Doctoral Thesis

Nodalism:
A Framework for
Network Music Performance

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This thesis presents a body of theoretical research combined with a portfolio of original works residing within the field of Sonic Art; more specifically, a sub-genre entitled network music. Network music is a specific type of performance in which technological, sociological, conceptual, theoretical, and abstract models of a network are the foci. This thesis contains critical analysis of three historical examples of network music, as well as critical reflection of three artistic responses. The responses constitute the portfolio included in this thesis, and they are the creation of the author.

The theoretical element of the research aims to convey the concept of nodalism as a critical, conceptual, and theoretical framework beneficial for the analysis, reflection, investigation, and creation of network music. The thesis draws on theoretical models and abstracts of nodalism to argue this, supported by network theory, networkology, critical theory, cybernetics, systems theory, and network music theory. It proposes that common threads exist between fields with respect to understandings of relation, interrelation, interconnectedness, and intersubjectivity. The thesis also proposes that adopting nodalism as a critical framework in the field is beneficial from a number of perspectives, as well as directive of the future research and development of both type and genre.
Acknowledgements

My mother, father, sister, brother-in-law, and my nephew Oscar; who never doubted my ability to complete this phase of my life, even if they never understood exactly what it was I was doing. How much of that is down to the fact that I never really understood myself is, of course, debatable.

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Declaration

Concepts and arguments that have been presented in this thesis have already appeared in the following publications:


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Chapter One

1. Introduction

This thesis is a result of the author undertaking the Doctorate of Philosophy programme at the Sonic Arts Research Centre (SARC), Queen’s University Belfast. This document comprises the written component of the requirements; forming the theoretical support, contextual analysis, critical evaluation and reflection with respect to the attached portfolio of original works. The doctorate was undertaken from January 2012 till September 2015.

It would be a pleasure to say that the form, structure, focus, and composition of the thesis was known throughout, but this statement would be entirely false. I, as academic, theorist, and artist, learned as I bundled along; piecing together understanding as the thesis evolved - supported, guided, and inspired by people, places, and things. At times, as artist, I fell in awe of the works I was responding to; sometimes as artist, I was wholly convinced that I was creating unique interpretive works. As theorist, I drowned in the depths of knowledge that existed before me; sometimes as I wrote, I felt waves of inspiration and surges of creative offering. There were ups and downs: creatively, technically, professionally; personally. As goes life.

This first chapter will seek to outline the motivational background for the research, offering personal reflections on why I chose the specific investigative path. I will attempt to stay clear of academic rigour - initially, as I know there will be enough of that as the thesis develops. I just hope that my writing is clear, and my thought processes comprehensible. This is not to say they were throughout the whole process; but if not on reflection, then never.

1.1. Background and Motivation

There was a moment during the process when I was asked, in quite a formal manner, by a fellow PhD student exactly why I was researching what I was (see Roberts, 2015). I had to think about it. The answer came relatively quickly to mind:
I had continued on the path of a PhD as I had known that government funding was available. I then answered that the only reason I pursued the line of enquiry I did was due to my supervisor, Prof. Pedro Rebelo, gently offering network music as a possible route into the PhD programme at SARC. This really only tells half the story.

When I think more holistically about why my interest in network music cemented after first investigating the genre - aside from economic and pseudo-political motivations - it is difficult to pinpoint one exact reason. Abstract relations formed in my mind between network music, as introduced to me by Prof. Rebelo, and concepts I was more familiar with; electronic music, sampling culture, dj culture, dj performance practice, internet culture, cybernetic culture, to name a few. There is, however, one standout example of my interests resonating with my formative notions (see M-nus Inc, 2008); forging my personal interest in electronic music with the early investigations and guided research that I undertook as I went about planning my PhD research proposal.

Ritchie Hawtin, the founder of the M-nus Record Label, explained the reasoning behind the shows his company created to celebrate the ten year anniversary of his record label: Contakt “....people like to see us together. We like to have contact with the people. We like having contact together on stage, how do we...how do we build upon that? Let's get closer to each other, and closer to the crowd, and then we started to build the idea and the technologies, and even the greater concept around that. There has been some technological advancements in dj'ing. I had moved away from turntables. I was using Traktor. So this started to open up a door of being able to have a timecode that would allow me to sync, you know, other people to my records that I was playing.” (M-nus Inc, 2008). The concept and ideology of Contakt effected my understanding of what music could be in the future; a music where multiple performers played together, always synchronised. This, in turn, influenced my idea of what a network performance was, is, or could be. This idea then developed, through my own MSc Thesis (Renwick, 2011), onto my PhD application, and then into my actual PhD research.

This formative concept of network music was framed by some of the early network music theory that I had been gently pointed towards by Prof. Rebelo. This framing then helped to form my own MSc Thesis focus, in which I devised a software system for the synchronisation of digital audio workstations (DAW) over local networks, by implementing a Max/MSP based programming patch (see Renwick, 2011; Renwick 2012). This research afforded me a solid foundation in network
music, with which I arrived at the SARC; to further my own understanding of what network music, was, or could be.

1.1.1. Initial Abstract of Network Music

During the preparation for my differentiation process at SARC I wrote a conceptual abstract; what I believed to be the potential of network music. It might be seen now as grossly optimistic, idealistic, or even naive - but one should always dream.

The concept, as best as can be articulated currently, is centred on the idea that as humanity progresses, expanding ever more deeper into the networked, computer dependent, digital era; music will cease to be object based. It will become a process. A process in which we are all involved in, either directly at a production level - those contributing to the process; making, or at a consumer level - extracting from the process; listening. If one can imagine a very broad array of computers and computer processes, all controlled, synchronised and directly connected; music becomes an ever moving, ever changing entity, one whose makeup is never static and never complete. Music will become a continuous cycle of processes; expanding and contracting, the inherent scale and complexity of which never allows for repetition. All that remains is for those listening to extricate pieces whose constitution will be decided by themselves, through a unique, interactive process. Musical identity and originality will no longer be formed by the composers or performers, as is the case now; it will be formed by the listener. The art will become the listening, the interaction, the choosing; not the performing or composing. The composition and performance will be mass distributed, collectively devised, multi-versed and authored multi-nodally, with no distinct central ownership or formulation hub.

This description developed at the time of my differentiation through a combination of understanding I had developed from existing literature, and my own imagination. The concept evolved further, just as my research did; ultimately leading to an even more idealogical and optimistic abstract that is presented in the concluding chapter of this thesis.

1.2. Thesis Structure

This chapter outlines my own personal background and motivations as they pertain to the research presented here, explaining how my ideas developed from initial
interests, to forming the basis of my MSc studies, before developing onto more solid academic and theoretical footing through my PhD research at SARC. The chapter will also explain my methodologies: practice-based, theoretical framework structuring and implementation, reflective analysis, and critical evaluation. It will outline the rationale for the chosen historical works, and also give a brief introduction to my own portfolio. Following on from this, I will elucidate what I believe to be the contributions to the field, in both artistic, theoretical, conceptual, and technical terms. It is felt that these should be the conditions against which the success or failure of the thesis should be judged.

The second chapter will mark the beginning of the academic rigour pervading the body of the thesis. It will act as an introduction to the theoretical concepts leaned upon throughout. This grounding will benefit the reader, affording them an overview of key themes, concepts, ideologies, and theories that arise as the thesis develops.

The third chapter will outline the thesis’ core conceptual theory: nodalism. It draws on the genealogy of the term, outlining the current state of research, and then makes explicit connections between the concept and the various other theories, including networkology and network music performance theory. These links are seen as foundational binds between nodalism and network music performance. By the chapter’s culmination the reader will be able to acknowledge the relevance nodalism has to network music performance, as well as the benefits that may accrue from analysing network music works through a nodalistic lens.

The fourth chapter marks the beginning of the reflective analysis and critical evaluation process. Three historical artworks are introduced, explained, conceptualised, and then analysed through the reflective lens of nodalism. The three artworks are Max Neuhaus’ *Public Supply I* (1966), Maryanne Amacher’s *City-Links* series (1967-1980) and John Cage’s *Variations VII* (1966). It is thought that this specific type of reflection has not been completed before, and so it represents a core contribution to the field. The analysis is supported by existing theory in the field of experimental music, as well as related theoretical models drawn from associated fields. The reflective practice will elucidate key artistic concerns mirrored in my own practice; attempting to locate my artworks as conceptual, theoretical, technical, and artistic responses to these historical works.

The fifth chapter continues the reflective analysis and critical evaluation process, but turns attention towards my own portfolio. The reflective analysis is completed
through a direct comparison exercise with the historical works. There are three
historical works and three responses - set out in pairwise fashion: Skype Supply is a
response to Neuhaus’ Public Supply I, Synchrocities a response to Amacher’s City-
Links, and Web Variations a response to Cage’s Variations VII.

The concluding chapter summarises the previous five chapters. It will also attempt
to draw some conclusions and implications with respect to the effects the reflective
practice and critical analysis has on the field in general. Future directions are also
speculated on; linked to existing theory as much as they are pseudo-idealistic
fantasy. It is hoped that by the end of the thesis, the speculative abstraction that was
laid out in section 1.1.1 will be viewed as being based on a more grounded concept
and theory; locating my own ideologies of network music concretely within the
realms of nodalism, experimental music practice, cybernetics, networkology,
systems theory, and performance eco-systems.

1.3. Methodology

This thesis, and accompanying portfolio, was created through a formulated
methodology. I am not going to state formally that the methodology was cemented
from day one of the doctoral process, but a loose structure did originate in the first
few months which, thankfully, solidified as time passed; theories, concepts, ideas,
and strategies fastening and securing as they made more compleitive sense.

A practice-based method provided the methodological structure for the thesis.
Linda Candy defines the practice-based process: “..[it] is an original
investigation undertaken in order to gain new knowledge partly by means of
practice and the outcomes of that practice.” (Candy, 2006, pp. 1). The actual
process consisted of:

A) investigating and researching historical works; deriving direct inspiration from
them.

B) creating original works - seen as artistic responses - by exploring core concepts
contained within the historical works.

C) completing critical and reflective evaluation through the investigation of
particular aspects of the historical works; relating them to existing theory from a
number of fields, but primarily through the relation, interrelation, and
intersubjective concerns of nodalism.
It must be stated that the process emerged organically: As I explored concepts in the historical works, I tried to implement them into my own creations. As I reflected on my own creations, I realised that there was a mass of theory that could frame my artistic ideas. As I explored theoretical concepts, I realised that there were profound similarities between theory and practice in both the historical works and my own created responses. The process was not linear, even if the chronological analysis tends to that impression. Ideas, reflection, and analysis bled from project to project as I progressed. Critical reflections traversing temporal and idealogical spans.

1.3.1. Practice-based Research (PbR)

Artefacts created during the research process are tools through which one may engage in an academic “mode of ‘discourse’” (Seago and Dunne, 1999, p.16). Any researcher working with practice-based methods acts as a “critical interpreter of design processes and their relationship to culture and society” (Seago and Dunne, 1999, p.16). For this thesis, I interpreted a series of established, historical works; drew inspiration from them; analysed them through a theoretical model; created a portfolio of responses; reflected on the process, and then analysed and investigated how the theoretical model revealed unique reflections of my own method, as well as the methods of artists such as Neuhaus, Amacher, and Cage.

1.3.2. Nodalism as Framework

The realisation that nodalism was the over-arching framework for the thesis did not appear until the mid-way point of the PhD process. I understood, somewhere along the line, that nobody had explored the concept of nodalism and its relation to network music performance. I remember the moment I first encountered Gochenour’s theories of nodalism (Gochenour, 2006; Gochenour; 2008) and then later discovering that respected experimental music practitioners and academics had incorporated the term into their own artistic practice (Adkins & d'Escrivan, 2013; Adkins, 2014a; Adkins, 2014b). I remember the sudden sense of excitement, and admittedly foreboding, beginning to wash over me. I realised the deep connection that was starting to bridge disparate sections of my evolving research. Experimental music practice, network music practice, network music theory, network theory, systems theory, communications theory, cybernetics, cyberspatial theory, to name a few, suddenly had a cohesive binding element and meta-framework: nodalism.
I began to devise a theoretical model for the analysis of network music projects through the lens of nodalism. I did this by relating nodalism, and its concrete interrelational concerns, to an understanding of systems theory, and performance eco-system models. I understand that any musical performance consists of certain elements, or agents; acting in an organised fashion - a system. Once one defines these agents and their roles (even if the roles morph or evolve during the performance) one can begin to place them into a theoretical model; affording assessment of specific roles, the interrelations between roles and, of course, the system as a whole.

The framework I devised is relatively simple. I first looked at the specific agent role of performers; analysing them from a number of differing perspectives - focusing on how nodalistic analysis affords deeper reflection on how a performing agent may interact with, or react to, other agents in the system. I also spent some time considering the role of the instrument. The definition of an instrument is very loose, but may be seen in this case as any sounding object - regardless of its constitution, or constitute parts. I also pay considerable attention to the role of the listener; reflecting on how nodalism, and its related concepts and ideas, alter the perspective of the listening agent; through listening behaviour, or a modified model of aesthetics.

1.3.3. Reflective Analysis

The vast majority of the contributions to the field arise from the reflective analysis completed through the lens of nodalism. As the thesis develops, it will become clear how a comprehensive understanding of nodalism and its related theories, concepts, models, and ideologies unearth intriguing, unique, and original observations about network music performance. Chapter 4 and Chapter 5 illustrate the detailed reflection and evaluation process that I undertook. I am sure there are aspects I have failed to elucidate, but I am certain that I undertook the process with an open and inquisitive mind; attempting to frame the exploration of three historical works and three original works in a manner that was befitting of a PhD.

1.4. Rationale for Historical Works

When I reflect on the choices I made; formulating my artistic responses to chosen historical works, there is a single obvious reason that springs to mind. For those that are unfamiliar with the three works, a common thread runs through them all. The three artists chose to explore the influence technologies had on sound, and
more specifically sound art. They implemented technological mediums of their day to explore the relationship between performers and technology, audience and technology, and between performer, audience, and the experiential nature of sound. Neuhaus implemented radio and telephone in Public Supply I, Amacher used telephone and radio in City-Links, while Cage and his co-performers used a host of technological apparatus in Variations VII, including radio, short wave radio, electrocardiography (ECG) equipment, and telephone.

All three works are examples of embryonic network artworks (see Joy, 2010). Max Neuhaus implemented radio and telephone to create a complex bi-directional communicational network. Maryanne Amacher implemented high bandwidth telephone lines to create a live network of soundscapes. John Cage, and his colleagues, implemented a host of equipment to create a performance in which performers sourced, gathered, and then modulated, a network of sounds that otherwise lived an obscured, etheric existence; hidden away from the natural listening ear.

Investigating the works and their creators further, more similarities continue to surface. For instance, all three composers were active in the field during the same period, and even more surprisingly within a very similar geographical area: as part of the avant-garde experimental art scene developing in New York at the time. This scene, in the 1960’s and 1970’s, is seen as reaction against developing mainstream music culture, in accordance with similar movements in the contemporary art worlds of dance, and performance art.

Studying the similarities between the three artists is outside the remit of this thesis; but it must be said that doing so could be seen as nodalistic practice in itself; drawing lineage and relation between subjects, whether in a conceptual, artistic, political, or geographical sense. What remains, is that three works were chosen as they inspired me in some way - as did the artists. They explored concepts involving technology; as medium and inspiration, vehicle and device; stimulus and spur.

I might have chosen different works than the ones I did. For instance, Max Neuhaus completed a series of works named Broadcast Works, including Radio Net, where he set up a complex communications network between two hundred or so radio stations; each of them being given an automated mixing instrument so that groups of telephone callers at each station could engage in a self governing performance network (see Neuhaus, 1994). Though this was a truly audacious and inspiring work, I admit - humbly - that the sheer scope would have been beyond my own
limited skills. Thus, I chose to explore, reflect, and respond to *Public Supply I*. A work that is seen as a pre-cursor, both temporally and conceptually, to *Radio Net*. The artistic inspiration for my own response came immediately and, for the most part, effortlessly. I could imagine the telephone being replaced with *Skype*, and the radio transmission being replaced with the audio/visual medium of *Youtube*.

In the case of Amacher, *City-Links* was a series of iterations whose core themes became evident as I reflected on them; the collection of works touched on many - all interesting in their own right, and it took a period of reflection to grasp Amacher’s true artistic and conceptual communications. I could have chosen to interpret any of her iterations - merely updating the mediums and altering the locations - but this was not what inspired me. So, the notion of sonic synchronicity became my engagement - a notion that Amacher had formed during her long-form listening practices. It intrigued me in a number of ways; the concept, its perception, and the actual listening dedication that was completed by Amacher for its realisation.

_Variations VII_ was a case similar to that of Amacher. A structure supplanted from the original artistic concepts; re-imagined and re-contextualised. I discovered, through research, that _Variations VII_ investigated indeterminacy, and I wanted to explore that in my own work. I also knew that using the medium of the Internet I could take the concept of a ‘network of sounds’, and place it into the realms of a digitally hosted performance stage. It was, perhaps, a fanciful idea at first - but as the thesis evolved, it became obvious that the culmination of my thoughts as theorist, and as artist, could be reflected through the work. Deciding which came first; the work, or the understanding of the work, is much like the oft told chicken and egg conundrum. Many a time discussed; perhaps never fully understood.

### 1.5. Portfolio Outline

The attached portfolio consists of the documentation and supporting materials for the three artistic responses: *Skype Supply*, *Synchrocities*, and *Web Variations*. The full descriptions of the pieces: documentation materials, installation software, supporting programming code, technological infrastructures, and installation instructions may be found both at the supporting documentation website (http://robinrenwick.net) and within the attached hard drive. Below is very brief introduction to the pieces - in the form of programme notes - as well as information as regards the time and dates of the demonstrations, performances, or installations.
1.5.1. Skype Supply

Friday 19th April, 2013 Open Skype Supply Session  
@ Ps2 Gallery, Belfast  
A Participative Interactive Audio/Visual Installation

*Skype Supply* is a response to Max Neuhaus’ *Public Supply I* (1964), one of a suite of works Neuhaus entitled *Broadcast Works*. *Skype Supply* implements the often used modern day communication mediums *Skype* and *Youtube* to create a virtual stage that affords dialogue between members of the public; both at the gallery space and further afield. Users interact with the work by calling a designated *Skype* address: skypesupply2013, delivering their voice, image, words, actions; creativity into the installation. The system then supplants their offering into a bespoke designed software management application; creating a dynamic collage of participant offerings - attempting to forge semantic dialogue and meaning through its efforts. The output of the installation is simultaneously broadcast onto the Internet through the medium of a ‘one-to-many’ broadcast station: *Youtube*. Members of the public not situated at the gallery space may watch this broadcast and communicate with the installation, through *Skype*, from their own Internet enabled device. The two-way dependency between the installation and the participant creates a dynamic space in which the artwork pertains the ability, if leveraged, to feed back into itself.

1.5.2. Synchrocities

Saturday 27th & Sunday 28th September, 2014  
@ Network Music Festival, Birmingham  
An Audio/Visual Installation

*Synchrocities* is a multi-channel audio/visual installation in which a series of open microphone streams are analysed, in pairs, through FFT based spectral analysis. When the governing system, based in Max/MSP, determines a synchronous event it performs a specific process. A synchronous event is determined as a period of time in which simultaneous audio activity exists in two concurrent streams above a certain amplitude threshold, and within a pre-defined frequency range (FFT bin). Four streams are analysed, in a bi-focal system. When a simultaneous event occurs, specific processes intervene. In the first instance, the governing system replays the specific FFT bin in which the synchronous event transpires. This may be called a
'frozen’ moment. In the second instance, the system replays the sonorous activity through a convolution technique. The synchronous events from each stream are convolved with one another, and then replayed through the space - accentuating an interrelation between the two places.

The installation also contains a visual element in which a map is displayed on the front wall. The map remains hidden until a time in which a synchronous moment emerges. The synchronous event then reveals the specific locational origins of the streams. The interplay between the visual representation and the sonic events allow the listener to forge an understanding of the spectral relationship of the paired sites. *Synchrocities* is displayed within a quadrophonic array. The sonic pairings are made from microphone streams sourced through the *Locus Sonus* open microphone platform.

### 1.5.3. Web Variations

**Friday August 14th, 2015**  
@ Sonic Arts Research Centre (SARC), Belfast  
An Internet Based Performance Stage.  
Located @ [http://webvariations.herokuapp.com](http://webvariations.herokuapp.com)

*Web Variations* is an artistic response to John Cage's *Variations VII*, which was performed in 1966. Cage designed a collaborative performance in which a group of musicians and performers gathered sound through their chosen method; utilising a array of available sources; radio receivers, telephone lines, electrocardiography (ECG) machines, to name a few.

*Web Variations* alters the creative focus; allowing the composer to source sound from any node within a musical network. The performance environment allows composers, and listeners, to explore and navigate interrelation and intersubjectivity through musicality; creativity never in isolation, but always in relation. Upon entering the system, a base node appears. This node represents the fundamental sound source; a live microphone stream, sourced from the *Locus Sonus* live microphone platform. A user may create their node by performing with this sound source. If more than one user resides within the system, they will also appear as nodes. The user may listen to, or compose with, any available node within the performance environment.
The performance stage resides on the Internet, as a website. All interactions are interfaced by this website. As of now, the system only runs on the Google Chrome Internet desktop browser: due to complications with cross browser web-audio standard implementations. It is hoped that as the web standards develop and evolve, the website will be accessible through a multitude of browsers, and a multitude of devices.

1.6. Contributions to the Field

Linda Candy makes the distinction, leaning on the theoretical concepts of Scrivener, between pure practitioners engaging with personal research and researchers in the field who engage in practice. Candy states that practice-based research “aims to generate culturally novel apprehensions that are not just novel to the creator or individual observers of an artefact” (Candy, 2006, pp. 2). This perspective suggests that the goal of a researcher in the academic arts is to create a deeper level of understanding through the reflection and analysis of practice-based methods, regardless of whether the methods, or artefacts, are created by the researcher or not. The new apprehension forms the basis of the contributions to the field of knowledge; a general stipulation for most doctoral research (see Candy, 2006). Candy states that a key element of research “…is the transferability of the understandings reached as a result of the research process” (Candy, 2006, pp. 2). This transferability implies that a research document must provide some level of new knowledge, or understanding, that can be interpreted and understood by other researchers, or practitioners, in the field. She goes on to state: “creative output can be produced, or practice undertaken, as an integral part of the research process. However, the outcomes of practice must be accompanied by documentation of the research process, as well as some form of textual analysis or explanation to support its position and to demonstrate critical reflection” (Candy, 2006, pp. 2).

The textual documentation contained herein hopefully reflects some form of deeper level analysis and transferable knowledge; engaging with critical reflection, encompassing and extending a discussion that, I feel, is both undervalued and insufficient. From a personal perspective, as soon as I realised that there was a sparsity of communicated relation and interrelation between nodalism and network music performance it became the focus of both my thesis, and my critical reflection. It also became the core focus of the final piece Web Variations.

The creative element contained within the documentation portfolio hopefully supports and reflects the textual analysis in equal measure; expressing my own
artistic process. It should also elucidate a degree of technological expertise with various elements of sonic art creation, whether that be creative programming, systems design and architecture, or technical management. It is hoped that through the creative works the reader will acknowledge some sense of originality, uniqueness, and personality; even if all three works are, admittedly, merely responses to prominent existing works. It would be naive of me to state formally that my own creative works stand on their own as creative contributions to a field of knowledge. The seemingly ever-expanding database of network-orientated art that holds sound, or music, as its creative fulcrum (see Joy, 2010) seems to attest to an ever enriching vocabulary; ever widening vernacular; and most importantly an ever extending language from textual, contextual and creative perspectives. I just hope that this thesis may be seen as a respected part of that ongoing evolution.
Chapter Two

2. Conceptual Grounding

This chapter will outline a number of principles, ideologies, and concepts; network theory, cyberculture, systems theory, performance eco-systems theory, cybernetics, agency, affordance, dramaturgy, networkology, and the aesthetics of network listening. Discussion of these will aid understanding of core terminology; framing concepts within network orientated art, network music performance, and nodalism. It will also allow a degree of freedom to be entertained when discussing certain idioms, as the chapter progresses. The chapter will clarify why certain terms are used; offering theoretical validation to arguments and discussions. An investigation of pivotal notions will assist the framing of network music performance by nodalism; creating a conceptual and theoretical bed onto which discussions, and analysis, may rest.

2.1. Core Concepts

The first conceptual notion that will be discussed is the network itself; offering definitions drawn from sociology, network theory, and systems theory. This elucidation will form the basis of any discussion surrounding the network, as the thesis moves forward. Communication, connectivity and collaboration will then be discussed, framing their importance within network orientated art. An outline of concept of cyberculture will follow; allowing the term to be aligned with concepts found within cybernetics and systems theory. This exploration of cyberculture will include terms such as cyberspace, cyberplace, and cyberformance; noting their relevance within the scheme of network orientated art. An outline of agency and affordance will follow, as both concepts are utilised at length throughout the thesis. A discussion of dramaturgy is then offered, delineating the term’s specific relation to network music performance. This discussion will allow a framing of certain topological network formations discussed later in the thesis. To complete the chapter, aesthetics pertaining to the practices covered in the thesis, will be briefly
discussed. The concept of relational aesthetics will be introduced, especially with regards to the embodied listening aesthetic found within network music, from the perspectives of both performer and audience. It is hoped that by outlining these terms, the chapter will serve as a reference point, while also acting as a condensed literary review, so that terms’ employments within certain theoretical and conceptual frames are delineated.

2.1.1. The Network

The term ‘network’ has been incorporated into many fields, but a full understanding of the concepts implications and meaning is yet to be forthcoming. This thesis implements the term ‘network’ in relation to a specific type, or genre, of sonic art, so an attempt to clarify the word’s meaning is beneficial. The concept of ‘network’ is a dominant watchword of the current age (Barney, 2004; Castells, 2007, Newman, et al, 2006; Varnelis, 2008; Vitale, 2014; Wigley, 2004). A word that “slides seamlessly from biology, to technology, to society” (Wigley, 2004, pp. 94). This domain-to-domain slinking underlines the inherent transmutability of the notion; a mirror-like reflection of its morphological nature.

An attempt to define the term may be seen as foolish, as the notion is one that defies structured specification. Two, or three, dimensional topological formations graphing network structures fail to explain or demarcate the implications of the whole; delineating connection and relation, yet remaining ill-equipped when demonstrating coalescence or synergy. Considering this, it would be worthwhile to elucidate some notions of the term ‘network’ from varied sources. Comprehension of the terms application in fields such as biology, systems science, sociology, politics, and philosophy might reflect a sense of common understanding, as similarities are unearthed from a host of differing domains. These commonalities will then be used to identify core conceptual notions.

Newman, et al propose a “New Science of Networks” (Newman, et al, 2006, pp. 2), with the postulation that “networks are everywhere” (Newman, et al, 2006, pp. 1); pervading modern culture. They propose a definition of a network that has its foundations in graph theory - a field of discrete mathematics - which in “the past three centuries has become the principal mathematical language for describing the properties of networks” (Newman, et al 2006, pp. 2). They describe: “In its simplest form, a network is nothing more than a set of discrete elements (the vertices), and a set of connections (the edges) that link the elements, typically in a pairwise fashion. The elements and their connections can be almost
anything” (Newman, et al, 2006, pp. 2). This open-ended definition, while being malleable enough for this thesis, does not cater for more specific elemental analysis.

Manuel Castells offers another untethered definition, derived from politics and sociology: “a network is a set of interconnected nodes” (Castells, 2000, pp. 15). Castells stresses the concept of interconnection; evoking a sense of interdependence and interrelation between elements (nodes) in a network system. Though Castells is interested in the sociological and political ramifications of organised societies, he also understands that technological and communicational infrastructure has been critical to the development of intricate and cohesive social bonds. Varnelis supports this notion; echoing sentiments on the cruciality of technology and the ubiquity of network culture; suggesting a “new societal condition” (Varnelis, 2008, pp. 145) within a culture dominated by networked logic: “ours is the first modern age in which the network is the dominant organizational paradigm” (Varnelis, 2008, pp. 147); a culture that he feels “succeeds postmodernism” (Varnelis, 2008, pp. 149).

The most appealing definitions, though, are drawn from political science via Darin Barney, and philosophy, through Christopher Vitale. Barney analyses the network society, much like Castells; attempting to understand how societal network formations influence change within politics, sociology, and economics. He defines a network as being “comprised of three main elements: nodes, ties and flows. A node is a distinct point connected to at least one other point....a tie connects one node to another...flows are what pass between and through nodes along ties” (Barney, 2004, pp. 26). This definition is the most apt at describing the processes that occur within a network system, while also being open-ended enough to allow for the concept to be placed inside, and onto, varying realms. This open-ended, yet elemental definition has similarities with the definition of Christopher Vitale, whose notion of networkology will be discussed in greater depth later in this chapter. Vitale describes a network as “any whole, composed of parts, distinguished from a background, and composed of other parts and wholes, layered into each other at multiple levels of scale” (Vitale, 2014, pp. 16). It must be noted that Vitale denotes a more unfastened description; inherently more complex. While Barney describes a system of interconnected and interdependent nodes - each with a transfer of information between and through them - Vitale describes a multi-layered stratum of interconnection and interrelation, with distinction between background and foreground. Both definitions are supportive in their attempt to describe network logic: Vitale’s all-encompassing definition is daunting to those hesitant to abandon
traditional two or three dimensional physics, as it deals with dynamic multi-
dimensional logic: concurrently transparent, translucent, lucid, and opaque. Yet,
both share an essence: nodes are points of perspective within the system, with
relational information flowing between them on a number of planes; visible and
invisible. Vitale clears up his position: “the parts connected in a network can be
recast as nodes, which are joined together by links” (Vitale, 2014, pp. 17). The
similarity between definitions is beneficial. In this thesis, the concept of a node,
along with the concept of a link, or tie, are fundamental to understanding the
makeup of a network system.

Linking the conceptual frames of Barney and Vitale with those already intricately
woven within musical performance will aid understanding of how the network
fashions network orientated musicality. The most concise description from within
network music theory, is offered by Rebelo, et al: “the network is understood as a
communication structure allowing information flow across the globe” (Rebelo, et
al, 2008, pp. 1). This structure is seen as being technologically supported by
communicational mediums; allowing for a flow of sound, or sonic data, through
and between, nodes distributed across planet earth. The mediums come in varying
sizes, depths and intricacies, from the now out-dated telegram, to telephone and
radio, to computer networking technologies and the zeitgeist that is the Internet. It
is seen that any network music performance will inherently rely on at least one
communicational medium to create a networked structure. What must be
remembered is that no one medium defines the network. It merely acts as support
and substructure.

2.1.2. Connectivity, Communication, and Collaboration

Our understanding of culture within the 21st Century is based upon an assumption
that society is becoming ever more deeply woven together - through network
fabrics (Barney, 2004; Castells, 2000; De Kerckhove, 1997; Graham, 2002;
Kurzweil, 2005; Varnelis, 2008; Vitale, 2014). It is a robust acknowledgment that
network music performance has both connectivity and collaboration as central
features. It is felt that both attributes are not mutually exclusive given the inherent
communicational aspects contained within. Parallels have been drawn between
connectionist cultural aspects of society and musical performance models;
especially those that are centred in and around a network (Ascott, 1968; Barbosa,
2003; Braasch, 2009; Carot and Werner, 2007; Chadabe, 1999; Fencott and Bryan-
Kinns, 2010; Follmer, 2005a; Jorda, 1999; Joy, 2010; Kane, 2007; Kapur, et al,
2005; Kim-Boyle, 2008; Makelberge, 2012; Oliveros, 2009; Packer, 2005; Rebelo,
et al, 2008; Renaud, 2009; Schroeder, 2013; Shanken, 2000; Shelemay, 2008; Tanaka, 2001; Tanzi, 2001; Weinberg, 2003; Whalley, 2012). Network music performance is borne through a connectionist cultural predicate; definitions of the art have always had networking ideologies at their centre. Gil Weinberg has outlined that artistic experimentation with networking technologies transpired as a direct response to object orientated production methods; a move towards more process orientated models (Weinberg, 2003). The development of ever more complex and powerful communication mediums “inspired musicians who were looking for new ways to expand the vocabulary of socio-musical expression” (Weinberg, 2003, pp. 26). This sociological aspect to music making is a rich feature in the study of network music performance, garnering interest from fields other than just music. The fact that “the network provides a cultural condition of unprecedented complexity” (Renaud et al, 2007, pp. 5) allows Golo Follmer to predicate on the existence of dualistic paradigms within network music: The compositional paradigm and the communicational paradigm; each deserving of interrelated and interdependent research (Follmer, 2005b). The communicational paradigm is where discussions of collaboration and connectivity are seen to reside.

The orientation of network music performance; standing at the cross section of music, technology, and socio-artistic experimentation augments the view that any artefacts borne from network music performances should be viewed with respect to the underlying processes involved, rather than their accomplished appearance. This move away from artistic critique based wholly on representational aesthetic is foreseen by Roy Ascott, who calls for an evolution of the aesthetic; to include principles of relations and study of systems; communications both visible and invisible (Ascott, 1993). Christopher Small, in a similar vein, views music in a ‘socio-centric’ manner. A people-orientated process, rather than object-orientated artefact “the fundamental nature and meaning of music lie not in objects, not in musical works at all, but in action, in what people do” (Small, 1998, pp. 8). Small further cements his own view by putting forth the premise that the set of relationships within any given musical performance is where the “meaning of the act lies” (Small, 1998, pp. 13). This celebration of musical relationships seems an ideal launchpad for a nodalistic perspective to appear. An approach that envisions musical interdependency and interrelatedness on a ‘hypermusical’ scale, akin to Tanaka’s acknowledgement of ‘hyperlink behaviour’ as being the “fundamental basis to define a musical language for the medium” (Tanaka, 2001, pp. 241).

Shelemay extends a view of musical community, offering a wholly complete and encompassing definition. She views the study of musical community as being a rich
source of understanding; pertaining the ability to bridge gaps between otherwise distinct academic fields (Shelemay, 2008). The study of network music performance has often used terms such as collaboration, collective, and co-operation interchangeably, perhaps to the detriment of any complete coherence (Makelberge, 2012). Community may be seen as another such term that affords as much confusion as it does resolution. What is certain is that terms such as those mentioned are central to any complete understanding of the implications of network music performance, but it lay not in the scope of this chapter to specifically delineate between them. What must be apprehended at this juncture is that network music performance is definitively a socio-centric model of musical production.

Collaborative efforts between musicians are merely an evolution of the “elaborate networks of co-operation” (Becker, 1974, pp. 768) found within traditional artistic creation. This inherited mode of production is radicalised through the intricate web of technologies used within modern day network music performance that work to “blur the boundaries among composers, performers and listeners through collaborative paradigms for musical creativity” (Freeman, 2010, pp. 149). The sense of entanglement between those involved, whether termed collaboration, co-operation or collective creation is “central to music culture in our day and age” (Makelberge, 2012, pp. 28). Makelberge announces the demise of individual creativity, foregrounding relational concepts such as ‘interdependence’ (Weinberg, 2003) and ‘reciprocity’ (Tanaka 2006). What is certain is that those involved within network music performance are involving themselves in the dilution of individuality through the use of modern technologies; creating a shift towards musical works “beyond the product of a single creator” (Whalley, 2012, pp. 10).

The move away from hierarchically modelled, centralised structures, towards horizontal “co-ordinate and co-operate paradigms where multiple entities self-assemble” (Whalley, 2012, pp. 5) sanctions relationship concerns; how they are formed, governed, structured, and evolve - given their inherently fluid nature: “the network needs to be understood as a dynamic entity; as a structure that is open to dynamic transformations” (Schroeder, 2009, pp. 379). Nodalism, outlined in full in the following chapter, is seen as the acknowledgement and study of the interrelational and intersubjective characteristics of any given communicational system. It is seen as a somewhat natural progression to frame network music performance within a nodalistic predicate, given the genre’s core connective and communicational attributes.
2.1.3. Cyberculture

Cyberculture is seen as a reflection of society in the 21st Century: “digital technologies create new personal and social worlds - new immersive environments in which concepts of time, space and place are reconfigured” (Graham, 2002, pp. 69). Embedded deeply with, and through, the Internet, this cultural ‘transhumanist’ (Graham, 2002) shift has implications on how we view the development of music; its meaning and practice within the 21st Century. Viewing cyberculture as pertaining the inherent ability to reconfigure musical performance and composition models is not such a fanciful proposition, especially as cyberculture is such a dominant cultural modality. Widdass asserts “ways in which the structure of musical performance can mirror local cultural factors” (Widdass, 2012, pp. 88). With local cultural factors being evermore influenced by the digitised, computer dependent experience, it is no great ideological leap to imagine “new forms beyond that of the physical, where we enter into new architectures that are invisible, yet tangible, where we envision new forms of music made collaboratively, where the composer no longer asserts control, but rather conducts an environment, invents new systems” (Packer, 2005, pp. 524).

At this stage, it may be difficult to convene a complete and definitive definition of the term cyberspace as used within discussions of cyberculture, but a gentle generalisation enables a better grasp of the implications of how, moving deeper into the 21st century, society will become evermore interweaved, interlinked and interdependent in cyberspace. Benedikt outlined a working definition of cyberspace in 1991: “cyberspace is a globally networked, computer-sustained, computer-accessed, and computer-generated, multi-dimensional, artificial, or ‘virtual reality’” (Benedikt, 1991, pp. 122). The concept of ‘virtual reality’ may seem extremely notional, especially in relation to network music performance, but a concept of a ‘third space’ being created by the interconnection of two otherwise ‘disconnected’ spaces has been oft discussed. As this thesis progresses the connection between ‘virtual space’ and network music becomes more concrete, especially in regards to Max Neuhaus’ concern with the concept in his work Public Supply I, and my own response to it, Skype Supply. The ability of modern communicational technologies to create bridges between two places, allowing for a ‘virtual space’ to be populated, is a central facet of network music performance: “networked media and its peer-to-peer relations subvert the traditional constraints of musical and artistic practice leading to new forms of media composition that embrace the evolving architecture of virtual space” (Packer, 2005, pp. 510). It is
the population of this space that we envisage being the interweaving of artistic
premise through concepts of cyberculture.

