

Can We Build a Wireless Communications Infrastructure That Values Everyone's Right to Communicate?

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Putting Equity On the Front Burner

If you believe that community based media is a good idea, then you probably think that it's a good idea for all communities. Whether any community in particular will get access to community radio or TV is predicated on a number of factors. Radio licenses may be available for community use, but most often are not. Under existing rules, the most affordable and technically accessible type of community broadcasting, low power FM radio (LPFM), has a "secondary" status – community low power stations can be moved or even bumped completely off the dial by large commercial broadcasters. Community based television also lives under the shadow of industry. Because the financing for community access TV comes from the fees negotiated between municipalities and cable companies, the cable industry almost always gets a chance to wiggle out of its community obligations every time one of these local contracts comes up for renewal. Additionally, the industry lobbies at the national level to unfetter itself from these obligations. Finally, in keeping with a trend already well known to most community media advocates, those groups and communities which most need immediate access to powerful communication infrastructures, such as groups warning of health crises, environmental disasters, or important political votes that effect the entire community, almost never have an immediate way to communicate their messages clearly.

Our thesis is that if it were possible for the public to directly access the airwaves, without having to negotiate with an intermediary – the FCC or one of it's sanctioned industry kingpins – then perhaps it would be possible to expand vital community media services to all communities. It may even be possible for community-based communications providers, and home-grown communications tools built in-house by organizations who need them, to grow and thrive on an as-needed basis. We believe that current and future technological advances will make this scenario increasingly possible and economically feasible. With a good legal case being made for this kind of community communications initiative, we hope that this groundwork can inform grassroots action to bring it into being.

The goal of more equitable distribution of information by the public and for the public should be of paramount importance to any democratic government. Yet, far too often in the United States, approaches to public policy are made only in economic terms that favor efficiency tradeoffs over equity tradeoffs. Those who ask questions about equitable access to other necessary resources therefore rarely ask questions

about equitable access to wireless communications infrastructures. However, we would argue that a wireless communication infrastructure based on the best of current wireless technologies – smart radio – is a public good that can be consumed by everyone including those who cannot pay. It is difficult to overstate the social justice potential for a communication infrastructure based on smart radio.

We must also discuss that in light of the drastic advances in communication technology that are taking place, we need to seriously reconsider what constitutes the public interest. As we approach “pervasive connectivity” over the airwaves – that is, cheap and ubiquitous communication – current thinking of what constitutes public access must be changed. In this new communications paradigm at least two important shifts are possible. First, our ideas about what constitutes adequate access to communication must be radically expanded upward, to encompass these new possibilities in new technologies. Second, we must fight for independent communication systems that can be created and controlled at the local level, without the heavy hand of government deciding who gets to communicate with whom, and without the controlling hand of corporate monopolies. These local systems need not all look the same, serve the same constituencies, or be sustained in the same ways. Smart radio is flexible enough to support many models, including home grown and ad hoc communication.

I. “Assume Everyone Has the Right to Broadcast.” The Technical Case

The Wi-Fi Accident

The first wave of smart radio was accidentally unleashed directly on the public in 1999. WI-FI – two-way smart radios that network computers to each other and to the internet – was envisioned by its creators as a way to network offices without wires, but it quickly became a way for neighbors – all over the world – to share internet service. But WiFi is only a taste of what is possible with Low-Power Community Based Communications that use Smart Radio technology.

Leading Smart Radio expert Kevin Werbach believes the best way for the airwaves to be allocated in the Smart Radio context is to assume that everyone has a “baseline universal privilege to communicate.” In *Radio Revolution: The Coming Age of Unlicensed Wireless*, Werbach states, “Using a combination of the techniques outlined in this paper, it is possible to imagine a world in which anyone can be a broadcaster.”

The 999,999 Missing Channels of Communication

The cluster of computer and networking innovations collectively known as Smart Radio makes it possible for the airwaves to be used for many, many times more channels of communication than could be imagined just a few years ago. At a recent public talk in DC, FCC Chief Engineer Ed Thomas said that he never would have predicted the current developments in wireless communications even five years ago, but today “I’m amazed by what can be put into a small box.”

