

REPORT OF
CHERRY LANE DIGITAL LLC
ON
DIGITAL AUDIO BROADCASTING
FOR THE
RECORDING INDUSTRY ASSOCIATION OF AMERICA, INC.

To Be Submitted In

FEDERAL COMMUNICATIONS COMMISSION

MM Docket No. 99-325

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INTRODUCTION

It's not radio.

Digital Audio Broadcasting ("DAB"), also known as "high-definition radio" or "HD Radio," is a new medium, something very different from the traditional analog radio we know today.

Sometimes HD Radio receivers look like traditional receivers, but more often the new styles do not. HD Radio sometimes sounds like a traditional radio, but it needn't. It can and does sound much better. And when you reach for the dial, you realize HD Radio feels very different from traditional radio:

- It can have a record button that records music from the radio to a digital memory card;
- It can pause, rewind and fast-forward the radio;
- It can filter song titles and data to customize recordings for each individual listener;
- It can swap its memory with your computer, either directly over a USB cable, Bluetooth or by moving memory cards, in all the same ways you move digital photos; and
- It can display video and pictures and run software from data transmissions.

Because of this new functionality, we say this is not radio.

DAB Digital Radio is not the same as analogue radio. This may seem a rather facile statement, but the implications of introducing the most radical development in radio broadcasting since the early 1950's when VHF-FM came along, cannot be underestimated. DAB Digital Radio is a completely new technology, and as such any country considering its implementation must rethink its regulatory environment.
– World DAB Forum, Summer 2003¹

BACKGROUND

This is a report from Cherry Lane Digital to the Recording Industry Association of America (“RIAA”) on DAB (or HD Radio). We understand that this report is to be submitted to the Federal Communications Commission in response to a Further Notice of Proposed Rulemaking and Notice of Inquiry in the matter of Digital Audio Broadcasting Systems And Their Impact on the Terrestrial Radio Broadcast Service, MM Docket No. 99-325.

You asked us to provide a report addressing the following topics:

- I. Describe Digital Audio Broadcasting, or HD Radio;
- II. Report on DAB’s rollout and acceptance;
- III. Assess the current and future market for products and services enabling HD radio recording;
- IV. To what degree do these products and services now, or will they in the future, integrate features that enable on-demand access to sound recordings;

¹ World DAB Forum, Summer 2003, Aiding Implementation and Roll-Out of T-DAB, http://www.worlddab.org/images/DRAFTBROCHURE_5_FINAL.pdf, Page 14.

V. To what degree do these products and services now, or will they in the future, permit redistribution, either through removable media or digital outputs or other methods;

VI. What other products and services may be developed?

I. Describe DAB or HD Radio

A. What is Digital Audio Broadcasting?

Like many technology-based businesses, global AM/FM radio broadcasting is amidst a transition from analog to digital. Where analog waveforms once crackled, popped and warbled with lightning and atmospheric change, digits will increasingly rule the airwaves.

The U.S. iBOC standard varies from its European counterpart, but the function and form are the same: Digital broadcasting brings with it the primary virtue of digital fidelity to the program material, higher quality sound with music true to its digital capture.

Debate is a constant amongst audiophiles, and implementations from broadcasters can and will differ, but DAB under weak signal conditions maintains its intended quality and under optimal conditions and full use of the standards is for many people audibly indistinguishable from a standard compact disc.

Furthermore, the broadcast data stream carries the opportunity to include more digital information than is necessary for the primary audio broadcast. This extra data capacity offers revenue opportunities and interactivity for listeners not present with analog radio.

B. DAB Is Not Radio As We Know It

Except insofar as it involves radio technologies, DAB isn't radio as we know it.

*DAB Digital Radio is a whole new way of broadcasting radio, and it brings you a whole new way of listening! DAB Digital Radio offers you: More choice; Improved Sound Quality; Ease of Use; No Re-Tuning; Multimedia Fun; and all for ... Free!*²

Don Bogue, founder of Command Audio, iBiquity's partner in developing the future of DAB, said: "[DAB] challenges the industry norms; at its most basic, on-demand interactive audio requires people to think differently about radio, about content, advertising, devices, business models and the value chain."³

He continued: "Audio-on-demand, a solution that leverages DAB technology to deliver choice, convenience and control to listeners and far better messaging capabilities to advertisers, is that 'killer app.' It addresses one of the most powerful trends we have ever seen in media consumption: Personalization. And it enables radio to capitalize on that trend and share in the economic benefits it will produce."⁴

Here's a partial list of reasons why DAB is not an evolution from traditional radio; rather, we believe it is a revolution that creates a new paradigm, turning a service that provides users with what a programmer wants them to hear into a service that permits a user to select what she wants to hear:

1. DAB receivers store content, radios don't: DAB receivers today sport both internal RAM and tiny multimedia storage identical to that used in digital cameras:

² <http://www.digitalradionow.com/>.

³ Don Bogue speech the Radio Academy at The Radio Festival, July 9-11, 2001, Page 17, <http://www.worlddab.org/images/RadioFestivalCommandAudiospeech.pdf>.

⁴ Don Bogue speech the Radio Academy at The Radio Festival, July 9-11, 2001, Page 21, <http://www.worlddab.org/images/RadioFestivalCommandAudiospeech.pdf>.



Someday soon these receivers will ship with built-in hard drives, which will follow the standard course of regularly doubling in storage size and falling in price. Customers will be able to custom program their DAB radios utilizing smart buffering technology:

File caching in the receiver: The WorldDAB Forum has now established a specification for using an optional caching facility in the receiver. **The user will benefit from a so-called “rewind radio” which will allow listening to the latest programme at any time. The caching device will also allow the user to use the DAB receiver as a kind of PVR (Personal Video Recorder) device for time-shifted playout of audio events (with or without associated data).** It should be pointed out that the use of caching may change the way how [sic] people access and enjoy radio listening. It potentially widens the programming possibilities offered by the broadcaster but also introduces new technical and operational problems (copyright, EPG, etc).⁵

The software manufacturer RadioScape announced a new product in September 2003 – the RS200L module – that incorporates smart buffering:

One of the features of this module is **the inclusion of Rewind Radio that enables about ten minutes of audio to be stored on a RAM chip.** This can be used to listen to a news clip again, or to time shift by pausing and resuming the radio broadcast. The module has been designed using the DRE200 chip from Texas Instruments, which is probably one of the world’s best selling receiver chips for the EU-147 standard. This chip has now been superseded by a new version DRE310 that can decode more than one channel simultaneously and includes time-shifted radio, announcement support, service linking (FM/DAB ensemble switching), TII (Transmitter Identification Information) and support for MP3 / Windows Media Audio CDs.⁶

⁵ http://www.ebu.ch/trev_297-kozamernik.pdf, Page 10 (emphasis added).