Whalley further delineates concepts through the use of ‘cyber’, distinguishing
between cyberspace and cyberplace in their correlation with both the
communication and production paradigms found within the study of network music
performance (Whalley, 2012). He outlines cyberspace as being concerned with
production values, especially the informational paths that operate within a network
5) and cyberplace as “the meeting points between parties in cyberspace” (Whalley,
2012, pp. 5). A distinction between these two concepts augments the view that
cyberculture, and theoretical concepts contained within, is central to a complete
comprehension of both compositional and performance approaches to network
music.

The term cyberformance was coined by Helen Varley Jamieson and is defined as
“the combination of cybernetics and cyberspace with performance” (Packer, 2015).
The term’s aptness for this thesis will come to light as a discussion of cybernetics
and systems theory is opened up in the following sections. However, at this stage, it
is worth framing the portfolio works within the realms of cyberformance. The term
could be used to discuss Skype Supply and especially Web Variations, as both
projects implement Internet technologies to bridge existing geographical distances
between both performers and audience members. Jamieson discusses
cyberformance as occurring within cyberspace. This cyberspace is defined by
Jamieson as a virtual space, mediated by both computing and networking
technologies, that also “...extends into and absorbs a little bit of the physical
environment of everyone present” (Jamieson, qtd in Packer, 2015). The extension of
real space also creates a theoretical thread, linking cybernetics and cyberculture,
made concrete through the theory of Mitra (2003). She theorises that the extension
of real space, through the virtual, leads to the creation of cybernetic space. This
sense of extended space is beneficial to the thesis, as is a discussion of the term
cybernetics. Cybernetics’ basis is found in communication and systems theory.
Common threads such as command, control, determinacy, and indeterminacy are all
utilised when analysing certain projects within this thesis; their basis may also be
found within cybernetics.
2.1.4. Cybernetics

Mitra’s perspective of cybernetic space as the intersection of the real and the virtual allows one to analyse certain works that explore concepts of the ‘real’ and the ‘virtual’ through a cybernetic frame. This link between the real and virtual is explicitly seen in Neuhaus’ *Public Supply I*, as well as my own *Skype Supply* and *Web Variations* projects. In both *Public Supply* and *Skype Supply*, a ‘virtual’ space is created, through the connection of otherwise disconnected participants. In *Web Variations*, the essence of the ‘virtual’ is more explicit, as the work exists as a digital performance stage, located on an Internet web page, populated by performing and listening participants.

The most explicit link between cybernetics and experimental music is found in the discursive writing of Dunbar-Hester (2010). She detailed the link between cybernetic theory and certain experimental musicians in the period 1950 - 1980. Though she felt there was a paucity of sources that explicitly linked cybernetics to experimental music, she often found “sources whose rhetoric seemed quite in keeping with cybernetic theories” (Dunbar-Hester, 2010, pp. 130). She analysed composers; noting their exploration of themes that had much in common with cybernetic theory. She describes John Cage’s interest in composing music for social systems; noting how he viewed music systems as social systems (Dunbar-Hester, 2010). Similar discussions found their way into early formations of network music: Bischoff, et al - early pioneers of network music - stated of their own *Music for an Interactive Network of Microcomputers*: “a pleasure to play and be part of a dynamic musical cybernetic process!” (Bischoff, et al, 1978, pp. 28). Bischoff, et al, also credit Cage as pioneering an important form of collaborative music: a social music - designed, played and conveyed within socially orientated musical systems (Bischoff, et al, 1978).

Dunbar-Hester felt that the period between 1950 and 1980 marked the beginning of true human-machine musical integration, leading to discussions centred around cybernetic issues such as “information, autopoiesis, and determinacy/indeterminacy, control, and complexity....” (Dunbar-Hester, 2010, pp. 131). These features are also central avenues of discussion within this thesis, whether it is the determinacy and indeterminacy discussion of Cage’s *Variations VII*, the control and complexity found in the topological formations of Amacher’s *City-Links*, or the discussions concerning autopoiesis and homeostasis found within my own work, *Synchrocities*. Dunbar-Hester describes the link between experimental music and cybernetics clearly, denoting how the theory offers “...a malleable and popular
vocabulary for discussing and creating music to reflect a range of topics considered important by experimental practitioners” (Dunbar-Hester, 2010, pp. 135).

Pressing also elucidates the link between interactive performance systems and cybernetics (Pressing, 1990). Discussing his analysis will aid as introduction into both interactive performance, and eco-systemic, thought within musical systems. Pressing outlines his definition of cybernetics as “the science of control and communication” (Pressing, 1990, pp. 12), and this aligns itself with Dunbar-Hester’s description of cybernetics - based on Weiner’s early description - as being concerned with “broad themes such as command and control, systems, and analogies between organisms and machines, including computers” (Wiener, qtd in Dunbar-Hester, 2010, pp. 84). Pressing makes a concrete link between cybernetic systems and the works of Neuhaus and Cage, describing Public Supply I and Variations VII as examples of performance models where ‘sound sculpting’ occurs: “when the human operator shapes some external ongoing process or its effects (naturally occurring or designed) that is being concurrently amplified or transduced to function as, again, either a sound source or a control source” (Pressing, 1990, pp. 13). While Pressing focuses on command and control from the perspective of a musical instrument user, the links between musical interaction and cybernetics is clear. Interaction is viewed by Pressing as meaning “mutual influence” (Pressing, 1990, pp. 20). A bi-directional interaction in which an instrument, or performance system, “...directly and variably influences the production of music by a performer” (Pressing, 1990, pp. 20). The term ‘variably’ is used, as Pressing feels that an interactive instrument may be ‘programmed’. Given a set of programmed instructions, the way in which the instrument influences the performer may change (Pressing, 1990). Pressing goes on to describe the ways in which cybernetic theory may aid analysis of the range of programmed influence found within musical systems, highlighting that cybernetics as a field of study benefits analysis of any interactive music system, or designed performance system - like those found in Variations VII and Public Supply I, or my own Skype Supply and Web Variations.

2.1.5. Performance Eco-Systems

Any musical performance may be viewed analytically as an input-output communication system. The system usually incorporates elements such as, but not limited to: composer, performer, listener, and environment. This elemental perspective forms the basis of musical eco-systemic understanding: a holistic
interpretation of the embodiments, interactions, characteristics, environs, and
behaviours incorporated into any given musical performance. Having much in
common with the ‘musicking’ theories of Christopher Small (see Small, 1997;
Small, 1998), eco-systemic thinking incorporates technological developments into
the discussion. For instance, how characteristics of the environment (whether real,
virtual, or a combination of both), or designed interactions (such as computer
programmes, feedback systems, etc) have influence on totalistic system behaviour
(Waters, 2007). Examples of this may include projects based within networked
spaces, or those that include algorithmic elements that are wholly, or partly,
indeterminate; influencing the interactive and/or emergent properties of the system.

Waters borrows Impett’s description of music: “a dynamical complex of interacted
situated embodied behaviours. These behaviours may be physical or virtual,
composed or emergent, or of a time scale such that they figure as constraints or
constructs. All interact in the same space by a process of mutual modelling,
redescription, and emergent restructuring” (Impett, qtd in Waters, 2007, pp. 1).
Waters goes on to describe three core elements of music - performer, instrument,
and environment - discussing how the interaction and interrelation between, and
among, them defines the performance system as a whole (Waters, 2007). This
conceptual model has much bearing on this thesis, as analysis of certain projects
will be done from an eco-systemic perspective. Musical performances are analysed
from the perspective of varying elements; specifically through traditional
formations such as performers, instrument, audience, space, and place. The
relations, interactions, behaviours, and communication channels that exist are
analysed with the hope of unearthing beneficial reflections. This analysis is always
completed through the lens, or filter, of nodalism. Analysing elements through a
nodalistic frame will allow one to better understand the interactions and relations
that exist, while also allowing one to decipher the complex feedback models and
regulating principles that occur; correlating general systems theory, as outlined by
Dunbar-Hester (2010) and Gochenour (2006; 2008), with the more musically
orientated eco-systemic thought outlined by Waters (2007), Di Scipio (2003), and
Kollias (2008).

It is worth noting, at this juncture, that writers also create a bind between
cybernetics and systems-theory. Kollias explicitly links cybernetics with “systems-
thinking” (Kollias, 2008, pp. 1). He also states that musical performances are
essentially input-output systems, comprised of a number of elements, including the
environment in which they are situated (Kollias, 2008). Di Scipio also creates a
direct and concrete link between cybernetic thought, systems theory, and an
understanding of the musical performance eco-system (Di Scipio, 2003). He incorporates the pioneering biological systems thinking of Maturana and Varela, describing how musical systems are those that comprise of “computational tools capable of reacting in real time... upon changes in their external conditions” (Di Scipio, 2003, pp. 269). Di Scipio is careful to state that there is also a design element within any musical performance in which interactions and behaviours are constructed and implemented. He moves further forward to define composing musical interactions as those in which one: “designs, implements and maintains a network of connected components whose emergent behaviours in sound one calls music” (Di Scipio, 2003, pp. 271).

What is left to discuss is the concept of interaction, linking it back to the brief discussions centred on interaction that were found while discussing cybernetics. Kiousis draws correlation between models of interaction and cybernetics, explaining how feedback flows between senders and receivers comprise any system. He describes the ‘cybernetic model of interactivity’ - in which the emphasis is on feedback (Kiousis, 2002). This line of enquiry has commonalities with Di Scipio’s eco-systemic view of the performance system, and also Pressing’s view of cybernetic performance models - where feedback plays a defining role. In both perspectives, feedback provides the crucial interaction between designed elements and the environment. Kiousis describes how the ‘cybernetic model of interactivity’ should include a number of characteristics. In the context of this thesis, the most important is that there is a “shift away from an emphasis on channels and more towards the interconnected relationships among exchanged messages (also referred to as third-order dependency)” (Kiousis, 2002, pp. 359). This shift is important to recognise in the context of framing certain projects with the theoretical model of nodalism. In the analysis chapters, emphasis will be on how agents relate and respond to each other; attempting to highlight the intricate interconnected, stimulus-response system that any music performance may be seen as.

2.1.6. Agency

Throughout the thesis, the term agent is used to describe any participant within a performance, whether active, passive, subject, or object. It is worth framing the term agency so that we can understand its use, and how it relates to network music. Alfred Gells’ definition of agency: “an agent is the source, the origin, of causal events, independently of the state of the physical universe” (Gell, 1998, pp. 16) is apt at describing the assertion of any entities designated role within a performance.
Entities, or agents involved in the performance, naturally obtain an ability to act, either on the performance, or each other; the infusion of a bi-directional communicational model onto the governance of the performance architecture.

Shanken outlines two models of agency: ‘active-active’ and ‘active-passive’. He states that neither are “mutually exclusive” (Shanken, 2000, pp. 68). The active-active model of agency, leveraged through the implementation of technology, is viewed as being the key driver wherein “many artists have sought alternatives to the hierarchical relationship of subject and object and the active-passive conditions of agency” (Shanken, 2000, pp. 74). Network music performance has oft been associated with a move away from hierarchical performance structures, towards more flexible, fluid and dynamic ones. Shanken points to Ascott’s vision of ‘telematic art’, where “multiple agents interacted with each other on myriad levels, all contributing to the overall behaviour of a non-linear system of exchange” (Shanken, 2000, pp. 73). Network music performance is seen as a sub-genre of telematic art, given Shanken’s acceptance of Nora and Minks’ view of telematics as “a broad field of computer-mediated communication” (Shanken, 2000, pp. 65). Questions concerning the network's ability to enhance and evolve participant agency; its ability to augment or afford subject-object and subject-subject relationship models; its ability to disperse musical creativity through time and space, between persons and objects, are all paradigms that warrant further investigation.

The Ascottian ideal of an artform “which is never a static product, but always remains in process throughout its duration” (Shanken, 2000, pp. 66) is the ideological concept underlining this thesis. The sense of a narrative, distributed through a hypermedium, collectively devised by a mass ensemble of dispersed musical agents is fundamental to the ideological potential of nodalistic music. Crucially, it must be understood that the technology used is determinant of this ideal, where “technology would enable agency to emerge bottom-up through the periphery, rather than from centralised institutions controlling social relations hierarchically from the top-down” (Shanken, 2000, pp. 68)

Walker sees this type of distributive narrative as a move beyond post-modern aesthetics; away from “fragments and bricolage” (Walker, 2004, pp. 1) towards an aesthetic that “collapses the unity of forms as well as that of content and concept” (Walker, 2004, pp. 8). This collapsing of forms will be seen clearly as we move through the thesis. Agent roles collapse into myriads and multiples; ambiguity becomes a pivot. Born discusses Gell’s sense of creative agency,
introducing a term that bears a large amount of semblance to both network music, and the concept of using nodalism to frame it: “distributed across space, time and persons, music can become an object of recurrent decomposition, composition and re-composition by a series of creative agents. We need a new term for this capacity: I suggest relayed creativity” (Born, 2005, pp. 26). This term ‘relayed creativity’ - in which creative agents participate in a continual process of musical reprocessing - is useful when trying to define the action and interaction of agents within a performance system. The sense of there becoming, or existing, relay agents within a performance system is intriguing; the idea being developed and explored further as the thesis continues. The concept of action and interaction is also developed by Follmer, as he introduces the term “intra-action” (Moore and Place, qtd in Follmer, 2005b, pp. 186), which is described as “the processes in musical systems wherein single players’ actions intercede onto those of other players” (Follmer, 2005b, pp. 186). This perspective is borrowed from a more traditional notion of a performing agent, but the term is beneficial for explaining, or framing, the way in which agents’ behaviours intercede onto each other within network music performances. In Web Variations an agent is allowed to explore this propensity explicitly. The project reflects a state in which music moves away from “absolute state as it is repeatedly relayed and transformed across time, space and persons” (Born, 2005, pp. 28). This ability correlates persuasively with the concept of nodalism. Nodalism becomes the suitable frame in which to analyse relayed, or intra-active, actions of agents within a music performance system.

2.1.7. Affordance

Affordance is defined by Gaver as “properties of the world, that make possible some action to an organism equipped to act in certain ways” (Gaver, 1991, pp. 80). Gaver also acknowledges that affordances are independent of our perception of them (Gaver, 2000). Kane puts forth affordances of the network with respect to network orientated art (Kane, 2007), outlining the affordances that any performance should seek to leverage. It is by no means an exhaustive list, but goes some way to developing a suitable goal-orientated methodology for network music performance; guarding against rudimentary constructions of the art-form: “the network must be distinguished from any sort of digital microphone cable” (Kane, 2007, pp. 3).

Kane further augments his argument; striving toward an advanced aesthetic. One in which network music performances are not judged on their object-orientated output, but more on their success or failure to enact and actualise the specific affordances of the assigned network (Kane, 2007). Outlining a series of strategies
for network music, Kane solicits a blueprint for successful performances, one in which the artist has been successful in their attempt "to create mappings that will force the listener into an awareness of the contingent nature of the interface with which they are involved" (Kane, 2007, p. 9). Kane references the modern ideal of the aesthetic as: "the science of how things are known via the senses" (Kane, 2007, pp. 5); urging ‘net musicians’ to develop artistic realisations that create "new practices that realise the ideational or essential dimensions of the network" (Kane, 2007, pp. 3).

Braasch supports Kane’s argument, pressing that "unique affordances exist for telematic music systems, which is the basic requirement for them to serve as a platform for new types of music" (Braasch, 2009, pp. 431). Braasch urges us to consider telematic systems "as a new class of musical instruments" (Braasch, 2009, pp. 421), mirroring Kane's view that design motives should reflect this fundamental shift in the perception of, and methodology for, this specific class of art. Braasch urges those that are involved in telematic art to shift their motivations towards more exploratory orientations: "one of the most interesting aspects of our telematic collaborations has always been the exploratory aspect of the connection" (Braasch, 2009, pp. 426), noting an exploratory affordance as being one of the central features of the art form.

The explicit role of affordance and its importance with respect to experimental artistic endeavours is also reflected by Born: "electronic and digital technologies afford and enhance a dispersed and collaborative creativity" (Born, 2005, pp. 25). This collaborative creativity is central in allowing an inference of how nodalism may frame network music, a type of music in which constant decomposition and re-composition may occur. Born acknowledges a new class of musical creativity being derived from certain technological affordances, suggesting that technologies should be used to explore these avenues, furthering our understanding of how music may be seen as a medium that pertains the ability to travel across time, space and persons in constant mutability (Born, 2005).

Returning to Gaver, and by focusing specifically on his assertions of the affordances of media spaces, we can frame network music as affording specific actions that are under-investigated, and indeed, under-explored, with relayed creativity and intra-action being standout cases. It is assumed that media spaces "provide different possibilities for action" (Gaver, 1992, pp. 18), and that these actions may not be as obvious as those found within objects existing in physical realms. A specific affordance that Gaver acknowledges is "remote
which these days seems rudimentary, but he notes the continual and rapid evolution of technology found within, and utilised by, media spaces enables new affordances to be investigated. He states that interaction is ‘different’ within these spaces, and that exploration of these differences are merited; keeping pace with the development of the technology that enables it. The rate of change within media spaces has elevated specific affordances; highlighted when comparing and analysing the embryonic examples of network performance with the artistic responses contained within the attached portfolio. The change is not always for the better, and this is acknowledged, but it exists nonetheless.

2.1.8. Dramaturgy

The term dramaturgy has been applied as a conceptual tool; aiding the comprehension of the enacted topologies found within network music performance. The term is borrowed from the performing arts, specifically theatre, where it has been implemented as a conceptual frame for understanding "notions of authorship, collaboration, structure, content and as an umbrella term for a number of aspects that characterise performance practice" (Rebelo, et al, 2008, pp. 1). Rebelo, et al (2008), and Schroeder (2009) have discussed the link between concepts of dramaturgy and network music performance. They view dramaturgy as an investigative tool that affords exploration of "questions of involvement of multiple sites/nodes and the relation between multiple kinds of artistic input" (Rebelo, et al, 2008, pp. 1). Understanding how the concept of dramaturgy aids this thesis is crucial. Exploring the varying dramaturgical models that Rebelo, et al discuss, as well as the propensity for models to co-exist and overlap with "varying degrees of definition" (Rebelo, et al, 2008, pp. 1) will aid the comprehension of certain projects, as topologies are analysed and discussed. This understanding is specifically relevant when discussing how the structural spirits of enacted topologies evolve, as performances transform and develop over time.

Schroeder foregrounds dramaturgy by disputing whether a connectionist model of the network is sufficient to understand network music performance; whether the model is "sufficient to describe the relationship between artistic practice and sites" (Schroeder, 2009, pp. 379). Schroeder feels that dramaturgical modelling may enhance understanding of artistic practice involving network collaboration (Schroeder, 2009). She also discusses the ability for dramaturgical analysis to allow a greater degree of self-awareness and self-reflection within network music performance. This concept eventually evolves into a theoretical posing of the listening aesthetic found within network music performance - which will be
discussed further on in this chapter. It is important to understand how the root of this hypothesis is found within the extended notion of dramaturgical analysis. Schroeder notes that the network “urges us to continually consider our practices from within: from our standpoint, from our physical location; and also from without: from a point of view that tells us what our practices may look or sound like from an external standpoint - that is, from another location and most importantly, what they look or sound like at the other location” (Schroeder, 2009, pp. 380). This awareness; of oneself in relation to, and from the perspective of, somewhere else, or somebody else, is crucial to understanding why dramaturgical modelling is important to consider. By analysing any specific project through dramaturgical modelling, we can better understand or develop notions of how performance perspectives may change from site to site, person to person, or agent to agent. When analysing specific projects this dynamic shifting of perspective becomes a crucial avenue of reflection. It must be acknowledged that early investigations into dramaturgical modelling paved the way for this overview.

Rebelo, et al offer three specific types of enacted dramaturgy: Projected, Directed and Distributed. The potential of any enacted topology to move towards a fluid and dynamic state rather than a concrete one is also noted. The three descriptions merely offer a theoretical guide for the understanding or analysis of roles, goals and motivations of a network performance, especially with regard to agent involvement. For instance, Projected Dramaturgy - defined as: “one node as author and the other as contributors” (Rebelo, et al, 2008, pp. 2) seems to define a relatively centralised and hierarchical structure in which one node gathers content from a number of other distributed nodes. This topology may allow one to analyse certain aspects or characteristics of nodal relations within the structure, while offering the template to explore the inherent success, or failure, of the enacted formation - such as how successful a node was at governing the contributions of other nodes, or how much affordance was offered to the contributing agents through the designed performance system.

Alternatively, one may look at Distributed Dramaturgy: “each node retains authorship while contributing specific content and expertise to a shared production” (Rebelo, et al, 2008, pp. 2). This specific model would seem to describe a more decentralised formation; affording a greater degree of creative agency to contributing nodes, while also changing authorship, and potential ownership, considerations. With this in mind, analysis of such may go along different lines to those found in the projected model, as individual artistic offerings may be the focus of analysis, or the way in which distributed nodes communicate
themes or ideas common to the shared production. What must be understood is that viewing any performance model through a dramaturgical aperture may allow deeper investigation to surface, especially with respect to the communications, and role definitions, of any nodes within the system.

2.1.9. Networkology

Christopher Vitale speculates on the state of humanity. He realises what, he feels, are truths about existence - humanity is becoming ever more bound together; leveraged through a networked mesh of digitality (Vitale, 2014). Though Vitale understands that the technological infrastructure of the Internet and globally interconnected networking technologies are affording this bind, he recognises that the infrastructure is acting as “…epitome and guide, mirror and engine” (Vitale, 2014, pp. 3) - as well as cause; representing an allure to more deep seated, intricate logic (Vitale, 2014). For Vitale, the new form of connectedness is “far from unitary. Rather, it is fractal, multiplying in layers within layers of burgeoning complexity. We live in an age of radical differentiations, cascades and crashes, decentralized affiliations and baroque complexifications, all of which shatter as they recompose and destroy as they create” (Vitale, 2014, pp. 2). This lyrical treatise may seem above and beyond necessary comprehension of network theory, but Vitale’s acknowledgment of certain concepts are enlightening; supporting the actualisation of network theory, and nodalism, into artistic realms. Understanding nodalism as a valuable analytical tool for the critical analysis and reflection of sonic art practice, as well as the creation of it, is critical. Elucidating the link between nodalism and networkology should comprehensively bind two core concepts that are, in some ways, already intricately linked. Nodalism is seen as the acknowledgement, and thus study, of interactions, interrelations and interdependencies between agents within a networked, communicational system, whereas networkology is seen as a fundamental philosophy of network systems and networked behaviours.

Vitale’s network philosophy is based on a postulation that existence is “networked to the core” (Vitale, 2014, pp. 4), from both physical, chemical, and biological perspectives. He feels that networked nature permeates all of humanity - from neural networks and brain electrode connections, to chemical interactions in the eco-system, to sociological formation and political organisation. Understanding this interconnectedness is key to understanding life, at all levels - from the bottom up emergence of ant colonies, to the intricate synchronisations found in memory allocations in the brain, to the science of DNA formations (Vitale, 2014).
Fathoming network theory from this all pervasive and omnipresent perspective will give one the tools to better understand both the miniature and the monumental. It will also enable a conceptual support system to appear. Concepts such as ‘reification’, ‘levels of scale’, and the ‘principle of relation’, will afford deeper exploration of certain characteristics of artistic projects.

Having described Vitale’s conceptual model of a network earlier (see section 2.1.1), it is worth noting his notion of “levels of scale” (Vitale, 2014, pp. 18). To Vitale, a network is comprised of a number of other networks. He describes: “The manner in which parts and wholes of networks contain each other gives rise to layers which are called levels, or levels of scale” (Vitale, 2014, pp. 18). A simpler explanation of this may be merited at this stage. On one level of scale, a pebble on a beach would be part of a network of other pebbles located on the same beach. On another level, that same pebble would be on a beach that is part of a network of beaches along a coastline. On yet another level of scale, this coastline is part of a network of coastlines that are situated within a continent, and so on. The process of moving, or traversing, between levels of scale for the sake of analysis or understanding, Vitale calls “leveling” (Vitale, 2014, pp. 18). He acknowledges that in order to view this multi-dimensional ‘leveling’, a certain abstract mental process must be completed. This is termed ‘reification’: “The temporary solidification of processes which gives rise to particular nodes, links, grounds, and levels....Reification is necessary to produce and maintain networks...” (Vitale, 2014, pp. 19). Reification is seen as the process by which formations appear to be solid and fixed, although they are, in fact, part of a fluid and dynamic system. It is also seen as a necessary process “...essential to the formation, support, change, and development of any and all networks...” (Vitale, 2014, pp. 19).

The final term is perhaps the most important with respect to this thesis, as it links the two theories of networkology and nodalism implicitly and directly. This is the concept of the “principle of relation” (Vitale, 2014, pp. 50). This principle represents the notion that “...the stuff of the world and all its networks are seen as fundamentally relational in nature, for everything is ultimately the result of the complex networking of its aspects with each other” (Vitale, 2014, pp. 50). Vitale goes on to describe the concept of relation as being the central bind of meaning and sensibility: “...nothing is ever truly isolated from others, and anything is only sensible and valuable in regard to what is related.” (Vitale, 2014, pp. 50). This foregrounding of relation is crucial. Nodalism foregrounds relational aspects to the same degree, as will be seen in the chapter 3, as do the notions of intersubjective and interrelational beauty that will be described through Schroeder’s notions of
network aesthetics. Elucidating this common discursive thread between nodalism, networkology, and concepts of relational, intersubjective, or interrelational aesthetics is crucial to understanding the merits and conceptual backbone of this thesis as a whole.

2.1.10. Aesthetics

Network orientated art lends itself to a shift in aesthetic evaluation. Traditional judgements of worth and beauty are, perhaps, no longer adequate to evaluate an art form whose value is predominantly found in process, not object (Ascott, 1990; De Kerckhove, 1995; Duckworth, 2003; Follmer, 2001; Tanzi, 2005c). De Kerckhove depicts “webness” (De Kerckhove, 1995, pp. 4) as a core aesthetic consideration; beauty in patterns, topologies, network formations; depth, quality, and character of interconnectedness (De Kerckhove, 1995). While De Kerckhove illuminates the term ‘webness’, Ascott calls for a complete jettison of an antiquated value system; one based on form, appearance, decoration, and object. He feels that it should be replaced with one “concerned with the complexity of relationships and the subtlety of systems, with the invisible and immaterial, the evolutive and the evanescent, in short, with apparition” (Ascott, 1993, pp. 277). This concern for relationships, systems, relations, interconnections; interdependence and ‘inter-influence’, both visible and invisible, translucent and lucid, bears strong resemblance to Bourriaud’s relational art; art that sits inside a “social interstice” (Bourriaud, 2002, pp. 14).

Bourriaud discusses a “radical upheaval of the aesthetic” (Bourriaud, 2002, pp. 14); a move towards art forms that “takes being-together as a central theme, the ‘encounter’ between beholder and picture, and the collective elaboration of meaning” (Bourriaud, 2002, pp. 15). Commonalities between this critical guide, and the altered aesthetic of Ascott and De Kerckhove are evident: most notably through a move towards a foregrounding of the value found in relational elaboration.

This relational stance is taken also by Schroeder, as she discusses “network[ed] listening” (Schroeder, 2013, pp. 215). Schroeder elucidates the considerations that operating within a network has on a formulation of aesthetic principles for network orientated art: “the network urges the performer to exist simultaneously in a state of self-preoccupation, of being here and in a state of what the philosopher Iris Murdoch has referred to as unselfing, a state in which one moves out from one’s own ego to enable to ‘see’, or in my case hear, the other more clearly” (Schroeder, 2013, pp. 223). Schroeder draws on a notion of beauty, developed by Elaine Scarry; correlating Murdoch’s concept of ‘unselfing’ with Scarry’s “opiated
adjacency” (Scarry, qtd in Schroeder, 2013, pp. 223). Schroeder feels that network performance is a “specific mode” (Schroeder, 2013, pp. 225), in which performative agents alter their perspective of ‘themselves’, and the ‘other’. Schroeder notes how this altered perspective happens, somewhat paradoxically, in a simultaneous fashion (Schroeder, 2013); the concrete connective and relational properties of the network urge a synchronisation to occur within the realms of subjective reflection. Lines usually drawn between the other and the self fold onto themselves; becoming obscured within the web of interrelation.

Schroeder revises the perspective of the ‘self’ within a network performance, viewing “network[ed] listening as an ideal corporeal state, which offers a rethinking of linear conceptions of the other and subject’s own relation with her world” (Schroeder, 2013, pp. 215). Admittedly, this is a performer centric perspective, but the concept has repercussions for any agent operating within a network orientated system, especially a system whose focus is sound. Schroeder posits that listening to, and within, a network, entices the ear “to be zooming in and out of different nodes, acoustic sites and sounds” (Schroeder, 2013, pp. 222) as well as offering a “multi-dimensional experience that is continuously being re-shaped by technological, socio-political and cultural concerns” (Schroeder, 2013, pp. 225). Schroeder states that ‘network[ed]’ listening reveals relations between subjects in a heightened state of splendour; radiating relations and elucidating the self as a body in continual and perpetual relation.

With respect to nodalism, there are similarities between the re-configuring of the linear perceptions of the subject’s relation to others (Schroeder, 2013) and the concept of the subject being comprised of nothing but a set, mesh, or network, of dynamic relation; a net of relations that are continually reconfigured and rearranged: evolving through the addition (or subtraction) of external or internal stimuli (Gochenour, 2006; Gochenour, 2008). With respect to networkology - the multi-dimensional experience containing a constant dynamic ‘zooming’ of focus that Schroeder discusses (Schroeder, 2013) bears resemblance to the multi-dimensional traversing through ‘levels of scale’ of Vitale (Vitale, 2014).

The similarities between the relational and reflective aesthetic of Bourriaud and the intersubjective aesthetic positioning of Schroeder may also be noted. Schroeder discusses the reconfiguration of a subject’s relation to the other, whereas Bourriaud elucidates an aesthetic that is concerned with both the beholder and the picture. As Schroeder describes beauty found in the network’s illumination of one’s position in
relation to another, Bourriaud petitions that beauty is found in the links and bonds between the viewer and the viewed; the elegance of the encounter.

2.2. Summary

This chapter has delineated a number of concepts felt to be crucial to the comprehension of the thesis as a whole. Introducing them at this stage allows a certain degree of freedom to be entertained with respect to how these terminologies are used. It outlines a number of abstractions, and attempts to relate them to either network orientated art, network theory, or ‘network[ed]’ listening. It is felt that each concept is grounded in relation to network music performance, and nodalism - which is detailed fully in the following chapter. This grounding is seen as pivotal, as abstract concepts are reigned in and their relation to the thesis is itself reified.

The first concept that was delineated was the concept of the network. With the term being used extensively throughout the thesis, it was important to distinguish what was meant by it, and the definition that would be leaned on.

Secondly, a number for core communicational terms were introduced; to act as guide throughout the rest of the thesis. This section identified a number of terms that may be used to describe similar processes, or elements, within the same activity.

Following on from this, three terms were introduced; the relation between them outlined: cyberculture, cybernetics, and performance eco-systems. These three terms are grouped together at this stage, as it is felt that performance systems, and thus systems theory, is a core commonality.

Following on from these three sub-sections there is discussion of another triad of crucial theoretical terms: agency, affordance and dramaturgy. It is felt that all three of these terms were deserving of a sub-section each, as they hold much weight within the thesis as a whole. It is hoped that each sub-section explains each idiom, and places it on strong theoretical foundations; bridging the gap between concepts and specific network music performance related theory.

The penultimate sub-section of this chapter discusses a certain strand of network philosophy. It is felt that certain philosophical notions are crucial in two aspects. The first is to delineate certain characteristics of network systems, the second is to
create a concrete link between nodalism and networkology - primarily through the 'principle of relation', as discussed by Vitale.

The final section of the chapter outlined a number of aesthetic perspectives that are crucial to understanding the merits, worth and motivations of network music performance. Aesthetic concepts were drawn from both network art, as well as more network music centric abstracts. The aesthetic principles aid comprehension of the goals and value of any successful network performance, and the basis on which evaluation of any network music project may be analysed.
Chapter Three

3. The Relation of Nodalism to Network Music Performance

This chapter introduces nodalism, outlining the nodalistic trope as a beneficial tool that informs theoretical and conceptual discussions of network music. It elucidates the main proponents of the theory, as well as its origins. It will also align nodalism with network music performance theory, drawing on aspects of cybernetics, networkology, and network theory. By completion of the chapter the reader will have a better comprehension of the term nodalism, its benefit to the thesis, and an understanding of its implementation as critical tool; aiding analysis and reflection of network music projects and performances.

3.1. Nodalism

The nodalistic discourse is a critical theory centred around the perspective that nodes situated within a network of other nodes govern many facets of contemporary thought: social theory, cognitive science, psychology, communications theory, neurology, information and communications technology, systems theory, to name a few. Nodalism, “reduces phenomena to a topographic structure; it emphasizes the importance of links and connections and stigmatizes disconnectedness and solitude.....the nodalistic trope is not just a descriptive metaphor, but a set of values and prescriptions” (Gochenour, 2008, pp. 2).

Phil Gochenour has been one of the main proponents of nodalistic thought, developing the critical theory of nodalism from Vilem Flusser’s systems theory, among others; appropriating concepts into the realms of digital media, digital culture, and online distributed community (Gochenour, 2005; Gochenour, 2006; Gochenour, 2008). Gochenour has instantiated the nodalistic trope “x is like a node in a network” (Gochenour, 2008, pp. 1) as a central facet of the digital humanities; evolving the view of the “intersubjective” (Flusser, 2005, pp. 325) self. Flusser’s relational model, where the subject is defined by the interaction it has with others,
is a “concept of the subject as a ‘knot’ of relations, as the intersections of various ‘channels’ of information, out of which the ‘net’ is formed” (Gochenour, in Flusser, 2005, pp. 321). The core conceptual perspective is that the relations one has to other subjects, defines the subject.

A migration of core associativist principles from neurological and psychological realms into the technological allows the nodalistic trope to become a “…structural metaphor with application outside of neuroscience, psychology, and information technology” (Gochenour, 2008, pp. 7). It evolves into a discourse beneficial to a host of other fields. As structural metaphor, it allows us to view many disciplines with a slightly canted view, and so the set of prescribed principles associated with nodalism may inform a deeper, more involved comprehension of network music. Essential properties adopted within Gochenour’s nodalism such as the nodal subject, homeostasis, autopoiesis, structural coupling, and associativism all have metaphorical, analytical, or conceptual implications within an understanding of network music.

3.1.1. Nodalism as Structural Metaphor

Adkins and d’Escrivan (2013) consider their recent music work, Geometries of Flight, as an example of nodalism. They utilise concepts from the theory to outline their ‘progressive’ remix practice, discussing how antiquated notions of ‘commercial’ remix are inadequate for understanding intricate re-interpretations of source material. They contemplate the implications of this practice with respect to artistic originality, calling into question their role as artists, as well as the “kinship” (Adkins and d’Escrivan, 2013, pp. 43) of their work. Adkins and d’Escrivan view the raw materials from which they worked as ‘nodes’; re-interpreting and re-framing the nuggets of information through their own imagination and technical aptitude, while also paying heed to the “harmonic fields” (Adkins and d’Escrivan, 2013, pp. 43) of the original. The resultant nodalistic perspective ensures that the “notion of the remix is extended to include deeper level musical processes and a more experimental approach to listening” (Adkins and d’Escrivan, 2013, pp. 44). Through reflection, the artists become aware of the plurality of their work. The artistic output is no longer seen as solitary, but ancestrally related to others. Their understanding of nodalism dissects the meaning of their practice, enabling recognition that it is such nodal connections “that makes the contemporary remix such a rich creative endeavour” (Adkins and d’Escrivan, 2013, pp. 44). The nodalistic discussion is extended by Adkins, in his Manifesto of Nodalism (Adkins, 2014a), as he acknowledges a multitude of
processes that may be framed by nodalism; from the genre based compositional flocking behaviour described by Cascone, to Dawkins’ meme theory, or the understandings of neurological mappings by scientists such as Hayek, or Hebb (see Adkins, 2014a). Adkins also groups a number of thought models - concerned with contemporary society - under the umbrella of nodalism, denoting how “many theories emphasise the individual and their connectedness” (Adkins, 2014a, pp. 55). He proposes nodalism as a “meta-framework within which all these new models exist” (Adkins, 2014a, pp. 55). This concept of a ‘meta-framework’ is alluring, aiding this thesis’ own sub-framing of network music.

3.2. Nodalism and Network Music Performance

Within network music performance, terms are often used as metaphorical and factual descriptors: distributive, collaborative, communicative, rhizomatic, connective, post-structuralist, to name but a few. These idioms offer linguistic and analytical tools through which epistemological underpinnings may be garnered. However, the term nodalism has not been embraced to its fullest potential. Adkins and d’Escrivan (2013) offer up the potential for the terms inclusion within experimental music practice, yet no such dissection of it has been forthcoming with respect to online, web-based, network music. Adkins furthered the discussion by viewing the totality of artistic output as being ‘nodal’ in type, evolving the debate to incorporate elements of systems theory, meme theory, and neurological science (Adkins 2014a; Adkins 2014b). What is left to consider is whether nodalism may be used as a structural frame of reference for the analysis and reflection of network music performances, and if so - what are the benefits?

