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A Case of Specifying and Using Networked Computers in the Sound Design for THE CHERRY ORCHARD

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A Case of Specifying and Using Networked Computers in the Sound Design for THE CHERRY ORCHARD

A thesis submitted in partial satisfaction of the requirements for the degree Master of Fine Arts in Theatre and Dance (Design) by Andrew Vargas

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2016
The thesis of Andrew Vargas is approved and it is acceptable in quality and form for publication on microfilm and electronically:

Chair

University of California, San Diego

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LIST OF SUPPLEMENTAL FILES

File 1. *The Cherry Orchard* portfolio page: Audio Over the Production Network

File 2. *The Cherry Orchard* portfolio page: Sound System Computer Setup

File 3. *The Cherry Orchard* portfolio page: Audio Software on the Production Network 1


File 5. *The Cherry Orchard* portfolio page: Sound System Wiring Schematic
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Professor Shahrokh Yadegari, an incredibly brilliant and encouraging mentor and committee chair, helped most of the process along. This process of creating, organizing, and editing the documentation of my craft started as a project without direction or clarity. The reminder to treat the recounting of my craft as a craft in itself not only helped give me focus, but will certainly endure as a valuable lesson. Thank you Shahrokh.

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ABSTRACT OF THE THESIS

A Case of Specifying and Using Networked Computers in the Sound Design for THE CHERRY ORCHARD

by

Andrew Vargas

Master of Fine Arts in Theatre and Dance (Design)

University of California, San Diego, 2016

Professor Shahrokh Yadegari, Chair

For theatre sound design, detailed planning of networked hardware and software affords a sound designer and the audio crew efficiency and flexibility during the process of rehearsals, designer quiet time, technical rehearsals, and performances. The need to properly specify and use networked computers is demonstrated in the corresponding documentation within the portfolio of the sound design for The Cherry Orchard by Anton Chekhov. This play, which was produced by the UCSD Department of Theatre and Dance, opened in the Sheila and Hughes Potiker Theatre on November 29, 2015. The audio system and sound design process used current network technologies and practices
to automate tasks, provide ease of access and control, and display information with better clarity and speed. The description of my experience as sound designer in this production of *The Cherry Orchard*, and the included portfolio documentation, is an example for theatre sound designers to take advantage of computer network technologies that are involved in the audio reinforcement system and sound design process of a theatrical production.
NETWORK TECHNOLOGIES IN THE SOUND DESIGN
FOR THE CHERRY ORCHARD

The local ethernet network, as part of the sound system design in this production of *The Cherry Orchard*, had four Apple computers connected to a managed ethernet switch, which was also connected to a wireless access point. Each computer had a specific role and was given a descriptive name: The board operator controlled a 'sound playback Mac Mini' which was designated for sound cue playback and audio mixer automation. A 'sound shop Macbook' was used by me and the sound shop technicians to run system tuning software and control software for the sound equipment. A 'recording Mac Pro' handled multitrack archival recording and was operated by a recording engineer. I used my 'designer Macbook' to create and edit music and sound, as well as remotely control all of the other computers. Also included in the network were wired connections to a Dante-MY16-AUD expansion card installed into a Yamaha DM2000V2 digital audio mixer, a Meyer Sound Galileo 616 AES speaker processor, two Shure UR4D wireless mic receivers, and a connection to a separate switch that handled the networked devices within the video projection system.
The design of this computer network was included in the paperwork that was submitted to the sound shop and was built to the specified details along with the placement of the speakers and wiring of the audio mixer. As a designer with no assistant, the planning of the network highly prioritized access and control over the various components of the sound system from my Macbook. Automation of tasks was prioritized because of my need to stay within a creative and artistically critical mindset as the company works through tech rehearsals. Another consideration was the proper delegation of tasks given to the sound board operator and the recording engineer, in terms of the networked computers that they would operate. The location, network configuration, and installed software were all detailed as well, which helped delegate the work of setting up and configuring the computers. The plan was executed as intended and allowed my attention to be focused on the sonic and artistic elements of the play.

