



An Open Next Generation SMIL Reference Implementation

Project Overview and Proposal

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1 Project Abstract

In March, 2004, the World Wide Web Consortium (W3C) invited members of the **AMBULANT** project to join the development consortium for the next-generation version of the SMIL language. The W3C developed a workplan and set of deliverables that span a 24 month period, starting in May 2004 [1].

The **AMBULANT/NxG** project has as its goal to design, specify, implement and verify an implementations of the next-generation SMIL player. The **AMBULANT/NxG** players will be made available to the research community in implementations for Linux, MAC OS and Windows. Various packagings, including desktop, TabletPC and PDA, will be supported. All versions and packagings will be available under a GNU licensing scheme.

As with the CWI GRiNS/1 and Oratrix GRiNS/2 players, we expect to be the first to release new language versions after they are approved by the W3C SYMM working group. This will promote the visibility of the existing **AMBULANT** infrastructure and it will help in our goal to make the **AMBULANT** player architecture be the dominant player in the research and development community. The project will produce its deliverables to coincide with the W3C workplan.

According to the rules and procedures of the W3C, a reference implementation can only be built by participants of the W3C working group process. Access to internal working drafts of the new versions of SMIL are only available to members of the SYMM group, and only those members can submit implementations for testing by W3C. For this reason, participation in the meetings, teleconferences and specification generation process is essential for our goals of producing a complete, tested reference implementation.

The project will require an average loading of 0,8 FTE over a twenty-four month period and carries a budget of € 235k in personnel, travel and equipment expenses. Of this amount, CWI will self- fund 40% of personnel costs (amounting to 35% of project costs) and NLnet is asked to fund € 150k over a period of 24 months, from May, 2004 to April 2006.

2 Project Description

This section will discuss the scope and deliverables of the **AMBULANT/NxG** project in terms of its goals, methodology, deliverables and importance. It will position the proposed work with work other institutions.

2.1 Background

In 1996 the Synchronized Multimedia working group (SYMM) of the World Wide Web consortium (W3C) defined version 1.0 of the Synchronized Multimedia Integration Language (SMIL). SMIL is a time-based format for combining external objects into a single coordinated entity. SMIL 1.0 was the first XML-based language defined by W3C. While the coordination of multimedia objects (such as audio, video, text and image information) are the primary application of SMIL, the language is also suited to more generalized encapsulation of temporal information. Many of the core aspects of the SMIL language were based on the CWI CMIF language, which was developed in the period 1992-1995. The main adopters of SMIL 1.0 technology were RealNetworks in (the RealPlayers 6/7/8), CWI/Oratrix (in GRiNS/1) and Apple (in Quicktime 4.1).

In 2001, W3C released the second version of SMIL. SMIL 2.0 contained significant temporal composition extensions, increased facilities for user interaction, support for transitions and animation, and a multi-profile architecture that allowed implementation of SMIL concepts in various degrees of complexity and in various host languages. The main technology adopters were RealNetworks (RealOne), Oratrix (GRiNS/2), Microsoft (HTML+Time in IE-5.5 and later), the 3GPP mobile telephony consortium and CWI's **AMBULANT** Player.

The CWI **AMBULANT** open player project started in 2003. This project implemented a GNU open-source version of the SMIL language for Linux, Windows and Macintosh platforms, in packagings for Desktop, TabletPC and PDA devices. It is the only SMIL player to support all of these delivery platforms (open or closed). The **AMBULANT** Player is positioned to provide open-software support for the research and development community. Our goal has been to stimulate the further development of Internet multimedia research by providing a common experimental infrastructure that can be used to obtain verifiable and inter-operable results.

Based on its efforts in supporting SMIL, the W3C invited CWI to join the new incarnation of the SYMM working group. This group has a charter to develop two new versions of the SMIL language: an intermediate extensions release in 2004/2005 and an

enhanced version of the language in 2005/2006. The **AMBULANT/NxG** project is CWI's vehicle for providing this support.

The motivation for CWI in joining the SMIL specification and development effort is to ensure that its interests on defining declarative integration languages for multimedia are protected and promulgated. We also wish to share our expertise and experience within the W3C community.

2.2 Proposed Work

The **AMBULANT/NxG** project will develop, design and implement the **AMBULANT/NxG** based on the schedule and work program of the SYMM working group. The working group currently expects to phase three major deliverables of SMIL technology:

- *Phase I*: a SMIL 2.1 specification that support extensions for mobile multimedia and improved layout and meta-information capabilities;
- *Phase II*: development, implementation and testing of a timed text format; and
- *Phase III*: development, implementation and testing of a next generation SMIL version with enhanced specification capabilities.

All three releases are covered by the **AMBULANT/NxG** project.

Phase I: SMIL 2.1

The main research and implementation questions concern the structuring of SMIL extensions for mobile multimedia and for the integration of SMIL with a wide-range of capture and delivery devices.

