

Context-aware multimodal output selection for the Device and Modality Function (DeaMon)

#Ralf Kernchen

(Centre for Communication Systems Research, University of Surrey, Guildford, UK)

Bernd Mrohs (Fraunhofer FOKUS), Marcin Sałaciński (Blstream oz), Klaus Moessner (CCSR, UniS)



- Introduction
 - Multimodal Interfaces
 - Objective & Identified challenges
 - Device and Modality Function (DeaMon)
- Multimedia Infotainer scenario
- Selection process & fission algorithm
- Details of the identified parameters for output selection
 - Modality output request
 - Context based recommendations
 - Modality device description
- References

- Multimodal systems process two or more combined user input modes in a coordinated manner with multimedia system output [Sharon Oviatt, 2003]
- The MobiLife definition of Multimodal Interfaces:
 - Multi-modal user interfaces support **multiple ways of interaction between the user and the system** in terms of communication channels that correspond to human senses. Depending on the implementation, a multi-modal user interface can utilise these channels as **various input and output modalities** in sequential and/or parallel manner. In addition, biomedical data (passively) available from the user can also be part of a multi-modal user interface.
 - The term multi-modality is preferred to be used for technical implementations whereas human-human communication is multi-modal by nature since it inherently utilises all available modalities, i.e. senses.

How does a Mobile Multimodal Interface look like?

Modalities



Interface Devices



Portal Device



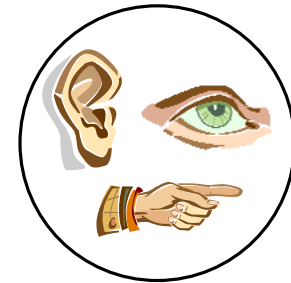
User



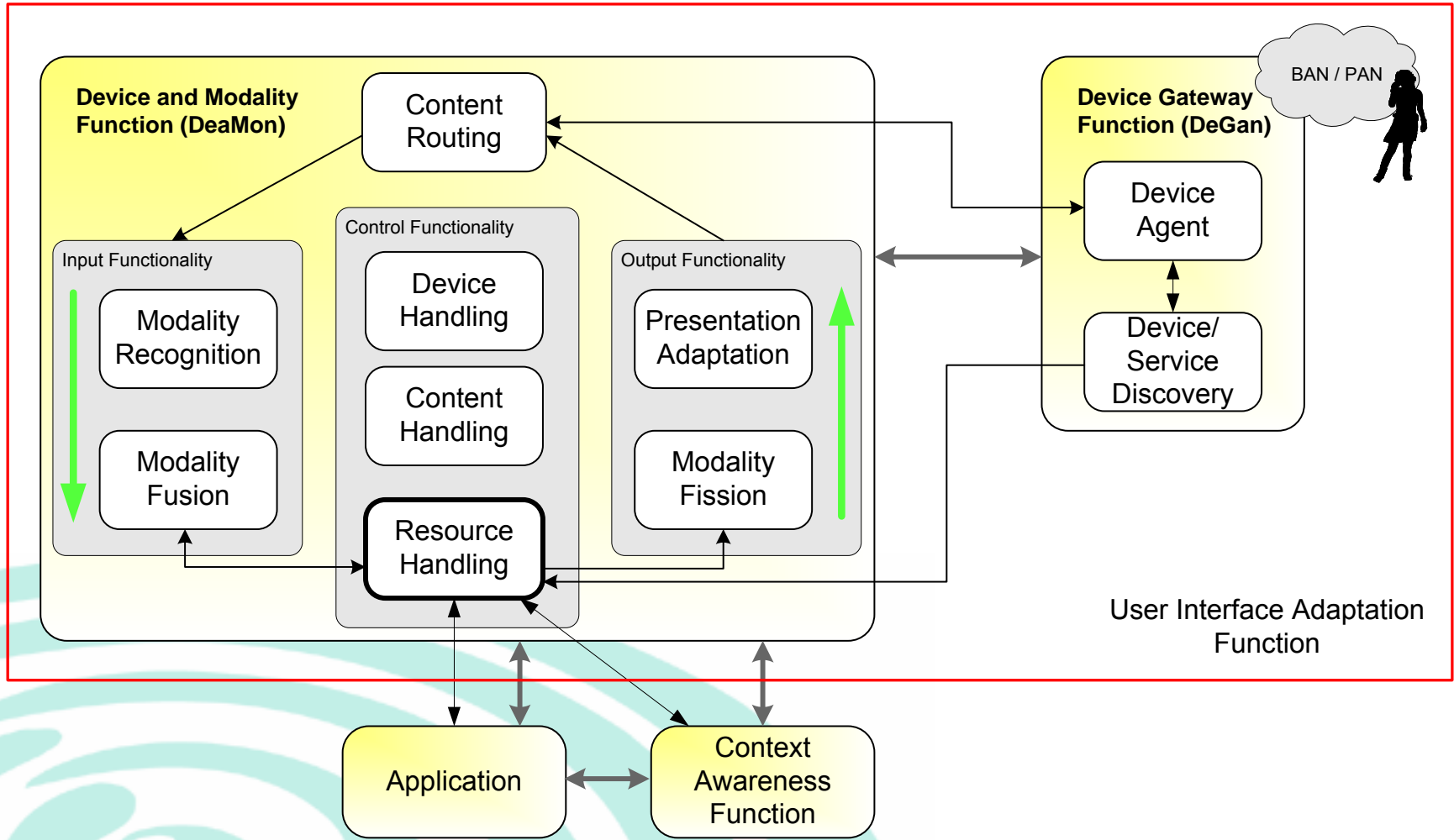
Media output selection for multimodal interfaces

