EXPLORATIONS

DIGITAL

CULTURES

BURKHARDT

SHNAYIEN

GRASHÖFER

Weather or Not: On Digital Clouds and Media as Environments

Tim Othold

Bibliographic information:
Othold, Tim. 2020. “Weather or Not: On Digital Clouds and Media as Environments.” In *Explorations in Digital Cultures*, edited by Marcus Burkhardt, Mary Shnayien, and Katja Grashöfer. Lüneburg: meson press. DOI: 10.14619/1716 <Online first version>.

CLOUD

COMPUTING

NETWORKS

MEDIA PHILOSOPHY

Weather or Not: On Digital Clouds and Media as Environments

Tim Othold

The cloud, as a metaphorical and cultural framing of certain aspects of the digital interconnectivity grounding important social and political interaction, is sometimes seen as contradicting and misrepresenting its own technical reality. It seems to obscure the network protocols and data centers it emerges out of. This article explores how instead of a simple contradiction, the cloud as a deliberately vague concept enables shifts in meaning and practice and how this contrasts with the metaphor of the network. This includes a move from a predominantly topographical to a more process-based understanding—ultimately resonating with broader tendencies in media theory to conceptualize media as environmental or atmospheric.

More than a decade ago "the net" had already been characterized as a "semantic index-fossil" (Schüttpelz 2007, 25; translation T.O.), as a metaphor and term so ingrained in popular and academic discourse as to become a benchmark for other metaphors. Despite the implied critique of having become fossilized that evokes connotations of becoming rigid as well as obsolete, the media-technological configuration designated by this metaphor has even gained in importance since. The vision of the Internet of Things is but one prominent example of this—with a myriad of interconnected objects, networked systems and agents, from smart homes and self-driving cars to smart cities, wearables and innumerable electronic tags. However, this metaphor is now faced with competition. Whereas in the 1990s the "network," along with the "web," served as a prime conceptual prism to understand the inner workings of social, technological, and political interaction (Castells 2009; Galloway and Thacker 2007; Schröter 2004), the "cloud" seems to have become increasingly central to these interactions in recent years, especially regarding how we store, analyze, and use data:

> [T]oday it is no longer the web, with its clear distinction between logged-in and logged-out (or online and offline) states as well as its more or less explicit suggestion of capture, that describes the most novel, hyped, and advertised form of the distributed network. Today it is the cloud, with its privileging of perpetual connectivity over presence and its presentation of a conceptual immateriality that carries no obvious suggestion of entrapment or capture, that is increasingly invoked in the popular and commercial framing of work and leisure computing. (Franklin 2012, 446–447)

In comparison to the network the notion of the cloud points toward an infrastructural reconfiguration: in the cloud, hardware and software are outsourced to data centers and accessed remotely—infrastructure, platforms, and data processing capacities have become a service, with many users and few providers (Amoore 2017, 4). This infrastructural shift, however, points to an apparent incongruity between the metaphor of the cloud and the technical structure it refers to. With their impressive server arrays and equally impressive cooling and energy needs, the data centers have a concrete materiality that, together with the actual processes, protocols etc. of the network (Galloway and Thacker 2007; Sprenger 2015), seems at odds with the more lofty connotations of a cloud. Franklin identifies this as a contradiction "between the specific material possibilities and limitations afforded by computer technologies and the way these technologies are culturally framed as immaterial sources of boundless

possibility" (Franklin 2012, 444). Or, more concisely, as a "contradiction between technical materiality and conceptual immateriality" (Franklin 2012, 445). Others have highlighted this contradiction as well, usually to focus on topics such as the geopolitical consequences of the data centers' locations (Amoore 2017), the shifts in power, and the practices resulting from the centralization of data (Bratton 2015, 29; Mosco 2014), or to generally emphasize the underlying materiality of the cloud (Bolin 2014; Cubitt, Hassan, and Volkmer 2011; Holt and Vonderau 2015).

It is important to stress here that digital clouds are not regarded as, strictly speaking, replacing or superseding digital networks. In fact, as Franklin himself indicates in the quote above, the cloud can be understood as being itself a form of a distributed network, albeit distributed differently. Both terms, among others, mainly express certain cultural framings of digital interconnectivity and offer certain perspectives on the processes, practices, and (infra)structures they refer to, each emphasizing different facets over others.[1] The common thread of many academic dealings with the digital cloud is in this sense a critique that the metaphor, in its implication of immateriality, obscures the actual platforms and algorithms, the code and cables that are seen as key to an effective understanding of digital interconnectivity.

This materialistic approach, while no doubt important and worthwhile, is however not without its own problems. As Tung-Hui Hu points out, *both* networks and clouds are simultaneously material objects and ideas, both a media-technological configuration and "a state of *desire*" (2015, 10). As such, these metaphors and the concepts and assumptions bound to them do not simply contradict or reveal their material reality, but shape how we perceive, understand, and engage with these media.[2] A narrow focus on the contradiction the cloud seemingly embodies thus runs the risk of underestimating the operative ideological and epistemic facets of the metaphor, especially since it is not limited to an implication of immateriality.