According to J. H. Snider’s *Citizen’s Guide to the Airwaves*, the same amount of airwaves that carried one TV channel in 1960, can today carry 10 channels. Similarly, the amount of the airwaves that was tied up by a single mobile phone call in the 1940s today handles 100,000 phone calls. As time marches on we can expect even more

improvements. “Yet all of these advances,” Snider states, “may be little compared to what’s likely to happen in the next decade. Another increase in spectrum capacity by a factor of 100,000 is quite possible.”

But these advances in wireless communication have not been applied equally. Though some of the innovations that make so much more communication possible have been around for decades and many are already being used by some broadcasting based industries, the FCC is only now considering whether these innovations will be applied across the board. So the question must be raised, will the benefits of these new technologies be applied to direct public access? What would community media look like it were multiplied by 100,000 or 100,000 x 100,000?

Unlicensed – The More Fair Regime

WiFi is one of dozens of wireless radio devices including portable phones, garage door openers, remote controls and Mr. Microphones that transmit and receive on special radio bands that have been designated “unlicensed.” Unlicensed does not mean – as some big telecoms are saying right now – that there are no rules and chaos reigns. Quite the contrary. On licensed radio, people get permission to broadcast from the FCC. With unlicensed radio, a potential creator requests permission to build a new device that takes advantage of unlicensed spectrum. Creators submit their design for a device to the FCC for approval. Unlicensed devices are required to follow strict specifications. Once a creator can prove that her device meets the FCC’s engineering standards, she can build any number of them can be made without requesting license permission for each unit. For example, people that want to use unlicensed devices – their portable phones, garage door openers or wifi phones – do not need to get prior permission to use them from the FCC.

When communities take advantage of these new technologies for their communication needs, innovative systems built on an as-needed basis begin to flourish.

For example, the city of Cleveland is creating what they call a citywide “municipal bicycle lane.” *One Cleveland* is a high speed city-wide network, designed to lower access costs for all who use it. Scalable to neighborhoods or other cities, the Cleveland project provides free wireless internet to the public while lowering communications costs for participating non-profits and government agencies. One Cleveland designers are focusing on five core aspects for planning their “digital city”: “bridging the digital divide, health care, arts and culture, scientific research and e-government.” Operational savings for participating educational, government, cultural, and healthcare organizations is anticipated to be 30-60%. Participating organizations are encouraged to provide free public access to their neighbors and communities.

By creating access points in all public schools, universities, and other public areas, the digital city planners hope to create the digital infrastructure they believe is critical to economic growth. By creating this core network for the city, the public should benefit by opportunities for “learning, job training, research, economic development, and community access to culture, healthcare, and e-government.

On a smaller scale along these lines, the *Urban League of Eastern Massachusetts* is networking computer training centers and non-profits in the Roxbury area of Boston, in order to more effectively share resources such as expensive computer training programs. In Urbana-Champaign, Illinois a community wireless group is providing

internet on a sliding scale capping at \$10 a month. And in southern California, eighteen Indian reservations in San Diego county are using wireless to reunite their tribe across a distance of over 200 miles with hopes of making their project self-sustaining by providing high-speed access to nonnative households.

If we want to see more community-based programs like this come to fruit, we should clearly understand how licenses impact a community's ability to use communications infrastructure. In his *Draft Principles of Progressive Spectrum Management*, Harold Feld points out the public interest problems with licensing, in light of the new technical possibilities: "Licensing spectrum...represents a fundamental restraint on the ability of citizens to communicate with one another. If licenses are exclusive, then citizens can only communicate with each other via a government sanctioned intermediary. If that intermediary has the right to choose how to deploy systems, or what content gets carried on the system, then communities and individuals find themselves at the mercy of government licenses. No matter what technical capacities the system may support, or what content people may prefer, or the rate at which communities would otherwise wish to see services deployed, decisions on these matters rest wholly with the licensee." He continues, "Free citizens should not have to go on bended knee, like serfs of old, to those given exclusive spectrum franchises by the government. Decentralized control of spectrum has been advanced on economic grounds, but it derives its fundamental justification from the principles of the First Amendment."

