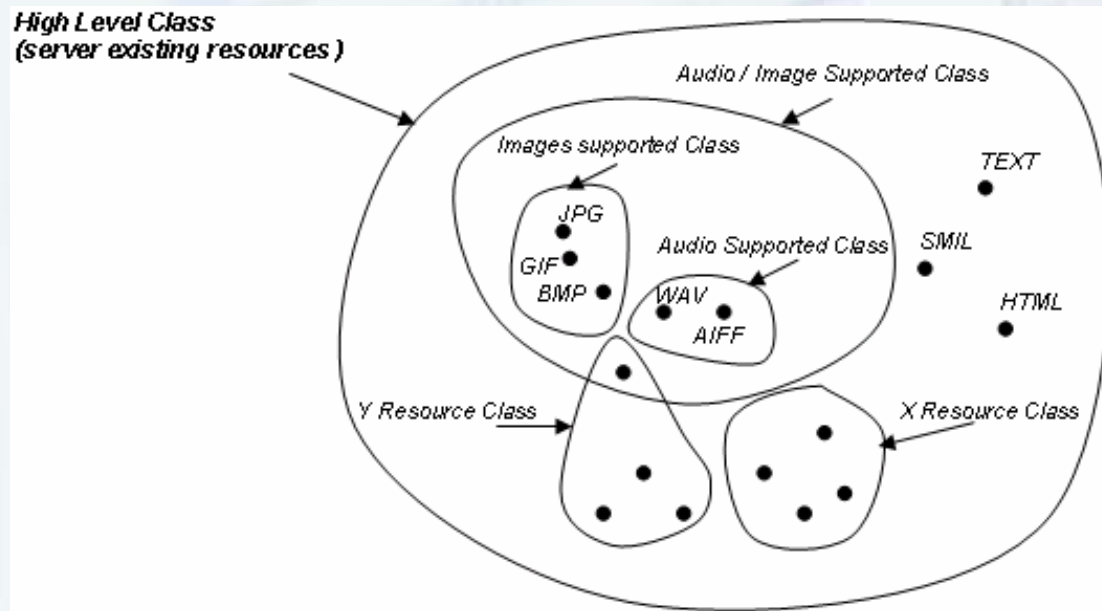
Concern the final presentation of the resource (format, colors number, size, resolution, etc.)

Definitions used dynamically by the adaptation task



Document Instances

- Document profiles describe a class of documents
- An instance may use a subset of particular resources



Client Profiling

Profiling concept: Definition of the environment characteristics in order to apply properly the content adaptation

Client side: the client must convey its capabilities regarding the support of multimedia resources to the server

Our approach: use of UPS to ensure the environment profiling



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

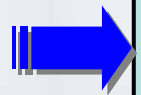
<http://www.w3.org/2000/07/04-ccpp#>



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#](http://www.inrialpes.fr/opera/people/Tayeb.Lemlouma/NegotiationSchema/*03012002#)



A Client Profile Example

```
<?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="MultimediaServicesRequieregment">
    .....
  </rdf:Description>
</ccpp:component>
```

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



Content Negotiation

Objective: Send only media which are adapted to the client capabilities and preferences

Resources can be: substituted, removed or transformed

Detailed view of the used resources in a requested document is required

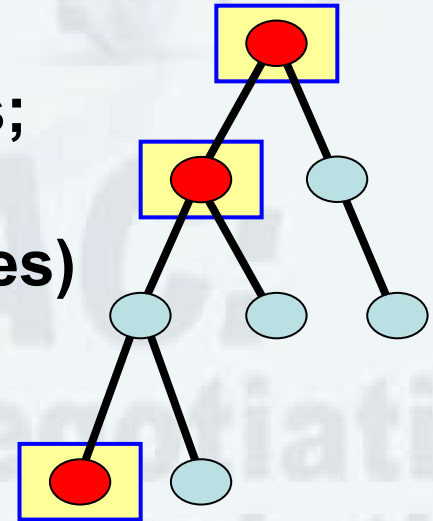
HTTP negotiation limitations: several accept headers, limited description syntax, etc.



