

# From Community Networks to Off-the-cloud toolkits

Art and DIY networking

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**Abstract.** The last fifteen years, and especially parallel to the increasing datafication of everyday life, an emerging scene of network practitioners from different fields has been actively involved in building alternative networks of communication and file-sharing. Among the practitioners of this DIY networking scene, a growing number of artists have been playing a crucial role offering alternatives and critical perspectives. The aim of this paper is to present and discuss these particular initiatives, while locating them within a context and relating them to the needs of the particular time-period.

Keywords: DIY networking, art, community networks, ad hoc networks, offline sharing, network commons

## I. INTRODUCTION

In the Post-Digital period, there is no room left for promises or illusions. As Florian Cramer has nicely put it, after the Snowden disclosures users are more and more faced with a contemporary disenchantment with digital information systems and media gadgets [1]. The other side of today's datafied world is the one shadowed by what we don't know about the networks and the platforms we are using. While our lives are becoming more and more transparent, network infrastructures are becoming invisible and little do we know about how processes and architectures work. The networked world is a world of opacity and this is one of the fundamental asymmetries between the users and the networks. "Without edges we cannot know where we are nor through whom we speak" artist Julian Oliver writes while artist Danja Vasiliev also remarks that "we hardly know what our device does behind our back" [2, 3].

Reaching the point where 'the internet does not exist', where all we know is the presence of the Cloud,

new facts need to be taken into consideration [4]. When technology is becoming invisible, we as users at the same time are losing our rights on it, Olia Lialina claims. We can no longer protect or delete our files, we cannot get them back, nor can we see technology itself [5]. The emergence of the Invisible User is therefore according to Lialina more important than the one of the Invisible Computer. In the era of stacktivism, a term which derives from Benjamin Bratton's 'Black Stack', we slowly realize that we might no longer have an understanding of infrastructures or have access to them. The 'stack' 'staged the death of the user' and allowed other nonhuman Users, like the sensors and the algorithms, to become actors [6]. This phenomenon can also be seen as the blackboxing of society and culture [7]. The sciences of behaviorism, game theory and cybernetics which are prevailing today have assisted in the formation of a system which is recording it and predicting it all, carefully exposing only its 'inputs' and 'outputs' [8]. As Latour has written "the more science and technology succeed, the more opaque and obscure they become." [9]. Contemporary infrastructure space has become "the secret weapon of the most powerful people in the world precisely because it orchestrates activities that can remain unstated but are nonetheless consequential." [10] So what is there to be done?

Networks should be made visible, computerized systems should become transparent, and technologies should be made responsive and available, Saskia Sassen writes[11]. The right to infrastructure can be reclaimed by reclaiming and reappropriating networks and infrastructures [12]. But for this to happen, a new form of ownership, supported by a new form of literacy directly related to infrastructures therefore seems to be

needed which connects to what Greenfield has also framed as a need for translators, for “people capable of opening these occult systems, demystifying them and explaining their implications” to the others. [13,14,15].

The last fifteen years, and especially parallel to the increasing datafication of everyday life, an emerging scene of network practitioners from different fields has been actively involved in building alternative networks of communication and file-sharing. Building their own infrastructures and using open hardware and software, they have been developing and communicating models that can be considered as current counter-infrastructures, as alternatives that aim to provoke change from below. Community networks, ad hoc offline networks and local WiFi access points are examples of such infrastructures that users themselves can own, manage and control. Among the practitioners of this DIY networking scene, a growing number of artists have been playing a crucial role offering alternatives and critical perspectives. The aim of this paper is to present and discuss certain exemplary initiatives within the time period they emerged in.

## II. FROM ORGANISATIONAL AESTHETICS TO THE NETWORK COMMONS

Don't hate the machine. Be the machine.” Matteo Pasquinelli wrote back in 2004, addressing a call for “radical machines” that would function “as places of autonomy and autopoiesis” which would allow the sharing of knowledge, tools and spaces [16]. Just when web 2.0 was about to emerge, such responses as ‘radical machines’ could already be seen coming from the field of art. Becoming the machine, becoming an apparatus or a network could be translated as designing a set of relationships, deciding the topology and the protocols that will define the organization between links and nodes and the exchange among them.