There are three network related software technologies that were particularly important to the sound system as it was built and operated for the production. They were primarily in effect while I was in the venue during either a dedicated sound designer quiet time or during technical rehearsals. Sync Pro by BitTorrent Inc., saved time with copying and backing up files before the company moved into the venue, during tech rehearsals, and after opening. Dante by Audinate Pty Ltd. enabled flexibility and seamlessness for audio routing and distribution in various situations throughout tech rehearsals. The Screen Sharing application, which is built into Mac OS X, made for easy access and control of devices over the network. These software applications are what I chose based on what is available and what I determined would best support the production. They are not the only protocols/programs that would have worked and can be respectively generalized by their roles: file synchronization and back up over the local network as well
as the internet; audio transmission over the local ethernet network; and remote system control over the local network.

Other software applications, such as Ableton Live and Figure 53 Qlab 3, are described only as augmented by the network software. Respectively, they are my chosen software applications for music/sound editing and sound playback. In order to function properly – especially as work continues away from the venue and production network – they need to save project files to a consistent and specified project directory or folder. Yamaha Studio Manager, Meyer Compass, Rational Acoustics Smaart, and Shure Wireless Workbench are applications that were only used at the venue. These are used to control the sound equipment and to analyze the speaker output.

BitTorrent Sync Pro is a software that automatically synchronizes a folder on one computer with a folder on another computer, without needing to access a web-based file sharing service. It can work while only connected to the production local network, it can work over just the internet, and it can work while connected to both the local network via ethernet and the internet via Wi-Fi. I own two Mac OS computers, one Macbook and one desktop 'Hackintosh'. Each personal computer has the same project directory, /TheCherryOrchard/production, that will continually work to have the same contents across both computers. A file added to the folder of one computer will immediately be copied to the folder in other 'synced' computers. Similarly, deleting or renaming a file in the folder of one will be reflected across the same folder in all 'synced' computers. In the part of the sound design process that takes place before moving into the venue, this software was used to automatically backup music and sound production files from my Macbook to my Hackintosh. This Hackintosh also created periodic backups of the hard drive that contained the important files, thus creating an additional copy. Simply saving a
new project on my Macbook, allows me to open the new project and continue working on my Hackintosh. Upon setting up the local network for the production sound system and configuring the production computers with the project directory, Sync Pro automatically copied all of the show files to all of the production computers. During the tuning of the speakers and microphones, configuration files for the mixer, speaker processor, and wireless microphones were, when saved, automatically copied to the project directory on each computer including my offsite Hackintosh, which in-turn backed up the file onto a separate hard drive.

With one project directory shared across four computers, plus my Hackintosh which made daily backups, there were six copies of all of the files related to the sound design of *The Cherry Orchard*. If one computer were to fail, all of the files would be safe. The continuous and automated functionality of Sync Pro save enough time and effort during all parts of the sound design process that I was comfortable without a design assistant.

Sync Pro also worked flawlessly after a multitrack recording of a performance wrote approximately twenty gigabytes of audio to the hard drive of the recording Mac Pro. For this file transfer, I set up a separately synchronized folder that contained the recorded audio: `/TheCherryOrchardRecording/`. This folder was only shared to my personal computers and was only activated after the recording was completed. Upon activation, the computers immediately ‘found’ each other and began copying the audio to my personal computers.

Dante is a protocol designed for the low latency transmission of uncompressed, multi-channel, digital audio over local ethernet networks. The Dante-MY16-AUD expansion card enabled all four of the networked computers to simultaneously send and
receive multiple channels of audio to the Yamaha DM2000V2 digital mixer. During system tuning, the shop macbook generated test tones and analyzed the speaker output through an analysis microphone. During technical rehearsals, this macbook received the 'solo bus' from the audio mixer and displayed real time audio analysis. The sound playback Mac Mini played multi-channel audio to the mixer, as did my Macbook when I wanted to play sound directly from Ableton Live, and the Mac Pro set up for recording received multi-channel audio from the mixer. Dante Controller is the application that sets audio routing from 'transmitters' to 'receivers' in the local network. It can be run from any computer on the local network and detects the current state of signal routing. For *The Cherry Orchard*, it was consistently run from the shop Macbook and also generated save files that were backed up to the project directory.

