

Radio Waves and Human Ideas Companions to Serve Us All

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Washington, D.C.

Presented at the Helen Keller Institute
December 6, 2007

Thank you for the invitation and opportunity to speak with you about National Public Radio's Captioned Radio project, and about our preliminary thoughts about marrying captioning to Braille output.

I am here with two key members of the NPR Labs staff, Dr. Ellyn Sheffield of Towson University in Baltimore, our cognitive researcher who specializes in user interfaces and Matthew Burrough, our technical researcher, who has great skills at designing solutions in software for us to exploit the power of the new digital radio service. These two deserve the thanks and recognition that often comes to me as the public face of NPR Labs.

At the outset, I must stress that we are here to listen to you – and to learn from the ideas you might share with us about how to best design a Braille – or other kinesthetically based radio service. We have only the most rudimentary notions of how to attempt creating a Braille radio service. So although I want to speak for a few minutes on the work we've been doing in our Accessible Digital Radio Broadcast Service project, and to give you some background on NPR Labs and digital radio in general, it is really your questions and thoughts we need more than anything else we might accomplish today.

As many of you likely know, radio broadcasting is the single most dominant form of daily mass medium on the planet. Some 4.3 billion people tune in to radio every week, and here in the United States the typical American listens to radio for 22 hours every week.

In 1989, I consulted for the Swaziland Broadcast and Information Service. Swaziland is a small landlocked country in Africa between Mozambique and South Africa. And it struck me in traveling to remote villages across the country just how pervasive radio really is. It requires no print literacy, no household electricity, and no disproportionate concentration of resources for effective operation. It is truly the most universal of mass media.

NPR itself has an annual budget of roughly \$165 million, some 850 employees, and a weekly audience of 26 million. National Public Radio is a private not for profit radio network that provides programming, interconnection, and regulatory and legislative advocacy for our roughly 825 member radio stations. We are not governmentally funded,

and in a typical year receive only 2 % of our budget by winning competitive federal grants offered by agencies like the Corporation for Public Broadcasting, or in the case of NPR Labs from NIDRR and other agencies like the Public Telecommunications Facilities Program.

Public Radio didn't exist as we know it today prior to the adoption of the Public Broadcasting Act of 1967. In the ensuing forty years we have worked up from 90 stations to nearly 900, and now reach somewhere around 98% of the American population with a radio signal. But in recent years we have been turning our attention from how to reach people at all, to how to reach them most meaningfully, and our work on Accessible Radio is just one facet of this mission. Other than a handful of demonstrations and tests we have conducted none of these radio programs are converted into text until the transcripts are released some days later after fact-checking and editing by our transcript services and librarians.

NPR Labs would not exist without the current multi-million dollar, multi-decade effort of converting radio broadcasting from analog to digital transmission. Currently, some 1300 radio stations have begun digital radio transmission using a system called HD Radio, a unique digital transmission system that is compatible with existing radio broadcasts and operates in the low power vacant channels immediately adjacent to the current radio station frequencies. We are approaching one million HD radios in the marketplace and all of this is good news – but it must be tempered by just how early we are in the transition to digital radio. There are reportedly some 750 million analog radios and some 13,000 radio stations, so we have just stuck our toe in the waters of digital radio in the first five years after the FCC approved the service in October 2002. A long transition for new technologies is the rule rather than the exception, despite all of the press attention focused on the quickening pace of introducing new consumer products.

Working on the many facets of digital radio transition is our core activity at NPR Labs and we believe digital radio will prove highly beneficial to increasing use and satisfaction with radio services in the years ahead. Radio is the last of the electronic media to be making the conversion to digital transmission technologies.

For us, the primary reason to move to digital is simply because we can add new public services that never before existed. Our Accessible Digital Radio Broadcast Services project, being funded by NIDRR is a prime example of what we hope to accomplish with digital radio. This project has two areas of focus.

