

An Adaptive XML-based Approach to Multimedia Documents



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Projet Opéra

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Opéra team

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- Permanent researchers:
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 - Nabil Layaida
- PhD students/engineers: 7 persons



Overview

- Opéra research activities
- Technical presentation
 - Content Adaptation Framework
 - Authoring adapted presentations
 - Adaptation in SMIL 2



Opéra research activities

- Document modeling and transformation
- Multimedia specification
- Authoring and presentation systems
 - Multi-views, direct manipulation
 - Adaptation
 - Visual language



Opéra activities (1)

- Document modeling
 - Video structured: go inside video black box (MPEG7)
 - XML transformation
 - Spatial and temporal composition
- Content adaptation
 - Negotiation, transformation, constraints



Opéra activities (2)

- Document generation
 - Automatic generation of multimedia documents
- Authoring systems
 - Structured document authoring
 - Multimedia authoring
 - Transformation authoring



Opéra activities (3)

- Presentation systems
 - User capabilities, multi-platforms
 - Scheduling, QoS (prefetch)
 - Web applications: various network constraints
 - High connection
 - Wireless



Opéra cooperation

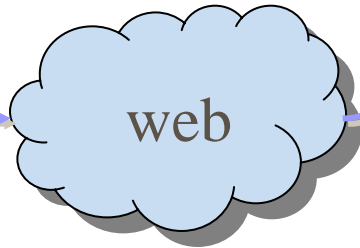
- W3C cooperation
 - Amaya team
 - SYMM group participation (SMIL)
- Industrial partners
 - European aircraft company
 - European telecom company



Overview

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A vision of the Web



- User Capabilities
- User Preferences: presentation/semantic
- Localization

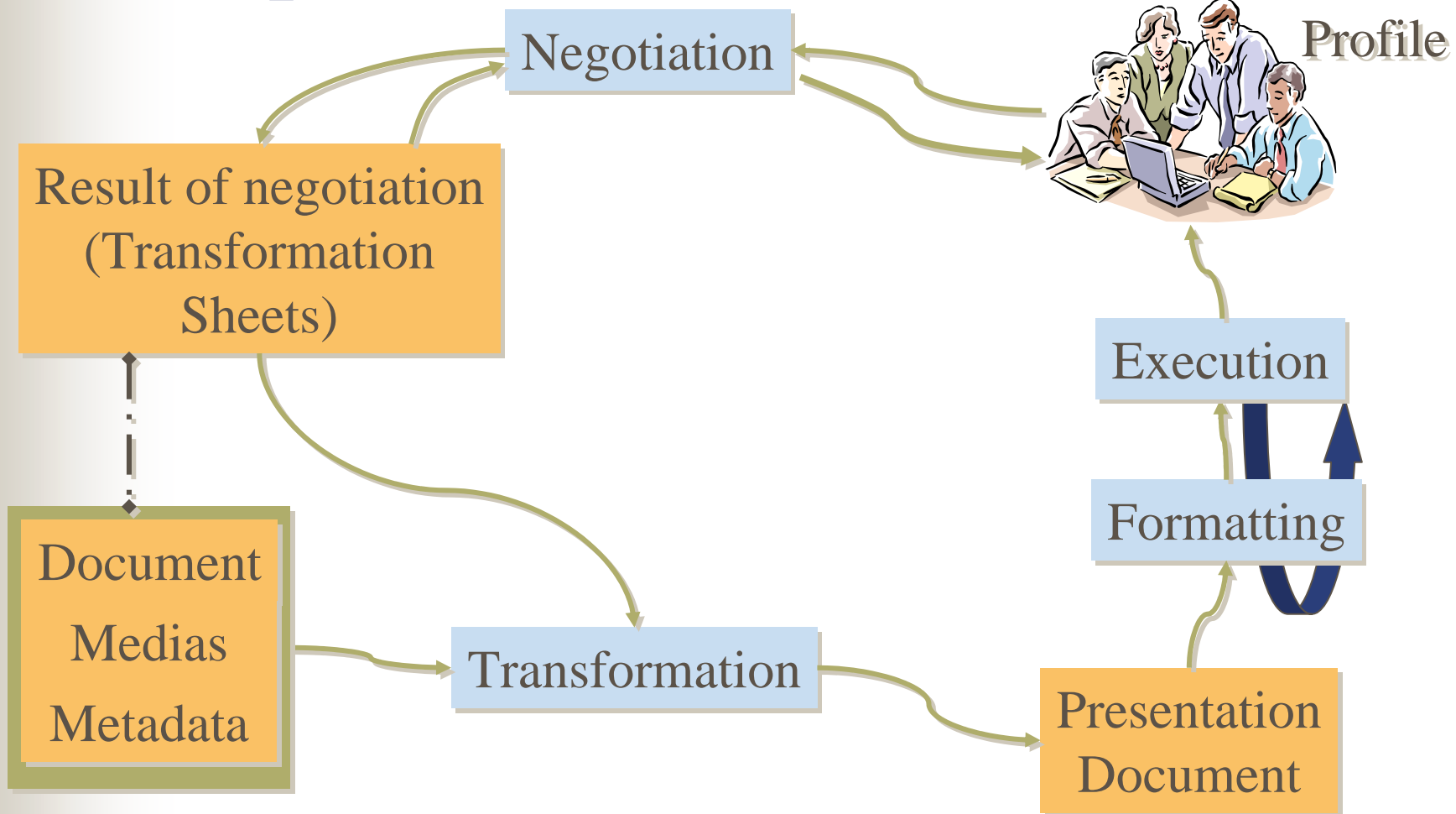
=> CC/PP (W3C)