Understanding networked music systems as being nodal in type enables an intersubjective analysis of composers, performers, audience, and aesthetics to appear. Gochenour’s concept of nodal subjects (Gochenour, 2005; Gochenour, 2006; Gochenour, 2008) may be aligned with the concept of ‘self’ that Schroeder describes while discussing the listening aesthetic found in network music. A theoretical thread is created that links the two concepts. This alignment highlights the implicative nature of intersubjectivity on network music. Reintroducing Christopher Vitale’s concepts of reification and levels of scale (Vitale, 2014) allows nodalism to be perceived as a concept that informs the multiple, layered stratum that exist within network orientated music systems; nodalism as a coherent rationale from ideological, metaphorical, and conceptual standpoints.
Many authors have offered critical insight into network music; the psychological implications (Bryan-Kinns, 2012; Schroeder 2013), theoretical implications (Rebelo et al, 2008; De Kerkhove, 1995; Braasch, 2009), social implications (Makelberge 2012), inherent concepts (Ascott 1993; Duckworth, 2003; Tanzi, 2005a; Tanzi, 2005b; Tanzi, 2005c), technologically imbued strategies (Carot, 2009), topological formations (Renaud, 2009; Weinberg, 2003), and so on - yet no central conviction guides all of the relatively disparate ideas. Nodalism offers a conceptual and structural metaphor, as well as a distinct set of epistemological currents that may serve as unifying bond.

3.2.1. Relating Nodalism to Network Music Performance

Network music encompasses a relatively wide range of practices. As the technological and computational backbone firms, evolves, and develops - a wide diaspora of distinct praxis, containing network ideals at their core, continue to emerge. Follmer draws a spatial ordering of network music with respect to three dimensions: “interplay with network characteristics”, “interactivity/openness”, and “complexity/flexibility” (see Fig 4 in Follmer, 2005b, pp. 188). Follmer’s spatial ordering offers up avenues of discussion in both the composition and communication paradigms (Follmer, 2005b), yet no concrete certainty exists with respect to exactly what ‘network characteristics’ constitutes. Follmer describes it as the “extent to which structural characteristics of electronic networks shape the resulting music” (Follmer, 2005b, pp. 187). If we are to imagine network characteristics as being defined by the interaction of nodes within a system (Adkins and d’Escrivan, 2013; Adkins, 2014b, Gochenour, 2008; Vitale, 2014), we must believe that aspects of the nodal discourse have pivotal implications on how we view both macro (the complete network), and micro characteristics (specific nodes within the network and their relationships to each other).

At the macro level, the nodal discourse informs our understanding of network music’s preoccupation with typology and topology, as authors continue to define structural properties within project specific analysis, and also the practice as a whole (Weinberg 2003; Follmer, 2005b; Carot 2009; Renaud 2009). The analysis of network music from a nodalistic perspective also informs our understanding of both network and systems theory, through the feedback of crucial understanding derived from critical reflection on network music practice; this feedback helps us to determine what exactly constitutes a network. Vitale has pointed that while there is much discussion of networks, “...it is often unclear precisely what they are, or could be” (Vitale, 2014, pp. 7). Taking this perspective on board, it may beneficial
to reflect and analyse on network configurations within artistic practice - especially those that seek specifically to foreground network topologies, in the hope of deriving valuable information or knowledge that can be filtered back into related disciplines.

At the micro level, the nodal discourse - through metaphor or implicative reasoning - may permeate Follmer’s communicational paradigm, informing our understanding of participant behaviour within any network orientated production - especially subject orientated discussions focused on topics such as communication, interaction, interdependency, and collaboration. The existing nodalistic dialogue contains a rich body of theoretical, conceptual, and scientific knowledge (Gochenour, 2008). Were this knowledge to be apportioned onto network music it would allow an aperture of understanding to be opened, akin to a long release lens; offering up an opportunity for a detailed view of a dynamic environment.

For example, the nodalistic analysis of Max Neuhaus’ Public Supply I - performed in 1966 - that follows in the subsequent chapter, allows us to gain deeper insight into important communicational and compositional aspects of the work. The conceptual reinforcement of the work was that a recursive feedback loop was created in which listeners were able to directly influence the broadcast by involving themselves. Neuhaus, influentially, saw himself not as composer, but as “moderator” (Joy, 2010, Vol. 3, pp. 89). From a nodalistic standpoint this role definition is immensely interesting. We realise that Neuhaus ‘moderated’ the input from a ‘chorus’ of performers who were communicating through a number of mediums. The two mediums of telephone and radio are self explanatory, but the nodalistic perspective allows one to also view Neuhaus as a medium. Information offered by distributed performers would pass through Neuhaus as he operated apparatus; he made decisions regarding amplitude and call lengths. Participants used the performance system to communicate with each other, but this communication was moderated - by Neuhaus.

The fundamental advantage of appropriating the nodalistic discourse onto current network music dialogue is that it offers up the opportunity, if only slight, to merge Follmer’s bi-focal dualism. Follmer believes that the communicative and compositional paradigms should remain distinct; each deserving study in their own right. Nodalism may offer the over-arching implicative; serving both paradigms in equal measure, while allowing a theoretical bridge to appear that connects the two. Apportioning concepts, metaphors and theories from the one discourse onto both
paradigms interweaves a thread of commonality through much of the discussion, allowing a central bind to appear.

Nodalism may also allow a distinct correlative formation to appear between two seemingly distinct, yet explicitly related fields: cybernetics and network music. Dunbar-Hester has already detailed explicitly the relationship of cybernetic thought to experimental music practice (Dunbar-Hester, 2010) yet, painfully, dissected this relationship through the analysis of ‘pre-web’ music. Building a connective rationale between cybernetics and network music opens up beneficial contextual underpinnings. Viewing network music as an experimental, art-based practice that informs both nodalism and the cybernetic discourse in corresponding measure may leverage network music into the realms of being a true inter-disciplinary research tool; a term oft used but seldom explicitly auto-explanatory.

3.2.1.1. Cybernetics as Theoretical Link

Network music is inextricably linked to both computer and networking technology (Ascott, 1968; Ascott, 1993; Barbosa, 2003; Braasch, 2009; Carot and Werner, 2007; Chadabe, 1999; Fencott and Bryan-Kinns, 2010; Follmer, 2005a; Follmer, 2005b; Jorda, 1999; Joy, 2010; Kane, 2007; Kapur, et al, 2005; Kim-Boyle, 2008; Makelberge, 2012; Oliveros, 2009; Packer, 2005; Renaud and Rebelo, 2006; Renaud, et al, 2007; Renaud, 2009; Schroeder, 2009; Shanken, 2000; Tanaka, 2001; Tanzi, 2001; Tanzi, 2003; Tanzi, 2005a; Tanzi, 2005b; Traub, 2005; Weinberg, 2003; Whalley, 2012). Those who have adopted network music as their artistic and experimental foci have outlined the long history of its relation to technology. The implications of adopting the network as a musical medium has straddled a wide range of discourses: musicological and philosophical perspectives (Ascott 1993; Braasch 2009; Duckworth 2003; Follmer 2005a; Packer, 2005; Rebelo, et al 2008; Schroeder, 2009; Schroeder, 2013; Tanzi, 2005a; Tanzi, 2005b; Tanzi, 2005c; Weinberg, 2003), technologically deterministic meanderings (Alexandraki et al, 2008; Bannier, 2009; Barabosa, 2003; Carot, 2009 Caceres and Chafe, 2009; Chew et al, 2004; Dannenberg and Jameson, 1993; Gurevich et al, 2006; Jorda, 1999; Renaud, 2009), as well as sociological implications (Bryan-Kinns, 2012; Chadabe, 1999; Makelberge, 2012; Vallis et al, 2012). It must be acknowledged that many of the authors seem to prance and bound between discourses; analysing through altering shades of perspective. What remains is a somewhat disjointed vista of what exactly constitutes affective network performance.
Dunbar-Hester offers a fragment of absolution; she offers cybernetics as a relevant, if not driving, conceptual standpoint from which to view experimental music (Dunbar-Hester, 2010). It is not a great stretch of the imagination to view cybernetics as being a useful critical tool for examining the connective and communicative paradigms that exist within network music. Gochenour offers up the alternative - if not completely unrelated - term: nodalism. It also seems a valid avenue of dissection, as participants within network music are seen as nodes, participating in a musical network comprised of other participative nodes. It is also worth recognising that Gochenour outlines the relationship between cybernetic theory and nodalism within his own writing, admitting that nodalism has been developed from a number of theories, cybernetics being principle (Gochenour, 2005; Gochenour, 2006; Gochenour, 2008).

It is hard to presuppose a concrete rationale as to why cybernetics and nodalism have not been indoctrinated into the current network music discourse. Linguistic descriptors such as node, knot, topology, link, structure, emergence, determinacy, indeterminacy, connectivity, communication, collaboration, to name a few, have all been equated with network music’s primary principles. Yet, the metaphorical and theoretical binds of both nodalism and cybernetics have not even begun to be explored to their potential. Dunbar-Hester (2010) acknowledges that John Cage, one of experimental music’s chief exponents and evolutionists, was deeply concerned with cybernetic principles. It is stated that he went as far as to develop an augmented view of the praxis’ aesthetic (Dunbar-Hester, 2010). It is no great surprise that some of Cage’s most innovative works may also be viewed as the subtle, embryonic vibrations of network music, such as *Imaginary Landscape No.4* (1951) and *Variations VII* (1966). Dunbar-Hester discusses Cage’s concern with the sociality of music; acknowledging that musical and social relations were inseparable to Cage. This inseparability firmly places musical activity into the realms of the relational, as the composer himself refused to separate musical systems from social systems (Dunbar-Hester, 2010).

Pressing (1990) also acknowledged a direct link between artists and cybernetics. Works such as Neuhaus’ *Public Supply I* and John Cage’s *Variations VII* are seen as concrete examples of works that have cybernetic principles as embedded motivation (see section 2.1.4). These two works are seen as primary examples of embryonic network music performances, supporting the common thread argument that connects theoretical implications of cybernetics, and the artistic practice of network music. In the subsequent chapter, both these works are analysed through a
nodalistic framework, outlining the rationale and, perhaps more importantly, the implications of viewing works through a nodalistic lens.

Gochenour relates systems theory to nodalism through the writings of Maturana and Varela. He describes their *Tree of Knowledge* (1998) as "a foundational yet basic introduction to the concepts of cognitive science" (Gochenour, 2006). Their biological, systems based discussion went on to inspire cybernetic thought - as theorists began to understand marriages of technology and biology as intricate systems of communication and interaction between agents and environments (Gochenour, 2005). Gochenour, however, is careful to understand communication in a linguistic sense: formations of humans within social systems use language as their communicative medium (Gochenour, 2006), which differs from the cybernetic stance that comprehends communication as interaction between agents (whether biological or technological) within organised structures.

Gochenour also makes explicit links between nodalism and systems theory through the writings of N. Katherine Hayles. It is no great surprise that, correspondingly, Hayles relates cybernetic thought to systems theory unequivocally. Hayles believes in a tangle between systems theory - as developed from second and third order cybernetics - and narrative; communicating the role that narrative plays within systems theory (N.K Hayles, 1995). This concern will be explored in the latter stages of the thesis, as discussion surrounding narratives and network music is teased out with respect to an understanding of ‘hypernarrative’. As the thesis develops, understanding network music as a systems based formation of musical agents where interlinked or interconnected narrative formations may be formulated becomes a direct concern - especially in relation to the *Web Variations* project - wherein a listening agent is afforded the potential to trace a narrative through a system of interconnected, and ‘intra-active’, performing agents.

### 3.2.1.2. The Intersubjective as Bind

Dramaturgical models allow us to understand any network music performance as a series of social agents, organised in such a way as to produce a collaborative output. Drawing distinctions between how agents are organised is where the associative and connectionist principles of nodalism come to the fore. Schroeder has previously questioned whether the connectionist models of the network are sufficient to describe network music (Schroeder, 2009) and this questioning is merited. The connectionist and associative models are not designed with artistic practice in mind. However, analysing a network music project from within the
The associative paradigm allows one to better understand and analyse the relational communication and collaboration structures contained within; detailing more accurately the way in which agents are associated with each other, how they organise themselves with respect to rule structures imposed, and most pertinently, how agents view themselves and their designated roles within the overall system.

The relational, agent specific, characteristics of any network performance are also influenced by concepts associated with nodalism. Gochenour outlines the view that the role of the self, or more accurately the ‘intersubjective’ self, as drawn from Flusser’s systems theory model, is a central pivot of the nodal discourse (Gochenour, 2008). Viewing network music as a set of ‘selves’ organised within a coherent and cogent structure, allows one to garner a better understanding of what it means to be a participatory ‘self’ within any given system. This line of thinking is supported from within the contemporary music model by Adkins, as he positions himself as a composer; concerned with “notions of the ‘self’ and ‘situatedness’” (Adkins, 2014a, pp. 55); realising that the fabric of relations defining the self are “inherently nodal” (Adkins, 2014a, pp. 55).

Schroeder recently outlined her view of the ‘self’ within network music with respect to listening practice: “Listening in and to the network as a performer highlights how the network makes one listen to oneself, and this in turn has repercussions for re-thinking our relation to others” (Schroeder, 2013, pp. 217). From this, we can draw a lineage back to the writings of Hayles, as similar statements are made concerning the subject’s concern with the other: “the subject uses his imagination to conceive of someone else, and then of the imagination of the other person, in which he finds himself reflected; and so he is reassured not only of the other persons existence, but of his own as well” (N.K Hayles, 1995, pp. 84). The similarities between the network orientated thinking of Schroeder, and the systems theory based thought of N.K Hayles is enlightening, and further cements the link between the two fields. Schroeder accentuates how listening to a network, animated through sound, takes on an almost ethereal state; one that is paradoxically, yet explicitly, coupled to one’s own corporeality; this paradox binding itself to the fragility of any such network performance. Network performance strips away sensory inputs, such as sight or smell, in favour of more unitive, or utopian, principles: “the network comes into being through being made resonant by the fragility of performance bodies on the lookout for a relation to self, and not through being seen” (Schroeder, 2013, pp. 223).
By using nodalism as a framing discourse relating in equal measure to the view of the ‘self’ as outlined by Schroeder (2013), the view of the agent ‘self’ as seen by Hayles, the composing ‘self’ as seen by Adkins, allows theorists to deepen their understanding of network music’s implications on experimental artistic practice, as a whole. It may also allow the genre to expand its inter-disciplinary influence, by broadening the conversation to include other discourses such as musicology, systems theory, psychology, sociology, collaborative dynamics, digital humanities, and even philosophy. Analysing network music through the ‘intersubjective’ or ‘interrelational’ lens would also allow the knowledge derived from such practice to be fed into any related discussions where collaborative organisation, emergence, and formation play a distinct role.

3.2.1.3. Relayed Creativity

Adkins and d’Escrivan proselytise the concept of nodalism by reducing it to first principles; suggesting it as an over-arching critical tool that covers and informs “the way of approaching the production of all artwork in contemporary culture” (Adkins and d’Escrivan, 2013, pp. 40). Through analysis of their own ‘remix’ practice, Adkins and d’Escrivan reinforce Born’s concept of technology afforded “relayed creativity” (Born, 2005, pp. 26), viewing artistic practice as one in which ideas, concepts, and objects are in a state of constant re-imagining across “time, space, and persons” (Born, 2005, pp. 28). Practice in which fragments of musical objects are re-interpreted and then re-moulded through the explicit use of technology into something ‘original’ has leveraged a “post-structuralist aesthetic in which the line between creating an ‘original’ artwork and one that uses elements of pre-existing material is fragile” (Adkins and d’Escrivan, 2013, pp. 42).

Within network music, drawing lines between themes such as ownership and authorship has often been difficult; distributed and co-creative elements rendering a dense fog over the constitution of the individual’s proprietary role, specifically when the network projects become complex in focus, topology, and design. Using nodalism as a tool to better understand ‘relayed creativity’ between nodes allows discussions to move away from antiquated themes such as authorship and ownership to more modern concepts such as kinship, as outlined by Adkins and d’Escrivan (2013), or themes such as interrelational, intersubjective, or intra-active creativity.

From the view of network music, nodalism may offer a set of tools, concepts, prescriptions, and metaphors that may be invaluable for a completive understanding
of the practice. Adkins and d’Escrivan acknowledge how nodalism may be viewed as “a vehicle of understanding in that it provides for a nodal hierarchy in which to traverse a work or art; it can become a research procedure as well as creative one” (Adkins and d’Escrivan, 2013, pp. 2013). Adkins proclaim nodalism to be a global model, with other more specific theories being viewed as local; sub-sets (Adkins, 2014a). This allows network music and its related theories to exist within a a ‘meta-frame’ of nodalism. From the perspective of nodalism, viewing network music as a distinct example of nodal practice would allow a discipline, through practice-based methods, to inform critical theory. Removing the critical tool from mere hypothesis; into more tangible, and even corporeal realms.

3.2.1.4. Reification and Levels of Scale

Whereas Adkins and d’Escrivan view the totality of artistic output as being nodal in type, this paper has outlined Schroeder’s intersubjective lens, and placed it within the nodalistic spectrum. The question remains as to how one concept can inform two differing stratums of artistic practice. It would seem that nodalism is described both as a high-level, overarching mechanism through which to dissect the totality of artistic output, as well as a low-level mechanism through which one may analyse participants and their distinct relations to each other.

The temporary solidification of processes that Vitale discusses is termed reification (Vitale, 2014). Network music performance may be seen as a process in which such a temporary solidification may be carried out, so analysis of the involved individualistic, and holistic, processes can be completed at differing “levels of scale” (Vitale, 2014, pp. 18). A multi-dimensional lens appears through which one can view the various stratums. Network music evolves into a practice where one may analyse and reflect on at the ‘level’ of the self and its relation to others - as outlined by Schroeder - or through differing, yet equally engaging, ‘levels’. Zooming in and out of differing foci ensures that artistic reflection informs other stratums - such as relationships between institutional agents, technological infrastructure suitability and/or efficiency, homeostatic or autopoietic tendencies, network security implementation and/or proficiency, ancestral relations between artistic objects and/or artists, so on and so forth.

3.2.1.5. Example of Nodalism as Analytical Tool

*Imaginary Landscape No.4* (1951) was a musical undertaking of a conceptual nature in which John Cage instructed twenty-four performers to ‘play’ twelve
instruments. In this instance the instruments were radios. The score contained “timed changes to the tuning and volume in terms of amounts to turn the knobs” (Joy, 2010, Vol.3, pp.63). If we apportion the nodalistic lens onto this example, facets of the project begin to reveal themselves on differing levels of scale. At one level, the relation of the instruments to the site of performance becomes of central importance. Through engagement with the piece, the audience understand that the radios relate directly to the area in which they reside. They are able to source radio waves only within their reception range.

Secondly, the performance allows the audience to gauge the ‘interrelatedness’ of the various radio stations. An awareness of the overall genre, or cultural, profile of the locale may become apparent; or awareness of the synchronicities within advertisement timings, or music playlists. These relations alter the aesthetic. Audiences may relish continuities or discontinuities between differing sounds as the knobs are altered. A sense of relation may also be born between radio stations that have similar sonic profiles, derived through their schedule or playlist programming. A differing aesthetic shade is revealed, beyond any tonal or temporal qualities of the piece.

A third characteristic that reveals itself is the fact that Cage instructed two performers to engage with each radio. The nodalistic discourse would allow a focus on the relationship between the two performers to appear; analysing the interaction and dynamic interrelations of their performance, akin to the way in which a duet at a piano may be analysed - even though the radio is not an instrument usually associated with bi-focal control. Such analysis highlights how the nodalistic discourse opens up differing avenues of understanding, each deserving of exploration in their own right.

3.3. Summary

This chapter has introduced nodalism, as outlined by Gochenour, as a core conceptual tool that aids theoretical discussions of network music performance. It has also outlined two specific examples of the nodalistic discourse being indoctrinated into discussions of experimental music practice. Adkins and d’Escrivan’s incorporation of the term, and its concepts, into their own ‘remix’ practice is shown as an illustration of the nodalistic discourse being implemented as an over-arching theoretical tool through which one can view the totality of artistic output, highlighting the implicative nature of the nodal discourse on all artistic activity. The chapter has also attempted to describe a coherent link between
Schroeder’s interrelational view of network music, and nodalism. The implication being that the augmented view of the self that Schroeder describes when involving oneself in network music is heavily related to the intersubjective self - as described by Gochenour - as well as Adkins’ concerns with the composing ‘self’.

The chapter has also drawn on Vitale’s network theory; specifically his concepts of ‘reification’ and ‘levels of scale’. These terms attempt to clarify how the nodalistic discourse may leverage a more detailed and thorough understanding of the multiple strata that exist within network music. A very brief analysis of Cage’s experimental music practice, entitled *Imaginary Landscape No.4*, followed. This brief analysis served as a short exemplification of the type that follows in the subsequent chapter - where three projects are dissected at length. The analysis of *Imaginary Landscape No.4* revealed strata within the compositional and the communicational paradigms of the work: the relation of the instruments to the site of performance, the relation between the instruments themselves, and the relation between the two performers operating each instrument. The subsequent chapter will flesh out similar perspectives and reflections in each of: Maryanne Amacher’s *City-Links*, Max Neuhaus’ *Public Supply I*, and John Cage’s *Variations VII*.

Speculatively, it may be acknowledged that the holistic framework of nodalism allows one to further develop both the practice and study of network music. A new aesthetic may appear, akin to Ascott’s (see section 2.1.9), where the relation between agents has more weight of bearing than the music itself. Composers and designers of network music may begin to think of their practice as nodal, allowing artists to alter their compositional methods; developing more intricate weavings of network-orientated concepts and techniques into their work. For example, a type of ‘navigable music’ (Novak, 1991; Novak, 1997) may begin to appear, where narratives are dispersed through and over a multitude of composers; where audiences specifically seek and discover narrative paths and/or musical relations and interrelations between agents. The study of such practices may then feedback into understandings of systems theory, network theory, and cybernetics; especially in regards to the role the human agent plays within these systems. This analysis may inform our understanding of the marriage between technological and humanistic values; altering the way we envision music developing in the 21st century.
Chapter Four

4. Analysis of Historical Works

This chapter will analyse three historical works through the nodalistic framework presented in the previous chapter. The works were briefly introduced in chapter 1; with the rationale for their choice in sections 1.2 and 1.4. The explanation and description of the framework is found in section 1.3.2.

The structure of this chapter will be as follows: there are three sections, each concerned with an artist and a specific example of their work. In each of these sub-sections there will be a brief introduction to the artist and the work in question. The work’s core concepts will then be introduced, explained, and interpreted. A reflective process and critical analysis will follow; completed through the developed nodalistic framework. Aspects will be drawn out of the work from a number of perspectives: instruments, performers, and the context of listening.

4.1. Broadcast Works: Public Supply I

Max Neuhaus was an integral part of the experimental music movement that developed in the United States during the latter half of the 20th century (Cox, 2009; Kotz, 2009; LaBelle, 2006; Licht, 2009; Murph 2013). Formally an instrumentalist, Neuhaus “abandoned performance completely to work with sound as an ‘entity’” (Licht, 2009, pp. 5). This elevated perspective of sound actuated Neuhaus’ evolution as artist, and he is credited with creating some of the first sound art installations (Cox, 2009; Kotz, 2009; LaBelle, 2006; Murph, 2013). Neuhaus “worked with sound from environment and as environment” (Licht, 2009, pp. 5), inferring the myriad roles that sound plays in ones engagement with it. He understood and engaged with the evolving role of the ‘composer’ in the 20th century; as maker; designer; architect; moderator; catalyser - depending on his orientation within any specific work: “interested in trying to move beyond that (performance) and beyond being a composer...” (Neuhaus, 1994, pp. 5). His engagement with ‘sound activity’ was a reflection of a desire to find “ways to
escape from our present conceptions of what music is” (Neuhaus, 1994, pp. 7), a treatise that was shared amongst his peers within the avant-garde movement of the 20th century.

Public Supply I, performed in 1966, was the first in a number of works, classified as Broadcast Works, that Neuhaus created specifically for the communicational mediums of the age - radio and telephone. Within Public Supply I, Neuhaus offered compositional and performance integrity to a distributed ensemble from which he moulded an engaging, original, and dynamic sonic ‘dialogue’. The ensemble were participating audience members, situated within a twenty mile transmission radius from WBAI FM radio station, which was located in New York. The idea for the piece came about when WBAI FM asked Neuhaus if he would like to give a broadcast interview. He recounts how he “...had this idea - instead of talking, why not try to make a work for the radio itself?” (Neuhaus, 1994, pp. 5).

With the medium of radio in mind, Neuhaus went about designing a bespoke performance system: “I built this wonderful pre-answering-machine.......Each phone sat on a small platform and had a solenoid-controlled lever which fit under its receiver. A plastic cup with a microphone inside was fitted over the ear piece. The mikes and solenoids were connected to a box with switches controlling the solenoids, and with pots for the mike gains. The output went to an amp and speaker.” (Neuhaus, 1994, pp. 6). Neuhaus was able to moderate the sonic input of a host of callers by implementing the system. Contributions would arrive, via a telephone call to the station, where they would then be mixed, merged, and broadcast over the airwaves. A communication system emerged; one in which participants could communicate with each other, and with the sonic environment as it evolved in time. Crucially, participants had access to a feedback channel - which was the radio broadcast itself. They would be aware of their involvement in the piece; how their contributions were collated by Neuhaus, as well as how other participants responded or engaged with their input.

Neuhaus designs sound art with specific attention to the concepts of environment or space (La Barbara, 1977; La Belle, 2006). In Public Supply I, Neuhaus was offered a space that had intangible borders, a space whose edges lay on the outer fringes of radio transmitter coverage. He recalls how he made a “virtual space” (Neuhaus, 1994, pp. 7); a space into which “any of the ten million people living there could enter into by dialling a telephone number” (Neuhaus, 1994, pp. 7). The relatively low technological barriers to entry ensured Neuhaus afforded ‘dialogue’ formation as participants were presented a two-way communication structure. Participants
could offer content, as well as perceive and interpret how their contributions were being implemented and responded too.


Neuhaus discussed the anthropological influences of *Public Supply I*; he found inspiration in the fact that music had been observed to possess a very different function to persons not in contact with ‘modern man’, as anthropologists had learned in the study of ‘secluded’ communities (Neuhaus, 1994). The anthropologists discovered music divergent from the coded, ‘composer - performer’, dichotomy that existed in the 20th century. It was described as: “sound dialogue among all members of the community” (Neuhaus, 1994, pp. 7). This ethos is echoed by Neuhaus as he discusses the motives for creating the suite of *Broadcast Works*: “these works are really about proposing to reinstate a kind of music which we have forgotten about and which is perhaps the original impulse for music in man: not making a musical product to be listened to, but forming a dialogue, a dialogue without language, a sound dialogue” (Neuhaus, 1994, pp. 7)

This concept of music as ‘dialogue’ has since evolved. Bruce Ellis Benson incorporates the term ‘dialogue’ into improvisatory practice, stating that ‘dialogue forming’ is fundamental to music making: “What is clear to me, though, is that the binary schema ‘composing’ and ‘performing,’ which goes along with the construal of music making as being primarily about the production and reproduction of musical works, doesn’t describe very well what musicians actually do. In its place, I wish to suggest an improvisational model of music, one that depicts composers, performers, and listeners as partners in dialogue. From this perspective, music is a conversation in which no one partner has exclusive control” (Benson, 2003, pp. x). This description, formed by an improvised model of communication between composer, performer, and listener has strong relation to the utopian sonic dialogue that Neuhaus sought to create within *Public Supply I*. Neuhaus involved agents in a participatory way, opening up avenues of activity by implementing widely accepted communication channels into a performance system. The performance system was not controlled by any one member, it was influenced by all participants as they formed a mutually inclusive dialogue.

A key technological instrument within the realisation of *Public Supply I* was the telephone, and its indisputable links with the realms of communication, and dialogue, is no coincidence. The telephone system, at the time, connected hundreds
of millions of people - both nationally and internationally; affording a depth and scope of communication on an unprecedented level. Coupling the affordances of the telephone with those of the radio, Neuhaus designed a performance system that encouraged distributed, bi-directional participation. Neuhaus describes the process; his art demonstrating a concrete move away from static, one-way relational models towards bi-directional exchange: “‘music did become a process of communication, a loop, rather than a one-way message from performer to audience’” (Neuhaus, qtd in Murph, 2013, pp. 65). The mediums of radio and telephone were used to leverage the artistic mode of the participant, affording involvement in a continual, real-time ‘sound dialogue’: “At that moment it became a group activity - a process of people making sound together, listening to it, and adjusting what they did according to what was going on. I think this is the heart of the musical process - this dialogue” (Neuhaus, qtd in La Belle, 2006, pp. 156).

4.1.2. Core Concepts: Virtual Space

Neuhaus understood that the ephemeral borders created by the Public Supply I performance system created a “virtual space” (Neuhaus, qtd in Traub, 2005, pp.1). A space into which participants could sonically enter and exit, while listeners simultaneously perceived through their aural sense. Neuhaus was intrigued by the concept, describing it as “independent of geography” (Neuhaus, 2005). This virtual space, disassociated with physical limitations, borders, and topography, allowed Neuhaus to create an intangible, ethereal network - connecting participants from otherwise disparate locations.

Joan La Barbara elucidates how Neuhaus’ “works focus on that most important function of the composer in society, of retraining ears and minds by utilising original contexts or situations as new forms in which to set pieces” (La Barbara, 1977). In was later that Neuhaus reflected on the creation of a new kind of space in Public Supply I. La Belle describes a veiled net - steeped in aurality; percipiently draped across an environment “so as to activate how one moves, occupies, and engages in space” (La Belle, 2006, pp. 163) - urging connection, communication, dialogue, participation, and substantiation (Tazzi, 1997). It was this net casting that encourages La Belle to comment on how the work “displaced the culture of new musical practice onto a larger context. Such a project, while making reference to certain musical attributes related to tonality, frequency, and compositional structures, moves more overtly into questions of spatiality, environmental relations, the mixing of found and constructed” (La Belle, 2006, pp. 164).
The two-way communicational performance system could also be seen as being a reflective pre-cursor to concepts and ideas that would later manifest themselves in the birth of the Internet. As apposed to information technology exchanging binary information through embedded communication channels, participants exchanged vibratory sonic information through ‘attached’ communication channels. The concept of virtual space and its inherent reliance on telephonic technology is articulated by Neuhaus: “the telephone forms a two-way virtual space in the aural dimension; we function in it aurally as if we were in one real space, but this space doesn’t physically exist” (Neuhaus, 1994, pp. 3). The existence of a space not rooted in physicality, yet holding the propensity to inflect, deflect, and reflect as an extension of ‘real space’ is also described: “The fact that there are single dimensional virtual spaces has some interesting aspects.......a one-dimensional virtual space doesn’t engulf us. It leaves us in our real world, but extends it” (Neuhaus, 1994, pp. 4). The extension of ‘real space’ is what Neuhaus explored in Public Supply I. He desired to create a work that inspired and excited in equal measure; prompting contemplation on what it was to be a pseudo-resident inside the ‘virtual’: “an aural virtual space reproportions focus and stimulates imagination...” (Neuhaus, 1994, pp. 4).

This concept of virtual space as an extension of real space has of course since evolved, in similar fashion to the way in which the concept of music as dialogue has. Mitra encourages one to think of cybernetic space as: “a synthetic world made up at the intersection of the real and the virtual.” (Mitra, 2003, pp. 1). Admittedly, this framing of the ‘virtual’ is considered with modern day encroaching ‘digitality’ in mind, but that is not to say that early cybernetic principles were not being explored by Neuhaus as he went about creating Public Supply I (Traub, 2005). Mitra views the Internet as being a synthetic world in which people dwell (Mitra, 2003). Neuhaus designed Public Supply I as a space in which temporary sonic residence of participants was welcomed; the work affording them the ability to create, alter and engage with content as they wished. It is even more interesting in this context to draw parallels between the theory of Mitra, and the actual broadcast output of Public Supply I. Mitra discusses the fracturing of identity within cybernetic space, schizophrenic tendencies, and the sense of dependency between the ‘real’ and the ‘virtual’ (Mitra, 2003). Within Public Supply I voices intermingle, interweave, appear, disappear, reappear; intrigue just as much as they discourage (Neuhaus, 1966). While all the time remaining in a shadowed space of interconnection, voices seem to respond and relate in a foggy soundscape of etheric interdependence. It would seem that the descriptor that Mitra uses is just as apt for Neuhaus’ art.
4.2. Nodalism: Reflection on Public Supply I

*Public Supply I* is seen as a relational work; governed by principles embedded in concepts and theories of nodalism: firstly, the fact that it is set within a virtual space, described by Neuhaus as a network (La Belle, 2006), affords relational and interrelational contemplation from a myriad of perspectives; secondly, the work is one in which a distributed, participatory audience substantiates a performance (Tazzi, 1977). At the macro level, understanding from within the perspective of the performance environment may appear, elucidating interesting features as regards the intangible territory of the performance space, the participating demographic, or the telecommunications infrastructure. At the micro level discussions surrounding individual participant dialogue, conversation, engagement, and disengagement should surface - as well as deeper apprehension of the actualised sonic content. Zooming in and out of various levels of investigation through a nodalistic lens allows for better understanding of the work, while also affording comparison with the process of Adkins and d’Escrivan (2013) - where static, pre-produced, content is re-formulated, re-interpreted, and re-amalgamated into an original art work - as apposed to *Public Supply I*, where dynamic content is moderated as contributions are seen as part of an active, networked instrument.

La Belle (2006) hints at the correlation between Neuhaus and the stylistic concerns of Minimalism, while discussing the relational aspects of *Public Supply I*. He feels the relational aspects exist due to the distributed, participatory, group nature of the performance: “lending significance to the relational and associative connections found between the many” (La Belle, 2006, pp. 159). La Belle views the relational dynamic as being similar to those found in Minimalism (La Belle, 2006), a movement later built upon theoretically with the concept of relational aesthetics - art that sits inside a “social interstice” (Bourriaud, 2002, pp. 14) where “the substrate is formed by inter-subjectivity....takes being together as a central theme, the ‘encounter’ between beholder and picture, and the collective elaboration of meaning” (Bourriaud, 2002, pp. 15). Tazzi describes the interrelational mechanism of transmission and reception embedded within *Public Supply I*, embarking on an engaging discussion of the performance system and its implications for participating agents. The term “sentient subject” (Tazzi, 1977, pp. 4) is introduced, describing the sensation of awareness that the participant derives through engagement with the work. The participant becoming mindful of their role within the interlocked transmission and reception system. Both writers suggest that comprehension and knowledge is formed by analysing Neuhaus’ work from relational perspectives.
4.2.1. A Nodalistic Perspective on Instrumentation

From a purely aesthetic viewpoint the participatory, bi-directional communicative nature of the work ensures that the intersubjective or interrelational aspects of the work are self-evident. It is also possible to consider the work in temporary reification (Vitale, 2014) - zooming out; affording a nodalistic or networked perspective of other aspects. Analysing the relational aspects of the instrumentation is perhaps the most fascinating avenue, whether they be subject-orientated, object-orientated, or a combination of the two. The performance did not just feature a distributed chorus; it was firmly supported by technological infrastructure. This infrastructure is seen as fibre, or mesh; weaving together disparate individuals, binding them into a coherent hive of aurality.

The space that Neuhaus created is populated by a number of agents who, in bind, create a performance environment. Crucially, the virtual space may be viewed as being instrument, or medium, depending on the perspective. Depending on the perspective one views the system from, elements take on differing roles, or functions, morphing in seemingly ephemeral states; fluid and mutable. Temporary reification now becomes a crucial process in understanding the roles that any element is afforded.

To reflect this mutability, we may look at the concept of virtual space: from the perspective of Neuhaus it may be seen as instrument - instrument that he coalesces to form a holistic sounding object. Alternatively it can be seen as medium - medium that he is architect of; medium that is moderated. From the perspective of the participating agent, the virtual space can also take on two differing roles; one of totalistic instrument - that agents are segment, fragment, or part of - or one of medium, through which agents voice themselves.

Viewing the performance system from a more holistic standpoint, it is possible to place the work into the realms of performance eco-systems. From the perspective of Neuhaus, it is possible to imagine him playing an instrument that he designed and implemented, with the distributed chorus taking the role of embedded polyphonic voice. From the perspective of a participating agent, it is possible to view them partaking in the distributed substantiation of an orchestra, one that vibrates and resonates in accordance, empathy, or sympathy with input. Di Scipio defines composing musical interactions as being systems where one “designs, implements and maintains a network of connected components whose emergent behaviours in
sound one calls music” (Di Scipio, 2003, pp. 271). It is this standpoint that bears close resemblance to Public Supply I. Neuhaus created and implemented a system; moderating the emergent behaviours that manifested from the environment in which it was situated. These manifestations arose from the interconnected behaviours of a group of participating agents.

4.2.1.1. Relation Between Instruments

It is important at this juncture to define the scale at which nodalistic analysis will be completed, as well as its perspective. For Neuhaus, the virtual space may be seen as medium. Medium through which the artist sources sound events. These sound events, in aggregate, establish a distributed orchestra. The participants, by offering up sound events, may be seen as instruments. These instruments are moderated: the mixed and merged radio broadcast being the combined musical output. From this position it is possible for a nodalistic analysis to be completed of the existing relations between instruments. Neuhaus described the role and process of his moderation; its cohesive importance, elucidating the actualised differences and similarities within the sourced ‘instruments’: “[I] tried to form interesting combinations of callers on the air and counterbalance the extroverted with the introverted” (Neuhaus, 1994, pp. 6). Neuhaus illuminates a sense of tuning and conducting. His role as a manager of relations from an aural perspective.

Listening to a recording of the original broadcast, a distinct search for relation can be found. At 29m 8s, a voice is heard: “Hello, can I speak to my mommy?” (qtd in Neuhaus, 1966). This vocal utterance may be viewed as a humorous extrovert voicing a comical anecdote, but nodalistic analysis frames it differently. The instrument may be seen as searching for concrete communicational, empathetic, or sympathetic relation within the medium of the virtual space; perhaps a reflection of the feeling of mis-direction or mis-location felt while navigating the intangible ether that Neuhaus created. If one continues to listen, it becomes even more absorbing at 29m 20s when the voice continues, now in a much more distressed tone: “is my mommy there? I want to speak to my mommy.” (qtd in Neuhaus, 1966). Immediately after this interlude it seems that the same voice continues, now more relaxed: “paul schriver, paul schriver, paul schriver, paul schriver, paul schriver, paul schriver, paul schriver, paul schriver. Paul, can you hear me? Paul, can you hear me? Paul, can you hear me? Paul, can you hear me? Paul, can you hear me?.....” (qtd in Neuhaus, 1966). This example is obvious in its reflection of a search for relation. A search for tangible link; genuine bond between instruments. The voice, or instrument, is searching for a relational response from another voice
from within the virtual space. As one listens on, it is not clear whether this link is ever found. It is not clear if the voice’s near desperate cry is answered, either by his ‘mommy’ or by ‘Paul Schriver’, reflecting a call for bind within a medium in which measurement remains illusory.