Communities Can Build, Own, and Control Their Communications Infrastructure

So far, unlicensed devices are always low-power. This means that the most smart radio devices like WiFi "whisper" instead of "shouting" the way big broadcasters do. Whispering has some big advantages. A lot more conversations can take place in a room where everyone is whispering instead of shouting. Low-power networks have proved to be very reliable and powerful in many situations. So-called "mesh" networks with lots of low-power transmitters constantly whispering to their neighbors – sending and receiving – are more reliable than old-fashioned point to point networks. An important advantage to the community-minded spectrum pioneer is that each transmitter in the mesh network is relatively inexpensive to buy and install compared to big transmitters that need special towers to work. The network grows bit by bit, cheap transmitter/receiver by cheap transmitter/receiver. As money becomes available the network grows. Each transmitter can be owned by the person who throws it up on the roof. And the more people who do so, the more coverage everyone has and the better the network can run.

Trickle Down Media Democracy Doesn't Work

Big Media and Big Telecoms complain loudly about the "command and control" way that the FCC doles out permission to use the airwaves. Command and control doesn't work well for media democracy either. One connecting thread among the various community based wireless systems that are popping up around the country is the excitement in the voices of those involved in building them. These diverse organizers see the tantalizing possibility of self-sustaining and self-reliant communications at the local level. Instead of being dependent on government subsidies forever, small for profits and non-profits all over the country are finding ways to bring access to the public for free in a sustainable manner.

Smart radio has a role to play in correcting some of the oversights of recent current communications policy. Let's tour a few of the failures:

The North End of Springfield, Massachusetts is one of the poorest areas in the state. The public library provides internet access, but it is open for just one week day per week, from 9 am to 5 pm. It is difficult to imagine successfully looking for a job or working on a school assignment with this level of "access." Yet from the fly-over perspective of policy makers, people on the North End have "access."

For some with pressing needs, "access" is not even on the table. In the summer of 1995, over 700 people died in Chicago in a record heat wave. (That's more than twice the number of people that died in the Great Chicago Fire.) Although it was an unprecedented health crisis, the media at the time did not treat it as such. In Eric Klinenberg's five year study of the deaths published in his book *Heat Wave* he identifies the victims as primarily poor, socially-isolated, elderly men. Though health workers were aware of the dire circumstances, the public at large was not informed because the story wasn't reported. The media, in their role as mediators of information, missed the boat, with potentially dire consequences for the city of Chicago, poised to suffer the same loss again. A fitting epitaph for these unfortunate men might be, "Trickle down media democracy worked no better for us than trickle-down economics."

It is likely that if we had a team of Eric Klinenbergs to study communities across the country, we would find similar stories everywhere. In Immokalee, Florida, a public health advisory circulated on the local media told residents not to drink the water due to bacterial contamination. Local officials had no idea that their health advisory was functionally inaudible to the majority of the town's population – its migrant workers – because there was no media that served them. If local officials and local media are unable to see the communication gaps that exist within their own community, how are national policy makers supposed to shore these gaps?

Wherever old style communications infrastructure is implemented, these problems persist. Sarah Kamal, who works with international organizations to build radio stations in rural areas in Afghanistan, points out that even well-meaning experts can make assumptions that lead to very ineffective communication systems. In her article, "Disconnected From Discourse: Women's Radio Listening in Rural Samangan, Afghanistan" Kamal points out that the western organizations that are setting up radio in rural Afghanistan, made multiple assumptions that did not take into account barriers to relevant use of radio by women there. Major factors such as linguistic differences, time of day of programming, women's access to radios, and relevance of programming were misunderstood by developers. The discomfort of western NGOs with the women's desires to hear Islamic programming was another difficulty. Kamal concludes, "Current operational assumptions of western radio organizations have created significant gaps between what rural women require and what their media system provides."

