

Not Just Another Wireless Utopia - developing the social protocols of free networking

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The discovery of radio waves and their potential use for communication more than 100 years ago stimulated a flurry of competing wireless utopian visions: a commercial boosterist version with worldwide monopolies, pyramidal fraudulent stock market schemes and lots of badly informed speculation in the press about the promises of personal communication freedom; the idea that communication fosters democracy and thereby leads to a better and fairer world (liberal, social democratic and socialist version); ideas of a similar but more utopian mold such as Tesla's dream to provide free (wireless) energy (engineer's utopia); futuristic visions of poets and artists like Klebhnikov and Marinetti who thought that radiowaves had psychotropic properties and could be used to directly influence the mind (artistic utopia).

Most of the futuristic artistic wireless dreams in the early 20th century smacked of the totalitarian systems those artists were associated with. The artist as member of the elite is granted access by the state to use the broadcast quality of radio to simultaneously reach out to all citizens.[1] Only a few thinkers saw the one-to-many direction of this communication model as a problem. The German playwright and communist Bertold Brecht thought about radio as a two-way communication medium. Walter Benjamin in 'The Author As Producer' demanded that writers should help to create mechanisms for others also to become writers.

It is not difficult to see how 100 years later wireless technology inspires wild utopianism in the commercial realm again. The ICT industry looks at the introduction of high-speed mobile broadband communication (3G or UMTS) as a potential saviour after the sector suffered heavily from the New Economy crash. Those commercial dreams are challenged by the notion of 'Free Networks', independent wireless community networks built and maintained by their users. Free Networks are an engineers' utopia minced with ideas that could be described as internet egalitarianism (a set of values and ideals derived from earlier versions of a pre-privatisation internet arcadia) and information ethics (based on 'hacker ethics' where hacker is a positive term, someone who actively engages with digital technology on the basis of a do-it-yourself philosophy). Artists are discovering electromagnetic waves as material and medium for art and are switching increasingly into the modus operandi that Benjamin suggested. Instead of seeking to express their subjectivity they try to create communication systems and collaborative platforms. [2]

In between the two wireless bubbles circa 100 years apart the world had to come to terms with the introduction of radio, tv and, as the century progressed, an ever more relentless flow of innovation in information processing and transmission technologies.[3] The point here is not to claim that the two wireless bubbles are just the same all over again but to see if there are common patterns in their unfolding and to get a better understanding of this process of how new technologies influence society and how they change under societies influence. One premise of this article is that we need to move on from speculative media theory and establish a clearer language of analysis and description based on material and structural properties of the 'media' we are talking about.

One of the cornerstones of such a type of critical framework is to always look at the network topology. This term can describe both the physical layout of a network (how its nodes and edges are connecting) and a social model of organisation (how messages are being passed on in a social system, which powerstructures, command control and feedback mechanisms are involved). The physical material and technological properties of communication media are another important factor that should be closely studied. This comprises the laws of physics (electromagnetic waves) and informatics (the protocols that govern communication in digital/electronic systems). On this level it makes sense to follow the approach that engineers have taken when creating those networks in the first place and look at them as a layered protocol stack (TCP/IP, OSI referential model). Each layer in the protocol stack has different functions to fulfil – establishing connectivity, transporting bits, forming messages out of bits, aggregating and channeling messages into types of 'content' and 'media' – and is entangled in a different political economy and social context.

Media theory, media studies and media art criticism have tended to ignore the technical basis and, to some extent, also the political economy of media and run danger now of paying a bitter price. Since so much of their thought is speculative, focusing on the content layer and its symbolic implications only, it simply becomes irrelevant when the ground underneath them keeps shifting because forces are at work they have not even tried to understand.

