Network-Enabled Platforms (NEP-2) Program
Semi-Annual Progress Report

Project Information

Lead Contractor:	McGill University		
Project Name:	Open Orchestra	Project #:	NEP-54
Date:	September 30, 2011.		
Claim Period:	March 1, 2011	To:	August 31, 2011.

PROGRESS REPORT CHECKLIST – Please ensure the following sections are completed:

Project Progress	Completed
1. Technological Progress	Yes
2. Project Development & Activities	Yes
3. Project Plan	Yes
4. Updated Claim Forecast	Yes
5. Intellectual Property	Yes
6. Communications	Yes
7. Web Site Information	Yes

CLAIM CHECKLIST - Please ensure the following sections are completed and attached to this document:

	Completed and Attached
8. Financial Claim Schedule	Yes
9. Invoices for Eligible Costs over $1000 incurred and paid	Yes
10. Employee Timesheets (signed by employees and supervisor)	Yes

APPENDIX CHECKLIST – Please include any relevant materials:

	Attached
11. Communication Materials	No

1. Technological Progress

1. Long Distance Bandwidth Problems

There have been two major efforts to solve low bandwidth problems when playing video at UBC from the server at McGill. These problems only occur with TCP over long distances. Initially even a relatively low bandwidth 15 Mbps stream would not play at UBC. After extensive network testing in May 2011 by engineers at Canarie, Communications Research Centre, UBC and McGill showed that there was nothing wrong with the network, it was discovered that the default TCP heuristics setting in Windows 7 “has the ability to automatically change its own TCP Window auto-tuning behaviour to a more conservative state regardless of any user settings.” (See: http://www.speedguide.net/articles/windows-7-vista-2008-tweaks-2574) With heuristics disabled in the UBC workstation, it was possible to set the auto-tuning level to play the video.

The August 2011 upgrade to 30 Mbps video, one of the objectives of the Project, resulted in renewed playback problems. Although the video would play, frequent unexplained drops in bandwidth would cause the video to freeze. Also the new feature of setting a video start point and end point to play a particular portion of the video would not play properly from UBC although it works at McGill. This does not appear to be a problem with the network, but rather something in the workstation computer at UBC or its connection to the network. Continued investigation by UBC network staff pointed to a potential problem with the Nortel switch at the UBC end which was rejecting a large number of packets. Cisco switches did not appear to have this problem and it was decided to try exchanging the Nortel for a Cisco.

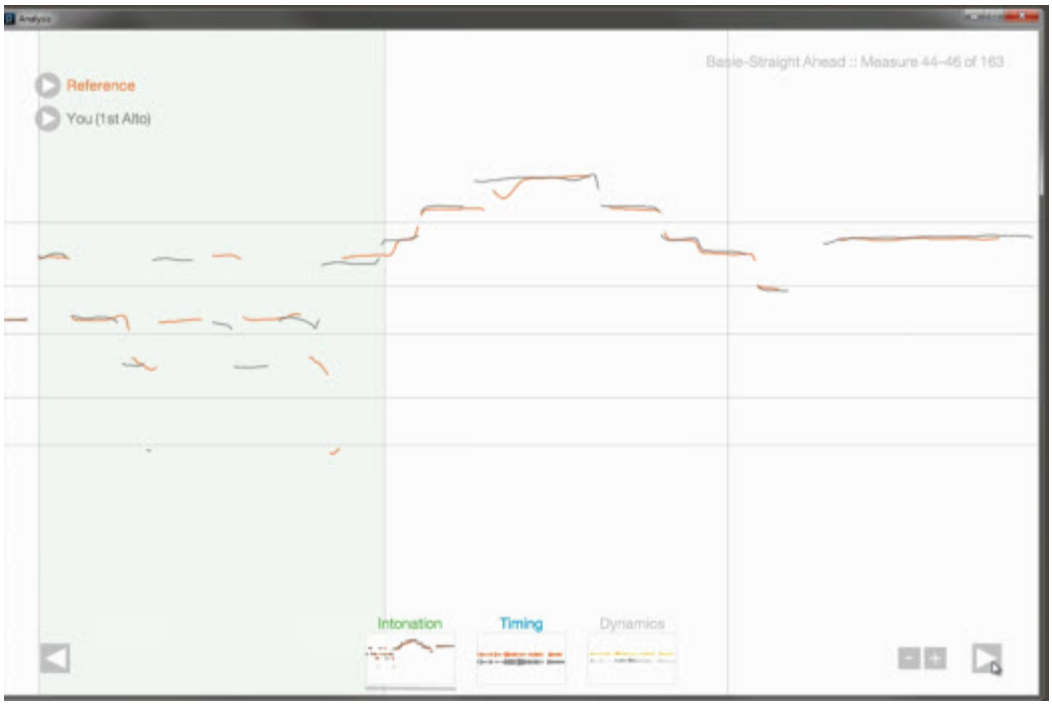
These problems have consumed a great deal of network and project staff time.