Provide users of mobile applications/services to receive media content through the optimal output channel via multimodality!

- Application interface description for output requests
 - Allow mobile services to request media output towards the multimodal interface
- Modality description
 - Description of surrounding devices and their modality and connectivity descriptions
- Context-Awareness link
 - Taking current situation of the user into account
- Resolution of ambiguous situations
 - Automatic decision vs. manual supported decision



Device and Modality Function (DeaMon)



Always with
the user



Audio Output,
Video Output,
Text Output

Car

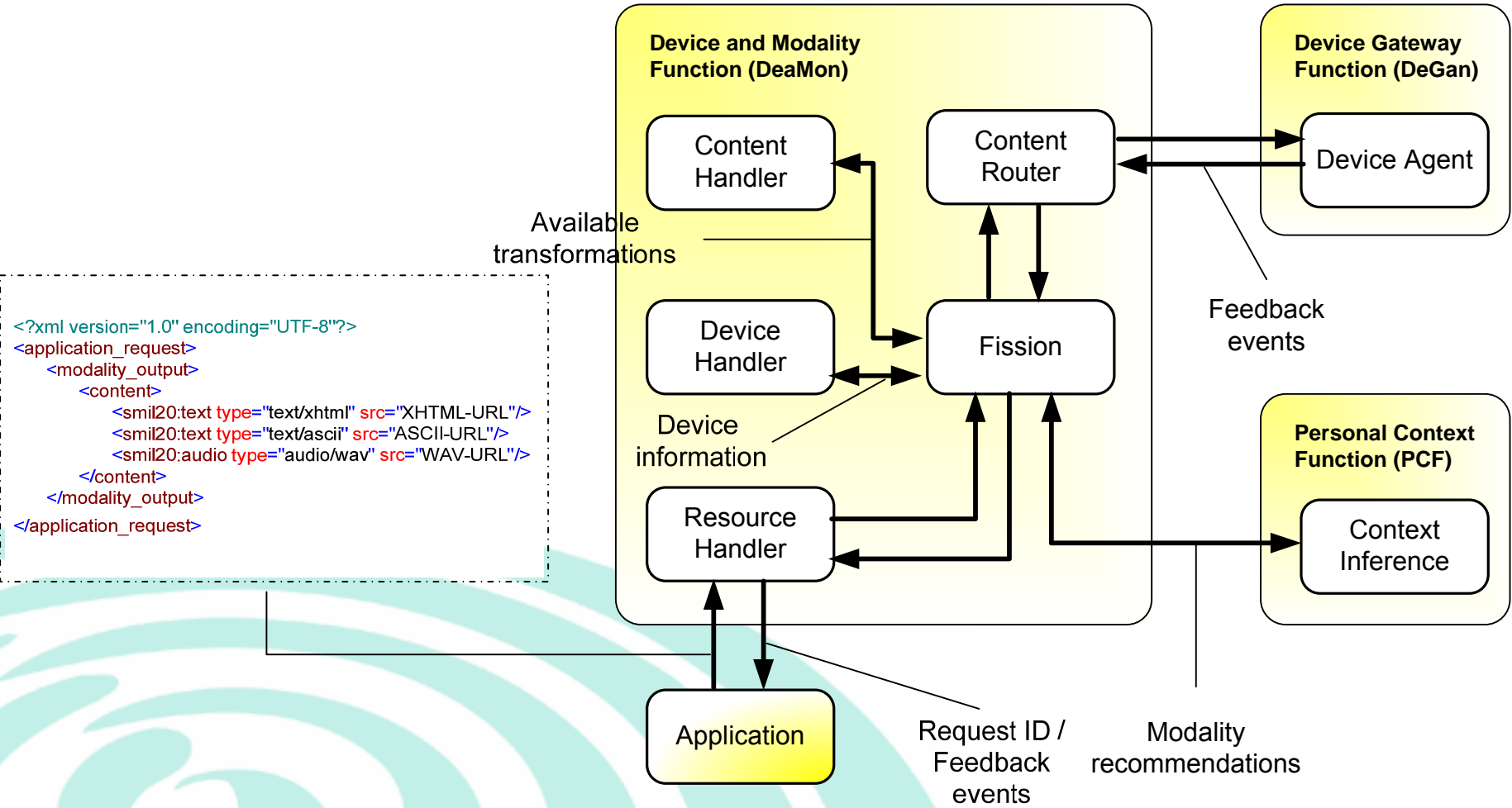


