Redefining Network Paradigms

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"There is no finality in architecture- only continuous change."[1] Walter Gropius

"Never believe that a smooth space will suffice to save us."[2] Gilles Deleuze and Felix Guattari

New Nets : Old Visions

In a way, the visions of the 60's have become a reality. As Archigram and Superstudio amongst others anticipated, we plug in, turn on and tune up our environment. We are global nomads untethered in an ocean of access, floating in the flux of information and capital that create the background of our happily networked and connected lives. The enabling infrastructures of communication and data networks that were fantasized in the early modern 30's, engineered in the thermonuclear paranoia of the 50's, and politicized and socialized in the counter culture of the 60's and 70's, are now materialized, beaurachracized and commercialized as the ubiquitous organizing structure for the post-consumer[3] dynamics of *Empire*[4].

However, now that we are here, the resemblance is only superficial to the technologically enhanced and connected futures imagined 45 years ago. In the broadest technological, political, philosophical, social and biological sense, network structures have become not the alternative to, but the dominant structure of power in the third era of modernism. Networks are the *modus operandi* of bureaucracies and corporations as much as environmental resistance groups and terrorist cells. Control, not freedom has become absolutely distributed and while we enjoy unprecedented access to information and personal communications devices, we are simultaneously smothered by the cloying ubiquity of networks that have no outside, while our media is characterized as "the most highly controlled mass media hitherto known."[5] In the short time since Archigram's first projects, network technologies that motivated visions like Constant Nieuwenhuis's *New Babylon*, have moved from the polemics of the visual, to the ambience of the infrastructural.

So as tempting as it is to read today's networks as realizations of the various visions of networks employed throughout 20th century modernism, they are not. For architecture, networks were powerful symbols that served various critical and ideological functions over the last 100 years, first of a technically liberated and connected globe in the 1930's, later transforming into a symbol of social democracy built on bodies and machines in the 1960's and 1970's. The connotations of the network image changed after World War 2 from that of a technical infrastructure to an association with resistance, subversion and anti-hierarchy which in turn came to be associated more strongly with the principles of social techno-democracy which inspired architectural practices such as Archigram, Superstudio, Team 10 and so on. Their networks were pure propaganda, the image of a futuristic yet probable technology granting authenticity to an agenda of architectural dissent. Images of networks acted in architecture as the foundation of a plausible aesthetic other, resisting the homogeneity of international modernism and the cronies of the London County Council. Networks provided the technical and social imagery that powered a critical dialogue on the environment and society towards the end of the second era of modernism. This history is well documented by others[6] and will not be repeated here, the point being that architecture's role was to translate the technical promise of networks into social/spatial terms through exhibitions, drawings, models and collages. While remaining for the most part technically inspirational fantasies, networks were nonetheless polemically invaluable. [7]

However in the last forty five years, the split between the commonly understood image of networks and what they actually signify, ie the reality of network technologies and organizations has become a full blown schizophrenia, one that is at the heart of networks today not only as they

are perceived, but as they operate. The image of the network symbolizing freedom, and democracy through technology has remained essentially stable since the 60's, while the complexity of the material and abstract organizations of networks as they construct our environment today has developed toward another paradigm entirely. Various strata of networks are revealed within this schism that are usually conflated and speak to a new topological condition, yet need to be defined and understood as nuanced in and of themselves. Within the scope of this essay I identify three kinds of networks which are linked but distinct; networks as symbol, network as infrastructure and network as organizational diagram or geometry, each of which participate in and are motivated by this schizophrenia in one way or another.

If the image of networks has remained constant, the development of network logic since the 60's is best characterized as an evolution of geometry. Network geometries have morphed through the classic stages of node and link chain networks, to decentralized and bus type distributions, to the distributed meshes diagrammed by Paul Baran at the Rand institute at the dawn of the internet[8]. But as each node in Baran's diagram became an end point in itself, the two dimensional geometry of the diagram has been pushed past a state of causal Euclidian clarity into an exponentially more complex topological realm of connection founded on *both* hierarchical and anti-hierarchical structures. Anticipating this development, McLuhan put it this way; "Euclidian space is the prerogative of visual and literate man. With the advent of electric circuitry and the instant movement of information, Euclidean space recedes and the non-Euclidian geometries emerge."[9]

By virtue of their geometric development, networks as abstract organizational diagrams and as material infrastructures have become the organizational paradigm. Underscoring the totality of this position, Castells writes, "Networks constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power and culture."[10] Spatially indeterminate, temporally contingent, unstable, inclusive and dynamic, networks capture the both/and condition of paradoxical inclusion more aligned to quantum mechanics than the either/or of a discursive modernism. Contemporary network formations are founded on the incompatibility and generative tension of two opposing diagrams of organization, or what Alexander Galloway in his study of network protocols, refers to as the "contradiction between two opposing machines."[11] This condition has been explored in political terms through *Empire* by Hardt and Negri, in sociological terms as the *Network Society* by Manuel Castells, and in digital/material terms as Galloway and Eugene Thacker begin to address.[12]