This idea however of becoming the machine or even the system and the node can be traced already back in previous decades of art history; Mail Art, the Fluxus as well as Systems Art, are the predecessors of Net and Network based art. Hans Haacke was writing in 1969: “The working premise is to think in terms of systems; the production of systems, the interferences with and exposure of existing systems. Such an approach is concerned with the operational structure of organisations, in which transfer of information, energy and/or material occurs” [17]. Process was primary for the work which was commenting on the influence of cybernetics, on the systematization of society and lived experience [18]. Mail art on the other hand, was an early community network born and expanded as a virus by artists who were exchanging small scale works using the postal system or sending instructions for the creation of DIY products [19]. Participation, sharing, openness, and inclusiveness were fundamental features for an early network that in a way opened the way for the early net art communities that followed. An open channel of communication and free exchange was being proposed.

“To analyse networking dynamics therefore requires reflection and consciousness in the use of technology

and media” Bazzichelli argues [20] and this is a process that artists building systems and networks greatly need to engage in. Olga Goriunova in her book about art platforms similarly remarks that “the art platform is a conceptual device that allows for a differentiation and problematization of networks... It is not only a way of looking, but also a dynamic of assembling and coming up with such a body” [21]. And in order to underline and express this dynamic of assembling that can be found in art, Goriunova uses the term organizational aesthetics that is more than a way of looking. “Organizational aesthetics is a process of emergence and a mode of enquiry that gives us a way to understand a digital object, process, or body” [22]. Adopting this term, Fuller also notes that the aesthetic undertaking can be found “in the development, movement and transformation of a loosely, precipitously or precisely assembled system of people, technologies, words, signals, the sense of those cohering, evaporating and reshaping over time” as well as “in the ethical dimensions of relations between processes, forms of access, cultures and their carriers, whether they are people, languages or technologies” [23]. Similarly, we can also recall Lovink’s codeword about ‘distributed aesthetics’, that is of the wish to move on to an approach that no longer highlights technology as something revolutionary or disruptive and that manages to point the social formations that the technologies of connectivity provoke” [24].

Having these last points into consideration, that is the assembling not only among people but also among languages and technologies and the attention paid on issues of access, openness and inclusion when such networks are developed, I wish to present and discuss the alternative DIY networks, platforms and initiatives that are being proposed by artists as a response to today’s datafied and controlled connected world. At the same time I wish to examine these organisational dynamics as decisive factors for the formation of what Armin Medosch framed as ‘Network Commons’ [25]. Involving both social and technological topologies and being based on the fundamental cultural commons such as the languages, the affects and the codes, these new infrastructures are significant for the fact that they are “constructed, possessed, managed and distributed by all”, adopting the approach of Hardt and Negri on the commons [26]. Becoming the machine, to return to Pasquinelli’s older call, can only be possible by commoning the machine and therefore assigning to it new properties and values.

## III. DIY NETWORKING AND ART

The fundamental idea behind DIY networking is that it offers its users the possibility of owning the infrastructure as well as all generated digital information [27]. Being based on affordable infrastructure, open source software and hardware and on topologies that are distributed or decentralized, it opposes today’s centralized control, formulating “an interesting alternative for an autonomous option for communication” [28]. Local offline networks not only ensure connectivity based on physical proximity

offering new opportunities for a combination of virtual and physical contact among diverse people but also allow for anonymity and protect privacy, thus creating feelings of ownership and independence [29]. DIY networking can be regarded therefore as a substantial alternative to today's centralized communication, escaping the fears of surveillance and commodification of our datafied world.

Aiming to locate art's contribution in this field, a categorisation of offline networks based on their services and aims is proposed and followed. Community Networks, Tactical Mesh Networks, Toolkits for offline interaction and Fictional networks are discussed as the main fields where artistic initiatives can be located. While highlighting artists' role for each section separately, common conclusions are drawn at the end in order to define the features and aims of the initiatives.

#### A. Community networks

*"The sleeping beauty of mesh has been kissed into life by the community"*

*Elektra* [30]

The need to connect offline is not new. Although mesh networking has become especially known in the last few years as a response to issues connected to state surveillance, data profiling and Internet blackouts, its first peak is located in the first half of the previous decade. This is when the well known mesh networks such as the Spanish Guifi, the German Freifunk, the Austrian Funkfeuer and the Athenian AWMN were built, establishing their first urban mesh nodes and links. While their popularity in the big metropolises at first grew quickly thanks to the greater speed their connections offered, especially compared to the slow Internet of the time, it soon became clear that the potentiality and the outreach of these networks would go far beyond that.