4.2.1.2. Relation Between Performers and Instrument

Temporary reification (Vitale, 2014) of network structures affords analysis on a number of differing planes, so it is imperative to engage in clarification. In this instance, the relation between the voices - the sourced sounding participants - and the virtual space will be analysed. This defined perspective is important to note, as on this plane the participants are undertaking the role of performers, while the virtual space is viewed, in totality, as instrument. Ambiguous roles existing within network orientated performances is a common discursive thread, similar to those found in discussions of ‘cyberspatial’ art, by authors such as Tanzi (2001), Benedikt (1991), De Kerkhove, (1997), and Ascott (1993). Myriad and multi-dimensional roles are elucidated most clearly by Tanzi, when discussing decentralised music environments: “we are induced to start a game of interpretation, deconstruction and synthesis, where many processes may be simultaneously present, and virtual, emerging or vanishing” (Tanzi, 2001, pp. 432). Processes appearing, vanishing, becoming real and being virtual pays heed to how one engages with nodalistic analysis; etheric processes appear intangible, and at times immeasurable, flitting between existence and non-existence.

There is a moment within the original broadcast of Public Supply I, at 19m 20s, when a participant utters the words “Why do you make the places sound dead. Why do you make everything sound so dead?” (qtd in Neuhaus, 1966). This sound event should be placed in context. It follows a longer passage of, what could be described as, ‘noise’. This noise sounds as though it could be created by a synthesiser, or perhaps a feedback circuit. It could also be a tape recording that is being played by a caller. Merged with this, there is what seems like a recording of a military radio broadcast. The words: “fourth battalion, right shoulder.” (qtd in Neuhaus, 1966) are heard. This section may be analysed from a nodalistic standpoint in at least two ways.

The first analysis is of the relationship that a participant forms when hearing two sounds. In this case, the sound of the noise is merged with the military recording. Perhaps, upon hearing this, the caller associates the overall tone and timbre with one of battle, bloodshed and combat. This may evoke memory, fear, and perhaps
above all, connotations with death and destruction. The cultural and associative
c:connections rouse strong emotions in the caller, and so, she voices the words. It is
not completely clear if this was the causal effect, but the outcome is certainly stark
enough for us to make that relational link. Adkins elucidates the individualistic
nodalistic associations that may be drawn while listening to music, linking the
concept to Born’s notion of musical “assemblage” (Born, qtd in Adkins 2014a);
music is a combination of a complex interaction of experience, sounds, and
individualistic knowledge and interpretation (Adkins, 2014a). The passage of audio
certainly seems to reflect this experiential understanding of music; reflecting
nodalistic behaviours on the part of the participant as they engage with the system.

Alternatively, there is another engaging nodalistic relation that may be unearthed.
Perhaps the caller relates to the virtual space in a fatalistic manner. Unable to
understand or perceive the virtual, etheric, intangible - they intentionally relate its
existence to something other-worldly; a place populated by spirits, ghosts,
phantoms, apparitions; the dead. Viewing the sound-byte in this manner illuminates
a perception of the broadcast. Perhaps the virtual space Neuhaus created was seen
as being from another place. One of which full understanding or comprehension
does not exist, but one that people were, nonetheless, enticed to engage with.

4.2.1.3. Relation Between Instrument and Audience

This section of the analysis will view the performance system as instrument. The
audience will be defined as those listening to the radio broadcast, but not
necessarily involved in its substantiation. From this perspective, nodalistic relations
will be drawn of how the audience perceived the experience. Johnson recounts his
own involvement with the work of Neuhaus, remembering “the situation more
vividly than the sounds” (Johnson, 1976, pp. 1). This reflection adds experiential
weight to the work, lending credence to the view that the work afforded active
participation over passive consumption, whether that be from a listening
perspective, a performance perspective, or a combination of both. In Public Supply
I a relational approach was emphasised by Neuhaus, which in turn affected how
participants engaged and experienced the work.

While listening to Public Supply I, there is a moment of illumination. One that is
not rehearsed - as none of the performance was - and certainly not intentional. The
indeterminate nature of the performance led to many unexpected results. One of the
most revealing, from the perspective of the relation between the audience and the
instrument, arrives at 29m 49s. Neuhaus created an instrument that was original and
unique, affording the public a level and range of engagement and interaction that exceeded traditional realms of performance. It was not, however, well documented how the audience should interact with this instrument; how to engage with the virtual space. The equivocal, ambiguous, immeasurable, and ethereal relation between audience and instrument is revealed by a radio presenter, whose job it was to sporadically intersperse the live broadcast with announcements regarding the work, its creator, and the ways in which the public might get involved. In one instance, the following was aired: “This is Public Supply. You supply the noise.....I mean.....the music. Max Neuhaus composes...” (qtd in Neuhaus, 1966). This sound byte could be attributed to a slip of the tongue from the announcer, a drop in concentration when reading his programme notes. It could also be interpreted another way. Perhaps the announcer was unsure of the piece; unsure of what exactly was supposed to be going on; unsure of its intended interpretation, or the intended interaction. He seems sure that Neuhaus is composing - even if this is not what Neuhaus felt himself - but uncertain of how to define the incoming sounds.

A second example is recalled by Neuhaus, as he recounts the apprehension the studio engineer at WBAI FM had of his ability to devise a working phone answering system: “The engineer laughed and asked me how I was going to answer them all” (Neuhaus, 1994, pp. 5). He also discusses the trepidation the studio engineer had with broadcasting live; fearing the station would lose its licence as there was no such thing as a live ‘call-in’ show at the time (Neuhaus, 1994). The solution “was to put a mike in the studio and pretend it was a strange kind of interview show” (Neuhaus, 1994, pp. 5). This uncertainty, from within the radio station itself, could be seen as representative of the wider audience; skeptical, doubtful - unconvinced of roles, interactions, and outcomes. The definition of the performance as a strange kind of ‘interview’ is also revealing in a nodalistic sense. The performance system may be seen as an instrument in which members of the audience interviewed themselves, in a live, self-reflective manner. In this instance, the audience may relate to the instrument as some form of mirror; steeped in aurality. One whose reflection is the composite of all participants located within a space where physicality has been reduced to mere sonic instance.

4.2.2. A Nodalistic Perspective on Performance

Neuhaus designed and created a system in which a distributed chorus of voices was afforded the ability to substantiate a performance. This substantiation was moderated by Neuhaus, as he mixed and merged the sourced content from the
public. Viewing the performance system from a holistic standpoint, it is possible to understand its fabric as a series of nodes that contribute material which is then, in a sense, governed by a moderating node. This nodalistic stance enables an analysis of the interactions, as well as the interrelational characteristics of the performance. The public, in this way, are seen as performing nodes, or performing agents, whose contributions make up the essence and body of the work. Analysis can be completed on a numbers of levels; relations between the performers; relations between the performers and moderator; relational properties that are formed during the substantiation of the piece that did not exist without the system’s instantiation.

Tazzi defines the role of the public within Public Supply I as more than mere contribution. The performance system “was more than a question of public ‘participation’, since the public supplied the work with its very substance” (Tazzi, 1997, pp. 3). Viewing the work as one that is substantiated by the participants may seem trivial, but in a nodalistic frame it is quite revealing. The use of the word substantiation evokes some sense of justification, or vindication to the piece; experienced through public interaction. The artistic meaning, or essence, of the work was not to be found in the contributed content, but in aspects surrounding it. This justification may be framed by nodalistic theory. Public Supply I may be seen as the exploration of the relationships that exist within the performance system; how the performers relate to each other, and what is revealed as they engage in, and through, the new public facing medium that Neuhaus created. Tazzi describes the work as one “that equally consisted of the sound materials that the public supplied, inserting them into its circuit of transmission, and of the structure which the artist had designed and predisposed in order to make the system work.” (Tazzi, 1997, pp. 4). An equal weighting is attributed to the sourced sound events and the medium through which they were voiced; relations formed through, and because of, the medium. La Belle quotes Neuhaus, as he describes the interrelation and interaction that existed between members of the public: “it became a group activity - a process of people making sound together, listening to it, and adjusting what they did according to what was going on” (Neuhaus qtd in La Belle, 2006, pp. 156). The interest from within the nodalistic frame is not the sound that was received into the system, but the way in which the medium afforded the existence of a crucial feedback channel. Performers were able to hear relations appearing and disappearing, mixing and merging; adjusting their behaviour as they did so; searching for stronger or more cohesive bonds. This search for bind may be seen as the essence of the piece.
4.2.2.1. Relations Between Performers

Neuhaus understood that the virtual space affected a distinguishable change in participants’ perspectives; of themselves, their relation to others, and also of their relation to the performance system as a whole. A new type of space was created; one which could be inhabited through aurality. By utilising the system, the public could become aware of their relation to others as they temporarily inhabited the virtual, in a way that differed from their understanding of relations in a physical sense. With physical borders not being present, the system altered their view of their own corporeality, especially with regards to how they might engage with the intangible spaces of the virtual: “it's not that the new levels of communication shrink the world, but that they create a whole new relation to it and the information within it” (Neuhaus, qtd in Traub, 2005).

The performance system being described as a two-way transmission and reception describes a cause and effect arrangement. Participants would actively seek out relation to others, as we have seen previously, as well as seeking a bind between themselves and the totalistic interpretation of the actualised performance. This can be traced through the differing ways in which people participated in the piece. Some participants saw it as a distinctly musical performance; thus offering up purely traditional musical content: by playing an instrument, or in some cases playing recordings of music that, it is assumed, they had some cultural or psychological connection with. In other cases, participants used the virtual space as a temporary sounding board; one into which they could offer up sound events, and then listen out for response. It is this perspective that is most compelling.

Participants sought sonically tangible causal correspondence from their input. An illuminating example of this search for bind can be found, within the original broadcast, at the 1h 5m 10s mark, when a voice utters: “I know you can’t answer now, but would you please make it known after the show. Will there be a party, and if so, where?” (qtd in Neuhaus, 1966). It may seem a trivial question, perhaps from a friend or colleague of Neuhaus, but it may also be seen alternatively. The caller may have acknowledged the anonymity that existed within the performance system, and chosen to divert around it. It is preceded by another comment: “Yes, Max. We got you again, how lucky we were indeed. Max, you cut us off before” (qtd in Neuhaus, 1966). Again, this comment may be seen as something throwaway, but it also reveals something intrinsically more important. It is as if the two examples highlight a search for bind and relation between the participants and the moderator - Neuhaus. Perhaps the callers are searching for some relation between themselves
and the designer, architect, or catalyst of the performance system; searching for some tangible human connection. This search may have been actuated because of the disconnect felt by the participants. The disconnect felt as they engaged in a space with no tangible borders, outline, or structure - as an etheric existence was imposed upon their corporeality, through aurality. This existence established a sense of dislocation and discomfiture; an uneasiness in the situation that would be rectified by drawing the experience back into more habitual realms. As the piece continues, there follows a conversation (1h 7m 10s) between two participants: Male Voice - “This makes an interesting situation, do you think he is completely at the mercy of the sounds that are sent in” - Female Voice - “I don’t know, I don’t think Max is at the mercy of anything” (qtd in Neuhaus, 1966). This discussion about the system, from within the system, inside a mesh of agent interactivity mirrors the conceptual idea of dimensional folding as discussed by ‘cybertheorist’ Benedikt (1991). The two participants are on one level discussing the system, but on another level, substantiating the system; in a bi-focal process. Benedikt outlines how parallel levels of interaction and comprehension appear within complex digitised systems (Benedikt, 1991). Though the performance system of Public Supply I is technologically distanced from the Internet based systems of Benedikt’s focus, it may be seen that the levels of interactivity and affordance of Public Supply I has similar traits.

4.2.3. A Nodalistic Perspective on Listening

Listening is a core part of the interactive experience for agents involved in Public Supply I, as well as being the experiential mode through which the public engage with the artwork; centred in aurality. Exploring the listening experience from both perspectives through a nodalistic lens will reveal engaging and interesting features of the work, and should alter the aesthetic frame in which to seat the piece.

Tazzi (1997) considers Neuhaus’ theoretical and conceptual ideals. He also crucially introduces the concept of the “sentient subject (the listener)” (Tazzi, 1997, pp. 4) in relation to the how one perceives the work. This sentient subject perceives and feels mainly through their aurality. Tazzi specifically relates the subject’s field of aural perception to Neuhaus’ Moment Works, which were a “series of large scale sound works for whole communities” (Neuhaus, 2004, pp. 1). He feels that the mechanism for perception within these is inverted compared to the Broadcast Works. Understanding the mechanism through which listeners perceive their own subjectivity within Public Supply I will highlight the nodalistic concerns
embedded within Neuhaus’ network orientated pieces. These concerns will then further assent the blossoming nodalistic aesthetic through retrospective understanding.

Tazzi understands that the ‘sentient subject’ is one that becomes aware of an artwork through engagement with it. He also understands that within the Moment Works this engagement is processed through an “act of subtraction” (Tazzi, 1997, pp. 4). This inverted mechanism differs from the Broadcast Works, in which the ‘sentient subject’ becomes aware of their engagement through the ‘act of addition’. With respect to the Broadcast Works we may also include another act; the ‘act of relation’. These concepts are worth clarifying.

Firstly, for the listener in an observing role – an audience member rather than a participator: the virtual space is ethereal and ephemeral; translucent borders and invisible topologies inhabited by participants whose presence, paradoxically, is as fleeting as it is concrete. This is the subject in the act of relation, as they bind to and within the virtual space offered them. Secondly, for the listener that is substantiating: the virtual space becomes a space which they add too, a dialogue which they engage with. This is the act of addition. However, the substantiating agent engages in the act of relation also, as they engage in a process of seeking relation to other substantiating agents. This act of relation has strong correlations with the aesthetic concerns discussed within Schroeder’s ‘network[ed]’ listening. Elaine Scarry’s “opiated adjacency” (Scarry, qtd in Schroeder, 2013, pp. 223) and Iris Murdoch’s “unselfing” (Schroeder, 2013, pp. 223) both contain commonalities with the act of relation. Murdoch’s ‘unselfing’ allows one to view their own subjectivity in a clearer fashion, having related it to another, whereas Scarry’s opiated adjacency is a heightened state of splendour in which one becomes aware of a relation to another. These links allow one to reflect on Public Supply I from an altered aesthetic perspective, evaluating the piece in the context of relational qualities, rather than tonal, harmonic, or rhythmic characteristics.

4.3. Summary

Through the implementation of nodalism as conceptual and theoretical framework, Neuhaus’ Public Supply I has been analysed and considered through a canted reflective lens. A systematic enquiry has afforded an investigation of the performance system, viewing elemental agents from a number of altering perspectives, framing them as existing inside a system steeped in parallax. Core concepts that Neuhaus explored through the work have been discussed, such as his
embryonic postulations and subsequent forming of virtual space, as well as his motivation and enthusiasm for modifying perspectives of music - from one as ‘object’ to one of ‘dialogue’.

Neuhaus’ motivational concerns were framed by nodalistic theory, before an investigation of the performance system was explored. Engaging characteristics of the actualised performance, the implemented topologies, and the elements - both objects and subjects - were discussed, such as the instrumentation, performers, and the environment as a whole. Each investigation, when framed within nodalism, allowed a deeper comprehension of Neuhaus as artist, and the work itself, to appear.

Engagement with the differing elements of the performance system allowed an aesthetic variant to evolve. The nodalistic characteristics of the piece are developed enough to alter the evaluative lens. By integrating certain aesthetic characteristics of network orientated art we see a direct link appearing between frames of reference. A link between ‘network[ed]’ listening, based on Schroeder’s implementation of moral philosophers Scarry and Murdoch, and nodalism. A bind also appears, from the listener’s perspective, between the previously mentioned evaluation of Tazzi - the ‘act of subtraction’ - and the more nodalistically relevant mode of reflection developed within this chapter - the ‘act of relation’. This bind allows a further strengthening of the link between nodalistic concerns and reflections of the artwork. This reflective bonding allows the work to be seen in a different light, and also strengthens the argument that has been mentioned; Public Supply I is a concrete example of an embryonic nodalistic performance.

4.4. City-Links

Maryanne Amacher was seen, by some, as one of the foremost experimental composers of the 20th Century (Borchet, 1997; Curran, 2009; Dietz, 2009; Kaiser, 2014). Her concern and exploration of the spatial, perceptual, and physiological aspects of sound distinguished her from other notable luminaries of the time. Amacher’s interest in perception - how we as humans perceive aspects of sound - was borne from her long-form listening habits. She “learned about the perception of dimension in sound” (Amacher, 1991, pp. 4) as she spent weeks, months, and, astonishingly, years - listening, playing, morphing - enveloping her life with the sound of spaces and places transmitted to her over high bandwidth telephone lines (Amacher, 1991).
One of the more established and documented catalogue of works by Amacher is a sequence of concerts, performances, radio broadcasts, and sound installations, entitled *City-Links*. This series of works contained approximately twenty two iterations, or events; constructed, planned and performed by Maryanne Amacher, at intervals, over a decade or so - beginning in 1967. *City-Links* may be viewed as the cornerstone of Amacher’s development as a sound artist; a predominant series of exemplifications of her artistic principles. Within the *City-Links* series, microphones were located at various sites and then connected to a number of dedicated telephone lines. The sounds of one space, or place, were transmitted through these telephone lines to be sounded at another. Amacher’s intent was on exploring “noise-related qualities of sites, such as their fundamental or resonant tones, and their dependence on conditions such as climate, weather, time of day and other, sometimes extremely subtle, changing aspects...” (Maier, et al, 2010, pp.1). It was Amacher’s dedication to understanding the sounds of a designated place that set her apart; her concentration and focus at times bordering on obsession.

Amacher’s “pure, uncompromising commitment” (Curran, 2009, pp. 1), coupled with her love for “drawn-out duration” (Curran, 2009, pp. 1), is recalled as she describes her process: “the mike had been placed in Boston Harbor, using a dedicated telelink that was hooked into my studio for three years, going into my mixer. I could play the space. That is how i learned.....” (Amacher, 1991, pp. 4). Amacher held a deep desire to learn about the spaces and the places that she connected remotely with - her involvement an active listening experience - engaging with sounds that traversed across the implemented communication means. Amacher’s embracing of the sounds affected her development as an artist, as did her involvement with the telephone as transporting medium “...i became very interested in using this technology to make deeper studies in my studio...living with this live sound like this....i really learned what interested me....” (Amacher, 1989). The ability to transport a sound, or series of sounds, from one place to another was a core developmental exercise for Amacher. She began to acknowledge her desire to discover and learn about the sounds, to understand them; to build an ‘instrument’ from them (Amacher, 1989). The *City-Links* series was an adventure down this road; exploring and experimenting with ways in which she could build her “live sound environment” (Maier, et al, 2010, pp. 2), understanding how she could design and build a musical tool that employed rich sound sources from remote places; developing relationships between the listener and sources in engaging and compelling ways.
Through analysis of the City-Links series, a developmental path may be traced that reveals how Amacher’s conceptual outlook of her “live sound environment” (Maier, et al, 2010, pp. 2) changed over time. City-Links #1 (Buffalo), performed in 1967, was a work in which eight different locations were transmitted to the studio of WBFO FM Radio, in Buffalo, where they were subsequently mixed by Amacher over the course of a 28 hour broadcast performance (Maier, et al, 2010). This long-duration performance, illustrated Amacher’s desire to translate the remote location’s environmental sonic characteristics to the audience, combining them through mixing techniques to create a conglomerate sonic landscape; a reflection of Buffalo city. This concept progressed as time passed. In 1974, City-Links #6 (Hearing the Space Day by Day “Live”), performed at MIT during the Interventions in Landscape exhibition, focused this ‘live sound environment’ concept. During this exhibition, Amacher would ‘perform’ the live transmissions, which were received from a microphone overlooking the water, at Pier 6, in the Boston harbour. Amacher would produce performances by re-directing the original harbour sound through her studio. She would call these performances ‘interventions’. They were “produced through mixing techniques, processing, synthesis, and additional combinations of tone structures. The performance actions were made freely in the course of each day in the studio, while Amacher lived with the live Harbor sounding space, listening and responding to its changing pattern.” (Maier, et al, 2010, pp. 7). This concept developed again in later iterations of the series: live instrumentalists were designated to play at remote locations, immersing themselves and their instruments into the sonic environment of the places. This was the case in City-Links #10 (Everything in Air), where “musicians were ‘on location’ with tuba and banjo at the East River Flats, a site on the Mississippi” (Maier, et al, 2010, pp.8) as well as City-Links #13 (Incoming Night, Blum at Pier 6), which involved flautist Eberhard Blum.

The most developed incarnation of this ‘live sound environment’ was demonstrated during one of the last iterations of the series. In City-Links #18 (Intelligent Life), Amacher was joined by John Cage and George Lewis. During this performance Cage and Lewis performed at designated locations; sending these localised performances through dedicated telephone wires to Amacher’s studio in New York, where she subsequently mixed and performed them. It was seen by Amacher that “each musician had a specialized atmosphere to perform in, that provided a unique setting for the music” (Maier, et al, 2010, pp. 13). Performed in 1979, this iteration was perhaps the most topologically developed of the series.
As time passed during the creation of the City-Links series, Amacher became interested in extending and developing the works to include more artists; differing their roles; experimenting with altered ideas, configurations, and topologies; continually attempting to create a living, breathing, real-time ‘instrument’ that she could ‘play’ and ‘perform’ with. This development of the series is seen as being crucial to understanding the development of Amacher as an artist, defining the artistic influence that she has to this day.

4.4.1. Core Concepts: Perception

As Amacher developed her “live sound environment” (Maier, et al, 2010, pp. 2), her interest in the physiological aspects of sound, as well as psycho-acoustic phenomenon, blossomed. Amacher regarded “the human perceptual organs as resonant bodies” (Maier, et al, 2010, pp. 1). Bodies that she could manipulate, converse, and communicate with. Amacher sought to create dialogue between sounding event and perceptual organ. This craving for interaction between listener and sounding event is described most poetically in an unpublished ‘concept summary’ for a work penned for the Kronos Quartet, in 1992: the words of Amacher subsequently being quoted by Bill Dietz, in 2009: “Let us imagine the possibility of electro-acoustic instrumental music as a space where performers & audience ‘meet nuerophonically, in interaural space.....acknowledging in musical composition the double function of ears and neuroanatomy in both receiving and emitting sound.....the audience....discovers themselves as AN INSTRUMENT JOINING THE PERFORMERS IN A REALIZATION OF THE COMPOSITION, a remarkable NEW RELATIONSHIP...’ ” (Amacher, qtd in Dietz, 2009, pp. 2). As the nodalistic analysis of the City-Links series develops, the relationship between composition and listener will emerge as a central pivot. In some of the iterations within the series, the listener becomes the central pivot. Amacher affords agency upon the listener; prompting them to explore distant sound environments through their perceptive senses; urging them to build relationships and meanings through aural experience. This affordance building was the origin of perception exploration by Amacher that developed in later works. Amacher appreciated that the relationship between sound and listener was deeper, more intricate, and more complex than she first imagined. She explored these ideas within the City-Links series, and even more so in subsequent compositional works such as Head Rhythm 1 And Plaything 2 (Amacher, 1999): where focus centred on the physiological and perceptual aspects of sound. A focus made possible through her exploration of these qualities within the City-Links series.
Amacher’s emphasis on perception was unearthed and developed through her experimentation with the “live sound environment” (Maier, et al, pp. 2). Her desire to form a habitual bond with the ‘tele-linked’ sound from Boston Harbour allowed Amacher to construct a deep apprehension of sonic locality. Amacher possessed the strength of mind to reflect on her perception of the sonic landscape as she lived with it, in both artistic and pseudo-scientific communion; a reflection of her desire to “get inside the ‘hum’...the hum that underpins all the mid- and foreground sound of life, the hum of all vibrating substance that holds our damned planet on heel.....Maryanne knew that inside that macro envelope of noise in the All: nascent melodies, harmonies, beats, and rhythms, starlike in their birth” (Curran, 2009, pp. 1). This meditation on environmental sound allowed Amacher to move beyond and above “narrative sonic drama” (Curran, 2009, pp. 1); seeking out a multi-dimensional perpetual experience, one that traversed through the outer layer of ‘first order hearing’ to “places and things unknown” (Curran, 2009, pp. 1).

4.4.2. Core Concepts: Dimension

Maryanne Amacher discovered new aspects of sound through her long-form listening, and close relationship with remote soundscape. She elucidated the hope: “that the split which now exists between these two worlds - that of musical language and of environmental sound - one day will be closed” (Amacher, qtd in Maier, et al, 2010, pp. 8). This desire saw her experiment and explore environmental sound for decades, learning as she went. Amacher discusses her discovery, and then continued acknowledgement and development of “spatial dimension” (Amacher, 1989), “physical dimension” (Maier, et al, 2010, pp. 2), and “dimension in sound” (Amacher, 1989); recalling how she assimilated knowledge of the concepts into her practice. She formed landscapes in her mind, of the far; near; high; low; strong; weak; leading to a multi-dimensional occupation with sound, physical space, and the acoustic and architectural properties of both place and space.

Discussing her artistic practice at Ars Electronica, 1989 - specifically her long-form listening habits - Amacher relates an understanding of the importance of staging “sound architecturally” (Amacher, 1989). The preoccupation with architectural dimensions informed the staging of various projects in the City-Links series, not only in the physical dimension, but also in the non-tangible. For example in City-Links #8 (Chicago), performed on May 8, 1974 at the Museum of Contemporary Art, Chicago, Amacher sourced sound environments from various locations around
the city. The performance consisted of her “interrupting the live sound......by the resonance of a tower, for example, recorded first in 1968 and later transformed for special characteristics internal to those of other indoor and outdoor spaces” (Amacher, qtd in Maier, et al, 2010). Amacher manipulated characteristics of sound according to specific properties of spaces; shaping and sculpting sonic characteristics so that she could explore different dimensions within her work.

In City-Links #9 (No More Miles - an Acoustic Twin), Amacher sought out an “acoustic twin” (Maier, et al, 2010, pp. 10) of an installation space. She found this ‘twin’ in “a Budget Rent a Car Store in the La Salle Court, an indoor Arcade in downtown Minneapolis, where voices, footsteps, and other sounds matched those heard in the gallery” (Maier, et al, 2010, pp. 10). Amacher reduced both distance and difference. Sounds perceived by the listener would seemingly appear to originate from within the installation space due to the similar architectural characteristics of the two environments. The “acoustic double” (Amacher, qtd in Maier, et al, 2010, pp. 10) afforded the listener a reduced sense of distinction. Amacher desired that the spaces merge, folding the acoustic and architectural dimensions unto themselves. This type of practice reflected Amacher’s understanding of sound and its inherent properties. She sought to reveal this depth of understanding to listeners of her work.

In City-Links #10 (Everything in Air), Amacher explored the concept of sound in space and place further. She transmitted the sound of instruments, again by ‘tele-link’, as they were played in a remote location; “colored” (Maier, et al, 2010, pp. 8) by the environment in which they were placed. This afforded the listener a sense of the ‘other’; contrasting, as well as merging, the two places. One site was the banks of the Mississippi River - where the instrumentalists were located - the other was the installation space at the Walker Arts Centre in Minneapolis. Amacher was aware that the river environment would supplement the sound of the instruments, casting a reflection of the environment to the listener, located at the exhibition space; a dimensional acoustic window onto a remote place, a remote landscape, a remote soundscape. This acoustic window is what interested Amacher; she understood that the technologies afforded her the ability to transport sounds across great distances, but also crucially, that listeners would be transported to other sound worlds through their perception of how the remote space sounded.
4.4.3. Core Concepts: Synchronicity

Maryanne Amacher’s artistic process allowed her to understand physical properties of sound, perceptual characteristics of sound, and environmental sound, in a unique way. Through her long-form listening practices, Amacher formed an interest in hearing “synchronicity ‘live’ as it is” (Amacher, qtd in Maier, et al, 2010, pp. 5). This fascination with ‘synchronicity’ and ‘synchronous moments’ urged Amacher to continue her long, deep relationship with remote sound, as she sought understanding of pure, distilled, synchronous time. Amacher attempted to decipher how humans perceive synchronous temporal moments, manifest through sound. She describes this learning process, as she discusses City-Links #4 (Tone and Place, Work I). Within this iteration, “...a five year live transmission of the Boston harbor was transmitted to Amacher’s studio..” (Maier, et al, 2010, pp. 3); the relationship that Amacher developed between herself and the sound environment enabled her to understand the relation of cause and effect within the vibratory world of sound: “Vibration in air is heard 3 minutes before the actual sound of a plane is heard. Changes in air vibration as different boats approach. Seagulls sensing these change in air - their anticipation, announcement of arrivals and disappearances, before the sound of the change is heard at the site” (Amacher, qtd in Maier, et al, 2010, pp. 3).

Amacher’s understanding of cause and effect, enabled her to develop an awareness of synchronicity in the environmental sound world. This interest has been linked to John Cage’s concern with the relationships between indeterminacy, nature, and sound. At Ars Electronica in 1989, Amacher differentiated herself from Cage. She acknowledges Cage’s interest in the existent sound world that envelopes us; tones, harmonies, and rhythms, but states that her interest lay in “how we as human perceivers are experiencing these sounds” (Amacher, 1989). During the latter questions and answers session, Amacher again acknowledges Cage, but reminds us that “there are many ways of hearing” (Amacher, 1989), and that her view of the environmental sound world was borne through her fascination with how humans perceive the environment through their listening habits, rather than the actual sounds.

Charles Hamm discusses notions of synchronicity within Cage’s work, most notably, Imaginary Landscape No. 4. Hamm relates Cage’s concept of synchronicity to Carl Jung’s philosophy. This relation also allows similarities to be drawn between Cage’s notions of synchronicity and Amacher’s. Amacher discusses
how listener’s awareness of certain ‘governing principles’ are altered as they are able to hear remote places simultaneously; leveraged affordance through the implementation of technology: “birds suddenly begin to sing at one location, music begins at another. Hearing simultaneously spaces distant from each other, experiencing over time, more than one space at same time, coincidental rhythms, patterns of synchronicity, emerge. Awareness suddenly altered by over-view – perception recognizing beyond the boundary of my walls” (Amacher, qtd in Maier, et al, 2010, pp. 5). This pattern recognition may be related to Cage’s notions of simultaneity and synchronisation, which Hamm feels is rooted in Jungian philosophy: “Cage had woven together the threads of Jung’s concept of synchronicity, with its denial of causality and its focus on the relationship of simultaneously-occurring events.” (Hamm, 1997, pp. 288). Just as Cage explored these concepts through his work in Imaginary Landscape No. 4 (1951), Amacher understood that the perception of synchronicity pertained the ability to transform one’s awareness of the environment, altering the shade, or lens, through which one viewed the reality of existence. As Jung philosophised on how to “take the coincidence of events in space and time as meaning something more than chance, namely, a peculiar interdependence of objective events among themselves as well as with the subjective (psychic) states of the observer or observers...” (Jung, qtd in Hamm, 1997, pp. 286), Amacher understood that the long-form habitual listening of locations, in which distance was collapsed to zero through technological means, could alter the listener’s perception, and therefore understanding, of the nature of reality.

While discussing Cage’s Imaginary Landscapes No. 4, Hamm elucidates similar properties to those found in City-Links: “Imaginary Landscape No. 4 leaves modernist modes of thought behind in inviting the listener to experience a ‘transcendental, undifferentiated’ event.........in order to share with the audience the experience of life, in the shape of whatever happens to be on the airwaves at the moment of performance” (Hamm, 1997, pp. 289). This description may be seen as equally as apt for City-Links, a series in which Amacher transmits raw acoustic life, foregoing any premeditated compositional notions and allowing other aspects to form narrative cohesion. Cage’s engagement with unstructured narrative relates interesting aspects of natural and unscripted cohesion between elements, revealing some form of deeper seated essence. The interdependence of objects was of fascination to Cage (Hamm, 1997), and this fascination can also be attributed to Amacher. She sourced multiple atmospheres and then engaged in affording long-form listening perspectives, forming relationships between spaces, allowing her an overview that revealed otherwise hidden, translucent or etheric aspects.
4.5. Nodalism: Reflection on City-Links

The conceptual framework of nodalism offers valuable insight into the City-Links series. Viewing the work through a nodalistic lens affords avenues of discussion, debate, and appreciation that may not have, as yet, been unearthed. Considering that Amacher’s portfolio of works has not been investigated, somewhat surprisingly, in as much detail as the works of her more esteemed colleagues, nodalism may offer the conceptual guide that allows for deeper apprehension of the work’s merits. Viewing City-Links as a series of nodalistic works may allow meaning to be attributed the works in isolation, the works in series, and also onto Amacher as an artist. Adkins and d’Escrivan (2013) re-evaluated their own work through a filter; discovering original and unique attributes that were only uncovered through nodalistic analysis, and Amacher’s body of work offers the same prospect. Adkins and d’Escrivan’s art may be seen as a more discrete nodalistic example, as they sourced raw materials that were previously created by another artist, but this is not to say that the City-Links series cannot be viewed through the same lens, or that equally engaging insights cannot be garnered from such an investigation.

City-Links is often viewed as a defining selection of works in which Amacher investigated and explored her own concept of “sonic telepresence” (Kaiser, 2014, pp. 19). This description allows the work to be classified as an early example of network art. This term relates what Amacher saw as a “transmission of sounds between divergent locations” (Kaiser, 2014, pp. 19). An investigation into the repercussions of this transportation and transmission of sounds is merited. If viewed through a nodalistic framework, an exploration of the relational aspects of the artwork will be forthcoming. Examining these will, potentially, place any interpretations or re-interpretations of the work in a different light.

4.5.1. A Nodalistic Perspective on Instrumentation

It is important to note, as a foreword to this section, that Amacher viewed a number of elements within the staging of the work as being part of her ideological, holistic view of a “live sound environment” (Maier, et al, 2010, pp. 2). Amacher imagined a myriad of agents as being constituent parts of a cohesive, communicational, and relational bond between ‘performer’ and ‘listener’. Amacher imbued agency onto varying elements of her ‘environment’, whether that be performer, musician, mixing desk, speaker, space, or place. This leveraging of agency can be conceptually framed by turning to ‘object-agency’ theory. Within agency theory, an
inanimate object can pertain the ability to ‘act’ if it is imbued with the authority to act on a subject’s behalf (Layton, 2003; van Oenen, 2008). Within City-Links, Amacher authorises objects to ‘act’ on her behalf. This plays out in her obsessive attention to detail in the ‘tuning’ of spaces, speaker arrangements (Curran, 2009; Dietz, 2009; Kaiser, 2014), or the enacted topological formations that ensured she held control of a number of different aspects of the work; reluctant to cede authority.

Amacher’s ‘live sound environment’ was rooted in the sourced “telelinked environments” (Kaiser, 2014, pp. 19). The environments were supplemented and supported by a number of agents: her performing self - through ‘interventions’ utilising mixing desks, filters, synthesisers, audio devices, and so on; musicians performing at designated spaces; considered placement of speakers and amplifying equipment; ‘tuned’ installation spaces; as well as the resonating aural cavities of listeners. Amacher felt that all these constituent parts defined and shaped her overall blueprint. For Amacher, all of these constituent elements formed one discrete, unified, ‘musical’ whole. From this perspective, the “live sound environment” (Maier, et al, 2010, pp. 2) may be viewed as a network of interconnected agents. Perceiving the environment in this way ensures that an analysis framed by nodalism is possible; examining the roles of each of the agents, and more importantly the relational links that exist between them.

4.5.1.1. Space as Instrument

Amacher explored “musical language and environmental sound in terms of acoustical and architectural space for over thirty years” (Brew, K., 2003, in Malloy, J. & Bentson, P., 2003, pp. 91). She also felt that a number of performative agents were central to her being able to create a unified, ‘musical’ whole. With this in mind, it is possible to define an extended realisation of what constituted an instrument to Amacher. In City-Links, installation spaces became active agents, interacting on the piece through their specific acoustic characteristics. It was Amacher that ensured that the spaces held agency within the works. The belief, developed over her career, was that installation spaces were able to convey meaning to the listener - engaging them through reciprocity; through character; through narrative. Paul Kaiser recalls how “Maryanne Amacher used to rail against the typical study and understanding of music that was blind to the reciprocal spaces of music - the space that determines the quality of sound and the space that a sound defines” (Kaiser, 2014, pp. 12). In later works, such as the Music For
Sound Joined Rooms, Kathy Brew describes how Amacher would use the “architecture of a site to stage the sound and evolve ‘stories’” (Brew, 2003 in Malloy, J. & Bentson, P., 2003, pp. 91). Amacher explored this artistic intention through the City-Links series (Brew, 2003, Kaiser, 2014). Dietz recalls her interest in the way that sound articulated itself in relation to the “actual presentation space (that is, how sound might travel up & down stairs, how it might slither through a certain wall or floor, how it might slowly waft down from far above......)” (Dietz, 2010, pp. 1). In 1989, Amacher discussed how she was still absorbed with how sound travelled through space; inside, around, in-between, and especially through, architectural and physical forms (Amacher, 1989).

Amacher involved herself in a “neurotic process of listening to and then tuning a specific space”, a process that she “never entrusted entirely to anyone else” (Kaiser, 2014, pp. 21). This description emphasises the importance of Amacher’s own engagement, or degree of agency, within the ‘sound environment’. It was of crucial importance to Amacher that the ‘object’ of the installation, or presentation space, was imbued with her artistic agency. The fact that the word ‘tuned’ is used, is also reflective of how Amacher viewed installation spaces. She understood that rooms could converse or communicate a sonic narrative if they were ‘tuned’ correctly (Dietz, 2010). She understood the crucial relational path that existed between the sourced atmospheric sound and the way it interacted with the space to which it was being ‘telelinked’.