1 Another noteworthy metaphor, with its own history and implications, would be the "swarm" (Kelly 1995; Thacker 2004; Vehlken 2012). Closely related to the "cloud," the "flow" and the "stream" are also prominent examples of a changing appreciation and framing of digital media (see Denecke in this volume). Although whereas the cloud points to structural and environmental aspects of media-technological connections, flow and stream tend to focus on data transmission and user experience.

2 This is especially relevant in the case of digital media, where designations can quickly lose their metaphorical status (van den Boomen 2014, 12; see also Blumenberg 2015). The operative and epistemic dimensions of metaphorical descriptions, specifically regarding the development of information technology, are also discussed by Busch (1998) and Tholen (2002, 19–60).

Importantly, the cloud also implies environmentality. Indeed, there is a meaningful interplay between real and metaphorical clouds: media technologies and their use are increasingly being discussed regarding their ecological consequences (Maxwell, Raundalen, and Vestberg 2015; Acland, Parks, and Starosielski 2015). Similarly, clouds, extreme weather, and climate are being portrayed and constructed as media events, with important social, political, and commercial consequences (Leyda and Negra 2015).[3] More and more data centers are switching to "greener"—and more marketable—energy sources such as solar and wind, resulting in a digital cloud that is at least in part powered by actual wind and weather (Green House Data 2020; Data Center Knowledge 2017; Sverdlik 2013).[4] Moreover, the metaphor of the cloud resonates with the significant transfer of ecological terms and concepts into media theory and the widespread description of media as underlying, atmospheric, and explicitly or implicitly environmental (Hörl 2017; Thrift 2004b; Hansen 2015; Heise 2002; Voss 2010; Gabrys 2016).

Rather than simply contradicting or misrepresenting its material and technical reality, the metaphor of the cloud and its very success can thus also be seen as part of a larger trend to conceptualize and understand media with regard to environmental aspects. A prominent example of this very trend, which will serve as the starting point for the rest of this paper, can be found in the work of John Durham Peters, who argues for an understanding of media as ontological: he not only speaks of media as environments, but also proposes to think of environments as media, and both as "an infrastructure of being" (Peters 2015, 10). For him, media are not merely human artifacts and intentional means of storing and transmitting information—along with natural environments they are "repositories of readable data and processes that sustain and enable existence" (Peters 2015, 4). They are "elemental media" and are productive of meaning without requiring a human subject or mind (Peters 2015, 380).

The explicitly digital clouds mostly remain on Peters' horizon[5] due to his primary focus on more time-honored kinds of media, like oceans, fire, boats, calendars, and of course writing. He does however deal with actual

3 Clouds and their representation are of course also a long-standing subject of art history (Damisch 2013). For examinations of clouds as objects of media in a more general sense, e.g., as a linguistic motif or regarding the distinct visuality of mushroom clouds, see Engell, Siegert, and Vogl (2005).

4 The weather can also disrupt the cloud, as in 2012 when a hurricane took out several unprepared data centers in New York (McNevin 2012).

5 Peters (2016) does engage with the digital cloud in a later text, albeit still focused on the linguistic, artistic etc. roots of the motif.

clouds, especially in the context of their portrayal in paintings. Here their fleeting form challenges the painter, as "[t]heir atmospheric logic defies the grid logic" of linear perspective (Peters 2015, 256). Clouds are:

> neither matter nor form, their vapory being tests the outer limits of representation. You can't specify their forms in terms of surfaces, and clouds raise the old philosophical problem of the heap—it is impossible to say where the boundary lies. (Peters 2015, 256)

It is no coincidence that the subject of clouds in particular is informed by and exposes a central theme of Peters' approach: the epistemological value of vagueness (Peters 2015, 382). It is vagueness that is a central characteristic of "elemental media," where it does not obscure meaning, but leaves it open. In keeping things indefinite, vagueness is productive and enables creativity and change. Thus, for Peters, "vagueness, it may be, is a good thing" (Peters 2015, 348).

According to Peters, traditional clouds can be understood as environmental and infrastructural media that allow figuration, creativity, and production of meaning not in spite of, but because of their vagueness. In the following, I aim to take a similar approach with respect to digital clouds. I propose that not only does the infrastructure of the cloud—its combination of technological devices, practices, and operations—become environmental in Peters' sense, but epistemically framing this part of our media infrastructure with the vague metaphor of the cloud does not simply obscure meaning, but enables it: the metaphor of the cloud promotes thinking about storms and silver linings in ways the network did not (Hagel and Seely Brown 2010; Cubitt, Hassan, and Volkmer 2011). From a media philosophical perspective, I will therefore explore how the cloud and the network differ in their framing of digital connectivity and collectivity. For this, I will expand upon the initial discussion of networks and clouds, highlighting and contrasting specific assumptions about these concepts, especially regarding their distinct topologies. My aim is not to propose yet another criticism or alternatively praise of cloud computing. Rather I am interested in developing, firstly, a broader perspective on digital networks and clouds as simultaneously both objects and ideas and to ask, secondly, how this perspective might inform new approaches for thinking about media in general. My goal here is thus not to replace one metaphor with another, nor to redeem either of the terms against possible and actual critique, but to examine how, similar to the painted cloud challenging the linear perspective of the painting, the concept of the digital cloud challenges the diagrammatical perspective of the network. What does it

mean when the "atmospheric logic" of one defies the "grid logic" of the other, and how does this reflect back on an understanding of (digital) media as environments?