In his analysis about why it is important building wireless free networks, written in 2006, Mike Lenczner lists the following points [31]:

- *they are free as in speech*; they are based on network-neutrality and non interference.
- *they are free as in beer*; they provide free metropolitan traffic.
- *they raise awareness*; they make people aware of other ways of doing things.
- *they bring in alternative design values for networks*; they offer opportunities to have a group's priorities reflected in the infrastructure of the community.
- *they invite people to think globally but act locally*; they bring people together physically in order to build and sustain the network.

Similarly, Armin Medosch, mentions that what was, and is, of central importance for community networks is the fact that they are formulating a different *dispositif*

based on the idea of network and communication freedom: they offer "the ability to connect without having to apply to a central point of governance" and the "ability of people to express themselves and communicate freely without top-down hierarchical control" [32].

Artists were involved in the development of mesh networks from the very beginning. James Stevens, founder of Backspace, and Julian Priest, artist-designer-entrepreneur, as Medosch explains started designing a model of community networking already back in 1999, naming it at first 'Model 1' after Henry Ford's first mass produced car [33]. Being interested in this "freedom to connect", from node to node, from user to user, they proceeded in building an actual mesh network prototype, called 'Consume.net', in collaboration with artist Alexei Blinov and a team of theorists, developers and admins working on relevant fields at the period [34]. The network was brought in different areas of UK with workshops run by the artists between 2000 and 2002. Right after London, this same team of people went to Berlin to influence the birth and creation of Freifunk, Berlin's popular mesh network in 2002 [35]. The new 'growing' infrastructure of Consume came to a city with no functional broadband and no proper infrastructure at the time and was activated by them and pioneers in wireless networking along with artists, theorists and practitioners who were active in new technologies, radio and electronics in the city [36, 37]. Interestingly, as Medosch explains, in Austria the free network Funkfeuer was also built by an artist, Franz Xaver, who designed it initially for a company but as the plan did not come through it passed to the hands of active volunteers. [38]

Apart from being initiators, artists in the last decade were also invited to use and animate networks in order to communicate their advantages to the citizens. Such was for instance the case of the SonicScene project which was developed in 2005 for the ISF network in Montreal; although the network is principally a network of independent free wifi access point, for the citizens of Montreal the nodes were connected through a group of artworks. Artists Michelle Teran, Kate Armstrong, Michelle Kasprzak and Tobias van Veen created fragmented artworks that could be experienced when the visitor would drift from one access point to the next. "Each fragment is unique to its hotspot, developing a relation between wireless art and its physical space—one must travel to a certain hotspot to experience a particular fragment" [39]. The aim of the initiators was to encourage, discover and use creatively the nodes of the networks in the city. A playful invite to discover the nodes of a mesh network was planned as a workshop by Adnan Hadzi and James Stevens in Luneburg in 2013. Wishing to empower Freifunk they invited inhabitants to walk around and discover QR code stickers that were adjacent to the nodes of the network [40].

The involvement of artists in community networks is not to be traced only in known urban mesh nets of big metropolises; their role has been especially significant in cases where community networks were built for distant

villages, poor areas and socially isolated populations. Such an example were the efforts of activist Elektra, a member of Freifunk, in Valparaiso and Santiago. Valparaiso Mesh for instance was a network aimed to build mesh nodes in a part of a city that was destroyed by a fire burn. Elektra run workshops in a local hackerspace where she taught people the basics of wireless mesh networking and involved them in practical networking building [41]. In these cases it is important to remember that free connectivity among inhabitants was meant to build not only an infrastructure after their needs, but also to build strong links among the members of the community and a sense of shared responsibility for its maintenance.

Other artists develop mesh networks, merging their artistic practice with activism. Such is the case of Christoph Wachter and Mathias Jud who are known for their sociopolitical projects and interventions, working with different groups and populations in different countries. The low cost routers they use for their mesh projects are empowered by a simple hack. Once a tin can is attached to the antenna of the router the signal becomes directional from round and can travel a bigger distance [42]. One of their well known projects in Hotel Gelem developed in collaboration with Roma Communities living in settlements in different cities [43]. Hotel Gelem was an awareness tourism project inviting citizens and tourists to live some days with the community. As part of it, they also built a community network to empower the Roma people living there. This was the community's greatest wish as the French government requires an address of a permanent residence and a bank account in order to provide a SIM card and therefore mobile Internet access [44]. For their network they used qual.net, a platform that allows free connectivity from device to device via WiFi and their low cost router antennas empowered with simple tin cans. Once the community network was established they also equipped it with a bicycle carrying an antenna and a computer. When driven around it would first collect the wishes of the community members for downloads and then when taken to the city it would connect to hotspots and download the requests. At a later stage internet connection was also provided to them through the neighbours [45].