Communication infrastructures created using smart radio could solve some of these problems. While the migrants in Immokalee now have an LPFM station to disseminate information about the next health crisis, the lengthy licensing process meant that the station was not up in enough time to solve that particular crisis. In the near future, inexpensive ad hoc networks like the ones that the US military is developing for battle will be able to pop up as cultural and civic needs emerge. It will be possible for the communications budget of, say, a county public health agency to be

used to provide wifi phones to the chronically ill. If such a system had been in place in Chicago in 1995, hundreds of lives could have been saved.

Today, in the North End of Springfield, Massachusetts, students from Syracuse University, led by Professor Murali Venkatesh, have partnered with local community organizations to design a wireless network to replace the one-day-a-week access with real, pervasive community-wide access. Key features of this project include an inherent design of sustainability, with the network also serving local businesses. Taking into account the needs of this primarily poor, primarily Puerto Rican community, the design team is looking for ways to make the network useful to non-English speakers and people with low or no literacy. In an era when this Springfield community has little to no commercial media representing them, and at a time when that community's access to mediamaking is at its lowest possible point, this project is designed to make it easy for people in the community to generate local multimedia content. It is the sincere hope of the Springfield project organizers, and of these authors, that the models and practices established by this community can be expanded to many community organizations and their needs across the country, and the world. As this group identifies its own needs, and creates an infrastructure tailored especially to serve those needs in a sustainable way, the best practices of this model will start to become clear.

Beyond Community Media and Forward to the Real Impacts of Community Communications

Communication is a powerful prophylactic. Over one hundred years of psychological, sociological, and medical research from nearly every sub-discipline and perspective all point in the same direction: quality of life and length of life is directly related to the quality of an individual's social ties. The more ties, and the stronger the ties, the stronger an individual is in every measurable way. We need to communicate in order to be healthy.

Current communications policy does not take this into account. Take, for example, the phone system. The majority of Americans pay a fee to the phone companies so that low-income users can access the phone system for a reduced rate. But this reduced rate often translates into reduced service and reduced access. While it is desirable that low-income people are able to call 911 if their house is on fire, day to day communication needs become undermined by policies that undervalue the quality of life. A holistic communication policy would recognize that people who are low-income, chronically ill, or marginalized for whatever reason often have stresses in their social networks and should encourage as much communication as is desired by such persons. Yet, the current structure is a subsidy to the phone industry that regressively taxes most users while providing limited service options to the poor. In essence, the policy says, "If your house is on fire call 911, but if your roof leaks and your foundation is caving, we can't help you."

Smart radio and the age of pervasive connectivity can change this arrangement. First, because the infrastructure of wireless communication can accommodate multiple networks or cooperative sharing of a single network, there is no need for us to have to rely on handouts from monopolies like the phone companies. Because the technology is affordable enough for counties, municipalities, small businesses or non-profits to build and use, the design of wireless networks can be tailored to those who will actually be using them. It must be recognized that what constitutes "meaningful" or "relevant" or "timely" or "necessary" communication cannot be determined by those

who stand above the grassroots level. Many of the problems that are embedded in well-intentioned but far away policy makers designing a network that attempts to anticipate other peoples needs can be avoided by building from the ground up – with the users able to tweak their network to suit their needs.

II. Cost Does Equal Access. The Economic Case

In a September 17, 2003 piece in the *Washington Post*, Rama Lakshmi reports “Radiophony, an Indian lobby group for community radio, claims that villagers can set up a low-powered, do-it-yourself radio station – with a half-watt transmitter, a microphone, antenna and a cassette player – for approximately \$25. The group says such a station can reach about a third of a mile and cover a small village.” Old fashioned low-powered analog radio is the communication choice for the world’s poorest people because it is the least expensive and easiest to use mass communication tool. Expanding the communication tools that rely on wireless and expanding the communication channels that are available via wireless should directly correlate with more accessible communication to more people. As smart radio makes possible “orders of magnitude” more communication over the same old airwaves, our expectations of what slice of the pie the public gets to use should increase magnitudinally as well.