4.5.1.2. Relation Between Instruments

It is possible to frame the City-Links series inside the realm of performance eco-systems. Doing this ensures that the works as a whole may be seen as an embryonic example of a environmentally orientated real-time musical ‘instrument’. Amacher desired to create an instrument that would merge the environment, the space, the listener, and the performer; drawing out engaging aspects of each, and all. Though Amacher did not have the necessary technologies to create a rich, interactive, self-regulating musical system, which is how more modern views of performance eco-systems have been cast (Di Scipio, 2003; Waters, 2013), she was intensely aware of the interplay and interconnection between agents; viewing the City-Links series as a mode through which to explore them.

Turning to City-Links #9 (No More Miles - an Acoustic Twin), it is possible to explore the relational and nodalistic aspects of Amacher’s work, correlated with her
recognition of the interplay between agents. Amacher wanted the ‘double’ of the space to appear as “a phantom presence when no one else was in the gallery” (Maier, et al, 2010, pp. 10). Within the piece “arcade and gallery sounds merged together acoustically” (Maier, et al, 2010, pp. 10). Amacher designed an installation where sounds, spaces, and narratives merged and amalgamated; creating dynamic, interconnected, and interconnected environments. Exploring the piece nodalistically, relations may be drawn between the two spaces. A description of the acoustic twinning process: “voices, footsteps, and other sounds matched those heard in the gallery” (Maier, et al, 2010, pp. 10) recounts how the spaces seemed to mirror each other, but no description is given as to why that was. Perhaps the mirroring merely reflected acoustic similarity; building materials being equivalent in each of the spaces, such as floor tiles, plasterboard, or the location of windows. Perhaps the shapes of the rooms were near identical, with, wall, height, or perimeter measurements being interchangeable. Perhaps the flow of persons through the rooms went along comparable paths, due to the location of exits and entrances, customer counters, or even bathrooms and adjoining rooms. Perhaps the analysis could zoom out a level, revealing relations between the architects or building contractors, or even cultural similarities with respect to those that frequented the rooms in terms of their attire, or choice of footwear. These similarities may seem simple to reflect on retrospectively, but it is worth noting how the work was a reflection of Amacher’s understanding that concepts of music - most notably music theory - “measured the time of music and its internal relations, but they let out half the story, which was space” (Kaiser, 2014, pp. 12). Kaiser discusses ‘superimposition’ when describing City-Links #9 (No More Miles - An Acoustic Twin). He describes the layering of one element over another; an augmented sonic reality, discussing the ‘presence of absence’, and ‘acoustic haunting’. Amacher was attempting to manifest relations that existed between one space and another at the ‘level of scale’ of the acoustic; communicating to the listener relations otherwise unheard; unperceived; sounds that were otherwise intangible - existing only in the ether.

4.5.1.3. Relation Between Performers and Instruments

Amacher understood, as she sought to create a dynamic performance environment, that interconnected agents would fashion relational paths of interest. She observed how these relations would draw out engaging aspects of sound, music, and space to listeners; revealing relationships otherwise under-explored. She understood the
relations and interrelations that sound had with space, as well as place; these becoming a central avenue of artistic exploration.

In City-Links #10 (Everything in Air), Amacher placed two musicians and their instruments at remote locations: a tuba at the East River Flats, a site on the Mississippi River, and a banjo in the area of St. Anthony’s Elevator #3 in the General Mills silo (Maier, et al, 2010). The “sound environments and instrumental sounds (colored by these atmospheres) were transmitted live to Amacher’s mixing facilities at the Walker Auditorium” (Maier, et al, 2010, pp. 8). At the installation space Amacher would perform with them, augmenting the sources with both pre-recorded sounds and music. It was important for Amacher that this work explored the sonic colouring of the atmospheres. She wanted to relate the remote locations and their sounds to the audience, as well as how the instruments were ‘colored’. She drew attention and reflection from the listener, not only of the reduced distance between sites, due to the implemented technology, but also of the characteristics of the environments in which the instruments were placed.

In City-Links #18 (Intelligent Life): “musicians were staged in different locations to create colors and psychological overtones that would not be possible if they performed in one public environment, with the same acoustic and environmental conditions” (Maier, et al, 2010, pp. 13). This reflects Amacher’s realisation that certain spaces, environments, and even ‘psychological overtones’, play distinguishable roles in how sound, or music, is heard. In this piece, the remote location of artists was a central explorative direction. John Cage was located at Amacher’s studio, while George Lewis was located at Pier 4 of New York Harbour. The trombone of Lewis was purposefully placed in the “humid, late night, water atmosphere of the harbor” (Maier, et al, 2010, pp. 14) and this “specialized situation, and the acoustic atmosphere of the harbor, were mixed with Cage’s private adding of texts at Amacher’s studio” (Maier, et al, 2010, pp. 14). Amacher hoped the listener would hear the reflection of the spaces. She felt that the relations between the harbour atmosphere and the trombone would be clearly conveyed to the audience, as well as any ‘psychological’ inflections that the situation would create. These may have been related to meteorological aspects such as the humid weather and warm air, environmental concerns such as the close proximity of water, birds, and people - or more situational aspects such as the solitary nature of Lewis’ performance and the lack of monitoring capabilities. Amacher also felt that the relations between her studio space in New York and John Cage would be conveyed through the piece. Again, these may have been instrumental aspects such as Cage’s familiarity with Amacher’s studio equipment, psychological aspects such as Cage’s
solitude, or environmental aspects such as the acoustic characteristics of the room in which Cage would voice himself.

Amacher - whether by design or intuition - saw herself as being a pivotal node through which relational paths traversed. For instance, it was of crucial importance that Amacher ‘tuned’ spaces herself. It seemed, also, that Amacher always remained in control of any mixing duties that were required. Analysing this from a nodalistic perspective, it is possible to imagine Amacher as being a ‘governing’, or even moderating node - with a flow of information, knowledge, or ideas, traversing through her before reaching the listener. This concept is reflected through the series’ implemented topologies. In *City-Links #1 (Buffalo)*, where eight remote location environments were transmitted to WBFO FM, Amacher would have been in complete control of how the streams were mixed, and how the final output sounded.

![Topology Diagram of City-Links #1 (Buffalo)](image)

**Fig. 1: Topology Diagram of City-Links #1 (Buffalo)**

In *City Links #18 (Intelligent Life)*, the topology was even more directorial. In this piece, environmental sounds were sent from New York harbour (where George Lewis was located), to Amacher’s studio (where John Cage would inflect his creativity), and then on to The Kitchen, in New York, where Amacher would perform the piece. This topological line structure, ensured that Amacher remained in sole control of the final output, with the creativity of the other musicians being ‘mediated’ through her.
4.5.1.4. Relation Between Instruments and Audience

Amacher’s perceptual concerns meant that she understood the relations between listening environment, the physiological makeup of aural senses, and the reception of sound. She describes, in an interview for *Sound Generation*, in 2006: “You have the actual tones, the acoustic tones that are sounding in the room, and then you have the sounds that the ears are creating” (Amacher, 2006, pp. 1). She understood, admittedly not entirely, how she could create a relation between space, sound, and listener (Curran, 2009): the listener becoming aware of the characteristics of the space - as sound travelled through it - as well as the relation of their own corporeality - as sound travelled through and around them. Curran recounts an episode in which a fixed medium piece was played to him: “Pulsing sounds emerged from what seemed like every direction, began to circle my head, I thought I was hallucinating swarms of biological air” (Curran, 2009, pp. 4). Amacher conveyed the listener’s cruciality within the listening experience, communicating the role of the listening senses; the importance of their ears in relation to what they heard. For Amacher, it was no longer just about the sound, it was about how the listener related, in a physiological sense, to the sound. This, in itself, becoming the music.

In an interview with Dr. Eliot Handelman, Amacher describes: “our ears act as instruments in responding to music, sounding their own tones in addition to the music in the room, like another instrument joining the orchestra” (Amacher, 1991, pp. 1). She continues to describe her process as composer: “What excites me musically is the interplay of aural and interaural sonic imaging. The convergence of these perceptual dimensions is really the main idea - a multi-dimensional
Amacher aspired to communicate the relation between sound and body. Between sounding ‘instrument’ and hearing ‘instrument’, drawing relations between the nature of sound and the nature of hearing. Stefany Goldberg describes, poetically, the artistic process of Amacher: “You can’t be sure, after a while, if the sounds you hear are those created by your ears or Maryanne Amacher. You cannot tell if your ears are listening or singing, because they are doing both. Maryanne Amacher was less interested in putting music into you than drawing music out of you” (Goldberg, 2014, pp. 1)

Amacher was able to draw relationships between spaces, sounds, and the listeners perception of sounds. In City-Links #16 (Listening at Boundary: Empty Way/Energy Way), Amacher “installed microphones in windows in a barn facing open farm fields and in a stable overlooking a canal to receive distant and nearby sounds travelling over the river” (Maier, et al, 2010, pp. 13). This work was a exploration of dimension and perception. Amacher wanted to reflect the differences and similarities between sounds, both distant and far; folding dimensional properties unto themselves so that the listener, located at a theatre in Groningen, would perceive the acoustic ‘near’ and the acoustic ‘far’ simultaneously; reflecting on the convergence or divergence of the two. Amacher afforded the listener a bi-focal presence, of ‘here’ and ‘there’ - so that they might reflect on the relationships between the two differing perspectives. A perspective otherwise unheard.

4.5.2. A Nodalistic Perspective on Performance

Amacher’s desire to create a “live sound environment” (Maier, et al, 2010, pp. 2) ensured that indeterminacy played a central role within the City-Links series, in a similar fashion to John Cage’s multi-faceted Variations VII, which is discussed in the following section (see section 4.7). Unlike Cage, Amacher acknowledged a gentle, yet persuasive, indifference to the sounds themselves; the works being concerned more with features such as dimension, perception, and synchronicity (Amacher, 1989). However, it must be remembered that Amacher was never in complete control of the sourced sound, atmosphere, or environment. This ensured that iterations always contained a semblance of unstructured narrative. This sense of indeterminacy, while not being critical to the series as a whole, still delivers an important perspective when viewed through a nodalistic lens.

Indeterminacy pervades much of the City-Links series, due to the ‘live’ nature of the transmissions, but can be seen most clearly within City-Links #8 (Hearing The
Space, Day By Day ‘Live’). The title hints at the piece’s focus. The topology is straightforward compared to other iterations, yet its indeterminate, explorative nature is explicit. Within this work “Two outdoor sounding environments - a site on the Mississippi River called the East River Flats and the surrounding space of the old General Mills silo landscape - were transmitted live each day for the five weeks of the exhibition” (Maier, et al, 2010, pp. 8). The differentiation between this piece and other works in the series, in particular the latter iterations, is that there was no performative ‘intervention’ by Amacher. The sourced atmospheres were merely transmitted and sounded. It seems that Amacher desired to let the sounds ‘be’. Amacher engaged the listener in the listening experience, involving them with the environments as they formed their own natural, ‘living’ narrative; forming perspectives of their own relation to the sourced atmospheres, perspectives of the relation between the two microphones, and perhaps most interestingly, a perspective of the relation that existed between Amacher and the locations in question. In this piece, Amacher encouraged the long duration listening that she had involved herself with. Through this form of listening, one may have been able to form a picture of the daily and nightly rhythms of the location, relating them to the rhythms of the gallery, or even one’s own internal rhythms; allowing a representational and relational picture to form of the ‘life’ of a place, as it existed naturally.

In City-Links #1 (Buffalo), Amacher sourced the sound atmospheres from eight different locations in and around the city of Buffalo. The list of sites sourced were as follows: “Bethlehem Steel, a stone tower (at Niagara Mowhawk Power Company), the airport, Pillsbury Four Machines, main street, surrounding area of the old Erie canal, exhaust pumps (Central Gas Plant), and the old grain mills area” (Maier, et al, 2010, pp. 3). The piece was performed in 1967. Through analysis of the sites, it is possible to see a distinction between ‘old’ and ‘new’. The two sites that are described as ‘old’ represent a time-worn Buffalo; an economy centred around the production of grain, and whose transportation system focused on canals connecting the economic centre of the city with Lake Erie. The newer sites seem to represent modern Buffalo, one whose industry is rooted in Gas, Steel, and Power, and whose transportation links are represented by an airport. It is possible to imagine the sonic content of the sites reflecting atmospheric differences; the quiet, unused grain mill being infused with gentle breezes, floating through cavernous time-worn spaces, dotted with nested birds, while the canal reflects pensive, disused waterways sounded with the gentle lapping of water against canal banks. These soundscapes would be in direct contrast to the exhaust pumps at the
Power station, bellowing smoke in a refined haze of pollution, the industrial sound of machines hard at work at the steel mill, or the busy rumbles and airborne murmurs of the city’s airport.

Amacher would have used the telecommunication channels to source these sound environments, merging them at her mixing desk, leveraging the ability to create a conglomerate soundscape. The mixing board, located at WBFO FM, allowed Amacher to travel across and between the varying soundscapes; wandering in, out, and through aural representations of the city; from the ‘old’ to the ‘new’ and back again; all the while traversing the pseudo-states of sonic reality that lay in between. Marvin Lee Minsky entitles Amacher’s skill at transporting listeners to ‘other’ places, “Subjective Transportation” (Minsky, 1988, pp. 1). He describes her aptitude for such transportation: “Amacher has become a master at controlling sounds…” enabling “…new senses of location and orientation” (Minsky, 1988, pp. 1). The skill shown in City-Links #1 (Buffalo) would have drawn out relations of not only differing acoustic characteristics, but also of the passage of time with respect to economic development and urban expansion. At the centre of this exploration may have been the sound of the main street, perhaps a mainstay of this ongoing cultural and sociological evolution. The sound of the city centre representing a central node in a relational system. A system whose inner progress, success, and evolution develops and generates change in the outlying nodes.

4.5.2.1. Relations Between Performers

In order to understand relations between performers in the City-Links series, it is important to not lose sight of the fact that Amacher believed that performative agency was held by a myriad number of agents within her ‘live sound environment’. She viewed spaces and places as pertaining both characteristics and narratives (Curran, 2009; Dietz, 2009; Minsky, 1988), as well as understanding that both physical and physiological attributes played a key role in the perception of sound and music (Amacher, 1991; Amacher, 2006; Kaiser, 2014; Minsky, 2009). This holistic view of performance allows one to draw relations between ‘performers’ in a unrestricted fashion, unhindered by classical notions and descriptions of the term. This extended concept of ‘performer’ allows all agents within the performance system to be analysed through a relational methodology; an attempt to understand the relations that exist, why they exist, and what can be inferred, on a greater scale, with respect to the communicational and informational flows that run between them.
Focusing on the concept of synchronicity, and its interest to Amacher, is perhaps the most interesting and engaging aspect of City-Links in a relational sense. It also allows one to draw a relation between the art of Amacher, and the metaphysical notions of synchronicity of Carl Jung, as outlined by Charles Hamm (see section 4.4.3). This, in turn, draws relational links between the art of Cage and that of Amacher. Notions of synchronicity are littered throughout the series, as Amacher allows her atmospheric sources to live and breathe within installation spaces. The simultaneous ‘telelinking’, transmission, and amplification of remote locational sounds affords immediate reflection on the coincidences that exist in the realms of the acoustic. Coinciding acoustic events allow reflection on the existence of transparent and etheric relationships between places.

It is while discussing City-Links #4 (Tone and Place, Work I) that Amacher elucidates her discovery of synchronicity (Amacher, in Maier, et al, 2010). Her long-form listening habits (November 1973 - May 1976) afforded her an unrivalled perspective of the soundscapes. She understood the relations between the sources better than anybody; cause and effect; coincidence; similarity; difference. Deeper engagement with the relations she may have discovered is merited, as reflection on her practice continues; as well as an attempt to understand what this attentive, reflective, listening practice reveals about both sound, and nature, in a nodalistic sense.

4.5.3. A Nodalistic Perspective on Listening

The three fundamental concepts that lay at the heart of Amacher’s work in the City-Links series were discussed earlier in this chapter: perception, dimension, and synchronicity. These principles are the basis of the aesthetic canvas onto which Amacher painted. The beauty in the work was not that it contained a series of sourced soundscapes, effectuated through technological means (Amacher, 1989). The beauty was the leveraging of affordance that her exhibits offered the listener. This leveraging is easily framed by nodalism’s theoretical considerations.

Marvin Lee Minsky, the co-founder of Massachusetts Institute of Technology’s AI laboratory, was deeply respectful of Amacher’s sonic art practice. He elucidates some grounded reflections on the art of Amacher, but perhaps the most interesting in relation to nodalism is the aforementioned “Subjective Transportation” (Minsky, 1988, pp. 1). Drawing correlation between this idea of the subject being ‘transported’ to “some very different place” (Minsky, 1998, pp. 1) through the
hearing of ‘telelinked’ remote soundscapes and Schroeder’s perspective of the
network affording exploration of remote acoustic sites (Schroeder, 2013) is
beneficial, as it will illuminate how notions of both perception and dimension were
prescribed by Amacher as being core articulations of her art.

City-Links #1 (Buffalo), for example, allows the listener to reflect on their
relationship with eight different soundscapes; potentially creating meaningful
relationships and deeper comprehension as they do. The significance of these
relationships could be myriad; based on memory, cultural association, familiarity,
appreciation, disapproval, pattern recognition, to name a few. The piece would also,
crucially, allow the listener to reflect on the relationship that exists between places.
For instance, the listener may be able to perceive difference, similarity,
synchronicity, or perceived cause and effect between one location to another. A
listener may notice subtle correspondence between the hustle and bustle of main
street Buffalo and the stress and anxiety of the busy city airport. Living rhythms of
nature, animals, insects, and industry may be heard and reflected on; whether it be
through the soundscape of city life, the wear and tear of industrial life; the
mechanical vibrations and bellowing hums of power plants, or the quietness and
solitude of the canal-side; sounds reflecting the insistent passing of concurrent
time.

This leveraging of altered perspective of the ‘self’ in relation to ‘others’, as well as
relations that exist between ‘others’ affords comparison with nodalism. The ‘other’
within City-Links changes from exhibit to exhibit, as focus and perspective shifts,
but the afforded relational standpoint remains throughout. This practice is also
linked to Schroeder’s, previously discussed, ‘network[ed]’ listening (see sections
2.1.10 and 4.2.3): the embodied listening experience in City-Links may be
correlated with philosophical notions of the listening ‘self’ in relation to an ‘other’
that Schroeder develops through the theories of Murdoch and Scarry.

The City-Links series altered listening affordance; extending it to include the sonic
landscape of remote places. A technologically enhanced avenue; extending sense.
The devised topologies broadened the depth and reach of the listener’s ear; altering
their perspective of place, space, sound, and, in a nodalistic context, the relation of
themselves to the soundscapes they were subjected to. Amacher desired that the
listener form, as she had done herself, deeper understandings, more complete
comprehensions, and stronger relationships with the places that they heard. These
extended relationships may be analysed through the nodalistic framework; offering
up avenues of discussion that add to a holistic comprehension of the City-Links
series, as well as feeding back into discussion surrounding perspectives of listening.

4.6. Summary

Nodalism has framed Maryanne Amacher’s City-Links series, drawing out engaging aspects and elements of the work from a multitude of perspectives. Perception, dimension and synchronicity have been outlined as key explorative concerns, each relating to knowledge that Amacher wished to share with her audience. The relational aspects of the work were discussed from the stance of a myriad of agents; agents onto which Amacher imbued her own artistic agency. The nodalistic framework has also afforded an avenue of reflection; revealing characteristics of individual iterations, the series as a whole, as well as of Amacher as artist.

Discussions surrounding enacted topologies have been set in a nodalistic frame, revealing the motivations surrounding them and the repercussions of them. Comparisons have been drawn between the conceptual outlook of Amacher’s work and some theoretical concepts that were formed more recently, reflecting the view of Amacher as one of the more modern composers of the 20th century. City-Links has also been framed as an embryonic example of network music; an example in which Amacher explored the idea of “sonic telepresence” (Kaiser, 2014, pp. 19). This framing has allowed relations to be drawn between the City-Links series, and the perspective of ‘network[ed]’ listening by Franziska Schroeder. This correlation has enabled City-Links to be explored, retrospectively, as a series of works which may be viewed as nodalistic in type.

The aesthetic concerns regarding the ‘self’ and the ‘other’ have also been briefly discussed, affording a more holistic view of the series with respect to subjective experience; especially once that is situated within a ‘network[ed]’ environment. It is seen that by reflecting on the series through a nodalistic lens, characteristics and aspects of the work not yet wholly understood, and certainly undervalued, have surfaced; allowing a more methodical and comprehensive view of the City-Links series to unfold. This reflective practice is seen as being able to feed back into concepts surrounding both nodalism and networkology, allowing the work of Amacher to influence theoretical and conceptual notions that reach outside of the realms of Sonic Art.
4.7. Variations VII

John Cage was perhaps one of the most influential experimental artists of the 20th century (Dunbar-Hester, 2010; Nicholls, 2002). His influence on the development, evolution, and direction of 20th century music is unquestioned, even if his role as composer, in the classical sense, is (Pritchett, 1993). Though this section does not discuss Cage’s integrity, or entitlement, to the title of composer, it is worth acknowledging the doubt that rests in some minds. The crux of uncertainty lies in whether Cage was a great and influential composer, or a great philosopher who composed music in order to actualise his philosophy (Pritchett, 1993).

*Variations VII* is one work contained within a suite of eight - entitled *Variations* - which were composed by Cage between 1958 and 1967 (Hope, et al, 2012). *Variations VII* was “an experiment in mak(ing) the inaudible audible and transferring the results via electronic sound processing” (Miller, 2009, pp. 74). David Miller recognises that the *Variations* suite was perhaps the “most radical and esoteric subset of Cage’s work” (Miller, 2009, pp. 66). *Variations VII* was an exploration of indeterminacy (Hope, et al, 2012; Miller, 2009). The notion of indeterminacy relates heavily to Cage’s ideal of letting “sounds be themselves” (Cage, 1968, pp. 10), wherein Cage developed “notations that circumscribed a field of musical possibility out of which an unrepeatable stream of unique sounds and actions could emerge” (Hope, et al, 2012, pp. 5). A composition that allowed sounds to be ‘gathered’, or in the words of the score, a process of “catching sounds from the air” (Miller, 2009, pp. 76). This gathering is the central pivot on which the piece rests.

It is worth noting that there exists no published score for *Variations VII*, merely a set of instructions. The initial instructions were written by Cage prior to the debut performance in 1966. A second, updated set of instructions were prepared in 1972; though they were never actually published (Miller, 2009). The instructions “consistently indicate that systems for discovering and gathering sound are the focus” (Miller, 2009, pp. 74). Performers are instructed to develop a performance system which contains “no previously prepared sounds” (Miller, 2009, pp. 76) but which allows the “free manipulation of available receivers and generators” (Miller, 2009, pp. 76). Cage also attempted to ensure that the score contained “no interposition of intention” (Miller, 2009, pp. 76) and that its focus was for “facilitating reception” (Miller, 2009, pp. 76).
David Miller recounts an early brainstorming note written by John Cage as he addressed his compositional and performance colleague, David Tudor. Contained within the writing were Cage’s ideals; how and where he imagined the sounds be gathered: “...things happening at the performance time (not prepared tapes) via TV, radio, telephone?, mike, police...from us...; from audience; from city; from zoo.....; from outer space if possible...” (Cage qtd in, Miller, 2009, pp. 74). This brainstorm is a beautiful treatise on the piece’s central conviction; sounds being manipulated and coerced into a coherent structure by the performers, and performance itself. Cage noted, in the later modification of the original notes, that the performers should not attempt to discourage aesthetically questionable sounds, discouraging any riddance of “the unlistenable ones” (Cage qtd in, Miller, 2009, pp. 74).

Cage devised a performance environment that afforded listeners an avenue of discovery, or ‘reception’, into the hidden or inaudible sounds that existed around them. He envisioned performers as being mediums through which sounds could traverse into the realms of tangibility by the implementation of technological equipment. Sounds that were otherwise unheard, but nonetheless ‘alive’, would be channeled by performers through their performance instruments. The indeterminate nature of the work was one of the most appealing features to Cage (Hope, et al, 2012; Miller, 2009). He realised that each and every performance would be unique and unrepeatable, and that no two realisations would ever be alike. This indeterminacy held an unquestionable beauty for Cage. He saw the delivered music as being true to the nature of sound. This fidelity between Cage’s view of indeterminacy and his view of the nature of sound, urges David Miller to recommend a deeper delve into the latter Variations. He believes that the days of viewing the works “as historical curiosities has passed” (Miller, 2009, pp. 84).

4.7.1. Core Concepts: Sounds from the Air

Cage, in Variations VII, instructed a suite of performers to develop and construct technological means through which they would channel audio, from “sounds considered inaudible” (Wenhart, 2006, pp.1). This channeling altered the perspective of the role of the performer: “...like the technological components, the composer and the other performers functioned more like participants immersed in this form of mediation than they did as people in charge of it” (Bonin, 2006, pp. 1). Bonin’s use of the word mediation is interesting. The mediation, one would assume, is between the listener and the ‘natural’ sound world. Cage would have viewed the
leveraging of technology as being the central conviction of this mediation. He was not concerned with the location of the otherwise inaudible sounds, nor was he concerned with the method through which the sounds were made audible. Cage did not care for the source of the sounds, just the sounds themselves.

The debut of Variations VII, as part of a multi-artist programme entitled 9 Evenings: Theatre and Engineering, was shown at the 69th Regiment Armory, New York, United States on October 15-16, 1966. (Bonin, 2006, p.1). Nina Wenhart describes the series of performances as those that “made the body into a sort of bridge between the stage and the technological environment” (Wenhart, 2006, pp. 1). She views the relationship between the listener and the performance environment as being a central avenue of exploration, even if indirectly. She notes how the industrialists of the day were interested in “changes in the user’s perception produced by the new technologies developed in the 1950’s and 1960’s” (Wenhart, 2006, pp.1). Wenhart feels that Cage recognised how the implementation of technology within the performance “made it possible to indirectly explore certain aspects of these questions” (Wenhart, 2006, pp.1).

Cage’s instructions to gather sounds from the ‘air’ through various means ensures the audience reflect on both the sounds as they appear, as well as the techniques used to make them audible. The performance process is seen as a reflection of the technologies, as well as a mediated expression of the sounds themselves. As Miller recognises, the indeterminate nature of the sounds ensures that the audience become aware, in some sense, of the sonic conditions of the age - discovering meaning and sense in the otherwise ‘inaudible’. The indeterminacy of the piece is “responsive to changing technological, art-historical, or sociological conditions” (Miller, 2009, pp. 64). This responsiveness reflects well on any engagement of the piece’s merit; more modern interpretations of the work will uncover elements above and beyond those found within the original.

Tom Plsek, as part of the Mobius Artist Group, re-imagined Variations VII in 2007 at the New Art Center, Newtownville, Massachusetts (Miller, 2007, pp.1). For this imagining, the group implemented differing techniques to those used at the original event in 1966. Plsek incorporated two laptop computers, each with differing foci: “One [laptop] was used to search for mostly live sounds, e.g. radio stations, [Air Traffic Control] transmissions, online microphones.....The other computer was my ‘Skype’ machine which was used to establish contact with folks who would then insert sounds into the system” (Plsek, qtd in Miller, 2009, pp. 76). The implementation of the differing technologies reflects cultural and technological
evolution. David Miller stated that Plsek was “interested in a 21st-century presentation which tries to locate the essence or most salient aspects of the original…” (Miller, 2007, pp.1). The essence that Miller speaks of includes practices such as “catching sounds in the air as though with nets” and “Inside composers picking up outside sounds” (Cage, qtd in Miller, 2007, pp.1). What differentiated this realisation from the original was the cultural and technological reflection of the mediation. Somewhat antiquated mediums are replaced by those more modern, while the implemented technologies are better representations of the age. The audience in 2007 would have been urged to reflect on the use and implementation of Skype in a musical setting, or perhaps consider more deeply the relationship between sound and the seemingly infinite store of information and data found on the Internet.

4.7.2. Core Concepts: Indeterminacy

The concept of indeterminacy played a large role in Cage’s career as composer, influencing his thinking far beyond just his musical ideals (Cage, 2008a; Cage, 2008b). Cage delineated experimental music as that which “initiates sonic processes the outcomes of which are not known in advance” (Cage, 2008b, pp. 221). Though it remains difficult to gather an overarching implicative behind Cage’s pre-occupation with indeterminacy without dissecting his philosophical infused literature, it is worth noting, as other authors have, that Cage’s acceptance of the indeterminate as a compositional tool filtered into large sections of his body of work (Miller, 2009; Nicholls, 2002; Pritchett, 1993).

Miller discusses Pritchett’s analysis, which deliberates on two strands of indeterminacy in relevance to Cage’s music: indeterminacy with respect to composition and indeterminacy with respect to performance. Pritchett outlines that indeterminacy within the two fields evoke very different outcomes. Variations VII was a performance that was indeterminate with respect to both the performance, and composition. Cage instructed performers to ‘gather’ sounds through technologically inclined means, and then to amplify these sounds within the performance space. Cage was not concerned with what these means were; allowing the performers to decide these matters. Cage also ensured that the indeterminate nature of the ‘gathered’ sounds would be mediated by the performers. He did not instruct the performers to behave, act, or perform, in any delineated ways. Cage wished for the indeterminate nature of the sounds to be translated to the audience, and for this ‘free’ nature to be mediated by the performers. Miller notes how “an
intriguing phrase of the score says ‘free manipulation of available receivers and generators’” (Miller, 2009, pp. 76). He recognises that the “dialectic between the score’s specifications and the freedoms provided by their ‘undetermined’ elements needs multiple realizations to explore their boundaries” (Miller, 2009, pp. 84). The fact that boundaries exist in the score, mainly through instructions to not involve pre-prepared materials remind us that “indeterminacy is not synonymous with an absence of boundaries” (Miller, 2009, pp. 62).

Cage conferred his musical ideals through writing in 1968, two years after the debut of Variations VII. He stated: “in musical terms, any sounds may occur in any combination in any continuity” (Cage, 1968, pp. 8). Cage also noted his feelings at the time: “we are, in fact, technologically equipped to transform our contemporary awareness of nature’s manner of operation into art” (Cage, 1968, pp. 9). Variations VII may be seen as a concrete example of Cage practicing these ideals. The manner in which Cage instructed performers to ‘gather’ sounds may be seen as a form of ‘socio-sonic’ (Rennie, 2014) practice. Performances of the piece reflecting places, spaces, as well as socio-cultural relationships between performers, audience, and technology.

4.8. Nodalism: Reflection on Variations VII

Nodalism’s core conceptual theories and principles may alter our perspective of Cage’s work, especially Variations VII. Previous analysis may be slightly adapted, or new depths of understanding uncovered; treading new meaning paths through the work as well as expanding the implications of what Cage’s conceptual considerations were when developing, devising, and performing the piece. Variations VII is seen as an example of experimental music practice containing cybernetic principles. The performance topology within Variations VII exists so that performers located within a space are able to source sonic information, through technological means, from the ‘air’. This gathering of sonic information creates at least five distinguishable communication channels; between the performers and their instrumentation; between the performers and the sourced sonic information; between the performers and the audience, between the audience and the technology used to gather the sourced sonic information, and of course between the audience and the sonic content. Immediately it must be acknowledged that a relatively complex system emerges which contains a series of agents all communicating in someway, whether directly or indirectly. Analysing this environment from a nodalistic perspective may alter our understanding of the piece as a whole, not to
mention altering our understanding of the agents within the system; defined roles; intended roles; and of course the implicative nature of the way in which they communicate.

The instructional notes that Cage drew up in 1966, further developed in 1972, imply that a group of performers arrange themselves within a certain topology; this being central to the conceptual outlook of the piece. Tom Plsek interpreted these notes and imagined the technological means to be a series of computers, which trawled the Internet; viewing the Internet as a dynamic database of sounds. Plsek implemented Skype as a tool to construct connections between contributing agents, opening up communication channels between them. Even though the Internet did not exist at the time of Cage’s original performance, in 1966, Cage envisioned a gathering of sounds from many sources. The fact that Cage envisioned a mesh of performing and contributing agents highlights the fact that he saw the performance system as being a set of relations between subjects. Dunbar-Hester notes that Cage was at the forefront of experimental music in period between 1950 and 1980, viewing Cage as an artist thoroughly concerned with cybernetic principles (Dunbar-Hester, 2010). The relation between Cage’s compositional ideals and his socio-centric, communicational cybernetic interests, allows us to c ant our focus slightly when analysing Variations VII. This canted view may open up interesting avenues of discussion that have not been explored to their full potential.

Within the performance of Variations VII, Cage envisioned a series of agents, actively engaging with a sonically indeterminate system: a system in which performers act as mediators on behalf of the audience. If we view the system as being comprised of a series of agents, an analysis of the relational aspects is possible, as well as an analysis of the affordance bestowed upon the agents through technological means. We may also begin to analyse these agents and their defined roles through nodalistic analysis, akin to the way in which Adkins and d’Escrivan analyse their own ‘remix’ practice. Contemplating Variations VII as a performance in which nodes communicate within a network of other nodes ensures that consideration of the meanings and implications of the relational communicative aspects becomes a fruitful exercise, as well as aiding any attempt to understand the system as a whole.
4.8.1. A Nodalistic Perspective on Instrumentation

The performance of *Variations VII* has been seen as a mediation, through technological means, between audience and performer (Bonin, 2006). Understanding this nodalistically, one may view the flow of information found within the performance environment as a network flow. Imagining a simple flow diagram, one becomes aware that information (in this case sonic content) flows from the ‘air’, as ‘gathered’ by the instrumentation, to the audience. The audience act as receptacles of this ‘gathered’ content. It is important to remember that the mediation occurs at the level of scale of the instrument. At this level, the mediation occurs due to performers having imagined, created, designed, and in most cases, played, the instantiations of technology that they have chosen. What is left to consider is whether there are relations worth exploring; relations between instruments, between performers and their designs, and also between the instruments and the audience.

4.8.1.1. Relation Between Instruments

During the debut performance of *Variations VII*, Cage envisioned a plethora of gathering tools channelling sonic content into the performance space. Such sources were seen as being public radio broadcasts, telephone conversations, air traffic controller broadcasts, police and fire department short-wave radio broadcasts, etc. During the performance, in 1966, a set of Geiger counters were also used; the gathered data being converted into sonic output. Within this performance of *Variations VII* it may have been possible to see a direct relational path between the instruments.

For instance, if there was to have been an increase in radiation activity in New York, for whatever reason, during the performance, a tangible relational communicational path would have developed between gathered sources. This may be seen as being a far fetched example, but the relational path is worth following. Initially, the Geiger counters would have given a distinct audible sonic indication of the increased ionised radiation. This perhaps would have been followed by a fire, or police, department broadcast alert - warning local departments of the increased safety risk. This may then have been followed by a public radio broadcast, ensuring broader awareness of the issue. The relational path between instruments would have become acutely focused. The network relations that existed, previously in the realms of the ether, would have become more tangible - due only to the mediation.
between performers and audience. It would have become possible for the audience, as well as the performers, to become aware, in an acoustic mode, of the flow of information through existing communication channels. A similar situation may have happened if there was a major accident on a state highway in New York, with relations between the radio broadcasts of the fire and police departments, as well as public radio, becoming ever more interrelated. The audience would have become aware of both the communication network and the flow of information as it passed from node to node. A relation that previously resided only in the ether.

4.8.1.2. Relation Between Performers and Instruments

In Variations VII, Cage did not attempt to determine what types of instruments were implemented within the performance environment. There were no rules or techniques imposed within the original instructions, or the updated version in 1972, as to how the instruments should be designed, programmed, controlled, or configured. Indeed, the “free manipulation” (Miller, 2009, pp. 76) of instruments seemed to be of concrete importance to Cage. This indeterminacy with respect to composition, and performance, is reflected when we analyse the original presentation of the piece. Relations between the performers and their chosen, or designed, instruments begin to surface. For example, one of the performers, David Behrman, implemented a set of electrodes on his forehead, interpreting, converting, and mapping the biological data to a suite of sine wave oscillators, which then varied in amplitude with respect to the dynamic data values received (Bonin, 2006). This relation between performer and his instrument highlights a keen interest by Behrman in early brain communication interfaces, with a relational path developing between Behrman and the use of such. One may also analyse Cage with the same filter. He implemented a similar technique, but instead of mapping electrodes to his own forehead, he mapped them to the foreheads of his collaborators, again interpreting the data received to sine wave oscillators. This example is even more interesting in a relational sense, as we begin to see proof of Cage’s early fascination with cybernetic principles. Cage may have been interested in the homeostasis of the performance environment, in a musical context, as well as sonic structural coupling. Cage desired to engage with the communicational feedback path that existed between performance environment, sonic output, performer interpretation, and the return of information to the performance environment.

These early examples of cybernetic tendencies support the view that Cage was a composer who was interested in systems theory and its associated principles (Dunbar-Hester, 2010). The relational paths, when dissected through a nodalistic
lens, also offer valuable insight into the performance system itself. Paths between performers are noticed, as similar techniques are implemented, highlighting the accumulated knowledge sharing that would have existed between the performance group. At another level of scale, relational paths between theories and concepts abstracted from varying fields of study are also seen. For example, the use of Geiger counters creates a communication path between radiology, experimental physics, and music; mediated through the performers.