Infrastructural and organizational networks today are complex, yet tend toward a natural state of *invisibility*. From communications networks to the organizational abstractions of *Netcentric Warfare*[13], the complexity of today's network organizations exceed visualization. As Lovink and Schneider point out, "The networking paradigm escapes the centrality of the icon to visual culture and its critics and instead focuses on more abstract, invisible, subtle processes and feedback loops. There is nothing spectacular about networking."[14] How the networked society can be represented is a question which echoes Fredric Jameson's call fifteen years ago for the production of new visual vocabularies to combat, "the incapacity of our minds, at least at present, to map the great global multinational and decentered communicational network in which we find ourselves caught as individual subjects."[15]

Yet despite their invisibility, or precisely because of it, networks are the organizational abstraction *du jour*. Their role in the popular imagination remains a cliché of technologically founded liberation through the tropes of connection, anti-hierarchy, access and "freedom" applicable to new modes of socialization such as *Myspace.* The connotations of freedom, democracy and egalitarianism are used to sell both White House policy at one end of the spectrum, and the commercial dream of the first "must have" personalized infrastructure (the net, cell phones, blackberry's etc) to the gadget crazed consumer desires of the middle classes at the other. As VerizonWireless advertises simply, "It's *The* Network"[16].

However the organizational diagram of networks has evolved to encompass a much larger ideological constituency and is applied to everything from the war on terror and domestic surveillance, to the pro-technology neo-Marxist discussions of resistance to Empire.[17] This is to say, while networks as infrastructures, technologies and organizational abstractions have geometrically and technically evolved, in the popular imagination their signification has largely stood still. The technical liberatory image of networks that have been decoupled from the reality of its opposite, that is networks as a form of distributed and ubiquitous control. It is important then to distinguish the image of networks from the networks themselves for as Thacker points out, "in the discourses surrounding networks, the tropes of connectivity, collectivity, and participation obscure the material practices of networks"[18]. The reality of their technical and organizational complexity, and their geometric transition shifts the complicated balance between the semantic and material understanding of networks. The image of the network has been repurposed from a tool of emancipation, to a mask for the more complex flows of their material application that have remained until recently beyond critique. And as the conventions of resistance have been co-opted, it is as though meaningful discussion of networks ended with the evolution *iTunes*. Thankfully this is changing as a post-digital space of theory and practice led by groups such as the *Critical Art Ensemble* are now emerging from the backchannels of the internet through new forms of discourse such as blogs, wikis, and chats.

It is important also to keep in mind that unlike the hypnotic power that technology wielded even 10 years ago, information technology has matured to the point where access to communication and information networks is pedestrian, an expectation although perhaps not a right. Now more than two generations implicitly understand networks not as an image or an idea, but through practice. As McLuhan suggests, "In the age of information, it is information itself that becomes environmental."[19] The activated electromagnetic spectrum that is so fundamental to contemporary devices and technologies known as the Hertzian landscape[20] is testimony to McLuhan's point and has become a regularly traversed territory and a diffuse new layer of urban context usually ignored by architects and urban planners.

The understanding of technology as a pervasive infrastructure, or environment forms the core of the ubiquitous computing movement, begun in the late 80's by Mark Weiser[21] at Xerox Parc. Summarizing the goals of ubiquitous computing, Weiser writes "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."[22] The aim of ubiquitous computing is to re-center the human being again in the relationship between humans and technology by embedding computers into our surroundings. Now that the celebration of networks for their technical capabilities which sponsored the dot.com era has subsided, the focus has broadened to include concerns for their implications in non-technical and non-commercial terms. This is especially present in the arts, such as the emerging field of locative media (see below), and the more established net art movement for example. However a critical mass has formed around a more developed discussion of networks that includes architecture, as art practice, design and research is coupled with the emergence of a pro-technology post-internet stance in critical theory through venues like Rhizome, Nettime, the V2 Organization and NEURO. [23]

So there is no novelty to the discussion of networks, particularly in their relation to architecture and design whose histories are tightly intertwined. Indeed they have been discussed more or less as an inevitable outgrowth of electronic technologies since the beginning of the 20th Century. Yet it is clear we are no longer discussing the same thing. Rather networks have developed a split personality, and the entrenchment of networks as the dominant hegemony of control and their morph into a pliable topological state that resists dialectics, demand a renewed enthusiasm for interrogation in the post-complexity era. Across all disciplines, questions concerning autonomy, subjectivity, control, resistance, surveillance, privacy, agency, visualization, collectivity and intelligence are once again being addressed, as well as the perennial question, what is to be done?