With political economy in this context I refer to ownership issues and their implications. Following the layered model of network communications, ownership issues apply to the physical layer (who owns the machines and cables), the logical layer (loosely speaking, not strictly OSI: intellectual property rights of programs and standards which facilitate communication) and the application and content layer (who owns the channel? who owns the content?). Another important element of the political economy surrounding communication media is how they are regulated, both internally (self-regulation) and externally (telecommunications laws and regulations, spectrum regulation). Once we have come to understand those layers, we might also move on to more complex social layers - how networks are embedded socially and how we conceptualize technology -, but first we should get the basics right.

The naivety of the first wireless bubble around 1910 was soon punished when history unfolded. The relative ease with which a broadcast licence could be obtained in the United States led to frequency wars after WWI, when commercial radio started to become viable. Stations tried to cancel out their rival stations signal by erecting stronger transmission towers and blasting stronger signals exactly on their neighbours frequency. This forced the state soon to react and create a system of state regulation of radio spectrum.[4] The totalitarian streak in wireless utopianism of the 1920ies and 1930ies came to the fore when Nazis seized power in Germany and embraced radio as a favorite propaganda medium with Der Volksempfänger. After WWII those threats, totalitarianism on one hand, wireless free market anarchy on the other, shaped the postwar consensus on the regulation of wireless which stayed in place for many years, until liberalisation/deregulation began.

The consensus was that the use of the carrier medium, electromagnetic waves, should be regulated by the state in the public interest. Parts of the spectrum got allocated for exclusive use by state organs (emergency services, military) or other privileged licence holders (state media, radio and tv, air traffic control). The content layer was also regulated following a state sponsored model. Most countries created a semi-independent National Broadcaster - independent enough to resist direct manipulation by the government of the day, but, as a public broadcaster, governed in its conduct by rules written by parliament and broadcast commissions. Personal telecommunication (for a long time synonymous with the telephone) was the exclusive domain of state monopoly companies which were under a 'universal service' obligation.

The European postwar consensus started to break apart when neo-liberal policies of 'deregulation' were put in place after the oil price shock in the seventies. Private radio and television companies were granted access to the airwaves and state monopoly telephone companies were gradually privatised. The emerging new Duopoly of state and privatised commercial media was attacked from the left by free media movements which emerged first during Anti-Vietnam and student protests in the 1960ies. When the internet was opened up for private use in the early 1990ies those threads seemed to come together for a moment. The internet was both seen as a mecca for non-commercial, political activism and artistic intervention and as the pinnacle of the free market ideology. The crash of the new economy should have destroyed many of the myths and legends surrounding the net but next generation mobile phones have triggered a resurgence of the commercial boosterist utopianism replacing the 'e' with an 'm' - from e- to m-commerce.

In the 1900s wireless (mobile) telephony seemed to be just around the corner, but it did not happen like that. It should take till the late nineteen nineties for the mobile phone to become the worlds most cherished icon of consumer capitalism. The upgrade from GSM via GPRS to G3 is the trigger for a new wireless revolution, a new speculative bubble the industry has been waiting for after much of it had flatlined growth rates after 2001. The speculative bubble is not just based on economics but also on the expectation that the switch to GPRS and 3G marks something more substantial, the shift to a mobile networking paradigm. Mobile devices are said to be about to become our main way of accessing electronic communication networks. This would imply a shift away from the internet paradigm and its egalitarian and participatory ideas, towards a much more tightly controlled mobile paradigm which is based on proprietary control of a centralised network topology. As internet access provided through wires gets also upgraded to so called 'broadband', changes in the ownership structure and provider landscape mean that the freedom which the net once promised and in a way still facilitates is under threat. It is worth noting here that 'freedom', one of the worlds most abused concepts, is meant to be understood in this context not as a metaphysical concept and not even on the level of political philosophy but on a very pragmatic level as a hacker type of freedom - the freedom to access and use communication networks under a minimum of restrictions, empowering individuals and communities to make the best use of those networks as they see fit. The radical libertarianism of this approach may be limited in its value as a political ideology but still separates this idea clearly enough from the two dominant models - the declining state ownership model and the still expanding private corporate 'empire building' model.[5]