2. Expert System for Analysis and Feedback on Student Performance

This prototype system demonstrates the analysis and feedback visualization capabilities of the Open Orchestra project. Currently the prototype is a standalone program that is run on the student’s recorded performance after using the Open Orchestra main interface. The plan is to integrate it with the main interface so that visual feedback can be given immediately.

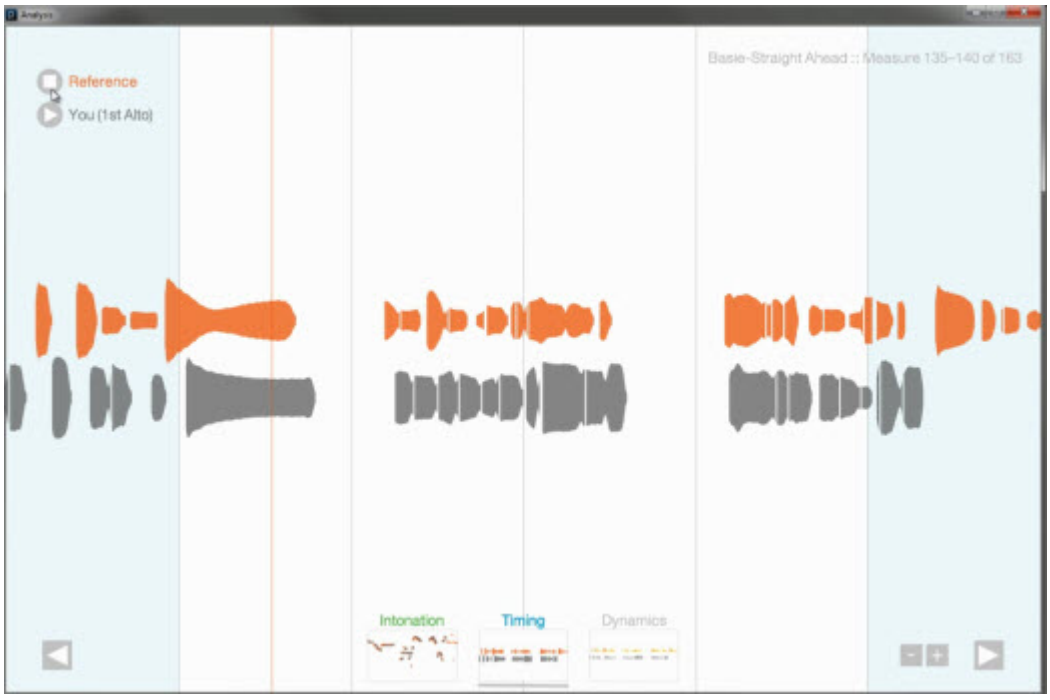
The student's playing is recorded, analyzed and compared to a reference recording of the same part, played by the original musician from the ensemble. This visualization allows the student to see and hear side-by-side comparison of the performances with three visualizations: intonation, timing, and dynamics.

- **Intonation** refers to the pitch of each note. The corresponding visualization shows the pitch contours of the reference and student performances, revealing both large scale mistakes such as wrong notes, and more nuanced interpretations of the more skilled players.



Measures of interest with pitch differences are highlighted in green (background).

- The **timing** visualization shows the shape of the notes as well as their start and end times. Differences in rhythms, late or early timing, and articulation can be seen here.



In music, articulation refers to how a particular note is voiced, both in duration and how aggressively or smoothly. Differences in the shapes of the notes can be seen in their length

and height. Measures of interest with timing differences are highlighted in blue (background).

- **Dynamics** refers to the volume of each note. The corresponding visualization conveys the variations with a smoothed amplitude display.