The first is designed to better serve the Radio Reading Services for the Blind and Print Impaired. There are over 100 radio reading services operating on FM subcarriers in the US, reaching roughly 1 million of the 8 million with serious visual impairments. The first of these services was established in 1969 and it has taken the ensuing nearly 40 years to slowly build out the services we have today. These services read the current news from local newspapers, books and magazines using special subcarrier radios that frankly do not sound good, and that require personal delivery in order to maintain the Congressional copyright exemption for the daily printed readings. This has been quite a

challenge over the years, and has resulted in fairly small quantities of radios being made with the subcarrier features. That has meant higher costs and poorer quality than what we think we can achieve with digital radio. It has also meant these consumers have been relegated to cottage industry manufacturing, rather than being part of a mainstreamed technology.

So NPR Labs first advocated and advanced the notion that the new digital radio system could support multiple program services. This is called multicasting and the HD Radio system was originally designed to avoid multicasting to limit competition among radio stations. However, public radio was successful in getting multicasting adopted by the FCC officially earlier this year, and the industry has adopted the technology with it now being part of every HD radio manufactured. It of course means that we are slicing the digital bandwidth in order to add these services and much of our work has been focused on documenting how the latest generation of audio coding technology results in very little compromise to the signal in adding multicast services. We now believe we can run three full audio channels, as well as additional services like Captioned Radio and traffic-casting services.

For radio reading services to convert to digital transmission, we also wanted to have conditional access technology added to the system so that we can activate a radio reading service for the blind – only on their mainstream-manufactured radios as a much more efficient and inclusive basis. To make a long story short, conditional access, the same technology that authorizes a satellite radio or satellite tv or pay per view service is now being manufactured into every new HD Radio. Only one piece of technology remains to be incorporated, a very efficient very low bit rate audio coder so that the reading service will sound a lot better than the analog service it will replace, as well as use such a small amount of bandwidth that no penalty will be required in the number of other channels and services that can be offered otherwise. The end result, we hope, is that success in all of these areas will mean many stations will add reading services in communities where they have yet to be established and that they will be much more efficient and effective than the old analog FM subcarrier services.

While we have made good progress in our first year with this effort, we are just beginning in earnest to prototype the entirely new idea of Captioned Radio for the Deaf and Hard of Hearing. Naturally, we're working with groups like Gallaudet and the Northern Virginia Resource Center in revisiting the basic elements of captioning as we add this feature to the new digital radios. The first generation of digital radios is migrating to larger display screens, and we are on the verge of having a baseline display that will support basic captioning. First we will create a series of prototypes and options for how the captioning will be presented, then we need to assess the strengths and weaknesses of each approach with many users, and then finalize the best designs into best operating practice recommendations for the radio and consumer electronics industry.

We are assuming that creating the proof of concept for the basic Captioned Radio technology will take at least another full year, with work on initial industry adoption to follow. Advanced features, that we hope to see in quick order would include the ability

to buffer the captioning so that it could be paused, replayed, and stored. We are also working with iBiquity Digital, the company that owns the underlying HD Radio technology, to deploy HD Radios with an Active Radio feature that will continuously monitor the designated local emergency radio station even when the receiver is turned off and will wake up when an emergency like a tornado or wildfire approaches, even in the middle of the night. This core software code has been created by iBiquity and is part of our demonstration we will be showing later. Our hope is to couple this feature with a universal output, such as a USB device, or even a basic form-C relay for activating a bed shaker or other appropriate technology for enhancing our ability to quickly message in times of threat to safety of lives of property situations.

Yesterday morning I left Jamaica at the end of a nice vacation. And in my final moments before leaving for the airport, I looked out on the waves of the ocean and thought about how waves are at the heart of vision, using some of the smallest wavelengths in the electromagnetic spectrum. And how waves are at the heart of hearing in that the lowest frequencies are the ones that carry sound through the air. But in between these two extremes is where all of our radio and television and cell-phone and blackberry operate. These are the invisible frequencies known as the radio spectrum that carry pictures and sounds over vast distances and that links us together across the nation and across the world. The radio spectrum is invisible, and silent, and hugely powerful. We look forward to talking with you about how we might harness it to open another doorway to ideas and thoughts and connections that don't currently reach the Deaf-Blind communities in an accessible, inclusive fashion.

I have talked a lot in an overview, and think it time to invite your questions and comments. . . .

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