The main work areas to be addressed in this phase are:

- *Layout extensions*: improved positioning of media content
- *Audio media extensions*: improved handling of audio control and spatial positioning
- *Transitions*: improved support to handle multi-object transitions
- *Definition of a revised Mobile SMIL profile*: the development of an implementation recommendation for supporting SMIL functionality on new mobile devices.

The main challenge in this work will be integrating the existing layout and transition models with new requirements that may be less media centric. Members of the **AMBULANT/NxG** project were the primary technology developers for the existing SMIL Layout functionality and are in a good position to coordinate this work.

One of the major motivations driving this work is the needs of the mobile community. By providing a reference implementation, the **AMBULANT/NxG** player can provide an open alternative to the closed mobile implementations provided by equipment manufacturers.

Phase I is expected to be completed during 2004.

Phase II: Timed Text

The main research and implementation questions in this phase are the development of a language and implementation for the presentation of sequenced text objects.

The main work areas to be addressed in this phase are:

- *Timed Text Architecture*: the definition of a model that support in-line and separated temporal text specification and implementation.
- *Time Text Authoring Interfaces*: the definition of an authoring model for specifying timed text for use in captioning and electronic book applications.
- *Timed Text Integration in SMIL 2.x*: a reference implementation that demonstrates the facilities of timed text support in a public player.

CWI's interests in this work are the development of a language with timing semantics that are consistent with the SMIL declarative model and which match the needs and capabilities of a wide range of user groups. We expect to be able to guide the specification of the architecture and the authoring model by focusing on the practical needs of the implementation community. Given that the lack of support for simple text objects that fit into SMIL's temporal architecture has been identified as one of the key limitations of current versions of SMIL, we feel that our active participation and early implementation of timed text will be essential to establishing the position of the **AMBULANT/NxG** player in the research community.

An initial implementation of timed text functionality is expected to be produced by mid-2005. An early prototype can be integrated in the SMIL 2.1 player if consensus is reached in the W3C working group by the end of the summer 2004.

Phase III: SMIL Next Version

The main research and implementation questions in this phase are the development of language extensions and enhancements for a new SMIL release.

The main work areas to be addressed in this phase are:

- Meta-data synchronization
- Media Identification and Linking
- Media Layout
- Miscellaneous extensions

CWI's interests in this area are in maintaining the consistency of the SMIL specification model and in supporting a wide range of cooperative media presentation scenarios. We also are interested in preserving a format that is suited to supporting incremental/dynamic authoring of presentations.

There remains a great deal of flexibility in the definition of work items for this Phase. Much of the success of this Phase will depend on the acceptance and enthusiasm generated by the SMIL 2.1 and Timed Text implementations.

Project Effort Allocation

CWI's effort in the **AMBULANT/NxG** project will consist of the following activities:

- *W3C SYMM Participation*: participation in the weekly teleconferences, quarterly face-to-face meetings and the implementation testing meetings of W3C. This participation is not optional, since only by participating in the process will we have access to the evolving SMIL specification.
- *SMIL Language Specification*: participation in the design and specification of the SMIL 2.1, Timed Text and SMIL/NV languages definitions via the W3C working group. This participation is necessary to ensure that a solid implementation base can be developed in a timely manner.
- **AMBULANT/NxG** *Player Design*: code specification and design, based on the functionality approved by W3C and any additional functionality required to meet the overall needs of the CWI **AMBULANT** projects;
- **AMBULANT/NxG** *Player Implementation*: coding, testing and verifying the implementation of the Player;
- **AMBULANT/NxG** *Player Deployment*: the development of a set of functionality demonstrators that make the features of the language understandable and accessible to the community.

Effort will also be spent on writing and presenting scientific articles based on our experience with the SMIL/NV design effort and presenting these results at relevant scientific conferences.

2.3 Deliverables

We propose to develop and deliver an open-source version (under GNU licensing terms) of a player that meets the following specifications:

- *operating systems*: Linux, MacOS, Win32
- *target platform*: Desktop, TabletPC, PDA and (if accessible) mobile handset.
- *target standards*: SMIL 2.1, Timed Text 1.0, SMIL Next Version.
- *supported media types*: all media types current supported by the **AMBULANT/O** player, plus extensions for timed text and new formats developed by the SYMM working group.
- *supported transfer protocols*: RTP/RTSP
- *implementation language*: C / C++.

The project will also result in a number of demonstrators and a test set that can be used to verify profiles on our and other devices. We expect that one or two journal articles and several conference articles will result from this work as well, discussing scheduling and control issues for networked multimedia.