Groundwork

Besides making a case for vagueness, Peters considers media as "infrastructures of being." For this he draws on two fundamental thinkers of media theory: from Marshall McLuhan he takes an awareness of the ontological dimensions of media and the effects they invariably have on their content and their users. To this he adds Friedrich Kittler's well-known observation that "media determine our situation" (Kittler 1999, XXXIX), as well as the hardware-centric thesis "Nur was schaltbar ist, ist überhaupt" (Kittler 1993, 182). Peters, however, reformulates Kittler's original claim when translating it as "Only that which is networkable or switchable exists at all. If Google can't find you, you don't exist. Wiring precedes being" (Peters 2015, 26–27). In this dialogue of thinkers, the interpretation of McLuhan's *Understanding Media* shifts, highlighting a different, more literal meaning of "under-standing": "infrastructural media are media that stand under" (Peters 2015, 33). Media as well as environments are infrastructural in the sense that they "stand under" our worlds. A common goal of both media theory and a rising interest in conventional infrastructure would thus be to bring them into the foreground and make them visible.

A core aspect of this infrastructural dimension of media, then, is not media's ability to store and transmit information as much as their quality of being a background, a condition of possibility for storage and transmission that itself tends to become invisible or at least elude direct attention. It is therefore significant that Peters proposes to translate Kittler's "schaltbar" not only as "switchable," which would be a direct translation, but also as "networkable." The network has indeed become infrastructural and a condition of possibility, equally in the sense of an arrangement of interconnected entities such as computers and people, and as a concept for thinking about these very connections. After all, Schüttpelz's rebuke of the network being a "fossilized" metaphor is precisely a reaction to how fundamental it has become. In considering these networks, questions of subjectivity, agency, and of shifts in political power have been especially pertinent. The (digital) networks have been discussed regarding their "protocol" (Galloway and Thacker 2007; Sprenger 2015), as "contagious" (Chun 2017, 25), as a new condition of meaning (Hörl 2011), from the direction of actor–network theory, and even as a "technological

unconscious" (Thrift 2004a, 2004b). Broadly, they are considered as architecture and infrastructure that, combined with certain practices and procedures of media and relevant discourse, evoke and shape forms of political and social collectivity and action.

It is therefore important not only to note that the term network describes and evokes connectivity and distributed agency, but to pay close attention to the manner in which it does so. A few years ago Ramón Reichert (2012) examined the political power that political, social, and media theory attribute to networked collectives such as web communities and online activists, with an explicit focus on the technical infrastructure grounding them. He considers this "power of the many" as a collective form of political subjectification, re-envisioned through the means of technological networks.[6] Reichert points out that these collectives actually have very little influence over the architecture that affords them their power: they can neither make decisions regarding the technical coordination of their communication nor in most cases determine the details of the software they use—the protocols are outside of their limited sphere of power. Networks are thus both means and condition of this kind of political power:

> If technological networks and media technology can be seen as constitutive parts of the figurations and relations of power, then a topological composition of collectivity can be genuinely assumed. Collectivity can in this sense be seen as a network of power, that is invariably constituted both socially and technologically (Reichert 2012, 13; translation T.O.).

Reichert points out that networks are neither inherently decentralized nor inherently free of forms of control—they just enact control differently. More importantly, Reichert calls attention to the "topological composition" of networked collectives and to how control and relations of power are processed in topological terms: the political power of the networked many is dependent on questions of inclusion and exclusion, of borders and notions of borderlessness, and on distances and the occupation of new, possibly virtual, spaces. An understanding of networks thus requires an understanding of the spatial logic implied by the concept of the network.

6 Interestingly, Reichert mostly concentrates on the appropriation of political power by individuals, employing or seemingly representing and then speaking for the faceless collective—meaning he technically does not actually deal with "the many." The problematization of speakers and leaders also brings to mind other schools of thought on political collectivity, e.g., crowd psychology in the vein of Gabriel Tarde and Elias Canetti, although Reichert himself does not explore these connections.

Reichert claims that this spatial logic is mostly treated as a premise and not itself examined as an epistemic condition (Reichert 2012, 19).

A possible example of the epistemic dimension of the spatial logic of networks can be found in Manuel Castells' well-known discussion of the network society, where he highlights how networks transform the traditional spatial structuring of society. Castells is interested in space not in a strictly physical sense, but in "space as a social form and a social practice" (Castells 2009, XXXI), i.e., in how physical distance, contiguity etc. frame and shape social practice. Whereas before digital networks communication and social practice were contingent on the proximity of people and were concentrated at certain *places*, e.g., cities, under the influence of networks they are increasingly independent from physical distance or location. They instead occur in the form of *flows*.

> This new form of spatiality is what I conceptualized as the *space of flows*: the material support of simultaneous social practices communicated at a distance (Castells 2009, XXXII).

In the form of the "space of flows" the network for Castells thus reconfigures the traditional spatial logic of society on multiple levels. Flows of capital redefine power, flows of people and flows of information change the meaning of distance and the time of communication.

> In this network, no place exists by itself, since the positions are defined by the exchanges of flows in the network. Thus, the network of communication is the fundamental spatial configuration: places do not disappear, but their logic and their meaning become absorbed in the network (Castells 2009, 442–443).