Goals

- Specification of adaptable applications
 - Single document adaptation
 - Document classes adaptation
- Authoring of adaptable documents
 - Instance content
 - Presentations (transformation sheets)
- Tools
 - Model of multimedia presentation
 - Operational architecture

Adaptation architecture





Document classes

- Describe a particular domain
 - Presentation schema: multimedia (SMIL), vector graphics (SVG)
 - Application schema: Docbook, ATA, etc.
- Language: DTD, XML Schema
- Allow preferences specification related to a specific domain



Adaptation parameters

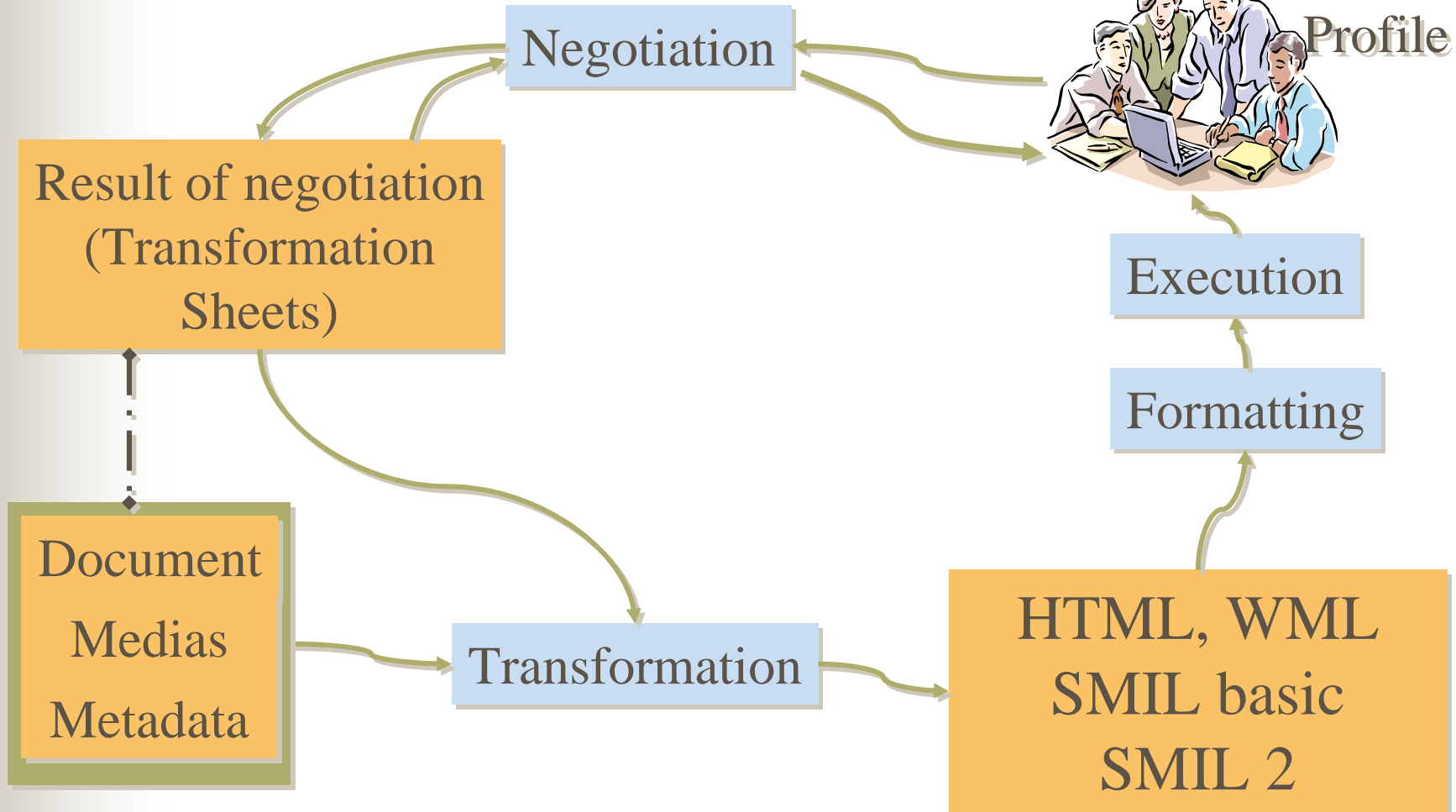
- Static
 - Reader capabilities
 - Hardware/Software Configuration
- Dynamic (Document)
 - Preferences related to document classes
 - Presentation preferences:
 - Window size, interactive (or not) presentation, etc.
- Dynamic (Media)
 - CPU resources, current bandwidth