2.4 Importance

With the convergence of media technology, we feel that it is of prime importance to provide the community with a flexible and open implementation of SMIL technology. It is clear that the broader adoption of SMIL depends on research extensions that can only be validated by integration into a common open-source base. The 'semi-open' solutions provided by commercial vendors such as Real Networks (in the Helix project) do little to protect the interests of the external development community. The extended acceptance of SMIL within the mobile community (where several million SMIL players have been released and 100's of millions of player are expected to be deployed within three years) have done much to raise the visibility of the language, but have done little to provide testable, open environment because of the closed nature of equipment vendor support for SMIL. We see the development of an independent reference player as a seminal contribution to the broader research community.

2.5 Relationship to Other Work

The work in this project will be aligned with the standards that have been developed for (mobile) networked media. As far as we are aware, no other party providing solutions for mobile media have announced intentions to provide public domain, open source implementations of the base media player.

Early versions of the **AMBULANT** player are already used by many academic research projects in Europe and North/South America. Several large European organizations are currently evaluating **AMBULANT** for use as a development player for new research projects. The **AMBULANT** player is also being evaluated for integration with the Daisy player for supporting the needs of the blind and accessibility community in Europe, the US and Asia.

Within CWI, this work will be used with the BRICKS PDC-3 project (PI: Bulterman), and within other research efforts in the SEN-5 and INS-2 research groups.

3 Project Financing: Staff, Travel and Equipment

Table 1 presents the financing needs for the **AMBULANT/NxG** project.

Item	Loading	Rate/Hr	Cost (€)
Personnel, by Activity			
Project Leader	20%	€84,13	56.000
SMIL Language Design	20%	€75,33	50.000
Player Implementation	30%	€75,33	75.000
Testing and Verification	10%	€75,33	25.000
Total Personnel			206.000
Travel			25.000
Equipment			4.000
Project Totals			235.000
CWI Self-Financing			85.000
NLnet Financing			150.000

Table 1 **AMBULANT/NxG** Financing

The costs in this table are based on a 1.650 hour work year. The hourly rates are based on CWI's 'Integral Costs scheme' and contain salary, social fees and overhead. The total project costs for NLnet represent approximately 60% of labor costs plus travel and equipment. As part of its commitment to this project, CWI will self-fund approximately 40% of labor costs. (Note that costs have been rounded to the nearest 1.000 Euros.)

3.1 Staffing Plans

The project will require four staff members, each working part time. The roles and responsibilities of each member will be described in this section.

The *project leader* will be responsible for the overall progress of the project and will determine the scope and implementation priorities of the work delivered. He will also serve as the external contact person for the entire project and the central contact point with the W3C SYMM working group.

The *SMIL language design* effort will be responsible for the systems architecture and specification of the SMIL implementation. This effort will require coordination with the project leader, with other SYMM working group members and with the implementation staff.

The *player implementation* effort will be responsible for developing the implementation specification and the code for the **AMBULANT/NxG** player for the Linux, Macintosh and Windows platforms.

The *implementation testing and verification* effort will be responsible for developing the test suite required for incremental and final project testing, as well as the development of implementation demonstrators.

The project leader will be D.C.A. Bulterman. The SMIL language design effort will be performed by Bulterman, Jack Jansen and Kleanthis Kleanthous (depending on the expertise required). The **AMBULANT/NxG** implementation effort will be performed by Jansen, Kleanthous and Kees Blom. The implementation testing and verification effort will be performed by member of the complete project team under the management responsibility of Bulterman. The total effort of all persons associated with the **AMBULANT/NxG** project is averaged at a 0,8 FTE loading over the duration of the project.

3.2 Travel Budget

The SYMM working group will hold design face-to-face meetings at the interval of approximately 1 per quarter and it also holds separate testing and integration meetings. It is anticipated that 8 meetings will be held during the scope of the project, of which one or two are expected to be held in Amsterdam. Given the make-up of the working group (the chairs are from Finland and Tokyo, and key industry partners are from the USA and France), we expect that three trips will be made within Europe, three trips will be made to the USA and one trip will be made to Japan during the duration of the project. This does not count the meetings expected to be held in Amsterdam.

The initial SMIL and Timed Text meetings will be held in Amsterdam in early May. The 2004 meetings are scheduled for Palo Alto (Timed Text, June), Tokyo (SMIL, September), Amsterdam (Timed Text, September), Helsinki (SMIL, December), Boston (Timed Text, December). Meeting locations for 2005 will be determined in late 2004.

The estimated per-person/per-trip cost for non-Amsterdam travel is €2.000. On average, 2 persons will represent the project on the six trips. Meetings hosted by CWI will use project travel funds to pay for the working group lunches that are usually supplied by the host; this is budgeted at €500 per meeting. The resulting estimated travel cost for the duration of the project is €25.000.

3.3 Equipment Needs

The equipment needs for **AMBULANT/NxG** are modest and consist of development software tools and updates to existing hardware. We estimate a need of €2.000 per 12 months.

4 References

- [1] W3C, *SMIL WG Charter*.
<http://www.w3.org/AudioVideo/Group/symm-wg-charter20040903.html>