4.8.1.3. Relation Between Instruments and Audience

Miller noted how realisations of *Variations VII* respond to a multiple of factors; representing the cultural conditions of the age in which they reside (Miller, 2009). For example, the use of technologies as sound ‘gathering’ machines will be dependent on factors such as their existence, ease of implementation, and their cost. In 1966, mediums such as radio and telephone were relatively commonplace. The audience would also have had a pre-existing relationship with these devices; familiar with their mode of operation, and intended use. Appropriating these technologies into *Variations VII* ensured further development of this relationship, if only slightly. Witnessing the appropriation would surely have enhanced and extended the audience’s view of the devices. For instance, the use of electrodes would have extended the relation that the audience had with such devices - exposure to them would not have been a common day occurrence for most, and certainly not in the context of a musical performance. The extension of the relational paths between audience and instrument and the altering of the audience’s perspective of the instruments was of interest to Cage, as it was to the industrialists (Wenhart, 2006). Understanding how the intended use of new technologies could be expanded and enhanced by the implementation of these technologies into situations in which they were not intended, opens up avenues of exploration into the changing relationships between man and machine; a question that Wenhart feels was being indirectly explored through the performance of *Variations VII* (Wenhart, 2006). For instance, analysing the existing relations that audience members have pre-performance, against how they may have changed, post-performance, would allow one to acknowledge a direct link between the experimental music performance and socio-cultural perspectives of technology. The audience may have had to draw new relations between themselves and the instruments, relations that would not have been formed prior to the witnessing of the performance. Audience members may not have viewed Police broadcasts as musical material, or even material that sits anyway inside the public sphere. Highlighting the content as being part of a
dynamic artwork, may alter perspectives and draw new relations between ‘inaudible’ content; its inherent meaning or intended mode of operation.

Honor Harger, festival director, sums up the motive for extending perceptions on the use of technology well. Speaking prior to a 2008 re-interpretation of Variations VII - the first time it was performed in the United Kingdom: "It was first performed at an event that was about using new technology. They were breaking new ground and in order to be in the spirit of the piece we have to have the chance of discovering something new to leave the audience with the same frisson." (Harger, qtd in Brown, 2008, pp. 1). It is the talk of ‘discovering’ that sits most interestingly in the conversation about extending the nodalistic relations between audience and instrument. In the 2008 performance, the performers wanted to further extend the relationship that the audience had with their modern day technology, much in the same way that Cage and his colleagues wanted to extend the relationships that the audience had to technologies in 1966. Attempting to do this is central to the projects merit. If the piece did not succeed in furthering and developing relations between the audience and instrument, it could, in some way, be seen as a failure.

4.8.3. A Nodalistic Perspective on Performance

By viewing the presentation of Variations VII at the level of scale of the performers, there are a couple of interesting features that begin to divulge themselves. Firstly, it must be defined within this analysis, that the performers may be viewed as nodes; nodes that operate within a network of other nodes - thus a network orientated system. Viewing the performance system in such a way will allow us to focus on the system as a whole, but also direct our attention inwards, onto the relations that exist between the nodes.

It is important to distinguish that Cage did not instruct the performers located on stage to act in any designated way. He envisioned performers “functioned more like participants immersed in this form of mediation than they did as people in charge of it” (Bonin, 2006, pp. 1). This distinction by Cage is crucial. If the performers are to act as participants, or more accurately mediators, then the sounds that are mediated by them are of similar importance to the performative context of the piece. One may even argue that the sounds gathered through the mediation process are of greater importance. The sounds may begin to be viewed as performers; with persons on stage merely acting as mediators. This notion alters our interpretation of the performance environment. The envisioned nodalistic lens changes focus. It
zooms out, to an alternate level, where a network of performing nodes are connected through the ether, rather than on stage; with the connection being reflected through the technological backbone designed and implemented by the mediators.

### 4.8.3.1. Relations Between Performers

Analysing the relations between performers in the manner stated above, one might analyse the original performance notes in a completely different shade of light. Within the original notes, Cage denoted telephone lines along with their associated telephone numbers on a piece of paper (see Fig. 3 below). These telephone numbers would be used for the implemented telephone equipment during the performance. It is now possible to see these numbers not solely as sound sources, but also as performers. If this is the case, it is possible to draw relations between these performing nodes. In a relational sense, we can uncover interesting reflections on the piece, the composer, and perhaps the nodes themselves. At the top of the list is the telephone number of Merce Cunningham. A representation, perhaps, of the close association shared between himself and Cage; an illustration of their trustworthy relationship, whether viewed professionally or otherwise. Incidentally, the relation between the first name on the list and the second - Anne Riley, wife of the minimalist composer Terry Riley, is also interesting. The relation of these nodes is perhaps a reflection of the close knit experimental art scene that was emerging in the United States during that time. Analysing relations such as these reflect on the piece as a whole, in a nodalistic sense, but also draw details of the relations that exist on a much more holistic level.
4.8.4. A Nodalistic Perspective on Listening

Nodalism frames the listening aesthetic of *Variations VII* in an engaging and interesting manner, and we can again trace this through the ‘network[ed]’ listening perspectives of Schroeder (2013). Within *Variations VII* agents in the environment should, given the way in which sounds are gathered through the ether, be afforded the opportunity to reflect in greater detail on themselves; on other agents; and perhaps most importantly on the relations that exist between any one agent and another. Crucially, this altered listening perspective is afforded through the implementation of the network.
Schroeder posits that the network is one which is “dark, but becomes animated through sound” (Schroeder, 2013, pp. 223). The fact that the network becomes alive or animated through a listening experience, is an expression of a concept that Cage intended to explore within Variations VII. Cage saw technology as being the medium through which an otherwise concealed, hidden and obscured sound world could be explored (Miller, 2009). He realised tools and techniques would unveil relations between audience, performers, technologies, and sounds. This revealing and uncovering of relations has similarities with what Adkins and d’Escrivan describe as “kinship” (Adkins and d’Escrivan, 2013, pp. 43). The use of the word kinship evokes sibling or ancestral relations between agents, or objects, in a manner similar to the way in which network diagrams convey topographical formations analogous to those found in diagrammatical family trees. An exploration of these sibling or ancestral relations allow a deeper understanding of the ‘network[ed]’ relations that exist within a system, allowing a more holistic understanding of the system as a whole to be garnered.

For example, the relationships between sounds sourced from a Police radio, and a Fire Department radio may analysed; searching for certain, occasional similarities, or synchronicities; in an attempt to uncover the relational bonds that exist between two governmental departments whose main function to the general public is similar. A second example may be found when analysing sounds that would be sourced from the list of telephone lines. Would it be possible to search and navigate through similarities and differences, as apposed to analysing the relational aspects of geographical location? This analysis is an example of the multi-dimensional play that exists within any network. In the previous example the relations between the owners of the telephone lines were analysed, in an attempt to understand the relations that existed. In this instance, it is the actual sonic content that is analysed. Is there sibling relation found between sources that reside in the state of New York? Would similar street soundscapes, like traffic sounds or apartment air-conditioner hums, be found? These sort of relations become interesting and beguiling when engaging with the work through a nodalistic lens.

4.9. Summary

Nodalism has been used as a framework for uncovering otherwise coded or hidden elements of John Cage’s Variations VII. The concept itself, as well as related concepts, has unearthed explorative avenues situated within the realms of the instruments, performers, as well as new perspectives on listening. Related concepts,
such as cybernetics and ‘network[ed]’ listening have informed these discussions. New frames of reference have been discovered and discussed; allowing a slightly canted view of Variations VII to appear. The discoveries are in no way complete, and nor has the discussion been completive, but what is certain in that the nodalistic lens allows a better understanding and comprehension of the idealistic and artistic concerns that Cage implemented within the creation of the work.

Relational paths have been traced between instruments, with an example demonstrating the relational path that might be traced between instruments, if a specific event ensued. An acknowledgment of the relations between performer and instrument was then outlined, as paths and connections between performer expertise, knowledge, and interests, were formed between themselves and their chosen, or designed, instrument. In the case of Cage, we saw a direct example of his interests in early cybernetic principles; sonic structural coupling, and homeostatic systems - as he developed a bi-directional feedback system between his instrument, and the perception of the sonic output of the performance.

As the analysis continued, relations were drawn between the audience and technology; mediated through performers. It was acknowledged that one of the primary goals of the performance of Variations VII was to extend the relationship they had with certain technologies. Increasing awareness of the network of sounds that would remain hidden were it not for the technologies that afforded communication with them.

The level of scale then shifted, zooming out a level of scale; focusing on the sound sources - viewing them as performing nodes within a system of other nodes. In this manner it was possible to draw relations between the performers; concentrating on alliances and allegiances that were apparent in the system. The analysis then moved towards a listening centred perspective; Schroeder’s (2013) concept of a dark network becoming animated through sound was related to the concept of a hidden sound world; where technologies drew out sound from an obscured network. One that would remain ethereal were it not for the tools employed by the performers, in any realisation of the piece.

4.10. Conclusion

The reflective framework demonstrates how the concept of nodalism may afford a deeper appreciation of existing artworks, especially one whose central conviction lies within the network orientated sphere. Understanding relations between nodes
reflects concerns that would otherwise remain sidelined, as value judgements may be made in more traditional manner: with respect to ‘tone’, ‘pitch’, ‘timbre’, ‘harmonic content’, ‘melodic content’, etc. Contemplating artworks through a nodalistic lens should give rise to “deeper level musical processes” (Adkins and d’Escrivan, 2013, pp. 44); furthering our understanding, not only, of the music or sonic content that appears in these works, but also of music and sound, in totality.

Extending our understanding of network music through a nodalistic lens gives rise to more modern aesthetic concerns; paving the way for a deeper appreciation of the network: what it is, what it may be, or the disparity that may exist between what we think it is now and what it may become. The concept of the network continues to envelop our 21st century lives, as we move into a socio-technological climate in which the self becomes greater interweaved and interconnected with the other through, what may be described as, an etheric medium. Understanding the relations that exist within this medium through reflective analysis of artworks is one way in which we may better understand both the self, and the other - whether in an artistic context, or not.
5. Analysis of Portfolio Works

This chapter will discuss a portfolio of works, that have been created as artistic responses to those outlined in Chapter 4. The three responses each have a direct counterpart, with the title of the work reflecting the relationship between the two: *Skype Supply* is an artistic response to *Public Supply I; Synchrocities* to *City-Links*, and *Web Variations* to *Variations VII*. By the culmination of the chapter, the reader will have a distinct grasp of the inspiration behind each project, the leveraged technologies, and most importantly the artistic reflection and analysis unearthed from the creative process.

Nelson (2006) suggests the knowledge derived from artistic practice does not solely exist supporting and surrounding literature, but in the embodied creation of each realisation, and, most importantly, the reflective practice that continues long after each piece is exhibited and documented. This chapter seeks to serve and support this. The works will be reflected on in chronological order. A brief introduction is followed by a declaration of the individual project's motivations. A discussion of the work's core concepts is then developed, affording a reflection and analysis process to be completed through the framework of nodalism.

5.1. Skype Supply

*Skype Supply* draws creative inspiration from Max Neuhaus’ *Public Supply I*. Neuhaus’ project implemented two popular and powerful communicational mediums of the age; telephone and radio. *Skype Supply* updates this model - replacing the mediums of the era with more modern, technologically contingent systems and architectures. The telephone is replaced by *Skype*, a communicational tool that uses the Voice Over Internet Protocol (VOIP), among others, for audio and video communication over the Internet. This medium allows participants to contribute both audio and video content by calling into a moderator. The moderator,
in this instance, is a bespoke, custom built software system that affords sonic and visual dialogue between otherwise disconnected persona. Replacing the radio is the one-to-many broadcasting tool, *YouTube*, a web-based platform that allows the dissemination of audio-visual media to the general public in real time.

*Skype Supply* is a response to *Public Supply I*. It is a sketching that implements technologically advanced digital systems to create bricolage dialogue between geographically displaced participants. The constraints of time and space are reduced, allowing collectively created audio-visual content to be moderated by an agent. The moderating agent is a digital system, specifically designed to afford the creation of an evolving dialogue inside a virtual space. The virtual space acts as bridge between disconnected persona; afforded by the implementation of the digital architecture.

**5.1.1. Core Concepts: Music as Dialogue**

Neuhaus sought to create a performance system in which participants engaged in sound dialogue; leveraging a bi-directional performance model into a dynamic and fluid sonorous entity. *Skype Supply*, at its core, holds the same conviction. *Skype*, as software programme, is a familiar tool to the majority of the participants, as it has become ubiquitous in the digital age of audio-visual communication. *YouTube* holds an equivalent degree of similarity, but as a one-to-many mode of communication as apposed to the one-to-one mode of *Skype*. *Skype Supply* pertained the ability to be viewed by all those with access to *YouTube*. It also held the potential to include, in an interactive sense, all those with access to a *Skype* device. The success or failure of the piece would rest almost solely on the system to afford and communicate this potential.

I desired to create a performance that afforded community dialogue, while at the same time devising a system involving comprehensive group participation, and substantiation. Dialogue forming was seen as the crux of the piece, with bi-modal reflection afforded through the installation space and the *YouTube* broadcast. Conceptually, I felt that it was of crucial importance to offer a similar avenue of reflection in *Skype Supply* as was available in *Public Supply I*. The anthropological influence discussed by Neuhaus and discussed in the analysis of *Public Supply I* (see section 4.1.1) was also a part of the desire to create *Skype Supply*. The system should attempt to reflect the sociological, personal, and musical spectrum of the participating agents. On reflection something should be learned about the group; an impression of the agents involved, both in isolation and in amalgamation.
5.1.2. Core Concepts: Virtual Space

Neuhaus created a virtual space, but it had limits and borders. The main causal factor that prevented a completely limitless virtual form was the restrictive range of the radio station’s transmitter. Skype Supply, on the other hand, created a virtual space that could be entered and exited by anybody with access to the Internet, Skype and Youtube; potentially creating a virtual space that circumnavigated the entire globe.

Conceptually, Skype Supply directly explored the extension of the virtual from the real (see Mitra, 2003), primarily through the physical installation space. The design of the system ensured that the virtual space was always on display for the duration of the performance, in real time, at the window of the gallery located at Ps2 in Belfast, as well as through Youtube. Understanding the bi-focal reflective avenues is important, as it is through this notion where Skype Supply conceptually differs from Public Supply I. In Public Supply I involved agents could engage or reflect with the virtual space through their aurality - by listening to the radio broadcast. In Skype Supply agents could engage and reflect through both the aural and visual modes - the real extending into the virtual through both senses; a technologically afforded bi-modal extension. Neuhaus, in Public Supply I, discusses a space that does not physically exist. The Skype Supply system creates a similar space, in a similar fashion. It was not a space that could be walked into, through, felt, or navigated in a tactile fashion, but it could be experienced through other distinct modes of transmission and reception.

5.2. Nodalism: Reflection on Skype Supply

Skype Supply may be described in similar fashion to the way in which Tazzi (1977) illustrates the public substantiation of Public Supply I: a distributed, participatory audience creates and endorses the conceptual and creative ideals of the designer; a series of agents produce a relational and participatory work within a virtual space, extending their agency from the real into the virtual. Dialogue formation may be analysed from a nodalistic perspective; investigating the distinct relationships that are formed within the virtual space. The ability, propensity, and density of these relations convey the success or failure of the performance system. This relational analysis is akin to understanding the nodalistic aesthetic of the piece.

La Belle (2006) and Tazzi (1977) discuss the intersubjective and interrelational mechanisms at work within Public Supply I; urging a consideration of the
transmission and reception system embedded within the designed environment, similar to the way in which Bourriard urges one to consider the relational encounter between the picture and the beholder: “the collective elaboration of meaning” (Bourriard, 2002, pp. 15). This discussion may also be applied to Skype Supply.

5.2.1. A Nodalistic Perspective on Instrumentation

*Skype Supply* is reliant, determined, and influenced by technology. The role of *Skype, Youtube*, back-end software infrastructure - consisting of the *Max/MSP* software patch, the *AppleScript* programming script, the Internet, as well as computer and network hardware - play key roles in the success, or failure, of the work. The core differentiation of *Skype Supply* from *Public Supply I* is the existence or makeup of the moderating agent. In *Public Supply I* the moderating agent was Neuhaus. In *Skype Supply* the moderating agent is a software patch. My own agency is attributed through the programming of the moderation procedures, and the architecture and topology of the performance system. In *Public Supply I*, Neuhaus’ agency was attributed through the design and building of the performance system, but also the act of controlling and balancing the hive of aurality within the virtual space.

In *Public Supply I*, it was possible to view the performance system as both instrument and medium; an instrument that Neuhaus moderated, or a medium that Neuhaus designed. In *Skype Supply* the moderating agent is a software script that makes few artistic decisions, unlike the moderation process of Neuhaus. Viewing the performance environment as medium, it is possible to say that it was created by myself, and that the chorus of distributed voices are akin to those found within *Public Supply I*; a distributed orchestra - each voice an instrument.

5.2.1.1. Relation Between Instruments

A temporary reification of processes must occur when analysing the instruments, or voices, within *Skype Supply*. Viewing the *Skype Supply* performance system as a medium ensures that relations between instruments may be analysed. In this manner, it is possible to view my own role as architect, or designer, eliciting a directed dramaturgy onto the piece.

In the documentation trailer for *Skype Supply* (Appendix A: .../Documentation_Material/2.Skype_Supply/Trailer/...) there is a distinct example of
a voice realising the relation that exists through engagement with the system. At 2m 03s, a participating agent is located at the installation space. He is engaging with the system through a mobile device. Crucially, he is positioned in such a way that he can view the performance as it is being broadcast. He announces “This is John...”. As the performance is behind him, projected onto the window of the installation space, he is aware of its current status. Knowing the voices that appear, he comments: “...and that’s Rob. Oh no, that’s Tullis now”. This is an example of the real intersecting with the virtual at a social “interstice” (Bourriaud, 2002, pp. 14). The relational properties of this moment are at their most lucid. John, the voice, actively engages with the system; relating his own experience with what has come before. This interrelational and intersubjective experience is then documented (as the Skype call was activated at the time), and supplanted into the performance.

5.2.1.2. Relation Between Performers and Instrument

*Skype Supply* may also be analysed from a different perspective to the one above. It may be viewed as a community of participants; the system as instrument. What differs from *Public Supply I* is that there is nobody ‘playing’ the instrument. The moderating agent is a computer software programme; imbued with certain rules and processes that aid the moderation process. My artistic or creative agency is limited to the design and writing of the programme, as well as the architecture of the performance system. This limiting leverages the indeterminacy of the piece. Not only am I not in control of the participant offerings, I am also not in control of how the offerings are mixed and merged.

The hardware schematic of *Skype Supply* also works in a different manner to *Public Supply I*. In *Skype Supply*, the hardware arrangement designated one computer as the host, with a number of distributed participants calling into this computer on a sequential basis, as apposed to the ten telephone lines that Neuhaus arranged within *Public Supply I*. In this manner, it took longer for the performance to gather momentum and density, but it also meant that each caller was enveloped into the performance system in isolation.

Attempting to understand, through reflective practice, how participants viewed their roles is perhaps the most interesting section of this analysis. It was immediately obvious that the participants did not view themselves as musical objects as such; certainly not in the traditional sense. This may have been because the mode of interaction could be interpreted as grossly deterministic; *Skype* and *Youtube* are two extremely populous communication tools, with cemented modes of
interaction. Neither are associated directly with music making, even if Youtube does have associations with music consumption. As Skype was the core tool through which participants engaged with the system, perhaps it was no surprise that participants used the medium as a public facing communicative tool; directing a lens onto their own personal lives. Why participants felt the need to open this aperture, or why they felt the need to use the system as a window into their lives to be viewed in public is extremely interesting. Reflecting on this further, it is possible to ask if this behaviour is representative of a general trend towards a death of privacy and growth of public facing individuality, such as is seen with the rise of social networks such as Twitter, Facebook, and the more recent visual modalities of social network extensions, such as Periscope and Meerkat.

For example, in the documentation of the Youtube broadcast (see .../Documentation_Material/2.Skype_Supply/Broadcast/...), there are many instances of participants using the system as a documentation tool, offering up miniaturised portraits of the current status of their lives. At 10m 39s we see a video of a male participant talking: “In my...uh...adopted city of Belfast at this current point in time...”, it continues at 10m 48s “...possibly the most pleasant evening thus far in Belfast’s illustrious year in that it’s sunny and I am not being rained on which is a great victory in the grand scheme of things...”. Another example is seen at 45m 06s when a female participant relates: “Bye Belfast, I am going back to Brazil...see you there..bye bye”. A third example is seen at 54m 52, with a male participant: “...a speech in city hall on Tuesday and I don’t really really want to, so, i still have to write it....”, with it continuing at 55m 13s “.... you know, dutch courage and all that. So uh....if anyone has any advice...umm..thanks..”.

The theme of public facing documentation can be found throughout, and at 1h 33m 43s we see and hear another voice: “...but...uh...that’s all that I have to say at the moment, but...uh...we’ll talk to you soon again. Take care, bye bye...”. What is perhaps most interesting about this last example is the linguistic subjectiveness that the participant uses with the word “you”. The fact that this participant is directly related to me, as she is my sister, communicates her own concept of the performance. As she is used to directly talking to me on Skype, outside of the context of the performance, she does not separate this association from the work, therefore using the word “you” as if she might actually be talking to me, as apposed to forming a dialogue with the number of other uses that are in the system at that time. Of course, it may also be the case that she was unsure that dialogue forming with a host of distributed voices was the project’s concern - this may not have been communicated effectively - or perhaps she did not feel it necessary to
watch the current status of the piece through the Youtube broadcast before engaging with the system.

The design of the system also meant that the presence of any participant in the virtual space was extended into the time dimension. The videos were not discarded once they were shown in the performance. They were stored in a folder, which the system could call on at any time it saw fit. This afforded one very interesting avenue which I hoped somebody would explore. Participants could have involved themselves on two different occasions, separated by time, thus being able to have a self referential dialogue, from inside a virtual space. Unfortunately, even though the system afforded this action, the chance was spurned - for reasons unknown.

5.2.1.3. Relation Between Instrument and Audience

In Public Supply I interesting perspectives appear when the piece is analysed with respect to the relation between the instrument and the audience. In Skype Supply this analysis is more difficult, as exposure to the piece was on a smaller scale. This reduction in scale seemed to alter the way in which the audience interacted with the instrument. Even though the performance system afforded a very wide potential exposure, the project did not harness it. The majority of performers had strong ties with either the installation space, the local art scene, or myself - as artist. This reduction in scale may have changed the way people engaged with the instrument; perhaps the personal nature of many messages reflected this relatively close-knit participatory environment as apposed to the quite distant, relatively anonymous Public Supply I.

The most interesting feature of the participatory engagements were the illuminating moments where participants morphed into audience members, and then back into participants again - as they were afforded the ability to reflect on their own performance almost immediately due to the design and architecture of the system. One caller realised they had made an error while calling from within Skype. Instead of ending the call, they had placed the call on hold - which then confused the software architecture. The audio was incorporated into the performance correctly, but the video was not (the video became squashed). The participant realised this and called again, with the latter video being incorporated correctly.

This engagement with the system may be framed by systems theory in the form of the term autopoiesis. The participant was able to engage with the feedback mechanism of the system, realise that their input needed to be adjusted and so re-
negotiated their involvement. This can be seen in the documentation of the *Youtube* broadcast (see .../Documentation_Material/2.Skype_Supply/Broadcast/...). At 40m 19s, the first offering may be heard, including the distorted, or ‘squashed’ video. It is not until later in the broadcast, that we see and hear the second offering. At 1h 39m 54s it is clear that the participant adjusted his error, thus producing a clearer video, albeit with similar audio content.

### 5.2.2. A Nodalistic Perspective on Performance

Neuhaus created a system that afforded a distributed chorus of voices the ability to substantiate a musical performance. In *Skype Supply*, I created a system that afforded a distributed chorus the ability to create both a sonic and visual performance. A nodalistic stance affords analysis and discussion of the interrelations and interactions between nodal agents; relations between the performers, and the relations between performing agents and the moderating agent. In *Skype Supply*, the nodes within the system are governed by a moderating agent, in a similar way to Neuhaus’ work, but the distinguishable difference is that the moderating agent within *Skype Supply* is a software programme. When dealing with an ‘object’ moderating agent as apposed to a ‘subject’ moderating agent, the change in perspective is subtle. In some cases no distinction will be made between the two, in others it will be my own creative agency, as software designer and architect, that is imparted and thus analysed.

*Tazzi* (1997) outlined the vindication or justification of *Public Supply I* lay mainly in aspects surrounding and supporting the contributed content, as apposed to the content itself; the exploration of the relations and relationships within the performance system. This stance is just as warranted within *Skype Supply*. However, the *Skype Supply* system limited the amount of callers to a number of sixteen. This decision was made for two fundamental reasons, and they are not entirely mutually exclusive.

Firstly, as the system was dealing with both audio and video, it would have put considerable strain on the hardware and software if the number of callers was more than sixteen. Secondly, and perhaps most importantly in this context, I decided that exploring the relations and relationships between sixteen calls, from a number of perspectives, was more interesting than creating a system that allowed for the constant generation of new content. This was a design decision that was imparted onto the system at an early stage, and was the main area in which my own creative agency was inflected onto the piece. I realised that the system could be designed so
that a collage effect would be created, with the system moving from video to video, forming a narrative from the individual sections of content as participants performed their offering. This concept was by no means perfect. The general affordances of Skype as the communicative tool were suitable, but issues surrounding the stability and speed of Internet connection at the gallery space caused pauses and glitches in video that may be seen throughout. Also, the fact that the software system was set to answer video calls immediately sometimes confused participants, as they were unsure if they were actually connected to the performance. This caused hesitance and pause in the contributions. Even given these deficiencies, Skype Supply still focused exploration and reflection onto the relations and relationships between callers, as well as the call content.

5.2.2.1. Relation Between Performers

Skype Supply allowed relations to be drawn and explored between participating agents in a virtual space, independent of physical borders, geographical distance, and, perhaps most importantly, distinct from time restrictions. Even though a two-way transmission and reception system was instantiated within Skype Supply, it did not seem that the participants were overtly aware of this - especially those that were located, at home, in their own physical spaces. At the installation space, where it was easier to acknowledge the two-way transmission and reception design, there was more of a propensity to engage with this affordance.

The nodalistic framework reveals interesting and engaging elements of the interrelations and interactions between performers. The design of the system urges reflection on the interrelations, as a collage was created of the collective contributions. Relationships and binds were created both in a relational, and temporal, sense. Within the Youtube broadcast (see /Documentation_Material/2.Skype_Supply/Broadcast/...) it is possible to see some of these relations, as the sense of collective dialogue is foregrounded. There is a revealing moment, created from a collage of three videos in sequence, beginning at 41m 49s. A performer is shown fixing his hair, and then starting to spin as he records his Skype message. As he does, he says “Yay...”. This is immediately followed by another participant - unfortunately whose video is squashed due to some technical issues with her call (she pressed the hold button as apposed to the end call button) - who is heard saying “.....see, and umm.....”. The display then changes, another video appearing, now of a male participant: “...we're connected....and absolutely thrilled to be here, unsurprisingly enough...”. These three videos may be analysed in isolation, but the way in which the system binds them affords a nodalistic analysis of the semantic
relations. If we were to bind the three segments of their sentences together, we get: “Yay...see and umm...we’re connected and absolutely thrilled to be here, unsurprisingly enough...”. This small segment of sense within the collaged performance foregrounds the relational constructs the piece attempts to explore.

The technology is affording semantic dialogue formation between participants. A formation that participants would not have necessarily been aware of. This dialogue formation is different from the dialogue created in *Public Supply I*. Neuhaus did not have the luxury of implementing automated software to cater for the bricolage procedural processes, as I did with *Skype Supply*. Neuhaus’s role was to manage a suite of callers, moderating their offerings; keeping some overall sense of balance and equilibrium. The computer software I had designed focused more on a search for semantic association.

Another example of this begins at 44m 15s. The first video is a male participant describing the scenario that he finds himself in “...in my adopted city of Belfast at this current point in time...and...uh...standing outside, on a very pleasant evening...”. The performance then cuts to another video, of a different participant, this time female; she is heard saying “...with Danielle”. At this point, Danielle enters the video, and we can hear “...Hi....so we had a great time, it was amazing”. Two videos are merged, with a cohesive narrative bridge appearing, formed by the software system. Nodally, the relations between the two videos are plain to hear and understand, but removing their words from their original context and then placing them in a slightly different one is an engaging artistic process.

5.2.3. A Nodalistic Perspective on Listening

The nodalistic framework is most apt for this section of the discussion from the perspective of an audience member. The system affords awareness of the relations created by the collage of videos. The concept of “*opiated adjacency*” (Scarry, qtd in Schroeder, 2013, pp. 223) that has previously been discussed allows a direct explorative and reflective avenue. It may be that this is where the aesthetic value of the piece resides; not in the tone, meaning, or timbre of the videos in their individuality - but the way in which they are relate to each other in collective form. This may be an imbued relation, as is the case with snippets of longer videos being merged and mixed together, or other forms of relation - such as videos taken at similar angles, places, or spaces.

We have seen in the examples, discussed above, relations that arise due to the software moderation of content, but there is also another example that highlights a
very different relation. In the documentation of the YouTube broadcast (see .../Documentation_Material/2.Skype_Supply/Broadcast/...) at 40m 39s, we can hear and see (though the visual is distorted due to an error in the ending of the call) a video of a female who called into the system from the installation location on a mobile device. She recounts an experience of the place that she is standing in, focusing the camera onto a Pizza shop: “.....[i had]...an interesting Pizza here one time. I am going to stand here....[facing the camera towards the pizza restaurant].....right there....and i had a garlic pizza and it was really crazy...and...ummm....i did have garlic pizza...and it wasn't that nice.....”. This communication is extremely interesting as it directly relates the virtual space to the real space, communicating this extension to the listening audience. The existence of that restaurant in real space is now known, as is the female’s memory of the Pizza - yet this relation now exists in a virtual space. A digital anthology of a memory; fleeting and ethereal. Perhaps an audience member may be able to relate directly to this experience. They may know the restaurant, the area, or relate the experience of the Pizza to a similar experience they may have had. The listener may become acutely aware of the other, or aware of their own relation to the other, through the performance system. These relations are drawn out by the embodied listening experience, one that is afforded by the performance architecture of Skype Supply.

5.2.4. Summary

Skype Supply was by no means a perfect project. The additional affordances of the technological upgrades were counterbalanced by glitches in the system, both software and hardware related. The glitches raise interesting questions regarding the acceptance of error in a performance of this type, especially considering inaccuracies such as packet loss, desynchronisation of audio and video content, dropping of calls, pixelated visuals, etc, that are a common occurrence with the everyday use of audio-visual Internet communication tools (albeit reducing in correlation with increasing data transferral speeds). It is interesting to question: are the audience are more accepting of error, given that they are more accustomed to them existing in the medium? Or do the nuances of a medium define the aesthetic?

The affordances offered exploration of some nodalistic aspects, while hindering others. There were architectural and design flaws: deciding to use Youtube as the real-time broadcasting medium meant communicating how the work should be consumed at home by the audience confused, and even alienated, some members - mainly due to poor communication on my part. However, having the physical installation space at the gallery meant that participants had a direct, physical
window into, and onto, the virtual space; an aperture of direct extension from the real into the virtual.

From a design perspective there were elements that could have been re-modelled, or adjusted. For instance, the collage effect created by the mixing and merging process could have been more efficiently handled by the software system. Instead of constantly drawing relations between videos in a consecutive manner, it may have been more interesting to create a conglomerate audio-visual mass, with audience members afforded the ability to draw their own perceived relations, rather than the system imposing them. This is, of course, a matter of conceptual perspective.

The most interesting and engaging aspect of the piece remains that the medium of Skype induced a certain performative manner, or behaviour, from the participants. The performers are, at least in someway, conditioned into using Skype as a personal communicative tool for relating and documenting their lives, so they continued to use the medium in that way. Though it must be said, this may have been due to my own lack of communication that Skype Supply was a ‘musical’ performance. Or perhaps, as I believe, they perceived the performance as a virtual space into which they could share aspects of their lives; projecting and broadcasting their individuality into a community.

5.3. Synchrocities

As an artistic response to Amacher’s City-Links, the focus of Synchrocities is on sonic synchronicity. Implementing certain mediums and technologies, the sound installation shifts attention towards the subtle vibrations of synchronicity that emerge from concurrent listening of microphone streams sourced from a number of disparate locations. By implementing Internet technologies, software programming tools, and the live microphone streams hosted by Locus Sonus (http://www.locusonus.com), it was possible to create a work that is conceptually similar to iterations #11, #16 and #17 of the City-Links series; where emphasis is drawn to natural sound environments and their respective sonic characteristics.

In Synchrocities, high bandwidth telephone lines are replaced by the communicational infrastructure of the Internet, including Ogg-Vorbis audio compression techniques for real-time transportation of audio information. Cycling 74’s Max/MSP software is implemented to analyse incoming audio data, as well as to create a visual representation of the analysis process. In City-Links, Amacher
desired to use the technologies of her day to understand and reflect on the sounds of places and spaces. *Synchrocities* implements current technologies to direct reflection and understanding of the relations between places. The affordances of modern technologies are used to leverage the embodied listening experience; urging reflection on an amalgamation of four distinct sonic environments, the subtle similarities and differences of sonic characteristics through the simultaneity of sonorous events.

Amacher, with *City-Links*, desired to create an instrument; a “live sound environment” (Maier, et al, 2010, pp. 2) for manipulation and modulation. *Synchrocities* moved in a similar direction, but removed the humanistic element of ‘playing’ the environments; allowing spaces to ‘play’ each other; a dance of technologically afforded interrelation. Sonic synchronicities caused swells and undulations of spectral activity, as the system analysed and then relayed relations that came and passed.

Topologically the piece was designed to reflect a projected dramaturgy; the installation space a central node gathering content from four remotely located nodes. Each remote node would have distinct characteristics; relayed as truly as possible given the technological infrastructure in place. It is hoped that a listener will be able to perceive the four remote places; understanding their similarity and difference.

5.3.1. Core Concepts: Perception

*Synchrocities* does not foreground the physiological aspects of sound, or psycho-acoustic phenomenon, that became central pivots for Amacher’s development as a sonic artist - but it does attempt to explore similar subtle metaphysical inclinations. Amacher explored the core nature of sound - the core hum, the “hum of all vibrating substance that holds our damned planet on heel” (Curran, 2009, pp. 1). *Synchrocities* attempts to reduce distance to zero, as well as re-configure the dimension of time; holding sound in interspersed states of temporal suspension - altering the listener’s perception of the past and the present. It does this through two methods. Distances are reduced by affording simultaneous listening of four remote locations. The perception of time is altered by implementing sample rate
FFT analysis and digital signal processing to manipulate linear temporal perceptions; temporally suspending sampled audio within the installation space.¹

*Synchrocities* magnifies and amplifies similarity and difference; moving sonorous events from the unknown to the known in an alluring, consistent, and recurrent fashion. This may be conceptually framed by the term “leveling” (Vitale, 2014, pp. 18). *Synchrocities* allows the listener to consistently perceive the multiple dimensions that exist within nodalistic, or network orientated projects; zooming into a level below what would normally be perceived by the human ear. The technologically afforded extension allows the listener to view two distinct microphone audio streams as part of the same network, even though they are sourced from cities hundreds of kilometres apart. For example, in the documentation trailer (…/Documentation_Material/3.Synchrocities/Trailer/…) there is a moment this process may be heard clearly. At 7m 42s, the sound of bells may be heard. The bell sounds originate from a microphone located on an Aix-en-Provence hillside. The sound of bells trigger an active process, as they match the activity from the stream located elsewhere, heard as the gentle tapping in the garden of a London residence. Even though the tonal qualities of the sounds may at first seem quite distinct from each other, the system views them as synchronous, due to the broad frequency spectrum of the bell sounds, as well as their temporality. The synchronous moment activates the system; the two processes, outlined above, combining with the steams in real-time to produce a noticeable swell within the installation space.

**5.3.2. Core Concepts: Dimension**

Arranging the speakers in the installation space in a quadrophonic layout ensures that a listener positioned in the centre of the configuration hears four distinct sound environments from four corners of the room. In theory, this means a listener may engage with an analogous reflection of geography through an embodied process, as they move about the space; focusing attention onto different speakers and thus different places. The design is primarily to afford listener agency, much in the same way that Amacher did within iterations of *City-Links*. She urged reflection on the

¹ The Max/MSP patch, included in the documentation folder, was the governing programme for the installation. The patch sourced four streams, in real-time, from the Locus Sonus sound map. The choice of streams was dependant on availability, but for the first realisation were: Berlin, Nantes, London and Aix-en-Provence. The system laid out the chosen streams in two pairs. The streams were individually subjected to FFT analysis. The system analysed the bins for simultaneous activity with respect to audio amplitude. Concurrent activity in a paired set of bins, within a threshold of 12db, activated two distinct processes: The first would be a replaying of the bins (size of 1024 samples) in the installation space for a period of 10 seconds. Secondly, time delayed audio streams would be convolved with each other. This convolution would also be replayed within the installation space.
sounds of places; building relationships through aural experience. *Synchrocities* urges listeners to explore the juxtaposition of similarity and difference between places through the physical space. Moments of lucid individuality and blended collectiveness are interspersed with moments of distinct kinship and synchronicity.

In the design process, the idea of placing speakers as a scaled geographical representation of the actual microphone locations was considered. This would have meant them being used as abstractions of the microphone locations; with speaker placements inside the installation space representing the scaled cartographical co-ordinates of the locations they amplified. A listener could then navigate the space as they would a scaled version of Europe. Conceptually, this would have been ideal, but logistical issues made this impossible in the first presentation. The main issue was that the installation space did not contain support structures suitable for placing speakers in these areas. Secondly, due to the directional characteristics of the amplification process, it would have been difficult for the speakers to amplify the sounds in 360 degrees. This directionality of sound would not have accurately reflected the mirrored analogy of placement.

It was considered more important to allow the listener navigation through the space, affording them the ability to focus on streams in pseudo-isolation, or from a position of centrality - which in turn urged a relational listening perspective. The dimensional acoustic windows would be present for the listener to engage with, just as in iterations of *City-Links*. These acoustic windows were merged with the dimensional window of synchronicity; urging the listener to reflect simultaneously on the other place, the relation between places, and most importantly, the moments of distilled synchronous time that appeared as sonorous swells in the installation space; a technologically afforded multi-dimensionality.