The diagrammatical roots of the term network become apparent here. As Schüttpelz describes in his examination of the "semantic index-fossil," the technique of the diagram has been a major catalyst in uniting the different genealogical facets of the term network and establishing it as a concept applicable to humans and devices as well as infrastructures and societies. Accordingly, Castells' "space of flows," ostensibly reconfiguring society on a fundamental level, is ultimately comprised of "nodes" and "edges" (Castells 2009, 501), of lines and vectors either intersecting or not, turning cities into "mega-nodes" (p. XXXVIII) and superimposing virtual and actual spaces.

In conceptualizing the network society using those terms, Castells underscores the pervasiveness of the effects of networked information technologies. He also demonstrates the epistemic dimension that Reichert pointed out, in that conceptualizing space in network terms changes what

space means. Castells' work on the network society is not just a neutral description of an important media-technological development—it is a diagnosis of how information technologies can change our ideas of distance, location, communication, and so on. The network in this case is more than topological—it is topographical in the sense that it inscribes the diagrammatical, spatial logic of networks into the situation it describes.[7] As Wendy Chun puts it: "Networks create and spawn the reality they imagine; they become self-fulfilling prophecies" (Chun 2019, 66). The concept reorders the relationships it is applied to, casting social relations and technological connections alike as lines, their directions and intersections not necessarily corresponding to their actual activity. Both social and technological connections are rarely static in practice, but can be intermittent, change dynamically, have varying intensities etc. Topographically framing them as a network can therefore indeed obscure certain aspects of them. Uncritically framing the complex media-technological configurations of decentralized computing as networks can also facilitate projecting their inherent relations of power, their distribution of agency etc. as a conceptual space "reduc[ing] real-world phenomena to a series of nodes and edges" (Chun 2019, 70), privileging space over time and leading to an emphasis on dichotomic distinctions, such as the seemingly "clear distinction between logged-in and logged-out" that Franklin remarks on. In this light, any notion that the metaphor of the network is more accurate or more apt than the metaphor of the cloud is at least doubtful.

Evaporation

The cloud as a metaphor carries with it associations of knowledge both obscured and revealed. Visually, and as a motif in mythology and art, clouds are often without clear boundaries, possibly concealing something, yet transcendent—as epitomized by the cloud-chorus in Aristophanes' play *The Clouds*, whose mention seems to be almost mandatory when dealing with this metaphor (Franklin 2012; Mosco 2014; McKinsey 2009; Peters 2016, 56). The cloud is therefore not only vague as a metaphor, but it specifically expresses a sort of ambiguous continuity, between sky and earth, between figure and ground, between audience and play, or between user and hardware. Clouds in this sense are something fundamentally in-between and, as such, a medium (Franklin 2012, 451).

7 Networks, as well as clouds, could in this context also be considered an example of what Engell and Siegert (2019) call ontographical media.

In contrast to the network, the term cloud therefore suggests a different, less binary framing of digital interconnectivity. It also, as mentioned before, might seem at odds with the concrete architecture of server farms and data centers—themselves frequently situated underground—that constitute the digital cloud. Franklin reinforces this opposition:

> In contrast to the older web or rhizome model of a network that (to use the language of the mathematical discipline of network theory) presents a series of nodes (the individual computers, with their own local software and hardware) connected by edges or lines of communication, the cloud makes both hardware and software resources as well as data accessible from any device that falls within an amorphous blob or atmosphere of computability (Franklin 2012, 458).

Despite their differences, the network and the cloud here parallel each other in that their respective practical and conceptual dimensions both coincide. The concept of the cloud is understood as operative and consequently in an "oscillating role between environment [...] and agency" (Franklin 2012, 446), similar to Aristophanes' chorus. This is where, for Franklin, the problem and the contradiction arise regarding the metaphor of the cloud. Instead of expressing a binary logic, where nodes are either connected or disconnected, the cloud metaphor suggests a continuous environment, in which the boundaries of individual devices begin to blur. He concludes:

> The cloud is a form of mediation, a representation of immateriality and smoothness that both effects and obscures the functions of a structured, striated grid that is the only representation of a world that is possible within the technical functionality of the digital computer (Franklin 2012, 458).

For Franklin, the cloud effects and naturalizes the structured, networked logic of the digital computer through its misrepresentation of it. In his analysis, primarily oriented towards political critique, the cloud reveals itself to be an instance of a logic of digital control, building on and extending a Deleuzian society of control (Franklin 2015).[8]

It is indeed important to point out the technological reality of the cloud or rather of cloud computing: the digital cloud emerges from networked

8 Hu (2015) offers an alternative perspective: for him the cloud does not represent a shift from Foucault's model of disciplinary power to Deleuze's control society, but as a deeply historical and cultural phenomenon enables the reemergence of still older forms of sovereign power.

computers, their infrastructures and protocols. However, it is equally important to recognize the significant differences and shifts cloud computing entails in practice. The rise of data centers, the centralization of data, and the consequences thereof have already been mentioned. Closely related to this is the development of devices and software that can actually make use of these remote processing capacities. Experiments such as smart thermostats directing connected appliances to reduce their energy use in accordance with the current load on the power grid and common energy usage patterns (Nest 2017) would not have been possible, or at least not feasible, before cloud computing. Especially as a platform for big data, the cloud enables the use and coordination of a host of new sensors, algorithms and data sources, including new modes of surveillance and excessive profiling. Regardless of whether the result is useful or discomforting, this allows for new methods and new kinds of knowledge: "The cloud promises to transform not only what kinds of data can be stored, where, and by whom, but most significantly what can be discovered and analysed of the world" (Amoore 2017).[9] It can also be argued that in deriving value from the aggregation and analysis of data, be it Google search patterns, information about traffic flows, or intimate details broadcast to social media, this development decidedly changes the meaning of productivity and work (Schröter 2015, 2017).