Content Negotiation

Determination of used resources in a requested document

- **procedure Treats_node(n) {**
- **1 if (n represents a media resource){**
- **2 create an entry in the output CC/PP profile;**
- **3 explore n 's attributes;**
- **4 create media output attributes;**
- **}else{**
- **5 if (n contains other child nodes)**
- **6 for each child s {**
- **7 Treats_node(s); }**
- **}}**



Profiling-Based Media Delivery

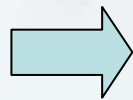
The adaptation task uses the profiles description to ensure a delivery of the adapted medias

- 1 for each
- (media resource category X existing in the profile of the requested document) {
- 2 if
- (all attributes and elements responds to the corresponding resource category X' (existing in the client profile)){
- 3 deliver X ;
- }else{
- 4 look for X -related resources (equivalent-to or adapted-to);
- 5 evaluate the resources;
- 6 if (an appropriate resource exist){
- 7 deliver it;
- }else{
- 8 look for available methods to adapt X according to X'
- constraints;
- 9 if (such methods exist){
- 10 apply the method on X ;
- 11 deliver the result;
- 12 }else remove X ;
- }}}}



Processing Resources: Example

- SMIL 2.0 includes related resources in the SWITCH element



Negotiation dimension: 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>
```



Processing Resources: Example

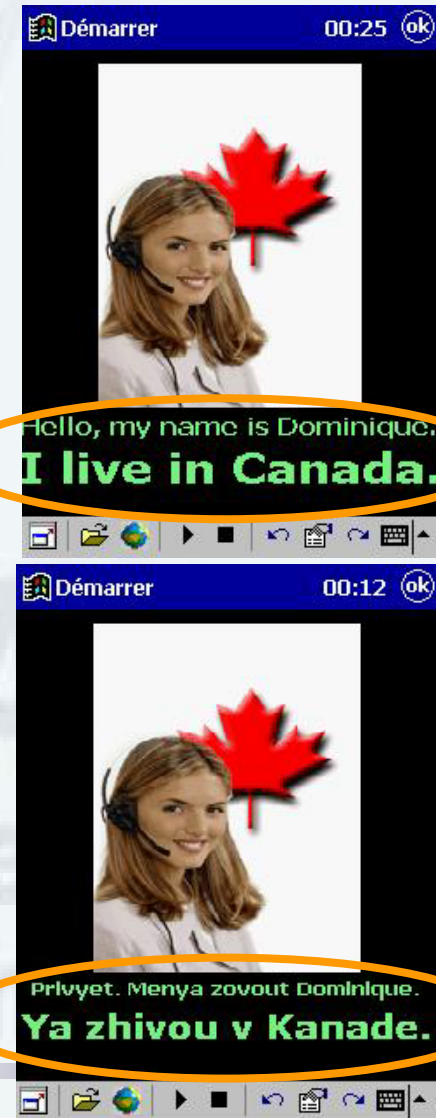
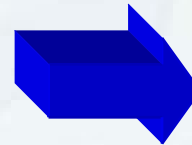
```
<neg:display>101x52Pixels</neg:display>  
<neg:PixelStretch>1.24</neg:PixelStretch>  
<!-- Here the language -->  
<neg:systemLanguage>ru</neg:systemLanguage>  
</rdf:Description>  
</ccpp:component>  