Audio Output,
Voice Input,
Gesture Input

Home

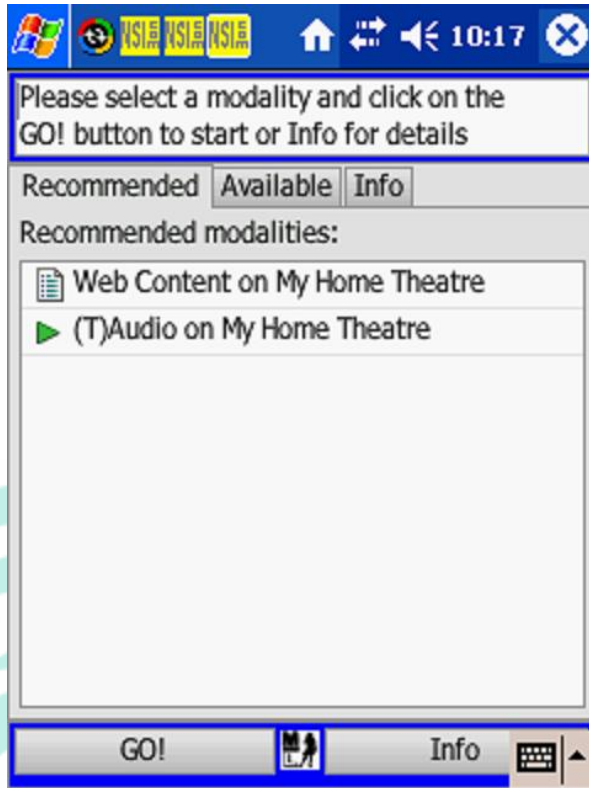


Audio Output,
Web Content,
High quality video



1. Get triggered through application request
2. Create a list of available content representations (given contents from the mobile service and possible content transformations)
3. Test the matches of all content representations for the available output modalities
4. Create prioritisation based on content quality and device capabilities
5. Cut down matches to recommended modalities
6. Select one of these remaining matches (avoid transformers)
-> automatic vs. manual selection (recommendation based)
7. Perform transformation if necessary
8. Deliver media output