Example: ATA documents

- Describe maintenance tasks
- Preferences related to ATA documents:
 - Generic vocabulary
 - Novice/Expert
 - Table of content
 - Specific vocabulary
 - Inclusion of sub-task description
 - Time estimation for task realization
 - Task procedure synchronization with its corresponding illustration

Presentation languages





Transformation for adaptation

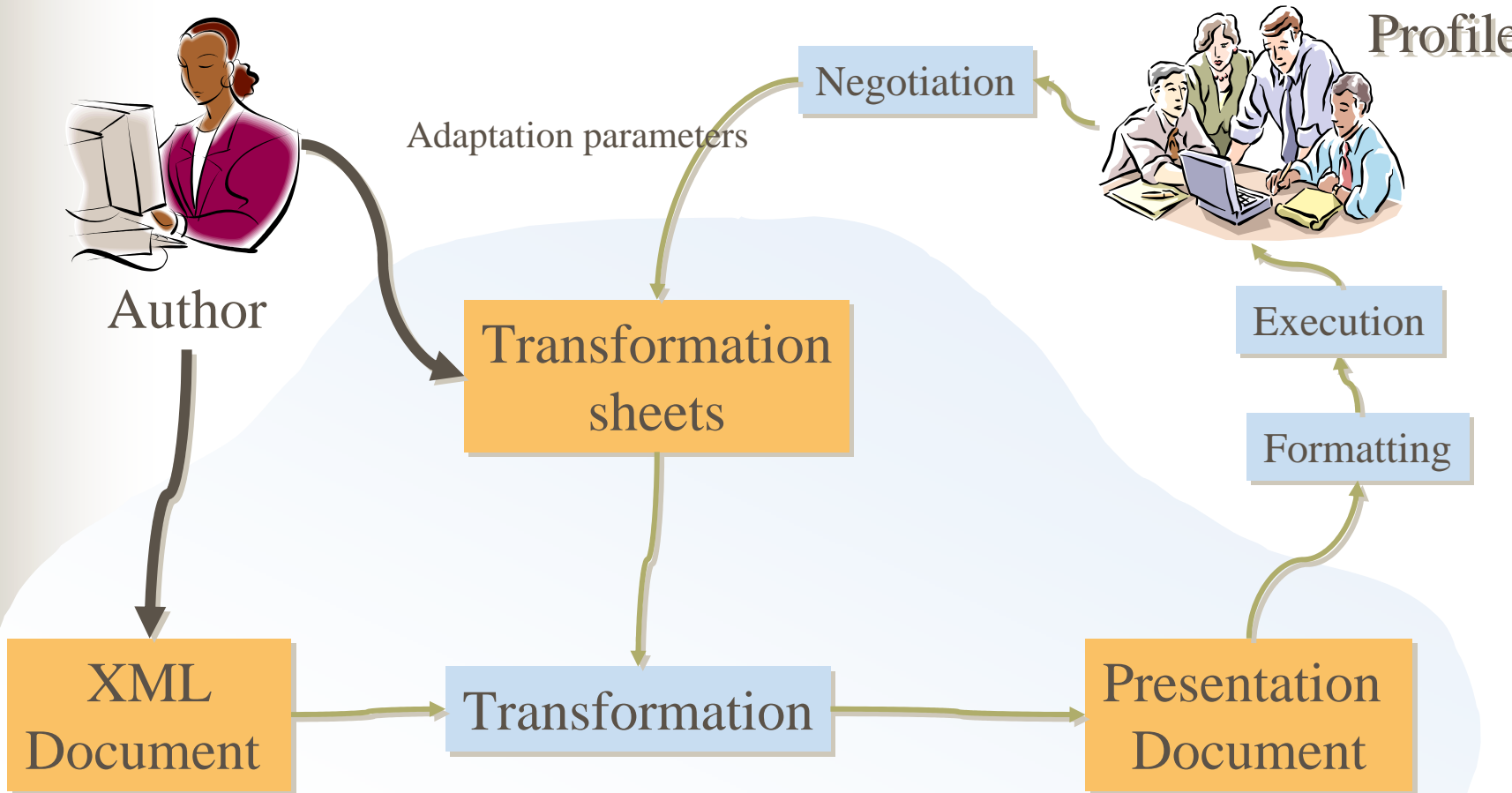
- Input Parameters

- A lot of adaptation parameters
- High combinatory
- Complex and time-consuming authoring

- Solution:

- The negotiation step produces transformation sheets

Author involvement






Source content authoring

- Through a presentation
 - See this presentation
- Need fast transformation
 - Incremental transformation
 - iXSLT: incremental Xalan
- Experimentation with docbook documents

Transformation sheets authoring

- Difficulty: programming language (XSLT)
- Current tools: text editing + debugger 
- Our solutions
 - Visual language
 - Direct manipulation



Authoring by direct manipulation

- Build XPath expression in source view
- Drag and Drop expression in presentation view
 - Generate transformation rules
- Need incremental transformation processor