⁶ EBU Technical Review January 2004, Page 10, http://www.ebu.ch/trev_297-kozamernik.pdf (emphasis added).

Rupert Goodwins, writing for Ziff-Davis in August 2002, previewed the thinking amongst hardware manufacturers about DAB buffers:

Another smart idea is to **integrate a hard disk into a digital radio receiver for the home environment**. Tony King Smith of Panasonic UK and Peter Wild of Roke Manor Research are calling this a **re-wind radio, which permanently stores in the background all the data received from a DAB transmitter**. Using this concept you can stop live reception whenever you want, and go back to an earlier part of a stored programme to retrieve a piece of information you may have missed earlier. Or if the telephone is ringing while you are listening to an interesting radio feature, you can just push the stop button on your DAB radio and continue listening when the time is right. This idea is not new, and has been used in the latest generation of digital satellite receivers, but it would do very well in radio receivers too.⁷

2. DAB far exceeds radio quality: DAB audio quality, of course, depends upon its implementation: Its near CD-quality broadcasts can't exceed that of its source material, and the bit-rate allocated to the audio channel determines quality in much the same way purity determines the value of a metal, with 384k transmission comparing to 64k transmission in the same way that 24 karat gold is superior to 10 karat, but the quality of DAB is marketed as better than analog radio.

Nonetheless, even weak digital signals fulfill their mission of delivering quality, noise-free sound in ways that analog radio cannot, and good signals with high-bit rate material approach and equal the quality of a compact disc.

According to a leading standards organization in a controlled test, "an analysis of the audio files demonstrates that even in an unimpaired channel, the quality of the IBOC audio recorded off of the USADR receiver is superior to the analog audio recorded off of the Denon receiver."⁸

⁷ <http://www.rnw.nl/realradio/features/html/digital020514.html> (emphasis added).

⁸ <http://www.nrcstandards.org/Dab/Appendixg.pdf> Page 4.

3. DAB knows what's coming, radio doesn't: DAB includes an Electronic Program Guide as an inherent feature of its use, essentially broadcasting advance programming notices to all receivers. It also incorporates on that EPG an easy recording shortcut.

Rupert Goodwins, writing for Ziff-Davis in August 2002, discussed the value of Electronic Program Guides to DAB:

By far the most impressive aspect of the software is the integration with the BBC's electronic programme guide (EPG). This has listings for radio programmes for up to a week ahead: if you want to record one, just click on it. Want to record everything John Peel does in a week? Search for his name in the EPG, click on the results, and that's that. It's like a video recorder for radio, **but a thousand times easier to use**. And writing as someone who has in the past painfully set up cassette recorders on clockwork time switches, this function alone is worth the money. Files vary in size depending on programme length and bit rate, but are typically around 1MB per minute.

In combination with a portable MP3 player, the EPG integration means I can record my favourite obscure late-night music and always have something worthwhile to listen to on my commute into work. Also, every so often I can go through the week's listening and just click on anything that looks interesting, thus creating a huge pool of **listen-on-demand programming** for those times when nothing's on. Files are given the names of the programme, so it's easy to remember which one is which. **It's wireless nirvana!** The EPG takes a couple of minutes to download over the air, it comes with links to the appropriate Web sites, and is a thing of joy in every respect.⁹

The Digital Radio Development Bureau in the UK also explains the impact of access to advanced program guides:

⁹ <http://reviews.zdnet.co.uk/hardware/audio/0,39023770,10001752,00.htm> (emphasis added).

An EPG could let the consumer search the listings of every digital radio station, and then dig deeper for more information about specific programmes. Having found what he wants, he could then use the EPG to select a programme, or set a reminder up to seven days in advance, so his DAB radio will automatically alert him when the programme is on. Using this type of automated time-shifting of programmes, your listeners could plan their week around their favourite programmes on your station. **Along with linking to interactive content, personal media recording is also possible.** And listeners could use the EPG to build a “favourites list” of radio stations, which, in turn, builds loyalty to those brands. The consumer could ask the EPG to “show me all the jazz programmes on this week” and then select the programmes that appeal to him, **in essence creating a “personalised radio.”**¹⁰

Frank Kozamernik, writing in the Swiss-based EBU Technical Review, observes, “DAB EPG will ... enable future technologies such as Personal Media Recording (the DAB equivalent of PVR) to be introduced. Manual or automatic time-shifting of the programme will be possible for the user to choose what they want to listen to and when.”¹¹

4. DAB isn't limited to audio, radio is: Whereas traditional radio merely delivers broadcast audio content, DAB radios will be capable of delivering pictures, data, even videos. “DAB radio is designed for the multimedia age: DAB can carry not only audio, but also text, pictures, data and even videos.”¹²

There are already implementations like Visual Radio, designed by Nokia and deployed in its partnership with Hewlett-Packard. DAB can carry text-like song lyrics, digital files of music and ring tones, virtually anything that can be digitized.

5. DAB is a fat data pipe that radio is not: DAB carries data with which the user can interact, in much the same way that the DirecTV television satellites can and do also

¹⁰ <http://www.drdb.org/article.php?id=235&from=hom>, 16 April 2004 (emphasis added).

¹¹ Frank Kozamernik, EBU Technical Review January 2004, Page 9, http://www.ebu.ch/trev_297-kozamernik.pdf.