Over the last few years loosely connected groups all over the world have started to build free networks, networks which are owned and maintained by their users and are largely free of state and corporate influence. This fledgling free network movement is not one coherent group, campaign or strategy, but another one of those multitudes, a free association of individuals who work together for a common goal under a loose umbrella of a few principles and with a lot of enthusiasm. Free networks try to build large scale networks following a bottom-up grassroots approach by using DIY technology (homemade antennas, second hand hardware, free software) and suggesting decentral self-organisation as preferred organisational model. There is no single entity that plans and builds the network. Instead groups promote the suggestion that people share bandwidth and organically grow a network by (wirelessly) connecting their local nodes.

This can be achieved with a number of technologies but recently the technology of choice became 802.11, a family of wireless ethernet standards developed by the IEEE which is incorporated in many mass market networking products such as wlan network cards and chipsets. Hardware prices have fallen dramatically over the last few years thanks to the commercial boom in wireless (powered by Apple Airport and Intel Centrino, among other players). Radio Networking brings together two powerful technologies, innovative wireless transmission technologies such as spread spectrum and computer networking technology. 802.11 is based on open standards which is an important advantage for the free network movement. It means that free software can run on most proprietary hardware platforms as long as the protocol has been properly implemented. It also works well with embedded Linux chips and with older computers running some Unix version. Networking across different platforms but based on open standards has been the success formula of the internet, a story repeating itself with 802.11.

The 802.11 technology was originally considered a substitute for cable based local networks in homes and offices. Wireless access points or hotspots create a Local Area Network (LAN) which can be accessed by any device within range with an 802.11 radio card or chipset; usually an access point also provides or is connected to a gateway to the internet. This type of node (access point plus gateway) is sitting at the center of a star topology; it is the master of all communications in the local net, while connecting to the next higher level on the internet, for example via an ADSL connection. Such a set-up is called a hotspot in the commercial world.

The vision of Free Networks as expressed by Consume [6], London, one of the ideologically most influential groups, is to apply the peer-to-peer principle known from file sharing networks to the underlying physical material layer of network communications. Consume proposed in 2000 that a wireless 'meshed network' should be built, a highly distributed network where each node is connected to many other nodes and no node is in a central or privileged position. The owners of nodes are legally independent from each other and arrange the traffic of data across the net by following the minimal requirements of the Pico Peering Agreement - a framework for owners of nodes to establish connections and formulate the rules that govern them.

The wlan standard 802.11b has two modes, the infrastructural mode (for Access Points) and the ad-hoc mode (also called peer-to-peer or computer-to-computer mode, depending on hardware/software vendor). When a wireless network is set-up in the latter way, each node can connect to each other node as long as they are within range of their radio signals. Since there is no privileged place in the network, each node carries out functions of switching data packets around, acting as a router and internet gateway. Since every node shares this task of switching packets around, the overlapping radio coverage of all nodes together forms a single wireless cloud. Computers located within this cloud can communicate with high data rates while the cloud is connected at its edges at a number of points with the internet. 'Unwiring' the edges of the commercial internet, owners/users in a free network cloud are reclaiming their right to self-define how they do their telecommunication.

The Consume idea of a large free data cloud over London has not succeeded (yet). Currently, what we have got is hundreds of wireless community networks in the UK and thousands more worldwide. Most of them operate on a local scale, forming little wireless clusters where people can at last share files, play games or watch videos without any outside interference. At the pragmatic end of the argument those networks allow to share the cost of bandwidth efficiently between a greater number of users. At the visionary end this should only be the beginning. The small free network islands should grow together and 'unwire' ever growing parts of a city, a region, a country, the world. By becoming bigger, the community networks could gain leverage in peering negotiations with commercial bandwidth providers and get cheaper access to global networks. In the long-term bandwidth might become free or reasonably cheap. And, more importantly, free networking might completely change the way telecommunication is provided.