The works of Wachter and Jud as well as the initiatives taken by the artists mentioned before are all examples of networks designed for particular communities or urban territories. In a way they are works that perfectly respond to what Matthew Fuller had written when discussing early forms of aesthetic organization: "The question is to make something happen: Don't moan, organize" [46]. The significance of them can be found in this exact element, that is in the disposition and interest of the artists to use the technology in order to build social links that will endure the community while also opening up prospects for an infrastructural literacy responding to the community's needs.

## B. Tactical Mesh Networks

The use of tactical mesh networks is connected to cases of emergency. In periods of insurrections or of environmental disasters when Internet black outs might occur, ad hoc networks can establish communication within a vicinity; connectivity used in this case is independent to the default one that is no longer functional. Ad hoc networks are most often dependent on mobile devices or on routers with mobile clients formulating a distributed network being called on demand. "An *ad hoc network* is a collection of wireless computers (nodes), communicating among themselves over possibly multihop paths, without the help of any infrastructure such as base stations or access points" Hu et al explain [47]. The topology of such networks is therefore dynamic and in constant change; a node is free to connect to any other node creating single sessions of data exchange whereas failures or drop outs do not significantly affect the network [48]. It is robust and flexible thanks to its independent nodes. Nodes cooperate to send packets to each other, allowing messages to spread like viruses. Although ad hoc is the term most often used in literature review for such networks, I prefer the use of the word tactical as it implies the need and the intention behind such networks. This also clarifies the differentiation from community mesh networks that often share the same infrastructure.

A known recent example of an Ad Hoc network is Firechat, which became especially known during the time of the student protests in Hong Kong in 2014. Firechat is an app, launched by the Open Garden Start Up company, which allows users who are at a certain proximity to communicate with each other with no internet access; using Bluetooth or Multi-peer connectivity on their mobile devices suffices. Firechat though has not been considered secure; it is public, with no encryption possible allowing everyone in the particular area to read the messages being exchanged [49].

Activists and artists have been responding to the emergency conditions with tactical mesh networks and actual tools, involving devices and technologies that the citizens either already have in their possession or get at at low cost and set up themselves. **Fluid Nexus** (2010) for instance by Nicholas Knouf was a model that in a way resembles today's Firechat. It was "a mobile phone application designed to enable activists and relief workers to send messages and data amongst themselves independent of a centralized mobile phone network." [50, 51] Planned for peer-to-peer, node-to-node connection, the network necessitated the physical movement and presence of people at the same location. Once the application was downloaded from the web to the phone, text, images, audio and video could be transmitted using blue-tooth anonymously from one device to the next. Messages were encrypted when stored at the device but not when sent to the next node.

Knouf's project though raised concerns in the US for the reason that it could also become a weapon in the hands of terrorists having thus a negative rather than a positive impact.

**Qual.net** (2011), by Matthias Jud and Christoph Wachter, mentioned before as part of Hotel Gelem, is actually also an ad-hoc network project, created as a response to communication blackouts and natural disasters. The artists refer particularly to the need to connect freely and independently that occurred after the shut downs of internet and mobile connections in Cairo in 2011 and the atrocious earthquakes in Haiti in 2010 [52]. The interesting aspect of Qual.net is that it is a software and a mesh net at the same time. Joining the network is quick and easy via any device. Once a qual.net node is located in the area, the software can be instantly downloaded, installed and the new node can join. This is of great importance as no internet is needed; the software can be downloaded and installed by any non experienced user. Computers, mobile phones and tablets can all become part of the network. Chat, twitter function and movie streaming are all possible. Qual.net offered therefore a wide spectrum of options that users could install and use according to their needs when wanting to connect to other people nearby.

Tactical mesh networks are therefore activating at the same time nodes and people in order to facilitate communication. They can offer opportunities for "political action in the network", "guided deliberately by human actors" to follow here Galloway and Thacker's words. [53] Compared to community mesh networks, the case here is not only about people building up and maintaining a node, but about users actually activating the nodes purposefully only when needed.