¹² http://www.worlddab.org/images/eureka_leaflet.pdf.

deliver e-mails and web pages to DirecWay satellite users at the same time that they deliver hundreds of channels of television and music to North America. Singapore, for example, has already proven an ability to use DAB for high-bandwidth interactivity. MediaCorp Radio Singapore on Friday, 31st October 2003, successfully demonstrated the integration of GPRS (General Packet Radio Service) technology as the back-channel return path with DAB. First showcased at Broadcast Asia 2001, it demonstrated an efficient wireless data transmission platform using DAB with a wide bandwidth of up to 1.2Mbits/s.¹³

In the UK, the data transmission possibilities are becoming reality, according to the Digital Radio Development Bureau: "DAB digital radio will enable new capabilities on mobile phones including both broadcast and downloadable music and video clips combined with text and information services, all of which can have interactive functions. As this venture moves forward, BT Wholesale will be working in conjunction with world-class manufacturers of cellular equipment to develop applications and new devices for the service. Third party content and information providers will be able to deliver services such as news, traffic, sport and music through the system."¹⁴

In their white paper entitled "How Data Transmitted Over An IBOC Station Will Be Managed: Using A Gateway to Generate Data Revenue," David Maxson (Managing Partner, Broadcast Signal Lab, LLP) and Paul Signorelli (Chief Technology Officer, Impulse Radio, Inc), both key people involved in creating and implementing the U.S. DAB standard, describe the new business model: "The new model for data flow in the IBOC environment will put broadcasters in the business of selling bits of data and

¹³ <http://www.mediacorpradio.com/smartradio/enews/decnewsletter.htm>.

managing myriad data clients on their broadcast channels. This new medium will require new strategies for efficiently selling, administering, queuing, transmitting and billing for data services.”¹⁵

Later in their essay they explain that content protection is essential to the DAB business model: “In addition to creating an assurance of interoperability between many receiver brands and types, this classification hierarchy will give content and service providers assurance that their valuable content and services will be available only to those whom are authorized and used only in the manner allowed. Data could be permitted for one-time use, no-recording, pay per use, free use, or no-exporting to other devices, among others.”¹⁶

*Listeners continue to want and need the flexibility, reliability and quality that radio offers today, but we in the radio industry want to give them even more. - Göran Arvedahl, Chairman of Regulatory and Spectrum Committee, World DAB Forum, Summer 2003*¹⁷

DAB is clearly not traditional radio:

- DAB receivers will store broadcast content in RAM or to hard drives or other media; traditional radio receivers do not do this;

¹⁴ <http://www.ukdigitalradio.com/press/display.asp?id=207>.

¹⁵ http://www.broadcastsignallab.com/white_papers/NAB-0402-mgmt-of-IBOC-data-trans.pdf, Page 1.

¹⁶ http://www.broadcastsignallab.com/white_papers/NAB-0402-mgmt-of-IBOC-data-trans.pdf, Page 10.

¹⁷ World DAB Forum, Summer 2003, Aiding Implementation and Roll-Out of T-DAB, http://www.worlddab.org/images/DRAFTBROCHURE_5_FINAL.pdf, Page 3.

- DAB receivers will permit you to rewind a broadcast program; traditional radio receivers do not do this;
- DAB broadcasts are in near CD-quality; traditional radio is at a much lower fidelity; and
- EPGs on DAB can notify the listener as to what is upcoming and permit listening – or recording – based upon EPG program data; traditional radio does not do this.

Because of these differences between DAB and traditional AM/FM broadcasting, we say that DAB is not radio.

II. DAB'S ROLLOUT AND ACCEPTANCE

Worldwide, DAB is growing at a rapid pace. There are today approximately 600 DAB channels on-air, with over 300 million people reached by their signals and receivers at all ranges of the market available for as little as \$75.¹⁸

Canada has 11 million potential DAB listeners, with 35% of its population within reception area of a DAB radio signal. Main highways are now acquiring coverage, which will increase that percentage to half the population.¹⁹

In Asia, China, India, South Korea and Taiwan are examples of DAB deployment, and Singapore is a worldwide leader in DAB cutting-edge technology.

Europe and Scandinavia have relatively high rates of DAB access, but Germany and the UK are exceptional in their adoption of DAB. Germany has 150 stations, with some

¹⁸ <http://www.worlddab.org/receiver.aspx>.

¹⁹ <http://www.digitalradio.ca/>.

digital only. Germany will achieve 85% coverage of its population by the end of this year.²⁰

Growth of DAB in the UK is exponential. Figures to the end of February 2004 show significant percentage growth of 229% year-on-year, putting cumulative penetration at 509,000 units.²¹

The DRDB's (Digital Radio Development Bureau) chief executive, Ian Dickens, says: "With more than 500,000 DAB digital radios in circulation, and millions tuning in to digital stations via their TV, it is clear that we are changing the way we listen to radio in the UK. Today's Rajar figures show continued growth in the popularity and awareness of new digital radio stations. Research shows that the chief reason for buying a DAB digital radio is to receive new, digital only stations, and these figures certainly bear that out."²²

²⁰ <http://www.worlddab.org/cstatus.aspx>.

²¹ <http://www.worlddab.org/newsletter.aspx>, May 2004.

²² <http://www.drdb.org/article.php?id=245&from=hom>.

III. ASSESS THE CURRENT AND FUTURE MARKET FOR PRODUCTS AND SERVICES ENABLING HD RADIO RECORDING

A. Recording features are a key feature of new chipsets

Chipsets are in the marketplace that facilitate the recording of DAB transmissions. The most popular new second-generation DAB chipset is from Texas Instruments, whose TMS320DRE310 is reportedly the choice of six of the last nine manufacturers to choose a chip.²³ It became available in sample quantities in the fourth quarter of 2003 and is now shipping to manufacturers.

Texas Instruments boasts in its chipset literature that one of the “key benefits” of its Eureka DAB Digital Radio Solution is that its

most integrated DAB baseband reduces cost and design time for adding features such as recording/playback, time-shifted audio ... (and) Digital Multimedia Broadcast design. ... It is especially well-suited for the automotive market ... while increasing the number of audio and data bit rates supported and integrating MP3 and Windows Media Audio (WMA) CD support onto the same silicon.²⁴

The TMS320DRE310 DSP-based baseband is the first to include on-chip support for features such as **record and playback from Flash memory and MultiMedia Card (MMC)**, as well as **time-shift recording and the capability for simultaneously listening to and recording of different channels**.²⁵

“Portable and handheld applications will have the ability to read and write to memory cards, utilizing the DRE310 baseband’s direct interface to MMC, Memory Stick and SD. These applications will also benefit from the on-chip USB 2.0 full-speed (12 Mbps)

²³ <http://focus.ti.com/docs/pr/pressrelease.jhtml?prellid=sc03230>.