Recommendations



Please select a modality and click on the GO! button to start or Info for details

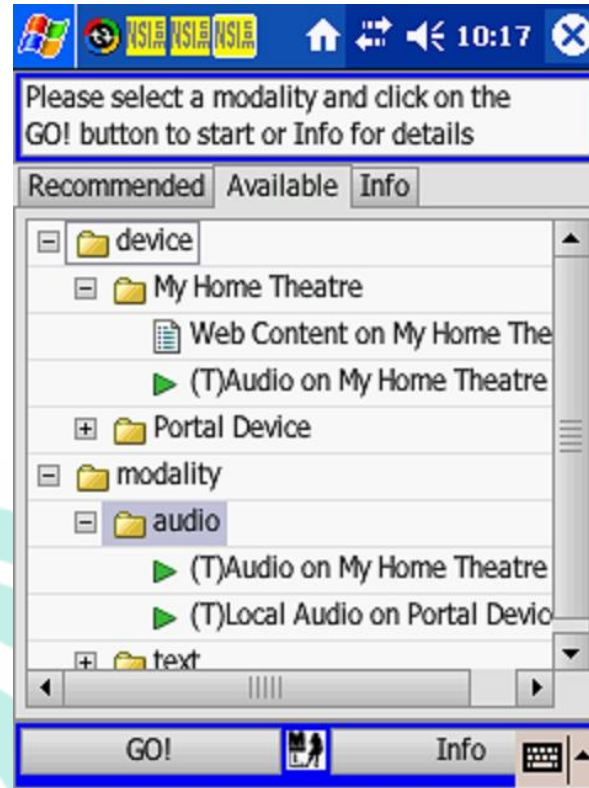
Recommended Available Info

Recommended modalities:

- Web Content on My Home Theatre
- (T)Audio on My Home Theatre

GO! Info

Available devices and modalities



Please select a modality and click on the GO! button to start or Info for details

Recommended Available Info

- device
 - My Home Theatre
 - Web Content on My Home The
 - (T)Audio on My Home Theatre
 - Portal Device
- modality
 - audio
 - (T)Audio on My Home Theatre
 - (T)Local Audio on Portal Devi
- text

GO! Info

Additional Information



Please select a modality and click on the GO! button to start or Info for details

Recommended Available Info

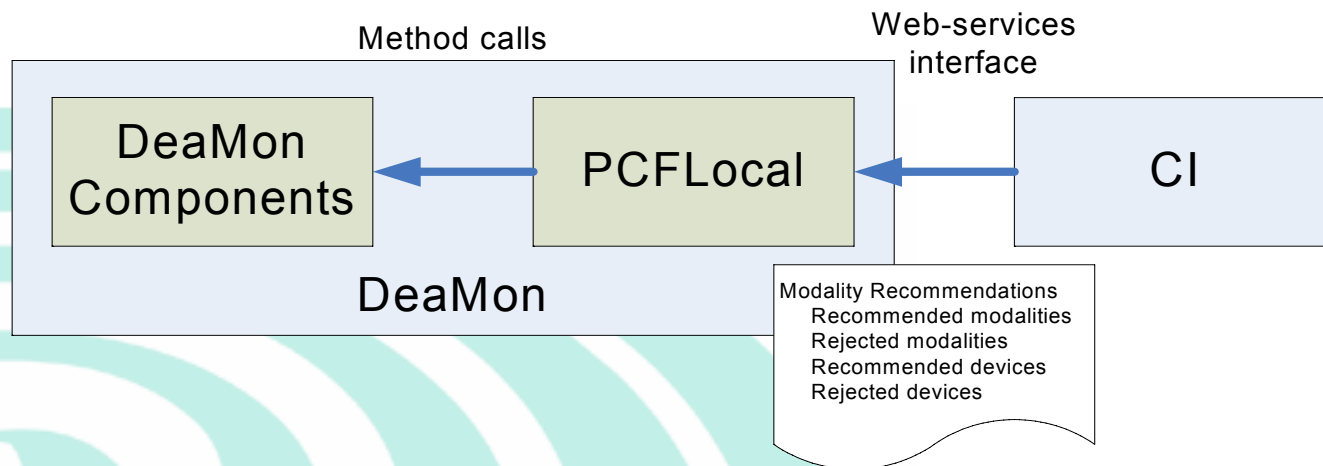
My Home Theatre is a recommended device from your preferences.