The field of art has presented different examples of ad hoc communication, often with a critical, playful or challenging disposition towards the structure itself. Ad hoc networks have also been associated to sneakernets and clandestine modes of communication, where information is transmitted secretly and anonymously to serve different purposes. One can recall here the project **Dead Drops** (2010) by Aram Bartholl, an ad hoc network of USB sticks mounted on walls in cities around the world waiting for users to go, attach their computers and share files surpassing fears and concerns of copyright and trust [54]. Or another playful example is Telekommunisten's **Deadswap** (2009/2015), a social game of exchanging data in USB sticks, notified through an anonymous SMS gateway. In such cases, questions arise for the very use and functioning of such networks. *How easy it is for users to trust and organize their communication or file sharing through a network? Does it really work?* The team of Telecommunication purposefully uses the provocative descriptions 'platforms of miscommunication' for their

works. Their project **R15N** (2012) was a great example of such a critique inviting people to use an ad hoc phone network in order to try and communicate with each other when phone calls and messages come in randomly. The 'revolutionisation of communication' as the artists called it, highlighted that the merging of the social and the technological is not necessarily a granted success. Ad hoc organization might not be such a simple task for the citizens of the connected world.

### C. Off-the-cloud toolkits

*The user of the future will own her own computer. She will own and control her own identity and her own data. She will even host her own apps. She will not be part of someone else's Big Data. She will be her own Little Data. Unless she's a really severe geek, she will pay some service to store and execute her ship - but she can move it anywhere else, anytime, for the cost of the bandwidth.*

'Future User', Lil Data [57]

The challenge for the future of DIY networking might be in successfully providing tools for our networked everyday life. Just like community network infrastructures appeared in relation to the restrictions of early internet connectivity and ad hoc topologies responded to times of emergency, new counter-infrastructures are expected nowadays to provide users with the hardware, the platforms and the knowledge that will help them escape the sovereignty of the Cloud. Having reached a point when "States are evolving into Cloud Platforms just as Cloud Platforms come to take on traditional functions of States" [59], allowing the interests of the market and the government to meet, it becomes clear that what Castells once called a 'space of flows' is now being divided to many privately owned internets [59]. The cloud(s) of Facebook, of Google and Amazon for instance are examples of Cloud Platforms which store the data of users that the latter have no control of. As Miss Data and the Israeli pirates write about their work **the Internets** (2015), where five routers generate five closed internets, the internet space is now nothing but a monitored space, governed by corporations [60]. Fears about constant surveillance and the commodification of users' data are directly connected to the formations of the cloud(s).

Having this contextualization as a starting point, I wish to refer to a new family of projects introduced by artists and hacktivists and examine them as possible counter-infrastructures and 'off-the-cloud' initiatives. With the term 'off-the cloud', I wish to discuss a new constellation of offline WiFi access points, sharing networks, autonomous mesh networks, personal servers and syncing platforms that together not only bring in alternative infrastructures but also communicate the new forms of literacies needed. In other words, it is not only about sharing and storing data safely and locally but also about knowing how to set up the system, how to use it, maintain it, control it and own it. It is not enough only knowing that you can share locally files with your

colleagues; it is important to know how it is done and what other possibilities such a system has.

The projects discussed in this section are introduced by their initiators mostly as toolkits. All information about their set up can be found online while some have plug-n-play ready solutions are sold by the artists almost at the cost of the equipment used. Instructions, fora as well as public talks and workshops often are planned in order to support them. As it will also be shown, off-the-clouds toolkits are by their nature open, gaining the features and the life their owners want them to gain.

One of the predecessors of today's projects addressing the need of a critical perspective to centralized infrastructures was *Hive Networks*, a project initiated by Alexei Blinov, Vladimir Grafoc and Ciron Edwards of Raylab back in 2006. Described by their creators as networks that could "watch, listen, sense and touch the world around them", **Hive Networks** (2007) were designed to "actively source, distribute and create content" promising to "turn the world on" and to empower users with autonomous networked systems [61]. Nodes of the network could therefore capture data, disseminate data and store data. The project emerged in a period of 'embedded capitalism' and of growing discussions around the 'internet of things' and its invisible connections [62]. To respond to this condition, the artists used a logic addressed as 'creative exposure' inviting users to learn how to build and set up their own devices [63]. *Hive Networks* was based on open hardware, open software and open spectrum (WIFI), and at the center of its philosophy was the idea that low cost, off-the-shelf technology could be repurposed to offer systems that users themselves could own and control. The creators of Hive Networks were making clear at the time that they were proposing a new model, a new creative solution. It was no longer "the artists asking technicians for a creative solution", but rather the engineer-artists who were proposing "a new framework for artists and other media practitioners", "a hiving network of desires and artistic creations" [64].