These new questions are no less important to architecture as entirely new environmental (Hertzian), contextual and social registers have emerged as a result of network technologies and topologies that challenge our understanding of place and process. Similarly, novel forms of practice are being explored that capitalize on new network models and allow for a highly distributed and agile global presence even for small practices[24]. However, tied intimately to its tools of visualization, architecture has always worked with representations of abstractions and the development of architecture depends on its ability to address Jameson's concerns for the invention of new visual vocabularies capable of dealing with real complexity. Architecture's role in translating the technical into the social is in desperate need of renewal within this netcentric framework. As the discussions around technology and networks move into a more mature phase of human centered design, perhaps the most pressing question for architecture to address is how to again locate the "subject" in today's environment.

Manuel Castells has articulated this as a concern for the "structural schizophrenia between function and meaning" from which "there follows a fundamental split between abstract, universal instrumentalism, and historically rooted, particularistic identities. Our societies are increasingly structured around a bipolar opposition between the net and the self."[25] Who are we designing for? What are their needs? What are their practices and how do they construct their own environments through new technologies at their disposal?

Within this split condition between the semantic stasis of networks, and new highly complex network technologies and organizations, lurks the real fear of the impotence of architecture to address the contemporary environment, just as theory itself is being questioned in the age of real-time events[26]. However as Gropius reminds us, change is fundamental to architecture. As the nature of design is re-qualified in netcentric terms, Architecture has begun to respond. What is emerging is an organizational architecture based on negotiation and contractual formation capable of activating the potential of networked material, technical, and environmental intelligence. Through the design of organizational schema and the control of information exchange, architecture is beginning to address the creative potential of network praxis through what might be thought of as a *protocological architecture*.

Network of One: the work of Mark Lombardi[27]

BCCI-ICIC & FAB, 1972-91, is a monumental drawing, 52" x 138", summarizing in the fourth version which was shown at the exhibition "*PS1_ Greater New York"* in 2000, the highly self conscious aesthetic expression of a "1960s New Left Liberal in a late-twentieth-century New Right World"[28]. The drawing illustrates a network of relationships developed over 19 years of "black" banking practices that took place behind the stable and profitable façade of the Bank of Credit and Commerce International (BCCI) and the International Credit and Investment Corporation (ICIC), between 1972-1991. The drawing links the intelligence agencies of the US, the UK, Pakistan, the U.A.E and Saudi Arabia through the BCCI & ICIC to "a panoply of international gangsters, arms dealers, bagmen, corrupt foreign officials, drug smugglers, tax evaders, money launderers, and agents of influence"[29]. As Mark Lombardi's last large drawing before his death, it epitomized the *Narrative Structures*[30]series that he had been developing since 1994.

Lombardi's networks ranged from the connection of American Presidents and the arming of Saddam Hussein in the Iran-Iraq war between 1980-88, (*BNL, Reagan, Bush, & Thatcher and the Arming of Iraq, ca 1983-91*, first version 1995) to the flow of funds through the Vaticans' private bank involving characters such as Mussolini, the IRA and other terrorist groups (*Inner Sanctum: The Pope and His Bankers Michele Sindona and Roberto Calvi, ca. 1959-82*, 5th version 1998). His work comes from obsessive research into facts mined from other networks of public information, such as newspapers, magazines, and the internet, which were transferred into card files so extensive (over 14000 in 2000) they were, in the case of the *BCCI ICIC*, of interest to the FBI after 9/11. Yet, amongst the objectivity of his fact finding and excruciating research what Lombardi's work emphasizes is precisely the *opposite* of that assumed horizontal continuum of popularly imagined networks; that is, a point of concentration for the creative potential of a politically motivated *subjective* expression.

Through the development of his *Narrative Structures*, Mark Lombardi combined corporatized models for the envisioning of information[31], with an aesthetic critique of Marx derived from Herbert Marcuse, and it is through this internal dynamic that he was able to create a platform for his resistance to the developing new world order of the late 80's now more generally recognized as globalization. Lombardi considered his own work very self consciously as a counterpoint to the dominant hegemony of the developing *control society*, precisely through choosing to work within the visual information practices that it employs. That is to say, Lombardi saw networks as both the prevailing diagram of power, as well as simultaneously a means towards its resistance.