Wi-Fi has already demonstrated that smart radio can be inexpensive and accessible for communities in the United States. The cost to implement the community network in Springfield, Mass today is estimated to be \$60,000. That’s still a far cry from the \$25 dollar LPFM stations in India. Like all computer technology the cost of smart radios is likely to decrease over time. The largest computer chip manufacturer, Intel, is already making smart radio chips. Companies like Cisco, Microsoft, and Sony and are betting heavily on wireless technology. Wireless networks are not as easy to use or implement as old-fashioned radio- yet. The wonderful opportunities that smart radio brings to us will have arrived when they come down to the price and ease of use of LPFM.

Use of “consumer grade” technology means the communications infrastructure is affordable to many, and – if we work at it – maybe everybody. There are ways that the cost of smart radio can be made unnecessarily expensive for the little guy. Imagine, for example, that the government passed a rule that said anyone that drove on a public road must drive a Mercury Cougar. Ridiculous? Unfair? Yet, this is analogous to what the FCC mandated AM and FM broadcasters to do. A proprietary technology called IBOC, partially owned by ClearChannel must be used by any AM or FM broadcaster who wants to broadcast digitally. Big Media and the Big Telecoms must not be allowed to lock the public out of use of the airwaves by locking up control of key technologies. When the government mandates that everyone who wants to use the airwaves must use a specific corporation’s product, it gives that corporation a veto on free speech.

Another way the public could be cut out of the wireless loop is through “propertizing” of the airwaves. “Propertizing” is a term thrown about in Washington by a group called “the propertizers” and it describes the mental hopscotch that needs to be played en route to privatizing the airwaves. Yes, the same great minds who dreamed up pollution credits for mid-west air and for-profit water for South American peasants have their eyes set on the airwaves. Variations on the theme include transferring the work of the FCC over to a private entity, permanently selling off the

rights to broadcast to the highest bidder, and secondary markets for spectrum – like the ones we have for energy (think Enron). Imagine ClearChannel or The Carlyle Group “owned” the color green and anyone who wanted to use green had to pay them a fee. That is a literal analogy of what the propertizers want to do.

III. Ye Olde Dumb Network. The First Amendment Case

If it is possible that new communication technologies can evolve into infrastructures that allow people broad-based direct cultural and civic participation via the airwaves, as many of us believe to be the case, than the arguments of 70 years ago that allowed for monopoly control of communications over the airwaves may no longer be legally excusable. According to public interest telecom lawyer Harold Feld of Media Access Project, “The First Amendment prohibits the government from granting exclusive rights in communication unless the physical characteristics of the medium require exclusivity as a precondition for productive use.”

The framers of the constitution did more than pay lip service to free speech. When we begin to talk about building a state-of-the-art communication infrastructure that values everyone’s right to communicate, the response is usually an instantaneous and guttural, “THAT WILL NEVER HAPPEN!” But this is completely untrue. It already happened at least once.

When the American Revolutionaries met for their first big meeting at the Continental Congress, it isn’t surprising that one of the very first things on the table was putting in place their own communication system that would not be subject to the King. A former royal postmaster who had lost his job for his political beliefs and who was also printer and publisher of The Pennsylvania Gazette – Ben Franklin – was charged with setting up an alternative postal service. Back in the 1700s, mail was not only for letters to grandma, it was the only way for information or news to circulate. In those days, censorship could be heavy handed. Saying the wrong thing could get you burned at the stake or locked up for life. King George also used other clever laws like taxes on newspapers to control the flow of content and dissent. Even if one were able to speak one’s mind, political dissenters would be subject to spying as traditionally in Europe the mail system was also a spy system for the royalty.

It is truly astonishing and revolutionary that after they won their war, the Americans did not replicate the Europeans, but instead embarked on creating a communication system that reflected the Enlightenment value of Free Speech. Mail carriers were not spies. Control of content was exclusively in the hands of the “end user,” the “consumer” or as they used to say the “individual.” One of the first acts of the first federal congress was to create a subsidized communication system to tie the whole country together, including unprofitable rural areas. As Robert McChesney, Paul Starr and others point out, in its day, the postal system was the best way to provide the maximum amount of people with the most free speech.