This idea of providing a new cell, a tool for artists to use as a starting point for their work is found some years later in Sarah Grant's **Subnodes** project [65]. *Subnodes* (2012) is an open source initiative proposing an offline mesh network that users can set up themselves in order to communicate, share and distribute content within the immediate geographical location. The nodes are Raspberry Pi devices configured as WIFI access points, working as web servers not connected to the internet. The selection of a Raspberry Pi, a micro-computer used to learn how to program is not of course accidental. The artist although she runs workshops open to the public, she is mainly interested in how it can be used by artists "to express ideas" and by educators to use it in their activities. "It is important to also ask people what they will do with the network, to make them think about it" she argues [66]. A derivative of *Subnodes* was her project **Hot probs** (2013), a WiFi access point, a Raspberry Pi where users could connect to in order to chat anonymously [67]. This also brings to one's mind Dan Phiffer's more well

known **Occupy Here** (2011), a WiFi access point built with an inexpensive router for the New Yorkers in Zucotti Park [68].

In the last few years, this openness towards the use of alternative infrastructures became more and more apparent. The toolkits offer multiple functions and different services. One of the most well known examples is the **PirateBox** (2011-2015) introduced by artist and NYU Professor, David Darts [69]. Initially conceived as a local offline access point where users could connect to and share files, PirateBox became known as a counter-proposal to the piracy laws. The latest version of PirateBox does more than sharing though. Built with an inexpensive router and a USB stick, and configured with firmware of the artist, it also allows users to chat and to stream videos from the device while the possibility of creating a mesh network, connecting node to node, pirate box to pirate box is also under development. It is also important to mention that different variations of the PirateBox have been introduced by users and colleagues: such a case is for instance the Library Box, a portable digital file distribution tool especially addressing people working in education and healthcare [70]. Similar to the Library Box is the **Datafield** project by Henry Warwick, a Network Attached Storage Unit, that works as a Temporary Autonomous Field indexing and sharing files openly wherever it moves [71].

**Superglue** is a project that opens up to a different direction [72]. The particular toolkit, using the same infrastructure with PirateBox, that is off-the-self technology, a USB stick and a modified firmware, offers users a web authoring tool and a small personal server in the size of a plug where their data is stored. While the toolkit was officially launched in 2014, its team – led by artist Danja Vasiliev- is working towards its next step and the creation of a social network that Superglue would support. "We need to try to optimize it the whole time. It needs to stand for what we claim, to fulfill functionality and exhibit the qualities that it proposes" Vasiliev explains pointing out the disposition of the creators to constantly upgrade the tools that they make available [73].

This shift towards off-the-cloud initiatives is also embraced and empowered by artists developing systems in relation to today's existing infrastructures. Such an example is **Dowse**, a project by Jaromil and the team of Dyne, that aims to counterbalance the asymmetry of the Internet of Things and the automation that happens beyond users' control [74]. *Dowse* is a 'transparent' proxy for home network privacy that aims to connect objects and people in a new friendly, conscious and responsible manner. It offers users the possibility to become aware when new devices connect to their network notifying them with a light signal and a noise and to decide what kind of access is granted to them, which "flows of data comes in and which goes out". At the same time it filters web traffic removing undesired content and advertisements. *Dowse* just like Superglue and the other aforementioned initiatives place the user in the center of their design, highlighting the importance

not only of awareness but also of decision and permission for their data.

Off-the-cloud projects are initiatives still in progress at the time of writing this paper. Artists keep working on them, while offering them to the users for further exploration and use. The right to infrastructure signals the rise of the prototype Jimenez writes and he interestingly refers to Fuller and Haque [75]. Prototypes are always ‘pre-broken’, open to deconstruction and re-assembling. They are actually released as such, so that they can be re-used and re-purposed. This might also mean tools that are inexpensive and easy to build. As Vasiliev says, the point is to use the “existing topologies and infrastructures but separate them from the topology of the internet. Maybe there is no way for an individual to own infrastructure. Maybe we should use new ways to use what we are provided with. This would be much more pragmatic” [76].