While the cloud may thus be implemented similarly to the network on a purely technological level of computers being interconnected, it is difficult to deny that the practices it affords are different as well as the ways of collecting and handling data. Even Reichert, in his emphasis on the technical architecture and rules informing the "power of the many," recognizes that the collective users interpret these structures in their own way and do not necessarily perceive them as restrictions but rather as a malleable resource (Reichert 2012, 23). Consequently, the cloud, understood not just as a deceptive mediation of technical functionality, but rather as a combination of technology, conceptual framing, and evolving practices, does more than simply obscure and thereby effect the landscape

9 A more extreme version of this line of thought is the idea that this transformation results in "freeing" science from the necessity of hypotheses and theory, because connections and conclusions would just emerge out of big data: "No longer do we necessarily require a valid substantive hypothesis about a phenomenon to begin to understand our world. [...] In place of the hypothesis-driven approach, we can use a data-driven one. Our results may be less biased and more accurate, and we will almost certainly get them much faster" (Mayer-Schönberger and Cukier 2014, 55). While a data-driven approach proves useful in some instances, equating this to an "accurate understanding of the world" is extremely problematic.

of the network—it changes it. In blurring the distinctions between device and network and between nodes and edges, at least to a certain degree, the cloud—or rather its media-environment—challenges the binary grid logic of the network and consequently the diagrammatical understanding of space underlying it. Conceptually as well as practically the cloud is no simple "contradiction between technical materiality and conceptual immateriality" but can in its vagueness be productive of new meanings and new practices—like networks clouds can "spawn the reality they image." Its logic of continuity in particular suggests not simply viewing networked computers as being integrated into the existing environment, but as merging with it, thus changing what environment means.[10]

One example of such new practices can be seen in a recent extension of the cloud metaphor: the fog.[11] This term refers to a concept in the realm of information technology that is aimed at answering certain weaknesses of cloud computing. While the cloud does dissolve some distinctions, it remains bound to the distinction of local and global: local devices access a globalized pool of computing resources. These devices are therefore somewhat dependent on their connection to the cloud and on the speed of that connection, which can be a problem for very time-sensitive applications or highly mobile devices such as, respectively, medicinal equipment or autonomous vehicles.

> We argue that a new platform is needed to meet these requirements; a platform we call Fog Computing, or, briefly, Fog, simply because the fog is a cloud close to the ground (Bonomi et al. 2012, 13).

A "cloud close to the ground" in this case means pooling the computing resources not of remote servers, but of other local devices and employing them for real-time, mobile, time-sensitive cases, while the more distant cloud is used for more overall, long-term analysis and processing (Bonomi et al. 2012; Bonomi et al. 2014). For example, autonomous vehicles, smart traffic lights, and other nearby devices might form a local "fog" to deal with the immediate traffic situation without the need of remote processing power.

10 For instance, Jennifer Gabrys (2016) discusses the proliferation of networked sensors, cameras, and similar devices as leading to the emergence of an actively sensing and resonant environment, in which computing itself has become environmental, fundamentally changing human experience and action.

11 For an overview of fog computing, its characteristics, applications, and integration with the Internet of Things, see Atlam, Walters, and Wills (2018).

Even though the choice of the term was presumably at least in part influenced by it being catchy, the metaphor of the fog accentuates the cloud: its structure is extended from a centralized core to the edges of the network, effectively resulting in a redistributed network, oriented towards time-sensitivity, low latency, and fluidity.[12] This does not, however, necessarily promote simply replacing the privilege of space inherent in the network with a privilege of time inherent in the cloud and fog. Indeed, the quickening of the cloud is achieved through spatial means: "The main task of fogging is positioning information near to the user at the network edge" (Abdelshkour 2015). Instead of a new but familiar opposition of space and time, which would, in a way, continue to follow the binary logic of a network, the cloud and the fog again seem to suggest a more continuous relation.