Lombardi examines a potential outside to the hidden network organizations that engulf us today. As if standing amongst the trees, where all we can see are connections, Lombardi offers us a view of the forest. His drawings are intentionally rational, assembling the facts of his research into meaningful yet aesthetized compositions. To Lombardi, networks have strata that can be articulated through highly rationalized form, giving the works authority through the primary geometry of circles, rectangles and time lines. Yet he saw his drawings as always in motion, bodies unfinished. His drawings gain a paranoid tension from the interplay between the closed and open systems of form and content, between truth and speculation in a synchronous choreography of facts and relationships. Lombardi sought to make each narrative structure complete within itself, yet "was diametrically opposed to closure."[32].

His drawings, big enough to engulf ones peripheral vision even from a safe viewing distance, provoke the tension between an encompassing objectivity of the content, and the visceral and formal subjectivity of their presentation and composition. The bodily impression is replaced by an intellectual impression of the cloying omnipotence of the networks as the detail of Lombardi's illustrations becomes apparent. Although "every statement of fact and connection depicted in the work are true"[33], the compositions Lombardi created are determinedly personal. Renderings of organizations balance between the authority of flawlessly researched facts and a clarity of overall

assembly but with a complicating consciousness “of the need to make these webs cohere into greater constellations that would give each drawing an overall compositional unity.”[34]

In attempting to come to terms with contemporary network logics, it is precisely this intentional ambiguity or their topological complexity that make Lombardi’s works so illuminating. That Lombardi focuses his work on the networks of political and capital flow, that his drawings and notes are created and stored meticulously by hand at a time when digital printing and archiving mechanisms were routine, only continue to reinstate the subjective interpretive aspect of the works, reinforcing his fundamental resistance to the totalizing networks he illustrates and the “objectivity” of the content that he captures.

Lombardi’s narrative structures manufacture their own space of existence and resistance within the fluctuations and tensions *between* states– objective facts and subjective composition, open and closed, form and field, truth and fiction– and reveal the inherently unstable dynamic of contemporary networks constructed between two incompatible diagrams of control; centralization and distribution. Indeed, the incompatible diagram is central to the mathematics at the core of contemporary network logics which make them so powerful. Mathematicians Duncan Watts and Steven Strogatz whos’ research on small world network dynamics in the early 1990’s set the stage for the next generation of network thinking, state the most optimized form of organization is neither fully random or completely ordered “but somewhere between these two extremes.”[35] As networks have transformed over the last 20 years from the image of resistance to become the dominant form of control, they have necessarily become inclusive of both hierarchy *and* distribution. Brandon Hookway sums up this creative tension as “the drama of unique existence constantly supplanted by the universal equality of things”.[36]

Popular imagination of networks comes from the images of hub and spoke airline charts and the seamlessness of the internet. Usually a symbol of connectivity, equality, democracy, and freedom, these tropes hide the reality that networks are in fact built upon hegemonic protocols of information exchange required in order to operate. This is Galloway’s argument, that the protocols required in the material nature of actual networks, embedded in every packet of information moving around the globe, create a form of absolute control. Networks dependant on the consensual use of standard protocols are temporary, contingent and fragile in these terms, or as Lovink and Schneider write, “Networked environments are inherently unstable and its temporality is key, much like events. Networks are dense social structures on the brink of collapse and it is questionable if there are sustainable models that can 'freeze' them.”[37]

Importantly, Lombardi’s work speaks to the potential for creativity and resistance through the dynamics of networks themselves, offering an alternative to 20th century forms of protest such as mass demonstrations, strikes, boycotts, and sanctions, which have become ineffectual. In their place other modes of network enabled resistance have arisen such as the fusing of hacking and activism known as “hackitivism”, and the tactical media movement whose goals are to co-opt media against itself through opportunistic projects and interventions.[38] In Lombardi’s case, he offers a creative resistance pushing conventions of network representation past the point of its usual objectivity towards the an accelerated and plastic state or hypertrophy that theorists such as Galloway, Lovink, and Pasquinelli have more recently begun to champion.

In the process other questions are raised not only about the possibility of critique and resistance, *but the increasing banality of networking*. As Lovink writes about the absence of a radical critique of network society, “Instead, we got stuck with remnants of the '68 generation, and the mess they made, characterized by this particular blend of utopia, violence and sell-out. In the past decade collective work on ideas has been replaced by informal networking, a move away from politics towards culture and the arts, shifting the focus towards software, designing interfaces, and just playing around. Instead of blaming the 'nettime' generation one could also stress that theory can only grow out of reflected experiences. In that sense we might be too impatient. The question should rather be: how can theory come into being in an age of real-time events?”[39]