In the case of creating new sound files during tech rehearsals, the fact that my Macbook and the sound-cue-playback Mac Mini could simultaneously play multi-channel audio made the process fast, easy, and artistically useful. The Mac Mini played sound from QLab and my personal Macbook played back sound from Ableton Live. Although it was from different applications on different computers, the multi-channel configuration and loudness on each program were the same. This allowed me to, in some cases, play a sound cue from Ableton Live on my computer along with actors and other tech elements during a scene. In this situation, I was able to make edits before rendering the sound file and loading it into QLab on the Mac Mini. When the scene was run again after preparing QLab with the new sound, the sonic quality matched the edits made during the previous run. This process is quick, easy, inconspicuous, and useful. The technique requires proper coordination between the sound team and stage management.
However, when combined with automatic file synchronization, the technique is not only viable, but made this part of theatre sound design enjoyable and artistically satisfying.

During one of the performances, the Mac Pro, which was setup with multitrack recording software, recorded signals from both the audio mixer and the Mac Mini. The routing flexibility of the Dante system allowed this to happen without interfering with any other signal transmission. In the Dante Controller software, individual channels of either audio input or output – multiple channels on each device – are termed 'transmitters' and 'receivers'. The matrix of transmitters and receivers are organized by connected Dante enabled devices; a transmitter can be connected to multiple receivers but a receiver can only be connected to one transmitter. Since the Mac Pro didn't need to transmit – only receive for recording – connections from the transmitters, that corresponded to the desired recording tracks, were simply added to the receivers on the Mac Pro.

For most of tech rehearsals, I was in control of the entire system from my Macbook, while sitting at a tech table in the audience area. I was also able to set my Macbook next to the board operator and have the same control; I had an ethernet cable ran to both positions specifically for this flexibility. The remote control of the other computers is thanks to, among other Mac OS X networking abilities, the Screen Sharing application. When properly set up, I saw the screens of all four computers on separate 'desksops' of my Macbook, and each computer screen could be viewed by three-finger-swiping to the left or right on my trackpad. For better viewing of information, an LED display was added to the tech table and the screen for the Mac Mini was most often displayed.

During the tuning of the sound system I was able to freely move around the space and critically listen to the quality of the speaker system, while carrying my Macbook and
making adjustments to the sound system via Screen Sharing with the sound shop Macbook. Connecting to the production local network via the wireless access point incurs latency in the network connection when compared to connecting via an ethernet cable. However the ability to make changes to the mixer or speaker processor from anywhere in the seating area made system tuning fast and easy. Throughout the tech rehearsals, the sound shop Macbook would remain by the mixer and would display information from the software that accesses the audio equipment.

In the case of creating sound files during tech rehearsal, screen sharing allowed me to work quickly and entirely from the sound tech table in the audience area. After a sound file was created and copied over to the sound playback Mac Mini – many times only taking a few seconds – I would 'swipe' from control of my Macbook to control of the playback Mac Mini. The newly copied file would then be, remotely, 'dragged and dropped' into the QLab window and within the appropriate cue. The routing and level parameters would be set and the sound cue would be ready to rehearse with, usually in less than a minute. There were also the cases of making small changes to sound cue levels while a scene is running. This also happened easily and inconspicuously thanks to Screen Sharing.

The planning and operation of file synchronization, audio over ethernet, and screen sharing technologies was a significant contribution to the fact that the audio system performed stably and consistently throughout the run of performances. Not having the benefit and facilities of these technologies, I would have certainly been too distracted with tech tasks to be involved with making theatre as a designer. This technological setup allowed me to remain a creative and artistically attentive sound designer, even though I didn't have a sound design assistant who would normally take care of technological tasks.
The design and planning of the computer network in this UCSD production of *The Cherry Orchard*, and my experience of working as the sound designer, is an example of what benefits are possible with successfully implementing current network technology.