 - => iXSLT



iXSLT: incremental transformation

Two steps process

- Preprocessing: transformation sheets analysis
 - Build templates and variables dependency graphs
 - Build re-evaluation rules
(Editing operation, Instructions to be re-evaluated)
- Incremental processing
 - Execute the instructions computed during the first step



Conclusion

- Experimentation in
 - Opéra prototype **Kaomi** (authoring tool)
 - Xalan (transformation processor (Apache))
- To-do:
 - Experiment optimization techniques in Xalan
 - Enhance transformation rules generation
 - Distinction between generic and specific editing
 - Use schema knowledge: better rule generation, checking during edition



SMIL 2.0 : conception (1)

- Meta language
 - From simplest multimedia document
 - To more sophisticated

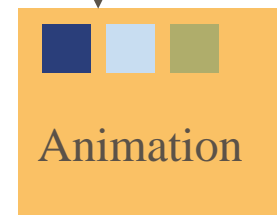
SMIL 2.0 : conception (2)

Language space

1 application *profile*

Vectoriel animations

Functional space



Syntax
Composition and
programmation
space





Conclusion

- Very large impact in industries
 - More browsers (HTML+SMIL in IE6)
 - More authoring tools
 - More servers
- To-Do
 - Fine grained control on media
 - Streamable SMIL
 - SMIL2.0 DOM