Rather than being understood as a negative, the structural incompatibility at the heart of network organizations encourages the development of their most notable attributes such as redundancy, contingency, ubiquity, heterogeneity, and flexibility that imbue networks with an unstable yet creative dynamism. In this context, precisely because Lombardi employs the conventions of node and link diagrams, the Narrative Structures distinguish themselves through their idiosyncrasies from other forms of network visualization such as the skitter graphs, and plankton maps of CAIDA[40], questioning the opacity of their authoritative structures. These conventions assign meaning to patterns within information, such as densities, clusters and gradients, within a completely constructed field, whose forms promote the illusion of naturalized objectivity, continuity and smoothness that Lombardi resists through his compositional drive, recognizing as J.J. King recalls, "Far from being passive object, …maps are instruments of social and political control."[41]

Lombardi seems to play on the topological pliability of networks, and even requires this tension to create the power within his Narrative Structures. He articulates the protocols of exchange through a series of symbols for the links devised to articulate the nature of the connections ranging for example from "some type of influence or control" to "sale or transfer of an asset" while the nodes themselves for the most part remain consistent. However, it is the tendency of networks to disappear behind the formal masks of these protocols in favor of a smooth space, to which Lombardi presents an ultimately luddite alternative that avoids technology altogether.

Working in the 90's, Lombardi's work set a precedent through an analogue practice that has, especially since 2000 been taken up vigorously by a growing collection of artists, technologists, programmers, industrial designers, graphic designers and architects, that have begun the task of exploring new visual vocabularies with new technology, seeking also to articulate a new kind of subjectivity within the creative and social potentials of network topologies. Locative media is one of these areas of exploration that encapsulates a very broad range of technologically derived projects, deploying hacked consumer products to highly sophisticated algorithms and specialist equipment. Curator and artist Drew Hemmet defines locative media as media that "uses portable, networked, location aware computing devices for user-led mapping, social networking and artistic interventions in which geographical space becomes its canvas."[42] As a creative practice Locative Media ties networks of space, technology and community together, and privileges visualization through collective actions and live experiences to create open projects, rather than rarified gallery works.[43]

Time based city mappings using GPS such as the *Amsterdam RealTime 2002*[44] project of the Dutch based WAAG articulate personal networks that are overlayed into maps of collective experience and paint a vastly different picture of Amsterdam and its citizens as collaboratory constituents of a dense network space. *PDPal* 2003[45] by Scott Paterson, Marina Zurkow and Julian Bleecker overlays user impressions and annotations to a public digital map through hand held PDA's and a specifically written interface. Both projects build visualizations of networks through interaction, flowing between the agency of the individual and the intelligence of the collective. However, while both build on the conventions of the basemap as a foundation for a network, they are clearly departures from hub and spoke formations and privilege new forms of visualization by working with the protocols for assembling and sorting data, without specifying either end points or boundaries, only protocols for interaction.[46]

What this type of visualization reveals is not only the creative use of a protocological practice or regime to construct these new visual vocabularies, but a *protocological landscape* itself[47]. By framing new territories through these modes of cartography that privilege open collective structures, the complex protocological landscapes we inhabit are revealed and activated as creative generators by re-scripting relationships between actors, technologies and the environment.

Towards a Protocological Architecture

"The architecture we produce will inevitably reveal the degree to which we have been able to show respect for the developing social pattern, which we are part of, without devitalizing our individual contribution to it."[48] Walter Gropius

"When the high water of continually evolving megastructures paraded in Archigram no.5 and plug-inscapes in Archigram no.6 receded, it revealed a world beyond architecture: a sublime world of pure servicing, information, networking, transience."[49] Simon Sadler

Protocols both define environments and offer a potential new suite of creative methods through which architecture may begin to respond to the network dynamics of Hardt and Negri's Empire, "a decentered and deterritorializing apparatus of rule that …manages hybrid identities, flexible hierarchies, and plural exchanges through modulating networks of command."[50] In Galloway's terms Protocol is, "a language that regulates flow, directs netspace, codes relationships, and connects life-forms. …Protocol is always a second order process; it governs the architecture of the architecture of objects."[51] Protocol is what makes networks and Empire function; they are formal constructs that provide the vitality to network logics, yet they also identify a territory of control points, super connected hubs of potential leverage within a design context where information is exchanged and regulated. They are trans-scalar or non-scalar in these terms, and in terms of design may be applied against a material, social or regional condition with equal effect.

As we operate within the terms of this encompassing material and procedural environment governed by protocol, what we might term a *protocology*, there remains the issue of visualization. Identifying and understanding a landscape in protocological terms is necessary before that knowledge can be turned into an active design agenda. In other words, how might a protocological architecture be activated? Following from Watts and Strogatz, a protocological architecture necessarily exists in the in-between space, the topological fold of both an empowering infrastructural ambience, and points of concentration which effectively organize that ambience. Technically progressive, yet without an object oriented focus a protocological architecture provides scope for the subject to re-emerge, described and empowered by their constitutive role as design agents. Through negotiating the potentials of material, organizational and political latency, an *intersubjective* rationalist schema of material and spatial intelligence may be possible. A protocological architecture is an architecture of organization, negotiation and management whose home is the complexity of the data base over the romance of the napkin sketch.