Condensation

Metaphors such as cloud, network, or web are not just descriptive but prescriptive. They condense cultural framings and change how we conceptualize and interact with digital technology and media. Consequently, an understanding of these media should not reduce them to their technological base but also attend to their operativity. Especially as environments and what Peters calls "infrastructures of being," media encompass technological frameworks as well as concepts and, importantly, practices: "Media are ensembles of natural element and human craft" (Peters 2015, 3). Exploring the network and the cloud as relatively recent forms of media-environments therefore first of all stresses how both not only enable, connect or transmit, but how they have an effect on what is being enabled, connected or transmitted—how they themselves are media. With regards to the cloud it becomes clear that the metaphor does more than seemingly conceal or contradict this media-technological reality; instead it marks a change in the logic of networks, where nodes, edges, and their distinctions begin to blur. It rescinds the conceptual privilege of space, opening and extending it in the direction of time and flux. And it thereby effects just how we conceive of our networked, interconnected environment and what questions we (can) direct at it. Franklin's recognition that the cloud oscillates between environment and agency in this regard closely

12 This move towards genuinely distributed computing also resonates with the ongoing development of blockchain technologies, not only for financial use, but as platforms for scripting and decentralized programming (see Leistert in this volume), i.e., distributing applications and entire operating systems between multiple, separate devices. One project in this field is aptly named *Ethereum*, coordinating its operations through so-called *Ether*.

mirrors Peters' broader statement that environments and nature have meaning without needing a (human) subject.

Exploring these very current shifts and developments in media-environments, in addition to their political, economical, social etc. significance, naturally raises its own questions, more than can ultimately be dealt with here. Still, with a media philosophical interest in how the concept of the cloud can reflect back upon an understanding of media as environments, one additional point can be made. Years before the rise of the digital cloud and even before Schüttpelz diagnosed the metaphor of the network as fossilized, Joseph Vogl (2004, 2005) wrote about clouds and about flocks, or rather "swarms of birds" (*Vogelschwärme*). He remarks that both tend to confuse the senses, being visually unstable and more a fleeting multiplicity than a consistent object. Bird swarms especially interfere with any act of perceiving them as something definite. Vogl emphasizes that this interference and confusion precedes any attempts at recognition and interpretation. Swarms are first simply seen, as fluttering or rippling, before they can be seen *as a swarm*. Similarly, clouds, as vapor and humid atmosphere, remain transient, lingering on the threshold of becoming visible only under certain conditions, and even then only as an effect of other unseen forces. In this confusion, interference and indefiniteness, "representations of events are overtaken by events of representation" (Vogl 2004, 140–41; translation T.O.).[13] For Vogl, this becomes characteristic of mediality in general and ties in with what he describes as "becoming media"—the coming together of heterogeneous moments, technical devices, symbols, institutional facts, practices, forms of knowledge etc. into a process, irreducible to any of its elements (Vogl 2001). Media in this sense are not devices or practices, nor a simple combination of both, but are fundamentally events, events of transmission that are also transmitting themselves. According to Vogl, a cloud therefore is "not just an unstable temporal object, a dynamic object, that uniquely and irrevocably exists only in time and as a duration. [...] The cloud is emergence and dissipation, the cloud is not an object, but a becoming; the cloud is—this seems to be its essential characteristic—an event" (Vogl 2005; translation T.O.).

Transferring this back to the digital cloud and the network highlights a crucial aspect of thinking media as environmental. The idea of "becoming media" obviously concurs with considering networks and clouds as configurations of technology, concepts, different agents and practices, and also

13 This of course bears a similarity to Serres' (1980) notion of "the parasite," which Vogl (2004, 146) himself notes.

with appreciating these configurations not just as spatial but also temporal. However, understanding them as "events" expressly emphasizes their ephemerality. It means understanding them not as objects, not as more or indeed less topographical constellations, and not even as "infrastructures of being" in any stable sense of the word, but as transitory processes. What the metaphor of the cloud in this sense might ultimately highlight regarding the environmentality of our digital media, the relationship of technological materiality and our conceptual perspective of it, and even the interactions of digital clouds, data centers and actual winds, is that these media-environments, as processes, not simply are, but actively and continually become both: media and environment.

References

Abdelshkour, Maher. 2015. "IoT, from Cloud to Fog Computing." Cisco. Accessed February 3, 2020. http://blogs.cisco.com/perspectives/iot-from-cloud-to-fog-computing.

Amoore, Louise. 2017. "Cloud geographies." *Progress in Human Geography* 28 (6): 1–21.

Atlam, Hany, Walters, Robert, and Wills, Gary. 2018. "Fog Computing and the Internet of Things. A Review." Big Data and Cognitive Computing 2 (2): 10.

Blumenberg, Hans. 2015. *Paradigmen zu einer Metaphorologie.* 6. Aufl. Suhrkamp-Taschenbuch Wissenschaft 1301. Frankfurt am Main: Suhrkamp.

Bolin, Göran, ed. 2014. *Cultural Technologies: The Shaping of Culture in Media and Society*. New York/London: Routledge.

Bonomi, Flavio, Rodolfo Milito, Jiang Zhu, and Sateesh Addepalli. 2012. "Fog computing and its role in the internet of things." In *Proceedings of the fFirst eEdition of the MCC wWorkshop on Mobile cCloud cComputing -- MCC '12*, edited by Mario Gerla and Dijiang Huang, 13–15. New York, New York, USA: ACM Press.

Bonomi, Flavio, Rodolfo Milito, Preethi Natarajan, and Jiang Zhu. 2014. "Fog Computing: A Platform for Internet of Things and Analytics." In *Big Data and Internet of Things: A Roadmap for Smart Environments*. Vol. 546, edited by Nik Bessis and Ciprian Dobre, 169–186. Studies in Computational Intelligence. Cham: Springer International Publishing.

Bratton, Benjamin H. 2015. *The Stack: On Software and Sovereignty.* Software Studies. Cambridge, MA: MIT Press.