²⁴ http://focus.ti.com/pdfs/vf/audio/dre310_prod_bull_06_12.pdf.

²⁵ Id. (emphasis added).

interface, which allow both an easy connection to the PC and record/playback capabilities.”²⁶

B. Recently released products provide for recording DAB, even in the automotive DAB receiver market.



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Blaupunkt's second-generation DAB receiver/recorder, the Woodstock DAB54 features MPEG recording capability with a 10-second advance buffer, interchangeable MMC memory cards and Bluetooth networking.

Blaupunkt introduced in Singapore in June of 2003 an automotive DAB recording device called the Woodstock DAB 53, and the company announced in April 2004 a more advanced version called the Woodstock DAB54. Country availability includes the United Kingdom, Singapore, Germany and Canada, making the product a truly world-wide phenomena. As a first robin of spring, it offers a taste of digital radio to come, and is becoming standard equipment on some European automobiles, including models from Vauxhall,²⁸ Lotus²⁹ and Daewoo.³⁰

²⁶ Id.

²⁷ http://www.bluespot.co.uk/stock/woodstock_dab54.asp.

²⁸ http://www.dab-digital-radio.com/dab_digital_radio_news.htm.

²⁹ <http://www.drdb.org/newsletter/index.php?id=119>.

³⁰ See, for example, http://www.carpages.co.uk/daewoo/daewoo_offers_dab_digital_radio_option_on_lacetti_18_03_04.asp.

The DAB54 predecessor, Blaupunkt's DAB53,³¹ found marketplace acceptance and inclusion as a standard feature in new automobiles. Daewoo, for example, heralded its integrated "recording function – simply insert an MMC or SD card into the unit and press OK when you hear a track that you wish to record from the station that you are listening to."³²

Blaupunkt's next-generation DAB54 eases this recording functionality with a 10-second buffer added to the record function, helping you record songs even though you didn't hit the record button at the very beginning of the song.

"The Woodstock DAB54 [] is equipped with a unique recording function that allows the listener to record their favourite DAB programme. **This special recording feature allows for delayed recording by data cache on MMC/SD.** In other words, should you miss the first few seconds of the radio programme, you are still able to record it entirely."³³

These devices are evolving features that enable on-demand access. For example, Blaupunkt clearly intends this result from its recording feature. What was at first a simple recording function sprouted a ten-second buffer of intelligence. Blaupunkt's partner Daewoo refers publicly to its ability to record music tracks, and emphasizes that it's in the MP3 format.³⁴ The new TI chipset heralds its ability to both decode DAB in its native MP2 while simultaneously writing it in MP3 or WMA format.³⁵ These devices and others have now set a standard of writing and reading MP3 files to and from portable

³¹ http://tonytalkstech.com/2003/10/blaupunkt_dab532_car_stereo.php.

³² http://www.carpages.co.uk/daewoo/daewoo_offers_dab_digital_radio_option_on_lacetti_18_03_04.asp.

³³ <http://smartradio.mediacorpradio.com/enews/april2004newsletter.htm> (emphasis added).

³⁴ http://www.carpages.co.uk/daewoo/daewoo_offers_dab_digital_radio_option_on_lacetti_18_03_04.asp.

storage, such as SD (Secure Digital) and MMC (MultiMedia Card). These are common data storage devices, the same as those found on many consumer digital cameras.

The Bug



Design guru Wayne Hemingway teamed up with PURE Digital to create The Bug, available with MP3 playback and ReVu(tm), which lets users pause, rewind and record live radio.

The Bug became available on 13 May 2004. It's key features include: DAB digital radio for more stations and digital-quality interference-free sound; ReVu(tm) - Pause, rewind and record live radio; Playback MP3 files (SD Card required); Record to SD Card

³⁵ http://focus.ti.com/pdfs/vf/audio/dre310_prod_bull_06_12.pdf.

or to an external MiniDisc player; Alarm, sleep and timer record functions; Display shows scrolling artist, song title, news, sports results and more.³⁶

"The Bug does things you've never heard before on a radio. You can rewind it, you can pause it, you can record it."³⁷

Kevin Dale, president of PURE Digital, says "The BUG looks fantastic and adds features that will totally change the way people listen to and interact with their radios forever."³⁸

"Phone ringing? Pause live radio, talk, and then restart the radio from where you left off. Missed something? Don't worry, rewind live radio and play it again. Really like that track? If you need to hear that track again, even though it's almost over, don't panic. Just rewind and hit record.** **Playback your recordings or MP3s on your Bug or convert them to MP3 on your PC for playback on your portable MP3 player or MP3 enabled phone or PDA.** Out and about? Too busy to stay in and listen to the radio? Set the timer, record your favourite programmes to SD card*** and listen to them later."³⁹*

(* 5-12 minutes depending on transmission; ** for personal use only; *** SD card not included.)

"And if the stuff above isn't enough, there's a high-resolution adjustable display; SD card slot; USB connector for PC connection; optical output; amazing sound; stereo

³⁶ <http://www.worlddab.org/images/PURE-Digital-Launches-Bug.pdf>.

³⁷ <http://www.digitalradionow.com/>.

³⁸ <http://www.worlddab.org/images/PURE-Digital-Launches-Bug.pdf>.

³⁹ Id. (emphasis added).

speakers; selectable EQ settings; full Band III reception for all UK DAB broadcasts; and a designer pedigree!”⁴⁰

Output connectors include 3.5 mm headphone; 3.5 mm stereo; USB; Secure Digital memory card slot; and Optical (S/PDIF) Toslink connector. When most of us remember recording to a cassette recorder, it was with the headphone or stereo jack’s analog output. This device can interconnect digitally in three ways: USB (Universal Serial Bus), MMC Memory card (of the type found on some cameras) and with its “Optical (S/PDIF) Toslink connector” – this last connector is a digital audio connector the permits access to the digital audio stream for purposes of recording.

⁴⁰ Id.

Sangean DPR1

Sangean reports this DPR1 DAB radio with recorder function is now available for sale, beginning June 2004.⁴¹



Sangean says this is a DAB receiver with radio rewind facility; FM and DAB bands; AC/DC operated; digital record/playback using built-in memory or via external SD slot.⁴² Since November 2003, it's been available in the United Kingdom as the Roberts Gemini RD1 Portable for about £200.