#### IV. CONCLUSIONS

As the paper has shown, artists have been involved in different directions of DIY networking which respectively respond to different needs of today’s users. Going offline and off-the-cloud not only is a way of escaping data surveillance and commodification but it also assists in building new bonds among a community, in connecting in times of emergency, and in having control of one’s data. Despite the different features and aims mentioned, the following remarks can be made in order to draw some common conclusions about the initiatives, toolkits and forms of organization coming from the field of arts.

Firstly, all networks discussed follow a user-centered approach. The human and non human elements that a network involves are balanced by always allowing the users to have control of the nodes of the network; setting them up, controlling them and sustaining them. In the era of algorithmic automation and control, it is important to remember what Munster and Lovink wrote, that the rise of networks should be made understood as an all too human behaviour [77]. Whereas as Medosch says ‘in ubiquitous computing, it is usually the devices which get smarter and the people who remain stupid’, in the cases of such initiatives a ‘new Internet of People’, following here Nold and van Kranenburg, and can emerge against the Internet of things [78, 79].

Secondly, the topologies of DIY networking are exposed and understood by a merging of the social and the technological. As a user is always behind a node and in control of a node, it is easier to realize the edges and nodes, the architecture and potentiality of the network. This idea of “becoming the machine” that Pasquinelli mentioned can be understood as becoming the node and gaining control of the network.

Thirdly, all infrastructures of different scale are based on open software and hardware leaving open to the users the possibility for modifying and even repurposing them for their own needs; this way not only the DIY but also the DIWO ethos is encouraged embracing the logic of thinking, sharing, working

together. This is a manifestation of what Hardt and Negri have stated when they argued that “being with” is no longer enough”; a “doing with” is necessary [80]. Alternatives based on collaboration and sociality are introduced to spread and teach people how not only to modify and use infrastructures but also to make decisions, possibly based on criteria which are qualitative and humanistic [81]. Staying out of the market of centralized systems and platforms, a new system and theory of value is embraced. Encouraging forms of exchange economy and providing tools and knowledge freely and openly, a significant effort is made for social value to outbalance market value, for sharing networks to surpass zones of property.

Fourthly, and in continuation of the above arguments the infrastructures proposed can be seen as part of the new ‘Network Commons’ as Armin Medosch puts it. Although Medosch refers primarily to the community networks, this can greatly stand for the wider family of offline sharing networks as they are systems in terms of infrastructure and content that are meant to be constructed, possessed and managed by all. Through such platforms, users are invited “to speak and think, to become informed and to participate”, as Stavrides has put it for the necessity of the contemporary commons [82]. The making of the common in the case of infrastructures is therefore a process based on potentialities, skills and affects of the users and this can be approached as meaningful acts of commoning.

Finally, to sum up all of the above and to understand the contributory role of art, it is useful to turn again to the notion of organizational aesthetics used by Goriunova and Fuller as well as to the distributed aesthetics coined by Lovink. The forms of organization artists introduce as part of a DIY networking practice capture not only social and technological topologies but also experiences, languages, codes, driven we could say by affect. Just like Goriunova wrote for the art platforms that she studied, one can point out about artistic offline sharing networks that they are not only a type of practice, but also types of networks and network organization; following her approach, these forms of organization mobilize and reinvent network systems and cultures, conditioning and co-creating new forms of life [84]. To understand this, one only needs to think how a community network might have changed the life of the Roma, how a PirateBox toolkit facilitated a university course or how a flying mesh network in a balloon in the sky could have triggered discussion about free communication and sharing in the networked world. This is how the “cultural, the individual and the social” is constantly produced and organised [84].

The special role that the artists seem to take, is therefore the one of the facilitator, the mediator, the commoner of knowledge and experience. Perhaps we can see them as those that can invite us “to a participatory journey aiming to capture the not yet described and yet visualized, going beyond poles as real, virtual, new, old, offline, online, global and local” and therefore as the ones that can unite all these

different elements in the experience of networking [85]. Or they might be the ones that respond to the exact need that Michael de Lange mentions:

“We must shift attention from technologies that seamlessly blend in with everyday life, towards technologies that move people and enable them to move others’ [86].

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