### 5.3.3. Core Concepts: Synchronicity

Amacher dedicated herself to long form listening practices. A practice that enabled a trained ear for synchronicity to develop; a devotion that allowed her to understand the similarity and difference between sonic cause and effect, and true sonic synchronicity. Amacher understood that simultaneous listening of spaces allowed a deeper sense of awareness to appear; an awareness “altered by an overview” (Amacher, qtd in Maier, et al, 2010, pp. 5). *Synchrocities* attempts to foreground this overview, an overview leveraged and extended by the technological instantiations of the supporting hardware and analysis software.
John Cage’s Jungian inspiration was related to Amacher’s conceptual understanding of synchronicity in Chapter 4, detailing how the two composers, through different methods, engaged with philosophical notions such as the interdependence of objects, and the natural unscripted cohesion of elements; revealing some form of universal interrelational essence. *Synchrocities* explores the same metaphysical curiosity, but in a different manner. Cage explored the concept through indeterminate compositional and performative musical practices, as well as methods involving chance. Amacher explored it through long-form listening practices involving multiple remote locations. *Synchrocities*, on the other hand, leveraged technologies to draw out synchronicity; explicitly conveying them to the listener. A gross communication of the interrelations, relations, relationships, and simultaneity of sonorous events. Synchronous events were distilled and purified down to their lowest ‘digital common denominator’; stretched and drawn, until little sonic ambiguity remained. It was this complete lack of obscurity that was then replayed to the listener; a coercion of awareness of deep rooted similarity at its most fundamental level; that of vibration.

The extended awareness afforded to the listener is perhaps the most interesting and engaging discussion. The technological instantiations, coupled with the design of the system, affords deeper meditation on the transported sounds. The concept of extended awareness will be addressed further on in this chapter, when the nodalistic concerns of the listening practices within *Synchrocities* will be discussed, but what must be stated at this point is that the distilled moments of synchronicity the system foregrounded is where the true meaning of the piece resides.

### 5.4. Nodalism: Reflection on Synchrocities

Amacher used the term “sonic telepresence” (Kaiser, 2014, pp. 19) to describe *City-Links*; a project primarily concerned with the transportation of sounds to disparate locations. *Synchrocities* is seen as a similar work. It is beneficial, however, to view the work simultaneously as nodalistic; its other primary concern to convey the existing relations between places. What differs in the analysis below, as compared to the analysis of *City-Links*, is that there is only one instantiation of *Synchrocities*. Therefore, the analysis will be more concentrated as it will only discuss one iteration, as apposed to the portfolio of iterations found within *City-Links*.
5.4.1. A Nodalistic Perspective on Instrumentation

Amacher’s *City-Links* contained a number of elements or agents that acted as constituent parts to form a unified musical whole. A unified whole that was, in Amacher’s eyes, a “live sound environment” (Maier, et al, 2010, pp. 2). *Synchrometics* may be viewed from a similar perspective, and thus I will examine the role of agents within the system - whether they are defined as spaces, places, or objects - through a nodalistic lens. For instance, the object that resides at the centre of the system, in the form of the analysing Max/MSP software patch, may be seen as acting on the behalf of the places that it is analysing, through the networked microphone streams, or on the behalf of myself as the creator and designer of the work - depending on the perspective taken.

My own agency is imparted onto the work through the topological formation of the performance framework, the installation set-up and design, and the software and hardware configurations at the centre of the system. With this in mind, it is important to consider how the installation space conveyed meaning to the listener (see section 5.3.2). Just as Amacher viewed spaces as pertaining the ability to articulate narrative qualities by aiding and evolving stories, it is worth considering how the installation space at the *Network Music Festival 2014* was used to articulate the narratives of location, relation, difference and synchronicity.

5.4.1.1. Space as Instrument

Without imagining that I hold the same conviction as Amacher as regards the ability of spaces to articulate narrative, it was important for me to utilise the designated space at the installation site as a representation of the topological formation of the work, as well as a representation of the conceptual backbone of the project. With this in mind, I understood that the designed layout of the space should reflect the network topology. A quadrophonic speaker layout was established, with a single location’s discrete microphone stream being amplified at each designated corner (see Fig. 4).
It was important that relational pairs were created, so each speaker had a sonorous ‘partner’ located in the opposite corner. This ensured that relational paths between sites were, at least in some way, distinct. The software programme supported this pair-wise distinction so that when a synchronous moment occurred, the sonorous distillation was centred on these two speakers only - reflecting the individual interrelation, while leaving the remaining two speakers unaltered.

It is important to distinguish that the space was being used as an instrument in a designed sense. It depended on creative and rational decisions made by myself regarding the location of speakers, as well as the interplay between the designed work and the installation space. In this respect, there was also one other key decision. The visual element of the installation reflected a dark space; illuminated when a synchronous moment appeared (see Fig. 5). This reflects the vision of Schroeder, as she describes a dark network; illuminated by sound (Schroeder, 2013). The visual element contained a pure black layer, which hid a coloured map of Europe. Each time a synchronous moment occurred, the places in which the sonic information originated were revealed; a burst of activity in an otherwise still environment. A network coloured by synchronous sound. Through this method, the space was imbued with my agency as an artist; reflecting my vision of the conceptual backbone of the work. The designed layout of the room communicated a narrative to the listener, in a way that may be seen as similar to how Amacher communicated through spaces in *City-Links*. 
5.4.1.2. Relation Between Instruments

*City-Links* is viewed as a series of designed performance eco-systems. *Synchrocities* may also be viewed as one, however, an investigation of the interrelation between instruments is difficult, given that there was only one installation space, and only one iteration of the piece. It is true that we may change perspective and view other agents within the system as instruments, whether that be speakers; the microphones; or the sonic transportation means, but given that we have defined the instrument as the installation space and will continue to use this definition, it would not be wholly worthwhile.\(^2\)

5.4.1.3. Relation Between Instrument and Audience

As the installation space is being seen as an instrument in *Synchrocities*, imbued with my own artistic agency through the design of the piece, an analysis of the relations drawn between the listening audience and the instrument is possible. It has been mentioned above that the speaker configuration imbued a sense of dimension on the project, in a three dimensional sense, with the temporal stretching of synchronous moments reflecting the fourth dimension of time. These characteristics communicate the dimensional aspects of the work, allowing the

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\(^2\) The relation between performers and instrument is also not covered within this section, due to the perspective taken throughout the analysis of the microphone streams being viewed in a performative sense. From this perspective the relation between the location streams (as performers) and the installation space will be a more fruitful exercise. Please see section 5.4.2.2 for the completed analysis.
audience to perceive multi-dimensional traits through an embodied listening experience.

The visual aspect of the performance was designed to reflect the conceptual notion, articulated by Schroeder, of the network-orientated listening experience. This was seen as another avenue of reflection. The brief, yet consistent, glimpses of colour that intersected a dark canvas illuminated the notion of the network as a dark space, illuminated by sound. At the scale of the spectral analysis, the locations are seen to have direct relation to each other only when they have simultaneous or synchronous events, and this is reflected by the visual element.³

The installation space also allows avenues of relation to be explored at another level. Listeners are urged to develop their own relationships with places as the remote locations’ sounds are continuously streamed into the installation space. Listeners are also recurrently coerced into reflecting on the moments of synchronisation; a level that sits below their normal perception. This is a simultaneous multi-dimensional listening experience. Nathan Thomas, a reviewer of the festival, summed up the experience: “For the most part it wasn’t clear what events were triggering the swell response, which led to a beautiful impression of the senses being extended to grasp coincidences and correspondences that wouldn’t normally be perceptible — the world as heard by a patiently listening network.” (Thomas, 2014, pp. 1)

5.4.2. A Nodalistic Perspective on Performance

If we change perspective slightly, viewing the installation in totality as an instrument - the framework of nodalism aids understanding of the performative elements, especially with respect to the set of programmed rules imbued through my own artistic, or creative, agency. The installation ‘performed’ in response to sonorous activity at each remote location, as information was analysed by the governing system. The microphone streams also may be seen as performative - sources of distinct temporal, spatial, and timbral narrative; indeterminate and unstructured. Synchrocities gathered sonic content from remote locations; utilising

³ The visual element was quite simple in operation: the approximate geographical co-ordinates of the streams were pin-pointed on a map of Europe (located within the installation folder). This map would be hidden by a dark overlay within the software patch. When a synchronous moment was measured, the software patch would reveal these locations in a particle by particle fashion. This process would last for the same duration as the two audio processes heard within the installation space. The display would return to its dormant state once the synchronous moment had passed; the locations being hidden again by the dark overlay. This process may be seen at various points within the documentation trailer (../Documentation_Material/3.Synchrocities/Trailer/...).
their performative nature in two ways. Firstly, the ungoverned streams are amplified in the installation space. Secondly, the system implements the streams as information sources, with their content being analysed in a manner that affords synchronicity to affect the installation space.

Viewing the installation space as instrument, opens up avenues of discussion regarding the concept of homeostasis, which is interesting from nodalistic, and performance eco-systemic perspectives. Gochenour states that homeostasis is “a state of equilibrium between the system and the environment” (Gochenour, 2005, pp.3). In *Synchrocities*, the state of equilibrium is found in how the instrument gathers information from the outside environment through the microphone streams; adjusting its state with respect to this data. Hayles (1995) draws on Paul Dell’s theory, as she discusses the equalising effects of homeostasis: “homeostasis implies that a system will remain the same” (Hayles, 1995, pp. 89). In the context of *Synchrocities*, it may be seen that the instrument has a defined equilibrium state - the time at which the location’s streams are being amplified in the installation space, in a restful state. It also listens and analyses to the input from the environment; ‘performing’ every time external stimulus falls within a set of designed parameters. If certain conditions are met, a designed sonorous event occurs; a spectral and temporal swell, before the system returns again to equilibrium. In this manner, *Synchrocities* is a homeostatic system - it remains in an equilibrium state, while monitoring input from an outside environment; altering conditions inside the system in response to a stimulus, before returning again to equilibrium.

This comparison may be made more clear through an analogous example, similar to the thermostat analogy discussed by Hayles (1995). We should first imagine a situation where a thermostat monitors outside temperature. Every time a gust of cold wind blows outside a room, the temperature dips a minute fraction, prompting a designed response: a heating fan turns on inside the room. This fan stays on for a set amount of time, before turning off again. The room remains in a state of equilibrium; an interplay between system and environment. An external event causes a change in the system for a period of time, before it returns to its natural resting state. The analogy between this example and *Synchrocities* is that the thermostat is the Max/MSP monitoring and analysing patch. The gust of cold wind is the synchronous sonic moment - as measured by the monitoring system - and the fan that comes on is the sonorous ‘performing’ swell.
5.4.2.1. Relation Between Performers

From an altered perspective the soundscapes may be seen as performing agents, outlining a projected dramaturgical formation - as described by Rebelo, et al (2008). Within this formation the streams become contributing agents, the installation space a central and governing node - gathering and analysing content from the distributed contributing nodes. This perspective opens up avenues of discussion centred on the interrelations between the performers; allowing exploration as to how *Synchrocities* reflects these relations to an audience. In *City-Links #1*, microphones sources were viewed as performative agents also; reflecting both a narrative of, and a dialogue between, locations. In that iteration, Amacher drew out relations between various locations, affording “*Subjective Transportation*” (Minsky, 1988, pp. 1). *Synchrocities* creates a similar experience; the listener is afforded an acoustic window onto remote locations; characteristics, daily and nightly rhythms, and narrative qualities.

As the microphones streams were unmoderated (apart from the automatic conversion to the Ogg-Vorbis audio format), *Synchrocities* afforded performative agency to the soundscapes. If all other performative aspects of the installation were removed, the microphone streams, in their natural live sense, would continue to communicate a sense of narrative, structure, and rhythm. The sources would continue to communicate meaning. Similarity and difference would continue to reveal relational characteristics, as would simultaneity and synchronicity.

Viewing the microphone sources as performative agents warrants continued discussion. The relations found within the spectral analysis process drive one distinct performative characteristic of the installation, but it is important not to lose sight of relations that exist regardless of this process; through an extended notion of performance - as outlined briefly in an earlier chapter (see section 4.4.4.2). *Synchrocities* draws out relations between remote places, extending them into identifiable sonorous events. The events are designed responses to synchronous moments. I attempted to build an installation that represented a perceptual and dimensional window onto relational reflection; exploring synchronicity in a multi-dimensional manner through residence of a three dimensional space. However, in a much simpler manner, the instrument also allows reflection on similarity, difference, and correspondence - aside from the synchronous spectral activity.

*City-Links #1* reflected eight remote sound atmospheres, communicated to the audience through Amacher, as she controlled a mixing desk, and thus the final
broadcast on WBFO FM. Through this method Amacher encouraged reflection on difference and similarity; the exhaust pumps at the Gas plant as compared to the old grain mills; the airport as apposed to main street; the old Erie canal as compared with Bethlehem Steel, and so on. The characteristics of each atmosphere, soundscape, or place, was borne out through relation; a constant and consistent contrast to another. The same may be said of Synchrocities. In *Synchrocities* the four chosen streams represented four distinct soundscapes: Berlin - as heard from an urban apartment block; London - a miniature of placid seclusion on an urban farm beneath the Heathrow landing path; Aix-en-Provence in France - a solar-powered microphone placed on a hillside, littered with the constant ringing of goat bells; Nantes - the sultry, yet persistent, sounds from a balcony in a bustling French city.

The sonic characteristics of the streams may be heard interrelating with each other through the installation: the gentle, but intrusive, ringing of bells as goats nibble on tufts of grass; the light breezy bird calls of the London retreat, interspersed with the demonic approach of landing airplanes; voices gently wafting on the late summer breeze in the Berlin residential quarter; the noisy streetscape of Nantes - cars passing and sirens wailing - a busy city soundscape hustling and bustling in continuous fashion. These sounds all give character, depth, and narrative to the work. The four speakers convey nature, temperament, tone and complexion - as one might expect from soundscapes. However, when heard concurrently, they tell a tale of similarity and difference; consequence and correspondence, and most importantly, synchronicity.

5.4.2.2. Relation Between Performers and Instrument

In section 5.4.2 the concept of homeostasis was discussed, as *Synchrocities* was viewed as an instrument. The informational and communicational flow between the performers, seen as the soundscapes, and the instrument, seen as the designed installation space and the incumbent equipment, is seen as uni-directional. This uni-directional flow is the transportation of sonic activity from the microphone locations to the installation space. The lack of a bi-directional communication system ensures that the system remains homeostatic, as apposed to autopoietic. This was a conscious design decision. The homeostatic nature of the designed instrument

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4 The streams were chose dependant on their availability during the installation period. As the sound map is dynamic in nature, the availability and dependability of microphone streams changes on a daily basis. During the testing process, these four streams seemed the most stable, and the most consistently available, and thus were used for the duration of the installation. Other iterations of the work may of course use different locations. This would have effect on the map implemented within the visual element, and, of course, on the pinpoint ‘reveal’ locations within the Max/MSP patch.
means that it is seen as reactive. The design of the installation ensures that microphone sources are viewed as performers in their own right; afforded with the ability to voice themselves within the installation space. The communicational flow ensures that the microphone streams are viewed as material to react to, in a performative manner.

The performance may be framed as reactive - in a process that sits between two categorisations: imitation and integration (Globokar, 1970). The swell that occurs at a synchronous moment is undoubtedly an imitation, as the software system samples a snapshot of sound, and then replays this fraction of material in a time-stretched manner. It is also seen as integration, as the snapshot is simultaneously integrated with the amplified soundscape. It is important to note this bi-focal perspective. The traditional notion of the composer is now attributed to the soundscapes; the notion of the performer attributed to the software patch - reacting to the material gathered from the composers. Viewing the system in this manner, the focus is radically shifted, altering the reflective lens.

The design of the instrument ensures a restful state is present until a set of sonic circumstances transpire, from which a performative act emerges. Depending on your perspective, the performative act stems from the designed software - as performer - or from the system - as designed instrument. From either perspective, the technology afforded a relation between the instrument and the soundscapes found at the microphone locations. The perspective shift opens up avenues of discussion as to whether the instrument is performing in its own right, to a set of designed instructions, or whether the streams are actually performing through the medium of the implemented performance system.

5.4.3. A Nodalistic Perspective on Listening

Similar traits may be apportioned to Synchrocities that have been to City-Links, with respect to the extended listening affordances leveraged through the implemented technologies. City-Links altered the listening perspective; extending the aural sense by reducing distance through enhanced technological avenues, and deepening comprehension of the relationships between remote spaces. A key difference between City-Links and Synchrocities is situated in the use of the software monitoring system; acting as performing agent. The software system gathered content, analysing and monitoring against a set of prescribed conditions. Once these conditions were met, the system engaged in a process that altered the
listener’s overview - drawing attention onto the moment of synchronicity; casting a net of interrelation over the work.

The temporal suspension of the synchronous fragment coerces the listener to reflect on the nature of the relationships between two soundscapes; urging a reflection on the relations between one and the other. This relation is drawn out for a period of time; a moment of lucidity born on a spectral level. This moment is possible due to the implemented technologies, as the software is more sensitive to the minute differences, simultaneities, and synchronicities found while monitoring and analysing the sonic data. City-Links afforded relational reflection through concurrent listening perspectives, but Synchrocities integrated technology so that the synchronous relations were immediately apparent; dominating the installation space with recurrent swells and crescendos. Minsky discussed the “Subjective Transportation” (Minsky, 1988, pp. 1) techniques of Amacher: “a master of controlling sounds that are comparatively “faint” yet produce new senses of location and orientation” (Minsky, 1988, pp. 1). Synchrocities may be seen in a similar shade, producing a similar altered sense of location; but crucially re-orientating the listener on a temporal level also.

From a nodalistic perspective it is beneficial to draw, in a manner similar to Schroeder, on certain philosophical notions. Murdoch acknowledges that beauty is found in the “appreciation of something else, something particular, as existing outside us” (Murdoch, 1959, pp. 52). Elaine Scarry further this line of enquiry: “There are many things in life that give us an acute state of pleasure, that opiate us, and there are many things in life that make us feel marginal or lateral or on the sidelines. But what is deeply and abidingly extraordinary about beautiful things is that they do those two things at once” (Scarry, 2014, pp. 2). Schroeder correlates these philosophic concepts with the intersubjective and interrelational listening perspective found within network music performance, so it will be beneficial to elucidate how these notions manifest within Synchrocities.

Synchrocities affords the listener engagement with the world outside; the external, remote and distant. It affords reflection of the other place. It also affords reflection on relation. It draws out the minute synchronicities between places and elongates them; creating tonal drones from what is, in reality, just digital data. In Scarry’s view, the beautiful thing is one that simultaneously includes us and marginalises us; coercing an awareness of something else at work. Synchrocities opiates us through the tonal qualities of the temporal suspension of spectral information; but more importantly is affords awareness of the gentle play of synchronicity that surrounds
us all while casting relation into interrelation, through a connective system. The awareness of relation exists through the designed interrelation. Its absence is felt once one quietens the monitoring system, or one leaves the installation space. The relational narrative left behind. The extended awareness ceasing to be.

5.4.4. Summary

*Synchrocities* was hosted by the installation space for a period of three days, over the course of the *Network Music Festival 2014*. There were no technical glitches, and the system ran without interruption for the time the festival was open to the public. On reflection, however, there are always elements that can be improved. For instance, the pairing system could have been altered, opening up exploration of alternate types of synchronicity. As the system stands, a pair is arbitrarily created between two monitored soundscapes. When synchronous activity is found within the streams, the spectral portion of the incoming audio data in which the synchronous activity occurs is sampled and then replayed over the amplification system. Simultaneously, the two spectral sections are involved within a convolution process - this is where the designed process evolves interrelation from relation. If a slightly different monitoring system were in place, concurrent monitoring of more streams could have taken place. A synchronous moment could then have been defined as simultaneous activity in four different locations - altering the relational listening overview.

Conceptually, I felt my artistic response was sensitive to the historical work. The inspiration for the installation came directly from Amacher’s own embodied listening experience, and I felt the engagement of available technologies afforded the listener a similar experience. The technology leveraged the listening experience, drawing out multi-dimensional awareness of related soundscapes; compelling the listener to reflect on their listening experience in a slightly different manner. The nodalistic analysis supports the conceptual meaning of the work; deepening comprehension by analysing it through a coherent and cogent framework.

5.5. Web Variations

*Web Variations* is perhaps the most complex of the portfolio projects, and certainly the most technologically contingent - given its Internet based residence. Though the relation to Cage’s *Variations VII* is, in some respects, relatively detached - it stands as the thesis’ definitive work, as concepts discussed throughout are demonstrated
Chapter 5. Analysis of Portfolio Works

and explored within the artwork; reflecting core themes through explicit methods, practices, and processes.

Beginning as an examination of indeterminacy, Web Variations explores nodalistic concerns through concepts of relayed creativity, ‘intra-action’, relational, and interrelational musical creativity. General themes, as well as specific instructions, contained within the performance notes of Variations VII were carried through to the design of Web Variations. Words notated by Cage in 1972, such as “free manipulation of available receivers and generators” (Cage, qtd in Miller, 2009, pp. 76), “catching sounds in the air as though with nets”, “Inside composers picking up outside sounds”, and “facilitating reception” (Cage, qtd in Miller, 2007, pp.1) were believed to be transferable to the medium of the Internet, which is seen a viable platform for the piece’s implementation.

The leveraging of web technology helps ensure that three distinct conceptual and artistic concerns can be incorporated into the work: “relayed creativity” (Born, 2005, pp. 26), “intra-action” (Moore and Place, qtd in Follmer, 2005b, pp. 186), and “navigable music” (Novak, 1997, pp. 1). As this chapter progresses, these concerns will be explored and related specifically to Web Variations, with the outcomes forming an important part of the subsequent concluding chapter.

5.5.1. Core Concepts: Sounds from the Air

Bonin (2006) framed Variations VII as a mediation. A mediation by the performing agents on behalf of the audience. Cage instructed a gathering of sounds from the ‘air’, without imposing any instruction onto method. This concept is altered within Web Variations. The base sound, also known as the base node, is gathered through the Internet. A microphone stream hosted by sound art research institute Locus Sonus (http://www.locusonus.org) is relayed into the performance system. The ‘air’ that Cage describes, in this sense, now resides digitally, as computer code. The performance stage in Web Variations also exists digitally; a meeting point of performing and listening agents.

It is useful to frame the performance environment by returning to the conceptual notions of cyberplace and cyberspace (see section 2.1.3) elucidated by Whalley (2012). The performance environment (http://webvariations.herokuapp.com) may be seen as a cyberplace: “the meeting points between parties” (Whalley, 2012, pp. 5) within cyberspace. Whalley defines cyberspace as: “a web of connections between people at nodes” (Whalley, 2012, pp. 5). This embedded conceptual
outlook may in turn be theoretically framed by returning to Vitale’s “leveling” (Vitale, 2014, pp. 18). Cyberspace may be viewed as being a higher level concept; a schematic of nodes creating and engaging in a web of connection, with the actual digital places where these nodes meet to connect being termed, cyberplaces.

The ‘air’ to Cage was seen as residing in an ethereal space - a space that remained inaudible. The technology he adopted drew sound from the ‘air’ and presented it to the audience. This sound was mediated by the choices of the performing agents; design decisions, instruments, performance methods, performance techniques, etc, all imparting distinguishable roles. However, within Web Variations the ‘air’ is viewed from a different perspective. Like Variations VII, it resides in an inaudible space, but is represented by digital data - as it flows into and amongst the nodes situated in the performance environment. However, Web Variations, is restrictive with respect to how a performing agent gathers their sound. The agent may only choose one directional path for their node; deciding from which other node they source, or gather, their input. This is seen as the content onto which they invoke their own creativity. They cannot, however, decide, or control, the direction their node outputs sound. The agents are also restricted in a performative sense, as their performance instrument, method, and technique is limited to the affordances of the digital processing effect offered by the system. The audio effect system is a custom-built web-audio effect containing a number of performative parameters. Each performing agent is afforded an individual instance of the sound sculpting instrument.

Cage’s focus on indeterminacy was reflected through his instruction to gather sounds from the ‘air’. This may be seen as being more determined a feature in Web Variations, as the ‘air’ resides only within the digital performance stage. The choice afforded to the performing agent is not what, or how, to gather sound, but which junction, point, or node to engage with. The agent has less choice with respect to the gathering, but more with respect to relational paths.

5.5.2. Core Concepts: Indeterminacy

Indeterminacy is a distinct concern to Cage (see section 4.5.1.2). This concern coursed through Variations VII’s compositional and performance method, from the open ended and indistinct performance instructions, to the compositional decision to not provide a musical score. Cage’s concern in Variations VII lay in providing a platform that allowed performers explore the relationship between technology and
art, while never losing sight of the relation between nature - in its widest sense - and music (Cage, 1968).

*Web Variations* contains a semblance of indeterminacy; a by-product of the compositional and performative goals of the work, as well of the enacted topology of the performance system. The piece - interfaced through the Chrome browser ([http://google.com/chrome](http://google.com/chrome)) - affords indeterminacy for the performer, and the listening audience, while also respecting certain designed boundaries - just as Miller (2009) discusses of *Variations VII*. The indeterminacy contained in *Web Variations* may be analysed from a number of perspectives; each viewpoint altering the overview.

From the perspective of the designer: the objective was to formulate a system that sourced a live microphone stream; ungoverned aside from the compression techniques used in the data transportation. This source would be represented in the system by a base node. The sonorous activity at every other node in the performance system would depend on the sonic activity at the base node, and thus the microphone location. All nodes would in some way be connected to the base node. Relational paths may differ, depending on enacted topologies, but a path would always exist. If there were birds singing at the microphone location, these events would course through the work - moderated, sculpted, and manipulated by the performing nodes. If there were planes passing overhead, this swell would flow into, and through, the input and output at each subsequent node; a sonorous cascade. The live, unscripted nature of the original microphone source ensures indeterminacy is a fundamental concern for any performance.

From the perspective of the performing agent - seen in this instance as being an agent controlling the modulation mechanism located at each node - in the form of an audio effects unit - indeterminacy is found through the lack of control the agent has over their node’s input; their artistic creativity is directly influenced by whatever is happening at their node’s input stream. This input stream may be the base node, or any other performing agent in the system. This relayed process is an embedded design feature. The system attempting to explore the indeterminate nature of ‘intra-action’; manifested through a networked performance system.

From the perspective of a listening agent - in this instance defined as one that listens to the output at any node but does not take any role in enacting a performance by creating a performing node - indeterminacy is found in a number of aspects. Firstly, there is no score for the piece, so each performance will be unique
- depending on factors like the number of performers, the vantage point of the listener, and the enacted topological formation - not to mention the live nature of the systems input. Of course, performances will sound similar, as the microphone stream will have an identifiable timbre, tone, or character - as does the effects unit - but individual parameter setting permutations and configurations will ensure that any performance will always remain distinct. This level and range of indeterminacy ensures that, in theory, each listening experience will be unique.

Secondly, the listener is able to choose the vantage point they wish to listen from, even changing their listening perspective as they engage with the work. Each individual listener (there is no upper limit on the amount of concurrent listeners) has the opportunity to hear a different piece of music, as they navigate through the enacted topology in their own manner. A listener may navigate through the performance, discovering the similarities and differences at each node, in a completely unscripted manner; viewing the performance through an altered aesthetic lens - one concerned more with the quality of the navigation, or the robustness of the performance system, than a passive consumption of a musical performance.

5.6. Nodalism: Reflection on Web Variations

When reflecting on Variations VII through a nodalistic lens, the work was seen as containing strong cybernetic principles. Variations VII was designed so that a series of agents would harness technologies of the age as sound gathering mechanisms; performers becoming mediators. Dunbar-Hester (2010) alludes to the cybernetic principles that course through much of Cage’s discography; allowing us to orientate Variations VII as a prime example, as well as being a clear illustration of early network music performance. Though similarities exist between Variations VII and Web Variations, there are also key differences - especially with respect to audience perspective, implemented technologies, and the primary focus of the artwork.

Firstly, the means by which performing agents source musical material is altered in Web Variations. In Variations VII, Cage asked for agents to use a variety of means to gather sounds. Web Variations is much more restrictive in this sense. Yet, paradoxically, from this restriction; choice is offered. In Web Variations the base sound remains constant, but agents are able to choose from which relational direction they receive sound. For example, if three agents are performing and a fourth joins - the fourth has a choice to connect to any of the three agent’s output, or if they prefer, to the base node.
Secondly, Web Variations implements the dominant medium of our age - the Internet - to provide a digital stage which agents populate, as they create a performance structure within a designed performance system. It also uses Internet technologies as extended information transportation tools, as the base sound is relayed from a microphone hosted by Locus Sonus. The medium is also used as a platform for disseminating the musical ideas and conceptual outline of the work; a cyberplace that exists as a meeting point for interested minds to interact musically.

Thirdly, from the perspective of the audience - or listening agents - the performers in their collaborative formation are seen as mediators, just as they were in Variations VII. The base node’s sound always, due to the design of the system, passes through performing agents’ nodes. Therefore, the output - at any subsequent node in the system - is mediated by agent actions. The level of mediation deviates from Variations VII, but, it is a mediation nonetheless - restricted within the bounds of the performance apparatus.

Analysing the elements of the performance system from a nodalistic perspective draws out engaging and interesting aspects regarding the system’s affordance for differing topological formations to appear, disappear, morph, and evolve, as well as the system’s affordance for the listener to engage in musical navigation; listening at any node they desire, exploring relations within a designed cyberplace.

5.6.1. A Nodalistic Perspective on Instrumentation

Given the notable difference between Variations VII and Web Variations with respect to the enacted instrumentation, a change in perspective for the following analysis is beneficial. In the case of Variations VII, the choice of instrumentation was left to the performing agents, as they were free to choose their own sound gathering mechanisms. In the case of Web Variations, this choice is restricted; the performing agents are only allowed to use a browser based web-audio effect. This simple, custom built effect is the same for every performing agent. However, this seemingly large disparity does not automatically imply that a nodalistic analysis of the instrumentation is ineffectual. Nodalism as a framework may be used to understand how performing agents relate their instruments to each other; how the

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5 The design of the effect was based on a simple fader based interface. A window appears when a user creates a performing node. The window displays a series of sliders that have recognisable names, and sonic results: similar to the way in which a DAW plug-in works. The simple, but effective, interface hides the relatively complex web-audio based signal processing functions that form the back-end operative of the instrument.
performers relate themselves to the instruments; and perhaps most interestingly, how the audience may see the collective formation of performing agents within an enacted performance as an instrument itself; a sounding object which they may ‘play’, or ‘compose’, with.

5.6.1.1. Relation Between Instruments

The system affords agents the ability to build a network formation of sonic relations. This being the case, reflecting on the relations that are graphed during each performance becomes a valid line of enquiry. For arguments sake, instances where performers do not want their creativity impinged on by any other performer may mean that a formation is created where each performer attaches their node to the base node (see Fig. 6).

Fig. 6: Six Performers in Flower Formation in Web Variations

In this specific formation, the relayed creativity and ‘intra-active’ affordances of the system are neglected, in favour of artistic individuality. In another hypothetical instance, performers may be curious to enact a strict line formation, where the base node’s sound source is passed through each and every subsequent node, in a linear fashion (see Fig. 7). This would mean that the sixth node’s output would be dependent on the each of the five nodes that preceded it.
As performing agents are free to leave the performance stage at any time - their node disappearing and the network formation re-shuffling to account for the decrease in numbers - reflecting on how performances are enacted, morph, evolve, and dissolve become distinct avenues of investigation; raising questions that inform fields such as emergence, systems theory, and communications theory. The morphological and parallax nature of the performance environment raises questions of concern for both network theory and nodalism also, with respect to concerns regarding the robustness of network systems, and themes such as isolation, solitude, connection, and disconnection.

In the analysis of Variations VII a hypothetical relational path between instruments was drawn; a comparison made as sonic information passed through differing gathering devices, and along different paths. The same investigational method could be completed in Web Variations. For instance, if a topology was formed as seen in Fig. 8, below, there would be two distinct paths for audio to travel. This would afford a listener a direct relational listening experience as they would be able to directly compare how the sonic content differed along each path. The path on the right may be populated by agents focused more on the soundscape, as sourced from Locus Sonus, and so use very subtle transformations on the incoming audio. The path on the left, in comparison, may be populated by more experimentally focused musicians, who want to explore the feedback and filter properties of the audio effect. The output of each path would be different - even though the same information was the source for both paths.
5.6.1.2. Relation Between Performers and Instruments

There are two perspectives to reflect on in this section. Firstly, it is possible to view the performance system in a similar manner to the formation that was enacted in *Variations VII*; a group of performers, with their instruments, settled inside a performance space. Of course, there are transformed characteristics within *Web Variations*: the performance space is replaced by a digital stage within cyberspace, the performers interact with their instruments through a digital interface as opposed to physical ones, and there exists one homogenous instrument offered to all performers, as opposed to a suite of opportunity.

In *Variations VII*, Cage afforded a large degree of freedom to the performers with respect to instrument choice, design, and implementation. This meant that one could reflect on the relations that existed between each performer and their instrument choice. In *Web Variations*, this degree of freedom is not entertained in the same manner. Each performer entering the system is offered the same instrument as everybody else. However, there is one defining aspect that is worth mentioning. In *Web Variations*, any instrument’s sound producing capacity depends directly on the sound events of the node it gathers audio from. Choices made by performers are crucial, like where they situate their own node in the system, how they reflect and relate their decision making processes to other nodes, what their perceived role within the system is, and perhaps - on deeper reflection - how they see the relation between themselves as performer in real life and their node’s positioning within the transitory performance environment of *Web Variations*. 
There is also another perspective to be taken. One may zoom out a level, and view the performance system in totality, as an instrument. Each node, or performer, now represents a voice. This is similar to the reflective perspective when analysing Neuhaus’ *Public Supply* (see section 4.2.1.3), where a collective of voices is viewed, holistically, as instrument - an instrument mediated by Neuhaus. In *Web Variations* the mediation is undertaken through a digital interface, with the ‘playing’ of the instrument completed by the listening agent. The role of the listener changes, from passive to active; altering the reflective overview. The listener’s navigational behaviour becomes a performative act. If the listener is now seen as a performer, it introduces a window for analysis onto the relations between this performing agent and the myriad of voices that exist in the system. A line of enquiry opens that affords reflection onto the performative act of the listener. Nodalistically, one may begin to analyse the choices of the listening agent: do they prefer to engage statically from one vantage point, or node, understanding the relations from a designated listening position; or are they intent on exploring the distinct connections in the system - searching for meaning, narrative, similarity, or difference amongst the myriad of existing ‘intra-actions’.

### 5.6.1.3. Relation Between Instrument and Audience

The activity, and interaction, of the listener is always part of the system in a performative sense. This perspective, however, raises some shortcomings of the system - mainly in terms of its communicative structure. From a holistic perspective, the voices (represented by performing nodes) are never aware of whether they are being listened to by an audience member. They exist within a microcosm of their own existence; cosseted by the lack of aural bi-directionality. The voice is aware of the direct relations nodes have with other nodes - represented by the ties and links that are graphed on the computer screen - but not of the activity of the audience member who traverses the topology. A node is also never aware of the how their output is affecting any other node - by design they are only ever engaged with their own sound. These may be seen as fundamental flaws of the performance environment. However, they also may be seen as a reflection of distributed dramaturgy (Rebelo, et al, 2008), where “*each node retains authorship while contributing specific content and expertise to a shared production*” (Rebelo, et al, 2008, pp. 2). Viewing the performance as this type of dramaturgical enactment allows one to view each node as creating a specific voicing to the performance; when these voices are amalgamated, there exists a shared production. The content produced at each node has bi-lateral associations with any other node that is connected to it, through input and output, but also plays a lateral role in
creating a narrative formation for the listening agent to traverse - who, in this context, is actually the totalistic system’s performer.

Defining of roles and agents within an environment like *Web Variations* becomes a confusing exercise, one fraught with semantic jeopardy. Specifying roles that, either by nature or situated environment, exist inside a digital parallax is a thankless task; ambiguous at best, unfathomable at worst. However, attempting to understand how a network music performance, as complex and deeply woven with interrelational inspiration and multi-perspective viewpoints is beneficial. For instance, the interrelational ethos that originated in the design stage of the work ensured that the work explored intriguing listenership themes. Most notably the ideologies of navigable music and hyper-narrative.

The concept of navigable music was developed by Marcus Novak (1997). He describes the potentiality of music to inhabit metamorphological spaces; liquid architectures. These architectures are described in a chapter nested inside *Cyberspace: First Steps* (Benedikt, 1991). A liquid architecture is described as being animated, animistic, metamorphic, continuos and discontinuous; crossing categorical boundaries, and evolving in both space and time; cyberspace being the perfect support mechanism (Novak, 1991). Novak describes what is found within such spaces, including what he details as a new kind of music: “it is possible to stop seeing music as singular, as a street between point a and point b, and to start seeing music as multiple, as landscape, as atmosphere, as an n-dimensional field of opportunities. If music is a landscape then it is possible to extract as many types of conventional music as there are trajectories through that landscape. The new problem for composition is to create that landscape.” (Novak, 1997, pp. 1). Novak continues to describe the formation: “Navigable music is not an organization of sounds in time, it is the organization of a matrix of sonic, visual, behavioral, and other possibilities. Actions within that matrix may contain every aspect of conventional music, because what is experienced within this landscape depends entirely upon the user's individually selected, unforeseen, interest-driven trajectory.” (Novak, 1997, pp. 1).

This description bears a strong resemblance to *Web Variations*; the work beginning with a blank digital canvas nestled in a cyberplace, in turn nestled within cyberspace - a description that itself bears resemblance to Novak's vision of cyberspatial architecture: “It is possible to envision architecture nested within architecture” (Novak, 1991, pp. 248). The canvas within *Web Variations* is then populated by agents; creating as they go - building on each other's work in sonic,
graphical and topological manners. When populated, a sonic structure is built; navigated by listening agents; who are in one perspective engaging in a performative act - creating a narrative as they traverse the many nodes, ties, and points of relation and interrelation found within.