Meshed networking - not as the description of a network topology but as a specific technology [7] - has generated a kind of geeky buzz around 'mobile ad-hoc networking'. Bleeding edge mobile ad-hoc networking protocols are seen as the key to a bottom-up wireless utopia. If ad-hoc network technology gets implemented in mass market mobile devices (handsets, PDAs), everybody who carries such a device becomes a walking personal telco. Dynamic, self healing routing software and computer controlled radio would always find the nearest working node within range and use it to pass on information. If this approach gets enough support it could in the end lead to a world without telecommunications providers and the people would truly become the network.[8] The free network paradigm and the mobile broadband paradigm as proposed by the mobile telcos are at opposing ends of the spectrum in regard to all major factors - the network topology, the political economy, their regulation and the social context: they could not be more different. For instance, free networks don't 'meter' traffic, they usually don't measure the volume of data exchanged because the network is built on mutual consent of allowing 'free transit'. Mobile phone networks meter just about everything, the volume of data, the time spent online, the location, calls made and received, etc. Mobile phone networks have the classic star network topology inherited from the age of monopoly telcos. The switching stations at the centres of connections have total control over every aspect of the network. The old way of thinking in the Post Telephone and Telegraph (PTT's) offices' way which is still the mobile network owners' credo reduces users of a network to being consumers. There is a network, which is theirs, because they own and maintain it, and users are being sold access to this network. Probably deep down inside they even think that they are generous letting anybody use their network. The consumer is considered as a leaf at the thin end of the tree structure of the network, as someone who mainly wants to download stuff.

In the free network scenario this is radically turned around. The user is not considered a dead end street, someone just sucking away somebody else's bandwidth, but is seen as a node that is fully integrated in the network and contributes to the value of the network as a bandwidth and content provider. Every connection is two-way and symmetrical, which means that the data rates for uploading and downloading are the same. The free network movement says that if we do things the right way we could create abundance - a maximum of bandwidth available at a minimum of price; scarcity of bandwidth is, according to some activists [9], a fiction upheld by the industry not to let their markets collapse.

One main reason why free networks could be so successful is that they operate in a band of the spectrum which is licence exempt in most industrialised countries. That means that certain frequencies can be used without needing to ask the authorities. The success of spectrum deregulation of the frequencies used by 802.11 inspired an 'open spectrum' movement which demands that more parts of the spectrum become licence exempt. New software controlled radio technology (spread spectrum, ultra-wideband) will allow micro-regulation to happen on a local scale without the strong arm of the government being needed, according to open spectrum activists.[10] The problem of interference that dogged radio in the 1920ies can be avoided with those new techniques and therefore we should completely rethink the way spectrum is regulated.

The mobile telephony industry has been crippled by the high licence fees companies had to pay when spectrum was auctioned off at the height of the new economy boom. The auctioning of spectrum marked a very different approach, when spectrum was sold as a commodity to the highest bidder. With the launch of 3G in many European countries already delayed, commercial pressure on companies is piling up. The name of the game is maximising the ARPU, the average revenue per user. Mobile business is frontier capitalism bending over backwards to microtune itself to every whim and whiff of the consumer. Many different models, services and price plans target different people's tastes, priorities, preferences, incomes, life-styles. In this race to increase the ARPU phones are getting gizmoed up to the eyeballs, with phones that can play 'true tone' ringtones, download, store and play music, shoot pictures and even video. Part of this campaign for the purse of the user is that mobile telcos have started to believe they must become 'content providers' and offer music and video files for download as well as news, sport and soft porn. Accessing the internet via mobile phone is probably the most expensive way of doing so on a bit per penny ratio. Behind the glossy brochures and consumerist promises looms a brave new wireless reality. The centralised command and control model flies in the face of ideas of communication freedom. The upgrading of phones will soon provide even more opportunities for social control. With the new generation of picture phones the whole (connected) world becomes a panopticon, a world of permanent observers and the permanently observed, where public and private, intimate social spaces and global networks are from now on permanently intertwined. As the mobile incorporates ever more functions such as being used as an electronic purse and in the context of emerging technologies such as biometry, it could become the preferred way of confirming one's identity - purse and passport all in one, managed by your corporate multinational of choice.