⁴¹ <http://www.thiecom.de/dpr1.htm>.

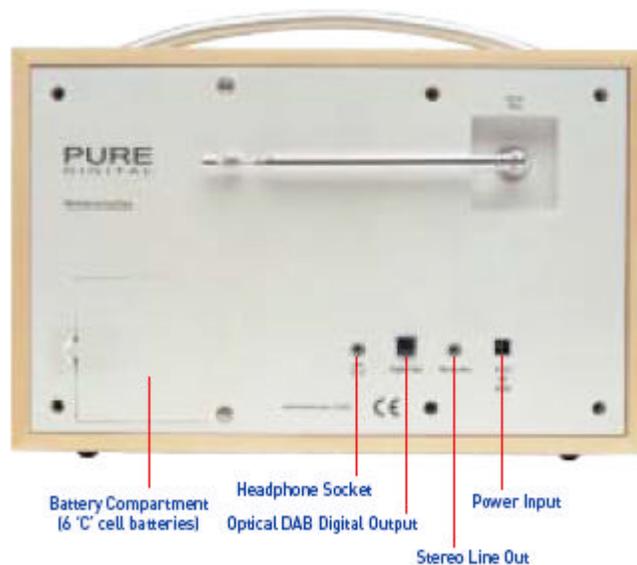
⁴² <http://www.sangean.nl/English/?opt3=DPR-1&opt5=66>.

Ministry of Sound MOSRC023 CD Radio



This DAB receiver/recorder is CD-R/RW compatible, has optical digital output, AM/FM with 40 presets, line out and full remote control. It costs about £150.⁴³ It became available in January 2004.

Pure Evoke 2



⁴³ <http://www.radioandtelly.co.uk/dabreceivers.html>.



Details: Stereo. Mains or battery (6 x C batteries), 3.5mm socket for stereo analogue audio output, plus DAB optical output, 6 presets Date and time display. Launched April 2003. Available for £130.

Even the low-priced, simple and portable Evoke from Pure facilitates digital recording with an optical output. Pure's new line of products features more advanced recording capabilities: "Coming later this year from PURE Digital is a mini-hi-fi system with a difference. The Legato breaks new ground for this form factor delivering DAB, FM, CD and MP3 playback, along with features such as Pause and Rewind. Priced at £349.99, Legato was launched at the Bristol Hi-fi show in February and is expected in stores this summer."⁴⁴

C. Product-Service Combinations Also Make DAB Interactive

Not all functionality will be provided by fully integrated products. In many cases, even more capabilities can be programmed by different software authors into more

⁴⁴ http://www.drdb.org/mar_2004.php.

utilitarian hardware devices. Examples are the various computer cards represented here by Modular Technologies' PCI card and the multipurpose Psion Wavefinder and its different software options.

The following two devices share a common feature: They require attachment to (Wavefinder) or installation within (Modular Tech) a computer, effectively turning that computer into a DAB receiver/recorder.

Psion Wavefinder



The Wavefinder, first available in the fall of 2001, is a DAB receiver implemented as a computer component; it requires a computer and when attached it enables the computer to function as a DAB receiver/recorder. It ships with Windows-based software of its own, but is adaptable with third-party or custom software written by others, including DAB Bar,⁴⁵ WinDAB,⁴⁶ DAB Explorer,⁴⁷ WaveLite⁴⁸ and LoboDAB.⁴⁹ Most if not all the software written for the Wavefinder incorporates recording capabilities, including

⁴⁵ <http://www.dabbar.co.uk/dabbar.htm>.

⁴⁶ <http://www.windab.co.uk/>.

⁴⁷ <http://www.spidersweb.freemove.co.uk/dab/wfaq/>.

⁴⁸ <http://www.todds-hanger.freemove.co.uk/wavelite.htm>.

⁴⁹ <http://www.leonlobo.com/>.

all of the software cited above. The Wavefinder will not work without a computer, and is priced at approximately \$50.⁵⁰

Modular Tech



Modular Tech and some other companies such as Bosch and Terra Tec make computer-based solutions that involve aftermarket devices such as PCI boards that are user-insertable into Windows and other computers.⁵¹ Like the Wavefinder from Psion, these permit aftermarket software to access the DAB signal for purposes of listening, recording and data extraction. The Modular Tech board sells for approximately \$200 and was first available June 2002.

The functional difference between the Modular Tech computer card and the Psion Wavefinder attachment is that the computer card is semi-permanently installed inside the case of a desktop computer or computer server; the Psion Wavefinder simply plugs into the computer case externally, and can work with a laptop computer as easily as it can a desktop or server computer.

⁵⁰ <http://www.spidersweb.freemove.co.uk/dab/wfaq/>.

⁵¹ <http://www.wohnort.demon.co.uk/DAB/pcdab.html>.

IV. TO WHAT DEGREE DO THESE PRODUCTS AND SERVICES NOW, OR WILL THEY IN THE FUTURE, INTEGRATE FEATURES THAT ENABLE ON-DEMAND ACCESS TO SOUND RECORDINGS?

One relatively simple explanation of the role of on-demand access in the music value chain focuses on the difference between “push” and “pull.” Music that is chosen by someone else and pushed by them to you usually costs you very little to hear in your car, for example, or at home or in a restaurant. It has little to no “option value,” meaning the consumer has no ability to control when or how (the option) to listen to (consume) a broadcast.

Music you pull – that you determine when you want to hear – on the other hand, is relatively expensive. On-demand access is loaded with option value, as you control when and how to listen. Buy music and you can use it at any time at your option.

In short, with regards to music, we pay for control. That which we cannot control is relatively cheap, and feels free, although it is not free (being required to listen to advertising is the consumer’s indirect “payment” for free over-the-air broadcasting). That which we can control, on the other hand, usually costs money, in some instances for as low as 99 cents per track from an on-line store such as iTunes to as much as \$14.99 for a commercially released compact disc, with other subscription services falling somewhere in between. The common thread for high-option-value music, however, is the fact that rights fees are paid to copyright owners for that increased value.

*Did you just hear a great song or something really funny? Go back and record it!*⁵² – Advertisement for Applian’s Radio Wizard

⁵² <http://www.radio-wizard.com/>.