GO! Info

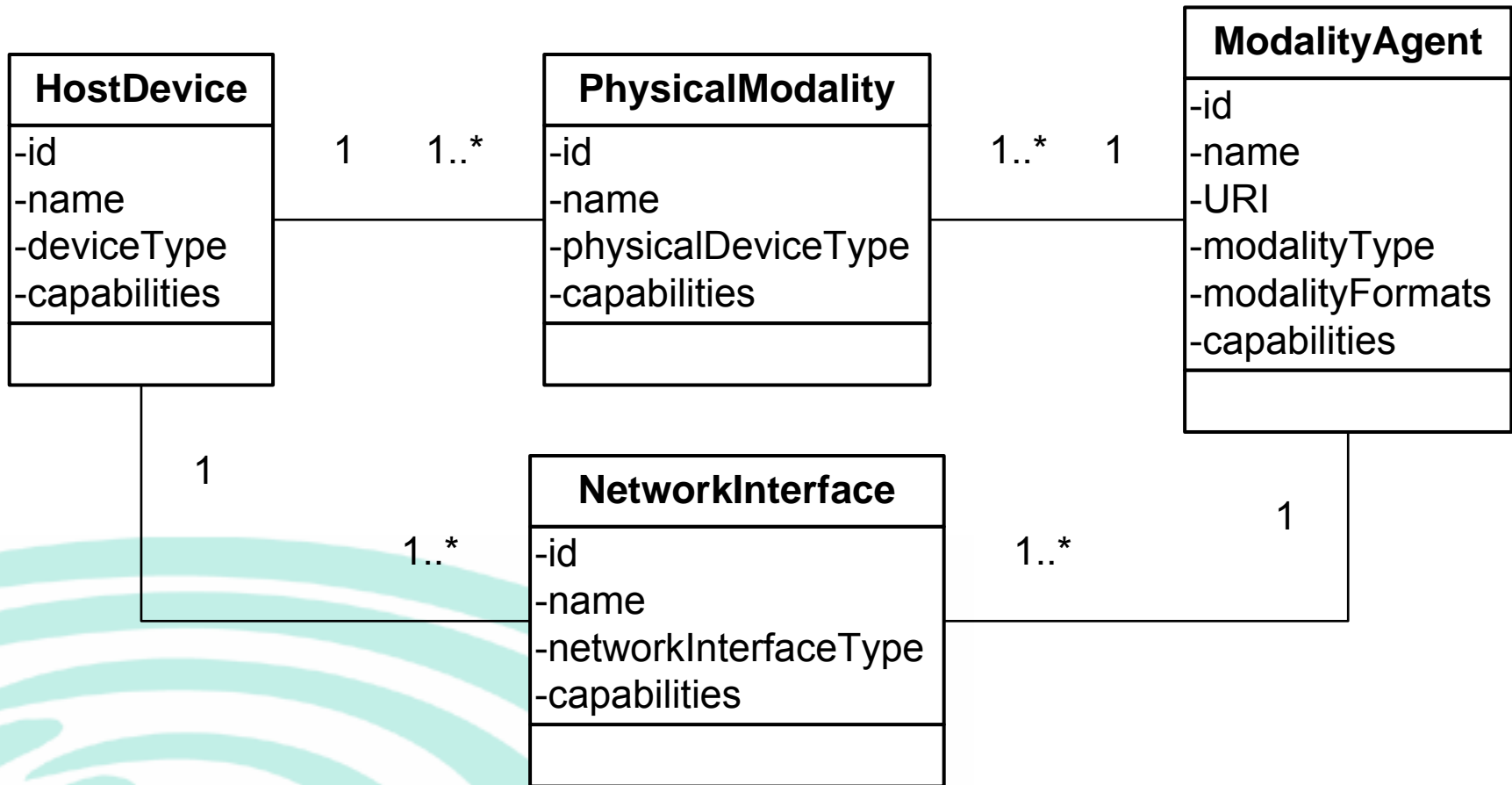
- Content within the output request is described using SMIL elements
- Types are defined using the MIME type standard
- Contents for the decision is always referenced

```
<?xml version="1.0" encoding="UTF-8"?>
<application_request>
  <modality_output>
    <switch>
      <smil20:text type="text/xhtml" src="XHTML-URL"/>
      <smil20:text type="text/ascii" src="ASCII-URL"/>
      <smil20:audio type="audio/wav" src="WAV-URL"/>
    </switch>
  </modality_output>
</application_request>
```