Another worrying factor in this respect is that mobile phones have proprietary system architectures. The operating systems of PCs have been liberated by Linux and other free versions of unix. Paying the prize of having to do a bit more of installation and maintenance work than the average Windows or Apple user, the Linux community enjoys the freedom to configure their machines exactly the way they want. With mobile phones we are back in the closed world of proprietary systems, the secrecy of corporate research and development laboratories and ever present Non-Disclosure Agreements (NDAs). Many of the freedoms that we just started to enjoy with the combination of the internet and freely programmable personal computers are threatened with the switch to mobile networks. The mobile urgently needs to get open sourced.

The internet facilitated a gift economy where millions engaged in the exchange of communications without any financial remuneration. From the personal homepage to communication in mailinglists and web-fora people worldwide embraced this opportunity to communicate in ways which were open ended and not directly goal oriented, not serving a specific purpose. When every communicative action becomes subject to metering and billing a gift economy is hard to sustain.

What fascinated us about the net first time round, that it was non-locative, a non-space, where it did not matter where you were, as long as you had access to the net, is getting reversed. With mobile phones as with a range of other devices which are location sensitive the information sphere gets connected with geographical space. Every user can be pinned down geographically, which opens a wealth of possibilities for surveillance and intrusive business propositions (location based spam).[11] As Myerson observes in 'Heidegger, Habermas and the mobile phone'[12] our concept of 'communication' has already changed and is undergoing further change. We are now likely to accept that it is an act of communication when two machines connect. Our personal motivation to use those connections is to satisfy needs or 'wants', or at least that's what the industry is selling: personal freedom to get what we want. There is no human other required in many of those 'communications', we are accessing information, retrieving data. This is not 'the great conversation' imagined by neo-liberal internet guru JP Barlow. It is also very different from Habermas' idea of the 'public domain'. But we have to be careful here. Many narrations about new media speak of loss, decline, etc (email ruins our grammar and spelling, and texting is the last nail in the coffin of the written language, according to cultural conservatives pessimistic outlook)[13]. But as far as I understand him, Myerson is up to something else, he is concerned with how we conceptualize communication. This goes far beyond a narrow angle of cultural conservative concerns and leads to the main thrust of this article.

When we speak of new media or communication technologies what matters is not just the technology - its cool naked efficiency - but how it is embedded into society. The free network proposition is to rethink our relation to technology and to reconceptualize technological systems based on them being grounded in communities which are actively involved in shaping them. Technologies of the future are developed now in our collective social imaginary; and the technologies that we have now have been shaped by imaginary futures of the past[14]. In the case of mobile telcos we are promised a consumer bonanza based on a Cold War style command and control architecture. Their networks are technological expressions of schizophrenia and paranoia. The free network proposition is to generate alternative future technologies based on ideas along the lines of a grassroots movement or the 'multitudes'. It is a utopia (if we even have to use this word) on the plane of immanence, where control is handed over to a distributed many-to-many architecture. Shaping future technologies becomes a job where everybody can and should be involved.

Within only a few years the wireless community and free network idea has come a long way. It has been recognised that there is an intrinsic connection between free networks, free software and free hardware [15]. They mutually depend on each other to guarantee their survival in the long term. Providing a liberated infrastructure for communication those movements protect freedom of speech and other communication rights. This interdependency has recently been described by the term 'network commons'. The network commons does not just comprise the physical network itself but also the protocols that run it and the content that is being carried. The network commons re-defines our understanding of the public domain in electronic communication.