Technology Can Now Turn Push Into Pull

Technology buffers can turn push into pull, and buffers are easier to use and gaining intelligence.

Traditional reel-to-reel tape recorders are, of course, buffers, but they were clumsy tools for grabbing audio. Cassettes made the task easier, of course, and digital recording was at first more of the same without the tape and the box.

Today, however, you can find intelligent buffers like the BOOMBox Internet Radio Player, which is “a small application to help you find online radio stations that interest you. It has a full suite of categorizing, searching, and filtering by bitrate (connection speed) to find that certain type of music your [sic] looking for. It includes a favorites database, and options to make [the] program work for your needs. [It] also include[s] a recorder so you can record songs off the station your [sic] currently listening to and a keyboard shortcut to not miss a second of the song.”⁵³

There are many similar recorders focused on recording streamed music, including Blaze Audio,⁵⁴ RipCast,⁵⁵ Inet Stream Archiver,⁵⁶ StreamRipperX,⁵⁷ Audio Hijack Pro,⁵⁸ PoGo!⁵⁹ and others.

These software and hardware radio recorders include record, play, start and stop buttons – the usual recording functions. Some of them, like PoGo!'s RadioYourWay,

⁵³ License agreement for Internet BoomBox Radio Player.

⁵⁴ <http://www.blazeaudio.com/>.

⁵⁵ <http://www.xoteck.com/ripcast/>.

⁵⁶ <http://www.xample.ch/>.

⁵⁷ <http://streamripperx.sourceforge.net/>.

⁵⁸ <http://www.rogueamoeba.com/audihijack/>.

⁵⁹ http://www.pogoproducts.com/radio_yourway.html.

add timers that automate the record function. These are relatively smart recorders, but nowhere near as intelligent as the next generation of recorders now coming to market.

Now the environment has changed dramatically: It is now possible to record songs with your computer without so much as telling the device to start recording at the beginning of the song, and stopping at the end. With this new software, you just start the software and return hours or days later to find the computer's drive filling with MP3 files of sound recordings.

Applian Software makes a suite of products designed to turn push radio into music you can pull, loaded with option value never intended by its broadcaster.

"Our name says it all: 'Applian' is short for 'Appliance.' Our software turns computing devices into useful appliances. We have the best suite of recording products on the market, including Replay Radio, WM Recorder and Radio Wizard."⁶⁰

Replay Radio, Radio Wizard, MP3 Magic, WindowsMedia Recorder

Replay Radio was one of Applian's first products, with Automatic Track Splitting ("Replay Radio now comes with a cool new track splitting feature, giving you more control over how you listen to your recordings.")⁶¹ "For internet only music radio stations like AccuRadio, Radio@Netscape, MSN Radio, Rhapsody, iTunes and others, Replay Radio can detect silence after a song has finished playing, and automatically create a

⁶⁰ <http://www.replay-music.com/company.php>.

⁶¹ <http://www.replay-radio.com/>.

new track. Then, you can listen on your MP3 Player or CD, and skip over songs you don't like, just as you do when listening online!"⁶²

"Version 4.03 will automatically add recorded tracks to iTunes. Whenever you sync your iPod, your recordings are transferred instantly, and organized so you can locate them with ease."⁶³

Applian also markets Radio Wizard, which is designed to make "listening to live online radio or streaming audio more fun than ever! Now you can take control of the audio stream – pause it, rewind it, fast-forward it, or record it. Radio Wizard is just like a TiVo™ for live internet radio. With this kind of control, you can enjoy live radio like never before."⁶⁴

MP3 Magic is another one of Applian's software products: "MP3 Magic makes it easy for you to split, chop, trim and edit MP3 files saved by Radio Wizard, Replay Radio or any other program. If you're looking for a way to eliminate ads, dead air or other unwanted filler in your recordings, MP3 Magic is the solution. You can also make segments by time, duration or file size. It's really handy!"⁶⁵

Replay Music

Eventually, Applian made its intentions completely clear with "Replay Music: The Easy New Way to Turn Streaming Music into MP3s."

⁶² <http://www.replay-radio.com/>.

⁶³ <http://www.replay-radio.com/>.

⁶⁴ <http://www.radio-wizard.com/>.

⁶⁵ <http://www.radio-wizard.com/mp3magic.php>.

“*Replay Music* is a revolutionary new way to capture online music into individual MP3 files. Just play music from your favorite online radio station or streaming music service, and every song is saved on your PC as a high quality MP3 file, automatically tagged with the artist and song title, and perfectly separated into individual tracks. You can even burn songs directly to CDs. It's a great way to discover new music!”⁶⁶

“Here's why *Replay Music* is the Ultimate Streaming Music Recorder: Captures streaming music into high quality MP3 files, and burns audio CDs too. Splits recordings precisely and accurately into separate tracks. Automatically tags songs with artist and track information.”⁶⁷

*Replay Music records MP3s, recognizes each song, and automatically adds the artist and song title to each MP3 file. How cool is that! – Applian advertisement for Replay Music*⁶⁸

“With one click, *Replay Music* can record most streaming music, including songs from these services: Rhapsody™ Napster™ Music Match™ Radio Radio@Netscape™ Yahoo Launch™ AOL Radio™ AccuRadio™ Ad-free Internet radio (i.e. Shoutcast™) and more!”⁶⁹

“Tags Songs Automatically: Only *Replay Music* can automatically tag your recorded MP3s. Using proprietary MoodLogic™ song recognition technology, *Replay Music*

⁶⁶ <http://www.replay-music.com/?src=RAD>.

⁶⁷ <http://www.replay-music.com/?src=RAD>.

⁶⁸ <http://www.replay-music.com/?src=RAD>.

⁶⁹ <http://www.replay-music.com/?src=RAD>.

identifies each song after it's recorded, and adds the artist and song name information to each MP3 file. Not only can you record, but now you know what you're listening to!"⁷⁰

"Precise Track Splitting: *Replay Music* sports the most sophisticated track splitting algorithms on the planet. Besides just recording and tagging, each MP3 file contains the entire song -- no more, no less. Other recording programs may chop off the start or end of the song, or add unwanted noise."⁷¹



⁷⁰ <http://www.replay-music.com/?src=RAD>.

⁷¹ <http://www.replay-music.com/?src=RAD>.

⁷² http://www.replay-music.com/user_guide.php.

