Network-Enabled Platforms (NEP-2) Program
Progress Report – Feb 28, 2010.

Project NEP54: Open Orchestra
Appendix 1: Project Scope

Project Scope – Initial Preparation

The engineering, video and audio teams had extensive discussions about the scope of the project during November and December of 2009. This included meetings with the McGill Music professors who are part of the McGill User Group: Gordon Foote, Hank Knox and Mark Fewer. Subsequently a list of options was drawn up and a mock-up of a possible workstation constructed for a full User Group meeting of all the participating institutions.

User Group Meeting

The scope of the project was discussed at length during the User Group Meetings in Montreal on January 21 and 22, 2010. Some of the options that were not adopted for the current project were put on a list of desirable features for a possible "Phase 2" or follow on project that might be undertaken if the current project is successful in attracting a large number of users.

Participants:
UBC: Mark Zuberbuhler
Banff Centre: Theresa Leonard
National Youth Orchestra: Barbara Smith and Douglas McNabney
Humber College: Steve Bellamy and Denny Christianson
National Arts Centre Orchestra: Maurizio Ortolani and Pace Sturdevant
McGill User Group: Gordon Foote, Hank Knox and Douglas McNabney; Regrets: Mark Fewer
McGill Project Leaders: Wieslaw Woszczyk, Jeremy Cooperstock and John Roston
McGill Engineering Team: Jeff Blum, Adriana Olmos, Haijian Sun, Nicolas Bouillot and Trevor Knight
McGill Audio Team: Doyuen Ko and Antoine Rotondo
McGill Evaluation Team: Adam Finkelstein

Summary of Conclusions:
1. Intended user level
- initial version must be challenging to university level student
- jazz work with McGill's top jazz band conducted by Gordon
- classical orchestral work options to be investigated – MSO? NACO? McGill?
- possible end of project recording of well known ensemble
- high school version left for phase 2

2. Use of system for asynchronous distance teaching
- NYOC will use system for preparation before orchestra members meet in person.
- NACO will use system for follow up teaching after live master classes.
- Everyone in user group will test asynchronous distance teaching. Users at different institutions will be paired and each will try asynchronous teaching with a student at the other institution.

3. Use of system for self-directed practice
- option of system generated summary feedback to instructor
- option of instructor being able to view recordings released by the student

4. Customization of system by instructor
- ability to turn system features on and off (e.g. introduction by conductor)
- ability to adjust pre-sets of system features
- ability to adjust what the instructor can view (e.g. student must release a recording for instructor to view)

5. System operation instructions
- First time user will have brief introduction to and practice in using the controls.
- System controls will have initial pre-sets.
- Student will be able to make adjustments and store custom settings.

6. Introduction to the orchestral work
- on screen introduction to the work by the conductor only
- ability to skip the introduction

7. Option for realistic or enhanced experience
- for realistic experience, student hears exactly what would be heard at that seating position
- for enhanced experience, student can:
- hear an enhanced mix of the orchestra with the ability to adjust pre-sets
- turn instruments on and off
- speed up or slow down the orchestra
- loop a section of the performance by selecting start and stop points

8. System feedback to student on performance
- rhythm
- intonation
- dynamic range
- wrong note
- length of note
- shape of note
- feedback to be a visual representation showing student's performance superimposed on a normal range of performances

9. Home use version
- single screen video showing conductor
- simplified controls
- test using YouTube recordings as well as low bandwidth versions of our recordings
- possible later enhancement to add ability to edit multiple performances into single polished performance

10. Phase 2 enhancements
- second version of same orchestral work using different conductor
- version for high school with more elaborate introduction by the conductor
- allow for improvisation in a jazz work
- help function – student having a problem with a particular section in the score could get suggestions on how to play it
- similar to help function, problem pointed out by system feedback would then provide suggestions for how to correct problem
- enhanced system generated summary feedback to instructor that would enable instructor to quickly check those sections of students' recordings that are causing problems

11. Export of files
- requires initial work on rights issues

Project Scope – Voice

While the decision on whether the system can be used for voice training isn't due until the next milestone, a great deal of progress was made on how it might be done with tests scheduled for April 2010 as soon as the first camera rig becomes available. There are two different recordings of a scene from an opera being planned – a "rehearsal" recording and a "performance" recording.