The creation of narrative is a defining engagement between listener and instrument in Web Variations; now seen as between performer and instrument. The audience member is creating their own personal narrative. This narrative is not completely divorced from those being driven at each node - but it remains unique. This behaviour is framed by Novak (1991) as the navigation of “hypermedia” (Novak, 1997, pp. 229), which in turn is discussed by Cicconi as being the medium through which one may compose “hypernarratives” (Cicconi, 2000, pp. 13): compositions with many possible outcomes, differing paths; multi-dimensionality. Cicconi describes the potentiality of these systems, but reminds us of the need for audience members to break down traditional concepts: “to perceive, see, understand, follow and put together the variety of narrative elements and materials presented....through non-linear, or rather, multi-lineal logic” (Cicconi, 2000, pp. 15). It is this multi-lineal logic that is presented to the audience member in Web Variations - the performance system altering the concept of narrative consumption.

5.6.2. A Nodalistic Perspective on Performance

The most important aspect of the following analysis is that the performance system of Web Variations may be analysed at differing levels, and from a number of perspectives. There is also a crucial difference between this analysis and that completed within Variations VII. In section 4.8.1.2., the gathered sources were viewed in a performative manner. This perspective was taken with a slight perspective shift; the human performers on stage were viewed as mediators. However, in Web Variations, this section of analysis becomes quite complex, mainly due to the parallax nature of the system. For arguments sake, the base node - the original source that is always present in the performance - is the original sound for all nodes. All subsequent sonic offerings, at varying degrees, derive from the output of this node. This is a holistic perspective, which may entail viewing the base node as the performing node, and all subsequent nodes as mediating nodes. From the perspective of any singular node in the system, things may appear differently: the node they directly gather from may be seen as performative, whether it is the base node or not. This perspective ensures that any unique node may be seen as mediator, as well as performer; their role changing depending on the perspective, frame of reference, and enacted topology. A node may be seen as
performing - offering evolving content for any attached node, or it may be seen as mediator - moderating and manipulating content it receives. A node’s function becomes bi-lateral. This simultaneous, and somewhat paradoxical, dualistic agent function reflects the view of Ascott, who discusses the affect that networking has on various art-forms: “Networking supports endless redescription and recontextualisation such that no language or visual code is final and no reality is ultimate” (Ascott, 1990, pp. 243).

Nodes within Web Variations are connected through a support structure - in a manner similar to how Cage envisioned sound being connected through the ether in Variations VII. The ether that Cage imagined in Variations VII is actualised in Web Variations through the structural communicative backbone of the Internet. The enabling transmitters, servers, hosts, responders, cables, routers, wires, etc, that support the informational flow are the representational analogue of air particles, radio waves, telephone wires, cables, receivers, radio transmitters, and ECG equipment found in Variations VII. The sound that Cage desired his mediators to mediate, now resides not only in a digital ether, but also in the invisible background of the communicational mass.

However, within this communicational mass it is possible to view one side of a node’s dualistic role in isolation. From a singular perspective, the node may be seen as a source - a source that performs. This performance is then mediated on by a subsequent node. Just as the sounds received by the mediators in Variations VII are seen as crucial performatve agents, similar implications are bestowed onto the sound sources in Web Variations. When analysing Variations VII, performative roles were bestowed onto a list of agents, who in actuality were an inventory of telephone numbers and their respective owners (see section 4.8.3.1.). This allowed analysis of, and reflection on, the sources - deciphering contextual and relational meaning to their presence. In Web Variations, there is no such list.

The dualistic role of the node, both as performer and mediator allows an avenue of reflection to open up regarding the way in which a participating agent implements their effects unit. The unit itself implements a dry/wet parameter setting. This parameter setting allows one to designate a ratio between the input source, and effected output, in a similar manner to the way in which a dry/wet setting works on a reverb effect - representing the ratio of the dry, input signal, to the wet, effected signal. In the context of this discussion, we may start to draw comparisons between the ratio of dry/wet parameter settings on the unit, and the degree to which a participating agent wants to involve himself onto the performance. For instance, an
agent that wants to involve his agency quite heavily may choose a high wet setting. An agent that does not desire such engagement, would choose a lower setting; their agency becoming less present in the context of the overall performance. The dry/wet parameter setting is then analogous to a performer/mediator setting.

Nodalistically, it is worth exploring how participating agents view their own roles. Do they feel their presence is to support and enhance other nodes more creative, or performative, urges - through a mediation process - or do they see themselves as performing nodes that others should mediate on? It is also worth exploring if participating agents feel they are afforded the potential to be both performer and mediator. Is the effect unit adaptable enough to allow the nodes explore bi-lateral function?

5.6.2.1. Relation Between Performers

Continuing the discussion raised in the section above, it becomes intriguing to attempt to understand the relation between participating agents. Of most concern is the potential of interesting engagements to arise, primarily through emergent behaviour, as nodes realise their individual behaviour modifications have potential implications for other nodes within the system. This potentiality may be linked to Deleuze’s notion of the ‘dividual’, which Varnelis (2008) describes as an individual identity dispersed through a community; where a single agent is “less an autonomous individual and more of a construct of the relations it has with others” (Varnelis, 2008, pp. 152).

Emergence has been described by Johnson as “a higher-level pattern arising out of parallel complex interactions between local agents” (Johnson, 2001, pp. 19). A search for pattern formation within a performance system may be an avenue for nodalistic reflection and analysis within Web Variations; a search for distinct co-operative and collaborative behaviour. It is Whalley that outlines how process centred systems that have moved away from hierarchically modelled, centralised structures, towards horizontal “co-ordinate and co-operate paradigms where multiple entities self-assemble” (Whalley, 2012, pp. 5) create musical works that are “beyond the product of a single creator” (Whalley, 2012, pp. 10).

The co-operative paradigm draws nodalistic concerns throughout analysis of any work, allowing the concept to frame many elements. Most alluringly, in this case, is the relation between agents. In the case of Web Variations the framework allows us to analyse how relations between performers are governed, structured, assembled,
morphed, and evolved. In a particular case, one may analyse how topologies are enacted, how they evolve over time as agents enter and leave the performance stage, or how agents interpret their role once they arrive. Nodalistically, understanding the relations between performers unearth interesting aspects of the design of the environment, the affordances of the environment, and also the failings of the environment.

For arguments sake, agents may wish to create more than one node, or change the position of their node in real time - two behaviours that are not afforded by the system. In another instance, agents may feel their own individual creativity is being impinged on by other agents, thus they feel a desire to attach their node to the base node, as opposed to any other node in the system. In another instance, coherent collaborative efforts may be seen, as agents attempt to design elaborate topological formations. Alternatively, disruptive behaviours may arise, as agents attach themselves only to the base node, thereby defeating one of the main designed affordances of the system. All of these discreet examples may be framed by nodalism; relational and interrelational behaviour being a fundamental characteristic of their actuality. Indeed it may be said that a continued nodalistic analysis may be worthwhile of Web Variations - analysing concerns over an extended period of time as the performance system matures in cyberspace, offering a place where musical agents meet and engage with a nodalistic musical system.

5.6.3. A Nodalistic Perspective on Listening

A nodalistic perspective on listening is perhaps the most interesting concern for Web Variations. Previously, relations were drawn between Schroeder’s concept of ‘network[ed]’ listening (Schroeder, 2013), and the affordances of technology within Variations VII to reveal obscured, hidden, and concealed sound worlds (see section 4.8.4.). Nodalistic concerns were drawn to the concept of ancestry and “kinship” (Adkins and d’Escrivan, 2013, pp. 43); Fire Department to Police Department radios, sound environments sourced from one telephone line location as apposed to another, and so on. An interrelational and interconnected listening aesthetic was implied as being a primary tool through which to view the work; unearthing deeper comprehension of the piece due to the framing of subtle and gross relations between elements.

Web Variations offers quite different nodalistic concerns; often far more explicit than in Variations VII. It is worth noting that this clarity is an intended affordance - designed from the embryonic stage. The core difference between the two lies in the
mode of listening, as performed by a listening agent. It is important here to define and structure the role of the listening agent, as it differs from the audience member as found in *Variations VII*. In *Variations VII* the audience member was, for the most part, a passive agent. This is not the case in *Web Variations*. The performance environment in *Web Variations* affords a level of interaction with the listener. Morphing a passive, non-participative role to one in which listening experience is codified by the agents own behaviour. This is borne out through a navigational tool; narrative negotiation of a network formation of active agents, through interfaced graphical representation. This navigational affordance is key to understanding the way in which nodalism frames the listening perspective of *Web Variations*.

It has been stated that the core of nodalism resides in the relational, interrelational, and intersubjective characteristics of any network, or nodalistic, system. Systems that emphasise the importance of links and connections, while warning against solitude and disconnectedness (Gochenour, 2011) (see section 3.2). It is from this vista that the core conceptual and theoretical worth of *Web Variations* is seen. The work is a implicit example of a nodalistic system. The nodalistic frame allows us to investigate how this affects the listening perspective. How the interactive listening agent formulates their understanding of the system; navigating through the field of relations, searching for coherent relational and interrelational paths between participating or performing agents; building coherent interrelational and relational meaning and narrative.

The concepts of hypernarrative (Cicconi, 2000) was discussed (see section 5.6.1.3) and it must be stated that this is a nodalistic act. As the listener navigates the field of relations within the system, they are navigating the similarities, differences, and interrelations within the performance system. It is this navigation through interrelation that represents the true worth of the artwork. It has also been discussed that a truly beautiful work is one that allows us to feel connection and marginality simultaneously (see section 5.4.3); inclusion and exclusion concurrently (Scarry, 2014). An agent within *Web Variations* feels just that, recurrently and continuously. Imagine the performer, situated at their node, connected to two others; harnessing the sonorous activity of one, while offering creativity to another in a splendour of rapturous relation, all the time being aware of a series of other nodes. Those who have chosen a different relational path remain distinct in their disconnect, yet paradoxically simultaneously interlinked through the base node; while a listening agent traverses the links, ties, and knots of interrelation and relation within the performance; engaging with sonic reliance and inter-reliance, action, and intra-
action; all the time remaining on the outside - listening and performing in their own splendid isolation.

**5.6.4. Summary**

Nodalism has been used as a frame for analysing and reflecting on my own work, *Web Variations*. It has been used to describe the fundamental concerns of the piece, and afforded an exploration of the varying alternate perspectives to view agent roles. It has demonstrated the piece’s conceptual ideals, and related them to concepts that were discussed in the reflection of *Variations VII* by John Cage; highlighting the similarities, and differences, of engaging in a side by side analysis. By framing the work through the theoretical lens of nodalism, interesting characteristics have been unearthed and discussed, most notably the potentiality of the piece to explore and reflect on Novak’s concept of ‘navigable music’, and Cicconi’s ‘hypernarrative’. The discussion has focused on these two aspects from the perspective of the listener, creating a system that explicitly attempts to create an environment in which an audience member can engage with a form of “opiated adjacency” (Scarry, qtd in Schroeder, 2013, pp. 223).

*Web Variations* is also seen as the culmination of ideas, concepts and technological affordances that have coursed through the other portfolio works, *Skype Supply*, and *Synchrocities*; whether that be the implementation of the Internet and cyberspatial support structures, bespoke programming tools and languages, the use of the network, or network music performance’s conceptual meaning to me, as artist. It is hoped that the reader will have grasped a common thread through all of the pieces, as they attempted to respond, artistically, to historical works - an explicit example of kinship in its own right - while also allowing my own theoretical concerns with nodalism, networkology, and network music performance theory to come to fruition.

I feel that through *Web Variations*, I created a tangible example of a nodalistic work, a work whose primary concern is with relation, interrealation and intersubjectivity. A work that coerces all agents to involve themselves in a dance of interconnection and ‘intra-action’. Involving agents in a collaborative mass of relayed creativity; emphasising nodalism’s great concern with connectedness, while also subtly reminding them of themes such as isolation and disconnect. It is hoped that the piece will continue to reside in cyberspace, being populated and de-populated in continuously unique and original ways; all the while affording agents navigation and negotiation of an etheric space of nodalistic elaboration.
I feel it is worth mentioning at this juncture, if nothing more than to support the
discussions found in this section, that *Web Variations* has been designed to afford
the explorations of a multitude of connections and interconnections; musically and
nodalistically. If we are to imagine a situation where eight unique users are intent
on enacting a topological formation, and thus performance, by creating eight
distinct nodes: the total number of possible topological configurations becomes a
worthwhile investigative act. The formula below (see Fig. 9), $F(n)$, represents the
total possible unique formations that may exist within the system when $n$ represents
the number of performing nodes (not including the base node).

$$F(n) = (n - 1)^2 n! - (n!) + 1$$

Fig. 9: Number of Possible Configurations within *Web Variations*

For $n=8$, the total number of possible ways in which eight users may arrange
themselves is 1,935,361. That is, there are almost 2 million ways in which any
performance may be enacted, given eight unique performing agents.

### 5.7. Conclusion

Three pieces were analysed and reflected on; each of them a response to a historical
work. A nodalistic framework was implemented throughout the analysis process;
hopefully drawing out engaging and interesting characteristics of each.

The use of the public facing installation space in *Skype Supply* meant that the
extension of the virtual from the real was tangible; reinforcing a core concept of the
piece through agent engagement. The propensity of the performance system to
create semantic dialogue formation through a bricolage effect also meant the piece
may be viewed through a nodalistic aesthetic. Concerns were unearthed, such as the
relational engagement found through agent interaction, or the autopoietic behaviour
that emerged as agents dealt with errors in the system. Interestingly, the
implemented medium, *Skype*, invoked a certain behavioural trait to be displayed in
the work and this is seen as one of the most interesting reflective aspects of the
piece. The nodalistic frame, allowed certain principles of relation to be applied
concurrently to both the historical work and to my own; cementing the relation that it is felt exists between them.

Within *Synchrocities*, relations between remote soundscapes were drawn out through engagement with powerful Internet and programming technologies. A core concept of Amacher’s work was focused on; and drawn out through the implementation of modern day technologies. These technologies afforded a leveraged awareness; an extended overview. Nodalistic concerns coursed through the work as the performance system revealed a number of aspects to the viewer: the difference between sonic synchronicity, simultaneity, cause and effect, multi-dimensional soundscape traits, and the technologically altered listening experience as the performance system magnified awareness.

*Web Variations* was seen as the exemplification of nodalistic thought that coursed through the thesis as a whole. These concerns became enacted into the design of a digitally resident performance system. The interactive, interrelational and interconnected concerns found in much of the nodalistic literature was seen as embryonic; remaining a concern throughout the process. Indeed, it is seen that *Web Variations* affords the unadulterated investigation and explorations of these concerns. Through this investigation, interesting aspects appeared - such as the way in which the system allowed for dualistic roles to form. This interplay between roles, dependant on perspective, became a central investigative slant. Differing relational and interrelational paths became a pivot for the pieces aesthetic; focusing in on the way in which the system allowed for multiple realisations, and multiple topologies to form. The most alluring aspects that unearthed themselves, however, were the related concepts of ‘Navigable music’, and ‘hypernarrative’, both seen as being actualised through the listening experience.
Chapter Six

6. Conclusion

This chapter offers an overview of the written document; reinforcing central themes and discussions, as well as postulating on possible future directions for the research outlined within. It will hopefully solidify the thesis as being one of doctoral standard and leave the reader with a coherent sense of its worth and academic contribution.

The first component will discuss the thesis’ contributions to the field; aligning the prospectives outlined in section 1.6 with what has actually been discussed. The second section contains a reflective summary, which outlines how my practice developed through the doctoral process; what I learned from the undertaking, both as artist and as researcher. I will then move onto future developments; reflecting on the thesis as a whole and outlining how I envision the research might evolve in times ahead. The section will attempt to understand how the developed nodalistic framework might aid both network and experimental music as the practice develops and advances. It will also highlight a number of knowledge gaps which exist. An abstract theory is then offered, in an attempt to venture forward from some of the concluding hypotheses found in the previous chapter; a speculative future where intricate, networked music performance systems are designed, developed and matured - in both research and practice realms - ripe for artistic experimentation, and elaboration, from a number of agent perspectives. I will allow myself a level of ideological pondering at this stage, as I discuss metaphysical and futuristic concerns - calling on ideational theories of Roy Ascott, William Duckworth, Alan Kirby, Jean Baudrillard, and Dante Tanzi. The section will be the final leg of the thesis, a final farewell to what was at times an arduous, but ultimately rewarding, process. Upon reaching this final juncture it is hoped that the reader is, at least somewhat, relieved as I.
6.1. Contributions

The thesis’ core transferable knowledge resides in chapters 4 and 5. Within these chapters a critical framework - devised in chapter 1 and then developed and rationalised in chapters 2 and 3 - was applied as a framework for analysis for both historical (chapter 4) and contemporary (chapter 5) works of art. This is not to say that transferable knowledge does not exist in any other area of the thesis. One might argue that elements of new knowledge exist in the current chapter (see sections 6.3 and 6.4), but there is an acceptance that the thesis’ foundational worth inhabits the chapters containing the critical reflection and analysis (chapters 4 and 5).

In chapter 3, I developed nodalism as a critical and theoretical analysis tool for network music performance. This perspective evolved through the analysis and critical evaluation of fundamental aspects of nodalism itself; attempting to find discursive similarities between it and the literature found within the practice of network music. Links and binds were discovered through a number of theoretical threads (chapter 2), as literature suggested concrete strands of similarity. Strands that I have hopefully explored, communicated, and conveyed. I discuss the principal relations in chapter 3: cybernetics, systems theory, performance eco-systems, and concepts of the intersubjective and interrelational. I also take the time to relate what, I felt, were extremely important theoretical constructs: ‘network[ed]’ listening, and ‘reification’, ‘leveling’, and the ‘act of relation’ - from networkology. These discussions are seen as a key determinant in deciding whether there exists a contribution to knowledge from this thesis as a whole.

Chapters 4 and 5 are seen as cementing the thesis’ complete contribution to the field. It is believed that no such nodalistic analysis has been completed with respect to the analysed works. The works have, of course, been analysed through other reflective lenses, and from a number of perspectives; some having been referenced as necessary. However, none address the works in a specifically nodalistic fashion.

In the case of Neuhaus: much has been written about the impactful and consequential nature of Broadcast Works; the way in which Public Supply I radicalised the perceived musical affordances of radio and telephone to create unique, live, participant dialogue formation within a ‘virtual space’ (Cox, 2009; Johnson, 1976; Kotz; 2009; La Barbara, 1977; La Belle, 2006; Neuhaus, 1994; Neuhaus, 2005; Tazzi, 1997; Traub, 2005). These discussions, however, have not
analysed the actual semantic dialogue formation, or discussed the parallax shifts that exist when analysing the performance from the varying agent perspectives.

Amacher is by far the least discussed of the three artists. The most concrete reference is written by those involved in the retrospective of her work which was exhibited in New York (Maier, et al, 2010). Analysing *City-Links* from within the framework of nodalism highlighted the differing methods and techniques through which Amacher set about designing, building, and staging her own live environment performance system. A system she sought to manipulate, modulate, reside with, understand, and explore, in real-time.

Through Cage’s *Variations VII*, reflections were drawn from a number of perspectives, and a slightly canted view was unearthed. This canted lens afforded a critical analysis of how Cage viewed technology; as a conduit for otherwise hidden, or obscured, musical processes. The analysis allowed one to reflect on elements within the performance - affording an understanding of how implemented technologies unearthed a hidden network of sound. It also allowed the reader to form a deeper appreciation for the implemented tools and techniques; framing the work in a modern manner. Whether that be the way one may view performers as mediators, gathered sounds as performers, or the listening experience as one which is interrelational in essence.

It should not be forgotten that a portfolio of original works are included with this thesis. It is hoped that the pieces stand on their own as works of art, whether that be in the context of gallery installations - as is the case with *Skype Supply* and *Synchrocities*, or as an Internet based performance stage - as is the case with *Web Variations*. The works should serve as exemplifications of my conceptual understanding and artistic practice, but also - in the context of embodied knowledge - as responses to important historical artworks. The responses were created, and then critically analysed, through the lens of a developed framework; so that others may garner some level of transferable knowledge from my own, personal, research process.

### 6.2. Reflective Summary

In chapter 1 (see section 1.1.1), I described a somewhat fanciful notion - an impression of a future that prioritised science-fiction over science-fact. Given these prospective imaginings at the beginning, it may be obvious that I held steadfast to them throughout: forged with the idea I was exploring a futuristic frame of
reference; a computer-mediated, multi-dimensional, fractal, and parallax system whose function was to interface, interconnect, and interrelate a mass of ‘intra-acting’ agents to produce beautiful, dynamic, musical motion. An infinite and eternal music; redefining the phenomenological, embodied experience of networked particle vibration. Quite the optimist indeed.

It was not until later in the process, as I attempted to contextualise my ideas and critically analyse my creative process, that I realised I was not alone in dreaming of such a system. My stance was not drawn from the inner recesses of creative genius (as much as I would like to think!) but, in fact, drawn from the mass of conceptual theory that I had digested along the way. The theory was informing the practice in fleeting moments of contextual understanding; congealing of theoretical focus.

Chris Brown’s *Eternal Network Music* (Brown, 1998) is a project that tantalisingly flirts with the speculative concept I set out in chapter 1 (see section 1.1.1); an idea developed and articulated through my own creative process in *Web Variations*. *Eternal Network Music* is a performance stage: “a website, where one or several flexible musicians are permanently going on. Whoever passes by can join in to play on the accessible controls of the music system, interacting with the machine as well as the other players” (Follmer, 2001, pp. 3). Follmer elucidates a concept that appears in the work; the parallax nature of the participant. He describes the creation of a new class of agent - a “listener-performer” (Follmer, 2001, pp. 6). This modified agent is also discussed by Bosma, as he elevates the traditional role of the listener in network projects from passive to active: “The listener is composer and musician; for want of a better term, a 'musicianer'” (Bosma, 2001, pp. 2). Follmer goes on to detail the system more exactingly: a description that, on reflection, lay the groundwork for *Web Variations*. A description I undoubtedly rested on in the quiet; meditated on in the still: “The composer would (still) be a person who sets a scope and lays connections of ideas, concepts and atmospheres in music. The performer would be the person to mediate a primarily auditory event, albeit following different rules than in the past. Finally, the listener would be the one to put it to a final order, to receive it at a final destination and interpret his/her personal version of it” (Follmer, 2001, pp. 6).

*Web Variations* was the culmination of an artistic process of discovery, through three established artists - Max Neuhaus, Maryanne Amacher and John Cage. A creative spark for the actual project was provided by the compositional notes of John Cage, with the idea then being refined, improved, and broadened through a theoretical support structure. My own creative practice evolved from first the
creation of a cyberformance space that afforded semantic dialogue formation through bi-modal interaction, in *Skype Supply*, to the investigation and illumination of synchronism and deep-seated interrelation, in *Synchrocities*, to the intricate weaving of interrelation, relayed creativity, and ‘intra-action’ of *Web Variations*. I realise - as both practitioner and researcher - that I was creating works that leant on my doctoral research just as much as my research leant on my creative ideals. One would not have existed without the other. An interdependence in itself. An ‘ideational intercedence’.

### 6.3. Future Developments

The basis for this sub-section derives from taking a small step back from the mass of critical reflection and analysis that has come before; turning attention towards how the research might evolve. There are a number of strands to consider; each deserving in their own right. This section merely acts as a gentle and unassuming guide to possible directions.

The first, and perhaps most obvious, line of research resides in further critical analysis and reflection. Nodalism has been articulated as being a worthy and beneficial framework through which to view, analyse, reflect on, and investigate network music performances. I outlined how nodalism had been used to frame experimental music works in chapter 3 (see Adkins & d’Escrivan, 2013; Adkins, 2014a, Adkins, 2014b), but, previous to this thesis, it has not been used as a frame for network orientated works. Delving into the ever expanding and evolving repertoire of network music with the lens of nodalism as a trusty ally - digesting, understanding, comprehending, and appreciating - would be beneficial to both the genre itself, and related fields. Comprehending a network artwork from the perspective of varying participating agents, for example, could elucidate or mirror aspects of nodalism, or unearth interesting and engaging aspects of cybernetics or systems theory. The relations between Art and Science may be strengthened through this process; fortifying interrelations that have, as yet, not been fully explored in this manner. The artistic and academic community may also become more familiar with both historical and modern examples of network art through this process. Understanding and apprehension may be fostered, as concepts and themes are developed and understood under a common theoretical support structure. A common syntax and language may be developed, aiding comprehension and discussion of specific works; through documentation process, critical analysis and reflection, or archival method.
The second, and perhaps most intriguing, development may be as an inspirational tool for the creation of new works. Through my own reflection and analysis process, I noticed a direct correlation between my evolving understanding of nodalism and the development of my artistic practice; culminating in the creation of *Web Variations*. As I began to understand aspects, modes and characteristics of the theory, direct evolution was enacted into the architectural process for both the performance system and the theoretical model. It may be a substantial assumption to believe that this would be the case for all other artists, but nodalism does seem to offer a robust support structure for comprehending what it actually is network music artists are attempting to explore. From a completely personal perspective, I felt that nodalism framed my pursued interests perfectly - both proactively and retrospectively - being beneficial as a conceptual model for all of my projects in some way: the semantic dialogue formation in *Skype Supply I*; the intricate and deep-seated synchronism explored in *Synchrocities*; to the combinatorial possibilities of the deeply interrelational and ‘intra-active’ digital performance system of *Web Variations*.

The third possibility for future development is something that I have touched upon lightly within the thesis, without perhaps fully dissecting the phenomenological core; the aesthetic of network orientated works. I would admit, entirely, that I am not a philosopher: my own knowledge base greatly limited in this regard. However, there exists a distinct knowledge gap that could be filled if one were to pursue this line of enquiry. Schroeder (2013) embarked on this process; relating the philosophies of Iris Murdoch and Elaine Scarry to her own philosophy and comprehension of ‘network[ed]’ listening. Adkins also takes on this mantle, aligning nodalism with critical theories and discussions surrounding both modernism and post-modernism (see Adkins, 2014a). However, I feel that the intersubjective stronghold that resides within the complex and multi-faceted agent adjacency of network music has enquiries and curiosities that have yet to be satiated, from both musicological and philosophical perspectives.

The fourth possibility resides within far more technologically hinged aspects. The *Web Variations* performance system is far from complete. The system exists in a functioning performance state, but there is no reason why it could not be developed and enhanced. Raising the user limit would be a simple measure that could be introduced, but other measures could also make distinguishable differences: the digital effects unit could be improved - as web audio technology evolves - perhaps offering the exciting potential for discrete users to be afforded choice of distinct, personalised effects units. A choice of base node streams may be implemented, so
that the possibilities of culture specific or location based performances may be enabled. A communications system may be programmed to aid properties and actions of emergence. A overhauled graphical user interface may be designed, representing the network topology in a 3D, rather than 2D, virtual space. A audio mixing system could be implemented, so that a listener might be able to directly compare and contrast differing narrative paths through the system. These are all aspects that were considered in the design process, but time and technology restraints meant they were not implemented. That is not to say that other artists, practitioners, or researchers, will not be interested in developing them in the future.

6.4. Speculative Theory

As much as my own work was seated in theory, it was also inspired by the pseudo-fictional pondering of others. I will attempt to call on these, and put forward my own fictitious fanfare as the thesis’ final words approach. Unfortunately, this section may be as fanciful as the one found in the first chapter (see section 1.1.1). It is not meant to puzzle or perplex - but to animate and excite. If nothing more, this section should stand as being my own concept of how cyberspatial music systems might evolve as we approach the sometimes abstract notion of technological singularity that Kurzweil believes is near (Kurzweil, 2005).

It is Duckworth that describes his concept of virtual music: “virtual music has the potential to become a live musical organism, living in cyberspace, growing, and changing course because of the collective actions of its users” (Duckworth, 2003, qtd in Tanzi, 2005, pp. 548). This is a concept that Web Variations pays homage to. For me, personally, there is nothing ‘virtual’ about the music or the enacted performances - even if they admittedly do contain some sense of hyperreality (see Massumi, 1987): the object within Web Variations never exists in stasis; existing in moments as lucid as they are transparent: a paradoxical enactment of mediated expression and elaboration.

The answer lies in imagining how web based systems like Web Variations might evolve. For that we return to a root of nodalism that has, admittedly, been under discussed in this thesis: nodalistic systems’ link to the neurological mappings of mind (Adkins & d’Escrivan, 2013, Adkins, 2014a; Adkins 2014b; Gochenour, 2005; Gochenour, 2006; Gochenour, 2008). Within this thesis, nodalism has been elucidated as a powerful concept and theoretical model for understanding iterations of network music. Yet, only the reflective mirror of an undulating surface has been illuminated. Delving into the associations between the biological system science
underpinning much of what nodalism attempts to convey, and abstract understandings of network music, may open up avenues of discussions that flux: inside, above, and in between the “multicursed labyrinth” (Hayles, 2001, pp. 21) of digimodenist (see Kirby, 2009) hypernarrative; “authorship is always plural” (Kirby, 2009, pp. 59).

The extension of the real into the virtual is discussed in chapter two (see section 2.1.3) and linked to the theories of both Mitra, and Pressing; concepts of cyberculture related to understandings of the cybernetic. Writers such as Ascott, Duckworth, and Tanzi, develop the ideas further - eulogising the mythical notion of a cyberspatial support structure evolving into both conduit and manifold for distributed consciousness. Ascott believes that “a technoetic infrastructure is forming through which art will lead us to a state of distributed mind” (Ascott, 1999, pp. 219), while Tanzi describes “cyberspace as a dynamic and malleable extension of oneself and others, poised between perturbation and compensation” (Tanzi, 2001, pp. 431). Duckworth relates the notion even more clearly, discretely linking concepts of network music and consciousness: “this model is more directly related to the functioning of a neural network than the music-as-sonic artifact concept of the past. Furthermore, the non-linear, time-curving nature inherent in these new Web technologies, when distributed in large-scale throughout the network, offers, at least in principle, a new metaphor for consciousness” (Duckworth, 2003, pp. 260).

Admittedly, great leaps of both imagination and faith may have been bridged as this thesis has hauled itself from a structured dissection of network music works through a simple nodalistic framework; analysing musical systems through concerns of relation, interrelation, parallax, object, process, determinacy, and indeterminacy - to an extravagant, yet ultimately fleeting, depiction of the relation between network music and consciousness. How is it conceivable to me, let alone you - the reader - that the two might be interrelated? The answer to this question lies in potentiality. The works of art that are discussed have all been shown to be nodalistic in some context; in most cases from a number of perspectives. Indeed, one might say they are all nodalistic works. If this postulation is accepted, in goodwill or not, then one might begin to presume how nodalistic works might develop in the future.

In my mind, it is possible to imagine a future where the interface is reduced to zero; the relationship between man and machine symbiotic, the agent always plural; communicating through an ethereal hyper-connected communicational
Appendices

The following sections include a guide to what is included in the documentation folder. The folder contains all the materials necessary to re-create the works, as well as the full documentation material, and any other associated material. Essential information and software for the re-enactment of any of the works will be included; software patches, programming code, set-up diagrams, and any material associated with public facing communication.

The included memory stick contains the information, and is organised on a project name basis. The memory stick also contains digital copies of all thesis’ textual material.

All of the material found on the included memory stick, may also be accessed through my own portfolio site (located at http://robinrenwick.net). The reader may choose to access this site online, or through an offline version that is contained within the documentation folder.

The following file structure will be employed in the home folder.

**Home Folder:**

 ~/Documentation_Material
~/READ_ME.rtf

**Sub Directories:**

 ~/Documentation_Material/1.Thesis
 ~/Documentation_Material/2.Skype_Supply
 ~/Documentation_Material/3.Synchrocities
 ~/Documentation_Material/4.Web_Variations
 ~/Documentation_Material/index.html
 ~/Documentation_Material/style.css

**Sub-sub Directories:**

 ~/Documentation_Material/1.Thesis/...
 ~/Documentation_Material/2.Skype_Supply/...
 ~/Documentation_Material/3.Synchrocities/...
 ~/Documentation_Material/4.Web_Variations/...
Appendix A: Skype Supply

Credits:
- Design and Architecture: Robin Renwick
- Programming: Robin Renwick

Performance Details:
Friday 19th April, 2013 Open Skype Supply Session
@ Ps2 Gallery, Belfast

Documentation:
- Live Youtube Broadcast Video (.../2.Skype_Supply/Broadcast)
- Communication Information (.../2.Skype_Supply/Communication_Info)
- Participation Installation (.../2.Skype_Supply/Participation_Installation)
- Participation Videos (.../2.Skype_Supply/Participation_Videos)
- Documentation Trailer of Ps2 Gallery Open Session (.../2.Skype_Supply/Trailer/…)

Installation Materials:
- Installation Folder (.../2.Skype_Supply/Installation_Folder/Installation_Folder.zip)
- Installation Instructions (.../2.Skype_Supply/Installation_Folder/1.README)
- Installation Max/MSP patch (.../2.Skype_Supply/Installation_Folder/1.SS_Installation.maxpat)
- CallRecorder Software (.../2.Skype_Supply/Installation_Folder/CallRecorder.zip)
- Installation Topology (.../2.Skype_Supply/Installation_Folder/Skype_Supply_Topology)
- Video Renaming AppleScript (.../2.Skype_Supply/Installation_Folder/Video_Renaming_App)

Programme Note:
Skype Supply is a response to Max Neuhaus’ Public Supply I (1964), one of a suite of works Neuhaus entitled Broadcast Works. Skype Supply implements the often used modern day communication mediums Skype and Youtube to create a virtual stage that affords dialogue between members of the public; both at the gallery space and further afield. Users interact with the work by calling a designated Skype address: skypesupply2013, delivering their voice, image, words, actions; creativity into the installation. The system then supplants their offering into a bespoke designed software management application; creating a dynamic collage of
participant offerings - attempting to forge semantic dialogue and meaning through its efforts. The output of the installation is simultaneously broadcast onto the Internet through the medium of a ‘one-to-many’ broadcast station: Youtube. Members of the public not situated at the gallery space may watch this broadcast and communicate with the installation, through Skype, from their own Internet enabled device. The two-way dependency between the installation and the participant creates a dynamic space in which the artwork pertains the ability, if leveraged, to feed back into itself.
Appendix B: Synchrocities

Credits:
- Design and Architecture: Robin Renwick
- Programming: Robin Renwick

Performance Details:
Saturday 27th & Sunday 28th September, 2014
@ Network Music Festival, Birmingham

Documentation:
- Documentation Video (.../3.Synchrocities/Documentation_Video)
- Documentation Trailer of Network Music Festival 2014 (.../3.Synchrocities/Trailer)

Installation Materials:
- Installation Folder (.../3.Synchrocities/Installation_Folder/Installation_Folder.zip)
- Installation Instructions (.../3.Synchrocities/Installation_Folder/1.README)
- Installation Sub Patch (.../3.Synchrocities/Installation_Folder/convolve_test_1.maxpat)
- Installation Sub Patch (.../3.Synchrocities/Installation_Folder/cross3.maxpat)
- Installation Max/MSP Externals (.../3.Synchrocities/Installation_Folder/Externals)
- Installation Sub Patch (.../3.Synchrocities/Installation_Folder/ogg_streamer_3.maxpat)
- Installation Topology (.../3.Synchrocities/Installation_Folder/Synchrocities_Topology)

Programme Note:
Synchrocities is a multi-channel audio/visual installation in which a series of open microphone streams are analysed, in pairs, through FFT based spectral analysis. When the governing system, based in Max/MSP, determines a synchronous event it performs a specific process. A synchronous event is determined as a period of time in which simultaneous audio activity exists in two concurrent streams above a certain amplitude threshold, and within a pre-defined frequency range (FFT bin). Four streams are analysed, in a bi-focal system. When a simultaneous event occurs,
specific processes intervene. In the first instance, the governing system replays the specific FFT bin in which the synchronous event transpires. This may be called a ‘frozen’ moment. In the second instance, the system replays the sonorous activity through a convolution technique. The synchronous events from each stream are convolved with one another, and then replayed through the space - accentuating an interrelation between the two places.

The installation also contains a visual element in which a map is displayed on the front wall. The map remains hidden until a time in which a synchronous moment emerges. The synchronous event then reveals the specific locational origins of the streams. The interplay between the visual representation and the sonic events allow the listener to forge an understanding of the spectral relationship of the paired sites. *Synchrocities* is displayed within a quadrophonic array. The sonic pairings are made from microphone streams sourced through the *Locus Sonus* open microphone platform.
Appendix C: Web Variations

Credits:
- Design and Architecture: Robin Renwick
- Programming: Stuart Brown

Testing Procedures:
- Documentation and testing procedures carried out throughout August 2015 @ the Sonic Arts Research Centre (SARC), Belfast
- Website currently resides at [http://www.webvariations.herokuapp.com](http://www.webvariations.herokuapp.com) and will continue to reside at this address for the foreseeable future.

Documentation:
- Documentation Videos (.../4.Web_Variations/Documentation_Videos/...)
- Documentation Trailer of Internet based installation/performance stage (.../4.Web_Variations/Trailer/...)

Installation Materials:
- Website Code (.../4.Web_Variations/Website_Code/...)

Programme Note:
*Web Variations* is an artistic response to John Cage's *Variations VII*, which was performed in 1966. Cage designed a collaborative performance in which a group of musicians and performers gathered sound through their chosen method; utilising a array of available sources; radio receivers, telephone lines, electrocardiography (ECG) machines, to name a few.

*Web Variations* alters the creative focus; allowing the composer to source sound from any node within a musical network. The performance environment allows composers, and listeners, to explore and navigate interrelation and intersubjectivity through musicality; creativity never in isolation, but always in relation. Upon entering the system, a base node appears. This node represents the fundamental sound source; a live microphone stream, sourced from the *Locus Sonus* live microphone platform. A user may create their node by composing with this sound source. If more than one user resides within the system, they will also appear as nodes. The user may listen to, or compose with, any available node within the performance environment.
The performance stage resides on the Internet, as a website. All interactions are interfaced by this website. As of now, the system only runs on the Google Chrome Internet desktop browser: due to complications with cross browser web-audio standard implementations. It is hoped that as the web standards develop and evolve, the website will be accessible through a multitude of browsers, and a multitude of devices.
Bibliography


Bibliography


Bibliography


Bibliography


Renaud, A. (2009). The Network as a Performance Space. (PhD. Dissertation, School of Music and Sonic Arts, Queen’s University Belfast, 2009)


Bibliography