Busch, Carsten. 1998. *Metaphern in der informatik: Modellbildung – Formalisierung – Anwendung*. Wiesbaden: Springer Fachmedien Wiesbaden.

Castells, Manuel. 2009. *The Rise of the Network Society.* 2nd ed. The Information Age 1. Chichester: Wiley-Blackwell.

Chun, Wendy Hui Kyong. 2017. *Updating to Remain the Same: Habitual New Media.* Cambridge, MA/London: MIT Press.

Chun, Wendy Hui Kyong. 2019. "Queerying Homophily." In *Pattern Discrimination*, edited by Clemens Apprich, Wendy Hui Kyong Chun, Florian Cramer, and Hito Steyerl, 59–97. Minneapolis: University of Minnesota Press.

Cubitt, Sean, Robert Hassan, and Ingrid Volkmer. 2011. "Does cloud computing have a silver lining?" *Media, Culture & Society* 33 (1): 149–158.

Damisch, Hubert. 2013. *Theorie der Wolke: Für eine Geschichte der Malerei.* Zürich: Diaphanes.

Data Center Knowledge. 2017. "Special Report: Data Centers & Renewable Energy." Accessed February 3, 2020. www.datacenterknowledge.com/special-report-data-centers-renewable-energy.

Engell, Lorenz, Bernhard Siegert, and Joseph Vogl, eds. 2005. *Wolken.* Archiv für Mediengeschichte 2005. Weimar: Verlag der Bauhaus-Universität Weimar.

Engell, Lorenz and Siegert, Bernhard. 2019. "Editorial: Schwerpunkt Ontography." *Zeitschrift für Medien- und Kulturforschung* 10 (1): 5–11.

Ethereum. 2020. "Using Ethereum." Accessed February 3, 2020. www.ethereum.org/ether.

Franklin, Seb. 2012. "Cloud Control, or The Network as Medium." *Cultural Politics* 8 (3): 443–464.

———. 2015. *Control: Digitality as Cultural Logic.* Leonardo book series. CambridgeMA/London: MIT Press.

Gabrys, Jennifer. 2016. *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet.* Electronic Mediations 49. Minneapolis: University of Minnesota Press.

Galloway, Alexander R. and Eugene Thacker. 2007. *The Exploit: A Theory of Networks.* Electronic Mediations v. 21. Minneapolis: University of Minnesota Press.

Green House Data. 2020. "Green Data Centers." Accessed February 3, 2020. www.greenhousedata.com/green-data-centers.

Hagel, John and John Seely Brown. 2010. "Cloud Computing – Storms on the Horizon." Deloitte: Center for the Edge. Accessed February 3, 2020. www.johnseelybrown.com/cloudcomputingdisruption.pdf.

Hansen, Mark B. N. 2015. *Feed-forward: On the Future of Twenty-First-Century Media.* Chicago/London: University of Chicago Press.

Heise, Ursula K. 2002. "Unnatural Ecologies: The Metaphor of the Environment in Media Theory." *Configurations* 10 (1): 149–168.

Holt, Jennifer and Patrick Vonderau. 2015. " 'Where the Internet Lives': Data Centers as Cloud Infrastructure." In *Signal Traffic: Critical Studies of Media Infrastructures*, Geopolitics of Information, edited by Lisa Parks and Nicole Starosielski, 71–93. Chicago: University of Illinois Press.

Hörl, Erich. 2011. "Die technologische Bedingung: Zur Einführung." In *Die technologische Bedingung: Beiträge zur Beschreibung der technischen Welt*, edited by Erich Hörl. 1., Auflage, 7–53. Suhrkamp Taschenbuch Wissenschaft 2003. Berlin: Suhrkamp.

———. 2017. "Introduction to General Ecology: The Ecologization of Thinking." In *General Ecology: The New Ecological Paradigm*, edited by Erich Hörl and James Burton, 1–73. London: Bloomsbury Academic.

Hu, Tung-Hui. 2015. *A Prehistory of the Cloud.* Cambridge, MA: MIT Press.

Kelly, Kevin. 1995. *Out of Control: The New Biology of Machines, Social Systems, and the Economic World.* Reading, MA: Addison-Wesley.

Kittler, Friedrich A. 1993. *Draculas Vermächtnis: Technische Schriften.* 1. Aufl. Reclams Universal-Bibliothek Bd. 1476. Leipzig: Reclam.

———. 1999. *Gramophone, Film, Typewriter.* Writing science. Stanford, CA: Stanford University Press.

Leyda, Julia and Diane Negra, eds. 2015. *Extreme Weather and Global Media.* New York: Routledge.

Maxwell, Richard, Jon Raundalen, and Nina Lager Vestberg, eds. 2015. *Media and the Ecological Crisis.* Routledge Research in Cultural and Media Studies. New York/London: Routledge.

Mayer-Schönberger, Viktor and Kenneth Cukier. 2014. *Big Data: A Revolution That Will Transform how we Live, Work and Think.* Boston/New York: Mariner Books/Houghton Mifflin Harcourt.