The rehearsal version will have the principal singers standing in a circle with music stands and will be very similar to the jazz band and classical orchestra recordings. It will be a full run through of the scene, but with the singers in a stationary position.

The performance recording will have the singers in costume without music stands and they will move around the stage as they normally would in a performance. This requires the camera rig to move as it would for the performer it is representing. While the camera rig has been designed to move, we are not at all sure how this will appear afterwards on a stationary workstation panoramic display that is being used by an opera student. Even if this does not work well, we are hopeful that the rehearsal version will and voice will be included in the final system.

Project Scope – Audio

The operational ease, simplicity and relevance of control, and the quality of auditory experience are essential characteristics of the Open Orchestra training tool. The system should be designed in anticipation of features, which will make training easier, more fun, and will result in learning improvement. The most important feature of the system is the accessibility of open orchestra to remote players and instructors.

The following operational characteristics, identified through discussions with professional and student musicians, recording engineers, and composers, have been established for the development of audio capability of the Open Orchestra:

- Student player is provided an adjustable monitoring of the orchestra stage environment that allows him/her to adjust the balance while being immersed in the sound of the orchestra.
- The orchestra is distributed all around to allow maximum audibility of all orchestral parts thanks to binaural selectivity and release from masking.
- For each player, the layout of the orchestral sections is indicated on the GUI and it corresponds sonically to the GUI and the visual layout provided by the video screens.
- The adjustability of the orchestral environment includes the on/off function for each section and provides gain control allowing to lower or to increase the loudness of each section.
- The panning position of each section and player is preset, and optimized for each practicing musician (system user, trainee).
- The acoustical perspective is preset and fixed for each section and player from the perspective of the practicing musician.
- The practicing musician (trainee) is able to increase his own playback level or to reduce it, and to add or reduce the reverberation of his own instrument.
- A preset may be provided for allowing the trainee or the instructor to hear the orchestra from the conductor's perspective. This is usually equivalent to the "audience' perspective in a recording.
- The start and end of recording can be activated by a foot or hand switch at the trainee's position. Versions of trainee's performance can be stored and over-written.
- The process of moving through pages of the score is equivalent to moving through the waveforms of the recording. The player does not see the waveforms (as recording engineer does), only the score, which is the only interface with the recording.
- The GUI allows the trainee to move the score as a continuous horizontal roll of pages using iPod style touch interface with simulated inertia.
- The sound quality is full bandwidth and high-fidelity surround sound.
- The sound of the orchestra and the trainee is provided via noise canceling headphones.

- A wired microphone will be used, most likely mounted from the ceiling, to accommodate performers who like to move around, e.g. singers.
- A simple track selector system will allow the trainee to switch between 3 or 4 already recorded performances, and to audition and construct a composite of the best parts.
- The re-recording of the composite edited version will not be provided.
- The trainee should be able to indicate on the score, which one of his performances should be featured at each time, and be able to audition this result.
- Alternatively, he/she would switch between performances on the fly while auditioning them, and the system will remember the switching, plus play back all changes during the subsequent listening session.

Muting Option
The trainee can mute sections or instruments in his/her monitor mixer or lower their volume by a preset amount ('dim' adjustment), or raise the volume of certain tracks by a certain level amount in order to hear his tuning or intonation against that group or instrument.

Mixing and Monitoring
The trainee is in charge of his orchestra mix, which is constructed by adjusting the monitor level of each section and any critical instrument or voice, if available.

The trainee can save his settings for the monitor mixer. This represents the way he likes to hear the balance of the orchestra for a given piece, or all music pieces. The default settings are always available and are preset by the system designer.

Dump Option
The trainee may want to 'dump' certain players and sections with the intent of practicing without them (with only certain instruments or groups at a time). The fade options are:

- 'auto fade out'- An instrument or a group fades out to zero when their icon is touched. You can stop the fade out at any time (and level) during the fade out by pressing again.
- 'accelerated fade out with a confirmation twist' - (sound effect identifying successful dump).

Tuning
The recording should provide a reference pitch for each instrument prior to the exercise.

Option: a tuning session should be provided before the practice session or performance, so that the trainee can tune with the orchestra as a whole, or with an instrumental group. We should provide 30-40 seconds of tuning reference. It

is a good and important practice to tune with the orchestra; this skill needs to be promoted and developed.

A tuning sensor and indicator may also be provided (iPhone style) to help the trainee to tune before the session.