In architecture we are already witnessing a meta-structural moment, through a renewed appreciation of organizational schema in terms of coding and material patterning as a rich source for design. In this sense a protocological practice is emerging in the hands of a maturing and dexterously digital generation, adept with the abstraction of organization diagrams and network complexity as much as the abstraction of code as a new open source standard of visualization and a living meaningful language. Similarly, as a generation of users executing a mastery over media, engaging with a two-way interactivity completely unlike unidirectional traditional media and architecture is an expectation. In this mediated and interactive environment, assembly and organization create meaning on the fly, forecasting the transformation of the architect necessarily along the lines of the negotiator. Design becomes the ability to schematize organizational structures and activate relationships using unique, purpose-built and intelligent software tools.[52]

Understanding the vanishing of the object into an empathetic appreciation of field, presence, process and the immanent, establish a vector of exploration for both the architect as its own subject, and the ambitions for novel forms of spatial articulation which can accommodate this form of topological complexity not as a formal metaphor, but as an open protocological schema. Recognizing the opportunities within the pliable topology of network geometries a protocological

architecture allows for the realignment of both semantic aspect of networks to their advanced technical and political condition that have become uncoupled in design through its inclusive organizational and pre-formal logic. A protocology of place and practice creates opportunities for architecture to again address broader questions of space and meaning, politics and power that have recently been largely ignored by the vanguard in favor of superficial obsessions, or obsessions *with surface*, centered on the recent yet strangely exhausted technologies of CNC routers and 3D printers.

While networks were a visionary apparatus initially for the technologically impelled megalomania of the likes of Buckminster Fuller and Constantinos Doxiadis[53], before transforming and humanizing into the radical visions of the 60's, today they have exchanged their polemical capacity for a ubiquitous materiality and agency. Less talk, more action. As Castells continuously points out, the network paradigm is not only technological, but social and economic, and it is now that we need to construct a critical and creative practice that recognizes this condition. In contemporary architectural terms, network practices have been couched in an almost single minded techno-utopian revival of a happy and inevitable past-future, with a *Marimekko* patterned aesthetic to match. However by attempting to continually synthesize the complexities of the political and material aspects of networks, by embracing this dynamic, architecture is able to construct a new form of generative and creative practice, perhaps even while coming to terms with its new subject. While being overwhelmed by a tsunami of technical affordances, architecture needs once again to critically interpret their human value through the spatial consequences and opportunities of the flows that have been put in motion by the technologies we have so eagerly consumed.

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[1] Walter Gropius in *Scope of Total Architecture,* (Harper and Row publishers, NY, NY) 1943, p75

[2] Gilles Deleuze and Felix Guattari, "A thousand Plateaus; Capitalism and Schizophrenia" (University of Minnesota Press, Minneapolis) 1987, p500

[3] Clay Shirky, Rip the Consumer, http://www.shirky.com/writings/consumer.html accessed 06.20.06 Shirky writes, "We have often heard that Internet puts power in the hands of the consumer, but this is nonsense -- 'powerful consumer' is an oxymoron."

[4] Michael Hardt and Antonio Negri, *Empire,* (Harvard University Press, Cam. Mass) 2000

[5] Alexander Galloway, *Protocol: How control exists after decentralization,* (MIT Press, Cam. Mass) 2004, p147

[6] See Mark Wigley, "Network Fever" in *Grey Room 04*, (MIT Press, Cam. Mass) summer 2001, and Simon Sadler, *Archigram; Architecture without Architecture* (MIT Press, Cam. Mass) 2005, as examples of more detailed discussions.

[7] This is not to ignore the fact that Archigram and other radical practices of the 60's and 70's era did build, and did position their practices and work in some instances as very real proposals for real spaces. However the majority of their work, and their self confessed interest in media and employing new tools of architectural production such as the 'zine *archigram*, makes their work important for the discourse it generated, the new tools of production they championed, the utopia's they imagined and the establishment they sought to undermine.

[8] Paul Baran's paper, "On Distributed Communications: 1 Introduction to Distributed Communications Networks", Rand Corporation Memorandum, RM-3420-PR, August 1964 is generally recognized as the research model that gave rise to the network logics that underpin the internet as we know it today.

[9] McLuhan, Marshall, "The relation of the environment to the anti-environment" in Marshall McLuhan – Unbound (04), (Ginko Press, Corte madera) 2005, p 15, First published ??