Today, important decisions are being made at the national and international levels about where the controls should be placed on who can communicate with whom. Much of the decisions revolve around what kind of networks can be built. Network theorist David Isenberg calls for a “Stupid Network” – one where the network pays no attention to what’s coming over it, and where all of the intelligence exists at “the edge

of the network” – the user and the user’s computer. Franklin would say, “Been there, done that.”

Convergence is here

At the New America Foundations Pervasive Connectivity conference this April, FCC Chief Engineer Ed Thomas said, “People have been talking about convergence for fifteen years.” “Convergence is now here.” Of course, Mr. Thomas is talking about the convergence of communication systems. But it also means that those of us who desire a communications infrastructure that widens and deepens the circle of meaningful participation can converge as well. Radio activists are no longer just radio activists, tv activists are no longer just tv activists, and computer activists are no longer just computer activists. The possibilities of smart radio and questions of fair use of spectrum even reach out to the environmental movement. Common Assets Defense Fund takes the position that spectrum is a natural resource.

As the wireless infrastructure opens new possibilities, many questions that go to the heart of public interest in communication deserve to be revisited: How quickly and how easily can communities/individuals solve a communications need or desire? What governmental entities or what corporations do they need to go through in order to resolve a communication need? What communication systems promote the highest degree of communication self-reliance for communities? How do we assess the depth and breadth of meaningful civic and cultural communication? In light of so many more channels of communication possible – what can we do with them? How far can consumer grade technology and consumer based infrastructure be pushed in the direction of putting citizens in the decision-making position? Who will decide what level of civic and cultural participation we can engage in and with whom we can engage?

The wisdom among our communications architects in Washington is that the public does not understand, does not care to understand, and cannot be made to understand what is at stake in current spectrum reform debates. Smart radio has created a feast of communication possibilities. We must change current wisdom by demanding a seat at the banquet even if we have to slip in through the backdoor sideways.

Fact-Sheet on New Spectrum Technologies

Today’s digital technologies differ from the devices of the past, which required regulation to prevent interference among signals. There are several ways in which new “smart” digital devices transmit and receive data in ways that distinguish between signals, allowing users to share the airwaves.

Cognitive Radio: Same thing as Smart Radio. Use “cognitive radio” when you want to sound obnoxious. Smart Radios are software defined. They would be better named Polite Radios because they cooperate very well with other wireless devices by “listening” before they transmit a signal. They can detect other nearby signals and avoid interfering with them. The imaginatively named Next Generation of smart radio is being developed by the Department of Defense. It will allow the DOD to set up complete communications systems without any interference to or from any existing broadcasting.

Software Defined Radio: using software to process the radio signals, these radios can also receive and transmit across a broad range of frequencies. Software radio is highly adaptable. For example, cellular telephone radio can transmit broadcast television signals. They can change transmission protocols on the fly and do many other nifty things.

WIFI: “A cordless phone for computers.”– Eli Noam.

Mesh Networks are based on small low-power two way radios. Each node in the network is both receiving and transmitting – capturing and retransmitting data – sent by other devices in the network. Each node that is added strengthens the network’s capacity by sharing the workload.

Spread-spectrum refers to several techniques to transmit a signal over a wide range of frequencies. Spread spectrum signals are transparent to other users.

Open Spectrum – describes mechanisms that allow for facilitated spectrum sharing. and key words are unlicensed, underlay, ultrawideb and and spread-spectrum. Unlicensed spectrum sets aside frequency bands for use with no exclusive rights. Unlicensed exists today, in the bands shared by computer devices such as cordless phones, and these bands are used by wifi (wireless internet) networks.

Underlay allows unlicensed users to coexist in licensed bands, by making their signals invisible and nonintrusive to other users. Ultrawideband devices transmit pulses of very short duration in order to avoid interfering with preexisting users of that same spectrum band.