<ccpp:component>
```

UPS profile

accept-language: fr

HTTP request

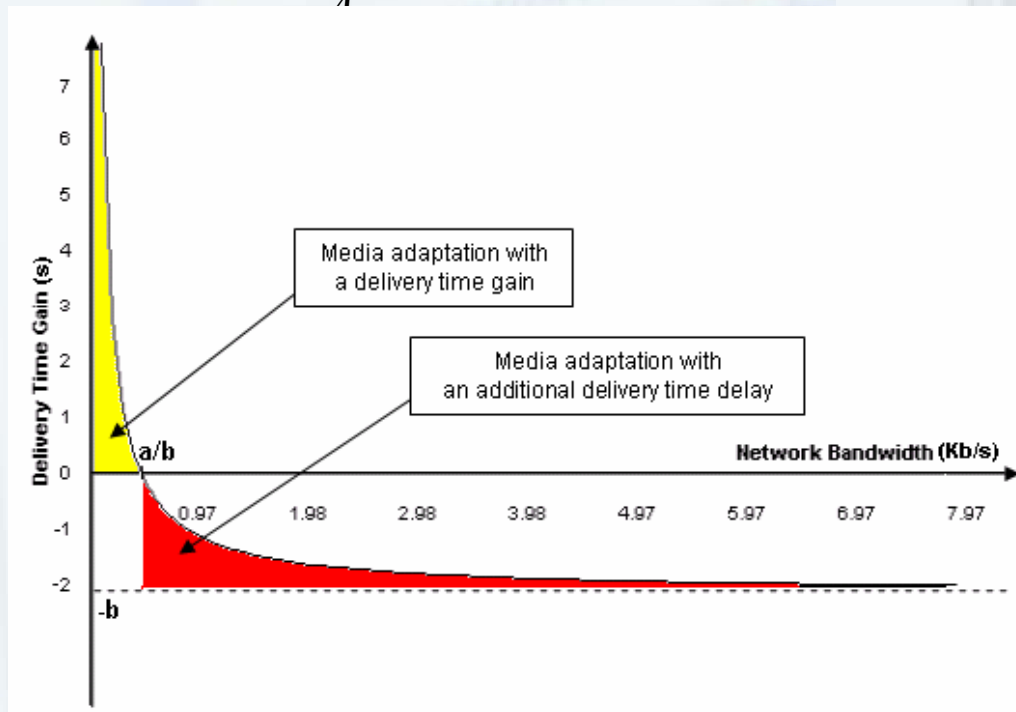
Resources are selected
according to the
negotiation dimension



The Evaluation of Media Adaptation

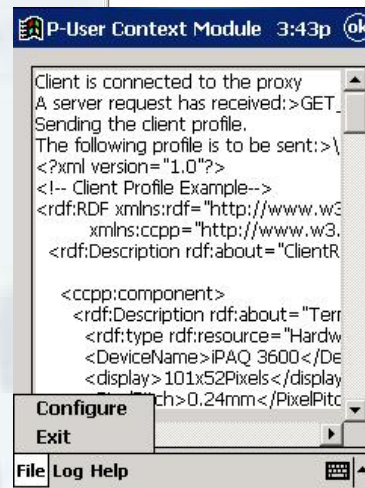
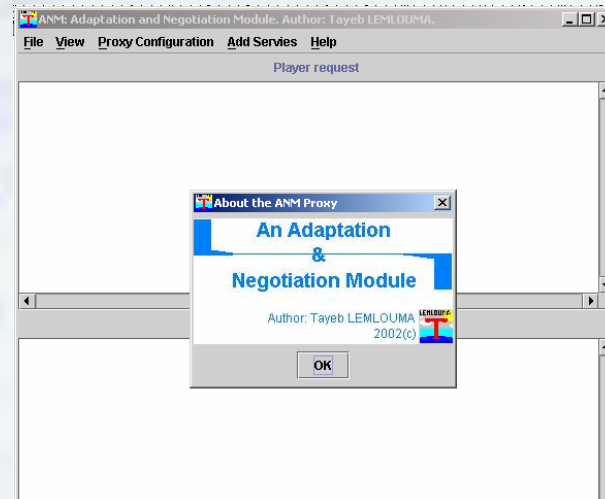
When the adaptation is benefic?

$$G_{Time} = \frac{\Delta Size}{B_A} - \sum_{i=l+1}^n T_{Transformation_k}(MR_i^v)$$



Architecture Overview

- 1 ANM Proxy
- 2 UCM Module
- 3 Adaptation Engine
- 4 SMIL Player



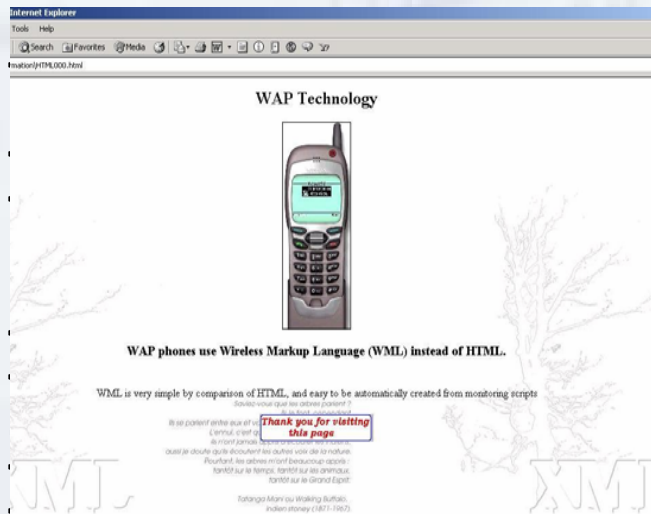
Adaptation Methods

- **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**



Media Resources Adaptation: Substitutions

- `<?xml version='1.0' encoding="iso-8859-1"?>`
- `<xsl:stylesheet xmlns:xsl='http://www.w3.org/1999/XSL/Transform' version='1.0'`