“Before you purchase Replay Music, you can record and tag ten tracks for free. When you purchase, you get an additional 5000 tracks to record and tag. You can purchase additional blocks of 5000 recordings when you run out.”⁷³

“If Eliminate similar tracks is checked, any duplicate songs with the same name during the current recording session are not saved. If you're recording online radio, leave this checked, as online radio stations may repeat songs.”⁷⁴

“After each song ends, Replay Music determines the artist and track name, and displays those names in the recorded songs list. Occasionally, a song cannot be recognized, in which case the song will appear as "Track1", "Track2", etc.”⁷⁵

“Replay Music can burn CDs automatically from your recordings. Both Audio CDs and MP3 DATA CDs can be created. Plus, you can make CDs on-the-fly, or pick tracks to place on a CD after a recording session has ended.”⁷⁶

You can even use Replay Radio to record from XM's new XM PCR (“PC Radio”) product.⁷⁷ Some fans are doing just that, as they've discussed on Internet bulletin boards.⁷⁸

The introduction of new hardware (radio receivers/recorders) and software that facilitates a consumer's ability to record free over-the-air DAB broadcasts and make libraries of thousands of copyrighted sound recordings turns what had been a

⁷³ http://www.replay-music.com/user_guide.php.

⁷⁴ <http://www.replay-music.com/?src=RAD>.

⁷⁵ http://www.replay-music.com/user_guide.php.

⁷⁶ Id.

⁷⁷ <http://www.bostonpocketpc.com/modules.php?op=modload&name=Mobile&file=rwview&id=121>.

⁷⁸ <http://www.xm411.com/>.

noninteractive push medium into one that gives tremendous control – pull capability – to the consumer. Consumers will no longer need to purchase music to obtain high option value – the ability to control when and how music will be consumed – with the new products described above. Instead, all they will have to do is record through a combination receiver/recorder or run a software application to capture all the music they want – all for free (except for the cost of purchasing such hardware or software).

V. TO WHAT DEGREE DO THESE PRODUCTS AND SERVICES NOW, OR WILL THESE OR OTHER PRODUCTS IN THE FUTURE, PERMIT REDISTRIBUTION, EITHER THROUGH REMOVABLE MEDIA OR DIGITAL OUTPUTS OR OTHER METHODS?

The global native DAB format is MP2,⁷⁹ easily converted through available free software into the standard codec for redistribution, which is MP3. For example, the popular and free software WinAmp allows an MP2 file to convert to a WAV file, and from there it encodes it to an MP3. The devices maintain digital-out capabilities and random access media, such as smart digital cards and multimedia memory cards. The new TI chipset can read DAB in MP2 at the same time as it writes data in MP3 or WMA, as can the Bosch chipset that powers Blaupunkt units.⁸⁰

In fact, a comparison of building an on-demand music collection through smart buffering of streaming digital media versus using peer-to-peer networks shows that the latter is more difficult and cumbersome by comparison, both technically and by risk analysis.

A technical comparison: The peer-to-peer user must understand computers, downloading and installing new software from Internet web sites, and how to interface the files gathered with the multimedia system in the computer. While many peer-to-peer services are easy to use, they frequently require a level of sophistication to get them to install properly onto a computer and to work with existing software. The quality of music available on a peer-to-peer system also varies greatly, depending upon the type of recording made by the source file sharer. Many efforts at downloads stop midway, if they start at all, and the songs are often not what they claim in their title.

⁷⁹ http://www.digitalradiotech.co.uk/digital_radio_samples.htm.

⁸⁰ http://focus.ti.com/pdfs/vf/audio/dre310_prod_bull_06_12.pdf.

In comparison, a programmable DAB receiver/recorder – like those outlined above or future iterations of these products – can fill a jukebox hard drive with all the songs played on the radio, being limited only by the size of a hard drive and number of songs broadcast on all radio stations in a local radio market. Such recording would almost certainly be easier than programming a VCR and would require a level of technical sophistication similar to what is required to operate a digital camera – very little.

Risk-wise, there is likewise an imbalance between peer-to-peer usage and DAB recording: The computer user is interacting with a network, leaving a digital signature that can be traced, and running the risks of contracting viruses, opening a computer to hackers and drawing the attention of copyright owners. Recording music from a DAB broadcast, on the other hand, would be anonymous, result in CD-quality audio recording, and would not expose the owner of a DAB recorder to viruses, hackers or copyright owners enforcing their rights.

VI. WHAT IS PLANNED FOR THE FUTURE?

Typically, we think of AM/FM radio as “one to many,” meaning it is broadly cast upon an audience, all of whom receive roughly the same simultaneous listening experience in whatever time and place they occupy at the moment.

DAB starts with this paradigm, but quickly leaves it behind, heading towards narrowcasting rather than broadcasting. Because DAB delivers a stream of digits more than ample for the delivery of a stereo audio signal, it carries with it additional data and additional channels that can be used for personalization supplements. The “main” broadcast signal will always be available, but the channels and services surrounding the “main” broadcast signal will change the fundamental nature of radio.

Combined with a data buffer that should continually grow in size and fall in price, DAB receivers are not so much simple players as they are complex storage devices that begin their interaction with pause, rewind and forward and progress to customized programming fed from numerous data channels.

Truly, DAB can be said to be “many to one,” not “one to many.” Its medium may be broadcasting, but its selectivity, data storage and intelligence converts this ability to narrowcasting. In effect, it is more like Tivo than broadcast television.

To be sure, it would be possible to implement a DAB system where the same audio signal is made available in identical fashion to every receiver in real-time, rendering it more like traditional audio broadcasting, but the specification for DAB contemplates

interactive access to a buffer through a programmed gateway as a means to optimize revenue and revolutionize the medium and its fiscal potential.⁸¹

Command Audio: iBiquity's Interactive Goals

All this discussion of the evolution of digital radio could be dismissed as mere conjecture and theory were it not already the clear path carved publicly for DAB by its creator, iBiquity Digital Corporation.