- Key mechanism for the **context based adaptation** of the **multimodal user interface** in terms of serving several user input and output channels (currently output)
- Provides **recommendations** to:
 - (not) use certain modalities (e.g. audio, text)
 - (not) use certain devices (e.g. audio player, XHTML display)
- Delivery through the CI towards the DeaMon



```
<poc>  
  <parameter name="external_device_management" type="DeaMon-CI_Parameter">  
    <parameter name="automatic_switching" type="simple_boolean" value="false"/>  
  </parameter>  
  <parameter name="generic_modality_recommendation">  
    <parameter name="recommended_output_modality_instance" value="big_display"/>  
    <parameter name="recommended_output_modality_instance" value="audio_player"/>  
  </parameter>  
</poc>
```



Questions?!

- [1] R. A. Bolt, "Put-that-there: Voice and gesture at the graphics interface." *Proceedings of the 7th annual conference on Computer graphics and interactive techniques*, Seattle, Washington, United States, 1980, 262 - 270.
- [2] S.L. Oviatt, "Multimodal interfaces", *In The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications*, J. JACKO ANDA. SEARS, Eds. Lawrence Erlbaum Assoc., Mahwah, NJ, 2003, chap.14, 286-304 G. O.
- [3] R. Kernchen, P. P. Boda, K. Moessner, B. Mrohs, M. Boussard, and G. Giuliani, "Multimodal user interfaces for context-aware mobile applications", in *The 16th Annual IEEE International Symposium on Personal Indoor and Mobile Radio Communications*. Berlin, Germany, 2005.
- [4] W3C: Composite Capability/Preference Profiles (CC/PP): Structure and Vocabularies. *W3C Working Draft*, November 8, 2002
- [5] WAP-174: "WAG UAProf User Agent Profile Specification", *Wireless Application Group*, <http://www1.wapforum.org/tech/terms.asp?doc=SPEC-UAProf-19991110.pdf>
- [6] A. Aftelak, L. Galli, E. Kurvinen and I. Zanazzo: "Group Coordination for Mobile Families" in *IST Mobile and Wireless Communications Summit 2005*, Dresden, Germany, June 2005.
- [7] A. Salden, R. Poortinga, M. Bouzid, J. Picault, M. Sutterer, R. Kernchen, C. Rack, M. Radziszewski and P. Nurmi: "Contextual Personalization of a Mobile Multimodal Application" *International Conference on Internet Computing (ICOMP)*, Las Vegas, USA, June 2005.
- [8] N. Freed, N. Borenstein, "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies." *IETF RFC 2045*, November 1996.
- [9] W3C: "Synchronized Multimedia Integration Language (SMIL 2.0)" [second edition]. *W3C Recommendation*, January 7, 2005
- [10] Wikipedia: "Algorithm", <http://en.wikipedia.org/wiki/Algorithm>
- [11] Wikipedia: "Pseudocode", http://en.wikipedia.org/wiki/Pseudo_code