What is yet missing is the social glue that binds all that together, the social protocol of sustainable network self-provision and self-organisation. There are efforts underway with the Pico Peering Agreement to provide such a social glue between network owners. Other open source developers are working with FOAF, RDF and other social network techniques which can help to bring together like minded people. Those efforts have so far failed to gain mass appeal. The free network movement has been carried forward by nerd enthusiasm. To grow beyond those isolated free network islands built by a handful of nerds and establish a viable network commons more people of different backgrounds need to join and together develop the social protocols of networking. This implies that we finally overcome the totalitarianism inherent in the wireless utopias of then and now. Free

Networks are (hopefully) not just another wireless utopia but a practical proposition for slowly changing the world by introducing a different relationship with the technical means of communication.

1 About the notion of totalitarianism in wireless futurism see for instance Gregory Whitehead: Out of the Dark: Notes on the Nobodies of Radio Art <http://www.somewhere.org/NAR/writings/critical/whitehead/main.htm>

2 This sentence refers to a second part of this article which has not been written yet and which deals with the work of wireless artists and activists such as Marko Peljhan and Shu Lea Cheang. The publication 'dive' by <Kingdom of Piracy> gives an introduction into copyleft culture and collaborative platforms. <http://kop.fact.co.uk>

3 Basically the whole electromagnetic spectrum can be used for communication, from very low to very high frequencies. Our understanding of spectrum is often obscured by language. 'Radio' is just one application that we have found useful. It operates at the lower end of the spectrum. While heat and visible light are the only parts of spectrum we can perceive through our senses, scientific progress has helped to make use of spectrum which we didn't even know it existed 100 years ago. We can now 'look' at things very small and very very far away, which means we are also looking back in time. See for instance "Hubble's deep view into the cosmos" <http://news.bbc.co.uk/1/hi/sci/tech/3546803.stm>

4 How the spectrum has been divided up can best be understood by looking at a frequency allocation map such as this one: <http://www.ntia.doc.gov/osmhome/allochrt.pdf>

5 For a more coherent explanation of the 'free' in free networks look at my lecture notes for a presentation at the Open Culture Conference, Vienna June 2003: <http://twentiethcentury.com/uo/index.php/OpenCultures>

6 Consume <http://consume.net>

7 Meshed networking technology has first been developed in a military context and is now carried forward by a special working group at the IETF, the mobile ad-hoc networking group (MANET); protocol specifications are published as RFC's and implementations released as open source.

8 At the time of writing mesh networking has been successful in small experimental settings (of up to 30 laptops running, for instance, the mobile mesh protocol) but has not been tested on a mass scale.

9 Malcolm Matson, co-founder of the Access To Broadband Campaign and a telecommunications insider for 20 years claims that if the market really was free bandwidth would cost nothing nowadays.

10 A very useful briefing on open spectrum issues: Open Spectrum, New America Foundation <http://www.newamerica.net/index.cfm?pg=article&pubID=1002>

11 A group of programmers, writers and artists is trying to introduce a more productive viewpoint on location based 'services' by re-naming it 'locative media': <http://locative.net/>

12 Myerson, George, 'Heidegger, Habermas and the Mobile Phone', 2001

13 Maybe there is actually a decline in standards of language use, maybe we cannot uphold any more the values of the classic era of the book. But even so that may be the case, there is a dialectical trade-off coming with that as was already described by Benjamin in the 1920ies, which is that we increasingly will see the benefits of widening participation: move over Joyce and Musil, here comes everybody. The internet, by cultural conservatives regularly blamed as consisting of 99 percent trash, has stimulated unprecedented amounts of text production. For example with the public diary keeping of 'bloggers' or 'web-loggers' amateur publishing is an ongoing success story as never before.

14 Barbrook, Richard, 'Imaginary Futures', Chapter One, 2004 (forthcoming)

15 Eben Moglen at Open Cultures, Vienna 2003: <http://opencultures.to.or.at/oc/participants/moglen>