- `<xsl:output doctype-public="-//WAPFORUM//DTD WML 1.3//"`
- `system="http://www.wapforum.org/DTD/wml13.dtd" />`



`{()}" newcontext="true"`
`'body/node()'" />`

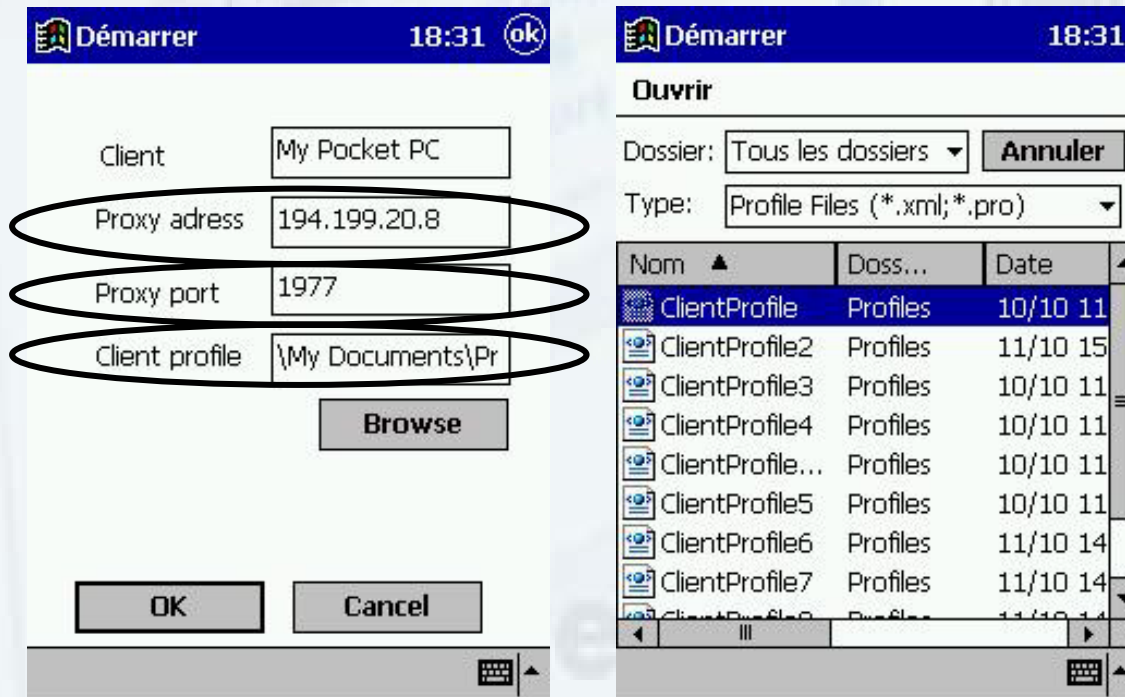


- `<xsl:value-of select="concat(substring-before(@src, '.'), '-ad"`
- `</xsl:variable>`
- ``
- `</xsl:template>`
- `xalan.bat -IN HTML000.html -xsl HTML2WML wmlpage.wml`



Media Resources Adaptation: Real-Time Methods

- After the NAC installation:
 - 1- Profile Selection using UCM module:

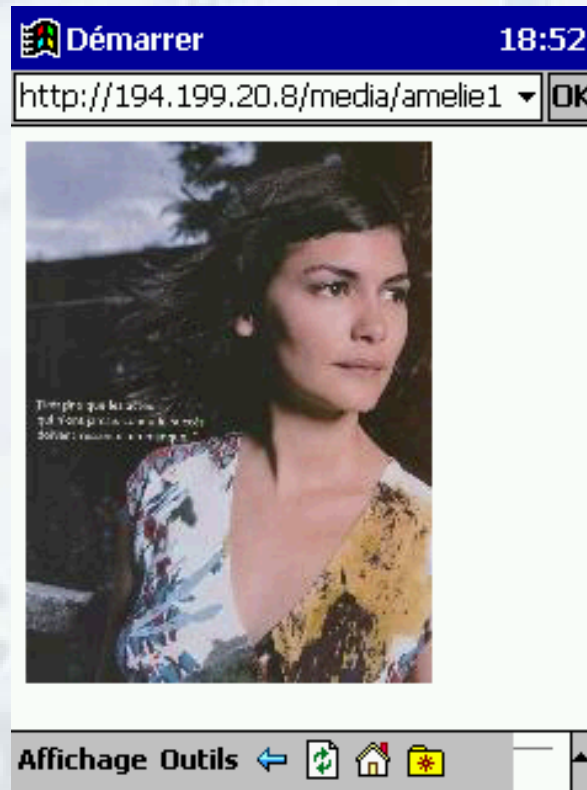


2- The client requests the content: a JPEG image

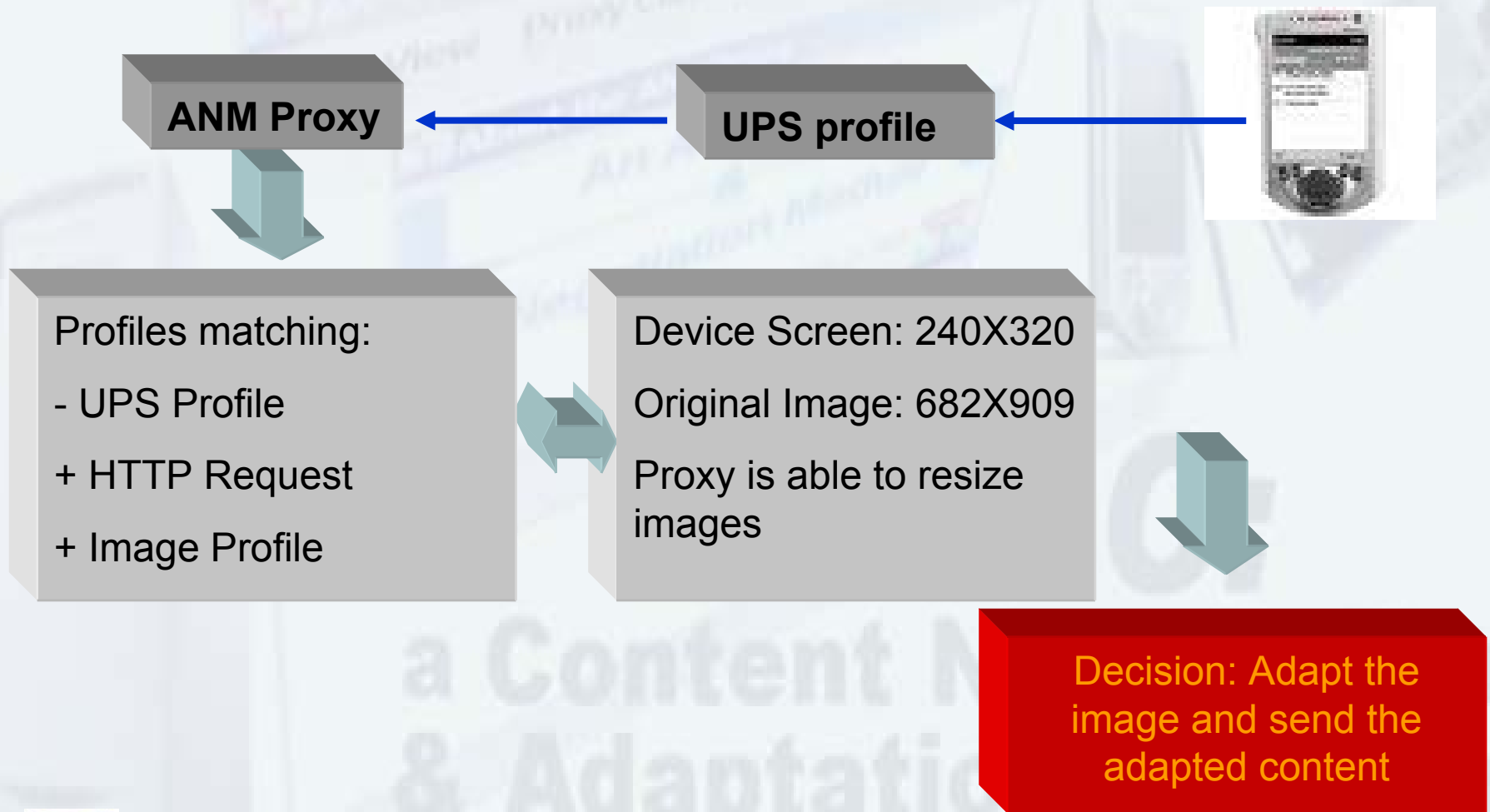


Media Resources Adaptation: Real-Time Methods

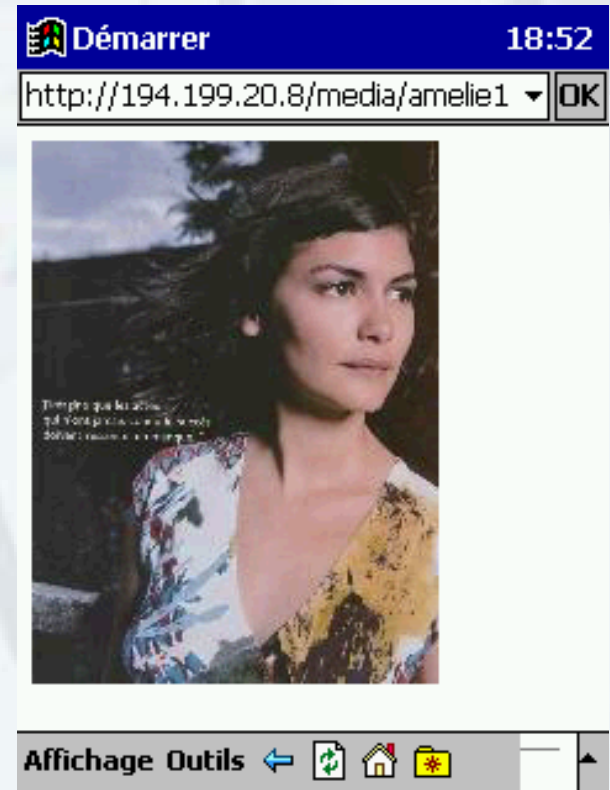
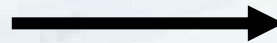
- **Result:**
 - The device receives an image adapted to its displaying capabilities



Media Resources Adaptation: Scenario



Media Resources Adaptation: Real-Time Methods



Conclusions

- Media adaptation in heterogeneous multimedia systems has a vital importance to respect the wide diversity of clients
- Structural transformations (like XSLT-based transformation) are not sufficient
- The definition of semantic relationships between resources ensures an efficient adaptation system and completes structural transformation
- Outgoing:
 - Developing the device independence principles
 - Adaptation of SMIL multimedia content for small devices (ICME 2003)
 - Definition of contextual based transformation language



Thank you

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For more information:

<http://wam.inrialpes.fr/people/lemlouma>

NAC:
a Content Negotiation
& Adaptation Solution