[10] Manuel Castells, *The information age: Economy, Society and Culture Volume 1, The Rise of the Network Society,* (Blackwell publishing, Malden USA) first published in 1996, second edition 2000, p500

[11] Alexander Galloway, Protocol: How control exists after decentralization, (MIT Press, Cam. Mass) 2004, p8

[12] Michael Hardt and Antonio Negri, *Empire,* (Harvard University Press, Cam. Mass) 2000, Manuel Castells, *The information age: Economy, Society and Culture Volume 1, The Rise of the Network Society,* (Blackwell publishing, Malden USA) first published in 1996, second edition 2000, Alexander Galloway, Protocol: How control exists after decentralization, (MIT Press, Cam. Mass) 2004

[13] Netcentric Warfare is an initiative launched by the US Secretary of Defense Donald Rumsfeld in 2003. This topic was perhaps first studied by John Arquilla and David Rosenfeldt in publications such as, *The Advent of Netwar*, Rand Monograph report, (Rand Institute) 1996, and *Networks and Netwars: The future of terror crime and militancy,* (Rand) 2001

[14] Gert Lovink & Florian Schneider, "Notes on the State of Networking", Makeworlds-Paper no. 4, Submitted by fls on Sun, 04/04/2004 - 16:51. http://makeworlds.org/node/100 accessed 05.26.06

[15] Frederic Jameson "The cultural logic of late capitalism," in *Postmodernism, or the cultural logic of late Capitalism.* (Durham: Duke University Press)1991, p44, and quoted in Brian Holms, "Counter Cartographies" in Janet Abrams and Peter Hall (eds.), *Else/Where: Mapping, New cartographies of Networks and Territories*, (University of Minnesota Design Institute, University of Minnesota Press, Minneapolis MN) 2006, p20