On August 6, 2002, iBiquity Digital acquired for all purposes related to digital radio the intellectual property of Command Audio,⁸² a privately held company backed by strategic investors Macrovision, Texas Instruments, and Motorola and leading financial investors, including Canaan Partners, Granite Ventures, J.P. Morgan Capital Partners, and Paul Allen's Vulcan Ventures.⁸³

“Next-generation broadcasts will give listeners content control: Just as many AM radio listeners turned their dials to FM because of its improved quality, the emerging digital radio spectrum may see listeners migrate away from traditional analogue radio altogether, attracted by the variety of content and flexibility of the digital offering. ‘Digital audio broadcasting [DAB] is a quantum leap, taking us past FM and into a higher level of quality and fidelity,’ says Duff Roman, president of Digital Radio Roll-Out Inc. (DRRI) in Toronto. ... (T)he goal of DRRI is not simply to make standard radio broadcasts sound

⁸¹ http://www.broadcastsignallab.com/white_papers/NAB-0402-mgmt-of-IBOC-data-trans.pdf.

⁸² <http://www.ibiquity.com/press/pr/080602.htm>.

⁸³ http://www.canaanpartners.com/releases/2001/pt_20010914.html.

better. Its long-term goal is to change the nature of radio itself. Roman wants to see a new kind of broadcasting that gives listeners more content and flexibility.”⁸⁴

Don Bogue, co-founder and chief executive officer of Command Audio, says the real selling point for digital radio is that it breaks from the linear broadcasting format of analogue radio.⁸⁵

“Command Audio enables digital broadcasters to deliver on-demand interactive audio – Personal Radio – to listeners. The Company ... bring(s) on-demand interactive audio services to life across the emerging range of digital audio broadcasting systems. Command Audio offers solutions to digital broadcasters, content providers and device manufacturers that enable the production, transmission, reception, and navigation of Personal Radio.”⁸⁶

These excerpts from the iBiquity press release tell the story in iBiquity’s own words:

Columbia, MD and Redwood City, CA - (August 6, 2002) - iBiquity Digital Corporation, the sole developer of digital AM and FM broadcast technology in the United States and Command Audio Corporation, the pioneer of broadcast on-demand interactive media technology, announced today that iBiquity has acquired an exclusive worldwide license to Command Audio’s intellectual property and technology in the field of digital radio and Command Audio’s other digital radio-related assets. The acquisition has set the stage for radio broadcasters to provide consumers content on-demand — from program selection via electronic guide to scanning content to pausing or saving for later listening. Advertisers will be able to develop new messages which appeal to and connect with consumers, and content providers will have new tools with which to design innovative programming. iBiquity has established a Redwood City, California office and has hired the former software engineering employees of Command Audio.

⁸⁴ http://www.dtg.org.uk/news/archive/sum_0011.htm.

⁸⁵ http://www.dtg.org.uk/news/archive/sum_0011.htm.

⁸⁶ <http://www.ukdigitalradio.com/press/display.asp?id=97>.

According to Robert Struble, President and CEO of iBiquity, “iBiquity plans to integrate the Command Audio technology with our digital AM and FM system to allow broadcasters and consumers to fully leverage the revolutionary capabilities of digital radio. ... Radio manufacturers will be positioned to fully utilize the additional storage and multimedia capabilities in their products to differentiate the digital radio experience from today's analog.”

In acquiring the digital radio assets of Command Audio, iBiquity Digital has secured exclusive licensing rights to all Command Audio intellectual property for all radio systems and products including digital AM and FM radio, satellite digital radio and other digital radio systems worldwide. Command Audio's business now is focused entirely on licensing its on-demand media intellectual property in non-radio fields, such as the fast-growing market for personal video recorders in terrestrial and satellite television applications.⁸⁷

“On-demand interactive audio offers a new dimension of media,’ said Don Bogue, co-founder and CEO of Command Audio.”⁸⁸

Before its license arrangement with iBiquity, Command Audio entered into a joint venture with U.K. broadcaster Capital Radio and UBC Media to promote on-demand interactive audio programming in that country. The goal is to let people create personal radio programs so they can listen to what they want, whenever and wherever they may be.⁸⁹

Listeners continue to want and need the flexibility, reliability and quality that radio offers today, but we in the radio industry want to give them even more. - Göran Arvedahl, Chairman of Regulatory and Spectrum Committee, World DAB Forum, Summer 2003⁹⁰

⁸⁷ <http://www.ibiquity.com/press/pr/080602.htm>.

⁸⁸ http://www.dtg.org.uk/news/archive/sum_0011.htm.

⁸⁹ http://www.hubcanada.com/story_7466_24.

⁹⁰ World DAB Forum, Summer 2003, Aiding Implementation and Roll-Out of T-DAB, http://www.worlddab.org/images/DRAFTBROCHURE_5_FINAL.pdf, Page 3.

VII. CONCLUSION

Digital Audio Broadcast brings great change to what was once called radio, changes far deeper than the difference between a crystal radio kit and today's transistor-based digital receivers.

As Digital Audio Broadcast reveals itself to a growing global audience, products will evolve to incorporate more memory, more features and at lower prices. Developments begun in Asia and Europe have already spread to Canada and will take root in the United States: Recording is a primary intended function for DAB devices, and there is available software to render digital streams into discs and drives that hold libraries and jukeboxes of music.

Regardless of recording capabilities, the sheer quantity of offerings and the program guide's facility with them will make interactive a medium that was once known for its passivity.

Taken in total, digital audio broadcast is an interactive multimedia experience, a far cry from traditional radio.

Its receivers have already sprouted integrated smart memory, and it is inevitable that left unchecked they will incorporate hard drives that double in size and halve in price with regularity. The technology to build an inexpensive jukebox that fills constantly with digital broadcast songs is not theoretical: It can be purchased today at retail, and will likely fall in price and find its way to integrated hardware relatively soon.

About Cherry Lane Digital LLC

Cherry Lane Digital LLC is run by Jim Griffin, ex-head of technology for Geffen Records, now a globally recognized expert in entertainment technology. Jim testified before the U.S. Senate Judiciary Committee on file sharing and as an expert witness in the Copyright Office CARP proceeding on web-casting rates. His clients include artists, record companies, music publishers, technology companies and media companies. He is an acclaimed author and speaker on entertainment and technology. This report was prepared by him and he takes full responsibility for its content.

Cherry Lane Digital is part of the Cherry Lane Music Group of companies, which include interests in publishing, sound recordings, magazines, and other elements of entertainment production, distribution and delivery. Cherry Lane has offices in New York, Los Angeles, Beijing and Washington.