

---

**ECE-5550 Advanced Real-Time Systems**  
**Project 3 Proposal**

---

**Project Title:** Real-time Media Player on ChronOS

**Group Members:**

1. Mihir Sagar Kulkarni (mihir31@vt.edu), 906105085
2. Omkar Shirish Dhande (osdhande@vt.edu), 906128413

**Date:** 04/06/2018

---

**Introduction:**

At user level, a media player is an application for playing multimedia files like video and audio files. However, from programmer's point of view, it is a computer program which directly provides multimedia service to the users and hence it is very important that the program should be able to deliver the media content at a constant rate to the users. Multimedia applications usually don't rely on a real-time scheduler. As a result, media player and the OS are not always able to meet the user expectations despite of full efforts. Multimedia tasks such as audio and video streaming require real time algorithms to avoid delays or jitters in their performance and hence we will be trying to achieve the same thing through this project.

**a. Goals:**

- Investigate how to rewrite an open-source multimedia application (e.g., Mplayer, mpv, x264, and VLC) in order to exploit real-time scheduling policies.
- Implement a prototype that exploits ChronOS scheduling.
- Evaluate the implementation (with multiple scheduling algorithms).

The final goal of the project is to deliver media content playback at a constant frame-rate and minimize data loss caused due to missed deadlines.

**b. Implementation:**

Incorporate real-time scheduling policies present in ChronOS via APIs into the source code of the aforementioned media players to minimise deadline misses, delays and playback jitter.

Visually, we expect the result of incorporating real-time schedulers to translate into smooth media playback at constant frame-rates. During the course of the testing we will try to play back media with files with increasing frame-rates and test them for smooth playback. We will later try to implement the application with different types of schedulers and will compare their performances in terms of peak and average frame-rates.

**c. Anticipated Outcome:**

On comparing a video clip played back by the unmodified media player and by incorporating real-time schedulers we expect to see a visually smoother video on the latter. We will also try to observe performance for different output bit-rates.

We will later try to observe the scalability of the system by running multiple files at the same time.

**d. Deliverables:**

- Source code of the media player modified for ChronOS containing real-time scheduling schemes.
- Installer for the media player.

- Project report containing:
  - Installation guide
  - User manual
  - Performance analysis compared to the original media player implementation.

**e. Tentative schedule:**

<b>Date</b>	<b>Description</b>
April 7th - 13th	<i>Literature Review</i> It is imperative to have a solid understanding of concepts for an optimal implementation. Reading and thoroughly understanding all the available references related to our goals including references to existing implementations of media players that incorporate real-time scheduling policies provided by operating systems.
April 14th - 20st	<i>Study of an available open source media player</i> Installing an open source media player on and studying the documentation of the same. This study includes the studying the source code and identifying target points where changes can be made for better performance.
April 21st - 28th	<i>Studying the ChronOS API</i> Adopting ChronOS API and modifying the scheduling policy of a media player so as to incorporate real time scheduling.
April 29th - May 5th	<i>Testing and debugging the modified source code</i> Testing the code with input files containing different frame-rates and benchmarking with respect to the unmodified implementation. Observe effect of playing back files with different bit-rates (data-rates).
May 5th - 8th	<i>Performance comparison and Documentation</i> Comparing the performance of the media player with and w/o modifications and documenting the same in the form of user manual, installation guide and project report.

**f. References:**

- <http://www.irmosproject.eu/>
- Integrating multimedia applications in hard real-time systems - L. Abeni; G. Buttazzo, Real Time Systems Symposium, 1998. Proceedings., The 19th IEEE. pp 4-13 1998
- Iovic, D.; Fohler, G. "Quality aware MPEG-2 stream adaptation in resource constrained systems", Real-Time Systems, 2004. ECRTS 2004. Proceedings. 16th Euromicro Conference on, On page(s): 23– 32