McKinsey. 2009. "Clearing the air on cloud computing." Accessed February 3, 2020. www.dpcinc.com/pdf/ClearingtheAirontheClouds.pdf

McNevin, Ambrose. 2012. "Hurricane Sandy takes out Manhattan data centers." Data Center Dynamics. Accessed February 3, 2020. www.datacenterdynamics.com/content-tracks/power-cooling/hurricane-sandy-takes-out-manhattan-data-centers/70690.fullarticle.

Mosco, Vincent. 2014. *To the Cloud: Big Data in a Turbulent World.* Boulder/London: Paradigm Publishers.

Nest. 2017. "Learn more about Rush Hour Rewards." Accessed February 3, 2020. https://nest.com/support/article/What-is-Rush-Hour-Rewards.

Parks, Lisa and Nicole Starosielski, eds. 2015. *Signal Traffic: Critical Studies of Media Infrastructures.* The Geopolitics of Information. Chicago: University of Illinois Press.

Peters, John Durham. 2015. *The Marvelous Clouds: Toward a Philosophy of Elemental Media.* Chicago/London: University of Chicago Press.

———. 2016. "Clouds." In *Digital Keywords: A Vocabulary of Information Society and Culture*, edited by Benjamin Peters, 54–62. Princeton Studies in Culture and Technology. Princeton: Princeton University Press.

Reichert, Ramón. 2012. *Die Macht der Vielen: Über den neuen Kult der digitalen Vernetzung.* 1., Aufl. Kultur- und Medientheorie. Bielefeld: transcript.

Schröter, Jens. 2004. *Das Netz und die virtuelle Realität: Zur Selbstprogrammierung der Gesellschaft durch die universelle Maschine.* Bielefeld: transcript.

———. 2015. "Das Internet der Dinge, die allgemeine Ökologie und ihr Ökonomisch-Unbewusstes." In *Internet der Dinge: Über smarte Objekte, intelligente Umgebungen und die technische Durchdringung der Welt*, edited by Florian Sprenger and Christoph Engemann. 1., Aufl, 225–240. Digitale Gesellschaft 9. Bielefeld: transcript.

———. 2017. "Performing the economy, digital media and crisis: A critique of Michel Callon." In *Performing the Digital: Performativity and Performances in Digital Cultures*, edited by Martina Leeker, Imanuel Schipper, and Timon Beyes, 247–275. Digital Society. Bielefeld: transcript.

Schüttpelz, Erhard. 2007. "Ein absoluter Begriff: Zur Genealogie und Karriere des Netzwerkkonzepts." In *Vernetzte Steuerung: Soziale Prozesse im Zeitalter technischer Netzwerke*, edited by Stefan Kaufmann, 25–46. Zürich: Chronos.

Serres, Michel. 1980. *Le Parasite.* Paris: B. Grasset.

Sprenger, Florian. 2015. *Politik der Mikroentscheidungen: Edward Snowden, Netzneutralität und die Architekturen des Internets.* Digital Cultures. Lüneburg: meson press by Hybrid Publishing Lab.

Sverdlik, Yevgeniy. 2013. "Apple reaches 100% renewable energy across all data centers." Data Center Dynamics. Accessed February 3, 2020. www.datacenterdynamics.com/content-tracks/design-build/apple-reaches-100-renewable-energy-across-all-data-centers/74708.fullarticle.

Thacker, Eugene. 2004. "Networks, Swarms, Multitudes: Part One." CTHEORY.Net. Accessed February 3, 2020. www.ctheory.net/articles.aspx?id=422.

Tholen, Georg Christoph. 2002. *Die Zäsur der Medien: Kulturphilosophische Konturen.* Orig.-Ausg. Suhrkamp-Taschenbuch Wissenschaft 1552. Frankfurt am Main: Suhrkamp.

Thrift, Nigel. 2004a. "Movement-space: The changing domain of thinking resulting from the development of new kinds of spatial awareness." *Economy and Society* 33 (4): 582–604.

———. 2004b. "Remembering the technological unconscious by foregrounding knowledges of position." *Society and Space* 22 (1): 175–190.

van den Boomen, Marianne. 2014. *Transcoding the Digital: How Metaphors Matter in New Media.* Theory on Demand #14. Amsterdam: Institute of Network Cultures.

Vehlken, Sebastian. 2012. *Zootechnologien: Eine Mediengeschichte der Schwarmforschung.* Sequenzia. Zürich: Diaphanes Verlag.

Vogl, Joseph. 2001. "Medien-Werden: Galileis Fernrohr." In *Mediale Historiographien*, edited by Lorenz Engell and Joseph Vogl, 115–123. Archiv für Mediengeschichte 2001. Weimar: Verlag der Bauhaus-Universität Weimar.

———. 2004. "Gefieder, Gewölk." In *Media Synaesthetics: Konturen einer physiologischen Medienästhetik*, edited by Christian Filk, Michael Lommel, and Mike Sandbothe, 140–149. Köln: Halem.

———. 2005. "Wolkenbotschaft." In *Wolken*, edited by Lorenz Engell, Bernhard Siegert, and Joseph Vogl, 69–79. Archiv für Mediengeschichte 2005. Weimar: Verlag der Bauhaus-Universität Weimar.

Voss, Christiane. 2010. "Auf dem Weg zu einer Medienphilosophie anthropomedialer Relationen." *Zeitschrift für Medien- und Kulturforschung* 1 (2): 169–184.