3. Student Workstation Touchscreens

The long delay in delivery of the 17" Bluecube touchscreens was detailed in the last progress report. Finally, it was decided to instead adopt the 22" Planar Touch PT2285PW. This touchscreen responds to touch only and not writing on screen with a stylus. It is therefore not possible to write notes on the electronic score appearing on the screen. However the much larger size allows display of two pages of the score on screen instead of one. This feature was a frequent request that emerged from early user testing using a small conventional monitor. The student can use an on screen keyboard and the microphone to send written and recorded audio notes to the instructor and vice-versa.

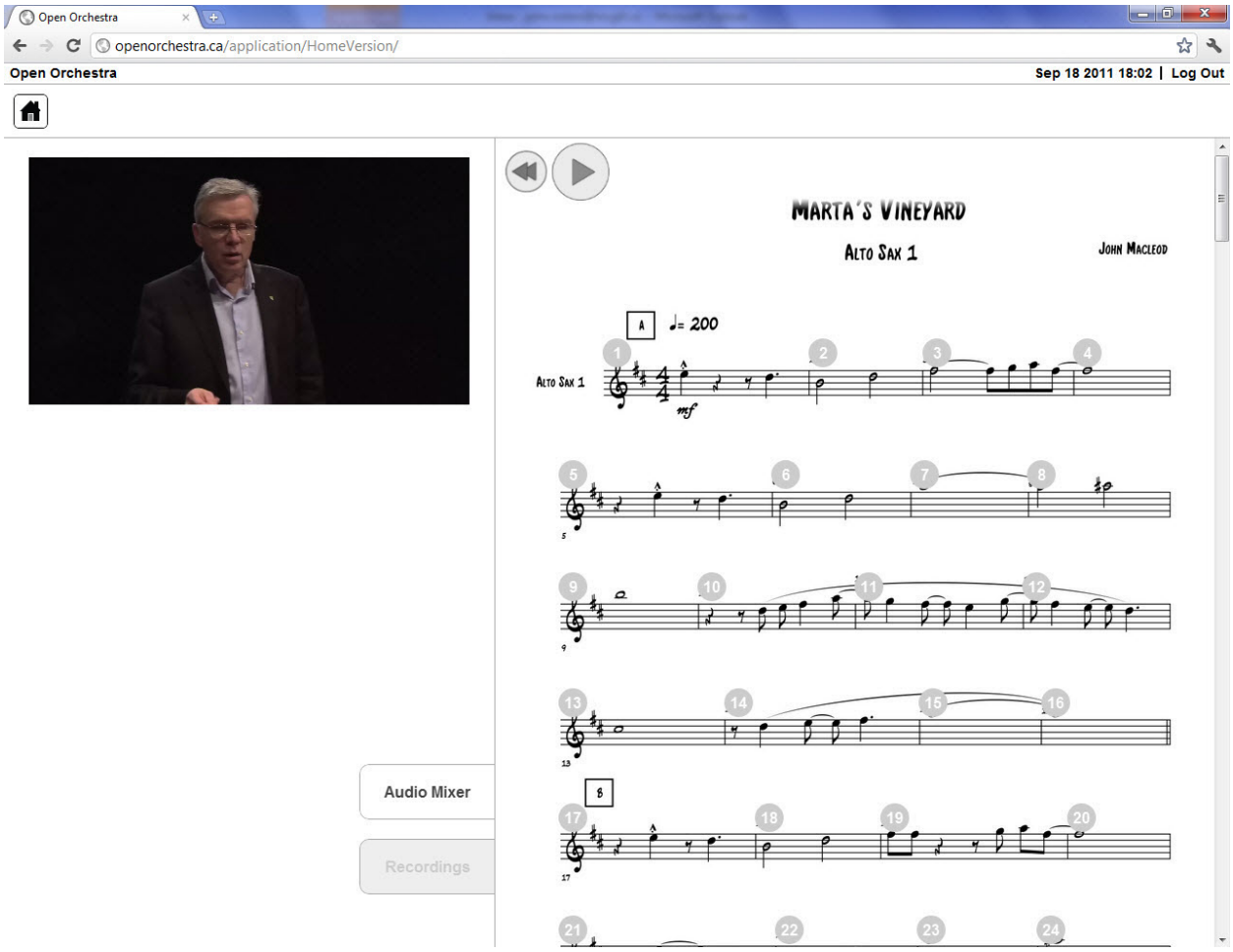
4. Improved Instructor Functionality

Two new features were added that were not part of the original system design.