[16] Verizon Wireless, a San Francisco Bay area advertising campaign 2005-2006

[17] As a recent example of the complex topology of the conflated infrastructural political and media networks, in the first days of the Israeli campaign against Hizbolla in July 2006, text messages were being sent by unknown sources into Lebanon warning of impending bombings that never happened. Whether this was a propaganda campaign or a real warning and from which faction in the conflict was never clear, yet the response from citizens was immediate and proliferated widely.
[18] Eugene Thacker "Forward: Protocol is as Protocol does" in Alexander Galloway, *Protocol: How control exists after decentralization,* (MIT Press, Cam. Mass) 2004, p xviii
[19] McLuhan, Marshall, "The relation of the environment to the anti-environment" in Marshall McLuhan – Unbound (04), (Ginko Press, Corte madera) 2005, p 17 First published ??
[20] Hertzian space: A term derived from the name of German Physicist Heinrich Rudolf Hertz (1857-1894) who was the first to produce electromagnetic waves artificially. The concept of Hertzian space was popularized by Anthony Dunne in his book *Hertzian Tales: Electronic Products, Aesthetic Experience and Critical Design* (Royal College of Art, 1994) and later expanded on in the 1998 essay "Tunable Cities" co-authored with Fiona Raby in *Architectural Design* (November-December 1998), as well as in their book *Design Noir: The Secret Life of Electronic Objects* (Birkhauser, 2001). Thanks to Alison Sant for this background.
[21] Mark Weiser considered to be the father of ubiquitous computing. For more see http://www.ubiq.com/weiser/
[22] Mark Weiser, "The Computer for the Twenty-First Century," *Scientific American,* pp. 94-10, September 1991, online at http://www.ubiq.com/hypertext/weiser/SciAmDraft3.html
[23] In fact these venues hae been operating in parallel with the development of the internet, yet they have matured from frail beginnings into hubs for critical reflection on new media, networks and other internet related issues.
[24] See Christopher Hight and Servo, this volume
[25] Manuel Castells, *The information age: Economy, Society and Culture Volume 1, The Rise of the Network Society,* (Blackwell publishing, Malden USA) first published in 1996, second edition 2000, p3
[26] Gert Lovink & Florian Schneider, " Notes on the State of Networking", Makeworlds-Paper no. 4, Submitted by fls on Sun, 04/04/2004 - 16:51. http://makeworlds.org/node/100 accessed 05.26.06
[27] I first used this phrase in my own practice around 2003, but was reminded of it recently in an article on Mark Lombardi by Frances Richard published for the online magazine Wburg.com in the winter of 2002 and in part in the Book Mark Lombardi Global Networks, that accompanied his exhibition curated by the Independent Curators International (ICI), New York in 2003. The quote reads, "In combination, the two terms epitomize the figure of the artist as compulsive articulator, a solitary node tying collective experience together." Frances Richard, *Toward a diagram of Mark Lombardi* in Wburg.com, (http://wburg.com/0202/arts/pdfs/lombardi.pdf), p7, accessed june 12th, 2006
[28] Robert Hobbs, *Mark Lombardi Global Networks,* (Independent Curators International (ICI), New York) Published to accompany the traveling exhibition, *Mark Lombardi Global Networks,* 2003, p49
[29] Robert Hobbs, *Mark Lombardi Global Networks,* (Independent Curators International (ICI), New York) Published to accompany the traveling exhibition, *Mark Lombardi Global Networks,* 2003, p96
[30] Robert Hobbs, *Mark Lombardi Global Networks,* (Independent Curators International (ICI), New York) Published to accompany the traveling exhibition, *Mark Lombardi Global Networks,* 2003, p13
[31] Edward R Tufte's book *Envisioning Information*, (Cheshire, Conn.: Graphics press) 1990 provided amongst other sources, a foundation for the development of Lombardi's *Narrative Structures.*
[32] Robert Hobbs, *Mark Lombardi Global Networks,* (Independent Curators International (ICI), New York) Published to accompany the traveling exhibition, *Mark Lombardi Global Networks,* 2003, p14
[33] Robert Hobbs, *Mark Lombardi Global Networks,* (Independent Curators International (ICI), New York) Published to accompany the traveling exhibition, *Mark Lombardi Global Networks,* 2003, p52
[34] Robert Hobbs, *Mark Lombardi Global Networks,* (Independent Curators International (ICI), New York) Published to accompany the traveling exhibition, *Mark Lombardi Global Networks,* 2003, p52
[35] Duncan Watts and Steven Strogatz, "Collective Dynamics of Small World Networks" Nature Vol 393 (Macmillan Publishers Ltd), June 4, 1998, p440
[36] Brandon Hookway, *Pandemonium, The rise of predatory locales in the postwar world,* (Princeton Architectural Press, NY NY) 1999, p81
[37] Gert Lovink & Florian Schneider, " Notes on the State of Networking", Makeworlds-Paper no. 4, Submitted by fls on Sun, 04/04/2004 - 16:51. http://makeworlds.org/node/100 accessed 05.26.06
[38] Hacktivism is the fusing of hacking and activism. For various definitions of tactical media See www.nyu.edu/fas/projects/vcb/definingTM.html
[39] Gert Lovink & Florian Schneider, " Notes on the State of Networking", Makeworlds-Paper no. 4, Submitted by fls on Sun, 04/04/2004 - 16:51. http://makeworlds.org/node/100 accessed 05.26.06
[40] CAIDA The Cooperative Association for Internet Data Analysis, at the University of California, San Diego, see http://www.caida.org/home/
[41] J.J.King, "The Node Knows", in Janet Abrams and Peter Hall (eds.), *Else/Where: Mapping, New cartographies of Networks and Territories*, (University of Minnesota Design Institute, University of Minnesota Press, Minneapolis MN) 2006, p44
[42] Wikipedia defines locative media as a "media of communication bound to a location. They are digital media [0]applied to real places and thus triggering real social interactions." http://en.wikipedia.org/wiki/Locative_media accessed 07.08.06. See Drew Hemmets article entitled, Locative Dystopia (2004) <http://www.drewhemment.com/2004/locative_dystopia_2.html> (accessed July 2006), reference courtesy of Alison Sant.
[43] For more on Locative media, see http://www.locative.net/
[44] http://realtime.waag.org/
[45] http://www.pdpal.com/

[46] See also Alison Sant, *Redefining the Basemap*, http://www.alisant.net/alison_sant_basemap.pdf Sant would argue that by relying on the base map that they reinforce our notions of spatial hierarchy which could be transformed by thinking about networks as another spatial organization.
[47] Keller Easterling has conducted significant research into this kind of ecology since the mid 1990's. See Keller Easterling, *Organizational Space: Landscapes, Highways and houses in America,* (MIT Press, Cam. Mass) 2001, *Network Ecology* 1995, Siting Protocols 1997, and others. See, www.panix.com/~keller
[48] Walter Gropius in *Scope of Total Architecture,* (Harper and Row publishers, NY, NY) 1943, pxxi
[49] Sadler, Simon, *Archigram; Architecture without Architecture,* (MIT press, Cam, Mass) 2005, p93
[50] Michael Hardt and Antonio Negri, *Empire,* (Harvard University Press, Cam. Mass) 2000, pxii
[51] Alexander Galloway, *Protocol: How control exists after decentralization,* (MIT Press, Cam. Mass) 2004, p75
[52] For further exploration of this point see, Anthony Burke, "After BitTorrent; Darknet to Native Data", in Chris Hight and Chris Perry (eds.), *Collective Intelligence,* AD, (Wiley Press, London) forthcoming Spring 2007
[53] See Mark Wigley, "Network Fever" in Grey Room 04, (MIT Press, Cam. Mass) summer 2001 for more on the relationship between Doxiadis, Fuller and McLuhan.