- At certain points in the electronic score there is a symbol that indicates that the instructor has provided comments about that particular section. Clicking on the symbol allows the student to play the video comments.
- The audio mixer allows the student to turn the different audio tracks on and off and adjust their levels. The instructor can now adjust these settings and send the settings file to their students so they hear what the instructor wants them to hear.

5. Simplified Home Version

A prototype of the simplified home version of the system was developed ahead of schedule. This version uses a normal browser and single computer screen with a commercial internet connection. The view is only of the conductor as provided by the centre camera. It appears in a small box the upper left corner of the screen. Only one page of the score is shown.



The other functionality is planned to be similar to that of the Open Orchestra workstation although without the audio quality provided by its professional components.

2. Project Development & Activities

1. Database tested under load
   Status: Complete

2. Expert system complete to display differences between user and expert performance
   Status: Complete as standalone program

3. Evaluation documents complete for video, audio and score playback, audio record and audio mixing console
   Status: Complete: Evaluation Report attached as Appendix 1.

4. Workspaces for user and instructor implemented
   Status: Complete

5. System demonstrated at Canada 3.0 and BCnet conferences
   Status: Complete

6. Audio comments and written comments on score implemented if suitable touchscreen available
   Status: The final touchscreen implementation does not permit writing comments on the score with a stylus as was originally hoped would be possible with a different touchscreen that is not yet available. However the student can type comments in a message and send them to the instructor and vice-versa. The recording function allows audio comments to be sent as well.

New Deliverables Added:

7. Video comments by the Conductor linked to specific points in the score
   Status: Complete

8. Ability for Instructor to set an audio mix and send it to the student
   Status: Complete

9. Sample video and audio tracks converted for simplified mode
   Status: Completed ahead of schedule

10. A prototype simplified mode player demonstrated
    Status: Completed ahead of schedule

3. Project Plan

The project has followed the plan outlined in the SOW and the last progress report with the following exceptions:

1. **Touchscreen**
   As mentioned above, the Bluecube 17" touchscreens were not delivered. Testing at the partner institutions was done using regular monitors and a mouse to turn pages of the electronic score. At the end of July, it was decided to instead adopt the 22" Planar Touch PT2285PW. This touchscreen responds to touch only and not writing on screen with a stylus.

2. **Network Bandwidth Problems**
   As mentioned above, there were two network bandwidth problems. The first involving TCP over long distances delayed the start of testing at Banff and UBC although testing was completed once the problem was solved.

The second problem involved the use of higher bandwidth video at UBC. This has delayed the use of higher bandwidth video to achieve better video playback quality. While this higher quality is not a deliverable, it is highly desirable and a major benefit of using the Canarie network. A Nortel switch at UBC has been identified as the possible cause of the problem and arrangements are being made to replace it with a Cisco switch.

These problems have consumed a great deal of network and project staff time.

3. Recording and testing schedule

The classical orchestral recording will take place at McGill on Sept. 22, 23 and 24.

A full round of user testing took place at the partner institutions. This went well except that, as anticipated, there was a negative response to using a mouse to turn the pages of the score. Testing with the new Planar touchscreens resumed in August and results are expected in the late fall.

4. Simplified Home Version

A prototype of the simplified home version of the system was developed ahead of schedule. This version uses a normal browser and single computer screen with a commercial internet connection. Sample video and audio tracks were converted for simplified mode ahead of schedule. Since the other deliverables were completed on schedule, this puts the entire project ahead of schedule.

Deliverables – December 31, 2011.

The deliverables on December 31, 2011 are:

1. Video and audio tracks converted for simplified mode
2. Evaluation documents complete for expert system, comments and workspaces
3. Simplified mode player complete
4. Final system complete
5. System documentation and user instructions complete
6. Evaluation documents complete for simplified mode and final system
7. Final system demonstrated for CANARIE staff, Press, RISQ and international and/or other appropriate conferences

4. Updated Claim Forecast

The actual cash flow summary, with actuals and forecasts for the remaining claim periods, is attached as Appendix 3.

5. Intellectual Property

There was no Intellectual Property developed during the reporting period.

6. Communications

There were presentations by John Roston of McGill and Mark Zuberbuhler of UBC at the BCnet Conference in Vancouver on May 3, 2011 and by Steve Bellamy of Humber at the Canada 3.0 Conference in Stratford on May 2 – 4, 2011. Copies of the presentations are attached as Appendix 2.

7. Web Site Information

The project web site address where documentation is being maintained is:
http://canarie.mcgill.ca/project_nep2_index.html